

Anholt/Djursland Offshore Wind Farm
Geotechnical Investigations
Cable Corridors
Geotechnical Report – CPT tests and vibrocores

GEO project no 32490
Report 2, 2009-08-26

Summary

Ramboll Wind has on behalf of Energinet.dk contracted GEO (Danish Geotechnical Institute) to conduct the geotechnical site investigations at the planned offshore wind farm between Anholt and Djursland.

The Anholt/Djursland Offshore Wind Farm worksite is located approximately 20 km off the coast of Djursland, north-east of the town Grenaa. The exact location of the farm is not yet established and several options are being assessed. The Anholt/Djursland Offshore Wind farm is planned as a 400 MW farm.

Power produced by the Wind Farm will be distributed via an approx. 20 km sea cable going to the shore of Djursland. The exact location of the cable is not yet established and therefore two options "Gjerrild Strand" and "Grenaa Nord" are being assessed.

The boring campaign in the wind farm area includes in total 7 boreholes to 40 metre below seabed. In addition to the sampling, in-situ testing (CPT tests) were carried out in the boreholes. Investigation of assumed deep gas was also included for a single location (BH08) in the scope of work.

For the cable corridors a total of 21 CPT tests and 21 vibrocores were executed. Both CPTs and vibrocores were planned to penetrate to 3 m below seabed.

All samples and cores from the boreholes and vibrocores have been geological described onshore. Classification-, chemical- and strength tests have been executed on selected samples.

This Report 2 summarizes the field- and laboratory work for the cable corridors and gives a general description of the geological and geotechnical variations along the corridors.

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2.I	Datasheet – Merete Chris
2.II	Datasheet - CPT Equipment and Cone Calibration Data
2.III	Datasheet - Vibrocore Equipment

1 INTRODUCTION AND SCOPE OF REPORT

1.1 Project and site location

On the instruction and under the supervision of Rambøll, acting on behalf of Energinet.dk a geotechnical investigation has been carried out by GEO at the location for the planned Anholt/Djursland Offshore Wind Farm.

The Anholt/Djursland Offshore Wind Farm is planned as a 400 MW farm. The exact location of the farm is not yet established and several options are being assessed. The overall worksite is located approximately 20 km off the coast of Djursland, north-east of the town Grenaa. The worksite is depicted (orange area) in Figure 1.1 and measures approximately 144 km². The water depth across the site generally ranges between 14 and 20 m.

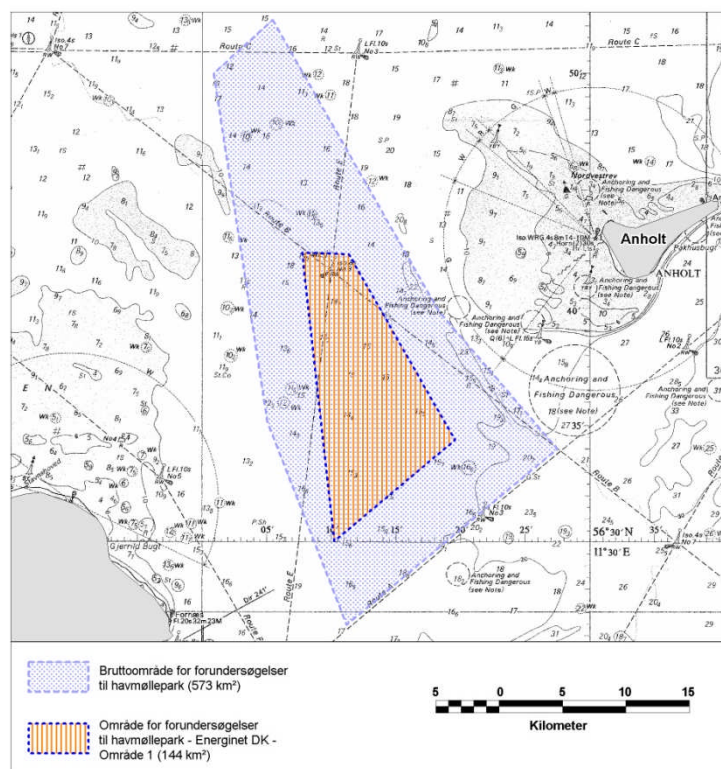


Figure. 1.1 Location of Anholt/Djursland Offshore Wind Farm

Power produced by the Wind Farm will be distributed via an approx. 20 km sea cable going to the shore of Djursland. The exact location of the cable is not yet established and therefore two cable corridors are being assessed, a northern alignment, Gjerrild Strand and a southern alignment, Grenaa Nord.

The purpose of the geotechnical investigation is to gather adequate geological and geotechnical data for a preliminary technical assessment of the conditions for cable laying. The geotechnical investigation follows a geophysical campaign and the vibrocore and CPT locations have been selected by the Client based on the results of this survey.

1.2 Geotechnical reporting under the contract

The performed geotechnical works for the Anholt/Djursland project are presented in totally 2 reports. The overall content of the 2 reports are:

Report 1: Wind Farm Area - Geotechnical Report – Boreholes (borehole logs, CPT profiles, laboratory results, soil conditions, summaries of work completed etc.).

Report 2: Cable Corridors – Geotechnical Report – CPT tests and vibrocores (vibro-core logs, CPT profiles, laboratory results, soil conditions, summaries of work completed etc.).

Report 3, which describes consolidation tests, is in progress.

1.3 Content of this report

This Report 2 includes factual field data and laboratory data and a interpretation of data from the vibrocores and CPTs performed for the two cable corridors.

2 FIELD OPERATIONS

2.1 General

The offshore geotechnical fieldwork was performed from the vessel Merete Chris.

Merete Chris was engaged between 26 May and 08 June, 2009. The operations were conducted on 12-hours basis. A summary of Daily Progress Reports is given in Enclosure 2B.04.

The following activities were carried out:

- 21 Nos. seabed deployed Piezocone Penetration Tests (PCPT)
- 21 Nos. vibrocores

All test locations are shown on the location plan, Enclosure 2A.01 and listed on the summary sheets, Enclosures 2B.01 and 2B.02.

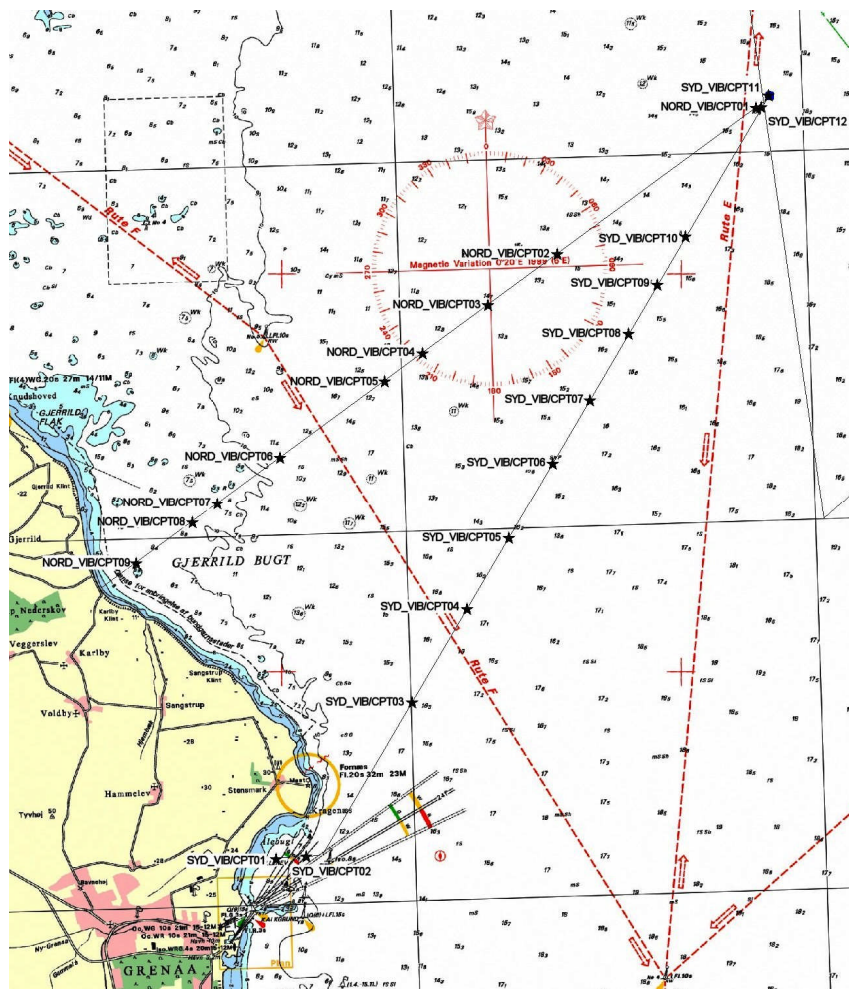


Figure 2.1 Schematic layout. Cable Corridors and test locations

2.2 Marine equipment

Merete Chris is a dredger vessel used for different marine works. The vessel has an overall length of 42.2 m and draught of 2.4 m and is equipped with a 530 HP main engine. On the vessel is installed a Sennebogen 640 R-HD 50 crane, which was used for handling the CPT and vibrocore equipment. The vessel was sub-contracted through Peter Madsen Rederi A/S in Denmark. The detailed data for the vessel is given in Appendix 2.I.

2.3 Vibrocore equipment and procedures

The vibrocores have been carried out from Merete Chris using the high-frequency vibrocore rig, Geo-Corer 3000. The rig is equipped with a sampler consisting of an open tube with anti flow-back valve, 3 m long, with a PVC 110/105 mm liner. The system description and technical data are included in Appendix 2.III.

The vibrocorer was operated using the crane on the vessel. A sample tube 3 m long was then vibrated into the seabed under observation of the penetration depth and speed. The crane recovered the equipment from the seabed to the deck, where the liner with sample was removed from the sample tube. The vibrocores were planned to penetrate to maxi-

mum 3 m below seabed. The actual penetration depth was measured with a counter, mounted on the vibrocore rig.

The sample was cut into sections of approx. 1 m length. On each top-end of the sample section a preliminary soil description has been performed. Each section was then sealed with end caps and PVC tape. All samples were shipped onshore to GEOs laboratory for geological description and testing.

All data from the fieldwork (penetration depth, core length, core recovery, record of collected samples) are given in the Summary – Vibrocores and on the vibrocore logs, Enclosures 2D.01 – 2D.21

2.4 CPT equipment and procedures

Piezo Cone Penetration Tests (PCPTs) have been carried out from Merethe Chris using GEO's seabed CPT-rig "GeoLight". A general description and technical specification for the GeoLight is presented in Appendix 2.II.

All the CPTs were planned to penetrate to maximum 3,0 m depths below seabed. The penetration depths, coordinates, seabed levels and stop reasons for each test are listed in Summary – CPT tests, Enclosure 2B.01.

The overall GeoLight system dimensions are; base plate 1.6 x 1.6, height 1.6 m with a ballast of approximately 5 ton providing 30 kN thrust at seabed.

The CPT's were conducted in accordance with the ISOPT1 (1988), ref /3/. Tip resistance, sleeve friction, pore water pressure (single filter located just behind the cone tip) and inclination of the cone were recorded during each test. The cones used were of the standard Van den Berg 60-degree type with cross sectional areas of 10 cm². The cone geometry, filter and sleeve diameter, joint-widths and rods were in agreement with the ISOPT1 recommendations.

All cones were calibrated in accordance with the contract specification and GEO procedures. The cone calibration data are enclosed in Appendix 2.II.

2.5 Comments to field work

On location SYD_VIB01 it was not possible to penetrate deeper than 1,0 m with the vibrocore rig due to the present of soft rock (limestone). The CPT test at the location was also stopped after approx. 1 m penetration and the cone (080917) was damaged. A reattempt (SYD_CPT01B) was performed to substitute the failed test.

2.6 Navigation and positioning

2.6.1 Datum and coordinate system:

Co-ordinates for all positions are given according to WGS84, UTM Zone 32.

All depths refer to DVR 90.

2.6.2 Equipment and procedures:

All positioning work have be based on the positioning system on Merete Chris. The system is a PDS2000 via Trimble 5700 DGPS system. The key reference point is the GPS antenna placed on the top of the crane boom (central above test positions).

To verify the accuracy of the positioning systems on board the Merethe Chris a position check was performed during the mobilisation. The test performed is stored in GEOs project files.

Water depths on the test positions have been established using a transducer on Geo-Light. Seabed elevations have been established using the recorded water depths in conjunction with sea levels recorded by the automatic water level gauges in Grenaa Harbour. The seabed elevations for the vibrocore has been assumed identical to the nearby CPT.

Positions and seabed elevations for the vibrocores and CPT tests are given in the Summaries, Enclosure 2B.01 and 2B.02, vibrocore logs, Enclosure Nos. 2D.01 - 2D.21 and on the CPT profiles, Enclosure Nos. 2E.01 - 2E.21 and Enclosure Nos. 2F.01 - 2F.21.

3 Geological descriptions and logs

All cores have been geologically described at GEOs laboratory in Lyngby. The geological description follows the specifications in Bulletin No. 1 "A guide to engineering geological soil description" from Danish Geotechnical Society (DGF), ref. /1/.

Soil encountered, stratification, soil classifications etc. in the individual vibrocore are given on the vibrocore logs, Enclosure 2D.01 - 2D.21.

Legend and Abbreviations, used on the vibrocore logs is enclosed as Enclosure 2C.00.

4 LABORATORY WORK

4.1 Testing program and standards

All cores have been sent to GEOs laboratory in Lyngby for testing.

Prior to commencing the onshore tests, GEOs suggested program for laboratory testing was commented on and accepted by Ramboll.

In Table 4.1 is listed the type of tests done on the project and standards used for the individual tests:

Type of test	Test standard
Natural moisture content	EN1997-2:2005(E) - BS1377
Particle size analysis (sieve & hydrometer analysis)	EN1997-2:2005(E) - BS1377
Atterberg limits (liquid limit, plastic limit and plasticity index) – Falling Cone Method	EN1997-2:2005(E) DS/CEN ISO/TS 17892-12
Unit weight	EN1997-2:2005(E) - BS1377
Density of solid particles	EN1997-2:2005(E) - BS1377
Density index of granular soils (e_{min}/e_{max})	Etc 5 - Draft
Carbonate content	EN1997-2:2005(E) - BS1377
Loss on ignition (organic content)	ASTM D2974
Thermal conductivity test	ASTM D5334-92

Table 4.1 Reference to laboratory test standards

4.2 Soil Tests

4.2.1 Natural moisture content

Natural moisture content determination was made on regular intervals in cohesive formations. Natural moisture content is also determined on all samples, where Atterberg limits are determined.

The results of the natural moisture content determinations are given on the vibrocore logs, Enclosure Nos. 2D.01 - 2D.21. Natural moisture content determinations are also presented on the Summary - Soil Classification Tests, Enclosure 2B.03.

4.2.2 Liquid and plastic limit

Liquid and plastic limit determinations (Atterberg limits) were made on selected samples in order to classify the plasticity of the materials.

The results of the determinations are given on the vibrocore logs, Enclosure Nos. 2D.01 - 2D.21 and are also presented on the Summary - Soil Classification Tests, Enclosure 2B.03.

4.2.3 Particle size analysis

Particle size analyses were undertaken on samples by sieving only or a combination of sieving and sedimentation.

The detailed results from the sieve- and sedimentation tests are presented on the Particle Size Distribution Curves, Enclosure 2G.01-2G.20. The percentage of clay (< 0,002 mm) is also presented in the Summary - Soil Classification Tests, Enclosure 2B.03.

4.2.4 Organic content

Determination of the organic content of soil was done for selected soil samples.

The results of the organic content determinations are given on Summary - Soil Classification Tests, Enclosure 2B.03.

4.2.5 Carbonate content

Determination of the calcium carbonate content was done on a number of the soil samples.

The results of the carbonate content determinations are given on Summary - Soil Classification Tests, Enclosure 2B.03 and on the vibrocore logs, Enclosure Nos. 2D.01 - 2D.21.

4.2.6 Thermal conductivity tests

This test method, which presents a procedure for determining the thermal conductivity of soil and soft rock using a transient heat method, has been undertaken on totally 7 samples. All samples were located within the first metres below seabed.

The results of the conductivity tests are presented in Enclosure 2H.01 - 2H.07.

4.3 Comments to laboratory work

Laboratory tests have been performed as ordered in the extent possible. Due to local soil variations within the core a few of the tests have been executed at slightly different depths than planned.

Effort has been made to ensure that geological descriptions are in agreement with results of classification tests, following the guidelines of the standards. All classification testing was carried out after the geological description, and descriptions of samples selected for classification testing were then compared with test results and adjusted, if necessary. Depending on a geological evaluation, descriptions of samples close to the sample tested were sometimes also adjusted.

5 Measured CPT data

The results of all measured data by CPTs are presented on the CPT logs, Enclosure 2E.01 - 2E.21. Legend and definitions for the logs are presented in Enclosure 2C.00.

The following data are presented for each test:

1. Cone resistance, q_c
2. Sleeve friction, f_s
3. Pore water pressure, u
4. Friction ratio, R_f

An explanation of the abbreviations used in the processing is given below:

- q_c is the measured cone resistance. q_c is shown as two curves; one corresponds to a low range scale (e.g. 0-5 MPa) and one to a high range scale (e.g. 0-50 MPa)
- f_s is the measured sleeve friction
- u is the pore water pressure (relative to seabed level)
- R_f is the friction ratio. Friction ratio is the ratio between the measured sleeve friction and the measured cone resistance i.e., $R_f = (f_s/q_t)100 \%$

6 Inferred CPT data

6.1 General

The results of all inferred data from the CPTs are presented on the CPT Profiles, Enclosure Nos. 2F.01 - 2F.21. Legend and definitions for the logs are presented in Enclosure 2C.00.

The following data are presented for each test:

1. Corrected cone resistance, q_t
2. Corrected sleeve friction, f_t
3. Corrected friction ratio, R_{ft}
4. Pore pressure ratio, B_q
5. Normalised cone resistance, Q_t
6. $F_r = f_s / (q_t - \sigma_{vo})$
7. The angle of internal friction φ
8. The undrained shear strength, c_u
9. Relative density, D_r

An explanation of the abbreviations used in the processing is given below:

- q_t is the corrected cone resistance. The values are shown in two scales, 0-5 MPa and 0-50 MPa. The corrected cone resistance is defined by $q_t = q_c + (1 - a) \cdot u$ where $a = 0.75$
- f_t is the corrected sleeve friction
- R_{ft} is the corrected friction ratio. Friction ratio is the ratio between the measured sleeve friction and the corrected cone resistance i.e. where $R_{ft} = f_s/q_t$
- B_q is the pore pressure ratio. $B_q = \frac{u - u_0}{q_t - \gamma \cdot Z}$ where $\gamma = 20\text{kN/m}^3$
 - [u_0 is the insitu, hydrostatic pore pressure (relative to seabed level)]
- Q_t is the normalized cone resistance. The normalized cone resistance is defined by $Q_t = (q_t - \sigma_{vo}) / \sigma'_{vo}$ where σ'_{vo} = effective vertical stress
- $F_r = f_s / (q_t - \sigma_{vo})$

6.2 Interpretation of soil types

On basis of our general experience the interpretation of geotechnical soil types have automatically been generated based on the model below:

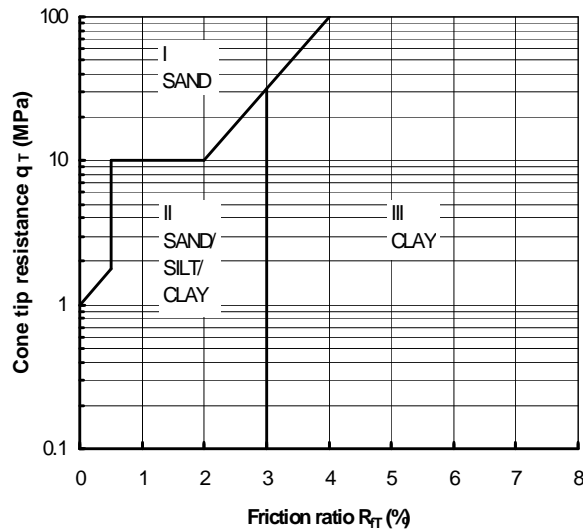


Figure 6.1 Empirical geological model for Anholt/Djursland Wind farm

The automatically generated soil types are not adjusted later with information obtained from the vibrocores, hence, the soil types included on the CPT profiles are based on the CPT data alone.

Interpretations of soil types for the different locations are presented on the CPT Profiles, Enclosure Nos. 2F.01 - 2F.21.

6.3 Strength Parameters

6.3.1 Undrained Shear strength:

The undrained shear strength have be determined from:

$$c_u = (q_t - \sigma_{vo})/N_{kt}$$

The undrained shear strength (c_u) have be calculated by the cone factor values N_{kt} 10 and 20 representative of the actual soil (both values are shown on the enclosures).

The undrained shear strength (c_u) presented is presented on the CPT Profiles, Enclosure Nos. 2F.01 - 2F.21.

6.3.2 Angle of internal friction:

The angle of internal friction ϕ' is determined from the relative density (D_r) determined from the CPT tests by the use of the expression:

$$\phi' = \alpha \cdot D_r + \beta$$

where

$$\alpha = 0.14^\circ \text{ and } \beta = 28.0^\circ \text{ (} D_r \text{ given in percent)}$$

This equation yields the maximum value $\phi' = 42.0^\circ$ for $D_r = 100 \%$.

The equation is based upon Figure 5.53 for uniform fine sand (Schmertmann, 1978) in “Cone Penetration Testing in Geotechnical Practice”, ref. /2/.

The internal friction ϕ' is presented on the CPT Profiles, Enclosure Nos. 2F.01 - 2F.21.

Relative Density:

The relative density (D_r) is estimated by the below expression, valid for normally and overconsolidated sands:

$$D_r = \frac{1}{C_2} \cdot \ln \left[\frac{q_c}{C_0 \cdot (\sigma'_{v0})^{C_1}} \right] \cdot 100\% \quad \text{where } q_c \text{ and } \sigma'_{v0} \text{ is given in kPa}$$

and $C_0 = 181$, $C_1 = 0.55$, $C_2 = 2.61$

The equation is based upon Figure 5.47 in “Cone Penetration Testing in Geotechnical Practice”, ref. /2/.

The relative density (D_r) is presented on the CPT Profiles, Enclosure Nos. 2F.01 - 2F.21.

7 DESCRIPTION OF GEOLOGICAL AND GEOTECHNICAL CHARACTERISTICS ENCOUNTERED

7.1 Geological characteristics

Overview of the geological soil types encountered along the cable route are listed in Table 7.1.

Soil type	Description	Environment and age
Marine postglacial sand	with shells and/or gravel	Ma Pg
Marine postglacial clay	Highly plastic, w %>60	Ma Pg
(Late-) glacial sand	with silt, clay, iron sulphides, organic	MaMw LgGc
(Late-) glacial clay	with laminae, iron sulphides, organic, gravel grains	MaMw LgGc
Limestone (Only position SYD_VIB01)	Silty, sandy w. unhardened parts	Ma? Da?

Table 7.1. Overview of geological soil types along cable corridors

7.2 Geotechnical characteristics

For each investigation point the test results (both laboratory and CPT tests) have been listed and related to the corresponding geological soil type to form a “mini database” of the geotechnical parameter variation. From this database typical values or ranges of the

geotechnical parameters have been identified and tabulated. The values extracted are presented in Table 7.2.

For the limestone it has not been possible to establish typical values of the geotechnical parameters since this formation is only found at the position SYD_VIB01.

The form of presentation is not a statistical work up of all data in each of the selected point leading to determination of characteristic design values for each soil type, since that work up is beyond the scope of this contract. The presentation is meant as guide to get a quick overview of the geotechnical parameter variation for each geological soil type to be used only for initial engineering purposes.

Geotechnical characteristics		Geotechnical soil type			
		Marine postglacial sand	Marine postglacial clay	(Late-) glacial sand	(Late-) glacial clay
Water content – w	%	na	45-75	na	15-35
Medium grain size - d_{50}	mm	0,10-0,30	0,009 – 0.025	0,18-0,28	0,003
Uniformity coef. – U		2-3 #1	na	4-6 #1	na
Clay fraction (0.002 mm)	%	-14	23-32	3-9	42-59
Liquid limit – w_L	%	na	54-84	na	39-55
Plastic limit - I_p	%	na	30-51	na	24-32
Carbonate cont. – Ca	%	0,8	4-14	na	13-32
q_c (CPT)	MPa	1 –3	1	1-2	1-2
Friction angle - φ (Estimated by CPT)	Deg.	30-33 locally >42	na	28-39	na
Undrained shear strength – c_v (Estimated by CPT)	kPa	na	50-100	na	50-100 locally >400

Table 7.2. Soil types – Classification parameters and strength parameters

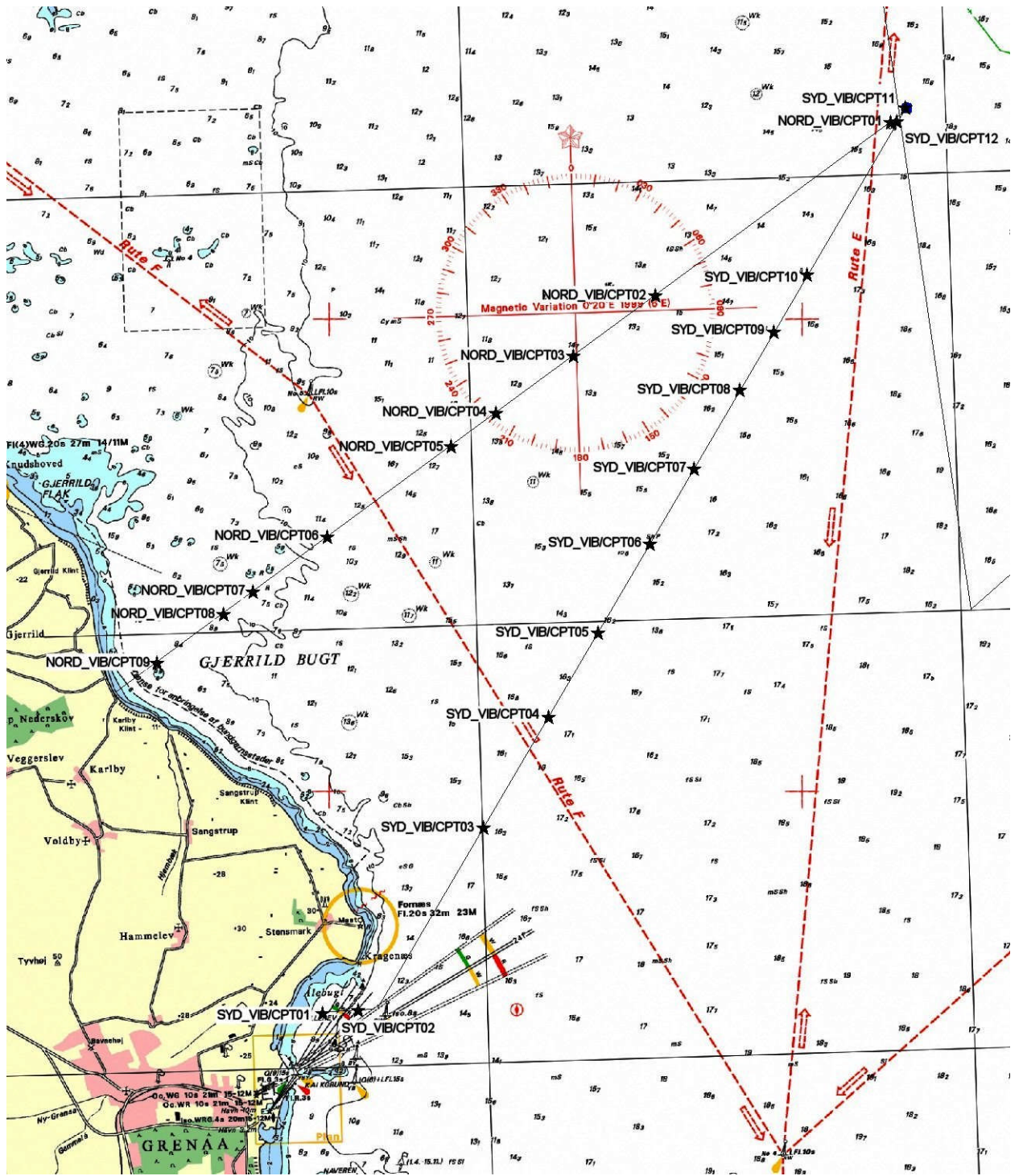
Notes:

#1: Higher U values recorded on some samples due to high gravel content

8 REFERENCES

- /1/ Danish Geotechnical Society, May 1995, Revision 1, Bulletin No. 1 "A guide to engineering geological soil description".
- /2/ Lunne, T., Robertson, P.K. & Powell, J.J.M. (1997). Cone penetration testing in geotechnical practice. Blackie Academic & Professional, London
- /3/ Penetration testing, 1988. Proceedings of the First International Symposium on Penetration Testing, ISOPT-1, Orlando

Enclosure 2A.00
Detailed Location Plan



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Date: 2009-06-25

Subject: Detailed location plan

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Approved : JBC

Date: 2009-06-29

Report 2

Enclosure 2A.00

Enclosure 2B.01
Summary - CPT Tests

Summary – CPT tests

Coordinates: UTM32/WGS84

Reference level: DVR 90

Sequence	CPT no	Cone no	Position Easting (m)	Position Northing (m)	Seabed (m)	Penetration Depth (m)	Final stop reason
11	NORD CPT 01	080914	631866	6274172	-16,5	3,00	Max depth
14	NORD CPT 02	080914	626880	6270496	-15,5	2,72	Max thrust
15	NORD CPT 03	080914	625145	6269218	-14,7	2,52	Max thrust
16	NORD CPT 04	080914	623503	6268009	-15,1	3,00	Max depth
17	NORD CPT 05	080914	622549	6267305	-14,6	2,41	Max thrust
18	NORD CPT 06	080914	619936	6265392	-12,4	3,00	Max depth
19	NORD CPT 07	080914	618362	6264220	-9,2	2,10	Max thrust
20	NORD CPT 08	080914	617730	6263754	-10,0	3,00	Max depth
21	NORD CPT 09	080914	616313	6262710	-8,5	3,00	Max depth
2	SYD CPT 01	080917			-8,3		Cone 080917 broken of rods
22	SYD CPT 01B	080914	619834	6255286	-8,4	0,33	Max thrust
1	SYD CPT 02	080917	620592	6255362	-11,3	3,00	Max depth
3	SYD CPT 03	080914	623240	6259224	-17,0	3,00	Max depth
4	SYD CPT 04	080914	624618	6261576	-17,9	3,00	Max depth
5	SYD CPT 05	080914	625664	6263360	-17,3	3,00	Max depth
6	SYD CPT 06	080914	626765	6265241	-16,9	2,60	Max thrust
7	SYD CPT 07	080914	627691	6266825	-17,5	2,24	Max thrust
8	SYD CPT 08	080914	628671	6268496	-16,4	3,00	Max depth
9	SYD CPT 09	080914	629388	6269729	-16,9	3,00	Max depth
10	SYD CPT 10	080914	630098	6270941	-17,0	2,32	Max thrust
13	SYD CPT 11	080914	632176	6274492	-17,4	2,48	Max thrust
12	SYD CPT 12	080914	632000	6274195	-16,7	1,93	Max thrust



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Subject: Summary - CPT tests

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Approved : JBC

Date: 2009-07-02

Report 2

Enclosure 2B.01

Enclosure 2B.02
Summary - Vibrocores

Summary - Vibrocores

Coordinates: UTM32/WGS84

Reference level: DVR 90

	Vibrocore No	Position Easting (m)	Position Northing (m)	Seabed (m)	Penetration depth (m)	Core length (field measurement) (m)
1	NORD VIB 01	631867	6274172	-16.5	3.00	2.72
2	NORD VIB 02	626881	6270497	-15.5	3.00	2.76
3	NORD VIB 03	625145	6269219	-14.7	3.00	2.82
4	NORD VIB 04	623503	6268010	-15.1	3.00	2.20
5	NORD VIB 05	622549	6267305	-14.6	3.00	1.38
6	NORD VIB 06	619936	6265393	-12.4	3.00	2.60
7	NORD VIB 07	618362	6264221	-9.2	3.00	2.70
8	NORD VIB 08	617730	6263755	-10.0	3.00	2.81
9	NORD VIB 09	616314	6262710	-8.5	3.00	2.86
10	SYD VIB 01	619835	6255287	-8.3	1.00	0.90
11	SYD VIB 02	620593	6255362	-11.3	3.00	2.90
12	SYD VIB 03	623241	6259223	-17.0	3.00	2.73
13	SYD VIB 04	624619	6261576	-17.9	3.00	2.80
14	SYD VIB 05	625664	6263361	-17.3	3.00	2.72
15	SYD VIB 06	626765	6265242	-16.9	3.00	2.68
16	SYD VIB 07	627691	6266826	-17.5	3.00	2.00
17	SYD VIB 08	628671	6268495	-16.4	3.00	2.85
18	SYD VIB 09	629388	6269730	-16.9	2.60	2.60
19	SYD VIB 10	630098	6270942	-17.0	3.00	2.72
20	SYD VIB 11	632176	6274493	-17.4	3.00	2.61
21	SYD VIB 12	632001	6274195	-16.7	3.00	2.80



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Job: 32490 Anholt. Djursland Wind Farm

Prepared : ROB

Date:

Subject: Summary - Vibrocores

Controlled : LAR

Date: 2009-06-08

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Approved : JBC

Date: 2009-07-02

Report 2

Enclosure 2B.02

Enclosure 2B.03
Summary – Soil Classification Tests

Vibrocore No	Sample No	Soil	Level m	Natural Moisture Content w %	Medium grain si- ze d ₅₀ mm	Uniformity coefficient U = d ₆₀ /d ₁₀	Clay fraction, (< 0.002 mm) %	Liquid and plastic limits (Atterberg limits)			Loss on ignition (organic content)) %	Carbonate content %
								WL %	WP %	IP %		
NORD_VIB01	2	SAND, fine - medium	-17.3	36.9								
NORD_VIB01	2M	SAND, fine - medium	-17.5		0.116	2.0						
NORD_VIB01	2B	CLAY, highly plastic	-17.8	35.0								
NORD_VIB01	3T	CLAY, highly plastic	-18.8	34.6	0.003		44.7	52.9	20.9	32.0		28.9
NORD_VIB02	1M	SAND, fine - medium	-16.0		0.304	106.9	7.8				0.8	
NORD_VIB03	2B	SAND, fine - medium	-15.6		0.186	6.2	2.7					
NORD_VIB04	2B	CLAY, highly plastic	-15.8	32.0			58.9	54.5	22.2	32.3		
NORD_VIB04	3	CLAY, highly plastic	-16.8	33.5								
NORD_VIB05	2T	SAND, fine - medium	-14.9		0.109	38.5	8.5					
NORD_VIB05	2	SAND, fine - medium	-15.2	12.9								
NORD_VIB06	1	SAND, fine - medium	-14.9		0.178	2.3						
NORD_VIB07	1	SAND, fine - medium	-9.7		0.180	1.6						
NORD_VIB08	1B	SAND, fine - medium	-10.8		0.534	1015.3	6.3					
NORD_VIB08	2B	CLAY, highly plastic	-11.0	45.2	0.025		23.1	54.3	24.6	29.7		
NORD_VIB08	2	CLAY, highly plastic	-11.2	49.7								
NORD_VIB08	3	SAND, fine, silty	-12.2	39.5								
NORD_VIB09	1T	SAND, fine - medium	-8.6		0.146	2.3						
NORD_VIB09	1B	CLAY, highly plastic	-9.3	73.5				80.4	34.0	46.4	4.6	
NORD_VIB09	2B	CLAY, highly plastic	-10.1	65.9								14.2
NORD_VIB09	3	CLAY, highly plastic	-11.1	66.8								



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Subject: Summary - Soil Classification tests

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Date: 2009-07-03

Report 2

Enclosure 2B.03 Rev.

Vibrocore No	Sample No	Soil	Level m	Natural Moisture Content w %	Medium grain size d ₅₀ mm	Uniformity coefficient U = d ₆₀ /d ₁₀	Clay fraction, (< 0.002 mm) %	Liquid and plastic limits (Atterberg limits)			Loss on ignition (organic content) %	Carbonate content %
								WL %	WP %	IP %		
SYD_VIB01	1	LIMESTONE, silty, sandy	-8.9	23.6								
SYD_VIB02	1T	GRAVEL, clayey, sandy	-11.5		21.600	215.6						
SYD_VIB02	1B	SAND, very clayey, silty	-12.3		0.061		28.2					
SYD_VIB02	3	CLAY, highly plastic	-13.5	28.7								
SYD_VIB03	2T	SAND, medium - coarse	-18.3		0.276	4.6						
SYD_VIB04	1T	SAND, fine - medium	-18.1		0.197	2.0				0.8		
SYD_VIB04	1B	SAND, fine - medium	-18.7		0.136							
SYD_VIB04	2B	CLAY, highly plastic	-19.5	26.2				43.8	18.3	25.4		31.7
SYD_VIB04	3	CLAY, highly plastic	-20.5	24.5								
SYD_VIB05	2T	SAND, fine - sorted	-18.0		0.128	2.3						
SYD_VIB05	2	CLAY, highly plastic	-18.8	27.9								
SYD_VIB05	3	CLAY, highly plastic	-19.5	26.9								
SYD_VIB06	2T	SAND, fine sorted	-18.2		0.165	3.0						
SYD_VIB06	3	CLAY, medium-highly plastic	-18.9	15.6								
SYD_VIB06	3B	SILT, v. sandy, w. clay l.	-19.3									13.5
SYD_VIB07	1	SAND, fine, well sorted	-18.0		0.098	2.1	2.9					
SYD_VIB08	1	SAND, fine - medium	-16.8		0.195	2.3						
SYD_VIB08	2M	SAND, fine - medium	-17.7		0.128		13.8					
SYD_VIB08	3	SAND, fine - medium	-18.7	26.6								
SYD_VIB09	1M	GRAVEL, very sandy	-17.4		28.300	512.9						
SYD_VIB09	2	CLAY, highly plastic	-17.9	26.9	0.003		41.9	39.6	15.9	23.7	2.9	
SYD_VIB09	3	CLAY, highly plastic	-19.2	21.1								
SYD_VIB10	1B	SAND, fine - medium	-17.7		0.189	2.6						
SYD_VIB10	2M	CLAY, highly plastic	-18.3	75.0	0.009		31.9	84.0	33.1	50.9	3.9	4.2
SYD_VIB10	3	CLAY, highly plastic	-19.3	24.5								
SYD_VIB11	2T	SAND, fine - medium	-18.0		0.203	3.1						
SYD_VIB12	1M	GRAVEL, very sandy	-16.9		11.700	59.6						



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Controlled :

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Approved : JBC

Date: 2009-07-03

Report 2

Enclosure 2B.03 Rev.

Enclosure 2B.04
Summary – Daily Progress Reports

Summary – Daily Progress Reports

Date	Activity
2009-05-26	Mobilisation of vibrocore equipment on MS Merete Chris. Transit Hundested to Grenaa.
2009-05-27	Performed Vibrocores: SYD VIB01, SYD VIB02, SYD VIB03, WOW.
2009-05-28	WOW.
2009-05-29	Performed vibrocores: SYD VIB04, SYD VIB05, SYD VIB06, SYD VIB07, SYD VIB08, SYD VIB09, SYD VIB10.
2009-05-30	Performed vibrocores: NORD VIB09, NORD VIB08, NORD VIB07, NORD VIB06, NORD VIB05, NORD VIB04, NORD VIB03, NORD VIB02, NORD VIB01.
2009-05-31	Performed Vibrocores: SYD VIB11, SYD VIB12.
2009-06-02	Performed CPTs: SYD CPT 02, SYD CPT 01, WOW
2009-06-03	WOW
2009-06-04	WOW
2009-06-05	WOW
2009-06-06	Performed CPTs: SYD CPT 03, SYD CPT 04, SYD CPT 05, SYD CPT 06, SYD CPT 07, SYD CPT 08, SYD CPT 09, SYD CPT 10, NORD CPT 01, SYD CPT 12, SYD CPT 11.
2009-06-07	Performed CPTs: NORD CPT 02, NORD CPT 03, NORD CPT 04, NORD CPT 05, NORD CPT 06, NORD CPT 07, NORD CPT 08, NORD CPT 09, SYD CPT 01B.
2009-06-08	Demobilisation of equipment in Hundested harbor.

Abbreviations:

WOW: Waiting on Weather.



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Prepared : KNM Date: 2009-06-26 Subject: Summary of Daily Progress Reports

Controlled : LAR Date: 2009-06-26 Page 1 / 1

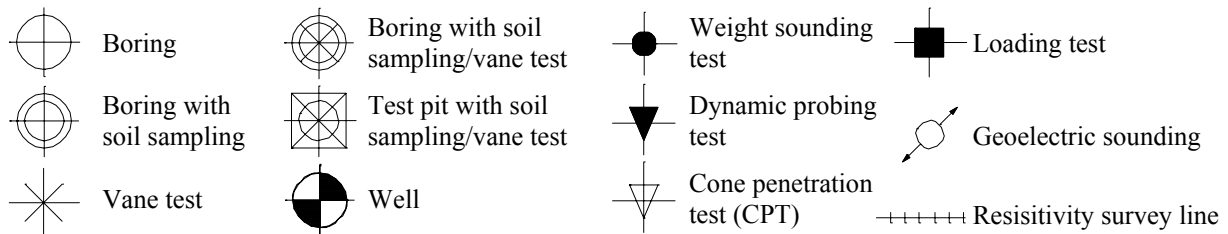
Approved : JBC Date: 2009-06-30 Report 2 Enclosure 2B.04 Rev.

Enclosure 3C.00
Legend and Abbreviations

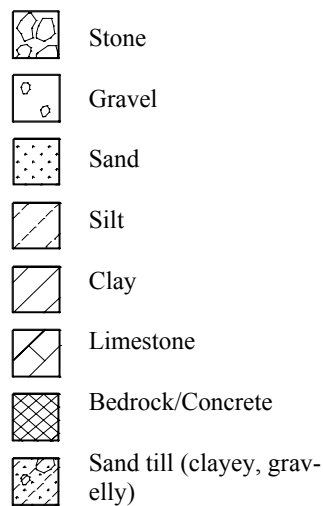
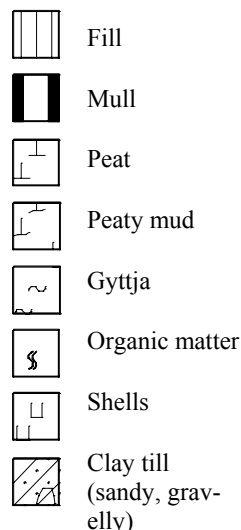
GEO-Standard: Legends and Abbreviations

Core drillings

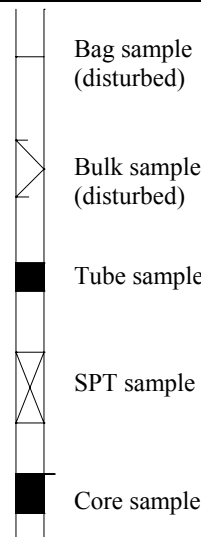
Site plan



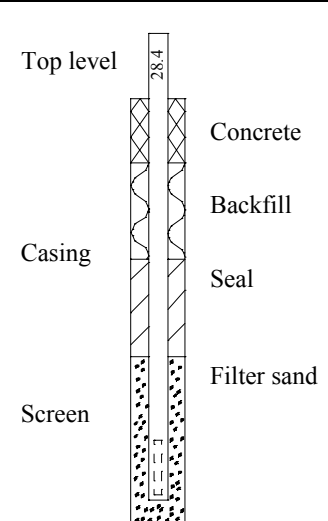
Soil types



Samples



Well installations



Note: In tills, a varying content of stones and blocks should be expected

Geological age

Re	Recent
Pg	Postglacial
Sg	Lateglacial
Gc	Glacial
Ig	Interglacial
Te	Tertiary
Mi	Miocene
Ol	Oligocene
Eo	Eocene
Pl	Palaeocene
Se	Selandian
Da	Danian
Ct	Cretaceous
Ms	Maastrichtian

Environment

Ae	Aeolian (wind deposit)
Br	Brackish water deposit
Fi	Fill
Fw	Fresh water deposit
Gl	Glacier deposit
Ls	Landslide deposit
Ma	Marine deposit
Mw	Meltwater deposit
Ss	Solifluction soil
Ts	Topsoil
Wd	Wash down deposit

General abbreviations

sl.	slightly
v.	very
w.	with
lam.	lamina(e)
fragm.	fragments
biot.	bioturbation
bryo.	bryozoans
calc.	calcareous
glauc.	glaucanite
T	top of sample
B	bottom of sample

Core samples

Recovery: Ratio in percentage between sample length and length of core run (Total Core Recovery, TCR). Value appears at top of core.

RQD: Rock Quality Designation. Ratio in percentage between total length of core pieces with length more than 100 mm, and length of core run. Value appears at top of core.

Fractures:



1 = S1	Unfractured	no fractures
2 = S2	Slightly fractured	10 cm < fracture spacing
3 = S3	Fractured	6 cm < fracture spacing < 10 cm
4 = S4	Very fractured	2 cm < fracture spacing < 6 cm
5 = S5	Crushed	fracture spacing < 2 cm

Induration:



1 = H1	Unlithified	Can easily be shaped with fingers
2 = H2	Slightly indurated	Can easily be worked with knife
3 = H3	Indurated	Can be worked with knife
4 = H4	Strongly indurated	Can be scratched with knife
5 = H5	Very strongly indurated	Cannot be scratched with knife

Tests

c_v	Shear strength	(kN/m ²)	Measured by vane test in undisturbed soil	vr.: Vane not penetrated to full depth
c_{vr}	Shear strength	(kN/m ²)	Measured by vane test in remoulded soil	vd.: Test with defective vane
c_l	Shear strength	(kN/m ²)	Measured by laboratory vane	st.: Vane test influenced by stone
c_u	Shear strength	(kN/m ²)	Measured by unconfined compression test or triaxial test	
N	Standard Penetration Test (SPT)		Number of blows per 0.3 m penetration of Ø51 mm SPT probe by use of the energy $h \bullet G = 0.7 \text{ m} \bullet 0.635 \text{ kN}$	
w	Water content	(%)	Ratio between weight of water and weight of grains	
w_p	Plastic limit	(%)	Water content at the boundary between semisolid and plastic state; NP: Non plastic	
w_L	Liquid limit	(%)	Water content at the boundary between plastic and liquid state	
I_p	Plasticity index	(%)	$w_L - w_p$	
γ	Unit weight	(kN/m ³)	Ratio between total weight and total volume	
e	Void ratio		Ratio between pore volume and grain volume	
e_{max}	Void ratio, loosest state		Void ratio of very loose standard state	
e_{min}	Void ratio, densest state		Void ratio of very dense standard state	
I_D	Relative density		$(e_{max} - e) / (e_{max} - e_{min})$	
ka	Carbonate content	(%)	Ratio between weight of carbonate and total grain weight	
gl	Organic content	(%)	Weight loss by prolonged glowing, in percent of total grain weight	

Supplementary tests

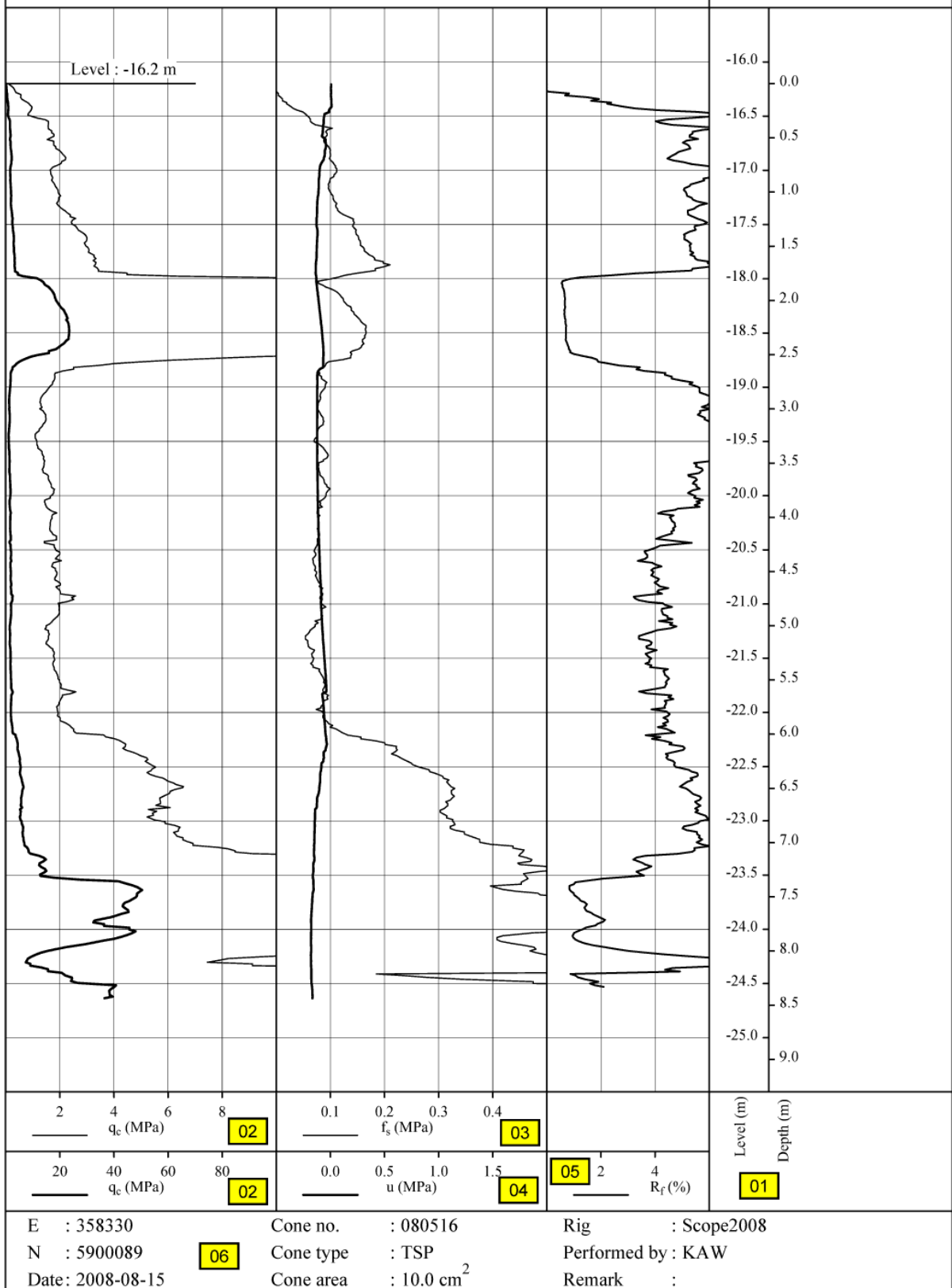
In situ tests:		Laboratory tests:			
PR	Pressiometer	B	Brazil	P	Point Load
FH	Falling Head	C	Consolidation	S	Simple shear
PP	Pumping	D	Specific gravity	T	Triaxial
EL	Elastmeter	E	e_{max} and e_{min}	U	Unconfined compression
GA	Gammalog	F	Photo	V	Shear box
		G	Grain size analysis	W	Vibration compaction
				SP	Standard proctor test
				MP	Modified proctor test

References

Dansk Standard:	Danish Geotechnical Society:	Dansk Geoteknisk Forening:
"Norm for fundering (DS415) (Code of practice for Foundation Engineers)	"A guide to engineering geological soil description", 1995	"Markundersøgelsesmetoder", 1990 (Field investigation methods, in Danish)

Vane tests are carried out and evaluated according to reference document, revision 3, August 1999 (in Danish), of the Danish Geotechnical Society. Conversion tables have been approximated by a straight line through the origin and the point corresponding to $\frac{2}{3} P_{max}$.

CPT name : Explanatory CPT soil profile



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Cone Penetration Tests

01	Depth:	Depth refers to the penetration depth below start of test level. The depth is not corrected for tool inclination
01	Level:	Level to penetration depth
02	q_c :	Tip resistance in two scales, 0 – 10 MPa and 0 – 100 MPa
03	f_s :	Sleeve friction in scale 0 – 0.5 Mpa. All measurements are referred back to the cone tip
04	u:	Pore water pressure relative to level at start of test in scale -0.5 – 2.0 MPa
05	R_f :	Friction ratio in scale 0 – 6 %
06		Other test information
E and N:		Test location (E: Easting and N: Northing)
Date:		Date of CPT testing
Cone no:		Number of cone used in test
Cone type:		Type of Cone – TSP. Tip resistance, Sleeve friction and Pore water pressure are measured in agreement with the ISOPT1 recommendations
Cone area:		10.0 cm ² in agreement with the ISOPT1 recommendations
Rig:		Name of rig
Performed by:		Initial of test operator
Remarks:		Remarks to test (If any)



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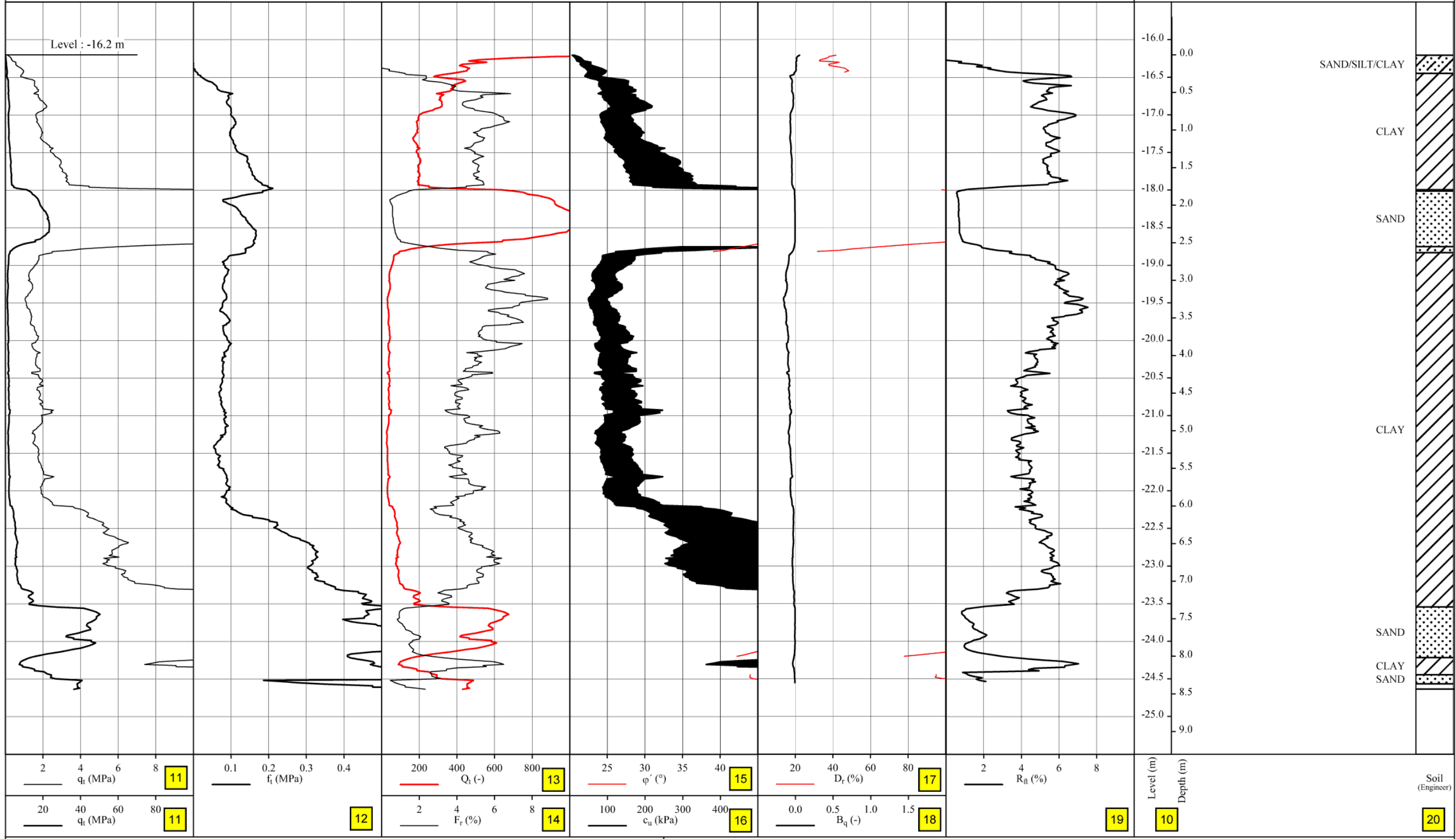
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Approved : Date: Report 2 Encl. 2C.00 Rev.

CPT name : Explanatory CPT soil profile



2 4 6 8	0.1 0.2 0.3 0.4	200 400 600 800	25 30 35 40	20 40 60 80	2 4 6 8	Level (m)	Soil (Engineer)
2 4 6 8		2 4 6 8	100 200 300 400	0.0 0.5 1.0 1.5		Depth (m)	
11	12	13	14	15	16	17	18
11						19	20

E : 358330	Cone no. : 080516	Rig : Scope2008
N : 5900089	Cone type : TSP	Performed by : KAW
Date : 2008-08-15	Cone area : 10.0 cm ²	Remark :

Cone Penetration Tests

- 10 Depth: Depth refers to the penetration depth below start of test level. The depth is not-corrected for tool inclination
- 10 Level: Level to penetration depth
- 11 q_t : Corrected tip resistance in two scales, 0 – 10 MPa and 0 – 100 MPa
- 12 f_t : Corrected sleeve friction in scale 0 – 0.5 MPa
- 13 Q_t : Normalized cone resistance in scale 0 - 1000
- 14 F_r : Normalized sleeve friction in scale 0 – 10 %
- 15 φ : Angle of internal friction in scale 20 - 45°
- 16 c_u : Undrained shear strength in scale 0 – 500 kPa
- 17 D_r : Relative density in scale 0 – 100 %
- 18 B_q : Pore pressure ratio in scale –0.5 – 2.0
- 19 R_{ft} : Corrected friction ratio in scale 0 – 10 %
- 20 Main soil description interpreted from CPT results
- 21 Other test information:
- E and N: Test location (E: Easting and N: Northing)
- Date: Date of CPT testing
- Cone no.: Number of cone
- Cone type: Type of Cone – TSP. Tip resistance, Sleeve friction and Pore water pressure are measured in agreement with the ISOPT1 recommendations
- Cone area: 10 cm² in agreement with the ISOPT1 recommendations
- Rig: Name of rig – SCOPE2008
- Performed by: Initials of test operator
- Remarks: Remarks to test (if any)



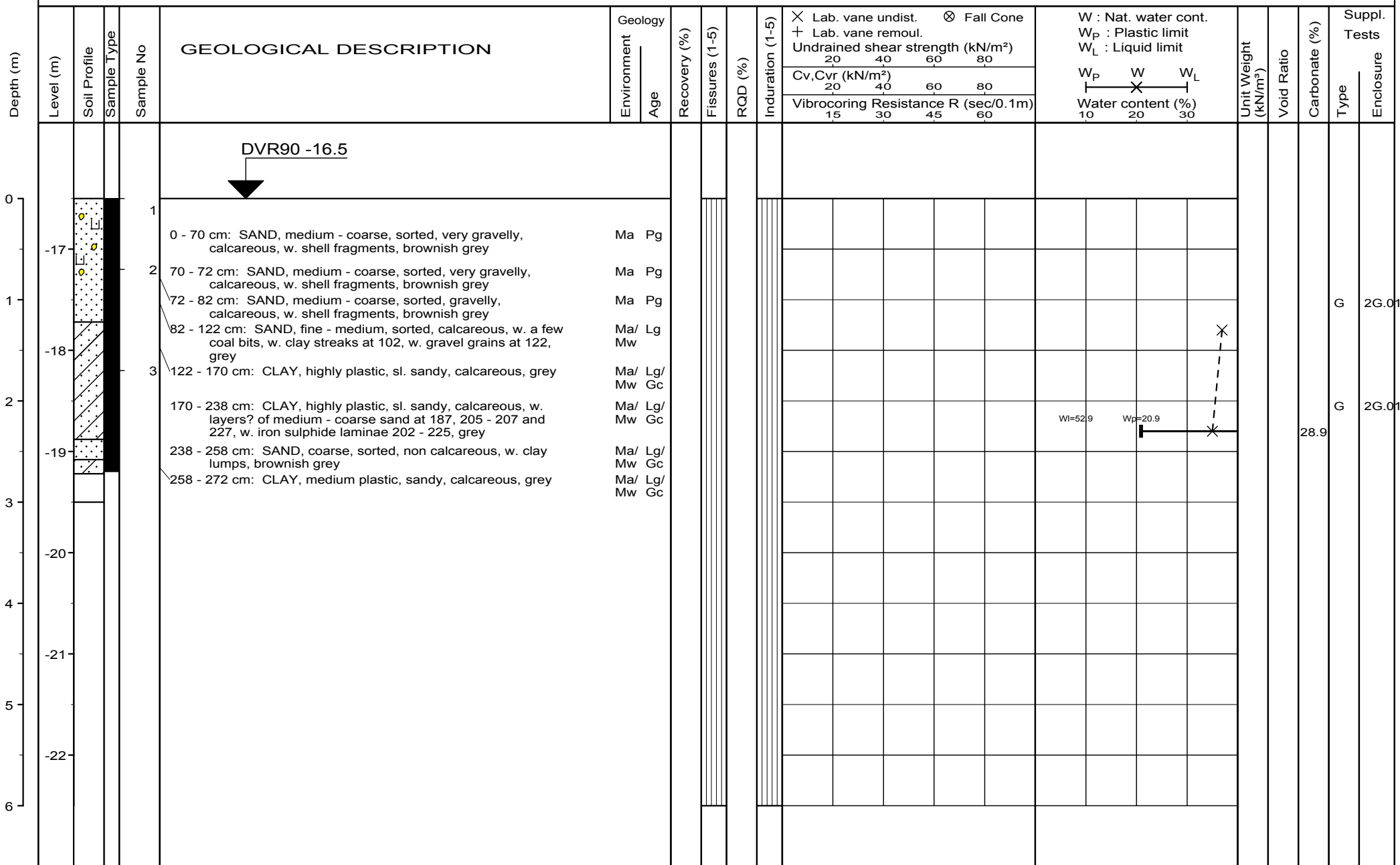
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Controlled	:	Date:	Page 6 / 6
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Enclosure 2D.01 - 2D.21
Vibrocore Logs

VIBROCORING NO. NORD_VIB01 Anholt. Djursland Wind Farm



Coordinates : E : 631867 (m) N : 6274172 (m)
 Prepared : SAM Date : 2009-06-12
 Comments : Checked : LAR Date : 2009-06-30
 Approved : JBC Date : 2009-07-01

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Job : 32490 Anholt. Djursland Wind Farm
 Vibrocoring : NORD_VIB01 Date : 2009-05-30
 Report No.: 2 Encl. No.: 2D.01

VIBROCORING NO. NORD_VIB02 Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	× Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit W _p W W _L ----- ----- Water content (%) 10 20 30			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests						
						Environment	Age					Cv,Cvr (kN/m ²)	Vibrocoring Resistance R (sec/0.1m)			Type	Enclosure											
					DVR90 -15.5 ▼																							
					0 - 35 cm: SAND, fine - medium, very gravelly, calcareous, organic, rich in shell fragments, brownish grey	Ma	Pg																					
					35 - 60 cm: SAND, fine - medium, sl. silty, sl. gravelly, calcareous, w. shell fragments, brownish grey	Ma	Pg																			G	2G.02	
					60 - 76 cm: SAND, fine - medium, poorly sorted, sl. clayey, sl. silty, sl. gravelly, calcareous, w. clay lumps, w. shell fragments, grey	Ma	Pg																					
					76 - 138 cm: SAND, fine - medium, sorted, sl. gravelly, calcareous, grey	Ma	Pg																					
					138 - 176 cm: SAND, fine - medium, sorted, sl. gravelly, calcareous, grey	Ma/	Lg/																					
					176 - 250 cm: SAND, fine - medium, poorly sorted, sl. silty, sl. gravelly, calcareous, grey	Ma/	Lg/																					
					250 - 276 cm: SAND, fine - medium, sorted, calcareous, grey	Ma/	Lg/																					


Coordinates :	E : 626881 (m)	N : 6270497 (m)	Prepared : SAM	Date : 2009-06-12
Comments :			Checked : LAR	Date : 2009-06-30
			Approved : JBC	Date : 2009-07-01

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Job : 32490	Anholt. Djursland Wind Farm
Vibrocoring : NORD_VIB02	Date : 2009-05-30
Report No.: 2	Encl. No.: 2D.02

VIBROCORING NO. NORD_VIB06 Anholt. Djursland Wind Farm


Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	× Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit W _p W W _L ----- ----- ----- Water content (%) 10 20 30			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests	
						Environment	Age					Cv, Cvr (kN/m ²)	Vibrocoring Resistance R (sec/0.1m)			Type	Enclosure						
					DVR90 -12.4 																		
0				1	0 - 60 cm: SAND, fine - medium, sorted, sl. silty, w. few gravels, non calcareous, w. shell fragments, olive grey	Ma	Pg															G	2G.06
-13				2	60 - 150 cm: SAND, fine - medium, sorted, sl. silty, w. few gravels, non calcareous, w. shell fragments, olive grey	Ma	Pg																
-14				3	150 - 160 cm: SAND, fine, poorly sorted, silty, sl. calcareous, w. organic laminae, rich in mica, w. plant remains, grey	Ma/	Lg/																
					160 - 260 cm: SAND, fine, poorly sorted, silty, sl. calcareous, w. organic laminae, rich in mica, w. plant remains, grey	Mw	Gc																
-15																							
-16																							
-17																							
-18																							
6																							

Coordinates : E : 619936 (m) N : 6265393 (m)	Prepared : SAM	Date : 2009-06-12
Comments :	Checked : LAR	Date : 2009-06-30
	Approved : JBC	Date : 2009-07-01



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Job : 32490 Anholt. Djursland Wind Farm
Vibrocoring : NORD_VIB06 Date : 2009-05-30
Report No.: 2 Encl. No.: 2D.06

VIBROCORING NO. NORD_VIB07 Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	X Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit W _p W W _L ----- ----- ----- Water content (%) 10 20 30			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests		
						Environment	Age					Cv, Cvr (kN/m ²)	Vibrocoring Resistance R (sec/0.1m)			Type	Enclosure							
					DVR90 -9.2 																			
0				1	0 - 70 cm: SAND, fine - medium, well sorted, non calcareous, w. few shell fragments, yellowish brown to grey	Ma	Pg															G	2G.07	
1	-10			2	70 - 170 cm: SAND, fine - medium, well sorted, sl. gravelly 75 - 95, non calcareous, w. few shell fragments, yellowish brown to grey	Ma	Pg																	
2	-11			3	170 - 270 cm: SAND, fine - medium, well sorted, non calcareous, w. few shell fragments, yellowish brown to grey	Ma	Pg																	
3	-12			4	Shoe sample: SAND, fine - medium, well sorted, non calcareous, yellowish brown	Ma	Pg																	
4	-13																							
5	-14																							
6	-15																							


Coordinates : E : 618362 (m) N : 6264221 (m)	Prepared : SAM	Date : 2009-06-12
Comments :	Checked : LAR	Date : 2009-06-30
	Approved : JBC	Date : 2009-07-01



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Job : 32490 Anholt. Djursland Wind Farm
Vibrocoring : NORD_VIB07 Date : 2009-05-30
Report No.: 2 Encl. No.: 2D.07

VIBROCORING NO. NORD_VIB08 Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	× Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests	
						Environment	Age					Cv, Cvr (kN/m ²) 20 40 60 80				W _p W W _L ----- ----- ----- Water content (%) 10 20 30						Type	Enclosure
					DVR90 -10.0 																		
0	-10			1	0 - 75 cm: SAND, fine - medium, well sorted, sl. organic 0 - 15, non calcareous, w. shell fragments, grey	Ma	Pg																
1	-11			2	75 - 80 cm: SAND, medium - coarse, v. gravelly, w. shell fragments, grey	Ma	Pg															G	G2.08
					80 - 85 cm: SAND, medium - coarse, v. gravelly, w. shell fragments, grey	Ma	Pg																
					85 - 180 cm: CLAY, highly plastic, silty, calcareous, rich in very sandy clay laminae, w. organic laminae, w. iron sulphides stains, rich in shells and shell fragments, w. plant remains, grey	Ma	Pg															G	2G.08
2	-12			3	180 - 200 cm: CLAY, highly plastic, silty, calcareous, rich in very sandy clay laminae, w. organic laminae, w. iron sulphides stains, rich in shells and shell fragments, w. plant remains, grey	Ma	Pg															G	G2.08
					200 - 280 cm: SAND, fine, silty, w. sandy clay lumps, calcareous, w. organic laminae, w. plant remains, grey	Ma/ Mw	Lg/ Gc																
3	-13																						
4	-14																						
5	-15																						
6	-16																						

Coordinates : E : 617730 (m) N : 6263755 (m)

Prepared : SAM Date : 2009-06-12

Checked : LAR Date : 2009-06-30

Approved : JBC Date : 2009-07-01


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Job : 32490 Anholt. Djursland Wind Farm

Vibrocoring : NORD_VIB08 Date : 2009-05-30

Report No.: 2 Encl. No.: 2D.08

VIBROCORING NO. NORD_VIB09 Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	X Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit W _p W W _L ----- ----- ----- Water content (%) 10 20 30			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests		
						Environment	Age					Cv, Cvr (kN/m ²)	Vibrocoring Resistance R (sec/0.1m)			Type	Enclosure							
					DVR90 -8.5 																			
0				1	0 - 25 cm: SAND, fine - medium, sorted, sl. silty, calcareous, sl. organic, w. shell fragments, olive grey	Ma	Pg															G	2G.09	
-9				2	25 - 85 cm: CLAY, highly plastic, sl. silty, w. few gravels, calcareous, w. shell fragments, w. shell layer 82 - 83, grey	Ma	Pg								W=74	Wl=80.4	Wp=34.0							
1					85 - 110 cm: CLAY, highly plastic, sl. silty, w. few gravels, calcareous, w. shell fragments, grey	Ma	Pg																	
-10				3	110 - 185 cm: CLAY, highly plastic, sl. silty, rich in plant remains, calcareous, w. few iron sulphide stains, grey	Ma	Pg										W=66			14.2				
2					185 - 286 cm: CLAY, highly plastic, sl. silty, rich in plant remains, calcareous, w. few iron sulphide stains, grey	Ma	Pg										W=67							
-11																								
-12																								
4																								
-13																								
5																								
-14																								
6																								

Coordinates : E : 616314 (m) N : 6262710 (m)
 Prepared : SAM Date : 2009-06-12
 Comments : Checked : LAR Date : 2009-06-30
 Approved : JBC Date : 2009-07-01



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Job : 32490 Anholt. Djursland Wind Farm
 Vibrocoring : NORD_VIB09 Date : 2009-05-30
 Report No.: 2 Encl. No.: 2D.09

VIBROCORING NO. SYD_VIB01

Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	Undrained shear strength (kN/m ²)				Water content (%)			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests		
						Environment	Age					20	40	60	80	20	40	60				80	W _p	W
0					0 - 90 cm: LIMESTONE, silty, sandy, hardened w. unhardened parts, w. few crushed dark grey flint gravels, very light grey Ma? Da?																			
-9																								
-10																								
-11																								
-12																								
-13																								
-14																								


Coordinates : E : 619835 (m) N : 6255287 (m)
 Prepared : SAM Date : 2009-06-12
 Comments : Checked : LAR Date : 2009-06-30
 Approved : JBC Date : 2009-07-01

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Job : 32490 Anholt. Djursland Wind Farm
 Vibrocoring : SYD_VIB01 Date : 2009-05-27
 Report No.: 2 Encl. No.: 2D.10

VIBROCORING NO. SYD_VIB02

Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	× Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit W _p W W _L ----- ----- Water content (%) 10 20 30			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests	
						Environment	Age					Cv, Cvr (kN/m ²)	Vibrocoring Resistance R (sec/0.1m)			Type	Enclosure						
					DVR90 -11.3 																		
0				1	0 - 30 cm: GRAVEL, clayey, sandy, w. clay lumps, calcareous, w. shell fragments, grey	Ma	Pg														G	2G.10	
-12				2	30 - 90 cm: SAND, very clayey, silty, sl. gravelly, w. highly plastic clay lumps, calcareous, w. few shell fragments, (disturbed by drilling), grey	Ma?	Pg?														G	2G.10	
1					90 - 170 cm: SAND, very clayey, silty, sl. gravelly, w. highly plastic clay lumps, calcareous, w. few shell fragments, (disturbed by drilling), grey	Ma?	Pg?																
-13				3	170 - 190 cm: CLAY, highly plastic, silty, rich in silty sand laminae, calcareous, w. few iron sulphide stains, grey	Ma/	Lg/																
2					190 - 260 cm: CLAY, highly plastic, silty, rich in silty sand laminae, calcareous, w. few iron sulphide stains, grey	Ma/	Lg/																
-14				4	260 - 290 cm: CLAY, v. silty, sl. sandy, w. few iron sulphide stains, calcareous, grey	Ma/	Lg/																
3					Shoe sample: CLAY, v. silty, sl. sandy, calcareous, grey	Ma/	Lg/																
-15																							
4																							
-16																							
5																							
-17																							
6																							

Coordinates : E : 620593 (m) N : 6255362 (m)

Prepared : SAM Date : 2009-06-12

Checked : LAR Date : 2009-06-30

Approved : JBC Date : 2009-07-01

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








Job : 32490 Anholt. Djursland Wind Farm

Vibrocoring : SYD_VIB02 Date : 2009-05-27

Report No.: 2 Encl. No.: 2D.11

VIBROCORING NO. SYD_VIB03

Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	× Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit W _p W W _L ----- ----- ----- Water content (%) 10 20 30			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests	
						Environment	Age					Cv, Cvr (kN/m ²)	Vibrocoring Resistance R (sec/0.1m)			Type	Enclosure						
					DVR90 -17.0 																		
0	-17			1	0 - 70 cm: SAND, fine - medium, sorted, sl. silty, sl. organic, non calcareous, w. shell fragments, olive grey	Ma	Pg																
1	-18			2	70 - 130 cm: SAND, fine - medium, sorted, sl. silty, sl. organic, non calcareous, w. shell fragments, olive grey	Ma	Pg															G	2G.11
				3	130 - 170 cm: SAND, medium - coarse, sorted, very gravelly, sl. calcareous, grey	Ma/	Lg/																
2	-19				170 - 240 cm: SAND, medium - coarse, sorted, very gravelly, sl. calcareous, grey	Ma/	Lg/																
					240 - 270 cm: SAND, medium - coarse, sorted, gravelly, fining downwards, sl. calcareous, grey	Ma/	Lg/																
3	-20																						
4	-21																						
5	-22																						
6	-23																						

Coordinates : E : 623241 (m) N : 6259223 (m)	Prepared : SAM	Date : 2009-06-12
Comments :	Checked : LAR	Date : 2009-06-30
	Approved : JBC	Date : 2009-07-01












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Job : 32490	Anholt. Djursland Wind Farm
Vibrocoring : SYD_VIB03	Date : 2009-05-27
Report No.: 2	Encl. No.: 2D.12

VIBROCORING NO. SYD_VIB04

Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	× Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit W _p W W _L ----- ----- Water content (%) 10 20 30			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests	
						Environment	Age					Cv, Cvr (kN/m ²)	Vibrocoring Resistance R (sec/0.1m)			Type	Enclosure						
					DVR90 -17.9 																		
0	-18			1	0 - 25 cm: SAND, fine - medium, well sorted, non calcareous, sl. organic, w. shell fragments, olive grey	Ma	Pg															G	2G.12
				2	25 - 80 cm: SAND, fine - medium, sorted, sl. silty, calcareous, sl. organic, w. shell fragments, grey	Ma	Pg															G	2G.12
1	-19				80 - 135 cm: SAND, fine - medium, sorted, sl. silty, calcareous, sl. organic, w. shell fragments, grey	Ma	Pg																
				3	135 - 180 cm: CLAY, highly plastic, silty, w. very silty sand laminae, w. iron sulphide stains, calcareous, grey	Ma/	Lg/																
2	-20				180 - 280 cm: CLAY, highly plastic, silty, w. very silty sand laminae, w. iron sulphide stains, calcareous, grey	Ma/	Lg/																
				4	Shoe sample: SAND, clayey, v. silty, w. shell fragments, w. few peat? lumps, calcareous, grey	Ma/	Lg/																
3	-21																						
4	-22																						
5	-23																						
6	-24																						

Coordinates :	E : 624619 (m)	N : 6261576 (m)	Prepared : SAM	Date : 2009-06-12
Comments :			Checked : LAR	Date : 2009-06-30
			Approved : JBC	Date : 2009-07-01

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Job : 32490	Anholt. Djursland Wind Farm
Vibrocoring : SYD_VIB04	Date : 2009-05-29
Report No. : 2	Encl. No. : 2D.13

VIBROCORING NO. SYD_VIB05

Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology Environment Age	Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	X Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80	W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit	Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Type	Suppl. Tests Enclosure
											Cv, Cvr (kN/m ²) 20 40 60 80	W _p W W _L 					
											Vibrocoring Resistance R (sec/0.1m) 15 30 45 60	Water content (%) 10 20 30					
					DVR90 -17.3 ▼												
0					0 - 15 cm: SAND, fine - medium, well sorted, non calcareous, sl. organic, w. shell fragments, dark olive grey	Ma Pg											
-18					15 - 70 cm: SAND, fine - sorted, silty, sl. calcareous, sl. organic, w. shell fragments, grey	Ma Pg											
1					70 - 140 cm: SAND, fine - sorted, silty, sl. calcareous, sl. organic, w. shell fragments, grey	Ma Pg											
-19					140 - 170 cm: CLAY, highly plastic, silty, w. few gravels, w. silty sand laminae, calcareous, grey	Ma/ Lg/ Mw Gc											
2					170 - 270 cm: CLAY, highly plastic, silty, w. few gravels, w. silty sand laminae, calcareous, w. iron sulphide 200 - 205, 210 - 215, w. 2 - 4 cm sand layers 230 - 270, grey	Ma/ Lg/ Mw Gc											
-20					Shoe sample: SAND, clayey, v. silty, calcareous, grey	Ma/ Lg/ Mw Gc											
3																	
-21																	
4																	
-22																	
5																	
-23																	
6																	








Coordinates : E : 625664 (m) N : 6263361 (m)	Prepared : SAM	Date : 2009-06-12
Comments :	Checked : LAR	Date : 2009-06-30
	Approved : JBC	Date : 2009-07-01


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Job : 32490	Anholt. Djursland Wind Farm
Vibrocoring : SYD_VIB05	Date : 2009-05-29
Report No.: 2	Encl. No.: 2D.14

VIBROCORING NO. SYD_VIB06

Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	X Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit W _p W W _L ----- ----- Water content (%) 10 20 30			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests	
						Environment	Age					Cv, Cvr (kN/m ²)	Vibrocoring Resistance R (sec/0.1m)			Type	Enclosure						
					DVR90 -16.9 																		
0	-17			1	0 - 68 cm: SAND, fine - medium, sorted, sl. silty, non calcareous, sl. organic, rich in shell fragments, olive grey	Ma	Pg																
1	-18			2	68 - 120 cm: SAND, fine - medium, sorted, sl. silty, non calcareous, sl. organic, rich in shell fragments, olive grey	Ma	Pg														G	2G.14	
2	-19			3	120 - 168 cm: SAND, fine, sorted, sl. silty, sl. calcareous, w. few shell fragments and plant remains, grey	Ma	Pg																
	-19				168 - 190 cm: SILT, v. sandy, w. clay lumps, calcareous, grey	Ma/	Lg/																
	-19				190 - 235 cm: CLAY, medium - highly plastic, silty, v. silty 205 - 220, calcareous, grey	Ma/	Lg/								X								
	-19				235 - 265 cm: SILT, v. sandy, w. clay laminae, calcareous, grey	Ma/	Lg/																
	-20																						
4	-21																						
5	-22																						
6	-23																						

Coordinates : E : 626765 (m) N : 6265242 (m)

Prepared : SAM Date : 2009-06-12

Checked : LAR Date : 2009-06-30

Approved : JBC Date : 2009-07-01

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Job : 32490 Anholt. Djursland Wind Farm

Vibrocoring : SYD_VIB06 Date : 2009-05-29

Report No.: 2 Encl. No.: 2D.15

VIBROCORING NO. SYD_VIB07

Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	Undrained shear strength (kN/m ²)				Water content (%)			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests	
						Environment	Age					20 40 60 80		20 40 60 80		W _p	W	W _L				Type	Enclosure
					DVR90 -17.5 																		
0				1	0 - 100 cm: SAND, fine, well sorted, sl. silty, w. few shell fragments and plant remains, non calcareous, grey	Ma	Pg															G	2G.15
-18				2	100 - 200 cm: SAND, fine, well sorted, sl. silty, w. few shell fragments and plant remains, non calcareous, grey	Ma	Pg																
-19																							
-20																							
-21																							
-22																							
-23																							
6																							

Coordinates : E : 627691 (m) N : 6266826 (m)

Prepared : SAM Date : 2009-06-12

Checked : LAR Date : 2009-06-30

Approved : JBC Date : 2009-07-01

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Job : 32490 Anholt. Djursland Wind Farm

Vibrocoring : SYD_VIB07 Date : 2009-05-29

Report No.: 2 Encl. No.: 2D.16

VIBROCORING NO. SYD_VIB08

Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	X Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²) 20 40 60 80				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit W _p W W _L ----- ----- Water content (%) 10 20 30			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests	
						Environment	Age					Cv, Cvr (kN/m ²)	Vibrocoring Resistance R (sec/0.1m)			Type	Enclosure						
					DVR90 -16.4 																		
0				1	0 - 85 cm: SAND, fine - medium, sorted, non calcareous, w. shell fragments, grey	Ma	Pg															G	2G.16
-17				2	85 - 110 cm: SAND, fine - medium, sorted, non calcareous, w. shell fragments, grey	Ma	Pg																
1					110 - 150 cm: SAND, fine - medium, unsorted, silty, calcareous, rich in shell fragments, grey	Ma	Pg															G	2G.16
-18				3	150 - 185 cm: SAND, fine - medium, clayey, w. silty clay laminae, calcareous, w. iron sulphide stains, grey	Ma	Pg/ Lg																
2					185 - 190 cm: SAND, fine - medium, clayey, w. silty clay laminae, calcareous, w. iron sulphide stains, grey	Ma	Pg/ Lg																
-19					190 - 285 cm: SAND, fine - medium, v. clayey, w. highly plastic clay lumps, calcareous, w. iron sulphide stains, w. few shell fragments, grey	Ma	Pg/ Lg																
3																							
-20																							
4																							
-21																							
5																							
-22																							
6																							

Coordinates : E : 628671 (m) N : 6268495 (m)

Prepared : SAM Date : 2009-06-12

Checked : LAR Date : 2009-06-30

Approved : JBC Date : 2009-07-01

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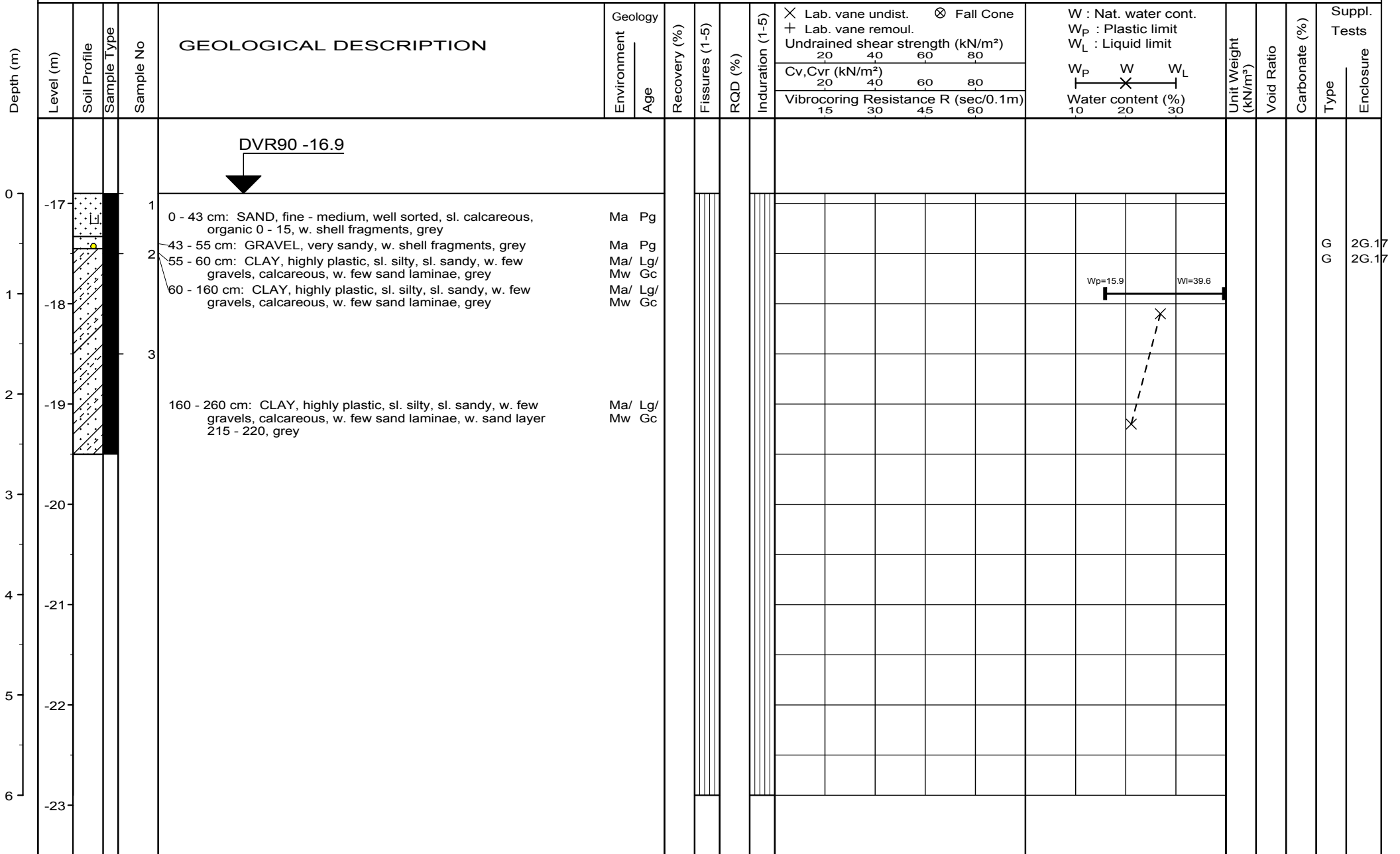
Job : 32490 Anholt. Djursland Wind Farm

Vibrocoring : SYD_VIB08 Date : 2009-05-29

Report No.: 2 Encl. No.: 2D.17

VIBROCORING NO. SYD_VIB09

Anholt. Djursland Wind Farm




Coordinates : E : 629388 (m) N : 6269730 (m)
 Prepared : SAM Date : 2009-06-12
 Comments : Checked : LAR Date : 2009-06-30
 Approved : JBC Date : 2009-07-01

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Job : 32490 Anholt. Djursland Wind Farm
 Vibrocoring : SYD_VIB09 Date : 2009-05-29
 Report No.: 2 Encl. No.: 2D.18

VIBROCORING NO. SYD_VIB10

Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	× Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²)				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests		
						Environment	Age					20	40	60	80	20	40	60				80	W _p	W
					DVR90 -17.0 																			
0	-17				1 0 - 15 cm: SAND, fine - medium, sorted, organic, non calcareous, w. shell fragments, dark grey to olive grey 15 - 70 cm: SAND, fine - medium, sorted, sl. silty, non calcareous, w. shell fragments, grey	Ma	Pg																G	2G.18
1	-18				2 70 - 130 cm: SAND, fine - medium, sorted, sl. silty, non calcareous, w. shell fragments, grey	Ma	Pg																	
2	-19				3 130 - 165 cm: CLAY, highly plastic, silty, non calcareous, organic to very organic, w. shell fragments, olive grey 165 - 170 cm: SAND, fine - medium, sl. clayey to clayey, non calcareous, w. clay lumps, w. iron sulphide stains, grey 170 - 225 cm: SAND, fine - medium, sl. clayey to clayey, non calcareous, w. clay lumps, w. iron sulphide stains, grey	Ma	Pg																	
3	-20				4 225 - 272 cm: CLAY, highly plastic, silty, sl. gravelly 240 - 260, w. silty sand layers and sand laminae, non calcareous, w. iron sulphide stains, grey Shoe sample: CLAY, highly plastic, silty, sandy, non calcareous, w. iron sulphide stains, grey	Ma/ Mw	Lg/ Gc																	
4	-21																							
5	-22																							
6	-23																							


Coordinates : E : 630098 (m) N : 6270942 (m)
 Comments :
 Prepared : SAM Date : 2009-06-12
 Checked : LAR Date : 2009-06-30
 Approved : JBC Date : 2009-07-01


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Job : 32490 Anholt. Djursland Wind Farm
 Vibrocoring : SYD_VIB10 Date : 2009-05-29
 Report No.: 2 Encl. No.: 2D.19

VIBROCORING NO. SYD_VIB11

Anholt. Djursland Wind Farm

Depth (m)	Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	Undrained shear strength (kN/m ²)				Water content (%)			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests	
						Environment	Age					20	40	60	80	W _p	W	W _L				Type	Enclosure
					DVR90 -17.4 																		
0				1	0 - 60 cm: SAND, fine - medium, sorted, sl. silty, calcareous, w. shell fragments, grey	Ma	Pg																
-18				2																			
1					60 - 140 cm: SAND, fine - medium, sorted, sl. silty, calcareous, w. shell fragments, grey	Ma	Pg														G	2G.19	
-19				3	140 - 160 cm: SAND, fine, poorly sorted, silty, w. few gravels, calcareous, grey	Ma/	Lg/																
2					160 - 200 cm: SAND, fine, poorly sorted, silty, w. few gravels, calcareous, grey	Ma/	Lg/																
2					200 - 230 cm: SAND, medium - coarse, sorted, sl. gravelly, coarsing downwards, sl. calcareous, grey	Ma/	Lg/																
2					230 - 260 cm: SAND, fine, poorly sorted, silty, w. few gravels, calcareous, grey	Ma/	Lg/																
-20																							
3																							
-21																							
4																							
-22																							
5																							
-23																							
6																							

Coordinates : E : 632176 (m) N : 6274493 (m)
 Prepared : SAM Date : 2009-06-12
 Comments : Checked : LAR Date : 2009-06-30
 Approved : JBC Date : 2009-07-01



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Job : 32490 Anholt. Djursland Wind Farm
 Vibrocoring : SYD_VIB11 Date : 2009-05-31
 Report No.: 2 Encl. No.: 2D.20

VIBROCORING NO. SYD_VIB12

Anholt. Djursland Wind Farm

Depth (m)

Level (m)	Soil Profile	Sample Type	Sample No	GEOLOGICAL DESCRIPTION	Geology		Recovery (%)	Fissures (1-5)	RQD (%)	Induration (1-5)	X Lab. vane undist. ⊗ Fall Cone + Lab. vane remoul. Undrained shear strength (kN/m ²)				W : Nat. water cont. W _p : Plastic limit W _L : Liquid limit			Unit Weight (kN/m ³)	Void Ratio	Carbonate (%)	Suppl. Tests	
					Environment	Age					20	40	60	80	W _p	W	W _L				Type	Enclosure
											Cv, Cvr (kN/m ²)				Water content (%)							
0				DVR90 -16.7 0 - 20 cm: SAND, medium, well sorted, calcareous, w. shell fragments, grey	Ma	Pg																
-17				20 - 75 cm: GRAVEL, very sandy, calcareous, w. shell fragments, grey	Ma	Pg															G	2G.20
1				75 - 80 cm: SAND, fine - medium, sl. clayey, silty, gravelly, calcareous, grey	Ma/ Mw	Lg/ Gc																
-18				80 - 95 cm: SAND, fine - medium, sl. clayey, silty, gravelly, calcareous, grey	Ma/ Mw	Lg/ Gc																
2				95 - 180 cm: SAND, fine, clayey, silty, w. 2 - 4 cm clay layers 105, 125 and 175, w. gravel layers 145 - 150 and 168 - 173, grey	Ma/ Mw	Lg/ Gc																
-19				180 - 220 cm: SAND, medium - coarse, sorted, gravelly, calcareous, grey	Ma/ Mw	Lg/ Gc																
3				220 - 280 cm: SAND, fine, clayey, silty, calcareous, grey	Ma/ Mw	Lg/ Gc																
-20																						
4																						
-21																						
5																						
-22																						
6																						
-23																						

Coordinates : E : 632001 (m)	N : 6274195 (m)	Prepared : SAM	Date : 2009-06-12
Comments :		Checked : LAR	Date : 2009-06-30
		Approved : JBC	Date : 2009-07-01

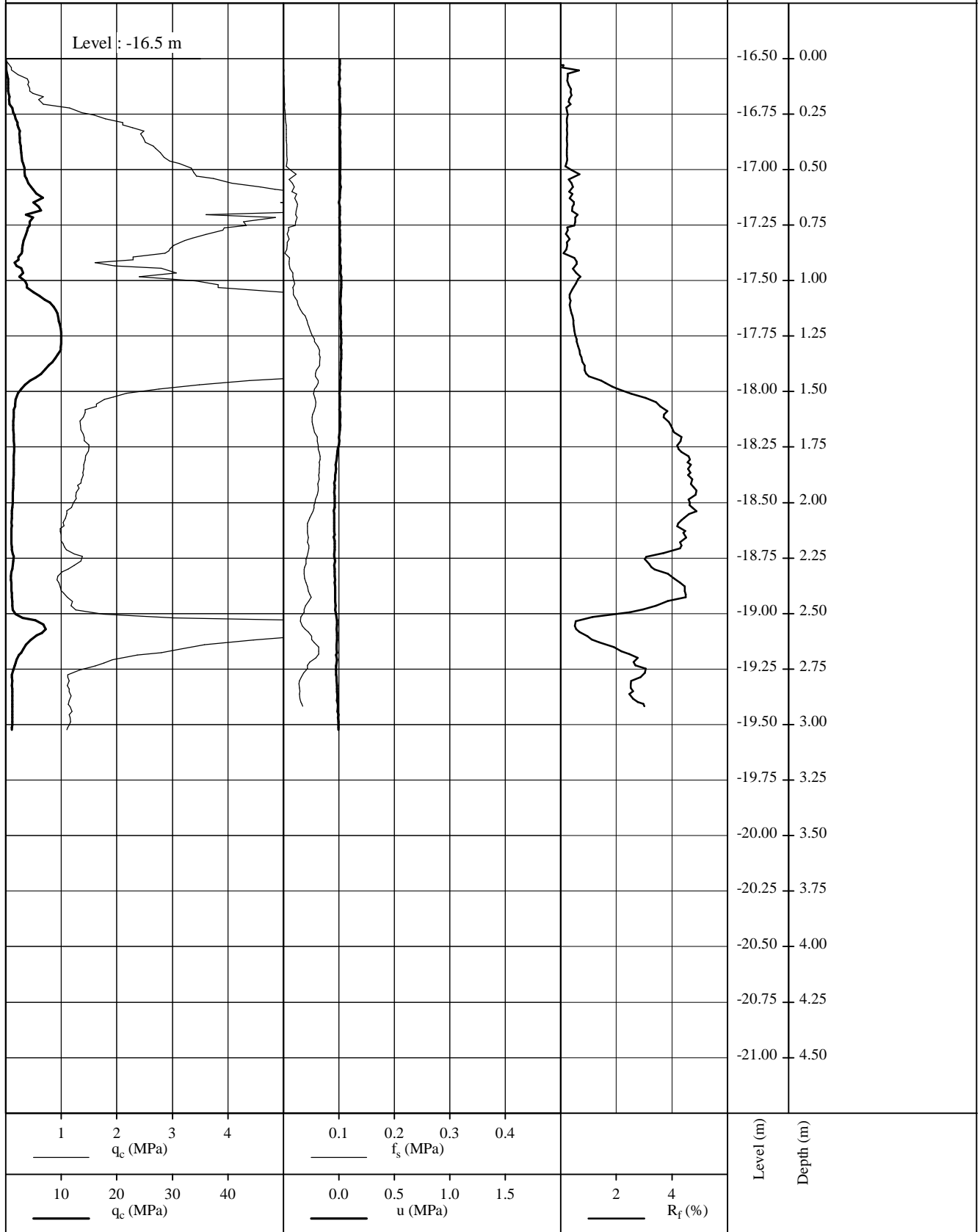


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Job : 32490	Anholt. Djursland Wind Farm
Vibrocoring : SYD_VIB12	Date : 2009-05-31
Report No.: 2	Encl. No.: 2D.21

Enclosure 2E.01 – 2E.21
CPT Profiles with q_c , f_s , u and R_f

CPT name : NORD CPT 01

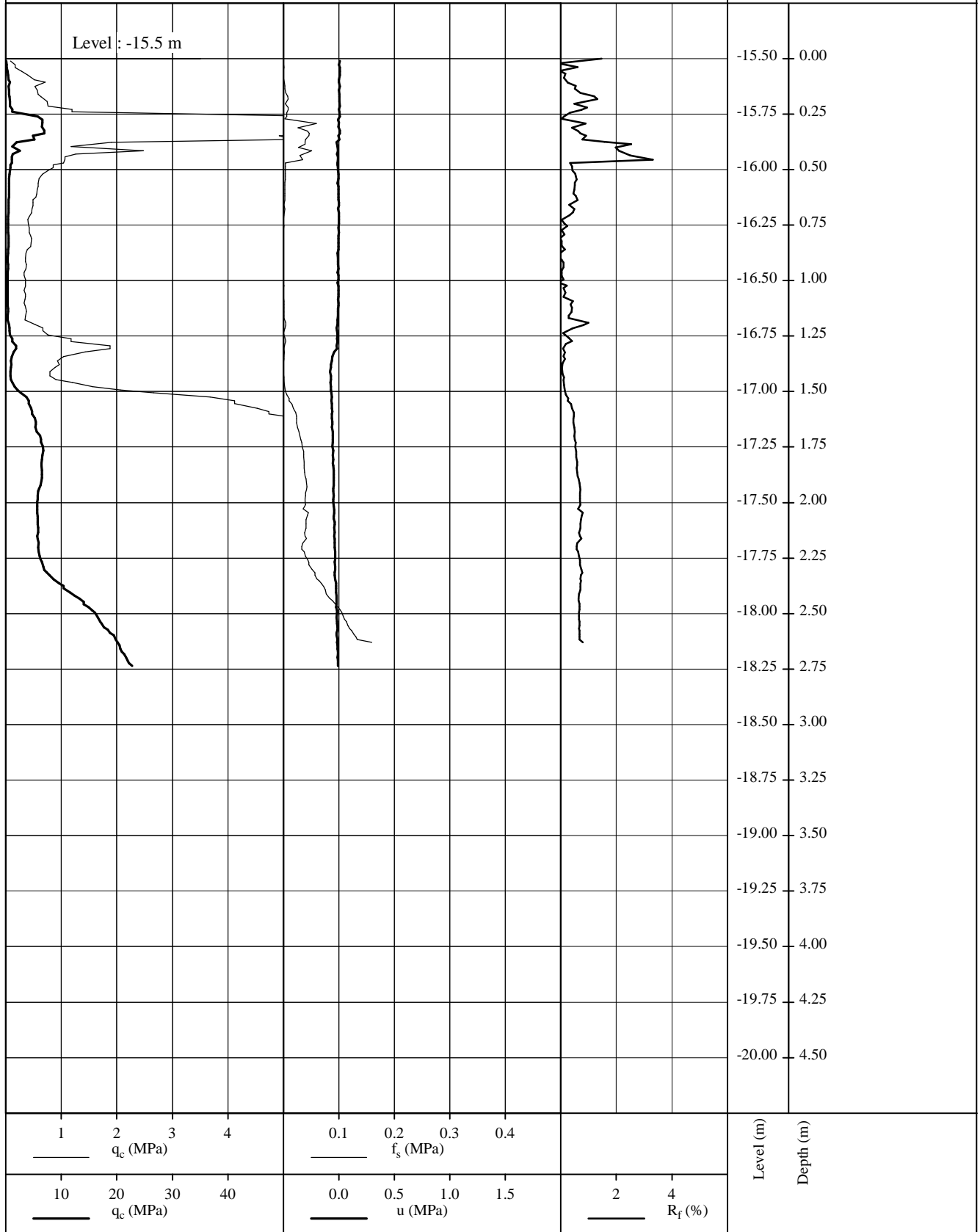


E : 631866	Cone no. : 080914	Rig : Minirig
N : 6274172	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: NORD CPT 01	
Checked : LAR	Date: 2009-06-22		Page 1 / 1
Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.01	Rev.

CPT name : NORD CPT 02

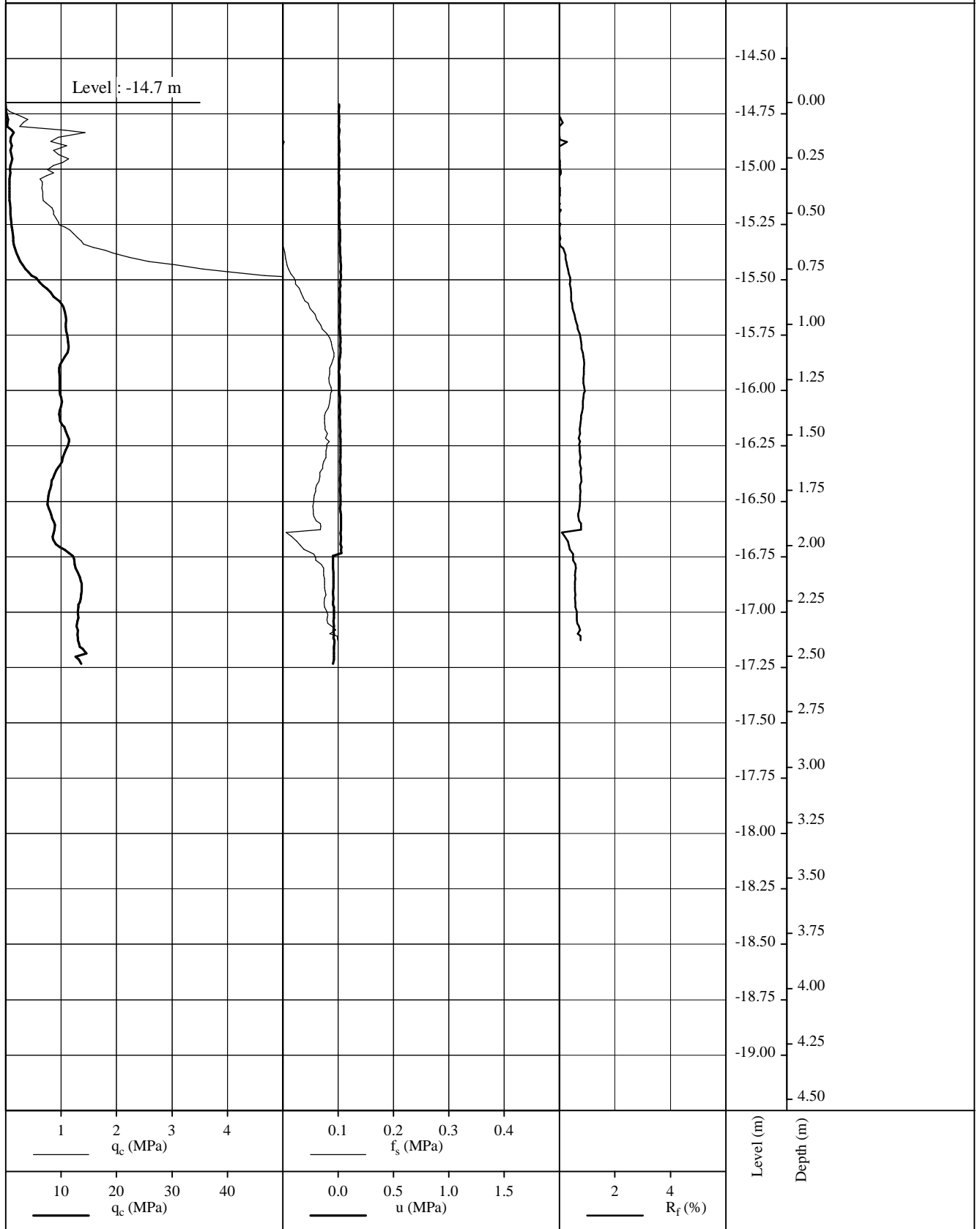


E : 626880	Cone no. : 080914	Rig : Minirig
N : 6270496	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark : Stop reason: max thrust

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: NORD CPT 02	
Checked : LAR	Date: 2009-06-22		Page 1 / 1
Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.02	Rev.

CPT name : NORD CPT 03

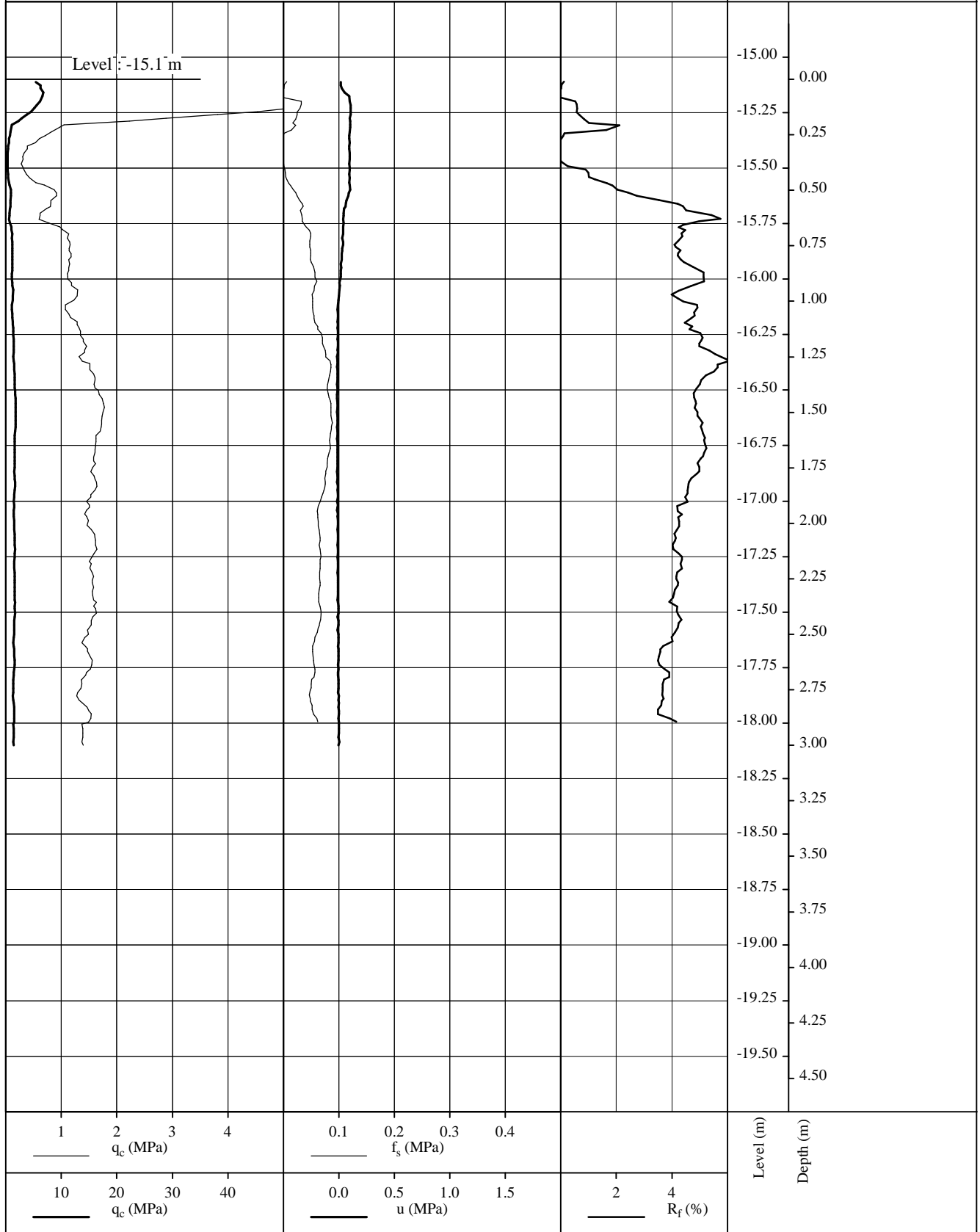


E : 625145	Cone no. : 080914	Rig : Minirig
N : 6269218	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark : Stop reason: max thrust

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: NORD CPT 03	
Checked : LAR	Date: 2009-06-22		Page 1 / 1
Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.03	Rev.

CPT name : NORD CPT 04

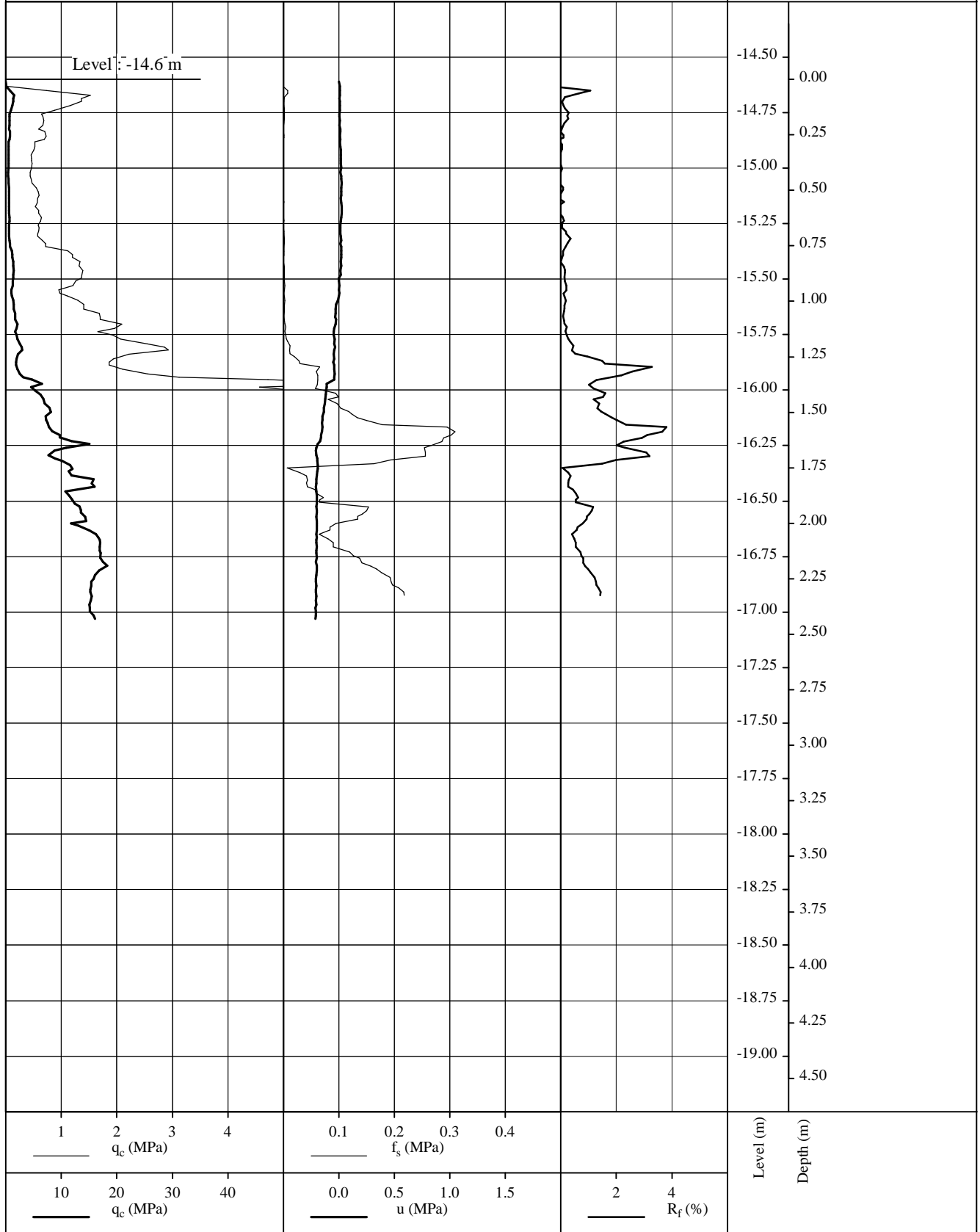


E : 623503	Cone no. : 080914	Rig : Minirig
N : 6268009	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

GEØ Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: NORD CPT 04	
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Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.04	Rev.

CPT name : NORD CPT 05

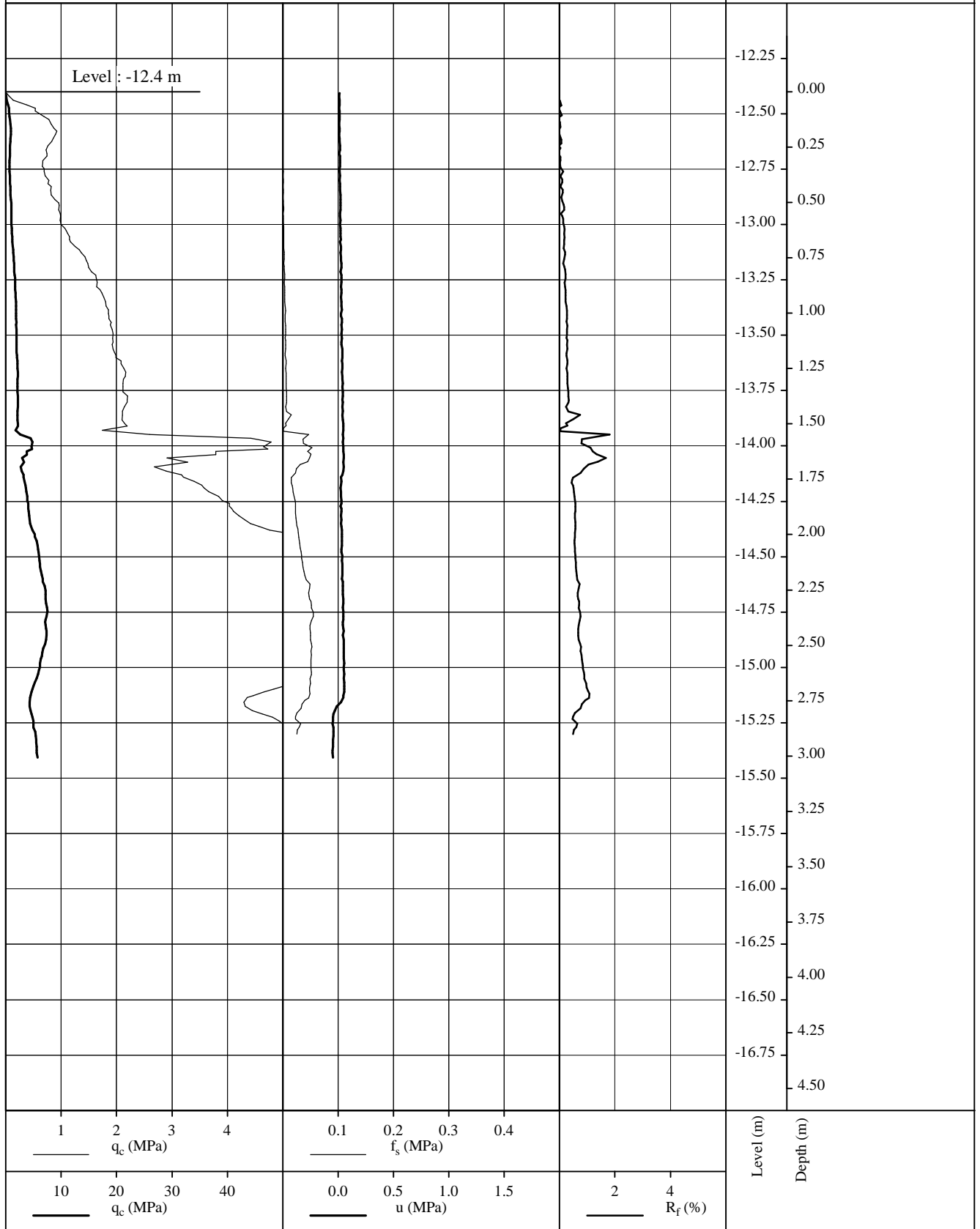


E : 622549	Cone no. : 080914	Rig : Minirig
N : 6267305	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark : Stop reason: max thrust

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: NORD CPT 05	
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CPT name : NORD CPT 06



E : 619936	Cone no. : 080914	Rig : Minirig
N : 6265392	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM Date: 2009-06-22 Subject: NORD CPT 06

Checked : LAR Date: 2009-06-22

Approved : JBC

Date: 2009-06-22

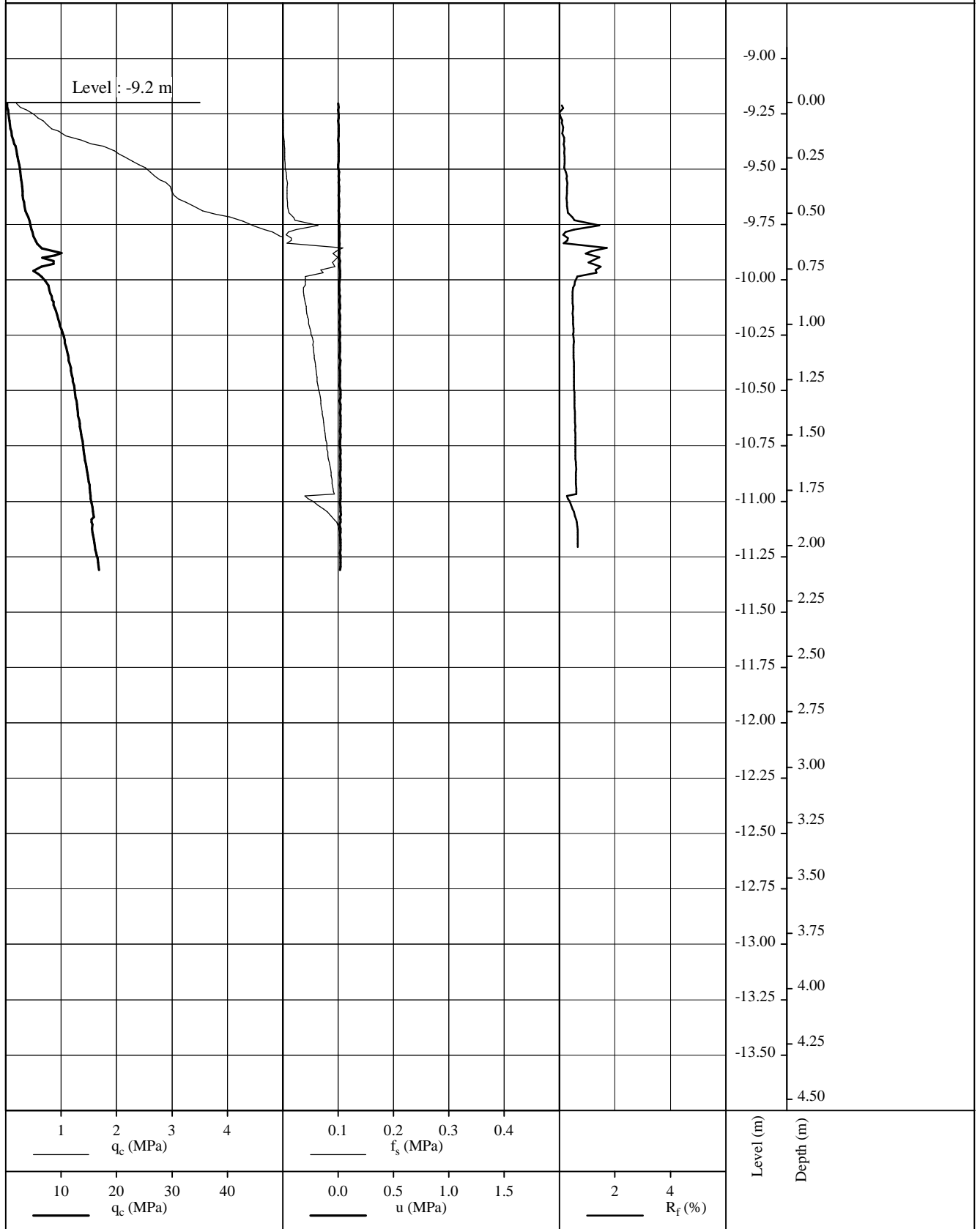
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Enclosure: 2E.06

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Rev.

CPT name : NORD CPT 07

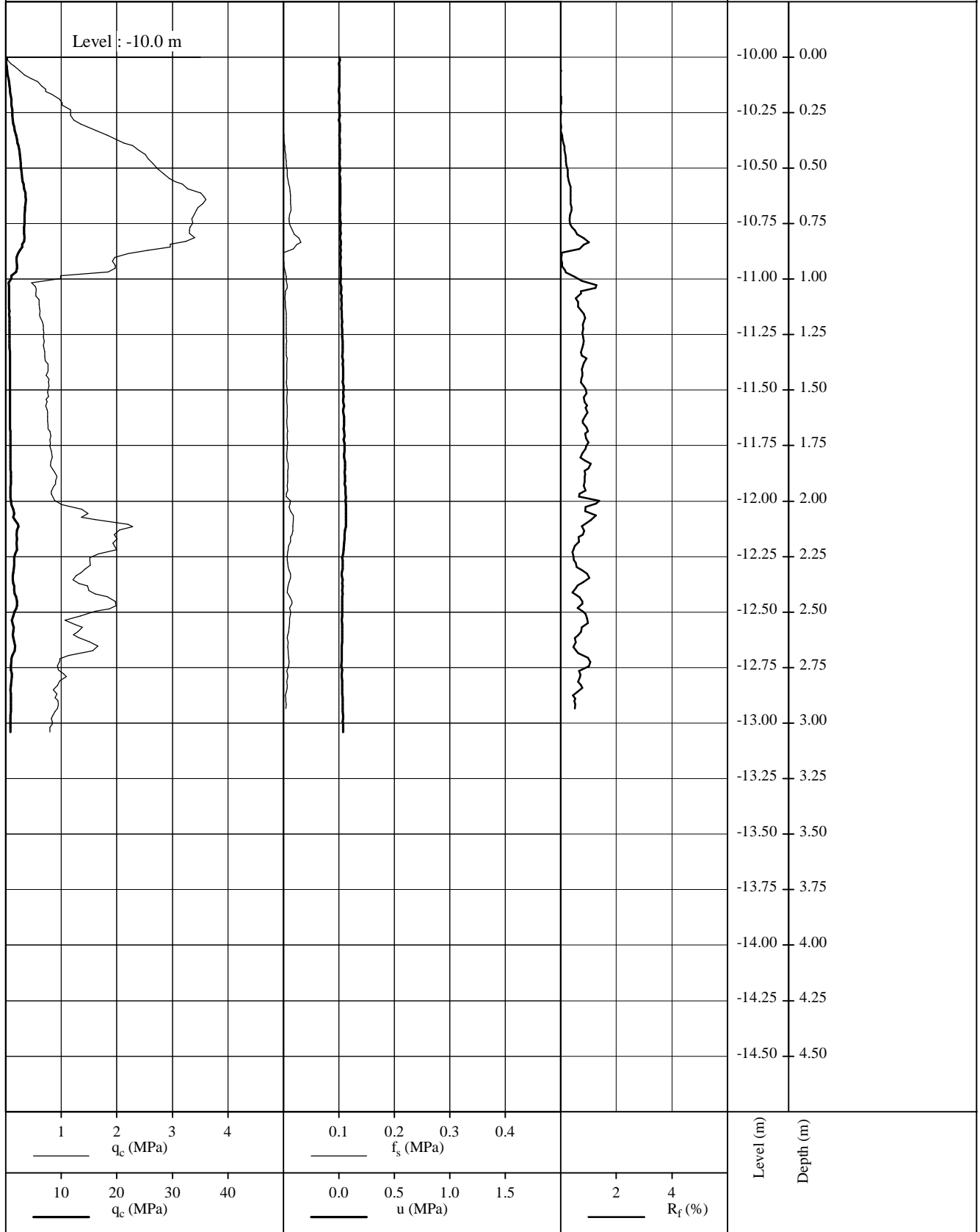


E : 618362	Cone no. : 080914	Rig : Minirig
N : 6264220	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark : Stop reason: max thrust

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

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CPT name : NORD CPT 08

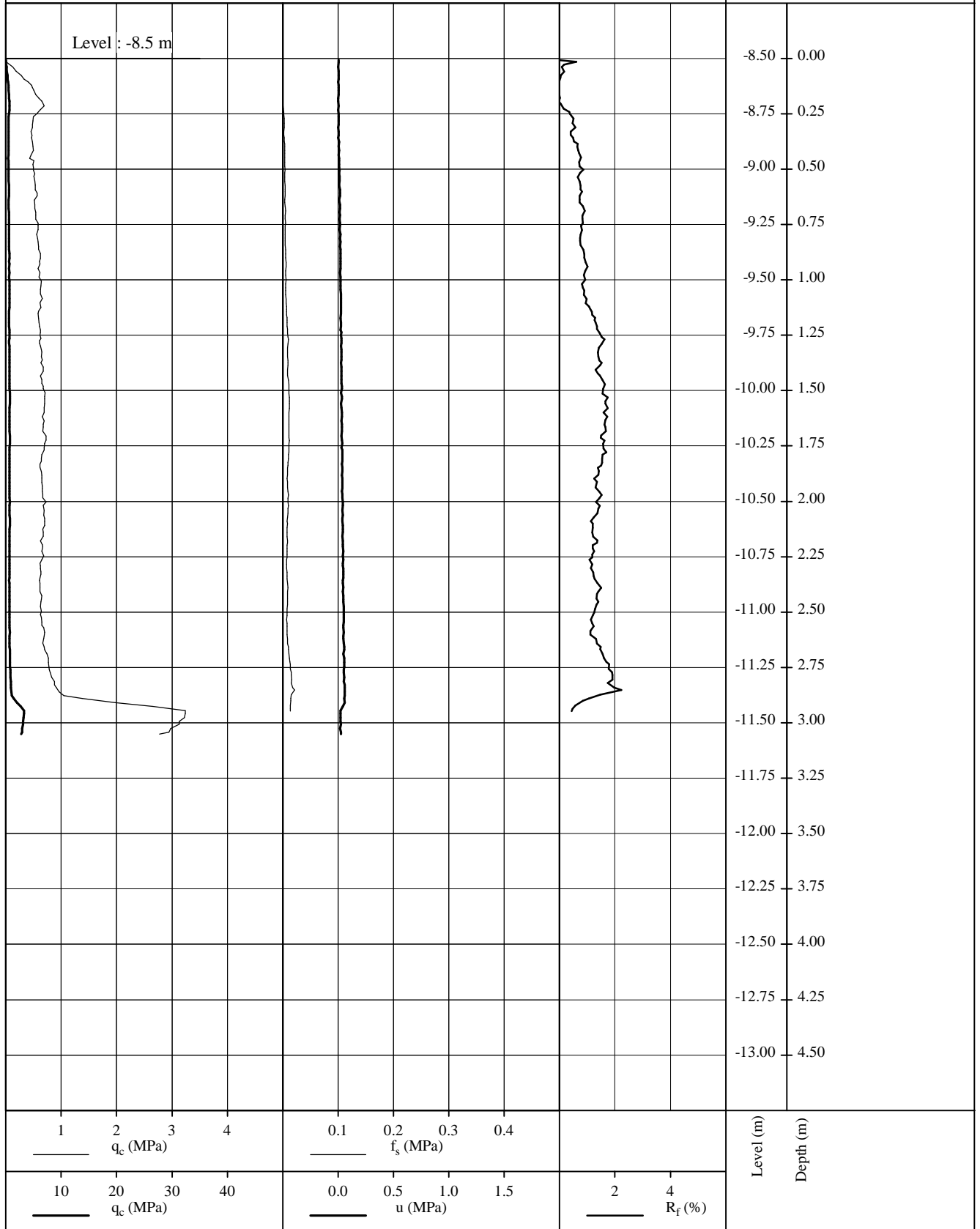


E : 617730	Cone no. : 080914	Rig : Minirig
N : 6263754	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: NORD CPT 08	
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Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.08	Rev.

CPT name : NORD CPT 09

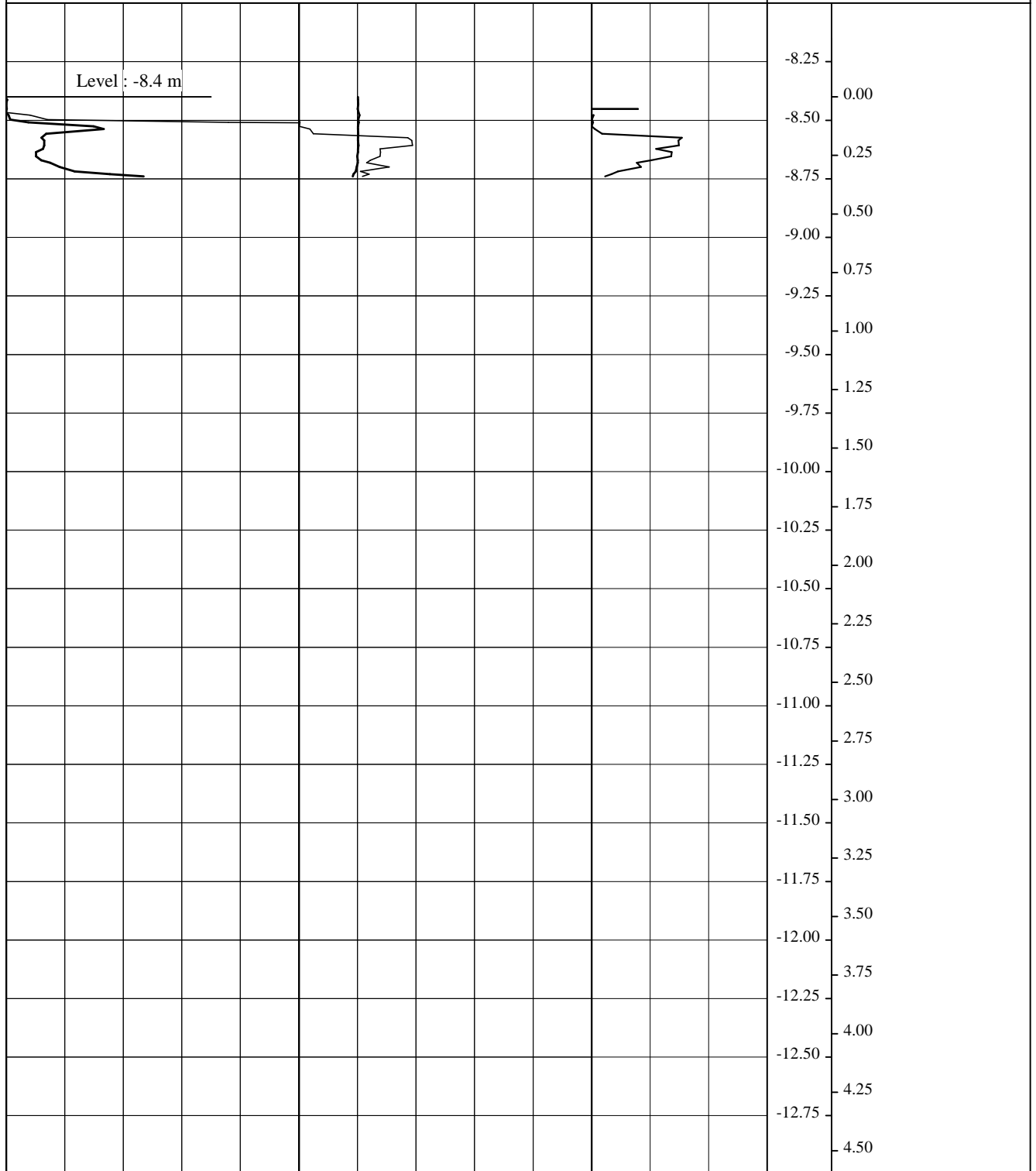


E : 616313	Cone no. : 080914	Rig : Minirig
N : 6262710	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: NORD CPT 09	
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Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.09	Rev.

CPT name : SYD CPT 01B

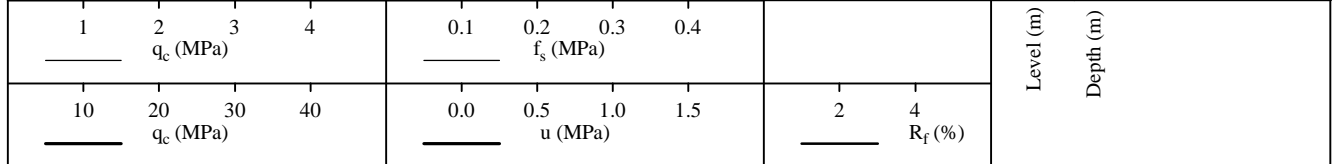
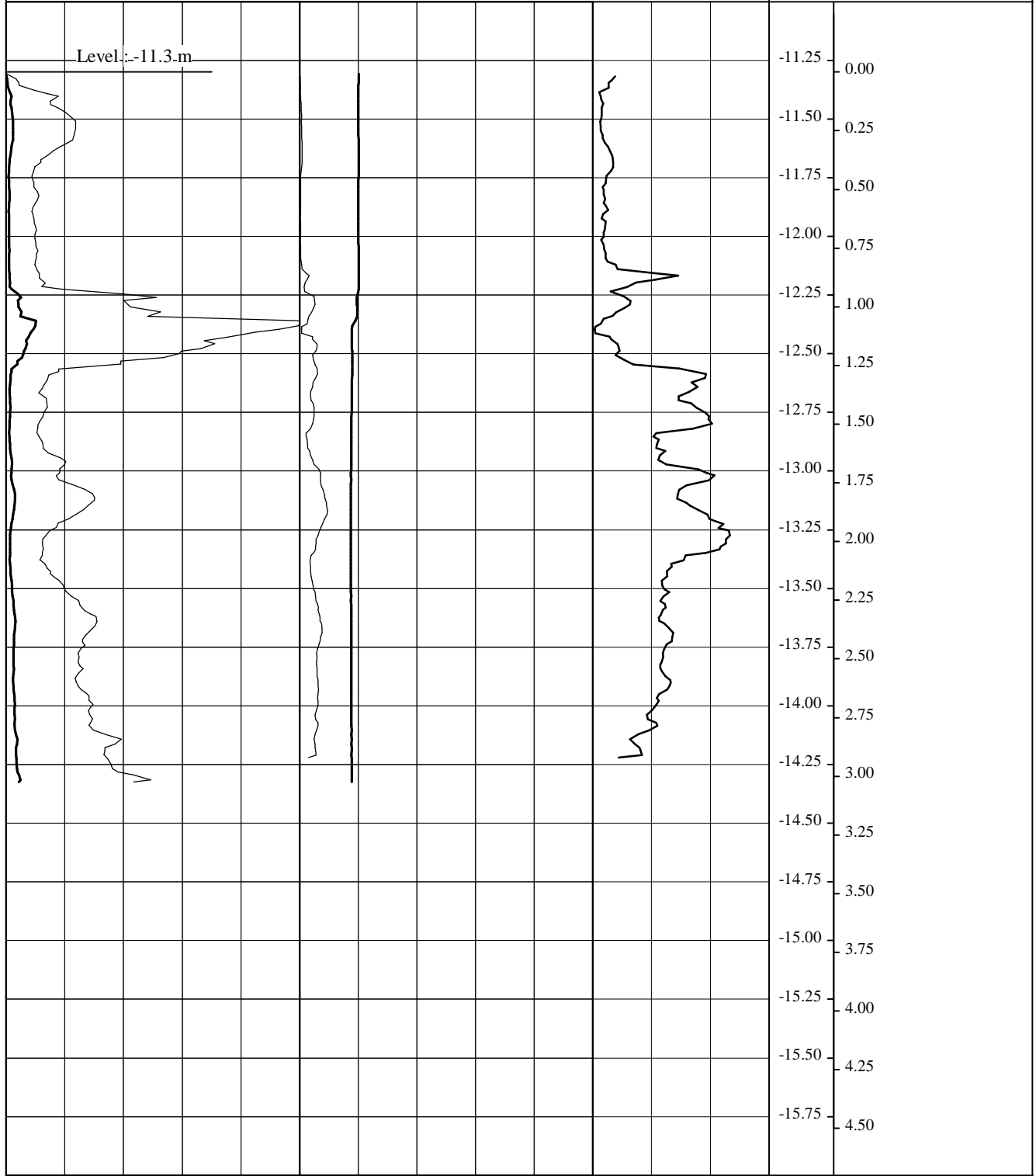


E : 619834	Cone no. : 080914	Rig : Minirig
N : 6255286	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark : Stop Reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: SYD CPT 01B	
Checked : LAR	Date: 2009-06-22		Page 1 / 1
Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.10	Rev.

CPT name : SYD CPT 02

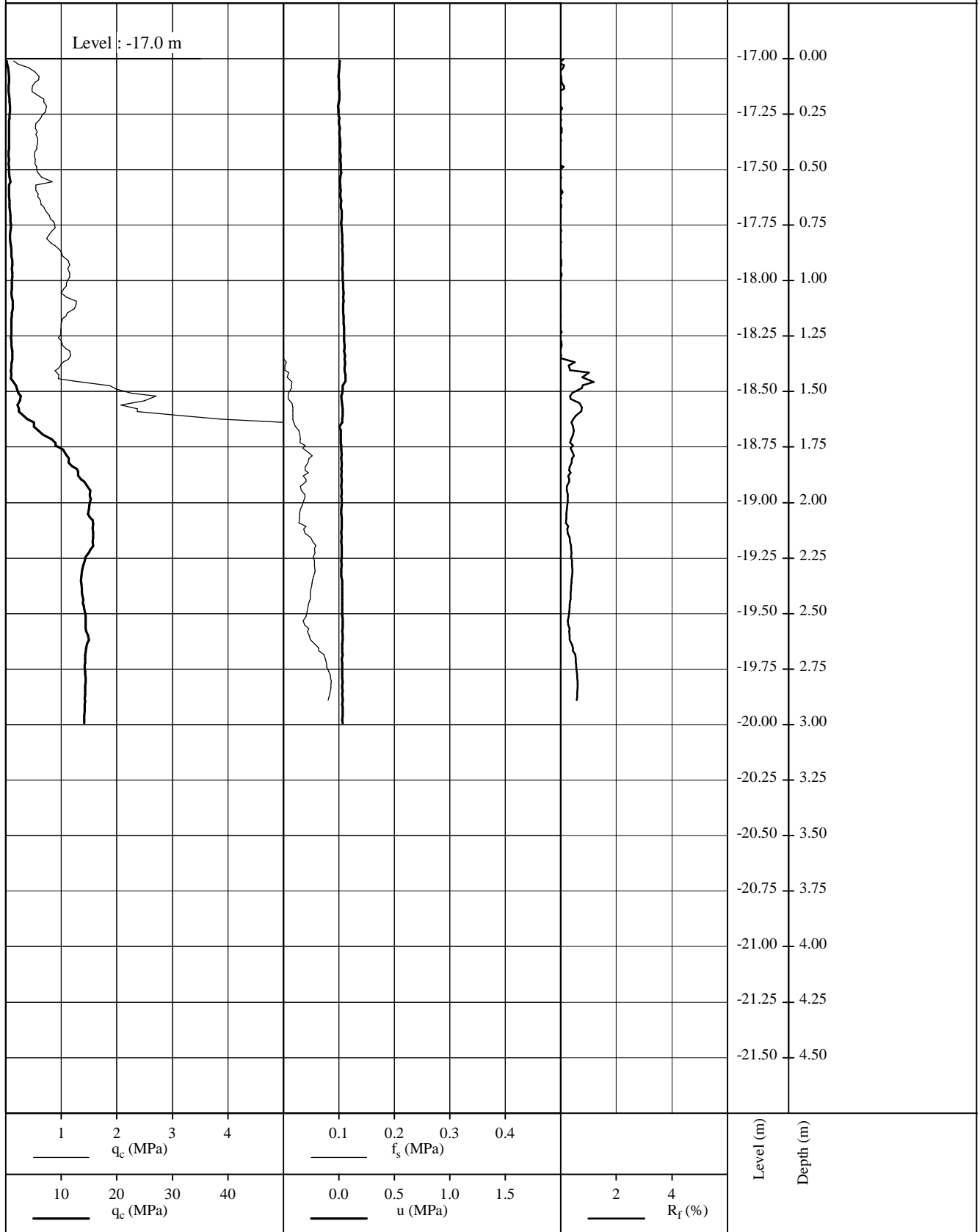


E : 620592	Cone no. : 080917	Rig : Minirig
N : 6255362	Cone type : TSP	Performed by : PHA-ROB
Date : 2009-06-02	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: SYD CPT 02	
Checked : LAR	Date: 2009-06-22		Page 1 / 1
Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.11	Rev.

CPT name : SYD CPT 03

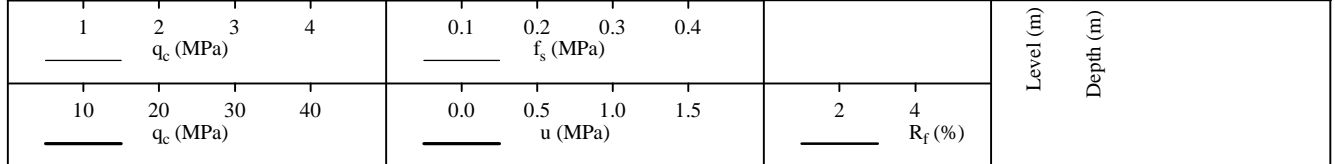
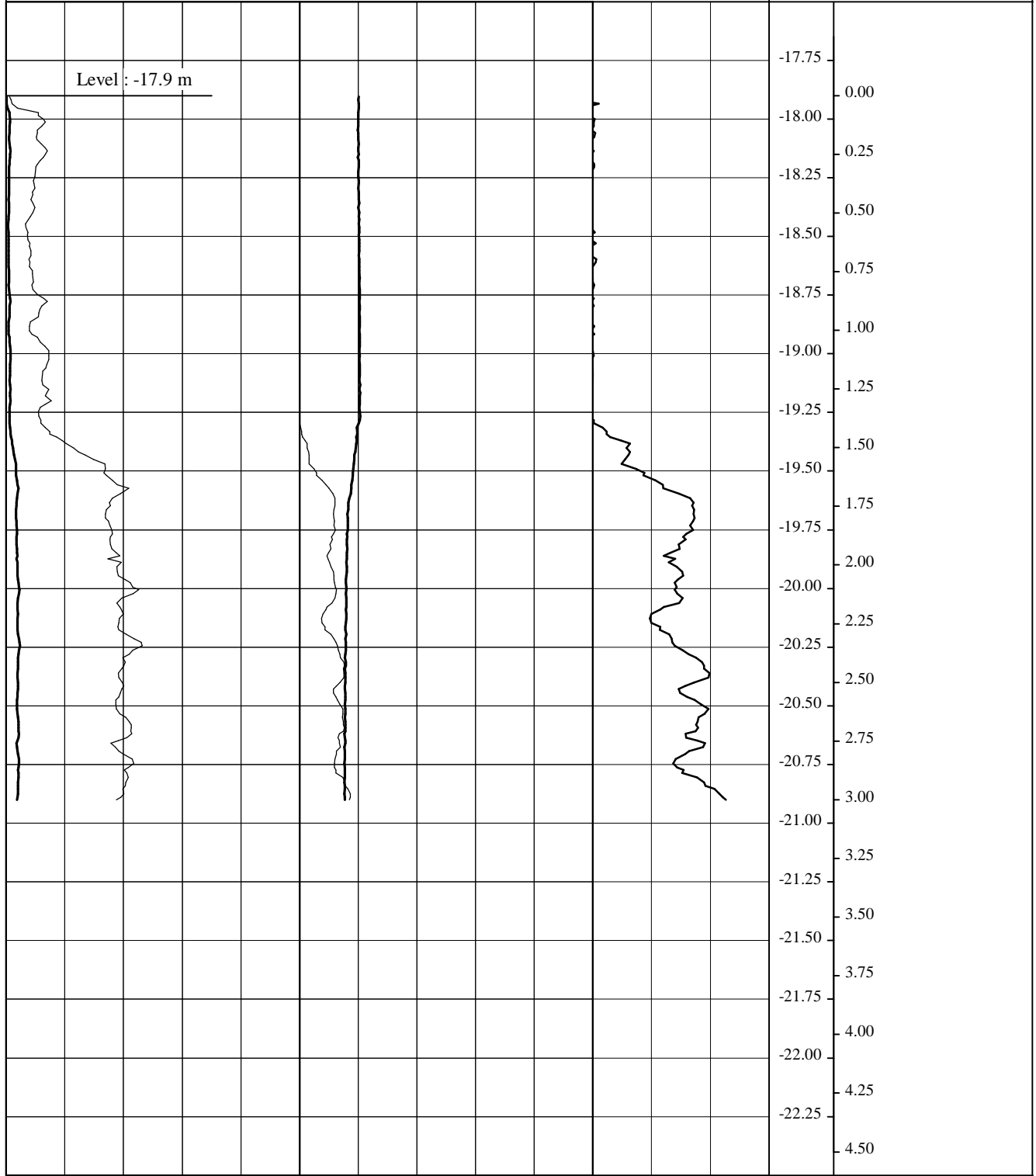


E : 623240	Cone no. : 080914	Rig : Minirig
N : 6259224	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: SYD CPT 03	
Checked : LAR	Date: 2009-06-22		Page 1 / 1
Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.12	Rev.

CPT name : SYD CPT 04

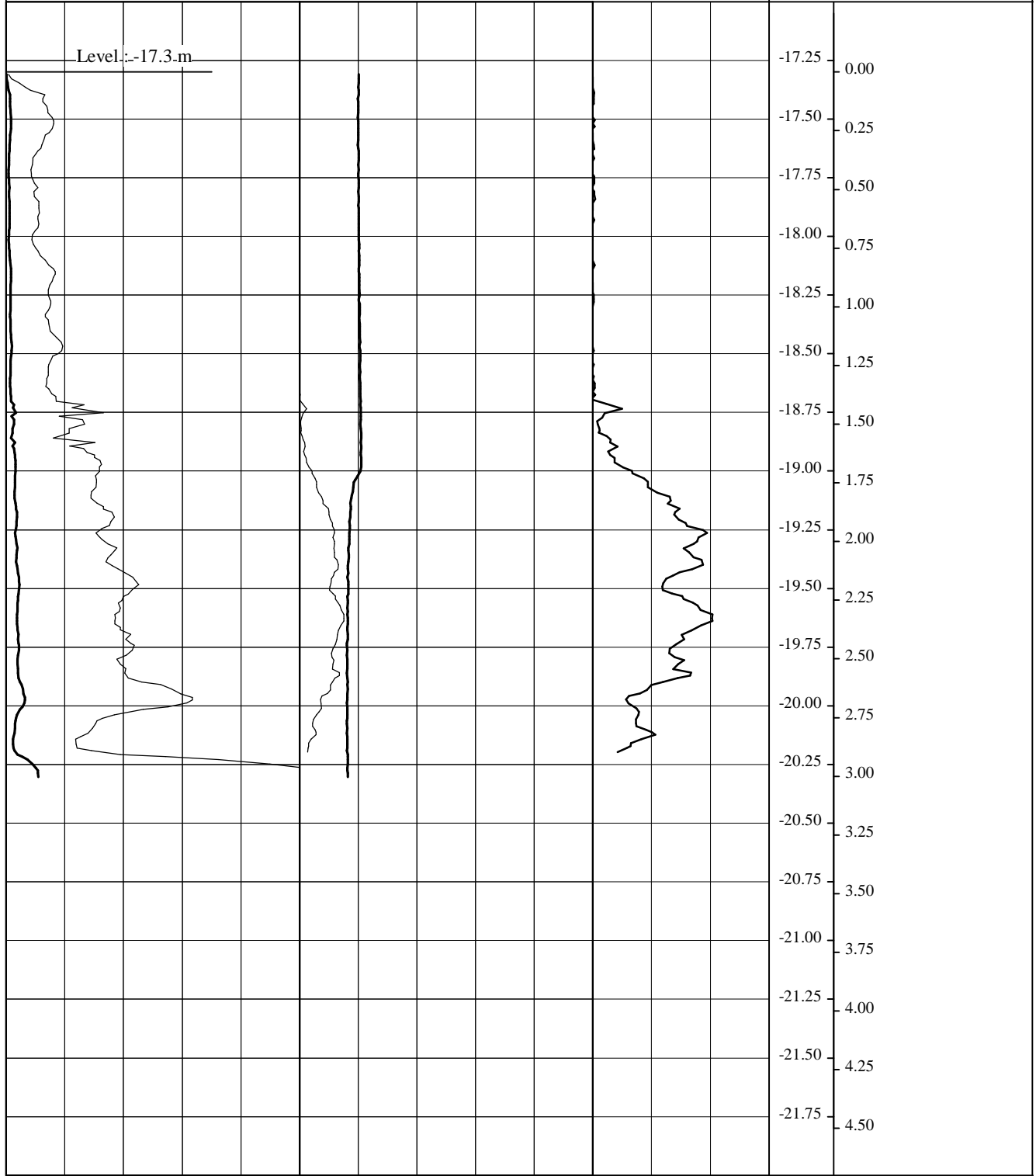


E : 624618	Cone no. : 080914	Rig : Minirig
N : 6261576	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: SYD CPT 04	
Checked : LAR	Date: 2009-06-22		Page 1 / 1
Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.13	Rev.

CPT name : SYD CPT 05



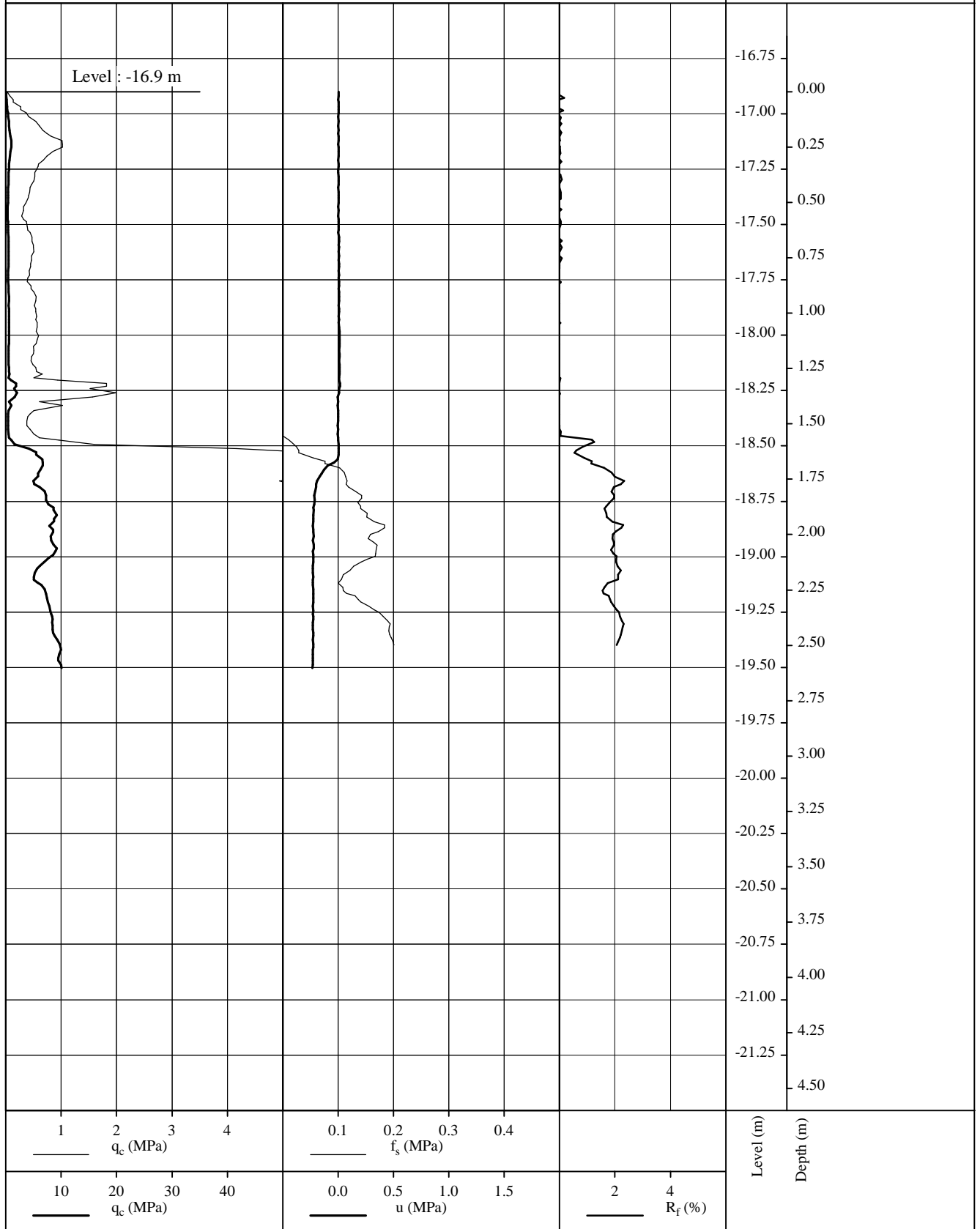
1	2	3	4	0.1	0.2	0.3	0.4						
q_c (MPa)				f_s (MPa)									
10	20	30	40	0.0	0.5	1.0	1.5	2	4				
q_c (MPa)				u (MPa)				R_f (%)					

E : 625664	Cone no. : 080914	Rig : Minirig
N : 6263360	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: SYD CPT 05	
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CPT name : SYD CPT 06



E : 626765	Cone no. : 080914	Rig : Minirig
N : 6265241	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max thrust

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM Date: 2009-06-22 Subject: SYD CPT 06

Checked : LAR Date: 2009-06-22

Approved : JBC

Date: 2009-06-22

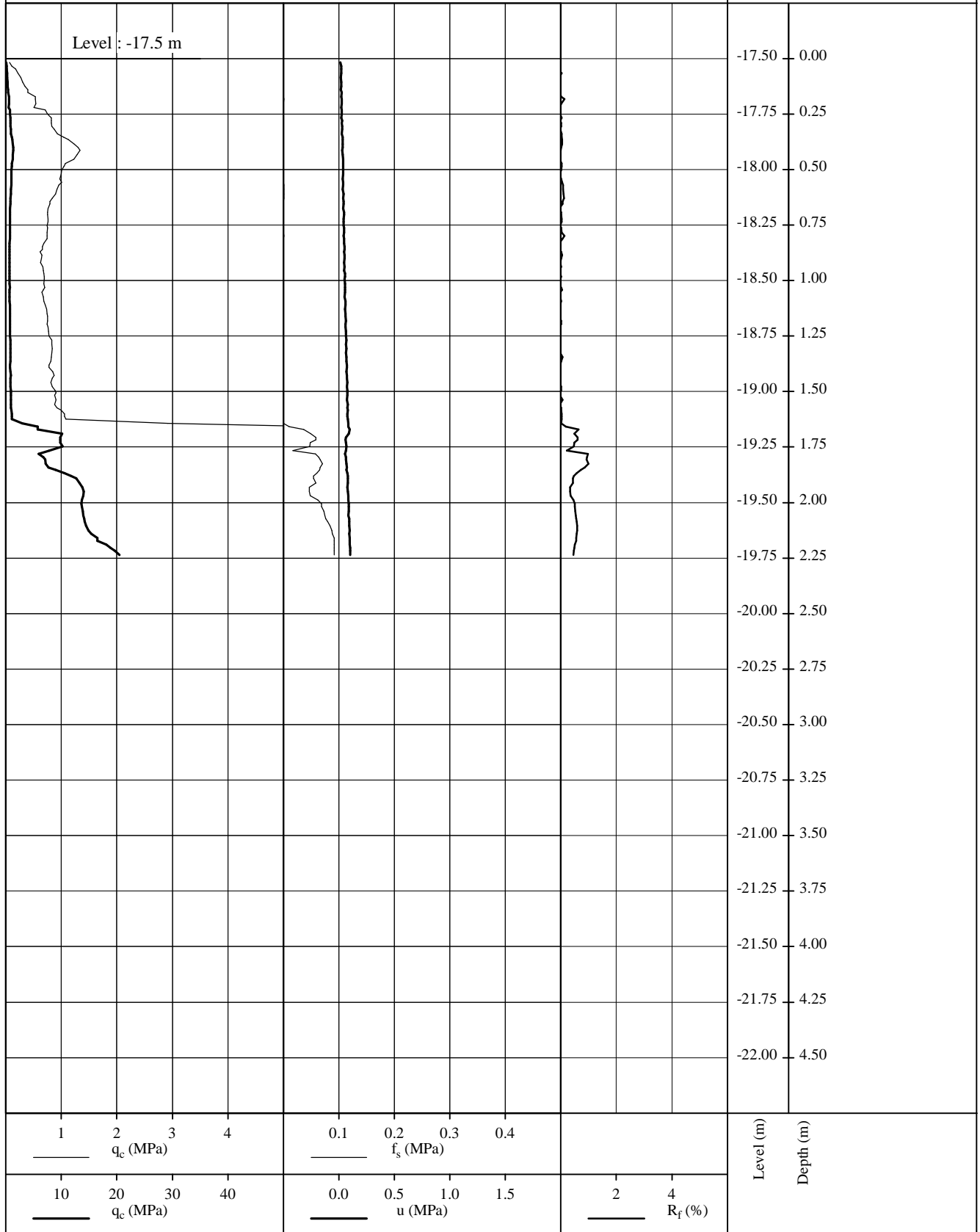
Report 2

Enclosure: 2E.15

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CPT name : SYD CPT 07



E : 627691	Cone no. : 080914	Rig : Minirig
N : 6266825	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max thrust

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM Date: 2009-06-22 Subject: SYD CPT 07

Checked : LAR Date: 2009-06-22

Approved : JBC

Date: 2009-06-22

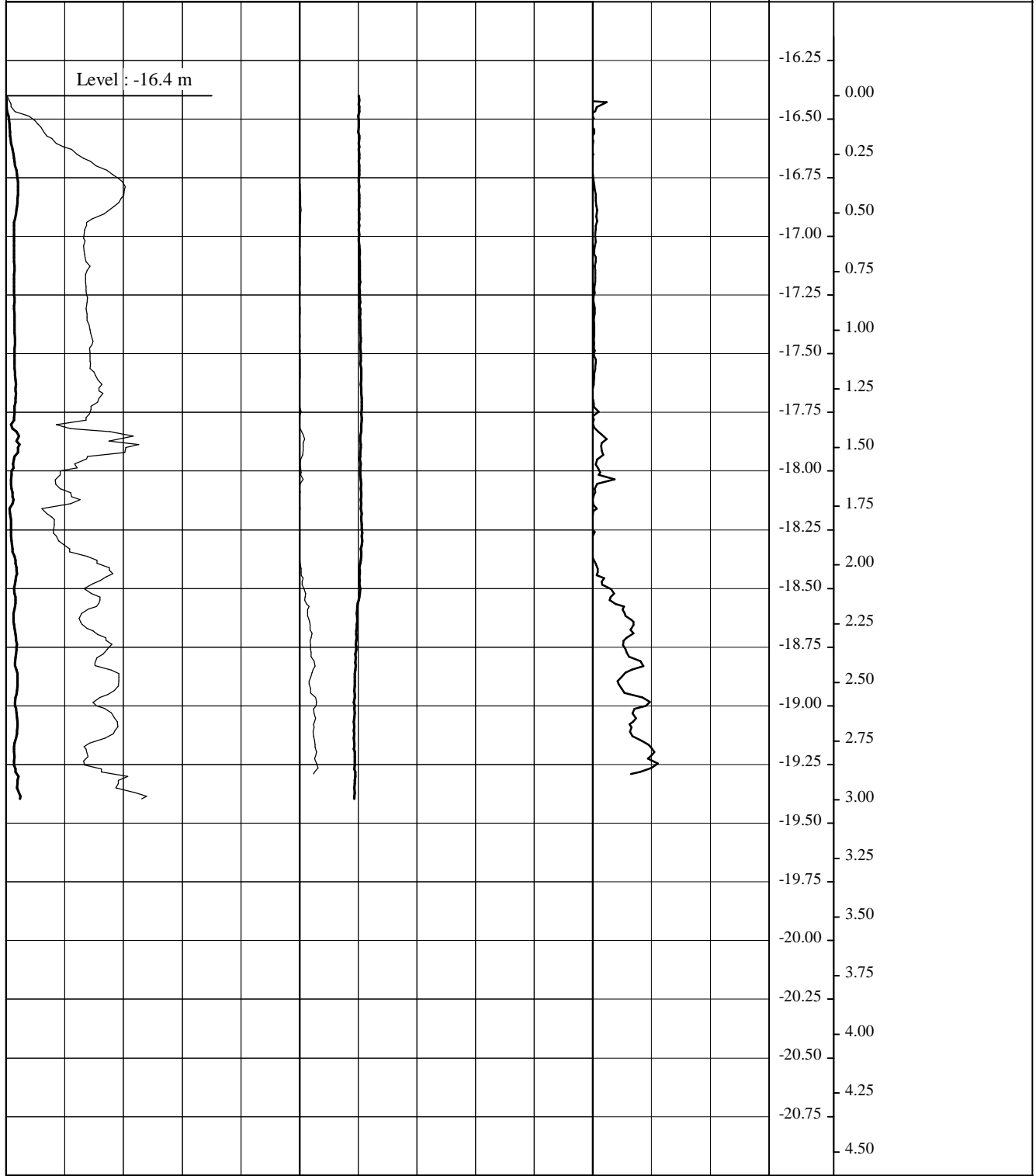
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Enclosure: 2E.16

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CPT name : SYD CPT 08

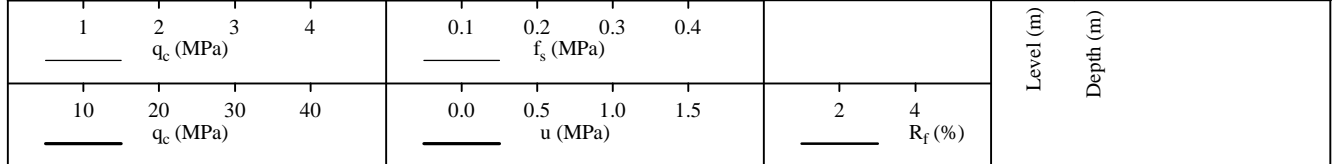
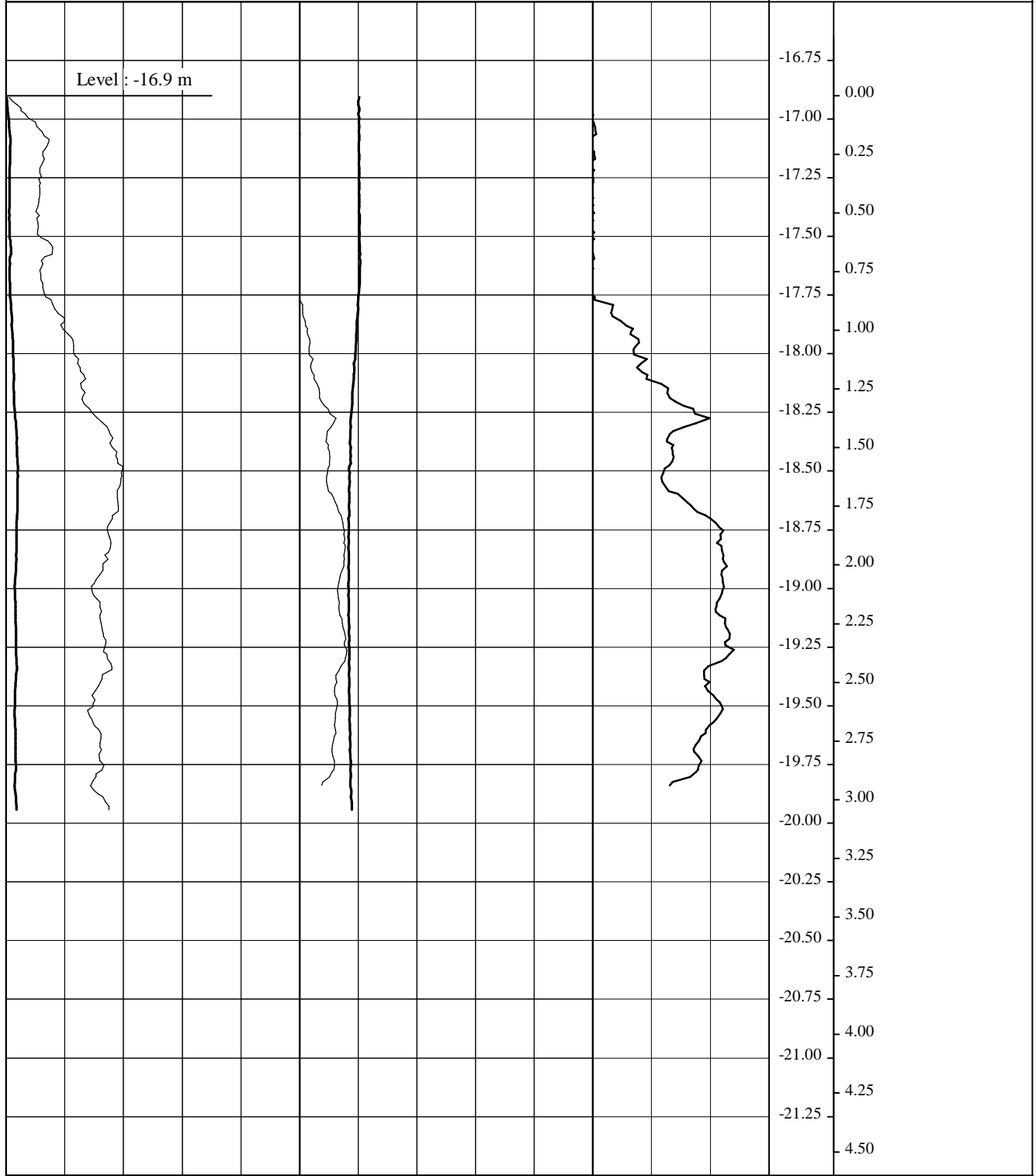


E : 628671	Cone no. : 080914	Rig : Minirig
N : 6268496	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: SYD CPT 08	
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Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.17	Rev.

CPT name : SYD CPT 09

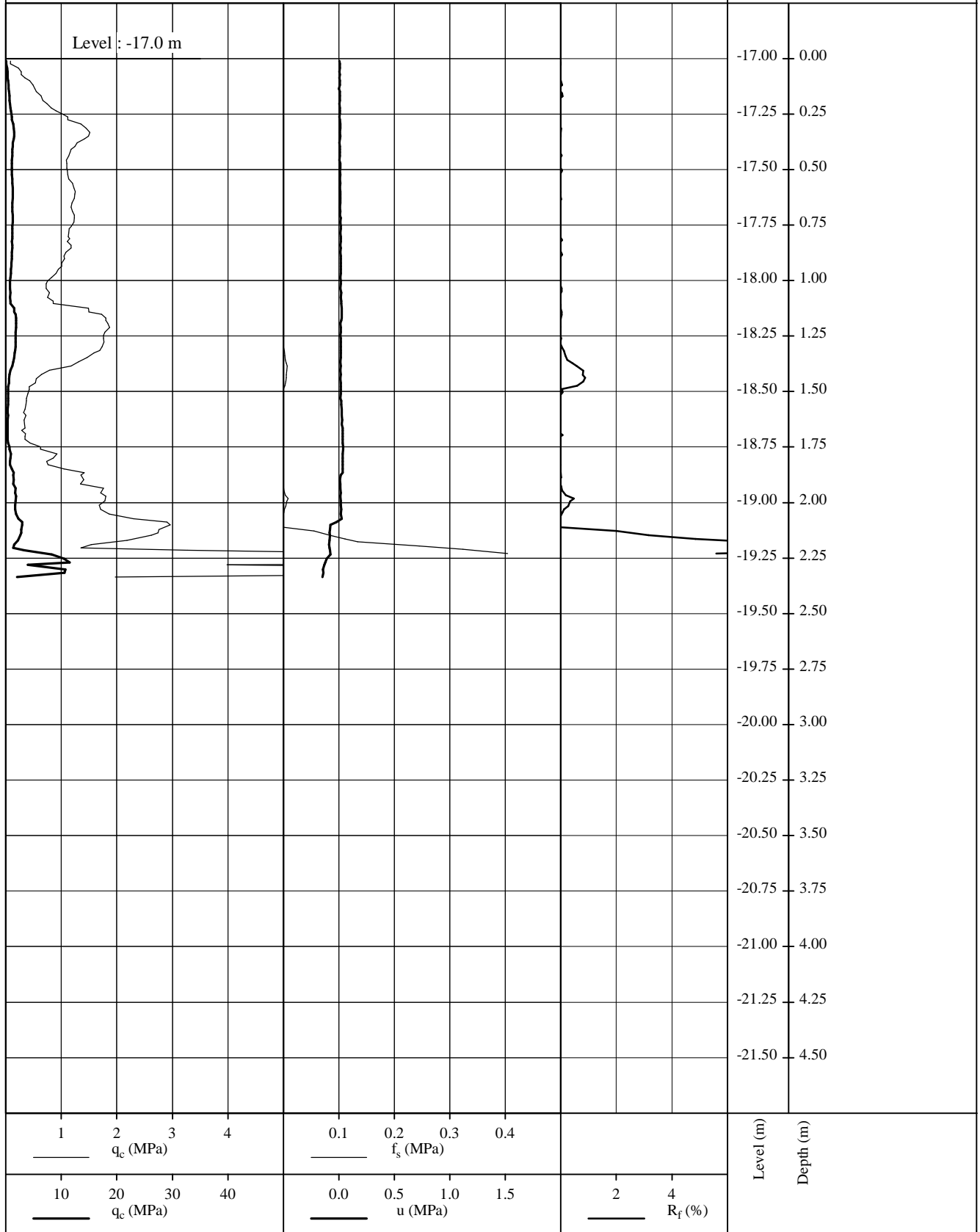


E : 629388	Cone no. : 080914	Rig : Minirig
N : 6269729	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max depth

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: SYD CPT 09	
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Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.18	Rev.

CPT name : SYD CPT 10

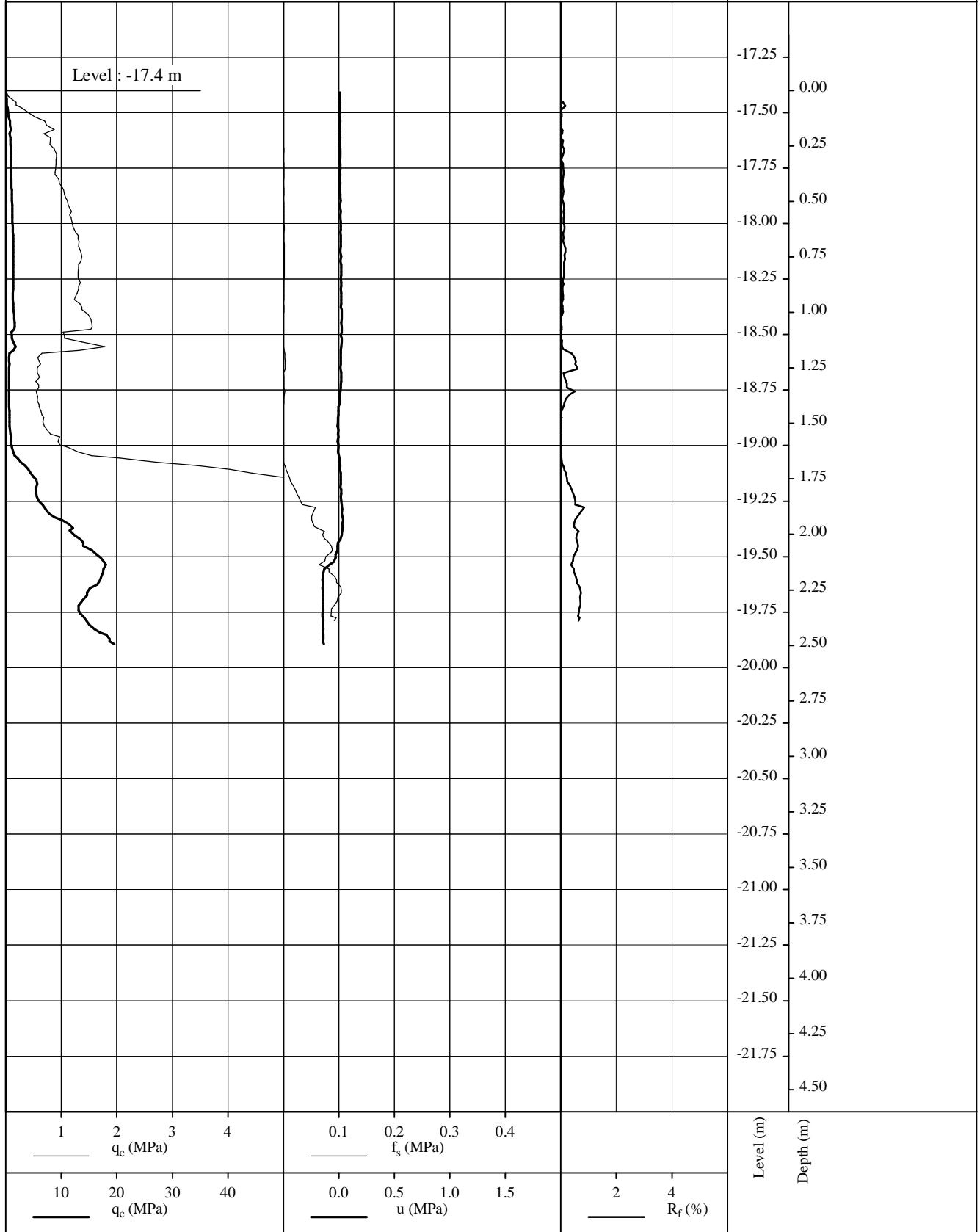


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N : 6270941	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max thrust

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: SYD CPT 10	
Checked : LAR	Date: 2009-06-22		Page 1 / 1
Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.19	Rev.

CPT name : SYD CPT 11

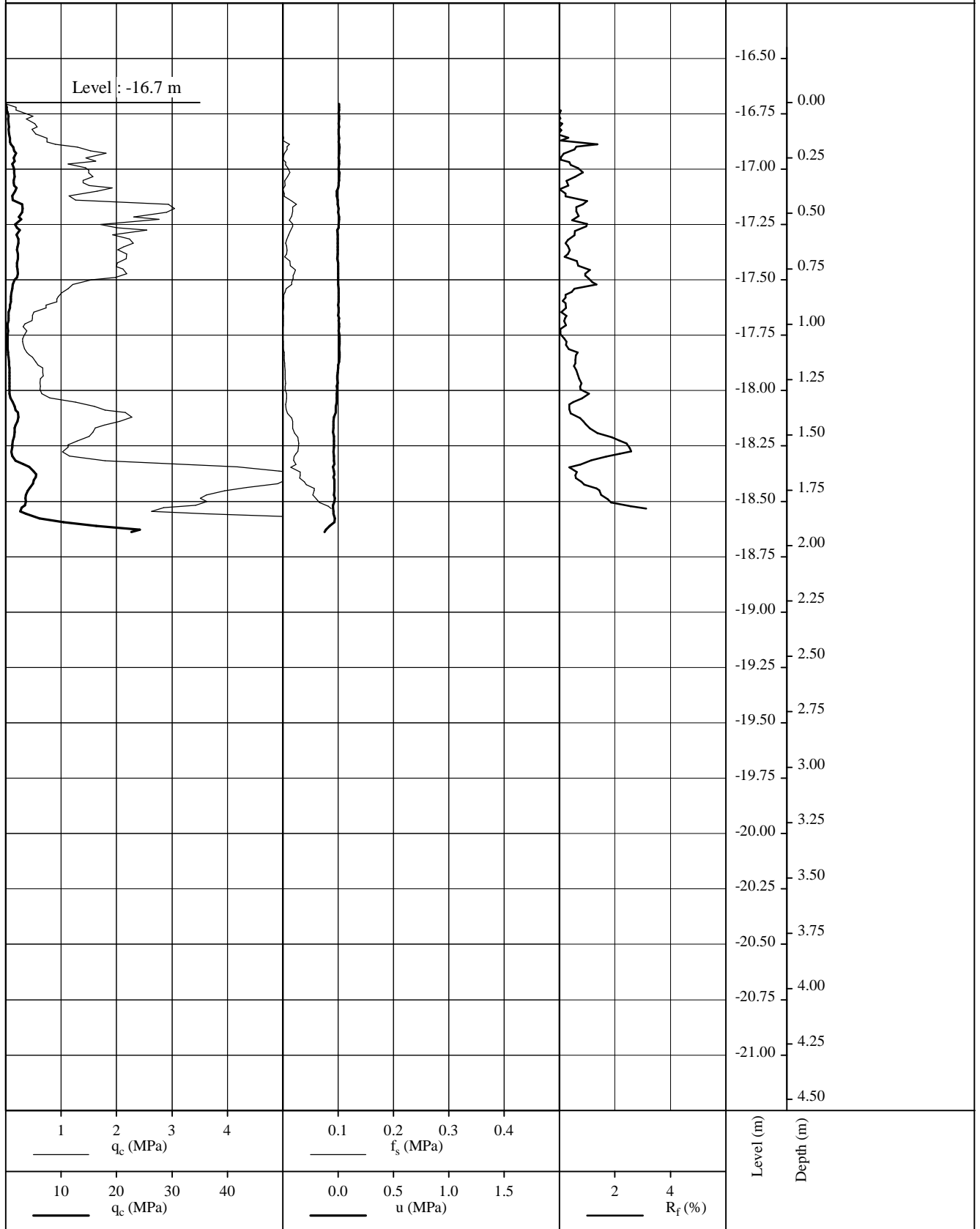


E : 632176	Cone no. : 080914	Rig : Minirig
N : 6274492	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max thrust

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: SYD CPT 11	
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Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.20	Rev.

CPT name : SYD CPT 12



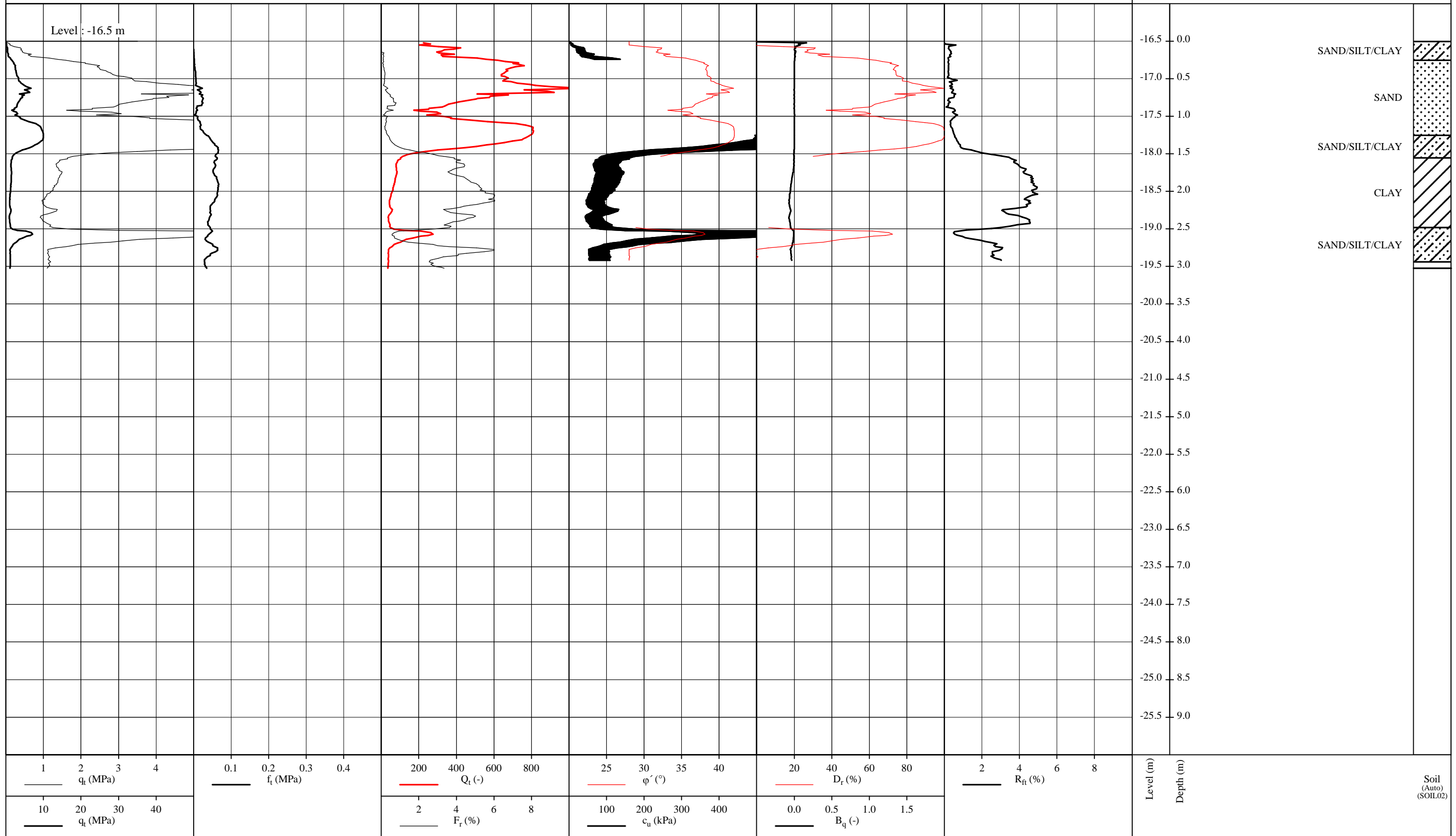
E : 632000	Cone no. : 080914	Rig : Minirig
N : 6274195	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark : Stop reason: max thrust

 Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-22	Subject: SYD CPT 12	
Checked : LAR	Date: 2009-06-22		Page 1 / 1
Approved : JBC	Date: 2009-06-22	Report 2 Enclosure: 2E.21	Rev.

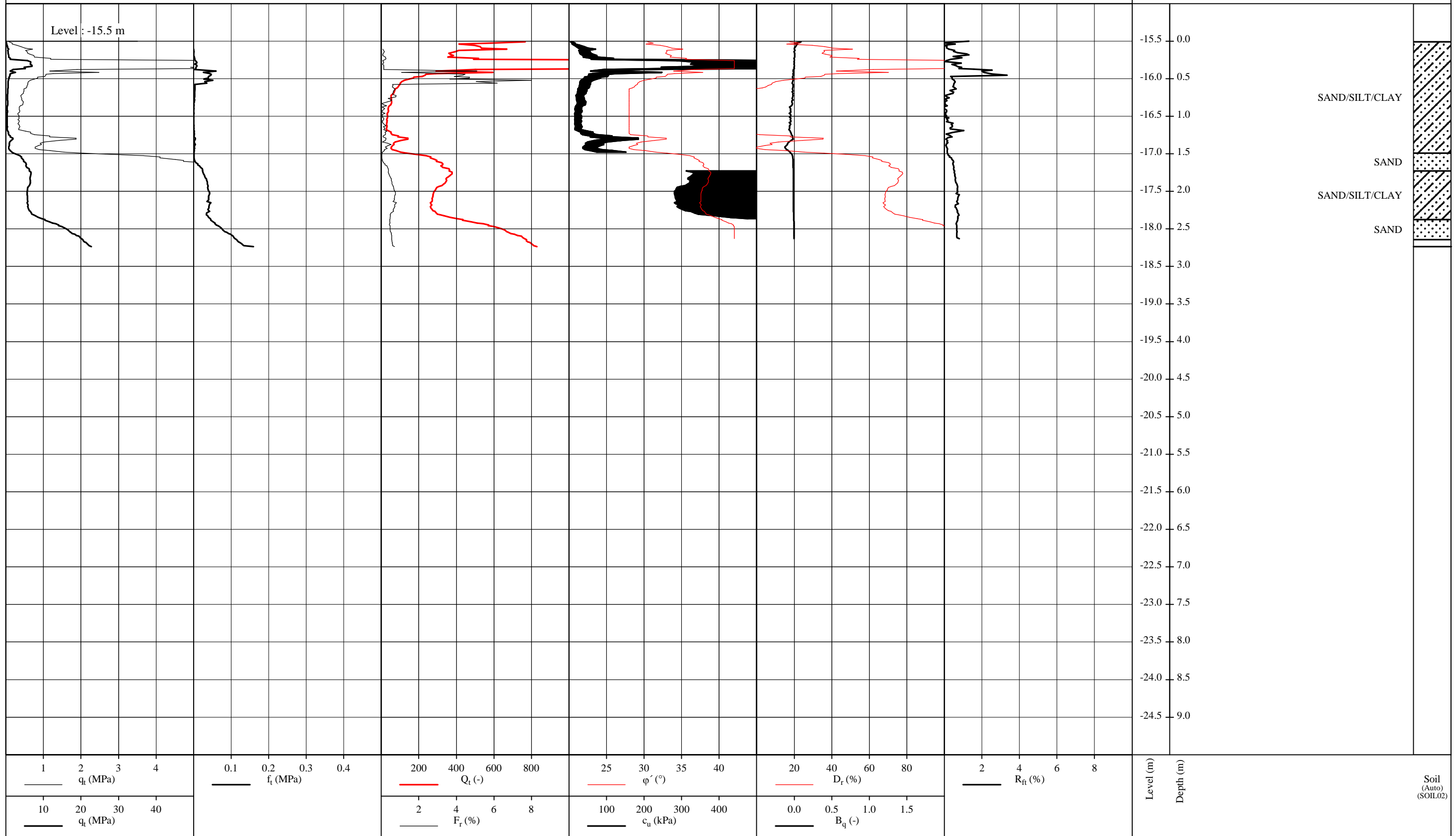
Enclosure 2F.01 – 2F.21
CPT profiles with q_t , f_t , B_q , R_{ft} , Q_t , F_r , φ , D_r and c_u

CPT name : NORD CPT 01



E : 631866	Cone no. : 080914	Rig : Minirig
N : 6274172	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-06-29	Subject: NORD CPT 01
Checked : LAR	Date: 2009-06-29	Page 1 / 1
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.01 Rev.

CPT name : NORD CPT 02



1 2 3 4
qt (MPa)

0.1 0.2 0.3 0.4
ft (MPa)

200 400 600 800
Qr (-)

25 30 35 40
φ' (°)

20 40 60 80
Dr (%)

2 4 6 8
Rfi (%)

Level (m)
Depth (m)

10 20 30 40
qt (MPa)

2 4 6 8
Fr (%)

100 200 300 400
cu (kPa)

0.0 0.5 1.0 1.5
Bq (-)

E : 626880 Cone no. : 080914 Rig : Minirig
N : 6270496 Cone type : TSP Performed by : PHA
Date : 2009-06-07 Cone area : 10.0 cm² Remark :

GEO Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM Date: 2009-06-29 Subject: NORD CPT 2

Checked : LAR Date: 2009-06-29

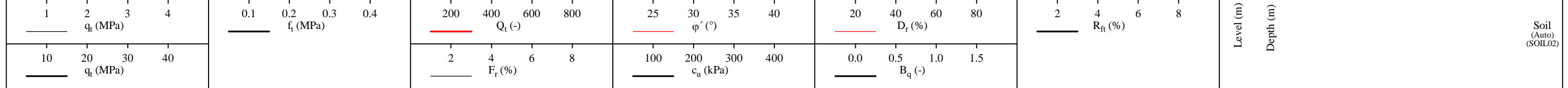
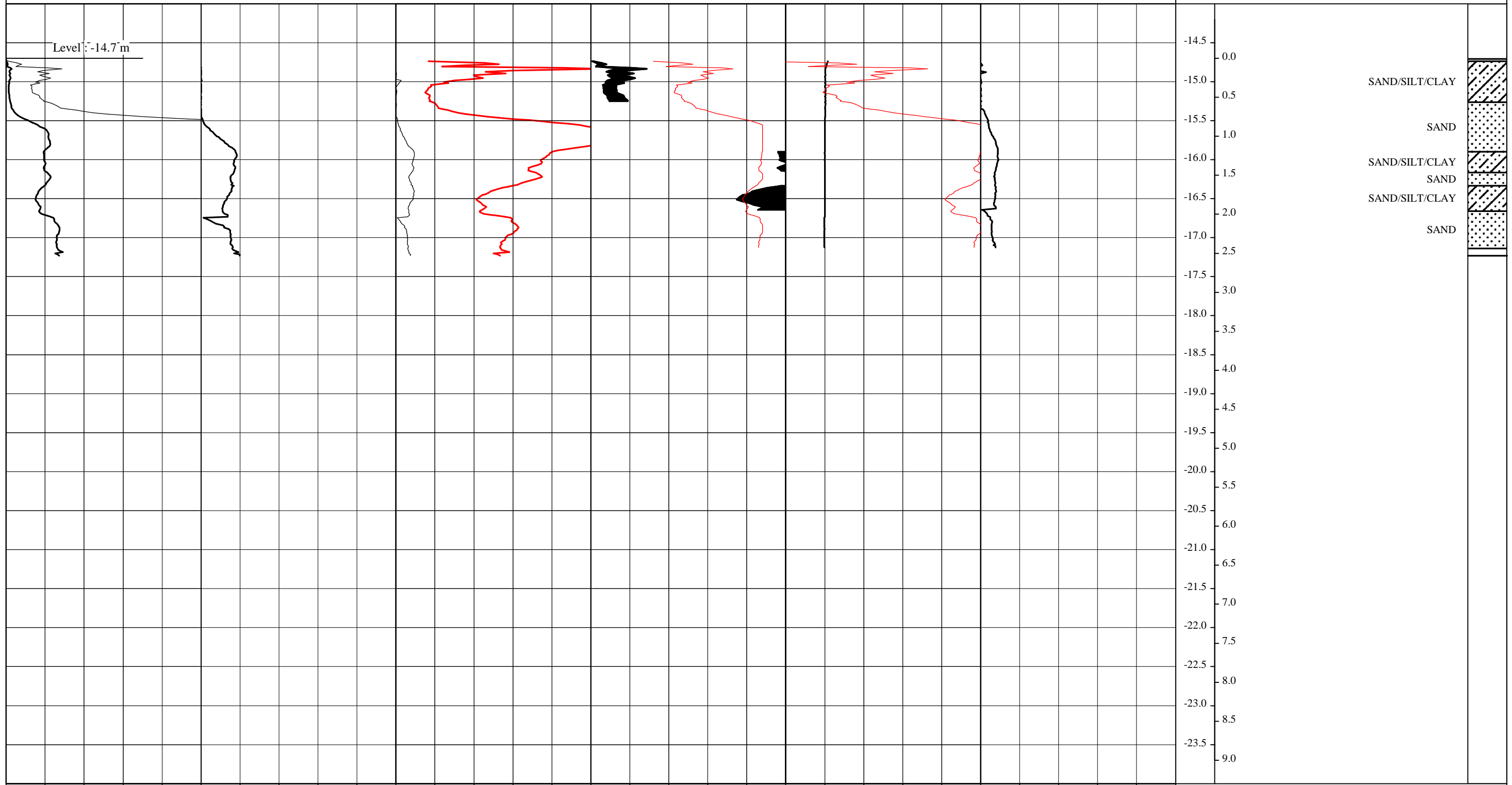
Approved : JBC Date: 2009-06-29

Report 2 Enclosure: 2F.02

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Rev.

CPT name : NORD CPT 03



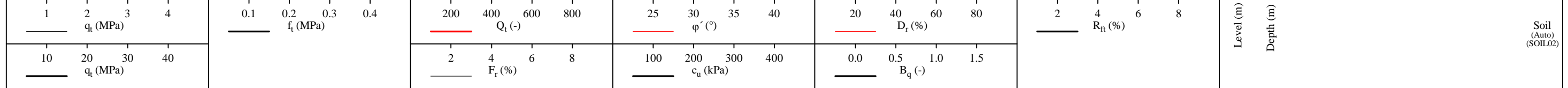
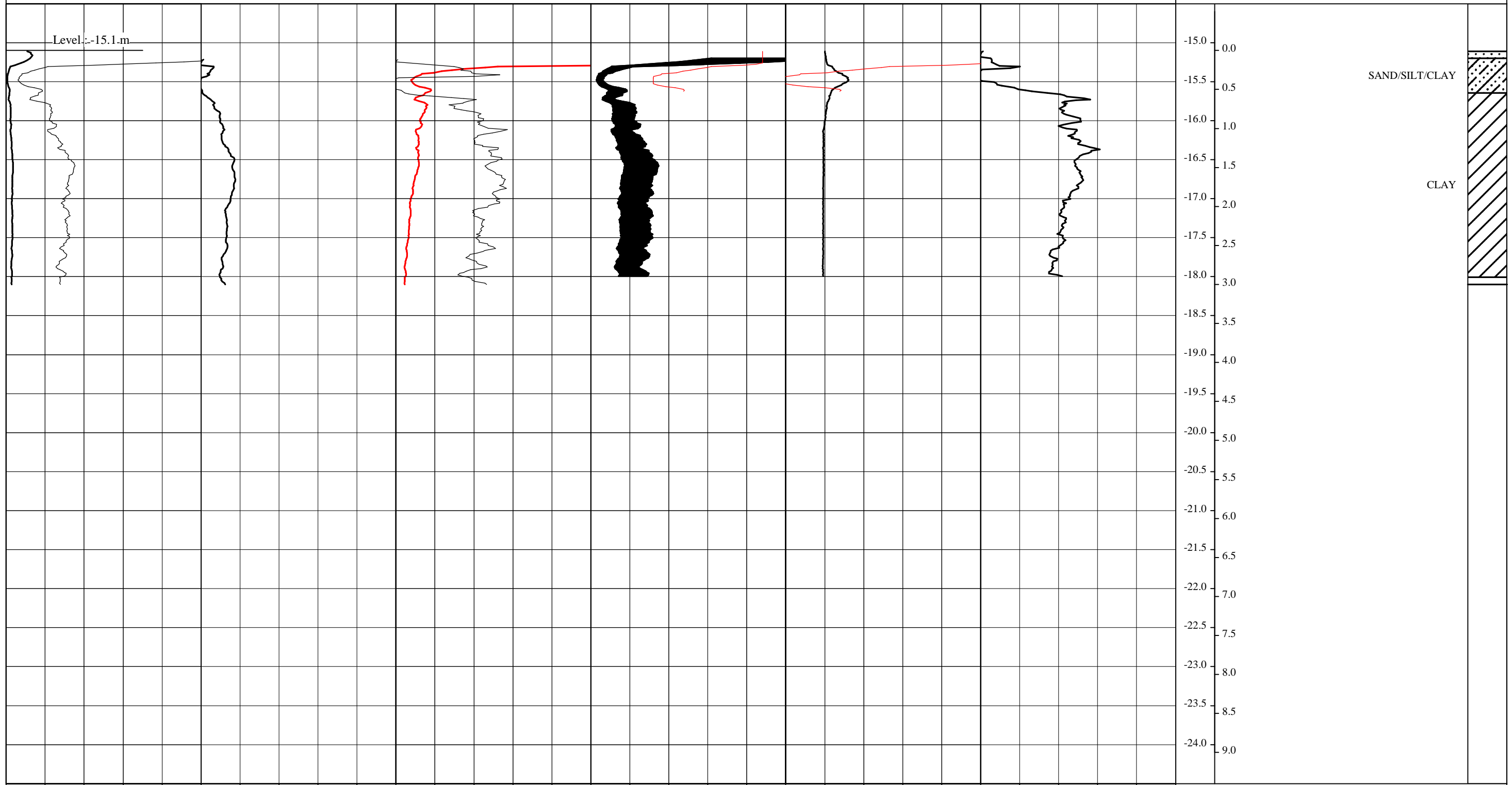
E : 625145	Cone no. : 080914	Rig : Minirig
N : 6269218	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark :

GEO Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-29	Subject: NORD CPT 03
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.03

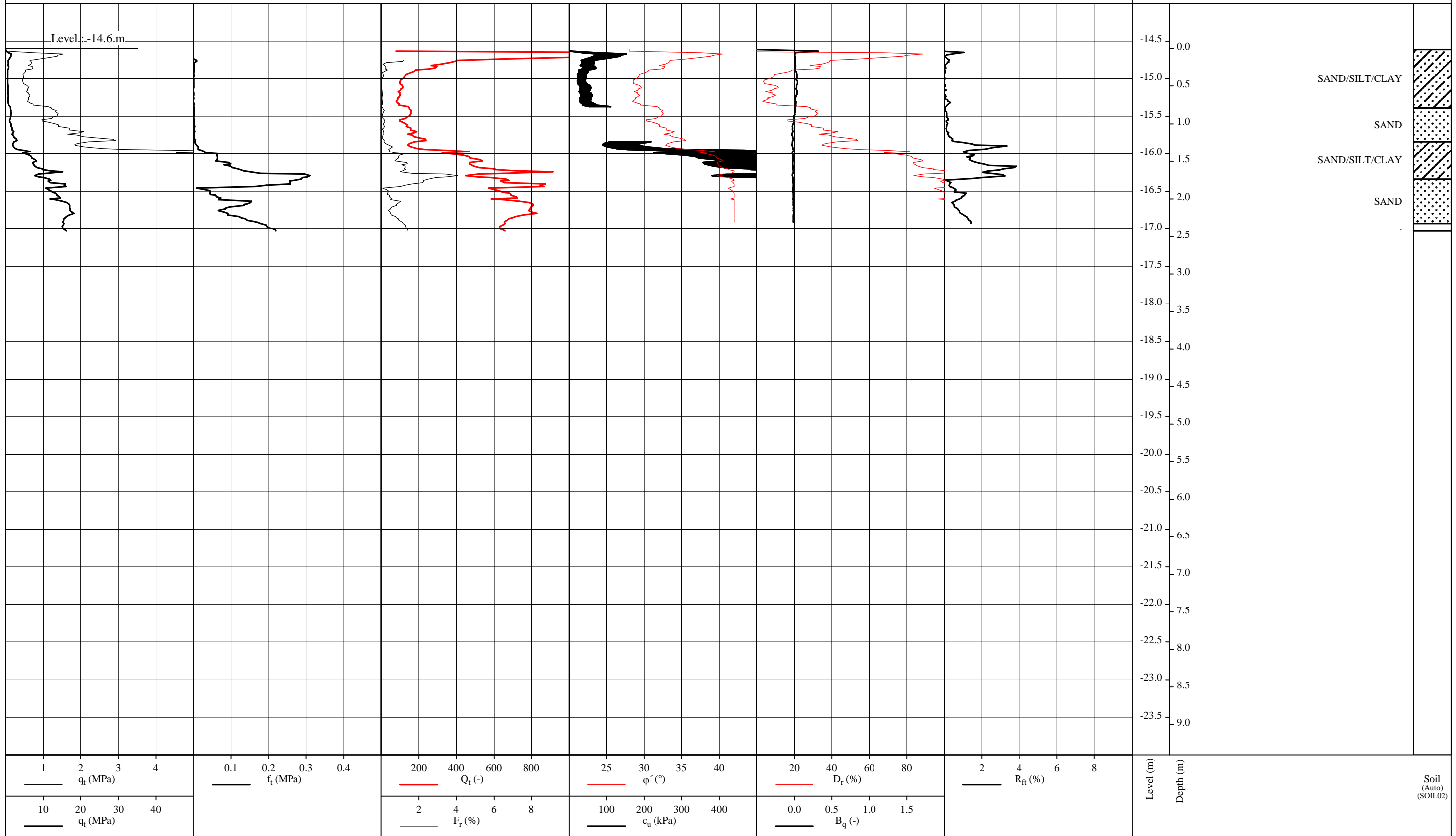
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Rev.

CPT name : NORD CPT 04



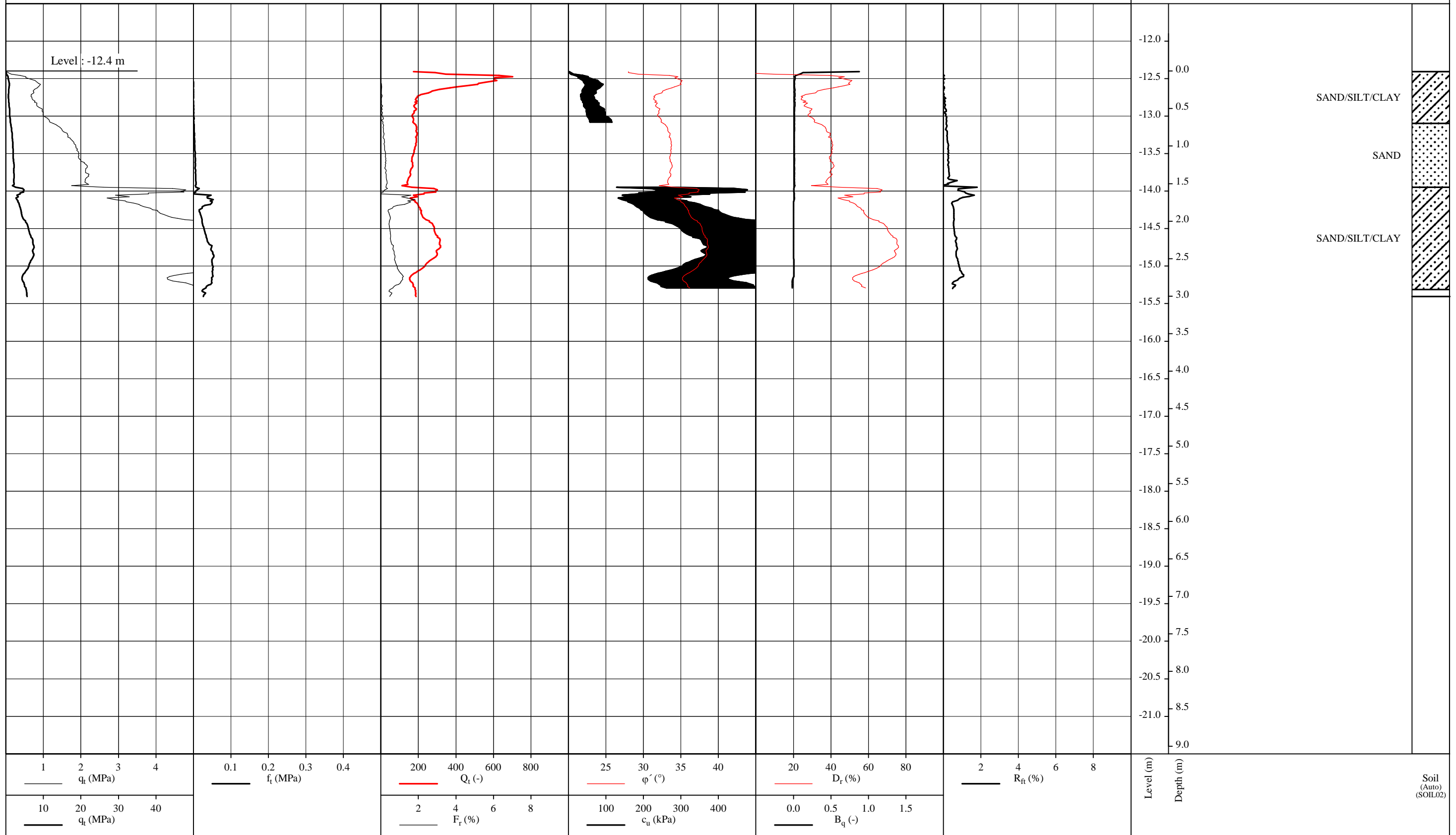
E : 623503	Cone no. : 080914	Rig : Minirig
N : 6268009	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-06-29	Subject: NORD CPT 04
Checked : LAR	Date: 2009-06-29	Page 1 / 1
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.04 Rev.

CPT name : NORD CPT 05



E : 622549	Cone no. : 080914	Rig : Minirig
N : 6267305	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-07-01	Subject: NORD CPT 05
Checked : LAR	Date: 2009-07-01	Page 1 / 1
Approved : JBC	Date: 2009-07-01	Report 2 Enclosure: 2F.05 Rev.

CPT name : NORD CPT 06

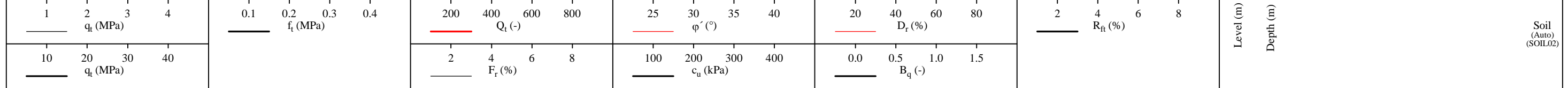
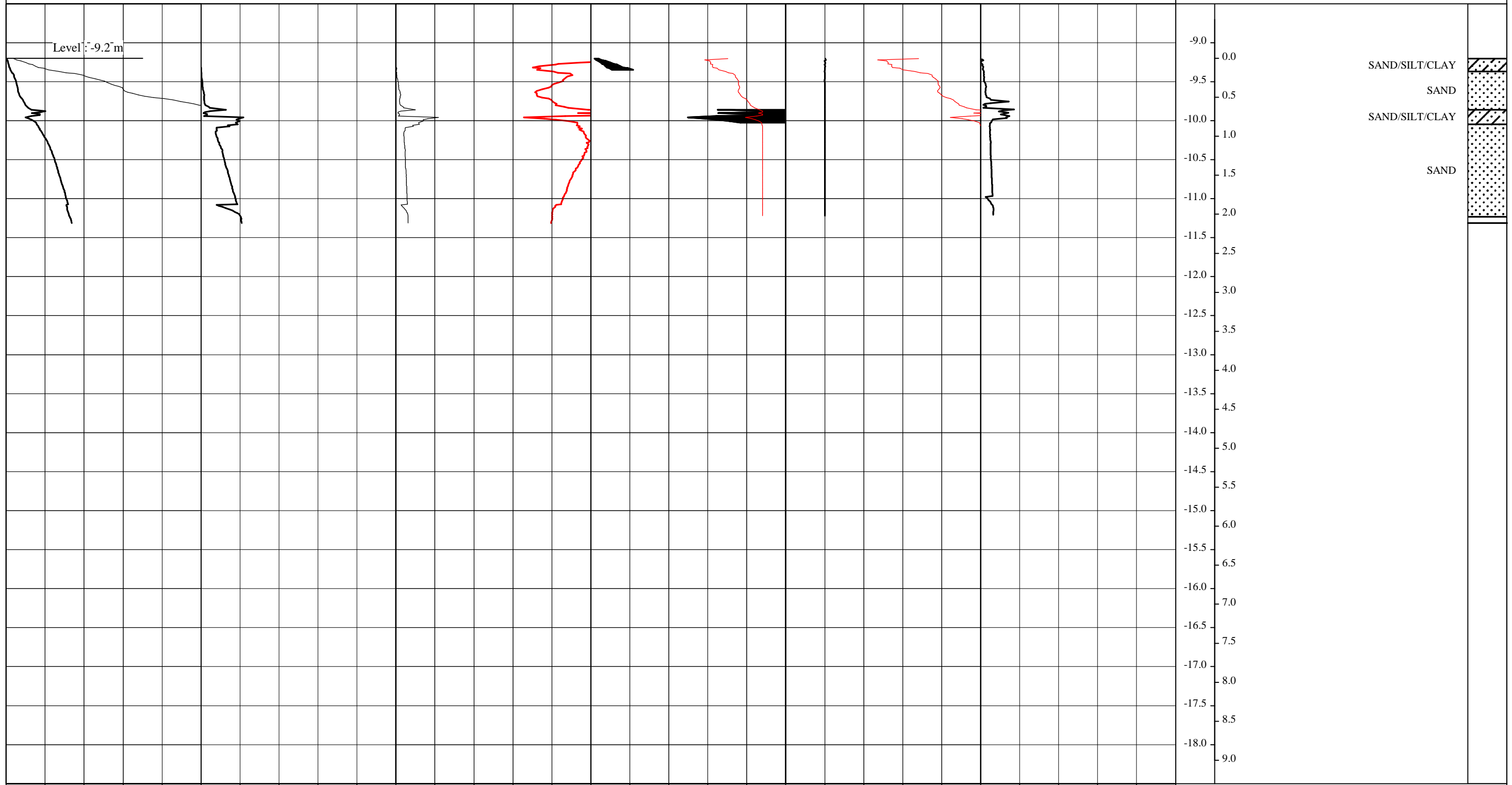


E : 619936	Cone no. : 080914	Rig : Minirig
N : 6265392	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark :

GEO Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-29	Subject: NORD CPT 06
Checked : LAR	Date: 2009-06-29	Page 1 / 1
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.06 Rev.

CPT name : NORD CPT 07

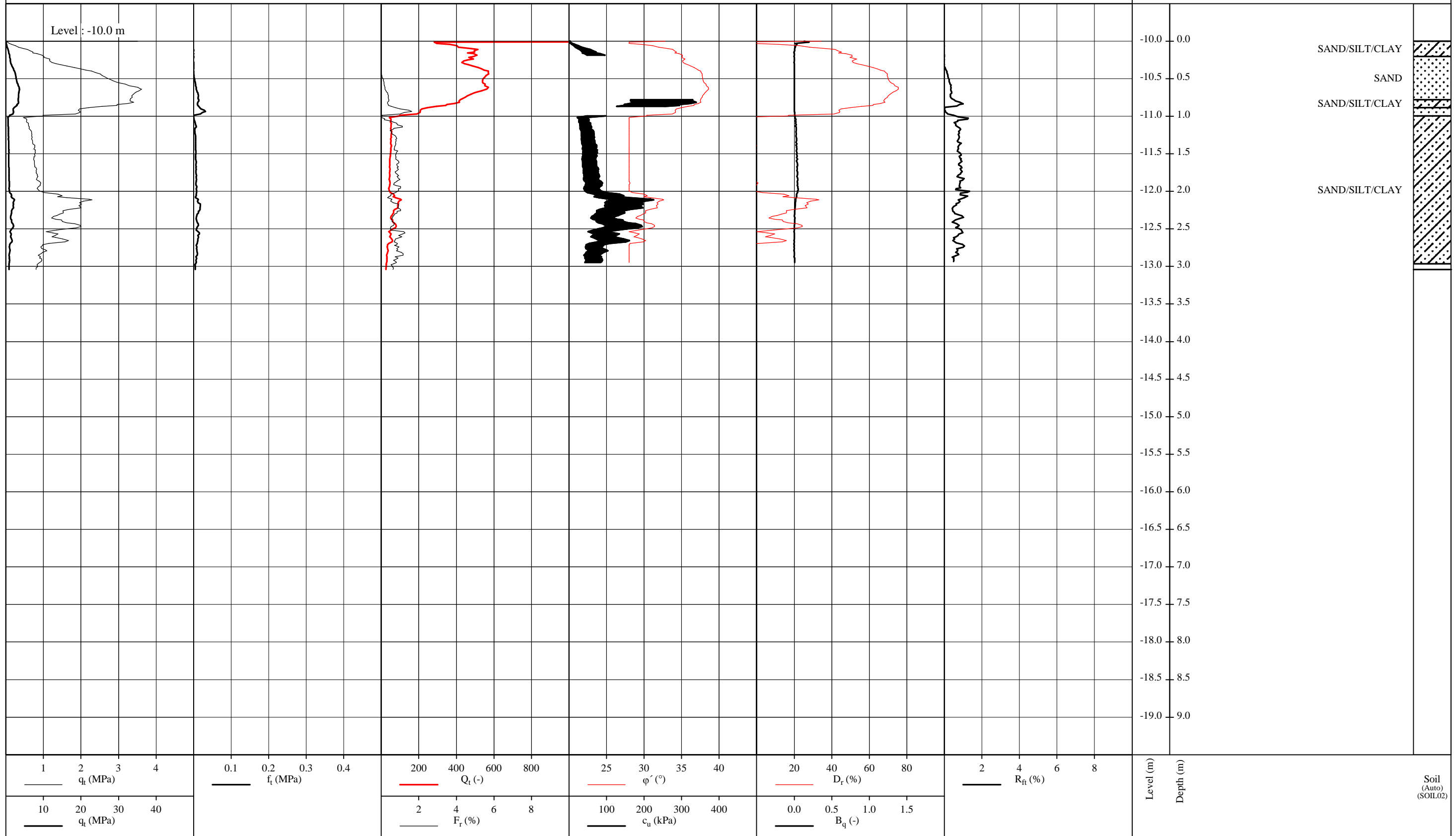


E : 618362	Cone no. : 080914	Rig : Minirig
N : 6264220	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark :

GEO Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

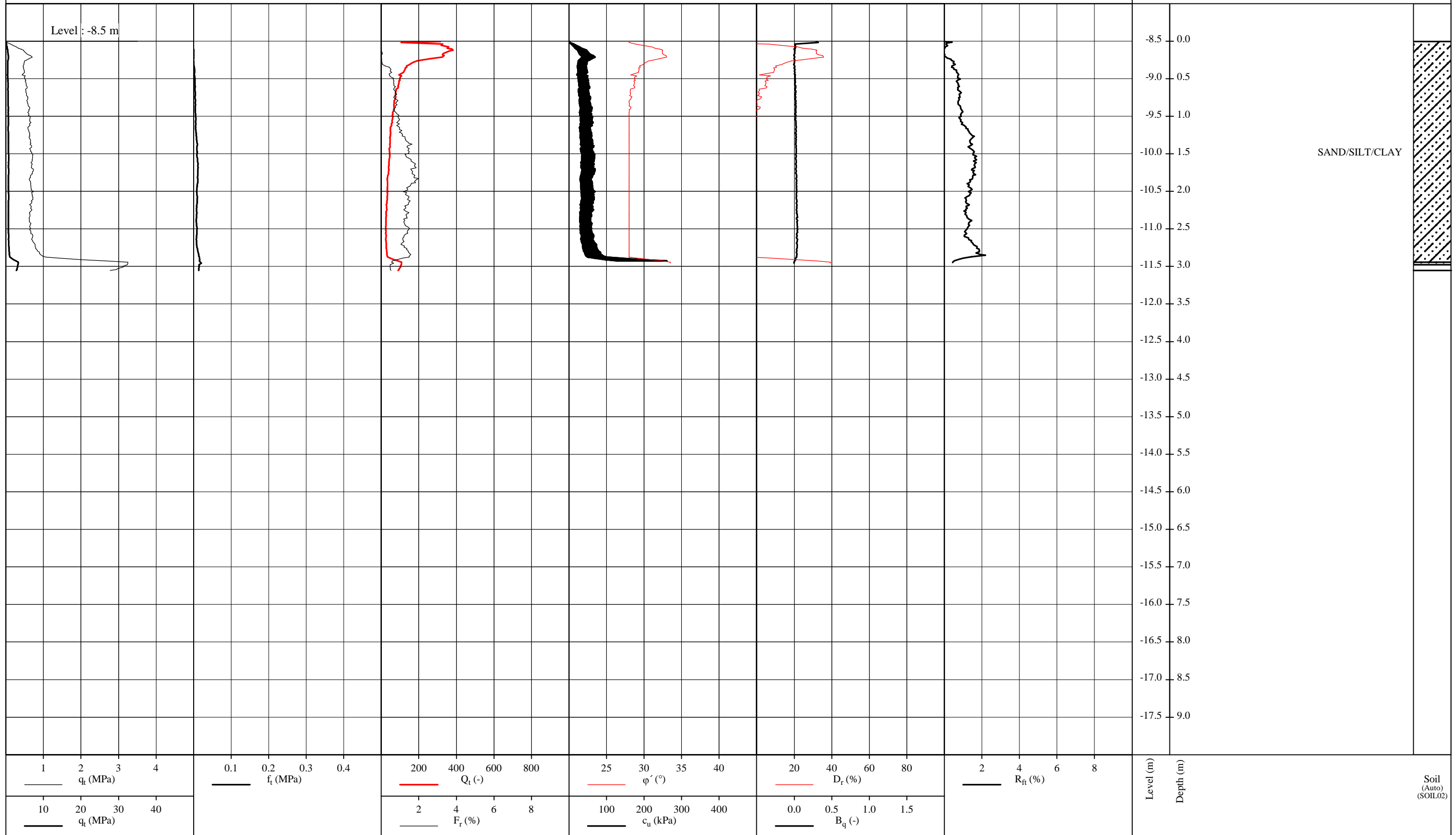
Prepared : MTM	Date: 2009-06-29	Subject: NORD CPT 07
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.07

CPT name : NORD CPT 08



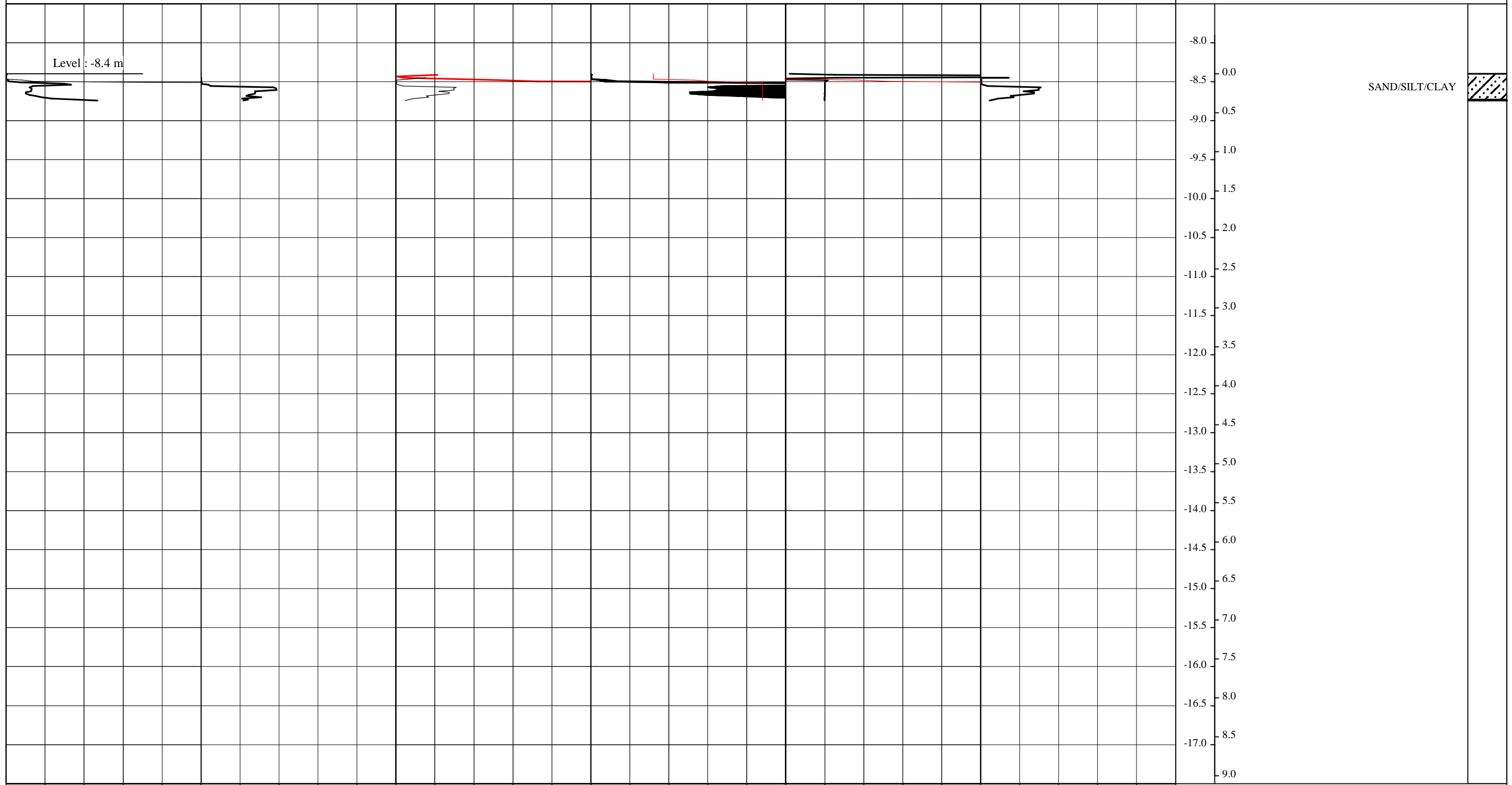
E : 617730	Cone no. : 080914	Rig : Minirig
N : 6263754	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-06-29	Subject: NORD CPT 08
Checked : LAR	Date: 2009-06-29	Page 1 / 1
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.08 Rev.

CPT name : NORD CPT 09



E : 616313	Cone no. : 080914	Rig : Minirig
N : 6262710	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-06-29	Subject: NORD CPT 09
Checked : LAR	Date: 2009-06-29	Page 1 / 1
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.09 Rev.

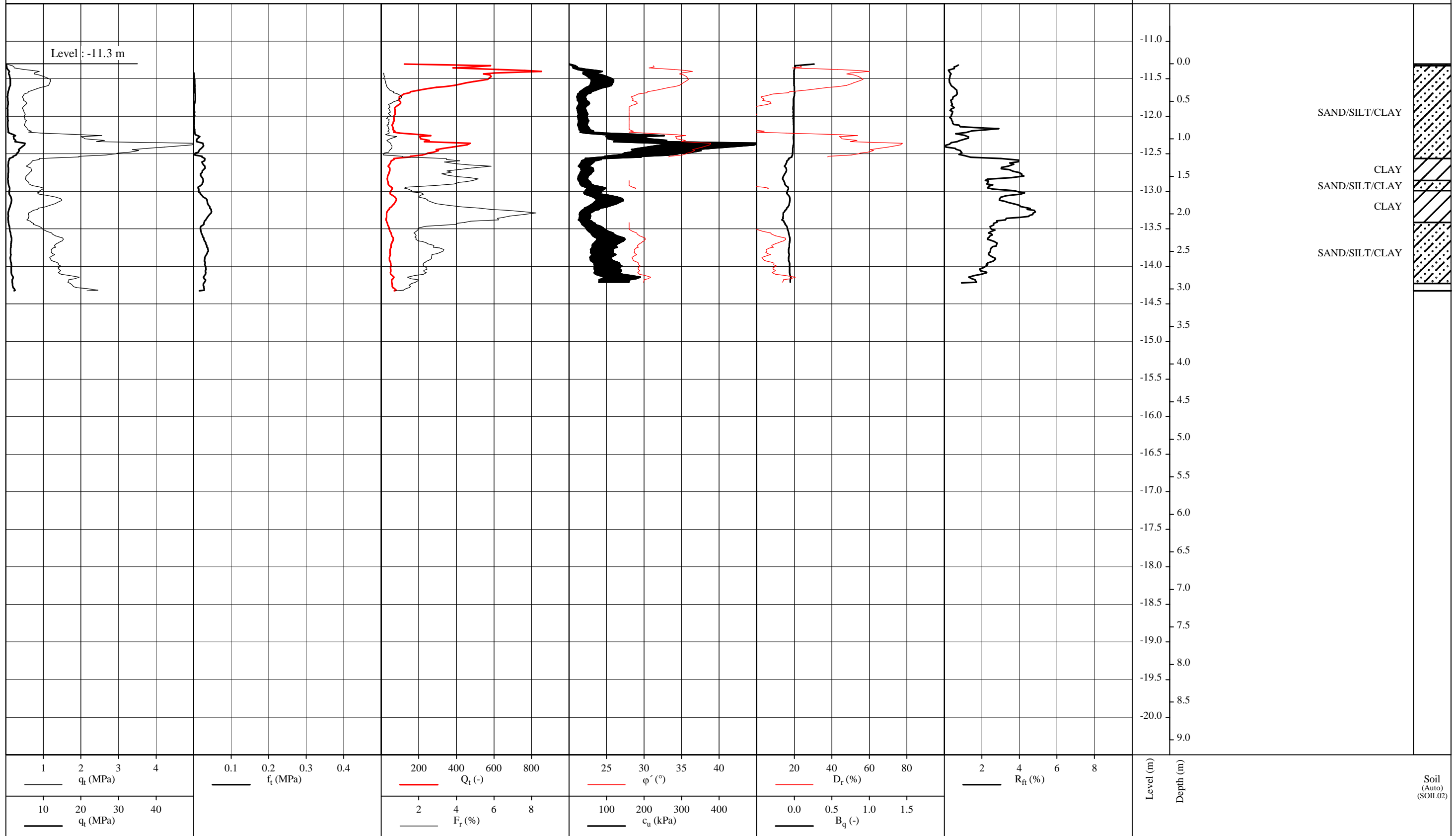
CPT name : SYD CPT 01B



1 2 3 4 qt (MPa)	0.1 0.2 0.3 0.4 ft (MPa)	200 400 600 800 Qt (-)	25 30 35 40 φ' (°)	20 40 60 80 Dr (%)	2 4 6 8 Rf (%)	Level (m) Depth (m)	Soil (Auto) (SOIL02)
10 20 30 40 qt (MPa)		2 4 6 8 Fr (%)	100 200 300 400 cu (kPa)	0.0 0.5 1.0 1.5 Bq (-)			

E : 619834	Cone no. : 080914	Rig : Minirig
N : 6255286	Cone type : TSP	Performed by : PHA
Date : 2009-06-07	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-07-01	Subject: SYD CPT 01B
Checked : LAR	Date: 2009-07-01	Page 1 / 1
Approved : JBC	Date: 2009-07-01	Report 2 Enclosure: 2F.10 Rev.

CPT name : SYD CPT 02

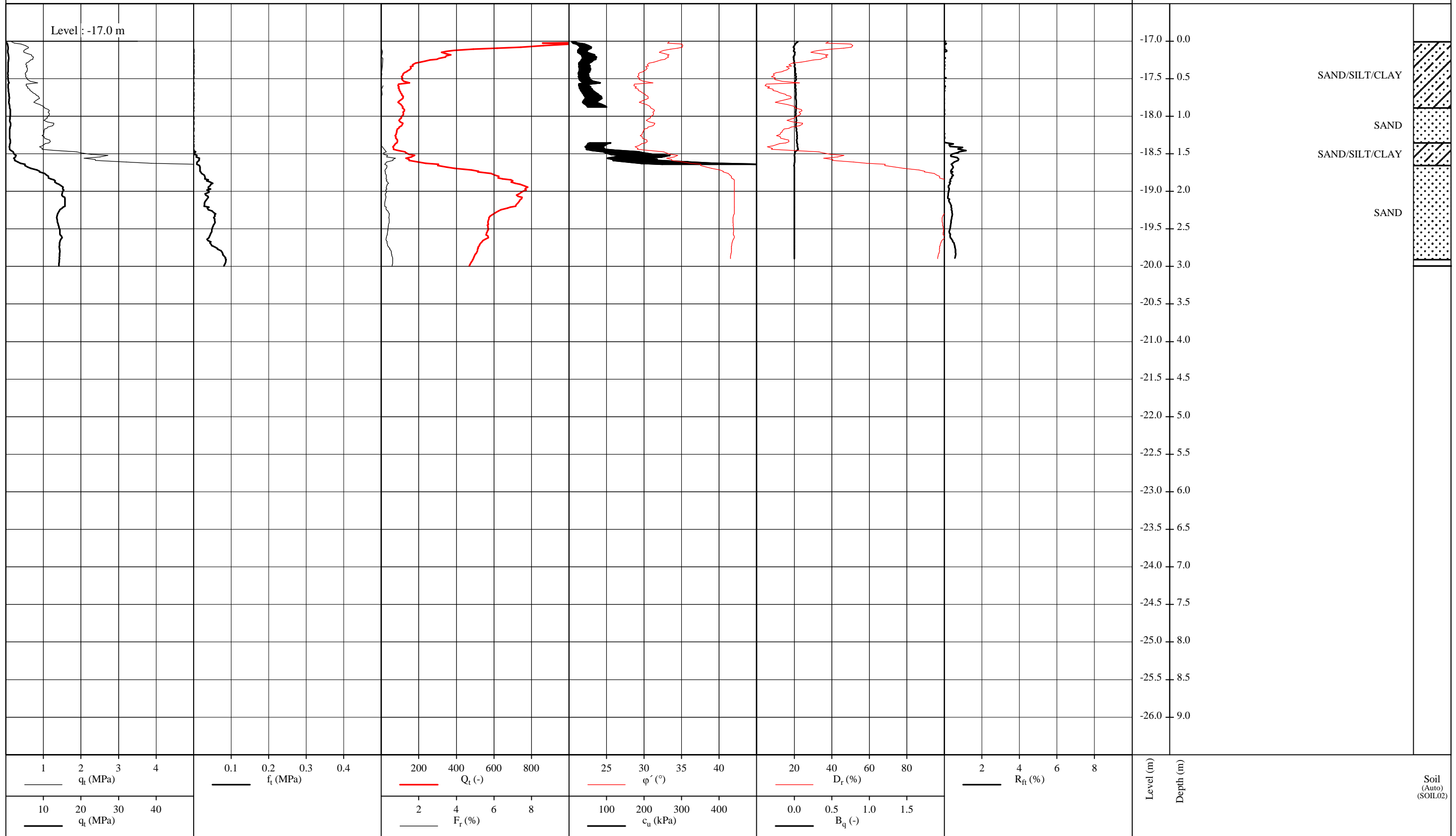


E : 620592	Cone no. : 080917	Rig : Minirig
N : 6255362	Cone type : TSP	Performed by : PHA-ROB
Date : 2009-06-02	Cone area : 10.0 cm ²	Remark :

GEO Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-29	Subject: SYD CPT 02
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.11

CPT name : SYD CPT 03



1 2 3 4
qt (MPa)

0.1 0.2 0.3 0.4
fr (MPa)

200 400 600 800
Qr (-)

25 30 35 40
phi (°)

20 40 60 80
Dr (%)

2 4 6 8
Rfr (%)

Level (m)
Depth (m)

10 20 30 40
qt (MPa)

2 4 6 8
Fr (%)

100 200 300 400
cu (kPa)

0.0 0.5 1.0 1.5
Bq (-)

E : 623240
N : 6259224
Date : 2009-06-06

Cone no. : 080914
Cone type : TSP
Cone area : 10.0 cm²

Rig : Minirig
Performed by : PHA
Remark :

GEO Danish Geotechnical Institute

Project : 32490 Anholt Djursland OWF.

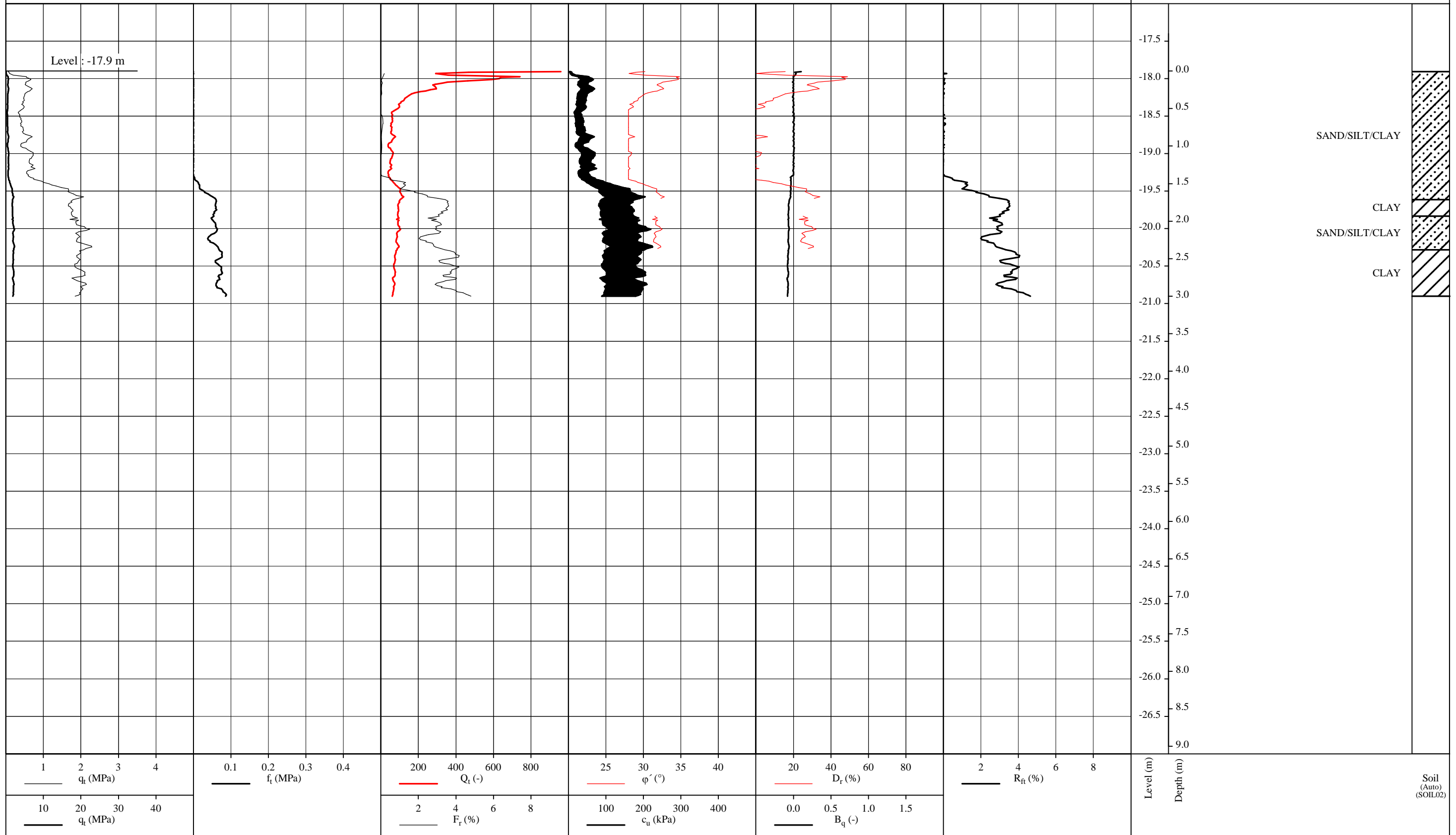
Prepared : MTM
Checked : LAR
Approved : JBC

Date: 2009-06-29
Date: 2009-06-29
Date: 2009-06-29

Subject: SYD CPT 03
Report 2 Enclosure: 2F.12

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CPT name : SYD CPT 04

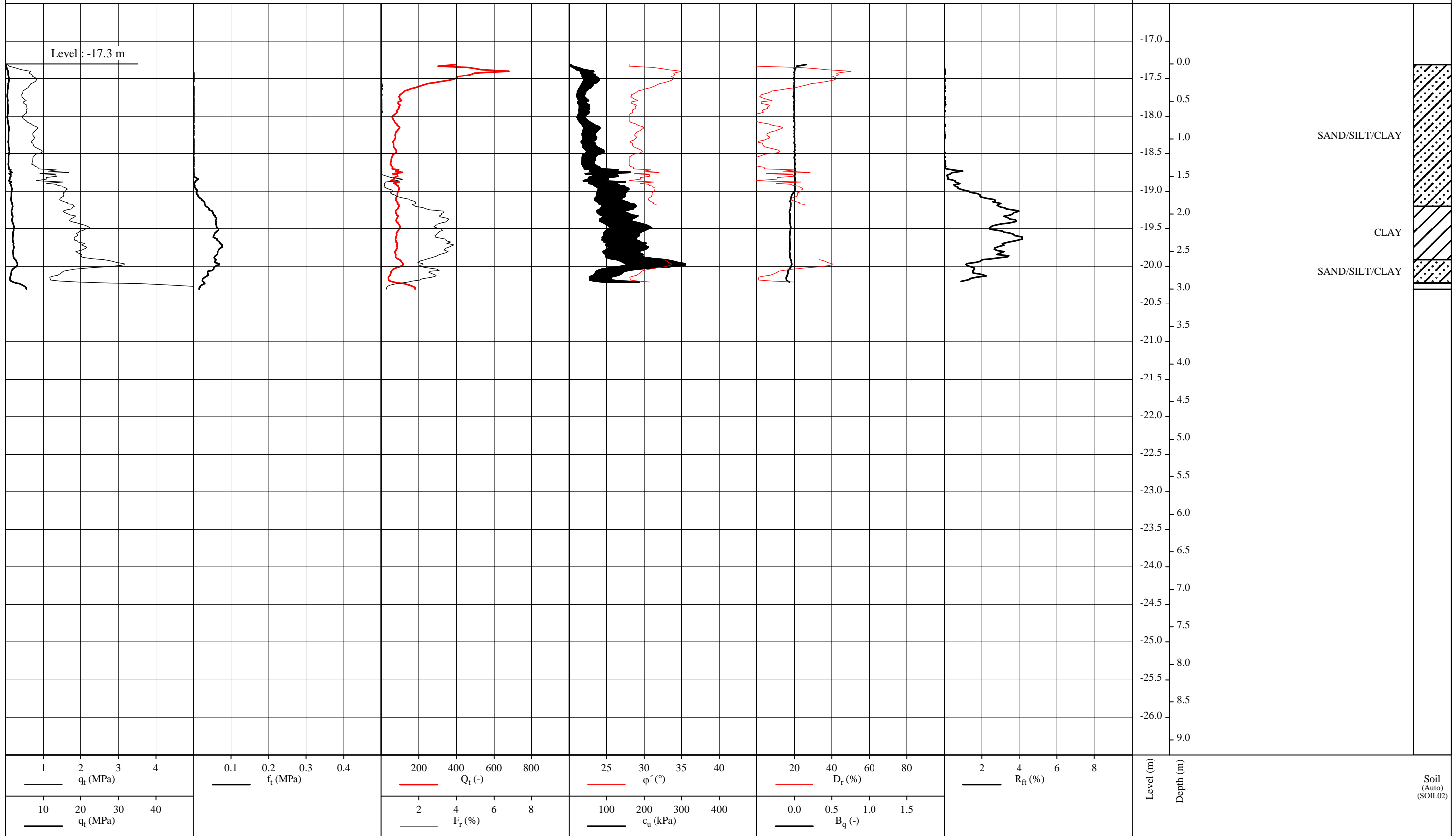


E : 624618	Cone no. : 080914	Rig : Minirig
N : 6261576	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark :

GEO Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

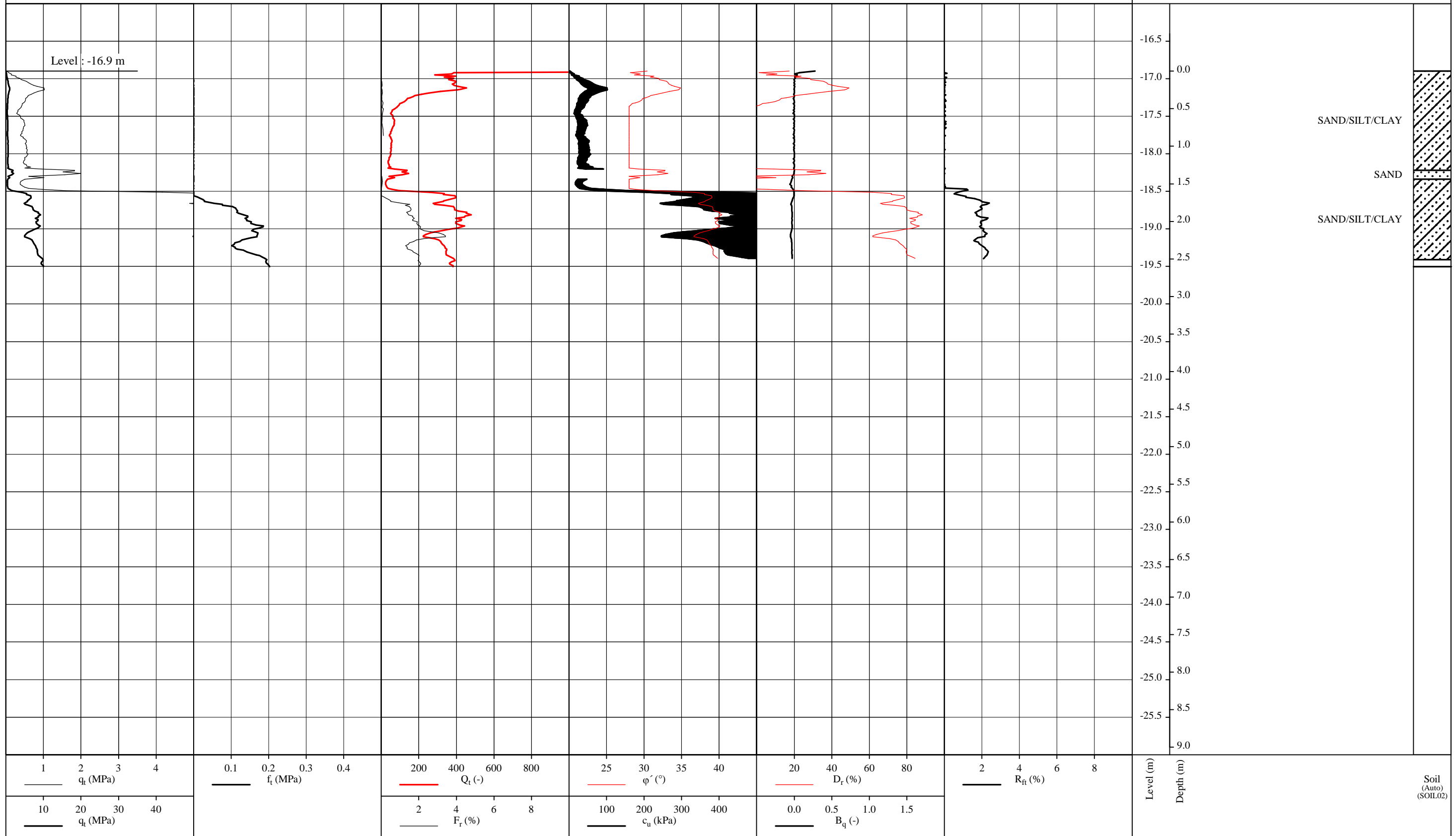
Prepared : MTM	Date: 2009-06-29	Subject: SYD CPT 04
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.13

CPT name : SYD CPT 05



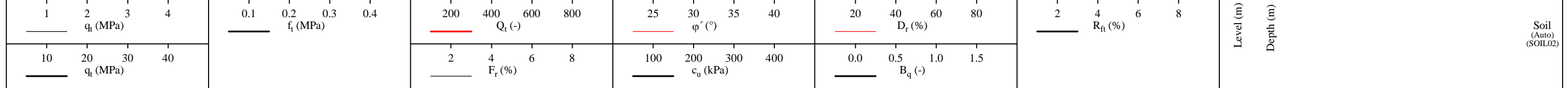
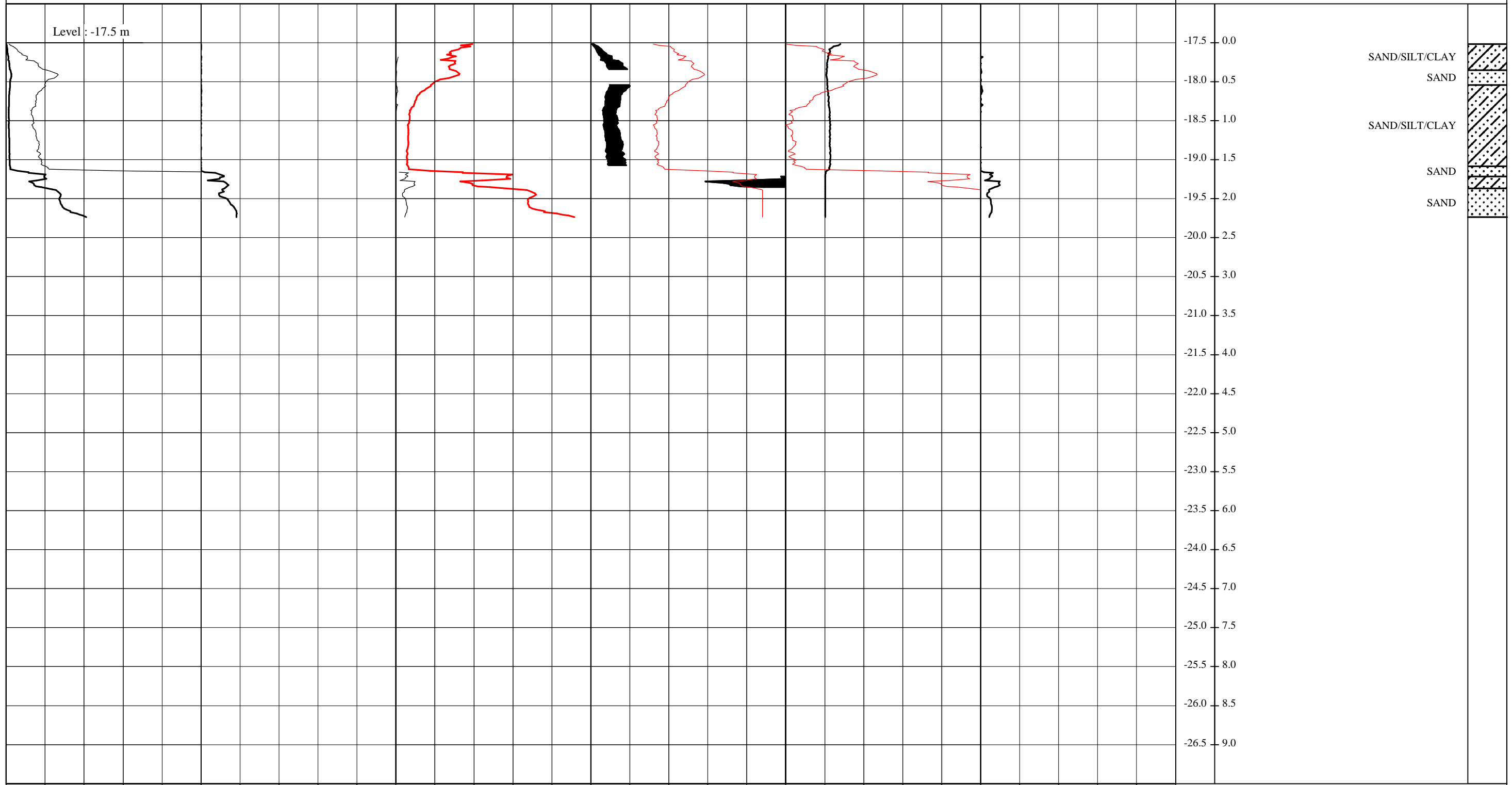
E : 625664	Cone no. : 080914	Rig : Minirig
N : 6263360	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-06-29	Subject: SYD CPT 05
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.14
		Page 1 / 1 Rev.

CPT name : SYD CPT 06



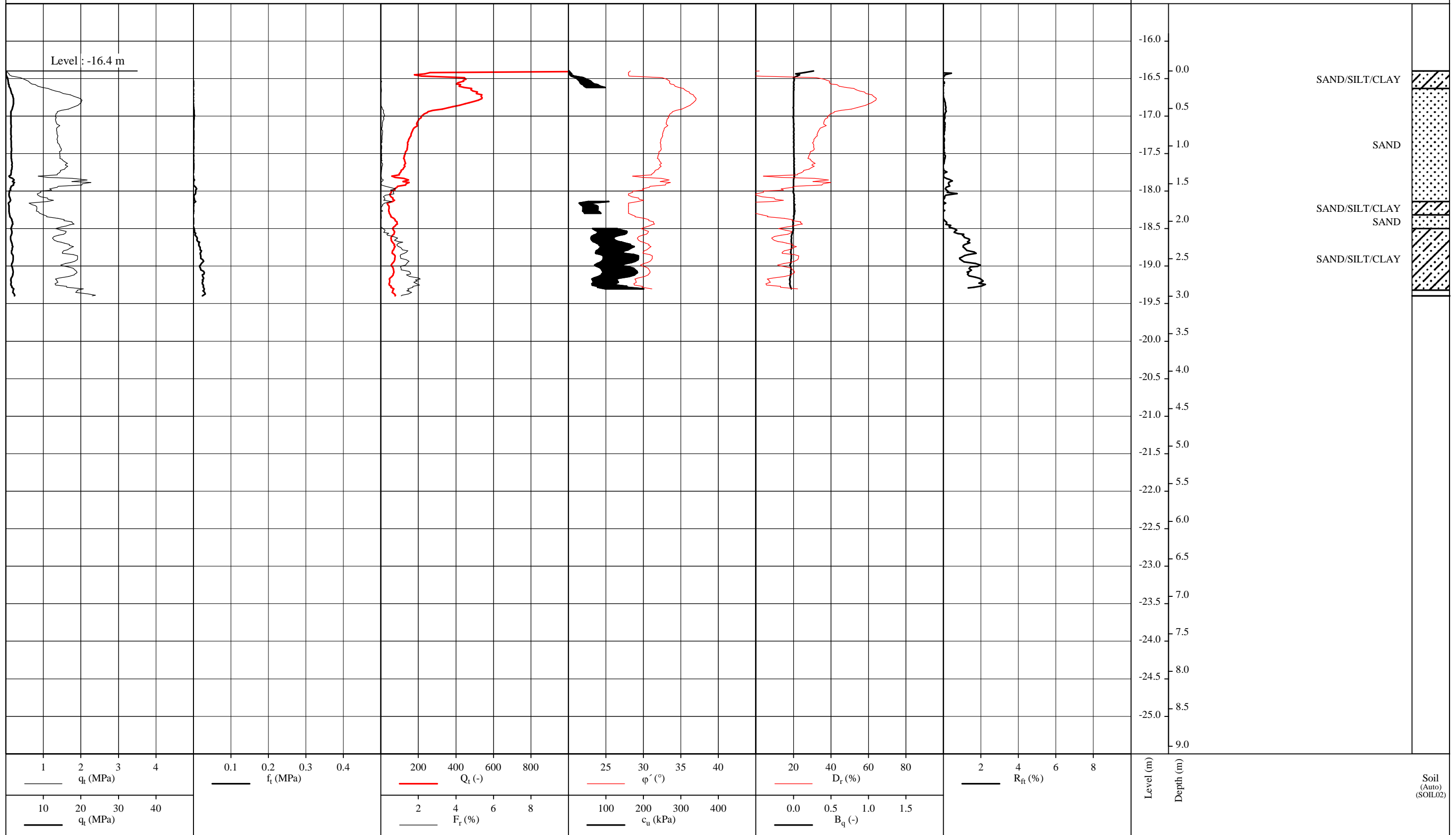
E : 626765	Cone no. : 080914	Rig : Minirig
N : 6265241	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-06-29	Subject: SYD CPT 06
Checked : LAR	Date: 2009-06-29	Page 1 / 1
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.15 Rev.

CPT name : SYD CPT 07



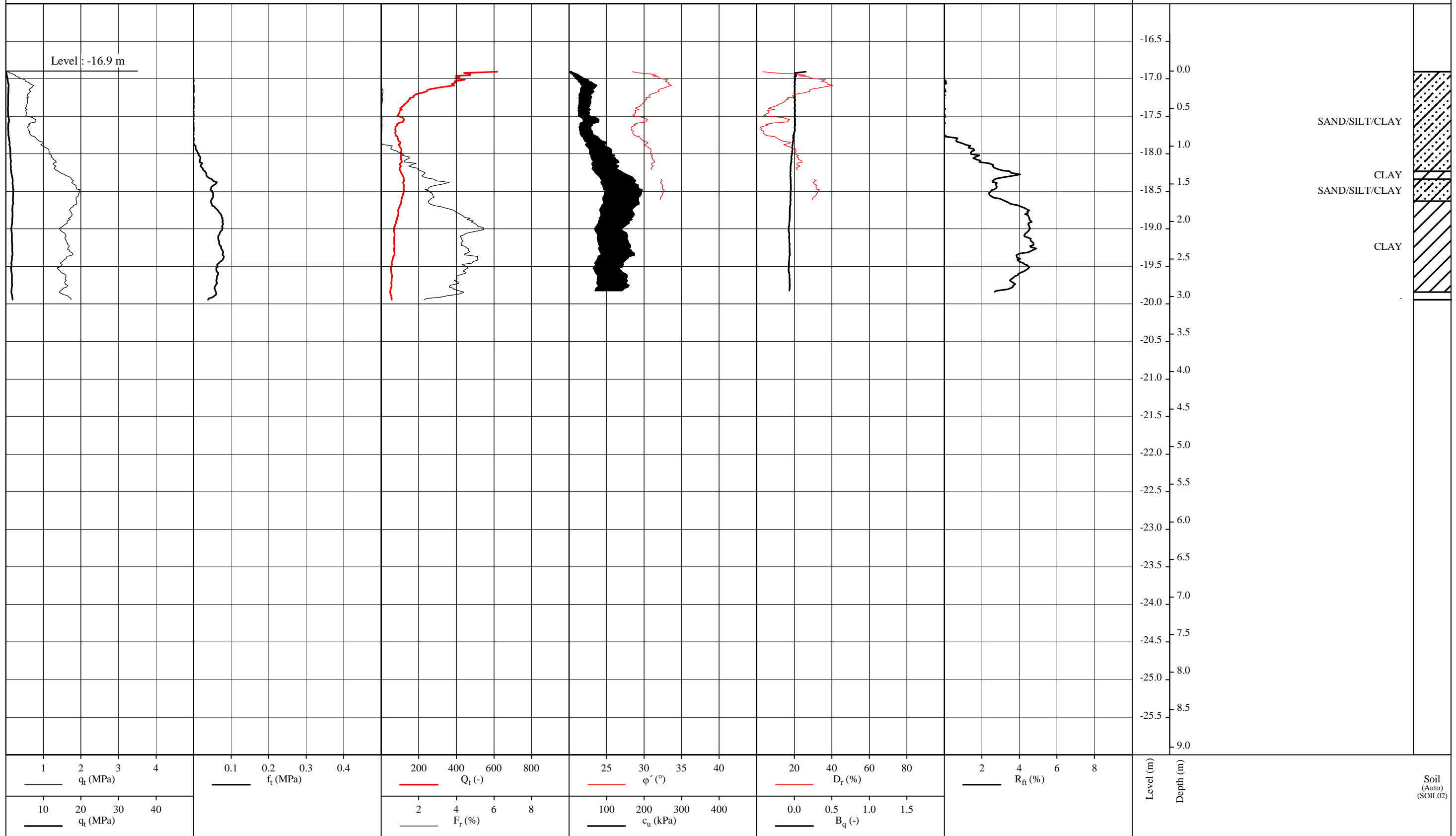
E : 627691	Cone no. : 080914	Rig : Minirig
N : 6266825	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-06-29	Subject: SYD CPT 07
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.16

CPT name : SYD CPT 08



E : 628671	Cone no. : 080914	Rig : Minirig
N : 6268496	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-06-29	Subject: SYD CPT 08
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.17

CPT name : SYD CPT 09

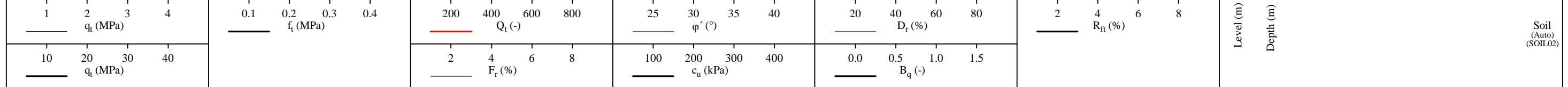
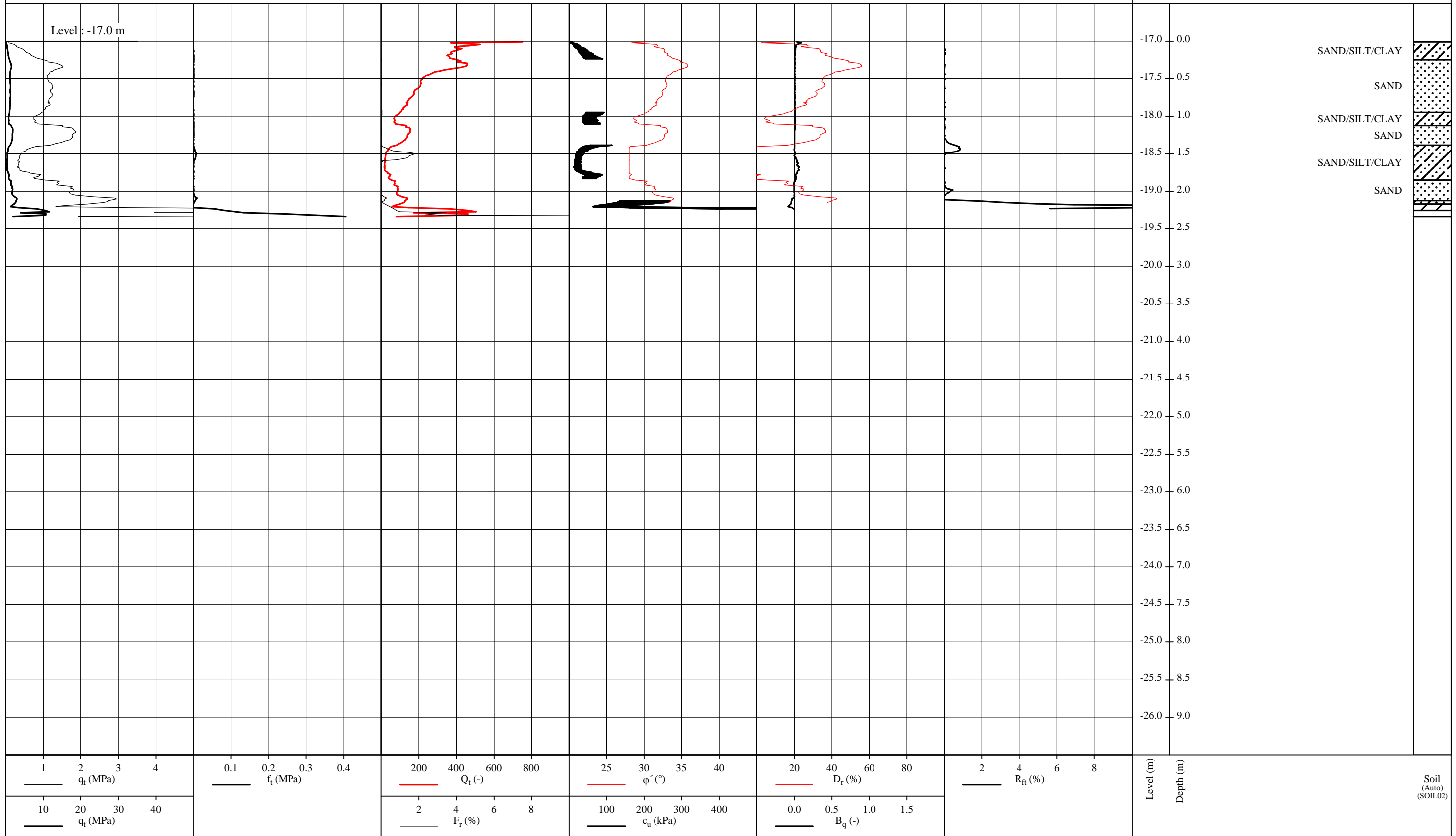


E : 629388	Cone no. : 080914	Rig : Minirig
N : 6269729	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark :

GEO Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

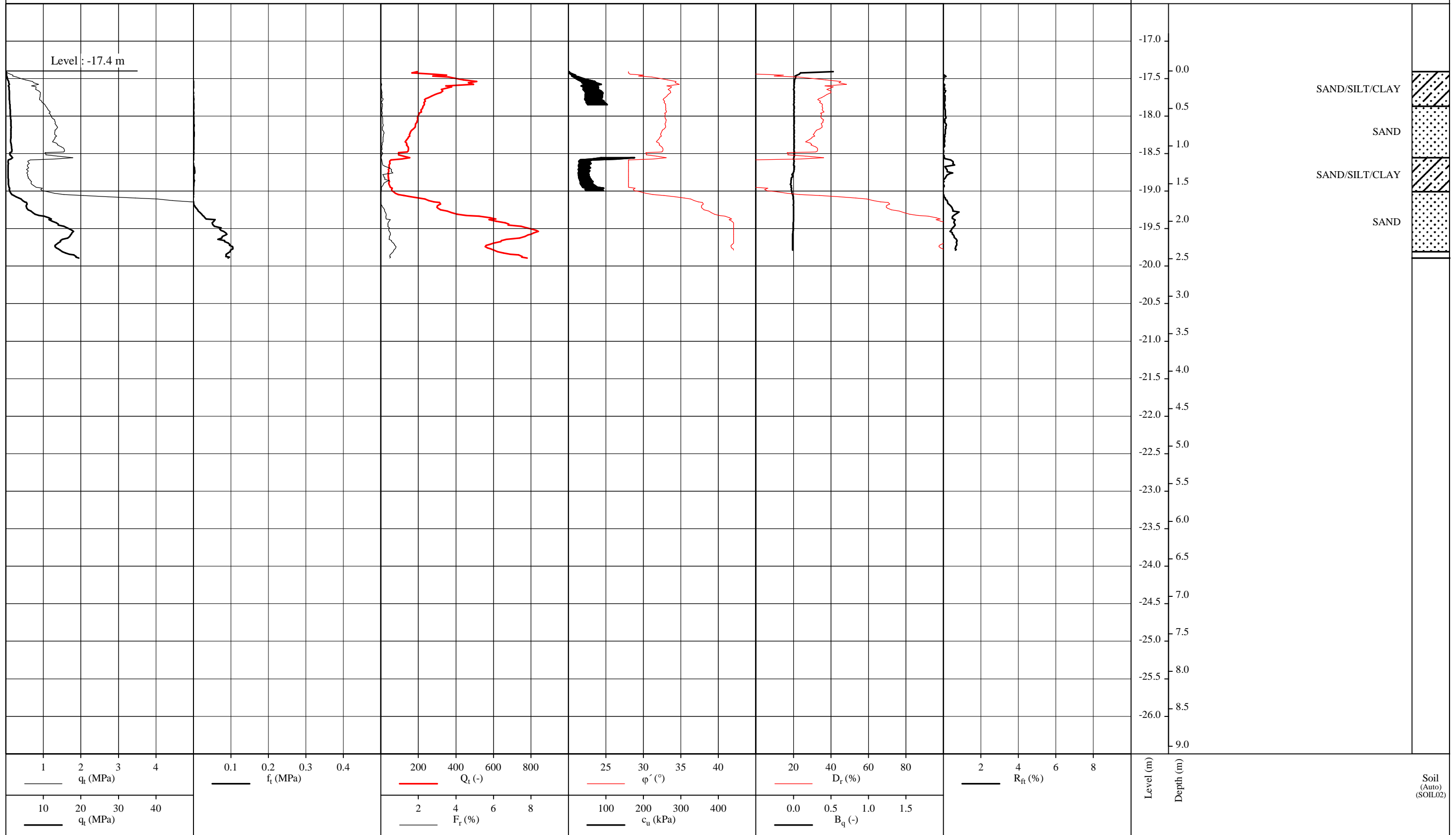
Prepared : MTM	Date: 2009-06-29	Subject: SYD CPT 09
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.18

CPT name : SYD CPT 10



E : 630098	Cone no. : 080914	Rig : Minirig
N : 6270941	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-06-29	Subject: SYD CPT 10
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.19
		Page 1 / 1
		Rev.

CPT name : SYD CPT 11

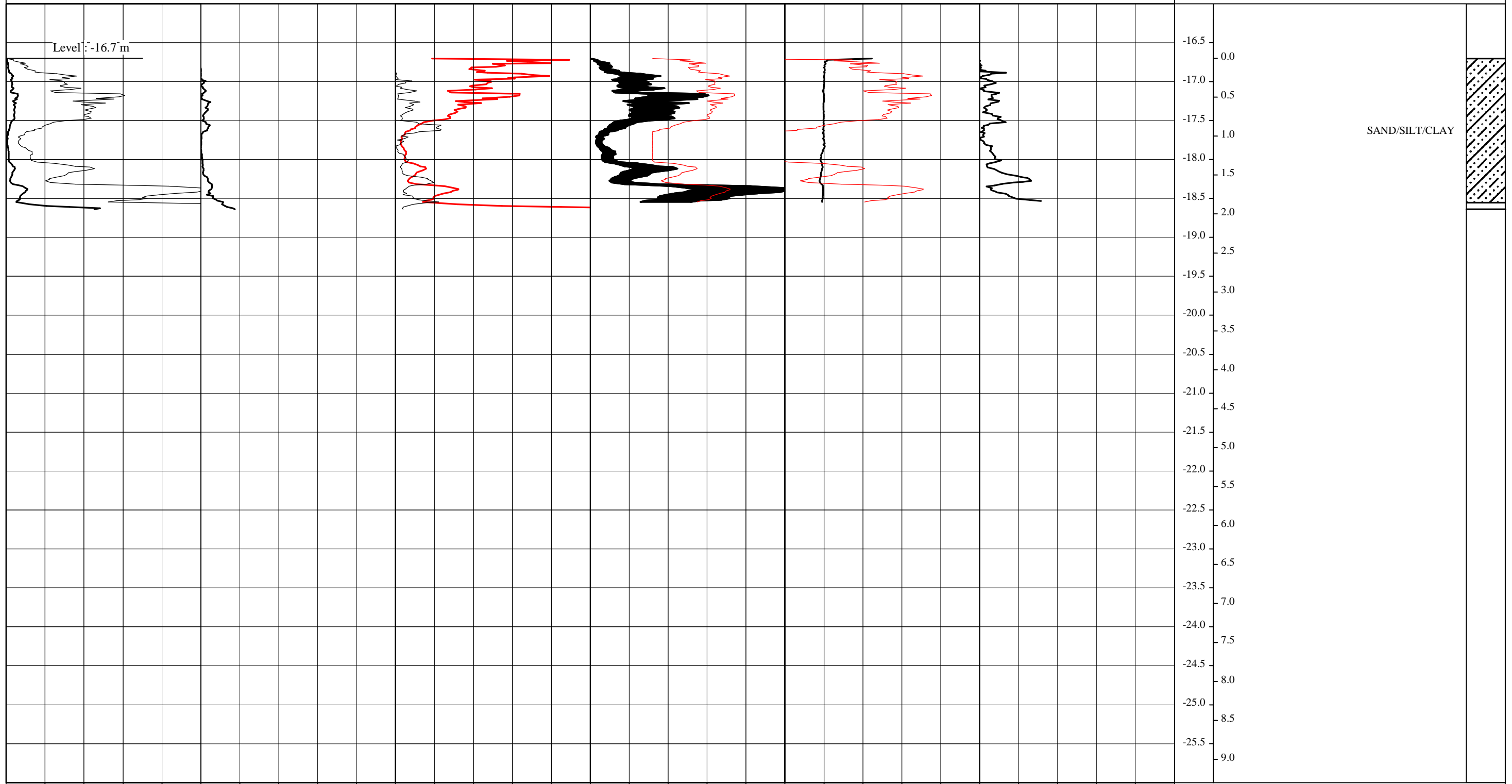


E : 632176	Cone no. : 080914	Rig : Minirig
N : 6274492	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark :

GEO Danish Geotechnical Institute Project : 32490 Anholt Djursland OWF.

Prepared : MTM	Date: 2009-06-29	Subject: SYD CPT 11
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.20

CPT name : SYD CPT 12



1 2 3 4 q _t (MPa)	0.1 0.2 0.3 0.4 f _t (MPa)	200 400 600 800 Q _t (-)	25 30 35 40 φ' (°)	20 40 60 80 D _r (%)	2 4 6 8 R _{fi} (%)	Level (m) Depth (m)	Soil (Auto) (SOIL02)
10 20 30 40 q _t (MPa)		2 4 6 8 F _r (%)	100 200 300 400 c _u (kPa)	0.0 0.5 1.0 1.5 B _q (-)			

E : 632000	Cone no. : 080914	Rig : Minirig
N : 6274195	Cone type : TSP	Performed by : PHA
Date : 2009-06-06	Cone area : 10.0 cm ²	Remark :
GEO Danish Geotechnical Institute		Project : 32490 Anholt Djursland OWF.
Prepared : MTM	Date: 2009-06-29	Subject: SYD CPT 12
Checked : LAR	Date: 2009-06-29	
Approved : JBC	Date: 2009-06-29	Report 2 Enclosure: 2F.21

Enclosure 2G.01 – 2G.20
Particle Size Distribution Curves

Performed : EMB
 Checked : LIV
 Approved : JLC

Date : 2009-06-25
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

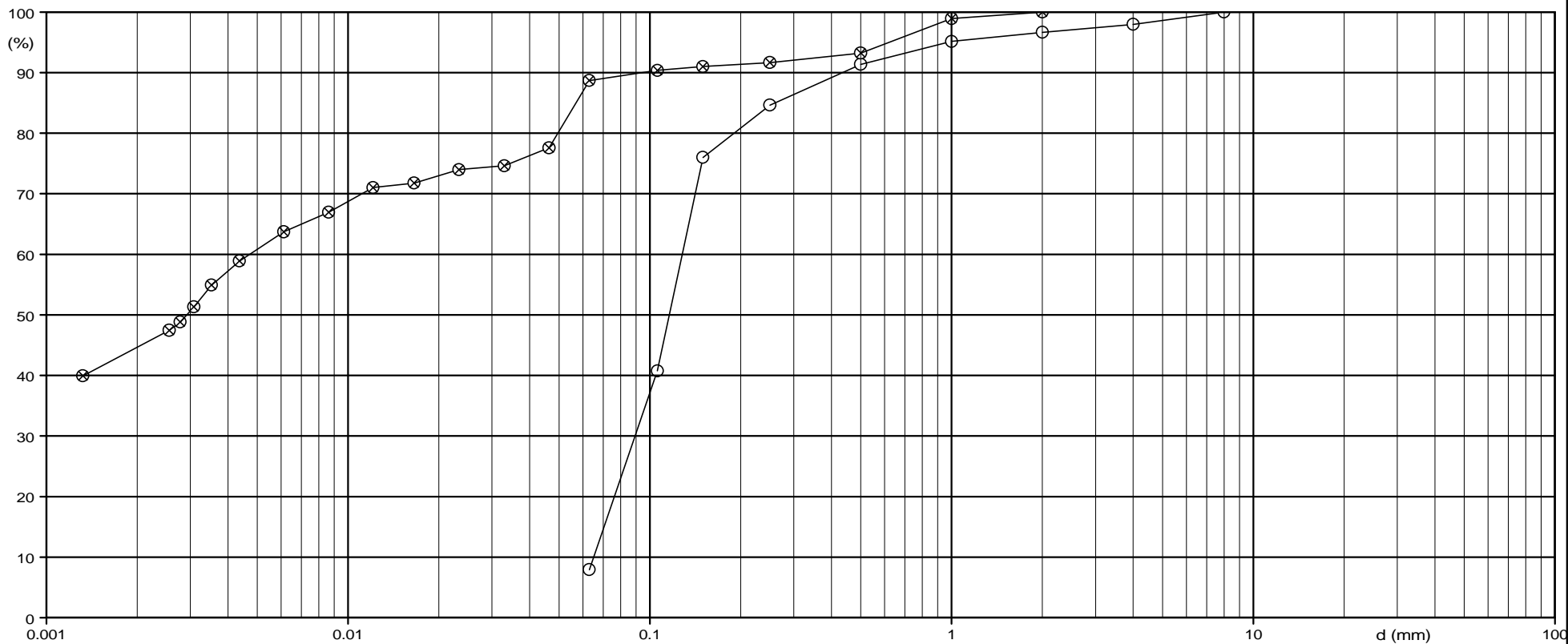
Anholt: Djursland Wind Farm

Encl. No. : 2G.01 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	NORD_VIB01 / 2M	NORD_VIB01 / 3T	/	/	/
Curve	○	⊗			
Geology	SAND	CLAY			
Medium grain size d_{50} (mm)	0.116	0.0029			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.128 / 0.0651 = 1.97	0.0047 / =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	52.9 - 20.9 = 32.0	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	32.0 / 44.7 = 0.72	/ =	/ =	/ =
CaCO ₃ (%)		28.86			
Specific gravity d_s					
Note					

Performed : EMB
 Checked : RIM
 Approved : JLC

Date : 2009-06-30
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

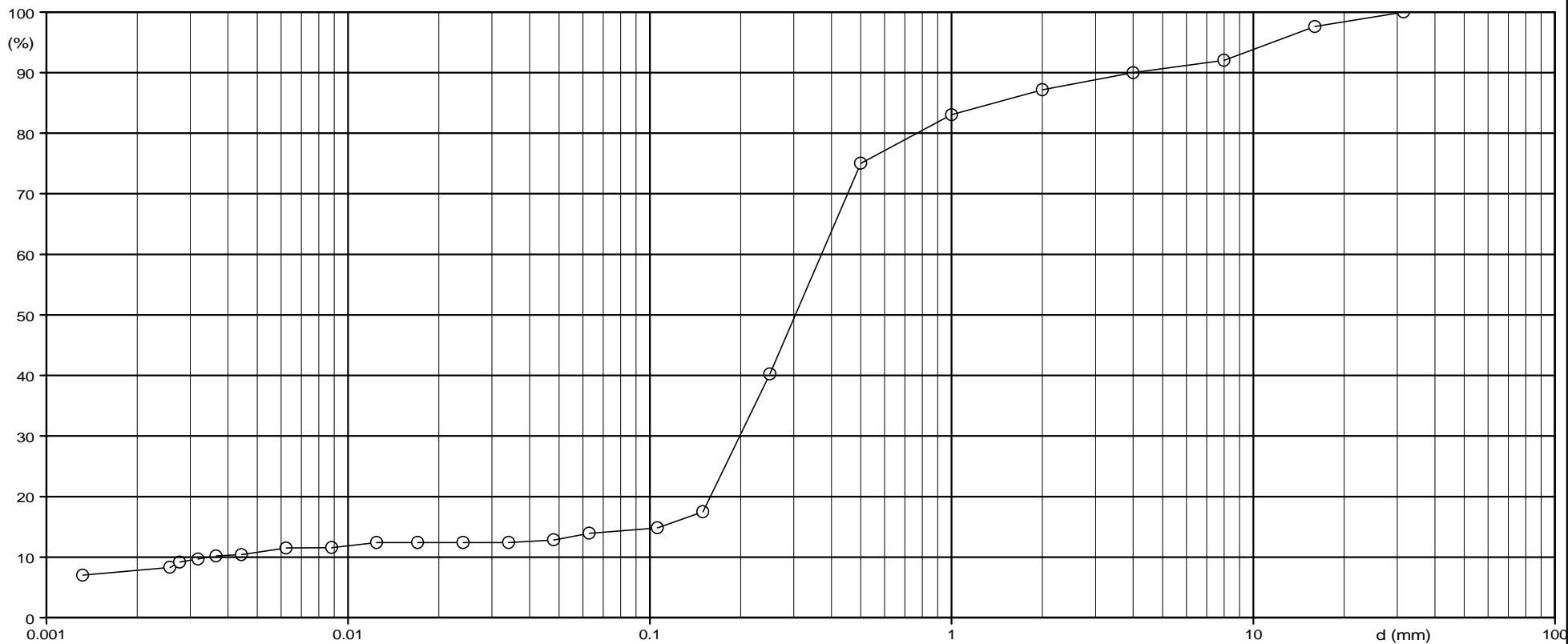
Anholt: Djursland Wind Farm

Encl. No : 2G.02 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	NORD_VIB02 / 1M	/	/	/
Curve	○			
Geology	SAND			
Medium grain size d_{50} (mm)	0.304			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.371 / 0.0035 = 106.92	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ 7.8 =	/ =	/ =	/ =
CaCO ₃ (%)				
Specific gravity d_s				
Note				

Performed : EMB
 Checked : RIM
 Approved : JLC

Date : 2009-06-30
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

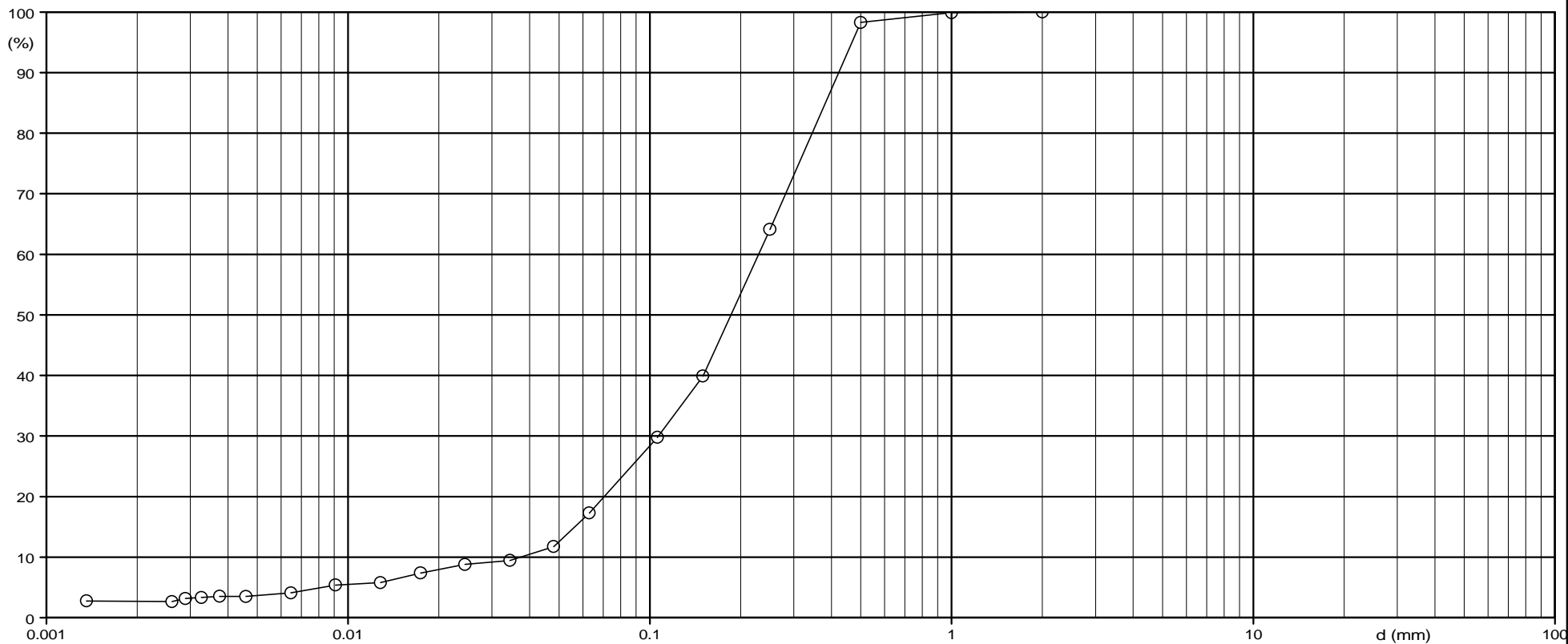
Anholt: Djursland Wind Farm

Encl. No. : 2G.03 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	NORD_VIB03 / 2B	/	/	/	/
Curve	○				
Geology	SAND				
Medium grain size d_{50} (mm)	0.186				
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.229 / 0.0372 = 6.16	/ =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ 2.7 =	/ =	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					

Performed : EMB
 Checked : RIM
 Approved : JLC

Date : 2009-06-23
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

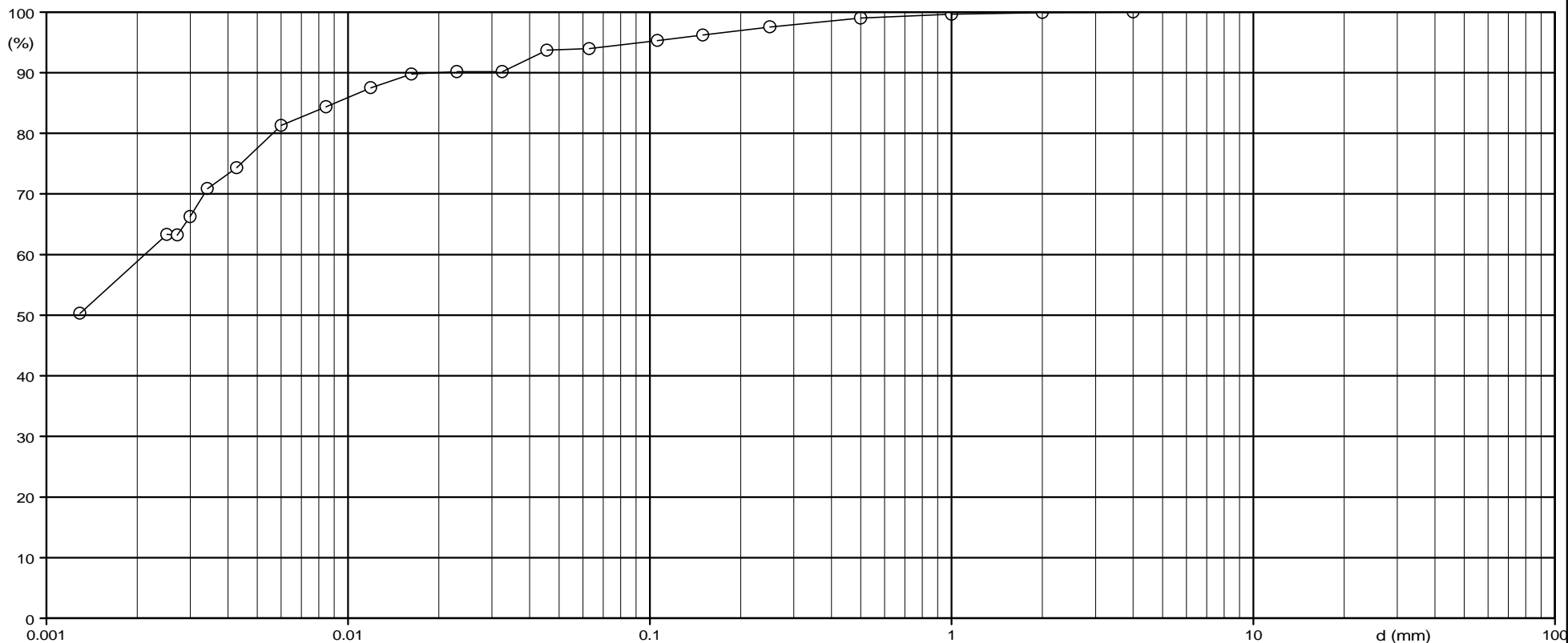
Anholt: Djursland Wind Farm

Encl. No : 2G.04 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	NORD_VIB04 / 2B	/	/	/	/
Curve	○				
Geology	CLAY				
Medium grain size d_{50} (mm)					
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.0021 / =	/ =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	54.5 - 22.2 = 32.3	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	32.3 / 58.9 = 0.55	/ =	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					



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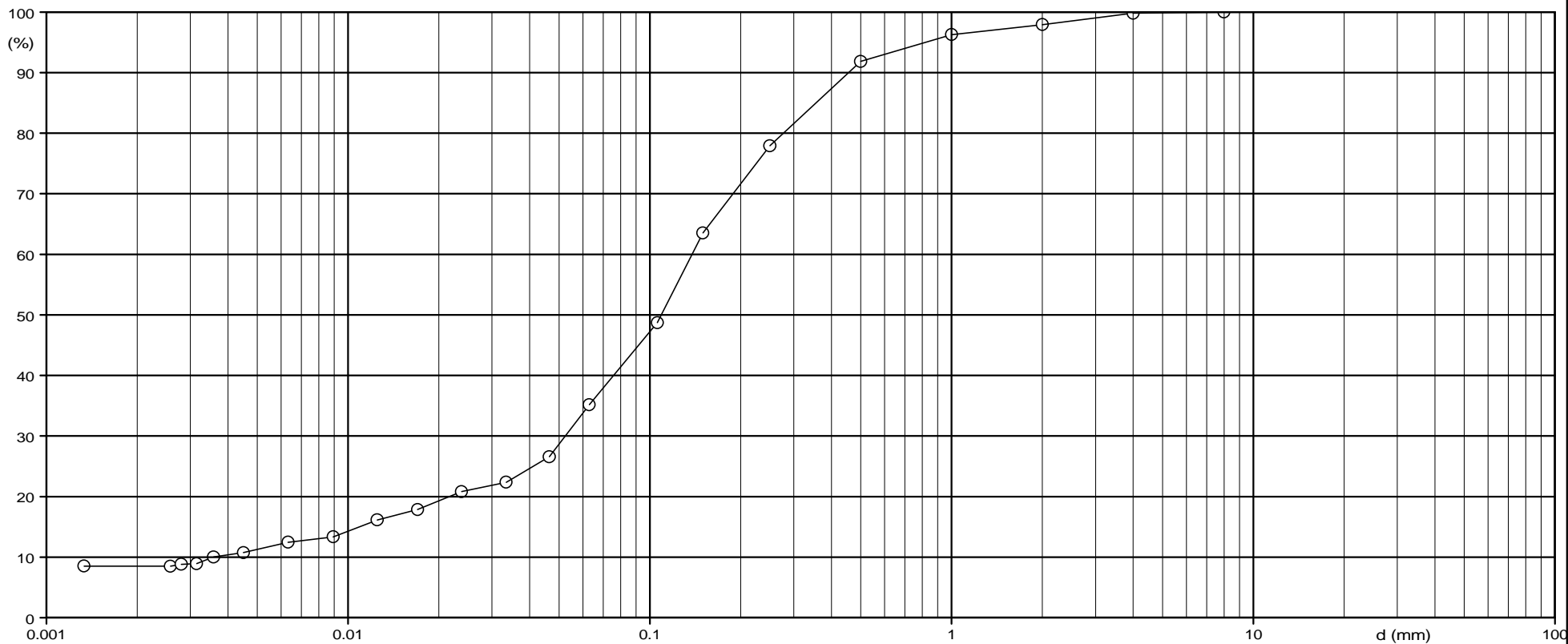
Grain Size Distribution

Performed : RIM
Checked : RIM
Approved : JLC
Date : 2009-06-30
Date : 2009-06-30
Date : 2009-07-01

Job : 32490

Anholt: Djursland Wind Farm

Encl. No. : 2G.05 Pg. 1 / 1



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	NORD_VIB05 / 2T	/	/	/
Curve	○			
Geology	SAND			
Medium grain size d_{50} (mm)	0.109			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.138 / 0.0036 = 38.55	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ 8.5 =	/ =	/ =	/ =
CaCO ₃ (%)				
Specific gravity d_s				
Note				

Performed : EMB
 Checked : LIV
 Approved : JLC

Date : 2009-06-26
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

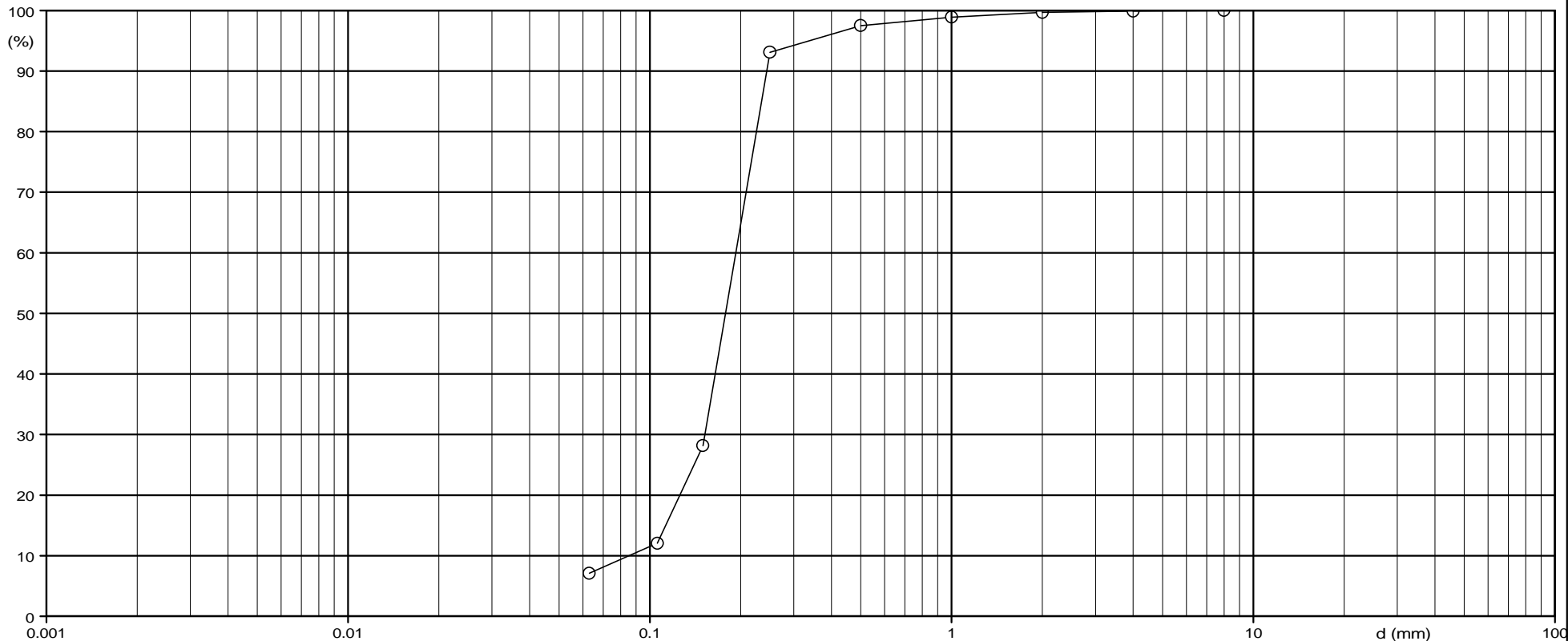
Anholt: Djursland Wind Farm

Encl. No. : 2G.06 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	NORD_VIB06 / 1	/	/	/
Curve	○			
Geology	SAND			
Medium grain size d_{50} (mm)	0.178			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.193 / 0.0855 = 2.26	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	/ =	/ =	/ =
CaCO ₃ (%)				
Specific gravity d_s				
Note				

Performed : EMB
 Checked : LIV
 Approved : JLC

Date : 2009-06-26
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

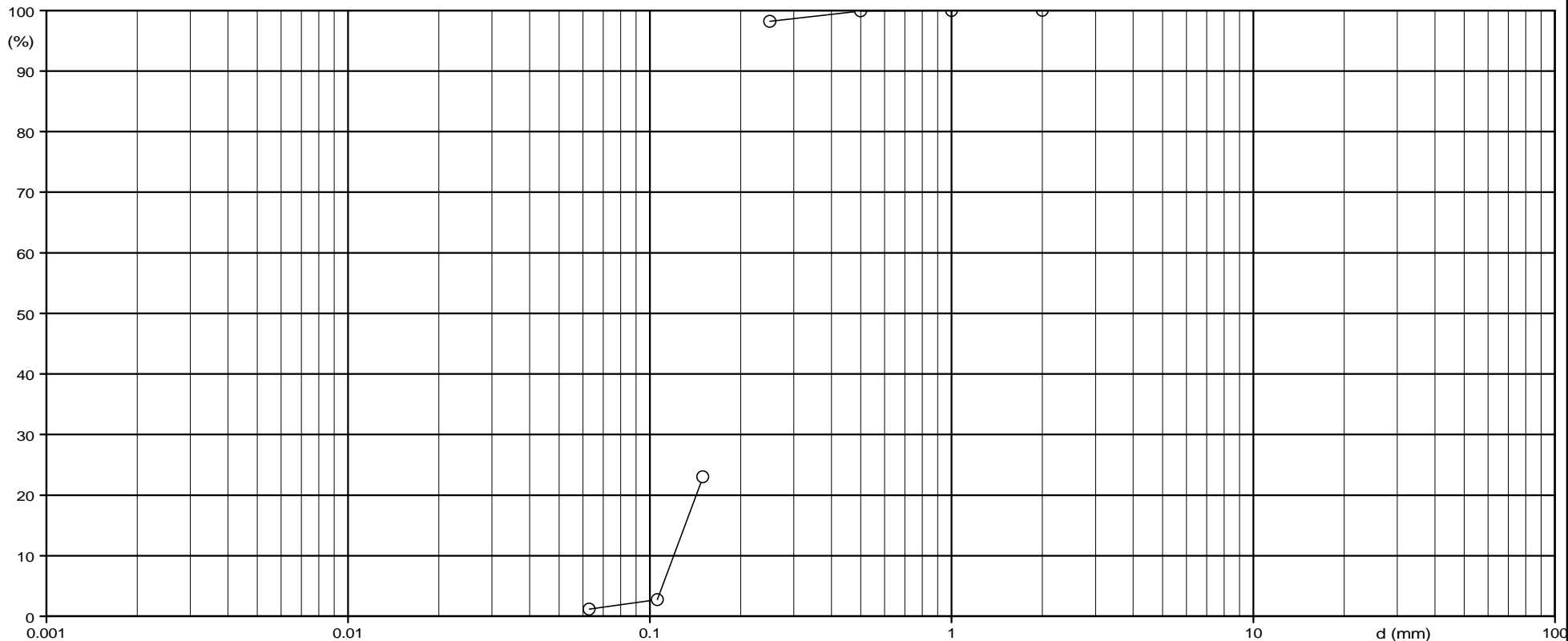
Anholt: Djursland Wind Farm

Encl. No : 2G.07 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	NORD_VIB07 / 1	/	/	/
Curve	○			
Geology	SAND			
Medium grain size d_{50} (mm)	0.18			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.193 / 0.12 = 1.61	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	/ =	/ =	/ =
CaCO ₃ (%)				
Specific gravity d_s				
Note				

Performed : RIM
Checked :
Approved :

Date : 2009-06-30
Date :
Date :

Job : 32490

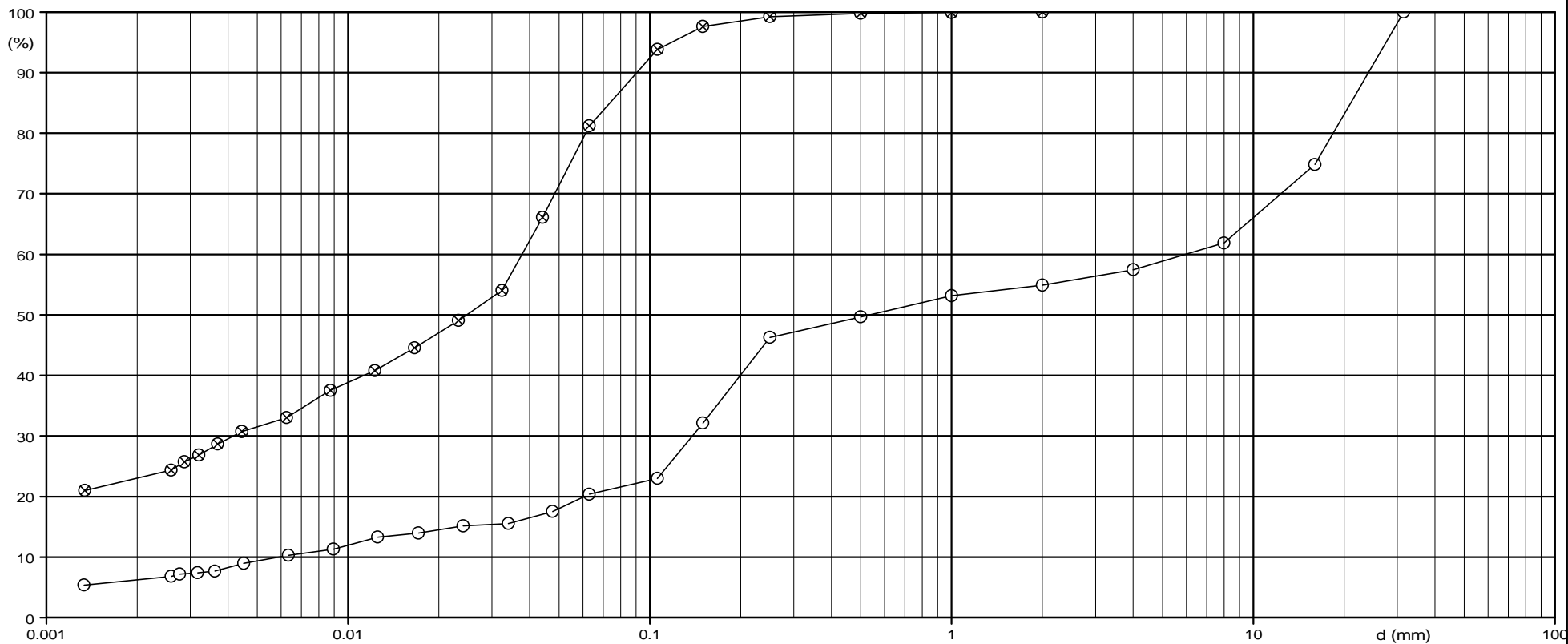
Anholt: Djursland Wind Farm

Encl. No. : G2.08 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	NORD_VIB08 / 1B	NORD_VIB08 / 2B	/	/	/
Curve	○	⊗			
Geology	SAND	CLAY			
Medium grain size d_{50} (mm)	0.534	0.0247			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	5.96 / 0.0059 = 1015.33	0.0377 / =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	54.3 - 24.6 = 29.7	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ 6.3 =	29.7 / 23.1 = 1.29	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					



Performed : RIM
Checked : LIV
Approved : JLC

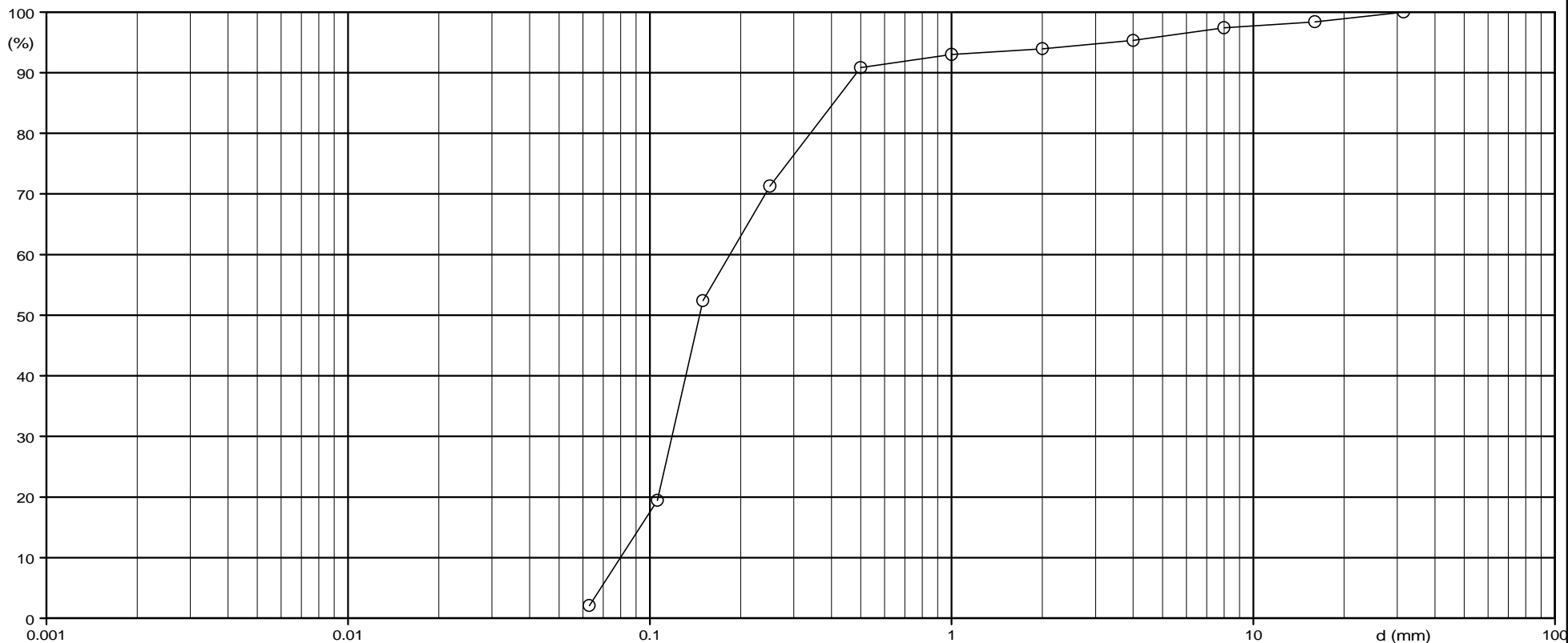
Date : 2009-06-30
Date : 2009-06-30
Date : 2009-07-01

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Job : 32490

Anholt: Djursland Wind Farm

Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	NORD_VIB09 / 1T	/	/	/
Curve	○			
Geology	SAND			
Medium grain size d_{50} (mm)	0.146			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.184 / 0.0799 = 2.3	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	/ =	/ =	/ =
CaCO ₃ (%)				
Specific gravity d_s				
Note				

Performed : EMB
Checked : RIM
Approved : JLC

Date : 2009-06-25
Date : 2009-06-30
Date : 2009-07-01

Job : 32490

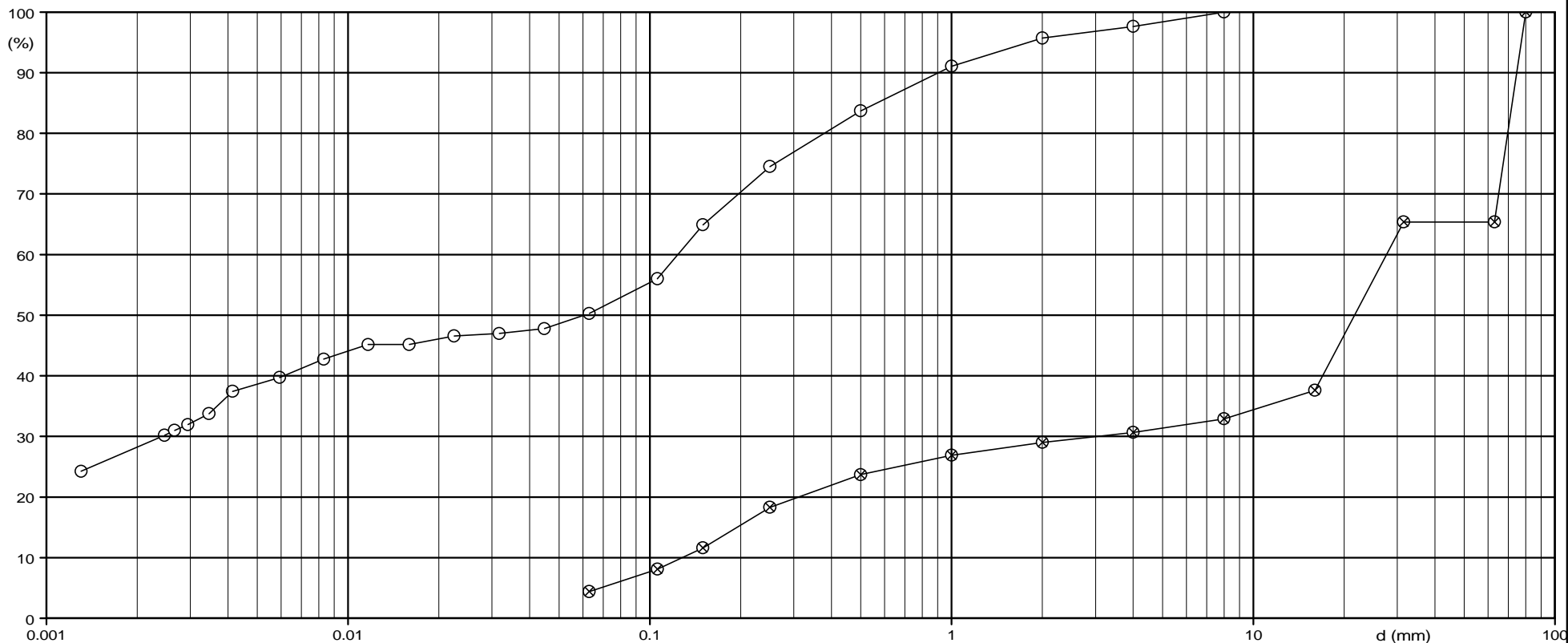
Anholt: Djursland Wind Farm

Encl. No. : 2G.10 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB02 / 1B	SYD_VIB02 / 1T	/	/	/
Curve	○	⊗			
Geology	SAND	GRAVEL			
Medium grain size d_{50} (mm)	0.0607	21.6			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.124 / =	27.6 / 0.128 = 215.63	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ 28.2 =	/ =	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					

Performed : EMB
 Checked : LIV
 Approved : JLC

Date : 2009-06-26
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

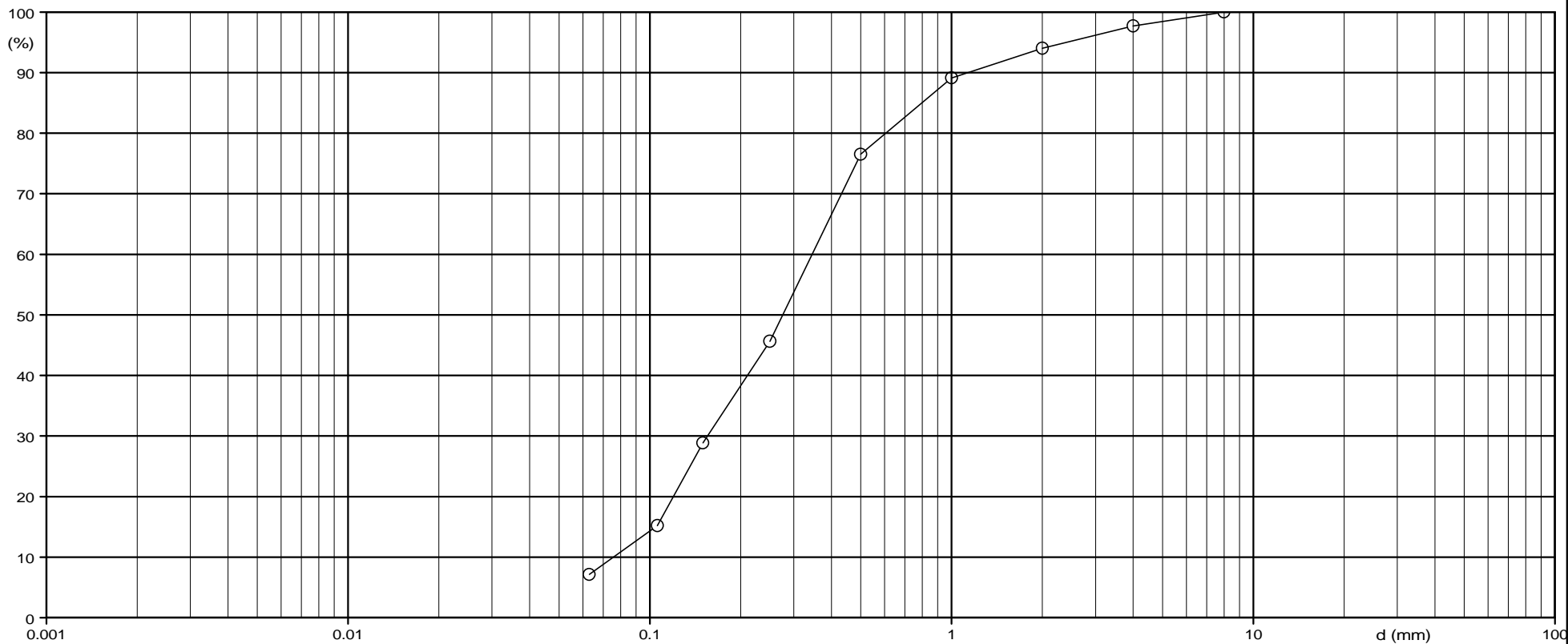
Anholt: Djursland Wind Farm

Encl. No. : 2G.11 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB03 / 2T	/	/	/	/
Curve	○				
Geology	SAND				
Medium grain size d_{50} (mm)	0.276				
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.345 / 0.0757 = 4.56	/ =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	/ =	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					

Performed : EMB
 Checked : LIV
 Approved : JLC

Date : 2009-06-26
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

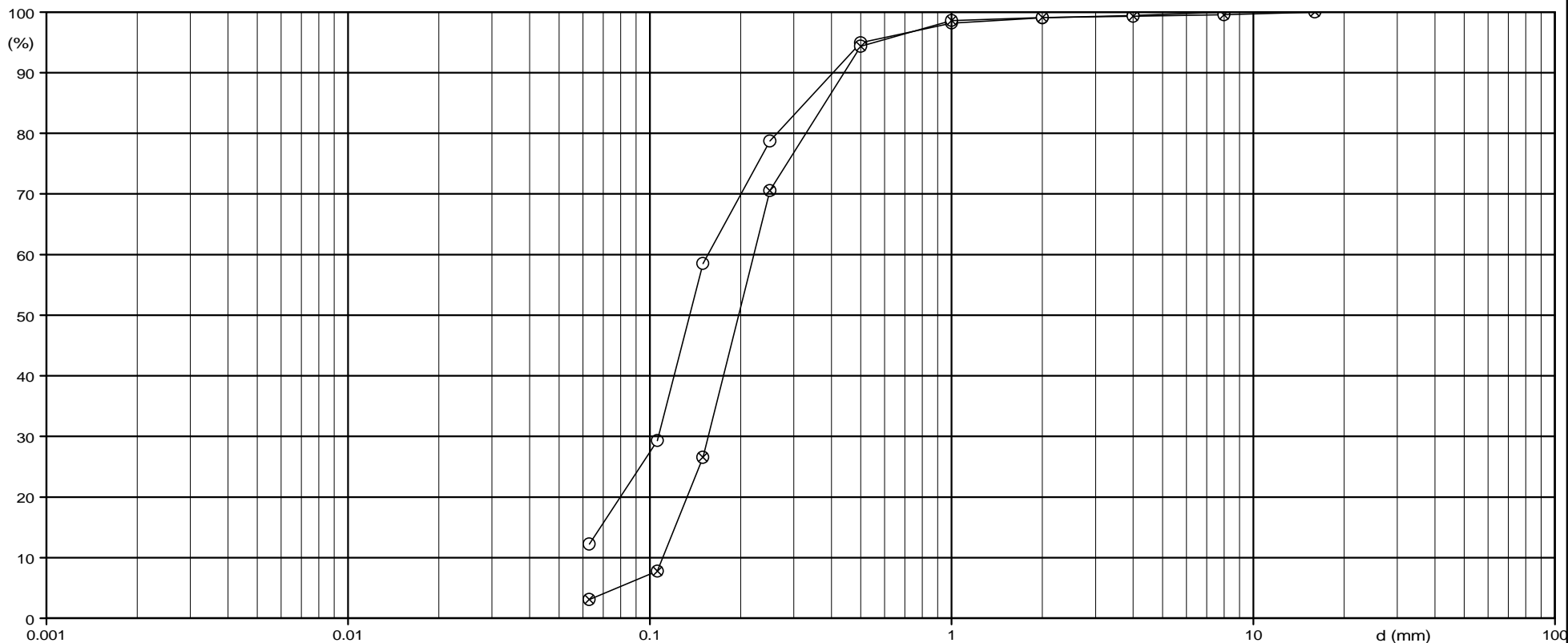
Anholt: Djursland Wind Farm

Encl. No : 2G.12 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB04 / 1B	SYD_VIB04 / 1T	/	/	/
Curve	○	⊗			
Geology	SAND	SAND			
Medium grain size d_{50} (mm)	0.136	0.197			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.156 / =	0.221 / 0.11 = 2.01	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	/ =	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					



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Grain Size Distribution

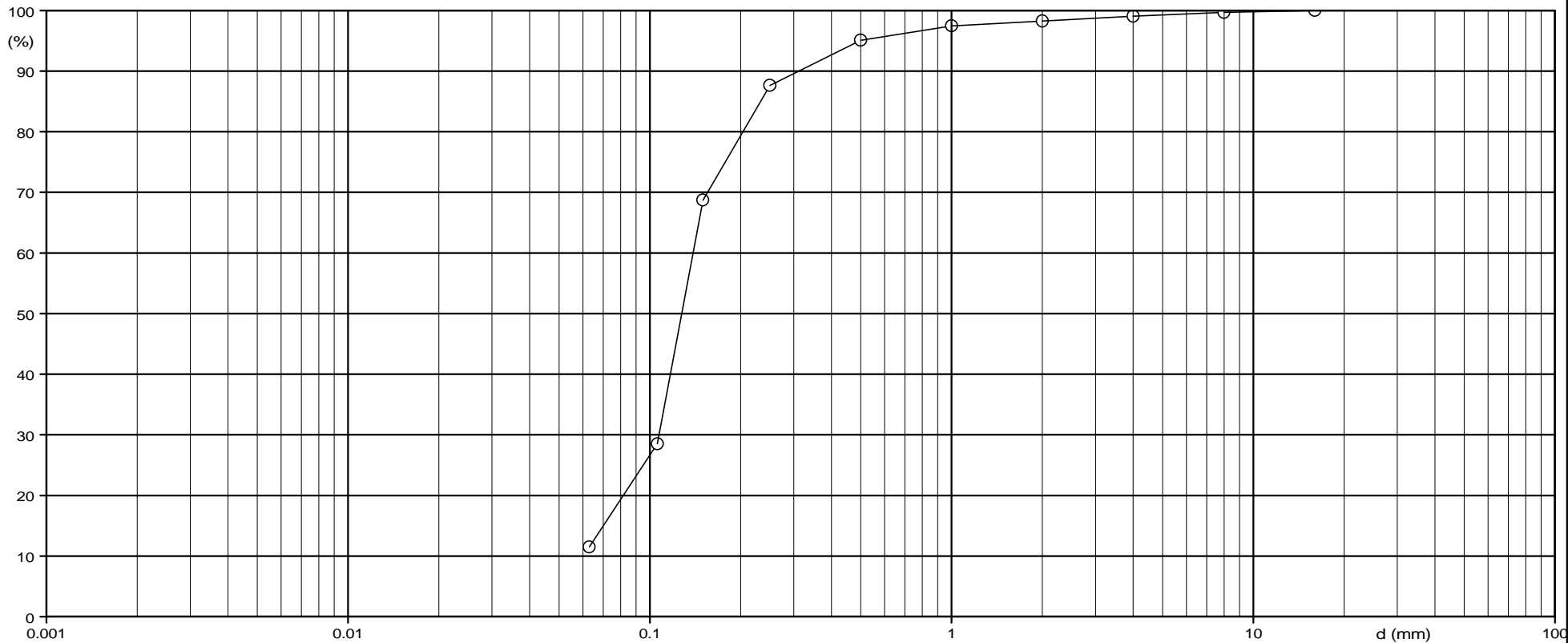
Performed : EMB
Checked : LIV
Approved : JLC

Date : 2009-06-25
Date : 2009-06-30
Date : 2009-07-01

Job : 32490

Anholt: Djursland Wind Farm

Encl. No. : 2G.13 Pg. 1 / 1



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB05 / 2T	/	/	/
Curve	○			
Geology	SAND			
Medium grain size d_{50} (mm)	0.128			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.139 / 0.0602 = 2.31	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	/ =	/ =	/ =
CaCO ₃ (%)				
Specific gravity d_s				

Note



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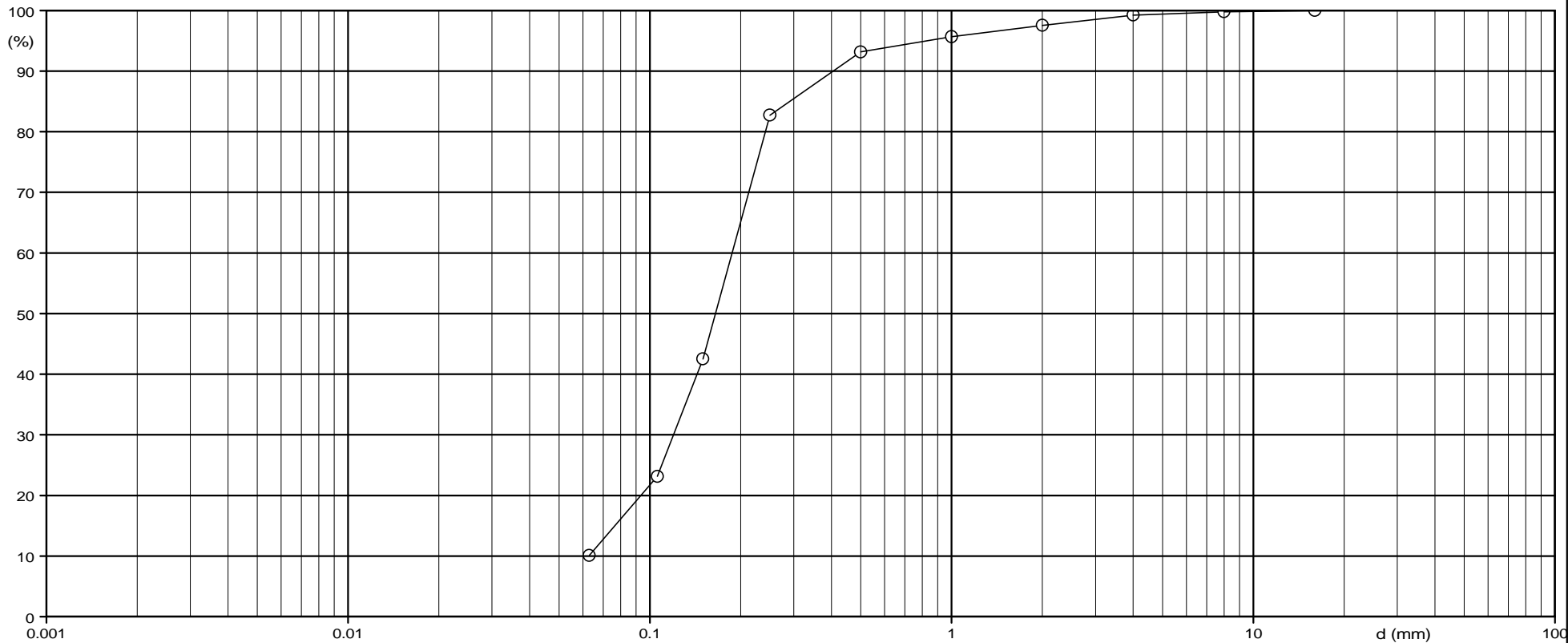
Grain Size Distribution

Performed : EMB
Checked : LIV
Approved : JLC

Date : 2009-06-25
Date : 2009-06-30
Date : 2009-07-01

Job : 32490

Anholt: Djursland Wind Farm



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB06 / 2T	/	/	/	/
Curve	○				
Geology	SAND				
Medium grain size d_{50} (mm)	0.165				
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.187 / 0.0627 = 2.98	/ =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	/ =	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					

Performed : EMB
 Checked : RIM
 Approved : JLC

Date : 2009-06-26
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

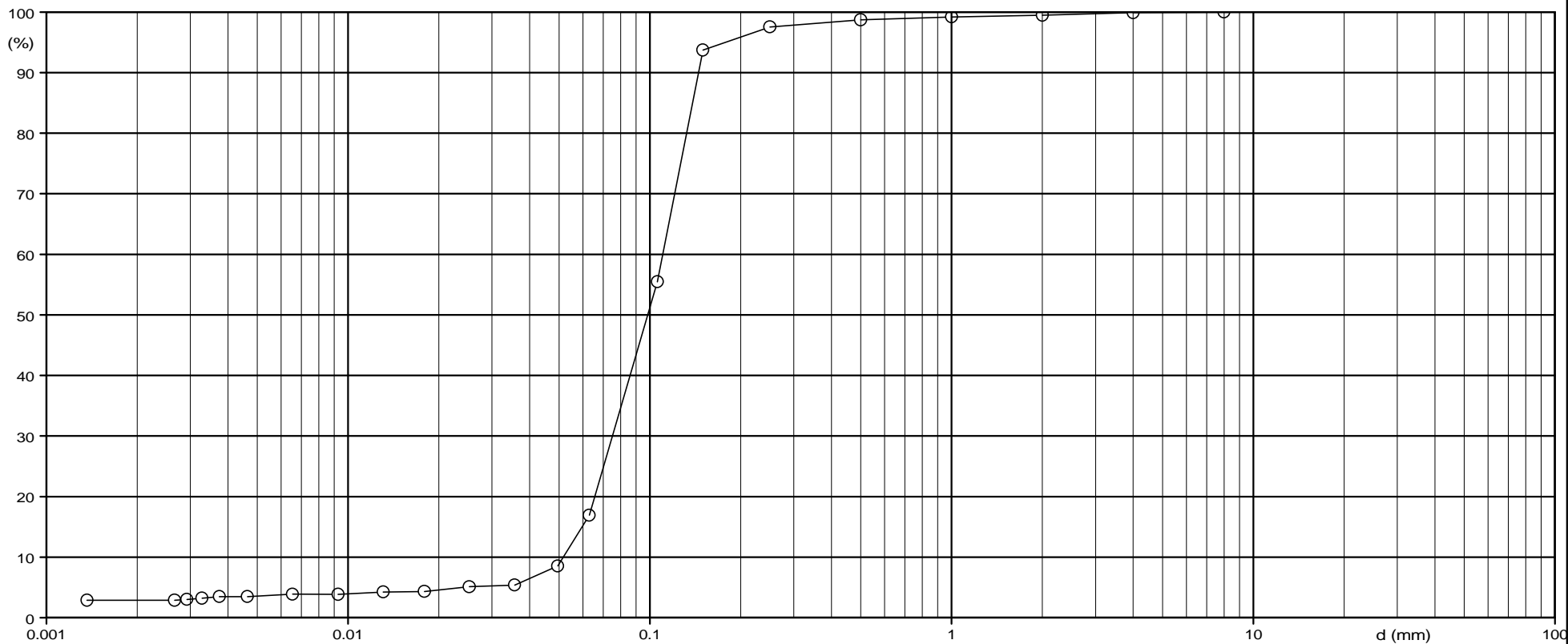
Anholt: Djursland Wind Farm

Encl. No. : 2G.15 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB07 / 1	/	/	/	/
Curve	○				
Geology	SAND				
Medium grain size d_{50} (mm)	0.0985				
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.11 / 0.0516 = 2.13	/ =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ 2.9 =	/ =	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					

Performed : EMB
 Checked : RIM
 Approved : JLC

Date : 2009-06-23
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

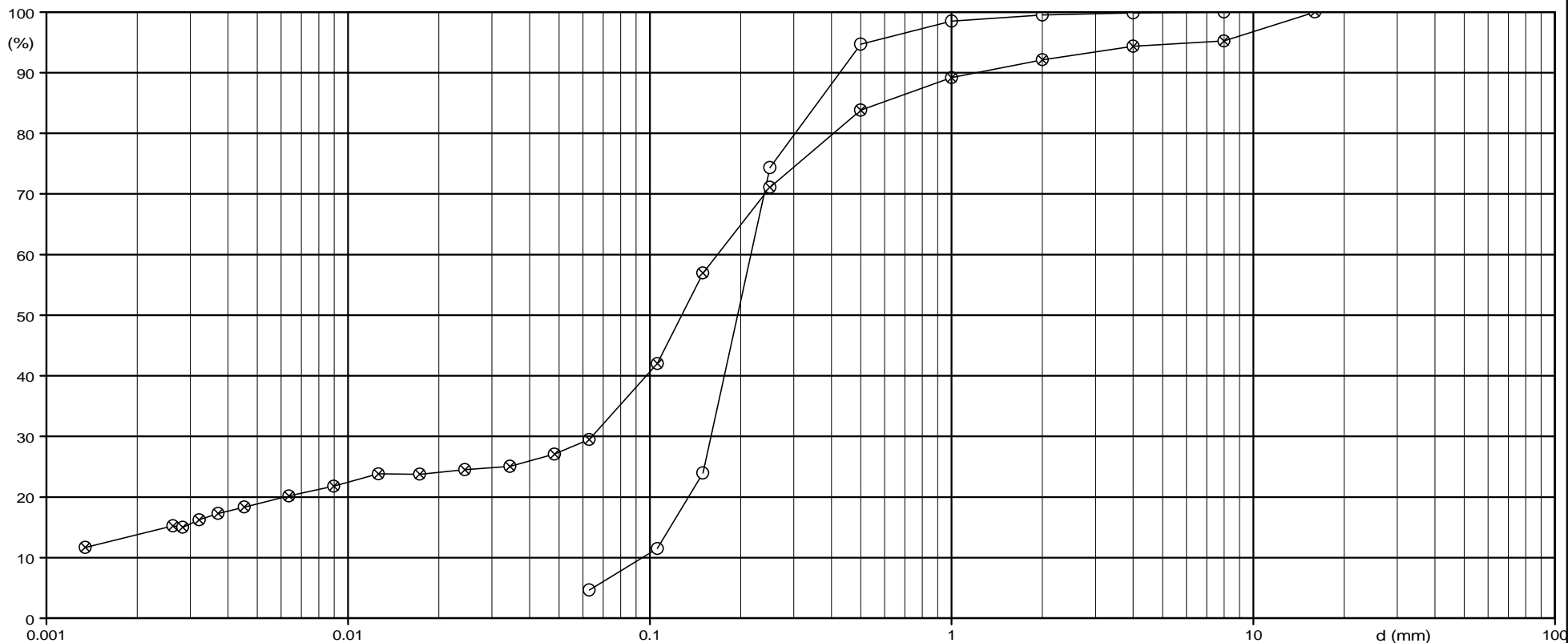
Anholt: Djursland Wind Farm

Encl. No. : 2G-16 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB08 / 1	SYD_VIB08 / 2M	/	/	/
Curve	○	⊗			
Geology	SAND	SAND			
Medium grain size d_{50} (mm)	0.195	0.128			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.216 / 0.0945 = 2.29	0.167 / =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	/ 13.8 =	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					

Performed : EMB
 Checked : RIM
 Approved : JLC

Date : 2009-06-23
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

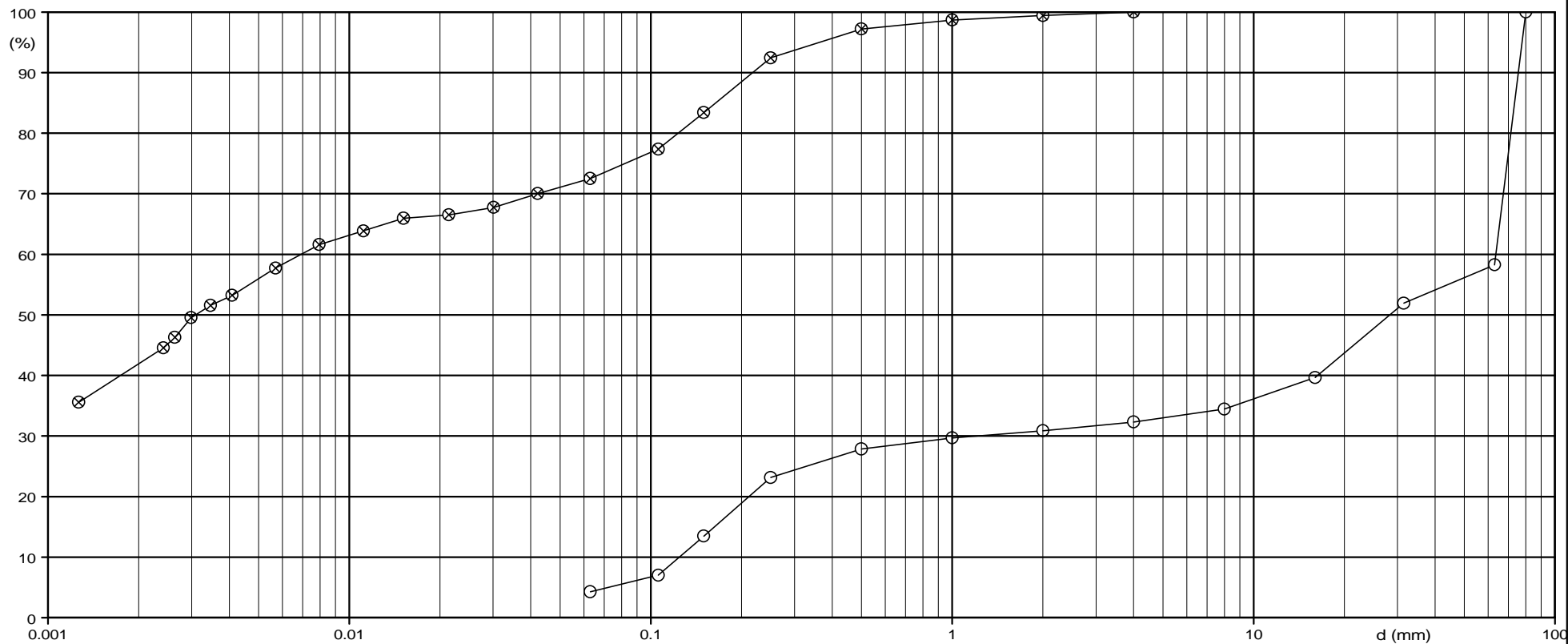
Anholt: Djursland Wind Farm

Encl. No. : 2G.17 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB09 / 1M	SYD_VIB09 / 2	/	/	/
Curve	○	⊗			
Geology	GRAVEL	CLAY			
Medium grain size d_{50} (mm)	28.3	0.0031			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	63.6 / 0.124 = 512.9	0.0069 / =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	39.6 - 15.9 = 23.7	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	23.7 / 41.9 = 0.57	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					

Performed : EMB
 Checked : RIM
 Approved : JILC

Date : 2009-06-23
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

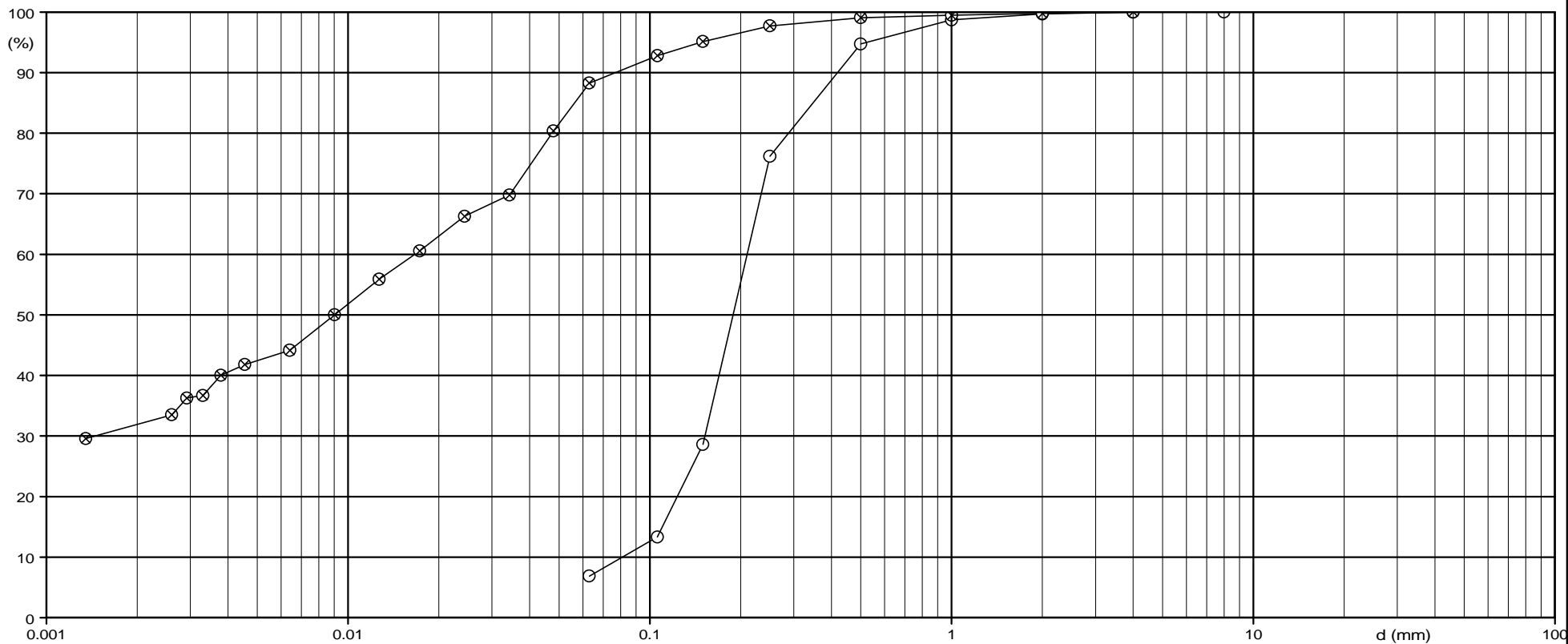
Anholt: Djursland Wind Farm

Encl. No. : 2G.18 Pg. 1 / 1



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Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB10 / 1B	SYD_VIB10 / 2M	/	/	/
Curve	○	⊗			
Geology	SAND	CLAY			
Medium grain size d_{50} (mm)	0.189	0.009			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.21 / 0.081 = 2.59	0.0166 / =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	84.0 - 33.1 = 50.9	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	50.9 / 31.9 = 1.6	/ =	/ =	/ =
CaCO ₃ (%)		4.23			
Specific gravity d_s					
Note					



Performed : EMB
Checked : LIV
Approved : JLC

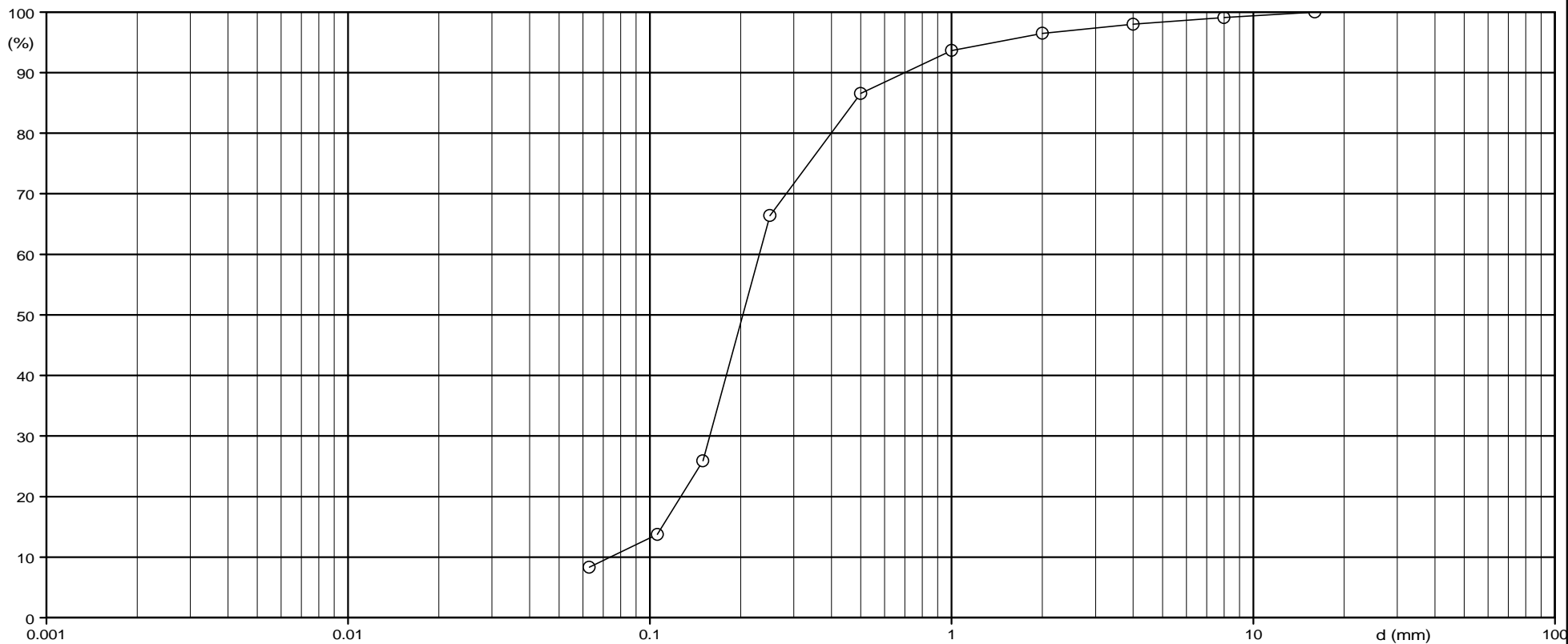
Date : 2009-06-25
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Date : 2009-07-01

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Job : 32490

Anholt: Djursland Wind Farm

Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB11 / 2T	/	/	/	/
Curve	○				
Geology	SAND				
Medium grain size d_{50} (mm)	0.203				
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	0.231 / 0.074 = 3.12	/ =	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	/ =	/ =	/ =	/ =
CaCO ₃ (%)					
Specific gravity d_s					
Note					

Performed : EMB
 Checked : LIV
 Approved : JLC

Date : 2009-06-26
 Date : 2009-06-30
 Date : 2009-07-01

Job : 32490

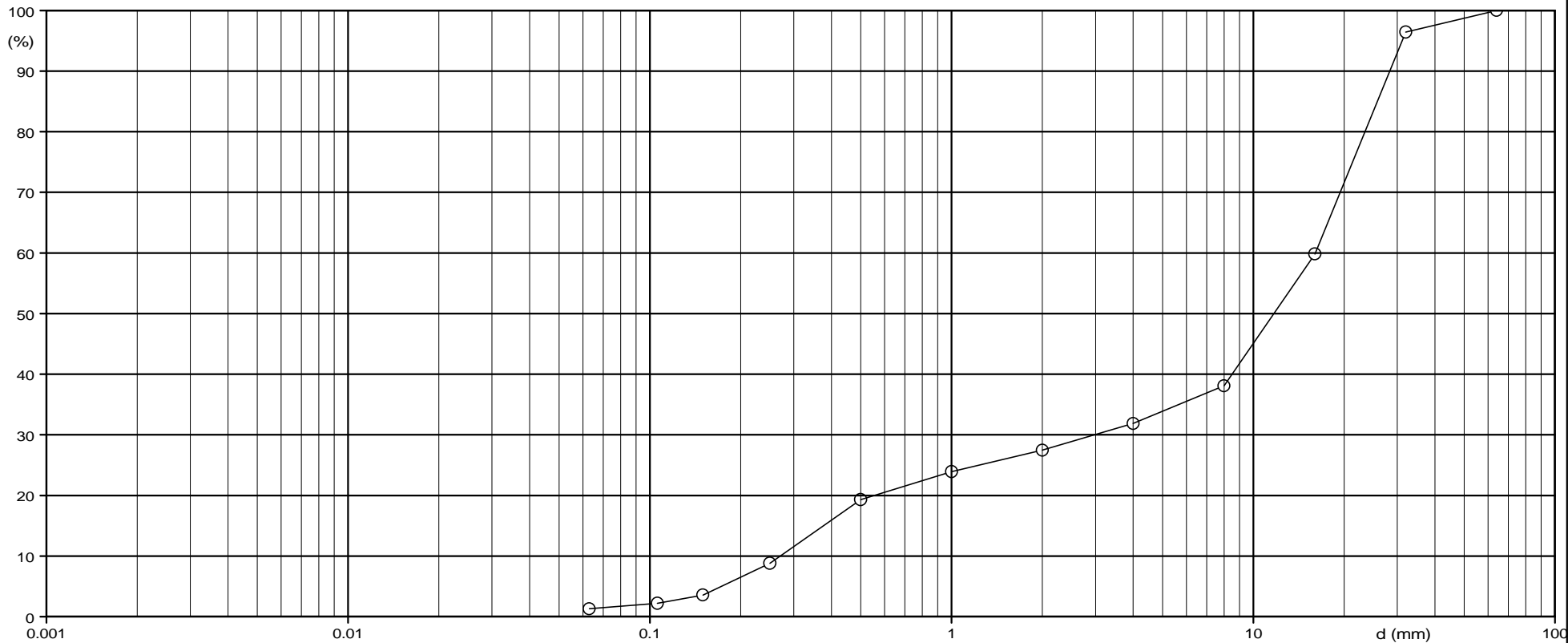
Anholt: Djursland Wind Farm

Encl. No. : 2G-20 Pg. 1 / 1



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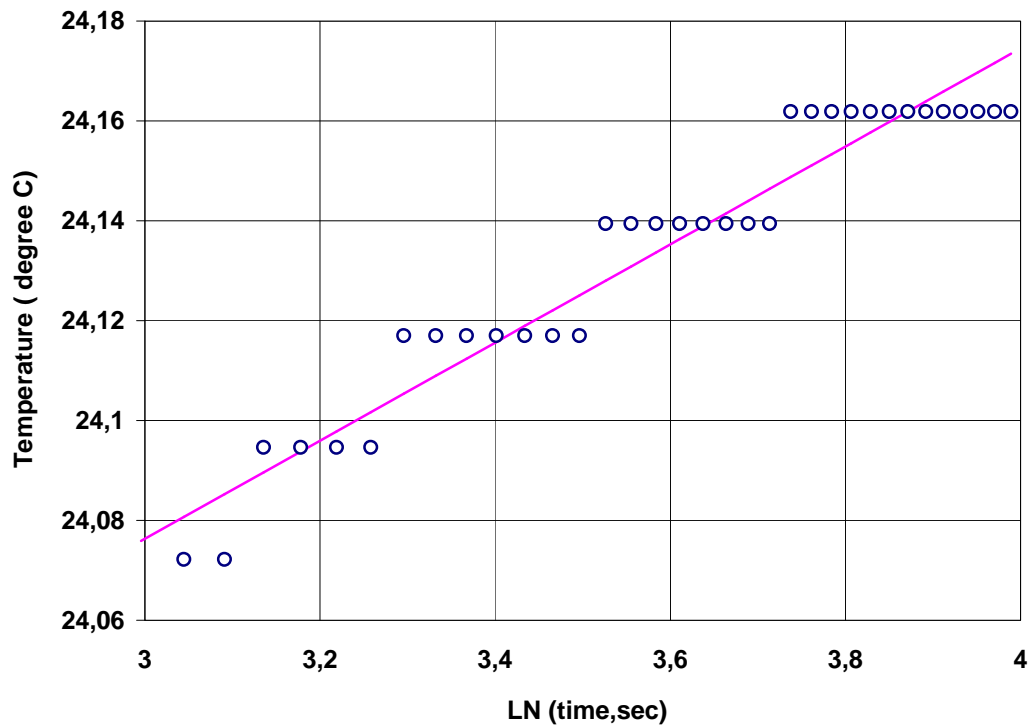
Grain Size Distribution



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	
CLAY	SILT			SAND			GRAVEL			STONE

Boring/Sample No. :	SYD_VIB12 / 1M	/	/	/
Curve	○			
Geology	GRAVEL			
Medium grain size d_{50} (mm)	11.7			
Uniformity coeff. d_{60} (mm) / d_{10} (mm)	16.1 / 0.27 = 59.63	/ =	/ =	/ =
Plasticity index $W_L - W_P = I_P$ (%)	- =	- =	- =	- =
Activity I_P (%) / I_{er} (%) = I_A	/ =	/ =	/ =	/ =
CaCO ₃ (%)				
Specific gravity d_s				
Note				

Enclosure 2H.01 – 2H.07
Thermal Conductivity Tests



Geology: SAND, fine - medium, sl. silty, sl. gravelly, calcareous, w. shell fragments				
Sample dia.	100	mm	λ	2,48 W/m-°C
Sample height	100	mm	$1/\lambda$	0,40 °C - m/W
e	-		c	kWh/m ³ °C
ρ_d		g/cm ³	Q	3,06 W/m
w	17,5	%	r^2	0,94
ρ_s (est.)	2.65	g/cm ³	S_0	- %

λ : Thermal conductivity $1/\lambda$: Thermal resistivity c : Heat capacity

Q : Heat input

Depth	0,5	m	Bor. No.	NORD VIB02
Level:	-16	m	Lab. No.	1

Test Procedure: Thermal Needle Probe ASTM D5334-92

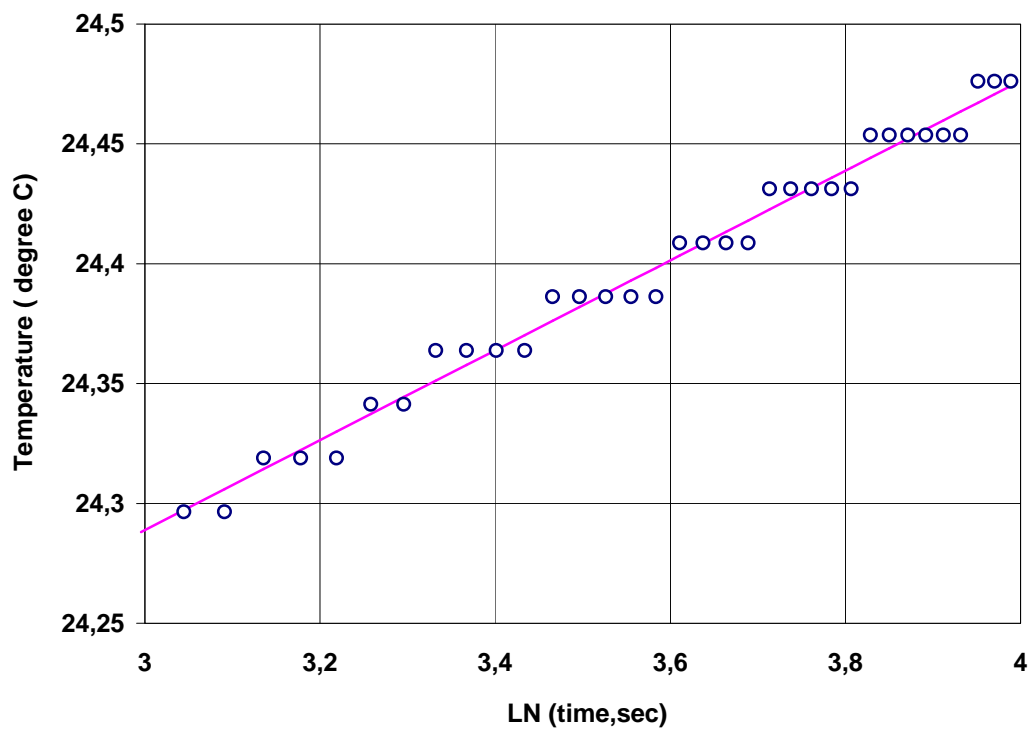
GEO

Project: 32490 Anholt. Djursland OWF

Test : LIV Date : 20090624 Subject: Thermal conductivity

Control : JLC Date : 20090625

Approved : LFJ Date : 2009-06-30 Report 2 Encl. No. 2H.01 Page: 1 / 1



Geology: CLAY, highly plastic, silty, very silty at 63 - 70, sl. sandy, sl. Calcareous			
Sample dia.	100 mm	λ	1,30 W/m-°C
Sample height	100 mm	$1/\lambda$	0,77 °C - m/W
e	0,839	c	kWh/m ³ °C
ρ_d	1,441 g/cm ³	Q	3,06 W/m
w	31,2 %	r^2	0,98
ρ_s (est.)	2.65 g/cm ³	S_0	98,6 %

λ : Thermal conductivity $1/\lambda$: Thermal resistivity c : Heat capacity

Q : Heat input

Depth	0,55 m	Bor. No.	NORD VIB04
Level:	-15,65 m	Lab. No.	2

Test Procedure: Thermal Needle Probe ASTM D5334-92

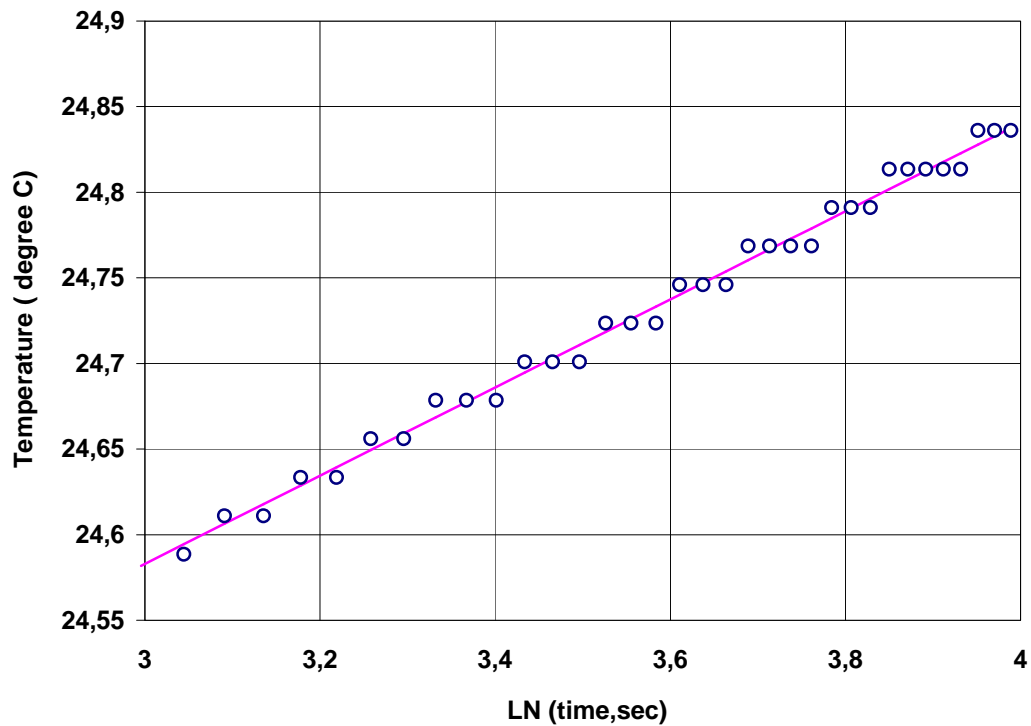
GEO

Project: 32490 Anholt. Djursland OWF

Test : LIV Date : 20090624 Subject: Thermal conductivity

Control : JLC Date : 20090625

Approved : LFJ Date : 20090630 Report 2 Encl. No. 2H.02 Page: 1 / 1



Geology: CLAY, highly plastic, sl. silty, w. few gravels, calcareous, w. shell fragm., w. shell layer 82 - 83					
Sample dia.	100	mm	λ	0,95	W/m-°C
Sample height	100	mm	$1/\lambda$	1,06	°C - m/W
e	1,879		c		kWh/m ³ °C
ρ_d	0,931	g/cm ³	Q	3,06	W/m
w	67,4	%	r^2	0,99	
ρ_s (est.)	2,68	g/cm ³	S_0	95	%

λ : Thermal conductivity $1/\lambda$: Thermal resistivity c : Heat capacity

Q : Heat input

Depth	0,7	m	Bor. No.	NORD VIB09
Level:	-9,2	m	Lab. No.	1

Test Procedure: Thermal Needle Probe ASTM D5334-92

GEO

Project: 32490 Anholt. Djursland OWF

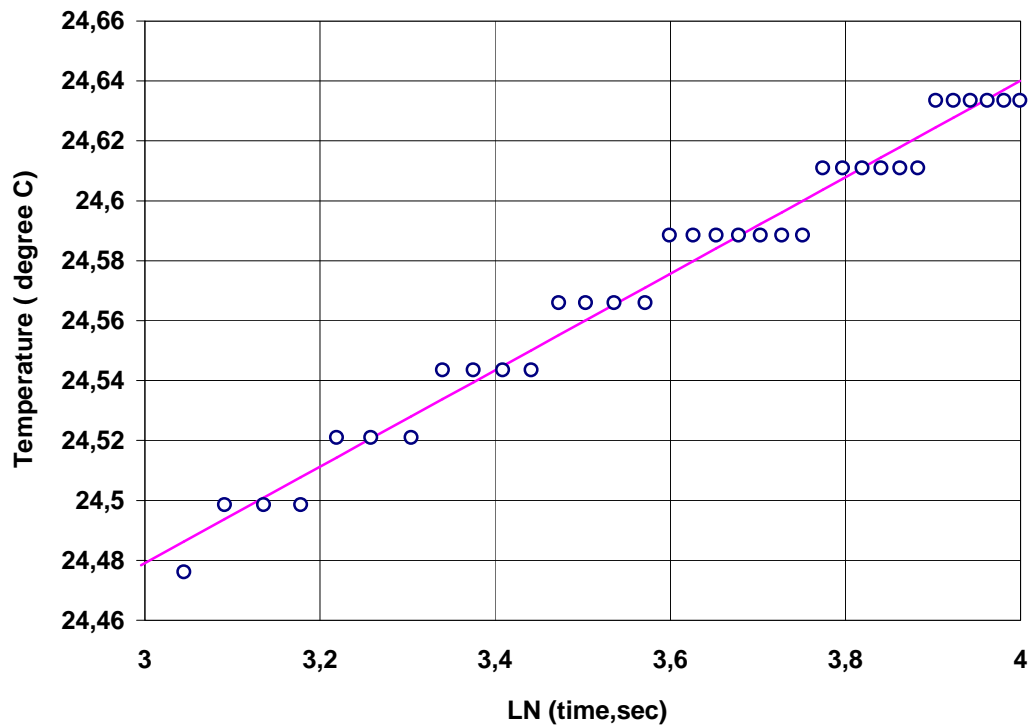
Test : LIV Date : 20090624 Subject: Thermal conductivity

Control : JLC Date : 20090625

Approved : LfJ Date : 20090630

Report 2

Encl. No. 2H.03 Page: 1 / 1



Geology: LIMESTONE, silty, sandy, hardned w. unhardened parts, w. few crushed dark grey flint gravels				
Sample dia.	100	mm	λ	1,51 W/m-°C
Sample height	100	mm	$1/\lambda$	0,66 °C - m/W
e	-		c	kWh/m ³ °C
ρ_d	-	g/cm ³	Q	3,06 W/m
w	24,3	%	r^2	0,98
ρ_s (est.)	2,71	g/cm ³	S_0	%

λ : Thermal conductivity $1/\lambda$: Thermal resistivity c : Heat capacity

Q : Heat input

Depth	0,3	m	Bor. No.	SYD VIB01
Level:	-8,6	m	Lab. No.	1

Test Procedure: Thermal Needle Probe ASTM D5334-92

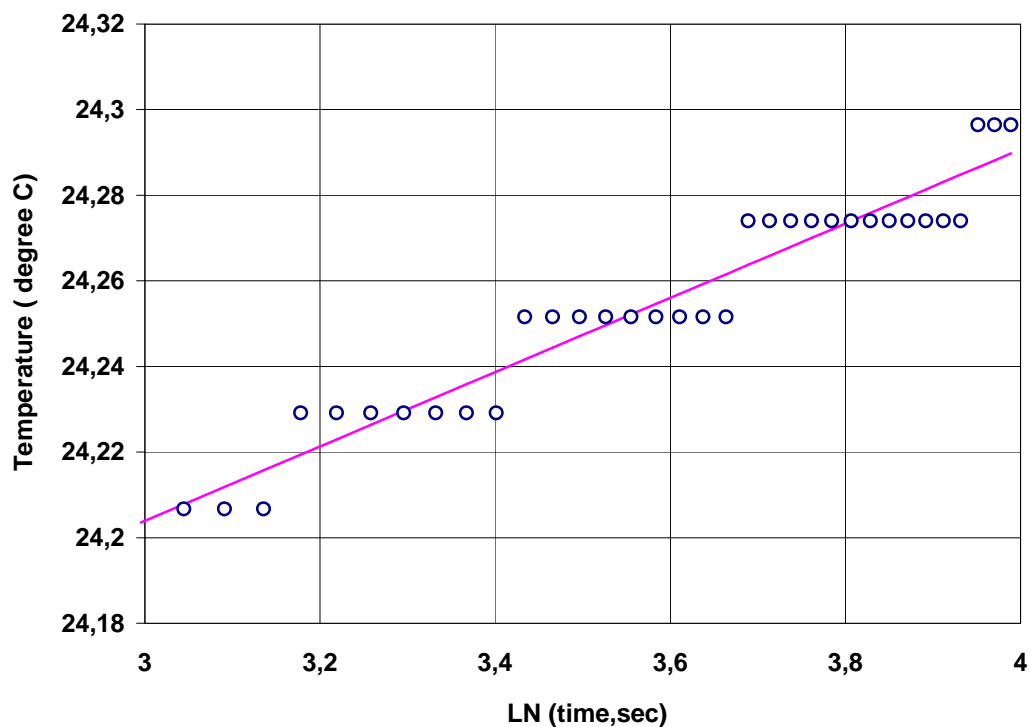
GEO

Project: 32490 Anholt. Djursland OWF

Test : LIV Date : 20090624 Subject: Thermal conductivity

Control : JLC Date : 20090625

Approved : LFJ Date : 20090630 Report 2 Encl. No. 2H.04 Page: 1 / 1



Geology: SAND, fine - medium, well sorted, non calc., sl. organic, w. shell fragments				
Sample dia.	100	mm	λ	2,81 W/m-°C
Sample height	100	mm	$1/\lambda$	0,36 °C - m/W
e	-		c	kWh/m ³ °C
ρ_d		g/cm ³	Q	3,06 W/m
w	20,7	%	r^2	0,94
ρ_s (est.)	2.65	g/cm ³	S_0	- %

λ : Thermal conductivity $1/\lambda$: Thermal resistivity c : Heat capacity

Q : Heat input

Depth	0,2	m	Bor. No.	SYD VIB04
Level:	-18,1	m	Lab. No.	1

Test Procedure: Thermal Needle Probe ASTM D5334-92

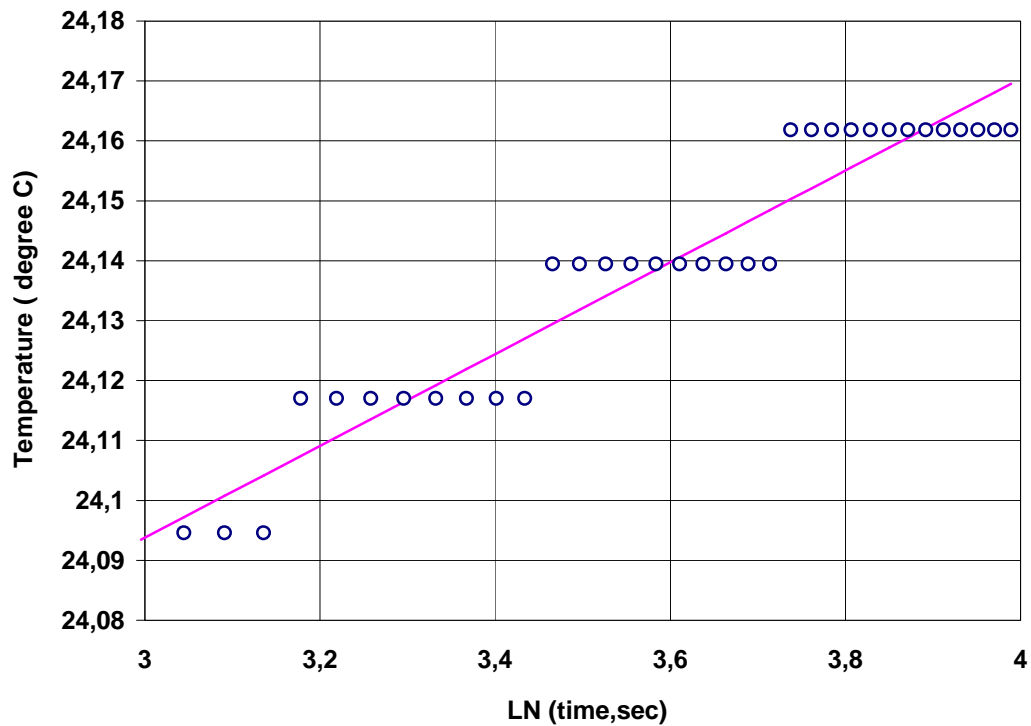


Project: 32490 Anholt. Djursland OWF

Test : LIV Date : 20090624 Subject: Thermal conductivity

Control : JLC Date : 20090625

Approved : LFJ Date : 20090630 Report 2 Encl. No. 2H.05 Page: 1 / 1



Geology: SAND, fine-medium, sorted, sl. silty, non calc., w. shell fragm.					
Sample dia.	100	mm	λ	3,18	W/m-°C
Sample height	100	mm	$1/\lambda$	0,31	°C - m/W
e	-		c		kWh/m ³ °C
ρ_d		g/cm ³	Q	3,06	W/m
w	22,2	%	r^2	0,93	
ρ_s (est.)	2.65	g/cm ³	S_0	-	%

λ : Thermal conductivity $1/\lambda$: Thermal resistivity c : Heat capacity

Q : Heat input

Depth	1,3	m	Bor. No.	SYD VIB10
Level:	-18,3	m	Lab. No.	2

Test Procedure: Thermal Needle Probe ASTM D5334-92

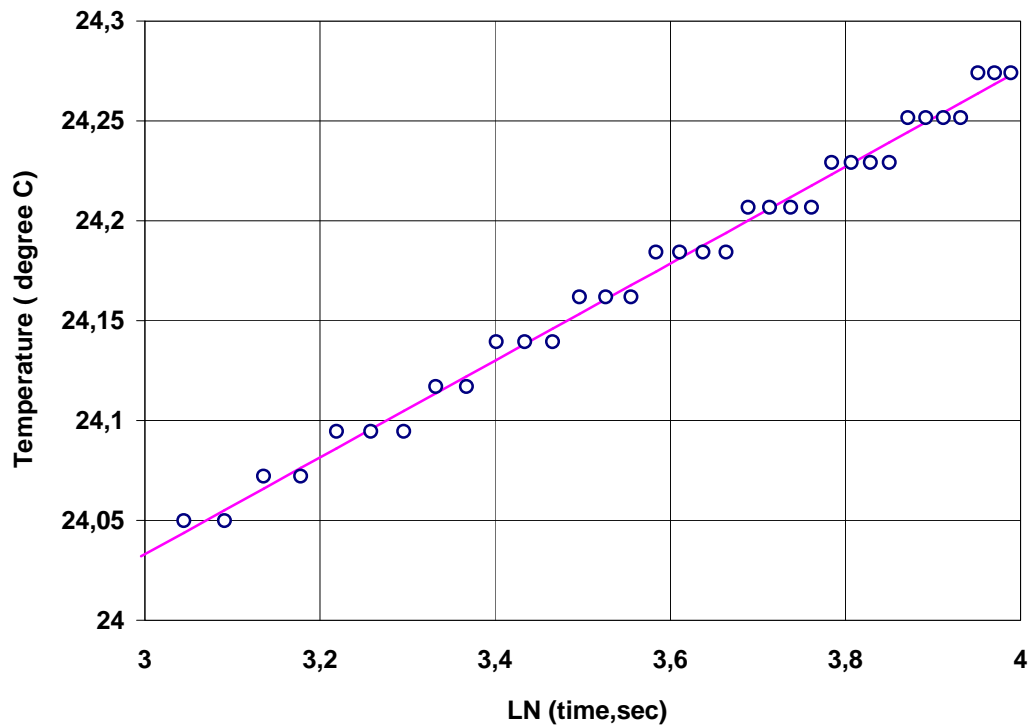


Project: 32490 Anholt. Djursland OWF

Test : LIV Date : 20090624 Subject: Thermal conductivity

Control : JLC Date : 20090625

Approved : LFJ Date : 20090630 Report 2 Encl. No. 2H.06 Page: 1 / 1



Geology: CLAY, highly plastic, silty. non calc. organic to very organic, w. shell fragm.					
Sample dia.	100	mm	λ	1,00	W/m-°C
Sample height	100	mm	$1/\lambda$	1,00	°C - m/W
e	2,596		c		kWh/m ³ °C
ρ_d	0,737	g/cm ³	Q	3,06	W/m
w	94,4	%	r^2	0,99	
ρ_s (est.)	2.65	g/cm ³	S_0	95,3	%

λ : Thermal conductivity $1/\lambda$: Thermal resistivity c : Heat capacity

Q : Heat input

Depth	1,5	m	Bor. No.	SYD VIB10
Level:	-18,5	m	Lab. No.	2

Test Procedure: Thermal Needle Probe ASTM D5334-92

GEO

Project: 32490 Anholt. Djursland OWF

Test : LIV Date : 20090624 Subject: Thermal conductivity

Control : JLC Date : 20090625

Approved : LFJ Date : 20090630 Report 2 Encl. No. 2H.07 Page: 1 / 1

Appendix 2.I
Datasheet – Merete Chris

(1 page)

m.s. "MERETE CHRIS"

Dykker- & Entreprenørskib

Telefon 20 40 31 63 54
Fax 20 40 32 63 54

Besætning 3 personer
Beboelse 6 personer
Redningsmidler 6 personer
Tonnage BRT 247 NRT 74
Klassifikation Bureau Veritas class I 3/3 E - Dredger
Bygget 1966 / 1987
Længde 42,19 m
Bredde 7,50 m
Dybgang Tom: 1,8 m Lastet: 2,4 m
Lastekapacitet 300 ton eller 173,5 m³
(last 10,47 x 5,0 x 3,32 m)
Fremdrivning Scania DS11, 530 HK
Fart Tom: 9,0 knob Lastet: 8,5 knob

Arbejdsudstyr:

Sennebogen 640 R-HD 50 ton kran
Standard udstyr: Bom 16,0 m. Gravedybde indtil 35,0 m. Grab 2,5 m³
Tandgrab. Fladgrab. Polypgrab.

Støtteben 2 stk, forankrer indtil 9,5 m dybde
4 stk. hydrauliske varpspil med 3,5 ton træk
Capstane agter med 3,5 ton træk
Motorbåd 55 HK

Option – Elektronisk positionering med RTK
GPS og PMS positioneringssoftware



m.s. "MERETE CHRIS" er velegnet til:

- Molebyggeri og stenarbejder
- Planerings- og bundsikringsarbejder
- Oprensnings- og uddybningsarbejder
- Rørlægnings- og dykkerarbejder
- Rammearbejder
- Mange former for entreprenør arbejde i øvrigt



PETER MADSEN REDERI A/S

Søren Nymarksvej 8 DK-8270 Højbjerg Telefon +45 8629 0100 Fax +45 8629 4333
www.peter-madsen.com info@peter-madsen.dk

Appendix 2.II

Datasheet - CPT Equipment and Cone Calibration Data

(9 pages)

Description:

GeoLight is a marine CPT rig designed for 4-ton effective CPT ballast for working at water depth up to 100 m. The rig has a hydraulic wheel drive system and the online registration of all parameters gives a safe and controlled operation

System set-up:GeoLight:

Umbilical cable
Control Unit for GeoLight
Data acquisition package

Option:

Tension winch with umbilical

GeoLight:Dimension:

L x W x H: 1.6 m x 1.6 m x 2.0 m
Weight in air: 5 ton
Weight in water: 4 ton

Specification:

Thrust system: Hydraulic wheel drive system
10 cm² CPT rods
Thrust capacity: 40 kN
Rate of penetration: 20 mm/sec
Operation depth: Up to 100 m
Online registration: Penetration depth, penetration rate and cone readings
Power supply: 440 VAC/60 Hz, 18 kW and stable 220 V
Lifting wire: Min. 20 mm

Umbilical

Standard Scorpio
Cable type: 6169

Control Unit for GeoLight

Standard PC with 2 serial RS 232 Ports and GEOs software for rig control.

Data acquisition packet

Standard PC with GEO's data acquisition software, with online display of data.

Data stored in GEO format. Printout of results in field and conversion to ascii form. CPT set-up in accordance with ISSMFE Procedures 1988.



Kalibreringscertifikat

Type : CPT Sonde (TSP)
Fabrikat : A.P. Van den Berg
Serienummer : 080914

Spidstryk

Dato for kalibrering	:	16-09-2008
Hældningskoefficient	:	13.134 kN/V
Skæringspunkt på y-aksen	:	-0.377 kN
Nedre grænseværdi (Lower)	:	-7.666 V
Øvre grænseværdi (Upper)	:	7.666 V
Delta (Zero value)	:	0.152 kN
Zero	:	-0.003 V
Gain	:	2.338 V
Gain - zero	:	2.341 V
Nominel belastning	:	50.000 MPa
Maksimum belastning	:	100.000 MPa

Kappemodstand

Dato for kalibrering	:	17-09-2008
Hældningskoefficient	:	4.812 kN/V
Skæringspunkt på y-aksen	:	-0.210 kN
Nedre grænseværdi (Lower)	:	-4.200 V
Øvre grænseværdi (Upper)	:	4.200 V
Delta (Zero value)	:	0.012 kN
Zero	:	-0.001 V
Gain	:	2.338 V
Gain - zero	:	2.339 V
Nominel belastning	:	0.750 MPa
Maksimum belastning	:	3.000 MPa

Poretryk

Dato for kalibrering	:	17-09-2008
Hældningskoefficient	:	0.449 MPa/V
Skæringspunkt på y-aksen	:	0.005 MPa
Nedre grænseværdi (Lower)	:	-0.233 V
Øvre grænseværdi (Upper)	:	3.103 V
Delta (Zero value)	:	-0.001 MPa
Zero	:	0.001 V
Gain	:	0.512 V
Gain - zero	:	0.511 V
Nominel belastning	:	4.000 MPa
Maksimum belastning	:	6.000 MPa



 GEO

Udført : JRL Dato : 16-09-2008
Kontrolleret : *LOD* Dato : 2008-09-12
Godkendt : *Jm* Dato : 2008-09-18

Kalibreringsbilag

Kalibreringstype : Spids
Dato & tid for kalibrering : 16-09-2008 16:47:10
Udført af : JRL
Type : CPT Sonde (TSP)
Fabrikat : A.P. Van den Berg
Serienummer : 080914

Reference :

Serienummer : 11975-2006
Spænding : 12.0024 V
Nulpunktsforskydning : 0.5798 mV

Kabel :

Zero : -0.0032 V
Gain : 2.3378 V

Kalibreringsværdier :

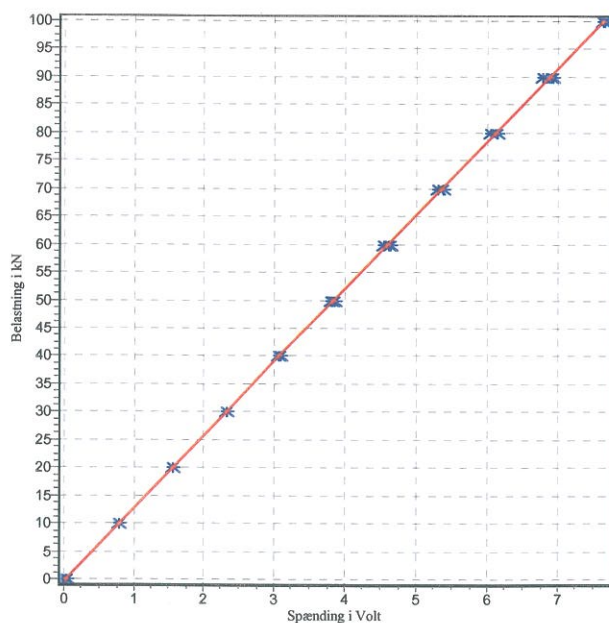
Hædningskoefficient : 13.134 kN/V
Skæringspunkt på y-aksen : -0.377 kN
Delta : 0.152 kN

Kontrolværdier :

Største afvigelse : 1.038 kN
Residualvarians : 0.151 kN²
Std. afv. på residualvarians : 0.388 kN



Tryk (kN)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)
0.000	0.07	0.038	0.06	0.040	0.06	0.040	0.06	0.041	0.06	0.041	0.06	0.042
10.000	10.00	0.798	10.04	0.802	9.97	0.798	10.02	0.794	9.96	0.795	10.02	0.801
20.000	19.96	1.557	20.03	1.564	19.96	1.555	20.02	1.558	19.97	1.556	20.04	1.560
30.000	30.00	2.323	30.04	2.312	29.97	2.323	30.04	2.314	29.97	2.322	30.04	2.320
40.000	39.97	3.072	40.03	3.057	39.99	3.087	40.04	3.059	40.00	3.091	40.01	3.053
50.000	50.04	3.841	50.00	3.795	50.04	3.799	50.00	3.796	50.02	3.857	49.99	3.798
60.000	60.04	4.609	60.04	4.632	59.99	4.621	60.00	4.552	60.03	4.608	60.00	4.552
70.000	69.98	5.383	70.04	5.308	69.96	5.383	69.99	5.306	70.02	5.384	70.04	5.306
80.000	80.04	6.155	80.03	6.051	79.98	6.154	80.04	6.060	80.03	6.137	80.02	6.054
90.000	90.02	6.930	89.99	6.802	89.98	6.914	90.01	6.903	90.04	6.921	89.97	6.902
100.000	100.02	7.677	100.02	7.664	100.04	7.671	100.01	7.664	99.99	7.660	99.96	7.658



Kontrolberegninger :

Tryk (kN)	Gennemsnit (V)	Beregnet (kN)	Diff. (kN)
0.000	0.040	0.152	-0.152
10.000	0.798	10.107	-0.107
20.000	1.558	20.089	-0.089
30.000	2.319	30.080	-0.080
40.000	3.070	39.941	0.059
50.000	3.814	49.717	0.283
60.000	4.596	59.985	0.015
70.000	5.345	69.824	0.176
80.000	6.102	79.764	0.236
90.000	6.895	90.187	-0.187
100.000	7.666	100.305	-0.305

Kalibreringsbilag

Kalibreringstype : **Kappe**
Dato & tid for kalibrering : 17-09-2008 08:12:12
Udført af : JRL
Type : CPT Sonde (TSP)
Fabrikat : A.P. Van den Berg
Serienummer : **080914**

Reference :

Serienummer : 21129-2006
Spænding : 12.0023 V
Nulpunktsforskydning : 140.3577 mV

Kabel :

Zero : -0.0009 V
Gain : 2.3382 V

Kalibreringsværdier :

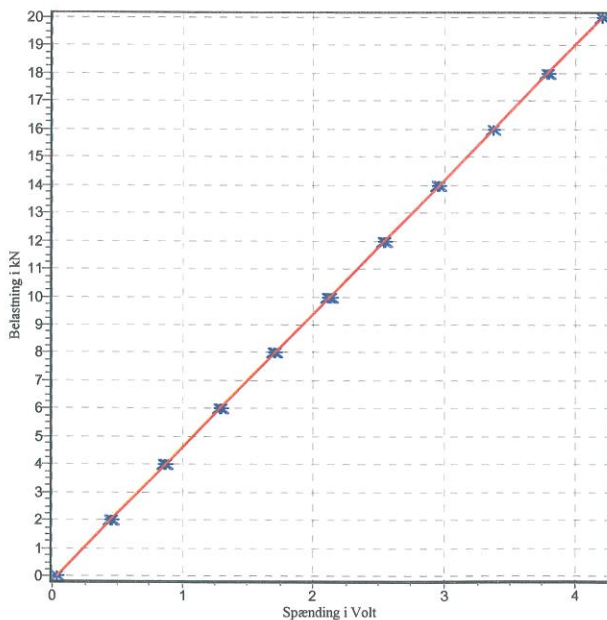
Hældningskoefficient : 4.812 kN/V
Skæringspunkt på y-aksen : -0.210 kN
Delta : 0.012 kN

Kontrolværdier :

Største afvigelse : 0.079 kN
Residualvarians : 0.001 kN²
Std. afv. på residualvarians : 0.025 kN



Tryk (kN)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)
0.000	0.03	0.045	0.04	0.046	0.04	0.046	0.04	0.047	0.04	0.047
2.000	2.00	0.463	2.01	0.460	2.00	0.464	2.01	0.458	2.00	0.461
4.000	4.00	0.879	4.00	0.879	3.99	0.879	4.01	0.865	3.99	0.878
6.000	6.00	1.300	6.00	1.290	6.00	1.308	6.00	1.285	6.00	1.299
8.000	8.01	1.714	7.99	1.704	7.99	1.710	8.00	1.704	8.01	1.713
10.000	10.00	2.130	10.01	2.119	9.99	2.127	10.00	2.114	10.01	2.130
12.000	12.00	2.541	12.01	2.536	12.00	2.544	12.00	2.532	11.99	2.543
14.000	14.00	2.961	13.99	2.945	13.99	2.955	14.00	2.943	13.99	2.954
16.000	16.00	3.369	16.00	3.363	15.99	3.370	16.00	3.363	15.99	3.371
18.000	18.00	3.785	18.01	3.787	18.00	3.785	18.00	3.778	18.00	3.782
20.000	19.99	4.198	19.99	4.197	20.00	4.202	20.00	4.202	20.01	4.199



Kontrolberegninger :

Tryk (kN)	Gennemsnit (V)	Beregnet (kN)	Diff. (kN)
0.000	0.046	0.012	-0.012
2.000	0.460	2.003	-0.003
4.000	0.876	4.004	-0.004
6.000	1.295	6.020	-0.020
8.000	1.708	8.008	-0.008
10.000	2.123	10.007	-0.007
12.000	2.538	12.004	-0.004
14.000	2.951	13.992	0.008
16.000	3.367	15.991	0.009
18.000	3.783	17.993	0.007
20.000	4.200	19.999	0.001

Kalibreringsbilag

Kalibreringstype : **Pore**
 Dato & tid for kalibrering : 17-09-2008 10:50:45
 Udført af : JRL
 Type : CPT Sonde (TSP)
 Fabrikat : A.P. Van den Berg
 Serienummer : **080914**

Reference :

Serienummer : 20056/279
 Spænding : 0.0000 V
 Nulpunktsforskydning : 0.0000 mV

Kabel :

Zero : 0.0010 V
 Gain : 0.5124 V

Kalibreringsværdier :

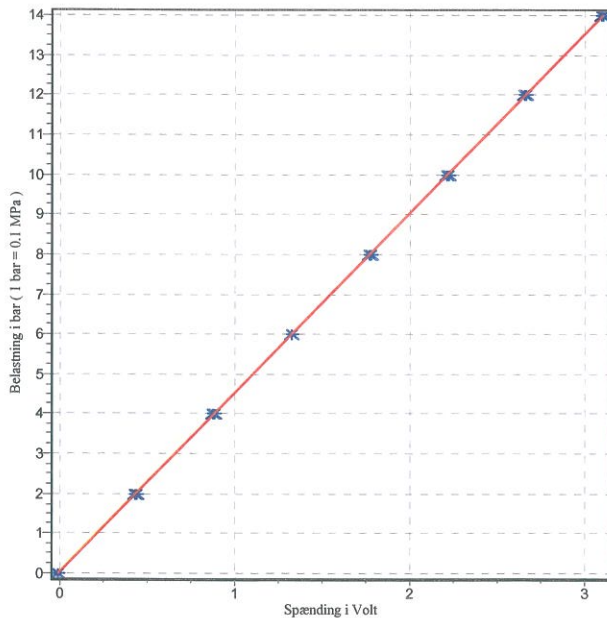
Hædningskoefficient : 0.449 MPa/V
 Skæringspunkt på y-aksen : 0.005 MPa
 Delta : -0.001 MPa

Kontrolværdier :

Største afvigelse : 0.024 MPa
 Residualvarians : 0.000 MPa²
 Std. afv. på residualvarians : 0.014 MPa



Tryk bar	Belastning (V)	Aflastning (V)	Belastning (V)	Aflastning (V)	Belastning (V)	Aflastning (V)
0.000	-0.012	-0.012	-0.011	-0.012	-0.012	-0.012
2.000	0.430	0.436	0.431	0.436	0.430	0.434
4.000	0.877	0.884	0.878	0.884	0.878	0.884
6.000	1.322	1.330	1.323	1.330	1.323	1.330
8.000	1.766	1.775	1.768	1.775	1.768	1.775
10.000	2.211	2.219	2.213	2.219	2.213	2.219
12.000	2.655	2.661	2.659	2.663	2.658	2.663
14.000	3.099	3.100	3.104	3.105	3.104	3.104



Kontrolberegninger :

Tryk bar	Gennemsnit (V)	Beregnet bar	Diff. bar
0.000	-0.012	-0.005	0.005
2.000	0.433	1.993	0.007
4.000	0.881	4.005	-0.005
6.000	1.326	6.007	-0.007
8.000	1.771	8.006	-0.006
10.000	2.215	10.004	-0.004
12.000	2.660	11.999	0.001
14.000	3.103	13.991	0.009

Kalibreringscertifikat

Type : CPT Sonde (TSP)
Fabrikat : A.P. Van den Berg
Serienummer : 080917

Spidstryk

Dato for kalibrering	:	17-09-2008
Hældningskoefficient	:	13.329 kN/V
Skæringspunkt på y-aksen	:	-0.003 kN
Nedre grænseværdi (Lower)	:	-7.518 V
Øvre grænseværdi (Upper)	:	7.518 V
Delta (Zero value)	:	-0.068 kN
Zero	:	-0.004 V
Gain	:	2.335 V
Gain - zero	:	2.339 V
Nominel belastning	:	50.000 MPa
Maksimum belastning	:	100.000 MPa

Kappemodstand

Dato for kalibrering	:	17-09-2008
Hældningskoefficient	:	4.840 kN/V
Skæringspunkt på y-aksen	:	-0.119 kN
Nedre grænseværdi (Lower)	:	-4.161 V
Øvre grænseværdi (Upper)	:	4.161 V
Delta (Zero value)	:	0.021 kN
Zero	:	-0.003 V
Gain	:	2.335 V
Gain - zero	:	2.339 V
Nominel belastning	:	0.750 MPa
Maksimum belastning	:	3.000 MPa

Poretryk

Dato for kalibrering	:	17-09-2008
Hældningskoefficient	:	0.489 MPa/V
Skæringspunkt på y-aksen	:	-0.009 MPa
Nedre grænseværdi (Lower)	:	-0.185 V
Øvre grænseværdi (Upper)	:	2.880 V
Delta (Zero value)	:	0.000 MPa
Zero	:	0.001 V
Gain	:	0.512 V
Gain - zero	:	0.511 V
Nominel belastning	:	4.000 MPa
Maksimum belastning	:	6.000 MPa



GEO GEO

Udført : JRL Dato : 17-09-2008
Kontrolleret : *LS* Dato : 2008-09-17
Godkendt : *Jan* Dato : 20080917

Kalibreringsbilag

Kalibreringstype : Spids
Dato & tid for kalibrering : 17-09-2008 13:04:24
Udført af : JRL
Type : CPT Sonde (TSP)
Fabrikat : A.P. Van den Berg
Serienummer : 080917

Reference :

Serienummer : 11975-2006
Spænding : 12.0023 V
Nulpunktsforskydning : 0.5492 mV

Kabel :

Zero : -0.0041 V
Gain : 2.3353 V

Kalibreringsværdier :

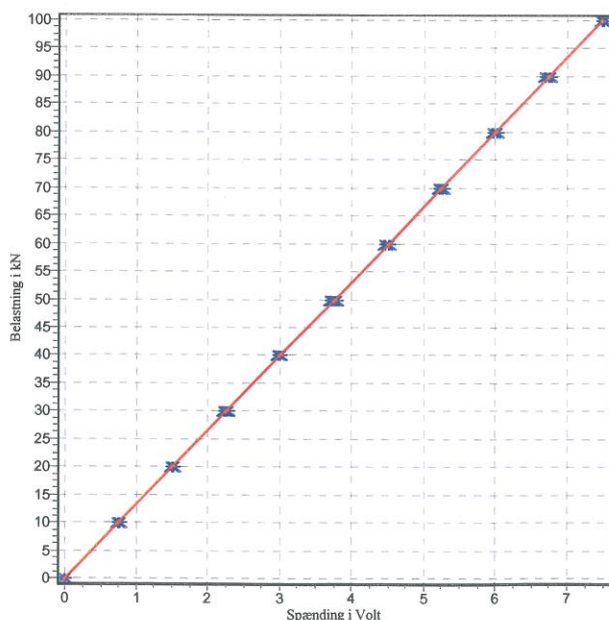
Hædningskoefficient : 13.329 kN/V
Skæringspunkt på y-aksen : -0.003 kN
Delta : -0.068 kN

Kontrolværdier :

Største afvigelse : 0.606 kN
Residualvarians : 0.077 kN²
Std. afv. på residualvarians : 0.278 kN



Tryk (kN)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)
0.000	0.07	-0.003	0.07	-0.004	0.07	-0.004	0.07	-0.005	0.07	-0.005	0.07	-0.007
10.000	10.01	0.768	10.02	0.765	9.96	0.762	9.99	0.754	9.97	0.763	9.98	0.746
20.000	19.98	1.523	20.03	1.502	20.00	1.521	20.03	1.494	19.96	1.521	20.00	1.499
30.000	30.00	2.255	30.01	2.240	30.00	2.277	29.99	2.242	29.97	2.273	30.00	2.243
40.000	39.97	3.015	40.04	2.984	39.97	3.012	39.98	2.979	39.99	3.008	39.99	2.983
50.000	50.05	3.782	50.02	3.725	50.01	3.767	49.96	3.724	50.00	3.777	50.02	3.729
60.000	59.98	4.511	60.02	4.475	59.98	4.521	60.03	4.475	60.02	4.522	59.99	4.469
70.000	69.96	5.257	69.99	5.222	70.01	5.268	70.00	5.217	70.00	5.265	70.04	5.240
80.000	79.99	6.024	80.05	6.024	80.03	6.028	79.99	5.966	79.98	6.024	80.02	5.966
90.000	89.97	6.768	89.99	6.712	90.00	6.756	90.03	6.715	89.96	6.771	89.97	6.705
100.000	99.96	7.517	99.97	7.517	99.97	7.514	99.96	7.515	100.00	7.527	100.02	7.519



Kontrolberegninger :

Tryk (kN)	Gennemsnit (V)	Beregnet (kN)	Diff. (kN)
0.000	-0.005	-0.068	0.068
10.000	0.760	10.123	-0.123
20.000	1.510	20.123	-0.123
30.000	2.255	30.054	-0.054
40.000	2.997	39.942	0.058
50.000	3.751	49.987	0.013
60.000	4.496	59.920	0.080
70.000	5.245	69.904	0.096
80.000	6.005	80.039	-0.039
90.000	6.738	89.804	0.196
100.000	7.518	100.204	-0.204

Kalibreringsbilag

Kalibreringstype : **Kappe**
Dato & tid for kalibrering : 17-09-2008 09:20:50
Udført af : JRL
Type : CPT Sonde (TSP)
Fabrikat : A.P. Van den Berg
Serienummer : **080917**

Reference :

Serienummer : 21129-2006
Spænding : 12.0023 V
Nulpunktsforskydning : 140.3509 mV

Kabel :

Zero : -0.0032 V
Gain : 2.3355 V

Kalibreringsværdier :

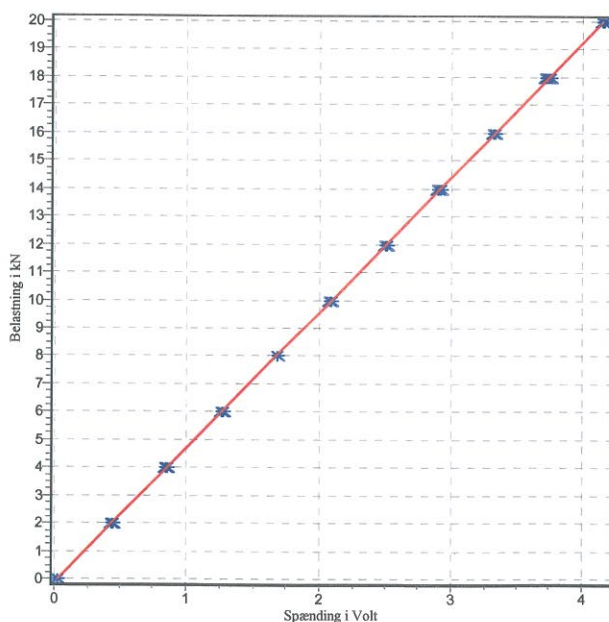
Hædningskoefficient : 4.840 kN/V
Skæringspunkt på y-aksen : -0.119 kN
Delta : 0.021 kN

Kontrolværdier :

Største afvigelse : 0.115 kN
Residualvarians : 0.001 kN²
Std. afv. på residualvarians : 0.038 kN



Tryk (kN)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)	Belastning (kN)	Aflastning (V)
0.000	0.03	0.029	0.04	0.029	0.04	0.029	0.04	0.029	0.04	0.029	0.04	0.029
2.000	1.99	0.440	2.01	0.431	2.00	0.439	2.01	0.430	2.00	0.438	2.01	0.437
4.000	4.00	0.855	4.00	0.848	3.99	0.852	4.00	0.849	3.99	0.855	4.00	0.853
6.000	6.01	1.274	6.00	1.258	5.99	1.264	6.01	1.261	6.00	1.274	6.00	1.263
8.000	8.00	1.688	7.99	1.682	8.00	1.683	8.01	1.681	8.00	1.690	8.01	1.681
10.000	10.00	2.099	10.01	2.092	9.99	2.097	9.99	2.090	9.99	2.100	10.01	2.084
12.000	12.00	2.508	12.00	2.498	12.00	2.511	11.99	2.501	12.00	2.515	12.00	2.502
14.000	13.99	2.922	14.00	2.905	14.00	2.923	14.01	2.905	14.00	2.927	14.01	2.907
16.000	16.00	3.340	16.01	3.317	16.00	3.337	16.00	3.318	16.00	3.339	16.00	3.319
18.000	17.99	3.745	18.01	3.729	18.01	3.752	18.00	3.729	18.00	3.751	18.01	3.722
20.000	19.99	4.161	19.99	4.160	19.99	4.158	20.00	4.160	20.00	4.164	19.99	4.163



Kontrolberegninger :

Tryk (kN)	Gennemsnit (V)	Beregnet (kN)	Diff. (kN)
0.000	0.029	0.021	-0.021
2.000	0.436	1.991	0.009
4.000	0.852	4.005	-0.005
6.000	1.266	6.006	-0.006
8.000	1.684	8.033	-0.033
10.000	2.094	10.013	-0.013
12.000	2.506	12.007	-0.007
14.000	2.915	13.988	0.012
16.000	3.328	15.989	0.011
18.000	3.738	17.972	0.028
20.000	4.161	20.018	-0.018

Kalibreringsbilag

Kalibreringstype : Pore
Dato & tid for kalibrering : 17-09-2008 10:24:56
Udført af : JRL
Type : CPT Sonde (TSP)
Fabrikat : A.P. Van den Berg
Serienummer : 080917

Reference :

Serienummer : 20056/279
Spænding : 0.0000 V
Nulpunktsforskydning : 0.0000 mV

Kabel :

Zero : 0.0010 V
Gain : 0.5124 V

Kalibreringsværdier :

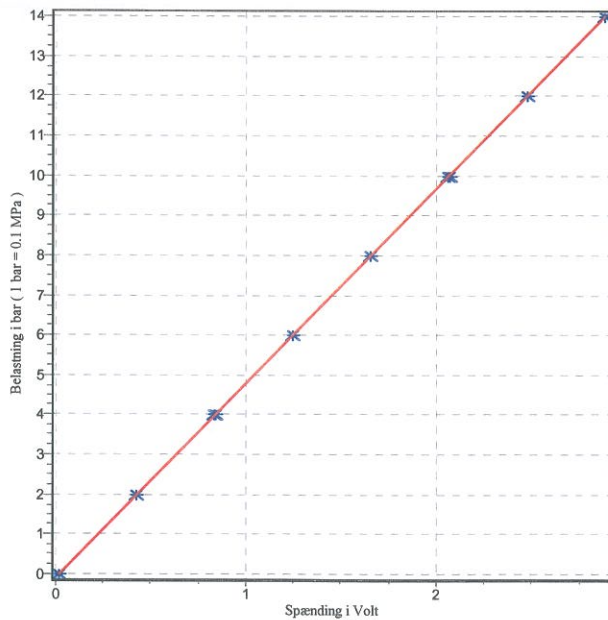
Hældningskoefficient : 0.489 MPa/V
Skæringspunkt på y-aksen : -0.009 MPa
Delta : 0.000 MPa

Kontrolværdier :

Største afvigelse : 0.017 MPa
Residualvarians : 0.000 MPa²
Std. afv. på residualvarians : 0.008 MPa



Tryk bar	Belastning (V)	Aflastning (V)	Belastning (V)	Aflastning (V)	Belastning (V)	Aflastning (V)
0.000	0.020	0.019	0.020	0.020	0.020	0.020
2.000	0.425	0.429	0.425	0.429	0.425	0.428
4.000	0.833	0.838	0.834	0.838	0.835	0.839
6.000	1.243	1.248	1.244	1.248	1.245	1.248
8.000	1.653	1.657	1.654	1.657	1.654	1.658
10.000	2.063	2.065	2.063	2.065	2.063	2.065
12.000	2.472	2.473	2.472	2.473	2.472	2.473
14.000	2.880	2.880	2.880	2.880	2.880	2.880



Kontrolberegninger :

Tryk bar	Gennemsnit (V)	Beregnet bar	Diff. bar
0.000	0.020	0.003	-0.003
2.000	0.427	1.994	0.006
4.000	0.836	3.997	0.003
6.000	1.246	6.001	-0.001
8.000	1.655	8.004	-0.004
10.000	2.064	10.003	-0.003
12.000	2.472	12.001	-0.001
14.000	2.880	13.996	0.004

Appendix 2.III
Datasheet – Vibrocore Equipment

(4 pages)



Applications

- Stratigraphic Studies
- Geological Mapping
- Mineral Exploration
- Environmental Surveys
- Pollution Investigations
- Geotechnical Investigations

High Frequency Vibration

The Geo-Corer 3000 + 6000 is a high frequency, electrically driven, vibrocorer system capable to penetrate fast into all common seabed sediments ranging from compact sands to stiff clays and even unconsolidated chalk.

Proven Performance

The Geo-Corer 3000 + 6000, has a well-known record of over 20 years proven performance.

Small Vessel Operation

The Geo-Corer 3000 + 6000 can be deployed from a small vessel and is easy to handle. Thanks to its lightweight construction and smart pull-out system, it requires a limited hoisting power of 5 tons maximum, when working in stiff clays.

Operational Features

- High frequency Vibration
- Proven Performance
- Small Vessel Operation
- Reliable & Cost Effective
- Easy to Handle & Modular
- Pivoting Barrel Head
- High Quality Cores

Variable Coring Parameters

The standard configuration is designed for taking cores of 6 m length in ordinary PVC liners with an internal diameter of 106 mm.

The system can be easily modified for taking shorter cores of 3 m.

The force on the cutting shoe can be adjusted using different dead weights on the vibro-unit.



Pivoting Core Barrel Head

The pivoting head allows rapid change of the core barrel and easy retrieval of the liner, while the vibro corer remains in up-right position



Reliable & Cost Effective

Its straightforward concept and high quality construction guarantee a simple and reliable operation with a minimum of maintenance.



Easy to Handly and Modular Construction

The Geo-Corer 3000 + 6000 has been designed so that all structural parts can be handled by human force.

This feature is not only reflected in a very short rig-up and rig-down time, but also in low transportation costs.



High Quality Cores

The fast penetration rate results in high-quality cores with a minimum of disturbance.



Technical Specifications

Type	Geo-Core 6000 / 3000
Manufacturer	Geo-Resources Instruments
Max Weight in Air	approx. 1000 -1200 kg depending on deadweights in use
Max Weight in Water	approx. 850 - 1050 kg depending on deadweights in use
Fully Containerized System	The system is designed to fit into a standard 20-foot container. The same container is used for storage of barrels and liners during operation offshore.
Total Height (6 m barrel configuration)	7.2 m
Total Height (3 m barrel configuration)	4.4 m
Footprint (6 m barrel configuration)	diameter 4.6 m
Footprint (3 m barrel configuration)	diameter 2.8 m
Corrosion Protection / maintenance	All structural steel parts are hot dip galvanized, Core barrels made of stainless steel 316
Vibro Unit	electrically driven (5 kW) double vibrator
Vibrating Frequency	28 Hz
Vibrator Swing Force 3	0 kN
Dead Weights on Vibrator Unit	adjustable: 150 - 300 kg
Electric Power	380 VAC, 3 phase, 50 Hz Starting power 25 A Running Power 8 A
Electric Umbilical	12 leads of 1.5 mm ² for power and controls Kevlar reinforced, PU insulated, OD 16 mm High quality (Hydrovolt) underwater connectors
Electric Umbilical Cable Reel	Optional for shallow water operations < 100 m Mandatory for deep water operations > 100 m stainless steel electrical cable reel with integrated connector diameter reel 0.9 m, width reel 0.5 m
Electrical Control Unit	Electric Power control by Ampere meter Automatic switch-off, when fully penetrated Optional: depth transducer
Core Barrel	ID/OD: 111mm/ 121mm, Stainless Steel 316 Length: 6 m, or 3 m Core Catcher (Stainless Steel 316) Replaceable Cutting Shoe (Carbon Steel) Special anti flow-back valve Pivoting core barrel head
Core Liner	ID/OD: 105 mm / 110 mm, PVC Length 6 m or 3 m
Operational Depth	standard 600 m, greater depth range is optional
Hoisting Requirements	maximum 5 ton, when operated in stiff clays or hard soils a torsion-free steel cable, diameter 12 mm is sufficient N.B. Provision of hoisting cable is optional
Minimum Height below A-frame	8.5 m for the 6 m barrel configuration 5.5 m for the 3 m barrel configuration

Main Mechanical Components

(numbers refer to parts in figures)

no	description	material, comment
1	basement	hot-dip galvanised, can folded together
2	guiding poles	high strength steel
3	sliding frame	hot-dip galvanised,
4	dead weights	adjustable, up to 6 pieces.
5	rigging head	hot-dip galvanised,
6	stays	stainless steel 316
7	vibrator unit	three-phase AC motor
8	barrel pivot	hot-dip galvanised / stainless steel
9	springs	reinforcing vibration motion to 30 kN
10	core barrel	ID/OD 113 x 121 stainless steel 316
11	pivoting barrel head	stainless steel 316
13	cutting shoe	replaceable, carbon steel
14	core catcher	stainless steel, tulip type, replaceable
15	anti-return valve	Delrin / stainless steel
16	liner	PVC tube ID/OD 106 x 110
17	guiding block	HMPE
18	hoisting wire rope	anti-torsion 12 mm steel cable
19	underwater power cable	PU kevlar-inforced

The vibrocorer main structure consists of: the basement (can be folded together during transportation) (1), the two guiding poles (2), the sliding frame (3) with vibrator (7) and up to six dead weights (4) allowing to adjust the downward penetration force.

Both guiding poles (2) are connected at the top by a rigging head (5), which are re-enforced by stainless steel stays (6) to the basement (1).

The vibrator unit (7) is powered by a three-phase AC motor. It is freely moving in vertical direction with its sliding frame (3) in between the guiding poles (2) and is coupled by the springs (9) in both directions.

The barrel (10) made of stainless steel is connected with the barrel pivot (8) by two locking bolts (11) allowing to put the barrel in a horizontal position when the liner (16) is extracted.

The barrel (10) is provided with the cutting shoe (13), which fixes the core catcher (14) in its position. In conjunction with the anti-return valve (15) on the top of the barrel (10), this prevents the core from moving backwards while pulling it out of the bottom.

A PVC liner (16) is used to recover the core.

The guiding block (17) guides the barrel (10) in the basement (1). It is positioned in the basement via a flap.

The steel wire (18) and the power supply cable (19) are used to deploy the vibrocorer from the vessel.

The electric motor of the vibrator (7) is operated (switch on/off) via the power supply cable (19) and the control unit.

The required hoisting power while drawing the barrel (10) out of the seabed is reduced by the fourfold reduction of the steel hoisting cable (18).