PROJET SOLCYP

CNS interface shear tests on chalk samples from Le Tréport Windfarm site

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EXECUTIVE SUMMARY

The SOLCYP+ project includes a specific Task related to the response of chalk during installation of open-ended tubular piles by driving.

CNS chalk-steel interface shear tests have been identified as a valuable and representative approach to determine the shaft friction which could be mobilised along driven piles in chalk. It was decided to perform a series of tests on chalk samples recovered from the site of the future windfarm to be installed offshore Le Tréport.

Testing of the samples was performed at the 3SR Laboratory in Grenoble. Results are gathered in two companion reports:

- T. Kopf (2019) “Behavior of chalk-steel interfaces under Constant Normal Stiffness shear conditions” Thesis for the requirements of the degree of Master in Civil Engineering, University of Grenoble-Alpes, July 2019;

- C. Dano (2019) “Document de Synthèse - Etude de la réponse de l’interface sol-pieu pour les pieux battus dans la craie” (Décembre 2019)

The present report :

- Describes how the samples have been obtained on site in the context of the detailed site investigation

- Provides the chalk properties (BH logs, CPT data, identification and shear strengths data), in the immediate vicinity of the samples ;

- Discusses the interface conditions prevailing along driven metallic piles in chalk ;

- Provides the parameters required for the CNS interface testing campaign. This includes :

  - The initial normal stress to be applied to the specimens,

  - The normal stiffness to be used, which was evaluated on the basis of a detailed analysis of the rock mass shear modulus of the chalk.

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1. INTRODUCTION

The SOLCYP+ project includes a specific Task related to the response of chalk during installation of open-ended tubular piles by driving.

CNS chalk-steel interface shear tests have been identified as a valuable and representative approach to determine the shaft friction which could be mobilised along driven piles in chalk. It was decided to perform a series of tests on chalk samples recovered from the site of the future windfarm to be installed offshore Le Tréport.

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The samples were collected by Fugro during a large site investigation on Le Tréport windfarm site. This document is intended to:

- describe the conditions of the site investigation;

- provide geotechnical properties of the chalk in the vicinity of the chalk samples used for the CNS testing programme;

- justify the values of the normal rigidity and of the initial normal stress to apply on the samples collected and sent to the 3SR Laboratory.

The whole testing activity has been financially supported by the SOLCYP project:

- tests at 3SR were awarded by IREX “Lettre de Commande” LC/18/SOL/69

- geotechnical data collection from site and definition of testing parameters were awarded to Fugro by IREX “Lettre de Commande” LC/18/SOL/68

This report presents the work executed in compliance with the scope of the LC/18/SOL/ 68 Lettre de Commande.

2. DATA ADQUISITION FROM SITE INVESTIGATION

2.1 The site

Éoliennes en Mer Dieppe – Le Tréport (EMDT) is planning the development of the offshore Dieppe – Le Tréport wind farm. The wind farm site is located approximately 14 km west from Le Tréport, in the French part of La Manche/English Channel. The size of the development area is approximately 110 km^2 with water depths ranging from 14 m to 25 m. The Dieppe – Le Tréport wind farm development includes 62 wind turbine generators (WTG) with associated foundation and supporting infrastructure, an offshore high voltage station (OHVS) and buried inter-array cables (IAC). The WTG and OHVS will be installed on jacket type structures with driven pile foundations as a base case.

2.2 The general geotechnical investigation context

A project-specific geotechnical survey was commissioned to acquire information in support of the planned development. The survey included seafloor in situ testing, sampling from seafloor and geotechnical drilling with downhole in situ testing, downhole sampling and borehole geophysical logging. The acquired data are intended to provide input in the planning, design and installation of the wind farm, specifically the 62 WTG and the OHVS foundation elements.

The operations on site were conducted from the specialist drilling platform Fugro Excalibur, the specialist drilling vessels Fugro Scout and MV Normand Flower, and the MV Despina, between 7 July and 22 October 2018.

A total of 69 geotechnical logs with a target depth of 70 m were obtained.

2.3 The samples recovered

The chalk samples used for the present testing programme in the 3SR Laboratory were collected during the execution of the K01 borehole (19 to 23 September 2018). Due to bad weather conditions exceeding the station keeping capabilities of the dynamic positioning system, the borehole K01 was abandoned at a penetration of 51.5m. This borehole is named K01-BH in the following. The vessel was subsequently repositioned (bump over) within a radius of 5m from the previous position. Then the usual procedure consists in performing destructive drilling down to the depth already attained and resume drilling, sampling and CPT testing to the target depth. Aware of the objectives of the SOLCYP+ needs, the client (EMDT) authorized the recovery of additional samples in the 37.0 to 51.5 m interval. The material encountered is typical of the Le Tréport chalk.

Seven 1.5m-long rotary cores were collected, named R1 to R7. Rotary core samples were drilled with a Geobor-S equipped with a triple tube wireline core system with a 102 mm nominal inner diameter. The samples are of very high quality.

The client also accepted to share with the SOLCYP+ project the information gathered within the K01-BH borehole over the interval of interest (37 to 51.5m) which includes CPT data, core descriptions, and laboratory testing data.

The cores R1 to R7 which are not 'contractual' are not referenced in the borehole logs. The Table below summarizes the position of the SOLCYP+ cores obtained in K01-BHb and their correspondence with the cores or CPT data collected in K01-BH.

Table 2-1. Summary of K01-BHb cores

Core	Depth (m)	Correspondence with K01-BH
R1	37.00 – 38.50	(~ RC8)
R2	38.50 – 40.00	(~ CPT 07)
R3	41.50 – 43.00	(~RC10)
R4	44.50 – 46.00	(~RC11)
R5	46.00 – 47.50	(~RC12)
R6	47.50 – 49.00	(~ CPT 09)
R7	49.00 – 50.50	(~RC13)

3. CHALK PROPERTIES IN THE VICINITY OF THE K01 BOREHOLE

3.1 Logs of K01-BH and K01-BHb

The logs of the boreholes drilled at the K01 location are gathered in Annex A

3.2 CPTs at K01-BH and K01-BHb locations

The results of the CPT carried out at the K01 location are gathered in Annex B. CPT data are presented under both formats:

- Net and total cone resistance; friction ration R_f, excess pore pressure Δu; pore pressure ratio Bq;

- Normalised cone resistance and shaft friction; soil identification index Ic.

3.3 Laboratory data on K01-BH and K01-BHb samples

Laboratory data acquired at the K01 location include:

- Classification tests

- Unconfined Compression Tests

They are presented in Annex C

3.4 Photographs of K01-BH and K01-BHb samples

The photographs of all the chalk samples recovered are gathered in Annex D

4. CHALK-STEEL INTERFACE CONDITIONS ALONG DRIVEN PILES

4.1 Effects of pile driving

When an open-ended steel pile is driven into a chalk formation, two major observations can be made:

- A thin annulus of remoulded chalk is formed around the periphery of the tube. The thickness of the annulus of putty chalk is of the same order of magnitude as the thickness of the steel wall. Obviously shaft friction at short and long term is controlled by the interface properties of the steel/remoulded chalk interface.

- The radial stress imposed by the surrounding soil to the pile wall is modified by the penetration of the pile. The volume of the steel should be absorbed by the soil. When driving in a chalk layer present at surface, formation of radial cracks is visually observed.

4.2 Reconstitution of the remoulded chalk

The reconstitution of samples representative of the remoulded chalk annulus present around driven piles is still subject to discussions.

The preparation of the samples for the 3SR testing campaign is discussed in the companion report by T. Kopf (2019) and it is not included in this report.

4.3 Parameters for CNS testing

In CNS testing the lateral (radial) stiffness of the surrounding soil is imposed as boundary condition. The Constant Normal Stiffness (CNS) test represents a middle ground between the two extreme conditions simulated in the CNL (Constant Normal Loading) and CV (Constant Volume or Infinite Stiffness) tests.

In practice, during shearing, a constant ratio is maintained between the variations in the normal stress ant the normal displacement from the application of the initial normal stress. The normal stress is constantly modified, taking into account the variation of the normal displacement and the imposed normal stiffness, in accordance with the equation:

$$\sigma_n - \sigma_0 = k_n([u] - [u]_0)$$

Where

σ_n= normal stress

σ_0= initial normal stress

k_n= normal stiffness imposed at the interface

$[u]$= normal displacement

$[u]_0$= normal displacement under initial stress σ_0

For more details, reference can be made to:

- Puech A. and Quiterio-Mendoza B. (2019). Characterization of rock masses for designing drilled and grouted offshore windfarm pile foundations. Proceedings of the XVII European Conference on Soil Mechanics and Geotechnical Engineering, Reykjavik.

- Characterization of rock-grout interfaces for socket pile design: definition of parameters for conducting CNS direct shear tests (May 2019) Rapport SOLCYP (IREX LC/18/SOL/67)

Two parameters are then required for defining a CNS testing programme:

- The initial normal stress σ_0 : this parameter is discussed in section 5
- The normal stiffness imposed at the interface k_n : this parameter is determined in section 6

5. DISCUSSION ON INITIAL NORMAL STRESS

The initial normal stress applied on the sample should be representative of the radial normal stress applied on the pile wall by the annulus of remoulded chalk after driving and equalisation of pore pressures.

The ICP method (Jardine et al., 2005)) provides a practical solution to estimate the effective radial stress σ'_{rc}

- In drained conditions: $\sigma'_{rc} = 0.029\ q_c\ (\sigma'_{vo}/Pa)^{0.13}\ (h/R^*)^{-0.38}$

where: σ'_{vo} = effective vertical stress

q_c = cone resistance

Pa= atmospheric pressure

h = distance from pile tip

R* = equivalent radius for an open-ended pile ($R^* = (R^2_{ext}\ \_\ R^2_{int})^{0.5}$

From CPT data it may be inferred: q_c # 25 MPa

Thus, for a 2m OD pile driven to 60m below seabed (BSL), the radial effective stress at 45m penetration would be of the order of 185 kPa

- In undrained conditons : $\sigma'_{rc} = Kc.\ \sigma'_{vo}$

with $Kc = [2.2 + 0.016.YSR - 0.870\ \log_{10}St]\ YSR^{0.42}\ (h/R^*)^{-0.20}$

where : σ'_{vo} = effective vertical stress

YSR = Yield Stress Ratio

St = sensitivity

h = distance from pile tip

R^* = equivalent radius for an open ended pile ($R^* = (R^2_{ext} - R^2_{int})^{0.5}$

From laboratory test data it may be inferred: YSR # 4.5 and St # 10

Thus, for a 2 m OD pile driven to 60 m BSL, the radial effective stress at 45m penetration would be of the order of 480 kPa

This value is considered excessively high because it assumes totally undrained conditions and does not account for the high compressibility of the chalk with formation of the putty annulus. Back analyses of average shaft friction on piles driven in chalk (e.g. Buckley et al. 2018) would suggest effective radial stresses of the order of $K_0.\sigma'_{vo}$ (i.e. about 0.5x 400 = 200kPa at 45m BSL)

As a conclusion it is considered that the range of interest of the effective radial stress for studying the interface response of large driven piles in chalk is :

$$50 < \sigma'_{rc} < 250\text{kPa}$$

6. CHARACTERISATION OF ROCK MASS FOR CNS TESTING

6.1 Intact Rock Properties

6.1.1 Unconfined compression strength and elastic modulus

The compression strength and the intact elastic modulus (E_i) values were obtained through the performance of UCS tests on selected samples from the rock cores obtained during the site investigation.

Figure 6-1 presents the available results of tests performed on K01-BH samples. The UCS varies from 0.8 to 2.4 MPa, while the mean value is of 1.7 MPa.

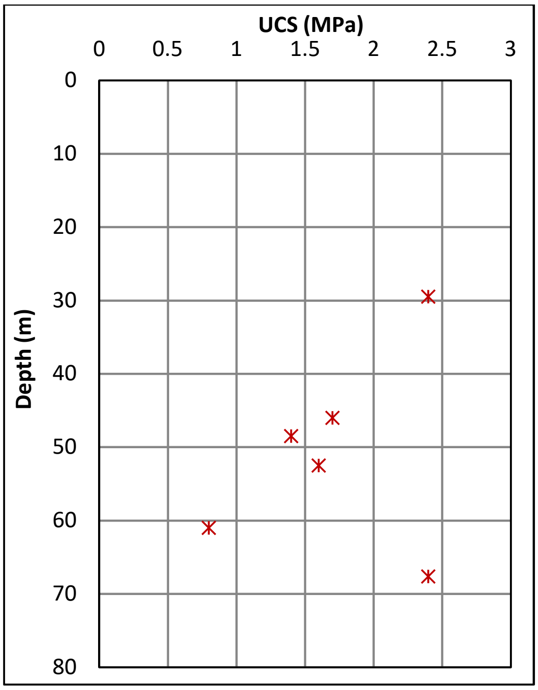

Figure 6-1. UCS values for samples of K01-BH location

6.1.2 Intact shear modulus

Intact rock shear moduli G_i, were derived from Elastic (Young's) intact moduli E_i using a Poisson's coefficient $\nu = 0.30$ in the expression:

$$G_i = \frac{E_i}{2(1+\nu)}$$

Results are plotted in Figure 6-2, where intact shear modulus varies between 100 and 300MPa. The mean value is around 200MPa.

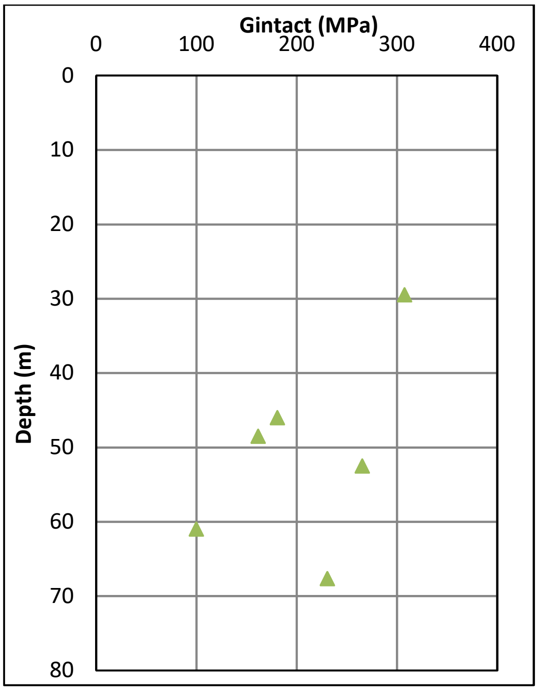

Figure 6-2. Intact shear modulus of K01-BH location

6.2 Rock Mass Classifications

6.2.1 Rock Quality Designation

The statistics of the RQD values obtained from information of borehole log are given in Table 6-1. A mean value of 63% was obtained, showing the relatively low fracturing level of the core rock. This is consistent with the photographs of the cores.

Table 6-1. Summary of RQD values

RQD (%)			
Min	Max	Mean	Standard deviation
0	94	63	24

6.2.2 Geological Strength Index

The GSI or Geological Strength Index was derived from the RQD values and discontinuities information given in the borehole logs. The obtained values vary between 29 and 55%, and the mean is of 42.5%; see Table 6-2

Table 6-2. Summary of GSI values

GSI (%)			
Min	Max	Mean	Standard deviation
29	55	42.5	9.0

6.3 Constant Normal Stiffness

During CNS direct shear tests, the normal stress is regulated to maintain a constant k value during shearing. The normal stress, σ_n, is adjusted continuously to satisfy the following equation:

$$\frac{\Delta\sigma_n}{\Delta \mathrm{h}} = k$$

where $\Delta\sigma_n$ is the change in normal stress and Δh is the change in height due to sample dilation or compression during shearing.

The stiffness, k, is calculated using the equation:

$$k = \frac{4G_m}{D}$$

where, D is the diameter of the pile (or of the drilled hole in case of bored piles) and G_m is the shear modulus of the soil or rock mass.

6.3.1 Rock Mass Shear Modulus

In order to assess the constant normal stiffness, the shear modulus of the rock mass should be obtained. Different correlations to obtain this value were compared in order to have the most representative values. Hereafter are presented the relations used in this project to derive the rock mass moduli.

Detailed information about the definition of parameters may be found in the report entitled “Characterization of rock-grout interfaces for socket pile design: definition of parameters for conducting Constant Normal Stiffness direct shear tests” (Quiterio-Mendoza and Puech, 2019). This report was financed by the SOLCYP project and kindly provided to the SOLCYP+ partners.

6.3.2 Obtaining G_m from rock mass factor

The shear modulus of the rock mass, G_m, may be estimated from the shear modulus of the intact specimen, G_i, using the rock mass factor, $j = G_m / G_i$, with values of the rock mass factor, j, as proposed by Hobbs (1974) and summarised in Table 6-3 below.

Table 6-3: Rock mass factor correlations (after Hobbs, 1974)

Quality classification	R.Q.D. %	Mass Factor j(RQD)
Very poor	0-25	0.2
Poor	25-50	0.2
Fair	50-75	0.2-0.5
Good	75-90	0.5-0.8
Excellent	90-100	0.8-1.0

For this first approach, the rock mass modulus is then estimated for the borehole data available at the borehole K01-BHb selected for CNS testing, according to the following formulation:

$$G_m = G_i \cdot j(RQD)$$

6.3.3 Obtaining G_m from geological indices

GSI and RQD values can be entered into a number of equations providing the rock mass moduli E_m, either directly, or in combination with the intact rock properties such as intact moduli E_i or UCS values.

Formulations used for the assessment of rock mass moduli for this specific project are summarized in Table 6-4.

Table 6-4. Rock mass modulus equations

Author (s)	Equation, $E_{m=}$	Remark
Gardner (1987)	$\alpha_E E_i$ $\alpha_E = 0.0231RQD - 1.32$	For RQD>60. If RQD<60, α_E=0.15
Hoek and Brown (1997)	$\sqrt{\frac{UCS(MPa)}{100}}10^{\left(\frac{GSI-10}{40}\right)}$	[GPa]
Zhang and Einstein (2004)	$\alpha_E E_i$ $\alpha_E = 10^{0.0186RQD} - 1.91$	RQD from 0 to 100%
Hoek and Diederichs (2006)	$E_i\left(0.02 + \frac{1 - D/2}{1 + e^{\left(\frac{60+15D-GSI}{11}\right)}}\right)$	D=degree of disturbance (from 0 to 1)

Shear mass moduli G_m, were derived from Elastic (Young's) mass moduli E_m using a Poisson coefficient $\nu = 0.30$ in the expression:

$$G_m = \frac{E_m}{2(1+\nu)}$$

6.4 Range of Shear Moduli

The results of the different rock mass modulus computation are summarized in Figure 6-3

Lower Estimate (LE), Mean and Higher Estimate (HE) of shear moduli are tentatively presented

Table 6-5: LE, HE and mean Shear mass moduli

Borehole	LE G_m (MPa)	Mean G_m (MPa)	HE G_m (MPa)
K01-BH	50	100	200

The shear mass modulus, Gm, represents approximatively 50% of the intact modulus, G_i, obtained from laboratory measurements (see Figure 6-2).

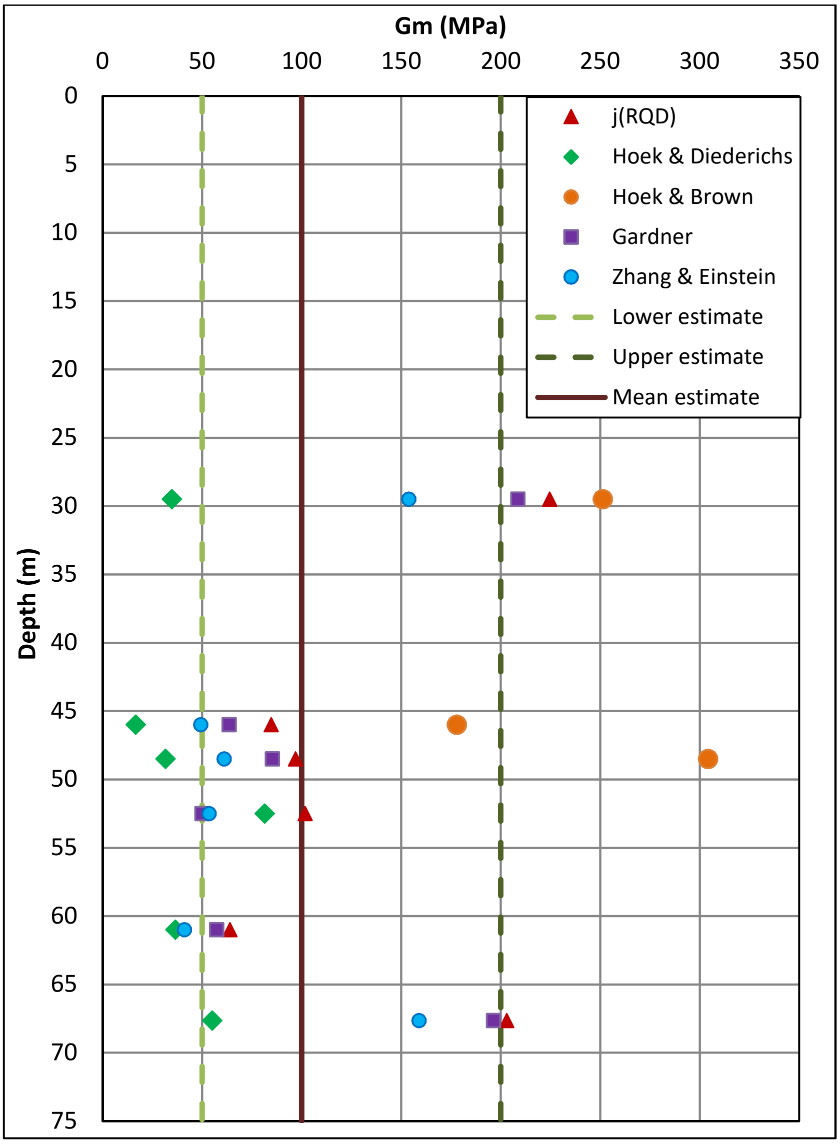

Figure 6-3. Shear moduli estimation

6.5 Recommended Normal Stiffness

It is proposed that the normal stiffness applied on the samples is taken from the mean rock mass shear modulus G_m.

The stiffness, k, is then calculated using the equation:

$$k = \frac{4G_m}{D}$$

where $D = 2m$. This diameter is presently contemplated for the piles of the future OHVS jacket structure.

Table 6-6: Recommended values for rock mass Shear moduli and Stiffness for CNS samples

Gm	Gm (MPa)	K (kPa/mm)
Mean	100	200
Lower estimate	50	100
Upper estimate	200	400

7. ACKNOWLEDGEMENTS

EMDT (Eoliennes en Mer Dieppe-Le Tréport) are gratefully acknowledged for their financial support in collecting the cores at the K01 location and authorizing access to local data on chalk characterization.

8. REFERENCES

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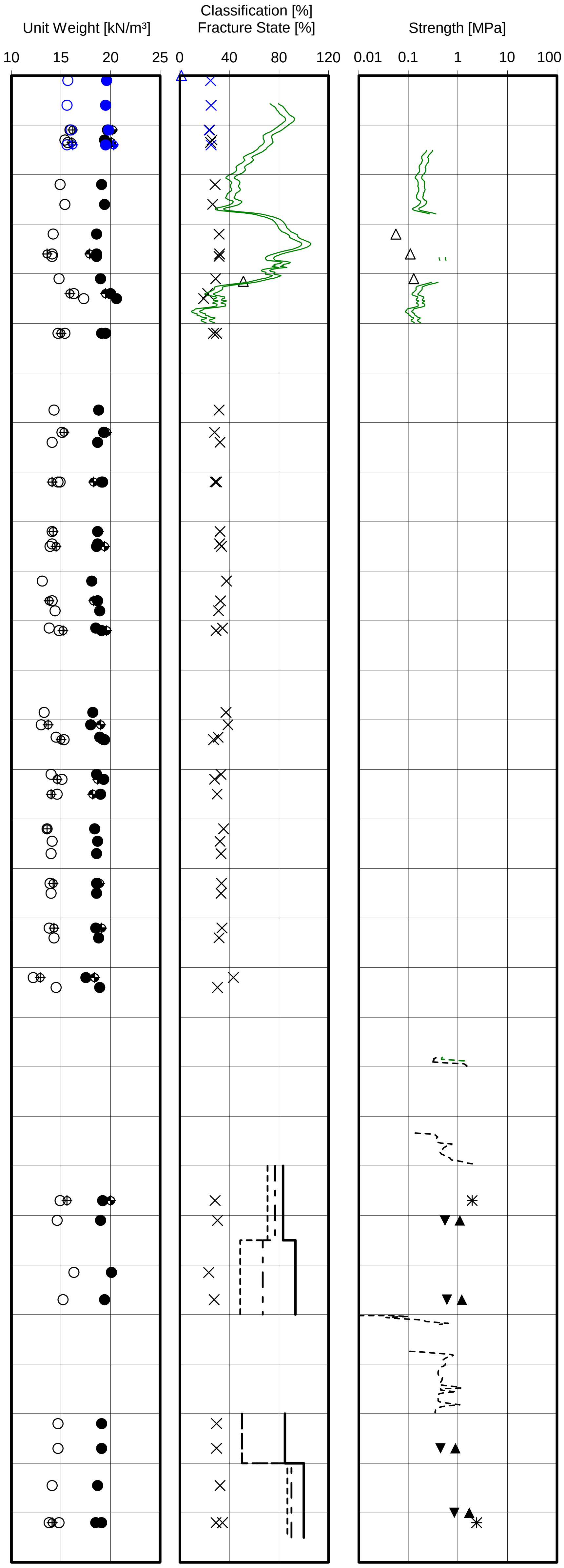
Zhang L, Einstein HH. (2004). Using RQD to estimate the deformation modulus of rock masses. International Journal of Rock Mechanics and Mining Sciences, 41(2), 337e41.

ANNEX A

Depth Below Seafloor [m]	Samples	In situ Tests	Strata Description
0.0	P1A, P1		0.0 m to 2.9 m - medium dense to very dense dark grey slightly gravelly calcareous silica fine to coarse SAND, with many shells and shell fragments. Gravel is fine to medium subangular to subrounded of mixed lithology
	P2, P2		
2.0	P3		from 1.7 m to 2.9 m - slightly silty at 2.4 m - with a very thin bed of shells and shell fragments at 2.7 m - with a thin lamina of black organic Silt
	P4		2.9 m to 4.2 m - medium to high strength grey sandy slightly gravelly CLAY. Gravel is light brown fine to coarse of flint
4.0	P5		4.2 m to 5.0 m - medium dense grey slightly gravelly clayey calcareous silica fine SAND. Gravel is white fine to coarse subangular to subrounded of chalk
	P6		5.0 m to 14.0 m - white to light grey structureless CHALK (CIRIA Dm) composed of gravelly SILT. Gravel is fine to coarse subangular to subrounded extremely weak to very weak low to medium density
6.0	P7		
	P8		
8.0	P9		from 8.4 m to 8.6 m - with coarse gravel of flint
	P10		
10.0		CPT01	
	P11		
	P12		
12.0	P13		
	P14		at 13.0 m - with a cobble of flint
14.0	P15		14.0 m to 19.8 m - white to light grey structureless CHALK (CIRIA Dc) composed of silty fine to coarse angular to subangular GRAVEL. Gravel is extremely weak low density from 14.4 m to 14.8 m - with traces of fine gravel of flint
	P16		
16.0	P17		from 16.2 m to 16.6 m - with traces of fine to medium gravel-sized fossils
	P18		
18.0	P19		from 18.0 m to 18.6 m - with traces of medium gravel of flint
		CPT01	
20.0	P20		19.8 m to 22.0 m - extremely weak to very weak low density white CHALK (CIRIA B to C)
		CPT02	
22.0	RC1		at 22.0 m - with a cobble of flint 22.0 m to 69.8 m - extremely weak to very weak low density white to light grey CHALK (CIRIA A2 to A3) - with closely to medium spaced subhorizontal planar rough to smooth very tight clean fractures occasionally with dark grey staining from 23.4 m to 23.9 m - Chalk (CIRIA B3)
24.0	RC2		at 24.1 m - with a cobble of flint at 24.6 m - with fine gravel of flint
		CPT03	
26.0		CPT04	
	RC3		at 27.3 m - with a cobble of flint
28.0	RC4		
			from 27.9 m to 30.2 m - Chalk (CIRIA A1) at 29.4 m - with a cobble of flint
30.0		CPT05	



Date commenced : 19-Sep-2018
Method : Rotary borehole drilling, sampling and testing
Recovery depth : to 69.8 m below seafloor
Penetration depth : to 70.0 m below seafloor
Water depth : 20.2 m
Vertical datum : Project Reference Level (PRL)
Coordinates : 371271 m E 5557265 m N

Note(s):

Location(s):
K01-BH
K01-BH-b
K01-BH-c
K01-CPT

Derived from water content
Derived from water content (dry)
Derived from volume mass calculation
Derived from volume mass calculation (dry)

Total Core Recovery
Solid Core Recovery
Rock Quality Designation
Water content
Plastic limit
Liquid limit
Plasticity index
Percentage fines
Carbonate content
Organic content
Relative density derived from CPT

Undrained Shear Strength (s_u)
Pocket penetrometer
Torvane
Laboratory vane
UU-triaxial
CU-triaxial
Direct simple shear
s_u from CPT
Slashed refers to remoulded soil

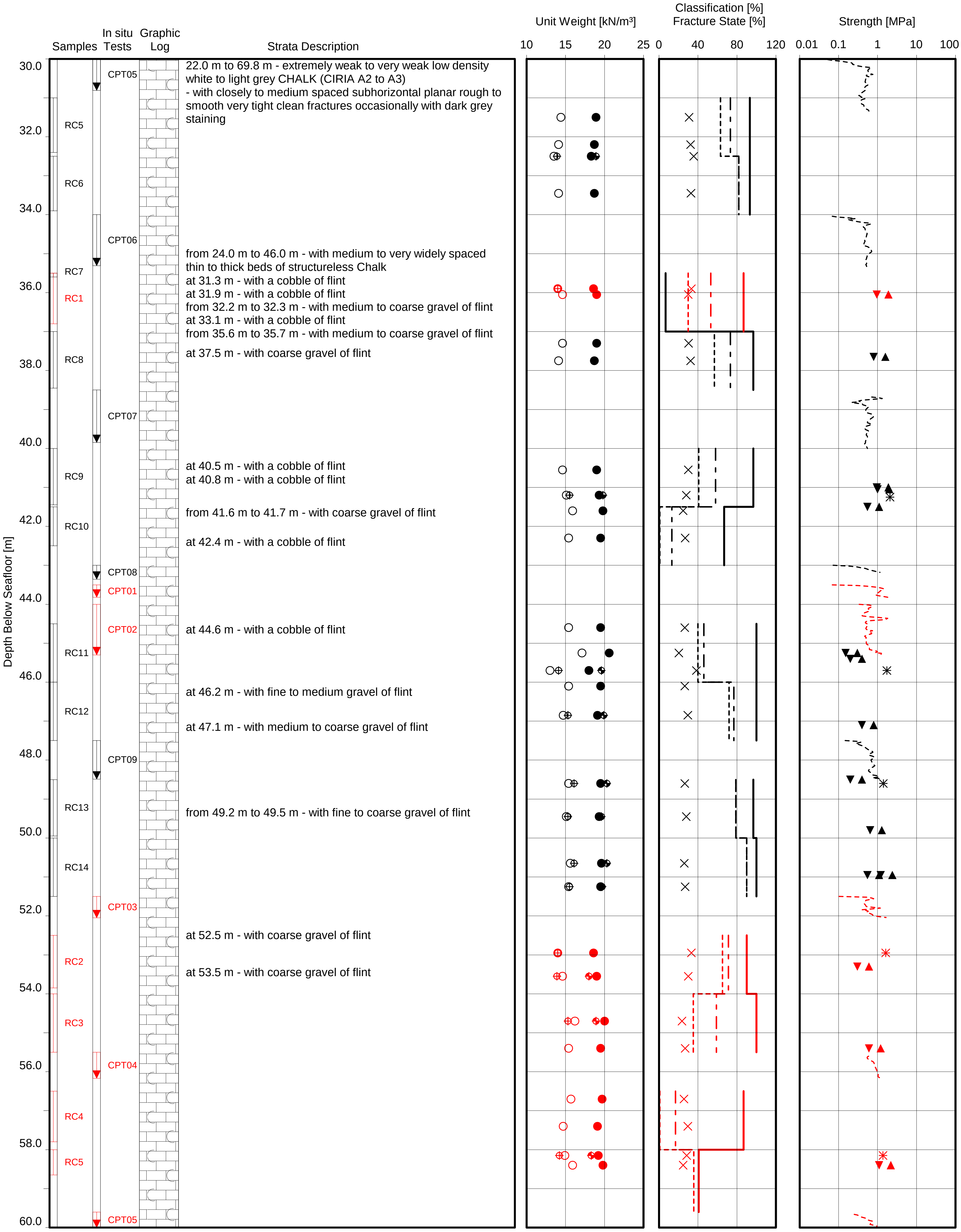
Uni-axial Compressive Strength (σ_c)
Needle penetrometer
Point load High
Point load Low
UCS
σ_c from CPT
> Symbol refers to result higher than equipment >

GEOTECHNICAL LOG

FUGRO

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

Samples	In situ Tests	Graphic Log	Strata Description
	CPT05		22.0 m to 69.8 m - extremely weak to very weak low density white to light grey CHALK (CIRIA A2 to A3) - with closely to medium spaced subhorizontal planar rough to smooth very tight clean fractures occasionally with dark grey staining
RC5			
RC6			
	CPT06		from 24.0 m to 46.0 m - with medium to very widely spaced thin to thick beds of structureless Chalk at 31.3 m - with a cobble of flint at 31.9 m - with a cobble of flint from 32.2 m to 32.3 m - with medium to coarse gravel of flint at 33.1 m - with a cobble of flint from 35.6 m to 35.7 m - with medium to coarse gravel of flint
RC7			
RC1			
RC8			at 37.5 m - with coarse gravel of flint
	CPT07		
RC9			at 40.5 m - with a cobble of flint at 40.8 m - with a cobble of flint
RC10			from 41.6 m to 41.7 m - with coarse gravel of flint at 42.4 m - with a cobble of flint
	CPT08		
	CPT01		
	CPT02		at 44.6 m - with a cobble of flint
RC11			
RC12			at 46.2 m - with fine to medium gravel of flint at 47.1 m - with medium to coarse gravel of flint
	CPT09		
RC13			from 49.2 m to 49.5 m - with fine to coarse gravel of flint
RC14			
	CPT03		at 52.5 m - with coarse gravel of flint
RC2			at 53.5 m - with coarse gravel of flint
RC3			
	CPT04		
RC4			
RC5			
	CPT05		



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Note(s):

Location(s):
K01-BH
K01-BH-b
K01-BH-c
K01-CPT

Derived from water content
Derived from water content (dry)
Derived from volume mass calculation
Derived from volume mass calculation (dry)

Total Core Recovery
Solid Core Recovery
Rock Quality Designation
Water content
Plastic limit
Liquid limit
Plasticity index
Percentage fines
Carbonate content
Organic content
Relative density derived from CPT

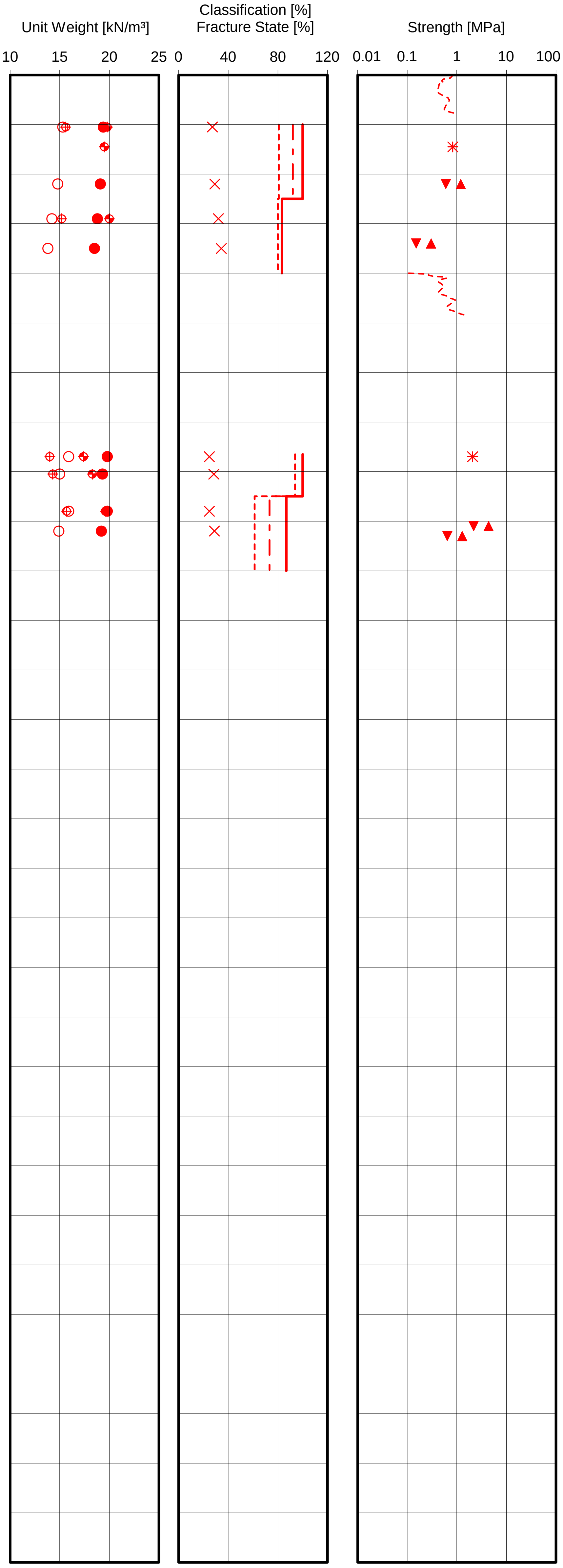
Undrained Shear Strength (s_u)
Pocket penetrometer
Torvane
Laboratory vane
UU-triaxial
CU-triaxial
Direct simple shear
s_u from CPT
Slashed refers to remoulded soil

Uni-axial Compressive Strength (σ_c)
Needle penetrometer
Point load High
Point load Low
UCS
σ_c from CPT
> Symbol refers to result higher than equipment

GEOTECHNICAL LOG

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

Depth Below Seafloor [m]	Samples	In situ Tests	Graphic Log	Strata Description
60.0		CPT05		22.0 m to 69.8 m - extremely weak to very weak low density white to light grey CHALK (CIRIA A2 to A3) - with closely to medium spaced subhorizontal planar rough to smooth very tight clean fractures occasionally with dark grey staining from 61.0 m to 61.3 m - with medium gravel of flint
62.0	RC6			
	RC7			at 63.0 m - with a cobble of flint at 63.6 m - with a cobble of flint
64.0		CPT06		
	RC8			
66.0	RC9			at 66.5 m - with a cobble of flint
68.0	RC10			
	RC11			
70.0				
72.0				
74.0				
76.0				
78.0				
80.0				
82.0				
84.0				
86.0				
88.0				
90.0				



Date commenced : 19-Sep-2018
Method : Rotary borehole drilling, sampling and testing
Recovery depth : to 69.8 m below seafloor
Penetration depth : to 70.0 m below seafloor
Water depth : 20.2 m
Vertical datum : Project Reference Level (PRL)
Coordinates : 371271 m E 5557265 m N
Note(s):

Location(s):
K01-BH
K01-BH-b
K01-BH-c
K01-CPT

- Derived from water content
- Derived from water content (dry)
- Derived from volume mass calculation
- Derived from volume mass calculation (dry)

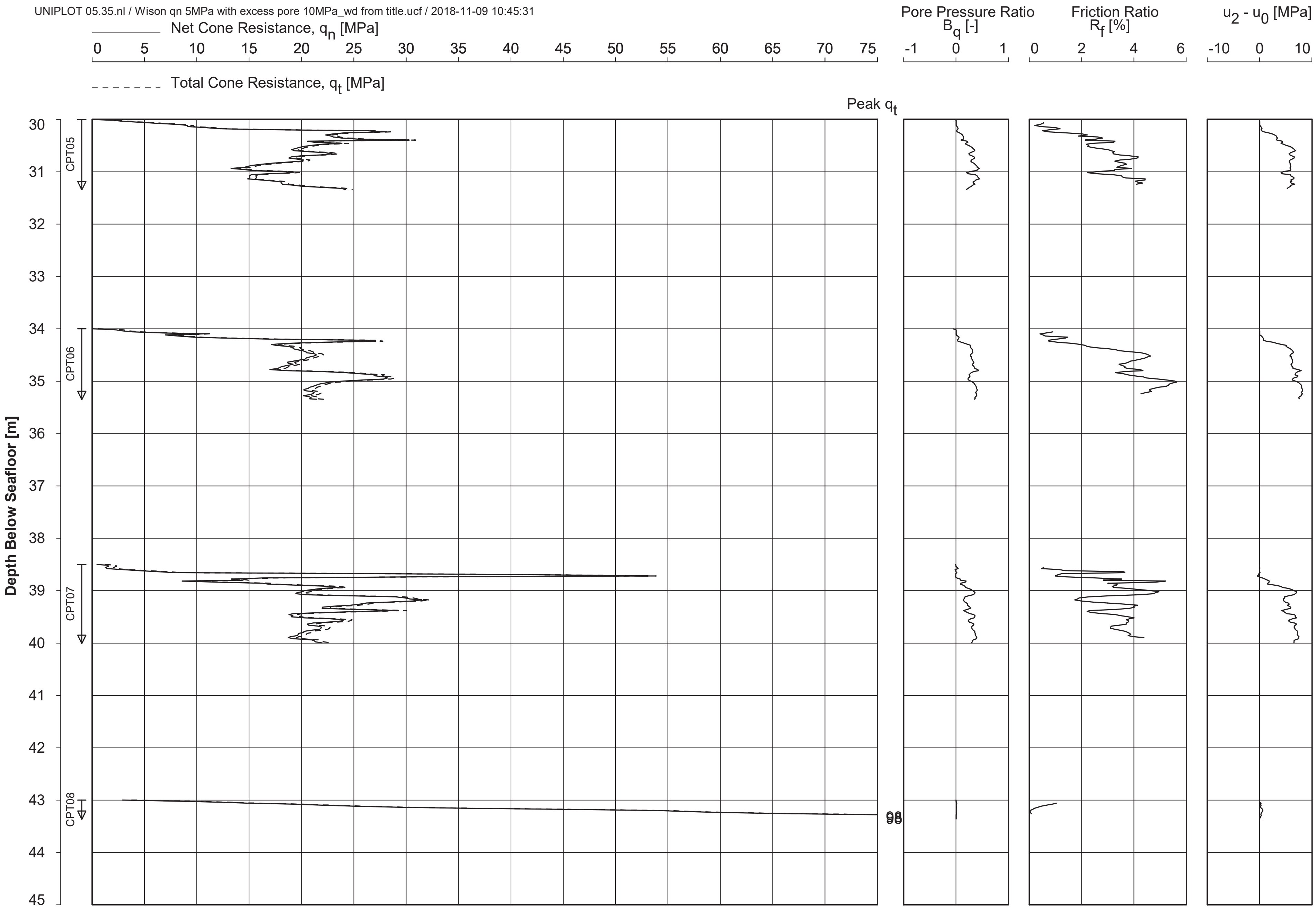
- Total Core Recovery
- Solid Core Recovery
- Rock Quality Designation
- Water content
- Plastic limit
- Liquid limit
- Plasticity index
- Percentage fines
- Carbonate content
- Organic content
- Relative density derived from CPT

Undrained Shear Strength (s_u)
- Pocket penetrometer
- Torvane
- Laboratory vane
- UU-triaxial
- CU-triaxial
- Direct simple shear
- s_u from CPT
- Slashed refers to remoulded soil

Uni-axial Compressive Strength (σ_c)
- Needle penetrometer
- Point load High
- Point load Low
- UCS
- σ_c from CPT
- > Symbol refers to result higher than equipment >

GEOTECHNICAL LOG

ANNEX B



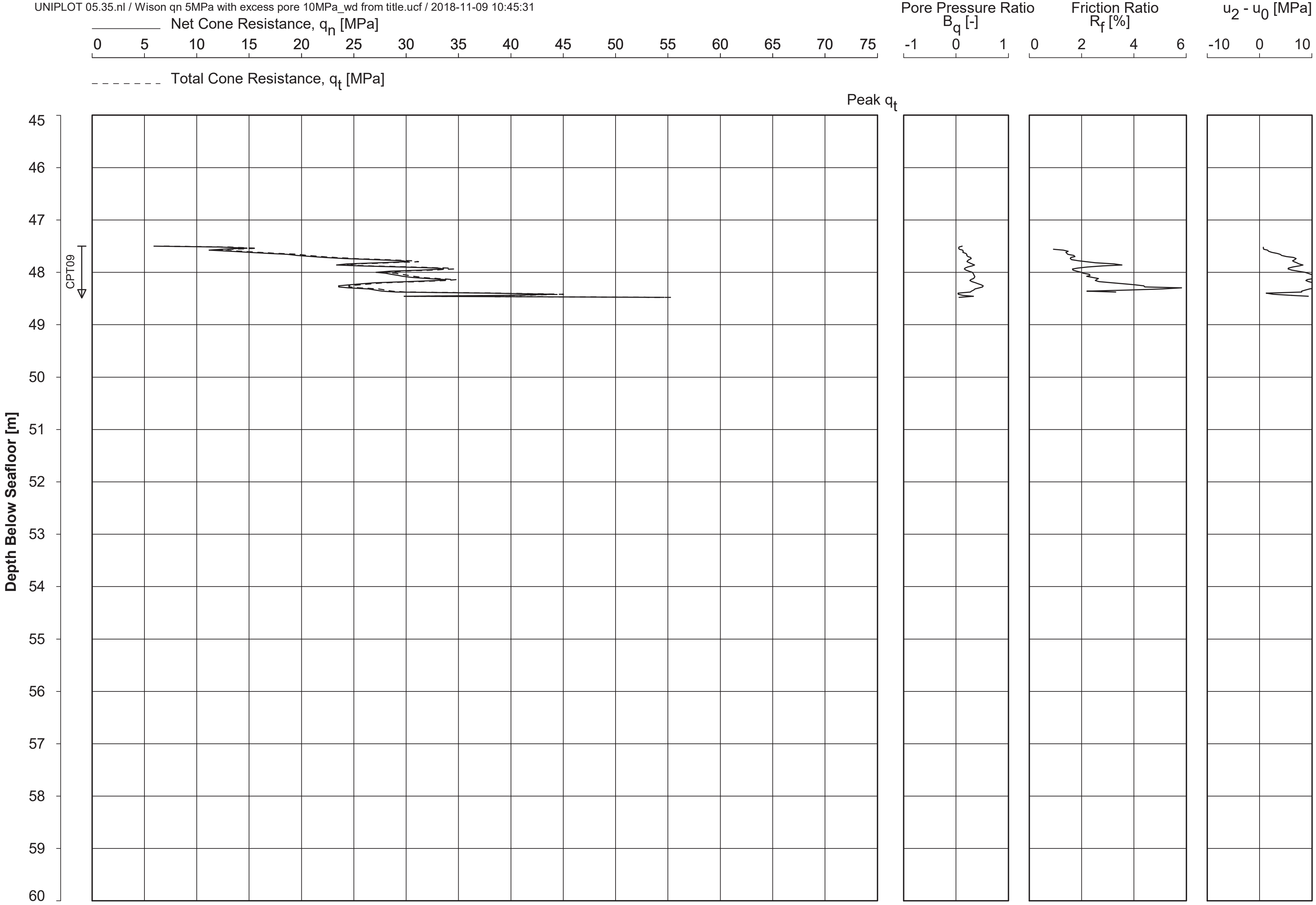
Date Of Testing : 20-Sep-2018
Water Depth [m] : 20.2
Coordinates [m] : E371271 N5557265

CONE PENETRATION TEST

K01-BH

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

UNIPLOT 05.35.nl / Wison qn 5MPa with excess pore 10MPa_wd from title.ucf / 2018-11-09 10:45:31

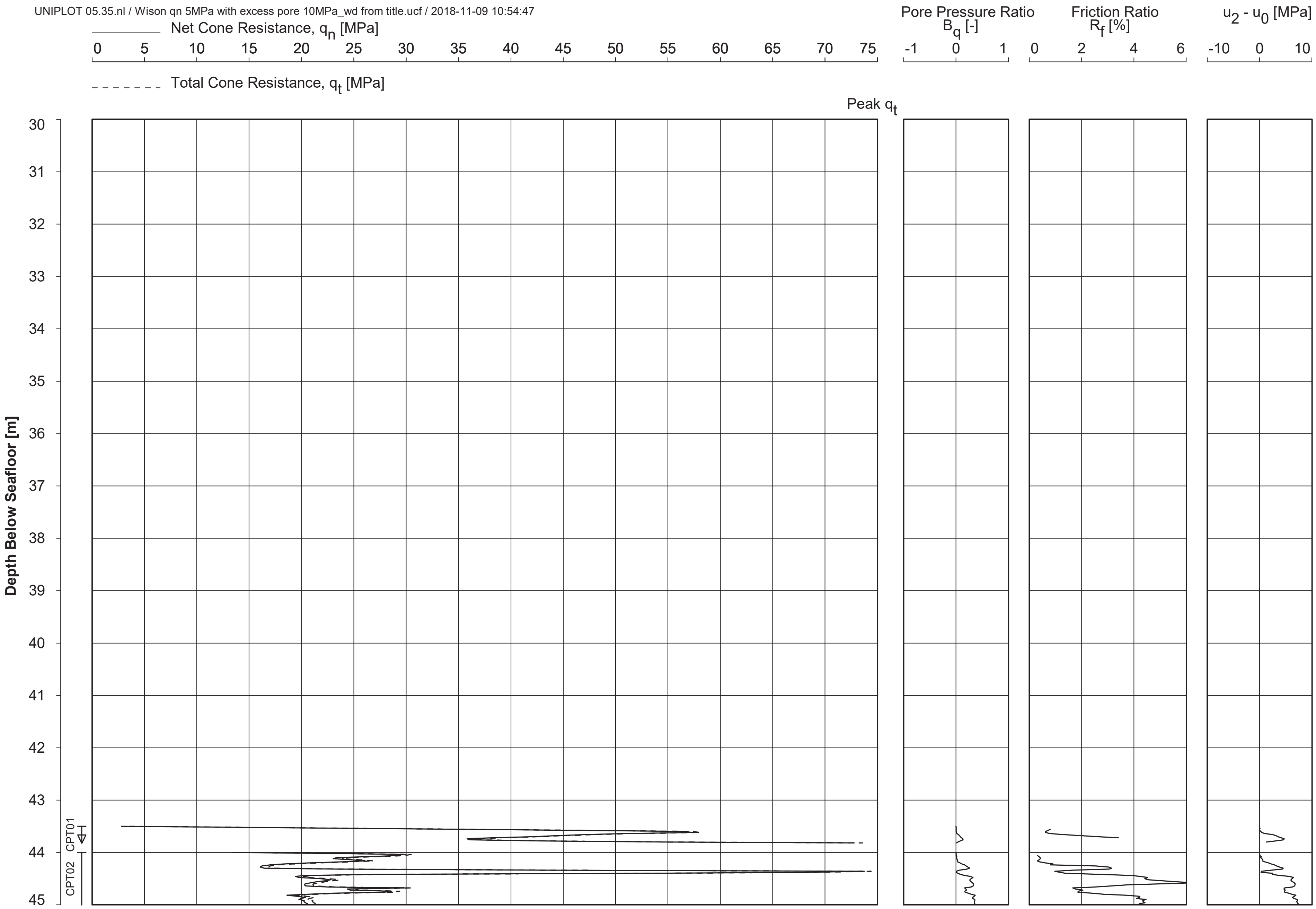


Date Of Testing : 20-Sep-2018
Water Depth [m] : 20.2
Coordinates [m] : E371271 N5557265

CONE PENETRATION TEST

K01-BH

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

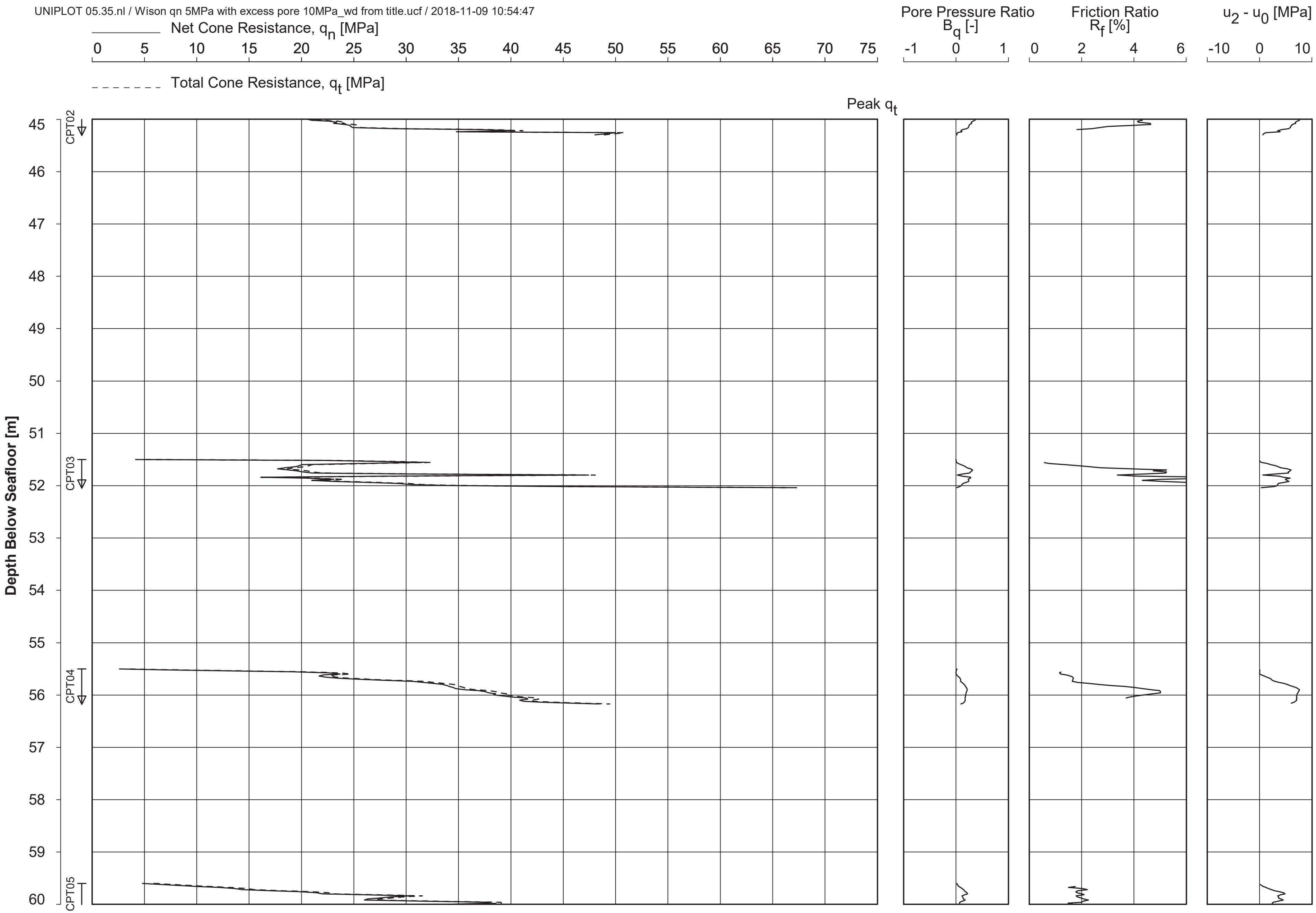


Date Of Testing : 24-Sep-2018
Water Depth [m] : 20.8
Coordinates [m] : E371269 N5557261

CONE PENETRATION TEST

K01-BH-b

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

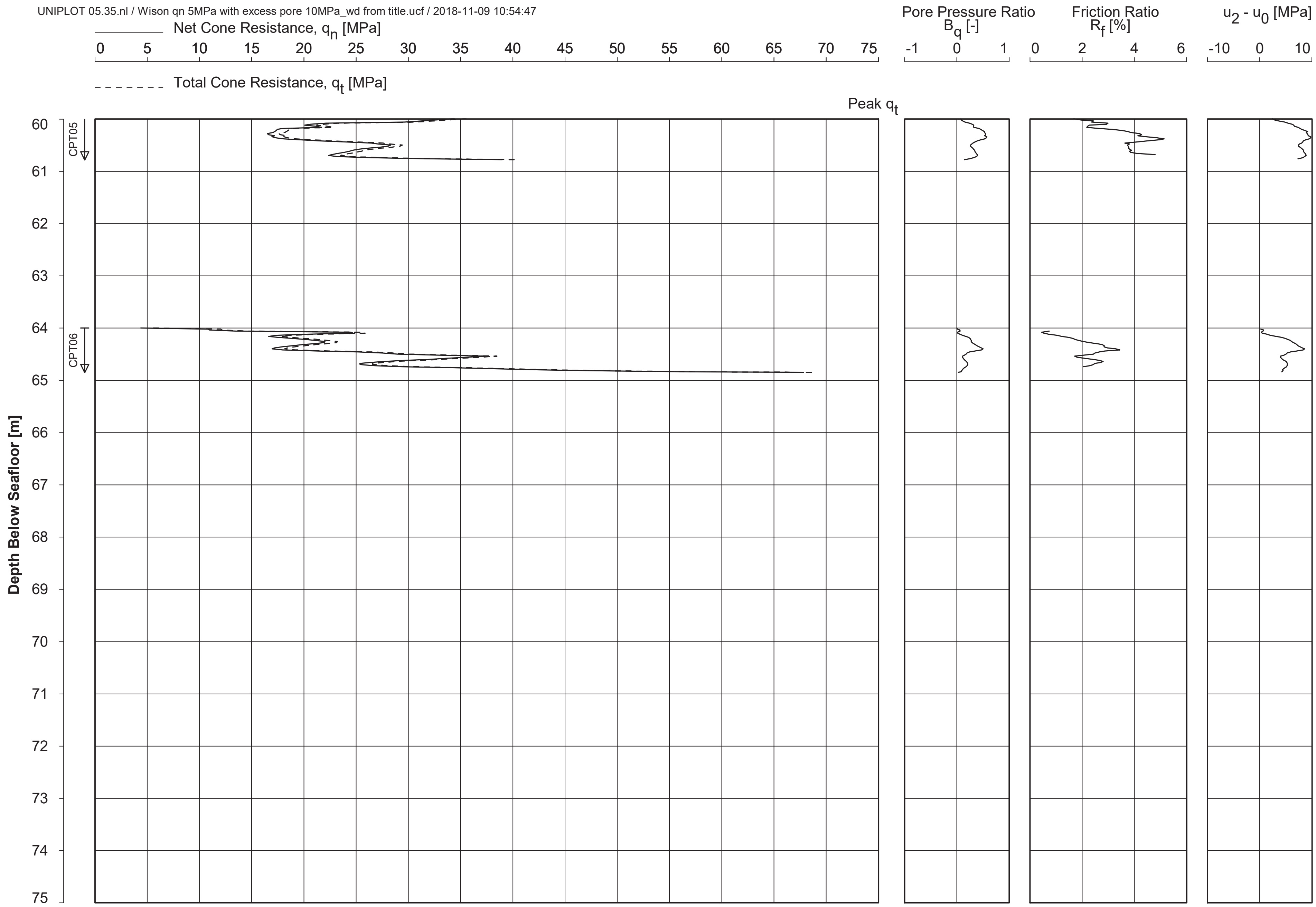


Date Of Testing : 24-Sep-2018
Water Depth [m] : 20.8
Coordinates [m] : E371269 N5557261

CONE PENETRATION TEST

K01-BH-b

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT



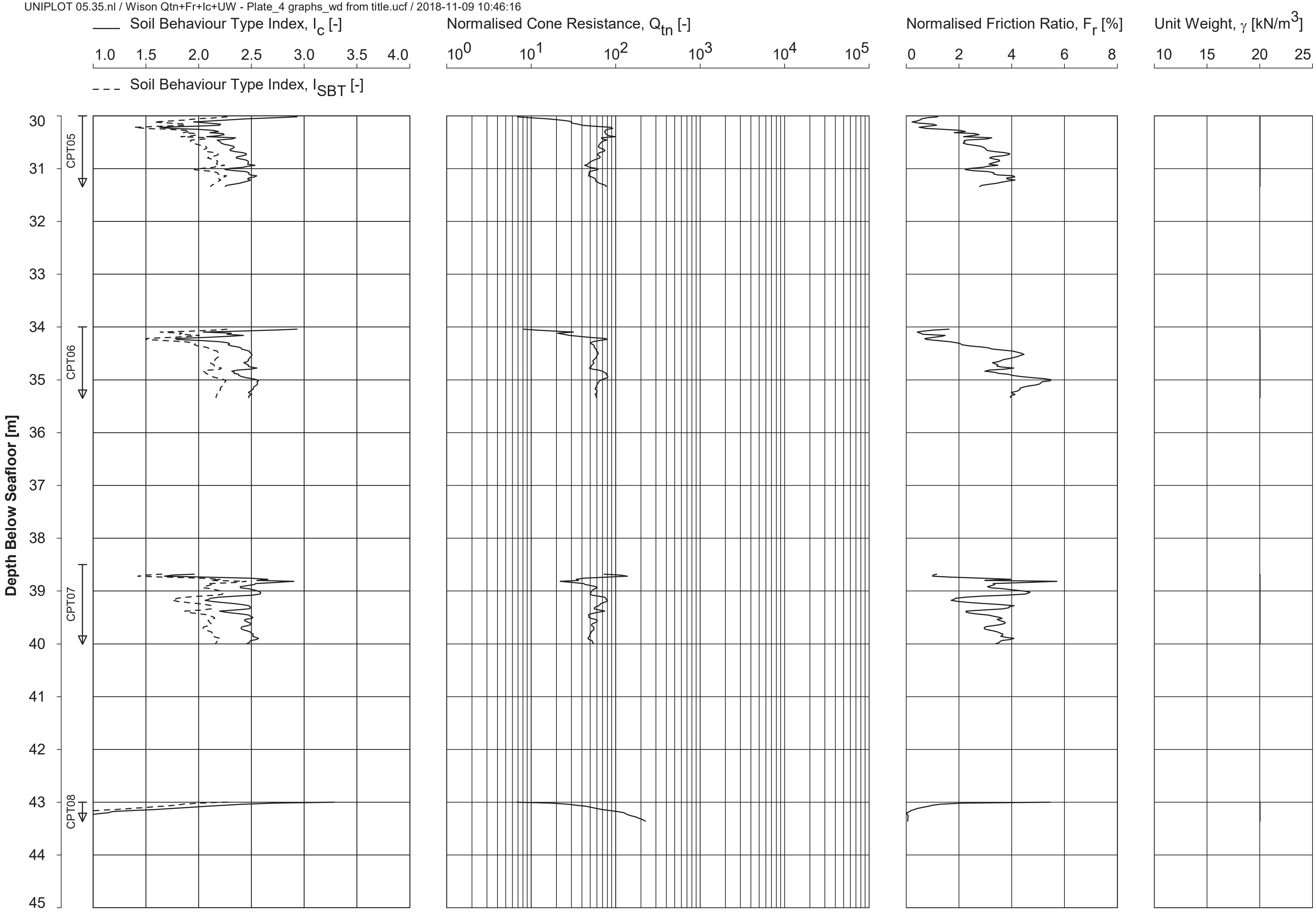
Date Of Testing : 24-Sep-2018
Water Depth [m] : 20.8
Coordinates [m] : E371269 N5557261

CONE PENETRATION TEST

K01-BH-b

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

UNIPLOT 05.35.nl / Wison Qtn+Fr+Ic+UW - Plate_4 graphs_wd from title.ucf / 2018-11-09 10:46:16

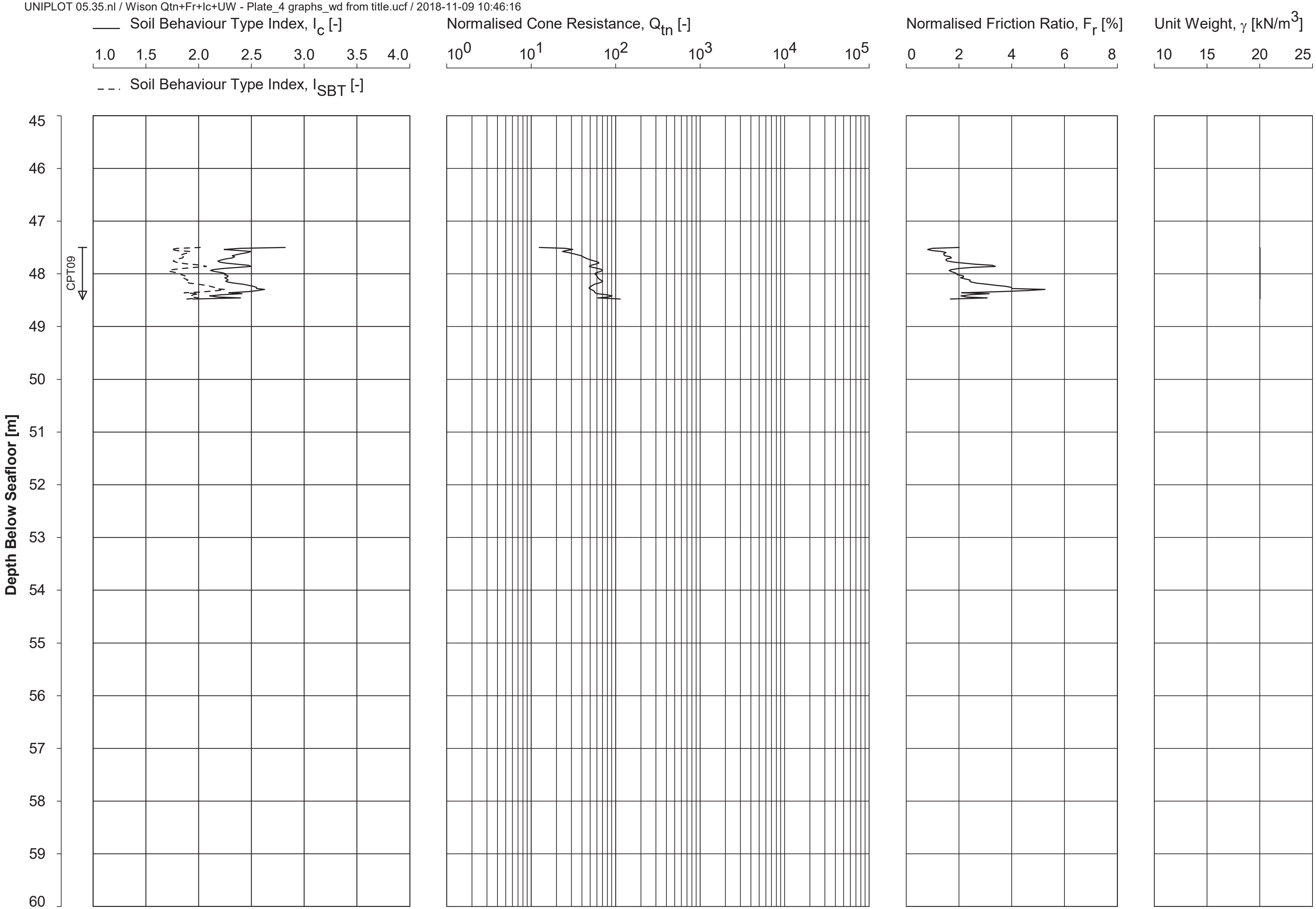


Date of Testing	: 20-Sep-2018		Probe Type	:	CP10-CF80PB20
Water Depth [m]	: 20.2		Cone Base Area [mm^2]	:	1007
Coordinates [m]	: E371271	N5557265	Ground Water [kN/m^3]	:	10.0

CONE PENETRATION TEST

K01-BH

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT



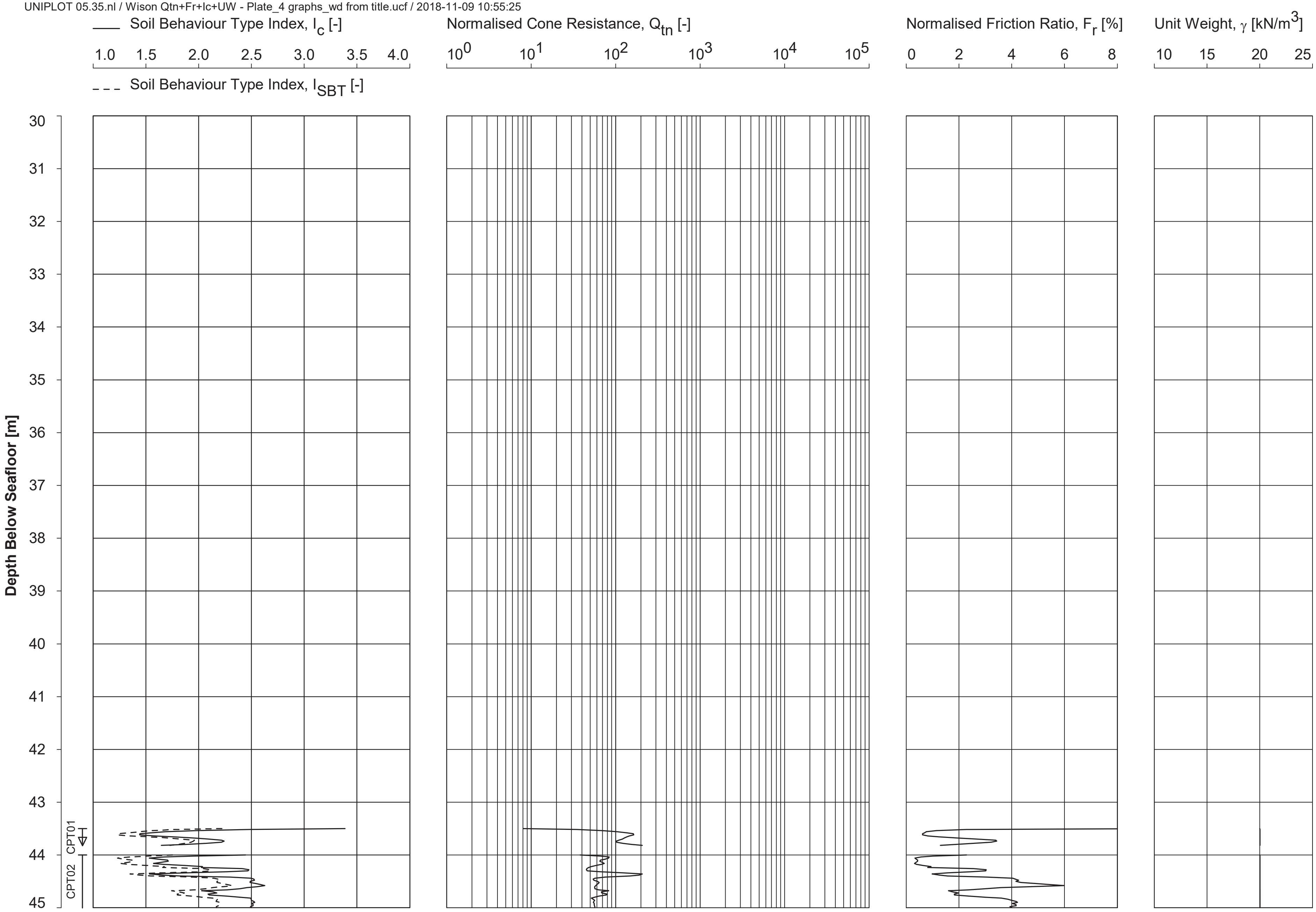
Date of Testing : 20-Sep-2018
Water Depth [m] : 20.2
Coordinates [m] : E371271 N5557265

Probe Type : CP10-CF80PB20
Cone Base Area [mm^2] : 1007
Ground Water [kN/m^3] : 10.0

CONE PENETRATION TEST

K01-BH

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT



Date of Testing : 24-Sep-2018
Water Depth [m] : 20.8
Coordinates [m] : E371269 N5557261

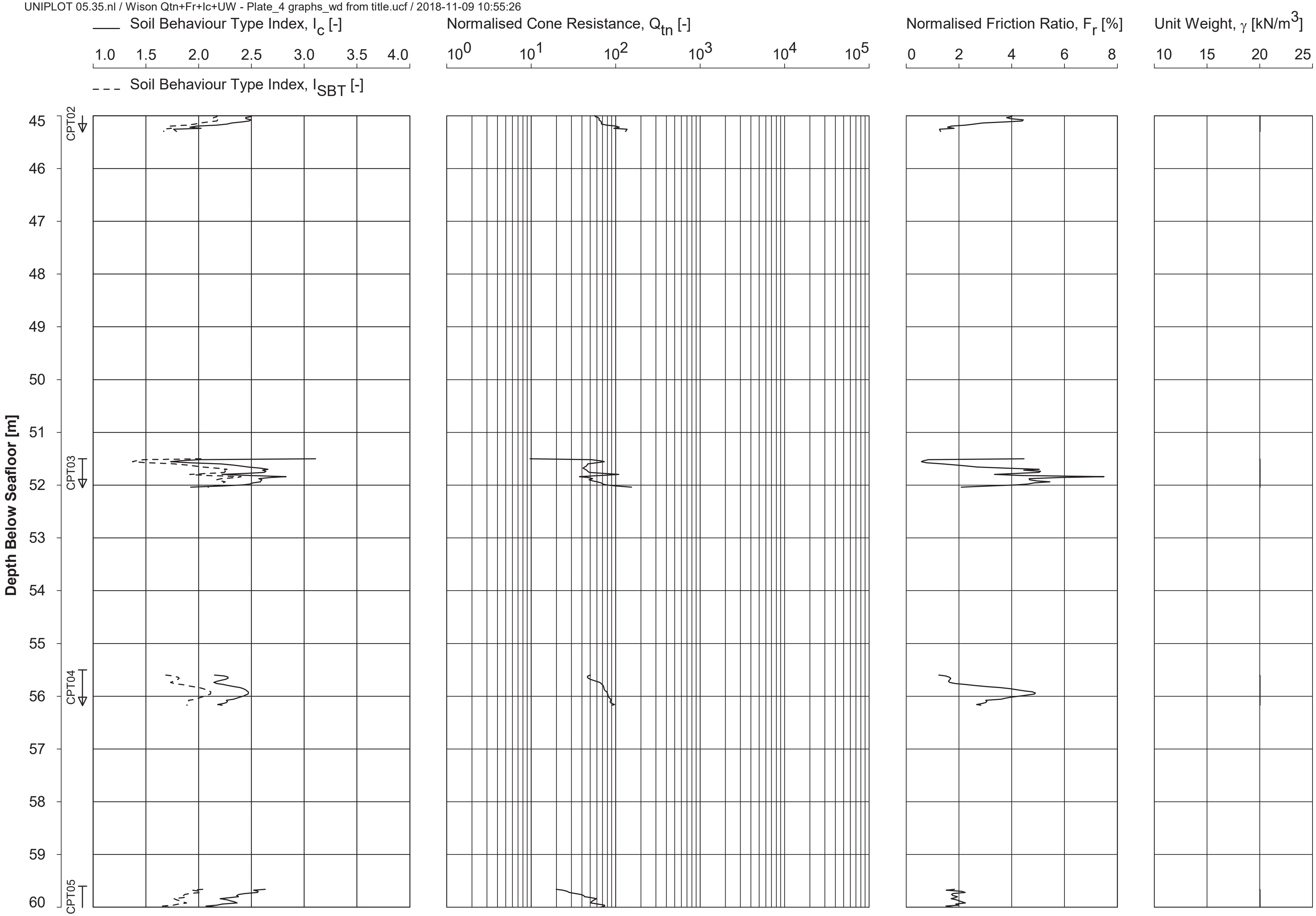
Probe Type : CP10-CF80PB20
Cone Base Area [mm^2]: 1007
Ground Water [kN/m^3] : 10.0

CONE PENETRATION TEST

K01-BH-b

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

UNIPLOT 05.35.nl / Wison Qtn+Fr+Ic+UW - Plate_4 graphs_wd from title.ucf / 2018-11-09 10:55:26



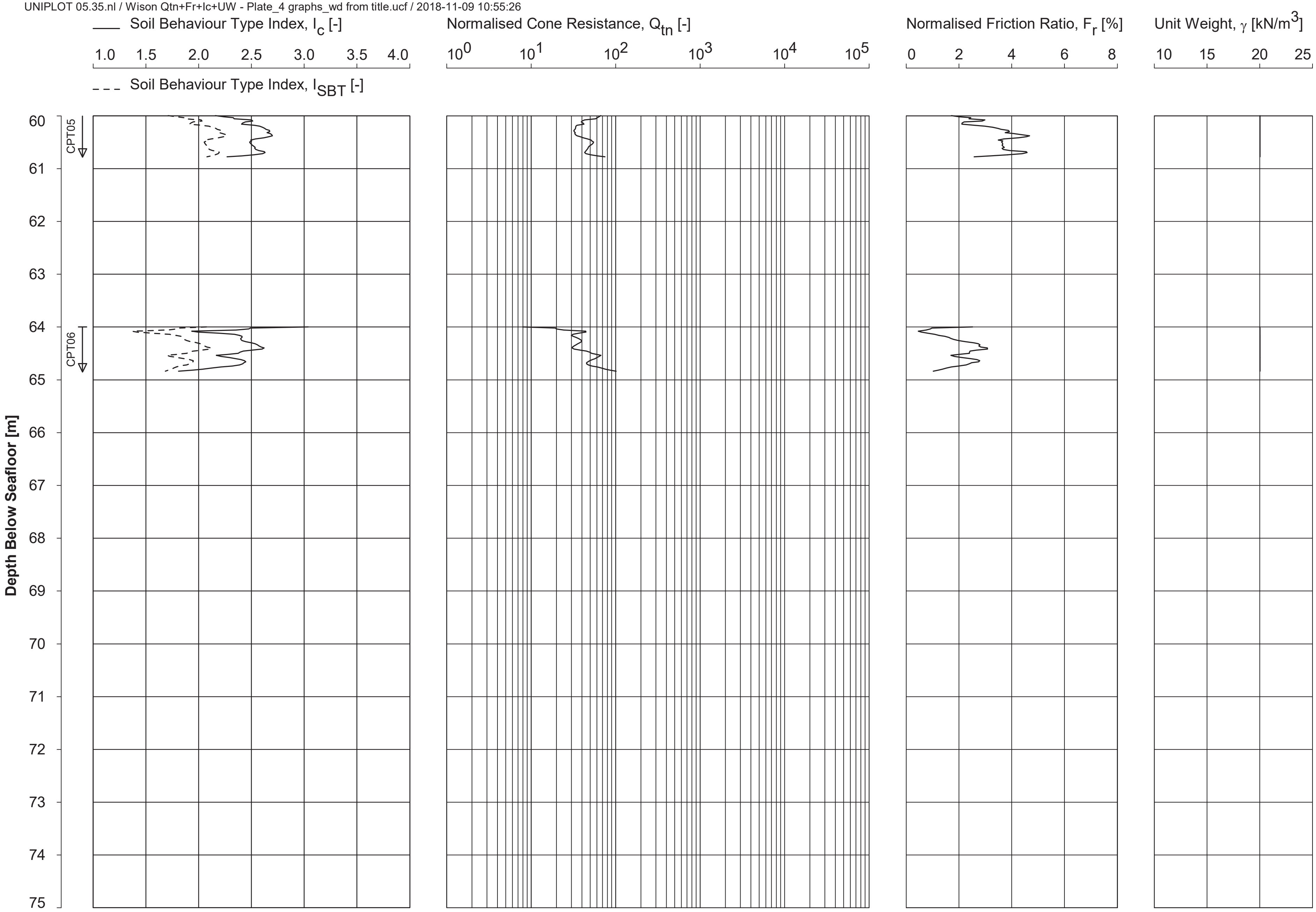
Date of Testing	: 24-Sep-2018	Probe Type	: CP10-CF80PB20
Water Depth [m]	: 20.8	Cone Base Area [mm^2]	: 1007
Coordinates [m]	: E371269 N5557261	Ground Water [kN/m^3]	: 10.0

CONE PENETRATION TEST

K01-BH-b

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

UNIPLOT 05.35.nl / Wison Qtn+Fr+Ic+UW - Plate_4 graphs_wd from title.ucf / 2018-11-09 10:55:26



Date of Testing : 24-Sep-2018
Water Depth [m] : 20.8
Coordinates [m] : E371269 N5557261

Probe Type : CP10-CF80PB10
Cone Base Area [mm^2]: 1007
Ground Water [kN/m^3] : 10.0

CONE PENETRATION TEST

K01-BH-b

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

ANNEX C

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

LABORATORY CLASSIFICATION TEST RESULTS

LOCATION K01-BH

Sample No.	Ground Description	Test Depth [m]	w [%]	Unit Weight [kN/m³] γ_1	γ_2	γ_{d1}	γ_{d2}	ρ_s [Mg/m³]	Carb. Cont. [%]	Org. Cont. [%]	Atterberg Limits w_P [%]	w_L [%]	I_P [%]	Fines [%]	c_u [kPa] PP	TV	LV	$I_{s(50)}$ PLT [MPa]
		37.65																0.16 a
		37.75	32.3	18.7		14.1												
RC9	40.00 m to 41.45 m - weak low to medium density white to light grey CHALK (CIRIA A3) - with closely spaced subhorizontal planar smooth very tight to tight fractures with infill of comminuted chalk at 40.45 m - with a cobble of flint (100x100x50 mm) at 40.80 m - with a cobble of flint (100x100x40 mm) at 40.90 m - with a thin bed of structureless Chalk (CIRIA Dm) composed of gravelly Silt. Gravel is medium to coarse angular extremely weak low density	40.00																
		40.55	30.2	19.0		14.6												
		41.00																0.19 d
		41.05																0.20 a
		41.20	28.0	19.3	19.8	15.1	15.5											
RC10	41.50 m to 41.70 m - weak low density white to light grey CHALK (CIRIA A3) - with very closely spaced subhorizontal undulating to stepped rough tight clean fractures from 41.60 m to 41.70 m - with coarse gravel of flint	41.50																0.11 d
		41.60	24.7	19.8		15.9												
	41.70 m to 42.30 m - white to light grey structureless CHALK (CIRIA Dc) composed of silty medium to coarse subangular GRAVEL. Gravel is extremely weak low density	41.70																
	42.30 m to 42.50 m - weak low density white to light grey CHALK (CIRIA A3) at 42.40 m - with a cobble of flint (100x80x30 mm)	42.30	26.8	19.5		15.4												
RC11	44.50 m to 44.60 m - weak low density white to light grey CHALK (CIRIA A3)	44.50																

Key:
- w : water content
- γ_1 : unit weight derived from water content
- γ_2 : unit weight derived from volume mass calculation
- γ_{d1} : dry unit weight derived from water content
- γ_{d2} : dry unit weight derived from volume mass calculation
- ρ_s : density of solid particles
- Carb.Cont. : carbonate content
- Org.Cont. : organic matter content
- w_P : plastic limit
- w_L : liquid limit
- I_P : plasticity index
- Fines : mass percentage of material passing 63 µm or 75 µm sieve
- PP : pocket penetrometer
- TV : torvane
- LV : laboratory vane
- c_u : undrained shear strength
- PLT : point load test (a = axial test, d = diametral test)
- $I_{s(50)}$: point load strength index
- 10r : r refers to test on remoulded soil

FUGRO

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

LABORATORY CLASSIFICATION TEST RESULTS

LOCATION K01-BH

Sample		Test Depth	w	Unit Weight [kN/m³]				ρ_s	Carb. Cont.	Org. Cont.	Atterberg Limits			Fines	c_u [kPa]			$I_{s(50)}$
No.	Ground Description			γ_1	γ_2	γ_{d1}	γ_{d2}				w_P	w_L	I_P		PP	TV	LV	PLT
		[m]	[%]					[Mg/m³]	[%]	[%]	[%]	[%]	[%]	[%]				[MPa]
RC12	44.60 m to 45.25 m - white to light grey structureless CHALK (CIRIA Dm) composed of gravelly SILT. Gravel is fine to medium subangular extremely weak low density	44.60	26.6	19.5		15.4												
	at 44.65 m - with fine to medium gravel and a cobble of flint (80x100x60 mm)																	
	45.25 m to 46.00 m - moderately weak low density white to light grey mottled grey CHALK - with coarse gravel-sized pockets of light grey marl	45.25	20.4	20.6		17.1												0.03 d
	at 45.50 m - with a thin bed of structureless Chalk (CIRIA Dc)																	
		45.40																0.04 a
		45.70	38.6	18.0	19.6	13.0	14.1											
	46.00 m to 47.50 m - weak medium density white to light grey CHALK (CIRIA A2) - with medium spaced subhorizontal undulating rough very tight clean fractures - with coarse gravel-sized pockets of light grey marl	46.00																
	at 46.25 m - with a very thin bed of fine to medium gravel of flint at 47.15 m - with a very thin bed of medium to coarse gravel of flint																	
		46.10	26.5	19.5		15.4												
		46.85	29.8	19.1	19.9	14.7	15.3											
		47.10																0.08 a

Key:
- w : water content
- γ_1 : unit weight derived from water content
- γ_2 : unit weight derived from volume mass calculation
- γ_{d1} : dry unit weight derived from water content
- γ_{d2} : dry unit weight derived from volume mass calculation
- ρ_s : density of solid particles
- Carb.Cont. : carbonate content
- Org.Cont. : organic matter content
- w_P : plastic limit
- w_L : liquid limit
- I_P : plasticity index
- Fines : mass percentage of material passing 63 µm or 75 µm sieve
- PP : pocket penetrometer
- TV : torvane
- LV : laboratory vane
- c_u : undrained shear strength
- PLT : point load test (a = axial test, d = diametral test)
- $I_{s(50)}$: point load strength index
- 10r : r refers to test on remoulded soil

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

LABORATORY CLASSIFICATION TEST RESULTS

LOCATION K01-BH

Sample		Test Depth	w	Unit Weight [kN/m³]				ρ_s	Carb. Cont.	Org. Cont.	Atterberg Limits			Fines	c_u [kPa]			$I_{s(50)}$
No.	Ground Description	[m]	[%]	γ_1	γ_2	γ_{d1}	γ_{d2}	[Mg/m³]	[%]	[%]	w_P [%]	w_L [%]	I_P [%]	[%]	PP	TV	LV	PLT [MPa]
RC13	48.50 m to 49.95 m - weak to moderately weak low density white to light grey CHALK (CIRIA A3) - with closely to medium spaced subhorizontal undulating rough very tight clean fractures - with few coarse gravel-sized pockets of grey marl and with few shells and shell fragments at 49.10 m - with a subhorizontal undulating rough wide fracture with infill of comminuted chalk and fine to medium gravel of flint from 49.25 m to 49.45 m - with fine to coarse gravel of flint	48.50																0.04 d
		48.60	26.4	19.5	20.3	15.4	16.1											
		49.45	27.9	19.3	19.6	15.1	15.3											
		49.80																0.13 a
RC14	50.00 m to 51.50 m - moderately weak medium to high density white to light grey CHALK (CIRIA A3) - with closely to medium spaced subhorizontal undulating rough very tight clean fractures - with coarse gravel-sized pockets of grey marl	50.00																
		50.65	26.0	19.6	20.3	15.6	16.1											
		50.95																0.11 a
		50.95																0.24 a
		51.25	26.9	19.5	19.7	15.4	15.5											

Key:

- w : water content
- γ_1 : unit weight derived from water content
- γ_2 : unit weight derived from volume mass calculation
- γ_{d1} : dry unit weight derived from water content
- γ_{d2} : dry unit weight derived from volume mass calculation
- ρ_s : density of solid particles
- Carb.Cont. : carbonate content
- Org.Cont. : organic matter content
- w_P : plastic limit
- w_L : liquid limit
- I_P : plasticity index
- Fines : mass percentage of material passing 63 µm or 75 µm sieve
- PP : pocket penetrometer
- TV : torvane
- LV : laboratory vane
- c_u : undrained shear strength
- PLT : point load test (a = axial test, d = diametral test)
- $I_{s(50)}$: point load strength index
- 10r : r refers to test on remoulded soil

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

LABORATORY CLASSIFICATION TEST RESULTS

LOCATION K01-BH-a

Sample		Test Depth	w	Unit Weight [kN/m³]				ρ_s	Carb. Cont.	Org. Cont.	Atterberg Limits			Fines	c_u [kPa]			$I_{s(50)}$
No.	Ground Description	[m]	[%]	γ_1	γ_2	γ_{d1}	γ_{d2}	[Mg/m³]	[%]	[%]	w_P [%]	w_L [%]	I_P [%]	[%]	PP	TV	LV	PLT [MPa]
P1	no recovery	0.00																
P2		1.00																
RC1		35.50																

Key:
- w : water content
- γ_1 : unit weight derived from water content
- γ_2 : unit weight derived from volume mass calculation
- γ_{d1} : dry unit weight derived from water content
- γ_{d2} : dry unit weight derived from volume mass calculation
- ρ_s : density of solid particles
- Carb.Cont. : carbonate content
- Org.Cont. : organic matter content
- w_P : plastic limit
- w_L : liquid limit
- I_P : plasticity index
- Fines : mass percentage of material passing 63 µm or 75 µm sieve
- PP : pocket penetrometer
- TV : torvane
- LV : laboratory vane
- c_u : undrained shear strength
- PLT : point load test (a = axial test, d = diametral test)
- $I_{s(50)}$: point load strength index
- 10r : r refers to test on remoulded soil

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

LABORATORY CLASSIFICATION TEST RESULTS

LOCATION K01-BH-b

Sample No.	Ground Description	Test Depth [m]	w [%]	γ_1	γ_2	γ_{d1}	γ_{d2}	ρ_s [Mg/m³]	Carb. Cont. [%]	Org. Cont. [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP	TV	LV	$I_{s(50)}$ PLT [MPa]
				Unit Weight [kN/m³]							Atterberg Limits				c_u [kPa]			
RC1	35.50 m to 36.80 m - very weak low density white to light grey CHALK (CIRIA A2) - with fine to medium gravel-sized pockets of grey marl from 35.60 to 35.70 m - with medium to coarse gravel of flint at 35.85 m - with a coarse gravel of flint at 36.20 m - with a subvertical planar smooth very tight fracture with light grey staining at 36.20 m - with a subhorizontal planar smooth very tight clean fracture	35.50																
		35.90	33.1	18.6	18.6	14.0	14.0											
		36.05	29.8	19.0		14.6												0.19 a
RC2	52.50 m to 53.85 m - moderately weak medium density white to light grey CHALK (CIRIA A2) - with medium spaced subhorizontal undulating rough very tight clean fractures - with traces of pockets of grey marl at 52.50 m - with a thin bed of gravel of flint at 53.45 m - with a thin bed of gravel of flint	52.50																
		52.95	33.2	18.6	18.6	14.0	14.0											
		53.30																0.06 a
		53.55	29.9	19.0	18.0	14.6	13.9											
RC3	54.00 m to 55.50 m - weak medium density white to light grey CHALK (CIRIA A3) - with very closely to closely spaced subhorizontal undulating rough very tight clean fractures - with vertical incipient fractures with infill of comminuted chalk at 54.00 m - with few coarse gravel of flint at 55.10 m - with few coarse gravel of flint	54.00																
		54.70	23.4	20.0	18.9	16.2	15.3											
		55.40	26.9	19.5		15.4												0.12 a

Key:

- w : water content
- γ_1 : unit weight derived from water content
- γ_2 : unit weight derived from volume mass calculation
- γ_{d1} : dry unit weight derived from water content
- γ_{d2} : dry unit weight derived from volume mass calculation
- ρ_s : density of solid particles
- Carb.Cont. : carbonate content
- Org.Cont. : organic matter content
- w_P : plastic limit
- w_L : liquid limit
- I_P : plasticity index
- Fines : mass percentage of material passing 63 µm or 75 µm sieve
- PP : pocket penetrometer
- TV : torvane
- LV : laboratory vane
- c_u : undrained shear strength
- PLT : point load test (a = axial test, d = diametral test)
- $I_{s(50)}$: point load strength index
- 10r : r refers to test on remoulded soil

LABORATORY CLASSIFICATION TEST RESULTS

LOCATION K01-BH-b

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

Sample		Test Depth	w	Unit Weight [kN/m³]				ρ_s	Carb. Cont.	Org. Cont.	Atterberg Limits			Fines	c_u [kPa]			$I_{s(50)}$
No.	Ground Description	[m]	[%]	γ_1	γ_2	γ_{d1}	γ_{d2}	[Mg/m³]	[%]	[%]	w_P [%]	w_L [%]	I_P [%]	[%]	PP	TV	LV	PLT [MPa]
RC4	56.50 m to 57.80 m - weak medium density white to light grey CHALK (CIRIA A3) - with closely spaced subhorizontal planar rough very tight clean fractures from 56.50 m to 56.65 m - with thin bed of fine gravel of flint	56.50																
		56.70	25.7	19.7		15.7												
		57.40	29.6	19.1		14.7												
RC5	58.00 m to 58.65 m - medium density white to light grey CHALK (CIRIA A3) - with closely to medium spaced subhorizontal undulating rough very tight clean fractures - with pockets of grey marl	58.00																
		58.15	28.5	19.2	18.3	14.9	14.2											
		58.40	24.7	19.8		15.9												0.22 a
RC6	61.00 m to 62.50 m - weak to moderately weak low to medium density white to light grey CHALK (CIRIA A2) - with medium to widely spaced subhorizontal undulating rough very tight clean fractures from 61.00 m to 61.30 m - with a thin bed of medium gravel of flint at 62.10 m - with coarse gravel of flint	61.00																
		61.05	27.1	19.4	19.8	15.3	15.6											
		61.45			19.5													
		62.20	29.2	19.1		14.8												0.12 a
RC7	62.50 m to 63.10 m - very weak low density white to light grey CHALK (CIRIA A3) at 62.80 m - with a very thin bed of white to light grey structureless Chalk (CIRIA Dm) composed of Silt. Gravel is coarse subangular to subrounded extremely weak to very weak low to medium density at 63.00 m - with a cobble of flint (80x70x100 mm)	62.50																

Key:
- w : water content
- γ_1 : unit weight derived from water content
- γ_2 : unit weight derived from volume mass calculation
- γ_{d1} : dry unit weight derived from water content
- γ_{d2} : dry unit weight derived from volume mass calculation
- ρ_s : density of solid particles
- Carb.Cont. : carbonate content
- Org.Cont. : organic matter content
- w_P : plastic limit
- w_L : liquid limit
- I_P : plasticity index
- Fines : mass percentage of material passing 63 µm or 75 µm sieve
- PP : pocket penetrometer
- TV : torvane
- LV : laboratory vane
- c_u : undrained shear strength
- PLT : point load test (a = axial test, d = diametral test)
- $I_{s(50)}$: point load strength index
- 10r : r refers to test on remoulded soil

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

LABORATORY CLASSIFICATION TEST RESULTS

LOCATION K01-BH-b

Sample		Test Depth	w	Unit Weight [kN/m³]				ρ_s	Carb. Cont.	Org. Cont.	Atterberg Limits			Fines	c_u [kPa]			$I_{s(50)}$
No.	Ground Description			γ_1	γ_2	γ_{d1}	γ_{d2}				w_P	w_L	I_P		PP	TV	LV	PLT
		[m]	[%]					[Mg/m³]	[%]	[%]	[%]	[%]	[%]	[%]				[MPa]
		62.90	32.0	18.8	20.0	14.2	15.2											
	63.10 m to 63.40 m - white to light grey structureless CHALK (CIRIA Dc) composed of silty fine to coarse subangular to subrounded GRAVEL. Gravel is very weak low density	63.10																
	63.40 m to 63.75 m - very weak low density white to light grey CHALK (CIRIA A2) - with medium spaced subhorizontal planar rough very tight clean fractures with grey staining at 63.60 m - with a cobble of flint (95x85x65 mm)	63.40																0.03 a
		63.50	34.4	18.5		13.8												
RC8	no recovery	65.00																
RC9	66.50 m to 66.70 m - coarse GRAVEL of flint, with a cobble of flint (90x100x90 mm)	66.50																
RC10	67.65 m to 68.50 m - weak medium density white to light grey CHALK (CIRIA A2) - with medium spaced subhorizontal planar smooth very tight clean fractures	67.65																
		67.70	24.7	19.8	17.4	15.9	14.0											
		68.05	28.3	19.3	18.3	15.0	14.3											
RC11	68.50 m to 69.80 m - weak medium density white to light grey CHALK (CIRIA A3) - with closely spaced subhorizontal planar to undulating smooth very tight clean fractures - with inclined subhorizontal to subvertical planar rough very tight clean fractures	68.50																
		68.80	24.7	19.8	19.6	15.9	15.7											
		69.10																0.44 a
		69.20	29.0	19.2		14.9												
		69.30																0.13 d

Key:
- w : water content
- γ_1 : unit weight derived from water content
- γ_2 : unit weight derived from volume mass calculation
- γ_{d1} : dry unit weight derived from water content
- γ_{d2} : dry unit weight derived from volume mass calculation
- ρ_s : density of solid particles
- Carb.Cont. : carbonate content
- Org.Cont. : organic matter content
- w_P : plastic limit
- w_L : liquid limit
- I_P : plasticity index
- Fines : mass percentage of material passing 63 µm or 75 µm sieve
- PP : pocket penetrometer
- TV : torvane
- LV : laboratory vane
- c_u : undrained shear strength
- PLT : point load test (a = axial test, d = diametral test)
- $I_{s(50)}$: point load strength index
- 10r : r refers to test on remoulded soil

FUGRO

MARINE GROUND INVESTIGATION - DIEPPE - LE TREPORT

LABORATORY CLASSIFICATION TEST RESULTS

LOCATION K01-BH-c

Sample		Test Depth	w	Unit Weight [kN/m³]				ρ_s	Carb. Cont.	Org. Cont.	Atterberg Limits			Fines	c_u [kPa]			$I_{s(50)}$
No.	Ground Description	[m]	[%]	γ_1	γ_2	γ_{d1}	γ_{d2}	[Mg/m³]	[%]	[%]	w_P [%]	w_L [%]	I_P [%]	[%]	PP	TV	LV	PLT [MPa]
P1	0.00 m to 0.65 m - light olive brown calcareous silica medium to coarse SAND, with many shells and shell fragments	0.00						2.66										
	at 0.20 m - with a thin bed of shells and shell fragments																	
		0.10	24.9	19.6		15.7												
		0.60	25.0	19.5		15.6												
P2	1.00 m to 1.30 m - light olive brown calcareous silica coarse SAND, with shells and shell fragments	1.00																
	at 1.25 m - with a thick lamina of very silty fine sand																	
		1.10	23.5	19.8		16.0												
	1.30 m to 1.50 m - very dark greyish brown slightly gravelly calcareous silica medium SAND. Gravel is fine to medium of flint	1.30																
		1.40	25.2	19.5	20.3	15.6	16.2											

Key:

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- γ_1 : unit weight derived from water content
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- ρ_s : density of solid particles
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- w_P : plastic limit
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- I_P : plasticity index
- Fines : mass percentage of material passing 63 µm or 75 µm sieve
- PP : pocket penetrometer
- TV : torvane
- LV : laboratory vane
- c_u : undrained shear strength
- PLT : point load test (a = axial test, d = diametral test)
- $I_{s(50)}$: point load strength index
- 10r : r refers to test on remoulded soil

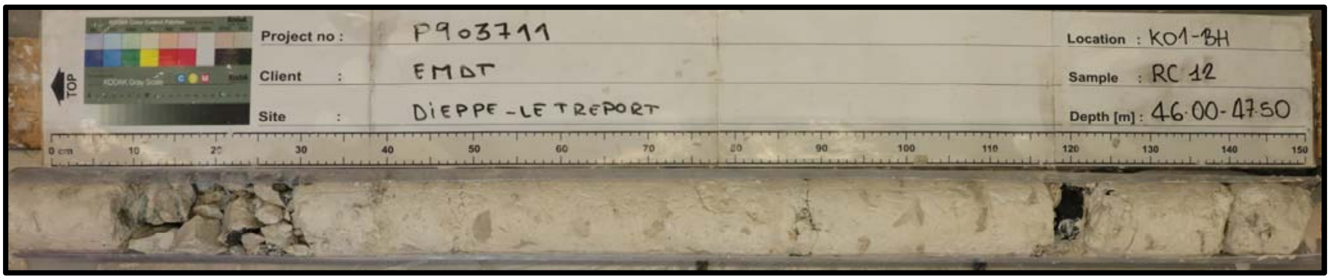
ANNEX D

Location : K01-BH
Sample : RC9
Depth [m BSF] : 40.00 to 41.45

Location : K01-BH
Sample : RC10
Depth [m BSF] : 41.50 to 42.50

SAMPLE PHOTOGRAPHS

Location : K01-BH
Sample : RC11
Depth [m BSF] : 44.50 to 46.00



Location : K01-BH
Sample : RC12
Depth [m BSF] : 46.00 to 47.50

Release Date: 27-2-2019
Drawn with: UU_Plate_Maker v3.4
Photo Folder:
Presented Plate: Downhole_Portrait
Processed by:
Date: 27-2-2019

SAMPLE PHOTOGRAPHS

Location : K01-BH
Sample : RC13
Depth [m BSF] : 48.50 to 49.95

Location : K01-BH
Sample : RC14
Depth [m BSF] : 50.00 to 51.50

SAMPLE PHOTOGRAPHS

Location : K01-BH-b
Sample : RC1
Depth [m BSF] : 35.50 to 36.80

Location : K01-BH-b
Sample : RC2
Depth [m BSF] : 52.50 to 53.85

SAMPLE PHOTOGRAPHS

Location : K01-BH-b
Sample : RC3
Depth [m BSF] : 54.00 to 55.50

Location : K01-BH-b
Sample : RC4
Depth [m BSF] : 56.50 to 57.80

SAMPLE PHOTOGRAPHS

Release Date: 27-2-2019
Drawn with: UU_Plate_Maker v3.4
Photo Folder:
Presented Plate: Downhole_Portrait
Processed by:
Date: 27-2-2019

Location : K01-BH-b
Sample : RC5
Depth [m BSF] : 58.00 to 58.65

Location : K01-BH-b
Sample : RC6
Depth [m BSF] : 61.00 to 62.50

SAMPLE PHOTOGRAPHS

Location : K01-BH-b
Sample : RC7
Depth [m BSF] : 62.50 to 63.75

Missing Photograph

Location : K01-BH-b
Sample : RC8
Depth [m BSF] : 65.00 to 65.00
Note(s) : Missing

SAMPLE PHOTOGRAPHS

Release Date: 27-2-2019
Drawn with: UU_Plate_Maker v3.4
Photo Folder:
Presented Plate: Downhole_Portrait
Processed by: Date: 27-2-2019

Location : K01-BH-b
Sample : RC9
Depth [m BSF] : 66.50 to 66.70
Note(s) : Incorrect depth on photoboard

Location : K01-BH-b
Sample : RC10
Depth [m BSF] : 67.65 to 68.50