
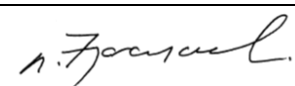
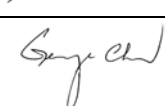
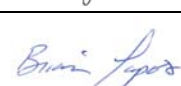


The Windsor-Essex Parkway Project

90% Geotechnical Investigation and Design Report – Phase I Sign Structures

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1 Introduction

1.1 Preface

The Windsor Essex Parkway (the Parkway) was conceived to strengthen transportation and trade links between Canada and the United States, reduce road congestion, and foster economic growth. The Parkway will connect Highway 401 to a new Canadian inspection plaza and a new international crossing over the Detroit River to Interstate 75 in Michigan, USA. It will be a below-grade, six-lane highway, 11 km long with 11 tunnels and a four-lane service road that will provide full access to schools, neighbourhoods, natural areas, and shopping. Other components of the project include community and environmental features, such as: 300+ acres of green space, 20 km of recreational trails, extensive landscaping throughout the corridor, as well as noise and environmental mitigation measures. The environmental mitigation measures were based upon Permit AY-D-001-09 which was approved in February 2010.

The Parkway's strategic international importance, urban location, and unique ecological context necessitate strong design and planning principles to guide infrastructure development. The Parkway is to be a state-of-the-art facility within a contextually sensitive landscape setting that has ecological integrity, builds physical and cultural connections, and establishes a sustainable network of amenities that can be enjoyed by present and future generations.

The plans for the Parkway strive to build and strengthen linkages within and between both human and ecological communities. Over time, restored green space will evolve into a tall grass prairie and oak savannah landscape that will, through ecological succession, allow the roadway to become a 'Parkway in a Prairie'. All of the green space areas of the Parkway, (whether associated with the Roadway, the Stormwater Management Areas, the Ecological Landscape areas, or the Screening), are ecologically based areas that in their totality will represent an extensive habitat network consisting of existing, new and rehabilitated terrestrial and aquatic communities.

Natural and cultural history are proposed to be celebrated in the artful design of three Gateways, and eleven Land Bridges that support the existing municipal road system and the inter-connected multi-use pathway system. The Gateways are conceived as bold and commanding landscapes that draw on sculpted landform, strong patterning, and public art to create strong visual elements for the driving experience within themes of 'Arrival, Settlement, and Flow'.

The Land Bridges draw on natural and cultural influences to create distinct and memorable places that serve as markers, urban respite areas, and focal points to the overall green space system. Other opportunities for artistic expression include the streetscapes and urban amenity areas, trail bridges; tunnel abutments, and noise walls. These structural elements offer opportunities for simple expression of the surrounding natural environment, area history and the 'prairie' landscape in particular, through color, form, materials, and the integration of public art.

The lasting legacy of the Windsor Essex Parkway project will not only be its significant contribution as an international trade and transportation route, but rather include the establishment of a contiguous and sustainable green space system that contributes to the quality of life in the community and supports the re-establishment of an ecologically rich Carolinian landscape.

On December 17, 2010 Infrastructure Ontario and MTO announced that the Windsor Essex Mobility Group (WEMG) reached financial close and signed a fixed-price contract with the Province to design, build, finance and maintain the Windsor-Essex Parkway. To build the initial works, WEMG has formed a Design-Build Joint Venture – Parkway Infrastructure Constructors. This team includes Dragados Canada, Inc., Acciona Infrastructure Canada Inc., and Fluor Canada Ltd. This combination brings a wide range of local and international experience to the project.

1.2 Report Introduction

This report presents the geotechnical design of the Phase I implementation of the overhead sign (OHS) and Changeable Message Sign (CMS). There are thirty-one signs in total for Phase I, eighteen OHS and thirteen CMS located in the proposed Windsor-Essex Parkway (WEP) project. There are two standard design types for OHS signs: 1) Tri-chord static sign supports, and 2) Cantilevered static sign supports as per MTO Sign Support Manual (R-34). There are two standard design types for CMS signs: 1) Variable Message Sign (VMS) overhead truss sign supports and 2) Amber Alerts Signs (AAS) pole-mounted sign supports as per MTO Sign Support Manual (R-34). This report includes the results of geotechnical investigation carried out to support the design and other relevant background information.

The 11.2 km long proposed WEP will run generally east-west and connect the existing Highway 401 in Tecumseh to the proposed new international crossing bridge across Detroit River (near Zug Island). It will run successively along segments of Highway 3 and Huron Church Road and then adjacent to the E.C. Row Expressway to its intersection with Ojibway Parkway. It will be constructed mostly within cut sections until the intersection of Huron Church Road and E.C. Row Expressway, beyond which it will be mostly on embankments. The proposed WEP includes major structures consisting of 15 bridges (Bridges B-1 to B-15), 11 tunnels (Tunnel T-1 to T-11), 9 trail bridges, approximately 5.5 km length of retaining walls, 2 submerged culverts, and other structures.

The eighteen proposed OHS (12 Tri-chords and 6 Cantilevers) and thirteen proposed CMS (6 VMS and 7 AAS) are located at the following stations:

Sign Designation	Station	Design Sign Type
OHS 7	STA 10+070L	Tri-chord
OHS 8	STA 10+415 HWY 401	Tri-chord
OHS 9	STA 13+460L	Tri-chord
OHS 10	STA 13+820L	Tri-chord
OHS 16	STA 11+429 HWY 401	Tri-chord
OHS 17	STA 12+305 HWY 401	Tri-chord
OHS 18	STA 10+940 HWY 401	Tri-chord
OHS 19	STA 11+440 HWY 401	Tri-chord
OHS 27	STA 30+100 HWY 3	Tri-chord
OHS 28	STA 41+410 HWY 3 (SR4)	Cantilever

OHS 29 STA 10+510 HWY 3 (SR5) Tri-chord

Sign
Designation Station Design Sign Type

OHS 32 STA 41+783 HWY 3 (SR4) Cantilever

OHS 33 STA 10+335 HWY 3 (SR5) Cantilever

OHS 34 STA 10+600 HWY 3 (SR5) Tri-chord

OHS 35 STA 10+140 HWY 3 (SR6) Cantilever

OHS 45 STA 10+385 WBR 10 Cantilever

OHS 46 STA 10+200 WBR 9 Tri-chord

OHS 47 STA 10+150 Howard Ave Cantilever

VMS 3 STA 10+875L HWY 401 Overhead Truss

VMS 4 STA 12+110L HWY 401 Overhead Truss

VMS 5 STA 12+240T HWY 401 Overhead Truss

VMS 10 STA 10+210L HWY 401 Overhead Truss

VMS 11 STA 12+676L HWY 401 Overhead Truss

VMS 12 STA 10+640T HWY 401 Overhead Truss

AAS 1 STA 9+833 Cabana Rd Pole Mounted

AAS 2 STA 10+256 Todd Lane Pole Mounted

AAS 3 STA 21+579 HWY 3 (SR2) Pole Mounted

AAS 4 STA 21+579 HWY 3 (SR2) Pole Mounted

AAS 5 STA 9+820 Howard Ave Pole Mounted

AAS 6 STA 10+400 Howard Ave Pole Mounted

AAS 7 STA 10+241 HWY 3 (SR6) Pole Mounted

This report is organized in two parts. Part 1 is the Factual Information and is presented in Sections 1 to 4. Part 2 presents the geotechnical design and recommendations in Sections 5 and 6. Other information is presented in Sections 7 to 9.

The design complies with the requirements of PA Schedule 15-2 Part 2, Article 8.4.

2 Background Information

2.1 Geological Setting

The WEP project site is located within the Essex Clay Plain (a part of the St. Clair Clay Plain physiographic region) (ref. R-11, R-13, R-14, and R-20). The Essex Clay Plain was deposited during the retreat of the late Pleistocene Era ice sheets, when a series of glacial lakes inundated the area. The ice sheets generally deposited materials with a glacial till like gradation in the Windsor area. Depending on the locations of the glacial ice sheets and depths of water in the ice-contact glacial lakes, the materials may have been directly deposited at the contact between the ice sheet and bedrock or, as the lake levels rose and the ice sheets retreated and floated, the soil and rock debris within and at the base of ice may have been deposited through the lake water (i.e., lacustrine environment). It is considered that unlike typical till deposits (that have undergone consolidation and densification under the weight of the ice sheet), the majority of the “glacial till” soils in the Windsor and Detroit area were deposited through water and have a soft to firm consistency below a surficial crust layer that has become stiff to hard due to weathering and desiccation. Geologically, the deposit in the project area is considered to be slightly over-consolidated, having experienced no major overburden stresses in excess of the existing stresses.

The overburden in the St. Clair Clay Plain has variously been described as a clayey silt till, silty clay till and glaciolacustrine clay. P.P. Hudec (R-20) summarized the overburden geology in Windsor as consisting of the following successive strata: desiccated lacustrine clay, normally consolidated lacustrine clay, silty Tavistock till, glaciolacustrine clay and coarse Catfish Creek till. A distinct change in overburden deposits occurs in the east-west direction along a boundary located generally along the Huron-Church Road. Whereas, the eastern part of Windsor is underlain by firm to stiff glaciolacustrine silts and clays with upper deposits of stiff sandy to silty weathered clay and hard to stiff lacustrine clay-silt crust, the western part of Windsor is characterized by a thin surficial granular deposit underlain by thin crust layer underlain by soft to firm glaciolacustrine silts and clays.

At the WEP project area, the glacial till like deposit is typically 20 to 35 m thick and consists primarily of silty clay and clayey silt gradation with a random distribution of coarser particles. Random and apparently discontinuous seams / lenses of silt, sand and or gravel are present at various depths within the mass of the silty clay deposit. A firm to hard surficial crust layer has formed due to desiccation. Up to 2 m thick surficial layers of lacustrine silty clay or silt and sand are also encountered in the western sector of the project. A 1 m to 6 m thick very dense or hard basal glacial till or dense silty sand may be found directly overlying the bedrock surface. The bedrock at the project area comprises the Devonian Dundee Formation of the Hamilton group of formation and the underlying Devonian Lucas Formation of the Detroit River group of formation.

The Windsor area, referred to as the Essex Domain (with respect to bedrock geology), is located in the Grenville Front Tectonic Zone (GFTZ). The bedrock geology within the Essex Domain was formed as part of the midcontinent rift southeastern extension. The midcontinent rift southeastern extension is composed of Paleozoic cover rocks which form the bedrock foundation of the Essex Domain. The bedrock was deposited in the Paleozoic Era during the Middle Devonian period. Within the Essex Domain the following strata were deposited: the Hamilton Group, Dundee Formation, and Detroit River Group Onondaga Formation all consisting of Limestone, Dolostone, and Shale.

2.2 Site Seismic Background

In accordance with the Canadian Highway Bridge Design Code (CHBDC), the soil profile at the site of the project meets in general the description for Soil Profile Type III (soft clay and silts greater than 12 m in depth). A limited number of cross-hole tests was completed during the background investigation program (ref. R-11 to R-18) at locations distributed strategically along the project alignment between Howard Road (east end) and Matchette Road (west end). The measured velocities of the shear waves were consistently over 200 m/s, with the bulk of results ranging between 200 and 300 m/s.

Seismic design requirements for bridges and highway structures are governed by CHBDC. Windsor-Tecumseh area is described in CHBDC by a seismic hazard associated to a Zonal Acceleration Ratio A of 0. Therefore, seismic acceleration effects on the sign structure foundations need not be considered.

2.3 Site Conditions

OHS, VMS, and AAS sites for Phase I are situated in the east of the Parkway. The topography of the lands immediately adjacent to Phase I OHS, VMS, and AAS structures is relatively flat with the following approximate existing ground surface elevations (before construction):

Sign Designation	Existing Ground Surface Elevation, m
OHS 7	180.9-181.2
OHS 8	181.4-181.6
OHS 9	185.8
OHS 10	186.3-186.4
OHS 16	182.3-182.6
OHS 17	184.1
OHS 18	186.2-186.4
OHS 19	187.7-188.3
OHS 27	181.6
OHS 28	185.2-185.5
OHS 29	186.9
OHS 32	185.8
OHS 33	186.5-186.6
OHS 34	187.6
OHS 35	187.4
OHS 45	187.2
OHS 46	186.6-187.4
OHS 47	187.6
VMS 3	182.3-183.9
VMS 4	183.6-184.0
VMS 5	198.0-198.1
VMS 10	180.8-181.7

Sign

Designation	Existing Ground Surface Elevation, m
VMS 11	184.6-185.5
VMS 12	187.4-187.9
AAS 1	180.7-181.0
AAS 2	180.8
AAS 3	180.9-181.5
AAS 4	180.9-181.5
AAS 5	186.2
AAS 6	187.6
AAS 7	187.4

Adjacent land use of the OHS, VMS and AAS signs is typically residential.

3 Geotechnical Investigations

3.1 Scope and Procedures of Geotechnical Investigations

Geotechnical investigations involving a number of boreholes, cone penetration tests (CPT) and Nilcon vane tests had been carried out in 2007-09 by Golder Associates (ref. R-11 to R-18) as part of background information for development of the WEP preliminary designs (pre-bid investigations). Additional geotechnical investigations (AMEC investigation) were carried out in 2011 to supplement the previously obtained (pre-bid) subsurface soil data, as required to support the detailed design development of the WEP embankment and structures. The AMEC investigation program at and around the proposed locations of Phase I OHS, VMS and AAS signs comprised a total of 24 boreholes (BH 12-RW, BH 13-RW, BH 18-RW, BH 19-RW, BH 25-RW, BH B11-1, BH B12-1, BH B12-2, BH B15-1, BH B15-2, BH B15-3, BH B9-2, BH B9-3, BH CV1-1, BH CV2-1, BH PS3-1, BH T11-3, BH T6-1, BH T6-2, BH T6-3, BH T7-1, BH T9-1, BH TB4-1, and BH TB4-2), 13 cone penetration tests (CPT 37-RW, CPT 39-RW, CPT 43-RW, CPT 47-RW, CPT 50-RW, CPT 55-RW, CPT B11-1, CPT B13-1, CPT B15-1, CPT B15-2, CPT B9-2, CPT B9-3, and CPT T10-), 8 Nilcon vane profiles ("NIL" adjacent Boreholes BH B9-1, BH B12-1, BH B15-1, BH T6-2, BH T6-3, BH T9-1, BH T9-2, and T11-3), and 5 flat plate dilatometer profiles (DMT B9-1, DMT B9-2, DMT B11-1, DMT T6-1, and DMT T9-1). Tables 3-1 to 3-3 list the test holes put down at or in close proximity to the corresponding sign sites during both the pre-bid and the geotechnical (AMEC) investigations.

Table 3-1: Test Holes at and around Phase I OHS Sites

Reference	Signs	Drawing	Boreholes	Nilcon Vane Tests	HGMW's ⁺	DMT's	CPT's
AMEC Investigation	OHS 7	285380-04-090-WIP1-8070	BH 12-RW, BHT6-2	NIL T6-2		DMT T6-1	
	OHS 8	285380-04-090-WIP1-8080	BH PS3-1, BH T7-1				CPT 39-RW
	OHS 9	285380-04-090-WIP1-8090	BH T11-3	NIL T11-3			
	OHS 10	285380-04-090-WIP1-8100	BH B12-1, BH B12-2	NIL B12-1			
	OHS 16	285380-04-090-WIP1-8160			HGMW-2		CPT 43-RW
	OHS 17	285380-04-090-WIP1-8170		NIL T9-2		DMT T9-1	
	OHS 18	285380-04-090-WIP1-8180	BH CV1-1, HGMW-6,	NIL CV1-1			
	OHS 19	285380-04-090-WIP1-8190	BH 25-RW				
	OHS 27	285380-04-090-WIP1-8270				DMT B9-1	
	OHS 28	285380-04-090-WIP1-8280	BH B11-1			DMT B11-1	CPT B11-1
	OHS 29	285380-04-090-WIP1-8290					CPT B13-1
	OHS 32	285380-04-090-WIP1-8320					CPT 50-RW
	OHS 34	285380-04-090-WIP1-8340	BH 18-RW				
	OHS 35	285380-04-090-WIP1-8350	BH 19-RW				
	OHS 46	285380-04-090-WIP1-8460					CPT 55-RW
	OHS 47	285380-04-090-WIP1-8470	BH 18-RW				
Pre-Bid Investigation	OHS 7	285380-04-090-WIP1-8070	BH 324				CPT 324
	OHS 8	285380-04-090-WIP1-8080	BH -127				
	OHS 9	285380-04-090-WIP1-8090	BH-107				
	OHS10	285380-04-090-WIP1-8100	BH-302				CPT 302
	OHS 16	285380-04-090-WIP1-8160	BH-119				
	OHS 17	285380-04-090-WIP1-8170	BH-115				
	OHS 18	285380-04-090-WIP1-8180	BH 233N, BH-4				
	OHS 19	285380-04-090-WIP1-8190	BH 225N, BH 226N				
	OHS 27	285380-04-090-WIP1-8270	BH-122, BH-123				CPT-10, CPT-123
	OHS 29	285380-04-090-WIP1-8290	BH-208				

Reference	Signs	Drawing	Boreholes	Nilcon Vane Tests	HGMW's*	DMT's	CPT's
	OHS 32	285380-04-090-WIP1-8320					CPT-3
	OHS 33	285380-04-090-WIP1-8330	BH-102, BH-206				CPT-206
	OHS 45	285380-04-090-WIP1-8450	BH 202, BH-203				
	OHS 46	285380-04-090-WIP1-8460	BH-101, BH-2				

Note: * HGMW denotes Hydro-geological Monitoring Well

Table 3-2: Test Holes at and around Phase I VMS Sites

Reference	Signs	Drawing	Boreholes	Nilcon Vane Tests	HGMW's*	DMT's	CPT's
AMEC Investigation	VMS 3	285380-04-090-WIP1-8003	BH B9-2, BH B9-3	NIL B9-1		DMT B9-2	CPT B9-2, CPT B9-3
	VMS 4	285380-04-090-WIP1-8004	BH T9-1	NIL T9-1			
	VMS 5	285380-04-090-WIP1-8005	BH B15-1, BH B15-2, BH B15-3	NIL B15-1			CPT B15-1, CPT B15-2
	VMS 10	285380-04-090-WIP1-8010	BH T6-1, BH T6-3	NIL T6-3	HGMW-7		CPT 37-RW
	VMS 11	285380-04-090-WIP1-8011					CPT T10-1, CPT 47-RW
Pre-Bid Investigation	VMS 10	285380-04-090-WIP1-8010	BH-129				CPT-11
	VMS 11	285380-04-090-WIP1-8011	BH-112				CPT-5
	VMS 12	285380-04-090-WIP1-8012	BH-101, BH-201, BH-202				CPT-201

Note: * HGMW denotes Hydro-geological Monitoring Well

Table 3-3: Test Holes at and around Phase I AAS Sites

Reference	Signs	Drawing	Boreholes	Nilcon Vane Tests	HGMW's*	DMT's	CPT's
AMEC Investigation	AAS 1	285380-04-090-WIP1-8201	BH TB4-1, BH TB4-2				
	AAS 2	285380-04-090-WIP1-8202	BH 13-RW				
	AAS 3	285380-04-090-WIP1-8203	BH T7-1				CPT 39-RW
	AAS 4	285380-04-090-WIP1-8203	BH T7-1				CPT 39-RW
	AAS 5	285380-04-090-WIP1-8204	BH CV2-1				
	AAS 6	285380-04-090-WIP1-8205	BH 18-RW				
	AAS 7	285380-04-090-WIP1-8206	BH 19-RW				
Pre-Bid Investigation	AAS 3	285380-04-090-WIP1-8203	BH-128				CPT-128
	AAS 4	285380-04-090-WIP1-8203	BH-128				CPT-128

Note: * HGMW denotes Hydro-geological Monitoring Well

Drawings listed in Tables 3-1 to 3-3 show the locations of the test holes and soil stratigraphic profiles along the WEP centreline for the general area at and around the sign structures.

3.1.1 Fieldwork

The boreholes were advanced using track-mounted CME 55 auger rigs owned and operated by Marathon Drilling Co. Ltd. under contract to AMICO and under technical supervision by AMEC engineers and technicians. Boreholes were generally advanced using 215 mm OD hollow stem augers, followed by wash boring with NW casing. The depth at which the drilling methods transition occurred was noted on the borehole logs.

Soil sampling was generally carried out using a 50 mm diameter split spoon sampler driven using an automatic trip hammer. At select depths, samples were also taken using 70 mm diameter and 600 mm long thin-walled Shelby tubes. Soil sampling was carried out generally at 0.75 m depth interval in the top 7 to 8 m and at 1.5 m depth intervals thereafter. All samples were identified and placed in airtight containers by an experienced technologist and were taken to AMEC's Tecumseh (Windsor) laboratories for further examination and testing. Rock coring of the bedrock was completed using NQ or HQ sized core barrels with a length of 1.5 m.

Standard Penetration Tests (SPT, ASTM D1586) were carried out in conjunction with split spoon sampling. Field vane tests (using conventional vanes) were carried out in between sampling at selected depths. The Nilcon vane tests (listed in Tables 3-1 to 3-3) were carried typically adjacent to the boreholes. Table 3-4 summarizes the depths of overburden penetration and rock coring as well as the list of instruments and the accompanying Nilcon vane tests.

Table 3-4: Overburden Thickness and Instrumentation in Boreholes

Borehole	Sign Designation	Location	Overburden Thickness, m	Rock Coring	Instrumentation Name & Elevation, m			
					Nilcon Vane	S-Piez.	VWP	MSG
BH 12-RW (2011)	OHS 7	332037.9E, 4679718.1N	> 6.6	N/A	N/A	N/A	N/A	N/A
BH 13-RW (2011)	AAS 2	331850.2E, 4679672.2N	> 7	N/A	N/A	N/A	N/A	N/A
BH 18-RW (2011)	OHS 34, OHS 47, and AAS 6	335692.7E, 4677390.7N	> 6.6	N/A	N/A	N/A	N/A	N/A
BH 19-RW (2011)	OHS 35 and AAS 7	335965.5E, 4677320.5N	> 6.6	N/A	N/A	N/A	N/A	N/A
BH 25-RW (2011)	OHS 19	336558.9 E 4677997.2 N	> 6.6	N/A	N/A	N/A	N/A	N/A
BH B11-1 (2011)	OHS 28	334583.9E, 4678221.4N	37	148.4 to 145.3	N/A	N/A	168.03	N/A
BH B12-1 (2011)	OHS 10	335208.46E, 4677785.87N	30.8	155.5 to 151.4	N/A	N/A	N/A	N/A
BH B12-2 (2011)	OHS 10	335208E, 4677739.1N	29.9	156.4 to 154.7	N/A	N/A	174.77, 167.25, 156.12	174.77, 167.25,
BH B15-1 (2011)	VMS 5	337046E, 4678489N	46.4	151.7 to 150.1	N/A	N/A	N/A	N/A
BH B15-2 (2011)	VMS 5	337073.3E, 4678473.2N	39.9	151.2 to 149.0	N/A	N/A	N/A	N/A
BH B15-3 (2011)	VMS 5	337107.6E, 4678467.7N	46.7	151.4 to 149.9	N/A	N/A	N/A	N/A
BH B9-2 (2011)	VMS 3	332622.8E, 4679218.5N	36.4	146.0 to 145.6	N/A	N/A	164.1, 150.4	171.4, 164.1
BH B9-3 (2011)	VMS 3	332677.6E, 4679140.0N	34.1	149.4 to 147.8	N/A	N/A	168.3, 158.4	N/A
BH CV1-1 (2011)	OHS 18	336115.0 E 4677690.9 N	> 6.6	N/A	N/A	N/A	N/A	N/A
BH CV2-1 (2011)	AAS 5	335208.6E, 4677918.5N	N/A	N/A	N/A	N/A	N/A	N/A
BH PS3-1 (2011)	OHS 8	332246E, 4679421N	33.5	N/A	N/A	N/A	N/A	N/A
BH T11-3 (2011)	OHS 9	334927.3E, 4677953.6N	32.6	153.2 to 148.3	N/A	N/A	178.2, 167.2	166.8
BH T6-1 (2011)	VMS 10	332067.4E, 4679627N	33.7	147.2 to 145.4	N/A	N/A	169.5, 148.9	169.6, 159.2
BH T6-2 (2011)	OHS 7	332066.1E, 467926.8N	30.5	148.3 to 146.1	N/A	N/A	N/A	N/A
BH T6-3 (2011)	VMS 10	332079.1E, 467957.5N	34.7	146.9 to 145.3	N/A	N/A	N/A	N/A
BH T7-1 (2011)	OHS 8, AAS 3, AAS 4	332295.2E, 4679413.6N	30.2	151.3 to 145.8	N/A	N/A	172.4, 161.7	172.1
BH T9-1 (2011)	VMS 4	333766.7E, 4678634.9N	32.3	151.7 to 149.1	N/A	N/A	151.4	161.0
BH TB4-1 (2011)	AAS 1	332128.6E, 4679732.3N	N/A	N/A	N/A	N/A	N/A	N/A
BH TB4-2 (2011)	AAS 1	332157.2E, 4679674.4N	N/A	N/A	N/A	N/A	N/A	N/A
BH-2 (Pre-Bid)	OHS 46	335881.7E, 4677673.6N	N/A	N/A	N/A	N/A	N/A	N/A
BH-101 (Pre-Bid)	OHS 46	335794.9E, 4677606.6N	33.3	154.1 to 150.3	N/A	152.7 to 150.3	N/A	N/A

Borehole	Sign Designation	Location	Overburden Thickness, m	Rock Coring	Instrumentation Name & Elevation, m			
					Nilcon Vane	S-Piez.	VWP	MSG
BH-101 (Pre-Bid)	VMS 12	335794.9E, 4677606.6N	33.3	154.1 to 150.3	N/A	152.7 to 150.3	N/A	N/A
BH-102 (Pre-Bid)	OHS 33	335512.7E, 4677631.8N	32.0	154.6 to 150.3	N/A	155.8 to 154.3	N/A	N/A
BH-107 (Pre-Bid)	OHS 9	334961.3E, 4677973.1N	30.7	155.7 to 151.0	N/A	153.0 to 151.5	N/A	N/A
BH-112 (Pre-Bid)	VMS 11	334221.3E, 4678413.3N	32.5	152.1 to 146.4	N/A	N/A	N/A	N/A
BH-115 (Pre-Bid)	OHS 17	333911.1E, 4678585.3N	32.3	151.5 to 146.2	N/A	N/A	N/A	N/A
BH-119 (Pre-Bid)	OHS 16	333120.6E, 4678961.6E	32.1	150.4 to 145.5	N/A	152.3 to 150.7	N/A	N/A
BH-122 (Pre-Bid)	OHS 27	332537.9E, 4679264.4N	35.1	146.6 to 141.3	N/A	143.2 to 141.3	N/A	N/A
BH-127 (Pre-Bid)	OHS 8	332251.6E, 4679370.9N	32.8	148.5 to 145.2	N/A	146.7 to 145.2	N/A	N/A
BH-128 (Pre-Bid)	AAS 3	332200.8E, 4679490.6N	N/A	N/A	N/A	N/A	N/A	N/A
BH-128 (Pre-Bid)	AAS 4	332200.8E, 4679490.6N	N/A	N/A	N/A	N/A	N/A	N/A
BH-129 (Pre-Bid)	VMS 10	332109.7E, 4679625.1N	32.9	147.9 to 143.8	N/A	N/A	N/A	N/A
BH-201 (Pre-Bid)	VMS 12	335770.5E, 4677610.4N	32.9	154.3 to 154.0	N/A	N/A	N/A	N/A
BH-202 (Pre-Bid)	OHS 45 and VMS 12	335753.3E, 4677573.5N	33.2	154.1 to 150.7	N/A	152.3 to 150.7	N/A	N/A
BH 203 (Pre-Bid)	OHS 45	3355743.5 E 4677539.3 N	32.7	154.6-153.4	N/A	N/A	N/A	N/A
BH-206 (Pre-Bid)	OHS 33	335462.4E, 4677645.8N	32.3	154.2 to 153.4	N/A	N/A	N/A	N/A
BH 208 (Pre-Bid)	OHS 29	335526.5 E 4677543.9 N	N/A	N/A	N/A	N/A	177.2	N/A
BH 225N (Pre-Bid)	OHS 19	336518.1 E 4678036.1 N	N/A	N/A	N/A	N/A	N/A	N/A
BH 226N (Pre-Bid)	OHS 19	336469.8 E 4677993.6 N	N/A	N/A	N/A	N/A	N/A	N/A
BH 233N (Pre-Bid)	OHS 18	336099.5 E 4677688.5 N	N/A	N/A	N/A	N/A	N/A	N/A
BH-302 (Pre-Bid)	OHS 10	335154.9E, 4677756.9N	N/A	N/A	N/A	N/A	N/A	N/A

Note: S-Piez. Standpipe Piezometer
VWP Vibrating Wire Piezometer
MSG Spider Magnet Heave/Settlement Gauge
N/A Not Available

Rock cores were examined and photographed in the field. For each core run, rock core recovery and rock quality designation (RQD) were determined. The recovery (TCR and SCR) and RQD values are given on the borehole logs.

The boreholes were decommissioned using a bentonite-cement grout following completion of sampling, testing and instrument installation.

The Nilcon vane tests, the CPTs and the DMTs, where conducted, were carried out in cohesive soil strata after augering hard surficial materials. The Nilcon tests were carried out at 0.5 to 1.0 m depth intervals.

The rate of rotational strain applied was in accordance with ASTM D2573. The CPT cone was pushed at a constant rate into the ground using hydraulic ram system of the drill rig (ASTM D5778). All CPTs were advanced to refusal. Pore pressure dissipation tests were carried out at selected depths: CPT 39-RW at 167.1 m, CPT 43-RW at 165.3 m, and CPT 47-RW at 167.6 m. The DMT probe was advanced also by hydraulic push with the drill rig and the test was performed at 200 mm depth intervals.

The locations of boreholes, Nilcon tests, DMTs and CPTs executed during the pre-bid and AMEC investigations and the inferred soil profile along the WEP alignment are shown on the drawings listed in Tables 3-1 to 3-3. Borehole, CPT and DMT logs from the AMEC investigation are included in Appendix A. Relevant borehole logs from the pre-bid investigation (identified in Tables 3-1 to 3-3) are included in Appendix B.

3.1.2 Laboratory Testing

All recovered soil samples and rock cores were examined in the field and the AMEC geotechnical laboratory. Natural moisture content tests were carried out on most of the recovered samples; grain size distribution and Atterberg limit tests were carried out on selected representative samples. Following these soil classification tests, representative soil samples were selected for advanced tests.

3.1.3 Instrumentation

Geotechnical instruments (standpipe piezometers (S-Piez), vibrating wire piezometers (VWP), and spider magnets heave/settlement gauges (MSG)), were installed at designated locations on completion of boreholes to monitor pore water pressure and deformation behaviour of the soil strata during and after construction. A brief description follows:

Standpipe Piezometers: These piezometers comprise 1.5 m or 3.0 m long, 10 mil slotted intake screen located at the designated depth and extended to the ground surface using 52 mm diameter, flush-joint, threaded, schedule 40 PVC riser pipe. A silica sand filter pack was placed between the intake screen and the wall of the borehole and extended approximately 0.3 m above the top of the well screen. Bentonite-cement grout was used to restore grade to 0.3 m below the ground surface.

Vibrating Wire Piezometers: The VWP transducers (RST Model VW2100, 0.35 MPa for shallow to mid-depth and 0.7 MPa for deep installations) were installed at the selected depths and electrical wires extended to the monitoring station located at the ground surface (outside the parkway footprint area). The borehole was filled with a bentonite-cement mixture designed to match, as near as practical, the permeability and strength-deformation characteristics of the native soils.

Magnetic Settlement/Heave Gauges: Spider magnets (RST, Model SSMM100 mechanical release spider target for 25 mm pipe) were installed in boreholes at select locations and depths to permit future measurement of heave and settlement. Each magnetic torus was placed around a 25 mm diameter pipe, which was extended to above the ground surface. The spider legs grip into the surrounding soil, which enables the magnetic torus to move up or down on the pipe as the soil settles or heaves. The locations of the magnetic torus are determined by lowering a magnetic probe inside the pipe.

3.2 Data Interpretation – General Discussion

Field Vane Test Data Correction: The chart (Figures 3-1 and 3-2¹) developed initially by Bjerrum (1972) and updated subsequently by Ladd et al (1977) based on circular arc failure analyses of embankment failures suggest correction by multiplying the field vane data by 1.05 to 1.10 for soils with plasticity index about 15. Interestingly, the undrained shear strength (S_u) profiles inferred from the DMTs and the S_u values obtained from the conventional field vane tests in boreholes were consistently higher than the Nilcon vane test values. However, based on re-evaluation of the Bjerrum chart by Aas et al. (1986), the Canadian Foundation Engineering Manual (ref. R-6) suggests that the vane test data for clays with $PI < 20$ should not be corrected. Therefore, the field vane test data (from conventional and Nilcon vane tests) at this site were not corrected for PI.

Strength Profiles from Cone Penetration Tests: The undrained shear strength of the silty clay deposit was estimated using the CPT tip resistance, Q_t , as follows:

$$S_{uCPT} = \frac{Q_t - \sigma_{vo}}{N_{kt}} \quad (1)$$

Where:

S_{uCPT} is the undrained shear strength estimated from the CPT test;

Q_t is the corrected total cone tip resistance;

σ_{vo} is the total vertical stress at the corresponding depth of measurement of the Q_t value;
and

N_{kt} is an empirical factor that varies, depending on soil type and test arrangement, typically between 8 and 20.

The CPT based S_u profiles were developed to achieve a general agreement with the nearby Nilcon vane test profiles. In this regard, the N_{kt} factor values used to calibrate the CPT strength profiles varied slightly for different segments of the WEP and the soil strata. Thus, an N_{kt} factor of 14 was used to estimate the undrained shear strength of the clay crust and transition layers discussed in Section 4. The N_{kt} factors used for the underlying grey silty clay to clayey silt stratum and the lower clayey silt stratum, for WEP segment from Sta. 9+500W to 13+500W, were 15-16, and 12-13, respectively. Figure 3-3 to Figure 3-12² presents the undrained shear strength profiles for WEP segment between Stas. 12+100W to 12+800W, 14+000W to 12+300L, 12+800L to 13+400L, and 10+100T to 12+300T.

¹ All figures are included at the end of the report text.

² See Tables 3.1 to 3.3 for source data for figures.

4 Subsurface Conditions

The general soil stratigraphy at the site consists of the following successive strata (listed in order of increasing depth):

- Surficial layers of occasional fill, topsoil and upper granular deposit;
- An extensive clayey silt to silty clay deposit below about elevation 186.0³;
- A lower granular deposit; and
- Bedrock.

The bedrock consisted of limestone and dolostone below about elevation 155.7 m (OHS 9) to 146.0 m (VMS 3). The bedrock was encountered at depths ranging from about 30.2 m to 46.7 m (OHS 8 and VMS 5, respectively) below the ground surface.

4.1 Surficial Fills, Topsoil and Upper Granular Deposit

(a) Sign Locations OHS 7, 9, 16, 17, 18, 19, 27, 28, 29, 33, 34, 45, 46, 47; VMS 3, 11, 12; and AAS 1, 2, 5, 6, 7

Topsoils were encountered at the ground surface in Boreholes BH T6-2 (OHS 7), BH 107 and BH T11-3 (OHS 9), BH 119 and HGMW-2 (OHS 16), BH 115 and DMT T9-1 (OHS 17), BH 112 (VMS 11), BH 122 (OHS 27), DMT B11-1 (OHS 28), BH 202 and BH 203 (OHS 45), BH 208 (OHS 29), BH 102 and BH 206 (OHS 33), BH 101 (OHS 46), BH B9-3 (VMS 3), BH 101, BH 201, and BH 202 (VMS 12), BH 225N and BH 226N (OHS 19), BH 233N (OHS 18), BH 321, BH T4-2 and BH TB4-1 (AAS 1), BH 13-RW (AAS 2), BH CV2-1 (AAS 5), BH 18-RW (OHS 34, OHS 47, and AAS 6), BH 19-RW (OHS 35 and AAS 7), BH 25-RW (OHS 19) and were encountered below the fills in Boreholes BH 321 and BH TB4-2 (AAS 1). The topsoil ranged in thickness from 0.1 m to 6.1 m at the borehole locations.

(b) Sign Locations OHS 7, 8, 9, 10, 28, 33; VMS 3, 4, 5, 10; AAS 1, 3, 4

Surficial fills were encountered at the ground surface in Boreholes BH 12-RW and DMT T6-1 (OHS 7), BH 127, BH PS3-1 (OHS 8), BH T7-1 (OHS 8, AAS 3 and AAS 4), BH B12-2 (OHS 9), BH B12-1 (OHS 10), BH B11-1 (OHS 28), BH T9-1 (VMS 4), BH B15-1, BH B15-2, and BH B15-3 (VMS 5), BH 129, BH T6-1/HGMW-07, and BH T6-3 (VMS 10), BH T4-1 and BH TB4-2 (AAS 1). Fills were encountered below the topsoil in Boreholes BH 102 (OHS 33), BH B9-2 (VMS 3), BH 321 (AAS 1). The fills were variable in nature and consisted of asphalt, sand and gravel to fine sand, and gravel and crushed aggregate. The fill thickness varied from 0.2 m to 8.2 m.

(c) Sign Locations OHS 8, 18, 46; VMS 3, 10, 12; AAS 1, 6

Upper granular soils were encountered below the topsoil in Boreholes BH 101 (OHS 46), BH B9-3 (VMS 3), BH 101 (VMS 12), BH T4-2 (AAS 1), BH 18-RW (AAS 6), and BH CV1-1 (OHS 18). Upper granular soils were encountered below the fill in Boreholes BH PS3-1 (OHS 8), BH T6-3 (VMS 10). The upper granular deposit consisted of sand to sandy silt / silty sand. The thickness of the upper granular deposit varied from 0.1 m to 1.9 m at the borehole locations.

³ Elevations are in metres and are referred to geodetic datum.

4.2 Silty Clay to Clayey Silt Stratum

The silty clay stratum was encountered directly underlying the topsoil deposit in BH 19-RW (OHS 35 and AAS 7), BH 25-RW (OHS 19), BH T6-2 (OHS 7), BH 107 and BH T11-3 (OHS 9), BH 119 and HGMW-2 (OHS 16), BH 115 and DMT T9-1 (OHS 17), BH 112 (VMS 11), DMT B11-1 (OHS 28), BH 122 (OHS 27), BH 201, and BH 202 (OHS 45 and VMS 12), BH 203 (OHS 45), BH 206 (OHS 33), BH 208 (OHS 29), BH 225N and BH 226N (OHS 19), BH 233N (OHS 18), TB4-1 and BH TB4-1(AAS 1), BH 13-RW (AAS 2), BH CV2-1 (AAS 5). The silty clay stratum was encountered directly underlying the surficial fill in Boreholes BH 12-RW and DMT T6-1 (OHS 7), BH CV1-1 (OHS 18) PS3-1 (OHS 8), BH T7-1(OHS 8, AAS 3 and AAS 4), BH B12-2 (OHS 9), BH B12-1 (OHS 10), BH B11-1 (OHS 28), BH 102 (OHS 33), BH B9-2 (VMS 3), BH T9-1 (VMS 4), BH B15-1, BH B15-2, and BH B15-3 (VMS 5), BH 129, and BH T6-1/HGMW-07 (VMS 10), BH T4-1 and BH TB4-2 (AAS 1). The silty clay stratum was encountered directly underlying the upper granular soils in BH 101 (OHS 46), BH PS3-1 (OHS 8), BH B9-3 (VMS 3), BH T6-3 (VMS 10), BH 101 (VMS 12), BH 321 and BH T4-2 (AAS 1), BH 18-RW (OHS 34, OHS 47, and AAS 6). The encountered depths below the existing topsoils, surficial fills, and upper granular soils ranged from 0.1 m to 8.2 m.

Based on the gradation, in-situ moisture content and undrained shear strength characteristics, the silty clay to clayey silt stratum may be divided into 4 sub-layers as follows: brown desiccated stiff to hard clay crust, transition zone, upper grey silty clay to clayey silt deposit (referred to hereafter as silty clay), and then a generally coarser lower grey clayey silt deposit (referred to as clayey silt). The properties of the clay soils (i.e., natural water contents, Atterberg limits and undrained shear strengths from Nilcon vane tests) are summarized in Table 4-1.

Table 4-1: Summary of Laboratory Index Test Results for the Entire Project Area

Area / Figure Signs	Profile 5, Sta. 12+100W to 12+800W / Figure 3-3				Profile 8, Sta. 14+000W to 14+700W / Figure 3-4			
	VMS 10 ⁽¹⁾				AAS 1 and AAS 2 ⁽¹⁾			
Property	Clay Crust	Transition	Grey Silty Clay	Clayey Silt	Clay Crust	Transition	Grey Silty Clay	Clayey Silt
Elevation Range (m)	>177	177-175	175-160	160-153	>178	178-175	175-161	161-150
Natural Water Content, w_N (%)	9 - 25	18 - 28	15 - 27	18 - 35	12 - 33	18 - 29	15 - 27	9 - 20
Liquid Limit, w_L			25 - 36		44		26 - 32	27 - 31
Plastic Limit, w_p			13 - 19		22		15 - 15	15 - 16
Plasticity Index, PI			11 - 20		22		11 - 17	12 - 15
Liquidity Index, LI			0.2 - 0.9		0 - 1.0		0 - 1.0	0 - 0.4
Undrained Shear Strength, S_u (kPa)	75	75-68	68-37	45-75	75	75-50	50-37	45-65

Note: (1) Values obtained are based on borehole data applicable to identified sign structures.
 (2) Low plasticity index values indicates presence of silty units within the cohesive deposits

Area / Figure	Profile 9, Sta. 14+700W to 10+400L / Figure 3-5				Profile 10, Sta. 10+400L to 11+000L / Figure 3-6			
Signs	OHS 7 and OHS 8 ⁽¹⁾				OHS 27, VMS 3, AAS 3 and AAS 4 ⁽¹⁾			
Property	Clay Crust	Transition	Grey Silty Clay	Clayey Silt	Clay Crust	Transition	Grey Silty Clay	Clayey Silt ⁽²⁾
Elevation Range (m)	>177	177-175	175-163	163-150	>177	177-175	175-163	163-151
Natural Water Content, w _N (%)	9 - 27	16 - 27	14 - 28	13 - 34	9 - 28	18 - 22	14 - 46	14 - 32
Liquid Limit, w _L		31		27 - 41	32 - 38		31 - 38	19 - 31
Plastic Limit, w _P		16		15 - 21	14 - 18		13 - 17	14 - 16
Plasticity Index, PI		15		12 - 20	17 - 20		16 - 19	3 - 15
Liquidity Index, LI		0 - 1.0		0 - 1.9	0 - 1.0		0.1 - 0	0 - 0
Undrained Shear Strength, S _u (kPa)	75	75-60	60-41	47-65	75	75-65	65-44	50-65

Note: (1) Values obtained are based on borehole data applicable to identified sign structures.
(2) Low plasticity index values indicates presence of silty units within the cohesive deposits

Area / Figure	Profile 11, Sta. 10+900L to 11+500W / Figure 3-7				Profile 12, Sta. 11+500L to 12+300L / Figure 3-8			
Signs	OHS 16 ⁽¹⁾				OHS 17 ⁽²⁾			
Property	Clay Crust	Transition	Grey Silty Clay	Clayey Silt	Clay Crust	Transition	Grey Silty Clay ⁽¹⁾	Clayey Silt
Elevation Range	>177	177-175	175-163	163-151	>178	178-175	175-163	163-151
Natural Water Content, w _N (%)	14 - 24	18 - 19	16 - 38	16 - 23	12 - 18	15 - 15	11 - 24	7 - 21
Liquid Limit, w _L			28 - 31	34			14 - 25	-
Plastic Limit, w _P			13 - 14	16			12 - 14	-
Plasticity Index, PI			14 - 17	18			2 - 11	-
Liquidity Index, LI			0 - 0.3	0 - 0.6			0 - 1.0	
Undrained Shear Strength, S _u (kPa)	75	75-55	55-43	49-65	75	75-60	60-50	57-80

Note: (1) Values obtained are based on borehole data applicable to identified sign structures.
(2) Low plasticity index values indicates presence of silty units within the cohesive deposits

Area / Figure	Profile 14, Sta. 12+800L to 13+400L / Figure 3-9				Profile 16, Sta. 10+100T to 10+700T / Figure 3-10			
Signs	OHS 28, OHS 32, VMS 4, and 11 ⁽¹⁾				OHS 9, OHS 10, OHS 18, OHS 19, OHS 29, OHS 33, OHS 34, OHS 35, OHS 45 OHS 46, OHS 47, AAS 5, AAS 6, and AAS7 ⁽¹⁾			
Property	Clay Crust	Transition	Grey Silty Clay	Clayey Silt	Clay Crust ⁽²⁾	Transition ⁽²⁾	Grey Silty Clay	Clayey Silt ⁽²⁾
Elevation Range	>179	179-175	175-163	163-156	>181	181-177	177-164	164-162
Natural Water Content, w _N (%)	11 - 19				7 - 28	9 - 18	11 - 43	13 - 25
Liquid Limit, w _L					16 - 33	17-21	23 - 43	20 -29
Plastic Limit, w _P					11 - 17	12-13	12 - 19	13-15
Plasticity Index, PI					5 - 16	5-9	10 - 24	7-14
Liquidity Index, LI					0 - 1.0	0 - 1.0	0 - 0.3	0 - 1.0
Undrained Shear Strength, S _u (kPa)	75	75-55	58-50	58-100	75	75-65	60-68	68-125

Note: (1) Values obtained are based on borehole data applicable to identified sign structures.
(2) Low plasticity index values indicates presence of silty units within the cohesive deposits

Area / Figure	Profile 17, Sta. 10+700T to 11+400T / Figure 3-11				Profile 18, Sta. 11+500T to 12+300T / Figure 3-12			
Signs	VMS 12 ⁽¹⁾				VMS 5 ⁽¹⁾			
Property	Clay Crust	Transition ⁽²⁾	Grey Silty Clay	Clayey Silt	Clay Crust	Transition	Grey Silty Clay	Clayey Silt
Elevation Range	>180	180-177	177-164	164-162	>185	185-178	178-163	163-150
Natural Water Content, w _N (%)	12 - 20	9 - 18	11 - 27	10 - 25	4 - 22	13 - 18	10 - 39	11 - 30
Liquid Limit, w _L	23 - 32	17	21 - 43	29		27 - 36	23 - 30	
Plastic Limit, w _P	13 - 16	12	12 - 19	15		15 - 15	12 - 16	
Plasticity Index, PI	9 - 16	5	9 - 24	14		12 - 21	11 - 14	
Liquidity Index, LI	0 - 0.3	0 - 0	0 - 0.5	0 - 1.0		0 - 0.2	0 - 0	
Undrained Shear Strength, S _u (kPa)	75	75-65	60-68	68-125	75	75	68-85	85

Note: (1) Values obtained are based on borehole data applicable to identified sign structures.
(2) Low plasticity index values indicates presence of silty units within the cohesive deposits

The effective shear strength properties applicable to the silty clay to clayey silt stratum were determined from triaxial and direct shear tests performed during the pre-bid and additional geotechnical investigations, Figures 4-1 and 4-2 (and supported by published PI versus Φ' relationships (ref. R-27 and R-32), and are summarized as follows:

Apparent cohesion, c'	0 kPa
Angle of internal friction, Φ'	30°
Critical state friction angle, Φ'_{cs}	25-26°

Effective cohesion (which may be potentially present) in the upper zones of over-consolidated clayey silt has been neglected for engineering design in consideration of potential long-term weathering, swelling resulting from unloading, and fissuring effects. The critical state friction angle has been estimated from typical values published in the engineering literature for clayey materials with PI <20% (Schofield and Wroth, 1968 – ref. R-44).

4.3 Lower Granular Deposit

(a) Sign Locations OHS 7, 8, 9, 10, 16, 17, 27, 28, 29, 33, 46, 47; VMS 3, 5, 10, 11, 12; AAS 1

Underlying the silty clay to clayey silt stratum and overlying the bedrock was a deposit comprising heterogeneous materials varying from silty sand, sand and gravel, and clayey silts with sand. The lower granular deposit was encountered in Boreholes BH T6-2 (OHS 7), BH 127 and BH PS3-1 (OHS 8), BH 107 and BH T11-3 (OHS 9), BH B12-1 (OHS 10), BH 119 (OHS 16), BH 115 (OHS 17), BH 122 (OHS 27), BH B11-1 (OHS 28), BH 102 and BH 206 (OHS 33), BH 101 (OHS 46 and VMS 12), BH 203 (OHS 45) and BH 208 (OHS 29), BH B9-2 and BH B9-3 (VMS 3), BH B15-1 (VMS 5), BH 119, BH T6-1/HGMW-7, and BH T6-3 (VMS 10), BH 112 (VMS 11), BH 201 (VMS 12), BH 321, BH TB4-1 and BH TB4-2 (AAS 1). This deposit was approximately 0.1 m to 5.5 m thick but varied significantly in compactness throughout the project area.

The lower granular deposit was observed to be discontinuous throughout the Windsor area. The lower granular deposit present at other sites of the project was not found in Boreholes BH 12-RW (OHS 7), BH13-RW (AAS 2), BH 18-RW (AAS 6), BH 19-RW (AAS 7), BH B11-1 (OHS 28), BH B12-1 and BH B12-2 (OHS 10), BH B15-1, BH B15-2 and BH B15-3 (VMS 5), BH B9-2 and BH B9-3 (VMS 3), BH CV2-1 (AAS 5), BH PS3-1 (OHS 8), BH T6-1 (VMS 10), BH T6-2 (OHS 7), BH T6-3 (VMS 10), BH T7-1 (OHS 8, AAS 3 and AAS4), BH T9-1 (VMS 4), BH T11-3 (OHS 9), BH-TB4-1 (AAS 1), BH-2 (OHS 46), BH 129 (VMS 10), BH 202 (VMS 12), BH 302 (OHS 10), and BH 324 (AAS 1).

4.4 Bedrock

(a) Sign Locations OHS 7, 8, 9, 10, 16, 17, 27, 28, 29, 33, 46, 47; VMS 3, 4, 5, 10, 11, 12; AAS 1

Where rock coring was undertaken, a white to grey, limestone bedrock was encountered. The bedrock was generally fresh, medium strong, thinly laminated, fine grained, faintly to moderately porous and moderately fractured. Bedrock was encountered at elevations ranging from 155.7 (OHS 9) to 146.0 m (VMS 3). The Rock Quality Designation (RQD) of the recovered rock cores varied, indicating a fair to good quality. Based on this core logging the rock mass classification was estimated to range from 2.8

to 5 for the Q- System (Barton et. al., 1974, ref. R-36) and 53 to 58 for the Rock Mass Rating (RMR) based on Bieniawski (1976, ref. R-37) and indicates that the rock mass can be considered as a Fair quality rock mass based on the later system.

It was found during the preliminary investigations reported in Golder's Subsurface Condition Interpretation Report (ref. R-14) that little variation in the strength of the rock mass conditions was identified from site to site. For this reason in order to obtain a reasonable statistical sample, the density, unit weight and uniaxial compressive strength of the samples from all of the key sites have been grouped and are summarised in (Table 4-2). The average strength of the limestone is determined to be 85.5 MPa and is 'strong rock' based on the ISRM (1978, ref. R-). Additionally, based on the coefficient of variation, enough test have been performed to characterise the compressive strength.

Table 4-2: Summary of Intact Properties

	Density (kg/m ³)	Unit Weight (kN/m ³)	UCS (MPa)
Number of Samples, N	12	12	16
Average	2502	24.54	85.5
Standard Deviation	96	0.94	25.4
Minimum Value	2340	22.95	35.5
Maximum Value	2660	26.09	135.3

Based on the rock mass classification and the strength properties assuming an $m_i = 12$ for a crystalline limestone, a disturbance factor of 0.7, and a factor of safety of 3.0, an allowable bearing capacity of the rock has been calculated to range from 5.3 MPa to 13.5 MPa. The mean allowable bearing capacity is determined to be 9.2 MPa using the Hoek and Brown strength criterion for determining the bearing capacity of a fractured rock mass (Wyllie, 1999, ref. R-39).

Bedrock was encountered in Boreholes BH T6-2 (OHS 7), BH 127 and BH T7-1 (OHS 8, AAS 3 and AAS 4), BH 101 and BH T11-3 (OHS 9), BH B12-1 and BH B12-2 (OHS 10), BH 119 (OHS 16), BH 115 (OHS 17), BH 122 (OHS 27), BH B11-1 (OHS 28), BH 206 (OHS 33), BH 202 (OHS 45), BH 101 (OHS 46), BH B9-2 and BH B9-3 (VMS 3), BH T9-1 (VMS 4), BH B15-1, BH B15-2, and BH B15-3 (VMS 5), BH 129 and BH T6-3 (VMS 10), BH 112 (VMS 11), BH 201 and BH 202 (VMS 12), and BH 321 (AAS 1).

4.5 Groundwater Conditions

Shallow and deep standpipe and vibrating wire piezometers were installed in selected boreholes to measure the water levels within overburden and bedrock, respectively.

The highest piezometric levels within the overburden and the bedrock were listed in Table 4-3. These observations suggest a slight downward gradient between the overburden and the bedrock. Nevertheless, given the general trend in the project area, occurrence of artesian condition in bedrock cannot be ruled out.

Table 4-3: Summary of Measured Groundwater Levels

Borehole	Sign	Surface El, m	Piezo. Type	Screen / Sensor El, m	Measured Groundwater level	
					Date	El, m
BH B9-2 (2011)	VMS 3	182.4	VWP	171.7 164.1 150.4	23 Jul. 2011	181.1 180.9 177.4
BH B9-2 (2011)	VMS 3	183.5	VWP	168.3 158.4	23 Jul. 2011	182.9 181.1
BH T11-3 (2011)	OHS 9	185.5	VWP	178.2 167.2	24 Jul. 2011	184.0 183.4
BH T6-1 (2011)	VMS 10	180.9	VWP	169.5 148.9	29 Aug. 2011	181.1 178.1
BH T7-1 (2011)	OHS 8 AAS 3 AAS 4	181.5	VWP	172.4 161.7	6 Aug. 2011	180.5 180.5
BH T9-1 (2011)	VMS 4	184.0	VWP	174.9 151.4	29 Aug. 2011	184.0 177.7
BH-101 (Pre-Bid)	OHS 46 VMS 12	184.6	S-Piez.	175.4 152.7 to 150.3	28 Jan. 2009	182.417 7.7
BH-102 (Pre-Bid)	OHS 33	186.6	S-Piez.	177.5 155.8 to 154.3	28 Jan. 2009	184.6 177.0
BH-107 (Pre-Bid)	OHS 9	185.9	S-Piez.	176.3 153.0 to 151.5	28 Jan. 2009	N/A 177.5
BH-119 (Pre-Bid)	OHS 16	182.5	S-Piez.	173.7 152.3 to 150.7	28 Jan. 2009	181.1 177.5
BH-122 (Pre-Bid)	OHS 27	181.7	S-Piez.	172.5 143.2 to 141.3	28 Jan. 2009	180.2 177.2
BH-127 (Pre-Bid)	OHS 8	181.3	S-Piez.	172.2 146.7 to 145.2	28 Jan. 2009	179.1 177.3
BH-202 (Pre-Bid)	OHS 45 and VMS 12	187.3	S-Piez	152.3 to 150.7	15 Apr. 2009	177.7
BH-208	OHS 29	186.9	VWP	177.2	26 May 2009	183.5

Legend: S-Piez. Screen elevations for Standpipe Piezometer
VWP Sensor elevation for Vibrating Wire Piezometer
EI Elevation

Perched groundwater is known to accumulate seasonally within the upper deposits of fill, topsoil and upper sand and silt layers, and within the fissures in the silty clay crust. In adverse conditions, the perched groundwater levels can rise to near the ground surface.

4.6 Subsurface Gases

The groundwater in the project area, especially within the lower granular deposit and bedrock, is known to contain dissolved hydrogen sulphide (H₂S) and methane (CH₄) gases that are liberated from the water on exposure to atmospheric pressure.

The H₂S gas can frequently be detected by odour at about concentrations 0.5 ppm and can be corrosive at concentrations of about 2 ppm to 3 ppm in the groundwater. The gas odour was not noted during the drilling at the time of writing this report.

Although the presence of the H₂S and CH₄ gases was not confirmed during geotechnical investigation for the sign structures, their presence cannot be ruled out. In this regard, it is recommended that the design and construction should address the potential presence of these gases. Air monitoring should be done during construction. In general, it is recommended that equipment operating in confined spaces be selected to safely operate in a potentially gaseous environment.

The understanding of the engineering behaviour (related to the design and construction) of the gassy soils is rather limited, except that these soils can experience rapid drop in undrained shear strength during unloading. Due to the relatively high compressibility of the pore fluid in gassy soils, the pore water pressure response (ΔU) to total stress reduction can be very low. This phenomena leads to reduction in effective stress with the decrease of the total stress, and hence of the available shear strength (Ref. 19 and 35).

5 Development of Geotechnical Designs

5.1 Geotechnical Design Criteria and Considerations

- The geotechnical design has been completed in compliance with the requirements of the executed version of the Project Agreement Schedule 15-2, Part 2, Article 8.4 (PA) for the Windsor-Essex Parkway Project. The foundation designs (consisting of augered cast-in-place caissons) are according to MTO Sign Support Manual (ref. R-34).

5.2 Site Specific Data for Each Sign Structure

The site specific data for each sign structure is summarized in Tables 5-1 to 5-3.

Table 5-1: Summary of Data for Each OHS

Sign Designation		OHS 7	OHS 8	OHS 9	OHS 10	OHS 16	OHS 17	OHS 18	OHS 19	OHS 27	OHS 28	OHS 29	OHS 32	OHS 33	OHS 34	OHS 35	OHS 45	OHS 46	OHS 47
Proposed Sign Structure Type		Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Cantilever	Tri-Chord	Cantilever	Cantilever	Tri-Chord	Cantilever	Cantilever	Tri-Chord	Cantilever
MTO Standard Design	Caisson Diameter (m)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2-1.35	1.2	1.2-1.35	1.2-1.35	1.2	1.2-1.35	1.2-1.35	1.2	1.2-1.35
	Caisson Depth(m)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0-7.5	6.0	6.0-7.5	6.0-7.5	6.0	6.0-7.5	6.0-7.5	6.0	6.0-7.5
Existing Ground Surface Elevation, m		180.9-181.2	181.4-181.6	185.8	186.3-186.4	182.3-182.6	184.1	186.2-186.4	187.7-183.3	181.6	185.2-185.5	186.9	185.8	186.5-186.6	187.6	187.4	187.2	186.6-187.4	187.6
Approx. Proposed Design Road Grade Elevation at Sign Location, m		174.3	173.8	180.2	178.9	176.9	177.8	187.0	190.0	184.4	186	189.0	187.6	188.6	188.0	187.0	189.0	188.5	188.0
Approx. Caisson Tip Elevation, m		167.8-168.8	167.3-168.3	173.7-174.7	172.4-173.4	170.4-171.4	171.3-172.3	180.0-181.0	183.0-184.0	177.9-178.9	178.5-180.5	182.0-183.0	180.1-182.1	181.1-183.1	181.0-182.0	179.5-181.5	181.5-183.5	182.0-183.0	181.0-182.0
Foundation Soil Type and Consistency or Relative Density Within Caisson Depth		Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay / Sand	Silty Clay	Engineered Fill / Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Silty Clay
		Stiff to Very Stiff	Firm to Stiff	Firm	Firm	Stiff	Firm / Loose	Hard/Stiff	Hard/Very Stiff	Stiff	Very stiff	Hard/Very Stiff	Stiff	Very stiff	Hard/Stiff	Hard/Very Stiff	Hard/Very Stiff	Stiff	Hard/Stiff

Note: The type of engineered fill is assumed to be consistent with the shear strength requirements of the MTO Sign Support Manual, or better.

Table 5-2: Summary of Data for Each VMS

Sign Designation		VMS 3	VMS 4	VMS 5	VMS 10	VMS 11	VMS 12
Proposed Sign Structure Type		Overhead Truss	Overhead Truss	Overhead Truss	Overhead Truss	Overhead Truss	Overhead Truss
MTO Standard Design	Caisson Diameter (m)	1.2	1.2	1.2	1.2	1.2	1.2
	Caisson depth (m)	6.0	6.0	6.0	6.0	6.0	6.0
Existing Ground Surface Elevation, m		182.3-183.9	183.6-184.0	198.0-198.1	180.8-181.7	184.6-185.5	187.4-187.9
Approx. Proposed Design Road Grade Elevation at Sign Location, m		175.7	178.5	190.7	173.4	177.2	182
Approx. Caisson Tip Elevation, m		169.2-170.2	172.0-173.0	184.2-185.2	166.9-167.9	170.7-171.7	175.5-176.5
Foundation Soil Type and Condition within Caisson Depth		Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay
		Soft to Stiff	Stiff	Stiff to Very Stiff	Firm to Stiff	Firm to Stiff	Firm to Stiff

Note: The type of engineered fill is assumed to be consistent with the shear strength requirements of the MTO Sign Support Manual, or better.

Table 5-3: Summary of Data for Each AAS

Sign Designation		AAS 1	AAS 2	AAS 3	AAS 4	AAS 5	AAS 6	AAS 7
Proposed Sign Structure Type		Pole	Pole	Pole	Pole	Pole	Pole	Pole
MTO Standard Design	Caisson Diameter (m)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Caisson Length (m)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Existing Ground Surface Elevation, m		180.7-181.0	180.8	180.9-181.5	180.9-181.5	186.2	187.6	187.4
Approx. Proposed Design Road Grade Elevation at Sign Location, m		182.1	180.1	182.0	182.6	186.8	186.0	187.4
Approx. Caisson Tip Elevation, m		176.6-177.6	174.6-175.6	176.5-177.5	177.1-178.1	181.3-182.3	180.5-181.5	181.9-182.9
Foundation Soil Type and Condition within Caisson Depth		Engineered Fill / Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Engineered Fill/Silty Clay	Silty Clay	Silty Clay
		Firm to Stiff	Firm	Stiff to Very Stiff	Stiff to Very Stiff	Stiff	Firm to Stiff	Stiff to Very Stiff

Note: The type of engineered fill is assumed to be consistent with the shear strength requirements of the MTO Sign Support Manual, or better.

5.3 Design Soil Properties

- The following design soil properties, applicable to all Phase I sign sites, for the upper clay crust of the silty clay to clayey silt deposit were interpreted from the CPT and Nilcon vane test profiles and the laboratory test results. The undrained shear strength, S_u or C_u , profiles were estimated from the CPTs based on the calibration described in Section 3.2. The S_u profiles inferred from the CPTs advanced between Sta. 12+100W to 12+800W, 14+000W to 12+300L, 12+800L to 13+400L, and 10+100T to 12+300T are shown in Figures 3-3 to 3-12. Selected typical design values obtained from the profiles are summarized in Tables 5-4 to 5-6.

**Table 5-4: Summary of Interpreted Design Clay Strength
(Profiles 5, 8, 9, and 10)**

Clay Substratum	Undrained Shear Strength (S_u or C_u), kPa	Angle of Internal Friction (Φ'), Degrees	Undrained Shear Strength (S_u or C_u), kPa	Angle of Internal Friction (Φ'), Degrees	Undrained Shear Strength (S_u or C_u), kPa	Angle of Internal Friction (Φ'), Degrees	Undrained Shear Strength (S_u or C_u), kPa	Angle of Internal Friction (Φ'), Degrees
Clay Crust	75	30	75	30	75	30	75	30
Transition	75-68	30	75-50	30	75-60	30	75-65	30
Grey Silty Clay	68-37	30	50-37	30	60-41	30	65-44	30
Clayey Silt	75	30	65	30	47-65	30	50-65	30
Figure / Profile	Fig. 3-3 /	Profile 5	Fig. 3-4 /	Profile 8	Fig. 3-5 /	Profile 9	Fig. 3-6 /	Profile 10

Note: S_u and C_u = Undrained Shear Strength

**Table 5-5: Summary of Interpreted Design Clay Strength
(Profiles 11, 12, and 14)**

Clay Substratum	Undrained Shear Strength (S_u or C_u), kPa	Angle of Internal Friction (Φ'), Degrees	Undrained Shear Strength (S_u or C_u), kPa	Angle of Internal Friction (Φ'), Degrees	Undrained Shear Strength (S_u or C_u), kPa	Angle of Internal Friction (Φ'), Degrees
Clay Crust	75	30	75	30	75	30
Transition	75-55	30	75-60	30	75-55	30
Grey Silty Clay	55-43	30	60-50	30	58-50	30
Clayey Silt	49-65	30	57-80	30	58-100	30
Figure / Profile	Fig. 3-7 /	Profile 11	Fig. 3-8 /	Profile 12	Fig. 3-9 /	Profile 14

Note: S_u and C_u = Undrained Shear Strength

**Table 5-6: Summary of Interpreted Design Clay Strength
(Profiles 16, 17, and 18)**

Clay Substratum	Undrained Shear Strength (S_u or C_u), kPa	Angle of Internal Friction (Φ'), Degrees	Undrained Shear Strength (S_u or C_u), kPa	Angle of Internal Friction (Φ'), Degrees	Undrained Shear Strength (S_u or C_u), kPa	Angle of Internal Friction (Φ'), Degrees
Clay Crust	75	30	75	30	75	30
Transition	75-60	30	75-65	30	75	30
Grey Silty Clay	60-70	30	65-60	30	75-70	30
Clayey Silt	125	30	68-125	30	85	30
Figure / Profile	Fig. 3-10/	Profile 16	Fig. 3-11/	Profile 17	Fig. 3-12/	Profile 18

Note: S_u and C_u = Undrained Shear Strength

5.4 Deep Foundations

5.4.1 Augered Cast-in-Place Caissons

Augered, cast-in-place, reinforced concrete caissons should be designed and constructed using the following recommendations.

Caissons are not to be constructed within the active zone of Retained Soil System (RSS) walls.

The caisson construction should be under the full-time inspection by a geotechnical engineer who will confirm the founding depths and soil conditions.

Based on the local soil and groundwater conditions, a temporary steel liner may be required to prevent sloughing of the soil.

Drilling for installation of the caissons may encounter groundwater seepage into the auger hole and possible inflow of cohesionless soils, particularly where surficial fills, topsoil and upper granular deposits are present at sign structure locations. Dewatering may be required prior to placement of reinforcing steel and pouring of concrete. Otherwise concrete for the caissons should be poured under water using the tremie method. An experienced caisson contractor should be engaged to install the caissons. The installation of the caissons should be inspected by a geotechnical engineer.

Prior to pouring concrete, the caisson base should be clean and inspected by qualified geotechnical personnel. All concrete should be placed by the tremie method. Relatively high (minimum 100 mm) slump concrete is recommended for the caissons and the liner should be withdrawn at a slow rate to prevent “necking” (intrusion of the soil from the sides of the caisson hole into the shaft of the caisson).

Caissons should be designed in accordance with the Canadian Foundation Engineering Manual, 4th Edition (reference R-6) and the MTO Sign Support Manual (Ref. 34).

The summarized soil conditions for design are provided in Tables 5-7 to 5-9 for the corresponding sign structure sites.

Table 5-7: Summarized Soil Conditions for Design of Phase I OHS⁽⁴⁾

Sign Designation		OHS 7	OHS 8	OHS 9	OHS 10	OHS 16	OHS 17	OHS 18	OHS 19	OHS 27	OHS 28				OHS 29	OHS 32	OHS 33	OHS 34	OHS 35	OHS 45	OHS 46	OHS 47							
Profile No.		9	9	16	16	11	12	16	16	10	14				16	14	16	16	16	16	16	16							
Caisson Foundation Soil Type and Condition		Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay / Sand	Silty Clay	Engineered Fill / Silty Clay	Silty Clay	Engineered Fill / Silty Clay				Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Engineere d Fill / Silty Clay	Silty Clay							
		Stiff to Very Stiff	Firm to Stiff	Firm	Firm	Stiff	Firm / Loose	Hard/Stiff	Hard/ Very Stiff	Stiff	Very stiff				Hard/ Very Stiff	Stiff	Very stiff	Hard/ Stiff	Hard/ Very Stiff	Hard/ Very Stiff	Stiff	Hard/Stiff							
Existing Ground Surface Elevation, m		180.9-181.2	181.4-181.6	185.8	186.3-186.4	182.3-182.6	184.1	186.2-186.4	187.7-183.3	181.6	185.2-185.5				186.9	185.8	186.5-186.6	187.6	187.4	187.2	186.6-187.4	187.6							
Approx. Proposed Design Grade Elevation at Sign Location		174.3	173.8	180.2	178.9	176.9	177.8	187.0	190.0	184.4	186				189.0	187.6	188.6	188.0	187.0	189.0	188.5	188.0							
Approx. Caisson Tip Elevation, m ⁽⁵⁾		167.8-168.8	167.3-168.3	173.7-174.7	172.4-173.4	170.4-171.4	171.3-172.3	180.0-181.0	183.0-184.0	177.9-178.9	178.5-180.5				182.0-183.0	180.1-182.1	181.1-183.1	181.0-182.0	179.5-181.5	181.5-183.5	182.0-183.0	181.0-182.0							
Undrained Shear Strength, S _u ⁽⁸⁾ (kPa)	Upper 2/3 ⁽⁶⁾	59-50	57-49	75-65	71-64	73-52	74-59	75	75	75	75				75	75	75	75	75	75	75	75							
	Lower 1/3 ⁽⁶⁾	50-45	49-44	65-63	64-62	52-49	59-56	75	75	75	75				75	75	75	75	75	75	75	75							
Φ', Phi Angle ⁽²⁾		30	30	30	30	30	30	30	30	30	30				30	30	30	30	30	30	30	30							
Bulk Density (kg/m ³)		2050	2050	2050	2050	2050	2050	2200	2200	2050	2200				2200	2200	2200	2200	2200	2200	2200	2200							
Proposed Sign Structure		Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Tri-Chord	Cantilever				Tri-Chord	Cantilever				Tri-Chord	Cantilever				Tri-Chord	Cantilever			
Class		-	-	-	-	-	-	-	-	-	1	2	3	4	-	1	2	3	4	-	1	2	3	4	-	1	2	3	4
Caisson Depth ⁽⁷⁾ (m)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	7.2	7.5	6.0	6.0	6.0	7.2	7.5	6.0	6.0	6.0	7.2	7.5	6.0	6.0	6.0	7.2	7.5
Caisson Diameter (m)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.35	1.2	1.2	1.2	1.2	1.35	1.2	1.2	1.2	1.2	1.35	1.2	1.2	1.2	1.2	1.35

- Notes:
- 1) Cohesion for cohesive soils refers to undrained shear strength (phi, Φ =0)
 - 2) Phi angle, Φ', for cohesive soils in drained condition (Cohesion, c'=0)
 - 3) **The type of engineered fill is assumed to be consistent with the shear strength requirements of the MTO Sign Support Manual, or better.**
 - 4) The soil resistance within the zone of frost penetration (1.0 m) is to be neglected.
 - 5) Based on the structures caisson depth from MTO Sign Support Manual
 - 6) “of Caisson depth”
 - 7) Based on the minimum structures caisson depth (L) form MTO Sign Support Manual and frost penetration depth (1.0 m)
 - 8) Within the depth of foundation caissons

Table 5-8: Summarized Soil Conditions for Design of Phase I VMS⁽⁴⁾

Sign Designation		VMS 3	VMS 4	VMS 5	VMS 10	VMS 11	VMS 12
Profile No.		10	14	18	5	14	17
Caisson Foundation Soil Type and Condition		Silty Clay Soft to Stiff	Silty Clay Stiff	Silty Clay Stiff to Very Stiff	Silty Clay Firm to Stiff	Silty Clay Firm to Stiff	Silty Clay Firm to Stiff
Existing Ground Surface Elevation, m		182.3-183.9	183.6-184.0	198.0-198.1	180.8-181.7	184.6-185.5	187.4-187.9
Approx. Proposed Design Grade Elevation at Sign Location		175.7	178.5	190.7	173.4	177.2	182
Approx. Caisson Tip Elevation, m ⁽⁵⁾		169.2-170.2	172.0-173.0	184.2-185.2	166.9-167.9	170.7-171.7	175.5-176.5
Undrained Shear Strength, $S_u^{(8)}$ (kPa)	Upper 2/3 ⁽⁶⁾	68-57	75-55	75	68-52	75-54	66-63
	Lower 1/3 ⁽⁶⁾	57-52	55-53	75	52-46	54-52	63-62
Φ' , Phi Angle ⁽²⁾		30	30	30	30	30	30
Bulk Density (kg/m ³)		2050	2050	2200	2050	2050	2050
Proposed Sign Structure		Overhead Truss	Overhead Truss	Overhead Truss	Overhead Truss	Overhead Truss	Overhead Truss
Class		-	-	-	-	-	-
Caisson Depth ⁽⁷⁾ (m)		6.0	6.0	6.0	6.0	6.0	6.0
Caisson Diameter (m)		1.2	1.2	1.2	1.2	1.2	1.2

Notes:

- 1) Cohesion for cohesive soils refers to undrained shear strength (ϕ , $\Phi = 0$)
- 2) Phi angle, Φ' , for cohesive soils in drained condition (Cohesion, $c' = 0$)
- 3) **The type of engineered fill is assumed to be consistent with the shear strength requirements of the MTO Sign Support Manual, or better.**
- 4) The soil resistance within the zone of frost penetration (1.0 m) is to be neglected.
- 5) Based on the structures caisson depth from MTO Sign Support Manual
- 6) "of Caisson depth"
- 7) Based on the minimum structures caisson depth (L) from MTO Sign Support Manual and frost penetration depth (1.0 m).
- 8) Within the depth of foundation caissons

Table 5-9: Summarized Soil Conditions for Design of Phase I AAS⁽⁴⁾

Sign Designation		AAS 1	AAS 2	AAS 3	AAS 4	AAS 5	AAS 6	AAS 7
Profile No.		8	8	10	10	16	16	16
Caisson Foundation Soil Type and Condition		Engineered Fill / Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Silty Clay	Silty Clay
		Firm to Stiff	Firm	Stiff to Very Stiff	Stiff to Very Stiff	Stiff	Firm to Stiff	Stiff to Very Stiff
Existing Ground Surface Elevation, m		180.7-181.0	180.8	180.9-181.5	180.9-181.5	186.2	187.6	187.4
Approx. Proposed Design Grade Elevation at Sign Location		182.1	180.1	182.0	182.6	186.8	186.0	187.4
Approx. Caisson Tip Elevation, m ⁽⁵⁾		176.6-177.6	174.6-175.6	176.5-177.5	177.1-178.1	181.3-182.3	180.5-181.5	181.9-182.9
Undrained Shear Strength, $S_u^{(8)}$ (kPa)	Upper 2/3 ⁽⁶⁾	75	75	75	75	75	75	75
	Lower 1/3 ⁽⁶⁾	75-70	75-50	75	75	75	75	75
Φ' , Phi Angle ⁽²⁾		30	30	30	30	30	30	30
Bulk Density (kg/m ³)		2050	2050	2050	2050	2200	2200	2200
Proposed Sign Structure		Pole	Pole	Pole	Pole	Pole	Pole	Pole
Class		-	-	-	-	-	-	-
Caisson Depth ⁽⁷⁾ (m)		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Caisson Diameter (m)		1.0	1.0	1.0	1.0	1.0	1.0	1.0

Notes:

- 1) Cohesion for cohesive soils refers to undrained shear strength (ϕ , $\Phi = 0$)
- 2) Phi angle, Φ' , for cohesive soils in drained condition (Cohesion, $c' = 0$)
- 3) **The type of engineered fill is assumed to be consistent with the shear strength requirements of the MTO Sign Support Manual, or better.**
- 4) The soil resistance within the zone of frost penetration (1.0 m) is to be neglected.
- 5) Based on the structures caisson depth from MTO Sign Support Manual
- 6) "of Caisson depth"
- 7) Based on the minimum structures caisson depth (L) from MTO Sign Support Manual and frost penetration depth (1.0 m).
- 8) Within the depth of foundation caissons

The minimum soil parameters below the frost layer (1.0 m) for the caisson foundations in accordance with the standard MTO design (R-34) are provided in Tables 5-10 to 5-12 in comparison with the design soil parameters applicable to the OHS/VMS/AAS sites.

Table 5-10: Comparison of Soil Strength for Phase I OHS with MTO Standard Design

MTO Standard	Case 1	Case 2	OHS 7	OHS 8	OHS 9	OHS 10	OHS 16	OHS 17	OHS 18	OHS 19	OHS 27	OHS 28	OHS 29	OHS 32	OHS 33	OHS 34	OHS 35	OHS 46	OHS 47
Caisson Foundation Soil Type	Sand	Soft Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay / Sand	Silty Clay	Engineered Fill & Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Engineered Fill & Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Silty Clay
			Stiff to Very Stiff	Firm to Stiff	Firm	Firm	Stiff	Firm / Loose	Hard/Stiff	Hard/Very Stiff	Stiff	Very stiff	Hard/Very Stiff	Stiff	Very stiff	Hard/ Stiff	Hard/ Very Stiff	Stiff	Hard/ Stiff
Length of Caisson Below Frost Depth	Upper 2/3	$\phi = 28^{\circ}$	$Cu = 25 \text{ kPa}$	$Cu \geq 25 \text{ kPa}$	$Cu \geq 25 \text{ kPa}$	$Cu \geq 25 \text{ kPa}$	$Cu \geq 25 \text{ kPa}$	$Cu \geq 25 \text{ kPa}$	$\phi \geq 28^{\circ} \text{ \& } Cu \geq 25 \text{ kPa}$	$Cu \geq 25 \text{ kPa}$	$\phi \geq 28^{\circ} \text{ \& } Cu \geq 25 \text{ kPa}$	$Cu \geq 25 \text{ kPa}$	$\phi \geq 28^{\circ} \text{ \& } Cu \geq 25 \text{ kPa}$	$\phi \geq 28^{\circ} \text{ \& } Cu \geq 25 \text{ kPa}$	$\phi \geq 28^{\circ} \text{ \& } Cu \geq 25 \text{ kPa}$	$Cu \geq 25 \text{ kPa}$	$Cu \geq 25 \text{ kPa}$	$\phi \geq 28^{\circ} \text{ \& } Cu \geq 25 \text{ kPa}$	$Cu \geq 25 \text{ kPa}$
	Lower 1/3	$\phi = 30^{\circ}$	$Cu = 50 \text{ kPa}$	$Cu < 50 \text{ kPa}^{(1)}$	$Cu < 50 \text{ kPa}^{(1)}$	$Cu \geq 50 \text{ kPa}$	$Cu \geq 50 \text{ kPa}$	$Cu < 50 \text{ kPa}^{(1)}$	$\phi \geq 30^{\circ} \text{ \& } Cu \geq 50 \text{ kPa}$	$Cu \geq 50 \text{ kPa}$	$\phi \geq 30^{\circ} \text{ \& } Cu \geq 50 \text{ kPa}$	$Cu \geq 50 \text{ kPa}$	$\phi \geq 30^{\circ} \text{ \& } Cu \geq 50 \text{ kPa}$	$\phi \geq 30^{\circ} \text{ \& } Cu \geq 50 \text{ kPa}$	$\phi \geq 30^{\circ} \text{ \& } Cu \geq 50 \text{ kPa}$	$Cu \geq 50 \text{ kPa}$	$Cu \geq 50 \text{ kPa}$	$\phi \geq 30^{\circ} \text{ \& } Cu \geq 50 \text{ kPa}$	$Cu \geq 50 \text{ kPa}$

Note (1) Foundation soils do not meet the requirements of the MTO Sign Support Manual (Ref. R-34).

Table 5-11: Comparison of Soil Strength for Phase I VMS with MTO Standard Design

MTO Standard		Case 1	Case 2	VMS 3	VMS 4	VMS 5	VMS 10	VMS 11	VMS 12
Caisson Foundation Soil Type		Sand	Soft Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay
				Soft to Stiff	Stiff	Stiff to Very Stiff	Firm to Stiff	Firm to Stiff	Firm to Stiff
Length of Caisson Below Frost Depth	Upper 2/3	$\phi = 28^\circ$	$C_u = 25$ kPa	$C_u \geq 25$ kPa	$C_u \geq 25$ kPa	$C_u \geq 25$ kPa	$C_u \geq 25$ kPa	$C_u \geq 25$ kPa	$C_u \geq 25$ kPa
	Lower 1/3	$\phi = 30^\circ$	$C_u = 50$ kPa	$C_u \geq 50$ kPa	$C_u \geq 50$ kPa	$C_u \geq 50$ kPa	$C_u < 50^{(1)}$ kPa	$C_u \geq 50$ kPa	$C_u \geq 50$ kPa

Note (1) Foundation soils do not meet the requirements of the MTO Sign Support Manual (Ref. R-34).

Table 5-12: Comparison of Soil Strength for Phase I AAS with MTO Standard Design

MTO Standard		Case 1	Case 2	AAS 1	AAS 2	AAS 3	AAS 4	AAS 5	AAS 6	AAS 7
Caisson Foundation Soil Type		Sand	Soft Clay	Engineered Fill / Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Silty Clay	Silty Clay
				Firm to Stiff	Firm	Stiff to Very Stiff	Stiff to Very Stiff	Stiff	Firm to Stiff	Stiff to Very Stiff
Length of Caisson Below Frost Depth	Upper 2/3	$\phi = 28^\circ$	$C_u = 25$ kPa	$\phi \geq 28^\circ$ & $C_u \geq 25$ kPa	$C_u \geq 25$ kPa	$\phi \geq 28^\circ$ & $C_u \geq 25$ kPa	$\phi \geq 28^\circ$ & $C_u \geq 25$ kPa	$\phi \geq 28^\circ$ & $C_u \geq 25$ kPa	$C_u \geq 25$ kPa	$C_u \geq 25$ kPa
	Lower 1/3	$\phi = 30^\circ$	$C_u = 50$ kPa	$\phi \geq 30^\circ$ & $C_u \geq 50$ kPa	$C_u \geq 50$ kPa	$\phi \geq 30^\circ$ & $C_u \geq 50$ kPa	$\phi \geq 30^\circ$ & $C_u \geq 50$ kPa	$\phi \geq 30^\circ$ & $C_u \geq 50$ kPa	$C_u \geq 50$ kPa	$C_u \geq 50$ kPa

Note (1) Foundation soils do not meet the requirements of the MTO Sign Support Manual (Ref. R-34).

From the comparison in Tables 5-10 to 5-12, it appears that the MTO Sign Support Manual (Ref. R-34) standard foundation design for the OHS, VMS, and AAS signs is acceptable (**except where noted in dark bold letters**). However, this has to be confirmed with respect to the design loads by the structural engineer who designs the OHS, VMS, and AAS signs.

For those signs identified in Tables 5-10 to 5-12 which do not conform to the MTO standard foundation design (Signs OHS 7, OHS 8, OHS 16 and VMS 10), additional analysis was carried out using proprietary software L-PILE v 5.0. The maximum allowable lateral loads and maximum allowable deflection are not provided in the MTO Sign Support Manual. Maximum lateral loads, at the caisson head, were back calculated using the provided MTO soil foundation strength requirements from the MTO Sign Support Manual and allowing two lateral deflection cases: 10 mm and 25 mm at the top of the caisson. Table 5-13 presents the results of the maximum lateral load for a free head caisson at the caisson head for 10 mm and 25 mm deflection based on MTO's soil foundation requirements and caisson class, depth and diameter for Signs OHS 7, OHS 8, OHS 16, and VMS 10.

Table 5-13: Maximum Lateral Load at the Caisson Head for 10 mm and 25 mm Deflection Based on MTO's Soil Foundation Strength Requirements and Caisson Class, Depth, and Diameter

Sign Designation		OHS 7	OHS 8	OHS 16	VMS 10
Profile No.		9	9	11	5
Class		-	-	-	-
Caisson Depth (m)		6.0	6.0	6.0	6.0
Caisson Diameter (m)		1.2	1.2	1.2	1.2
Young's Modulus, E (GPa)		20	20	20	20
Pile Moment of Inertia (m ⁴)		0.101788	0.101788	0.101788	0.101788
Undrained Shear Strength, S _u (kPa)	Upper 2/3 ⁽¹⁾	≥ 25	≥ 25	≥ 25	≥ 25
	Lower 1/3 ⁽¹⁾	≥ 50	≥ 50	≥ 50	≥ 50
Calculated Maximum Lateral Load at Caisson Head (kN)	Lateral Deflection Case, 10 mm	105.0	105.0	105.0	105.0
	Lateral Deflection Case, 25 mm	143.5	143.5	143.5	143.5

Notes: 1) "of Caisson depth"

Utilizing L-PILE, the calculated lateral maximum lateral load from Table 5-13, and the undrained shear strength (S_u) from Tables 5.7 to 5.9 were used to calculate lateral deflection at the caisson head of the caisson for signs OHS 7, OHS 8, OHS 16 and VMS 10. Table 5-14 presents the results of the maximum lateral deflection at the caisson head for Signs OHS 7, OHS 8, OHS 16 and VMS 10, the analysis neglected the soil stiffness over the frost penetration (1.0 m) in the model.

Table 5-14: Calculated Lateral Deflection at the Caisson Head⁽¹⁾

Sign Designation		OHS 7		OHS 8		OHS 16		VMS 10	
Profile No.		9		9		11		5	
Class		-		-		-		-	
Caisson Depth (m)		6.0		6.0		6.0		6.0	
Caisson Diameter (m)		1.2		1.2		1.2		1.2	
Undrained Shear Strength, S_u (kPa)	Upper 2/3 ⁽²⁾	59-50		57-49		73-52		68-52	
	Lower 1/3 ⁽²⁾	50-46		49-44		52-49		52-46	
Lateral Deflection Case (mm) Table 5-13		10	25	10	25	10	25	10	25
Calculated Maximum Lateral Load at the Caisson Head (kN)		105.0	143.5	105.0	143.5	105.0	143.5	105.0	143.5
Calculated Lateral Deflection at the Caisson Head (mm)		6-7	16-17	6-7	16-17	2-3	7-8	3-4	8-9
Figure		C.1		C.2		C.3		C.8	

Notes: 1) The analysis neglected the soil stiffness over the frost penetration (1.0 m) in the model.
2) "of Caisson depth"

The calculated lateral deflections for Signs OHS 7, OHS 8, OHS 16 and VMS 10 are lower than the lateral deflection cases of 10 mm and 25 mm, indicating that the MTO standard foundation design is acceptable at these sign sites. However, this should be confirmed with respect to the design loads and acceptable deflection at the caisson head by the structural engineer who designs the OHS, and VMS signs.

For sign caisson foundations located close to slopes, the minimum clear distance between the outer edge of the caisson and the crest of the slope should not be less than 1.0 m.

5.4.2 Resistance to Lateral Loads

- The ULS geotechnical resistance to lateral loads should be determined based on the amount of lateral movement of the caisson that is considered to be at failure.
- The SLS geotechnical resistance to lateral loads is dependent on acceptable levels of lateral caisson deflection under the design loads.

- Both the ULS and SLS lateral load resistances are strongly dependent on the structural configuration, applied loading and on the acceptable lateral deformations of the caissons. The design of the caissons lateral loads may be carried out using the horizontal subgrade reaction method based on recommendations given in the Canadian Foundation Engineering Manual, 4th Edition. The use of the method assumes relatively small lateral deflections of the caissons occur under SLS or ULS loading conditions. The coefficient of horizontal subgrade reaction, k_h , is based on the following equations:

$$k_h = n_h (z/d) \quad \text{for cohesionless soils, and}$$

$$= 67 (S_u/d) \quad \text{for cohesive soils.}$$

Where:

k_h (MPa/m) = Soil modulus of horizontal subgrade reaction

n_h (MPa/m) = Soil coefficient

S_u (MPa) = Undrained shear strength

z (m) = Depth below finished grade

d (m) = Pile diameter/width

An equivalent linear, lateral soil spring at any depth along the caisson may then be computed as:

$$K_{lat}(z) = k_h D_p \Delta z$$

Where:

D_p = caisson width

Δz = spacing between lateral springs along the caisson.

The recommended ranges for the coefficient of horizontal subgrade reaction are tabulated by sign type in Tables 5-15 to 5-17.

Table 5-15: Soil Parameters for Lateral Load Resistance Calculations, OHS Signs

Sign Designation	OHS 7	OHS 8	OHS 9	OHS 10	OHS 16	OHS 17	OHS 18	OHS 19	OHS 27	OHS 28	OHS 29	OHS 32	OHS 33	OHS 34	OHS 35	OHS 45	OHS 46	OHS 47
Caisson Foundation Soil Type	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay / Sand	Silty Clay	Engineered Fill & Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Engineered Fill & Silty Clay	Engineered Fill / Silty Clay	Silty Clay	Silty Clay	Silty Clay	Engineered Fill & Silty Clay	Silty Clay	Silty Clay
	Stiff to Very Stiff	Firm to Stiff	Firm	Firm	Stiff	Firm / Loose	Hard/Stiff	Hard/Very Stiff	Stiff	Very stiff	Hard/Very Stiff	Stiff	Very stiff	Hard/Stiff	Hard/Very Stiff	Hard/Very Stiff	Stiff	Hard/Stiff
Engineered Fill (cohesionless) k_h (MPa/m)								74.4-111.6		62.0-155.9	74.4-111.6	62.0-155.9				62.0-155.9		
Engineered Fill (cohesive) k_h (MPa/m)								1.4		1.2-1.7	1.4	1.2-1.7				1.2-1.7		
Native Silty Clay Crust k_h (MPa/m)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	3.7-5.0	3.7-5.0	4.2	3.7-5.0	3.7-5.0	4.2	3.7-5.0	3.7-5.0	4.2	3.7-5.0
Native Firm to Stiff Silty Clay k_h (MPa/m)	2.3-4.2	2.3-4.2	3.4-4.2	3.4-4.2	2.4-4.2	2.8-4.2	3.4-4.2	3.4-4.2	2.2-5.0	2.5-5.0	3.4-4.2	N/A	N/A	3.4-4.2	3.0-5.0	3.0-5.0	N/A	3.0-5.0

Note:
 n_h = 10 to 15 (MPa/m) for dry compact to dense sand.

Table 5-16: Soil Parameters for Lateral Load Resistance Calculations, VMS Signs

Sign Designation	VMS 3	VMS 4	VMS 5	VMS 10	VMS 11	VMS 12
Caisson Foundation Soil Type	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay
	Soft to Stiff	Stiff	Stiff to Very Stiff	Firm to Stiff	Firm to Stiff	Firm to Stiff
Engineered Fill (cohesionless) k_h (MPa/m)						
Engineered Fill (cohesive) k_h (MPa/m)						
Native Silty Clay Crust k_h (MPa/m)	4.2	4.2	4.2	4.2	4.2	4.2
Native Firm to Stiff Silty Clay k_h (MPa/m)	2.5-4.2	2.8-4.2	3.9-4.2	2.1-4.2	2.8-4.2	3.4-4.2

Note:

n_h = 10 to 15 (MPa/m) for dry compact to dense sand.

Table 5-17: Soil Parameters for Lateral Load Resistance Calculations, AAS Signs

Sign Designation	AAS 1	AAS 2	AAS 3	AAS 4	AAS 5	AAS 6	AAS 7
Caisson Foundation Soil Type	Engineered Fill / Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Silty Clay	Silty Clay
	Firm to Stiff	Firm	Stiff to Very Stiff	Stiff to Very Stiff	Stiff	Firm to Stiff	Stiff to Very Stiff
Engineered Fill (cohesionless) k_h (MPa/m)	62.0-155.9		62.0-155.9	62.0-155.9	62.0-155.9		
Engineered Fill (cohesive) k_h (MPa/m)	1.2-1.7		1.2-1.7	1.2-1.7	1.2-1.7		
Native Silty Clay Crust k_h (MPa/m)	3.7-5.0	3.7-5.0	3.7-5.0	3.7-5.0	3.7-5.0	3.7-5.0	3.7-5.0
Native Firm to Stiff Silty Clay k_h (MPa/m)	1.8-5.0	1.8-5.0	2.2-5.0	2.2-5.0	3.0-5.0	3.0-5.0	3.0-5.0

Note:

n_h = 10 to 15 (MPa/m) for dry compact to dense sand.

5.4.3 Resistance to Axial Loads

The applied axial loads on the caissons supporting signs should be checked against the ultimate bearing resistances. If insufficient, the diameter and/or the length of caisson should be increased accordingly. SLS values for caissons and corresponding movements may have to be checked if certain SLS criteria need to be satisfied (neglecting shaft friction above 1.0 m depth).

The ultimate geotechnical bearing resistance at ULS of caissons can be calculated from the following equation:

$$Q_u = \Sigma A'_s q_s + A'_t q_t$$

Where:

A'_s = surface area of the shaft

q_s = soil-pile friction/adhesion at shaft

A'_t = cross sectional area of the pile tip

q_t = bearing resistance at the pile tip

The recommended ranges of soil parameters are tabulated by sign type in Tables 5-18 to 5-20.

Table 5-19: Shaft and Toe Parameters for Factored Ultimate Resistance to Axial Load Calculations, VMS Signs

Sign Designation	VMS 3	VMS 4	VMS 5	VMS 10	VMS 11	VMS 12
Caisson Foundation Soil Type	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay
	Soft to Stiff	Stiff	Stiff to Very Stiff	Firm to Stiff	Firm to Stiff	Firm to Stiff
$q_s^{(1)}$ (kPa)	20	20	30	18	20	24
$q_t^{(1, 2, 3)}$ (kPa)	120	120	200	120	120	160

- Notes:
- 1) The type of engineered fill is assumed to be consistent with the shear strength requirements of the MTO Sign Support Manual, or better.
 - 2) For caissons with a depth to diameter ratio of equal to or more than 4, and founded on stiff to hard silty clay or engineered fill
 - 3) Based on a geotechnical resistance factor of 0.4

Table 5-20: Shaft and Toe Parameters for Factored Ultimate Resistance to Axial Load Calculations, AAS Signs

Sign Designation	AAS 1	AAS 2	AAS 3	AAS 4	AAS 5	AAS 6	AAS 7
Caisson Foundation Soil Type	Engineered Fill / Silty Clay	Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Engineered Fill / Silty Clay	Silty Clay	Silty Clay
	Firm to Stiff	Firm	Stiff to Very Stiff	Stiff to Very Stiff	Stiff	Firm to Stiff	Stiff to Very Stiff
$q_s^{(1)}$ (kPa)	10-20	20	10-26	10-30	10-30	30	30
$q_t^{(1, 2, 3)}$ (kPa)	120	120	160	200	200	200	200

- Notes:
- 1) The type of engineered fill is assumed to be consistent with the shear strength requirements of the MTO Sign Support Manual, or better.
 - 2) For caissons with a depth to diameter ratio of equal to or more than 4, and founded on stiff to hard silty clay or engineered fill
 - 3) Based on a geotechnical resistance factor of 0.4

6 Other Geotechnical Recommendations

6.1 Dewatering

- The design of the dewatering system should comply with the OPSS 517 and 518 provisions.
- Where construction excavations are required around the sign structures, due to the prevalent low permeability of the silty clay deposit, minor groundwater seepage is anticipated, which should be controllable by conventional temporary dewatering (around the sign structures). Runoff and seepage into the excavations from perched groundwater in the fill and upper granular layers (where present) should also be anticipated. In adverse conditions, these seepage rates can be significant. Provision should be made to deal with the seepage by pumping from properly filtered sumps located within the excavation. All surface water should be directed away from all open excavations.
- When using auger drilling to install the caissons, it is anticipated that movements of granular materials at the granular soil/clay interface will occur, which may require use of a temporary steel liner.

6.2 Construction Requirements

The anticipated construction conditions in this report are discussed only to the extent of their potential influence on the design decisions. References to construction methods are not intended to be the suggestions or directions on the construction methodologies. Contractors should be aware that the data presented in this report and their interpretations may not be sufficient to assess all factors that may affect the construction.

As mentioned earlier, the Contractors are fully responsible for the design, construction methods and performance (stability, deformability and deterioration) of the temporary slopes and temporary works. The following recommendations and comments are considered applicable:

- All excavation works should be carried out in accordance with the guidelines outlined in Occupational Health and Safety Act (OHSA) and Ontario Provincial Standard Specification (OPSS) 902. The native undisturbed soils may be classified as Type 3 soils. The excavations below the original ground levels may intersect water bearing backfill within trenches of active and/or abandoned utilities. In these cases, Type 4 soil conditions may occur and should be addressed accordingly.
- The recommendations provided herein are based on the assumptions that the excavations are properly protected at all times against surface erosion due to runoff, desiccation, freeze-thaw effects, etc.
- To protect the integrity of subgrade for foundations and pavements, the final excavation lift above the design elevation should not be less than 500 mm and should be carried out only when the contractor is ready to prepare and cover the subgrade with the materials specified in the design same day the final excavation is exposed and approved. No construction traffic should be permitted over subgrade without approved protective covers.
- The final lift above the design subgrade to be carried out using buckets equipped with smooth lips. Once exposed, the subgrade must be immediately inspected. Upon approval, a skim coat of lean concrete protection (mud mat) should be placed to provide also a working surface for forming and steel erection.

- The duration of exposure of the temporary excavation surfaces adjacent to slopes should be kept to a minimum within practical limitations. The adjacent slopes should be inspected regularly for signs of deformation, instability and/or surface deterioration, and appropriate mitigation measures should be implemented, as required.
- Excavations should be limited in size in the area and appropriate monitoring of the residence should take place. Monitoring should consist of a precondition survey along with regular surveying conducted of the residence.
- Periodic inspection of the condition of the sites should be carried out by qualified personnel.

6.3 Construction Quality Control

To ensure that construction is carried out in a manner consistent with the intent of the recommendations set forth in this report, a program of geotechnical inspection and testing should be developed and implemented throughout the construction phase. In addition, related laboratory testing should be carried out in conjunction with the field work to monitor compliance with the various materials and project specifications.

7 Limitations of Report

The work performed in this report was carried out in accordance with the Standard Terms and Conditions made part of our contract. The conclusions and recommendations presented herein are based solely upon the scope of services and time and budgetary limitations described in our contract.

This report presents the subsurface soil and groundwater conditions inferred from geotechnical investigation and geotechnical design of the structure mentioned in the report. The report was prepared with the condition that the structural and other designs of the WEP will be in accordance with applicable standards and codes, regulations of authorities having jurisdiction, and good engineering practices. Further, the recommendations and opinions expressed in this report are only applicable to the proposed project as described within AMEC's report.

There should also be an ongoing liaison with AMEC during both the design and construction phases of the project to ensure that the recommendations in this report have been interpreted and implemented correctly. Also, if any further clarification and/or elaboration are needed concerning the geotechnical aspects of this project, AMEC should be contacted immediately.

The conclusions and recommendations given in this report are based on data presented in the pre-bid geotechnical investigation reports and information determined at the test hole locations during the AMEC investigation carried out for the geotechnical design work. The data obtained from the pre-bid investigations (carried out by others) was assumed to be valid and applicable.

The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated.

The soil boundaries indicated have been inferred from non-continuous sampling, observations of drilling resistance, Nilcon vane, CPT and DMT probing. The boundaries typically represent a transition from one soil type to another and are not intended to define exact planes of geological change. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. Thus, unsuitable foundation soils may be encountered at the foundation grade requiring extra sub-excavations, subgrade improvement, and/or changes to the design. It is important that the AMEC geotechnical design engineer be involved during construction throughout the WEP project site to confirm that the subsurface conditions do not deviate materially from those encountered in test holes, and that any material deviations, if encountered, do not adversely affect the geotechnical design.

The stability analyses assumed a certain sequence of the construction; if different construction approaches are considered the geotechnical design will have to be reviewed. The calculated factors of safety assume strict adherence to the good construction practices with respect to the protection of the exposed slopes.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, it is recommended that AMEC be engaged during the final design and construction stages to verify that the design and construction are consistent with AMEC's recommendations.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the structural and other designers and constructor. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of the surficial topsoil and the clay crust layer, the presence of artesian conditions and exsolved natural gases, and the strength of the silty clay stratum may vary markedly and unpredictably. The constructor should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. The work presented in this report has been undertaken in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

The benchmark and elevations mentioned in this report were surveyed and provided by AMICO. They should not be used by any other party for any other purpose.

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

8 Closure

The design for Phase I sign foundations was developed by Ms. Nadine Miller, P.Eng and Mr. Nazmi Boran, P.Eng. The project was executed under technical direction of Dr. Prapote Boonsinsuk, P.Eng. (Lead designer) and was reviewed by Mr. George Chow, P.Eng., Mr. Matt Oldewening, P.Eng. managed the geotechnical investigation and Mr. Brian Lapos, P.Eng. was the project manager.

The cooperation received from Ms. Biljana Rajlic, P.Eng. and Mr. Philip Murray, P.Eng. of Hatch Mott McDonald and Mr. Daniel Muñoz, P.Eng. of PIC during the design study is gratefully acknowledged.

The AMEC design team should be given an opportunity to review the final foundation design drawings to ensure that they are consistent with the recommendations contained within this report, and to determine the scope of any additional geotechnical work that may be required prior to proceeding with construction.

Respectfully submitted by:

**AMEC Environment & Infrastructure,
a Division of AMEC Americas Limited**



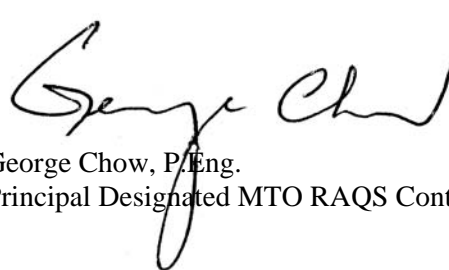
Nadine Miller, M.Eng., P.Eng.
Geotechnical Engineer



Nazmi Boran, P.Eng.
Geotechnical Engineer



Prapote Boonsinsuk, Ph.D., P.Eng
Principal Geotechnical Engineer



George Chow, P.Eng.
Principal Designated MTO RAQS Contact

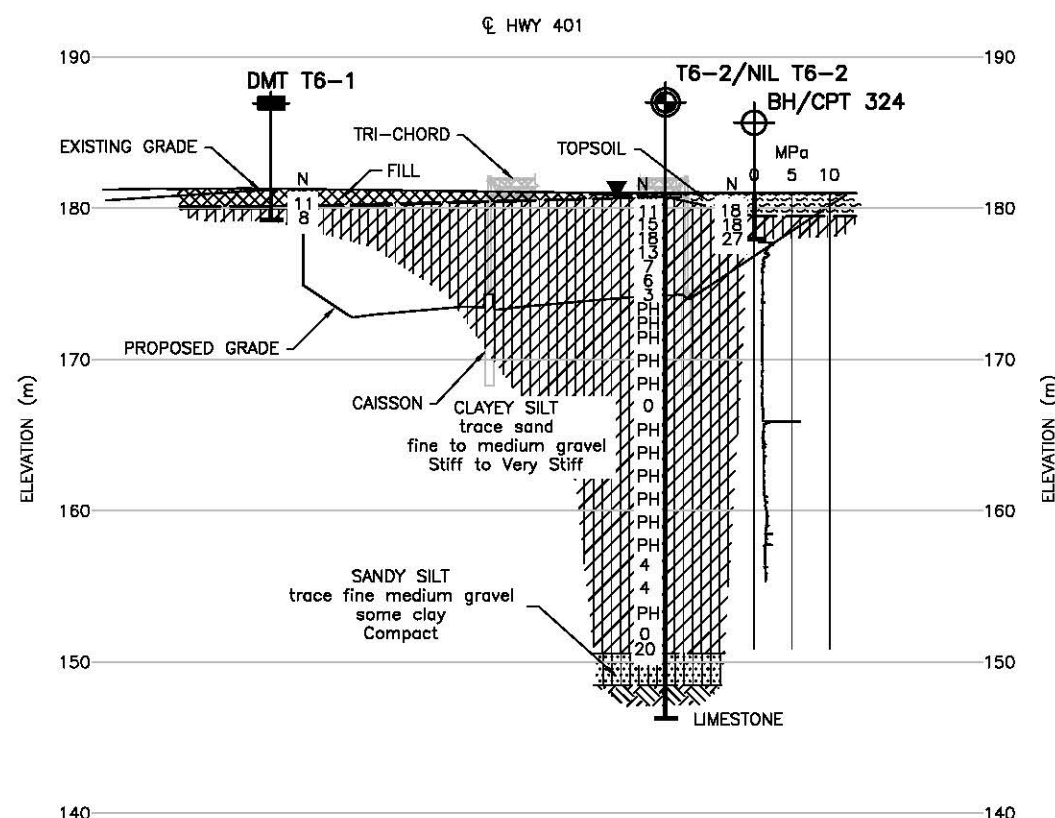
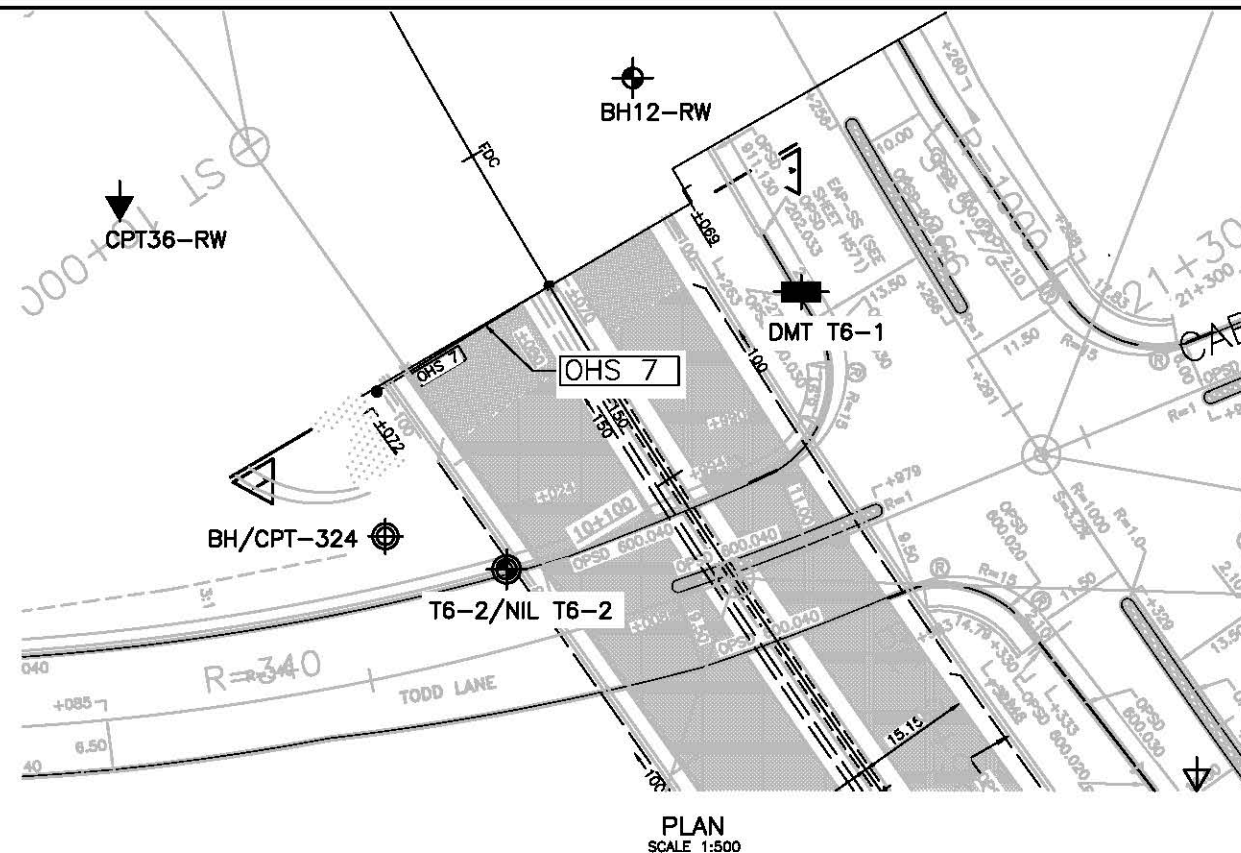
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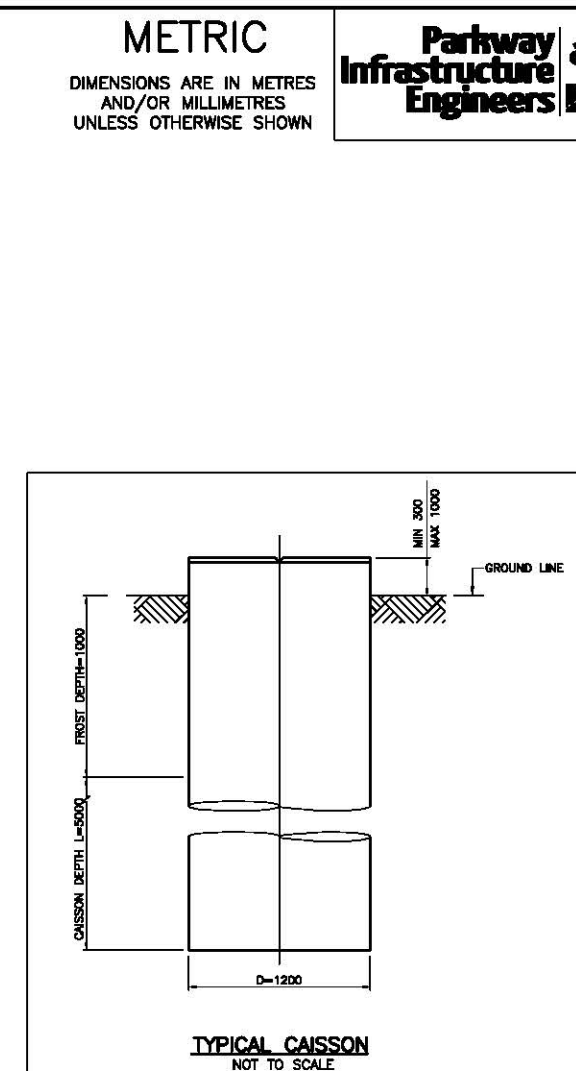
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Drawings



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VERT SCALE 1:250



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AMEC TESTHOLES			
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T6-2/NIL T6-2	180.9	4679626.8	332066.1

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 AND/OR MILLIMETRES
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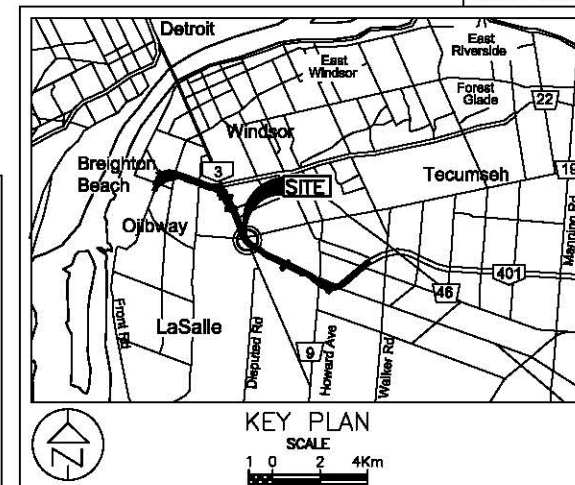
Parway Infrastructure Engineers
amc
Hatch Mott MacDonald

Windsor-Essex Parkway Project
RFP No. 09-54-1007

NEW CONSTRUCTION
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 BOREHOLE LOCATION PLAN & SOIL STRATA

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G8070

Phase 1
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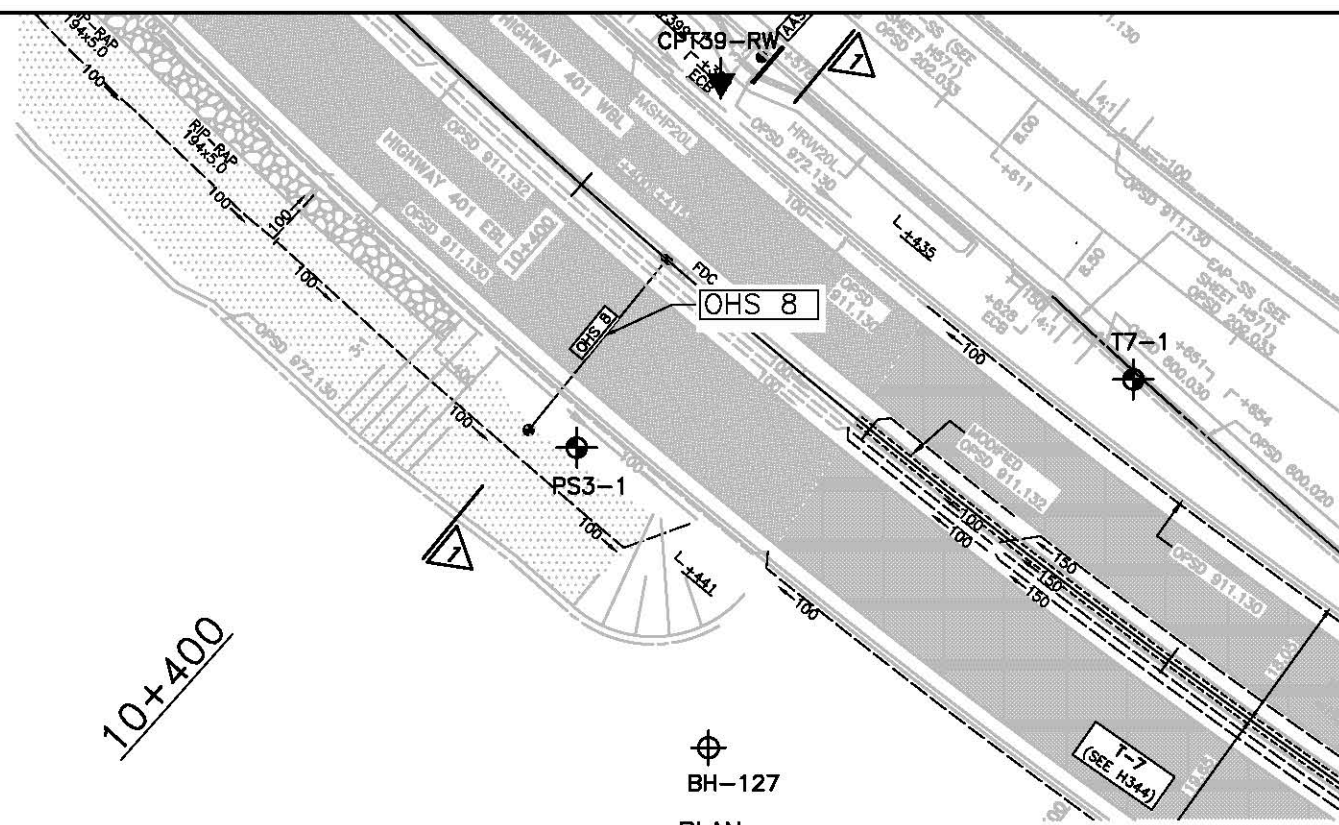


LEGEND

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 BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
 NILCON VANE CURRENT INVESTIGATION
 CPT - CURRENT INVESTIGATION
 DMT - CURRENT INVESTIGATION
 BOREHOLE PREVIOUS INVESTIGATION
 BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
 CPT -PREVIOUS INVESTIGATION
 SPT N-VALUE
 BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
 SEAL
 STANDPIPE
 DRY BOREHOLE DRY DURING DRILLING
 WATER LEVEL DURING DRILLING
 WATER LEVEL (SHALLOW PIEZO)
 WATER LEVEL (DEEP PIEZO)

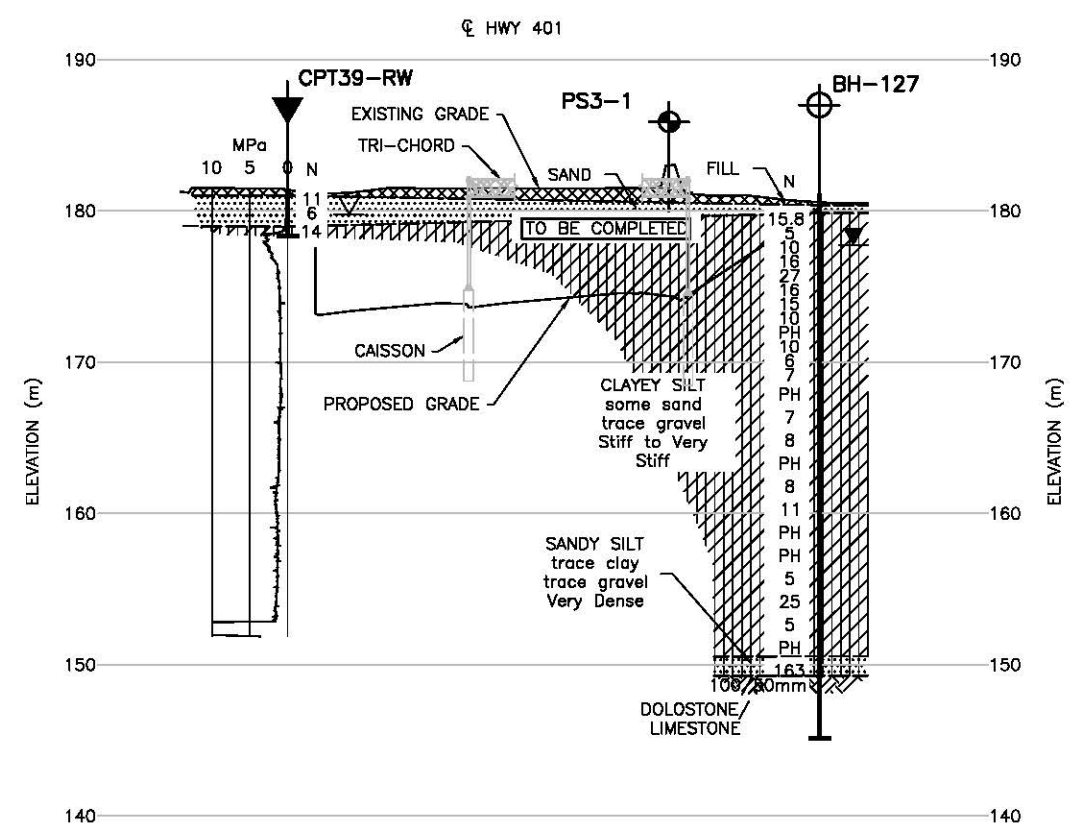
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 - ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

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24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 7 DATE 24-OCT-11



10+400

BH-127
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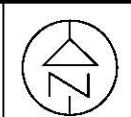
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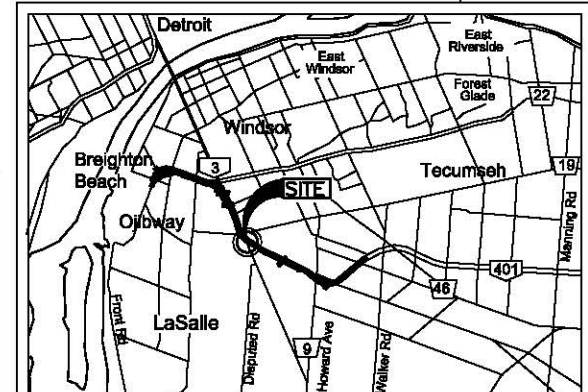
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



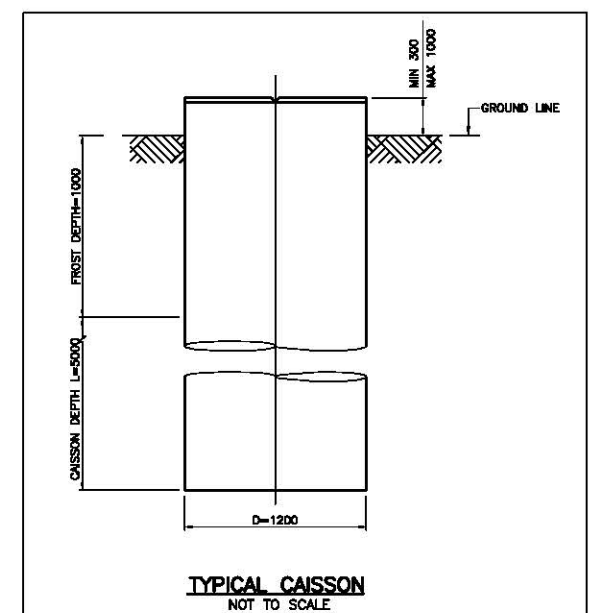
NEW CONSTRUCTION
OHS 8 - STA 10+415 HWY 401
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8080

Phase 1
90% Sub



KEY PLAN
SCALE
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TYPICAL CAISSON
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LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT -PREVIOUS INVESTIGATION
- N SPT N-VALUE
- 16 BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- DRY BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
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AMEC TESTHOLES			
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T7-1	181.5	4679413.6	332295.2

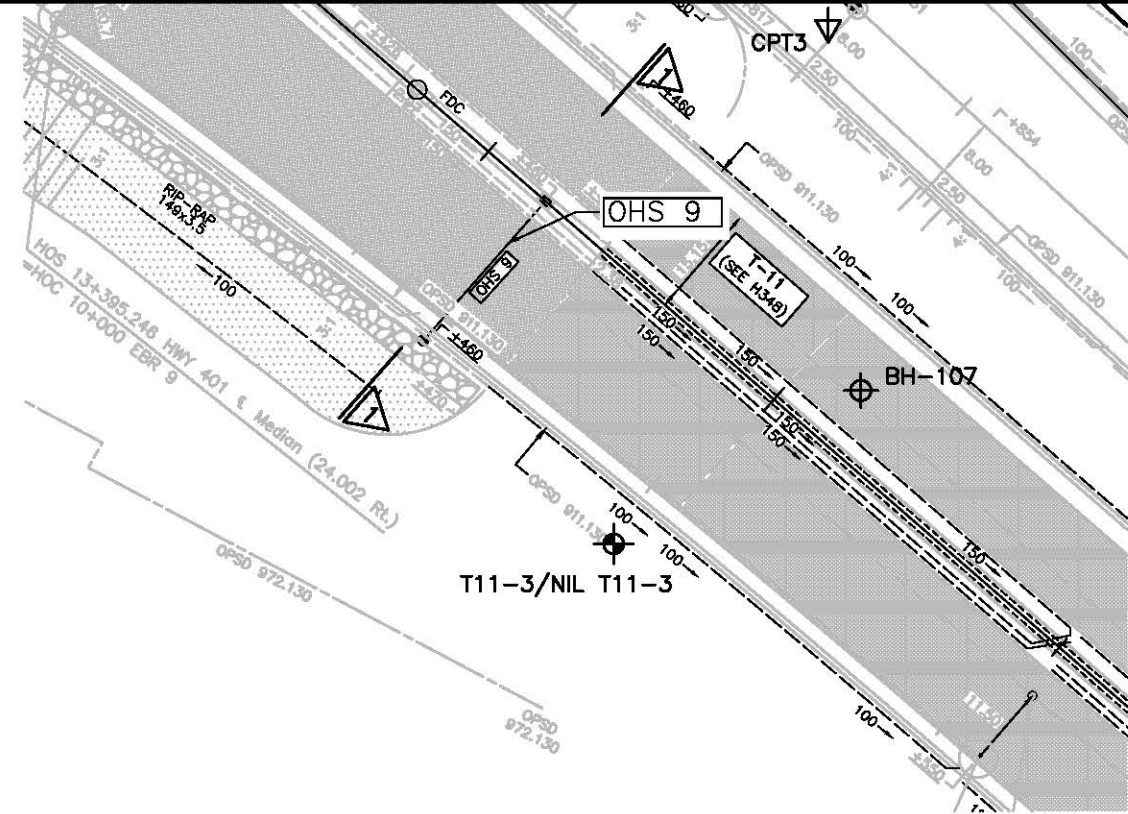
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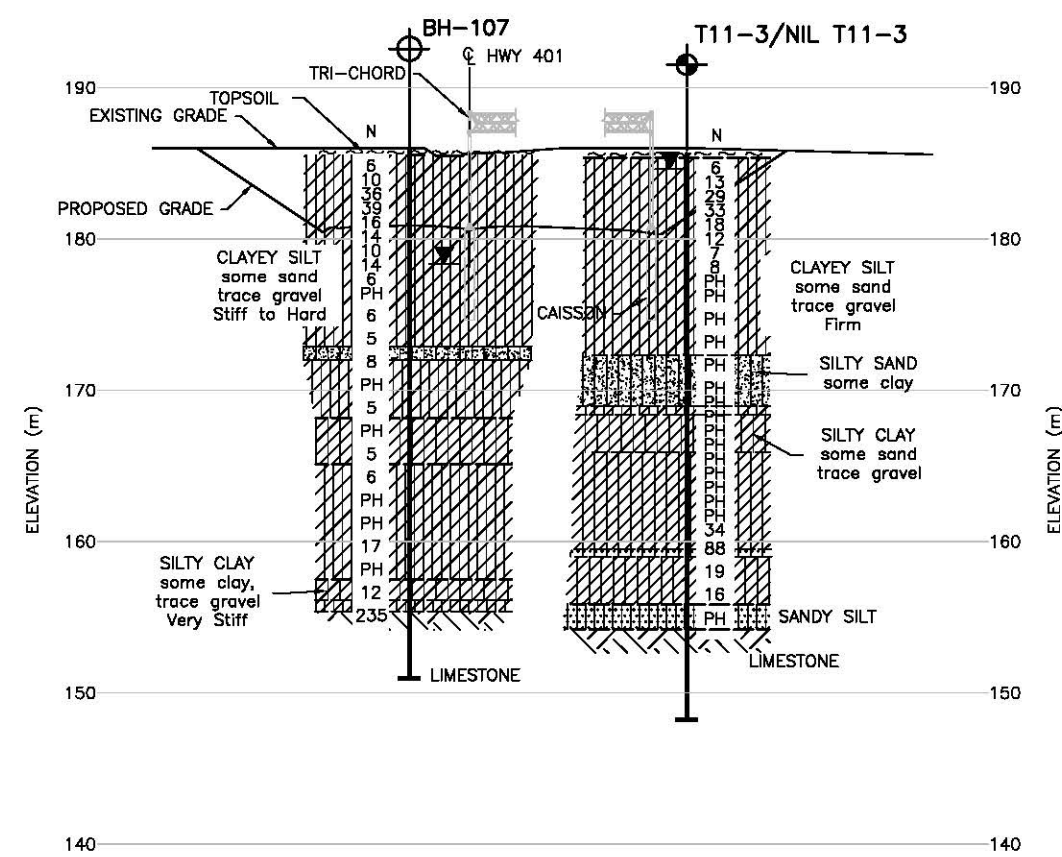
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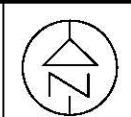
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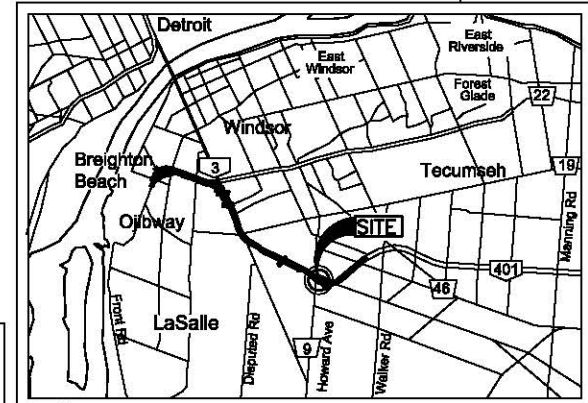
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



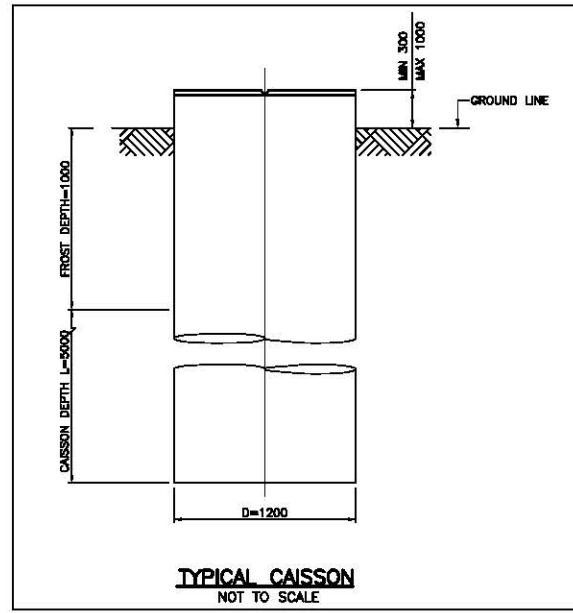
NEW CONSTRUCTION
OHS 9 - STA 13+460L
PHASE I SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8090

Phase 1
90% Sub



KEY PLAN
SCALE 1:4000



TYPICAL CAISSON
NOT TO SCALE

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
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- 16 BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
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- STANDPIPE
- DRY BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

NOTES

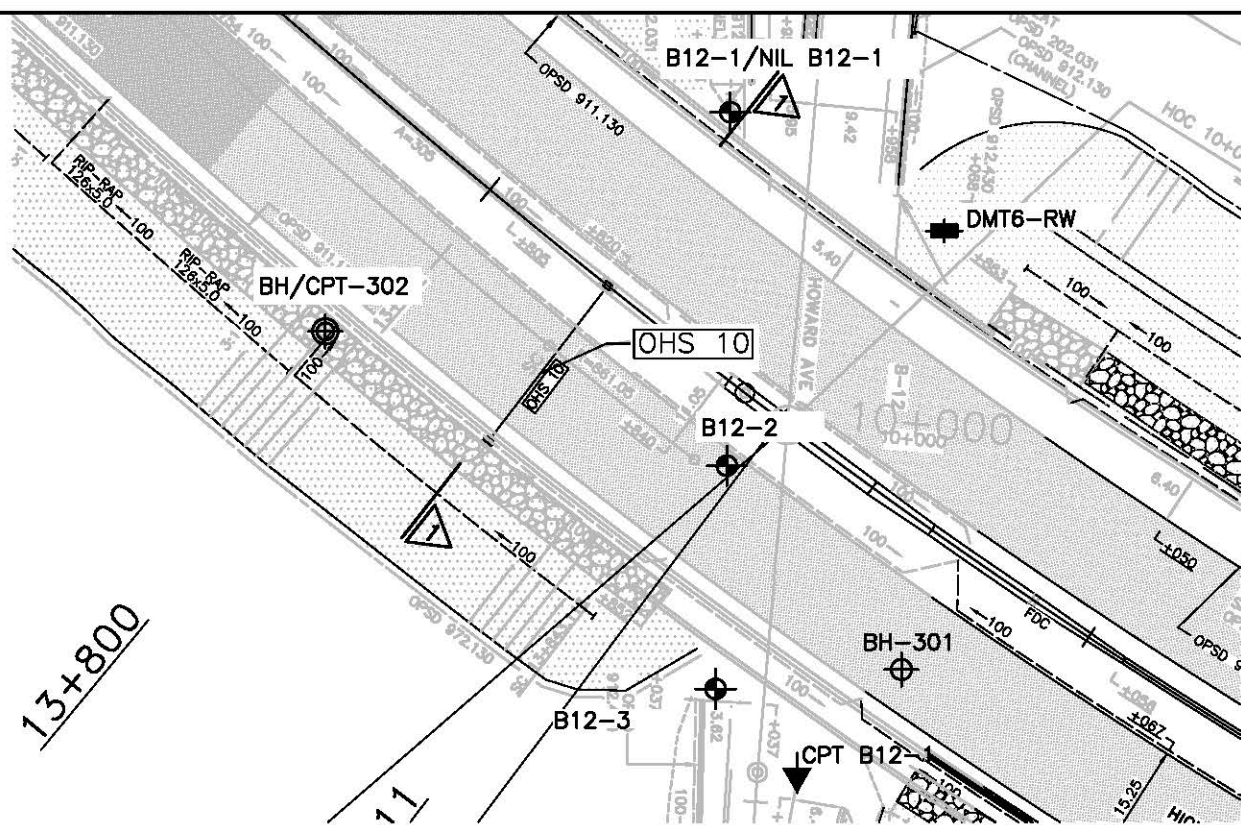
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GEOTECHNICAL DESIGN REPORT.
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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-107	185.85	4677973.1	334961.3
AMEC TESTHOLES			
T11-3/NIL T11-3	185.8	4677953.6	334927.3

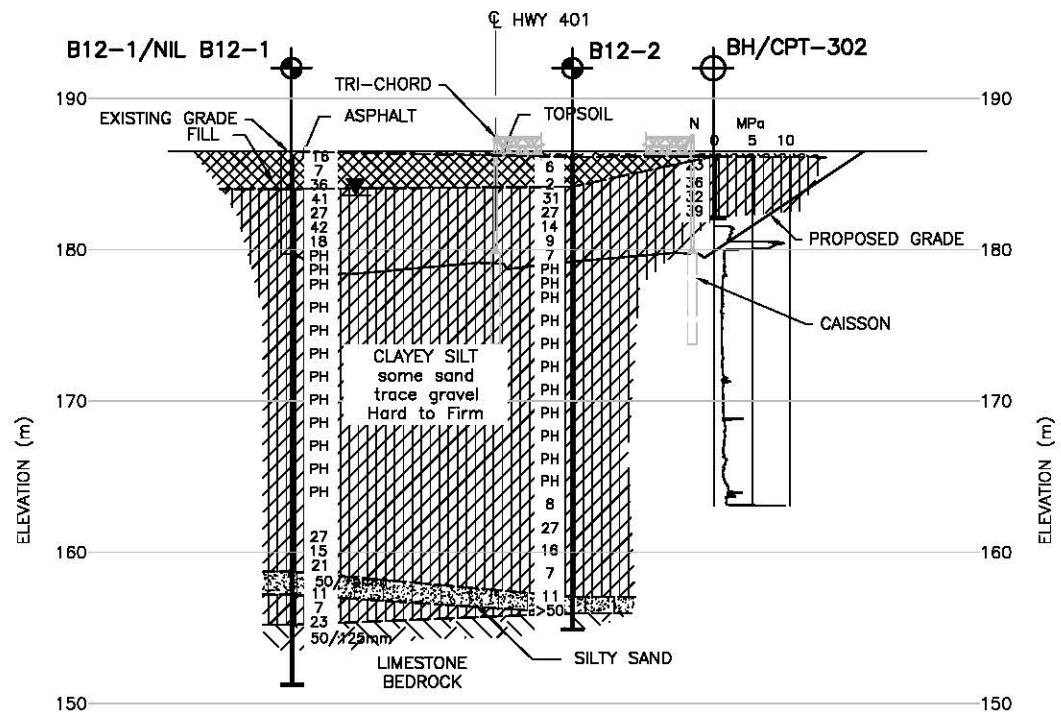
NOT FOR CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 9 DATE 24-OCT-11



PLAN
SCALE 1:500



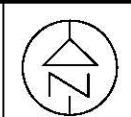
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



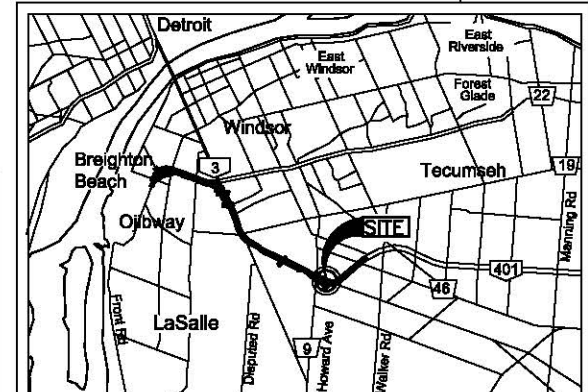
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



NEW CONSTRUCTION
OHS 10 - STA 13+820L
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8100

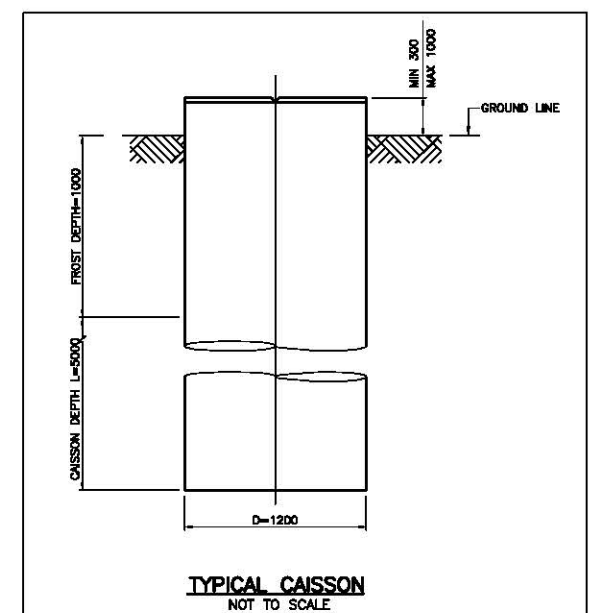
Phase 1
90% Sub



KEY PLAN
SCALE 1:4000

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT - PREVIOUS INVESTIGATION
- SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)



TYPICAL CAISSON
NOT TO SCALE

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH/CPT-302	186.26	4677756.9	335154.9
AMEC TESTHOLES			
B12-1/NIL B12-1	186.3	4677785.9	335208.5
B12-2	186.3	4677739.1	335208.0

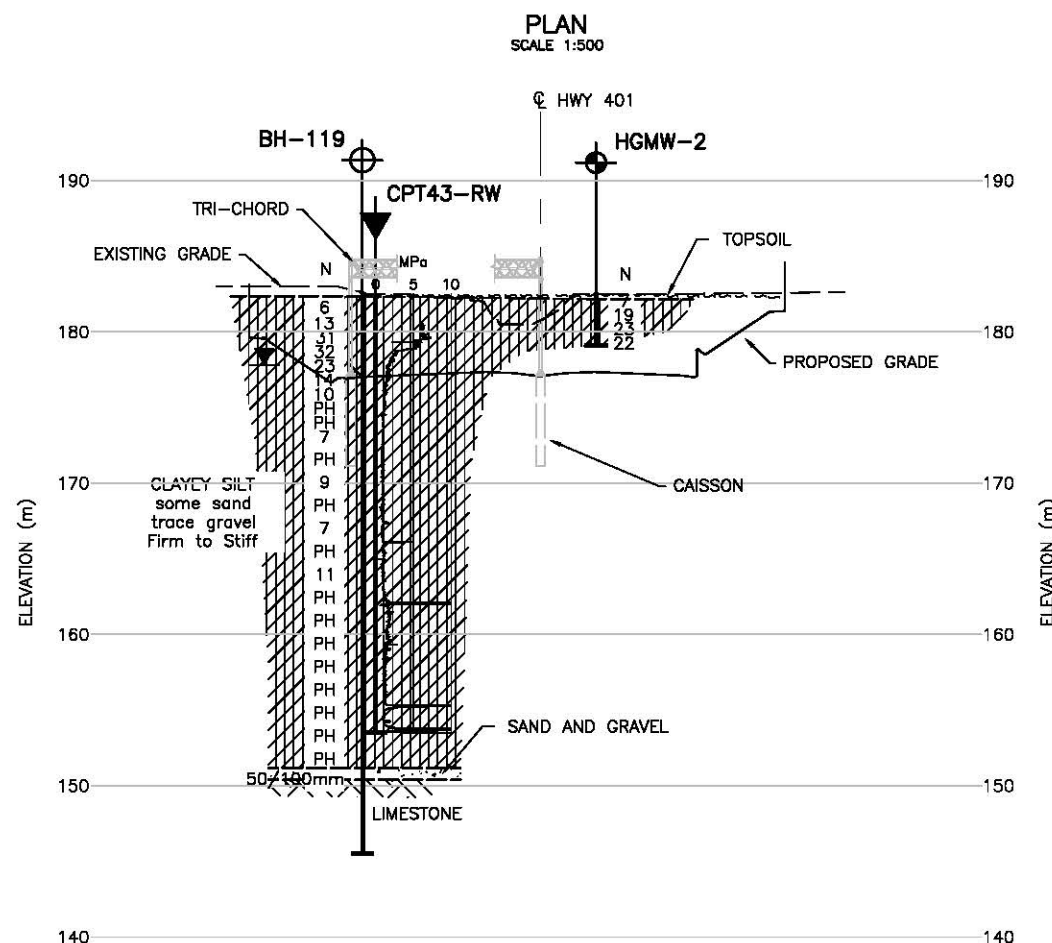
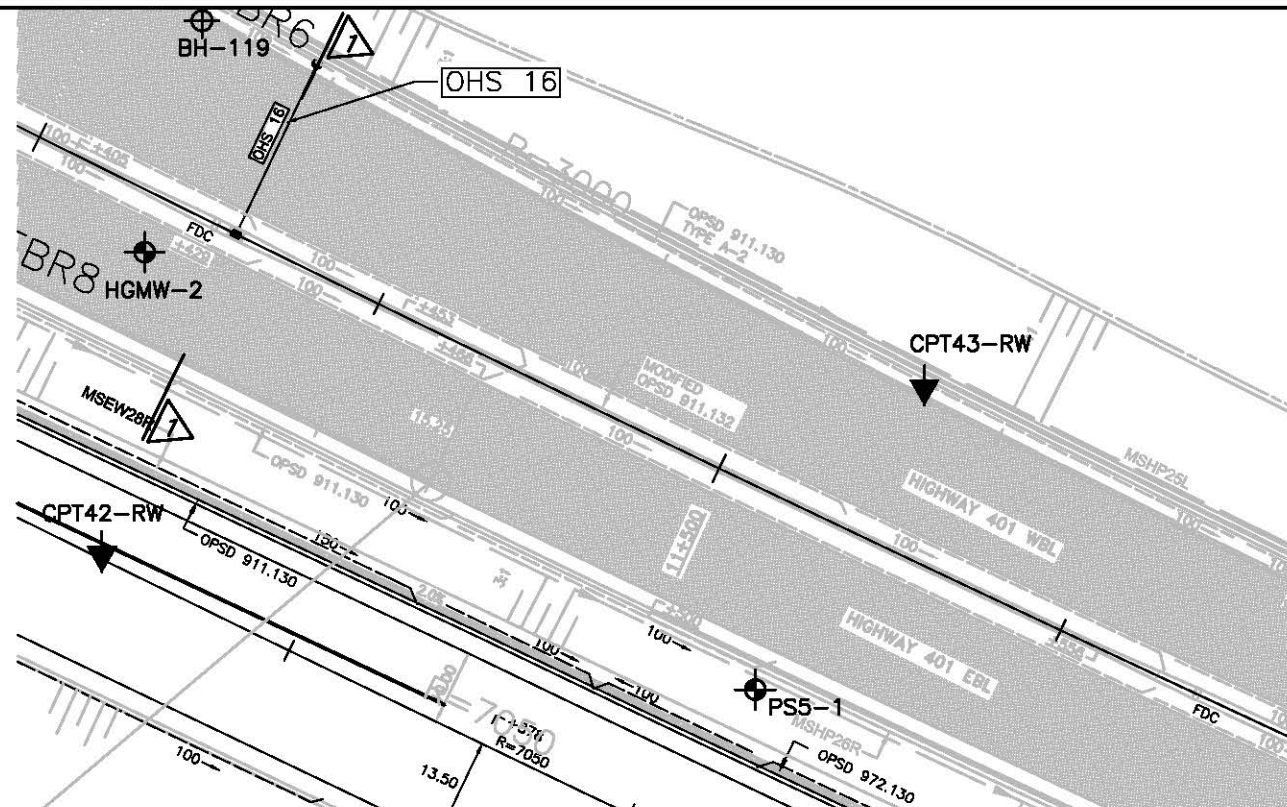
NOTES

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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

NOT FOR
CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 10 DATE 24-OCT-11



HORT SCALE 1:500
VERT SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

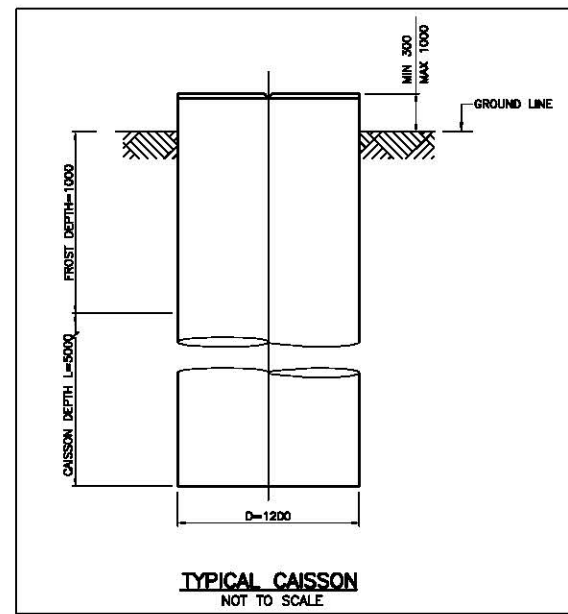
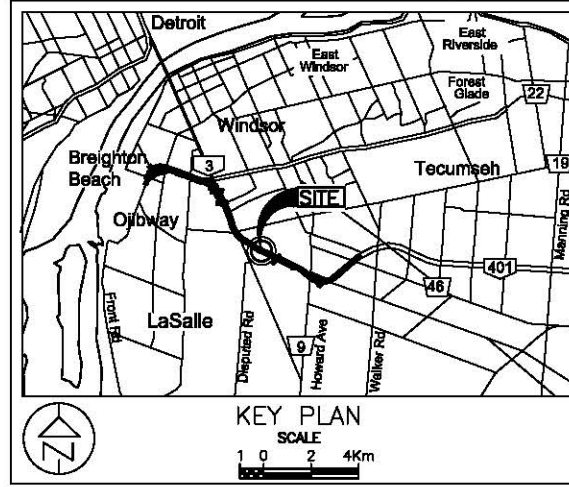


Windsor-Essex
Parkway Project
RFP No. 09-54-1007

NEW CONSTRUCTION
OHS 16 - STA 11+429 HWY 401
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8160

Phase 1
90% Sub



- LEGEND
- BOREHOLE CURRENT INVESTIGATION
 - BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
 - NILCON VANE CURRENT INVESTIGATION
 - CPT - CURRENT INVESTIGATION
 - DMT - CURRENT INVESTIGATION
 - BOREHOLE PREVIOUS INVESTIGATION
 - BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
 - CPT -PREVIOUS INVESTIGATION
 - SPT N-VALUE
 - BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
 - SEAL
 - STANDPIPE
 - BOREHOLE DRY DURING DRILLING
 - WATER LEVEL DURING DRILLING
 - WATER LEVEL (SHALLOW PIEZO)
 - WATER LEVEL (DEEP PIEZO)

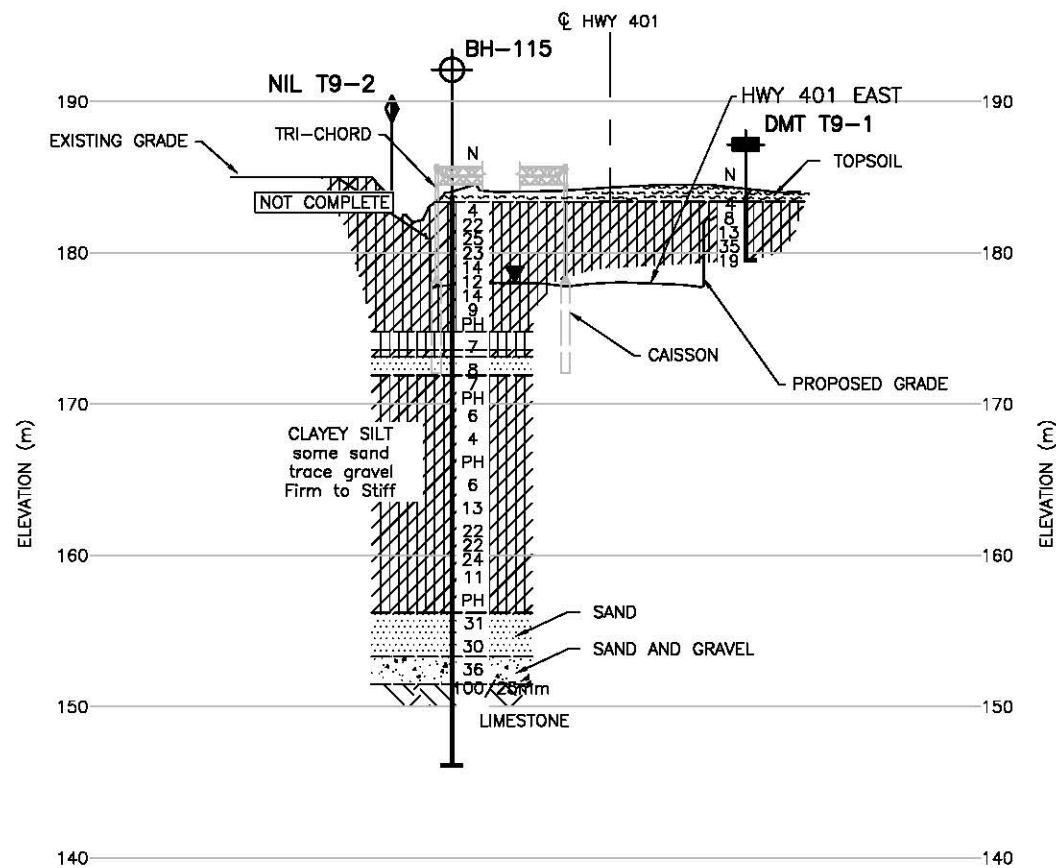
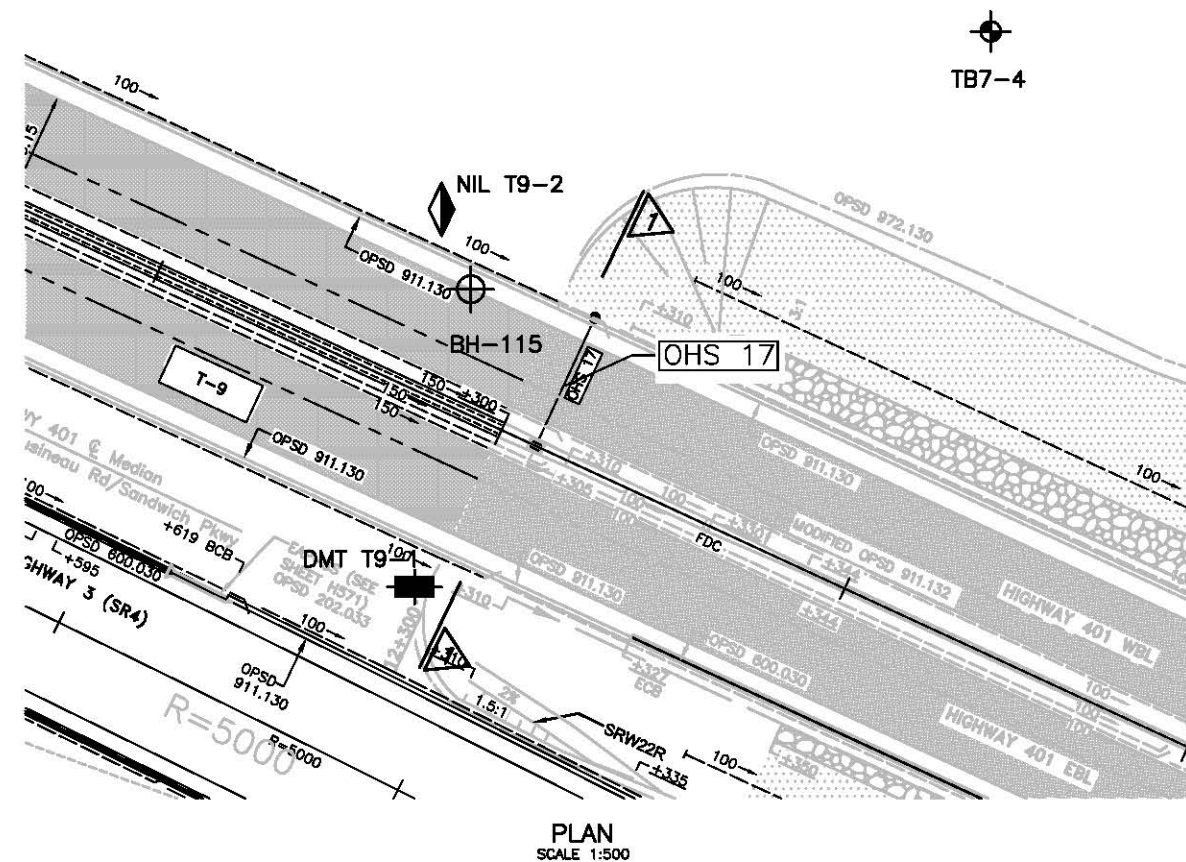
No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-119	182.5	4678961.6	333120.6
AMEC TESTHOLES			
CPT43-RW	182.6	4678907.6	333207.7
HGMW-2	182.3	4678946.3	333113.8

- NOTES
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 - ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

NOT FOR
CONSTRUCTION

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 16 DATE 24-OCT-11



HORT SCALE 1:500
VERT SCALE 1:250

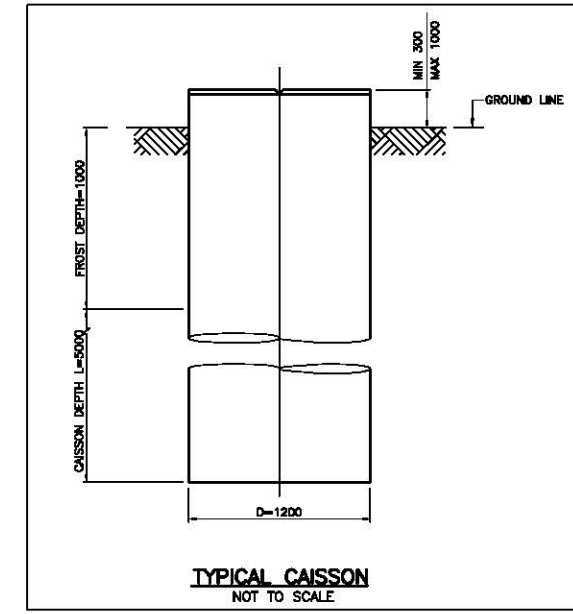
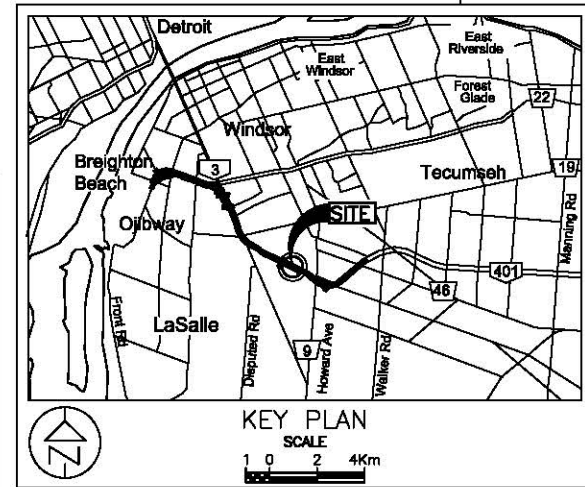
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

Parkway Infrastructure Engineers
amtec
Hatch Mott MacDonald

Windsor-Essex
Parkway Project
RFP No. 09-54-1007

NEW CONSTRUCTION
OHS 17 - STA 12+305 HWY 401
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8170
Phase 1
90% Sub



LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT -PREVIOUS INVESTIGATION
- SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

MPa
0 5 10
CPT

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-115	183.79	4678585.3	333911.1
AMEC TESTHOLES			
NIL T9-2	185.5	4678595.9	333907.2
DMT T9-1	184.1	4678544.5	333900.9

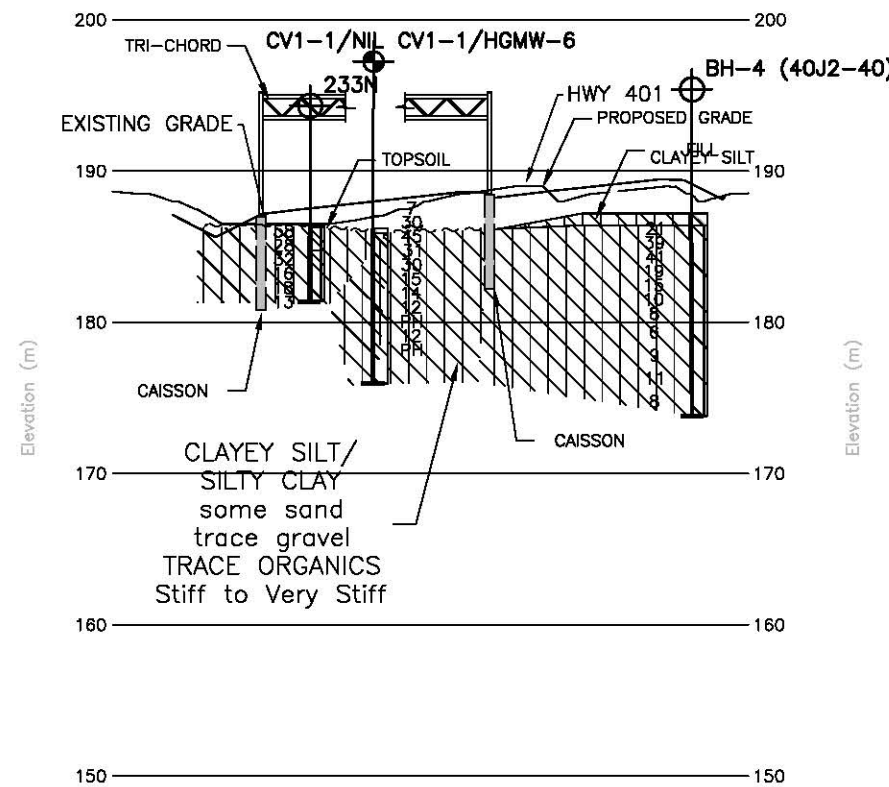
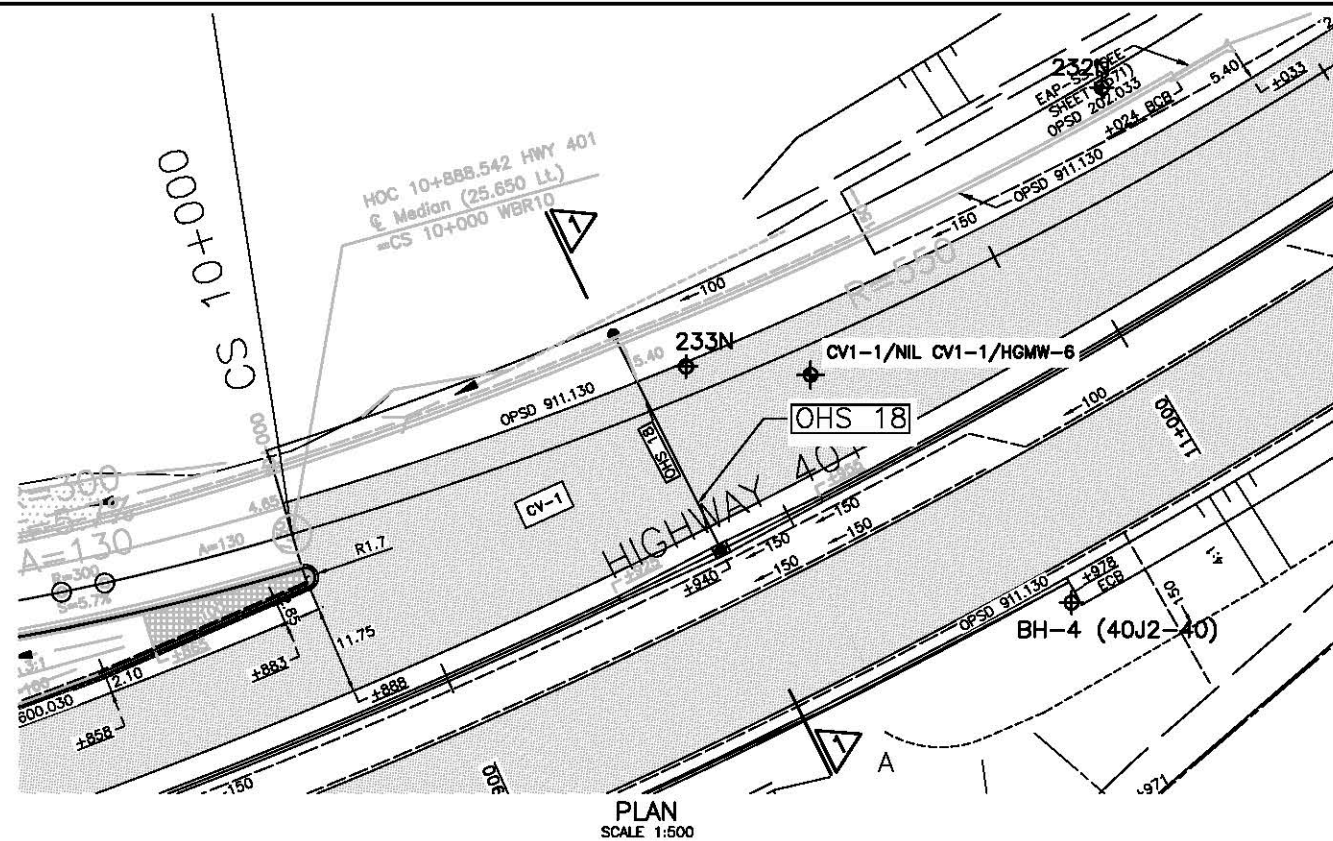
NOTES

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NOT FOR CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 17 DATE 24-OCT-11



HORT SCALE 1:500
VERT SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



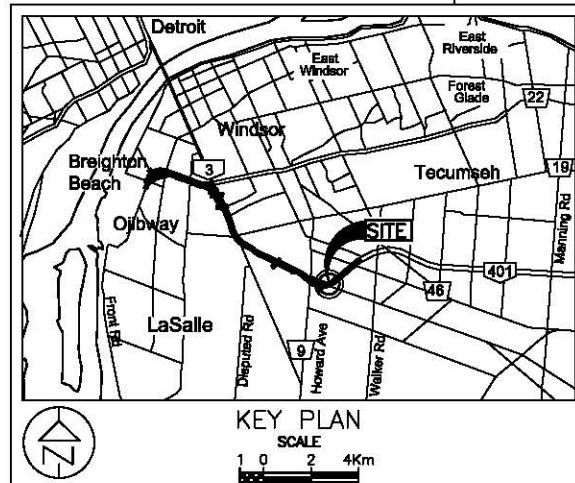
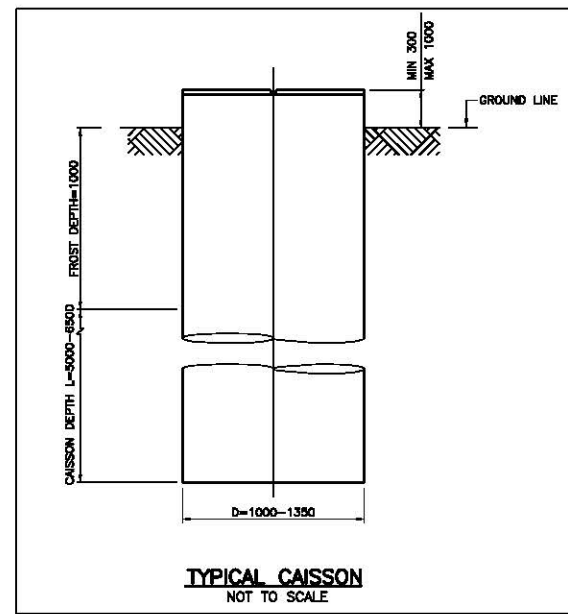
Windsor-Essex
Parkway Project
RFP No. 09-54-1007

NEW CONSTRUCTION
OHS 18 - STA 10+940 T
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA



SHEET
G8180

Phase 1
90% Sub



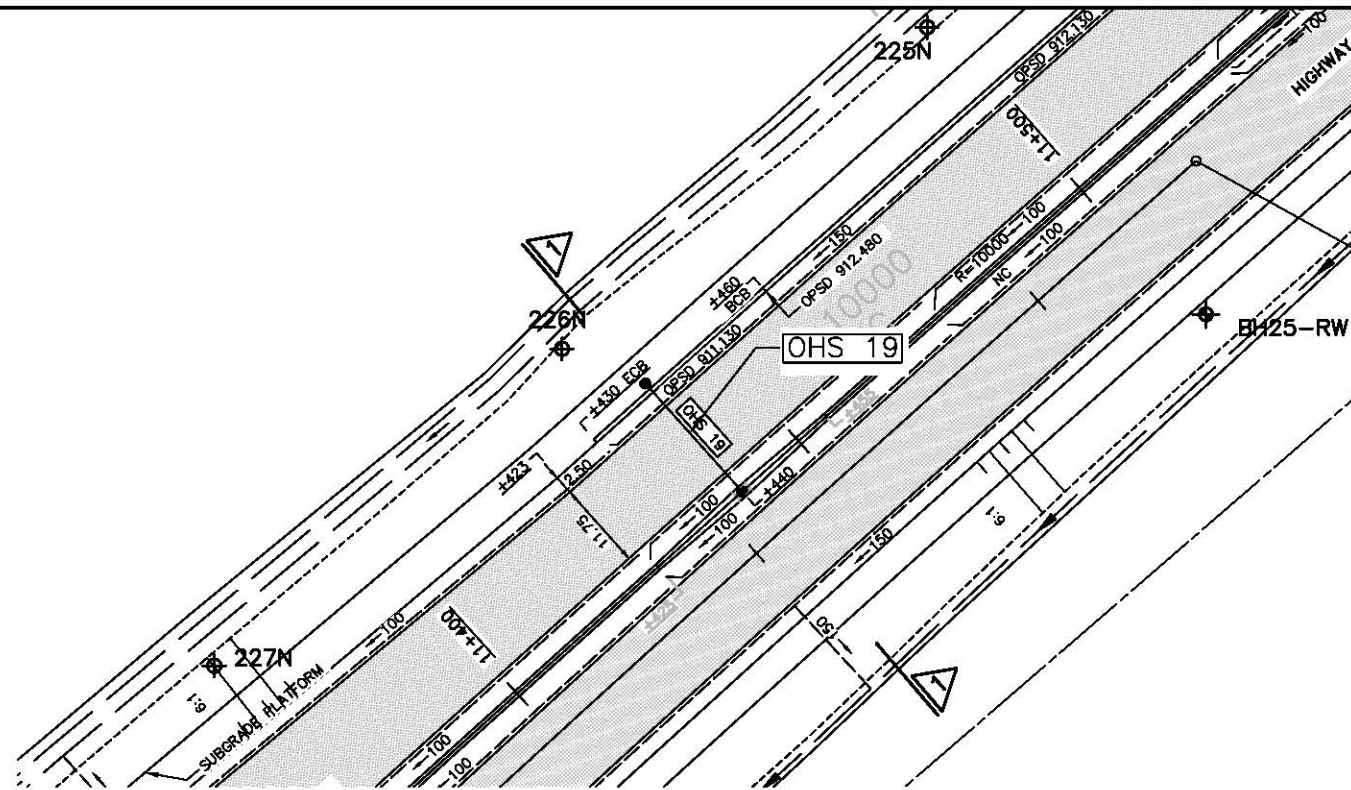
- LEGEND
- BOREHOLE CURRENT INVESTIGATION
 - BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
 - NILCON VANE CURRENT INVESTIGATION
 - CPT - CURRENT INVESTIGATION
 - DMT - CURRENT INVESTIGATION
 - BOREHOLE PREVIOUS INVESTIGATION
 - BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
 - CPT -PREVIOUS INVESTIGATION
 - SPT N-VALUE
 - BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
 - SEAL
 - STANDPIPE
 - BOREHOLE DRY DURING DRILLING
 - WATER LEVEL DURING DRILLING
 - WATER LEVEL (SHALLOW PIEZO)
 - WATER LEVEL (DEEP PIEZO)

- NOTES
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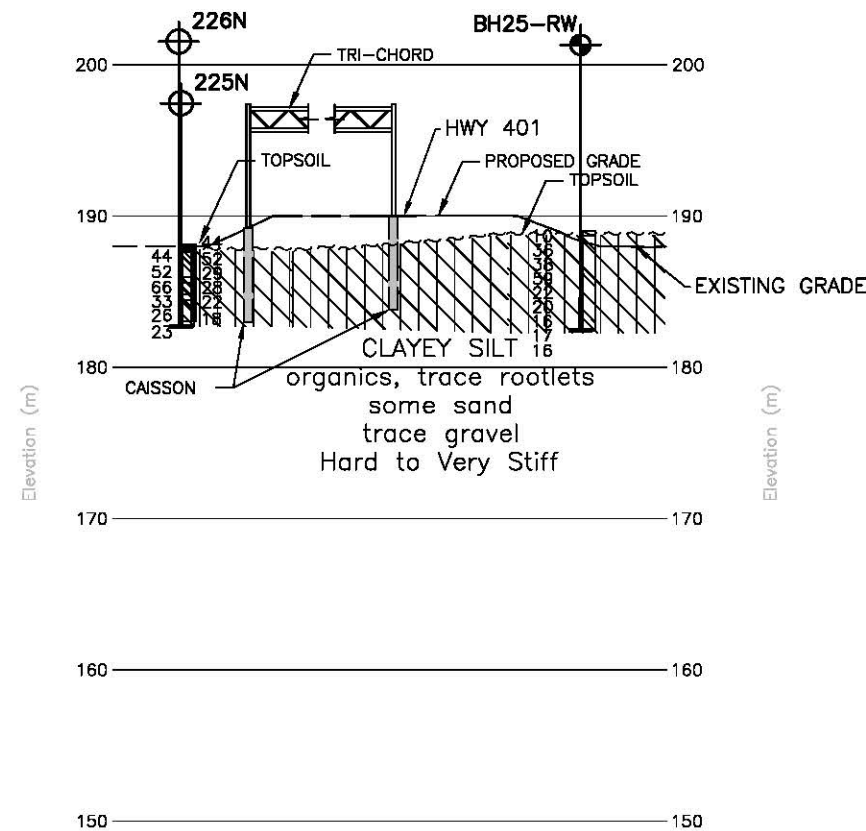
No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
233N	186.4	4677688.5	336099.5
BH-4 (40J2-40)	186.2	4677657.3	336150.5
AMEC TESTHOLES			
CV1-1/NIL CV1-1/HGMW 6	186.2	4677687.4	336116.0

NOT FOR
CONSTRUCTION

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 18 DATE 24-OCT-11



PLAN
SCALE 1:500



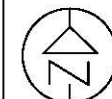
HORT SCALE 1:500
VERT SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

Parway Infrastructure Engineers
amec
Hatch Mott MacDonald

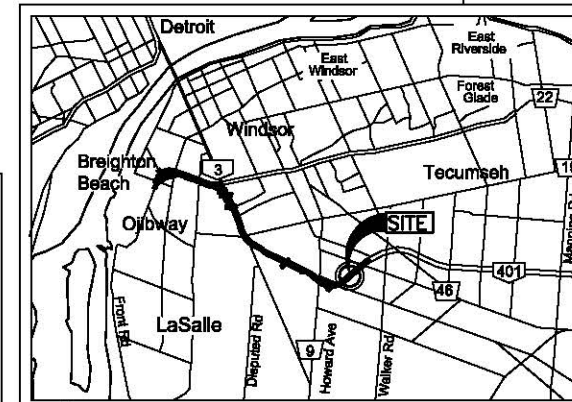
Windsor-Essex
Parkway Project
RFP No. 09-54-1007

NEW CONSTRUCTION
OHS 19 - STA 11+440T
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA



SHEET
G8190

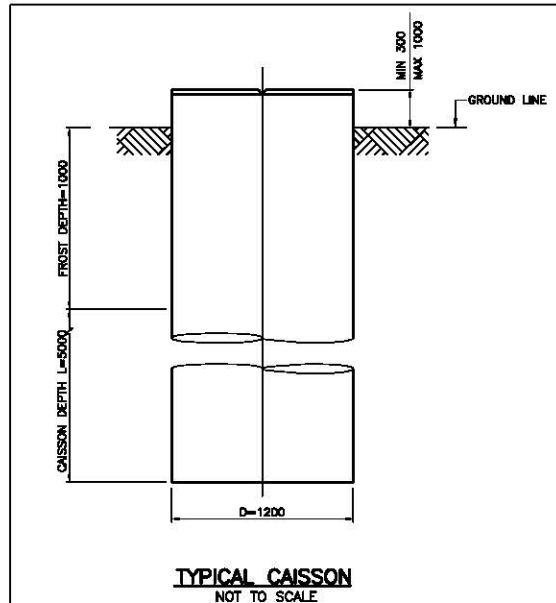
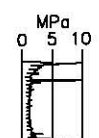
Phase 1
90% Sub



KEY PLAN
SCALE 1:0 2 4Km

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT -PREVIOUS INVESTIGATION
- N SPT N-VALUE
- 16 BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- DRY BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)



TYPICAL CAISSON
NOT TO SCALE

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
226N	187.72	4677993.6	336469.8
225N	188.09	4678036.1	336518.1
AMEC TESTHOLES			
BH25-RW	181.3	4677998.1	336555.0

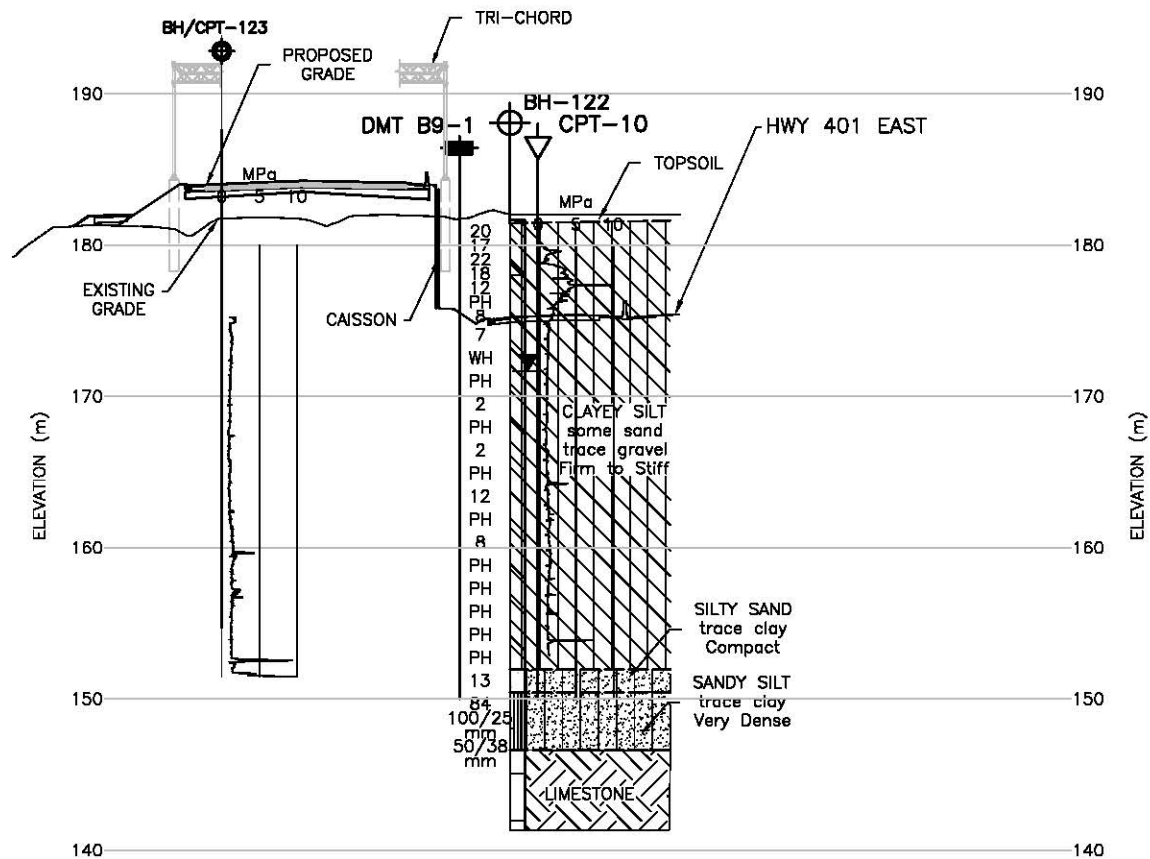
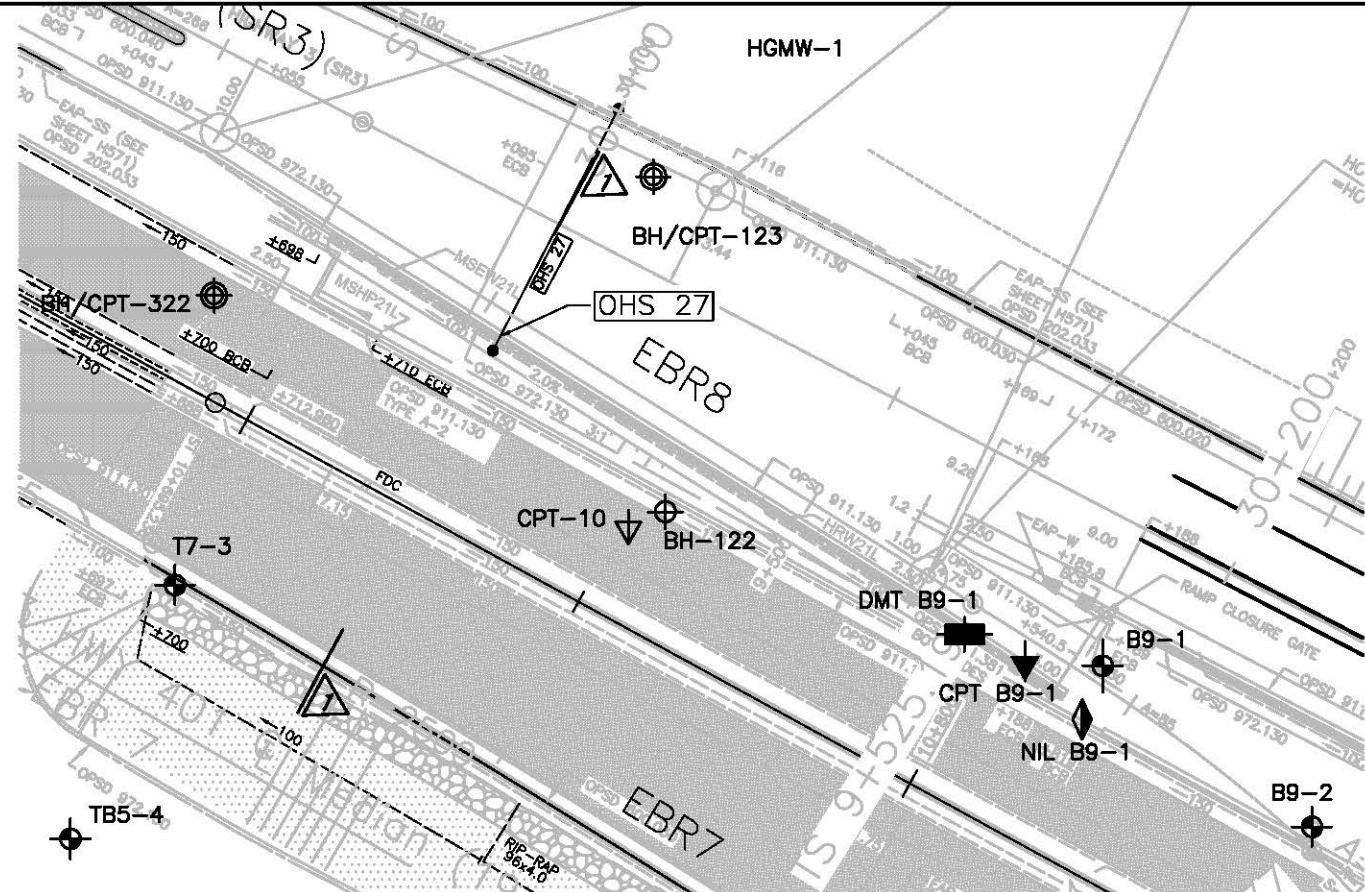
NOTES

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NOT FOR CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB	90% MTO SUBMISSION	
24-OCT-11	A	PB	90% MTO SUBMISSION	
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 19 DATE 24-OCT-11



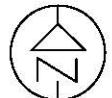
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



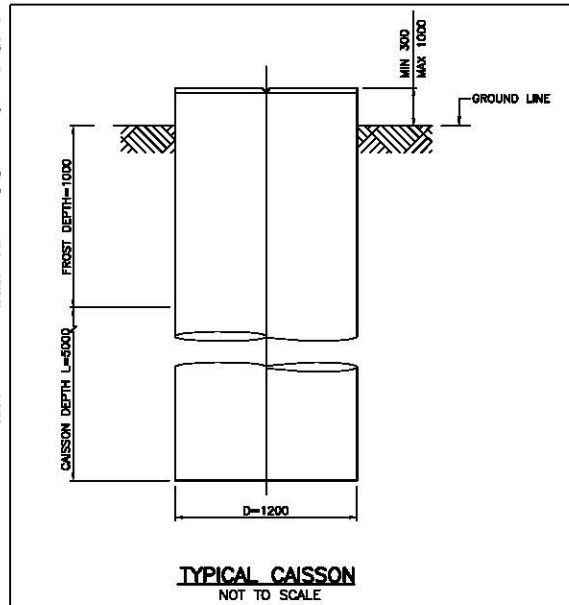
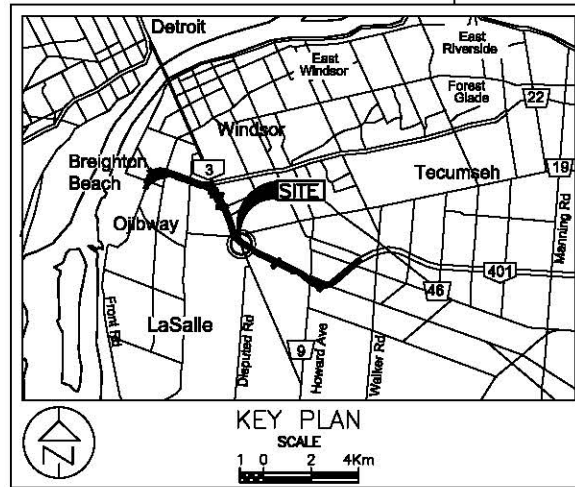
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



NEW CONSTRUCTION
OHS 27 - STA 30+100 HWY 3
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8270

Phase 1
90% Sub



- LEGEND**
- BOREHOLE CURRENT INVESTIGATION
 - BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
 - NILCON VANE CURRENT INVESTIGATION
 - CPT - CURRENT INVESTIGATION
 - DMT - CURRENT INVESTIGATION
 - BOREHOLE PREVIOUS INVESTIGATION
 - BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
 - CPT -PREVIOUS INVESTIGATION
 - SPT N-VALUE
 - BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
 - SEAL
 - STANDPIPE
 - BOREHOLE DRY DURING DRILLING
 - WATER LEVEL DURING DRILLING
 - WATER LEVEL (SHALLOW PIEZO)
 - WATER LEVEL (DEEP PIEZO)

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-122	181.7	4679265.4	332537.9
BH/CPT-123	181.7	4679309.7	332536.3
CPT-10	181.7	4679264.0	332533.0
AMEC TESTHOLES			
DMT B9-1	185.2	4679249.2	332577.9

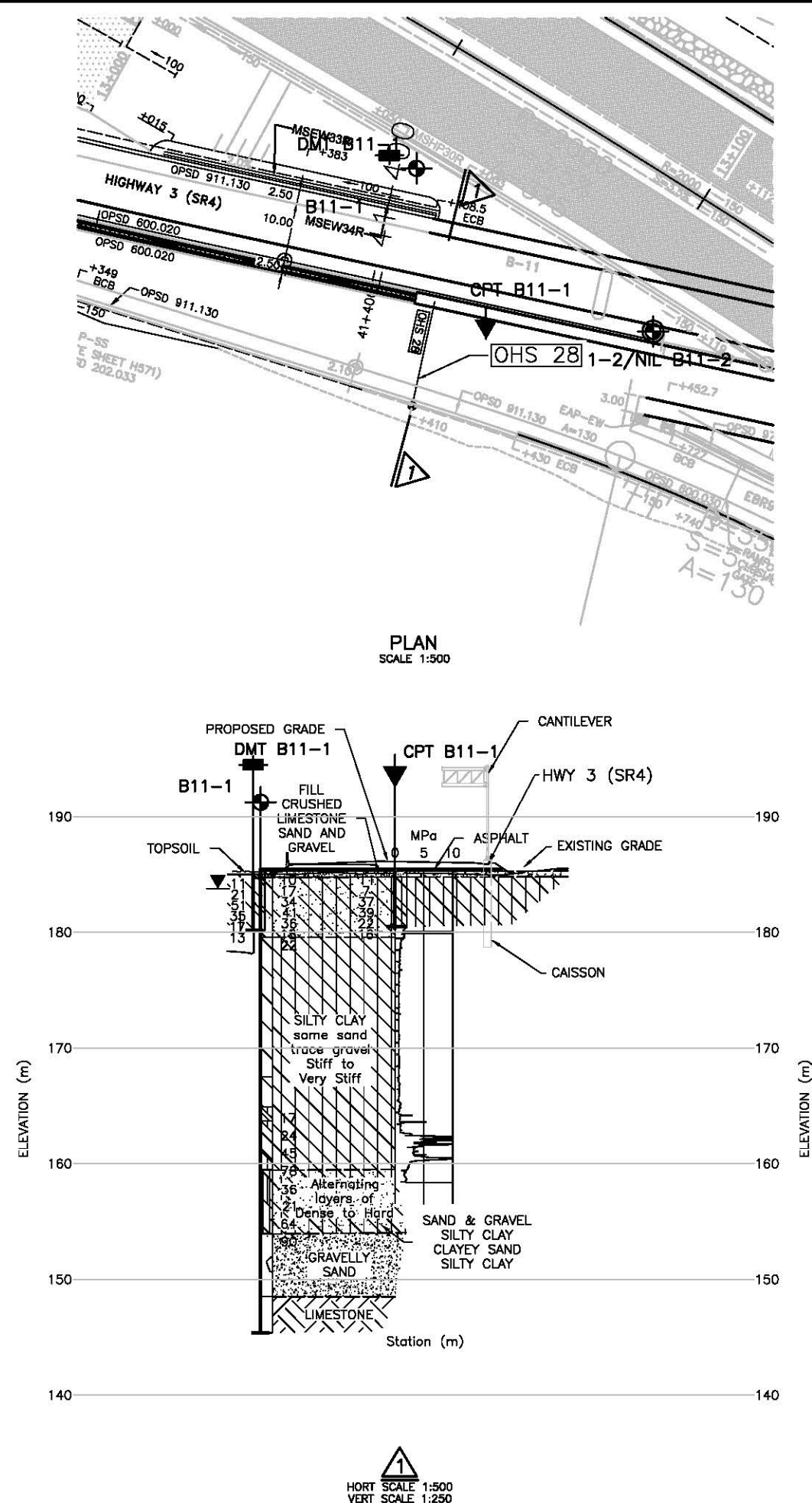
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NOT FOR CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 27 DATE 24-OCT-11

DATE PLOTTED: 3/7/2012 3:35:04 PM
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MINISTRY OF TRANSPORTATION, ONTARIO
PR-D-707
88-85



METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

Partway Infrastructure Engineers

amec

Hatch Mott MacDonald

Windsor-Essex Parkway Project

RFP No. 09-54-1007

NEW CONSTRUCTION

OHS 28 - STA 41+410 HWY 3 (SR4)

SIGN SUPPORT STRUCTURE

BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET

G8280

Phase 1

90% Sub

KEY PLAN

SCALE 1:4000

TYPICAL CAISSON

NOT TO SCALE

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
B11-1	185.4	4678221.4	334583.9
CPT B11-1	185.4	4678195.2	334595.9
DMT B11-1	185.1	4678223.6	334579.2

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GEOTECHNICAL DESIGN REPORT.

2. THE INTERPRETED STRATIGRAPHY REPRESENTS SIMPLIFIED SUBSURFACE CONDITIONS. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN DEFINED AT BOREHOLE LOCATIONS ONLY. CONDITIONS BETWEEN BOREHOLE LOCATIONS COULD DIFFER FROM ILLUSTRATED CONDITIONS.

3. ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

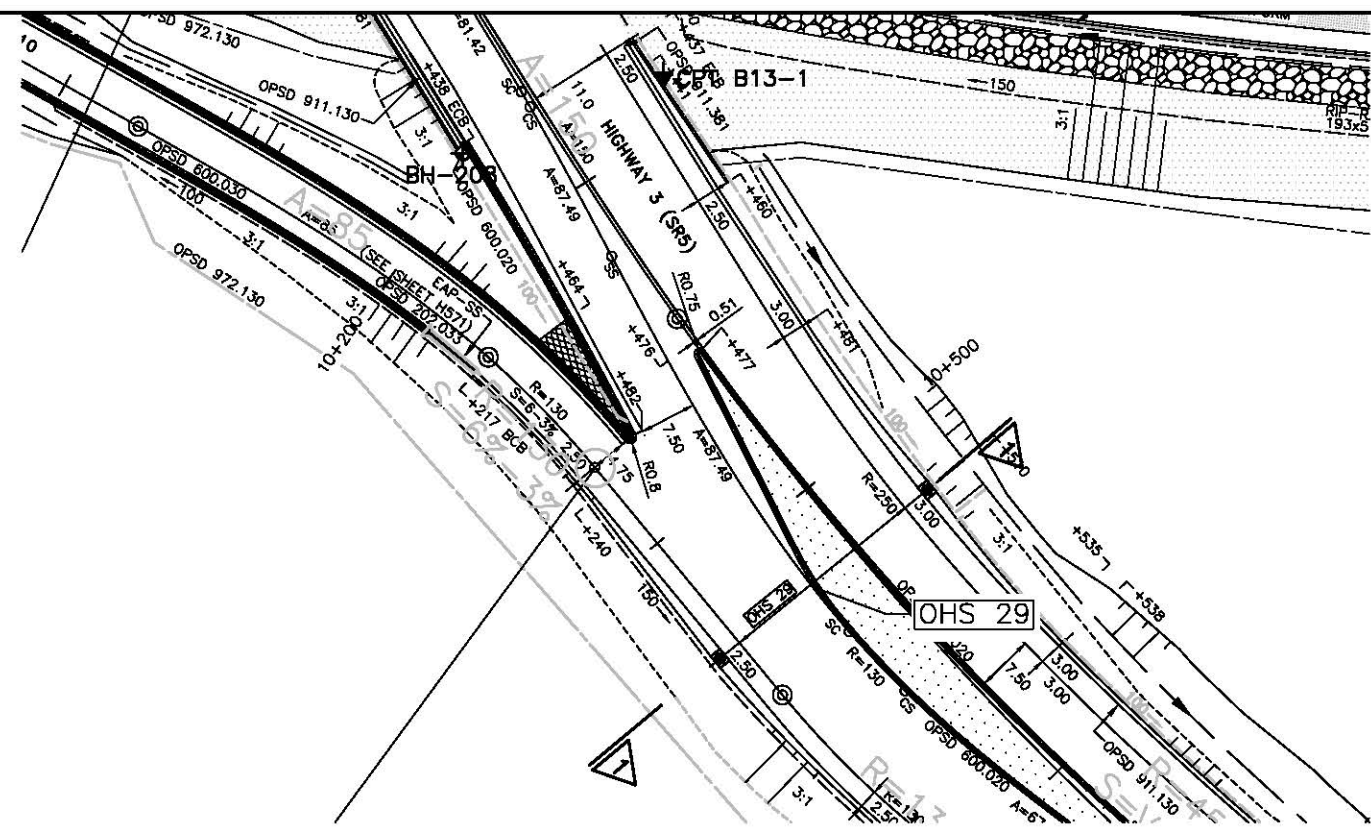
NOT FOR CONSTRUCTION

REVISIONS

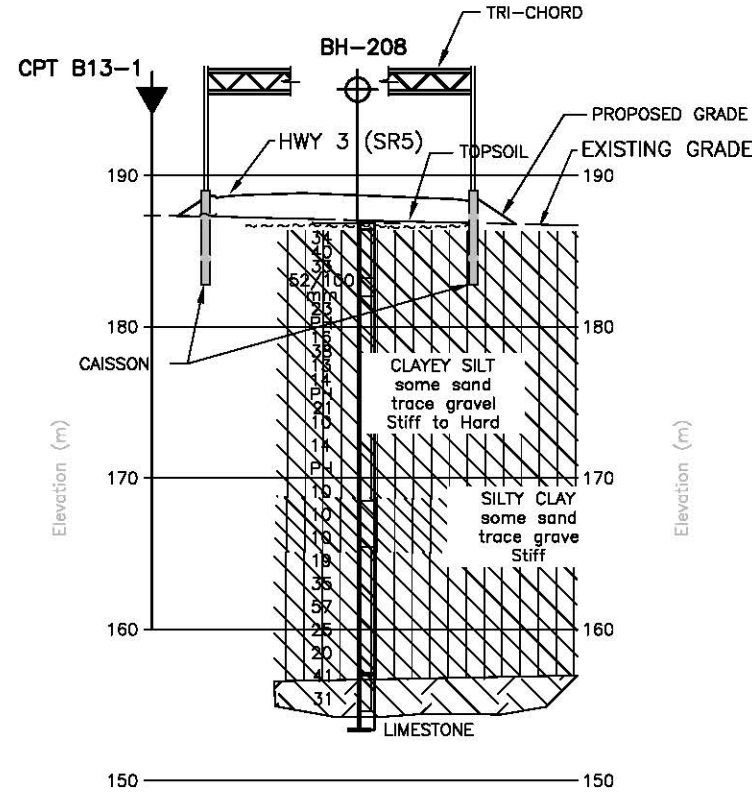
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24-OCT-11	A	PB	90% MTO SUBMISSION

DESIGN NM CHK BG CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN MM CHK PB SITE OHS 28 DATE 24-OCT-11

DOC: 285380-04-090-WIP1-8280



PLAN
SCALE 1:500

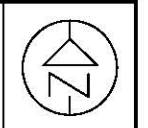


HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



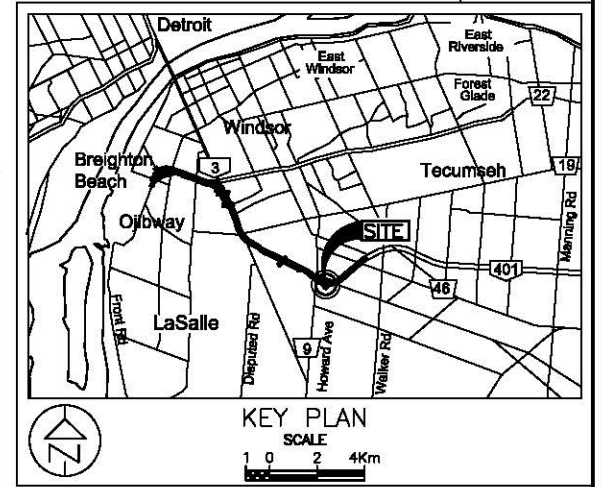
Windsor-Essex Parkway Project
RFP No. 09-54-1007



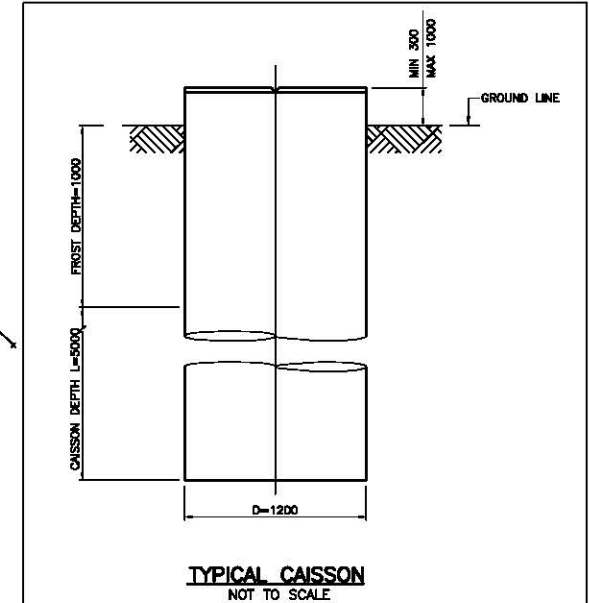
NEW CONSTRUCTION
OHS 29 - STA 10+510 HWY 3 (SR5)
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8290

Phase 1
90% Sub



KEY PLAN
SCALE 1:50,000



TYPICAL CAISSON
NOT TO SCALE

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-208	186.88	4677543.9	335526.5
AMEC TESTHOLES			
CPT B13-1	187.1	4677554.4	335553.0

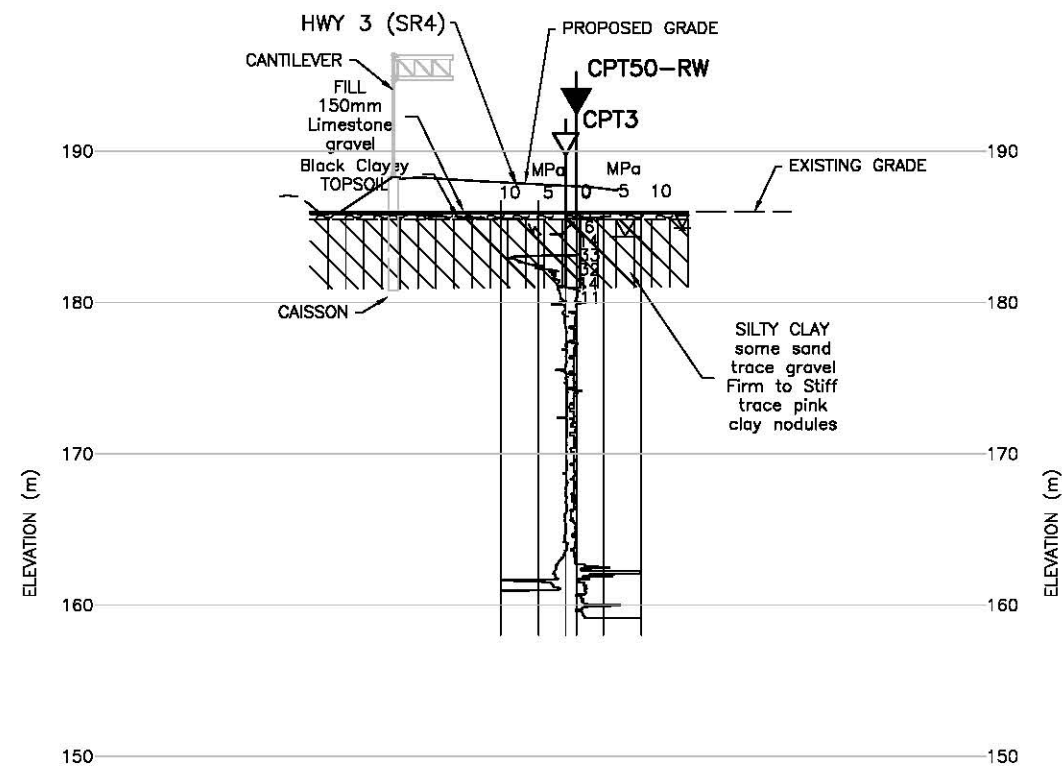
- LEGEND**
- BOREHOLE CURRENT INVESTIGATION
 - BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
 - NILCON VANE CURRENT INVESTIGATION
 - CPT - CURRENT INVESTIGATION
 - DMT - CURRENT INVESTIGATION
 - BOREHOLE PREVIOUS INVESTIGATION
 - BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
 - CPT - PREVIOUS INVESTIGATION
 - SPT N-VALUE
 - BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
 - SEAL
 - STANDPIPE
 - BOREHOLE DRY DURING DRILLING
 - WATER LEVEL DURING DRILLING
 - WATER LEVEL (SHALLOW PIEZO)
 - WATER LEVEL (DEEP PIEZO)

- NOTES**
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GEOTECHNICAL DESIGN REPORT.
 - THE INTERPRETED STRATIGRAPHY REPRESENTS SIMPLIFIED SUBSURFACE CONDITIONS. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN DEFINED AT BOREHOLE LOCATIONS ONLY. CONDITIONS BETWEEN BOREHOLE LOCATIONS COULD DIFFER FROM ILLUSTRATED CONDITIONS.
 - ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

NOT FOR CONSTRUCTION

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 29 DATE 24-OCT-11




HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

**NOT FOR
CONSTRUCTION**

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

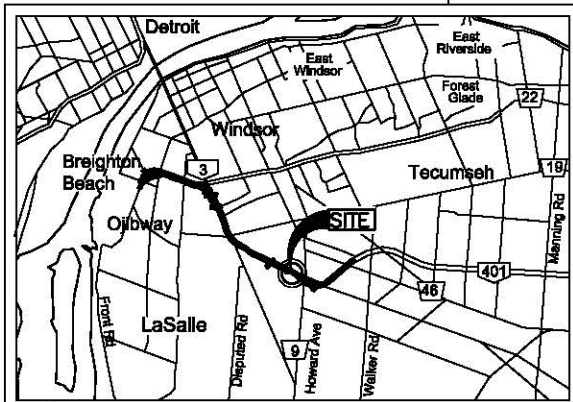
Parkway Infrastructure Engineers **amec** 
Hatch Mott MacDonald

Windsor—Essex
Parkway Project
RFP No. 09-54-1007

NEW CONSTRUCTION
OHS 32 - STA 41+783 HWY 3 (SR4)
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA














SHEET
G8320

Phase 1
90% Sub



KEY PLAN
SCALE
1 0 2 4Km

LEGEND

- | | |
|---|---|
|  | BOREHOLE
CURRENT INVESTIGATION |
|  | BOREHOLE AND NILCON VANE
CURRENT INVESTIGATION |
|  | NILCON VANE CURRENT INVESTIGATION |
|  | CPT - CURRENT INVESTIGATION |
|  | DMT - CURRENT INVESTIGATION |
|  | BOREHOLE PREVIOUS INVESTIGATION |
|  | BOREHOLE, CPT AND NILCON VANE
PREVIOUS INVESTIGATIONS |
|  | CPT -PREVIOUS INVESTIGATION |
| N | SPT N-VALUE |
| 16 | BLOWS/0.3m UNLESS
OTHERWISE STATED
(STD. PEN. TEST, 475 J/BLOW) |
|  | SEAL |
|  | STANDPIPE |
| DRY | BOREHOLE DRY DURING DRILLING |
|  | WATER LEVEL DURING DRILLING |
|  | WATER LEVEL (SHALLOW PIEZO) |
|  | WATER LEVEL (DEEP PIEZO) |

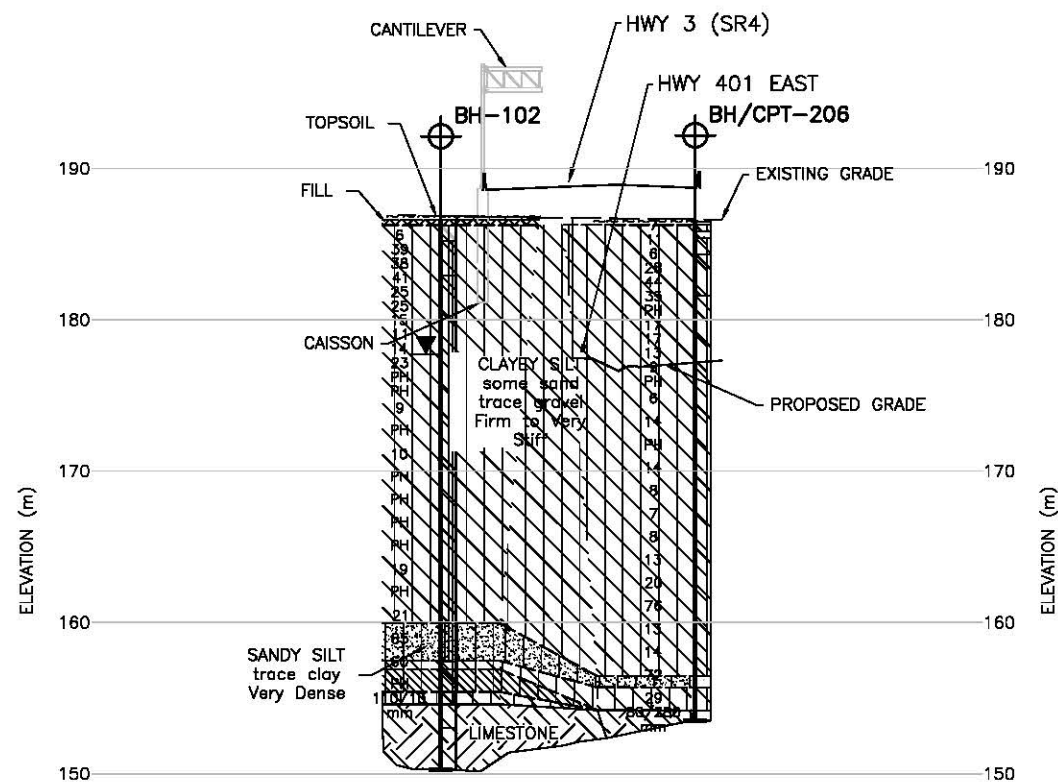
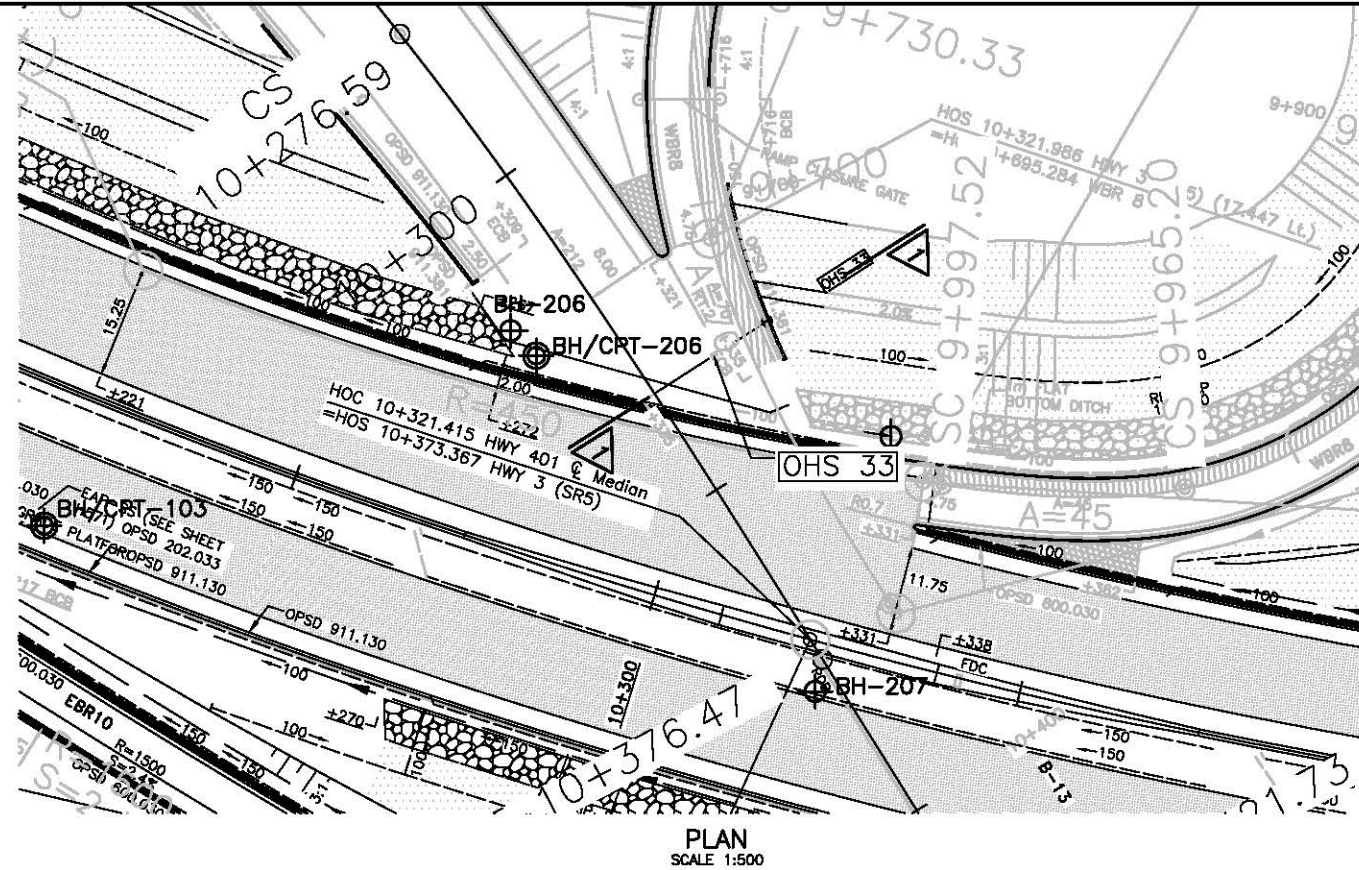
NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GEOTECHNICAL DESIGN REPORT.
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3. ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

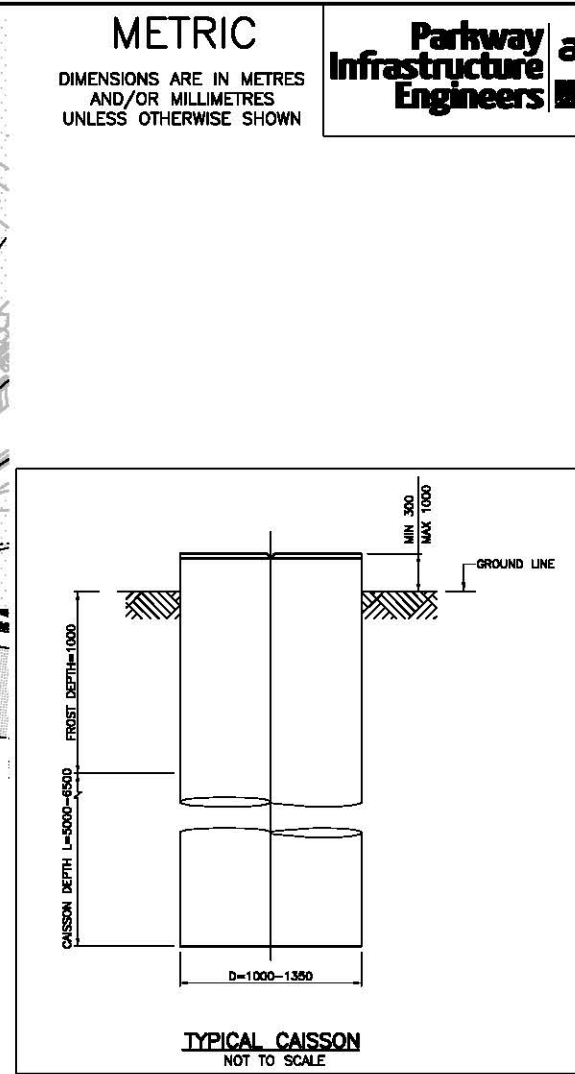
No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
CPT-3	186.0	4678022.02	334957.0
AMEC TESTHOLES			
CPT50-RW	185.8	4678085.0	334889.4

REVIEWS								
	22-FEB-12	B	PB	90% MTO SUBMISSION				
	24-OCT-11	A	PB	90% MTO SUBMISSION				
	DATE	REV.	BY	DESCRIPTION				
DESIGN	NM	CHK	BG	CODE	CAN/CSA	S6-06	LOAD	CL-625-ON
DRAWN	MM	CHK	PB	SITE	OHS	32	DATE	24-OCT-11

DOC: 285380-04-090-WIP1-8320



HORT SCALE 1:500
VERT SCALE 1:250



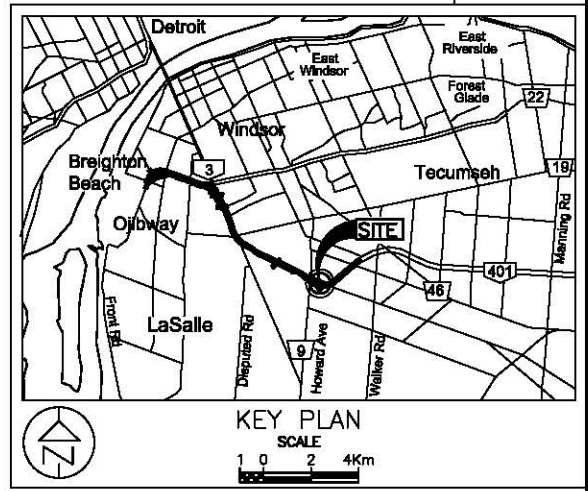
No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-102	186.60	4677631.8	335512.7
BH/CPT-206	186.48	4677642.5	335465.8

Windsor-Essex Parkway Project
RFP No. 09-54-1007

NEW CONSTRUCTION
OHS 33 - STA 10+335 HWY 3 (SR5)
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET G8330

Phase 1
90% Sub



LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT - PREVIOUS INVESTIGATION
- SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

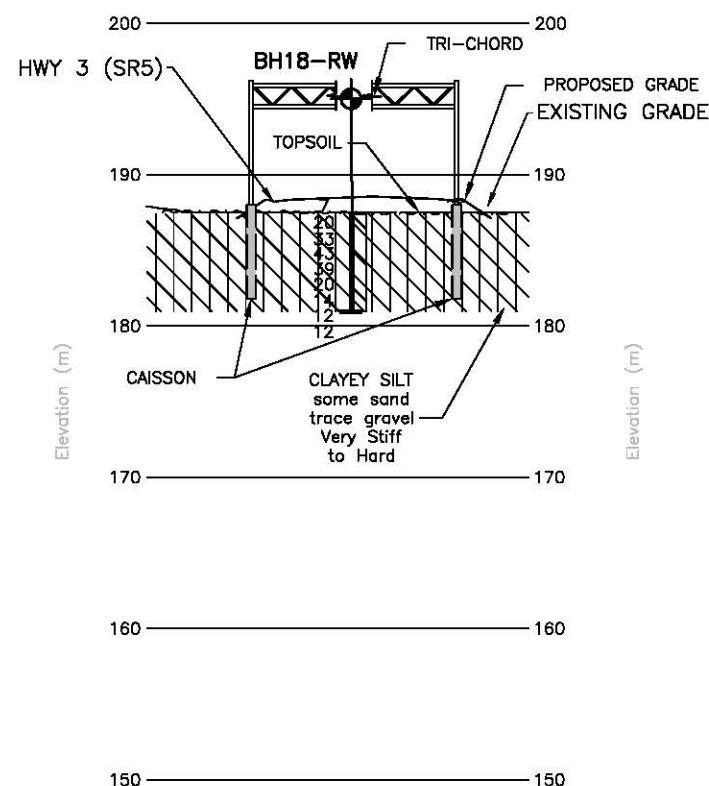
NOTES

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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

NOT FOR CONSTRUCTION

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 33 DATE 24-OCT-11



HORT SCALE 1:500
VERT SCALE 1:250

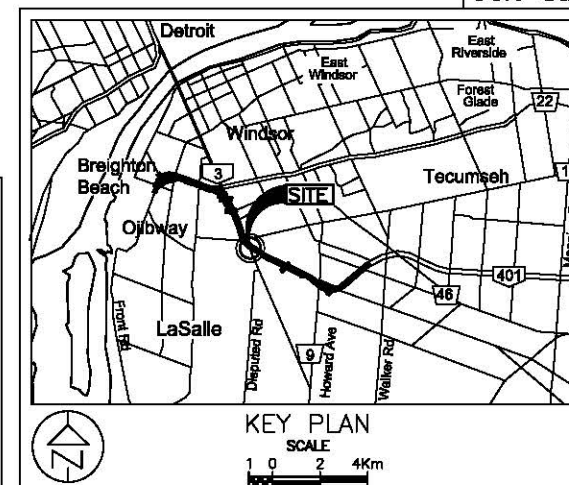
DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

amec

SHEET
G8340

Phase 1
90% Sub



	BOREHOLE CURRENT INVESTIGATION
	BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
	NILCON VANE CURRENT INVESTIGATION
	CPT - CURRENT INVESTIGATION
	DMT - CURRENT INVESTIGATION
	BOREHOLE PREVIOUS INVESTIGATION
	BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
	CPT -PREVIOUS INVESTIGATION
N	SPT N-VALUE
16	BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
	SEAL
	STANDPIPE
DRY	BOREHOLE DRY DURING DRILLING
	WATER LEVEL DURING DRILLING
	WATER LEVEL (SHALLOW PIEZO)
	WATER LEVEL (DEEP PIEZO)

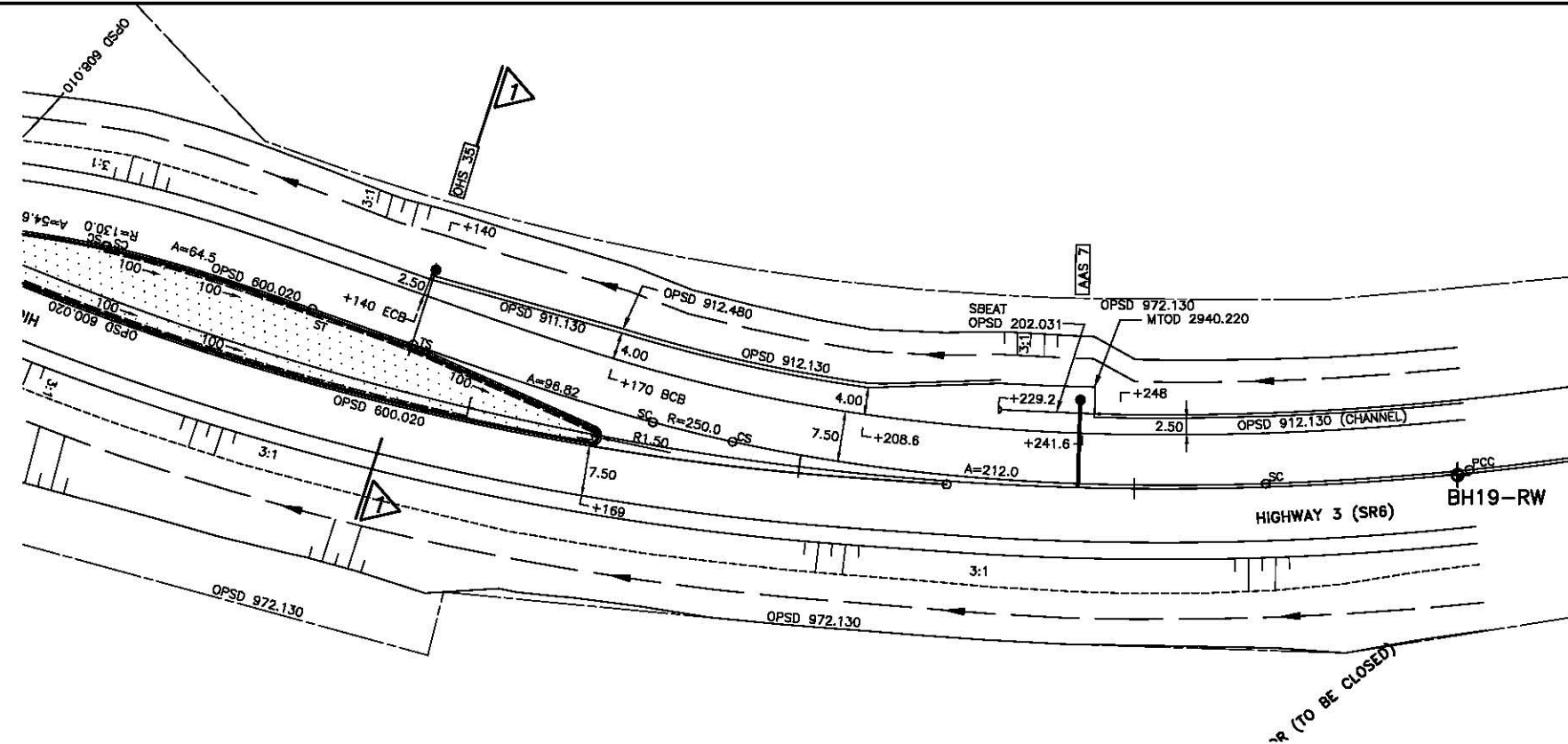
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GEOTECHNICAL DESIGN REPORT.
2. THE INTERPRETED STRATIGRAPHY REPRESENTS SIMPLIFIED SUBSURFACE CONDITIONS. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN DEFINED AT BOREHOLE LOCATIONS ONLY. CONDITIONS BETWEEN BOREHOLE LOCATIONS COULD DIFFER FROM ILLUSTRATED CONDITIONS.
3. ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

**NOT FOR
CONSTRUCTION**

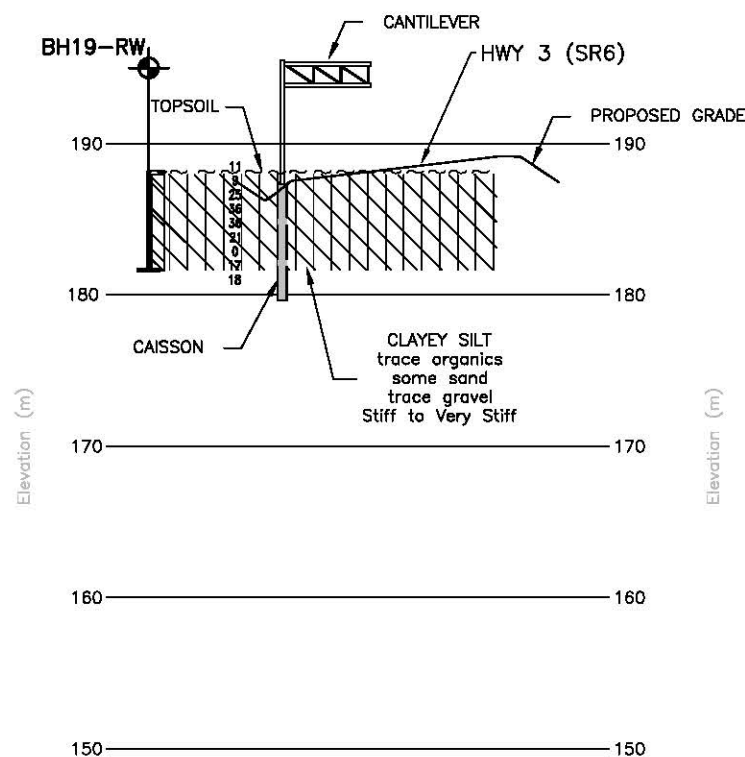
REVISIONS					
	22-FEB-12	B	PB	90% MTO SUBMISSION	
	24-OCT-11	A	PB	90% MTO SUBMISSION	
	DATE	REV.	BY	DESCRIPTION	
DESIGN	NM	CHK	BG	CODE CAN/CSA 56-06	LOAD CL-625-ON
DRAWN	NM	CHK	PB	SITE OHS 34	DATE 24-OCT-11

DOC: 285380-04-090-WIP1-8340

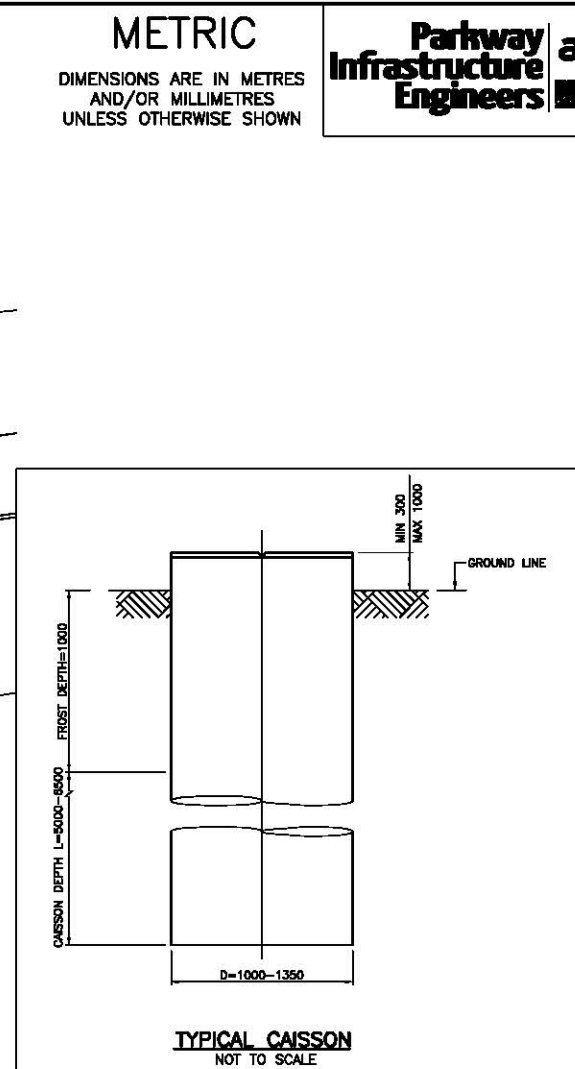
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MINISTRY OF TRANSPORTATION, ONTARIO
PR-D-707
88-85



PLAN
SCALE 1:500



HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250



No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
AMEC TESTHOLES		NORTHING	EASTING
BH19-RW	187.4	4677320.5	335985.5

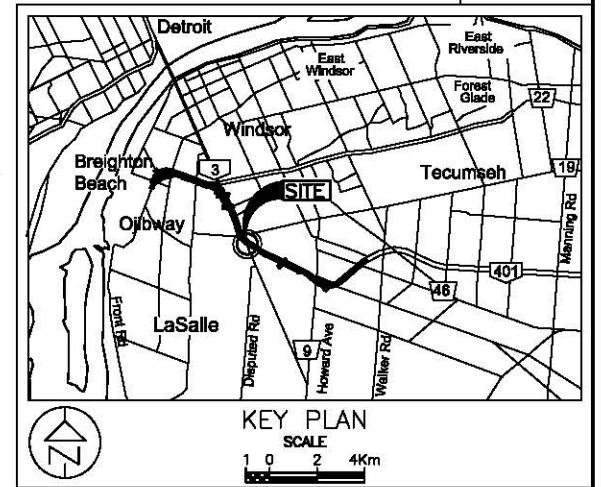
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

Partway Infrastructure Engineers
amc
Hatch Mott MacDonald

Windsor-Essex
Parkway Project
RFP No. 09-54-1007

NEW CONSTRUCTION
OHS 35 - STA 10+140 HWY 3 (SR6)
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8350
Phase 1
90% Sub



LEGEND

BOREHOLE
CURRENT INVESTIGATION

BOREHOLE AND NILCON VANE
CURRENT INVESTIGATION

NILCON VANE
CURRENT INVESTIGATION

CPT - CURRENT INVESTIGATION

DMT - CURRENT INVESTIGATION

BOREHOLE
PREVIOUS INVESTIGATION

BOREHOLE, CPT AND NILCON VANE
PREVIOUS INVESTIGATIONS

CPT -PREVIOUS INVESTIGATION

SPT N-VALUE
BLOWS/0.3m UNLESS
OTHERWISE STATED
(STD. PEN. TEST, 475 J/BLOW)

SEAL

STANDPIPE

DRY BOREHOLE DRY DURING DRILLING

WATER LEVEL DURING DRILLING

WATER LEVEL (SHALLOW PIEZO)

WATER LEVEL (DEEP PIEZO)

CPT
MPa
0 5 10

- NOTES**
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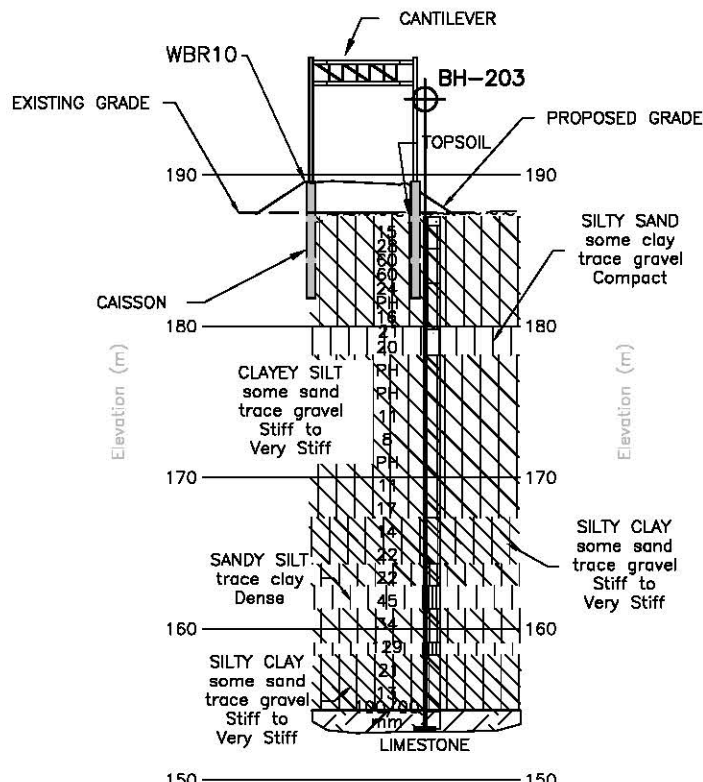
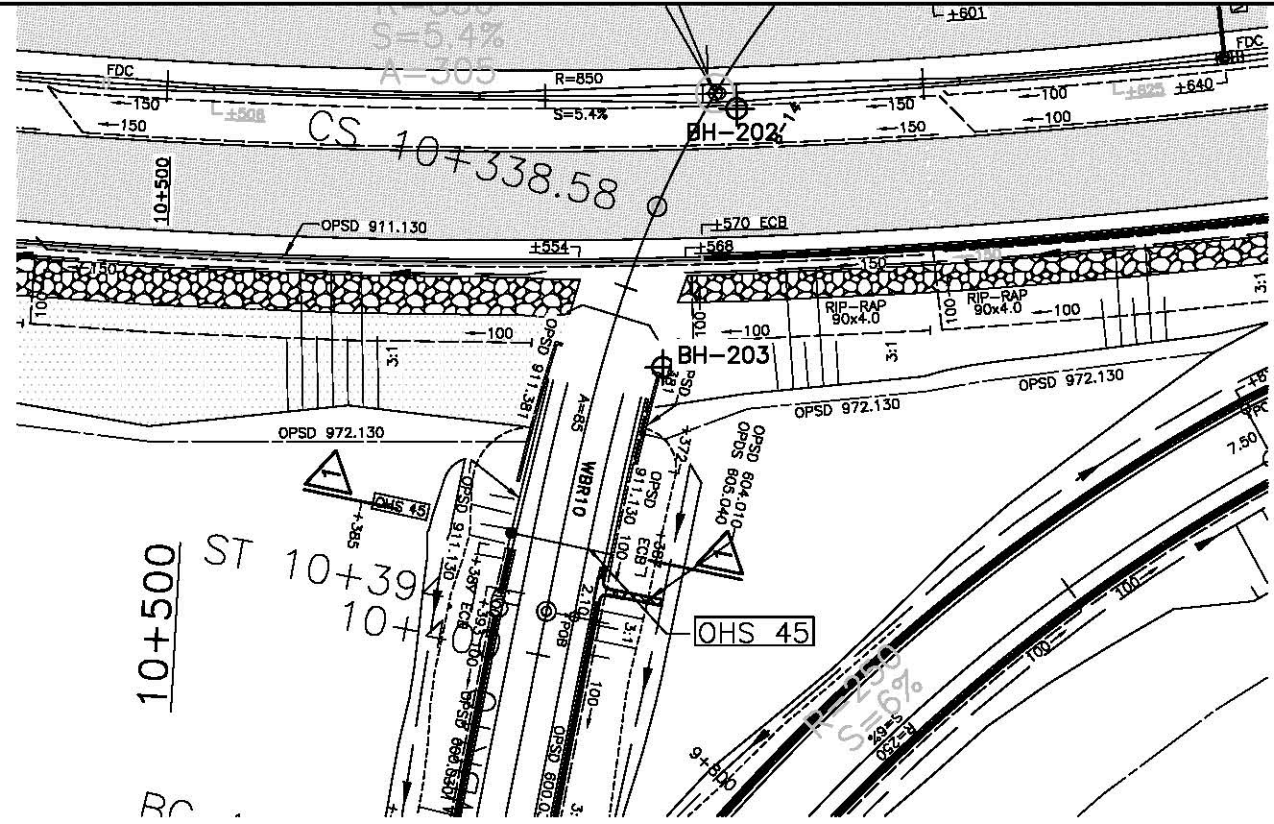
3. ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

NOT FOR CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB	90% MTO SUBMISSION	
24-OCT-11	A	PB	90% MTO SUBMISSION	
DESIGN	NM	CHK	BG	CODE CAN/CSA
DRAWN	MM	CHK	PB	SITE OHS 35
LOAD	CL	CL	625-ON	DATE 24-OCT-11

DOC: 285380-04-090-WIP1-8350

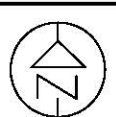


1
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



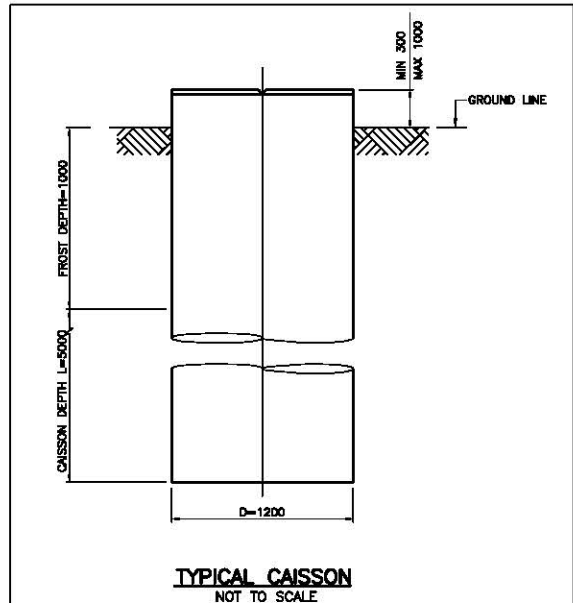
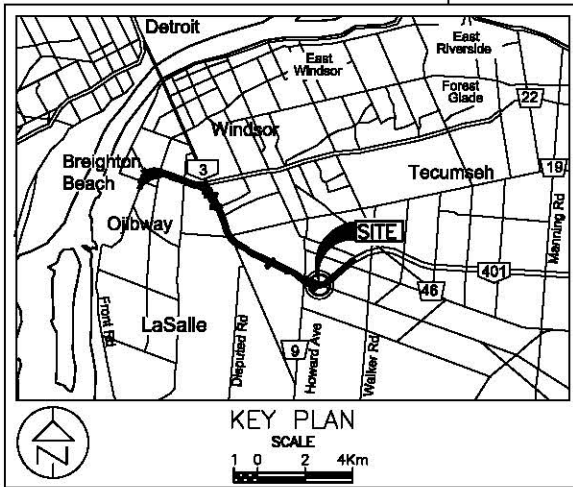
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



NEW CONSTRUCTION
OHS 45 - STA 10+385 WBR 10
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8450

Phase 1
90% Sub



TYPICAL CAISSON
NOT TO SCALE

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT - PREVIOUS INVESTIGATION
- SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-202	187.31	4677573.5	335753.3
BH-203	187.23	4677539.3	335743.5

NOTES

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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

NOT FOR CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 45 DATE 24-OCT-11



No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-101	187.37	4677606.6	335794.9
BH-2 (40J2-40)	186.6	4677673.6	335881.7
AMEC TESTHOLES			
CPT55-RW	187.5	4677609.7	335904.2

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

**NOT FOR
CONSTRUCTION**














DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

arnec

SHEET
G846

90% S

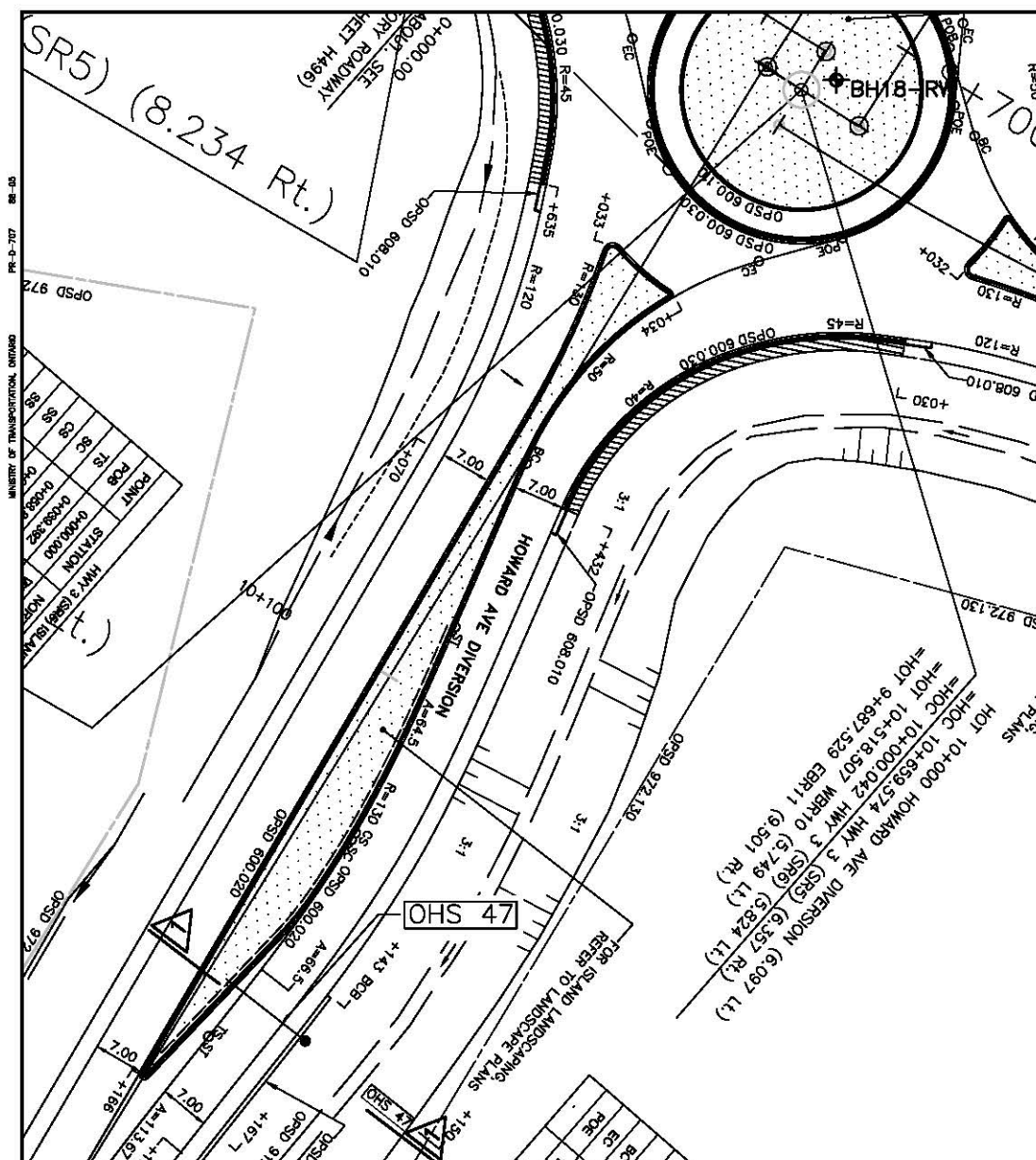


- | | |
|---|---|
|  | BOREHOLE
CURRENT INVESTIGATION |
|  | BOREHOLE AND NILCON VANE
CURRENT INVESTIGATION |
|  | NILCON VANE CURRENT INVESTIGATION |
|  | CPT - CURRENT INVESTIGATION |
|  | DMT - CURRENT INVESTIGATION |
|  | BOREHOLE PREVIOUS INVESTIGATION |
|  | BOREHOLE, CPT AND NILCON VANE
PREVIOUS INVESTIGATIONS |
|  | CPT -PREVIOUS INVESTIGATION |
| N | SPT N-VALUE |
| 16 | BLOWS/0.3m UNLESS
OTHERWISE STATED
(STD. PEN. TEST, 475 J/BLOW) |
|  | SEAL |
|  | STANDPIPE |
| DRY | BOREHOLE DRY DURING DRILLING |
|  | WATER LEVEL DURING DRILLING |
|  | WATER LEVEL (SHALLOW PIEZO) |
|  | WATER LEVEL (DEEP PIEZO) |

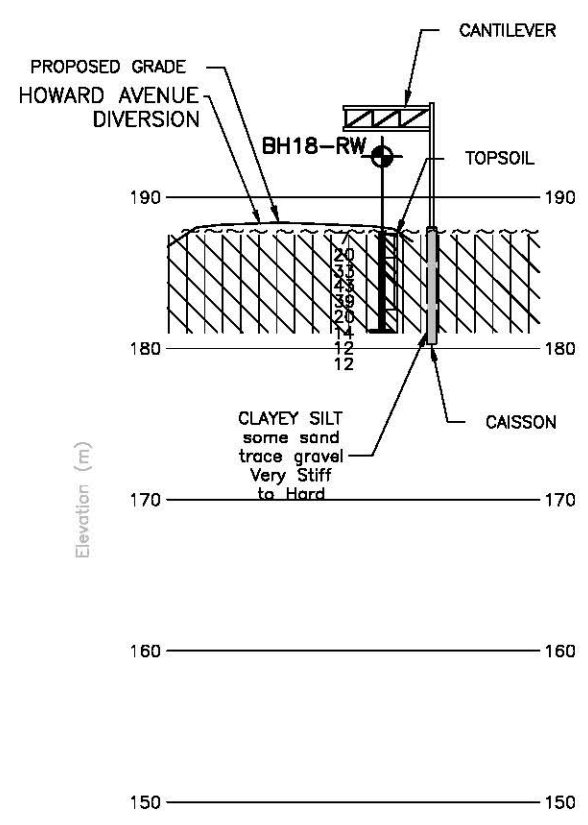
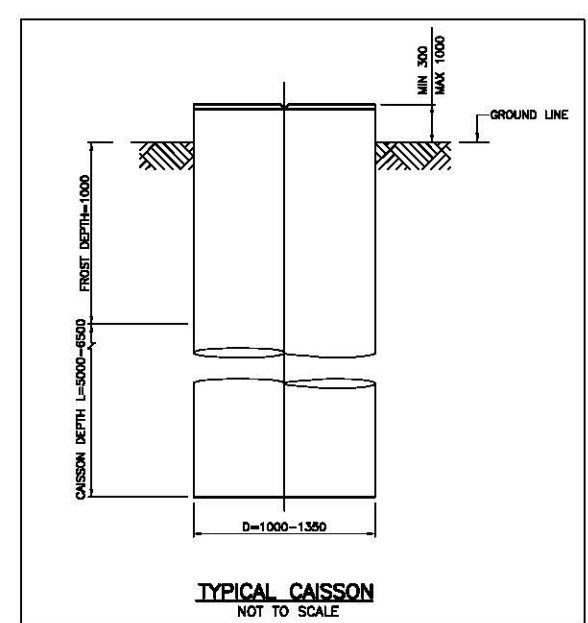
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3. ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

REVISIONS					
	22-FEB-12	A	PB	90% MTO SUBMISSION	
	24-OCT-11	A	PB	90% MTO SUBMISSION	
	DATE	REV.	BY	DESCRIPTION	
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06	LOAD CL-625
DRAWN	MM	CHK	PB	SITE OHS 46	DATE 24-OCT-

DOC: 285380-04-090-WP1-8460



PLAN
SCALE 1:500

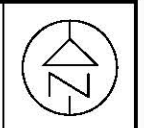


HORT SCALE 1:500
VERT SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



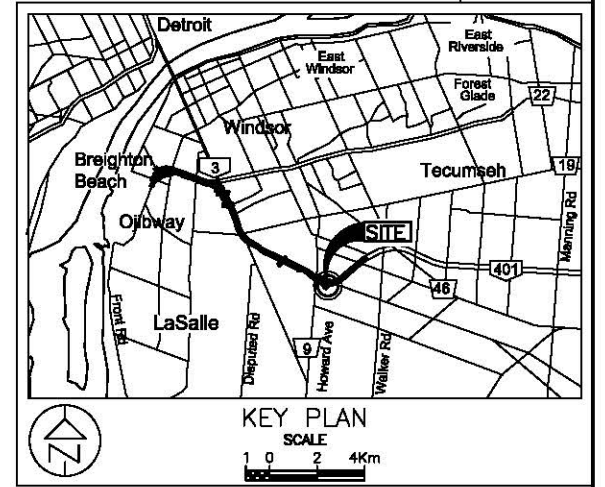
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



NEW CONSTRUCTION
OHS 47 - STA 10+150 HOWARD AVE
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8470

Phase 1
90% Sub



LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT -PREVIOUS INVESTIGATION
- SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

NOTES

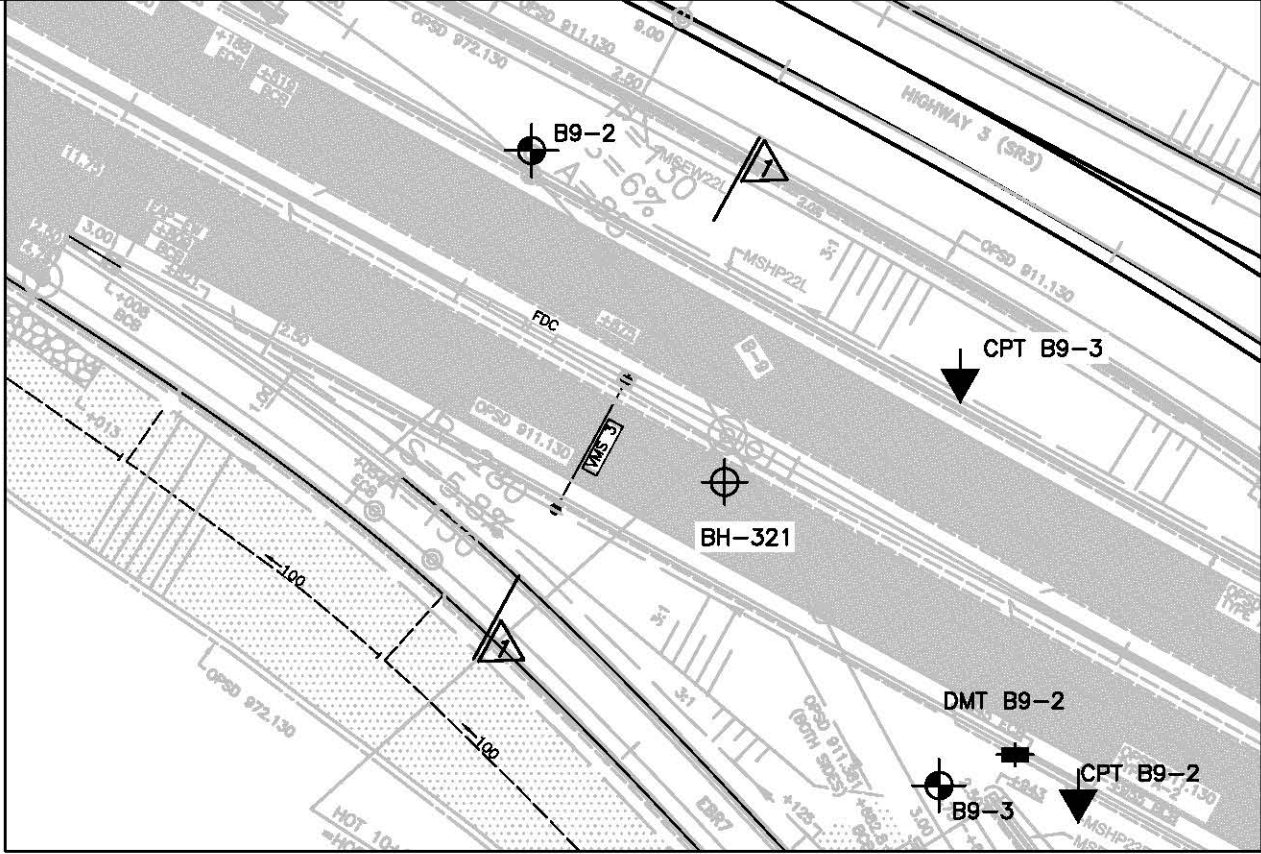
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GEOTECHNICAL DESIGN REPORT.
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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
AMEC TESTHOLES			
BH18-RW	187.6	4677390.7	335692.7

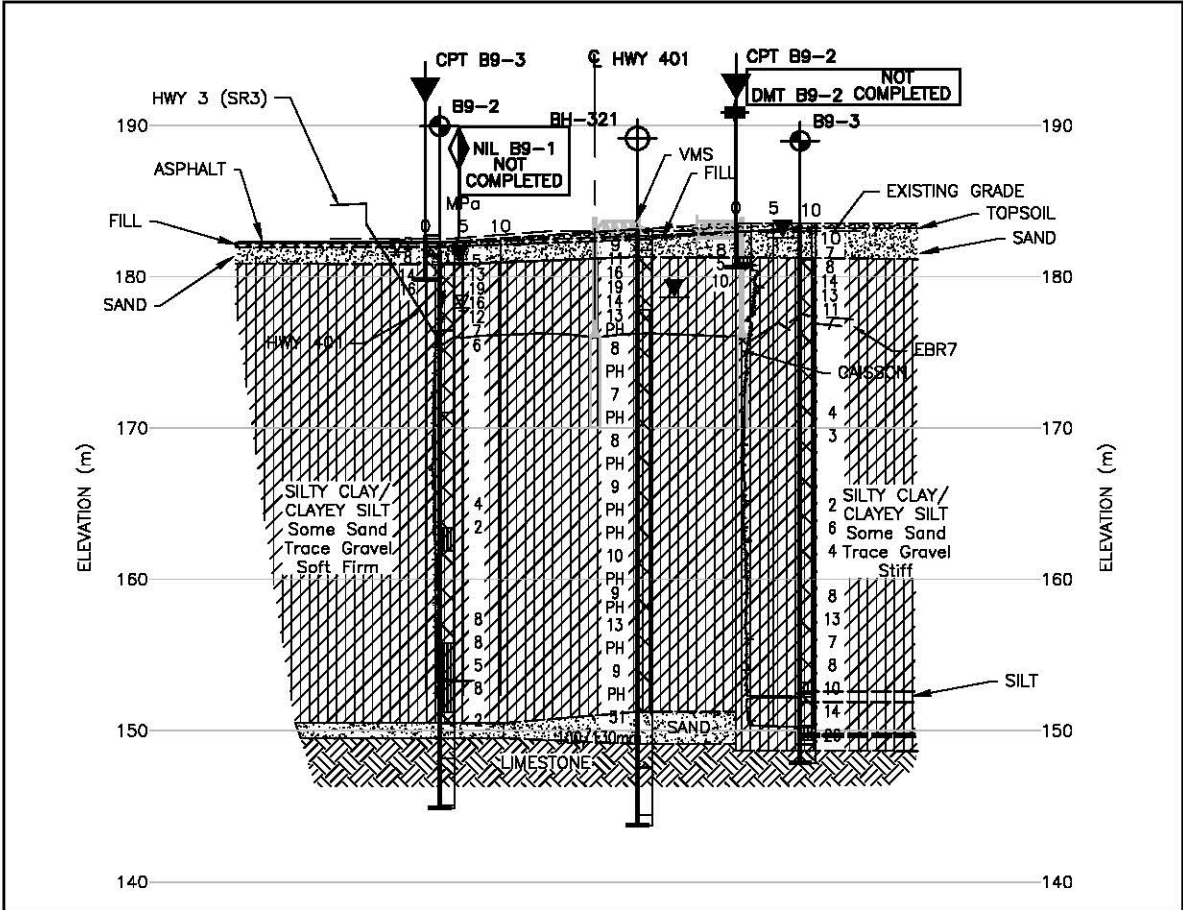
NOT FOR
CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS	DATE	REV.	BY	DESCRIPTION
22-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	BG	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK	PB	SITE OHS 47 DATE 24-OCT-11



PLAN
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

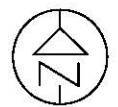


HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



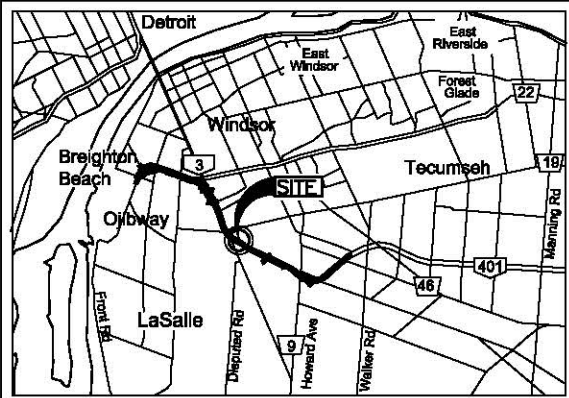
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



NEW CONSTRUCTION
VMS 3 - STA 10+875L HWY 401
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8003

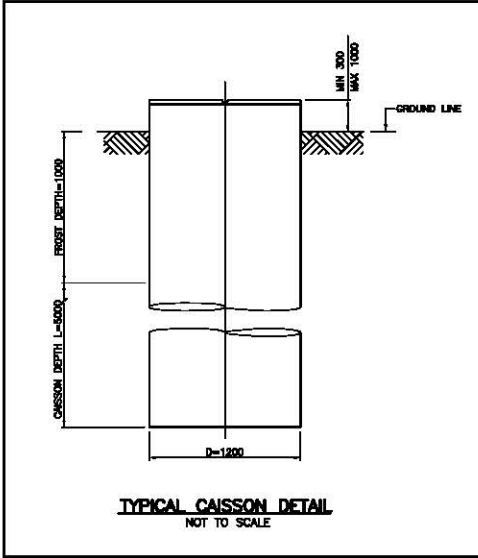
Phase 1
90% Sub



KEY PLAN
SCALE
0 2 4 Km

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT - PREVIOUS INVESTIGATION
- SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)



TYPICAL CAISSON DETAIL
NOT TO SCALE

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-321	183.14	4679179.9	332649.0
AMEC TESTHOLES			
B9-2	182.33	4679218.9	332622.2
B9-3	183.53	4679140.0	332677.6
CPT B9-2	183.85	4679138.6	332696.0
CPT B9-3	182.73	4679189.2	332678.6
DMT B9-2	183.53	4679144.8	332687.7
NIL B9-1	182.50	4679237.9	332593.0

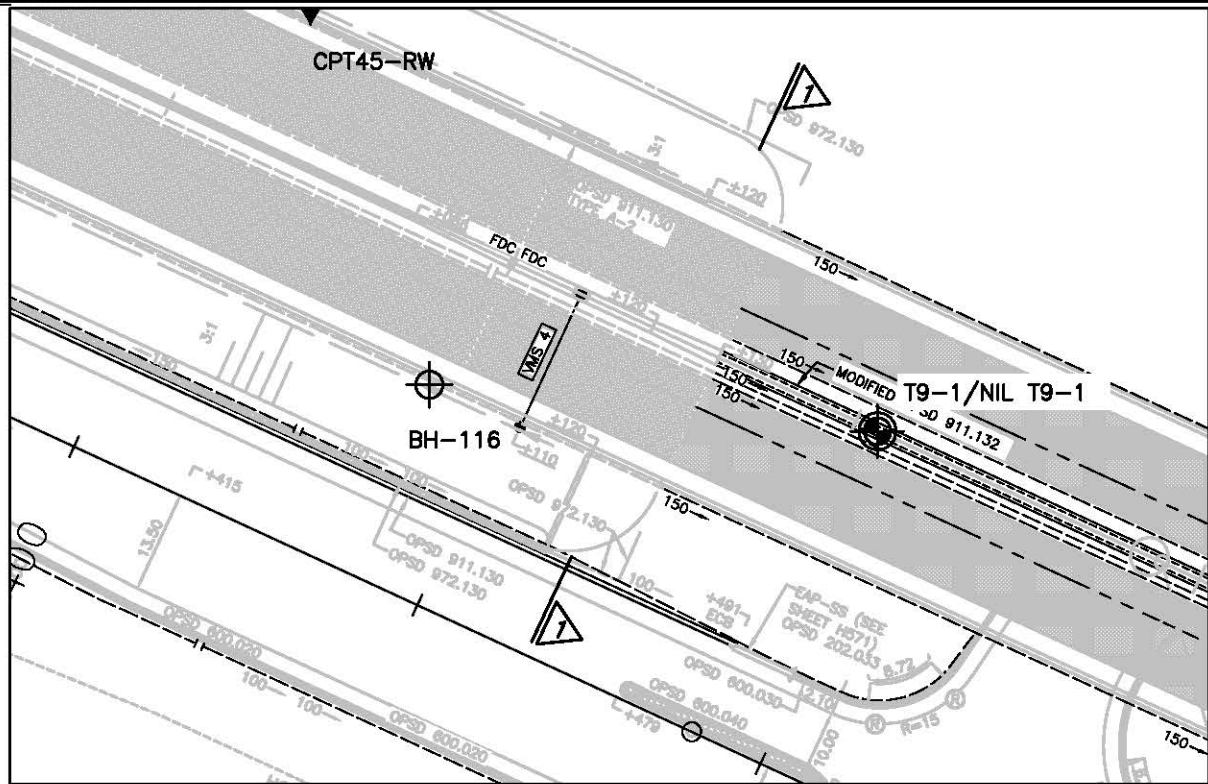
NOTES

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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

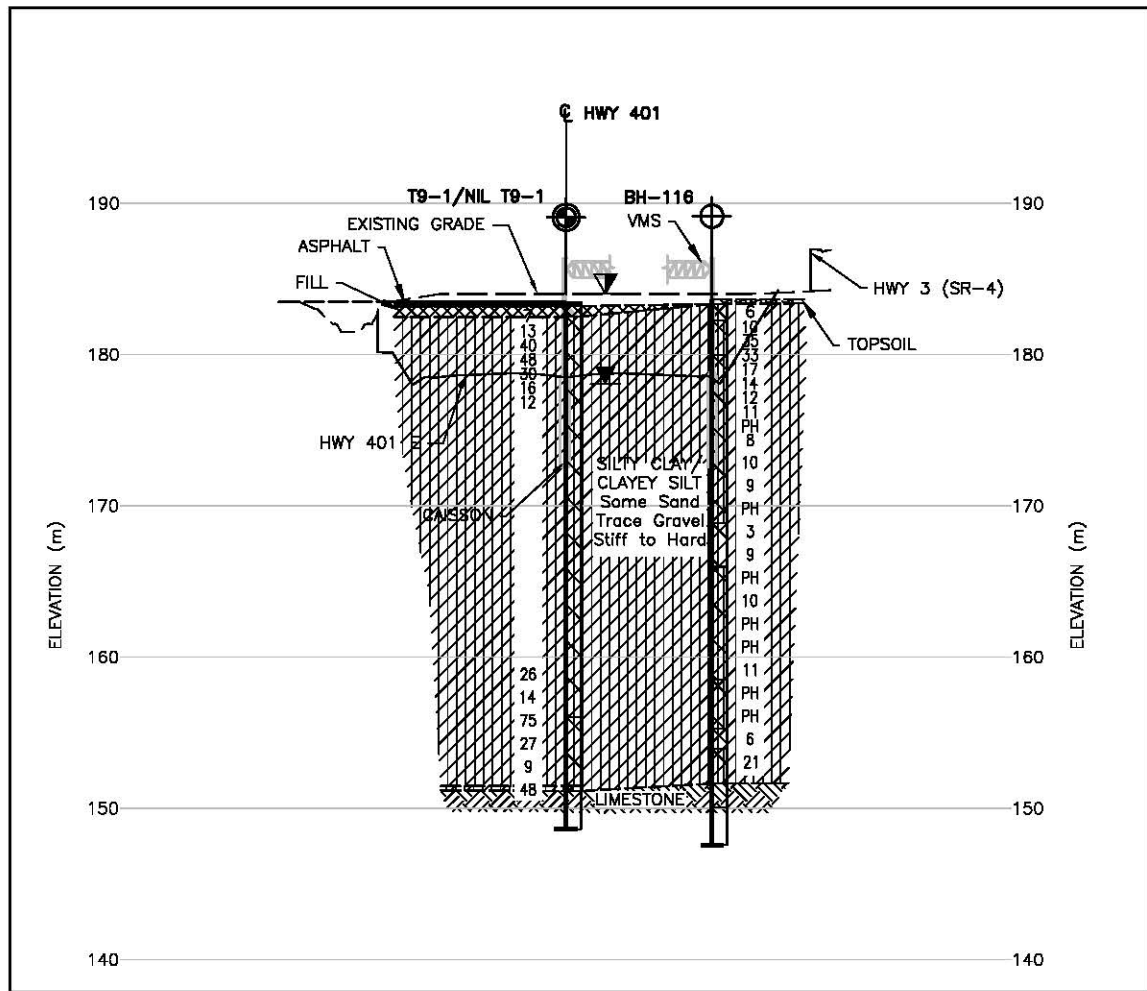
NOT FOR CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS		DATE	REV. BY	DESCRIPTION
17-FEB-12	B	PB	90% MTO SUBMISSION	
24-OCT-11	A	PB	90% MTO SUBMISSION	
DESIGN	NM	CHK	PB	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK	BG	SITE VMS 3 DATE 24-OCT-11



PLAN
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250



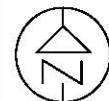
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

Parkway
Infrastructure
Engineers

amec
Hatch Mott
MacDonald

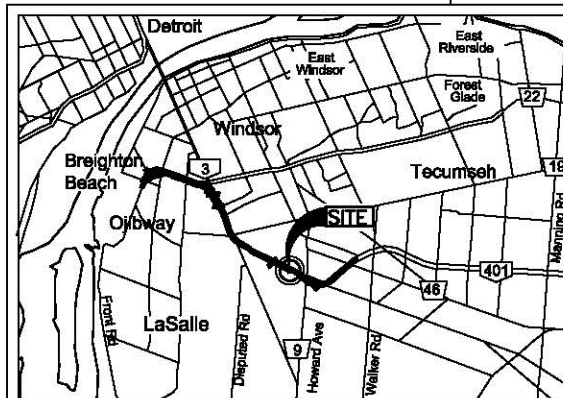
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



NEW CONSTRUCTION
VMS 4 - STA 12+110L HWY 401
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
C8004

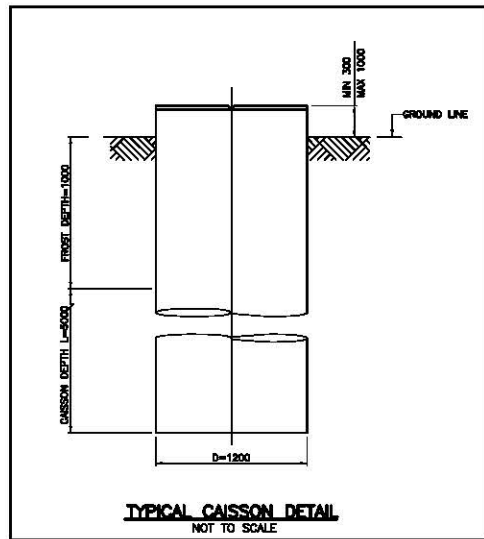
Phase 1
90% Sub



KEY PLAN
SCALE
1 0 2 4Km

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT -PREVIOUS INVESTIGATION
- SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)



No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-116	183.64	4678634.3	333722.5
AMEC TESTHOLES			
T9-1/NIL T9-1	183.98	4678634.8	333768.34

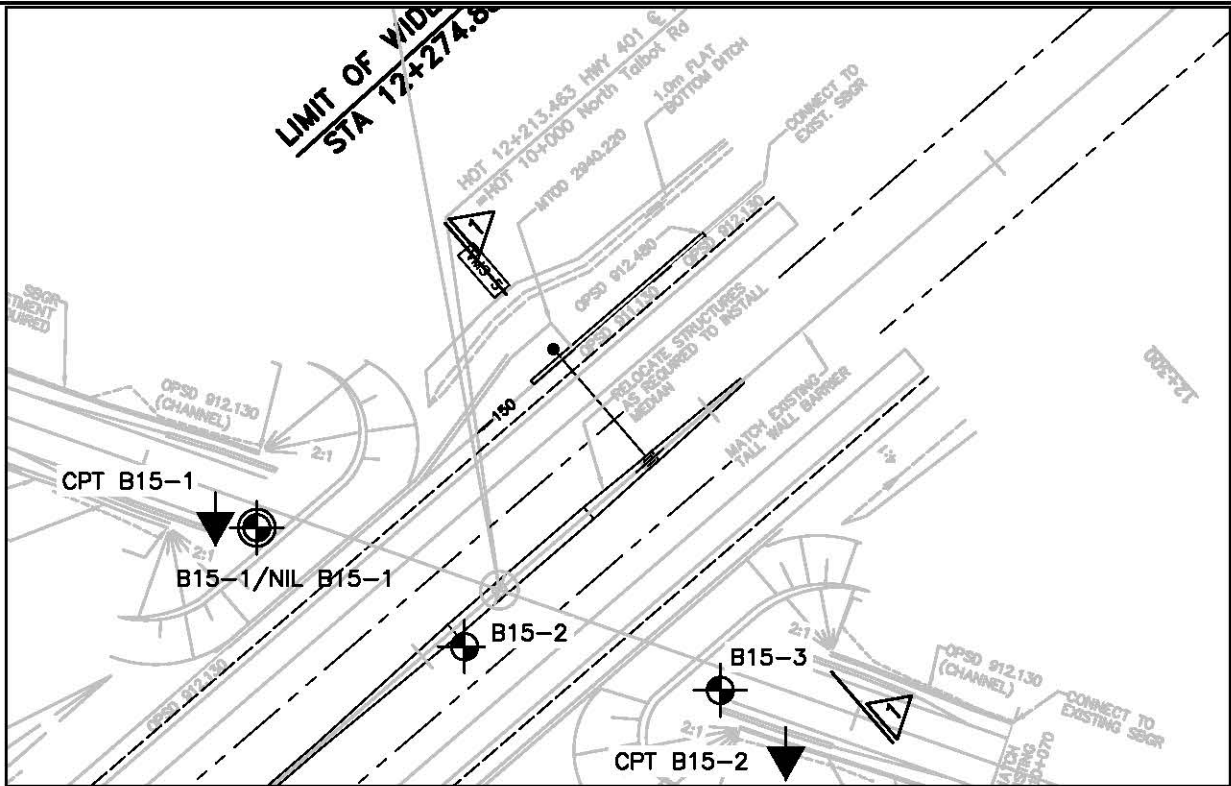
NOTES

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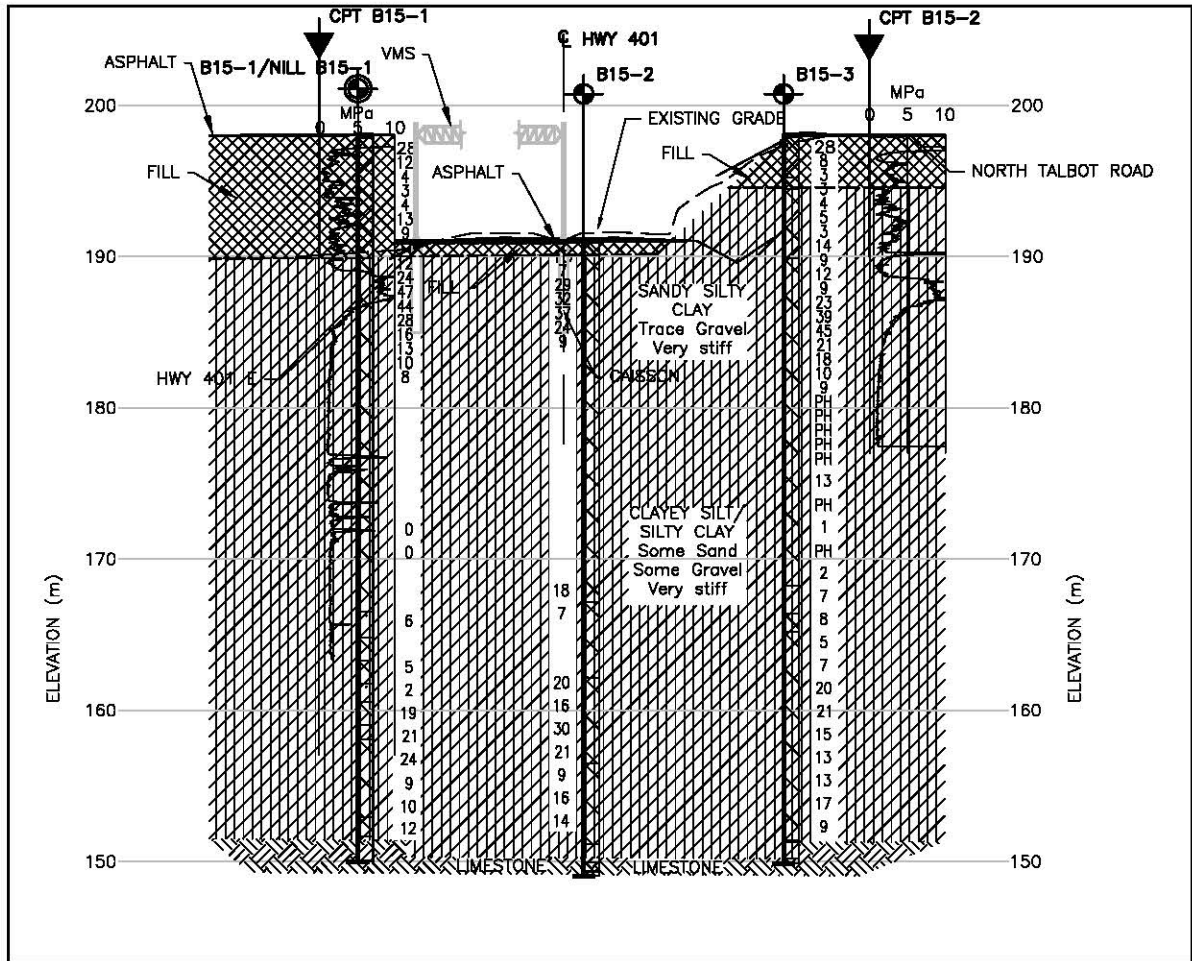
DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

NOT FOR
CONSTRUCTION

REVISIONS		DATE	REV.	BY	DESCRIPTION
17-FEB-12	B	PB	90% MTO SUBMISSION		
24-OCT-11	A	PB	90% MTO SUBMISSION		
DESIGN	NM	CHK	PB	CODE CAN/CSA S6-08	LOAD CL-625-ON
DRAWN	MM	CHK	BG	SITE VMS 4	DATE 24-OCT-11



PLAN
HORIZ SCALE 1:500
VERT SCALE 1:250



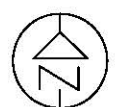
HORIZ SCALE 1:500
VERT SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

Parkway
Infrastructure
Engineers

amec
Hatch Mott
MacDonald

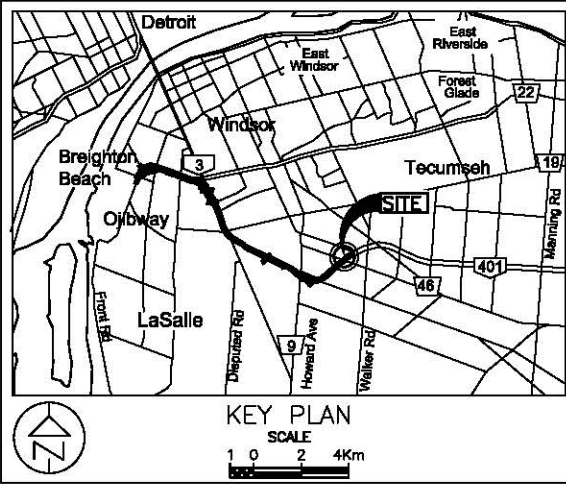
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



NEW CONSTRUCTION
VMS 5 - STA 12+240T HWY 401
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

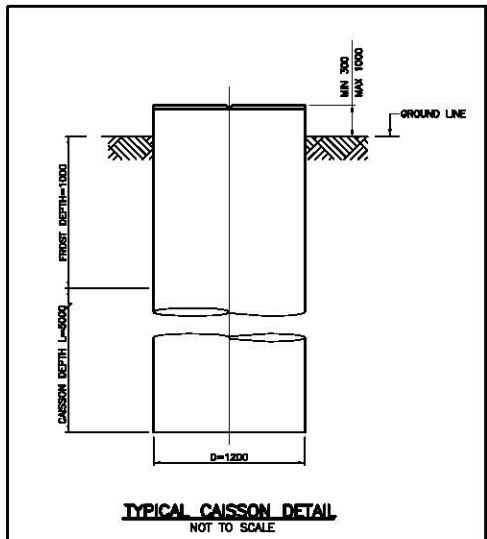
SHEET
G8005

Phase 1
90% Sub



LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT -PREVIOUS INVESTIGATION
- SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)



No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
AMEC TESTHOLES			
B15-1/NIL B15-1	198.14	4678489.2	337046.3
B15-2	191.10	4678473.5	337073.8
B15-3	198.09	4678467.7	337107.6
CPT B15-1	198.03	4678491.3	337040.8
CPT B15-2	197.98	4678460.3	337116.3

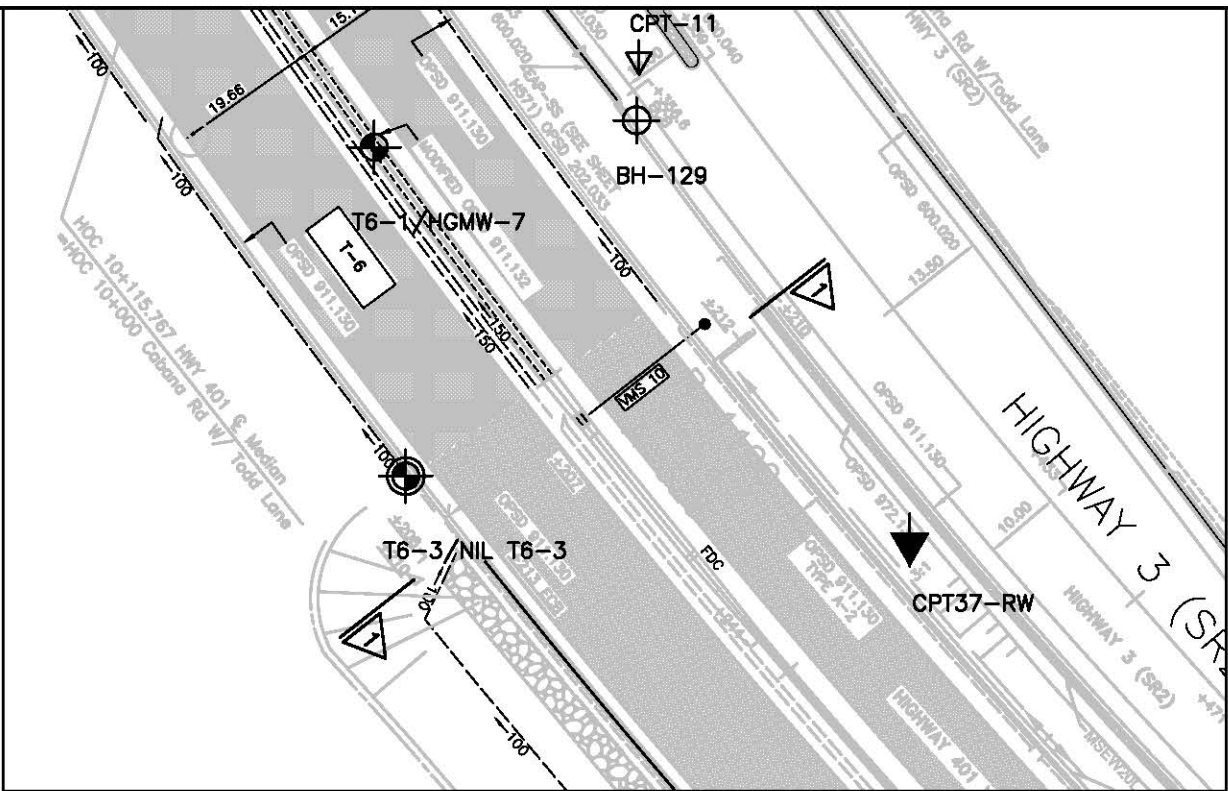
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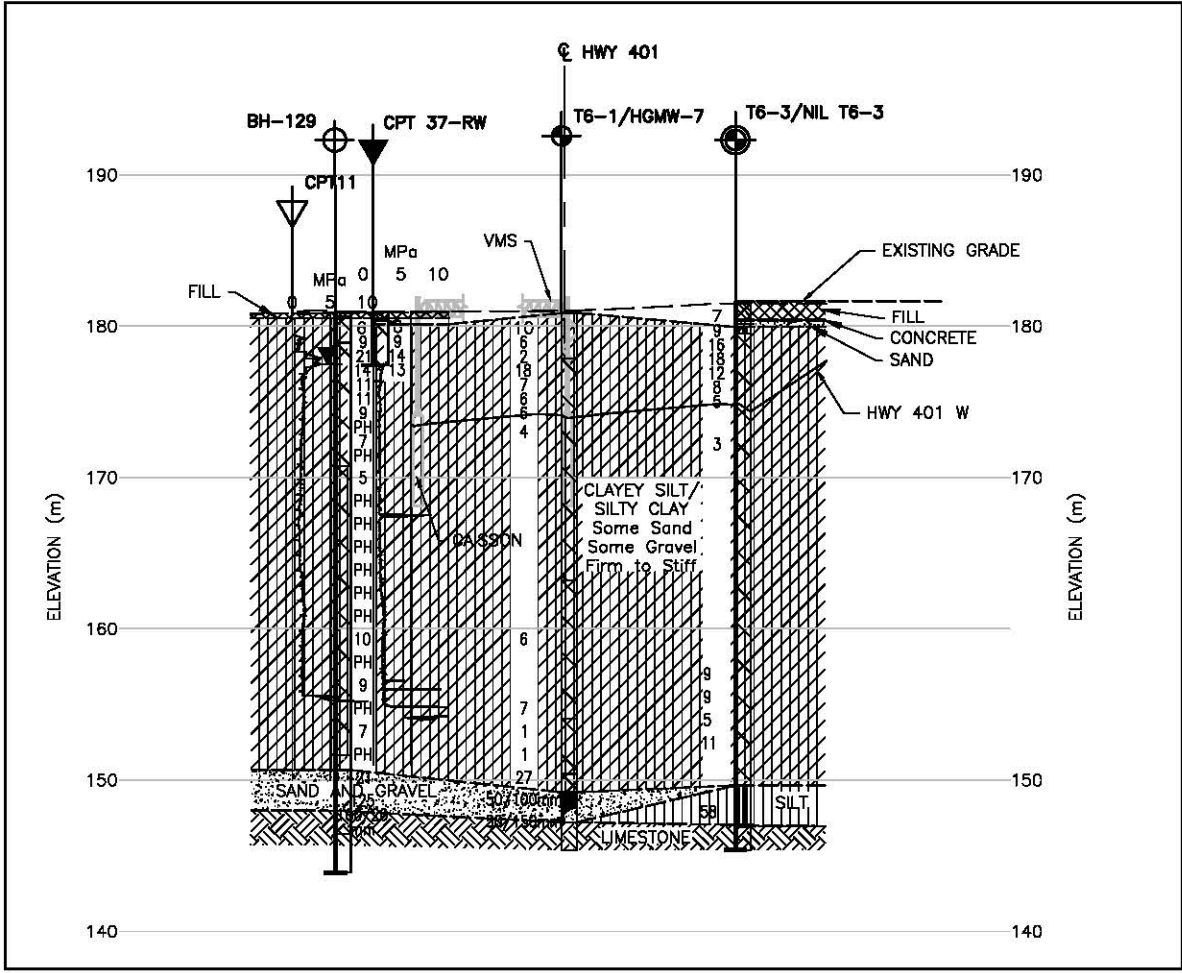
NOT FOR
CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS	DATE	REV.	BY	DESCRIPTION
17-FEB-12	B	PB		90% MTO SUBMISSION
24-OCT-11	A	PB		90% MTO SUBMISSION
DESIGN	NM	CHK	PB	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK	BG	SITE VMS 5 DATE 24-OCT-11



PLAN
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

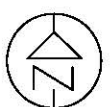


HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



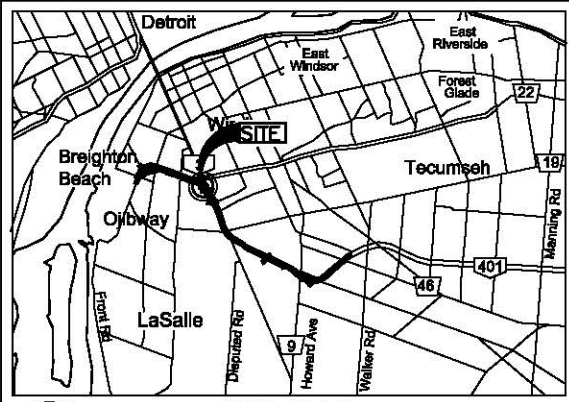
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



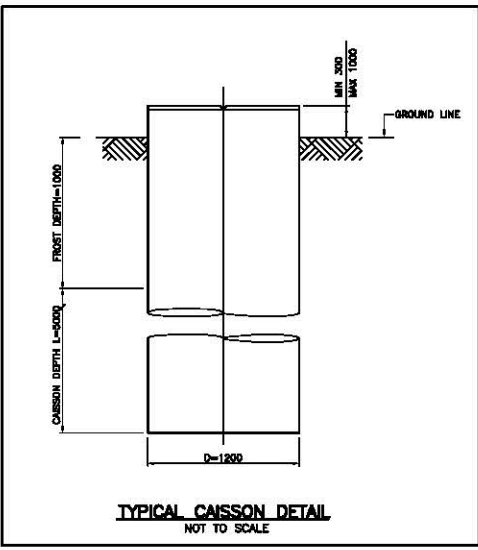
NEW CONSTRUCTION
VMS 10 - STA 10+210L HWY 401
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8010

Phase 1
90% Sub



KEY PLAN
SCALE
0 2 4 Km



TYPICAL CAISSON DETAIL
NOT TO SCALE

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT -PREVIOUS INVESTIGATION
- SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- SEAL
- STANDPIPE
- BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-129	180.78	4679625.1	332109.7
CPT-11	180.91	4679634.0	332110.0
AMEC TESTHOLES			
T6-3/NIL T6-3	181.65	4679577.5	332079.1
CPT 37-RW	180.93	4679571.4	332146.2
T6-1/HGMW-7	180.89	4679627.0	332067.4

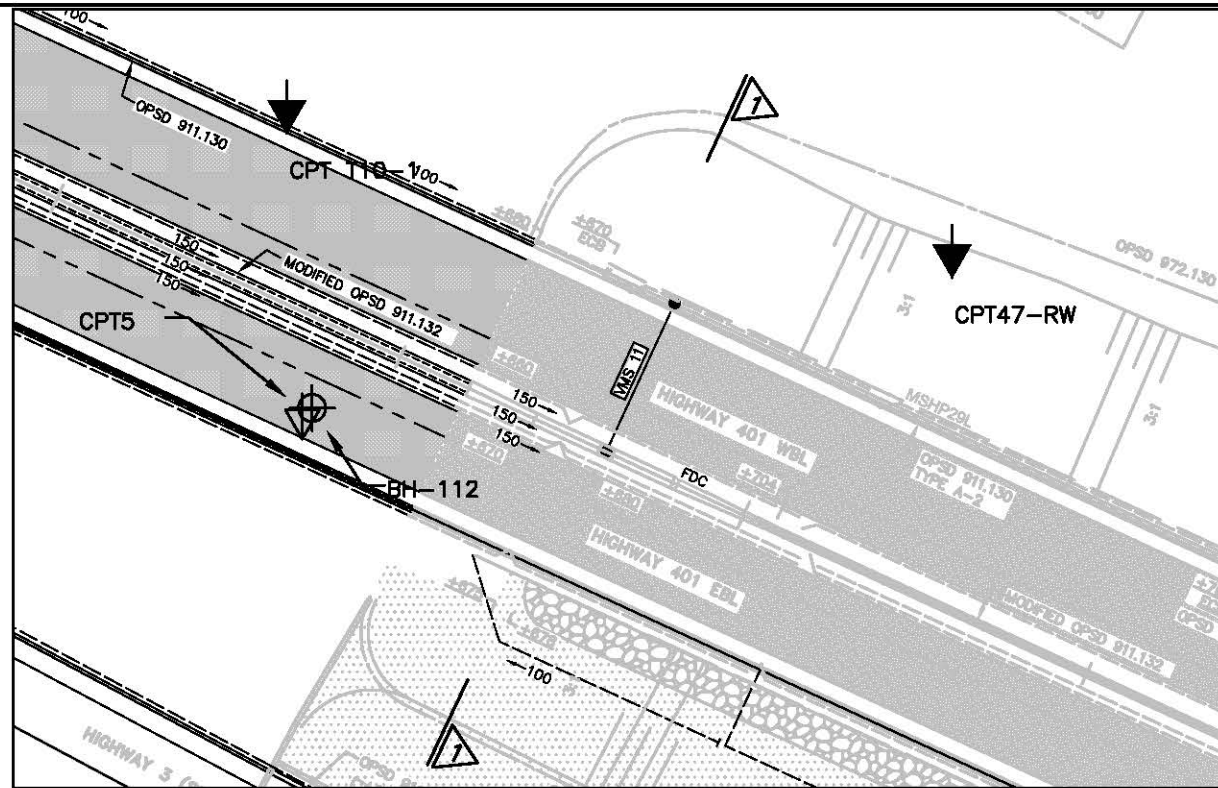
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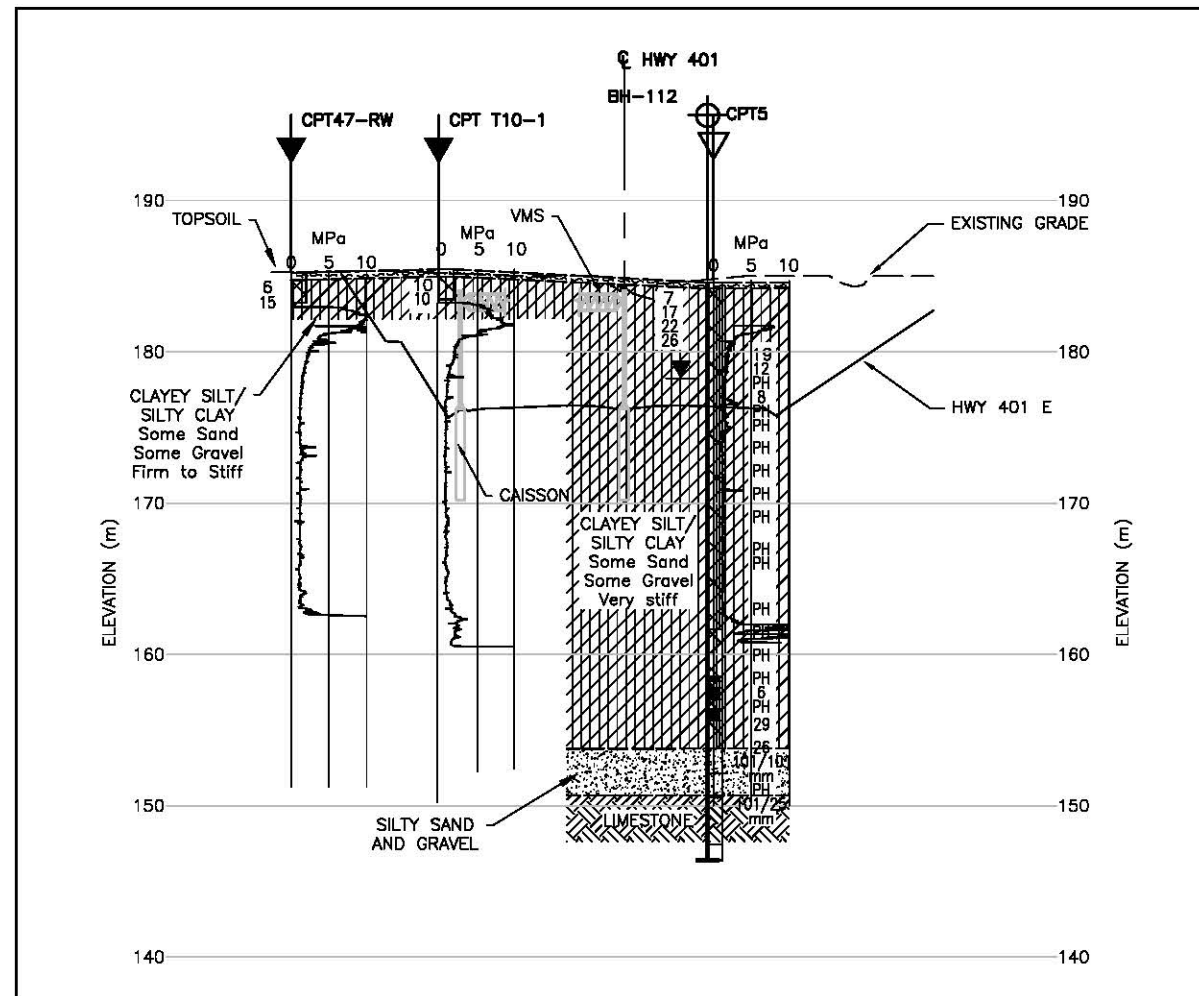
NOT FOR CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS	DATE	REV. BY	DESCRIPTION
17-FEB-12	B	PB	90% MTO SUBMISSION
24-OCT-11	A	PB	90% MTO SUBMISSION
DESIGN	NM	CHK PB	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK BG	SITE VMS 10 DATE 24-OCT-11



PLAN
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

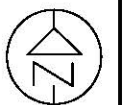


1
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

Parkway Infrastructure Engineers **amec**
Hatch Mott MacDonald

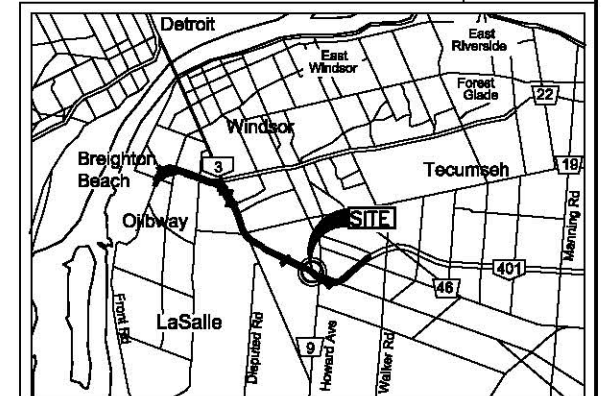
Windsor-Essex Parkway Project
RFP No. 09-54-1007



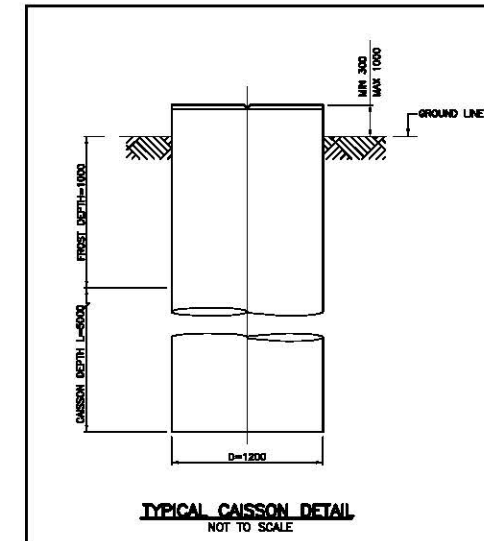
NEW CONSTRUCTION
VMS 11- STA 12+680L HWY 401
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8011

Phase 1
90% Sub



KEY PLAN
SCALE
1 0 2 4Km



TYPICAL CAISSON DETAIL
NOT TO SCALE

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-112	184.58	4678413.3	334221.3
CPT5	184.58	4678413.0	334220.0
AMEC TESTHOLES			
CPT47-RW	185.40	4678440.3	334300.2
CPT T10-1	185.45	4678454.0	334218.0

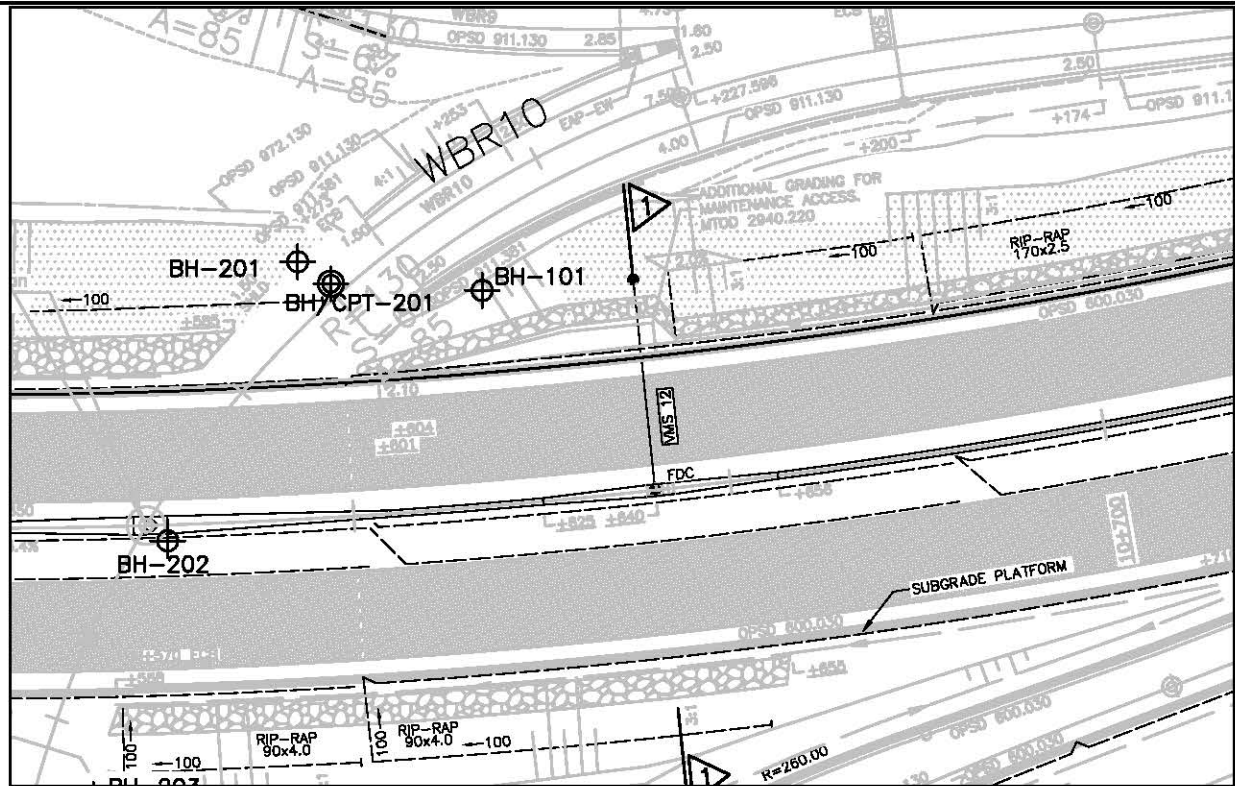
- LEGEND**
- BOREHOLE CURRENT INVESTIGATION
 - BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
 - NILCON VANE CURRENT INVESTIGATION
 - CPT - CURRENT INVESTIGATION
 - DMT - CURRENT INVESTIGATION
 - BOREHOLE PREVIOUS INVESTIGATION
 - BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
 - CPT -PREVIOUS INVESTIGATION
 - N SPT N-VALUE
 - 16 BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
 - SEAL
 - STANDPIPE
 - DRY BOREHOLE DRY DURING DRILLING
 - WATER LEVEL DURING DRILLING
 - WATER LEVEL (SHALLOW PIEZO)
 - WATER LEVEL (DEEP PIEZO)

- NOTES**
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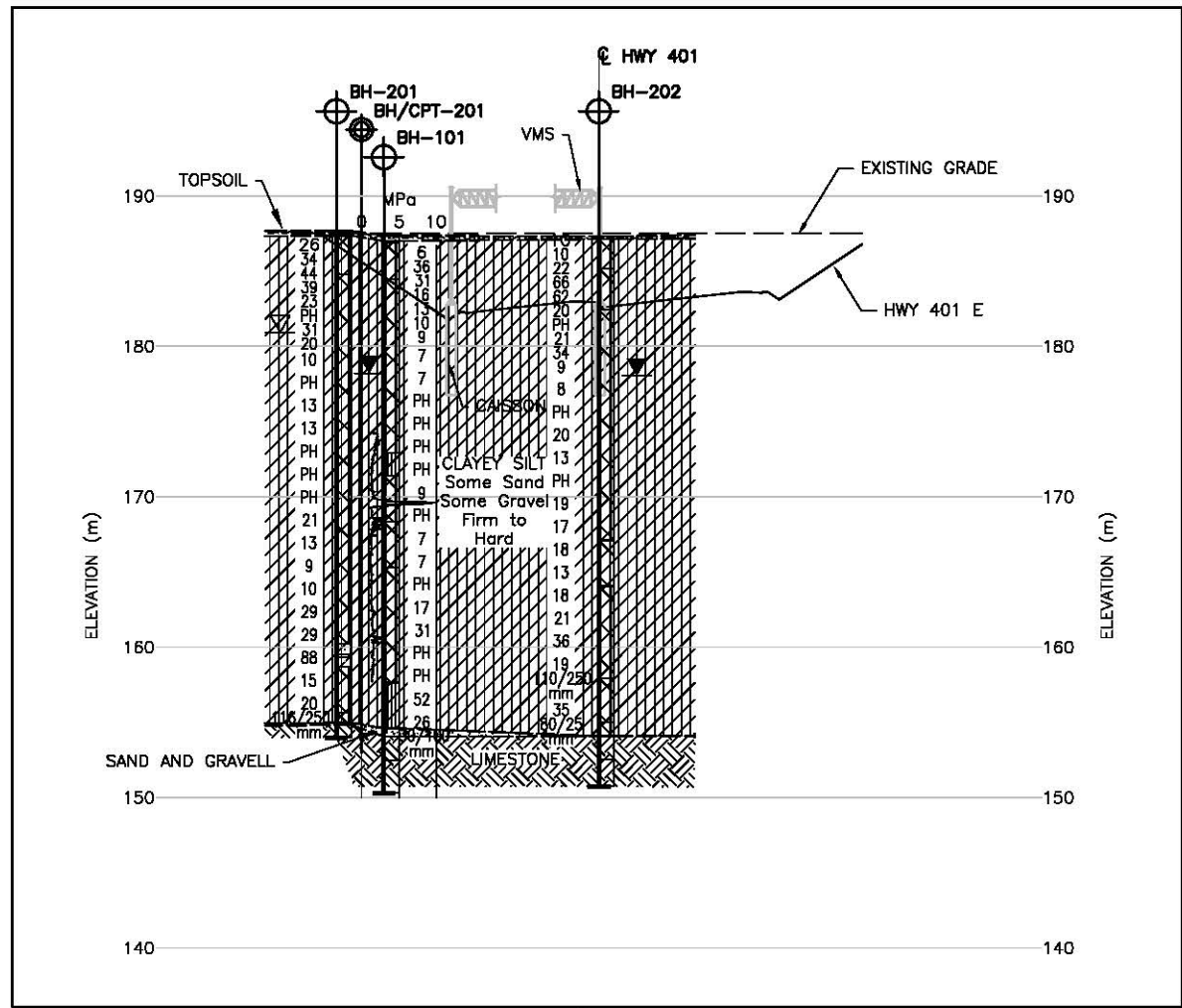
DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

NOT FOR CONSTRUCTION

REVISIONS		DATE	REV. BY	DESCRIPTION
17-FEB-12	B	PB	90% MTO SUBMISSION	
24-OCT-11	A	PB	90% MTO SUBMISSION	
DESIGN	NM	CHK	PB	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK	BG	SITE VMS 11 DATE 24-OCT-11



PLAN
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250



HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



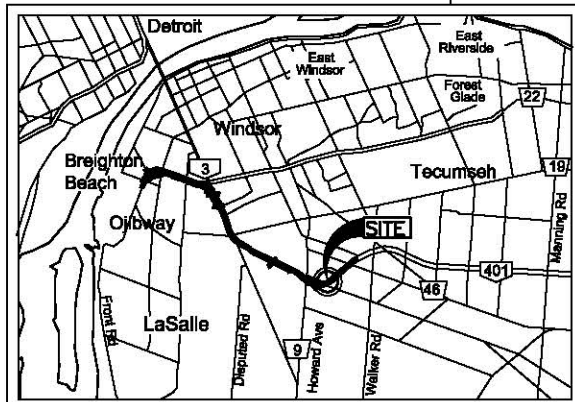
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



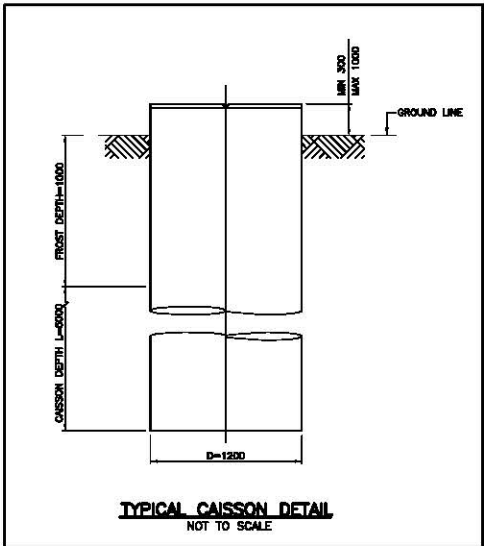
NEW CONSTRUCTION
VMS 12- STA 10+640T HWY 401
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8012

Phase 1
90% Sub



KEY PLAN
SCALE
1:0, 2, 4 Km



No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
PRE-BID TESTHOLES			
BH-101	187.37	4677606.6	335794.9
BH-201	187.67	4677610.4	335770.5
BH-202	187.31	4677573.5	335753.3
BH/CPT-201	187.67	4677607.5	335774.9

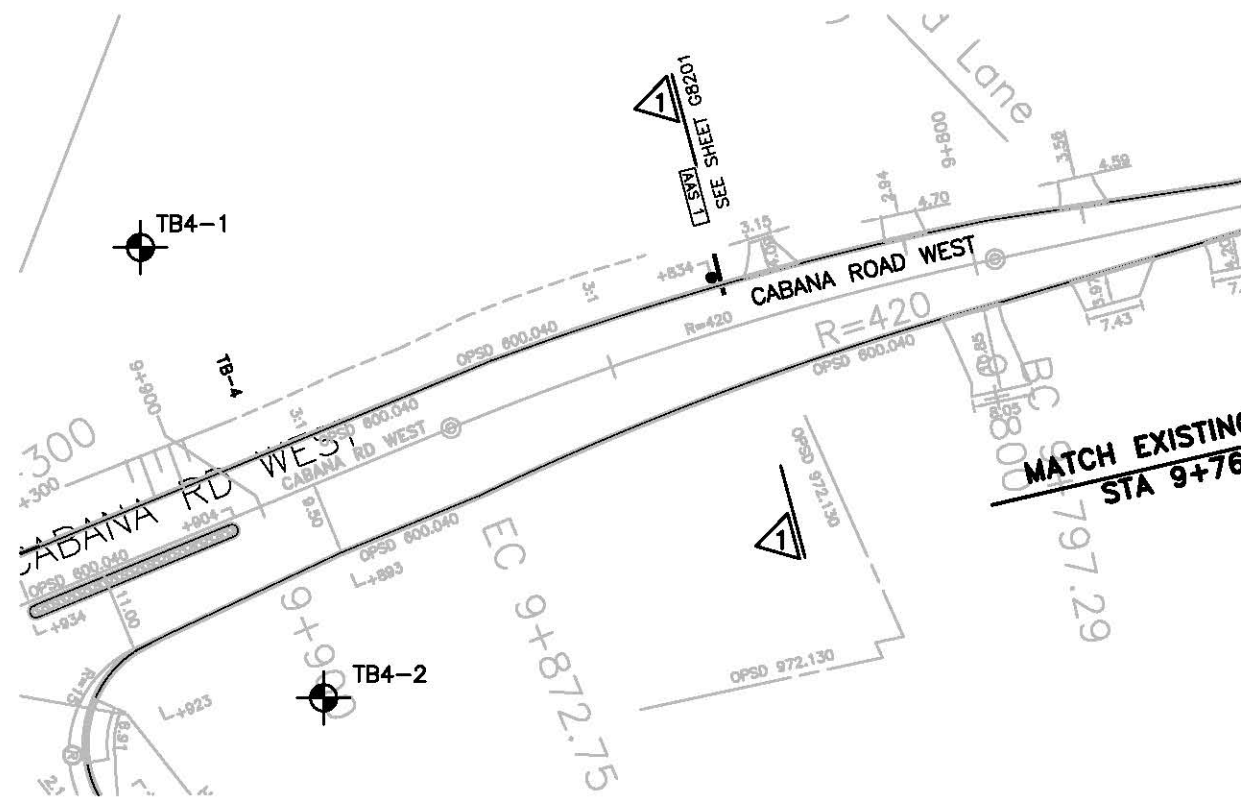
- LEGEND
- BOREHOLE CURRENT INVESTIGATION
 - BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
 - NILCON VANE CURRENT INVESTIGATION
 - CPT - CURRENT INVESTIGATION
 - DMT - CURRENT INVESTIGATION
 - BOREHOLE PREVIOUS INVESTIGATION
 - BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
 - CPT -PREVIOUS INVESTIGATION
 - N SPT N-VALUE
 - 16 BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
 - SEAL
 - STANDPIPE
 - DRY BOREHOLE DRY DURING DRILLING
 - WATER LEVEL DURING DRILLING
 - WATER LEVEL (SHALLOW PIEZO)
 - WATER LEVEL (DEEP PIEZO)
- MPa 0 5 10
- CPT

- NOTES
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 - ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

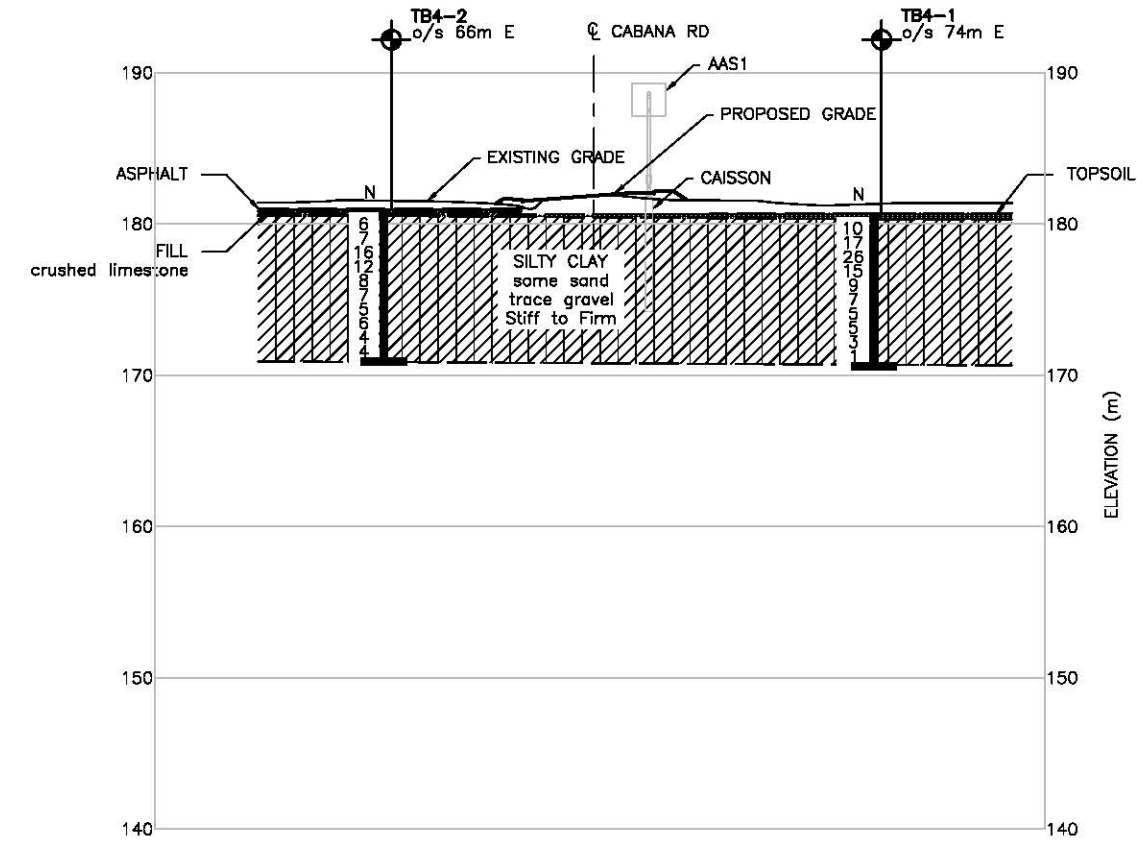
NOT FOR CONSTRUCTION

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

REVISIONS		DATE	REV. BY	DESCRIPTION
17-FEB-12	A	PB	90% MTO SUBMISSION	
24-OCT-11	A	PB	90% MTO SUBMISSION	
DESIGN	NM	CHK	PB	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK	BG	SITE VMS 12 DATE 24-OCT-11



PLAN
HORIZONTAL SCALE 1:500



VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

Parkway
Infrastructure
Engineers

amec
Hatch Mott MacDonald

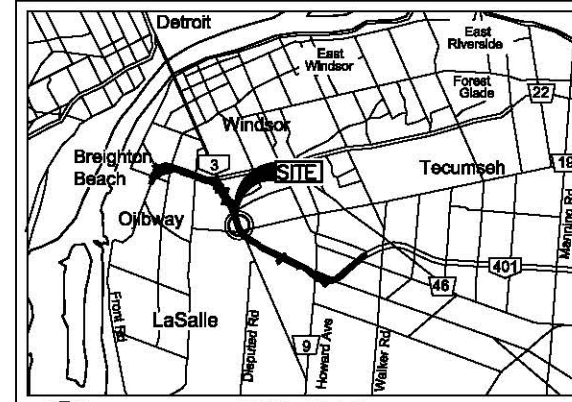
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



NEW CONSTRUCTION
AAS 1 - STA 9+833 CABANA RD
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8201

Phase 1
90% Sub



KEY PLAN
SCALE
1 0 2 4 Km

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT - PREVIOUS INVESTIGATION
- N SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- MHSG - MAGNETIC HEAVE/SETTLEMENT GAUGE
- P - VIBRATING WIRE PIEZOMETER
- DRY BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

NOTES

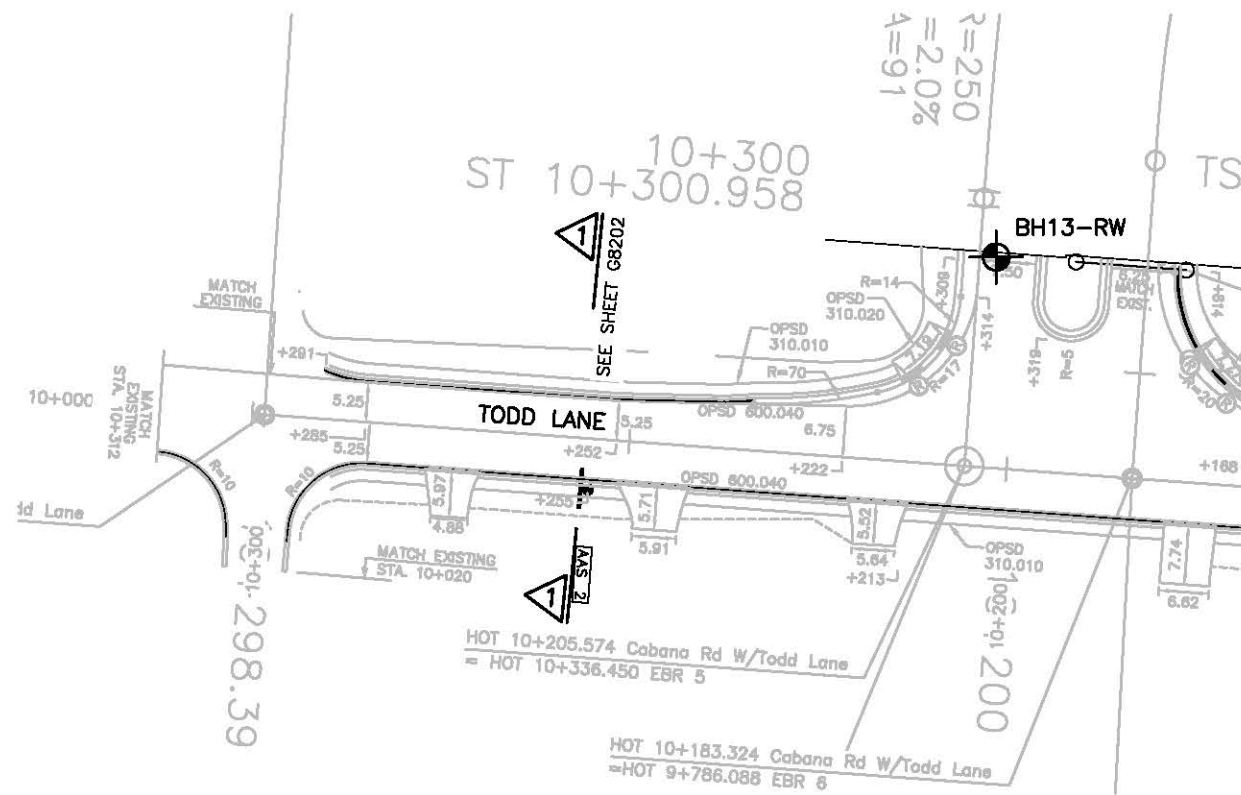
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GEOTECHNICAL DESIGN REPORT.
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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
AMEC BOREHOLES			
TB4-1	180.7	4679732.3	332128.6
TB4-2	181.0	4679674.4	332157.2

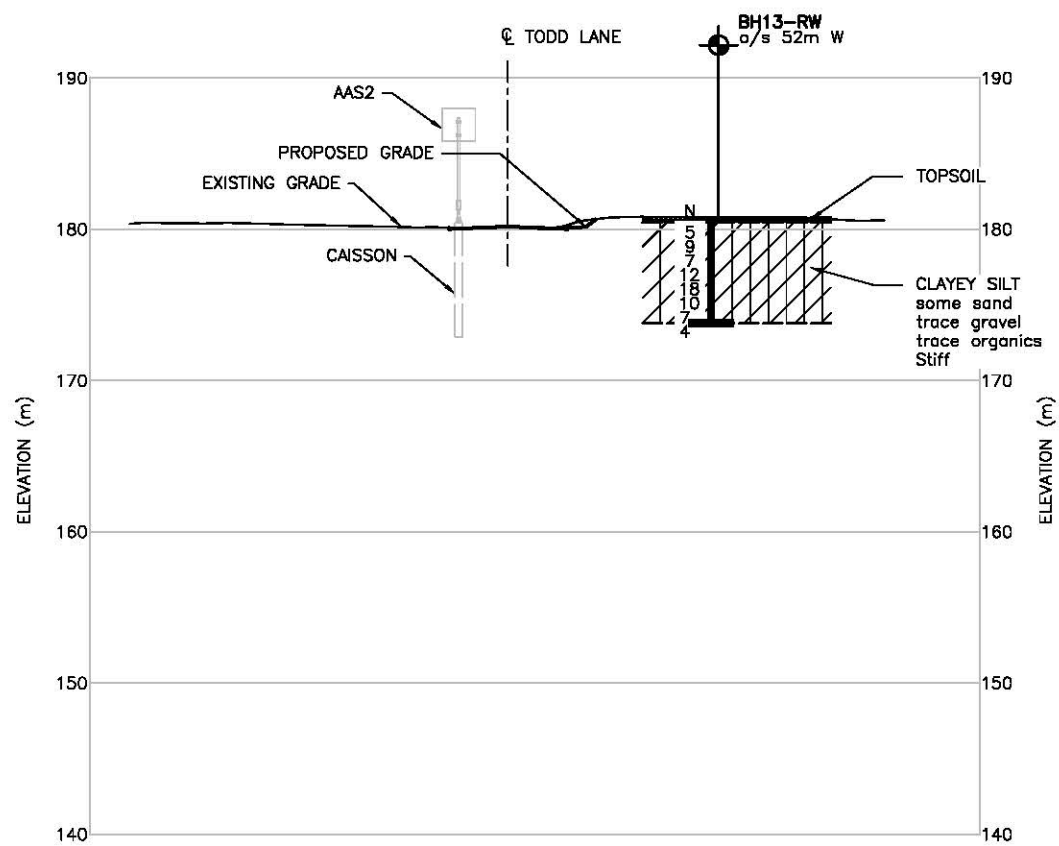
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100mm ON ORIGINAL DRAWING

NOT FOR
CONSTRUCTION

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24-OCT-11	A	PB	90% MTO SUBMISSION
DESIGN	NM	CHK BG	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK PB	SITE AAS 1 DATE 24-OCT-11



PLAN
HORIZONTAL SCALE 1:500



VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



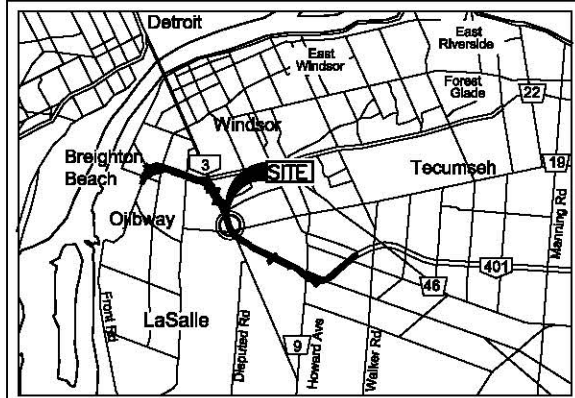
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



NEW CONSTRUCTION
AAS 2 - STA 10+256 TODD LANE
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8202

Phase 1
90% Sub



KEY PLAN
SCALE
1 0 2 4Km

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT -PREVIOUS INVESTIGATION
- N SPT N-VALUE
- BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- MHSG - MAGNETIC HEAVE/SETTLEMENT GAUGE
- P - VIBRATING WIRE PIEZOMETER
- DRY BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

NOTES

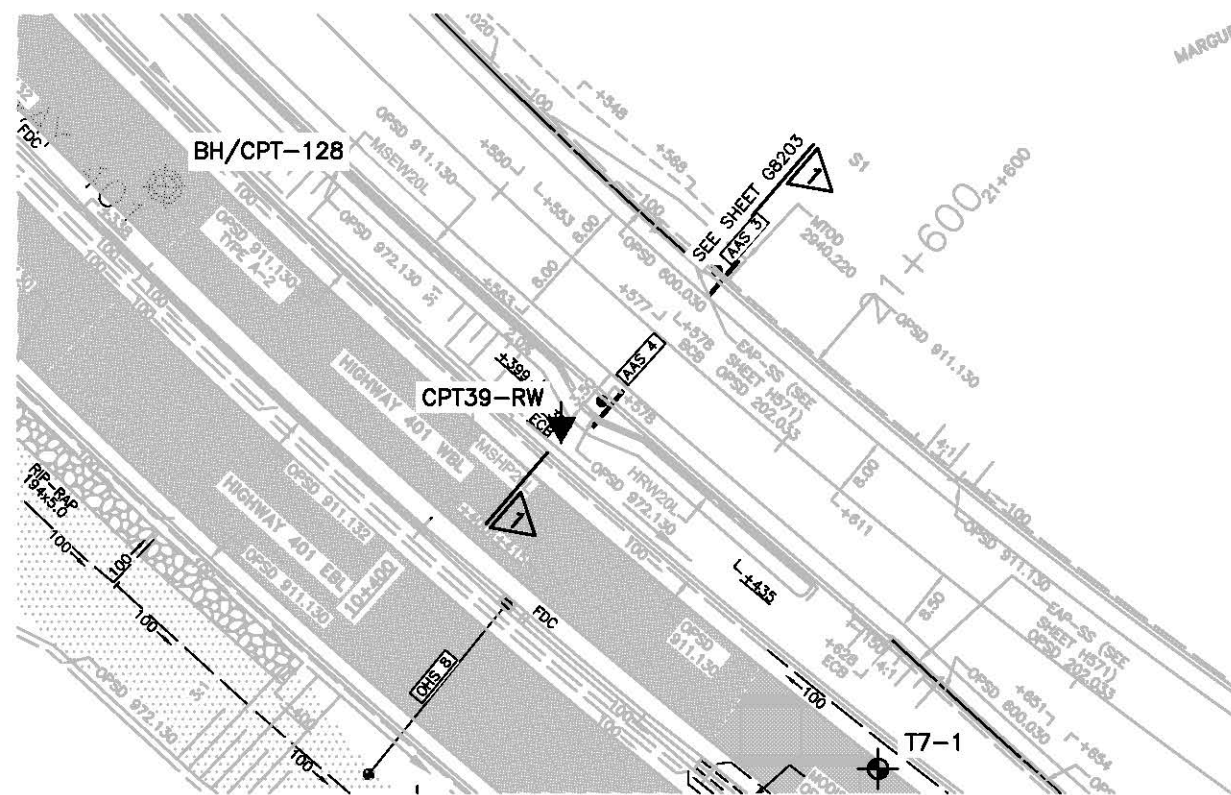
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GEOTECHNICAL DESIGN REPORT.
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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
AMEC BOREHOLES			
BH13-RW	180.8	4679672.2	331850.2

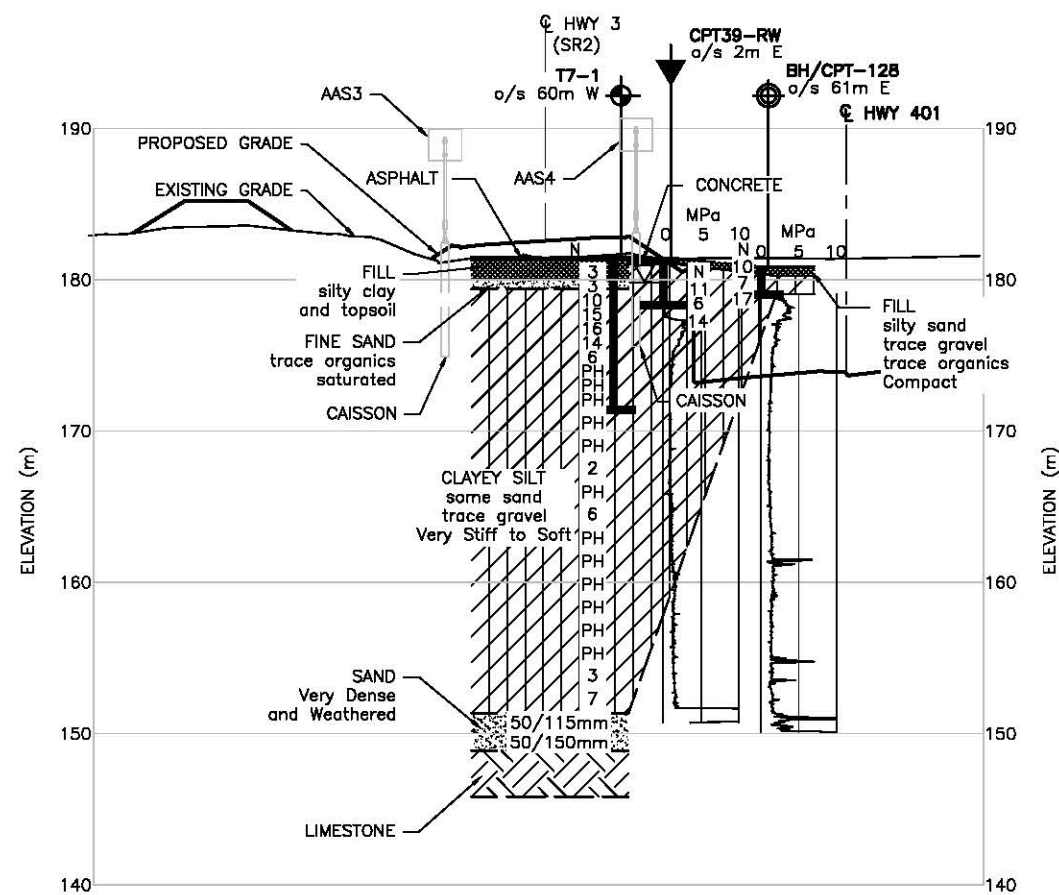
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100mm ON ORIGINAL DRAWING

NOT FOR
CONSTRUCTION

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24-OCT-11	A	PB	90% MTO SUBMISSION
DESIGN	NM	CHK BG	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK PB	SITE AAS 2 DATE 24-OCT-11



PLAN
HORIZONTAL SCALE 1:500



VERTICAL SCALE 1:250

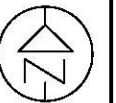
METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

**Parkway
Infrastructure
Engineers**

amec
Hatch Mott
MacDonald

Windsor-Essex
Parkway Project
RFP No. 09-54-1007

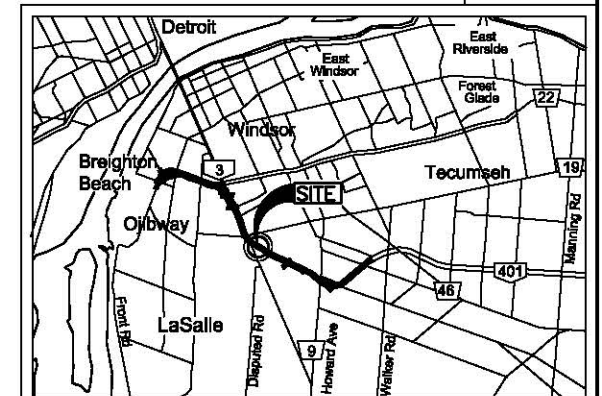


NEW CONSTRUCTION
AAS 3 & 4 - STA 21+579 HWY 3 (SR2)
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8203

Phase 1

90% Sub



KEY PLAN

SCALE
1 0 2 4 Km

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT - PREVIOUS INVESTIGATION
- N SPT N-VALUE
- 16 BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- MHSG - MAGNETIC HEAVE/SETTLEMENT GAUGE
- P - VIBRATING WIRE PIEZOMETER
- DRY BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

NOTES

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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

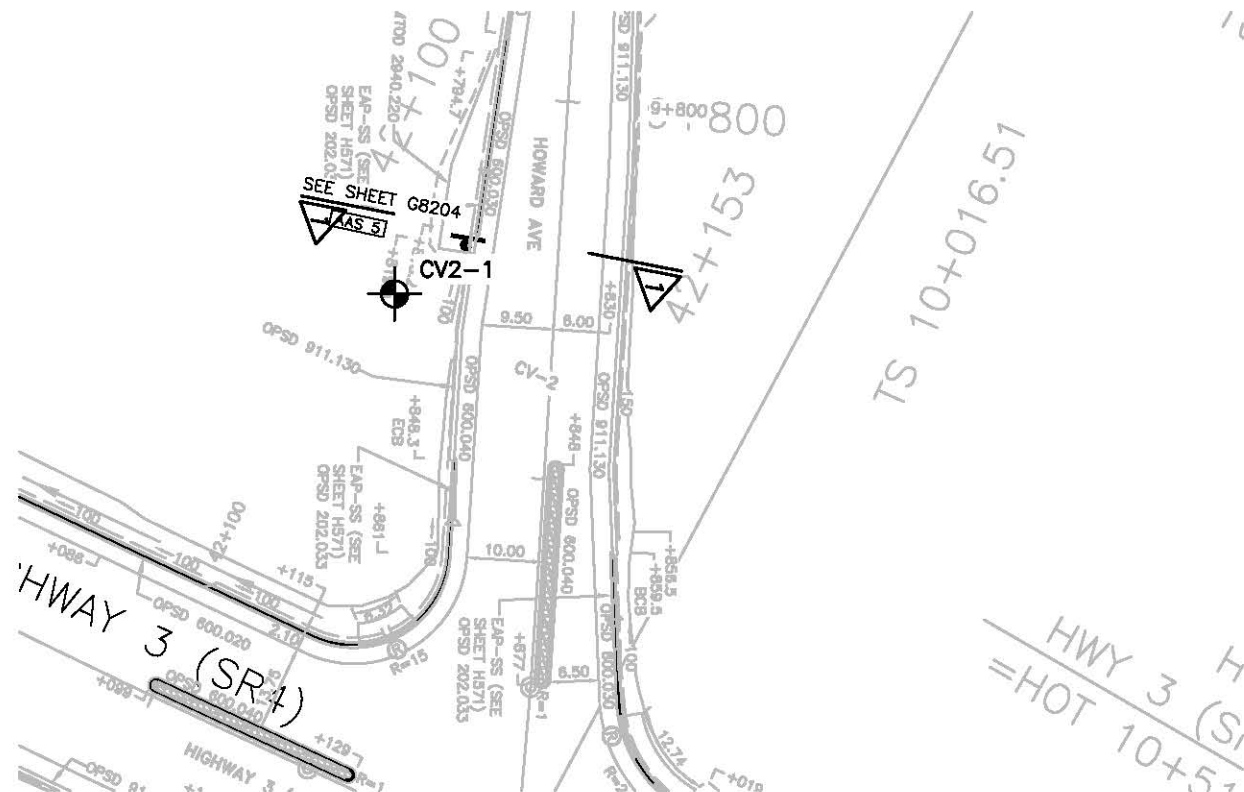
No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
AMEC BOREHOLES			
T7-1	181.5	4679413.6	332295.2
CPT39-RW	181.4	4679460.1	332253.2
PRE-BID BOREHOLES			
BH/CPT-128	180.9	4679490.6	332200.8

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

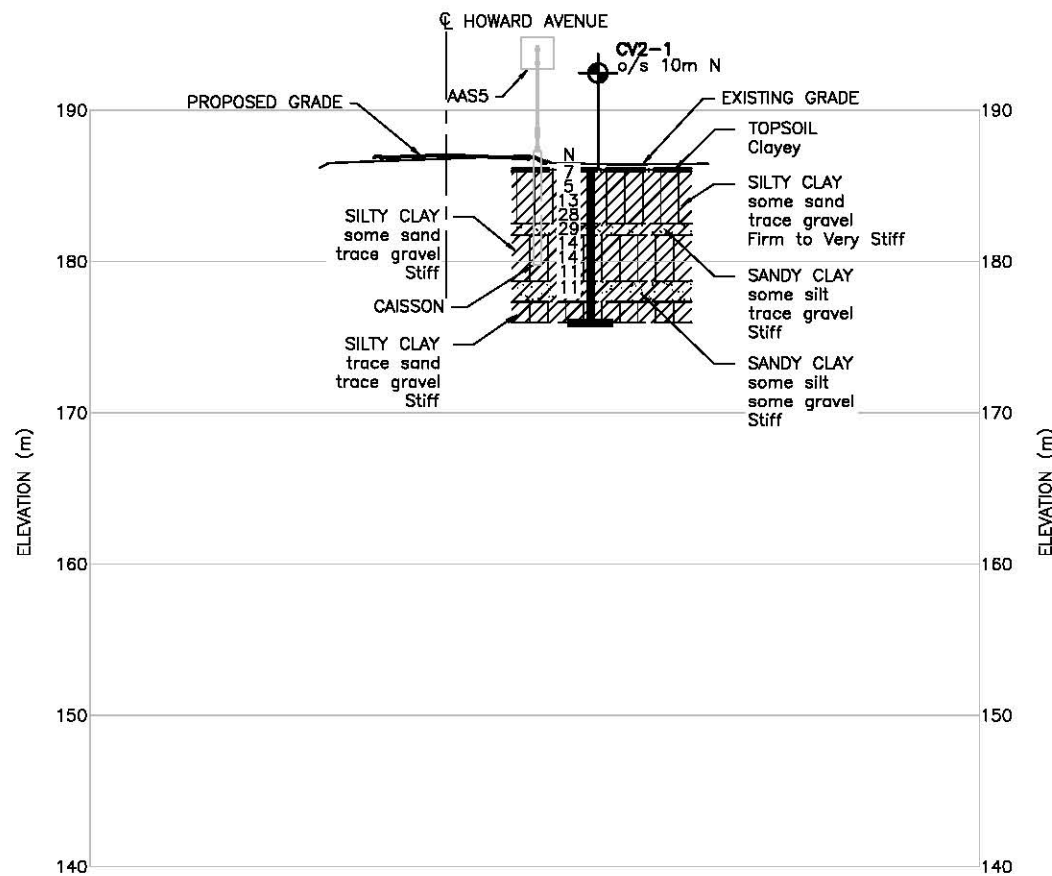
NOT FOR
CONSTRUCTION

REVISIONS	DATE	REV.	BY	DESCRIPTION
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DESIGN	NM	CHK	BG	CODE CAN/CSA S6-06 LOAD CL-825-ON
DRAWN	MM	CHK	PB	SITE AAS 3&4 DATE 24-OCT-11

DOC: 285380-04-090-WIP1-8203



PLAN
HORIZONTAL SCALE 1:500



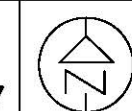
VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

Parkway
Infrastructure
Engineers

amec
Hatch Mott MacDonald

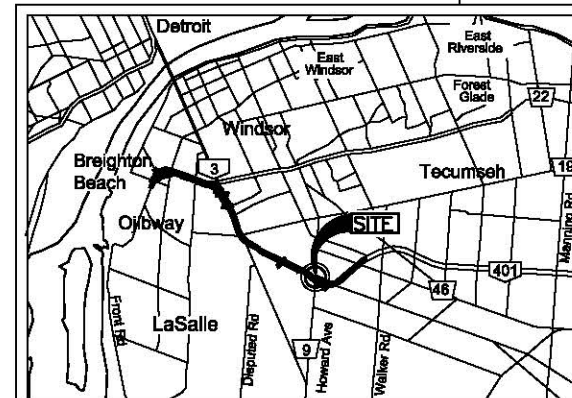
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



NEW CONSTRUCTION
AAS 5 - STA 9+820 HOWARD AVE
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8204

Phase 1
90% Sub



KEY PLAN
SCALE
1:0 2:0 4:0 Km

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT - PREVIOUS INVESTIGATION
- N SPT N-VALUE
- 16 BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- MHSG - MAGNETIC HEAVE/SETTLEMENT GAUGE
- P - VIBRATING WIRE PIEZOMETER
- DRY BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
AMEC BOREHOLES			
CV2-1	186.2	4677918.5	335208.6

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

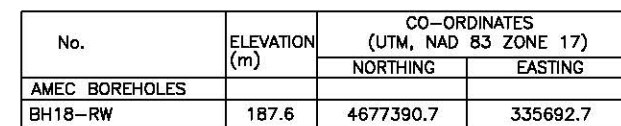
NOT FOR
CONSTRUCTION

REVISIONS	DATE	REV. BY	DESCRIPTION	DESIGN	CHK	BG	CODE	CAN/CSA	S6-08	LOAD	CL-625-ON
17-FEB-12	B	PB	90% MTO SUBMISSION								
24-OCT-11	A	PB	90% MTO SUBMISSION								
DATE	REV. BY	DESCRIPTION									
DESIGN	NM	CHK	BG	CODE	CAN/CSA	S6-08	LOAD	CL-625-ON			
DRAWN	MM	CHK	PB	SITE	AAS 5		DATE	24-OCT-11			

SHEET
G8205

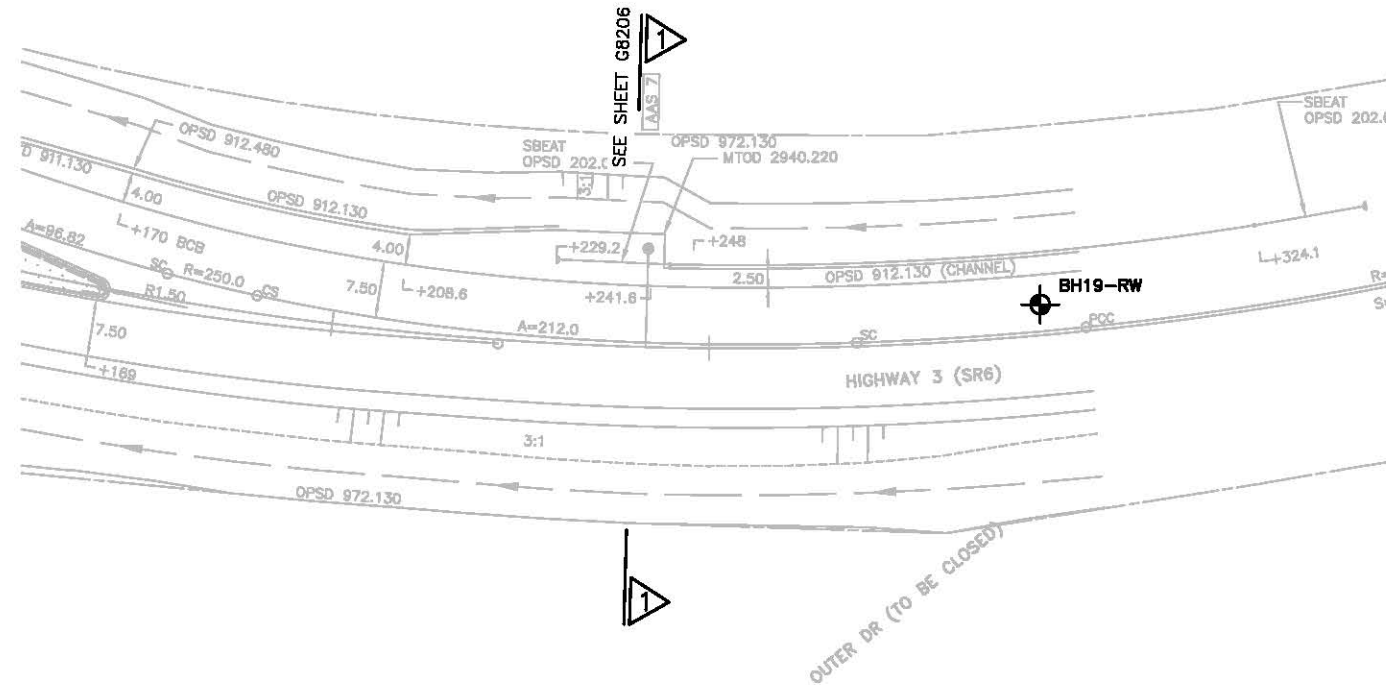
NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GEOTECHNICAL DESIGN REPORT.
2. THE INTERPRETED STRATIGRAPHY REPRESENTS SIMPLIFIED SUBSURFACE CONDITIONS. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN DEFINED AT BOREHOLE LOCATIONS ONLY. CONDITIONS BETWEEN BOREHOLE LOCATIONS COULD DIFFER FROM ILLUSTRATED CONDITIONS.
3. ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

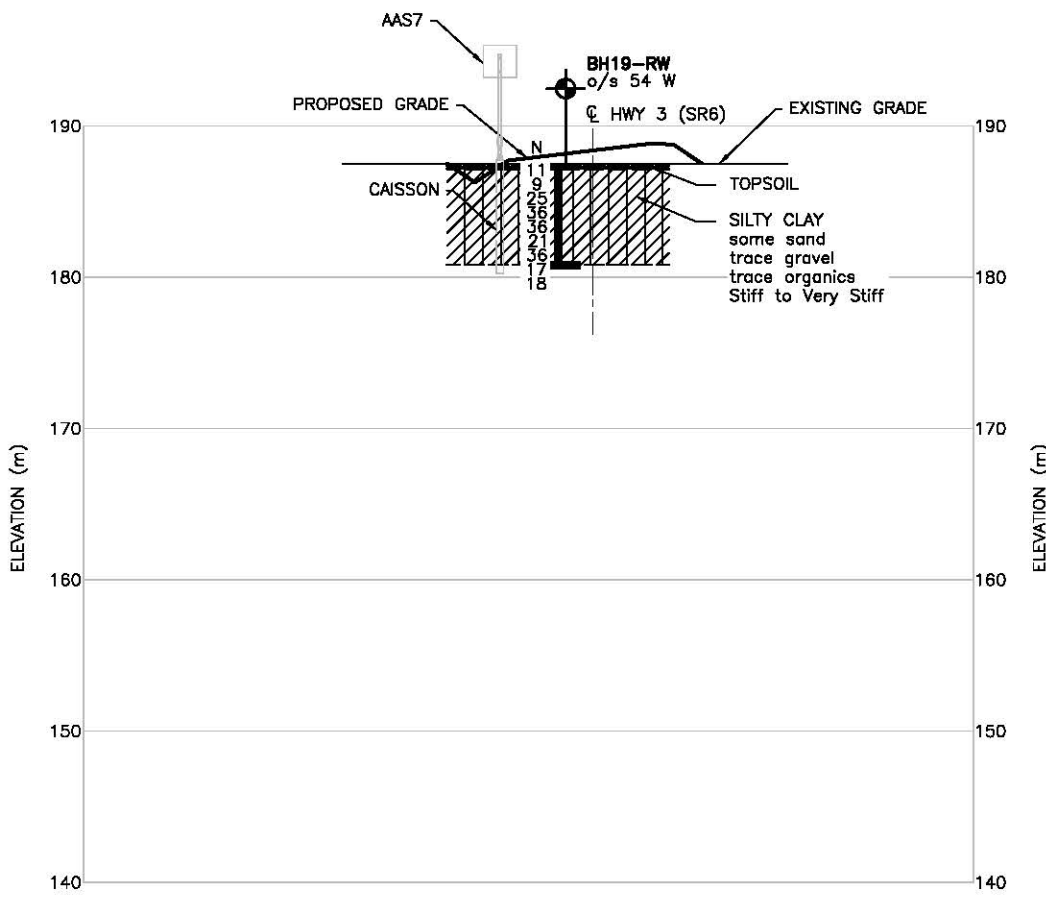


DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

DOC: 285380-04-090-WIP1-8205



PLAN
HORIZONTAL SCALE 1:500

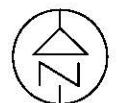


1
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



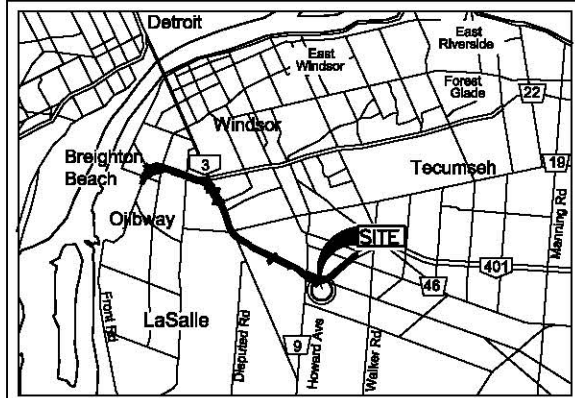
Windsor-Essex
Parkway Project
RFP No. 09-54-1007



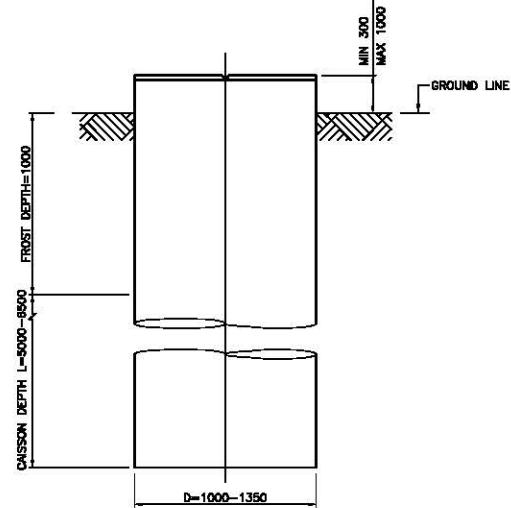
NEW CONSTRUCTION
AAS 7 - STA 10+241 HWY 3 (SR6)
SIGN SUPPORT STRUCTURE
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
G8206

Phase 1
90% Sub



KEY PLAN
SCALE
1 0 2 4Km



TYPICAL CAISSON
NOT TO SCALE

LEGEND

- BOREHOLE CURRENT INVESTIGATION
- BOREHOLE AND NILCON VANE CURRENT INVESTIGATION
- NILCON VANE CURRENT INVESTIGATION
- CPT - CURRENT INVESTIGATION
- DMT - CURRENT INVESTIGATION
- BOREHOLE PREVIOUS INVESTIGATION
- BOREHOLE, CPT AND NILCON VANE PREVIOUS INVESTIGATIONS
- CPT - PREVIOUS INVESTIGATION
- N SPT N-VALUE
- 16 BLOWS/0.3m UNLESS OTHERWISE STATED (STD. PEN. TEST, 475 J/BLOW)
- MHSG - MAGNETIC HEAVE/SETTLEMENT GAUGE
- P - VIBRATING WIRE PIEZOMETER
- DRY BOREHOLE DRY DURING DRILLING
- WATER LEVEL DURING DRILLING
- WATER LEVEL (SHALLOW PIEZO)
- WATER LEVEL (DEEP PIEZO)

NOTES

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- ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

No.	ELEVATION (m)	CO-ORDINATES (UTM, NAD 83 ZONE 17)	
		NORTHING	EASTING
AMEC BOREHOLES			
BH19-RW	187.4	4677320.5	335965.5

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

NOT FOR
CONSTRUCTION

REVISIONS	DATE	REV. BY	DESCRIPTION
17-FEB-12	B	PB	90% MTO SUBMISSION
24-OCT-11	A	PB	90% MTO SUBMISSION
DESIGN	NM	CHK BG	CODE CAN/CSA S6-08 LOAD CL-625-ON
DRAWN	MM	CHK PB	SITE AAS 7 DATE 24-OCT-11

Figures

Figure 3-1: Field Vane Correction Factor vs. Plasticity Index Derived from Embankment Failures

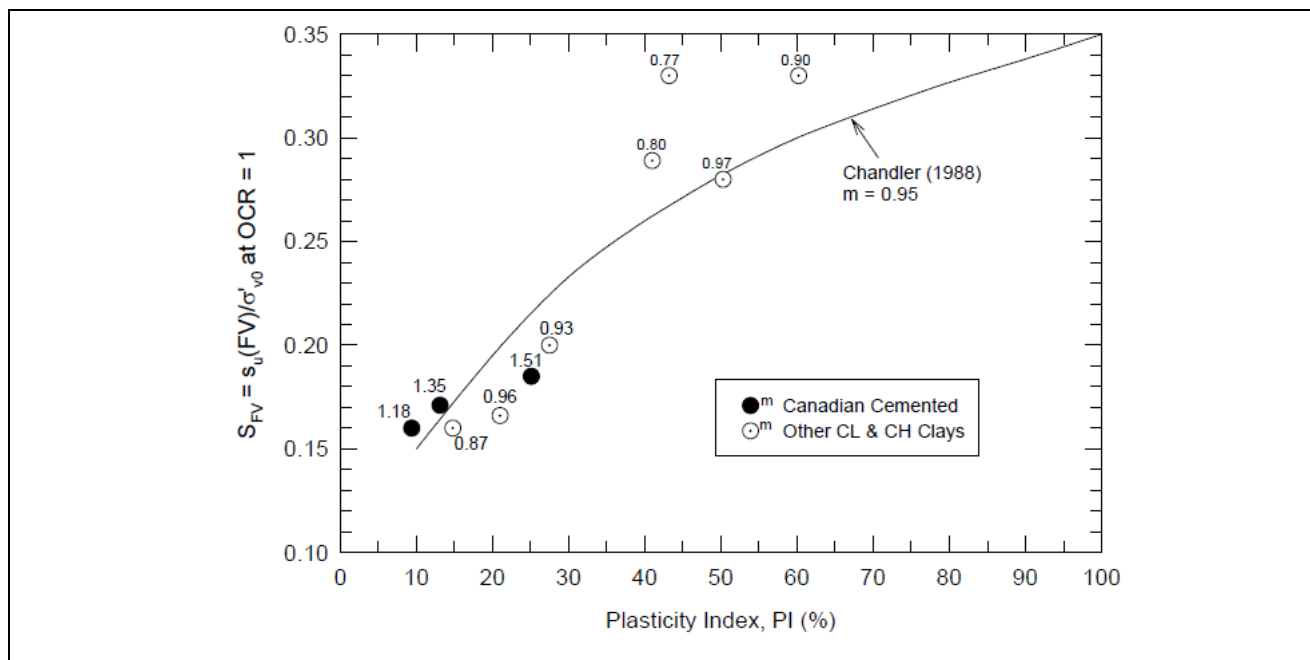
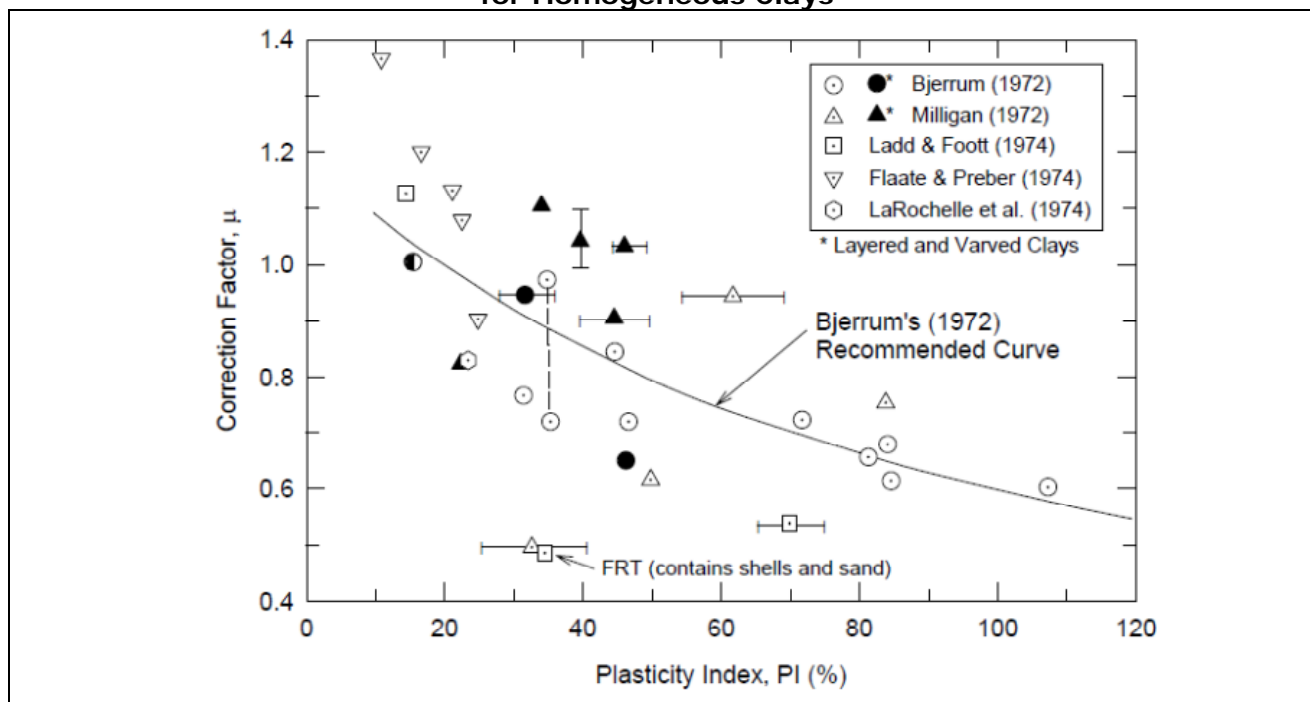
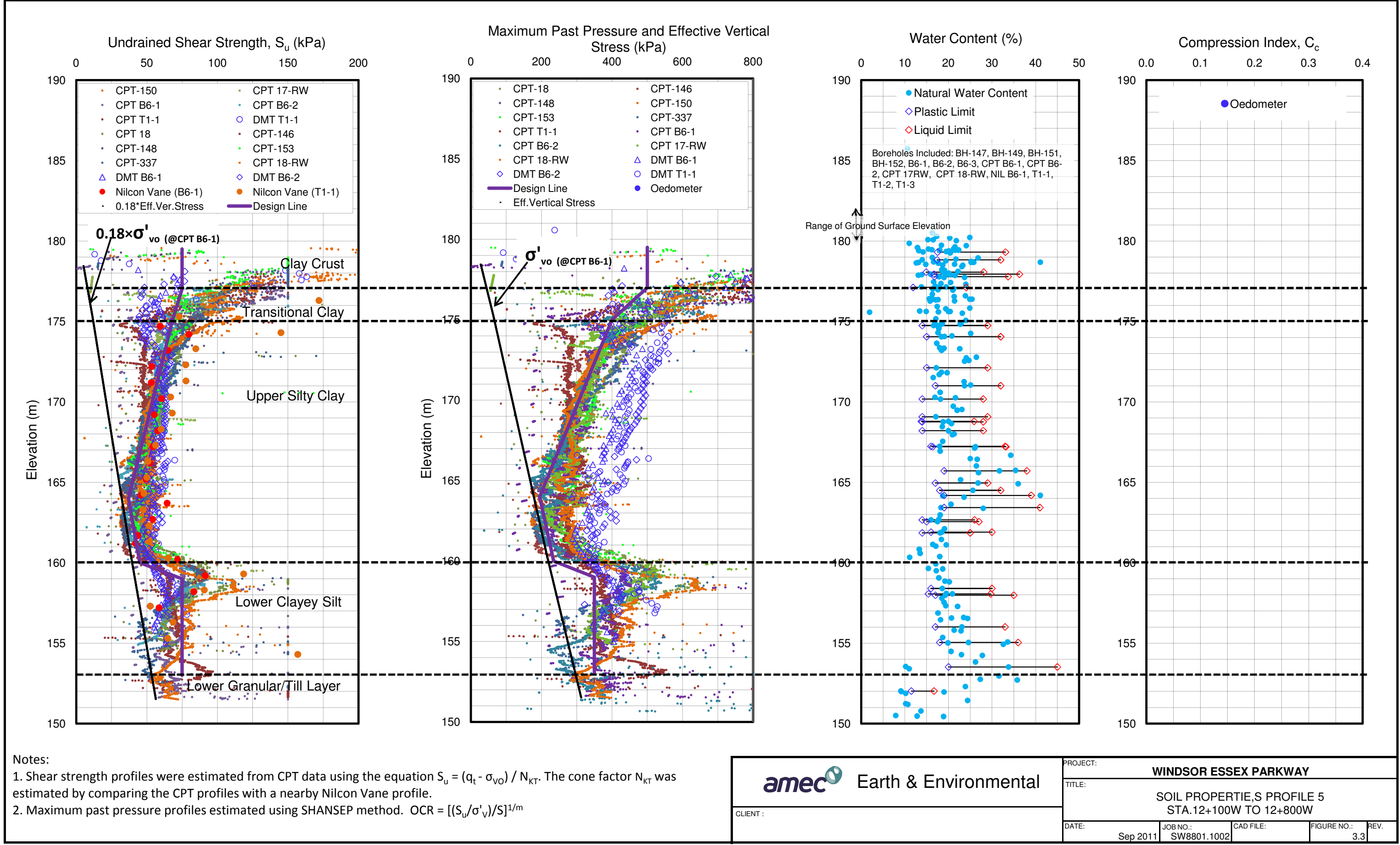
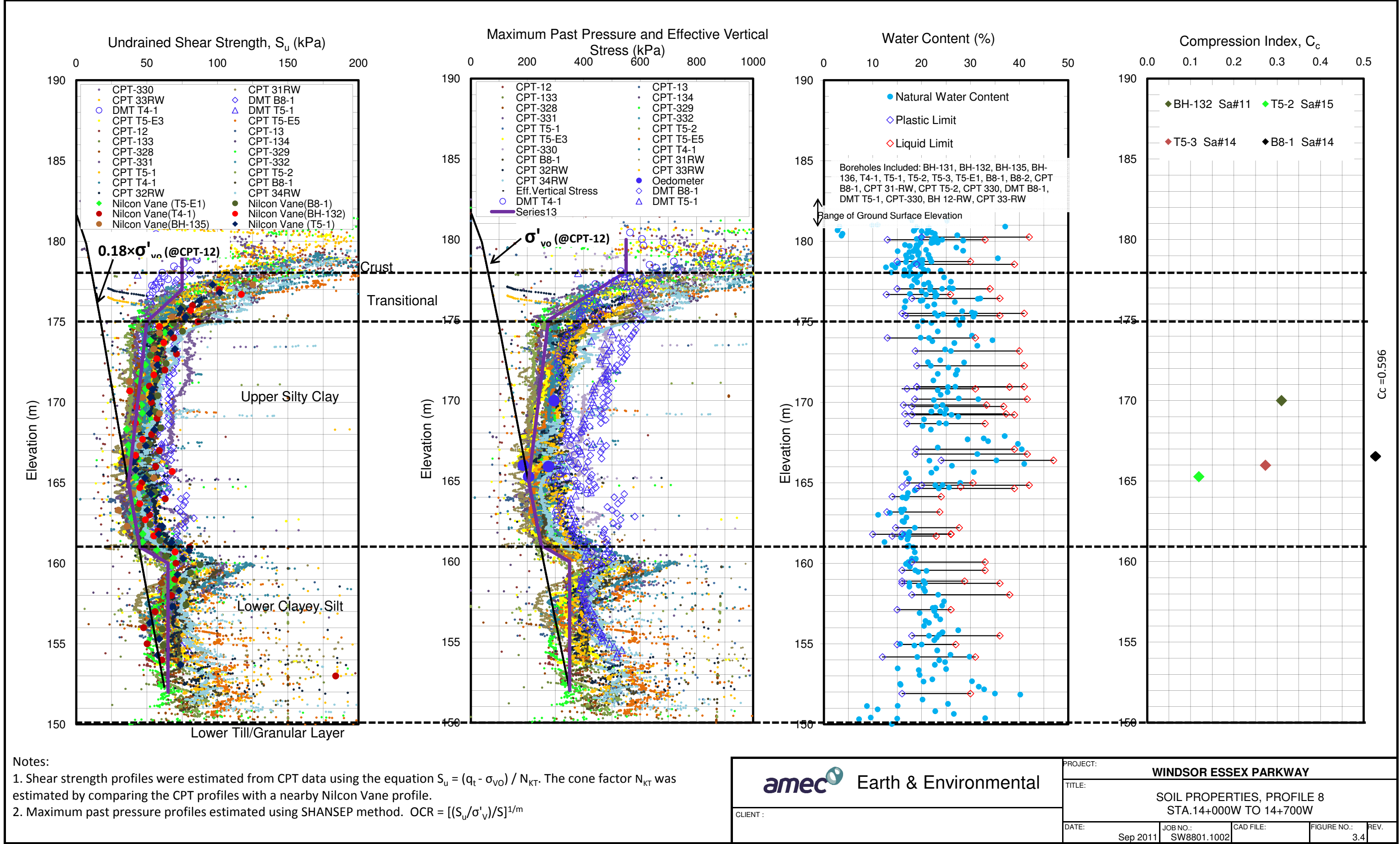
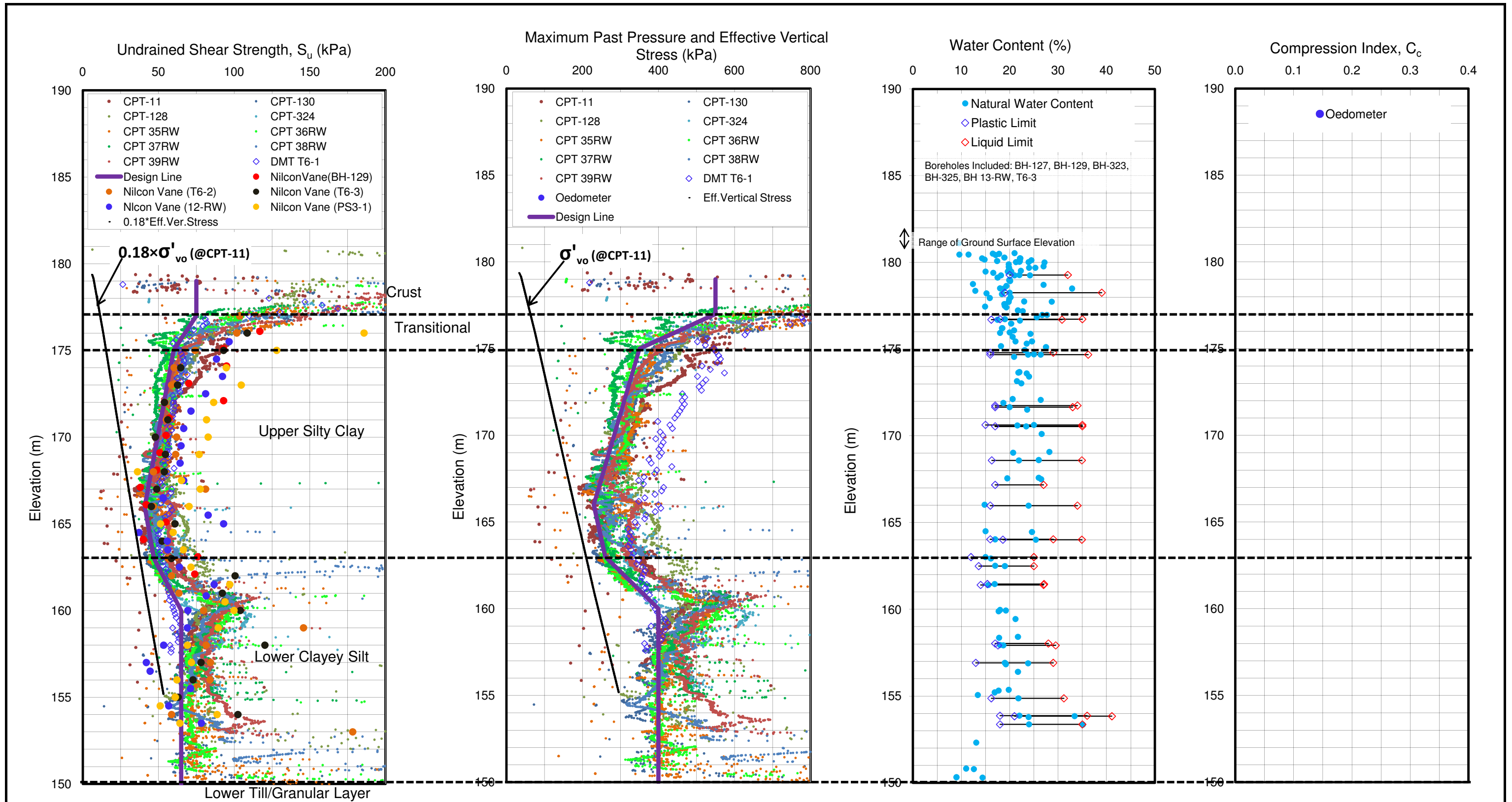


Figure 3-2: Field Vane Undrained Strength Ratio at OCR = 1 vs. Plasticity Index for Homogeneous Clays








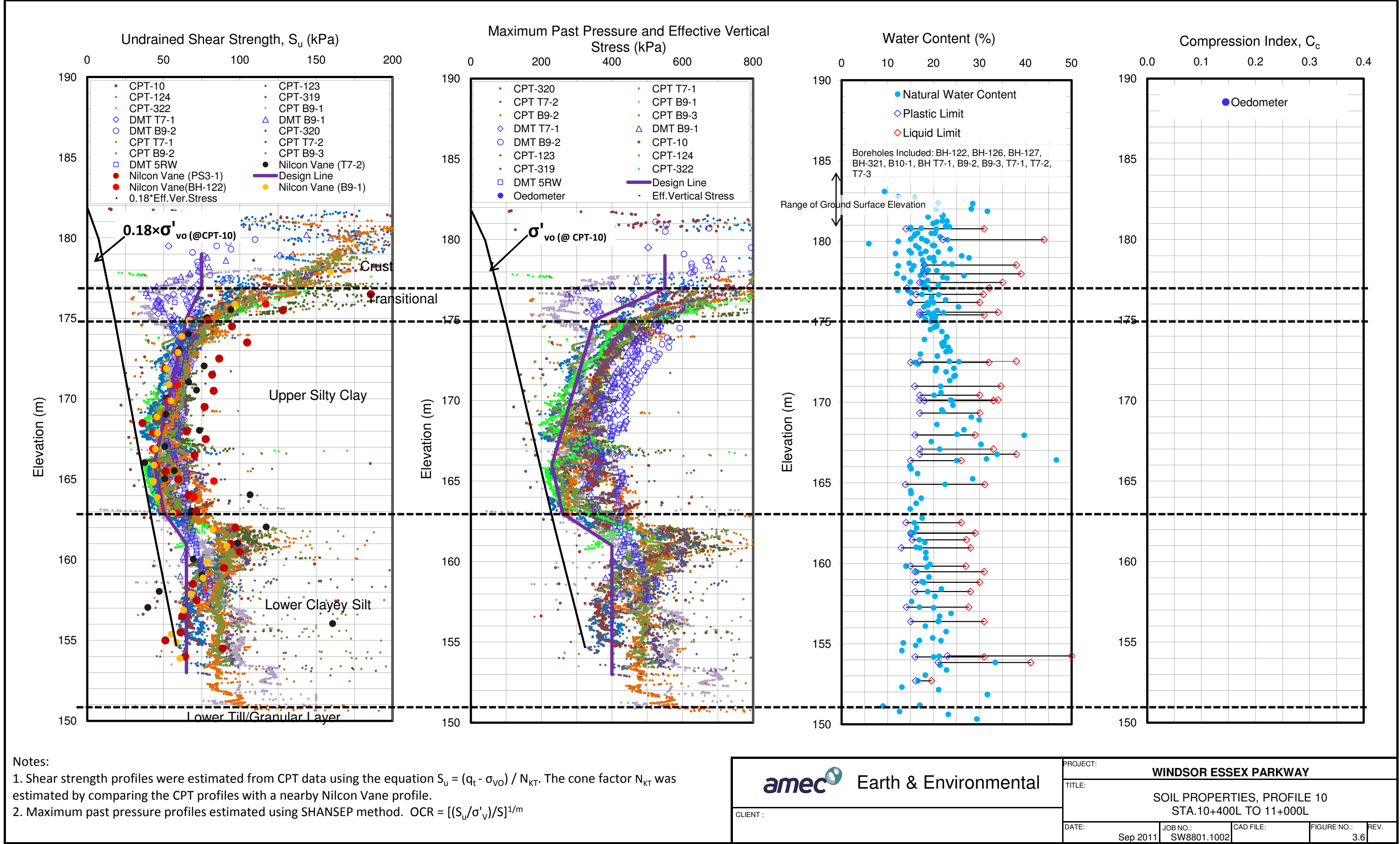


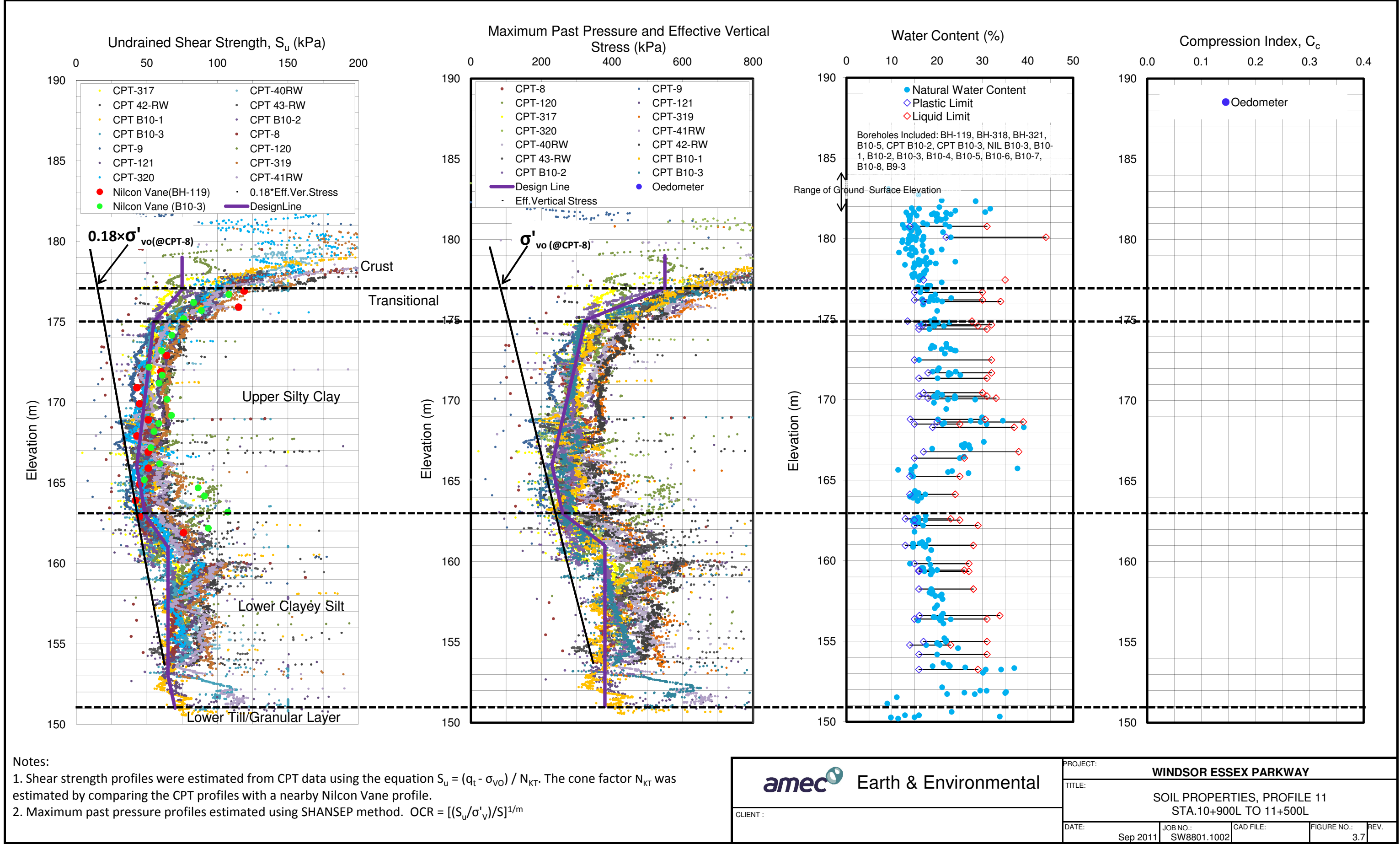
Notes:

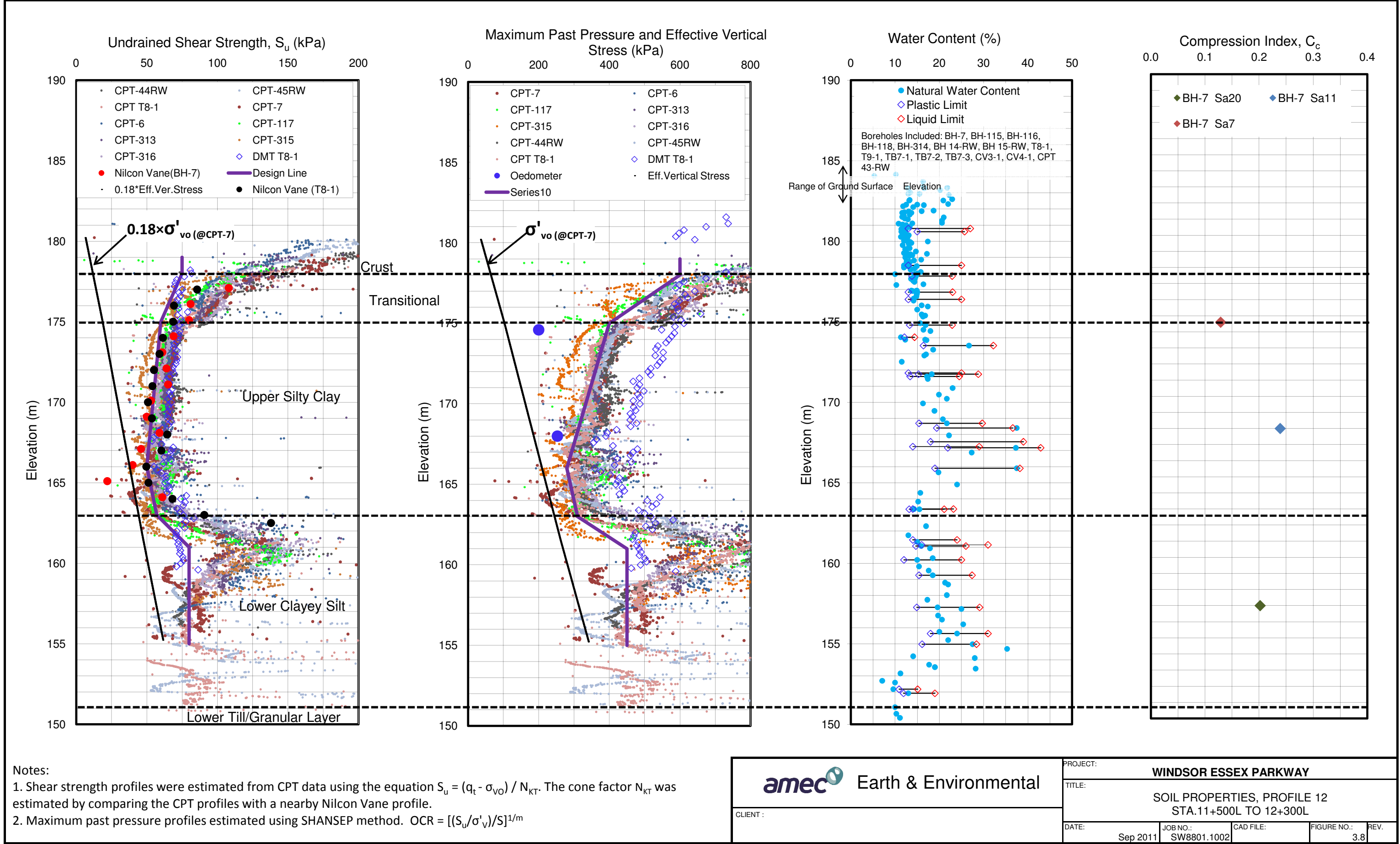
1. Shear strength profiles were estimated from CPT data using the equation $S_u = (q_t - \sigma_{vo}) / N_{KT}$. The cone factor N_{KT} was estimated by comparing the CPT profiles with a nearby Nilcon Vane profile.

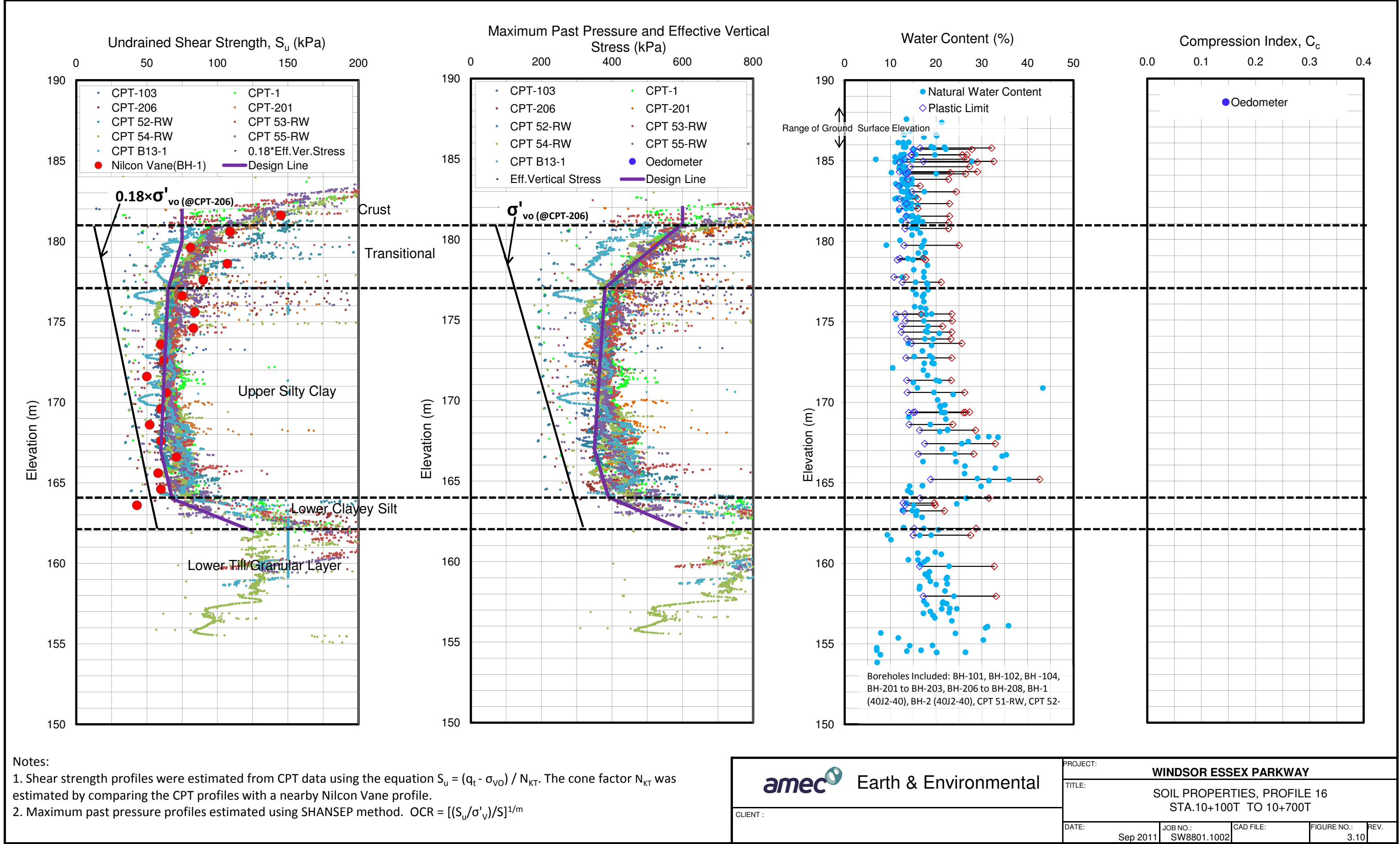
2. Maximum past pressure profiles estimated using SHANSEP method. $OCR = [(S_u / \sigma'_v) / S]^{1/m}$

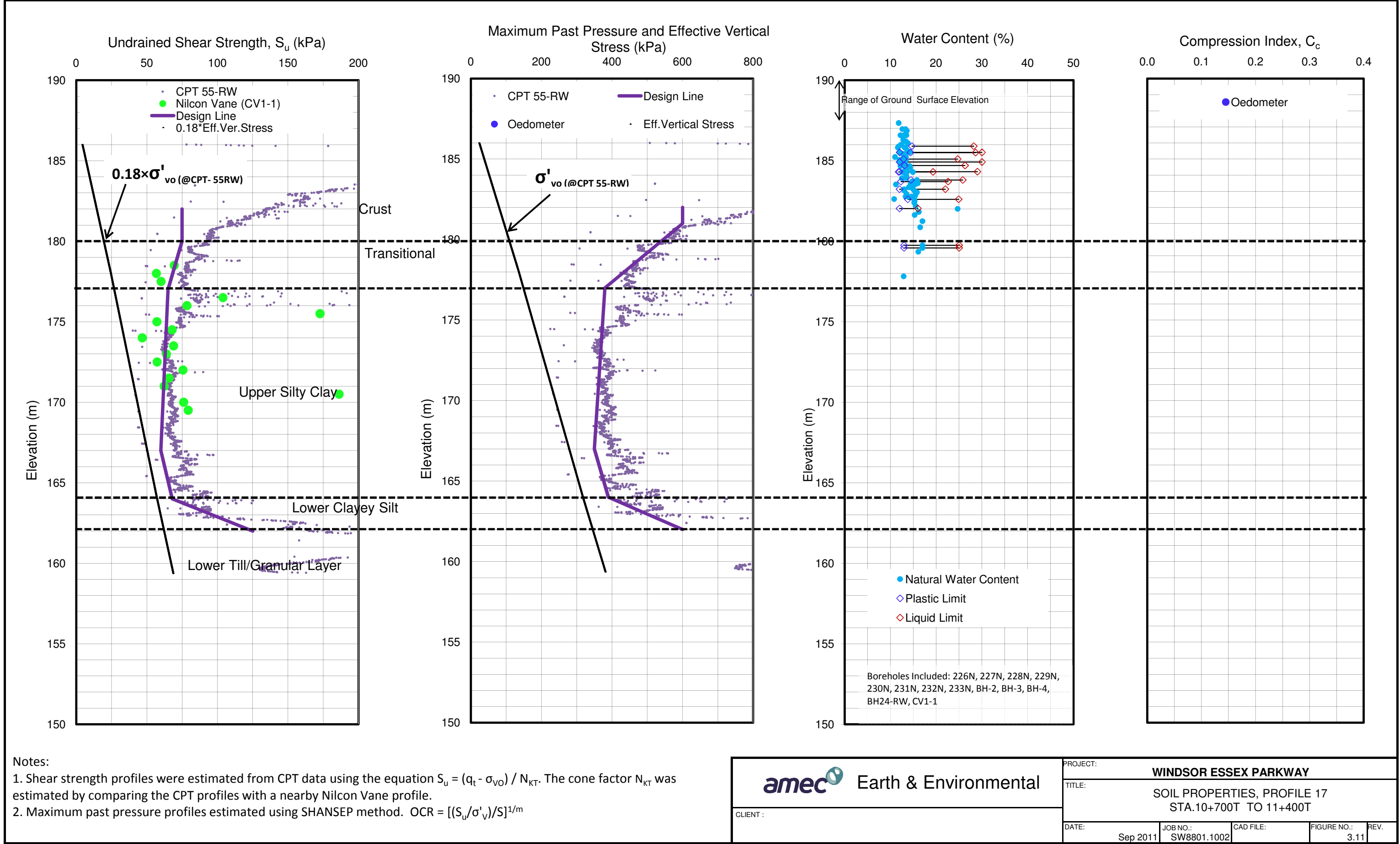
 Earth & Environmental	PROJECT: WINDSOR ESSEX PARKWAY				
	TITLE: SOIL PROPERTIES, PROFILE 9 STA.14+700W TO 10+400L				
CLIENT :	DATE:	JOB NO.:	CAD FILE:	FIGURE NO.:	REV.
	Sep 2011	SW8801.1002		3.5	

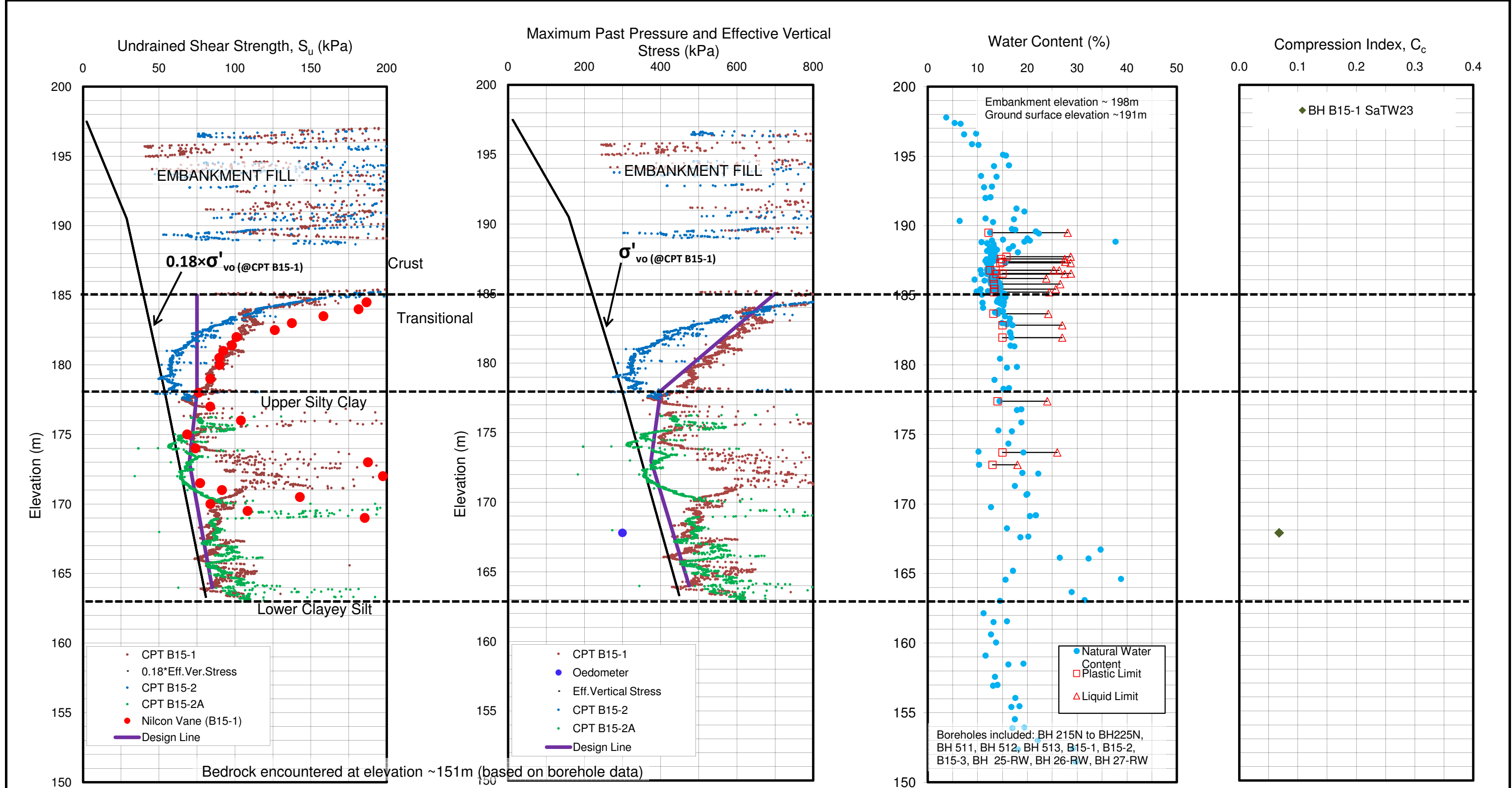












- Notes:
- 1. Shear strength profiles were estimated from CPT data using the equation $S_u = (q_t - \sigma_{v0}) / N_{KT}$. The cone factor N_{KT} was estimated by comparing the CPT profiles with a nearby Nilcon Vane profile.
 - 2. Maximum past pressure profiles estimated using SHANSEP method. $OCR = [(S_u / \sigma'_v) / S]^{1/m}$
 - 3. Water table is assumed at 0.5m below ground surface.
 - 4. All CPTs and Nilcon Vane probings are located within station 12+100T TO 12+300T (around Bridge B-15).
 - 5. Index data data are from boreholes located within station 11+500T to 12+300T.


 Earth & Environmental	PROJECT: WINDSOR ESSEX PARKWAY				
	TITLE: SOIL PROPERTIES, PROFILE18 STA.11+500T TO 12+300T				
CLIENT :	DATE: Sep 2011	JOB NO.: SW8801.1002	CAD FILE:	FIGURE NO.: 3.12	REV.

Figure 4-1: Data Summary of Compression Indices C_c , C_s and C_r

(Figure 6.7, Golder, 2009, ref. R-16)

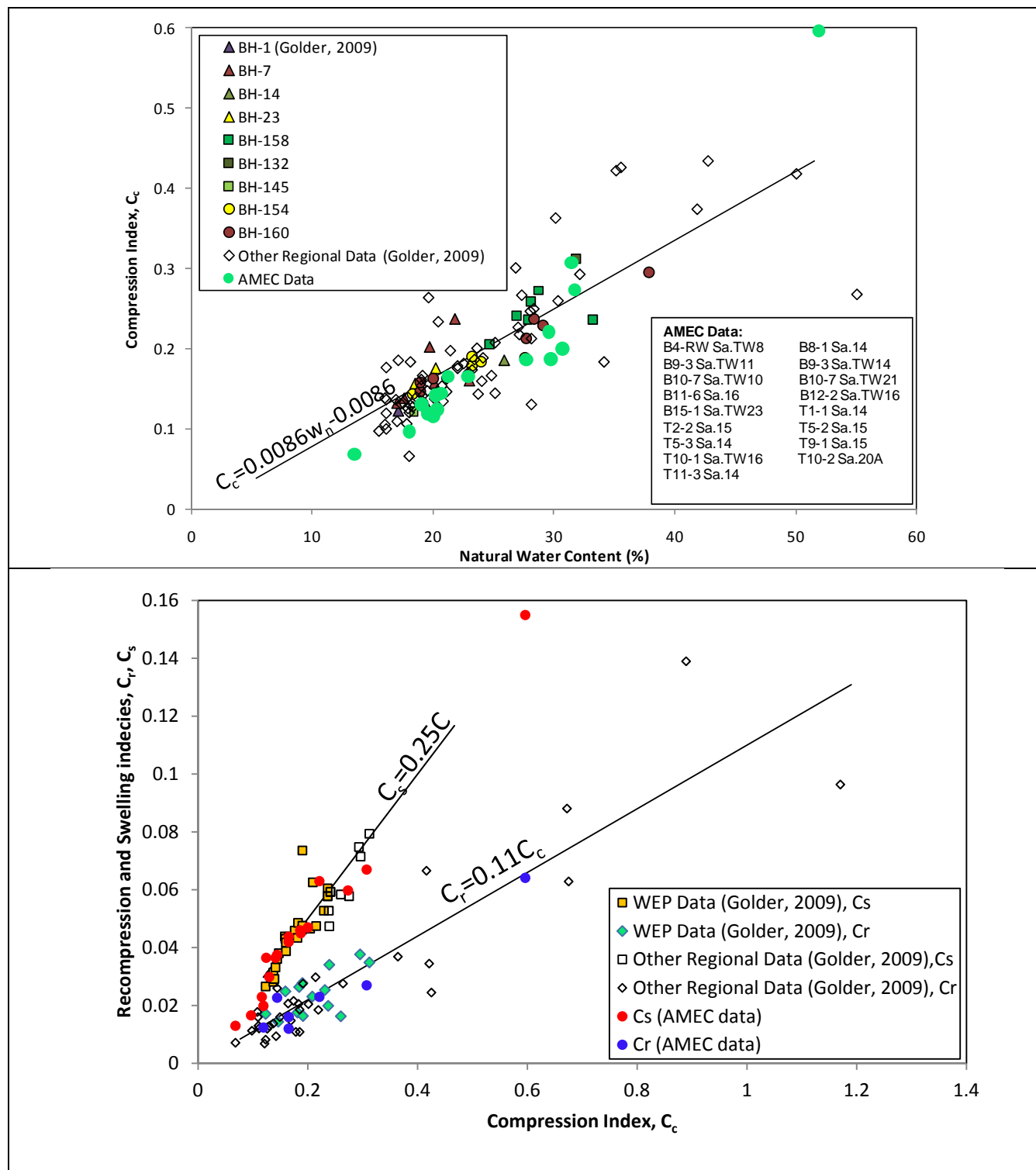
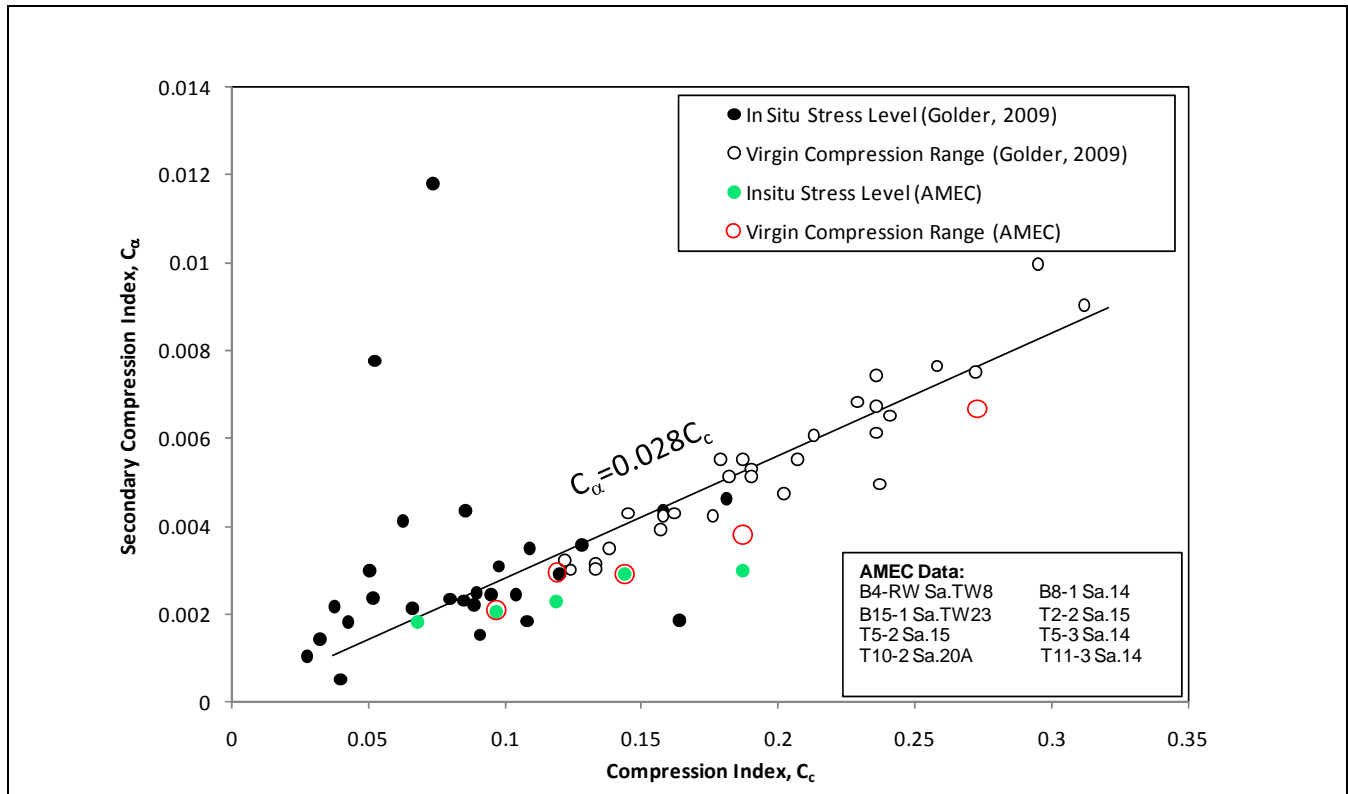


Figure 4-2: Data Summary of Compression Indices C_c and C_α



Appendix A Borehole, DMT, HGMW, and CPT logs from AMEC Geotechnical Investigation

RECORD OF BOREHOLE No B9-2

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679218.9, E332622.2 ORIGINATED BY DG
DIST HWY WEP BOREHOLE TYPE Track Mounted Drill - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Jul 10, 11 - Jul 12, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT		NATURAL MOISTURE CONTENT		LIQUID LIMIT		UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _P	W	W _L	WATER CONTENT (%)				
182.4	Pavement Surface																
0.0	50mm ASPHALT																
182.0	Over 350mm Crushed Limestone Sand and gravel																
0.4	FILL																
181.3	Brown Fine Sand (FILL?)		1	SS	5												
1.1	Brown Mottled CLAYEY SILT																
	Some sand, trace gravel		2	SS	13												
	Soft																
	Stiff																
	Very stiff		3	SS	19												
	Brown																
	Grey		4	SS	16												
	Stiff																
	-Some pink clay nodules		5	SS	12												
	-Trace pink clay nodules		6	SS	7												1 18 42 39
	Firm		7	SS	6												
			8	SS	PH												
																	-no recovery with shelby tube; sample retrieved by pushing split spoon
				VT													
			9	SS	PH												
			10	TW	PH												
				VT													
			11	SS	PH												
																	-VWP #P11 installed at 10.67m below ground surface -MG installed at 10.97m below ground surface
	-Increasing silt content		12	TW	PH												
	Soft to firm Laminated (thickness approx. 10mm) Some pink clay nodules			VT													
			13	TW	PH												

Continued Next Page

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No B9-2

2 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679218.9, E332622.2 ORIGINATED BY DG
DIST HWY WEP BOREHOLE TYPE Track Mounted Drill - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Jul 10, 11 - Jul 12, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED ● POCKET PEN.	+ FIELD VANE × LAB VANE									
	Brown Mottled CLAYEY SILT Some sand, trace gravel Soft (continued) Grey		14	TW	PH	167								19.5	1 17 44 38			
					VT		166				1.7							
	Soft-firm			15	SS	4	165											
							164									-installed MG and VWP #P18 at 18.29m below ground surface		
	-Some sand, trace gravel Very Soft			16	SS	2	163											
					VT		162											
	-Trace fine-medium gravel, trace sand Firm			17	TW	PH	161								21.6	4 26 46 24		
							160											
					VT		159											
	-Trace sand, fine-medium gravel			19	TW	PH	158								21.3	4 22 45 29		
							157											
	Fine-coarse gravel			20	SS	8	156									-end of drilling July 11; continue July 12		
							155											
							154											
							153											

Continued Next Page

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

METRIC

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

METRIC

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

METRIC

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No B9-3

3 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679140.0, E332677.6 ORIGINATED BY LC
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 11, 11 - Jul 12, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								20 40 60 80 100	20 40 60 80 100	10 20 30								
153.1 30.4	Grey SILT Trace clay, moist to wet		24	SS	10		153								-no recovery			
							152											
			25	SS	14		151											
150.3 33.2		Grey SANDY SILT Trace clay, trace gravel -Slightly cemented Compact Moist to wet	26	RC	26		150											
149.4 34.1	Grey LIMESTONE Fine grained Partially crystallized, calcite crystallization is visible, vuggy at approx. 34.44m Medium to coarse grained LIMESTONE Porous, laminated, fractured at approx. 35.63m END OF BOREHOLE Piezometric Levels in VWP #P15: July 23, 2011: EL. 182.9m Piezometric Levels in VWP #P25: July 23, 2011: EL. 181.1m		27	RC		149								RQD = 72% TCR = 100% SCR = 73% Rock Core Cu = 77.8 MPa				
149.1 34.4									148									
147.8 35.7							147											
							146											
							145											
							144											
							143											
							142											
							141											
							140											
							139											

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

RECORD OF BOREHOLE No B11-1

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678221.4, E334583.9 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE May 4, 11 - May 7, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)				
								○ UNCONFINED ● POCKET PEN.	+ FIELD VANE × LAB VANE		W _P	W	W _L		
185.4	Pavement Surface														
186.2	225mm ASPHALT														
0.2	Grey FILL														
184.6	Crushed limestone sand and gravel														
0.8	Mottled Brown-Grey CLAYEY SILT to SANDY SILT Some clay, trace gravel Stiff		1	SS	10										
			2	SS	17										
	Brown Hard		3	SS	34										
			4	SS	41										
			5	SS	36										
	Grey		6	SS	18										
	Very stiff		7	SS	22										
179.5			8	TW	PH										
5.9	Grey CLAYEY SILT Some sand, trace gravel Stiff		9	TW	PH										
				VT											
			10	TW	PH										
				VT											
			11	TW	PH										
				VT											
			12	TW	PH										
				VT											
			13	TW	PH										
				VT											

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO.MOT.GDT 09/11/11

METRIC

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

METRIC

[illegible]

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

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

RECORD OF BOREHOLE No B12-1

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4677785.87, E335208.46 ORIGINATED BY NB
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 9, 11 - Jul 10, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED ● POCKET PEN.	+ FIELD VANE × LAB VANE							
186.3	Pavement Surface							20 40 60 80 100	10 20 30							
186.0	200mm ASPHALT FILL															
	450mm Sand and Gravel to brown fine sand		1	SS	16						○					
	Saturated		2	SS	7							○				
184.2																
2.1	Brown-Grey SANDY CLAYEY SILT		3	SS	36						○					
	Trace gravel															
	Hard															
	-Oxidized		4	SS	41						○					
	Grey		5	SS	27						○					
	-Some sand															
	-Extensive oxidized fissures															
	Very stiff															
	Hard		6	SS	42						○					
	Very stiff		7	SS	18						○					
	Grey															
	Stiff		8	TW	PH						○					
	Firm		9	TW	PH						○	—		21.9 5 34 39 23		
			10	TW	PH						○	—		21.8 3 32 42 24		
				VT												
			11	TW	PH						○					
			12	TW	PH						○	—		21.2 3 27 42 28		
				VT												
			13	TW	PH						○					
						</										

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

METRIC

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

METRIC

[illegible]

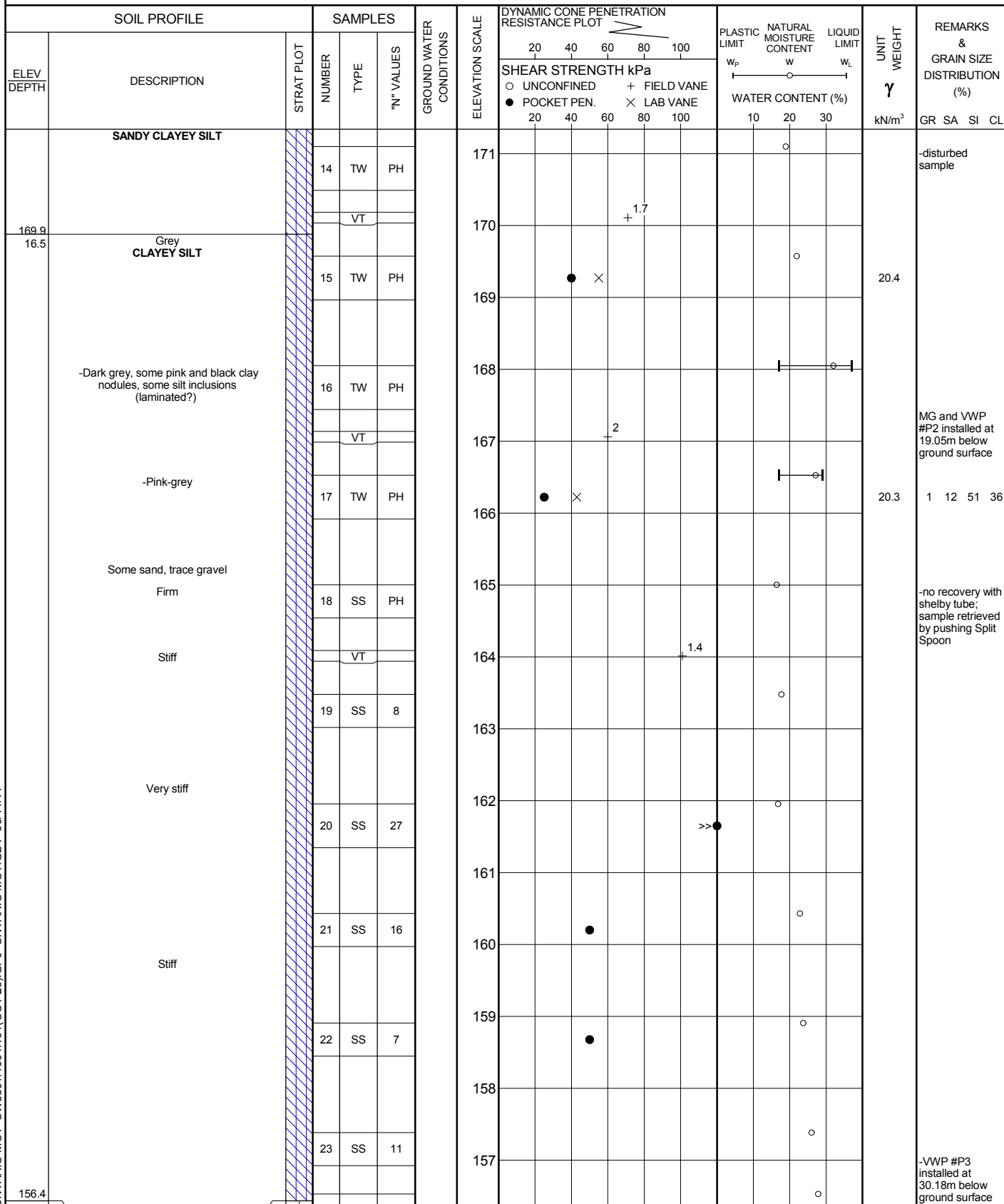
+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No B12-2

2 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4677739.14, E335208 ORIGINATED BY BS
 DIST HWY WEP BOREHOLE TYPE CME 850 - 150mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jun 28, 11 - Jun 29, 11 CHECKED BY MSO



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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No B12-2

3 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4677739.14, E335208 ORIGINATED BY BS
 DIST HWY WEP BOREHOLE TYPE CME 850 - 150mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jun 28, 11 - Jun 29, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)			
								○ UNCONFINED	+ FIELD VANE										
								● POCKET PEN.	× LAB VANE										
29.9	-Becoming Silty Sand, trace gravel		24	SS	>50										GR SA SI CL -Split Spoon refusal at 30.3m -end of drilling on June 28; continue with rock core on June 29 RQD = 78% TCR = 100% SCR = 78%				
155.5	White to Grey LIMESTONE Fine Grained																		
30.8	Stylolites present, pitted and vuggy between 29.9m and 30.39m (continued) Grey to Brown LIMESTONE		25	RC															
154.7	Pitted and medium to coarse grained														Rock Core Cu = 52.6 MPa from depth of 30.1m Rock Core Cu = 60.1 MPa from depth of 30.6m				
31.7	END OF BOREHOLE																		
	Piezometric Levels in VWP #P1: July 24, 2011: EL. 183.3m																		
	Piezometric Levels in VWP #P2: July 24, 2011: EL. 182.3m																		
	Piezometric Levels in VWP #P3: July 24, 2011: EL. 176.6m																		

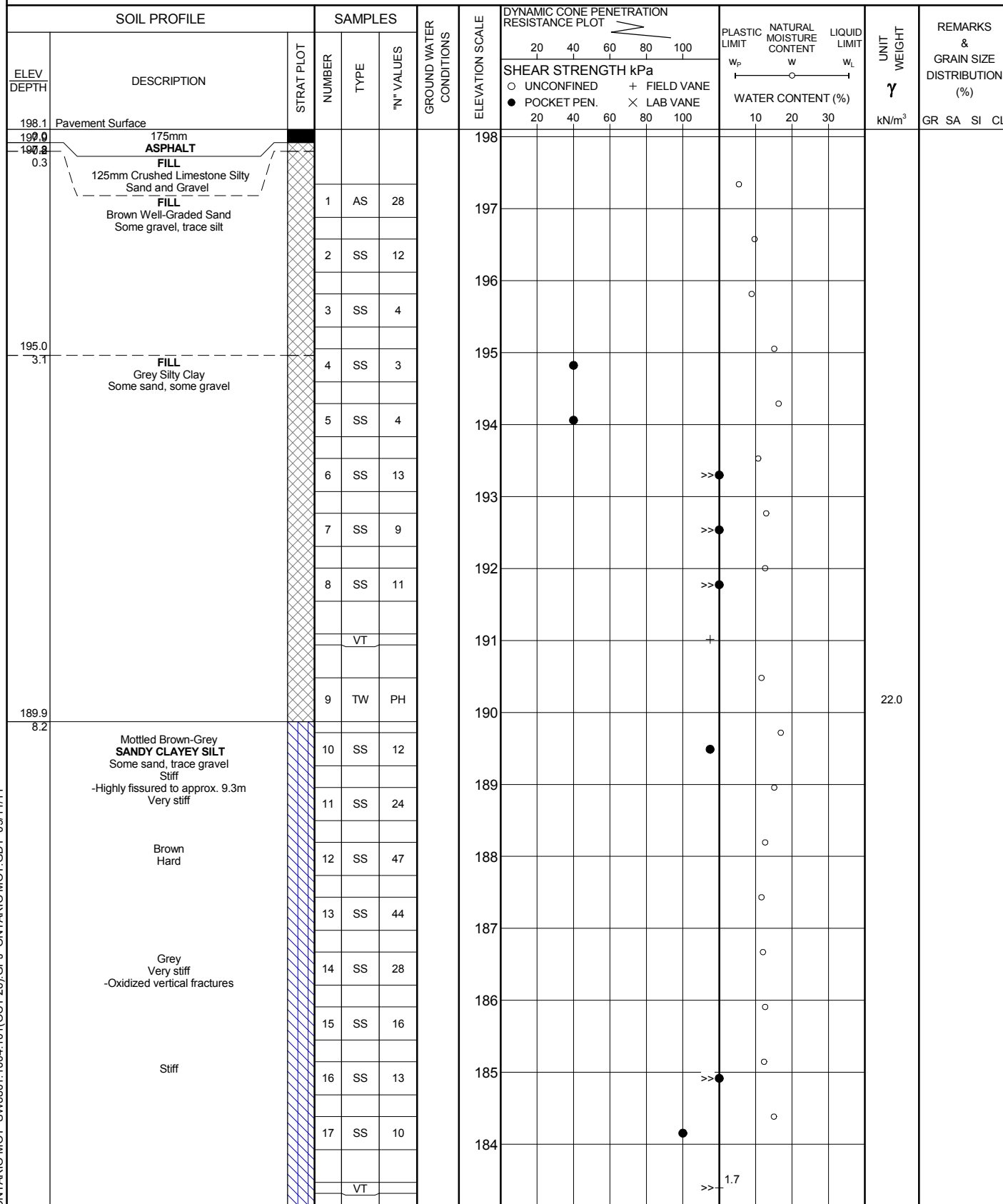
-Split Spoon refusal at 30.3m -end of drilling on June 28; continue with rock core on June 29
 RQD = 78%
 TCR = 100%
 SCR = 78%
 Rock Core Cu = 52.6 MPa from depth of 30.1m
 Rock Core Cu = 60.1 MPa from depth of 30.6m

RECORD OF BOREHOLE No B15-1

1 OF 4

METRIC

W.P. RFP No. 09-54-1007 LOCATION 4678489N, 337046E ORIGINATED BY DG
 DIST HWY WEP BOREHOLE TYPE Track Mounted Drill - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE May 25, 11 - May 30, 11 CHECKED BY MSO



Continued Next Page

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

METRIC

[illegible]

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

METRIC

[illegible]


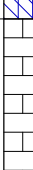
+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No B15-1

4 OF 4

METRIC

W.P. RFP No. 09-54-1007 LOCATION 4678489N, 337046E ORIGINATED BY DG
 DIST HWY WEP BOREHOLE TYPE Track Mounted Drill - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE May 25, 11 - May 30, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)			
								○ UNCONFINED	+	FIELD VANE	×	LAB VANE									
								● POCKET PEN.													
152.9 45.1	Grey SILTY CLAY Stiff		38	SS	12		20	40	60	80	100										
151.7 46.4	Grey to Brown LIMESTONE Fine-grained, fractured throughout, laminated		39	RC													-Rock Core Cu = 95.1 MPa RQD = 0% TCR = 100% SCR = 28%				
150.1 48.0	END OF BOREHOLE																				

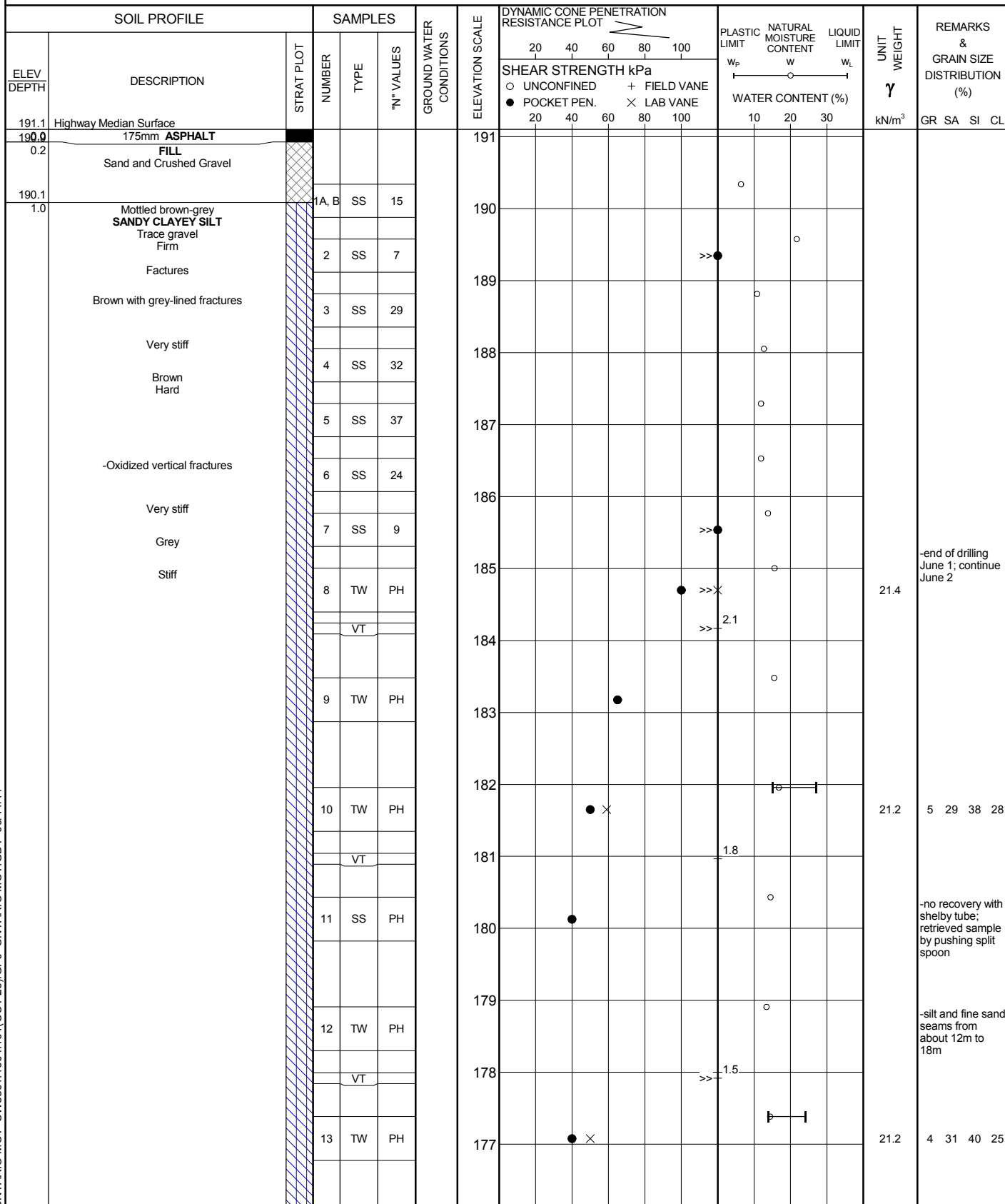
+ ³, × ³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No B15-2

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION 4678473N, 337073E ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jun 1, 11 - Jun 3, 11 CHECKED BY MSO



Continued Next Page

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

METRIC

W.P.	RFP No. 09-54-1007	LOCATION	4678473N, 337073E	ORIGINATED BY	TA
DIST	HWY WEP	BOREHOLE TYPE	CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers	COMPILED BY	SS
DATUM	Geodetic	DATE	Jun 1, 11 - Jun 3, 11	CHECKED BY	MSO

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No B15-3

1 OF 4

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678467.7, E337107.6 ORIGINATED BY NB
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jun 3, 11 - Jun 5, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w_p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w_L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa												
								○ UNCONFINED	+ FIELD VANE	● POCKET PEN.	× LAB VANE						WATER CONTENT (%)			
								20 40 60 80 100									10 20 30			
198.1	Pavement Surface						198													
197.9	200mm ASPHALT																			
0.2	FILL Brown Well-Graded Sand and Gravel		1	AS							○									
			2	SS	28						○									
			3	SS	8						○									
			4	SS	3						○									
195.2	FILL Homogeneous, Grey Silty Clay, some sand trace gravel		5	SS	3		195		●		○									
194.4	FILL Heterogeneous mix of mottled brown-grey to green silty clay and black clayey topsoil		6	SS	4		194		●		○									
			7	SS	5				>>●		○									
			8	SS	3		193		>>●		○									
			9	SS	14		192				○									
			10	SS	9		191		●		○									
			11	SS	12		190		>>●		○									
189.9	Mottled Brown-Grey SANDY CLAYEY SILT Trace gravel Stiff Very stiff		12	SS	9		189		●		○									
8.2	Brown with grey fissures		13	SS	23						○									
	Brown Hard Dark Brown		14	SS	39		188				○									
	Grey		15	SS	45		187				○									
	Very stiff		16	SS	21		186				○									
	Stiff		17	SS	18				●											
			18	SS	10		185		●		○									
			19	SS	9		184		●		○									

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

-end of drilling
June 3; continue
June 4




ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No B15-3

3 OF 4

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678467.7, E337107.6 ORIGINATED BY NB
DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Jun 3, 11 - Jun 5, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _p W W _L					
								○ UNCONFINED + FIELD VANE	WATER CONTENT (%)						
								● POCKET PEN. × LAB VANE	20 40 60 80 100	10 20 30					
29.9	SILTY CLAYEY FINE SAND <i>(continued)</i>						168							2 22 51 26 -end of drilling June 4; continue June 5	
			30	SS	7		167								
							166								
166.4	Pink-Grey Medium Plasticity SILTY CLAY Trace gravel (Varved), firm		31	SS	8		166								
31.7							165								
							164								
165.2	Grey CLAYEY SILT Some sand Firm -frequent silt and fine sand inclusions to about 34m						165								
32.9							164								
							163								
							162								
							161								
							160								
							159								
							158								
							157								
							156								
							155								
							154								

2 22 51 26
-end of drilling
June 4; continue
June 5

3 27 44 26

Continued Next Page

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

RECORD OF BOREHOLE No B15-3

4 OF 4

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678467.7, E337107.6 ORIGINATED BY NB
DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Jun 3, 11 - Jun 5, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
								20 40 60 80 100						
								○ UNCONFINED + FIELD VANE						
								● POCKET PEN. × LAB VANE						
								20 40 60 80 100						

RQD = 100%
TCR = 100%
SCR = 96%

RECORD OF BOREHOLE No BH12-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679718.1, E332037.9 ORIGINATED BY SD
DIST HWY WEP BOREHOLE TYPE Truck Mounted Drill - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Jul 16, 11 - Jul 16, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			w_p	w	w_L		
								○ UNCONFINED ● POCKET PEN.	+ FIELD VANE × LAB VANE						
181.2	Fill Surface														
180.0	Black FILL														
0.2	Topsoil														
	Brown-Black FILL														
	Possible Silty clay, some topsoil		1	SS	12										
	Mottled Brown Silty Clay		2	SS	10										
	Grey, some brown Silty Clay, wet		3	SS	4										
178.3															
2.9	Brown CLAYEY SILT		4	SS	16										
	Some sand, trace gravel														
	Very stiff		5	SS	15										
	Grey Stiff		6	SS	8										
	Wet Firm		7	SS	6										
			8	SS	6										
174.6	END OF BOREHOLE														
6.6	(no refusal)														
	Borehole dry on completion														

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No BH12-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679718.1, E332037.9 ORIGINATED BY SD
 DIST HWY WEP BOREHOLE TYPE Truck Mounted Drill - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 16, 11 - Jul 16, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			w_p	w	w_L			
								○ UNCONFINED ● POCKET PEN.	+ FIELD VANE × LAB VANE	WATER CONTENT (%)						
181.2	Fill Surface						181	20	40	60	80	100	10	20	30	-corrosivity sample
180.0	Black FILL Topsoil						180									
0.2	Brown-Black FILL Possible Silty clay, some topsoil		1	SS	12											
	Mottled Brown Silty Clay		2	SS	10											
	Grey, some brown Silty Clay, wet		3	SS	4											
178.3	Brown CLAYEY SILT Some sand, trace gravel Very stiff		4	SS	16											
2.9			5	SS	15											
	Grey Stiff Wet Firm		6	SS	8											
			7	SS	6											
			8	SS	6											
174.6	END OF BOREHOLE (no refusal) Borehole dry on completion						174									
6.6							173									
							172									
							171									
							170									
							169									
							168									
							167									

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


ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No BH13-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679672.2, E331850.2 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 75 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 7, 11 - Jul 7, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID LIMIT LIMIT CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)					
								○ UNCONFINED + FIELD VANE					W _p W W _L					
								● POCKET PEN. × LAB VANE										
180.8	Ground Surface						20	40	60	80	100							
0.0	TOPSOIL																	
180.4																		
0.4	Mottled Brown and Grey CLAYEY SILT Some sand, trace gravel to approx. 3m Trace organics Stiff		1	SS	5		180											
			2	SS	9		179											
			3	SS	7		178											
			4A, B	SS	12		177											
			5	SS	18		176											
			6	SS	10		175											
			7	SS	7		174											
			8	SS	4		173											
			173.8							1.7								
7.0	END OF BOREHOLE (no refusal) Borehole dry on completion																	

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No BH18-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4677390.7, E335692.7 ORIGINATED BY NB
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 13, 11 - Jul 13, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								20 40 60 80 100										10 20 30		
								○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE												
187.6	Ground Surface																			
186.8	100mm TOPSOIL		1	SS	7		187													
186.8	Brown-grey CLAYEY SILTY SAND		2	SS	20															
0.8	Trace gravel																			
	Brown SILTY CLAY		3	SS	33		186													
	Some sand, trace gravel																			
	Very stiff																			
	Moist																			
	Hard		4	SS	43		185													
	Hard -Oxidized																			
			5	SS	39		184													
	Grey		6	SS	20		183													
	Very stiff																			
	Moist																			
	Stiff		7	SS	14		182													
			8	SS	12		181													
			9	SS	12		180													
181.0	END OF BOREHOLE						179													
6.6	(no refusal)																			
	Borehole dry on completion						178													
							177													
							176													
							175													
							174													
							173													

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No BH19-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4677320.5, E335965.5 ORIGINATED BY NB
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 12, 11 - Jul 12, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
187.4	Ground Surface						20 40 60 80 100			10 20 30							
187.2	200mm TOPSOIL																
0.2	Grey-Brown SILTY CLAY Some sand, trace gravel -Trace organics Stiff		1	SS	11		187							-poor recovery with SPT; sample retrieved by pushing split spoon			
	2		SS	9													
	3		SS	25		186											
	4		SS	36		185											
	5		SS	36		184											
	6		SS	21		183											
	7		SS	36		182											
	8		SS	17													
	9		SS	18		181											
180.8	END OF BOREHOLE (no refusal) Borehole dry on completion						180										
6.6							179										
							178										
							177										
							176										
							175										
							174										
							173										

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO.MOT.GDT 09/11/11

RECORD OF BOREHOLE No CPT19-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4681454.0, E331184.5 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jun 13, 11 - Jun 13, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)							
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)				GR	SA	SI	CL
								○ UNCONFINED	● POCKET PEN.	+	×	FIELD VANE					LAB VANE							
182.0	Ground Surface																							
0.0	TOPSOIL																							
181.2	Compact Brown		1	SS	10																			
0.8	SILTY SAND																							
180.3	Firm Grey		2	SS	7																			
1.7	SILTY CLAY																							
180.0	to																							
2.0	CLAYEY SILT																							
	Some sand, trace gravel																							
	END OF SAMPLED BOREHOLE																							
	(Continue with CPT to refusal)																							
													</											

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

RECORD OF BOREHOLE No CPT37-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679571.4, E332146.2 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 75 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 15, 11 - Jul 15, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
								○ UNCONFINED	+	FIELD VANE						
								● POCKET PEN.	×	LAB VANE						
180.9	Fill Surface															
0.0	Grey FILL															
180.4	Crushed Limestone															
180.8	TOPSOIL															
0.6	Mottled Brown-Grey SILTY CLAY Some sand, trace gravel		1	SS	6											
	Brown		2	SS	9											
			3	SS	14											
			4	SS	13											
177.4																
3.5	END OF SAMPLED BOREHOLE (continue with CPT to refusal)															
							177									
							176									
							175									
							174									
							173									
							172									
							171									
							170									
							169									
							168									
							167									
							166									

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No CPT39-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679460.1, E332253.2 ORIGINATED BY TA
DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Jul 28, 11 - Jul 28, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		w _p	w	w _L		WATER CONTENT (%)				
181.4	Pavement Surface					▽		20	40	60	80	100						
180.0	ASPHALT						○ UNCONFINED	+ FIELD VANE										
181.0	CONCRETE						● POCKET PEN.	× LAB VANE										
0.4	Brown Poorly Graded Fine SAND		1	SS	11													
179.9			2	SS	6													
179.9																		
1.5	Grey CLAYEY SILT some sand, trace gravel																	
178.4			3	SS	14													
178.4																		
178.4																		
3.0	END OF SAMPLED BOREHOLE (continue with CPT to refusal)						178											
							177											
							176											
							175											
							174											
							173											
							172											
							171											
							170											
							169											
							168											
							167											

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

RECORD OF BOREHOLE No CPT43-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678907.6, E333207.7 ORIGINATED BY TA
DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Aug 3, 11 - Aug 3, 11 CHECKED BY MSO




SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa													
								○ UNCONFINED	+	FIELD VANE											
								● POCKET PEN.	×	LAB VANE											
182.6	Ground Surface						20	40	60	80	100										
0.0	TOPSOIL																				
182.3	Mottled Brown-Grey CLAYEY SILT Some sand, trace gravel		1	SS	11																
0.3																					
	Brown Trace fissures		2	SS	21																
180.6	END OF SAMPLED BOREHOLE (continue with CPT to refusal)																				
2.0																					
									</												

RECORD OF BOREHOLE No CPT47-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678440.3, E334300.2 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Aug 10, 11 - Aug 10, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)			GR	SA	SI	CL
								20	40	60	80	100					20	40	60				
185.4	Ground Surface																						
0.0	TOPSOIL																						
184.9																							
0.5	Mottled Brown-Grey CLAYEY SILT Some sand, trace gravel		1	SS	6																		
	Brown -Trace fissures		2	SS	15																		
183.4																							
2.0	END OF SAMPLED BOREHOLE (continue with CPT to refusal)																						
													</										

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

RECORD OF BOREHOLE No CPT50-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678085.0, E334889.4 ORIGINATED BY TA
DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE May 27, 11 - May 27, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)			GR	SA	SI	CL	
								○ UNCONFINED	+ FIELD VANE	● POCKET PEN.	× LAB VANE	W _p	W		W _L					20
185.8	Fill Surface																			
186.6	150mm Grey Limestone gravel																			
0.2	FILL																			
185.3	Black clayey TOPSOIL																			
0.5	CLAYEY SILT Some sand, trace gravel Firm -Extensive fissures to 2.0m		1	SS	6	▽	185													
		2A,B	SS	14	184															
		3	SS	33	183															
		4A,B	SS	32	182															
			5	SS	14	181														
	-Trace pink clay nodules		6	SS	11															
180.8	END OF SAMPLED BOREHOLE (Continue with CPT to refusal)																			
5.0																				
							180													
							179													
							178													
							177													
							176													
							175													
							174													
							173													
							172													
							171													

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

RECORD OF BOREHOLE No CPT55-RW

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4677609.7, E335904.2 ORIGINATED BY TA
DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Aug 6, 11 - Aug 6, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								20 40 60 80 100										10 20 30		
187.5	Ground Surface																			
0.0	TOPSOIL		1	SS	7		187													
187.2	Mottled Brown-Grey CLAYEY SILT Some sand, trace gravel		2	SS	6		186													
0.3							185													
184.5	Brown -Trace fissures		3	SS	33															
3.0	END OF SAMPLED BOREHOLE (continue with CPT to refusal)						184													
							183													
							182													
							181													
							180													
							179													
							178													
							177													
							176													
							175													
							174													
							173													

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No CPT B9-1

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679241.3, E332574.3 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 25, 11 - Jul 25, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE									
182.4	Ground Surface						● POCKET PEN.	× LAB VANE										
0.0																		
182.1																		
0.3																		
	TOPSOIL																	
	Brown CLAYEY SILT Some sand, trace gravel, trace organics		1	SS	11													
	Mottled Brown-Grey Some sand, trace gravel		2	SS	8													
			3	SS	9													
	Brown -Trace fissures		4	SS	20													
	Grey		5	SS	13													
178.1																		
4.3	END OF SAMPLED BOREHOLE (continue with CPT to refusal)																	

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No CPT B9-2

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679138.6, E332696.0 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 25, 11 - Jul 25, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)	
								○ UNCONFINED ● POCKET PEN.	+ FIELD VANE × LAB VANE									
183.9	Ground Surface																	
0.0	TOPSOIL																	
183.3																		
0.6	Brown FINE SAND Poorly Graded Trace silt		1	SS	10		183											
			2	SS	8		182											
181.6																		
2.3	Brown SANDY SILT		3	SS	5													
181.3																		
182.8	Brown CLAYEY SILT Some sand						181											
2.7	END OF SAMPLED BOREHOLE (Continue with CPT to refusal)						180											
							179											
							178											
							177											
							176											
							175											
							174											
							173											
							172											
							171											
							170											
							169											

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

RECORD OF BOREHOLE No CPT B9-3

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679189.2, E332678.6 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 26, 11 - Jul 26, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE														
182.7	Ground Surface							20	40	60	80	100						GR SA SI CL				
0.0 182.4	TOPSOIL		1	SS	2	▽	182											-sample from auger cuttings				
0.3	Brown FINE SAND Poorly Graded Trace silt		2A, B	SS	8																	
181.5	Grey CLAYEY SILT Trace to some sand																					
181.2	Grey SILTY CLAY Some sand, trace garvel -Trace oxidation		3	SS	14		181															
1.4																						
179.8	END OF SAMPLED BOREHOLE (Continue with CPT)		4	SS	16		180															
2.9																						
							179															
							178															
							177															
							176															
							175															
							174															
							173															
							172															
							171															
							170															
							169															
							168															

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

RECORD OF BOREHOLE No CPT B11-1

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678195.2, E334595.9 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE May 4, 11 - May 4, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)			
								○ UNCONFINED	+	FIELD VANE										
								● POCKET PEN.	×	LAB VANE										
185.4	Pavement Surface						20	40	60	80	100									
185.0	150mm ASPHALT																			
0.2	Grey FILL																			
184.7	Crushed Limestone sand and gravel																			
0.7	Mottled brown CLAYEY SILT Some sand, trace gravel -Horizontal and vertical fractures/fissures from 2m to 4m Stiff		1	SS	11															
	Brown																			
	Hard																			
			2	SS	7															
			3	SS	37															
			4	SS	39															
	Very stiff Grey																			
			5	SS	22															
			6	SS	16															
180.4	END OF SAMPLED BOREHOLE (Continue with CPT to refusal)																			
5.0																				
							180													
							179													
							178													
							177													
							176													
							175													
							174													
							173													
							172													
							171													



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

RECORD OF BOREHOLE No CPT T10-1

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678454, E334218 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Aug 9, 11 - Aug 9, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa													
								○ UNCONFINED	+	FIELD VANE											
								● POCKET PEN.	×	LAB VANE											
							20	40	60	80	100										
0.0	Ground Surface TOPSOIL																				
0.5	Mottled Brown-Grey CLAYEY SILT Some sand, trace gravel		1	SS	10									○							
			2	SS	10									○							
2.0	END OF SAMPLED BOREHOLE (Continue with CPT to refusal)																				

RECORD OF BOREHOLE No CV2-1

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION 4677918.502N, 335208.644E ORIGINATED BY DG
 DIST HWY WEP BOREHOLE TYPE Track Mounted Drill - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE May 25, 11 - May 25, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE	● POCKET PEN.						
186.2	Ground Surface					20	40	60	80	100	10	20	30	43.3	GR SA SI CL	
186.0	Dark Brown TOPSOIL 200mm, clayey		1	SS	7											
0.2	Mottled Brown-Grey CLAYEY SILT Some sand, trace gravel Firm		2	SS	5											
	Brown Stiff		3	SS	13											
			4	SS	28											
	Very stiff		5	SS	29											
182.5	Grey SANDY CLAYEY SILT Trace gravel Stiff		6	SS	14											
181.7	Grey CLAYEY SILT Some sand, trace gravel Stiff		7	SS	14											
4.4			8	SS	11											
			9	TW	PH											
			VT													
178.7	Grey SANDY CLAYEY SILT Some gravel Stiff		10	SS	11											
7.5																
177.3	Grey CLAYEY SILT Trace sand, trace gravel Stiff		11	TW	PH											
8.8																
175.9	END OF BOREHOLE (no refusal)			VT												
10.2	Borehole open and dry at completion															


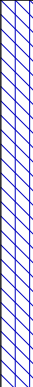
ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No DMT T9-1

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678544.5, E333900.9 ORIGINATED BY LC
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 19, 11 - Jul 19, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)		
								20	40	60	80						100	10	20
184.1	Ground Surface																		
0.0	Clayey TOPSOIL						184												
183.7																			
0.4	Brown-Grey SILTY CLAY/CLAYEY SILT		1	AS			183												
	Brown-Grey -Weathered fissures -Some sand, trace gravel with topsoil/organics in fissures -Brown fissures Stiff		2	SS			182									-hydrocarbon odour			
	-Oxidized Hard		3	SS			181									-spoon driven into hole after DMT removed. Sampled/Blow Counts disturbed/affected			
	Grey -Silty fissures Oxidized clay Very stiff		4	SS			180												
179.8																			
4.3	END OF SAMPLED BOREHOLE (Continue with DMT to refusal)																		
							179												
							178												
							177												
							176												
							175												
							174												
							173												
							172												
							171												
							170												

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

RECORD OF BOREHOLE No DMT B11-1

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678223.6, E334579.2 ORIGINATED BY LC
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Apr 29, 11 - Apr 29, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)			
								○ UNCONFINED	+ FIELD VANE	● POCKET PEN.						× LAB VANE			
185.1	Ground Surface																		
184.0	175mm Black organic Clay TOPSOIL																		
0.2	Mottled Brown-Grey CLAYEY SILT Some sand, trace gravel Stiff		1	SS	11														
	-Thin sand partings to 2.0m Very stiff		2	SS	21														
	Hard		3	SS	51														
	Brown		4	SS	35														
	Grey		5	SS	17														
	Very stiff																		
	Stiff		6	SS	13														
180.1	END OF SAMPLED BOREHOLE (continue with DMT to refusal)																		
5.0																			

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

RECORD OF BOREHOLE No DMT T6-1

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679696.9, E332057.3 ORIGINATED BY LC
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 14, 11 - Jul 14, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE	● POCKET PEN.						× LAB VANE		
181.2	Fill Surface																	
0.0	FILL Silty clay and topsoil Some sand, trace gravel																	
180.1			1A, B	SS	11													
180.0	Black CLAY Organic (Topsoil)																	
1.2			2	SS	8													
179.2	Grey-Brown SILTY CLAY Some sand, trace gravel Trace organic inclusion, weathered																	
2.0	END OF SAMPLED BOREHOLE (Continue with DMT)																	
							179											
							178											
							177											
							176											
							175											
							174											
							173											
							172											
							171											
							170											
							169											
							168											
							167											

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

RECORD OF BOREHOLE No HG-MW-2

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678946.3, E333113.8 ORIGINATED BY TR
DIST HWY WEP BOREHOLE TYPE Truck Mounted Drill - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Jul 18, 11 - Jul 18, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE									
								20 40 60 80 100 WATER CONTENT (%) 10 20 30									
182.3	Ground Surface																
0.0	TOPSOIL						182							-Observation Well installed in sampled borehole			
181.8	Mottled Brown CLAYEY SILT Some sand, trace gravel Stiff Brown, very stiff -Grey fissures, trace rootlets		1	SS	7		181										
0.5			2	SS	19		180										
			3	SS	23												
			4	SS	22												
178.8	-Multiple thin silt seams						179										
3.5	END OF BOREHOLE (no refusal)																
							178										
							177										
							176										
							175										
							174										
							173										
							172										
							171										
							170										
							169										
							168										


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

RECORD OF BOREHOLE No TB4-1

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679732.3, E332128.6 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 75 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 12, 11 - Jul 12, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)					
								○ UNCONFINED	+	FIELD VANE													
								● POCKET PEN.	×	LAB VANE													
180.7	Ground Surface							20	40	60	80	100											
0.0	TOPSOIL																						
180.3																							
0.4	Mottled Brown-Grey CLAYEY SILT Some sand, trace gravel Stiff																						
			1	SS	10																		
	Brown -Some fissures, occasional silt seams Very stiff			2	SS	17																	
	-Occasional sand pockets			3	SS	26																	
	Grey Stiff			4	SS	15																	
	Firm			6	SS	7																	

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RECORD OF BOREHOLE No TB4-2

1 OF 1

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679674.4, E332157.2 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 75 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 7, 11 - Jul 7, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
181.0	Pavement Surface														
180.8	25mm ASPHALT														
180.8	FILL														
180.4	Crushed Limestone														
0.5	TOPSOIL														
	Mottled Brown and Grey CLAYEY SILT		1	SS	6		180								
	-Some sand, trace gravel Firm		2	SS	7		179								
	-Trace fissures, stiff		3	SS	16		178								
	Grey		4A, B	SS	12		177								
	Firm		5	SS	8		176								
			6	SS	7		175								
			7	SS	5		174								
			8	SS	6		173								
			VT				172								
	-Trace pink nodules		9	SS	4		171								
			VT				170								
	Some pink nodules		10	SS	4		169								
			VT				168								
170.9	END OF BOREHOLE (no refusal)						167								
10.1	Borehole dry on completion														

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

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

RECORD OF BOREHOLE No PS3-1

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679421, E332246 ORIGINATED BY RL
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Aug 9, 11 - Aug 11, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL LIMIT MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)				
181.3	Pavement Surface							20	40	60	80	100							
180.0	ASPHALT						181												
	Grey FILL																		
180.5	Crushed limestone sand and gravel																		
180.2	Brown FILL		1	SS	10														
1.1	Brown SAND						180												
179.4	Trace silt, stiff		2	SS	9														
1.8	Grey CLAYEY SILT						179												
	Trace pink clay nodules to Coarse-Fine Sand, oxidation Stiff, wet		3	SS	14														
	Trace Coarse-Fine Sand																		
			4	SS	16		178												
	Very stiff																		
			5	SS	17		177												
			6	SS	16														
			7	SS	9		176												
	Stiff		8	TW	PH		175												
				VT			174												
	Trace fine sand, trace gravel, Wet		9	TW	PH														
							173												
			10	SS	5		172												
	Firm																		
							171												
	Trace pink clay nodules		11	TW/tw	PH		170												
			12	TW	PH		169												
							168												
				VT															
			13	TW	PH		167												

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ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No PS3-1

2 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679421, E332246 ORIGINATED BY RL
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Aug 9, 11 - Aug 11, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)	
								○ UNCONFINED	+ FIELD VANE	● POCKET PEN.	× LAB VANE							
	Grey CLAYEY SILT Trace pink clay nodules to Coarse-Fine Sand, oxidation Stiff, wet <i>(continued)</i>		14	TW	PH		166									-VWP #P15 and MG installed at 15.2m below ground surface		
					VT			165			1.4							
			15	TW	PH			164										
								163										
	Wet		16	TW	PH			162										
					VT			161										
			17	TW	PH			160										
								159										
			18	TW	PH			158										
					VT			157										
		19	TW	PH			156											
							155											
		20	SS	14			154											
							153											
	Stiff						152											
		21	SS	10														
		22	SS	10														
		23	SS	22														
	-Sand seams																	

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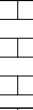
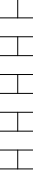


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RECORD OF BOREHOLE No PS3-1

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METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679421, E332246 ORIGINATED BY RL
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Aug 9, 11 - Aug 11, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE										
							20 40 60 80 100				10 20 30							
150.8	Grey SILT Some clay, trace Fine Sand, some gravel Rock pieces, hard, wet		24	SS	77		151								RQD = 0% TCR = 20% SCR = 1% -VWP installed at 32.9m below ground surface RQD = 90% TCR = 100% SCR = 97% RQD = 90% TCR = 100% SCR = 100%			
30.5							150											
								149										
148.8	COBBLES AND BOULDERS		25	SS			149											
32.5								148										
147.7	Brown LIMESTONE Fine Grained, well crystallized, having vugs throughout the section at different locations filled with calcite mineralization		26	RC			148											
33.5								147										
							147											
145.9	Grey to white LIMESTONE Fine Grained, well crystallized, having black inclusions, dense		27	RC			147											
35.4								146										
145.4	END OF BOREHOLE		28	RC			146											
35.8								145										
							145											
							144											
							143											
							142											
							141											
							140											
							139											
							138											
							137											

RQD = 0%
TCR = 20%
SCR = 1%
-WWP installed at 32.9m below ground surface

RQD = 90%
TCR = 100%
SCR = 97%

RQD = 90%
TCR = 100%
SCR = 100%

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO.MOT.GDT 09/11/11

RECORD OF BOREHOLE No T6-1/HG-MW-07

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679627.0, E332067.4 ORIGINATED BY DG
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 14, 11 - Jul 15, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
180.9	Fill Surface							○ UNCONFINED	+ FIELD VANE							20 40 60 80 100
0.0								● POCKET PEN.	× LAB VANE							
	Brown FILL Sand and Gravel													GR SA SI CL		
	-Some silty clay clumps		1	SS	10									-Vibrating Wire Piezometers (VWP) installed in sampled borehole		
			2	SS	6									-Observation Well installed in adjacent boring at (coordinates)		
			3	SS	2									-Spider magnets (MG) installed in adjacent boring at (coordinates)		
177.9			4	SS	18											
3.0	Brown CLAYEY SILT		5	SS	7											
	Trace sand, fine-medium gravel		6	SS	6											
	Very stiff		7	SS	6											
	Grey, stiff, trace pink clay nodules		8	TW	PH											
			9	SS	4											
			10	TW	PH											
			11	TW	PH											
			12	TW	PH											
			13	TW	PH											

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No T6-1/HG-MW-07

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METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679627.0, E332067.4 ORIGINATED BY DG
DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Jul 14, 11 - Jul 15, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE							w _p w w _L		
	CLAYEY SILT Trace sand, fine-medium gravel							20 40 60 80 100									
			14	TW	PH		165										
				VT					1.8								
			15	TW	PH		164										
							163										
			16	TW	PH		162		×				21.6	4 26 46 25			
				VT						1.9				-MG installed at 21.73m below ground surface			
			17	TW	PH		161										
							160										
			18	SS	6		159							-no recovery with shelly tube; sample retrieved by pushing split spoon			
				VT						2.5							
			19	TW	PH		158		×				20.9	3 23 44 31			
							157										
	Wet, soft		20	SS	0		156							-no blow counts, weight of rods pushed 0.45m			
							155										
	Trace sand, fine-coarse gravel Firm		21	SS	7		154										
	very soft						153										
			22	SS	1		152										
							151										
	Soft		23	SS	1												

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ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

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METRIC

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No T6-2

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679626.8, E332066.1 ORIGINATED BY DG
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 18, 11 - Jul 19, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _P	W	W _L				
								○ UNCONFINED + FIELD VANE	WATER CONTENT (%)							
							● POCKET PEN. × LAB VANE									
							20 40 60 80 100				10 20 30					
180.9	Ground Surface															
180.0	152mm TOPSOIL															
0.2	Mottled Brown-Grey CLAYEY SILT Trace sand, fine-medium gravel Stiff		1	SS	11		180								-Slope inclinometer casing installed in sampled borehole; Vibrating Wire Piezometers installed in adjacent boring at N4679627.0, E332068.1 -drove 50.8mm spoon to get sample for PIC -took 1.4 dioxane sample	
	Stiff-very stiff		2	SS	15		179									
	-Trace fissures Very stiff		3	SS	18		178									
	Stiff		4	SS	13		177									
	Grey -Trace pink clay nodules Firm		5	SS	7		176									
	-Trace fine-coarse gravel Firm		6	SS	6		175									
	Soft		7	SS	3		174									
			8	TW	PH		173									
				VT			172									
	-Trace fine-medium gravel, sand Pink clay nodules		9	TW	PH		171									
				VT			170									
			11	TW	PH		169									
				VT			168									
169.3	Grey CLAYEY SILT Soft to firm		12	TW	PH		167									
				VT			166									
166.3			13	SS	0											
14.6																

Continued Next Page

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

METRIC

Continued Next Page

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

RECORD OF BOREHOLE No T6-2

3 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679626.8, E332066.1 ORIGINATED BY DG
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 18, 11 - Jul 19, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)		
								○ UNCONFINED	+	FIELD VANE									
								● POCKET PEN.	×	LAB VANE									
							20	40	60	80	100		10	20	30				
150.4																			
30.5	Grey SANDY SILT Trace fine-medium gravel, some clay Saturated, compact		24	SS	20		150									end of drilling July 18; continue July 19			
							149												
148.3							148									RQD = 0% TCR = 31% SCR = 0%			
32.6	Grey LIMESTONE Fine Grained, fractured in form of rubble, dense. -Rock/boulder fragments and pieces		1	RC															
147.4							147									RQD = 87% TCR = 100% SCR = 90%			
33.5	Grey LIMESTONE Fine Grained, laminated, porous, stylolites present		2	RC															
146.1																			
34.8	END OF BOREHOLE Piezometric Levels in VWP #P11: July 23, 2011: EL. 181.0m Aug 6, 2011: EL. 180.7m Aug 29, 2011: EL. 180.8m Piezometric Levels in VWP #P18: July 23, 2011: EL. 180.9m Aug 6, 2011: EL. 180.6m Aug 29, 2011: EL. 180.6m						146												
							145												
							144												
							143												
							142												
							141												
							140												
							139												
							138												
							137												
							136												

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO.MOT.GDT 09/11/11

RECORD OF BOREHOLE No T6-3

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679577.5, E332079.1 ORIGINATED BY SD
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 14, 11 - Jul 19, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE	● POCKET PEN.						× LAB VANE		
181.6	Fill Surface						20	40	60	80	100	10	20	30	kN/m ³	GR SA SI CL		
0.0	Black Topsoil FILL Brown Sand/Silt mixture, trace gravel and bricks															-BH dry prior to wash boring at 15m		
180.4			1	SS	7													
180.1	CONCRETE																	
179.6	FINE SAND Trace gravel		2	SS	6													
1.7	Mottled Brown with Grey seams CLAYEY SILT Some sand, trace gravel, stiff Brown Very stiff		3	SS	16													
	Grey-Brown		4	SS	18													
	Grey Stiff		5	SS	12													
	Moist to wet, stiff -Trace pink inclusions		6	SS	8													
	Moist to wet, firm		7	SS	5													
			8	TW	PH													
				VT														
	Clayey Silt -Some sand, trace gravel, soft Wet -Sandy pocket		9	TW	PH													
	Wet, soft		10	SS	3													
				VT														
			11	TW	PH													
	Moist to wet, firm		12	TW	PH													
				VT														
168.6	Grey CLAYEY SILT Trace black and pink inclusions, varved Wet, soft		13	TW	PH													
13.0																		

Continued Next Page

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

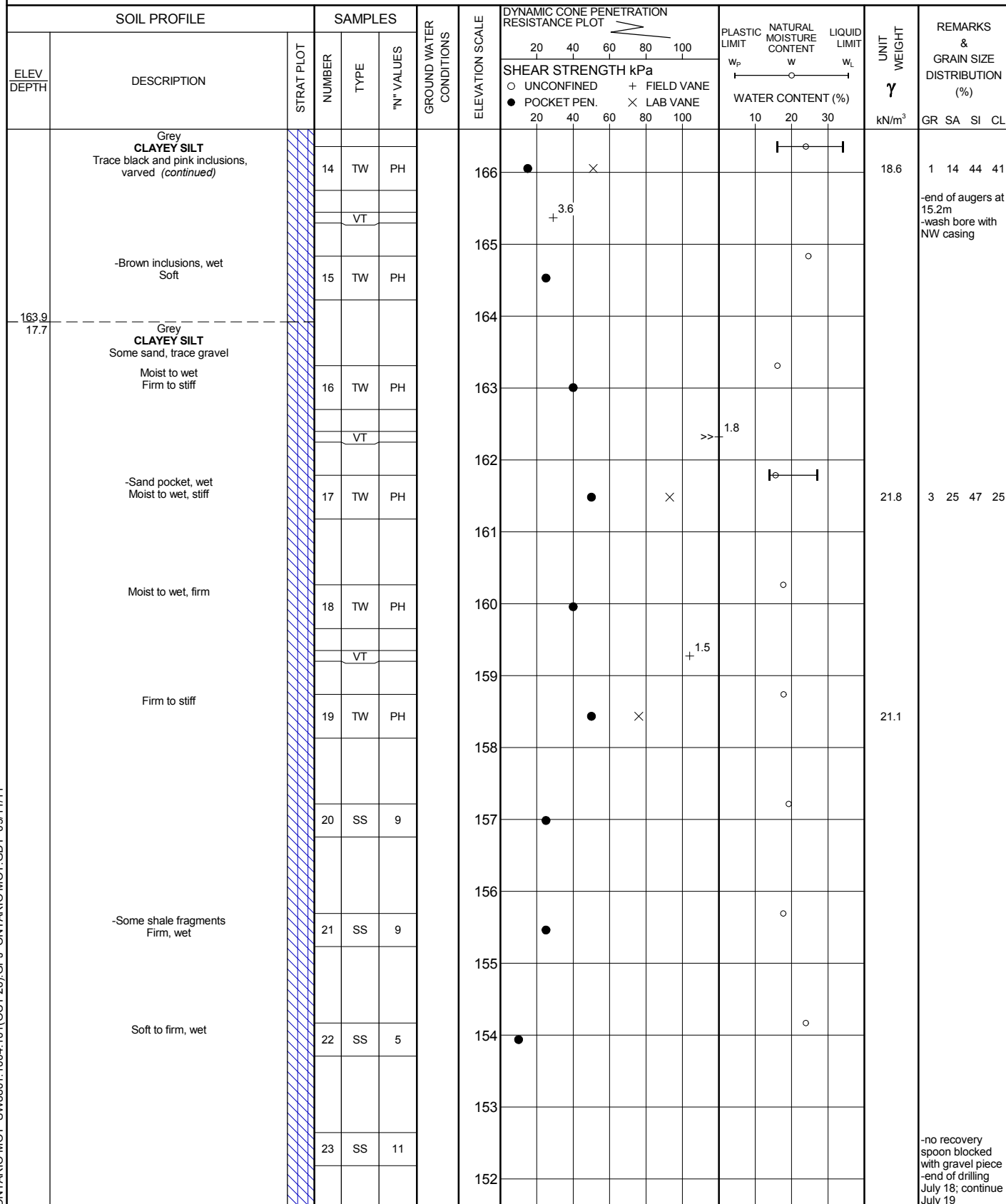
ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No T6-3

2 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4679577.5, E332079.1 ORIGINATED BY SD
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 14, 11 - Jul 19, 11 CHECKED BY MSO



Continued Next Page

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

-no recovery
spoon blocked
with gravel piece
-end of drilling
July 18; continue
July 19

METRIC

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

RECORD OF BOREHOLE No T7-1

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION 4679413.6N, 332295.2E ORIGINATED BY DG
DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Jul 7, 11 - Jul 7, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		NATURAL MOISTURE CONTENT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		PLASTIC LIMIT w _p	LIQUID LIMIT w _L		
								○ UNCONFINED ● POCKET PEN.	+ FIELD VANE × LAB VANE	WATER CONTENT (%)			
181.5	Pavement Surface						20 40 60 80 100						
180.0	50mm ASPHALT						20 40 60 80 100						
0.2	Over 200mm Crushed Limestone Sand and Gravel FILL												
	Green and Black, FILL		1	SS	3								
180.0	Silty Clay and Topsoil												
1.5	Green Grey to Brown SAND		2	SS	3								
179.4	Poorly Graded (Fine) Trace organics, saturated												
2.1	CLAYEY SILT		3	SS	10								
	Some sand, trace gravel -Trace medium-coarse gravel Stiff												
	Grey Trace fine-medium gravel, pink clay nodules Very stiff		4	SS	15								
	Very stiff		5	SS	16								
	-Trace fissures		6	SS	14								
	-Trace pink clay nodules, firm		7	SS	6								
	Fine sand nodules Trace fine gravel, pink clay nodules		8	TW	PH								
			9	TW	PH								
	-No pink clay		10	TW	PH								
				VT									
	-Trace fine-coarse gravel		11	TW	PH								
			12	TW	PH								
				VT									
	-Trace fine-medium gravel Very soft		13	SS	2								

Continued Next Page

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

METRIC

Continued Next Page








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

RECORD OF BOREHOLE No T7-1

3 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION 4679413.6N, 332295.2E ORIGINATED BY DG
DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
DATUM Geodetic DATE Jul 7, 11 - Jul 7, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								20 40 60 80 100	○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE								WATER CONTENT (%) 10 20 30
151.3							151									-no recovery, spoon bouncing continued to drill to 32m	
30.2	SAND And weathered LIMESTONE Cobbles and boulders (inferred) Very dense		24	SS	50/ 115mm		150										
			25	SS	50/ 150mm												
148.9	Brown LIMESTONE Medium to coarse grained Porous, vuggy, fractured at location between 33.07m and 33.22m Clacite crystallization is visible						149									RQD = 100%	
32.6			1	RC			148										
							147									RQD = 100%	
146.7	Brown to Grey LIMESTONE Laminated, medium to fine grained, porous Pitted at location between 34.78m and 35.14m		2	RC			146										
34.8																	
146.4																	
35.1	Grey LIMESTONE Fine Grained Vuggy, calcite crystals visible Grey LIMESTONE Fine Grained Laminated, porous and dense END OF BOREHOLE																
146.0																	
145.5																	
35.7																	
							145										
							144										
							143										
							142										
							141										
							140										
							139										
							138										
							137										

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

RECORD OF BOREHOLE No T9-1

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4678634.9, E333766.7 ORIGINATED BY NB
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Jul 15, 11 - Jul 16, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								○ UNCONFINED ● POCKET PEN.	+ FIELD VANE × LAB VANE					
184.0	Pavement Surface							20 40 60 80 100						GR SA SI CL
0.0	280mm													
183.7	ASPHALT													
0.3	Grey		1	SS						○				-Slope
183.0	FILL													Inclinometer
	Crushed Limestone		2	SS	7						○			casing installed in
	Silty sand and gravel													sampled
1.0	Brown													borehole;
	SANDY CLAYEY SILT													Vibrating Wire
	Trace gravel		3	SS	13						○			Piezometers
	Hard													(VWP) installed
														in adjacent
			4	SS	40									boring at
														N4678635.6,
														E333769.0
														-Spider Magnets
														(MG) installed in
														adjacent boring
	Grey		6	SS	30						○			
	Very stiff		7	SS	16						○			
	Stiff		8	SS	12						○			
			9	SS	11						○			
				VT										
			10	TW	PH							1.3		-end of drilling
														July 15; continue
														July 16

Continued Next Page

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

METRIC

[illegible]

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

METRIC

[illegible]

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

RECORD OF BOREHOLE No T11-3

1 OF 3

METRIC

W.P. RFP No. 09-54-1007 LOCATION N4677953.6, E334927.3 ORIGINATED BY TA
 DIST HWY WEP BOREHOLE TYPE CME 55 - 200mm Dia. Continuous Flight Hollow Stem Augers COMPILED BY SS
 DATUM Geodetic DATE Apr 19, 11 - Apr 21, 11 CHECKED BY MSO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE	● POCKET PEN.						×	LAB VANE	
185.8	Ground Surface																	
0.0	350mm																	
185.5	Black organic clay																	
0.3	TOPSOIL																	
	Mottled Brown-Grey																	
	CLAYEY SILT		1	SS	6													
	Some sand, trace gravel																	
	Firm																	
	Brown		2	SS	13													
	-Prominant vertical grey fissure (highly fractured)																	
	Hard		3	SS	29													
	Hard																	
			4	SS	33													
	-Vertical oxidized fissure																	
	Grey		5	SS	18													
	Very stiff																	
			6	SS	12													
	Stiff																	
	-Trace pink clay nodules below 5m		7	SS	7													
			8	SS	8													
			9	TW	PH													
177.3	Grey																	
8.5	SANDY CLAYEY SILT																	
	Trace gravel		10	TW	PH													
	Firm to stiff																	

Continued Next Page

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

ONTARIO MOT SW8801.1004.101(OCT 26).GPJ ONTARIO MOT.GDT 09/11/11

METRIC

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

METRIC

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

RECORD OF CONE PENETRATION TEST CPT 39-RW

METRIC

PROJECT Windsor-Essex Parkway

TEST DATE 7/28/2011 - 7/28/2011

SHEET 1 OF 2

LOCATION N4679460.1; E332253.2

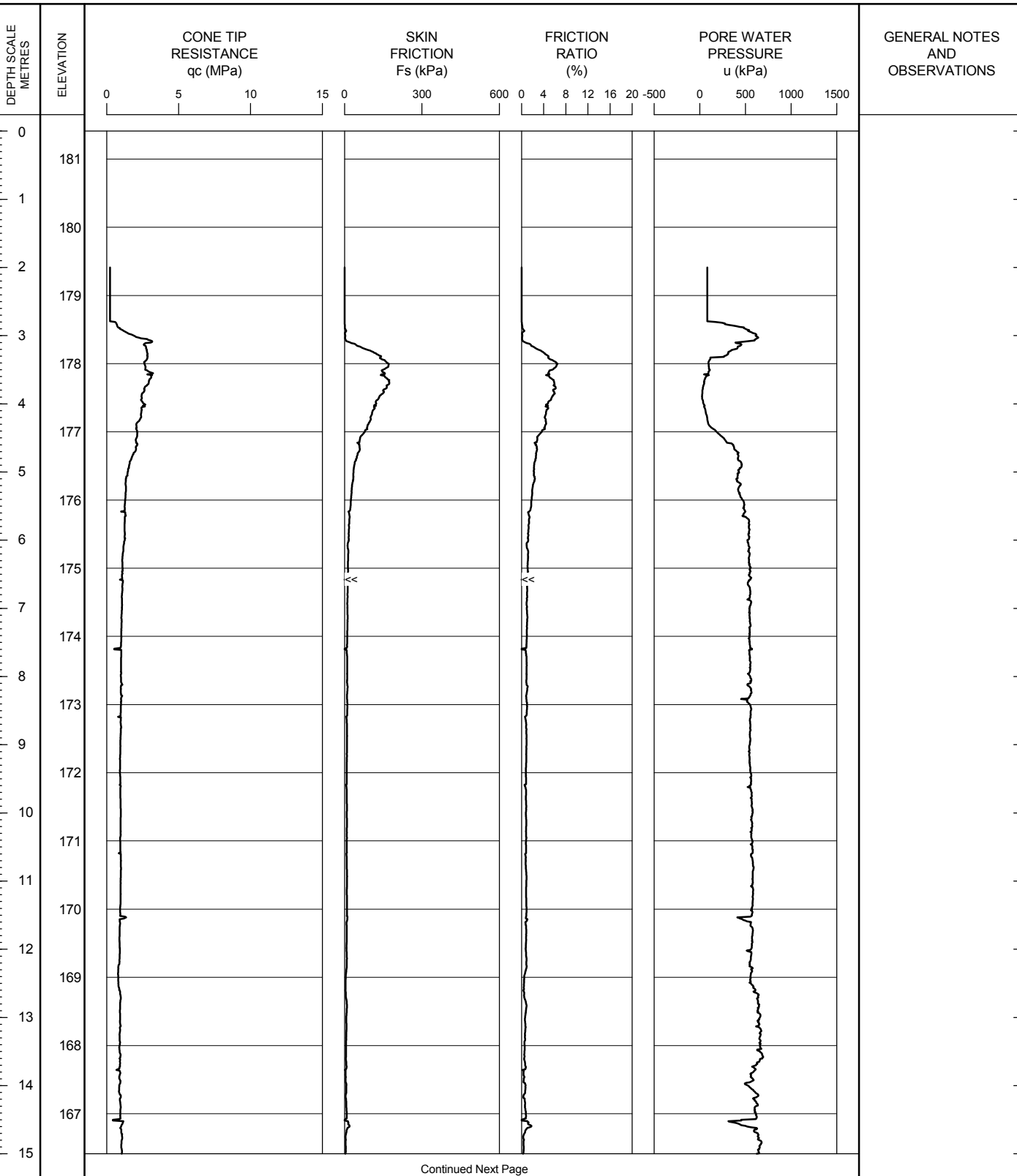
DATUM Geodetic

GROUND SURFACE ELEVATION: 181.4

PREDRILL DEPTH: 2

CORRECTION FACTOR A: 0.8

CORRECTION FACTOR B: 0



OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT 39-RW

METRIC

PROJECT Windsor-Essex Parkway

TEST DATE 7/28/2011 - 7/28/2011

SHEET 2 OF 2

LOCATION N4679460.1; E332253.2

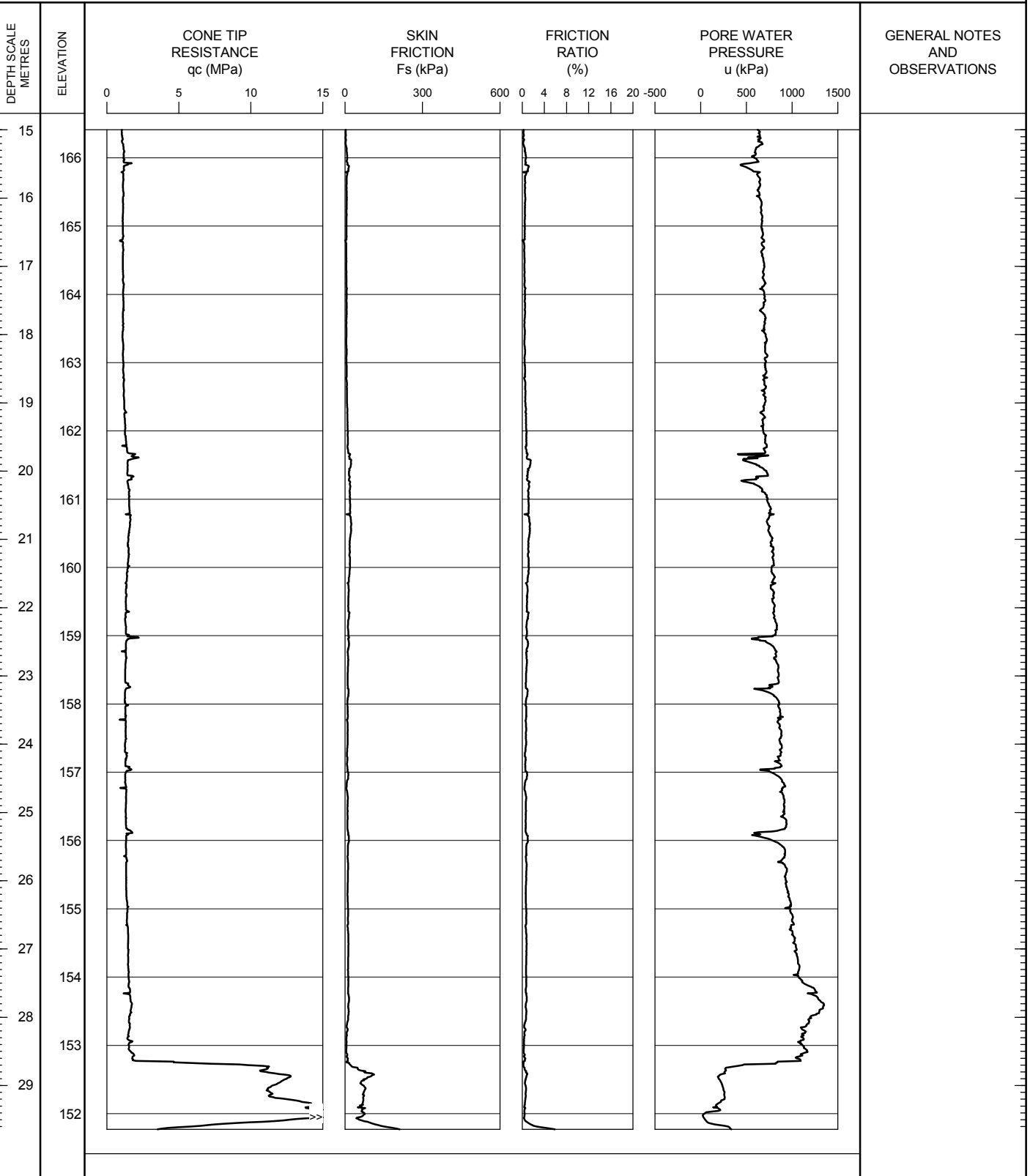
DATUM Geodetic

GROUND SURFACE ELEVATION: 181.4

PREDRILL DEPTH: 2

CORRECTION FACTOR A: 0.8

CORRECTION FACTOR B: 0



WEF CPT LOG CPT-RW/GPJ ONTARIO MOT GDT 06/01/12

OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT 43-RW

METRIC

PROJECT Windsor-Essex Parkway

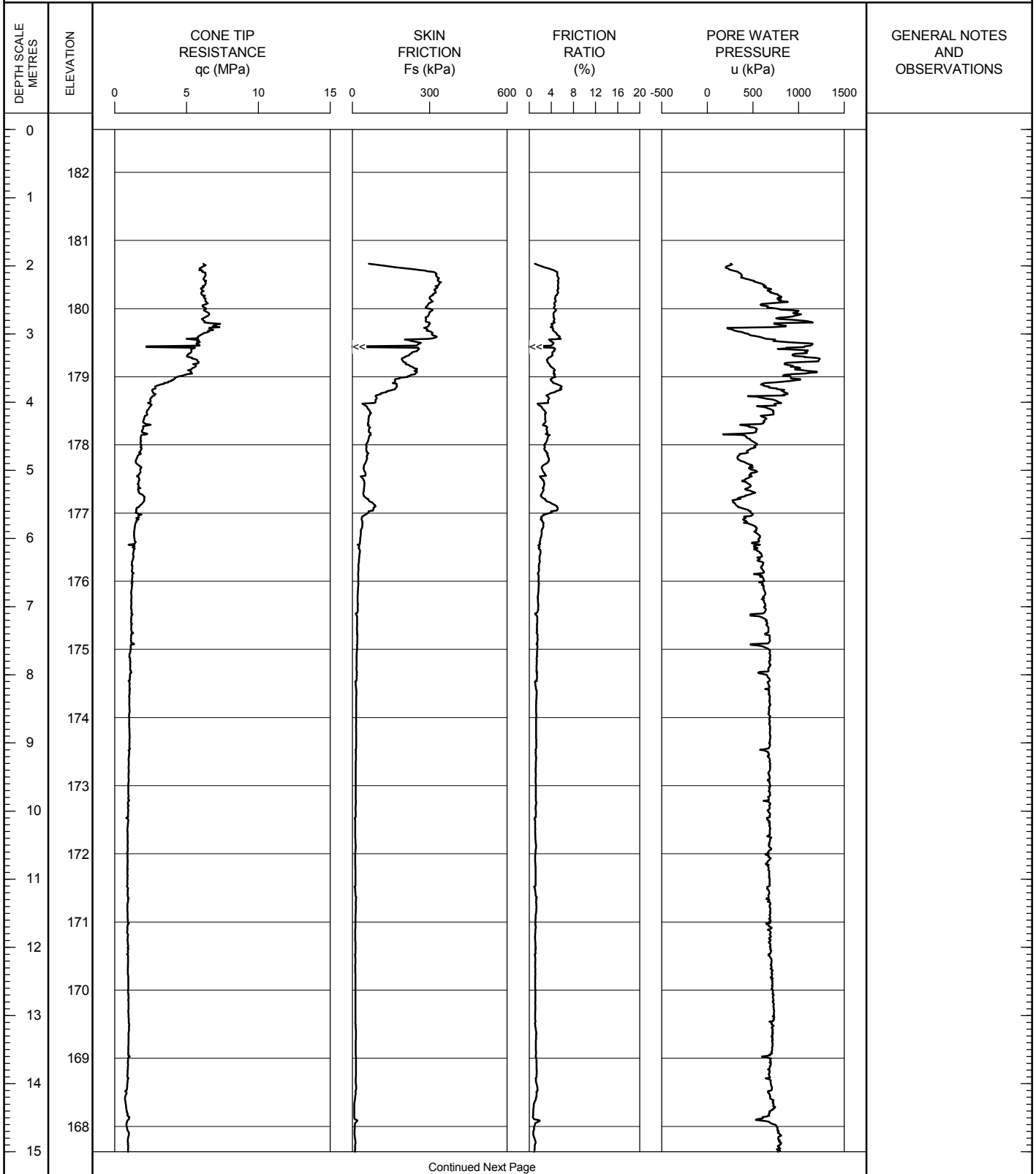
TEST DATE 8/3/2011 - 8/3/2011

SHEET 1 OF 2

LOCATION N4678907.6; E333207.7

DATUM Geodetic

GROUND SURFACE ELEVATION: 182.6 PREDRILL DEPTH: 1.97 CORRECTION FACTOR A: 0.8 CORRECTION FACTOR B: 0



OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT 43-RW

METRIC

PROJECT Windsor-Essex Parkway

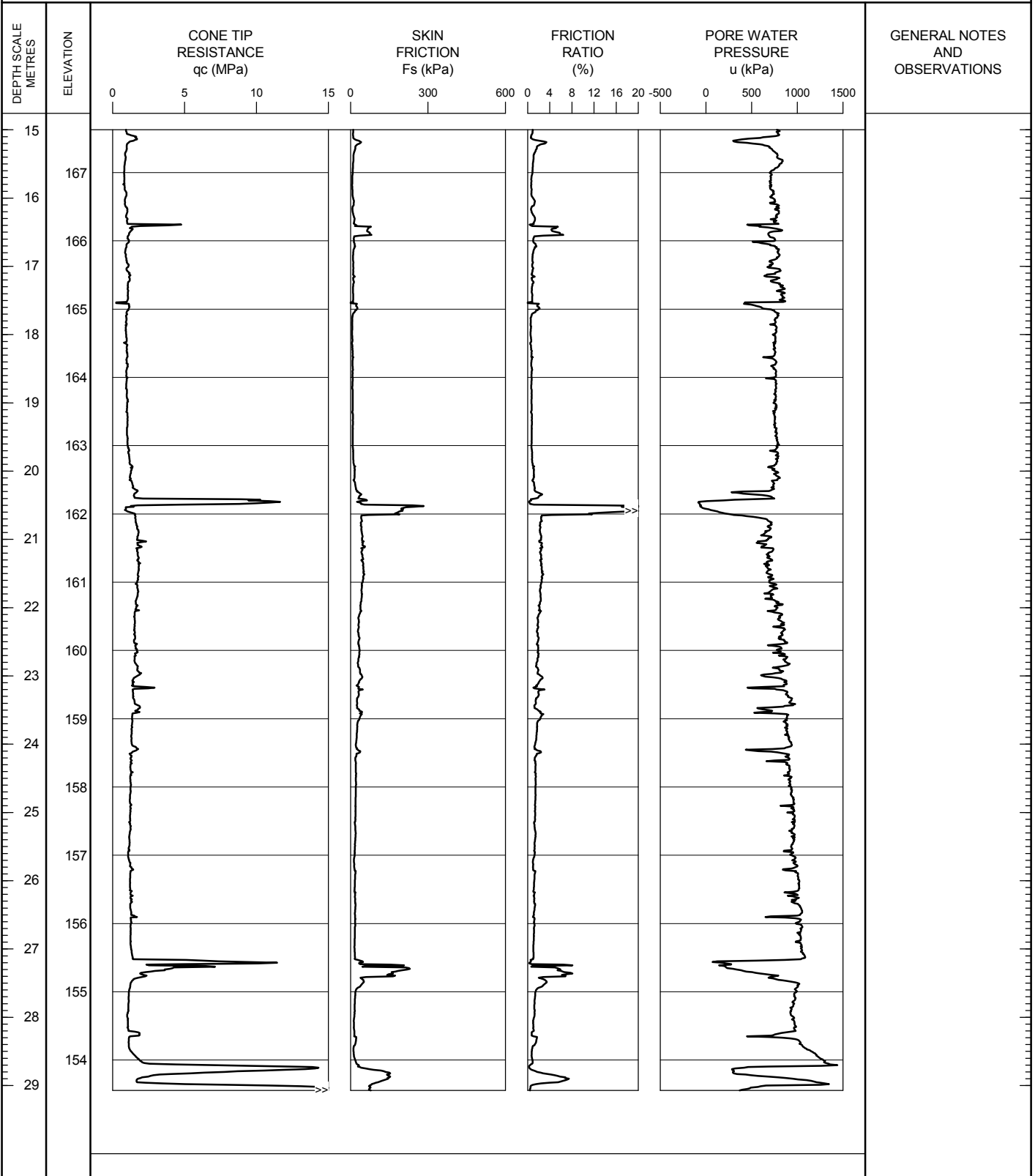
TEST DATE 8/3/2011 - 8/3/2011

SHEET 2 OF 2

LOCATION N4678907.6; E333207.7

DATUM Geodetic

GROUND SURFACE ELEVATION: 182.6 PREDRILL DEPTH: 1.97 CORRECTION FACTOR A: 0.8 CORRECTION FACTOR B: 0



WEP CPT LOG CPT-RW.GPJ ONTARIO MOT GDT 06/01/12

OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT 50-RW

METRIC

PROJECT Windsor-Essex Parkway

TEST DATE 5/27/2011 - 5/27/2011

SHEET 1 OF 2

LOCATION N4678085.0; E334889.4

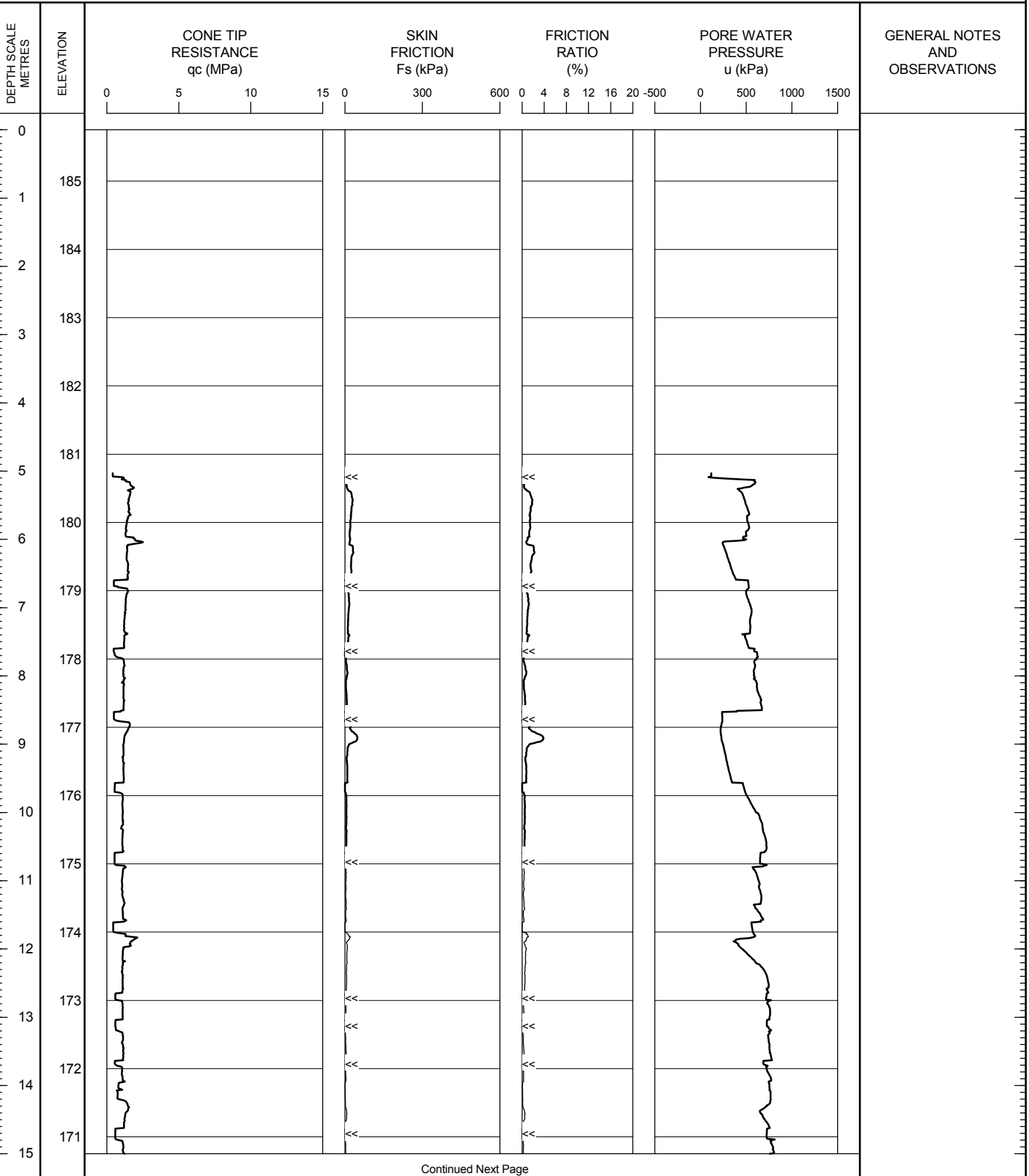
DATUM Geodetic

GROUND SURFACE ELEVATION: 185.8

PREDRILL DEPTH: 5

CORRECTION FACTOR A: 0.8

CORRECTION FACTOR B: 0



OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT 50-RW

METRIC

PROJECT Windsor-Essex Parkway

TEST DATE 5/27/2011 - 5/27/2011

SHEET 2 OF 2

LOCATION N4678085.0; E334889.4

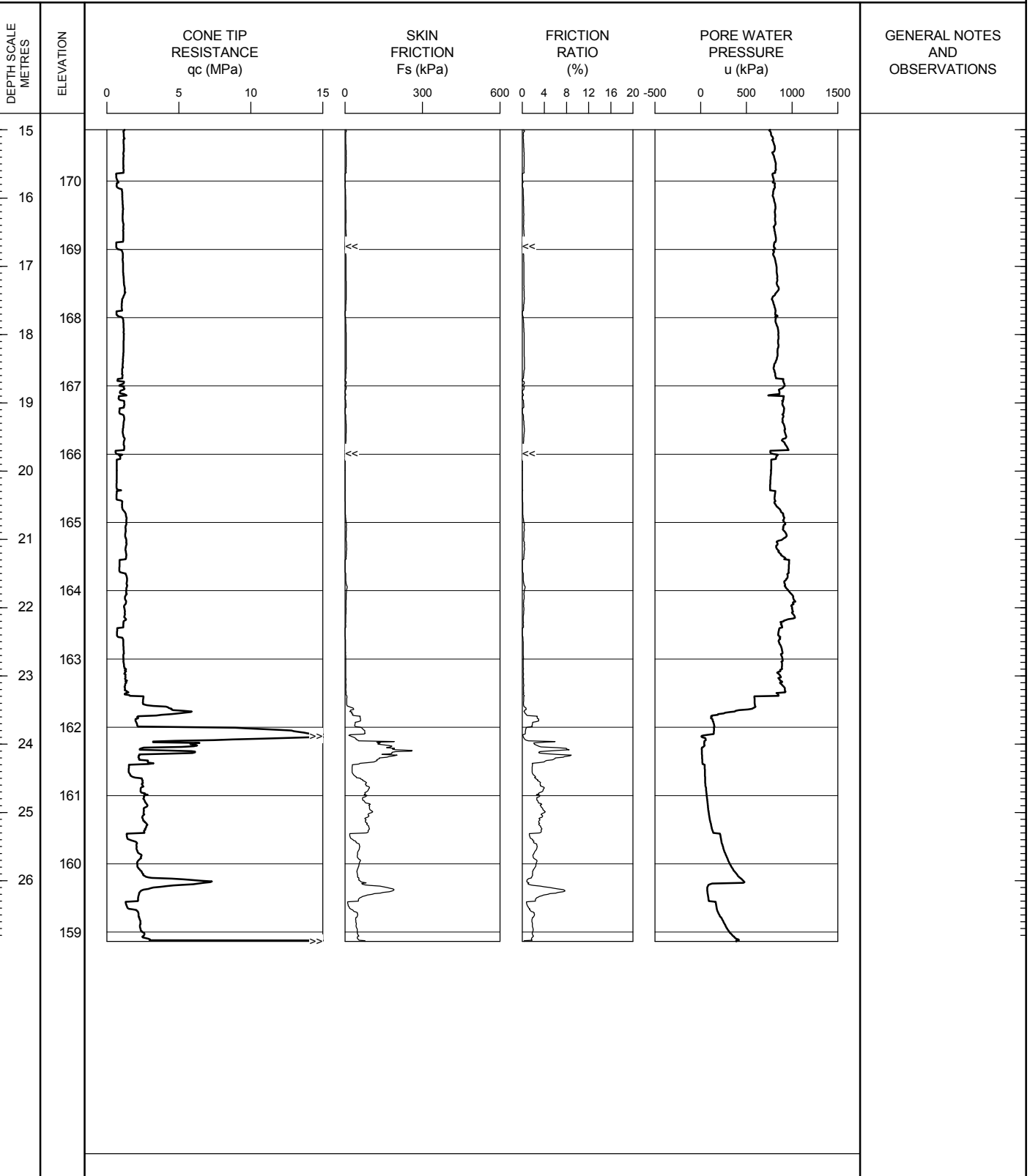
DATUM Geodetic

GROUND SURFACE ELEVATION: 185.8

PREDRILL DEPTH: 5

CORRECTION FACTOR A: 0.8

CORRECTION FACTOR B: 0



OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT 55-RW

METRIC

PROJECT Windsor-Essex Parkway

TEST DATE 8/6/2011 - 8/6/2011

SHEET 1 OF 2

LOCATION N4677609.7; E335904.2

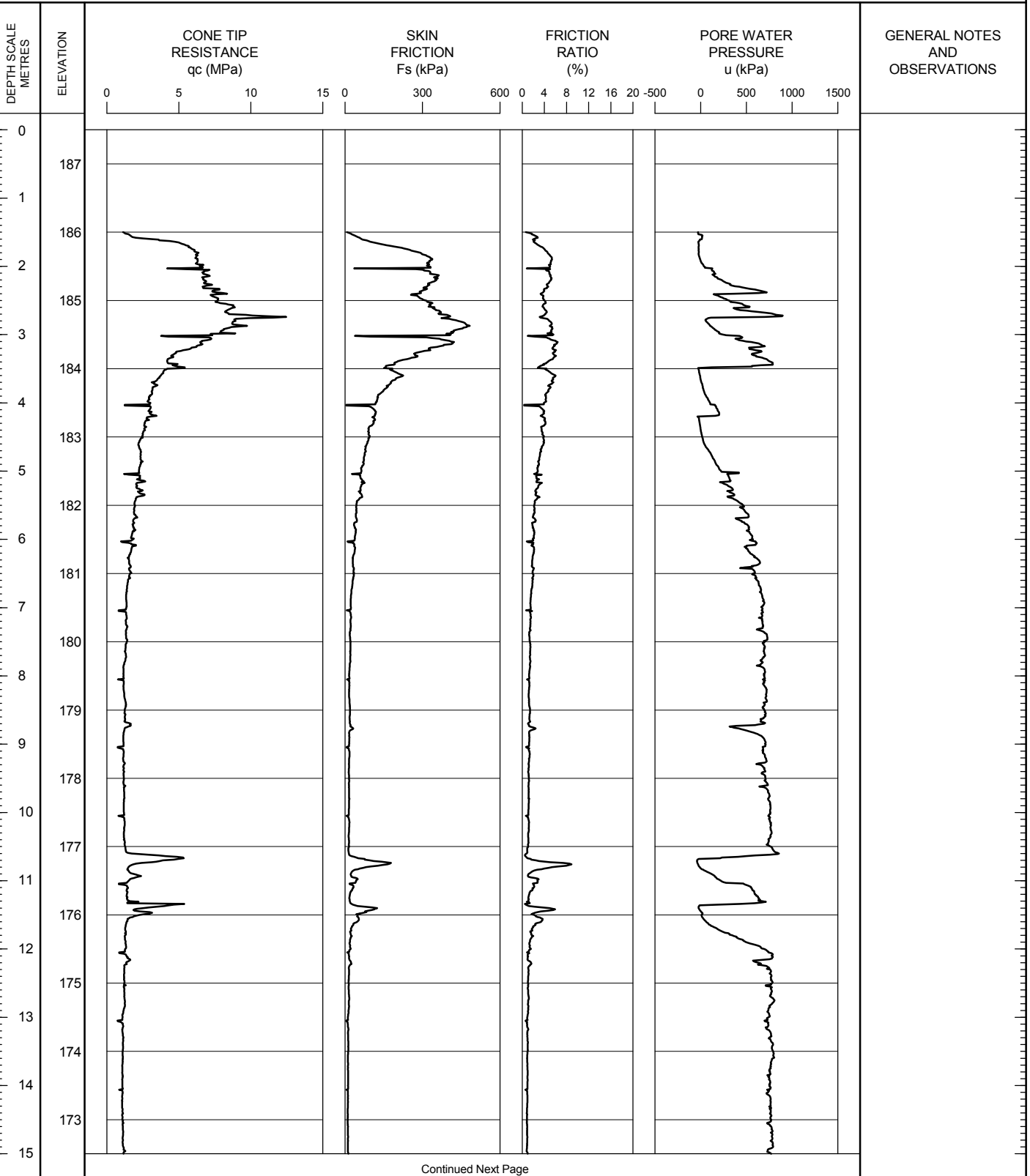
DATUM Geodetic

GROUND SURFACE ELEVATION: 187.5

PREDRILL DEPTH: 3

CORRECTION FACTOR A: 0.8

CORRECTION FACTOR B: 0



OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT 55-RW

METRIC

PROJECT Windsor-Essex Parkway

TEST DATE 8/6/2011 - 8/6/2011

SHEET 2 OF 2

LOCATION N4677609.7; E335904.2

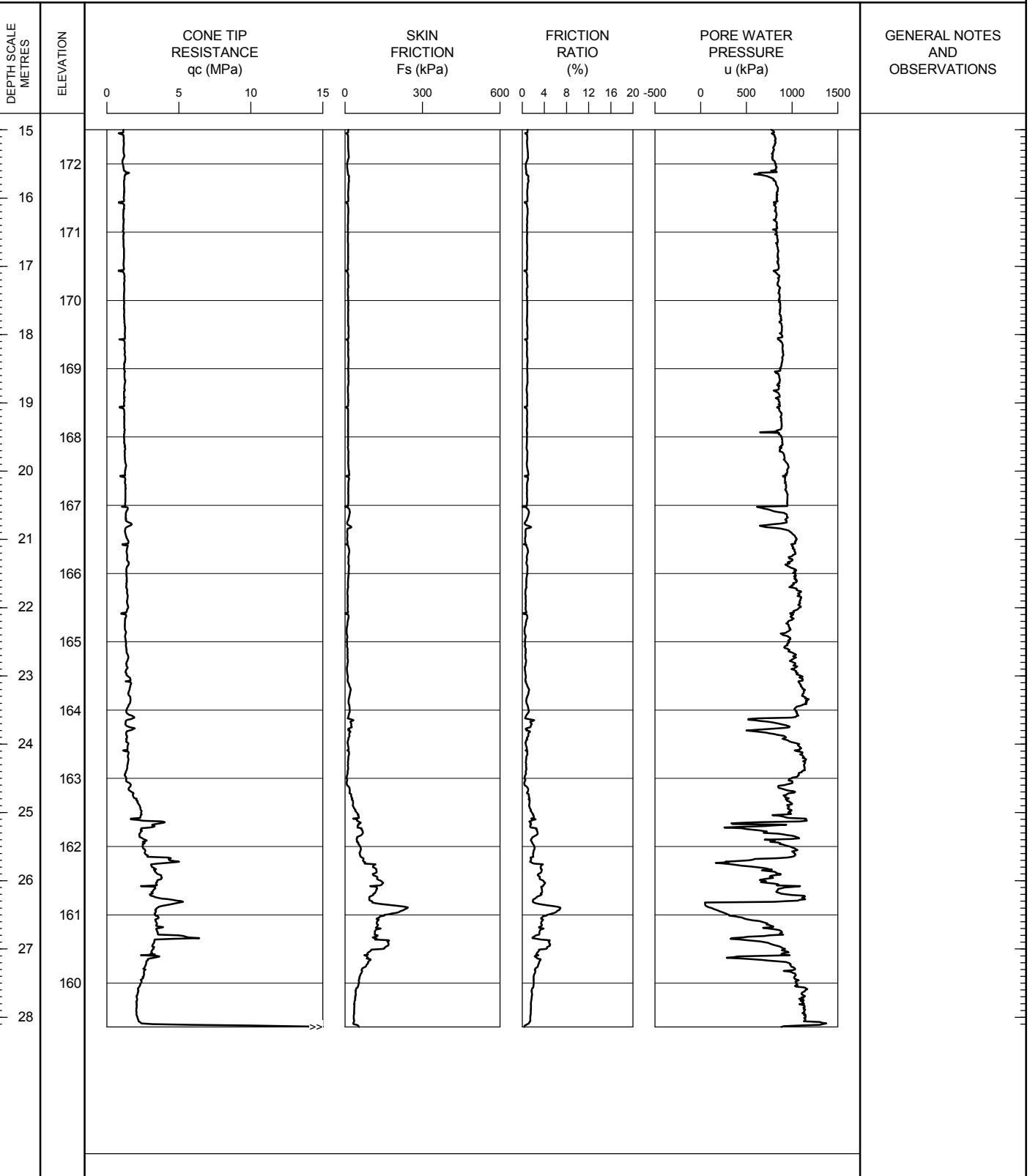
DATUM Geodetic

GROUND SURFACE ELEVATION: 187.5

PREDRILL DEPTH: 3

CORRECTION FACTOR A: 0.8

CORRECTION FACTOR B: 0



WEF CPT LOG CPT-RW.GPJ ONTARIO MOT.GDT 06/01/12

OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT B11-1

METRIC

PROJECT Windsor-Essex Parkway

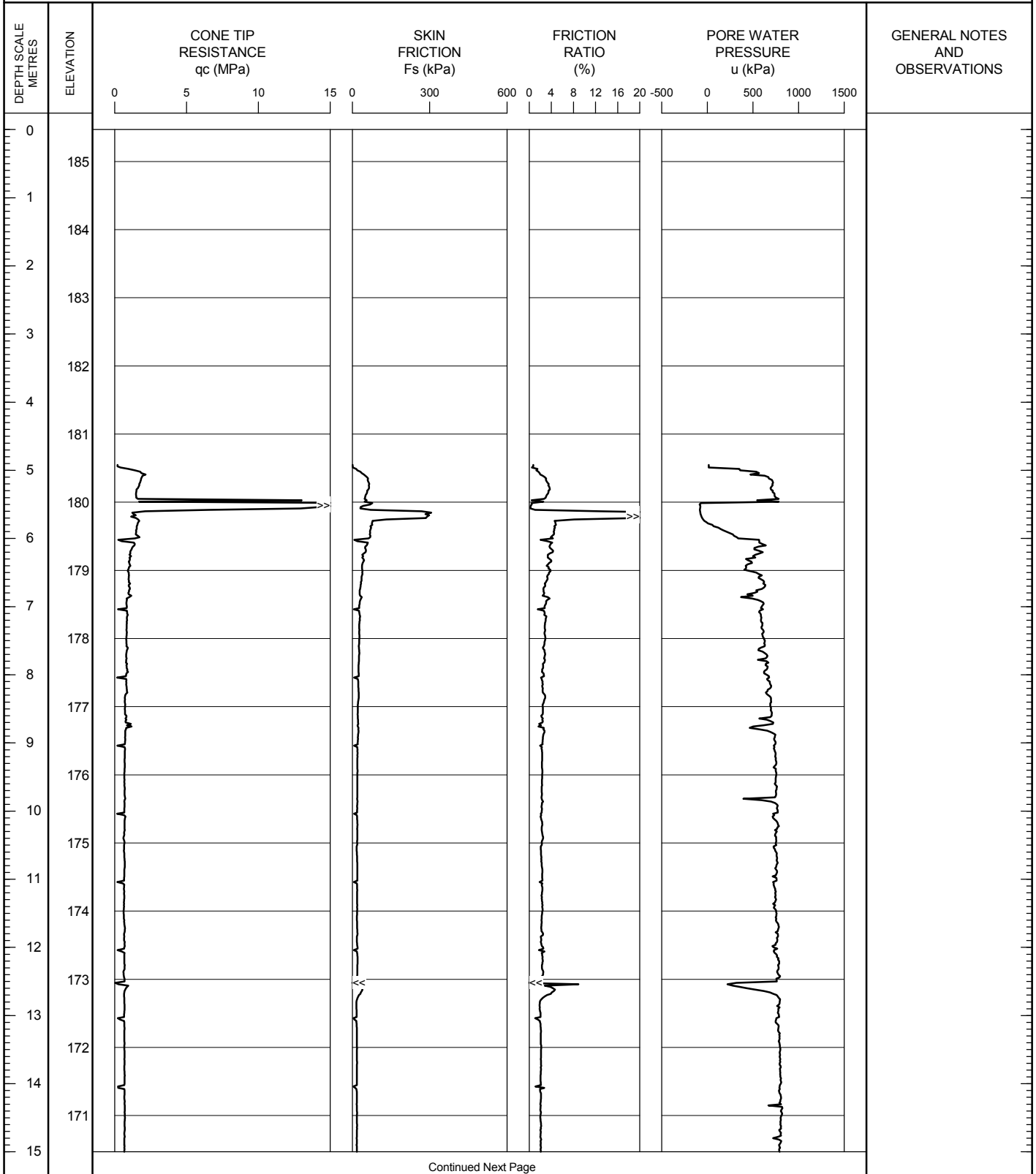
TEST DATE 5/4/2011 - 5/4/2011

SHEET 1 OF 2

LOCATION N4678195.2; 334595.9

DATUM Geodetic

GROUND SURFACE ELEVATION: 185.5 PREDRILL DEPTH: 4.9 CORRECTION FACTOR A: 0.8 CORRECTION FACTOR B: 0



Continued Next Page

OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT B11-1

METRIC

PROJECT Windsor-Essex Parkway

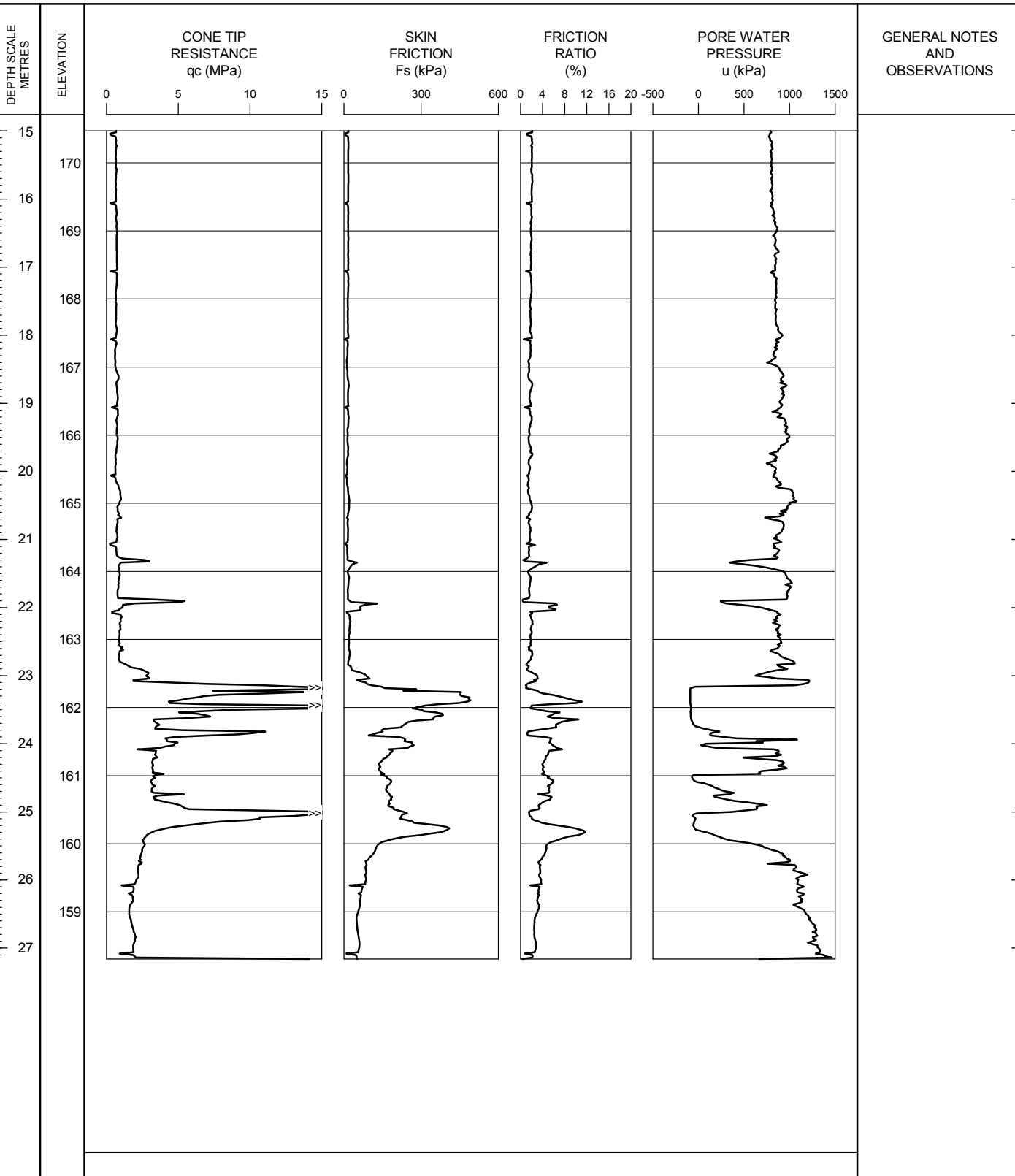
TEST DATE 5/4/2011 - 5/4/2011

SHEET 2 OF 2

LOCATION N4678195.2; 334595.9

DATUM Geodetic

GROUND SURFACE ELEVATION: 185.5 PREDRILL DEPTH: 4.9 CORRECTION FACTOR A: 0.8 CORRECTION FACTOR B: 0



OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT B13-1

METRIC

PROJECT Windsor-Essex Parkway

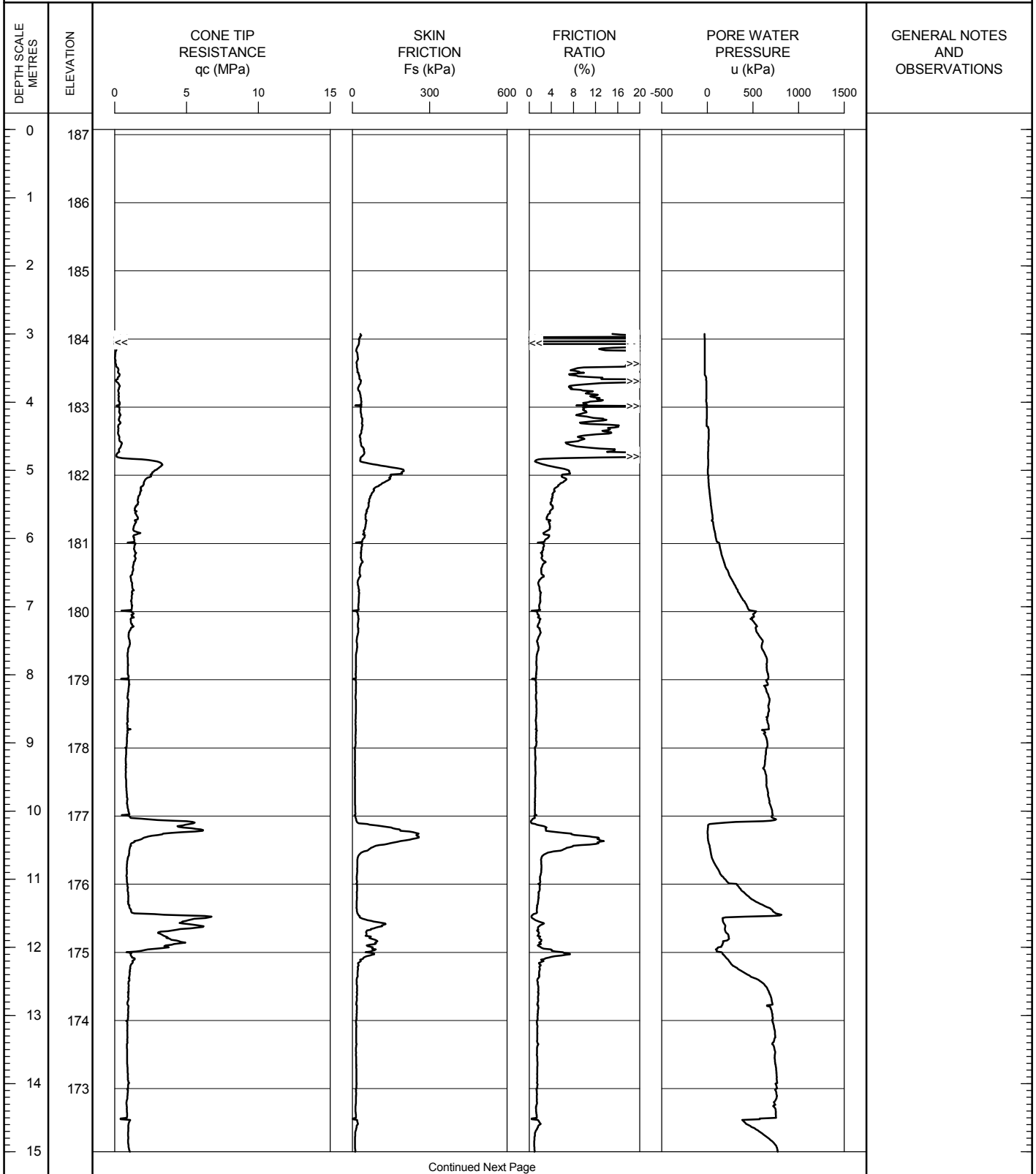
TEST DATE 8/5/2011 - 8/5/2011

SHEET 1 OF 2

LOCATION N4677554.4; E335553.0

DATUM Geodetic

GROUND SURFACE ELEVATION: 187.1 PREDRILL DEPTH: 3 CORRECTION FACTOR A: 0.8 CORRECTION FACTOR B: 0



OPERATOR: TA

CHECKED: DD

RECORD OF CONE PENETRATION TEST CPT B13-1

METRIC

PROJECT Windsor-Essex Parkway

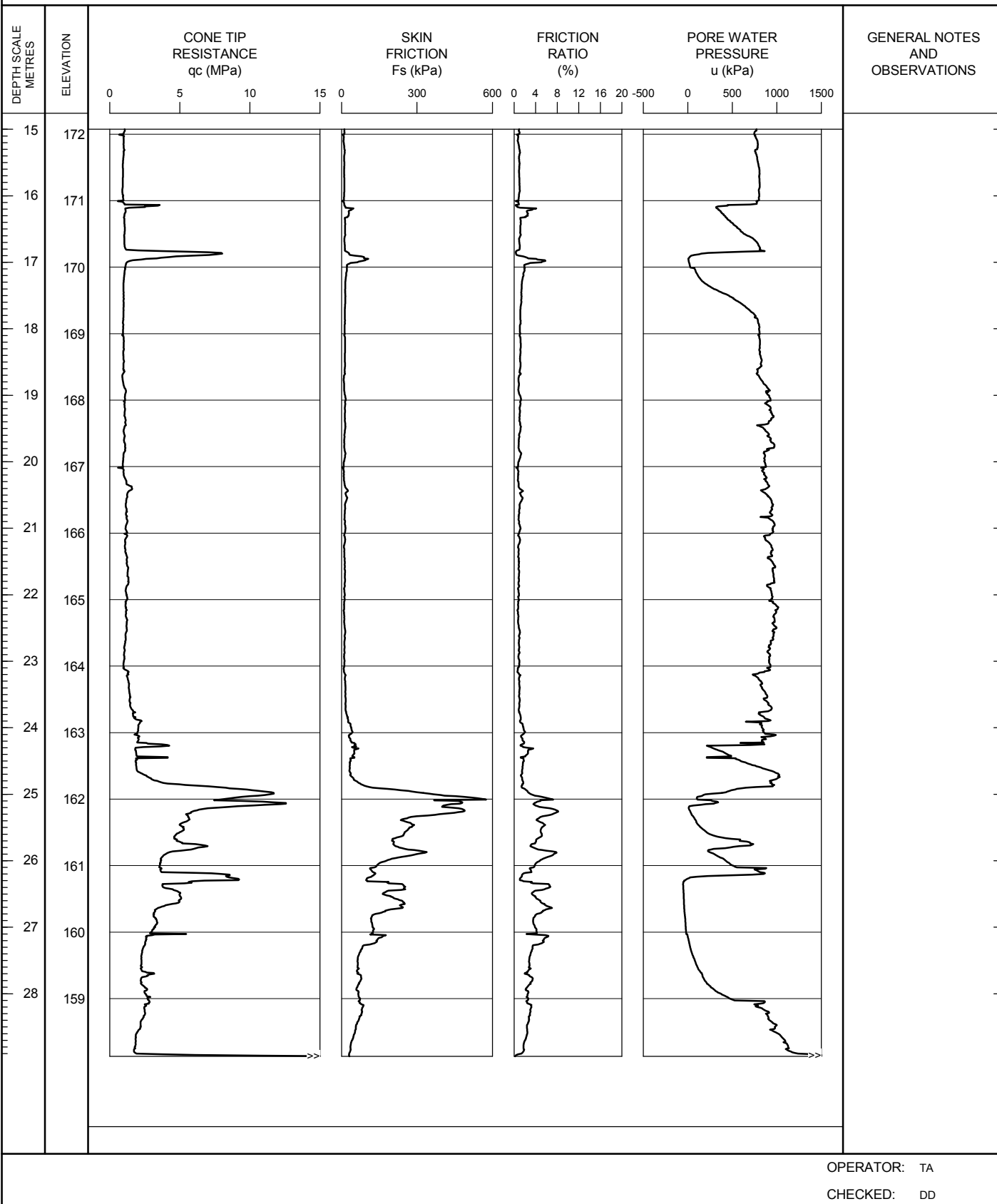
TEST DATE 8/5/2011 - 8/5/2011

SHEET 2 OF 2

LOCATION N4677554.4; E335553.0

DATUM Geodetic

GROUND SURFACE ELEVATION: 187.1 PREDRILL DEPTH: 3 CORRECTION FACTOR A: 0.8 CORRECTION FACTOR B: 0



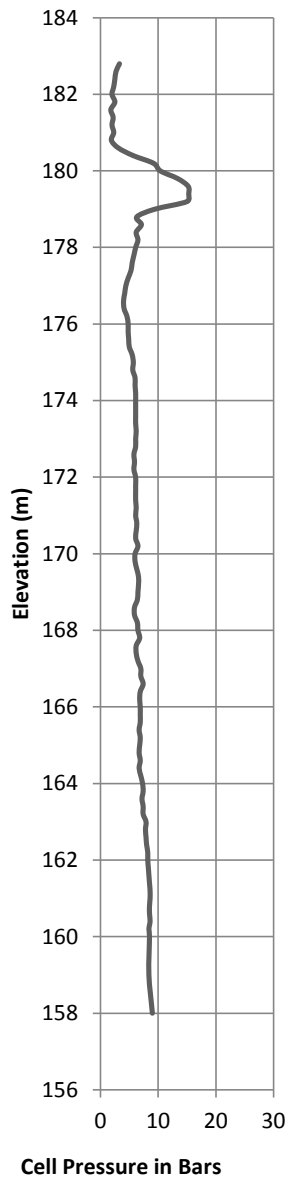
RECORD OF DILATOMETER TEST DMT B9-1

Project : Windsor-Essex Parkway
Location: N 4679242.7; E 332578.4
Ground Surface Elevation : 183.0

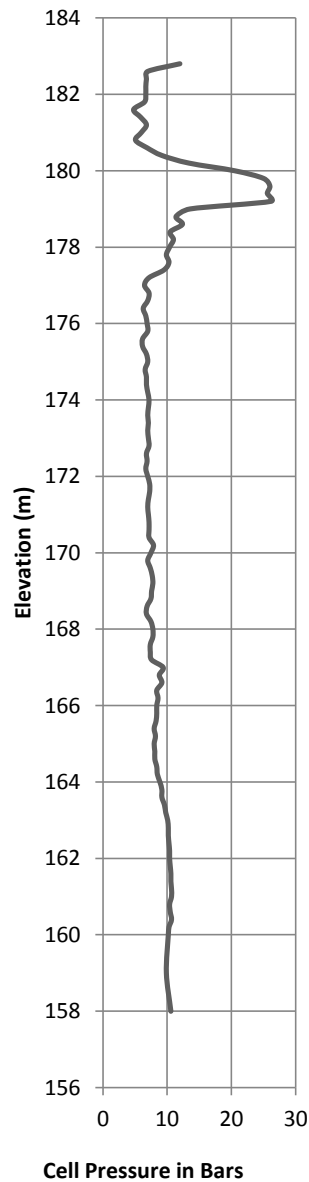
Test Date: 7/16/2011
Predrill Depth : 0.2 m
Delta A: 0.12 Bar

Sheet 1 of 1
Datum Geodetic
Delta B: 0.23 Bar

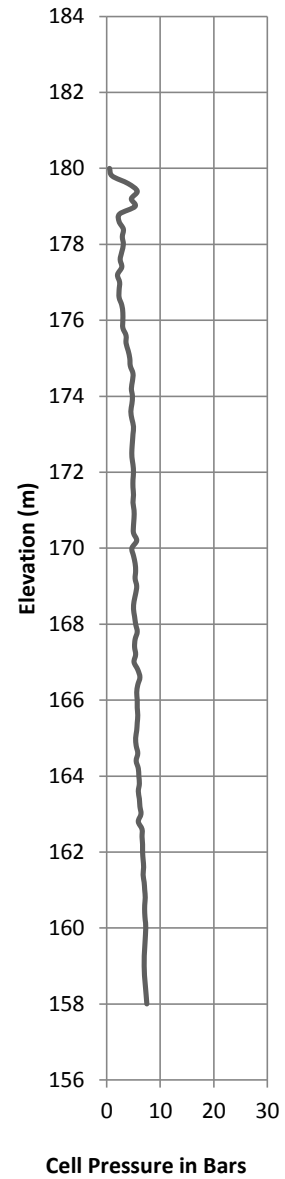
Reading A



Reading B



Reading C



Operator: LC

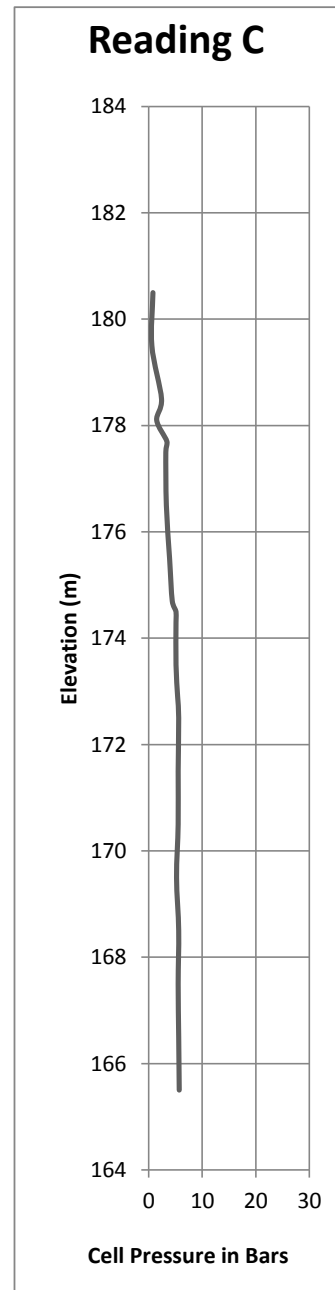
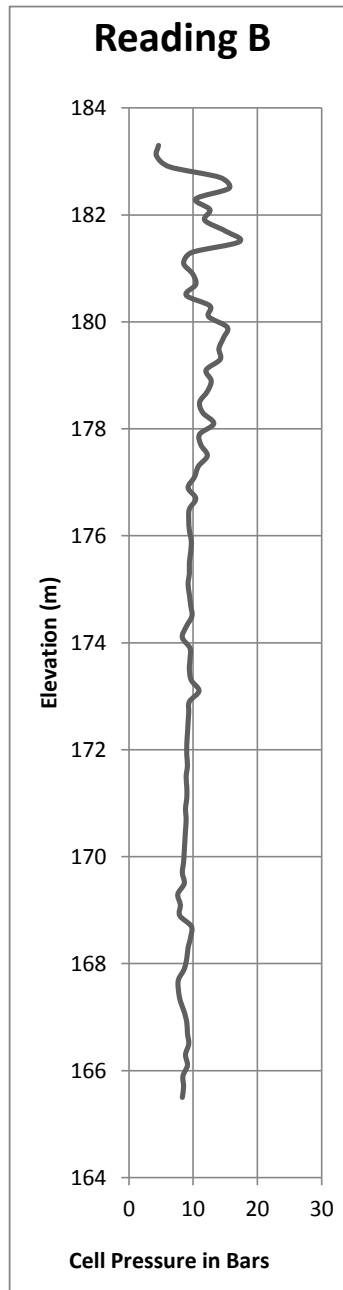
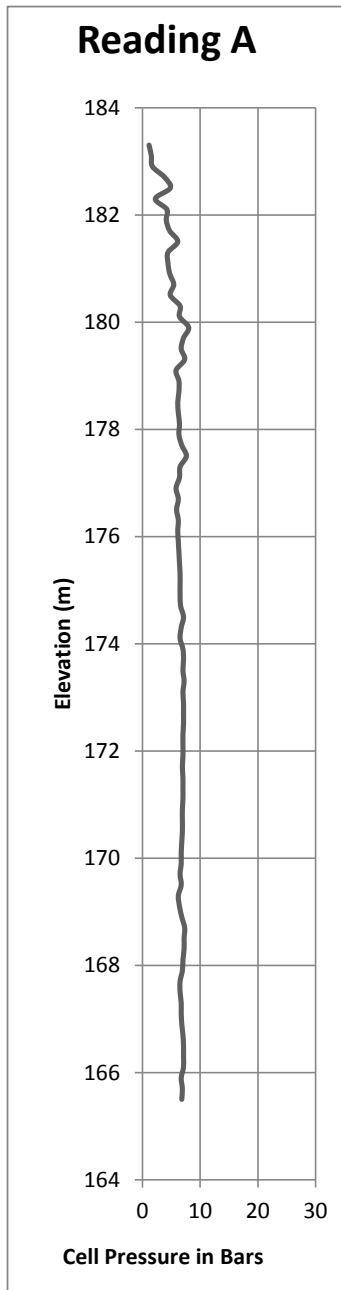
Checked: DD

RECORD OF DILATOMETER TEST DMT B9-2

Project : Windsor-Essex Parkway
Location: N 4679144.8; E 332687.7
Ground Surface Elevation : 183.5

Test Date: 7/18/2011
Predrill Depth : 0.2 m
Delta A: 0.14 Bar

Sheet 1 of 1
Datum Geodetic
Delta B: 0.19 Bar



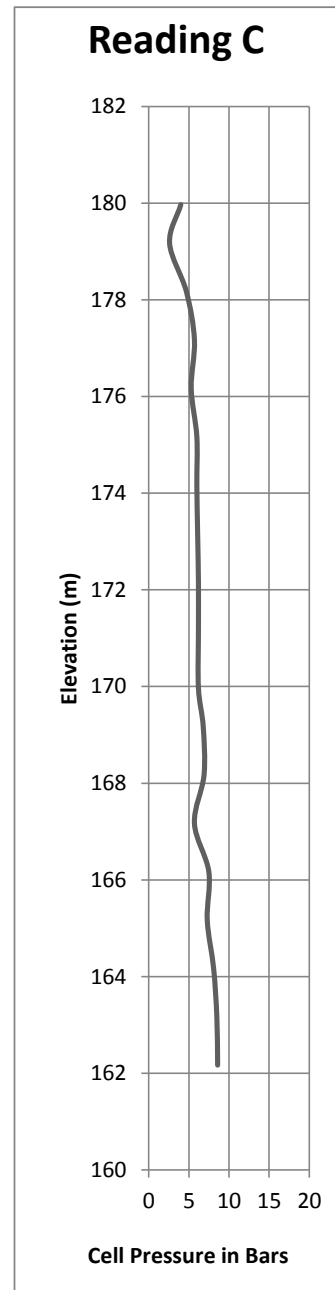
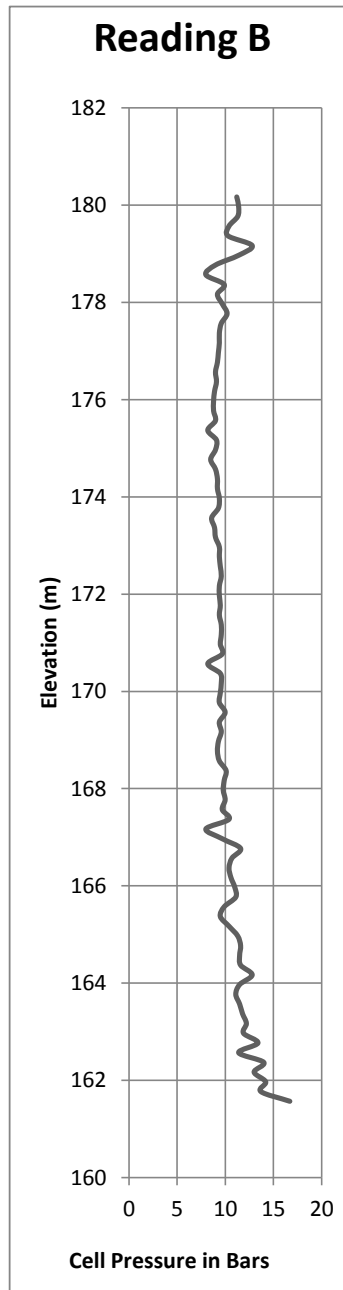
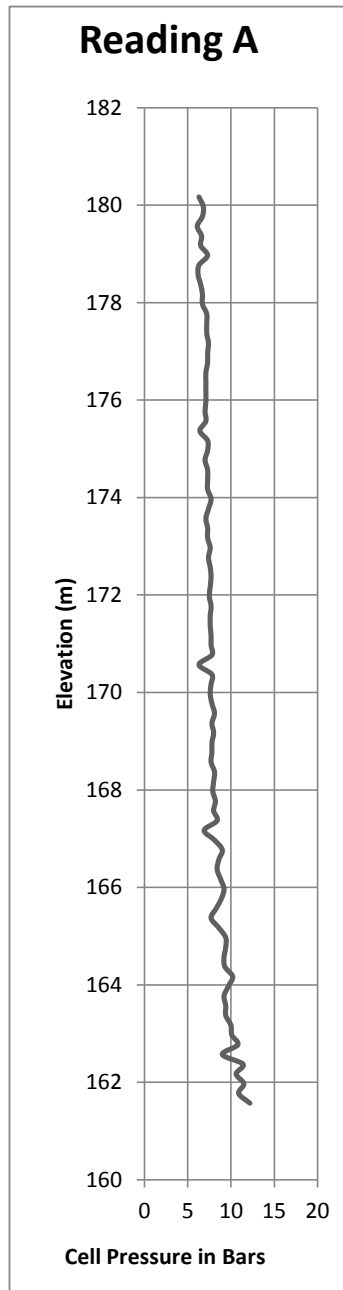
Operator: LC
Checked: DD

RECORD OF DILATOMETER TEST DMT B11-1

Project : Windsor-Essex Parkway
Location: N 4678223.6; E 334579.2
Ground Surface Elevation : 185.2

Test Date: 4/29/2011
Predrill Depth : 5 m
Delta A: 0.18 Bar

Sheet 1 of 1
Datum Geodetic
Delta B: 0.33 Bar



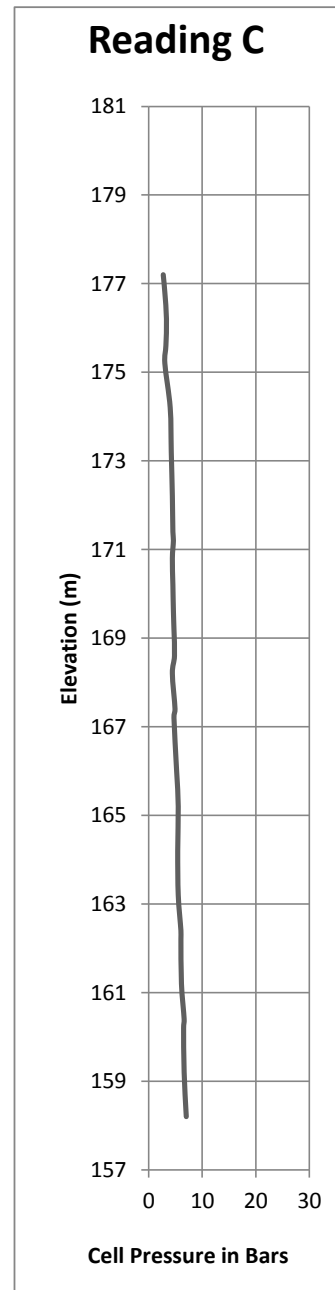
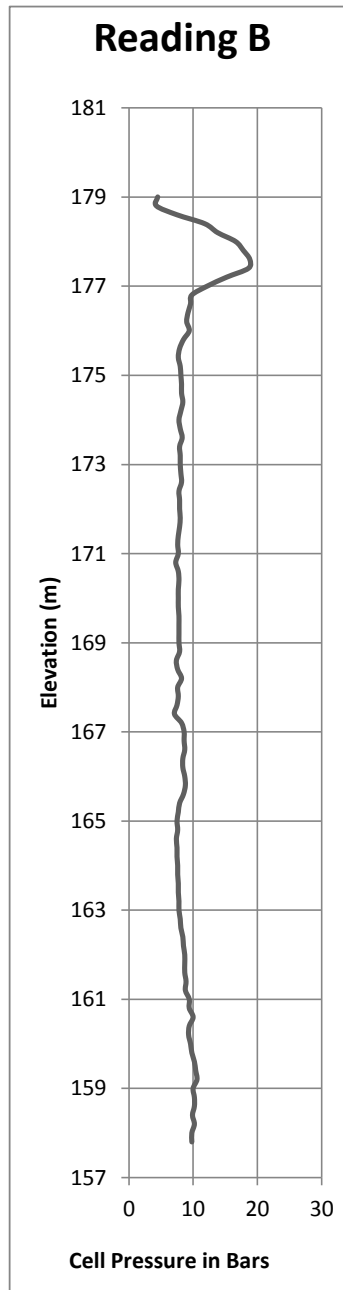
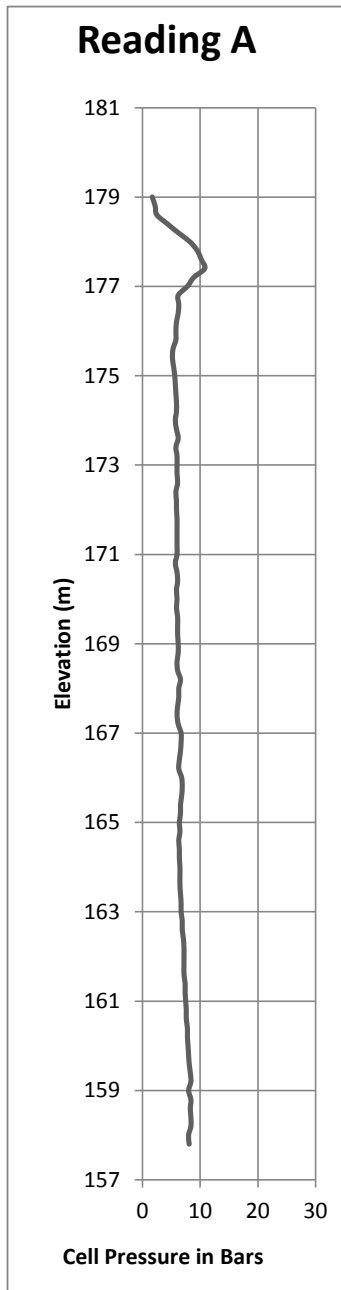
Operator: LC
Checked: DD

RECORD OF DILATOMETER TEST DMT T6-1

Project : Windsor-Essex Parkway
Location: N 4679696.6; E 332057.3
Ground Surface Elevation : 181.2

Test Date: 7/14/2011
Predrill Depth : 2.0 m
Delta A: 0.18 Bar

Sheet 1 of 1
Datum Geodetic
Delta B: 0.22 Bar



Operator: LC

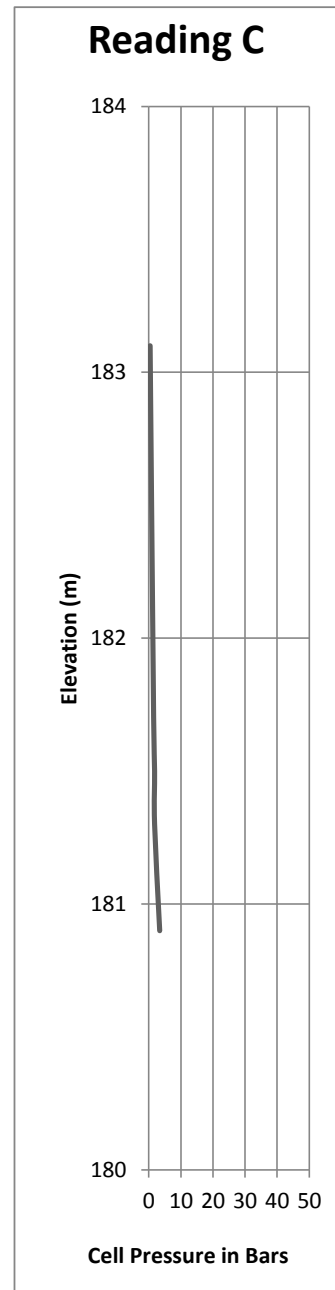
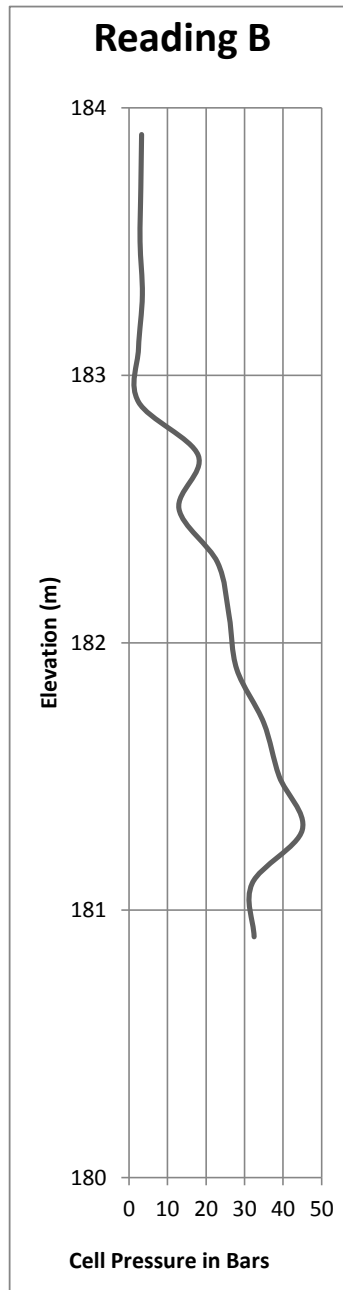
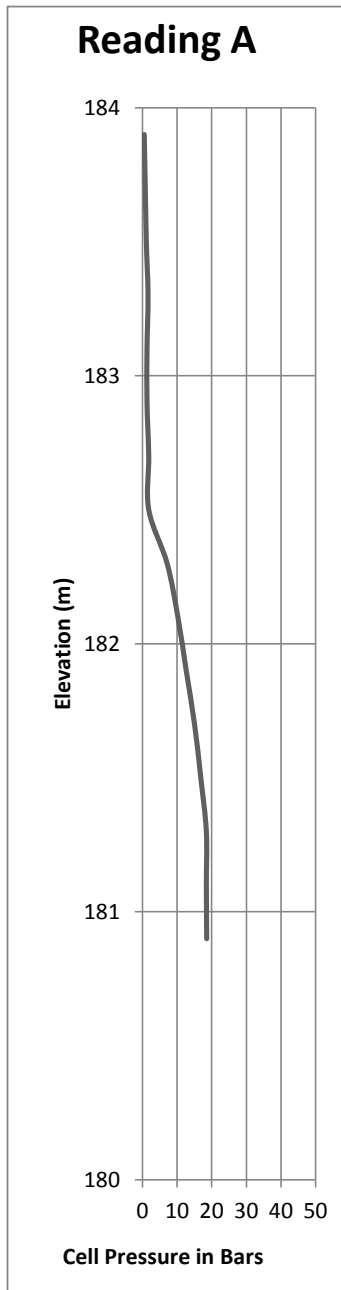
Checked: DD

RECORD OF DILATOMETER TEST DMT T9-1-SHALLOW

Project : Windsor-Essex Parkway
Location: N 4678544.5; E 333900.9
Ground Surface Elevation : 184.1

Test Date: 7/19/2011
Predrill Depth : 0.2 m
Delta A: 0.14 Bar

Sheet 1 of 1
Datum Geodetic
Delta B: 0.22 Bar



Note: DMT refusal at elevation 180.9m .Redrill to elevation 179.5m
Resumed DMT to elevation 162.5m

Operator: LC

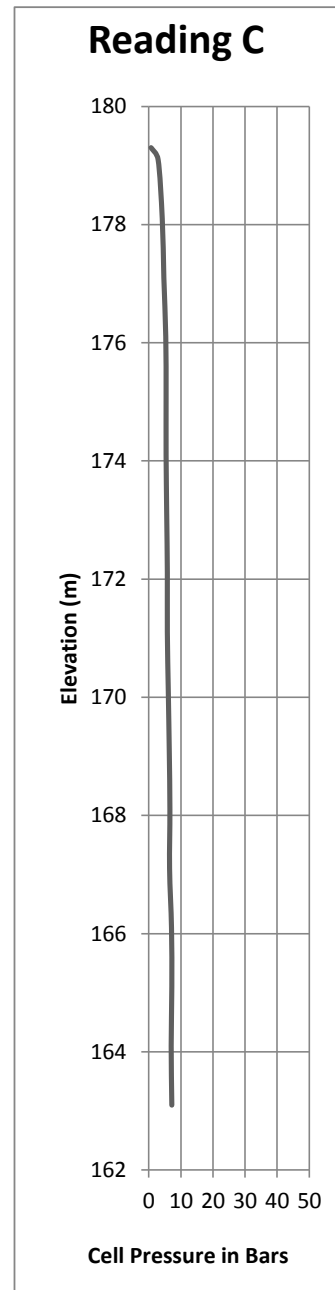
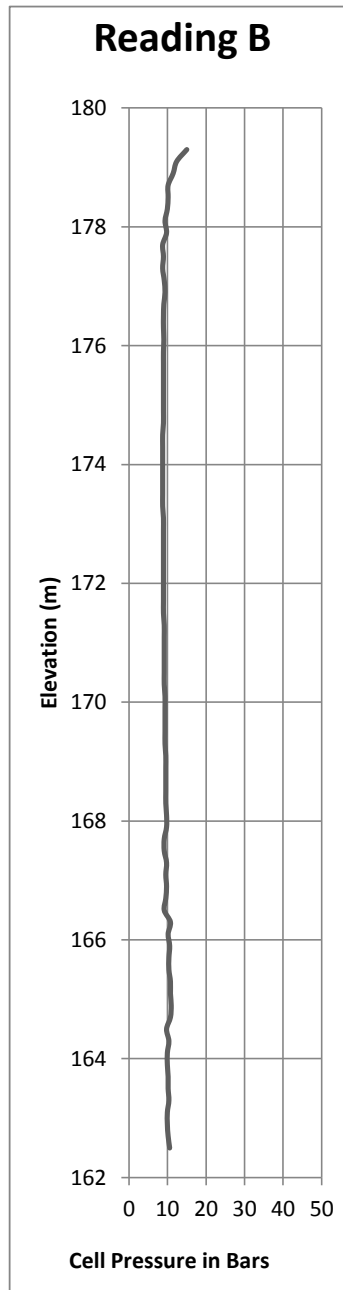
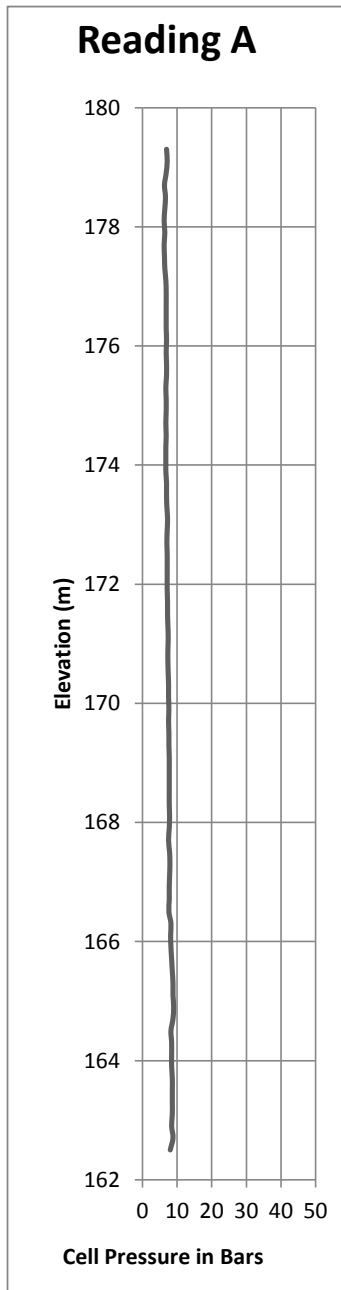
Checked: DD

RECORD OF DILATOMETER TEST DMT T9-1-DEEP

Project : Windsor-Essex Parkway
Location: N 4678544.5; E 333900.9
Ground Surface Elevation : 184.1

Test Date: 7/19/2011
Predrill Depth : 4.6 m
Delta A: 0.10 Bar

Sheet 1 of 1
Datum Geodetic
Delta B: 0.37 Bar



Operator: LC
Checked: DD

Appendix B Borehole and CPT Logs from Pre-Bid Investigations

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 101

1 OF 4

METRIC

W.P.

LOCATION

N 4677606.6 E 335794.9

ORIGINATED BY SM

DIST WEST HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC

DATE

February 29, 2008 - March 5, 2008

CHECKED BY *SSB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
187.37	GROUND SURFACE													
0.00	TOPSOIL, some clay Dark brown													
186.99	SAND AND GRAVEL Brown													
0.46	CLAYEY SILT, some sand, trace gravel, mottled Firm to hard Mottled grey and brown		1	SS	6									
			2	SS	36									
			3	SS	31									
184.47	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Grey		4	SS	16									
2.90			5	SS	13									
			6	SS	10									
			7	SS	9									
			8	SS	7									
			9	SS	7									
			10	TO	PH									
			11	TO	PH									
			12	TO	PH									
172.89	SANDY SILT, some clay, trace gravel Grey													
14.48														

Continued Next Page

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

LDN_MTO_01 07-1130-207-0.GPJ LDN_MTO.GDT 5/29/09

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 101

2 OF 4

METRIC

W.P.

LOCATION

N 4677606.6 E 335794.9

ORIGINATED BY SM

DIST WEST HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC

DATE

February 29, 2008 - March 5, 2008

CHECKED BY *SJS*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
								SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE		WATER CONTENT (%)				
								20 40 60 80 100	10 20 30					
171.37	SANDY SILT, some clay, trace gravel Grey		13	TO	PH		172							(56)
16.00	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Grey						171		1.3					
		14	SS	9	170			2.1					2 27 40 31	
					169									
168.32	CLAYEY SILT, trace sand Stiff Grey				168			1.2						
19.05					167			2.4						
		16	SS	7	166									
					165			1.9						
165.27	CLAYEY SILT, some sand, trace gravel Very stiff Grey				164			(>143.6)						
22.10					163									
					162									
					161									
					160									
					159									
					158									
157.65														
29.72														

Continued Next Page

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

LDN_MTO_01 07-1130-207-0.GPJ LDN_MTO.GDT 5/29/09

RECORD OF BOREHOLE No 101

3 OF 4

METRIC

PROJECT 07-1130-207-0

W.P.

LOCATION

N 4677606.6 :E 335794.9

ORIGINATED BY SM

DIST WEST HWY 401/3

BOREHOLE TYPE POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC

DATE

February 29, 2008 - March 5, 2008

CHECKED BY *SE*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w_p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w_L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100				
	SANDY SILT, trace clay Compact to very dense Grey		23	SS	52		157									0 36 58 6
			24	SS	26		156									
154.61							155									
32.76	SAND AND GRAVEL, trace silt, trace clay Very dense Grey		25	SS	30/100mm		154									
154.05	LIMESTONE, fresh, medium strong, thinly laminated, fine grained, faintly porous Light grey to tan		26	NQ RC			153	98	86	68						
33.32	(FOR DETAILED DESCRIPTIONS REFER TO RECORD OF DRILLHOLE)		27	NQ RC			152	100	100	100						
			28	NQ RC			151	100	95	80						UC
150.31	END OF BOREHOLE															
37.06	Water level in borehole at about elev. 187.0m during drilling between February 29 and March 3, 2008. Water level measured in deep piezometer at elev. 178.15m on March 20, 2008. Water level measured in deep piezometer at elev. 177.69m on July 22, 2008. Water level measured in deep piezometer at elev. 175.99m on September 19, 2008. Water level measured in deep piezometer at elev. 177.26m on November 14, 2008. Water level measured in deep piezometer at elev. 177.39m on January 28, 2009.															

PROJECT: 07-1130-207-0

RECORD OF DRILLHOLE: 101

SHEET 4 OF 4

LOCATION: N 4677606.6 E 335794.9

DRILLING DATE: February 29, 2008 - March 5, 2008

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: —

DRILL RIG: MUD ROTARY WITH HQ TRICONE, NQRC

DRILLING CONTRACTOR: AARDVARK DRILLING INC

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV.	RUN No.	PENETRATION RATE (mm/min)	FLUSH % RETURN	ELEVATION	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conjugate BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular PO - Polished K - Slickensided SM - Smooth Ro - Rough Br - Broken Rock <small>NOTE: For additional abbreviations refer to list of abbreviations & symbols.</small>										NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
				DEPTH (m)					RECOVERY			R.Q.D. %	FRACT INDEX PER 0.3	DISCONTINUITY DATA			ROCK STRENGTH INDEX		WEATH- ERING INDEX																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
									TOTAL CORE %	SOLID CORE %	DIP w.r.t CORE AXIS			TYPE AND SURFACE DESCRIPTION	R1	R2	R3	R4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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DEPTH SCALE

1 : 75



LOGGED: SG

CHECKED: SJR

LDN ROCK 03 07-1130-207-0-ROCK.GPJ GLDR LDN.GDT 6/29/09 DATA INPUT: WDF

RECORD OF BOREHOLE No 101A

1 OF 1

METRIC

PROJECT 07-1130-207-0

W.P.

LOCATION

N 4677606.6 E 335794.9

ORIGINATED BY SM

DIST WEST HWY 401/3

BOREHOLE TYPE POWER AUGER, HOLLOW STEM

COMPILED BY BRS

DATUM GEODETIC

DATE

March 5, 2008

CHECKED BY *SB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
187.37	SOIL CONDITIONS INFERRED FROM BOREHOLE No. 101 GROUND SURFACE													
0.00	TOPSOIL, some clay Dark brown													
186.99	SAND AND GRAVEL Brown													
0.46	CLAYEY SILT, some sand, trace gravel, mottled Firm to hard Mottled grey and brown													
164.47	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Grey													
2.90														
178.23	END OF BOREHOLE													
9.14	Water level measured in shallow piezometer at elev. 186.30m on March 20, 2008.													
	Water level measured in shallow piezometer at elev. 185.77m on July 22, 2008.													
	Water level measured in shallow piezometer at elev. 185.41m on September 19, 2008.													
	Water level measured in shallow piezometer at elev. 185.86m on January 26, 2009.													

LDN.MTO.01 07-1130-207-0.GPJ LDN.MTO.GDT 6/29/09

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 102

2 OF 4

METRIC

W.P.

LOCATION

N 4677631 8 E 335512.7

ORIGINATED BY SM

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM

GEODETIC

DATE

March 25, 2008 - March 28, 2008

CHECKED BY *SB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Grey		15	SS	10		171							0 24 43 33
			16	TO	PH		170							
			17	TO	PH		169							
			18	TO	PH		168							
			19	TO	PH		167							
			20	SS	19		166							
			21	TO	PH		165							
			22	SS	21		164							
			23	SS	85		163							
			24	SS	60		162							
							161							
							160							
							159							
							158							
							157							
159.93	SANDY SILT, trace clay Very dense Grey													
26.67														
157.41	CLAYEY SILT, some sand, trace gravel Hard Grey													
29.19														
156.88														
29.72														

LDN_MTO_01_07-1130-207-0.GPJ LDN_MTO.GDT 6/29/09

Continued Next Page

+ 3, x 3, Numbers refer to Sensitivity O 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No 102

3 OF 4

METRIC

PROJECT 07-1130-207-0

W.P.

LOCATION

N 4677631.8 E 335512.7

ORIGINATED BY SM

DIST WEST HWY 401/3

BOREHOLE TYPE POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC

DATE

March 25, 2008 - March 28, 2008

CHECKED BY *SLP*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100			
155.40	SILTY CLAY, some sand, trace gravel Very stiff Grey		25	TO	PH		156								
31.20	CLAYEY SILT, some sand, trace gravel Very stiff Grey						155								
154.58	LIMESTONE, fresh, medium strong, thinly laminated, fine grained, faintly porous Brown to grey		26	SS	110/13mm		154								
32.02	(FOR DETAILED DESCRIPTIONS REFER TO RECORD OF DRILLHOLE)		27	NQ RC			153								
			28	NQ RC			152								
			29	NQ RC			151								
150.28	END OF BOREHOLE														
36.32	Borehole dry during drilling between March 25 and 28, 2008 Water level measured in deep piezometer at elev. 177.91m on July 22, 2008. Water level measured in deep piezometer at elev. 175.88m on September 19, 2008. Water level measured in deep piezometer at elev. 177.26m on November 14, 2008. Water level measured in deep piezometer at elev. 177.00m on January 28, 2009.														

PROJECT: 07-1130-207-0

RECORD OF DRILLHOLE: 102

SHEET 4 OF 4

LOCATION: N 4677631.8 :E 335512.7

DRILLING DATE: March 25, 2008 - March 28, 2008

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: —

DRILL RIG: MUD ROTARY WITH HQ TRICONE, NQRC

DRILLING CONTRACTOR: AARDVARK DRILLING INC

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV.		RUN No.	PENETRATION RATE (m/min)	COLOUR (m/min)	FLUSH % RETURN	ELEVATION	RECOVERY				R.Q.D. %	FRACT INDEX PER 0.3	DISCONTINUITY DATA				HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL PORT LOAD INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
				DEPTH (m)	ELEVATION						TOTAL CORE %	SOLID CORE %	DIP w/1 CORE AXIS	TYPE AND SURFACE DESCRIPTION			10°	15°	20°	30°																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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DEPTH SCALE

1:75



LOGGED: SG

CHECKED: SJB

RECORD OF BOREHOLE No 102A

1 OF 1

METRIC

PROJECT 07-1130-207-0

W.P.

LOCATION

N 4677631 8 E 335512.7

ORIGINATED BY SM

DIST WEST HWY 401/3

BOREHOLE TYPE POWER AUGER, HOLLOW STEM

COMPILED BY BRS

DATUM GEODETIC

DATE

March 28, 2008

CHECKED BY SJB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
186.60	TOPSOIL, clayey Brown													
0.00	FILL, clayey silt, some sand, trace topsoil, trace gravel Firm to stiff Mottled brown and grey													
186.25														
0.35														
185.23	CLAYEY SILT, some sand, trace gravel, with silt seams Hard Brown													
1.37														
182.94	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Grey													
3.66														
177.46	END OF BOREHOLE													
9.14	Water level measured in shallow piezometer at elev. 184.97m on July 22, 2008. Water level measured in shallow piezometer at elev. 184.44m on September 19, 2008. Water level measured in shallow piezometer at elev. 184.56m on January 28, 2009.													

LDN_MTO_01_07-1130-207-0.GPJ LDN_MTO.GDT 6/29/09

RECORD OF BOREHOLE No 107

1 OF 4

METRIC

PROJECT 07-1130-207-0

W.P.

LOCATION

N 4677973.1 E 334961.3

ORIGINATED BY MA

DIST WEST HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

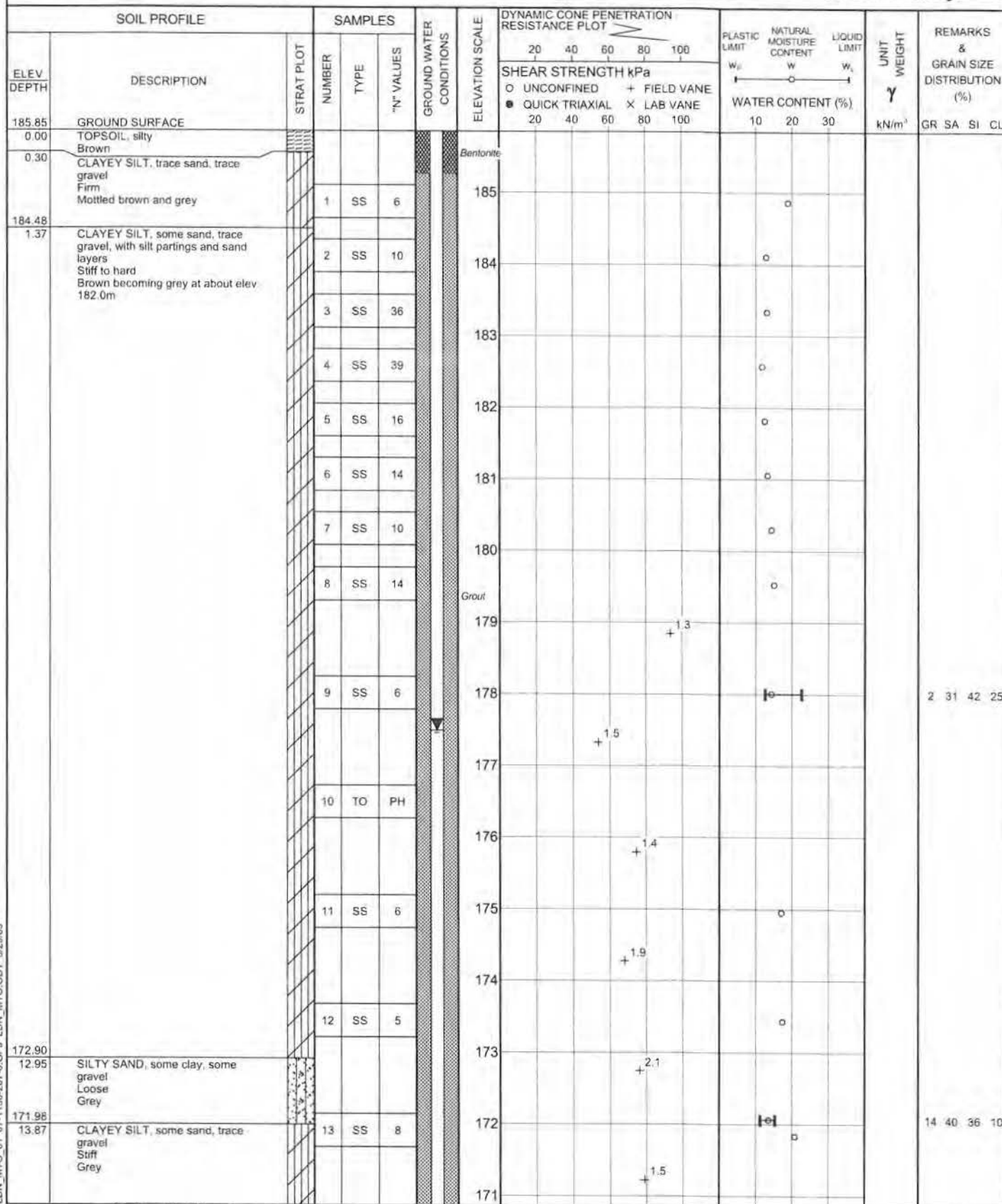
COMPILED BY BRS

DATUM GEODETIC

DATE

March 14, 2008 - March 19, 2008

CHECKED BY *SSB*



LDN_MTO_01_07-1130-207-0.GPJ LDN_MTO.GDT 6/29/09

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

RECORD OF BOREHOLE No 107

2 OF 4

METRIC

PROJECT 07-1130-207-0

W.P.

LOCATION

N 4677973.1 E 334961.3

ORIGINATED BY MA

DIST WEST HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC

DATE

March 14, 2008 - March 19, 2008

CHECKED BY *SB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
	CLAYEY SILT, some sand, trace gravel Stiff Grey		14	TO	PH		170	16						
			15	SS	5		169							
168.10							168	19						
17.75	SILTY CLAY, some sand, trace gravel Stiff Grey		16	TO	PH		167	29						
			17	SS	5		166							
165.05							165	24						
20.80	CLAYEY SILT, some sand, trace gravel Very stiff Grey		18	SS	6		164							2 20 46 32
			19	TO	PH		163							
			20	TO	PH		162							
			21	SS	17		161							
			22	TO	PH		160							
157.43							159							
28.42	SILTY CLAY, some sand, trace gravel Very stiff Grey		23	SS	12		158							
156.13							157							
29.72							156							

Continued Next Page

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

LDN_MTO_01_07-1130-207-0.GPJ LDN_MTO.GDT 6/29/09

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 107

3 OF 4

METRIC

W.P.

LOCATION

N 4677973.1 E 334961.3

ORIGINATED BY MA

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM

GEODETIC

DATE

March 14, 2008 - March 19, 2008

CHECKED BY *SLB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
155.25	CLAYEY SILT, some sand, trace gravel Very stiff Grey		24	SS	235		155								
30.68	SILTY SAND, trace clay, trace gravel														
154.61	LIMESTONE, weathered Tan and grey		25	NQ											
31.24	LIMESTONE, fresh, medium strong, thinly laminated, fine to medium grained, faintly porous Brown and grey			RC											
	(FOR DETAILED DESCRIPTIONS REFER TO RECORD OF DRILLHOLE)		26	NQ											
				RC											
			27	NQ											
			28	RC											
			29	NQ											
				RC											
			30	NQ											
				RC											
150.95	END OF BOREHOLE		31	NQ											
34.90				RC											
	Borehole dry during drilling between March 14 and 19, 2008.														
	Water level measured in deep piezometer at elev. 177.30m on November 14, 2008.														
	Water level measured in deep piezometer at elev. 177.48m on January 28, 2009.														

+3 X 3

Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 112

2 OF 4

METRIC

W.P.

LOCATION

N 4678413.3 :E 334221.3

ORIGINATED BY SM

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC

DATE

January 29, 2008 - February 12, 2008

CHECKED BY *SJB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
	CLAYEY SILT, trace sand, trace gravel Firm to very stiff Mottled brown and grey becoming grey at about elev. 181.2m		14	TO	PH		169							
			15	TO	PH		168							
			16	TO	PH		167							
			17	TO	PH		166							
			18	TO	PH		165							
			19	TO	PH		164							
			20	TO	PH		163							
			21	SS	6		162							
161.64	SILTY CLAY, trace sand, trace gravel Firm Grey		22	TO	PH		161							
22.94			23	SS	29		160							
158.52	SILT, trace clay Grey						159							
26.06	CLAYEY SILT, trace sand, trace gravel Grey						158							
26.37	SANDY SILT, trace gravel Grey						157							
157.76	CLAYEY SILT, trace sand, trace gravel Very stiff Grey						156							
26.82	SILT, some sand Compact Grey						155							
157.00	CLAYEY SILT, some sand, trace gravel Very stiff Grey													
27.58														
156.36														
28.22														
155.62														
28.96														

Continued Next Page

+ 3 × 3

Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

(85)

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 112

3 OF 4

METRIC

W.P.

LOCATION

N 4678413.3 : E 334221.3

ORIGINATED BY SM

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM

GEODETIC

DATE

January 29, 2008 - February 12, 2008

CHECKED BY *SJB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100			
153.80	CLAYEY SILT, some sand, trace gravel Very stiff Grey		24	SS	28		154								
30.78	SILTY SAND AND GRAVEL, with cobbles and boulders Very dense Grey		25	SS	101/101mm		153								
			26	TO	PH										
152.12	LIMESTONE, fresh, medium strong, thinly laminated to laminated, very fine to medium grained, faintly to moderately porous Light greyish brown		27	SS	101/25mm		152								
32.46	(FOR DETAILED DESCRIPTIONS REFER TO RECORD OF DRILLHOLE)		28	NQ RC			151								
			29	NQ RC			150								
			30	NQ RC			149								
			31	NQ RC			148								
146.39	END OF BOREHOLE						147								
38.19	Water level in borehole at about elev. 158.52m during drilling on February 5, 2008. Water level measured in deep piezometer at elev. 178.28m on February 12, 2008. Water level measured in deep piezometer at elev. 178.38m on March 20, 2008. Water level measured in deep piezometer at elev. 177.93m on July 24, 2008. Water level measured in deep piezometer at elev. 176.25m on September 19, 2008. Water level measured in deep piezometer at elev. 177.54m on November 14, 2008. Water level measured in deep piezometer at elev. 177.72m on January 28, 2009.														

+ 3, X 3

Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

PROJECT: 07-1130-207-0

RECORD OF DRILLHOLE: 112

SHEET 4 OF 4

LOCATION: N 4678413.3, E 334221.3

DRILLING DATE: January 29, 2008 - February 12, 2008

DATUM: GEODETIC

INCLINATION: -90°

AZIMUTH: —

DRILL RIG: MUD ROTARY WITH HQ TRICONE, NQRC

DRILLING CONTRACTOR: AARDVARK DRILLING INC

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV.	RUN No.	PENETRATION RATE (m/min)	COLOUR (m/min)	FLUSH % RETURN	ELEVATION	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conjugate										BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage										PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular										PO - Polished K - Slickensided SM - Smooth Ro - Rough										Br - Broken Rock NOTE: For occasional abbreviations refer to list of abbreviations & symbols	HYDRAULIC CONDUCTIVITY k, cm/sec				DISCONTINUITY DATA				RECOVERY				NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
				DEPTH (m)						TOTAL CORE %	SOLID CORE %	R.O.D. %	FRACT INDEX PER 0.3	DIP w.r.t. CORE AXIS		TYPE AND SURFACE DESCRIPTION		HYDRAULIC CONDUCTIVITY k, cm/sec		DISCONTINUITY DATA		RECOVERY																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
										10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°		10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°		10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°</

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 112A

1 OF 1

METRIC

W.P.

LOCATION

N 4678413.3 E 334221.3

ORIGINATED BY MA

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, HOLLOW STEM

COMPILED BY BRS

DATUM

GEODETTIC

DATE

February 12, 2008

CHECKED BY SJB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
184.58	SOIL CONDITIONS INFERRED FROM BOREHOLE No. 112 GROUND SURFACE													
0.00	TOPSOIL, silty, trace sand, trace organics													
184.18	Brown CLAYEY SILT, trace sand, trace gravel													
0.40	Firm to very stiff Mottled brown and grey becoming grey at about elev. 181.2m													
							184							
							183							
							182							
							181							
							180							
							179							
							178							
							177							
							176							
175.44	END OF BOREHOLE													
9.14	Water level measured in shallow piezometer at elev. 181.94m on March 20, 2008.													
	Water level measured in shallow piezometer at elev. 182.55m on July 24, 2008.													
	Water level measured in shallow piezometer at elev. 182.50m on September 19, 2008.													
	Water level measured in shallow piezometer at elev. 182.39m on January 28, 2009.													

LDN_MTO_01 07-1130-207-0.GPJ LDN_MTO_GDT 2/23/09

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 115

1 OF 4

METRIC

W.P.

LOCATION

N 4678585.3 E 333911.1

ORIGINATED BY MA

DIST WEST HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC

DATE

February 15, 2008 - February 21, 2008

CHECKED BY SJB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
183.79	GROUND SURFACE													
0.00	TOPSOIL, silty Brown													
183.36														
0.43	CLAYEY SILT, some sand, trace gravel Soft to very stiff Brown		1	SS	4		183				o			
			2	SS	22		182				o			
			3	SS	25		181				o			
			4	SS	23		180				o			
180.44														
3.35	CLAYEY SILT, some sand, trace gravel Stiff Grey		5	SS	14		180				o			
			6	SS	12		179				o			
			7	SS	14		178				o			
							177				o			
			8	SS	9		176				o			
							175							
174.80			9	TO	PH		174							
8.99	SANDY SILT, some clay, trace gravel Loose Grey						173							
173.58			10	SS	7		172							
10.21	CLAYEY SILT, some sand, trace gravel Firm Grey						171							
173.12							170							
10.67	SAND, trace gravel, trace silt Loose Grey		11	SS	8		169							
171.90			12	SS	7									
11.89	CLAYEY SILT, some sand, trace gravel Soft to very stiff Grey		13	TO	PH									
			14	SS	6									

LDN_MTO_01 07-1130-207-0.GPJ LDN_MTO.GDT 5/29/08

Continued Next Page

+3, x3. Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 115

2 OF 4

METRIC

W.P.

LOCATION

N 4678585.3 E 333911.1

ORIGINATED BY MA

DIST WEST HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC

DATE

February 15, 2008 - February 21, 2008

CHECKED BY **SLB**

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
	CLAYEY SILT, some sand, trace gravel Soft to very stiff Grey													
			15	SS	4		168							
							167							
			16	TO	PH		166							
							165							
			17	SS	6		164							
							163							
			18	SS	13		162							
							161							
			19	SS	22		160							
							159							
			20	SS	22		158							
							157							
			21	SS	24		156							
							155							
			22	SS	11		154							
			23	TO	PH									
156.21 27.58	SAND, trace sand, trace gravel, trace clay Dense Grey		24	SS	31									1 86 8 5
154.83 28.96	SAND, trace gravel Compact to dense Grey		25	SS	30									

Continued Next Page

+ 3, X 3. Numbers refer to Sensitivity O 3% STRAIN AT FAILURE

LDN_MTO_01_07-1130-207-0.GPJ LDN_MTO.GDT 8/29/09

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 115

3 OF 4

METRIC

W.P.

LOCATION

N 4678585.3 E 333911.1

ORIGINATED BY MA

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC

DATE

February 15, 2008 - February 21, 2008

CHECKED BY **SJB**

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
							20 40 60 80 100	○ UNCONFINED + FIELD VANE					
							20 40 60 80 100	● QUICK TRIAXIAL × LAB VANE					
									10 20 30				
153.31													
30.48	SAND AND GRAVEL, trace silt Dense Grey		26	SS	36		153						
							Grout						25 66 6 3
							152						
151.48													
32.31	LIMESTONE, fresh, medium strong, laminated, fine grained Light grey		27	SS	100/ 25mm		151						
	(FOR DETAILED DESCRIPTIONS REFER TO RECORD OF DRILLHOLE)						Bentonite						
			28	NQ RC			150	96 90 86					
							149						
			29	NQ RC			148	100 100 100					
							147	100 97 86					
146.15			30	NQ RC			147						UC
37.64	END OF BOREHOLE												
	Water level in borehole at about elev. 156.19m during drilling on February 21, 2008.												
	Water level measured in deep piezometer at elev. 178.00m on February 21, 2008.												
	Water level measured in deep piezometer at elev. 178.10m on March 20, 2008.												
	Water level measured in deep piezometer at elev. 177.69m on July 24, 2008.												
	Water level measured in deep piezometer at elev. 175.99m on September 19, 2008.												
	Water level measured in deep piezometer at elev. 177.25m on November 14, 2008.												
	Water level measured in deep piezometer at elev. 177.35m on January 28, 2009.												

LOCATION: N 4678585.3 E 333911.1

DRILLING DATE: February 15, 2008 - February 21, 2008

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: —

DRILL RIG: MUD ROTARY WITH HQ TRICONE, NQRC

DRILLING CONTRACTOR: AARDVARK DRILLING INC

[illegible]

DEPTH SCALE

1:75

LOGGED: SG

CHECKED: SJB

PROJECT 07-1130-207-G

RECORD OF BOREHOLE No 115A

1 OF 2

METRIC

W.P.

LOCATION

N 4678585.3 E 333911.1

ORIGINATED BY MA

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

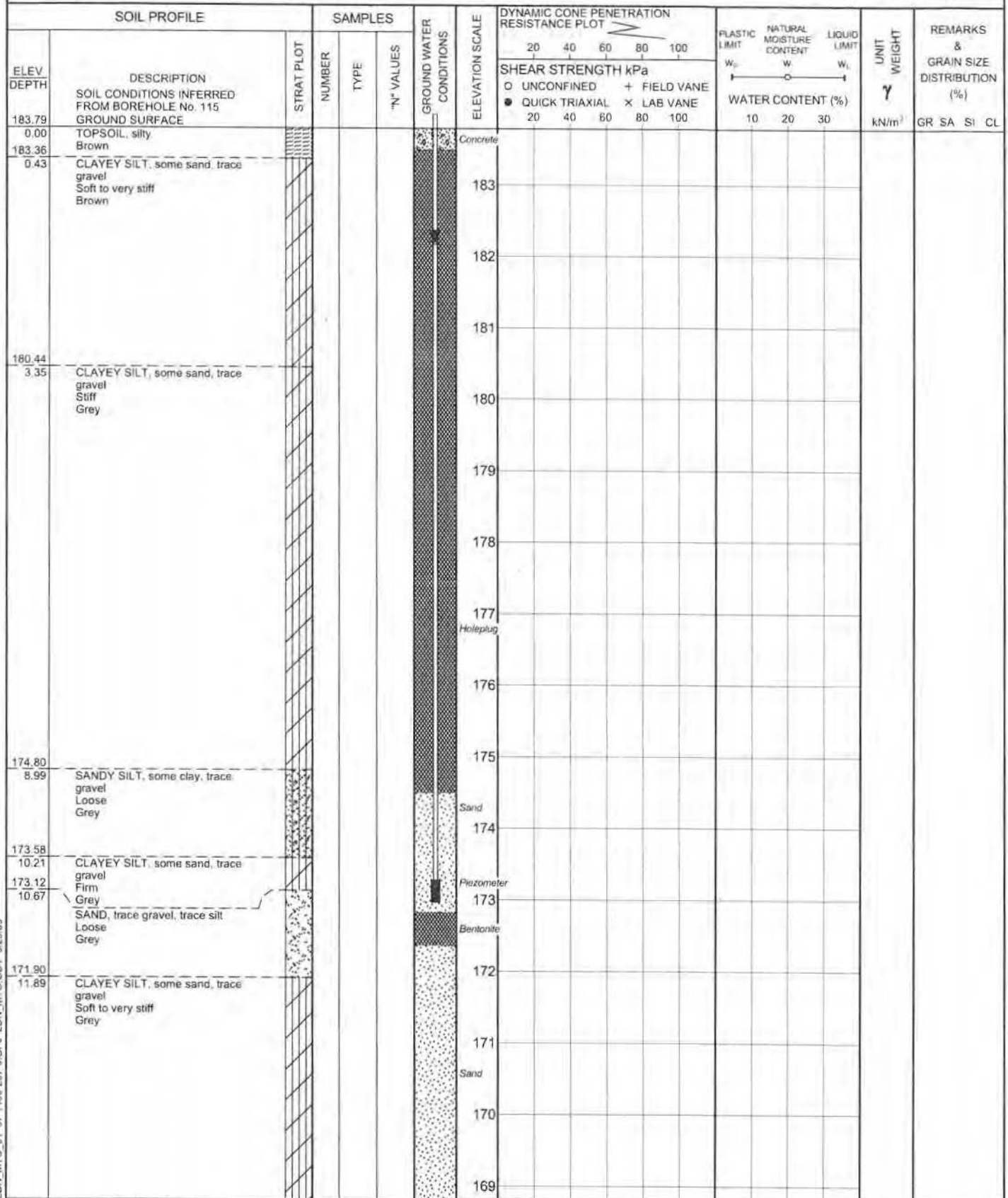
COMPILED BY BRS

DATUM GEODETIC

DATE

February 20, 2008 - February 21, 2008

CHECKED BY SDB



Continued Next Page

+ 3 × 3

Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 119

1 OF 4

METRIC

W.P.

LOCATION

N 4678961.6; E 333120.6

ORIGINATED BY SM

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETTIC

DATE

February 12, 2008 - February 20, 2008

CHECKED BY SJS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
182.50	GROUND SURFACE													
0.00	TOPSOIL, clayey Black													
0.15	CLAYEY SILT, some sand Brown													
181.74														
0.76	CLAYEY SILT, trace sand, trace gravel, trace organics Firm to stiff Mottled brown and grey		1	SS	6		182							
			2	SS	13		181							
180.37			3	SS	31		180							
2.13	CLAYEY SILT, some sand, trace gravel Firm to hard Mottled brown and grey becoming grey at about elev 178.6m		4	SS	32		179							
			5	SS	23		178							
			6	SS	14		177							
			7	SS	10		176							
			8	TO	PH		175							
			9	TO	PH		174							
			10	SS	7		173							
			11	TO	PH		172							
			12	SS	9		171							
			13	TO	PH		170							
167.74							169							
14.76							168							

Continued Next Page

+ 3, X 3

Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

LDN MTO 01 07-1130-207-0.GPJ LDN MTO.GDT 6/29/09

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 119

2 OF 4

METRIC

W.P.

LOCATION

N 4678961.6 E 333120.6

ORIGINATED BY SM

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

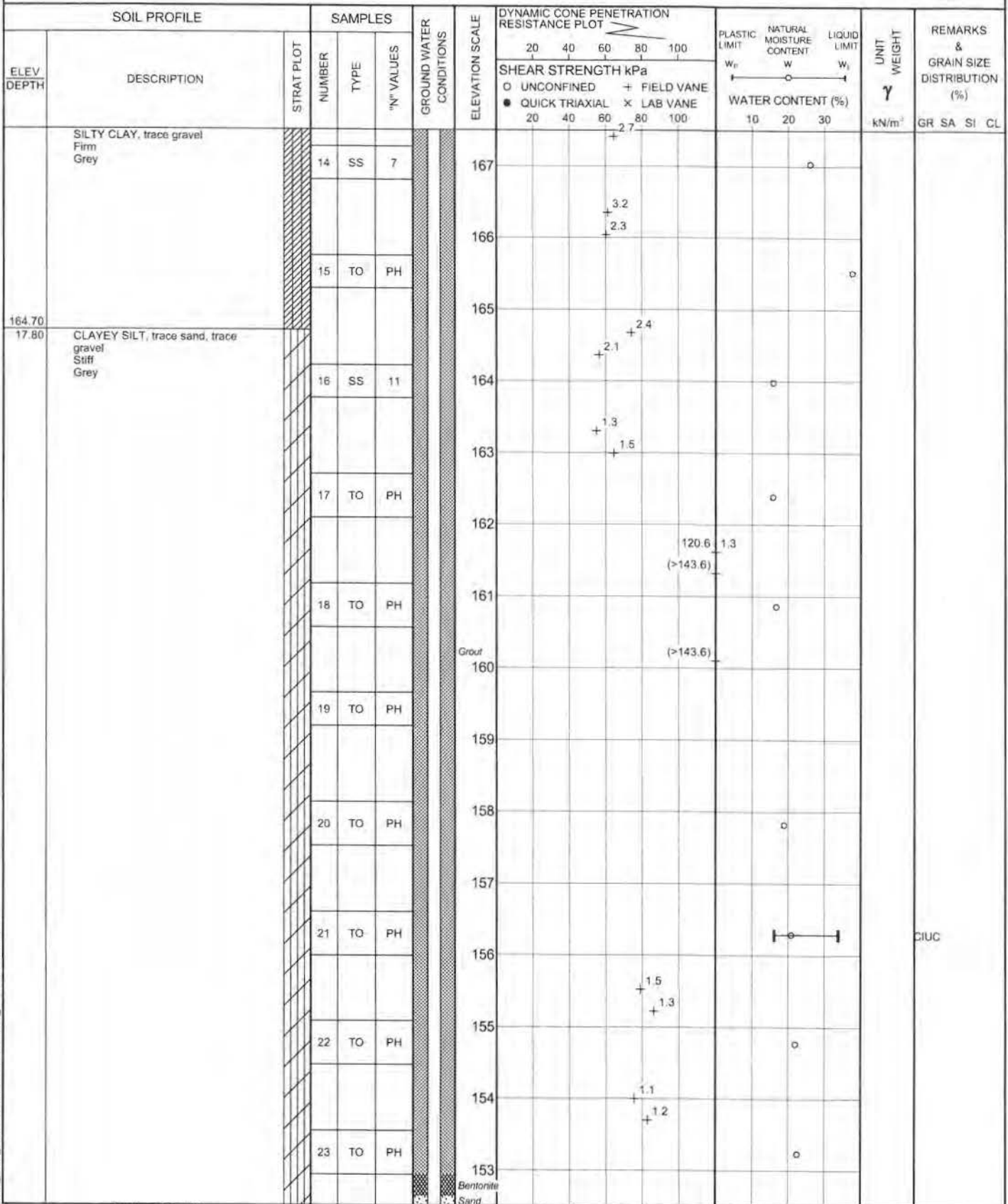
COMPILED BY BRS

DATUM GEODETIC

DATE

February 12, 2008 - February 20, 2008

CHECKED BY *SJB*



Continued Next Page

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

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 119

3 OF 4

METRIC

W.P.

LOCATION

N 4578961.6 E 333120.6

ORIGINATED BY SM

DIST WEST HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC

DATE

February 12, 2008 - February 20, 2008

CHECKED BY *SB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100			
	CLAYEY SILT, trace sand, trace gravel Silt Grey		24	TO	PH		152								
151.18							Screen								
31.32	SAND AND GRAVEL (Possible glacial till or weathered rock)		25	SS	50/0mm		151								
150.40			26	NQ RC			150	48	44	44					
32.10	LIMESTONE, fresh, medium strong, thinly laminated to laminated, very fine to fine grained, faintly porous to porous, light grey (FOR DETAILED DESCRIPTIONS REFER TO RECORD OF DRILLHOLE)		27	NQ RC			149	95	91	89					
			28	NQ RC			147	100	100	100					
			29	NQ RC			146	67	53	55					
145.54															
36.96	END OF BOREHOLE Borehole dry during drilling on February 19, 2008. Water level measured in deep piezometer at elev. 178.18m on March 20, 2008. Water level measured in deep piezometer at elev. 177.78m on July 22, 2008. Water level measured in deep piezometer at elev. 178.85m on August 11, 2008. Water level measured in deep piezometer at elev. 176.03m on September 19, 2008. Water level measured in deep piezometer at elev. 177.16m on November 11, 2008. Water level measured in deep piezometer at elev. 177.45m on January 28, 2009.														

+ 3, x 3

Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

PROJECT: 07-1130-207-0

RECORD OF DRILLHOLE: 119

SHEET 4 OF 4

LOCATION: N 4678961.6 E 333120.6

DRILLING DATE: February 12, 2008 - February 19, 2008

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: —

DRILL RIG: MUD ROTARY WITH HQ TRICONE, NQRC

DRILLING CONTRACTOR: AARDVARK DRILLING INC.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV.		RUN No	PENETRATION RATE (mm/min)	FLUSH % RETURN	ELEVATION	LEGEND										DIAMETRAL POINT LOAD INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
				DEPTH (m)	ELEVATION					RECOVERY		R.Q.D. %	FRACT INDEX PER 0.3 m	DISCONTINUITY DATA		HYDRAULIC CONDUCTIVITY k, cm/sec																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
										TOTAL CORE %	SOLID CORE %			TYPE AND SURFACE DESCRIPTION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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DEPTH SCALE

1 : 75



LOGGED: SG

CHECKED: SJB

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 122

1 OF 4

METRIC

W.P.

LOCATION

N 4679265.4 E 332537.9

ORIGINATED BY SM

DIST WEST HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

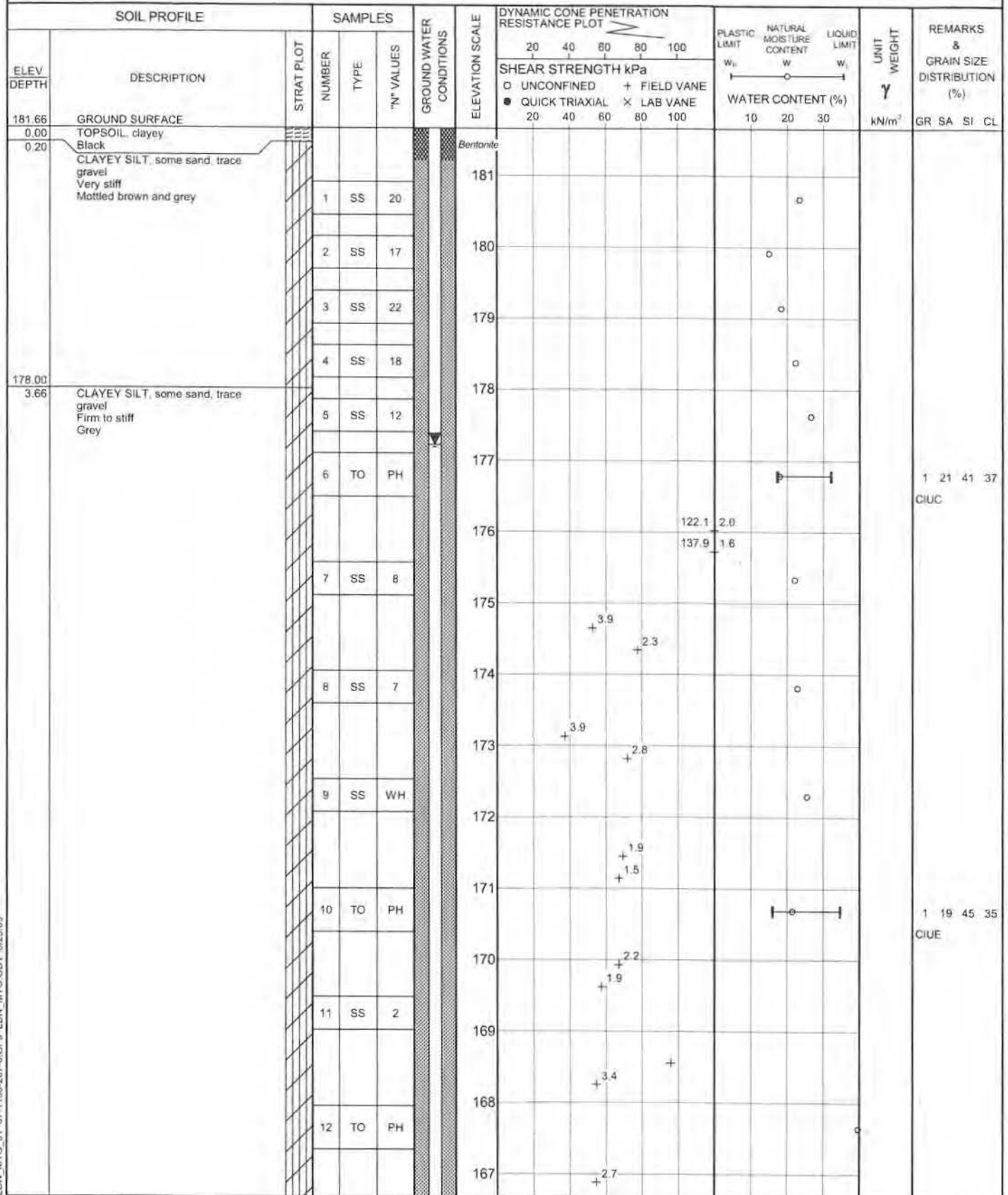
COMPILED BY BRS

DATUM GEODETIC

DATE

January 24, 2008 - January 29, 2008

CHECKED BY *SSS*



Continued Next Page

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

LDN MTO_01_07-1130-207-0.GPJ LDN MTO.GDT 8/29/09

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 122

2 OF 4

METRIC

W.P.

LOCATION

N 4679265.4 E 332537.9

ORIGINATED BY SM

DIST WEST HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

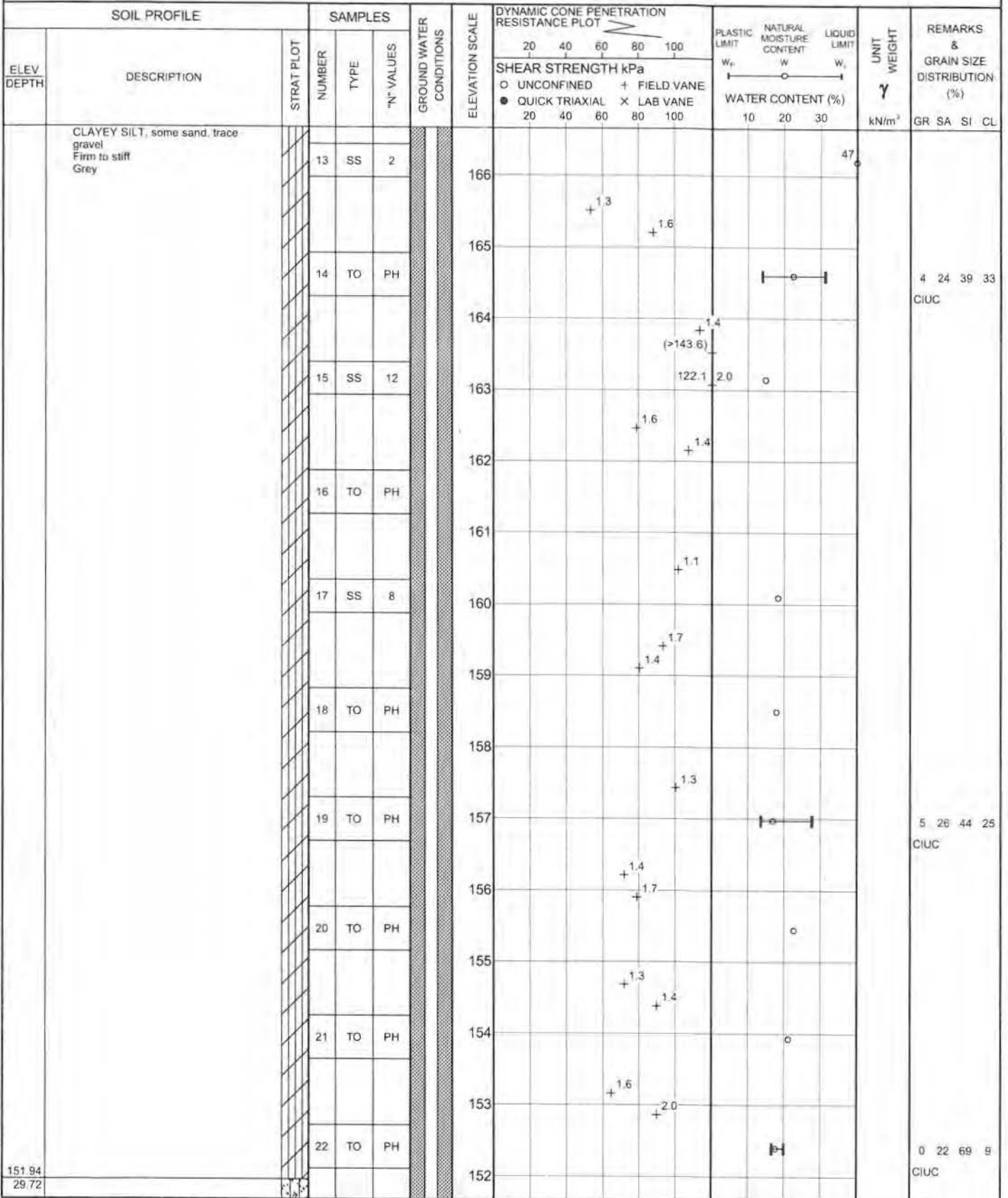
COMPILED BY BRS

DATUM GEODETIC

DATE

January 24, 2008 - January 29, 2008

CHECKED BY SJB



LDN MTO_01 07-1130-207-0.GPJ LDN MTO.GDT 6/29/09

Continued Next Page

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

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 122

3 OF 4

METRIC

W.P.

LOCATION

N 4679265.4 E 332537.9

ORIGINATED BY SM

DIST

WEST HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM

GEODETIC

DATE

January 24, 2008 - January 29, 2008

CHECKED BY *SJS*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
150.42	SILTY SAND, fine to medium, trace clay Compact Grey		23	SS	13		151								(29)
31.24	SANDY SILT, trace clay, with clayey silt intrusions Very dense Grey		24	SS	84		150								
			25	SS	100/12.5mm		149								
146.61	LIMESTONE, fresh, medium strong, thinly laminated to laminated, very fine to fine grained, faintly to strongly porous Brown to grey (FOR DETAILED DESCRIPTIONS REFER TO RECORD OF DRILLHOLE)		26	SS	50/3.8mm		148								
35.05			27	NQ RC			147								
			28	NQ RC			146	100	100	73					
			29	NQ RC			145	90	90	60					
			30	NQ RC			144	100	100	100					
141.33	END OF BOREHOLE						143								
40.33	Borehole dry during drilling between January 24 and 29, 2008. Water level measured in deep piezometer at elev. 178.01m on July 22, 2008. Water level measured in deep piezometer at elev. 178.26m on August 11, 2008. Water level measured in deep piezometer at elev. 178.26m on September 19, 2008. Water level measured in deep piezometer at elev. 177.54m on November 11, 2008. Water level measured in deep piezometer at elev. 177.21m on January 28, 2009.						142	93	93	93					UC

+ 3, x 3

Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

LOCATION: N 4679265.4 E 332537.9

DRILLING DATE: January 24, 2008 - January 29, 2008

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: —

DRILL RIG: MUD ROTARY WITH HQ TRICONE, NQRC

DRILLING CONTRACTOR: AARDVARK DRILLING INC

[illegible]

DEPTH SCALE

1:75

LOGGED: SG

CHECKED: 5/13

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 127

1 OF 4

METRIC

W.P.

LOCATION

N 4679370.9 E 332251.6

ORIGINATED BY SM

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

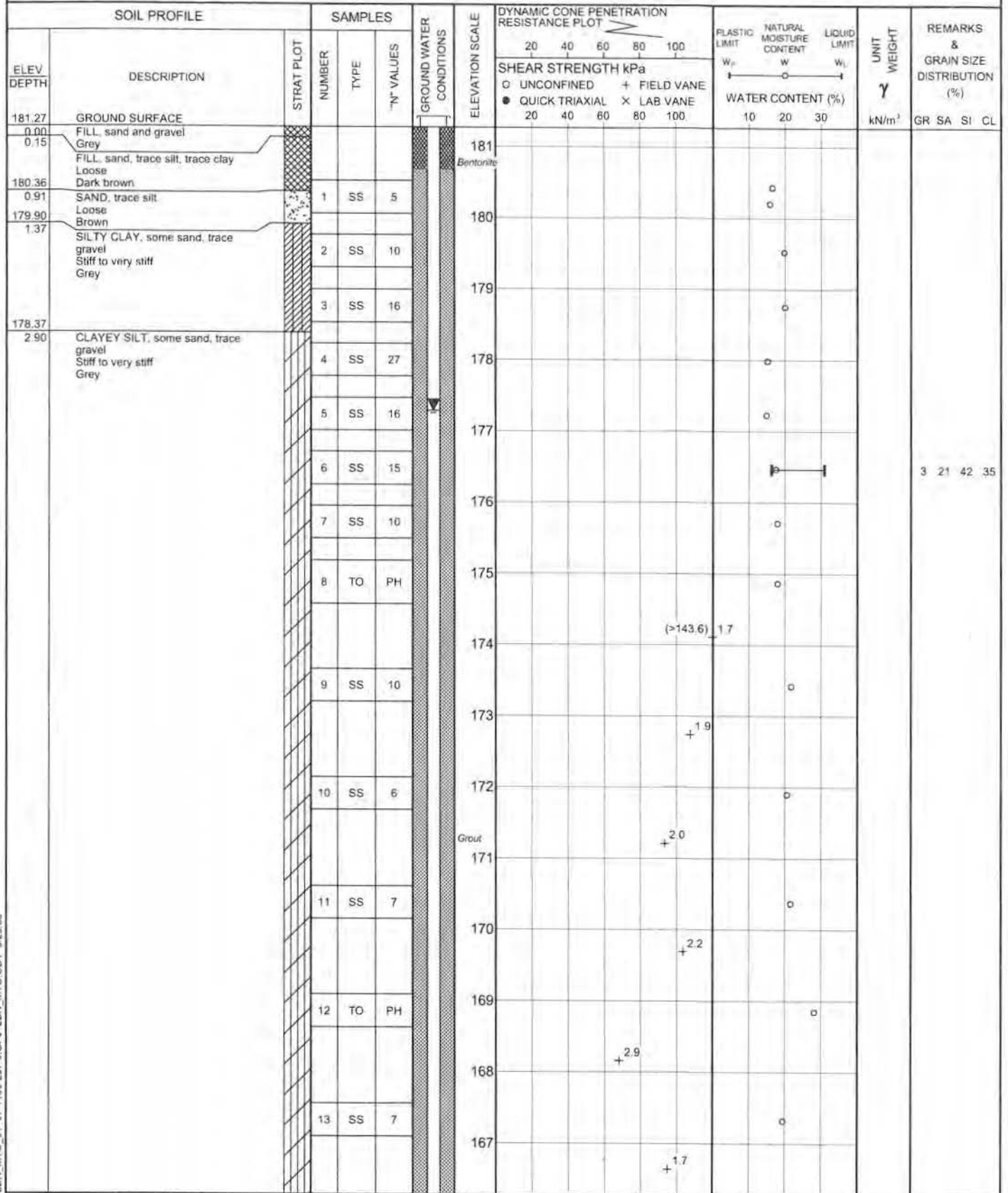
COMPILED BY BRS

DATUM GEODETTIC

DATE

March 11, 2008 - March 13, 2008

CHECKED BY *SJS*



LDN_MTO_01 07-1130-207-0.GPJ LDN_MTO.GDT 6/29/09

Continued Next Page

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

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 127

2 OF 4

METRIC

W.P.

LOCATION

N 4679370.9 E 332251.6

ORIGINATED BY SM

DIST

WEST

HWY 401/3

BOREHOLE TYPE

POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

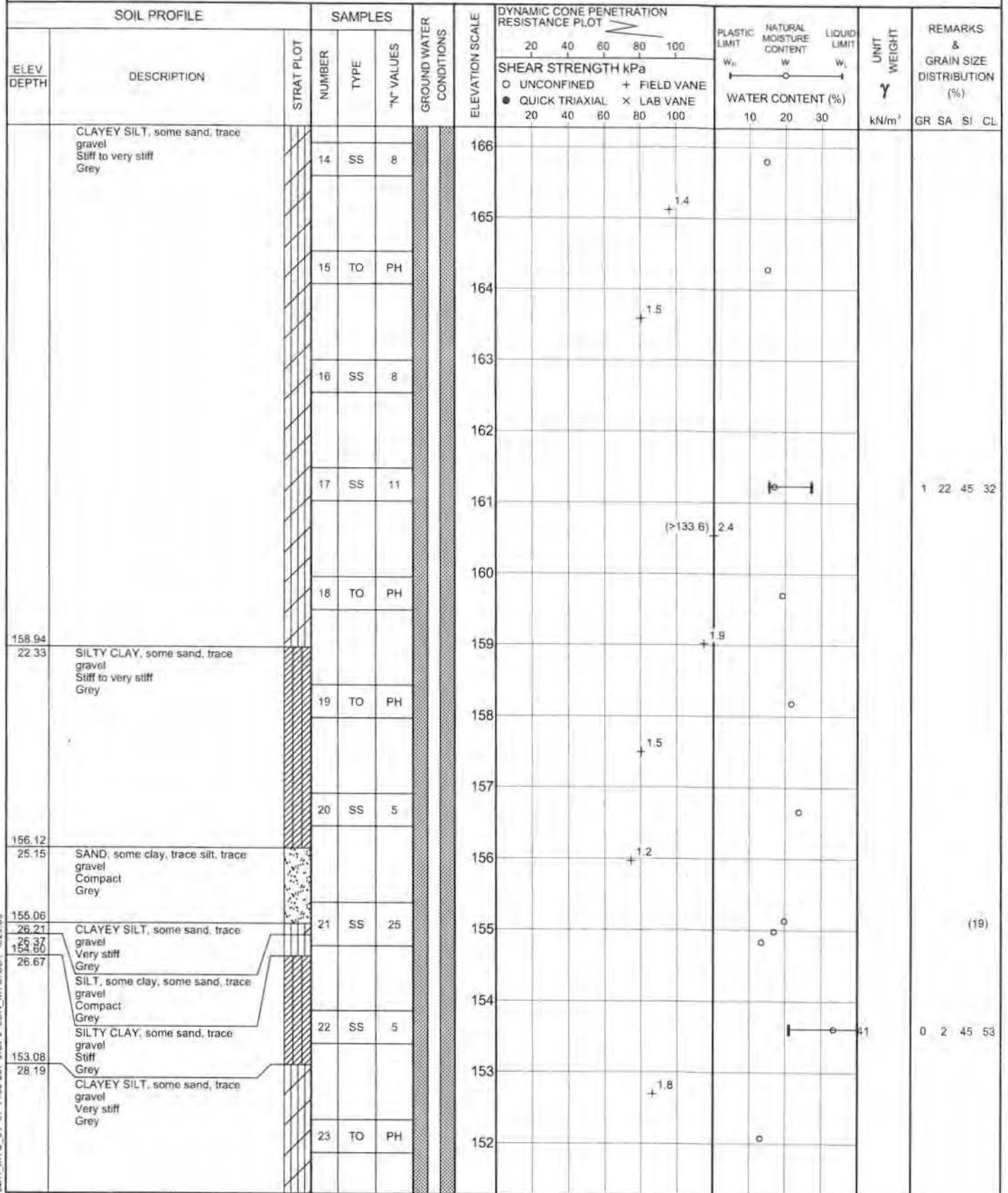
COMPILED BY BRS

DATUM GEODETTIC

DATE

March 11, 2008 - March 13, 2008

CHECKED BY *SJB*



+ 3 x 3 Numbers refer to Sensitivity
○ 3% STRAIN AT FAILURE

PROJECT: 07-1130-207-0

RECORD OF DRILLHOLE: 127

SHEET 4 OF 4

LOCATION: N 4679370.9 E 332251.6

DRILLING DATE: March 11, 2008 - March 13, 2008

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: —

DRILL RIG: MUD ROTARY WITH HQ TRICONE, NQRC

DRILLING CONTRACTOR: AARDVARK DRILLING INC

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV.	RUN No.	PENETRATION RATE (mm/min)	FLUSH	COLOUR % RETURN	ELEVATION	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conjugate BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular PO - Polished K - Slickensided SM - Smooth Ro - Rough Br - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols										DIAMETRAL POINT LOAD INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
				DEPTH (m)						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.3	DISCONTINUITY DATA		HYDRAULIC CONDUCTIVITY k, cm/sec																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
										TOTAL CORE %	SOLID CORE %			DIP #11 CORE AXIS	TYPE AND SURFACE DESCRIPTION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															

DEPTH SCALE

1:75

LOGGED: SG

CHECKED: SJB

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 127A

1 OF 1

METRIC

W.P. LOCATION N 4679370.9 E 332251.6

ORIGINATED BY SM

DIST WEST HWY 401/3 BOREHOLE TYPE POWER AUGER, SOLID STEM

COMPILED BY BRS

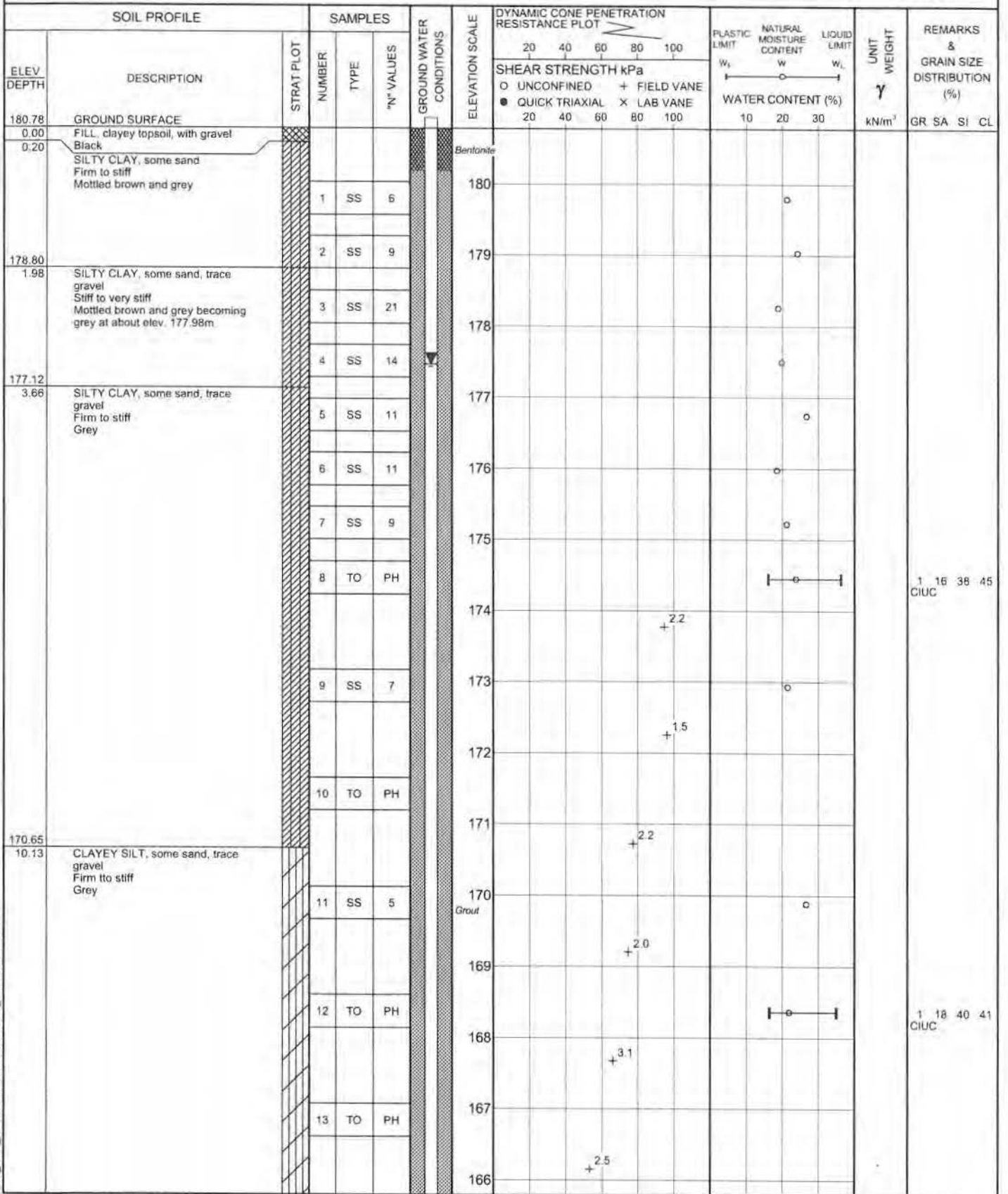
DATUM GEODETIC DATE March 13, 2008

CHECKED BY *SJB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		w_p	w	w_L		
	SOIL CONDITIONS INFERRED FROM BOREHOLE No. 127 GROUND SURFACE							20 40 60 80 100						GR SA SI CL
181.27														
0.00	FILL, sand and gravel Grey													
0.15	FILL, sand, trace silt, trace clay Loose Dark brown													
180.36														
0.91	SAND, trace silt Loose Brown													
179.90														
1.37	SILTY CLAY, some sand, trace gravel Stiff to very stiff Grey													
178.37														
2.90	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Grey													
171.97														
9.30	END OF BOREHOLE													
	Water level measured in shallow piezometer at elev. 172.35m on March 20, 2008.													
	Water level measured in shallow piezometer at elev. 179.06m on July 22, 2008.													
	Water level measured in shallow piezometer at elev. 179.12m on August 11, 2008.													
	Water level measured in shallow piezometer at elev. 179.11m on September 19, 2008.													
	Water level measured in shallow piezometer at elev. 179.07m on January 28, 2009.													

LDN_MTO_01 07-1130-207-0.GPJ LDN_MTO.GDT 6/29/09

PROJECT 07-1130-207-0		RECORD OF BOREHOLE No 129		1 OF 4 METRIC	
W.P. _____		LOCATION N 4679625.1 E 332109.7		ORIGINATED BY LZ/CC/MA/SM	
DIST WEST HWY 401/3		BOREHOLE TYPE POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC		COMPILED BY BRS	
DATUM GEODETIC		DATE March 4, 2008 - March 10, 2008		CHECKED BY <i>SJB</i>	



Continued Next Page

+ 3, x 3. Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

LDN_MTO_01 07-1130-207-0 GP1 LDN_MTO.GDT 6/29/09

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 129

2 OF 4

METRIC

W.P. LOCATION N 4679625.1 E 332109.7

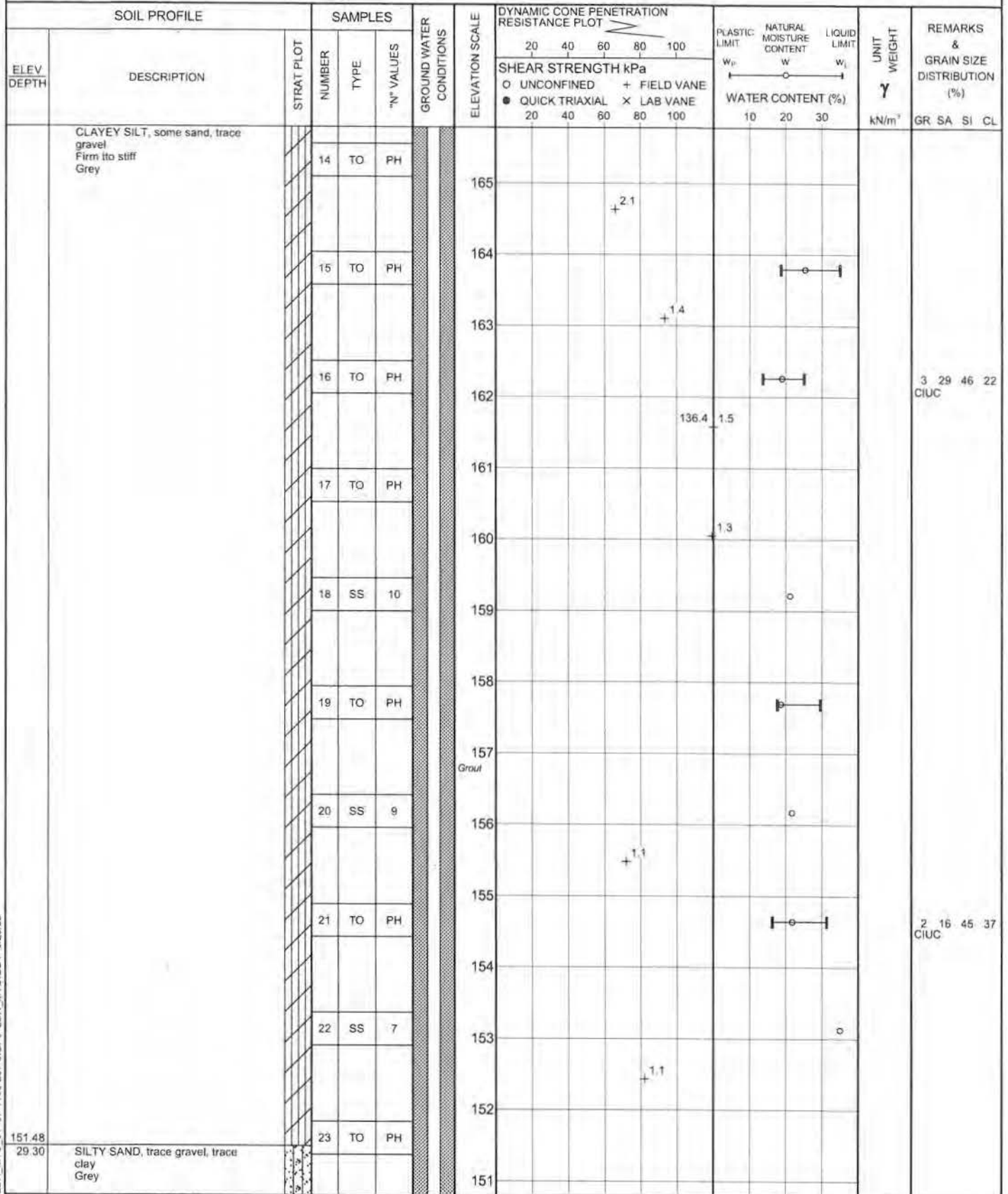
ORIGINATED BY LZ/CC/MA/SM

DIST WEST HWY 401/3 BOREHOLE TYPE POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC DATE March 4, 2008 - March 10, 2008

CHECKED BY *SHS*



Continued Next Page

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

LDN MTO_01 07-1130-207-0.GPJ LDN_MTO.GDT 6/29/08

PROJECT 07-1130-207-0

RECORD OF BOREHOLE No 129

3 OF 4

METRIC

W.P. LOCATION N 4679625.1 E 332109.7

ORIGINATED BY LZ/CC/MA/SM

DIST WEST HWY 401/3 BOREHOLE TYPE POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC

COMPILED BY BRS

DATUM GEODETIC DATE March 4, 2008 - March 10, 2008

CHECKED BY **SJB**

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
150.55							20 40 60 80 100	20 40 60 80 100	10 20 30			kN/m ³	GR SA SI CL
30.23	SAND AND GRAVEL, medium to coarse, trace silt Compact to very dense Grey		24	SS	21		150						
						Bentonite							
			25	SS	125		149						
						Screen							
147.88							148						
32.90	DOLOSTONE/LIMESTONE, fresh, medium strong, thinly laminated, very fine grained, faintly porous Grey to brown (FOR DETAILED DESCRIPTIONS REFER TO RECORD OF DRILLHOLE)		26	SS	100/120mm	Bedrock soil interface	147						
			27	NQ RC			146						
			28	NQ RC			145						
			29	NQ RC			144						
			30	NQ RC									
143.78	END OF BOREHOLE												
37.00	Borehole dry during drilling between March 4 and 10, 2008. Water level measured in deep piezometer at elev. 178.50m on July 22, 2008. Water level measured in deep piezometer at elev. 177.88m on August 11, 2008. Water level measured in deep piezometer at elev. 177.48m on September 19, 2008. Water level measured in deep piezometer at elev. 177.57m on November 11, 2008. Water level measured in deep piezometer at elev. 177.46m on January 28, 2009.												

LDN MTO 01 07-1130-207-0.GPJ LDN MTO.GDT 6/29/09

PROJECT: 07-1130-207-0

RECORD OF DRILLHOLE: 129

SHEET 4 OF 4

LOCATION: N 4679625.1 E 332109.7

DRILLING DATE: March 4, 2008 - March 10, 2008

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: —

DRILL RIG: MUD ROTARY WITH HQ TRICONE, NQRC

DRILLING CONTRACTOR: AARDVARK DRILLING INC.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV.		RUN No.	PENETRATION RATE (mm/min)	COLOUR % RETURN	FLUSH % RETURN	ELEVATION	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Congealate										BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage		PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular		PO - Polished K - Slickensided SM - Smooth Ro - Rough		Br - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL CORRELATION INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
				DEPTH (m)	RECOVERY						R.Q.D. %	FRACT INDEX PER 0.3	DISCONTINUITY DATA		TYPE AND SURFACE DESCRIPTION	DIP w.r.t. CORE AXIS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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DEPTH SCALE

1 : 75



LOGGED: SG

CHECKED: SJR

RECORD OF BOREHOLE No 129A

1 OF 1

METRIC

PROJECT 07-1130-207-0

W.P.

LOCATION

N 4679625.1 E 332109.7

ORIGINATED BY SM

DIST WEST HWY 401/3

BOREHOLE TYPE POWER AUGER, HOLLOW STEM

COMPILED BY BRS

DATUM GEODETIC

DATE

March 4, 2008

CHECKED BY SJB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N° VALUES			20 40 60 80 100	20 40 60 80 100					
180.78	FILL, clayey topsoil, with gravel													
0.00	Black													
0.20	SILTY CLAY, some sand													
	Firm to stiff													
	Mottled brown and grey													
178.60	SILTY CLAY, some sand, trace gravel													
1.98	Stiff to very stiff													
	Mottled brown and grey to grey at about elev. 177.98m													
177.12	SILTY CLAY, some sand, trace gravel													
3.66	Firm to stiff													
	Grey													
171.18	END OF BOREHOLE													
9.60	Water level measured in shallow piezometer at elev. 178.95m on July 22, 2008.3													
	Water level measured in shallow piezometer at elev. 178.93m on August 11, 2008.													
	Water level measured in shallow piezometer at elev. 178.95m on September 19, 2008.													
	Water level measured in shallow piezometer at elev. 178.84m on January 28, 2009.													

+ 3, X 3

Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

PROJECT 09-1132-0003

RECORD OF BOREHOLE No 201

1 OF 3

METRIC

W.P. 3118-08-01

LOCATION N 4677610.4 : E 335770.5

ORIGINATED BY NG

DIST WEST HWY WEP/3

BOREHOLE TYPE POWER AUGER, HOLLOW STEM, WASH BORING WITH HQ

COMPILED BY LMK/DMB

DATUM GEODETIC

DATE February 12, 2009 - February 13, 2009

CHECKED BY SJE

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
								● QUICK TRIAXIAL	× LAB VANE						
187.67	GROUND SURFACE						20 40 60 80 100								
0.00	TOPSOIL, clayey														
187.34	Black														
0.33	CLAYEY SILT, some sand, trace gravel, with oxidized fissures Very stiff to hard Mottled brown and grey		1	SS	26		187								
			2	SS	34		186								
			3	SS	44		185								
184.77	CLAYEY SILT, some sand, trace gravel, with occasional sand pockets Stiff to hard Grey		4	SS	39		184							2 30 43 25	
2.90			5	SS	23		183								
			6	TO	PH		182								
			7	SS	31		181								
			8	SS	20		180								
							179								
							178								
							177								
							176								
							175								
							174								
							173								
			9	SS	10										
			10	TO	PH										
			11	SS	13										
			12	SS	13										
			13	SS	PH										

Continued Next Page

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

RECORD OF BOREHOLE No 201

2 OF 3

METRIC

PROJECT 09-1132-0003

W.P. 3118-08-01

LOCATION N 4677610.4 E 335770.5

ORIGINATED BY NG

DIST WEST HWY WEP/3

BOREHOLE TYPE POWER AUGER, HOLLOW STEM, WASH BORING WITH HQ

COMPILED BY LMK/DMB

DATUM GEODETIC

DATE February 12, 2009 - February 13, 2009

CHECKED BY SJB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
	CLAYEY SILT, some sand, trace gravel, with occasional sand pockets Stiff to hard Grey													
			14	SS	PH		172							
							171							
			15	TO	PH		170							
							169							
			16	SS	21		168							
							167							
			17	SS	13		166							
							165							
			18	SS	9		164							
							163							
			19	SS	10		162							
							161							
			20	SS	29		160							
							159							
			21	SS	29		158							
160.24														
27.43	SAND, medium to coarse, some silt, trace gravel Very dense Grey													
159.52														
28.15	CLAYEY SILT, some sand, trace gravel Hard Grey		22	SS	88									
28.35														
158.71	SILTY SAND, trace gravel Very dense Grey													
28.96														
	CLAYEY SILT, some sand, trace gravel Very stiff Grey		23	SS	16									

Continued Next Page

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

LDN_MTO_01_09-1132-0003.GPJ LDN_MTO_GDT_8/29/09

PROJECT 09-1132-0003

RECORD OF BOREHOLE No 201

3 OF 3

METRIC

W.P. 3118-08-01

LOCATION N 4677610.4 :E 335770.5

ORIGINATED BY NG

DIST WEST HWY WEP/3

BOREHOLE TYPE POWER AUGER, HOLLOW STEM, WASH BORING WITH HQ

COMPILED BY LMK/DMB

DATUM GEODETIC

DATE February 12, 2009 - February 13, 2009

CHECKED BY SJB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
	CLAYEY SILT, some sand, trace gravel Very stiff Grey						157							
			24	SS	20		156							
155.67 32.00	CLAYEY SILT, some sand, trace gravel with sand pockets Hard Grey						155							
154.95 32.72	SAND AND GRAVEL, trace silt Very dense Grey		25	SS	116/ 250mm									
153.99 32.87	LIMESTONE (inferred) Grey													
153.68	END OF BOREHOLE													
	Groundwater encountered at about elev. 180.3m during drilling on February 12, 2009.													

LDN_MTO_01 09-1132-0003.GPJ LDN_MTO.GDT 5/29/09

RECORD OF BOREHOLE No 202

1 OF 4

METRIC

PROJECT 09-1132-0003

W.P. 3118-08-01

LOCATION N 4677573 5 E 335753 3

ORIGINATED BY NG

DIST WEST HWY WEP/3

BOREHOLE TYPE POWER AUGER, HOLLOW STEM, WASH BORING WITH HQ, NQRC

COMPILED BY LMK/DMB

DATUM GEODETIC

DATE February 18, 2009

CHECKED BY *SJB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
187.31	GROUND SURFACE													
0.00	TOPSOIL, clayey		1	SS	10		187							
0.18	Stiff Black													
	CLAYEY SILT, some sand, trace gravel		2	SS	10		186							
	Stiff to very stiff													
	Mottled brown and grey													
			3	SS	22									
185.18							185							3 27 39 31
2.13	CLAYEY SILT, some sand, trace gravel, with oxidized fissures		4	SS	66									
	Very stiff to hard													
	Brown													
			5	SS	62		184							7 28 43 22
			6	SS	20		183							
182.43			7	TO	PH		182							
4.88	CLAYEY SILT, some sand, trace gravel		8	SS	21		181							
	Firm to hard													
	Grey													
			9	SS	34		180							
							179							
			10	SS	9		178							1 31 44 24
			11	SS	8		177							
			12	TO	PH		176							
			13	SS	20		174							7 33 35 25
							173							
			14	SS	13									

Continued Next Page

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

PROJECT 09-1132-0003

RECORD OF BOREHOLE No 202

2 OF 4

METRIC

W.P. 3118-08-01

LOCATION N 4677573.5 E 335753.3

ORIGINATED BY NG

DIST WEST HWY WEP/3

BOREHOLE TYPE POWER AUGER, HOLLOW STEM, WASH BORING WITH HQ NQRC

COMPILED BY LMK/DMB

DATUM GEODETIC

DATE February 18, 2009

CHECKED BY **SDB**

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
	CLAYEY SILT, some sand, trace gravel Firm to hard Grey						172							
			15	TO	PH		171							
			16	SS	19		170							
			17	SS	17		169							
							168							1 23 44 32
167.11							167							
20.20	SILTY CLAY, some sand, trace gravel Stiff to very stiff Grey		18	SS	18		166							
			19	SS	13		165							
164.06							164							
23.25	CLAYEY SILT, some sand, trace gravel Very stiff to hard Grey		20	SS	18		163							
			21	SS	21		162							3 22 45 30
			22	SS	36		161							
			23	SS	19		160							
157.97							159							
29.34							158							
							157							

Continued Next Page

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

LDN_MTO_01 09-1132-0003.GPJ LDN_MTO_GDT 6/29/09

PROJECT: 09-1132-0003

RECORD OF DRILLHOLE: 202

SHEET 4 OF 4

LOCATION: N 4677573.5 ; E 335753.3

DRILLING DATE: February 18, 2009

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: —

DRILL RIG: POWER AUGER, HOLLOW STEM, WASH BORING WITH HQ, NQRC

DRILLING CONTRACTOR: LANTECH

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV.		RUN No.	PENETRATION RATE (mm/min)	COLOUR % RETURN	FLUSH	ELEVATION	JN - Joint FLT - Fault SMR - Shear VN - Vein CJ - Conjugate BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular PO - Polished K - Stickensided SM - Smooth Ro - Rough Br - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols										DIAMETRAL POINT LOAD INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
				DEPTH (m)	ELEVATION						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.3 m	DISCONTINUITY DATA		HYDRAULIC CONDUCTIVITY k, cm/sec																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
											TOTAL CORE %	SOLID CORE %			DIP #1 CORE AXIS	TYPE AND SURFACE DESCRIPTION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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DEPTH SCALE

1 : 75



LOGGED: SG

CHECKED: SJB

PROJECT 09-1132-0003

RECORD OF BOREHOLE No 206

1 OF 3

METRIC

W.P. 3117-08-01

LOCATION N 4677645.8 E 335462.4

ORIGINATED BY NG

DIST WEST HWY WEP/3

BOREHOLE TYPE POWER AUGER, HOLLOW STEM, WASH BORING WITH HQ

COMPILED BY LMK/DMB

DATUM GEODETIC

DATE February 9, 2009 - February 10, 2009

CHECKED BY SJB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
							20 40 60 80 100	○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
186.48	GROUND SURFACE													
0.00	TOPSOIL													
0.20	Firm Black		1	SS	7									
185.87	CLAYEY SILT, some sand, trace gravel						186							
0.61	Firm		2	SS	11									
185.41	Mottled brown and grey													
1.07	SAND, fine, trace silt						185							
	Compact Grey		3	SS	6									2 23 45 30
184.35	CLAYEY SILT, some sand, trace gravel, with oxidized fissures													
2.13	Firm to stiff						184							
	Mottled brown and grey		4	SS	28									
	CLAYEY SILT, some sand, trace gravel, with oxidized fissures						183							5 43 40 12
	Very stiff to hard		5	SS	44									
	Brown		6	SS	35									
							182							
181.60	CLAYEY SILT, some sand, trace gravel		7	TO	PH									
4.88	Firm to hard						181							
	Grey		8	SS	17									2 30 41 27
			9	SS	17		180							
			10	SS	13		179							
							178							
			11	SS	9		177							
			12	TO	PH		176							
							175							
			13	SS	6									6 28 41 25
							174							
			14	SS	14		173							
							172							
			15	TO	PH									

Continued Next Page

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

PROJECT 09-1132-0003

RECORD OF BOREHOLE No 206

2 OF 3

METRIC

W.P. 3117-08-01

LOCATION N 4677645.8 E 335462.4

ORIGINATED BY NG

DIST WEST HWY WEP/3

BOREHOLE TYPE POWER AUGER, HOLLOW STEM, WASH BORING WITH HQ

COMPILED BY LMK/DMB

DATUM GEODETIC

DATE February 9, 2009 - February 10, 2009

CHECKED BY SDB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
	CLAYEY SILT, some sand, trace gravel Firm to hard Grey													
			16	SS	14		171							
							170							
			17	SS	8		169							
							168							
			18	SS	7		167							1 13 40 46
							166							
			19	SS	8		165							
							164							
			20	SS	13		163							
							162							
			21	SS	20		161							
							160							
			22	SS	76		159							
							158							
			23	SS	13		157							1 14 49 36
			24	SS	14									
156.46														

LDN_MTO_01 09-1132-0003.GPJ LDN_MTO.GDT 6/29/09

Continued Next Page

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

PROJECT 09-1132-0003

RECORD OF BOREHOLE No 206

3 OF 3

METRIC

W.P. 3117-08-01

LOCATION N 4677645.8 : E 335462.4

ORIGINATED BY NG

DIST WEST HWY WEP/3




BOREHOLE TYPE POWER AUGER, HOLLOW STEM, WASH BORING WITH HQ

COMPILED BY LMK/DMB

DATUM GEODETIC

DATE February 9, 2009 - February 10, 2009

CHECKED BY SJS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
30.02	SILTY SAND, some clay, trace gravel, with silt pockets Very dense Grey		25	SS	72		156							GR SA SI CL 5 47 32 16
155.70														
30.78	CLAYEY SILT, some sand, trace gravel, with sandy silt pockets Very stiff to hard Grey		26	SS	29		155							
154.20														
32.28	LIMESTONE (inferred) Grey		27	SS	80/ 280mm		154							
153.51														
32.97	END OF BOREHOLE Groundwater encountered at about elev. 173.9m during drilling on February 10, 2009.													

LDN_MTO_01 09-1132-0003.GPJ LDN_MTO.GDT 6/29/09

PROJECT <u>09-1132-0080</u>		RECORD OF BOREHOLE No 321		1 OF 4	METRIC
W.P. _____	LOCATION <u>N 4679179.9 ; E 332649.0</u>	ORIGINATED BY <u>MR</u>			
DIST <u>WEST</u> HWY <u>401 / 3</u>	BOREHOLE TYPE <u>POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC</u>	COMPILED BY <u>LMK/DMB</u>			
DATUM <u>GEODETIC</u>	DATE <u>December 9, 2010 - December 14, 2010</u>	CHECKED BY _____			

[illegible]

Continued Next Page

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

DN_MTO_06 09-1132-0080.GPJ LDN_MTO.GDT 11/03/10

PROJECT <u>09-1132-0080</u>		RECORD OF BOREHOLE No 321		2 OF 4		METRIC	
W.P. _____		LOCATION <u>N 4679179.9 ; E 332649.0</u>		ORIGINATED BY <u>MR</u>			
DIST <u>WEST</u> HWY <u>401 / 3</u>		BOREHOLE TYPE <u>POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC</u>		COMPILED BY <u>LMK/DMB</u>			
DATUM <u>GEODETIC</u>		DATE <u>December 9, 2010 - December 14, 2010</u>		CHECKED BY _____			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _p	W	W _L				
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE							
	CLAYEY SILT, some sand, trace to some gravel Stiff to very stiff Grey		13	TO	PH		168						1 21 49 29			
					14		SS	9								
					15		TO	PH								
					16		TO	PH								
					17		SS	10								
					18		TO	PH								
					19		SS	9								
					20		TO	PH								
					21		SS	13								
			22	TO	PH											
			23	SS	9											

LDN_MTO_06 09-1132-0080.GPJ LDN_MTO.GDT 11/03/10

Continued Next Page

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

PROJECT <u>09-1132-0080</u>		RECORD OF BOREHOLE No 321		3 OF 4		METRIC	
W.P. _____		LOCATION <u>N 4679179.9 ; E 332649.0</u>		ORIGINATED BY <u>MR</u>			
DIST <u>WEST</u> HWY <u>401 / 3</u>		BOREHOLE TYPE <u>POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC</u>		COMPILED BY <u>LMK/DMB</u>			
DATUM <u>GEODETIC</u>		DATE <u>December 9, 2010 - December 14, 2010</u>		CHECKED BY _____			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	× LAB VANE	20						40	60	80
	CLAYEY SILT, some sand, trace to some gravel Stiff to very stiff Grey		24	TO	PH															
151.24																				
31.90	SAND AND GRAVEL, trace silt Very dense Grey		25	SS	51											21 69 7 3				
			26	SS	100/ 130mm															
149.12																				
34.02	LIMESTONE, fresh, medium strong, weakly laminated, very fine grained, faintly porous Light grey to brown (FOR DETAILED DESCRIPTIONS REFER TO RECORD OF DRILLHOLE)		27	NQ RC	-															
			28	NQ RC	-															
			29	NQ RC	-															
			30	NQ RC	-															
143.73																				
39.41	END OF BOREHOLE Groundwater encountered at about elev. 181.7m and at about elev. 151.7m during drilling between December 9 and 14, 2009. Water level measured at elev. 178.52 on February 24, 2010. Water level measured at elev. 178.26 on January 6, 2010.																			

PROJECT: 09-1132-0080

RECORD OF DRILLHOLE: 321

SHEET 4 OF 4

LOCATION: N 4679179.9 ;E 332649.0


DRILLING DATE: December 9, 2010 - December 14, 2010

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: MUD ROTARY WITH HQ TRICONE, NQRC

DRILLING CONTRACTOR: LANTECH

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV.	RUN No.	PENETRATION RATE (mm/min)	COLOUR (mm)	FLUSH % RETURN	ELEVATION	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conjugate BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular PO - Polished K - Slickensided SM - Smooth Ro - Rough Br - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols.										HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)			NOTES WATER LEVELS INSTRUMENTATION								
				DEPTH (m)						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA		DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION															
										TOTAL CORE %	SOLID CORE %																					
										80 60 40 20	80 60 40 20	80 60 40 20	5 10 15 20	0 30 60 90																		
																									10 ⁻⁸	10 ⁻⁶	10 ⁻⁴	10 ⁻²	2	4	6	
		ROCK SURFACE		149.12																												
	MUD ROTARY NO ROCK CORE	LIMESTONE, fresh, medium strong, weakly laminated, very fine grained, faintly porous, light grey		34.02	1				149																							
		LIMESTONE, fresh, medium strong, thinly laminated to bedded, very fine to fine grained, faintly porous, brown to grey		148.73					148																							
35				34.41																												
36																																
37		LIMESTONE, fresh, medium strong, weakly laminated, very fine grained, faintly porous, light grey, occasional stylolites		146.81					2					147																		
				36.33																												
																				</												

DEPTH SCALE

1 : 75



LOGGED: SG

CHECKED:

LDN_ROCK_03 09-1132-0080-ROCK.GPJ GLDR_LDN.GDT 11/03/10 DATA INPUT: LMK

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-3

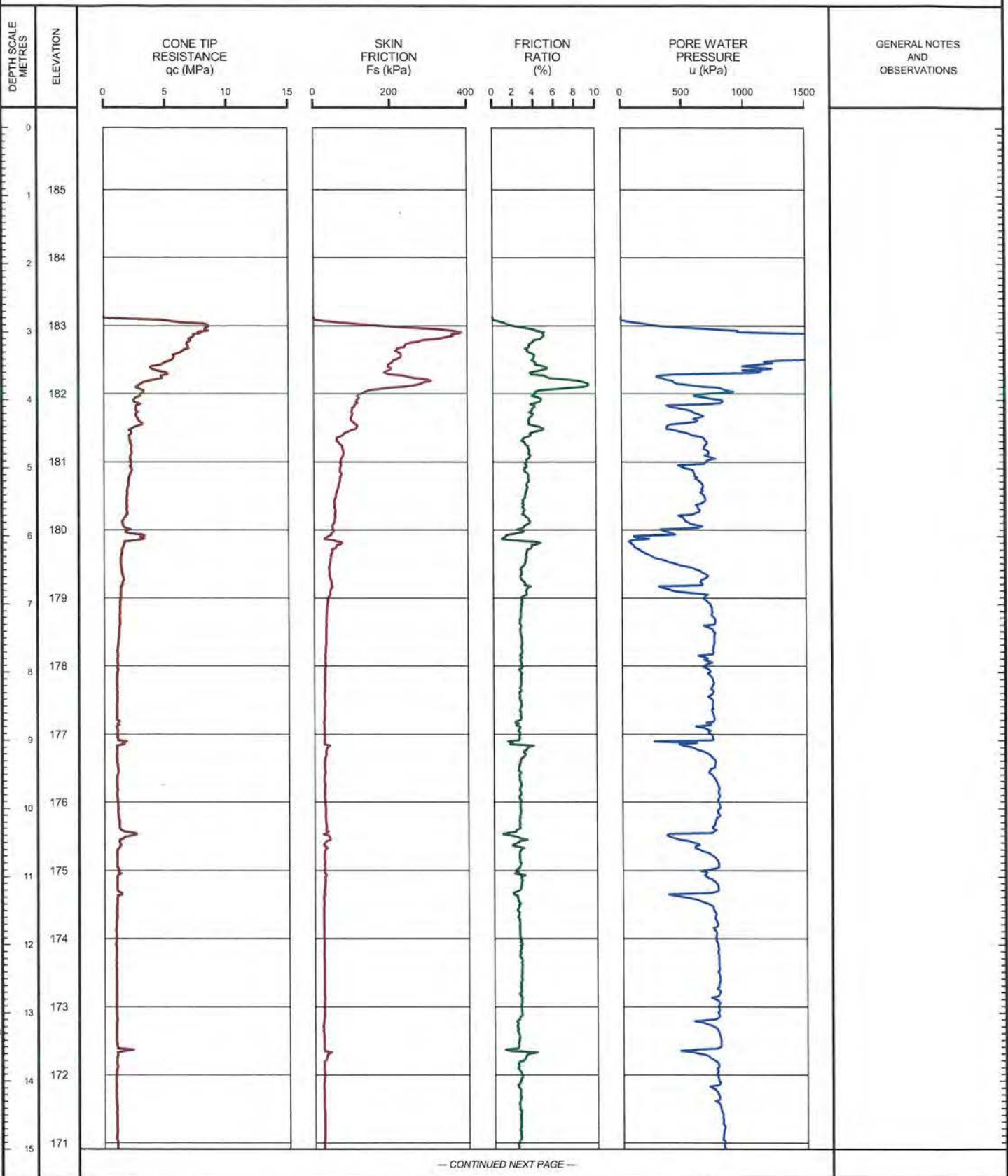
SHEET 1 OF 2

LOCATION: N 4678022.0 E 334957.0

TEST DATE: November 13, 2006

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 2.80m CORRECTION FACTOR A: 0.6 CORRECTION FACTOR B: 0.013



LDN CPT 01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75

OPERATOR: CC
CHECKED: SSB

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-3

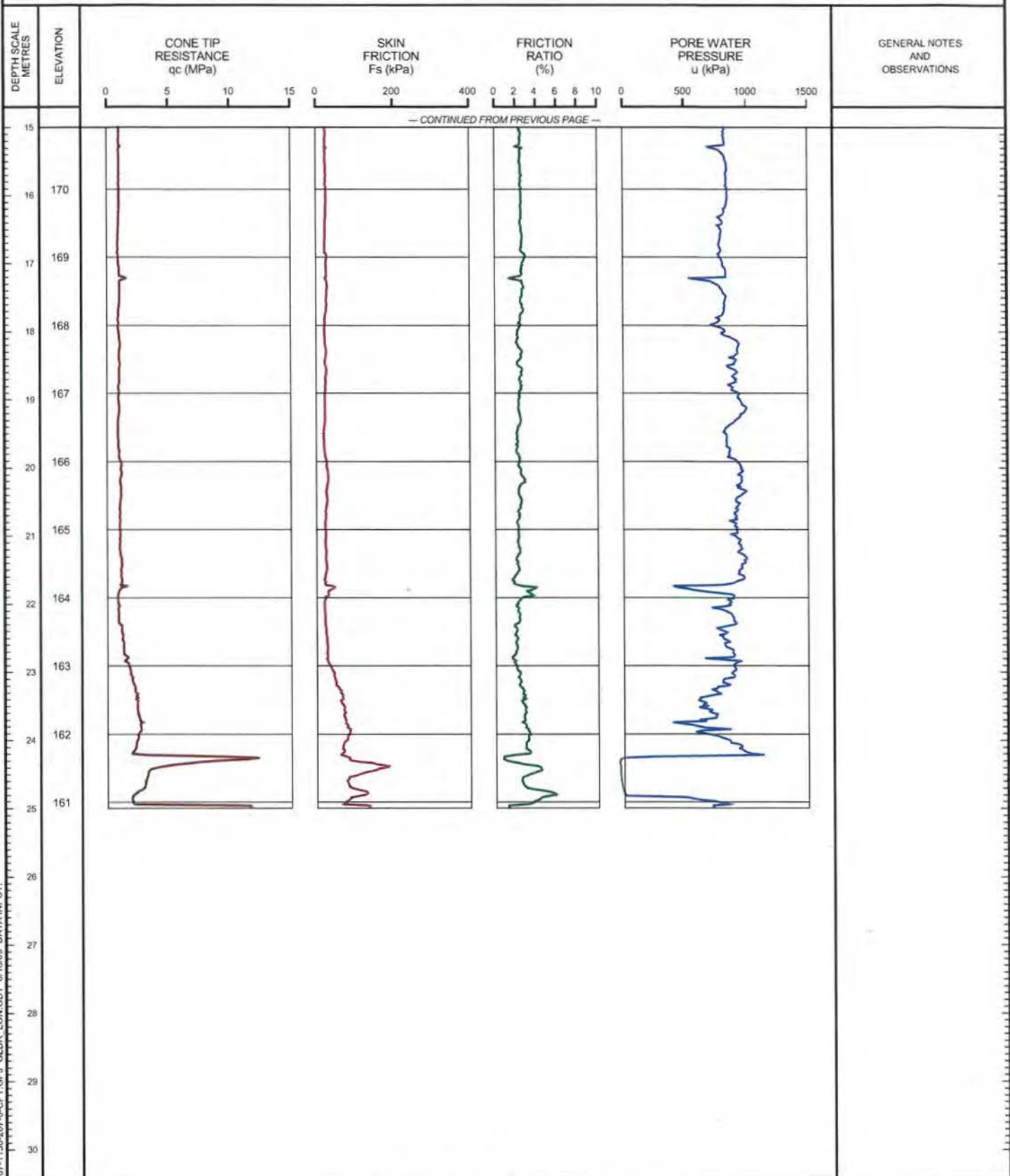
SHEET 2 OF 2

LOCATION: N 4678022.0 ; E 334957.0

TEST DATE: November 13, 2006

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 2.80m CORRECTION FACTOR A: 0.6 CORRECTION FACTOR B: 0.013



LON CPT 01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: CC

CHECKED: SSB

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-5

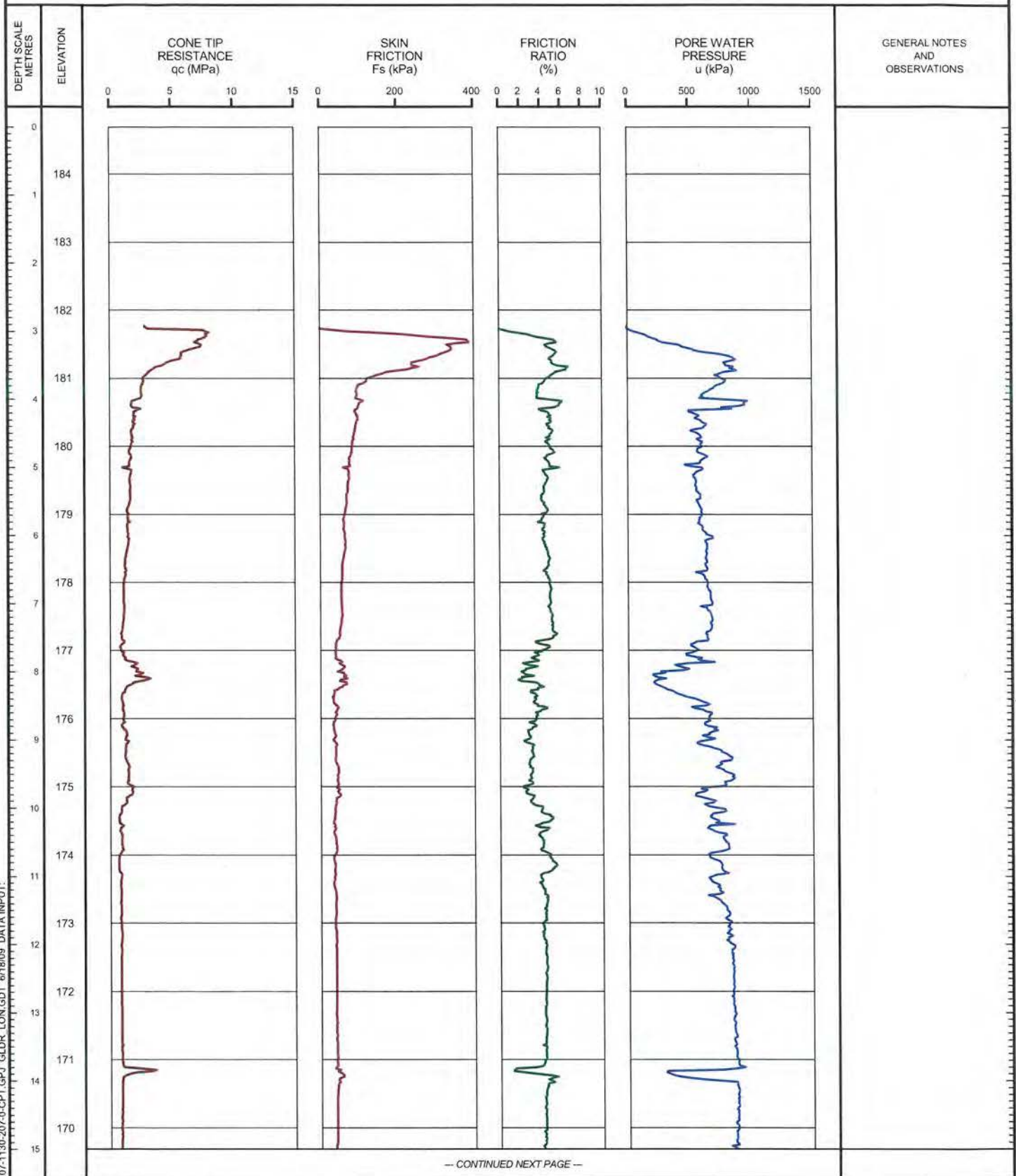
SHEET 1 OF 2

LOCATION: N 4678413.0 ; E 334220.0

TEST DATE: November 13, 2006

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 2.94m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN CPT 01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: CC

CHECKED: *SB*

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-5

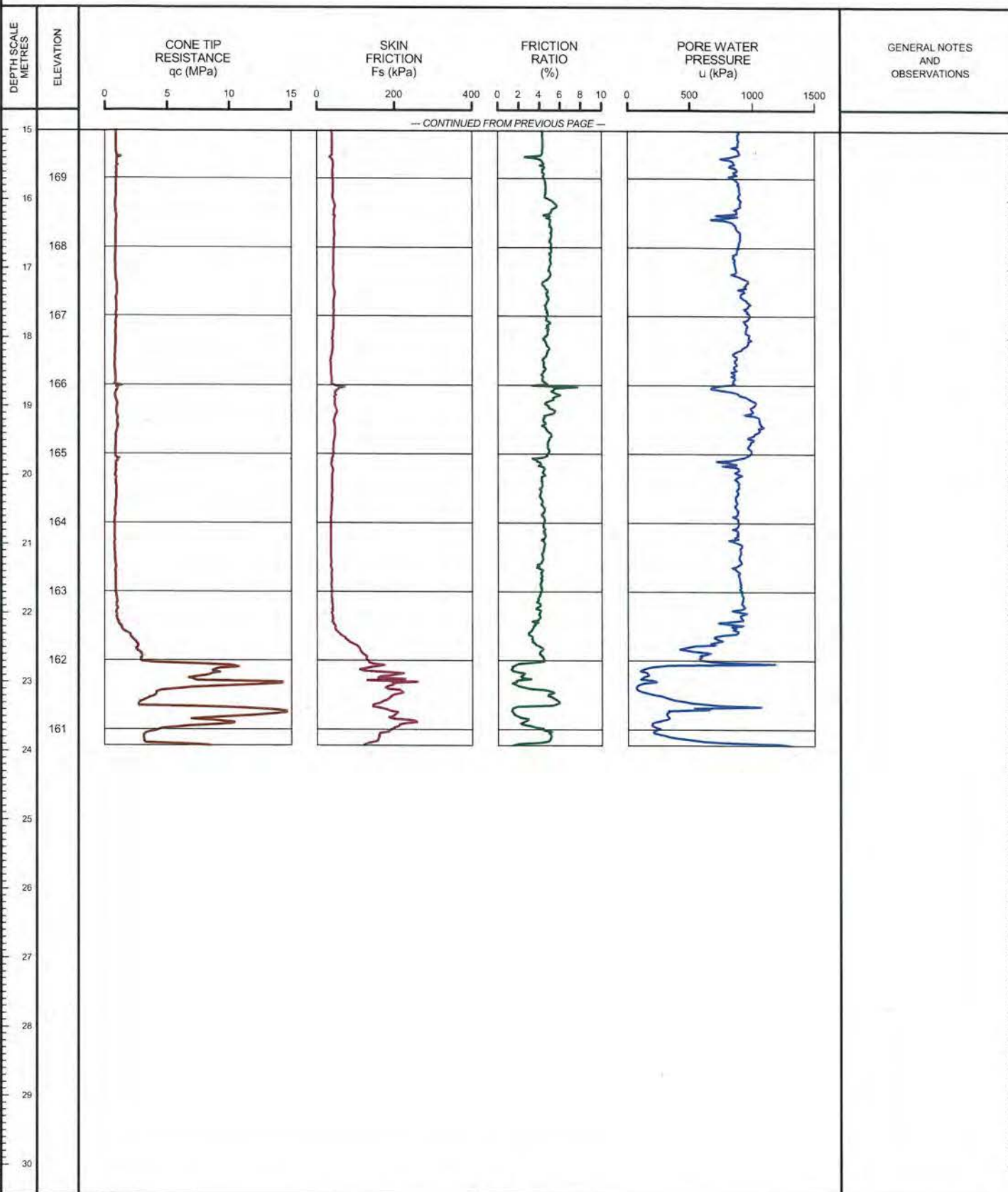
SHEET 2 OF 2

LOCATION: N 4678413.0, E 334220.0

TEST DATE: November 13, 2006

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 2.94m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN_CPT_01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/19/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: CC

CHECKED: *SSB*

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-10

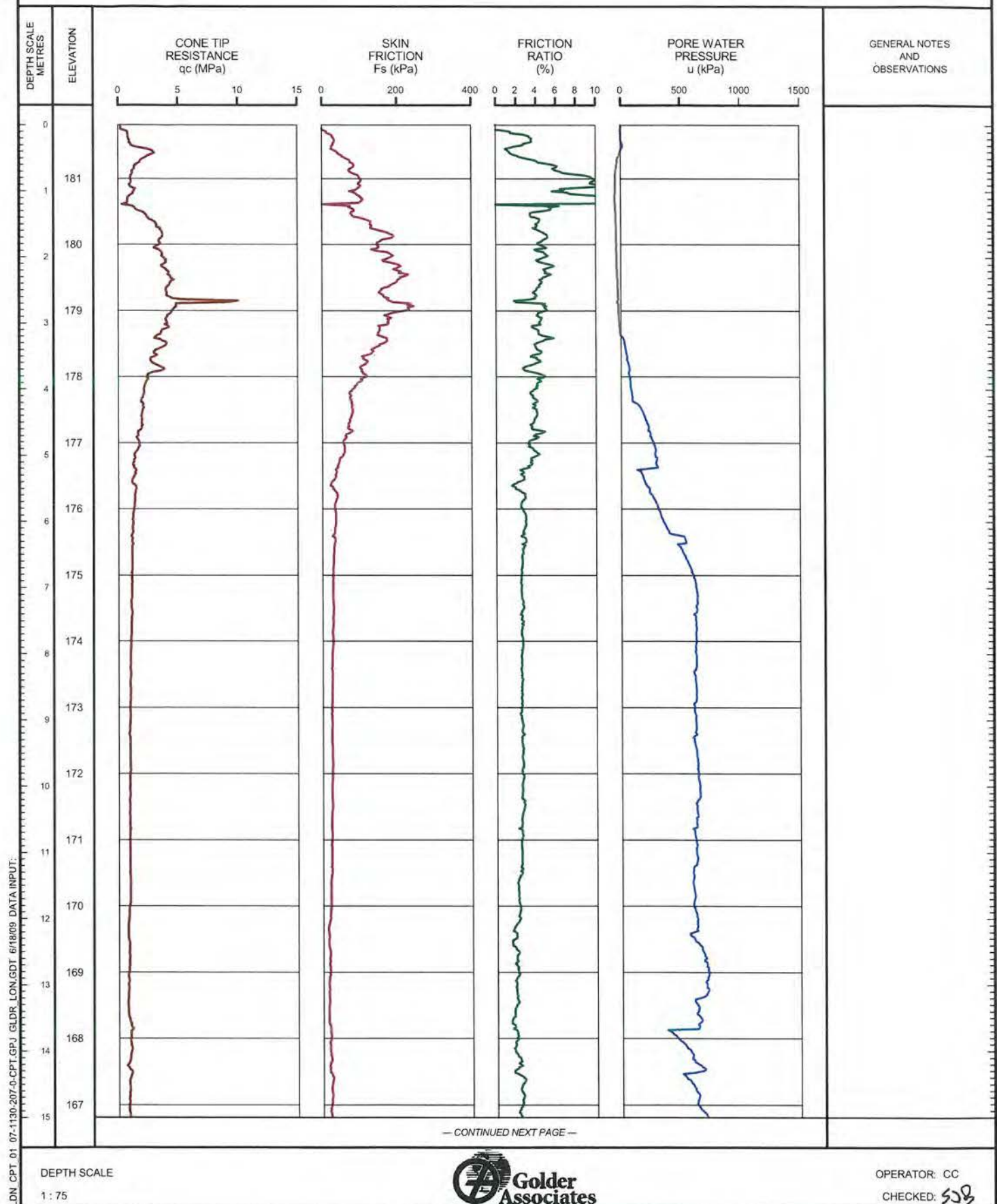
SHEET 1 OF 2

LOCATION: N 4679264.0 ; E 332533.0

TEST DATE: November 10, 2006

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 0.00m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-10

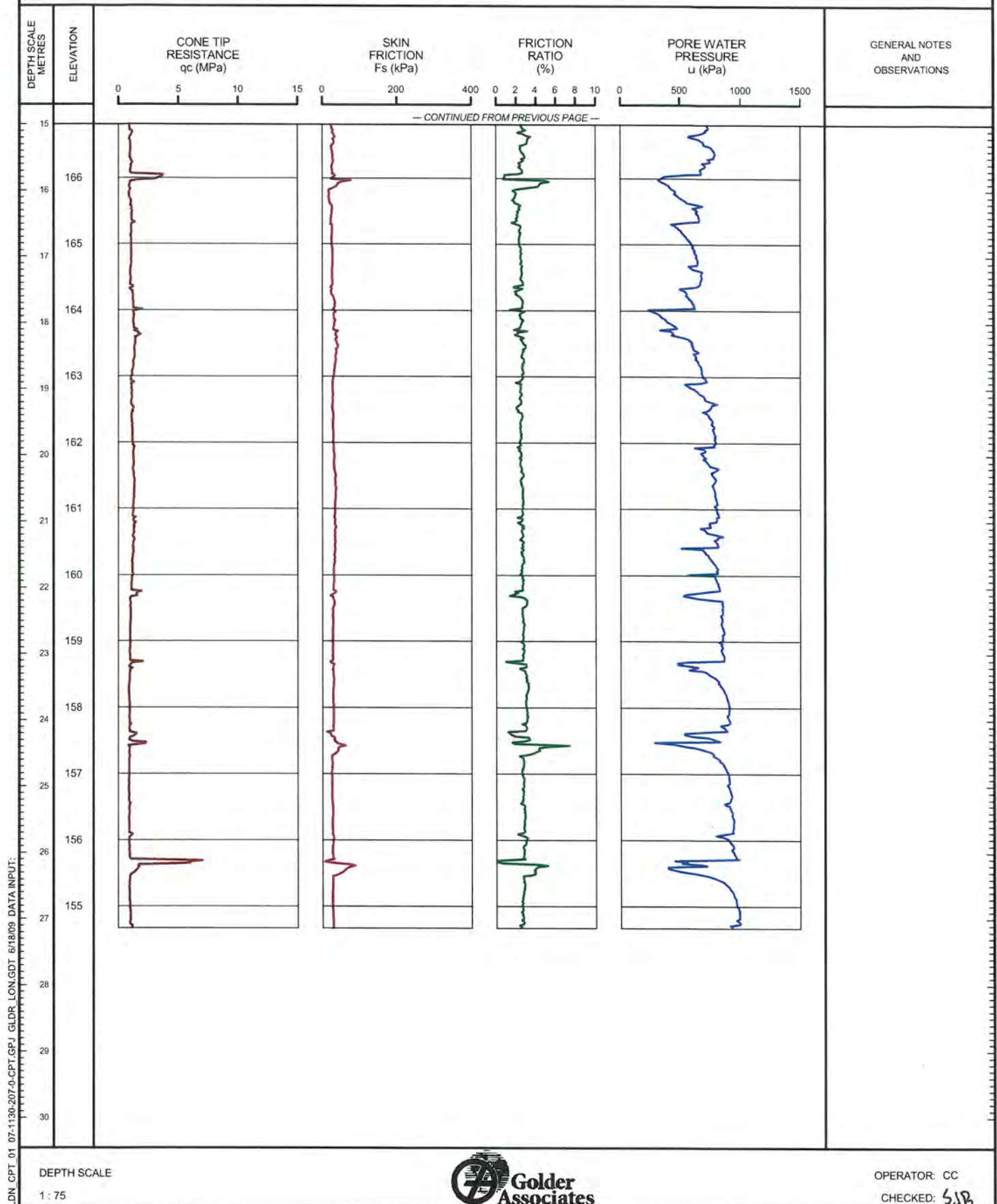
SHEET 2 OF 2

LOCATION: N 4679264.0 :E 332533.0

TEST DATE: November 10, 2006

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 0.00m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-11

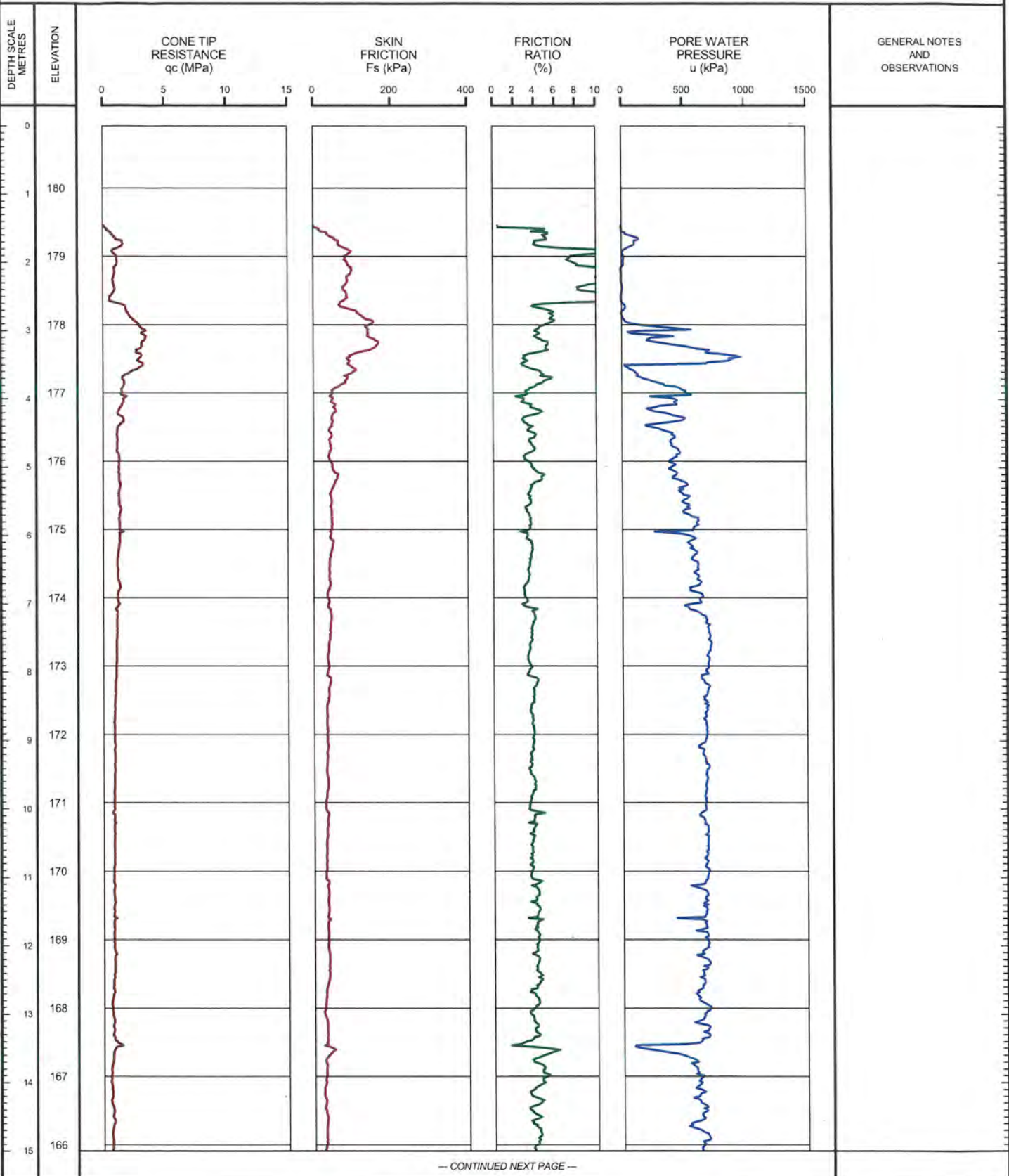
SHEET 1 OF 2

LOCATION: N 4679634.0 ; E 332110.0

TEST DATE: November 10, 2006

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 1.46m CORRECTION FACTOR A: 0.6 CORRECTION FACTOR B: 0.013



— CONTINUED NEXT PAGE —

LDN CPT 01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: CC

CHECKED: SJB

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-11

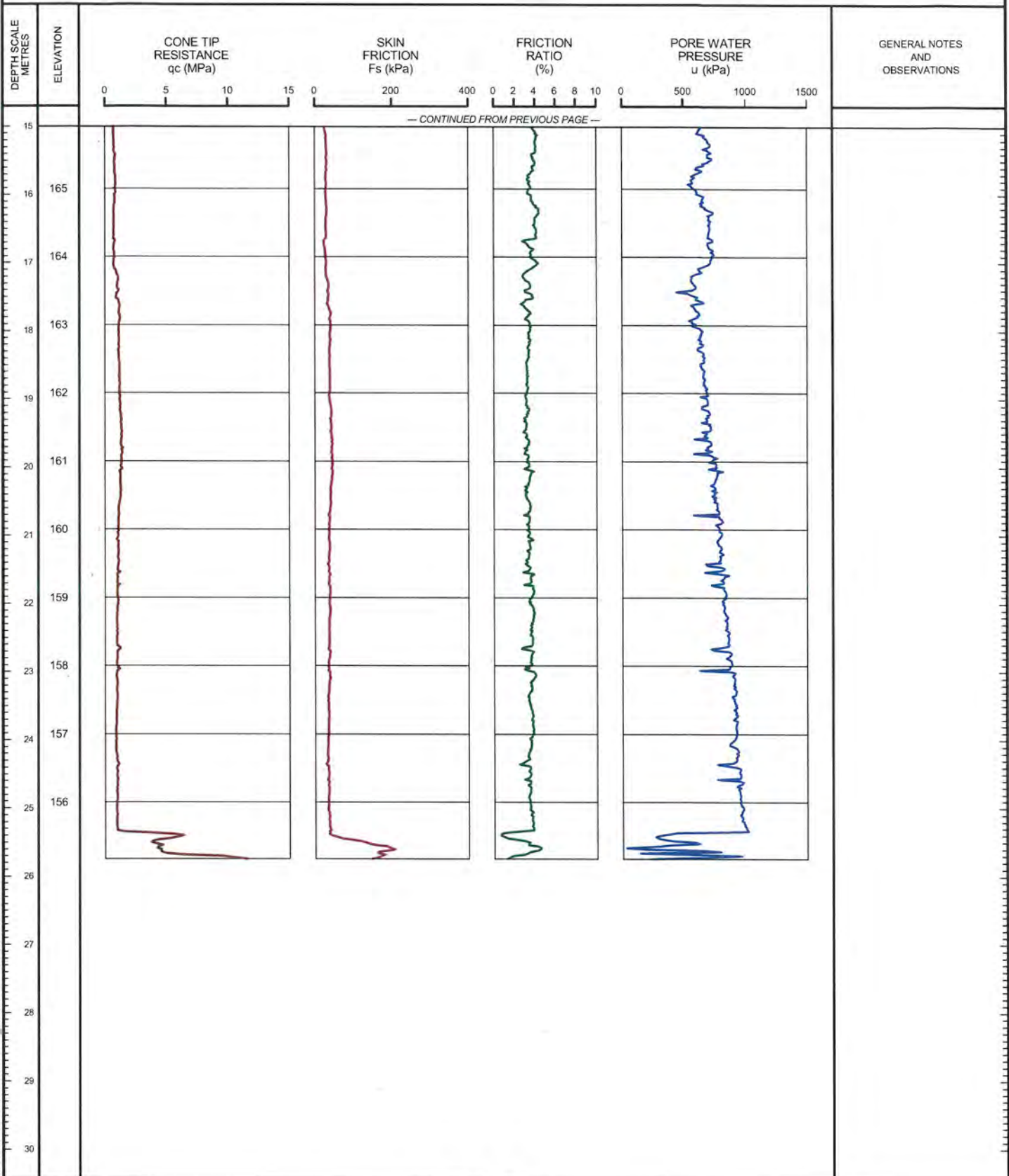
SHEET 2 OF 2

LOCATION: N 4679634.0 :E 332110.0

TEST DATE: November 10, 2006

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 1.46m CORRECTION FACTOR A: 0.6 CORRECTION FACTOR B: 0.013



LDN CPT 01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: CC

CHECKED: *SSB*

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-123

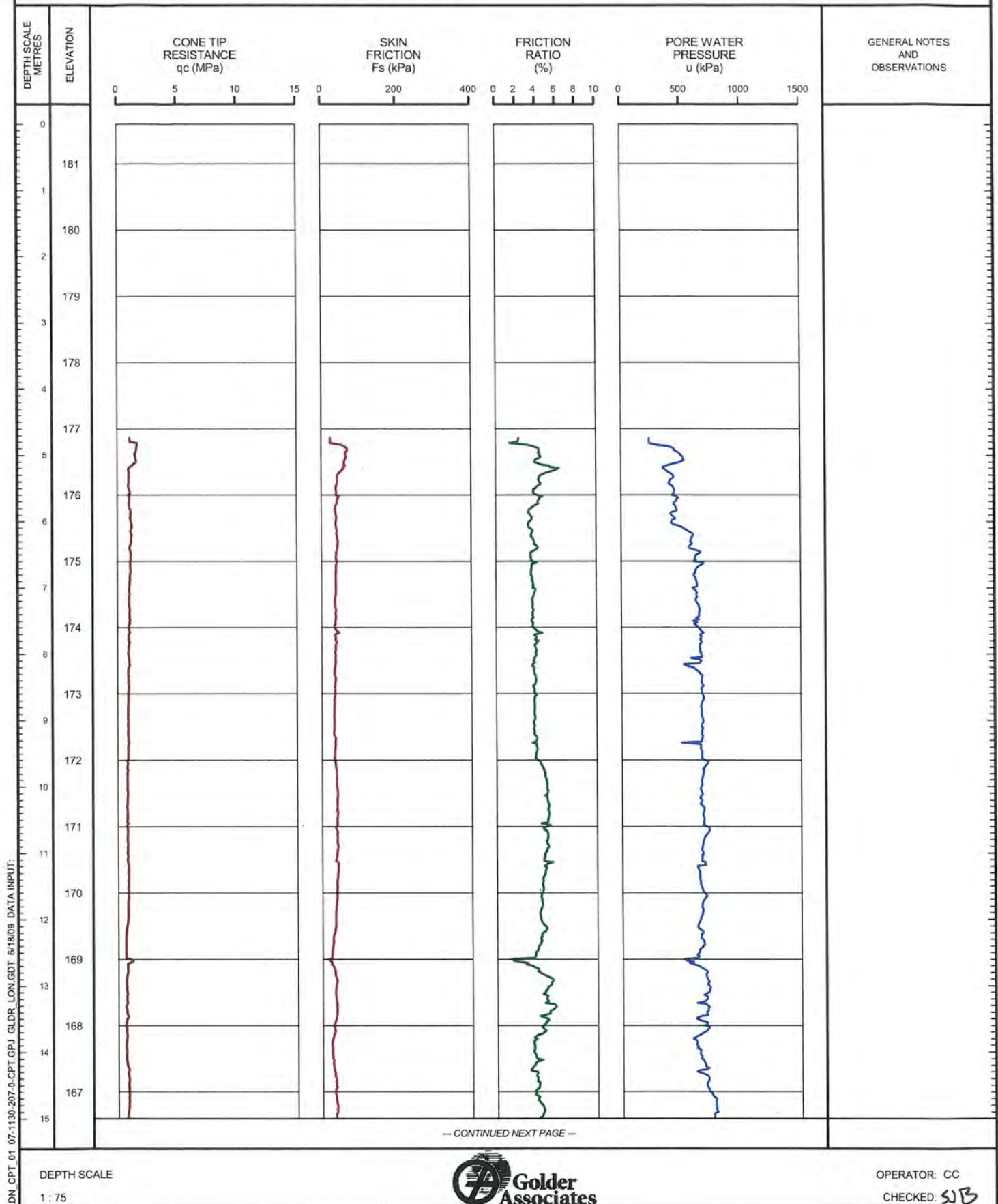
SHEET 1 OF 2

LOCATION: N 4679309.7 ; E 332536.3

TEST DATE: September 29, 2008

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 4.75m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN CPT 01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-123

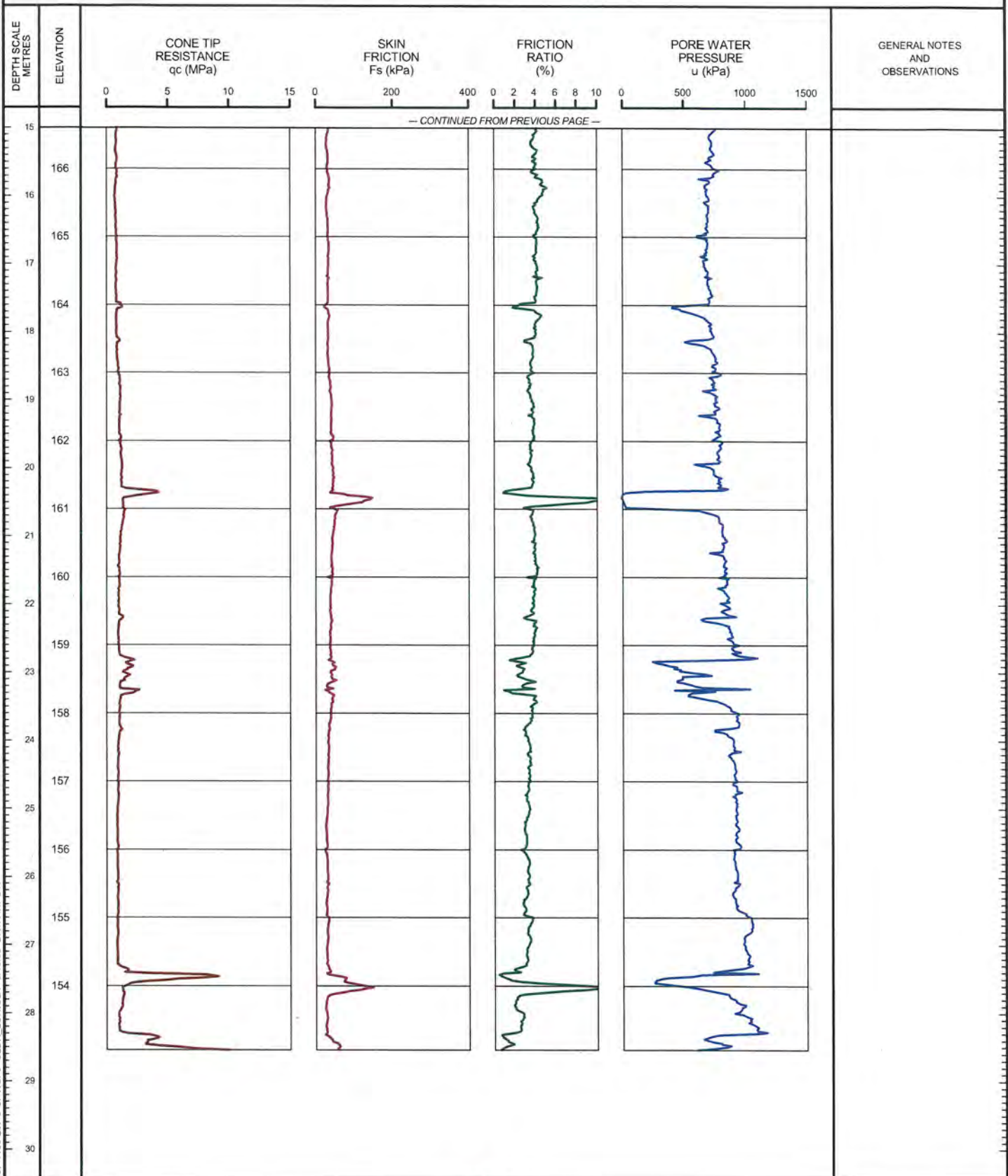
SHEET 2 OF 2

LOCATION: N 4679309.7 ; E 332536.3

TEST DATE: September 29, 2008

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 4.75m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN CPT 01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: CC

CHECKED: SSB

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-128

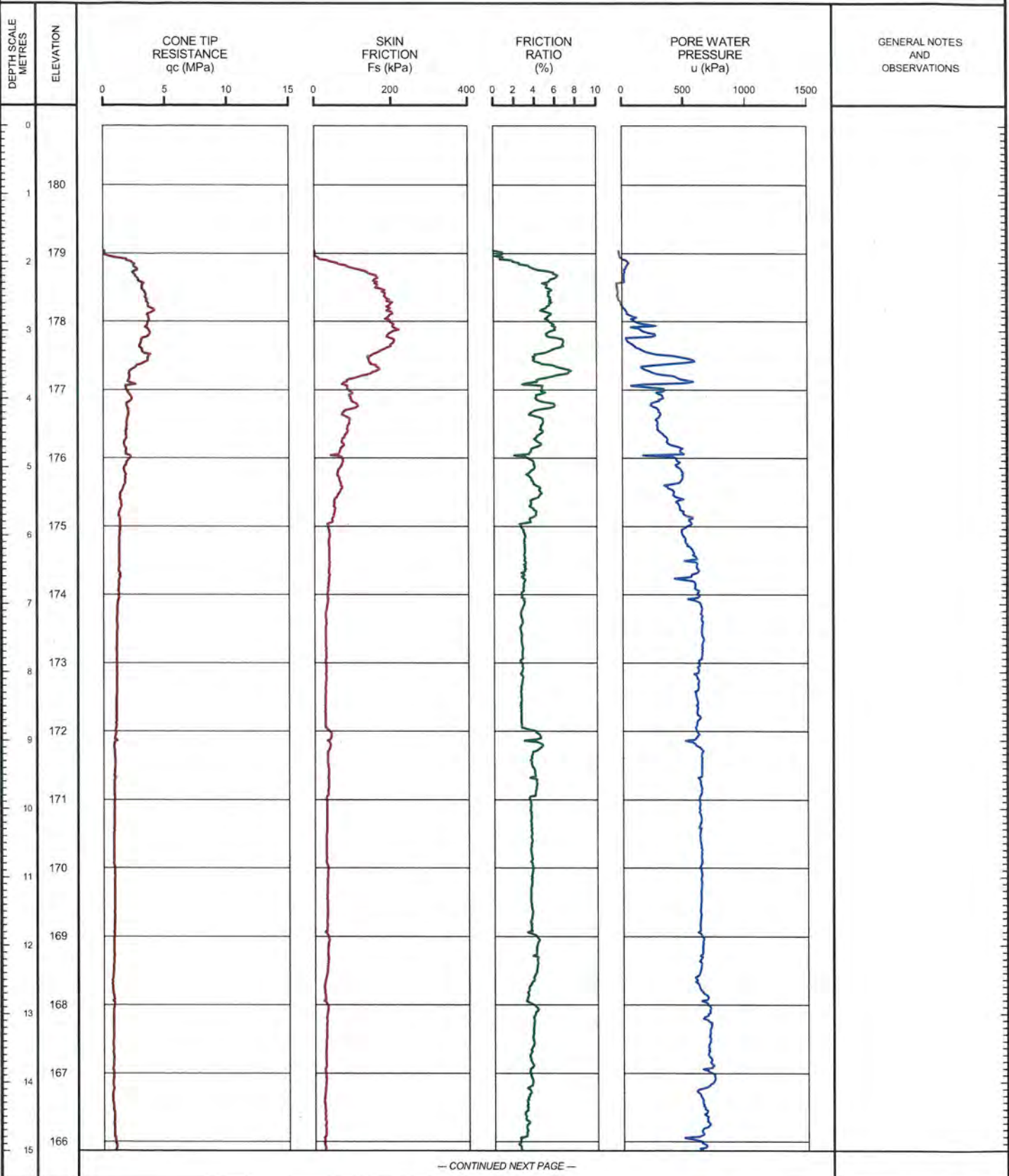
SHEET 1 OF 3

LOCATION: N 4679490.6 E 332200.8

TEST DATE: September 5, 2008

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 1.83m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN CPT 01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: CC

CHECKED: SJB

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-128

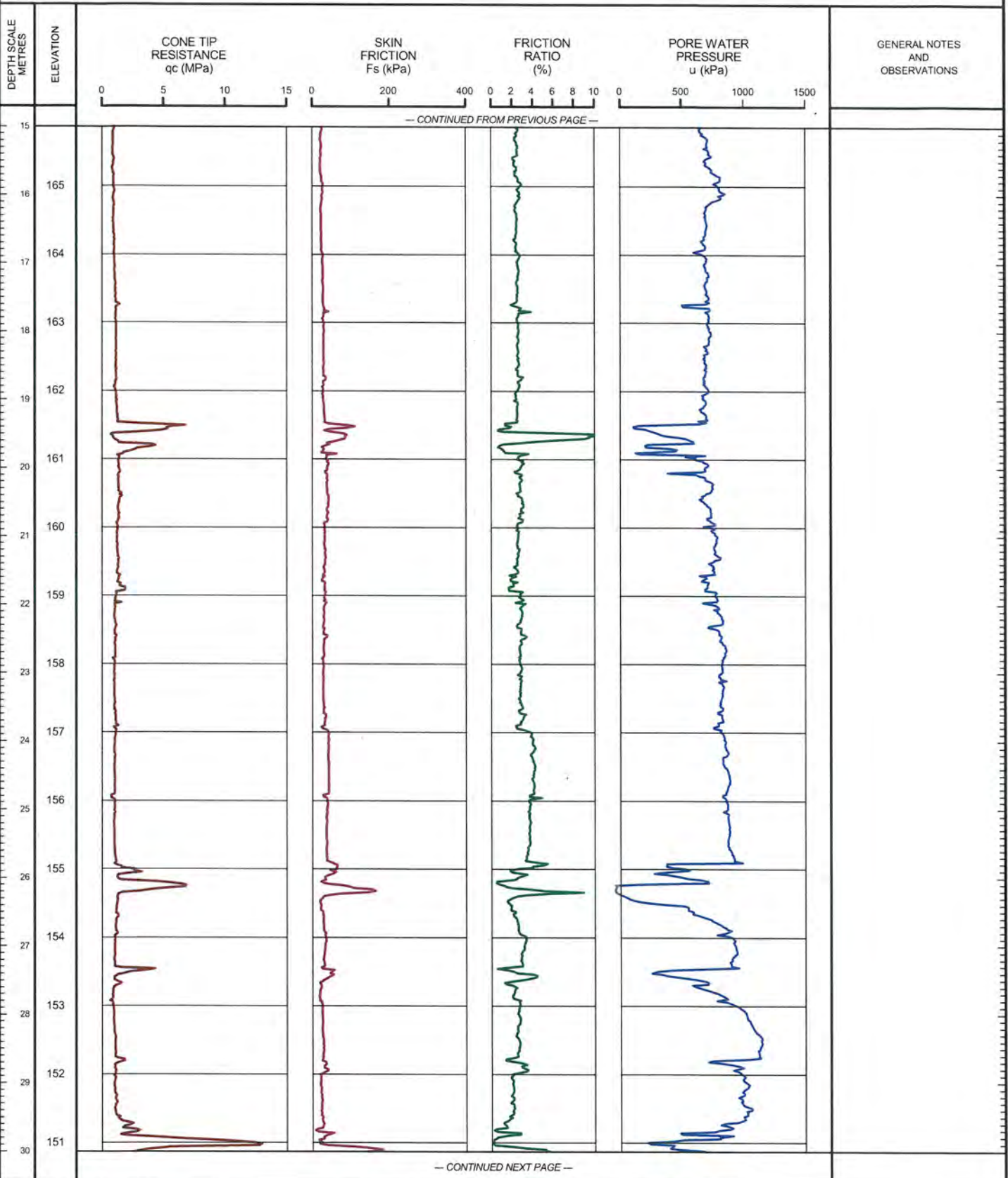
SHEET 2 OF 3

LOCATION: N 4679490.6 ; E 332200.8

TEST DATE: September 5, 2008

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 1.83m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN CPT 01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: CC

CHECKED: *SB*

PROJECT: 07-1130-207-0

RECORD OF CONE PENETRATION TEST CPT-128

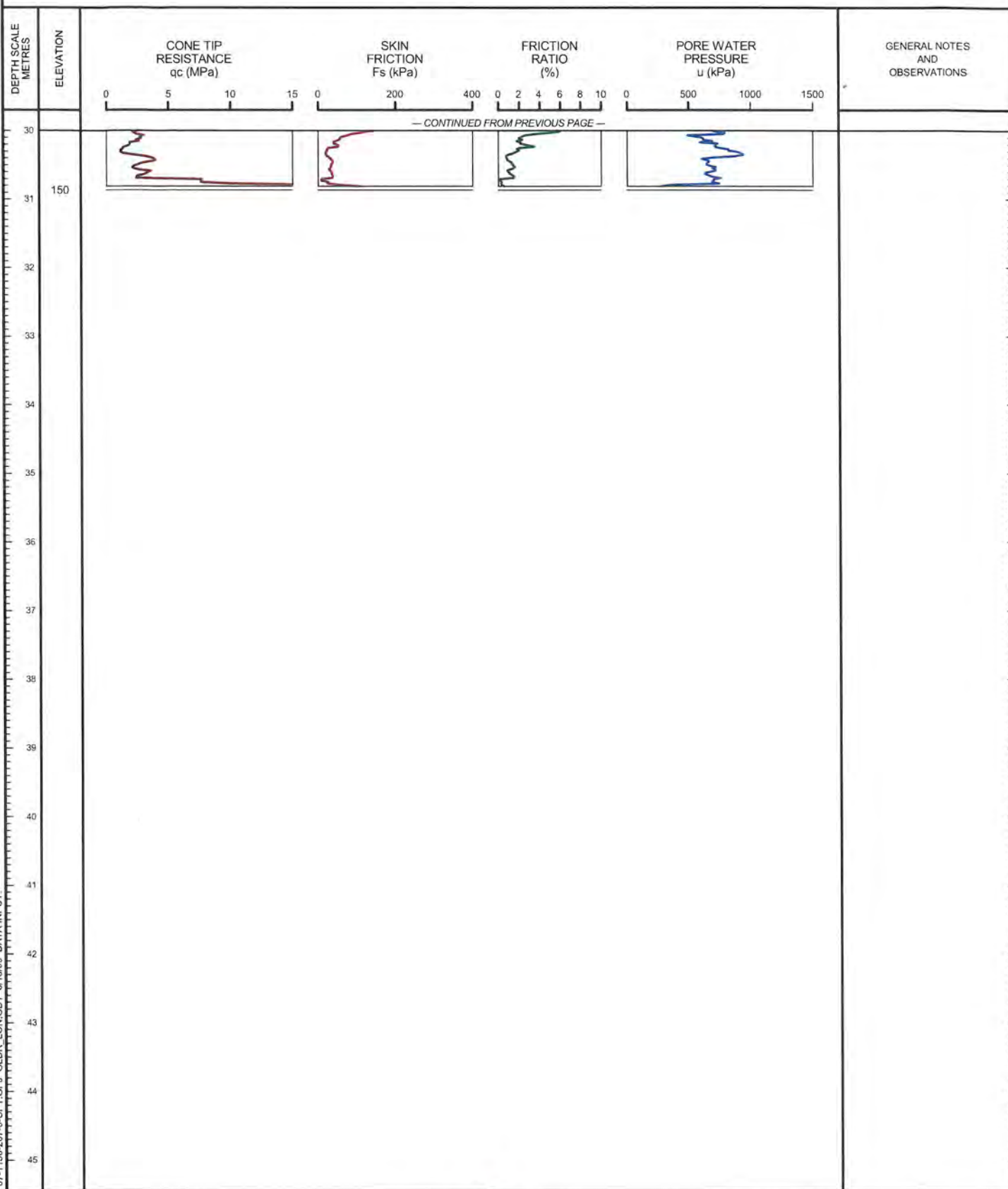
SHEET 3 OF 3

LOCATION: N 4679490.6 E 332200.8

TEST DATE: September 5, 2008

DATUM: GEODETIC

GROUND SURFACE ELEVATION: PREDRILL DEPTH: 1.83m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN CPT_01 07-1130-207-0-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: CC

CHECKED: SSB

PROJECT: 09-1132-0003

RECORD OF CONE PENETRATION TEST CPT-201

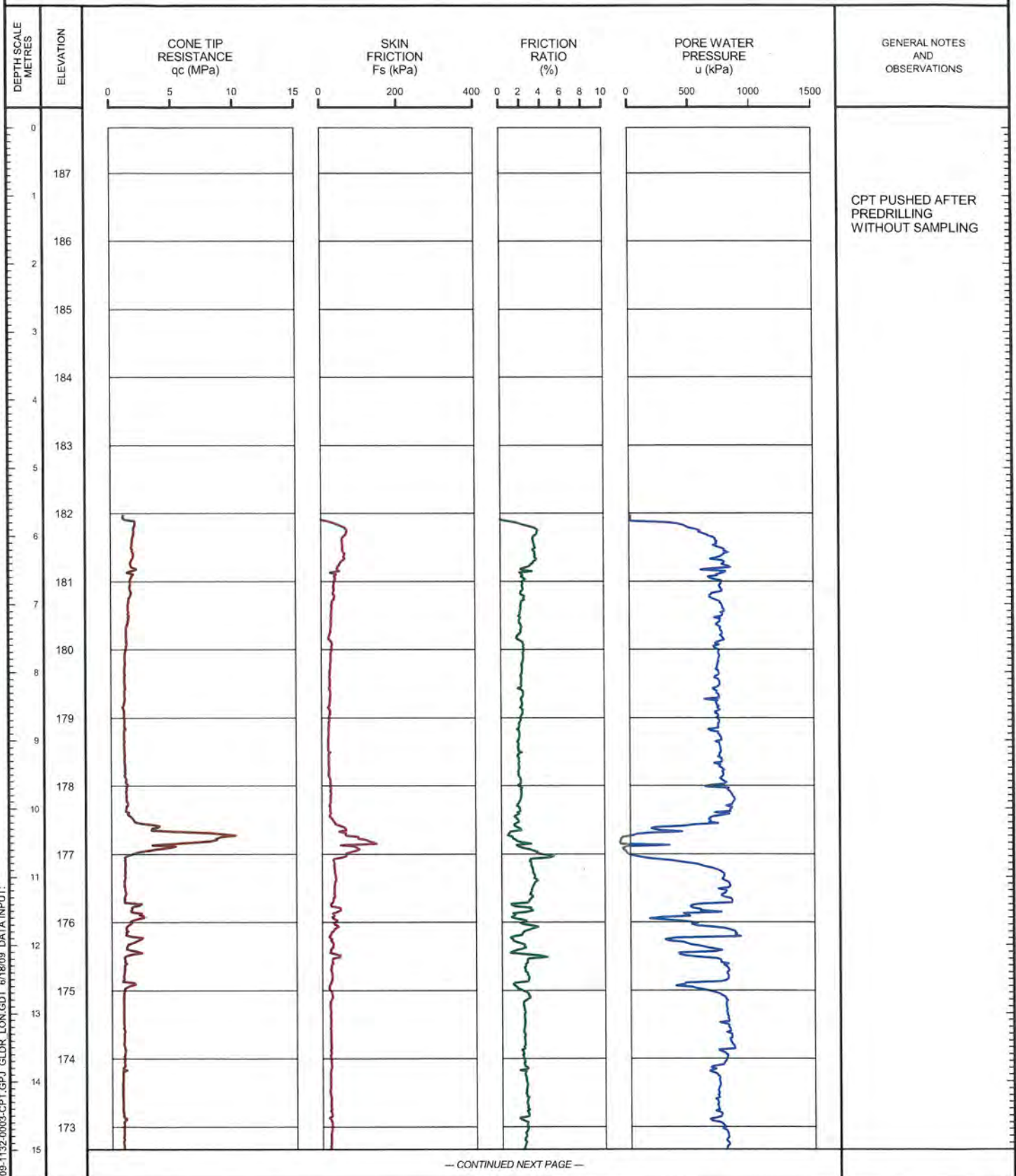
SHEET 1 OF 2

LOCATION: N 4677608.0 :E 335775.0

TEST DATE: February 24, 2009

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 187.67m PREDRILL DEPTH: 5.70m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012

CPT PUSHED AFTER
PREDRILLING
WITHOUT SAMPLING

LDN CPT 01 09-1132-0003-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: NG

CHECKED: SSB

PROJECT: 09-1132-0003

RECORD OF CONE PENETRATION TEST CPT-201

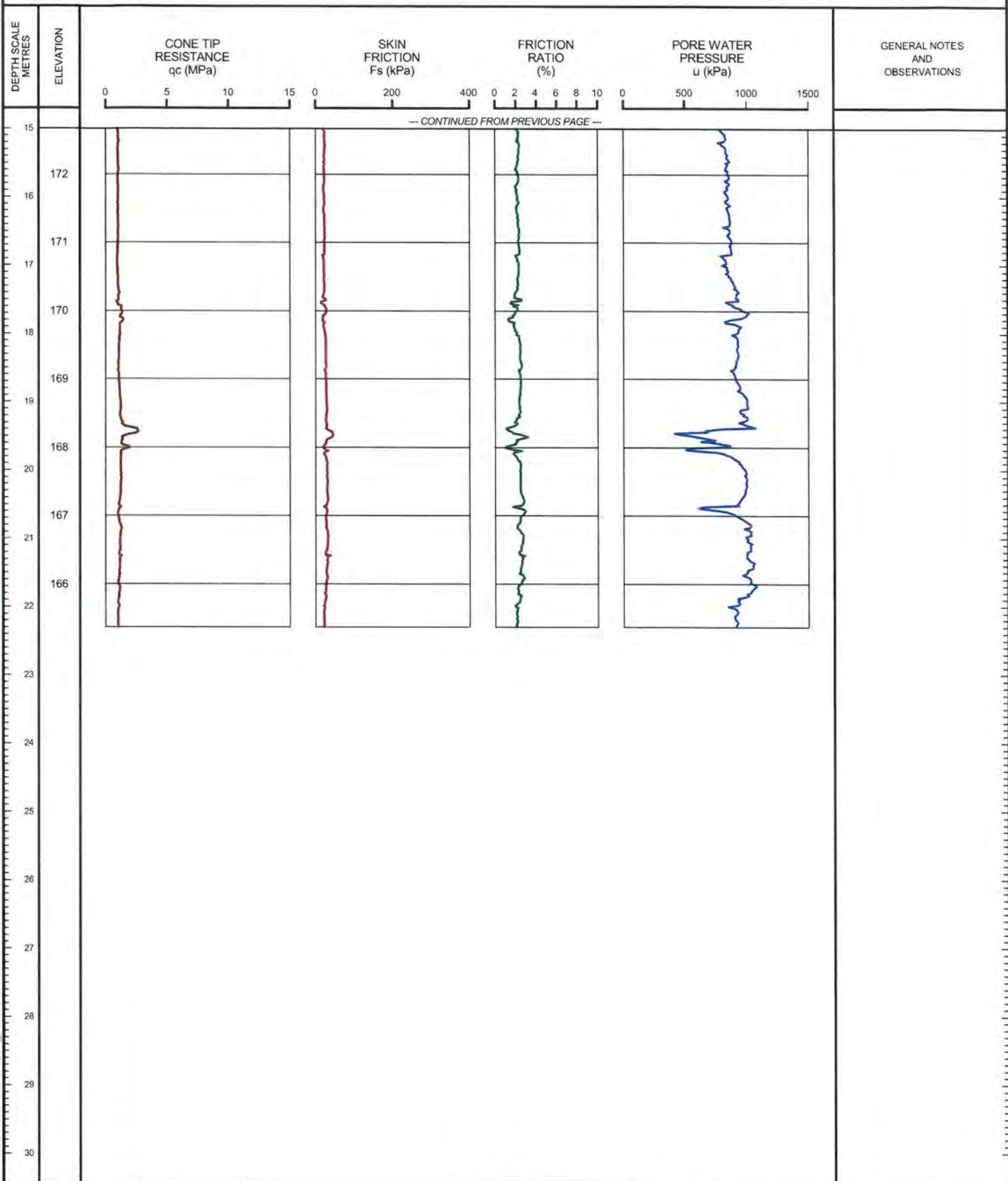
SHEET 2 OF 2

LOCATION: N 4677608.0 :E 335775.0

TEST DATE: February 24, 2009

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 172.67m PREDRILL DEPTH: 5.70m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN CPT 01 09-1132-0003-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: NG

CHECKED: *SSB*

PROJECT: 09-1132-0003

RECORD OF CONE PENETRATION TEST CPT-206

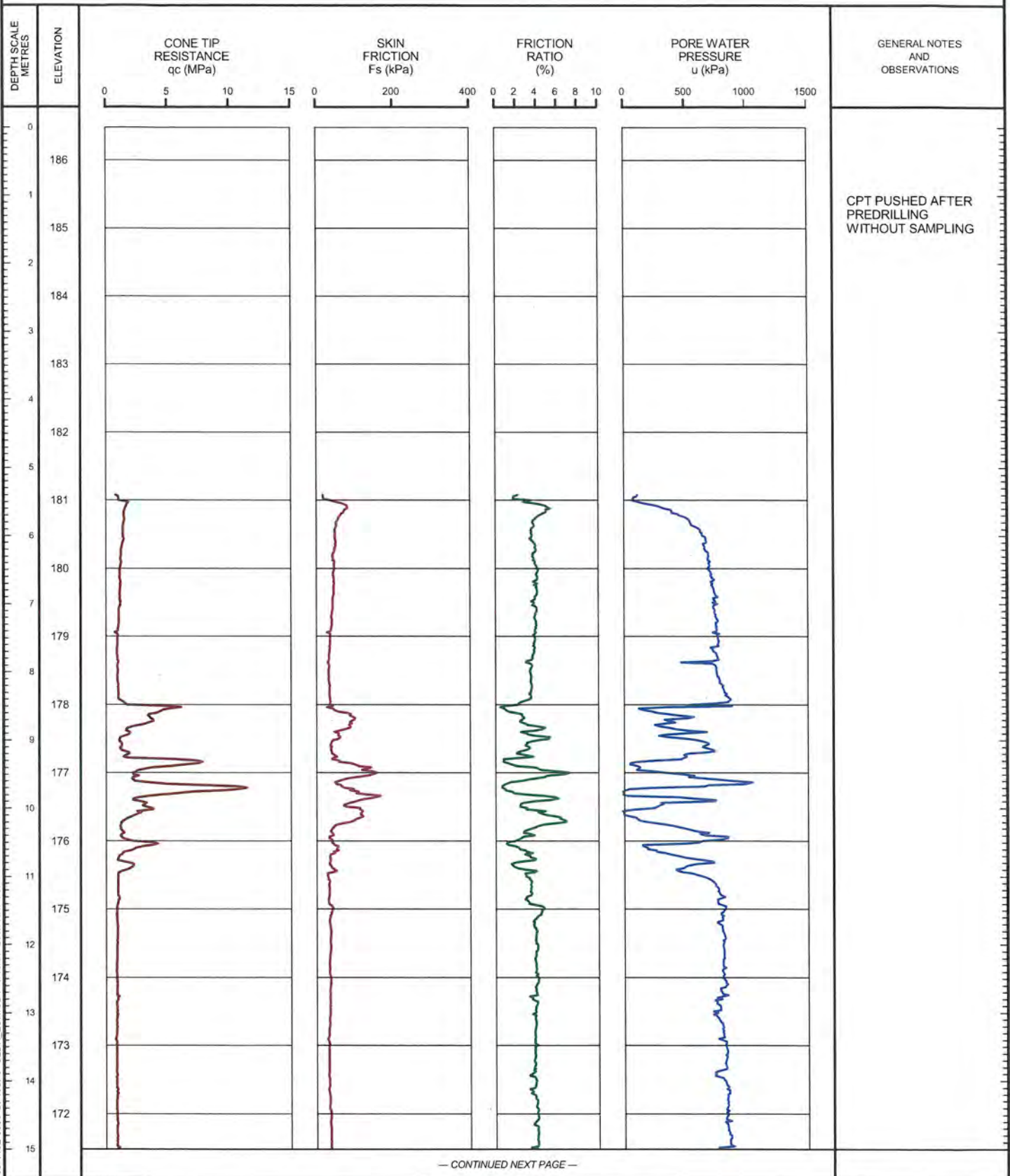
SHEET 1 OF 2

LOCATION: N 4677643.0 ; E 335466.0

TEST DATE: February 24, 2009

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 186.48m PREDRILL DEPTH: 5.40m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012

CPT PUSHED AFTER
PREDRILLING
WITHOUT SAMPLING

LON_CPT_01 09-1132-0003-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE
1 : 75OPERATOR: NG
CHECKED: *SDR*

PROJECT: 09-1132-0003

RECORD OF CONE PENETRATION TEST CPT-206

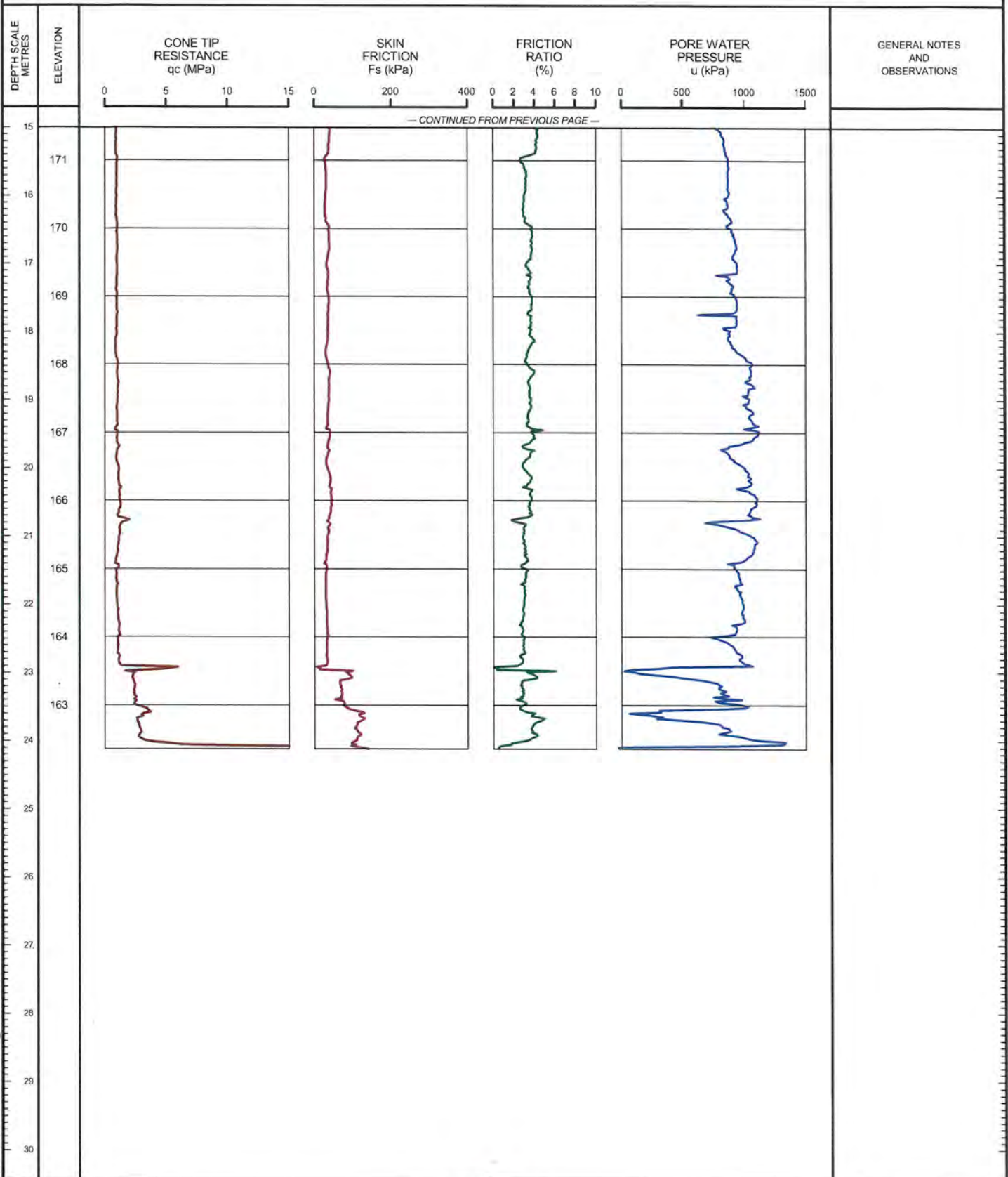
SHEET 2 OF 2

LOCATION: N 4677643.0 ; E 335466.0

TEST DATE: February 24, 2009

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 171.48m PREDRILL DEPTH: 5.40m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN_CPT_01 09-1132-0003-CPT.GPJ GLDR LON.GDT 6/18/09 DATA INPUT:

DEPTH SCALE

1 : 75



OPERATOR: NG

CHECKED: *SB*

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-302

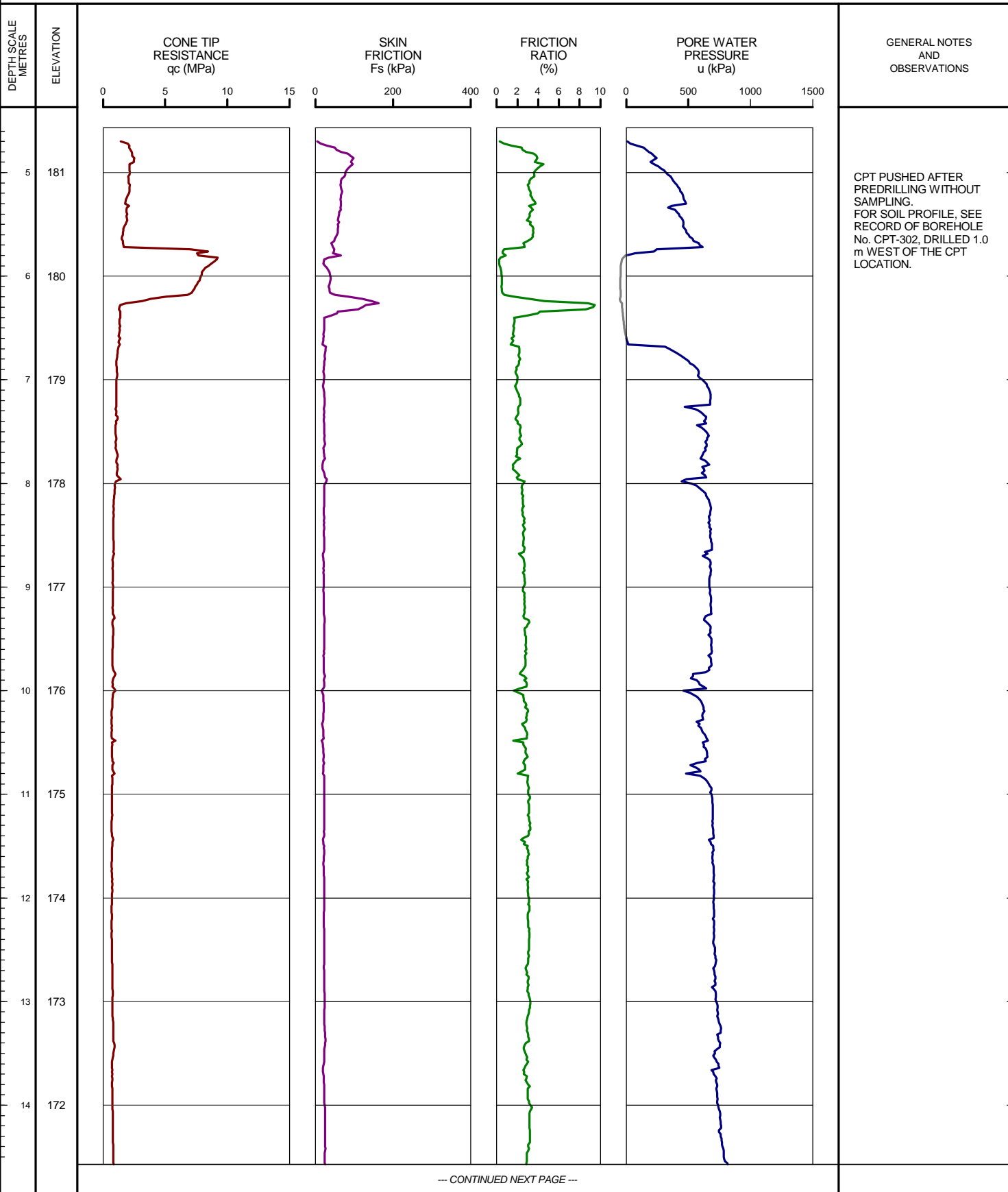
SHEET 1 OF 2

LOCATION: N 4677756.9 ;E 335154.9

TEST DATE: January 13, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 186.26m PREDRILL DEPTH: 4.57m CORRECTION FACTOR A: 0.6 CORRECTION FACTOR B: 0.013



LDN_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 02/23/10 DATA INPUT:

DEPTH SCALE

1 : 50



OPERATOR: TA

CHECKED:

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-302

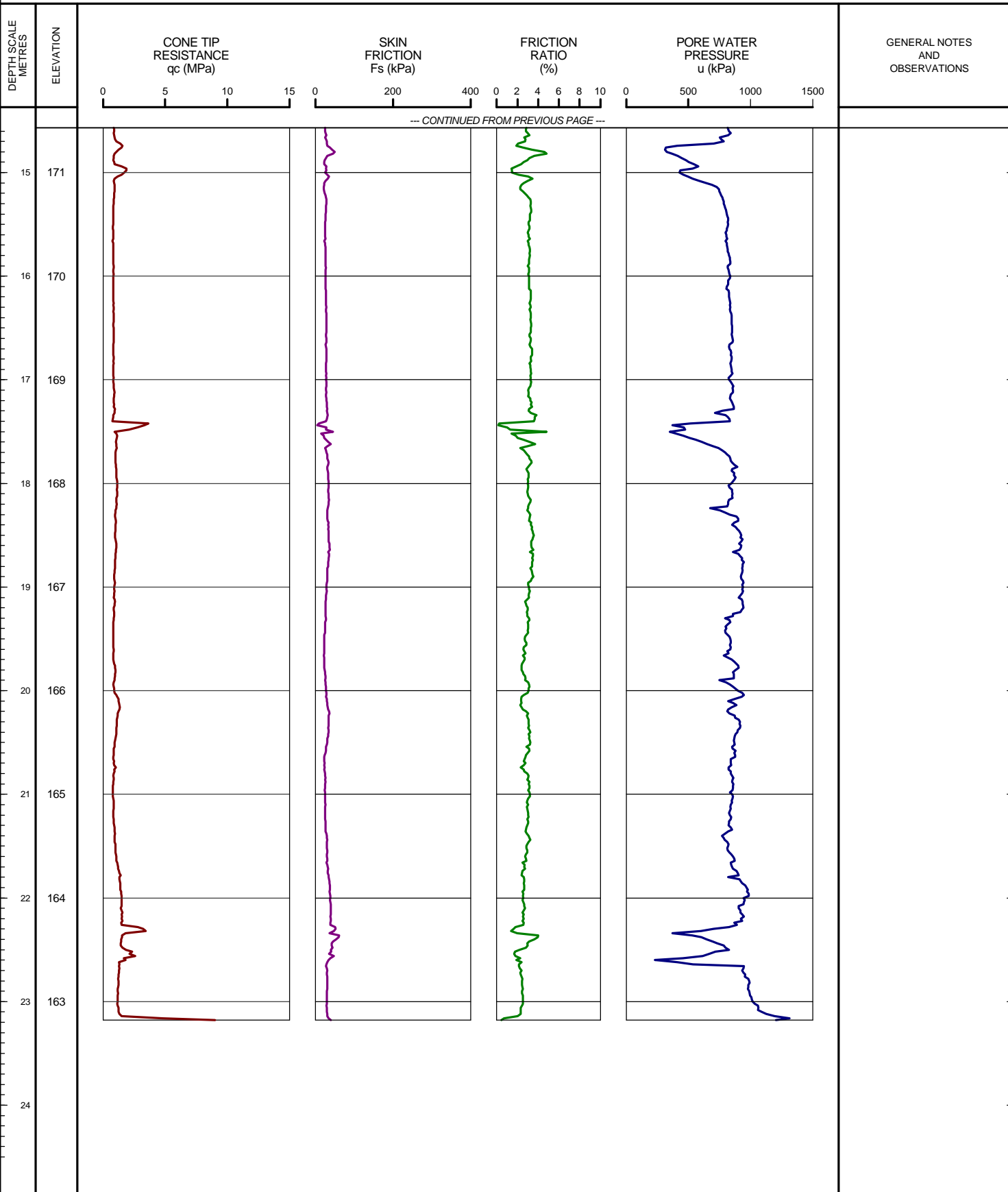
SHEET 2 OF 2

LOCATION: N 4677756.9 ;E 335154.9

TEST DATE: January 13, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 186.26m PREDRILL DEPTH: 4.57m CORRECTION FACTOR A: 0.6 CORRECTION FACTOR B: 0.013



LON_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 02/23/10 DATA INPUT:

DEPTH SCALE

1 : 50



OPERATOR: TA

CHECKED:

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-324

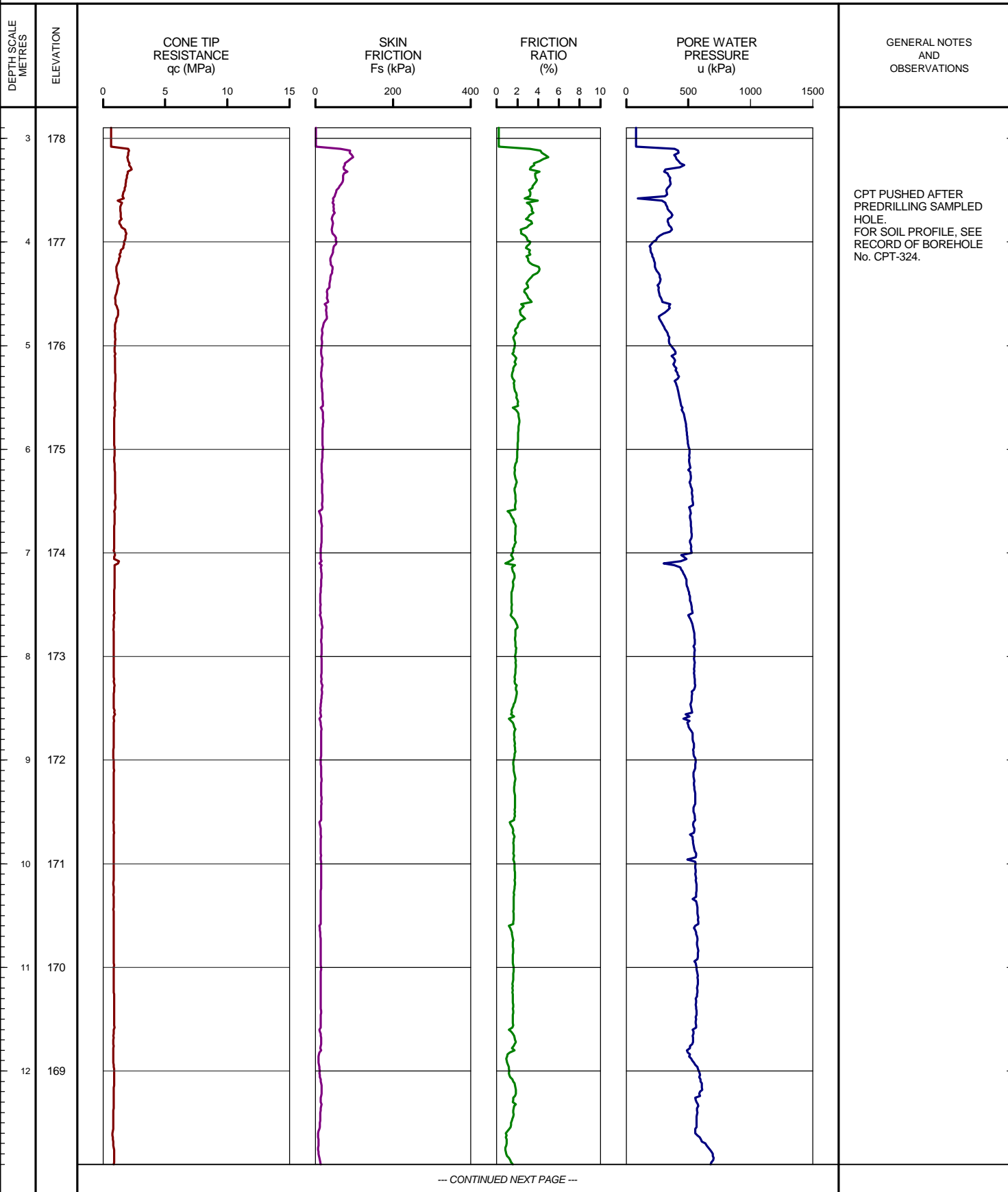
SHEET 1 OF 3

LOCATION: N 4679664.9 ;E 332002.7

TEST DATE: January 25, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 180.85m PREDRILL DEPTH: 2.90m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 02/23/10 DATA INPUT:

DEPTH SCALE

1 : 50



OPERATOR: TA

CHECKED:

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-324

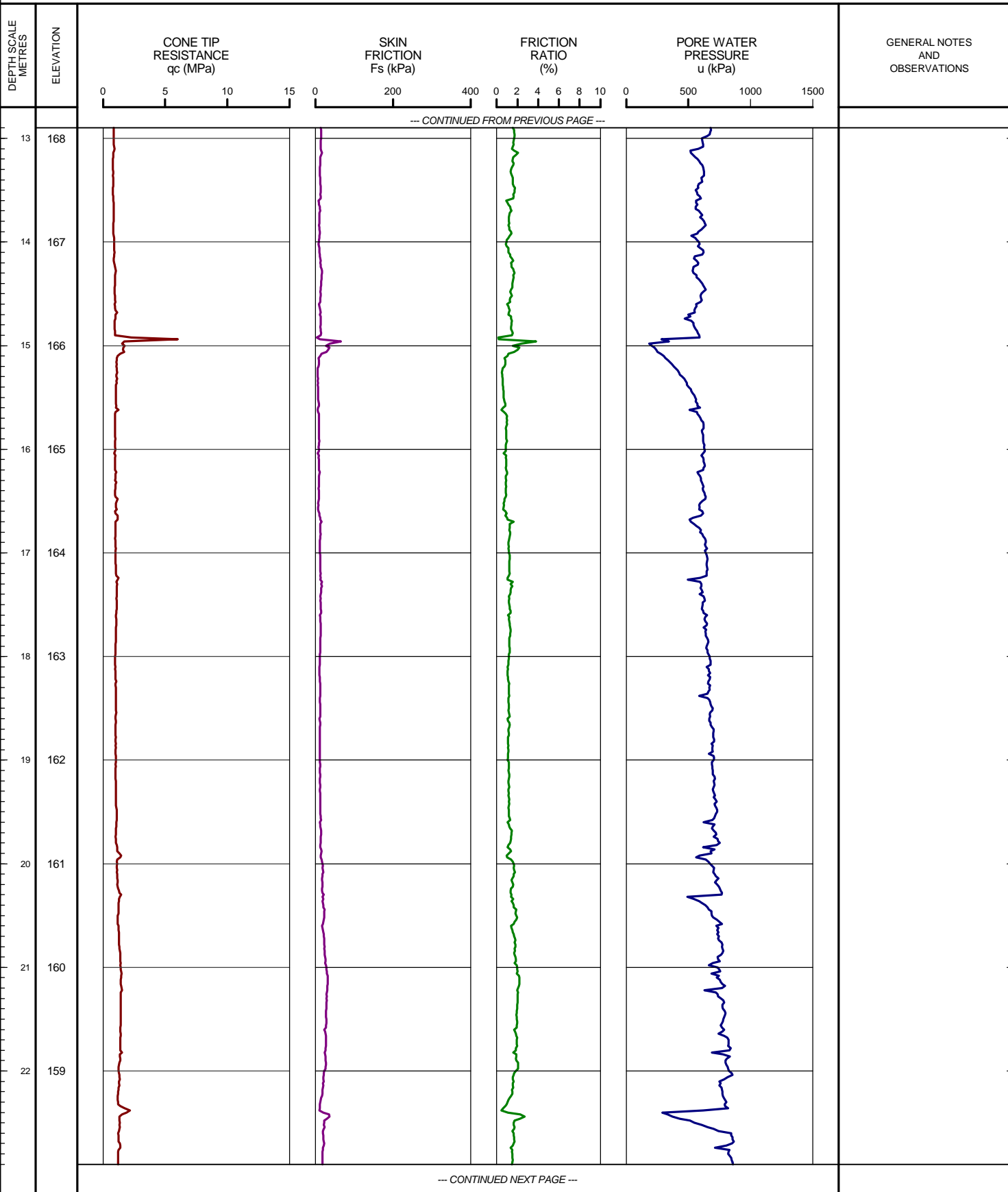
SHEET 2 OF 3

LOCATION: N 4679664.9 ;E 332002.7

TEST DATE: January 25, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 180.85m PREDRILL DEPTH: 2.90m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 02/23/10 DATA INPUT:

DEPTH SCALE

1 : 50



OPERATOR: TA

CHECKED:

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-324

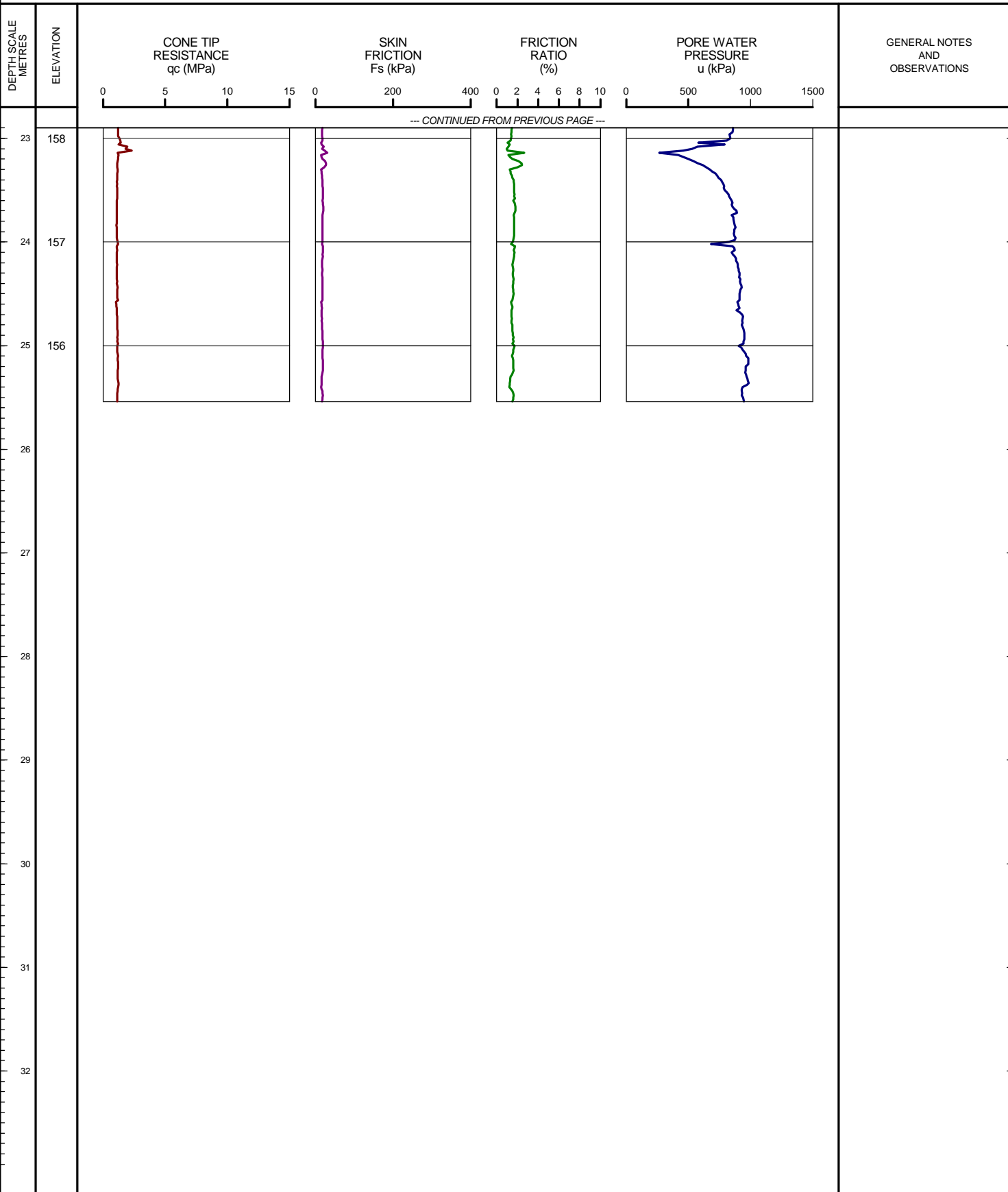
SHEET 3 OF 3

LOCATION: N 4679664.9 ;E 332002.7

TEST DATE: January 25, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 180.85m PREDRILL DEPTH: 2.90m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



LDN_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 02/23/10 DATA INPUT:

DEPTH SCALE

1 : 50



OPERATOR: TA

CHECKED:

Appendix C L-PILE Analysis

