From:	Gemma Keenan
To:	Tracey Williams
Cc:	Norfolk Vanguard; Sian Evans; rebecca.sherwood@vattenfall.com; "ruari.lean@vattenfall.com"; Josh Taylor (josh.taylor@wbd-uk.com)
Subject:	Norfolk Vanguard - Email 9 of 18 Deadline 1 Submissions
Date:	16 January 2019 15:18:59
Attachments:	ExA;WQApp16.3;10.D1.3 Norfolk Vanguard WQ Appendix 16.3 Crossing 2 GI.pdf

Dear Tracey

This is email 9 of 18 of the Applicant's submission for Norfolk Vanguard Examination Deadline 1.

We enclose the following documents:

Appendices to Written Questions:

- Appendix 16.3 TerraConsult Crossing 2

Please could you kindly confirm receipt.

Best Regards

Gemma Keenan BSc, MIEMA, CEnv
Senior Environmental Consultant

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Norfolk Vanguard Offshore Wind Farm

The Applicant Responses to First Written Questions

Appendix 16.3 – TerraConsult 2017 Ground Investigations Report: Crossing 2 (Q16.8)

Applicant: Norfolk Vanguard Limited
Document Reference: ExA;WQApp16.3;10.D1.3
Deadline 1

Date: January 2019

Photo: Kentish Flats Offshore Wind Farm

TerraConsult

November 2017
Report No 3318-R002-2

East Anglia (North) Offshore Wind Farm

Crossing 2 Site Investigation

Carried out for:

Gutteridge, Haskins and Davey Ltd (GHD)

East Anglia (North) Offshore Wind Farm

Crossing 2 Site Investigation

Date: November 2017

Report No 3318-R002-2

Prepared for:

Gutteridge, Haskins & Davey Ltd
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Engineer:

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DOCUMENT INFORMATION AND CONTROL SHEET

Document Status and Approval Schedule

Report No.	Title
3318-R002-2	East Anglia (North) Offshore Wind Farm Crossing 2 Site Investigation

Prepared by:	**Victoria Smith**	*Victoria Smith*	**Engineering Geologist**
Approved by:	**D Daniels**	[redacted]	**Operations Manager**
Date:	**01/11/17**		

Issue:	Date:	Description:	Prepared by:
1	11/10/17	Draft for Approval	VS
2	01/11/17	Final	DD

DISCLAIMER

This site investigation contract was completed by TerraConsult Ltd on the basis of a specification and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget, the degree of manpower and resources allocated to the project as agreed.

TerraConsult Ltd cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

This report is issued solely to the client and TerraConsult cannot accept any responsibility to any third parties to whom this report may be circulated, in part or in full, and any such parties rely on the contents at their own risk.

East Anglia (North) Offshore Wind Farm

Crossing 2 Site Investigation
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DRAWINGS

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East Anglia (North) Offshore Wind Farm

Crossing 2 Site Investigation

1 INTRODUCTION

TerraConsult Limited (TCL) was commissioned by Gutteridge, Haskins and Davey Ltd (GHD) to carry out a ground investigation for the proposed cable route crossing of the railway line near Hoe, Norfolk.

This report presents the factual records of the fieldwork and laboratory testing. The data is also presented separately in digital format following AGS4 (2011).

The scope of the investigation, which was specified by GHD, comprised:

- Boreholes formed by cable percussive techniques;
- In situ testing comprising of;
  - Standard penetration tests in boreholes;
  - Variable head permeability testing;
- Post fieldwork monitoring and sampling;
- Geotechnical laboratory testing;
- Geoenvironmental laboratory testing;
- Factual report (GIR) and AGS data.

The investigation was carried out in accordance with the contract specification and relevant standards (see References). The fieldwork was carried out between 18/07/17 and 26/07/17.

Whilst every attempt is made to record full details of the strata encountered in the exploratory holes, techniques of exploratory hole formation and sampling will inevitably lead to disturbance, mixing or loss of material in some soils and rocks.

All information given in this report is based on the ground conditions encountered during the site work and on the results of laboratory and field tests performed during the investigation. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations and water conditions between or below exploratory holes. It should be noted that groundwater levels, gas concentrations and gas flows usually vary due to seasonal, atmospheric and/or other effects and may at times differ to those measured during the investigation.

2 SITE DESCRIPTION

2.1 Location and Topography

The site is located approximately 2 km north east of the centre of Dereham, Norfolk. The approximate location of Crossing 2 is located between Ordnance Survey National Grid Reference TG 992 153 and TG 996 154. A site location plan is presented as drawing reference 3318(C2)D001-1.

2.2 Published Geology

The online British Geological Survey (BGS) 1:50,000 scale map shows the site to be underlain by the Weybourne Town Till Member glacial diamicton. Beneath these lies the White Chalk Subgroup.

3 FIELDWORK

3.1 General

Fieldwork was undertaken between 18/07/17 and 26/07/17. The scope of the works, as provided by GHD comprised:

Table 1: Scope of Intrusive Works and In Situ Testing

Exploratory Hole/In Situ Test Type	Proposed number
Cable percussion, SPTs, variable head permeability test, install	BH17-C2-01
Cable percussion, SPTs, variable head permeability test	BH17-C2-02
Cable percussion, SPTs, variable head permeability test, install	BH17-C2-03
Cable percussion, SPTs, variable head permeability test	BH17-C2-04

The exploratory hole locations were selected by GHD. The locations were set out by the GHD site representative prior to commencement.

3.2 Exploratory Holes

The exploratory holes were logged by an engineer in accordance with the recommendations of BS5930:2015, which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1. Methods of formation and geological descriptions, together with sample records, in situ test results and observations made during formation of the exploratory hole are given in the logs presented in Appendix A and should be read in conjunction with the Key included therein. Sample photographs are presented in Appendix B.

A summary of the exploratory holes formed is listed in the following table.

Table 2: Summary of Exploratory Positions

Exploratory position:	Type:	Final depth (m):	Easting (mE):	Northing (mN):	Level (mAOD):	Start date:	End date:
BH17-C2-01	CP	20	599332.97	315346.00	58.92	18/07/2017	19/07/2017
BH17-C2-02	CP	20	599394.14	315347.46	58.41	20/07/2017	21/07/2017
BH17-C2-03	CP	20	599547.92	315352.43	58.79	24/07/2017	25/07/2017
BH17-C2-04	CP	20	599596.68	315324.32	59.60	25/07/2017	26/07/2017

Type: CP – cable percussion;

Prior to commencement, all exploratory positions were checked for services by reference to available plans, visual inspection and CAT survey. Inspection pits were excavated by hand and rechecked with a CAT at all borehole locations.

An exploratory hole location plan is presented as drawing 3318(C2)D002-2.

3.3 Sampling

Samples for geotechnical and geoenvironmental testing and strata description were taken during the formation of the exploratory holes in general accordance with the specification, BS5930:2015, BS10175:2011 and BS EN ISO 22475-1:2006. Soil and water samples for geochemical analysis were taken in accordance with the specification and stored in cool boxes for despatch directly to Concept Life Sciences (Formerly Scientific Analysis Laboratories, SAL) in Braintree, Essex.

A summary of water samples taken from monitoring installations is presented in Appendix D.

3.4 In Situ Testing

In situ testing was carried in accordance with BS 5930:2015, BS 1377-9 (1990), BS EN ISO 22282-1:2012 and BS EN ISO 22282-2:2012 unless otherwise stated. SPT results are presented on individual exploratory hole logs. Information relating to the identification and calibration of SPT hammers can also be found on the individual borehole logs. Hammer calibration certificates are presented in Appendix G.

Falling head tests were carried out in suitable strata in the boreholes upon instruction from GHD. Results are presented in Appendix C.

3.5 Instrumentation and Monitoring

Details of instrumentation installed is presented on the exploratory hole logs. A summary of the installed instrumentation is listed in the following table.

Table 3: Summary of Instrumentation

Exploratory position:	Instrument type:	Instrument reference:	Internal diameter (mm):	Installed depth (m bgl):	Depth (m AOD):	Top of response zone (m bgl):	Base of response zone (m bgl):
BH17-C2-01	Standpipe	BH17-C7-01	50	19	39.92	15.0	19
BH17-C2-03	Standpipe	BH17-C7-03	50	20	38.79	15.0	20

Records of monitoring and gas/groundwater sampling carried out by TerraConsult during and after the fieldwork period to the date of issue of this report are presented in Appendix D. Calibration certificates are presented in Appendix G.

3.6 Surveying

On completion of the fieldworks, all exploratory positions were surveyed by use of GPS. Coordinates and reduced levels to Ordnance Survey are provided on the exploratory hole logs.

4 LABORATORY TESTING

4.1 Geotechnical Testing

The testing was scheduled by GHD and was carried out by GEO Site Testing Services Ltd (GSTL), Llanelli, Camarthenshire, in accordance with BS 1377 (1990) and BRE SD1 unless otherwise stated. The testing is summarised below and the results are presented in Appendix E.

Table 4: Summary of Geotechnical Laboratory Testing			
Lab test:	Number undertaken:	Method:	Remarks:
Atterburg Limit 4 Point Method	2	BS1377: Part 2: 4.3 & 5.3	
Particle size Distribution	2	BS1377: Part 2: 9.2	
BRE SD1 Suite	1	BRE SD1	
One dimensional consolidation	1	BS1377: Part 5: 3	
Triaxial 100mm single stage	2	BS1377: Part 7: 8	

4.2 Geoenvironmental Testing

The testing was scheduled by GHD and carried out by Concept Life Sciences. The results are presented in Appendix F.

5 REFERENCES

AGS: 2010: Electronic transfer of geotechnical and geoenvironmental data (Edition 4 including addendum 3, 2011). Association of Geotechnical and Geoenvironmental Specialists.

BRE Special Digest 1: 2005 Concrete in aggressive ground.

BS 1377 : 1990 : Methods of test for soils for civil engineering purposes. Published in nine parts. British Standards Institution.

BS 5930 : 2015 : Code of practice for site investigation. British Standards Institution.

BS 10175 : 2011: Investigation of potentially contaminated sites – Code of Practice. British Standards Institution

BS EN 1997-1: 2004 : Eurocode 7 – Geotechnical Design – Part 1: General rules. Including UK National Appendix of November 2007. British Standards Institution.

BS EN ISO 14688-1 : 2002 : Geotechnical investigation and testing – Identification and classification of soil – Part 1: Identification and description. British Standards Institution.

BS EN ISO 14688-2 : 2004 : Geotechnical investigation and testing – Identification and classification of soil – Part 2: Principles for a classification. British Standards Institution.

BS EN ISO 14689-1 : 2003 : Geotechnical investigation and testing – Identification and classification of rock – Part 1: Identification and description. British Standards Institution.

BS EN ISO 22282-1 : 2012 Geotechnical investigation and testing. Geohydraulic testing Part1: General Rules

BS EN ISO 22282-2 : 2012 Geotechnical investigation and testing. Geohydraulic testing Part 2: Water Permeability Tests in a borehole using open systems

BS EN ISO 22475-1 : 2006 : Geotechnical investigation and testing – Sampling methods and groundwater measurements – Part 1: Technical principals for execution (July 2011 reprint). British Standards Institution.

BS EN ISO 22476-3 : 2005 : Geotechnical investigation and testing – Field Testing – Part 3: Standard penetration test

6 LICENCES

British Geological Survey Reproduction Licence Number: IPR/187-68CF CO8/053-CSL

Ordnance Survey Reproduction Licence Number. 100035365

DRAWINGS

3318(C2)D001-1 Site Location Plan
3318(C2)D002-2 Exploratory Hole Location Plan

Site Location Plan

TerraConsult

Address:	Notes:
East Anglia	

AGS		Project:	East Anglia (North) Offshore Wind Farm	Drawing No:
Issue:	FINAL	Project No:	3318	**3318(C2)D001-1**
Scale:	1:25000	Client:	GHD Ltd	

Exploratory Hole Location Plan

TerraConsult

Legend Key

Locations By Type - CP

AGS		Project: East Anglia (North) Offshore Wind Farm	Drawing No:
Issue:	FINAL	Project No: 3318	3318(C2)D002-1
Scale:	1:3000	Client: GHD Ltd	

APPENDICES

APPENDIX A
Exploratory Hole Records

Key sheet

Boreholes

Exploratory Hole Key Sheet

TerraConsult

SAMPLES:

Undisturbed:	
U	Driven tube sample
UT	Thin wall driven tube sample
TW	Pushed thin wall tube sample
P	Pushed piston sample
L	Liner sample (from windowless or similar sampler), full recovery unless otherwise stated
CBR	CBR mould sample
BLK	Block sample
C	Core sample (from rotary core) taken for laboratory testing
Disturbed:	
D	Small sample
B	Bulk sample
AMAL	Amalgamated sample
Environmental:	
ES	Environmental soil sample
EW	Environmental water sample
Comments:	Sample reference numbers are assigned to every sample taken. A sample reference of 'NR' indicates that an attempt was made to take a tube sample; however, there was no recovery. Sample recovery is given as a percentage.

TESTS:

SPT S or SPT C	Standard Penetration Test, open shoe (S) or solid cone (C)
	The Standard Penetration Test is defined in BS EN ISO 22476-3 (2005). The incremental blow counts are given in the Field Records column; each increment is 75mm unless stated otherwise and any penetration under self weight in mm (SW) is noted. Where the full 300mm test drive is achieved the total number of blows for the test drive is presented as N = ** in the Test column. Where the test drive blows reach 50 (either in total or for a single increment) the total blow count beyond the seating drive is given (without the N = prefix).
ICBR	In situ CBR
IV	In situ vane shear strength, peak (p) and remoulded (r), kPa
HV	Hand vane shear strength, peak (p) and remoulded (r), kPa
PP	Pocket penetrometer test, converted to shear strength, kPa
KFH, KRH, KPI	Variable head permeability tests (KFH = falling head test, KRH = rising head test, KPI = packer test), permeability value
PID/FID	Photo-ionisation detector/Flame-ionisation detector
	Test results provided in Field Records column

DRILLING RECORDS:

The mechanical indices (TCR/SCR/RQD & If) are defined in BS 5930: 2015 and BS EN ISO 22575-1 (2006)

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
If	Fracture spacing, mm. Minimum, typical and maximum spacings are presented.
NI	Non intact is used where the core is fragmented.
CRF	Core recovered (length in m) in the following run
AZCL	Assessed zone of core loss
NR	Not recovered

GROUNDWATER:

▼ Groundwater strike

▽ Groundwater level after standing period

DEPTH REMARKS:

EoS	End of Shift
SoS	Start of Shift
EoBH	End of Borehole

INSTRUMENTATION:

Details of installations are given on the Record. Legend column shows installed instrument depths including slotted pipe section or tip depth, response zone filter material type and layers of backfill. The type of instrument installed is indicated by a code adjacent to the Legend column at the base of the instrument.

SP	Standpipe
SPIE	Standpipe piezometer
PPIE	Pneumatic piezometer
EPIE	Electronic piezometer
HPIE	Hydraulic piezometer
GMP	Gas monitoring standpipe
(xx)	Internal diameter
ICE	Biaxial inclinometer
ICM	Inclinometer tubing for use with probe
SLIP	Slip indicator
ESET	Electronic settlement cell/gauge
ETM	Magnetic extensometer settlement point
ETR	Rod extensometer

EXPLORATORY HOLE TYPE:

CP	Cable percussion
DP	Dynamic probe
DCP	Dynamic cone penetrometer
HA	Hand auger
IP	Inspection pit
OP	Observation pit/trench
PC	Pavement core
RC	Rotary core
RO	Rotary open hole
SH	Shaft
SNC	Sonic (resonance)
TP	Trial pit/trench
TRAV	Traverse
WLS	Windowless (dynamic) sample
WS	Window (dynamic) sample

AGS

Project: **East Anglia (North) Offshore Wind Farm**

Project No: **3318**

Client: **GHD Ltd**

Reference

KEY SHEET

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	18-07-17	18-07-17	TM	Hand tools	n/a	n/a	18-07-17	VS	
CP	0.00	20.00	18-07-17	19-07-17	TM	Dando 2000	n/a	n/a	19-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	599332.97
mN:	315346.00
mAOD:	58.92
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Frequent rootlets (TOPSOIL)					
			58.52	0.40	Firm to stiff dark orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint and white chalk. Occasionally mottled dark grey. (TILL)			0.50 0.50 0.50 - 1.00	D1 ES1 B1	
				(0.60)						
			57.92	1.00	*0.70 - 1.00 m: Becomes firm*			1.00 1.00	D2 ES2	
				(0.50)	Firm to stiff light orangish brown mottled dark orangish brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse white chalk and occasional flint. Occasionally mottles dark brown and light greyish white. (TILL)					
			57.42	1.50		Dry		1.50 1.50 1.50 - 1.95	C ES3 B2	N=27 (3,4/6,6,7,8)
					Firm light brownish grey occasionally mottled dark orangish brown and light orangish brown slightly sandy gravelly CLAY. Gravel subangular to subrounded fine to coarse white chalk and occasional flint. (TILL)			2.00 2.00	D3 ES4	
					2.00 - 4.00 m: Becomes stiff					
				(2.50)				3.00 - 3.45 3.00 - 3.45	D4 U1	75 (40%)
			54.92	4.00	Stiff dark brown mottled dark grey and dark orangish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse white chalk and occasional flint. (TILL)			4.00	D5	
	▼			(1.20)		Dry	3.00	4.50 4.50 - 4.95	S B3	N=27 (3,6/6,6,7,8)
			53.72	5.20	Firm to stiff dark grey mottled dark orangish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse white chalk and occasional flint. (TILL)			5.30	D6	
				(1.50)				6.00 - 6.45 6.00 - 6.45	D7 U2	80 (80%)
			52.22	6.70	Stiff dark orangish brown mottled dark reddish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse white chalk and occasional flint. Occasional black spots. (TILL)			6.70	D8	
				(0.50)				7.00	D9	
			51.72	7.20	*7.00 m: Dark orangish brown sand layer*					
					Firm to stiff dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse white chalk and rare flint. Occasionally mottled dark orangish brown. (TILL)	Dry	7.50	7.50 7.50 - 7.95	S D10	N=21 (1,5/5,4,5,7)
								9.00 - 9.45 9.00 - 9.45	D11 U3	73 (90%)
Inst						Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	3.00	5.50
150	19.50	19.50

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Log issue: FINAL

Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm

Project No: 3318

Client: GHD Ltd

Exploratory position reference:

BH17-C2-01

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	18-07-17	18-07-17	TM	Hand tools	n/a	n/a	18-07-17	VS	
CP	0.00	20.00	18-07-17	19-07-17	TM	Dando 2000	n/a	n/a	19-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	599332.97
mN:	315346.00
mAOD:	58.92
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
						Dry	7.50	10.50 10.50 - 10.95	S D12	N=22 (2,4/4,5,6,7)
				(8.10)						
					12.00 - 15.30 m: Becomes dark greyish brown			12.00 - 12.45 12.00 - 12.45	D13 U4	66 (80%)
					13.50 - 15.30 m: Becomes firm	Dry		13.50 13.50 - 13.95	S B4	N=23 (2,3/3,4,4,12)
			43.62	15.30	Light greyish brown clayey fine to medium SAND. Fine to coarse gravel sized pockets of light greyish brown mottled dark orangish brown sandy CLAY. (TILL)			15.30 - 16.00	B5	
				(1.20)						
			42.42	16.50	Medium dense dark yellowish brown gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint and chalk. (TILL)	Dry	16.50	16.50 16.50 - 16.95	C D14	N=25 (2,2/4,5,7,9)
					18.00 - 20.00 m: Becomes very gravelly	Dry	18.00	18.00 18.00 - 18.45	C D15	N=25 (2,2/4,5,7,9)
				(3.50)						
	SP					Dry	19.50	19.50 19.50 - 19.95	C D16	N=24 (1,2/2,4,7,11)
Inst			38.92	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
15.4	4.76	7.50	
0			

Diameter & casing:

Dia (mm):	Depth:	Casing:

Depth related remarks:

From:	To:	Remarks:
18.0	18.4	Blowing sands.
0	5	
19.5	19.9	Blowing sands.
0	5	

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Log issue: FINAL

Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm

Project No: 3318

Client: GHD Ltd

Exploratory position reference:

BH17-C2-01

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	20-07-17	20-07-17	TM	Hand tools	n/a	n/a	20-07-17	VS	
CP	0.00	20.00	20-07-17	21-07-17	TM	Dando 2000	n/a	n/a	21-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	599394.14
mN:	315347.46
mAOD:	58.41
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.50)	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets (TOPSOIL)					
			57.91	0.50	Firm to stiff dark orangish brown occasionally mottled dark greyish brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasional black spots. (TILL)			0.50 0.50 0.50 - 1.00	D1 ES1 B1	
								1.00 1.00	D2 ES2	
				(1.50)		Dry		1.50 1.50 1.50 1.50 - 1.95	C D3 ES3 B2	50 (5,11/50 for 225mm)
			56.41	2.00	Stiff light grey mottled dark orangish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. Occasional black spots. (TILL)			2.00 2.00	D4 ES4	
								3.00 - 3.45 3.00 - 3.45	D5 U1	70 (70%)
					3.40 - 5.50 m: Becomes firm and mottled reddish brown					
				(3.50)		Dry	3.00	4.50 4.50 - 4.95	S D6	N=13 (1,3/3,3,3,4)
			52.91	5.50	Stiff dark brownish grey occasionally mottled dark orangish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)			6.00 - 6.45 6.00 - 6.45	D7 U2	80 (90%)
					7.00 - 10.30 m: Becomes dark grey					
				(4.80)		Dry	3.00	7.50 7.50 - 7.95	S D8	N=28 (4,5/6,6,7,9)
								9.00 - 9.45 9.00 - 9.45	D9 U3	90 (90%)
Inst						Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	3.00	9.00
150	19.00	19.00

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Log issue: FINAL

Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm

Project No: 3318

Client: GHD Ltd

Exploratory position reference:

BH17-C2-02

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	20-07-17	20-07-17	TM	Hand tools	n/a	n/a	20-07-17	VS	
CP	0.00	20.00	20-07-17	21-07-17	TM	Dando 2000	n/a	n/a	21-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	599394.14
mN:	315347.46
mAOD:	58.41
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
			48.11	10.30	Stiff dark brownish grey occasionally mottled dark orangish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)					
				(0.40)		Dry	10.50	10.50	C	N=19 (2,3/3,4,5,7)
								10.50 - 10.95	B3	
			47.71	10.70	Firm dark grey slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint and chalk. (TILL)					
					Firm to stiff dark grey occasionally mottled dark orangish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)			11.00	D10	
								12.00 - 12.45	D11	60 (90%)
								12.00 - 12.45	U4	
					12.40 - 13.00 m: Becomes sandy					
				(4.10)						
						Dry	12.00	13.50	S	N=31 (4,9/7,7,8,9)
								13.50 - 13.95	D12	
			43.61	14.80				14.80	D13	
					Stiff dark orangish brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. Rare laminations of fine to medium SAND. (TILL)	Dry	15.00	15.00	C	N=23 (3,4/4,6,6,7)
								15.00 - 15.45	B4	
				(1.70)						
			41.91	16.50						
					Stiff dark orangish brown mottled light grey slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)	Dry	16.00	16.50	S	N=33 (3,3/5,6,10,12)
								16.50 - 16.95	D14	
				(1.50)						
			40.41	18.00						
					Dense to medium dense dark orangish brown gravelly clayey fine to coarse SAND. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)	Dry	18.00	18.00	S	N=36 (4,5/7,7,10,12)
					18.00 - 19.00 m: fine to coarse gravel sized pockets of dark brown snady CLAY.			18.00 - 18.45	D15	
				(2.00)	*19.00 - 20.00 m: Becomes slightly clayey*					
						Dry	19.00	19.50	C	N=26 (3,5/5,6,7,8)
								19.50 - 19.95	D16	
Inst			38.41	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
10.40	9.70	3.00	11.00
19.00	17.10	18.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Log issue: FINAL

Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm

Project No: 3318

Client: GHD Ltd

Exploratory position reference:

BH17-C2-02

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	24-07-17	24-07-17	TM	Hand tools	n/a	n/a	24-07-17	VS	
CP	0.00	20.00	24-07-17	25-07-17	TM	Dando 2000	n/a	n/a	25-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE: 599547.92
mN: 315352.43
mAOD: 58.79
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.30)	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets (TOPSOIL)					
			58.49	0.30				0.50	D1	
				(0.50)	Soft orangish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk. (TILL)			0.50	ES1	
			57.99	0.80				0.50 - 1.00	B1	
					Firm to stiff light greyish brown and orangish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk. (TILL)			1.00	D2	
								1.00	ES2	
				(1.20)		Dry		1.50	C	N=27 (4,4/6,7,7,7)
								1.50	ES3	
								1.50 - 1.95	B2	
			56.79	2.00	Firm light brownish grey slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint. (TILL)			2.00	D4	
								2.00	ES4	
								3.00	D5	44 (40%)
				(2.30)				3.00 - 3.45	D6	
								3.00 - 3.45	U1	
					4.00 m: Cobble of flint			4.00	D7	
			54.49	4.30	Stiff dark grey gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk. (TILL)	Dry	3.00	4.50	S	N=24 (2,3/5,6,6,7)
								4.50 - 4.95	D8	
				(1.50)				5.00	D9	
			52.99	5.80				5.80 - 6.30	B3	
				(0.50)	Firm light greyish brown slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint. (TILL)	Dry	6.00	6.00	C	N=21 (2,3/3,5,6,7)
			52.49	6.30	Firm light greyish occasionally stained orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint and chalk. Occasional black spots (TILL)					
								7.50 - 7.95	D10	60 (80%)
				(2.70)				7.50 - 7.95	U2	
			49.79	9.00	Firm dark grey slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint. (TILL)	Dry	7.50	9.00	S	N=35 (4,6/6,8,9,12)
								9.00 - 9.45	D11	
				(1.95)						
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
6.00	4.80	3.00	7.00

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	3.00	6.00
150	19.50	19.50

Depth related remarks:

From: To: Remarks:

Chiselling details:

From: to: Duration: Tool:

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Log issue: FINAL
Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm
Project No: 3318
Client: GHD Ltd

Exploratory position reference:

BH17-C2-03

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	24-07-17	24-07-17	TM	Hand tools	n/a	n/a	24-07-17	VS	
CP	0.00	20.00	24-07-17	25-07-17	TM	Dando 2000	n/a	n/a	25-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE: 599547.92
mN: 315352.43
mAOD: 58.79
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
					Firm dark grey slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint. (TILL)			10.50 - 10.95 10.50 - 10.95	D12 U3	85 (80%)
			47.84	10.95	Stiff dark grey gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk. (TILL)					
					10.95 m: Cobble of chalk					
						Dry	10.00	12.00 12.00 - 12.45	S D12	N=52 (5,8/10,12,13,17)
				(3.00)						
								13.50 - 13.95 13.50 - 13.95	D14 U4	80 (80%)
			44.84	13.95	Stiff light orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. (TILL)					
				(1.05)						
	▼		43.79	15.00	Medium dense light brown gravelly slightly silty slightly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint and chalk (TILL)	Dry	15.00	15.00 15.00 - 15.45	C B4	N=16 (3,3/3,4,4,5)
	▽			(1.50)						
			42.29	16.50	Medium dense becoming very dense light brown gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint and chalk. (TILL)	Dry	16.50	16.50 16.50 - 16.95	C B5	N=18 (2,3/3,4,5,6)
					18.00 - 20.00 m: Becomes greyish brown	Dry	18.00	18.00 18.00 - 18.45	C D15	N=39 (2,3/5,7,11,16)
				(3.50)						
						Dry	19.50	19.50 19.50	C D16	50 (1,2/50 for 225mm)
SP Inst			38.79	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
15.8	15.1	15.5	
0	0	0	

Diameter & casing:

Dia (mm):	Depth:	Casing:

Depth related remarks:

From:	To:	Remarks:
18.0	18.4	Blowing sands.
0	5	
19.5	19.9	Blowing sands.
0	5	

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Log issue: FINAL
Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm
Project No: 3318
Client: GHD Ltd

Exploratory position reference:

BH17-C2-03

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	25-07-17	25-07-17	TM	Hand tools	n/a	n/a	25-07-17	VS	
CP	0.00	20.00	25-07-17	26-07-17	TM	Dando 2000	n/a	n/a	26-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE: 599596.68
mN: 315324.32
mAOD: 59.60
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.30)	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Frequent rootlets (TOPSOIL)					
			59.30	0.30	Soft to firm orangish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk. (TILL)			0.50	D1	
								0.50	ES1	
								0.50 - 1.00	B1	
				(1.20)				1.00	D2	
								1.00	ES2	
			58.10	1.50	Firm light grey mottled light orangish brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)	Dry		1.50	C	N=18 (2,3/3,5,4,6)
								1.50	D3	
								1.50	ES3	
								1.50 - 1.95	B2	
				(1.50)				2.00	D4	
								2.00	ES4	
			56.60	3.00	Firm to stiff dark grey mottled light grey slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Rare shell fragments. Rare black claystone (TILL)			3.00	D5	42 (70%)
				(0.45)				3.00 - 3.45	D6	
			56.15	3.45	Stiff to very stiff dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to medium chalk and occasional flint. (TILL)			3.00 - 3.45	U1	
	▼									
				(1.85)		Dry	3.00	4.50	S	N=23 (1,3/5,5,6,7)
								4.50 - 4.95	D112	
	▽							4.50 - 4.95	D7	
			54.30	5.30	Firm light brownish grey mottled dark grey and dark orangish brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)			5.30 - 5.60	B3	
				(0.30)						
			54.00	5.60	Stiff to very stiff dark grey slight sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)			6.00 - 6.45	D8	78 (80%)
								6.00 - 6.45	U2	
				(4.90)		Dry	6.00	7.50	S	N=37 (2,5/7,8,10,12)
								7.50 - 7.95	D113	
								7.50 - 7.95	D9	
								9.00 - 9.45	D10	90 (80%)
								9.00 - 9.45	U3	
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
5.30	4.55	3.00	6.00

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	3.00	6.00
150	19.30	19.30

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Log issue: FINAL
Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm
Project No: 3318
Client: GHD Ltd

Exploratory position reference:

BH17-C2-04

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	25-07-17	25-07-17	TM	Hand tools	n/a	n/a	25-07-17	VS	
CP	0.00	20.00	25-07-17	26-07-17	TM	Dando 2000	n/a	n/a	26-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	599596.68
mN:	315324.32
mAOD:	59.60
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
					Stiff to very stiff dark grey slight sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)					
			49.10	10.50	Firm light greyish brown mottled dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. (TILL)	Dry	7.00	10.50 10.50 - 10.95 10.50 - 10.95	S D11 D114	N=23 (4,5/5,5,6,7)
				(1.95)				12.00 - 12.45 12.00 - 12.45	D12 U4	73 (80%)
			47.15	12.45	Stiff dark grey occasionally mottled dark brownish grey slightly sandy gravelly CLAY. Gravel if subangular to subrounded fine to coarse chalk and flint. (TILL)					
				(0.85)				13.30	D13	
			46.30	13.30	Firm orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)	Dry	13.50	13.50 13.50 - 13.95	C B4	N=13 (2,3/3,2,3,5)
			46.10	13.50	Firm light brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (TILL)					
				(1.50)						
	▼		44.60	15.00	Medium dense light orangish brown gravelly clayey silty fine to medium SAND. Gravel of subangular to subrounded fine to medium chalk and flint. (TILL)	Dry	15.00	15.00 15.00 - 15.45	C B5	N=13 (1,2/2,3,4,4)
	▽			(1.50)						
			43.10	16.50	Medium dense light brown silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse chalk and flint. (TILL)	Dry	16.50	16.50 16.50 - 16.95	C D14	N=23 (3,4/4,5,6,8)
					18.00 m: Becomes very gravelly	Dry	18.00	18.00 18.00 - 18.45	C D15	N=23 (1,1/2,4,7,10)
				(3.50)						
						Dry	19.50	19.50 19.50 - 19.95	C D16	N=25 (2,3/4,6,6,9)
Inst			39.60	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
16.0	15.3	16.0	
0	0	0	

Diameter & casing:

Dia (mm):	Depth:	Casing:

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Log issue: FINAL

Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm

Project No: 3318

Client: GHD Ltd

Exploratory position reference:

BH17-C2-04

APPENDIX B
Photographs

BH17-C2-01

1.00 m

2.00 m

5.30 m

6.70 m

7.20 m

13.50 m

15.50 m

16.50 m

BH17-C2-02

1.00 m

2.00 m


ath, Norwich, Norfolk NR13 6QP
271 Mobile: +44 (0)7785 313447
g.co.uk
DATE: 20.7.17
DEPTH: 6.45
SAMPLE No: 07

6.45 m

10.50 m

11.00 m

16.50 m

BH17-C2-03

2.00 m

4.50 m

13.95 m

12.00 m

15.00 m

16.00 m

BH17-C2-04

3.45 m

5.30 m

9.45 m

13.50 m

15.00 m

16.50 m

18.00 m

APPENDIX C
In Situ Testing Results

Variable head permeability test

Variable Head Permeability Test Results

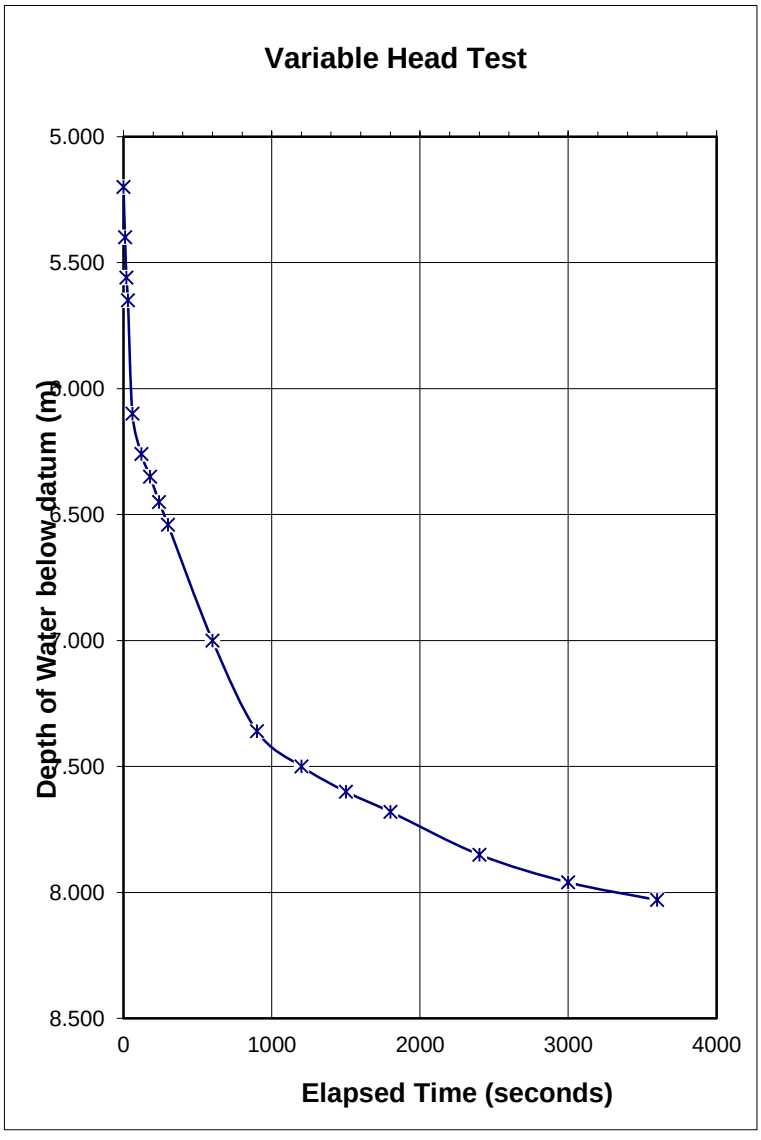
TerraConsult

Static water level (m)	14.70
Internal Diameter *(D)*	0.15
Length of Standpipe below Ground Level (m)	0.00
Height of Water above Ground Level (m)	0.00
Length of Standpipe above Ground Level (m)	0.00
Water level at start of test (m)	5.20
Top of Response Zone	15.00
Bottom of Response Zone	15.50

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	10.30
Final Head (h(t)) at (t)	7.47
Length of Response Zone *(L)*	0.50
Cross Sectional Area *(S)*	0.0177

Description	Clayey SAND

Elapsed Time (seconds)	Water below Datum	Head of Water
0	5.200	10.30
10	5.400	10.10
20	5.560	9.94
30	5.650	9.85
60	6.100	9.40
120	6.260	9.24
180	6.350	9.15
240	6.450	9.05
300	6.540	8.96
600	7.000	8.50
900	7.360	8.14
1200	7.500	8.00
1500	7.600	7.90
1800	7.680	7.82
2400	7.850	7.65
3000	7.960	7.54
3600	8.030	7.47



Shape Factor (F) calculated according to ISO 22282-1:2012

$$F = \frac{2\pi L}{ln\left\{\left(L/D\right) + \sqrt{\left(\left(L/D\right)^2 + 1\right)}\right\}}$$

$$= \frac{3.14}{1.90}$$

$$= 1.66$$

Equation for borehole permeability tests after BS EN ISO 22282-2:2012

$$k = \frac{S \ln\left(h_0/h(t)\right)}{F(t - t_0)}$$

k = 9.52E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C2-01**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

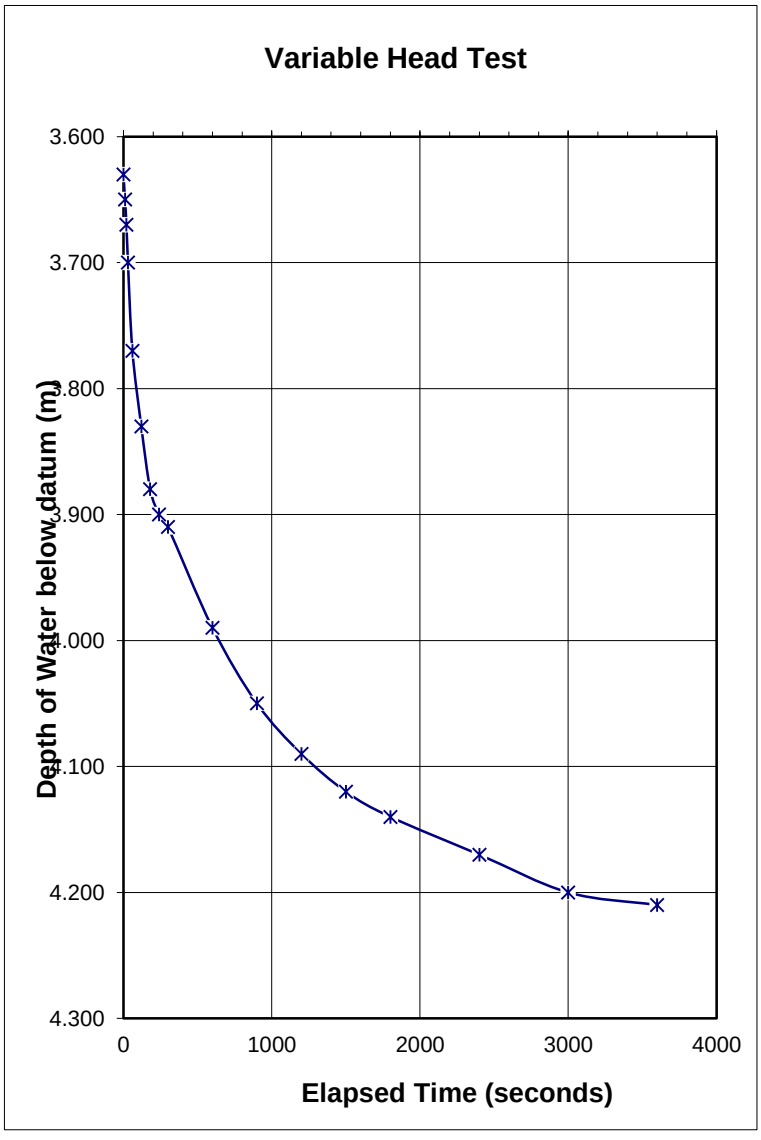
TerraConsult

Static water level (m)	9.70
Internal Diameter *(D)*	0.15
Length of Standpipe below Ground Level (m)	0.00
Height of Water above Ground Level (m)	0.00
Length of Standpipe above Ground Level (m)	0.00
Water level at start of test (m)	3.63
Top of Response Zone	9.00
Bottom of Response Zone	10.50

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	6.87
Final Head (h(t)) at (t)	6.29
Length of Response Zone *(L)*	1.50
Cross Sectional Area *(S)*	0.0177

Description	Sandy gravelly CLAY.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	3.630	6.87
10	3.650	6.85
20	3.670	6.83
30	3.700	6.80
60	3.770	6.73
120	3.830	6.67
180	3.880	6.62
240	3.900	6.60
300	3.910	6.59
600	3.990	6.51
900	4.050	6.45
1200	4.090	6.41
1500	4.120	6.38
1800	4.140	6.36
2400	4.170	6.33
3000	4.200	6.30
3600	4.210	6.29



Shape Factor (F) calculated according to ISO 22282-1:2012

$$F = \frac{2\pi L}{ln\left\{\left(L/D\right) + \sqrt{\left(\left(L/D\right)^2 + 1\right)}\right\}}$$

$$= \frac{9.42}{3.00}$$

$$= 3.15$$

Equation for borehole permeability tests after BS EN ISO 22282-2:2012

$$k = \frac{S \ln\left(h_0/h(t)\right)}{F(t - t_0)}$$

k = 1.38E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C2-02**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

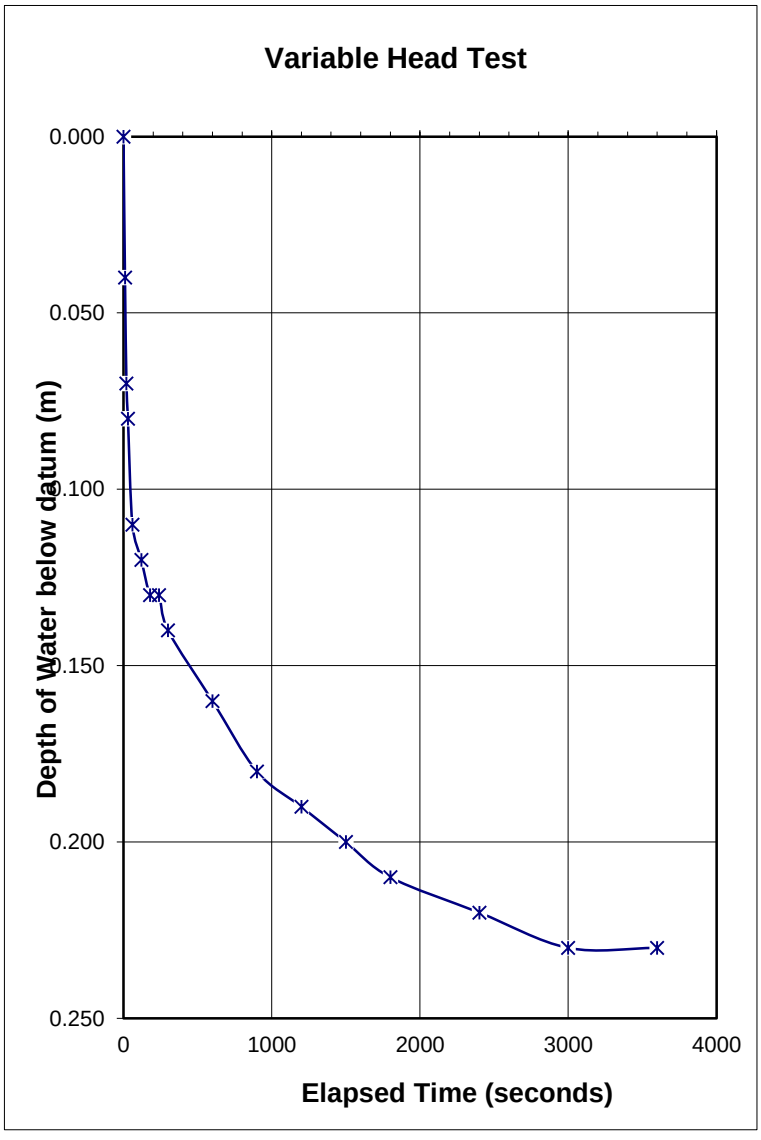
TerraConsult

Static water level (m)	4.80
Internal Diameter *(D)*	0.15
Length of Standpipe below Ground Level (m)	0.00
Height of Water above Ground Level (m)	0.00
Length of Standpipe above Ground Level (m)	0.00
Water level at start of test (m)	0.00
Top of Response Zone	5.50
Bottom of Response Zone	6.00

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	6.00
Final Head (h(t)) at (t)	5.77
Length of Response Zone *(L)*	0.50
Cross Sectional Area *(S)*	0.0177

Description	Slightly sandy slightly gravelly CLAY.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.000	6.00
10	0.040	5.96
20	0.070	5.93
30	0.080	5.92
60	0.110	5.89
120	0.120	5.88
180	0.130	5.87
240	0.130	5.87
300	0.140	5.86
600	0.160	5.84
900	0.180	5.82
1200	0.190	5.81
1500	0.200	5.80
1800	0.210	5.79
2400	0.220	5.78
3000	0.230	5.77
3600	0.230	5.77



Shape Factor (F) calculated according to ISO 22282-1:2012

$$F = \frac{2\pi L}{ln\left\{\left(L/D\right) + \sqrt{\left(\left(L/D\right)^2 + 1\right)}\right\}}$$

$$= \frac{3.14}{1.90}$$

$$= 1.66$$

Equation for borehole permeability tests after BS EN ISO 22282-2:2012

$$k = \frac{S \ln\left(h_0/h(t)\right)}{F(t - t_0)}$$

k = 1.16E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C2-03**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

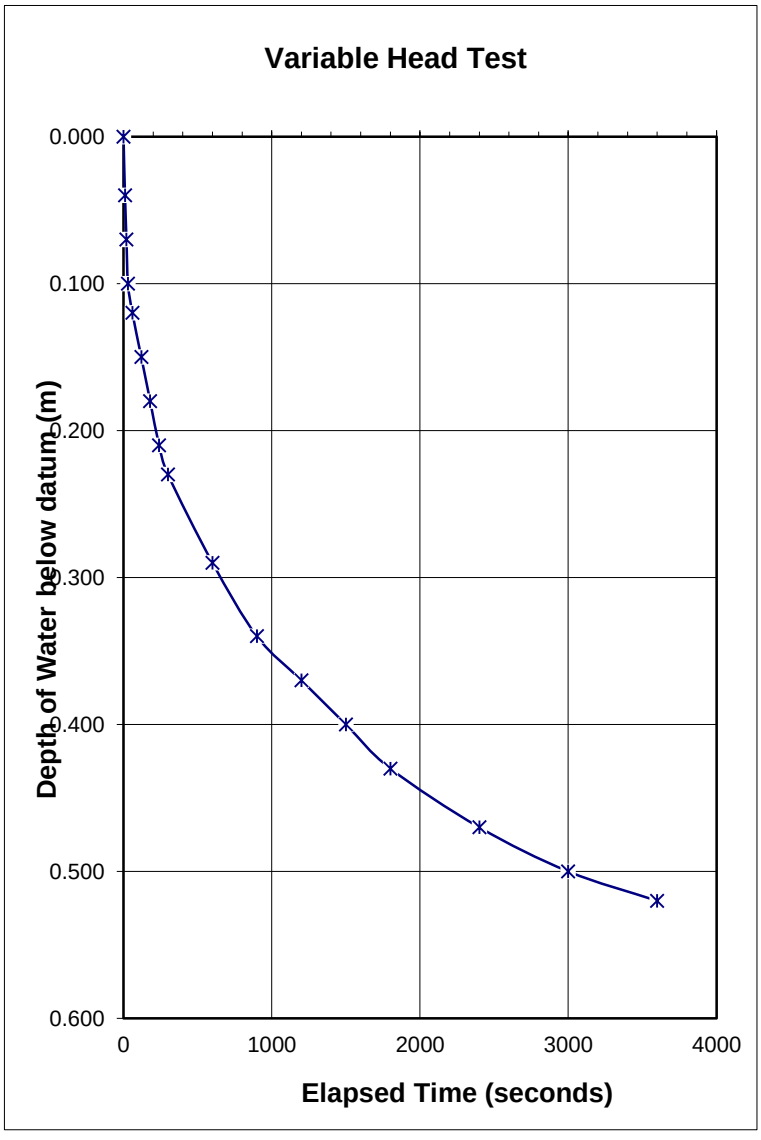
TerraConsult

Static water level (m)	4.55
Internal Diameter *(D)*	0.15
Length of Standpipe below Ground Level (m)	0.00
Height of Water above Ground Level (m)	0.00
Length of Standpipe above Ground Level (m)	0.00
Water level at start of test (m)	0.00
Top of Response Zone	5.00
Bottom of Response Zone	5.50

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	5.50
Final Head (h(t)) at (t)	4.98
Length of Response Zone *(L)*	0.50
Cross Sectional Area *(S)*	0.0177

Description	Slightly sandy slightly gravelly CLAY.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.000	5.50
10	0.040	5.46
20	0.070	5.43
30	0.100	5.40
60	0.120	5.38
120	0.150	5.35
180	0.180	5.32
240	0.210	5.29
300	0.230	5.27
600	0.290	5.21
900	0.340	5.16
1200	0.370	5.13
1500	0.400	5.10
1800	0.430	5.07
2400	0.470	5.03
3000	0.500	5.00
3600	0.520	4.98



Shape Factor (F) calculated according to ISO 22282-1:2012

$$F = \frac{2\pi L}{ln\left\{\left(L/D\right) + \sqrt{\left(\left(L/D\right)^2 + 1\right)}\right\}}$$

$$= \frac{3.14}{1.90}$$

$$= 1.66$$

Equation for borehole permeability tests after BS EN ISO 22282-2:2012

$$k = \frac{S \ln\left(h_0/h(t)\right)}{F(t - t_0)}$$

k = 2.94E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C2-04**
Checked by:	DD	Client:	GHD	

APPENDIX D
Instrumentation Sampling and Monitoring Records

No: **3318** GROUNDWATER AND GROUND GAS MONITORING

Site: **East Anglia OWF**

GROUND GAS AND GROUNDWATER MONITORING DATA

Location	Date	Monitored by	Well Details		Groundwater					Gas											Weather	
			Standpipe diameter (mm)	Depth to Base (m bgl)	Water Depth (m bgl)	Water Sample Taken?	Water Temp oC	Odour	Colour	Atmospheric Pressure (mbar)	Atmospheric Pressure Comment	Relative Pressure (Pa)	Flow (l/h)	CH_4 (% v/v)	GSV CH_4 (l/hr)	CO_2 (% v/v)	GSV CO_2 (l/hr)	O_2 (% v/v)	CO (ppm)	H2S (ppm)	VOC (ppm)	Conditions	Ambient Temp °C
BH17-C2-01	11/08/17	KW	51	19.19	15.19	Y				1011	NM	-33	-5.4	0.0	0.0000	0.3	-0.0162	18.0	0	0	NM	Sunny, dry	21
	22/08/17	VS	51	19.20	15.23	N				1015	NM	0.0	0.0	0.0	0.0000	3.8	0.0000	7.7	0	0	NM	Sunny, dry	21
	31/08/17	VS	51	19.00	15.28	N				1008	NM	0.0	0.0	0.0	0.0000	4.5	0.0000	7.8	0	0	NM	Sunny, dry	19
	15/09/17	VS	51	18.95	15.29	N				1004	NM	0.0	0.0	0.0	0.0000	5.0	0.0000	10.2	0	0	NM	Sunny spells	16
BH17-C2-03	11/08/17	KW	51	18.31	14.81	Y				1010	NM	0.0	0.0	0.0	0.0000	0.4	0.0000	20.6	0	0	NM	Sunny, dry	21
	22/08/17	VS	51	18.10	14.90	N				1014	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.7	0	0	NM	Sunny, dry	21
	31/08/17	VS	51	17.96	14.96	N				1009	NM	-2.0	-0.3	0.0	0.0000	0.6	-0.0018	19.4	0	0	NM	Sunny, dry	18
	15/09/17	VS	51	17.96	14.96	N				1005	NM	0.0	0.0	0.0	0.0000	0.3	0.0000	19.5	0	0	NM	Sunny Spells	16

NOTES:
NM = Not Measured.
(x) = Peak value recorded.
[grey] = Below detection limit..

GSV (l/HR) = [gas concentration (%v/v)] x [gas well flow rate (l/hr)
100

APPENDIX E
Geotechnical Laboratory Test Results

Report References: GSTL 35625

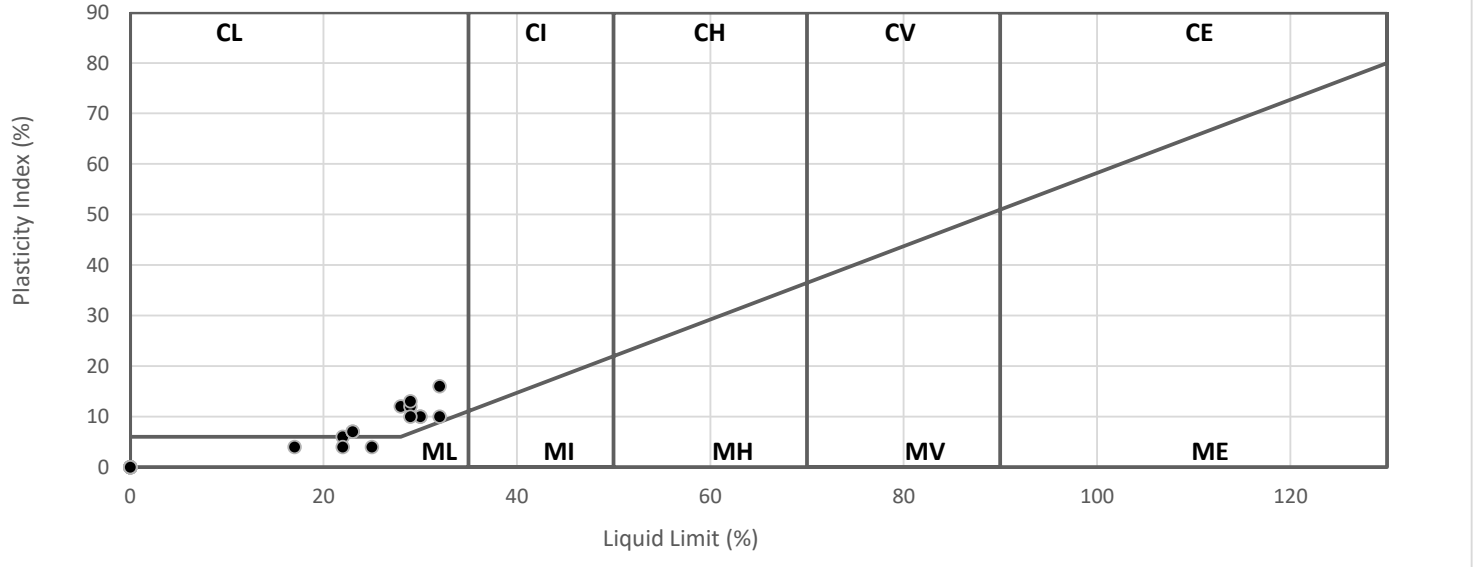
CLS 684646

GSTL	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5)	
Contract Number	**36525**	
Site Name	**E Anglia Wind Farm - Cable Route**	

Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing .425mm %	Remarks
BH17-C2-02	7	D	6.00	-	6.45	17	28	16	12	77	CL Low Plasticity
BH17-C2-03	6	D	3.00	-	3.45	19	32	16	16	72	CL Low Plasticity
					-						
					-						
					-						
					-						
					-						
					-						
					-						

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

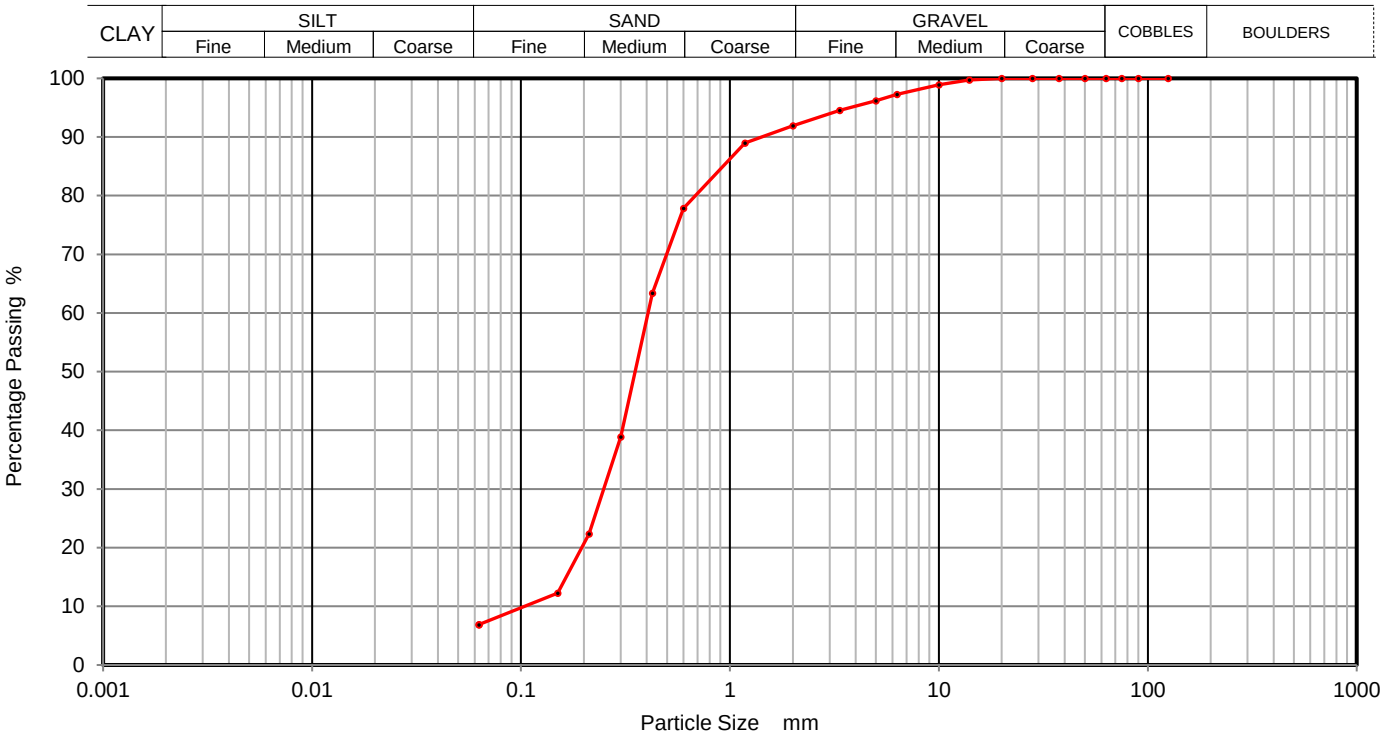
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



Operators	Checked	20/09/2017	Sean Penn	[redacted]
DB	Approved	21/09/2017	Ben Sharp	

UKAS TESTING 2788

GSTL	**PARTICLE SIZE DISTRIBUTION** **BS 1377 Part 2:1990** **Wet Sieve, Clause 9.2**	Contract Number	**36525**
		Borehole/Pit No.	**BH17-C2-01**
Site Name	**E Anglia Wind Farm - Cable Route**	Sample No.	**14**
Soil Description	Brown slightly silty slightly fine to medium gravelly fine to coarse SAND	Depth Top	**16.50**
		Depth Base	**16.95**
		Sample Type	**D**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	
90	100	0.0060	
75	100	0.0019	
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	97		
5	96		
3.35	95		
2	92		
1.18	89		
0.6	78		
0.425	63		
0.3	39		
0.212	22		
0.15	12		
0.063	7		

Sample Proportions	% dry mass
Cobbles	0
Gravel	8
Sand	85
Silt and Clay	7

Grading Analysis	
Uniformity Coefficient	

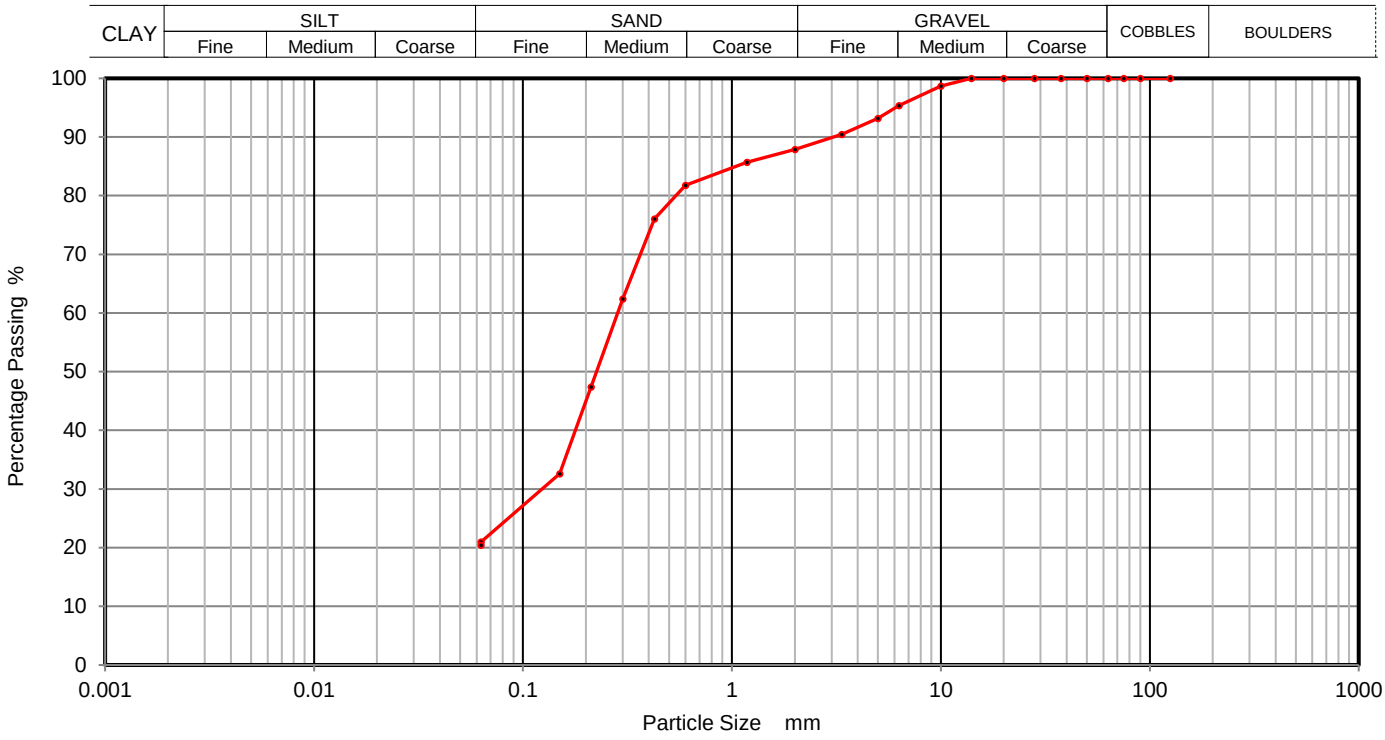
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	20/09/2017	Sean Penn
RO/MH	Approved	21/09/2017	Ben Sharp

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	36525
		Borehole/Pit No.	BH17-C2-04
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	5
Soil Description	Brown fine to medium gravelly silty fine to coarse SAND	Depth Top	15.00
		Depth Base	15.45
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	
90	100	0.0060	
75	100	0.0019	
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	95		
5	93		
3.35	90		
2	88		
1.18	86		
0.6	82		
0.425	76		
0.3	62		
0.212	47		
0.15	33		
0.063	21		

Sample Proportions	% dry mass
Cobbles	0
Gravel	12
Sand	67
Silt and Clay	21

Grading Analysis	
Uniformity Coefficient	

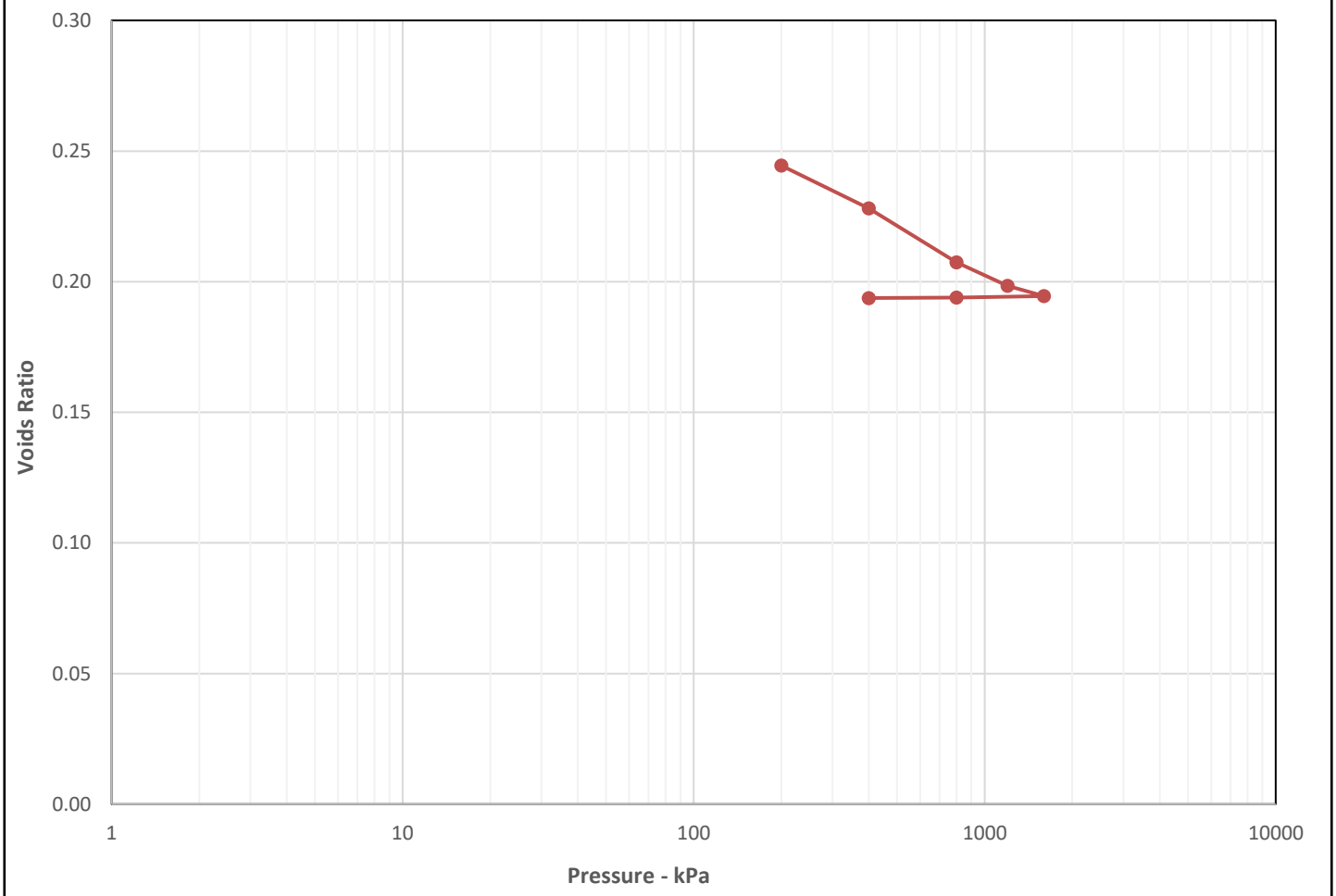
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	20/09/2017	Sean Penn	[redacted]
RO/MH	Approved	21/09/2017	Ben Sharp	

UKAS TESTING 2788

GSTL	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3	Contract Number	36525
		Borehole/Trialpit No.	BH17-C2-02
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	4
Soil Description	Grey fine to medium gravelly sandy silty CLAY	Depth Top (m)	12.00
		Depth Base (m)	12.45
Lab Temperature	20°c	Sample Location	Middle
Remarks	Cv Calculated Using T90	Sample Type	U

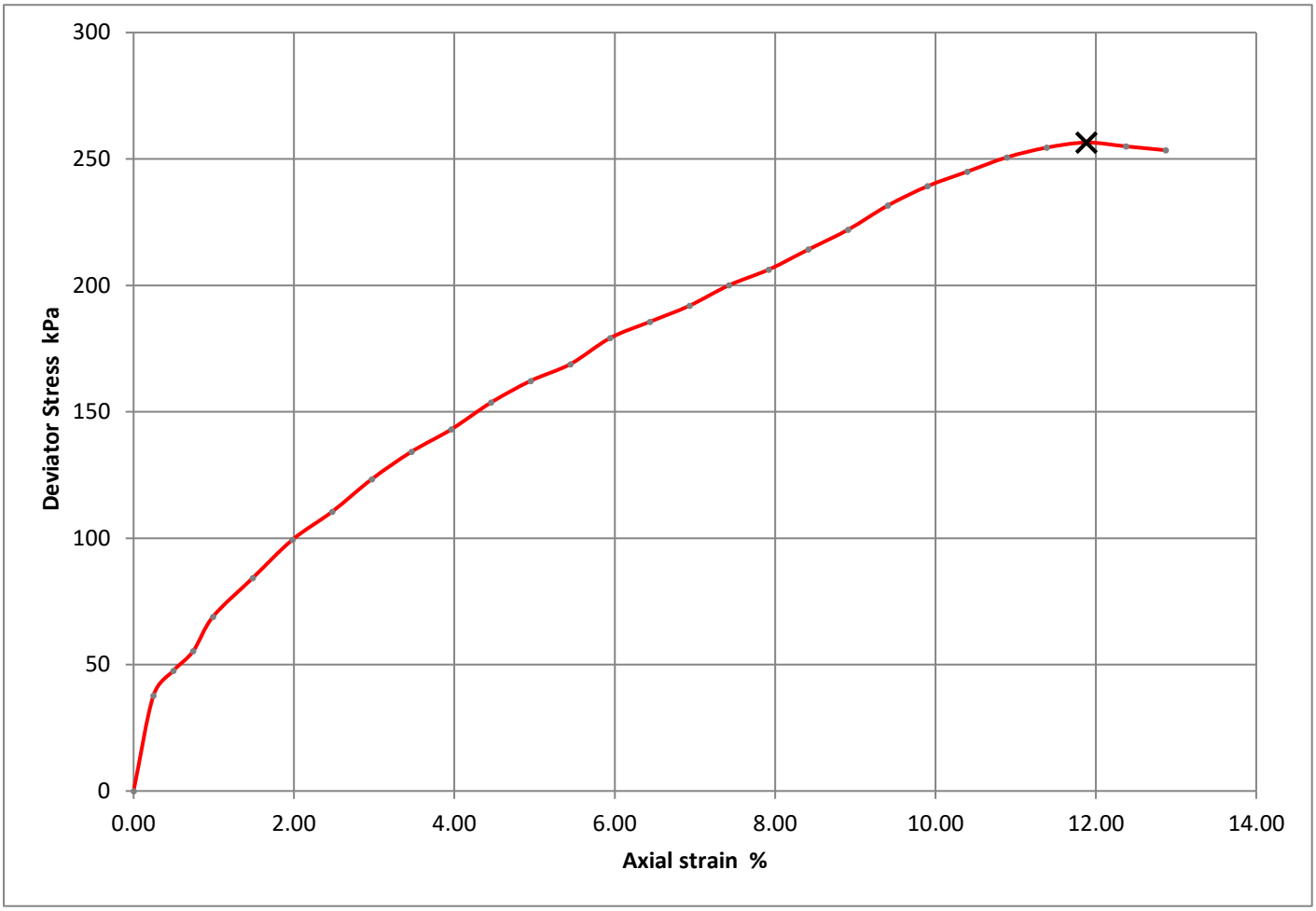


Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	12	0	-	200	0.16	16		-			
Bulk Density (Mg/m3)	2.30	200	-	400	0.066	12		-			
Dry Density (Mg/m3)	2.06	400	-	800	0.042	12		-			
Voids Ratio	0.2848	800	-	1200	0.0	7.6		-			
Degree of saturation	108.0	1200	-	1600	0.0081	4		-			
Height (mm)	19.96	1600	-	800	-0.00061	19		-			
Diameter (mm)	50.05	800	-	400	-0.0004	13		-			
Particle Density (Mg/m3)	2.65		-					-			

Operators	Checked	20/09/2017	Sean Penn	[redacted]
LG	Approved	21/09/2017	Ben Sharp	

UKAS TESTING 2788

GSTL	Single Stage Unconsolidated-Undrained Triaxial Test BS 1377 : 1990 Part 7 : 8	Contract Number	36525
		Borehole/Pit No.	BH17-C2-04
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	2
Soil Description	Light brown fine to coarse gravelly sandy silty CLAY	Depth Top (m)	6.00
		Depth Base (m)	6.45
		Sample Type	U



Moisture Content (%)	19
Bulk Density (Mg/m^3)	2.15
Dry Density (Mg/m^3)	1.81
Specimen Length (mm)	202
Specimen Diameter (mm)	103
Cell Pressure (kPa)	120
Deviator Stress (kPa)	256
Undrained Shear Strength (kPa)	128
Failure Strain (%)	11.9
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	3.00

Specimen Post Test	Sample Split
PICTURE NOT AVAILABLE	PICTURE NOT AVAILABLE

Checked	20/09/2017	Sean Penn	[redacted]
Approved	21/09/2017	Paul Evans	

UKAS TESTING 2788

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of Concept Life Sciences Analytical & Development Services Limited registered in England and Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

3 Crittall Drive
Springwood Industrial Estate
Braintree
Essex
CM7 2RT
Tel : 01376 560120
Fax : 01376 552923

Report Number: Supplement 1B to Report Number 684646-1

Date of Report: 23-Oct-2017

Customer: TerraConsult (South) Limited
Suite F17 Dugard House
Peartree Road
Colchester
Essex
CO3 0UL

Customer Contact: Victoria Smith

Customer Job Reference:
Customer Site Reference: Happisburgh/East Anglia
Date Job Received at Concept: 05-Sep-2017
Date Analysis Started: 26-Sep-2017
Date Analysis Completed: 29-Sep-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

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Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked and authorised by :
Chelsea Entwistle
Senior Customer Service Advisor

Issued by :
Aislinn Arthey
Customer Service Adv

[redacted]

Concept Reference: 684646
Project Site: Happisburgh/East Anglia
Customer Reference:

Soil Analysed as Soil
BRE SD1 (SE)

Concept Reference	**684646 004**
Customer Sample Reference	**17-C2-04 D1 @ 0.50m**
Date Sampled	**25-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	<0.01
(Water soluble) Cl-	T710	A40	0.01	g/l	<0.01
Magnesium	T112	A40	1	mg/l	**1**
(Water soluble) NO3	T710	A40	0.01	g/l	<0.01
pH	T7	A40			**8.2**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	**0.02**
SO4(Total)	T102	A40	0.02	%	**0.03**
Sulphur (total)	T6	A40	0.01	%	**0.01**
Moisture @105C	T162	AR	0.1	%	**15**
Retained on 2mm	T2	A40	0.1	%	**1.0**

Index to symbols used in Supplement 1B to Report Number 684646-1

Value	Description
AR	As Received
A40	Assisted dried < 40C
M	Analysis is MCERTS accredited
N	Analysis is not UKAS accredited

Notes

Retained on 2mm is removed before analysis
Supplement 1B Report reissued to include only sample 004

Method Index

Value	Description
T6	ICP/OES
T7	Probe
T242	2:1 Extraction/ICP/OES (TRL 447 T1)
T2	Grav
T102	ICP/OES (HCl extract)
T112	ICP/OES (SIM)(Water Extract)
T162	Grav (1 Dec) (105 C)
T710	2:1 Extraction / Discrete Analyser

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	N	004
(Water soluble) Cl-	T710	A40	0.01	g/l	N	004
Magnesium	T112	A40	1	mg/l	N	004
(Water soluble) NO3	T710	A40	0.01	g/l	N	004
pH	T7	A40			M	004
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	M	004
SO4(Total)	T102	A40	0.02	%	M	004
Sulphur (total)	T6	A40	0.01	%	M	004
Moisture @105C	T162	AR	0.1	%	N	004
Retained on 2mm	T2	A40	0.1	%	N	004

APPENDIX F
Geoenvironmental Laboratory Test Results

Report References: 672447

675177

CONCEPT LIFE SCIENCES
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Concept Life Sciences

Certificate of Analysis

3 Crittall Drive
Springwood Industrial Estate
Braintree
Essex
CM7 2RT
Tel : 01376 560120
Fax : 01376 552923

Report Number: Supplement 1E to Report Number 672447-1

Date of Report: 23-Oct-2017

Customer: TerraConsult Limited
Unit 34
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

Customer Contact: Mr Derek Daniels

Customer Job Reference: 3318
Customer Purchase Order: PO-001748
Customer Site Reference: Norfolk Vanguard Cable Route
Date Job Received at Concept: 13-Jul-2017
Date Analysis Started: 03-Aug-2017
Date Analysis Completed: 11-Aug-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked and authorised by :
Claire Brown Crociquia
Customer Service Manager

Issued by :
Aislinn Arthey
Customer Service Advi

[redacted]

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Miscellaneous

				Concept Reference	**672447 045**	**672447 050**
				Customer Sample Reference	**BH17-C2-01 ES1 @ 0.50m**	**BH17-C2-02 ES2 @ 1.00m**
				Date Sampled	**18-JUL-2017**	**20-JUL-2017**
				Matrix Class	**Sandy Soil**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Arsenic	T257	A40	2	mg/kg	**13**	**17**
Barium	T257	A40	2	mg/kg	**49**	**53**
Beryllium	T245	A40	0.5	mg/kg	**1.2**	**1.3**
Boron (water-soluble)	T82	A40	1	mg/kg	<1	<1
Cadmium	T257	A40	0.1	mg/kg	**0.2**	**0.4**
Chromium	T257	A40	0.5	mg/kg	**28**	**29**
Copper	T257	A40	2	mg/kg	**27**	**22**
Lead	T257	A40	2	mg/kg	**18**	**17**
Mercury	T245	A40	1.0	mg/kg	<1.0	<1.0
Nickel	T257	A40	0.5	mg/kg	**29**	**42**
Selenium	T257	A40	3	mg/kg	<3	<3
Vanadium	T257	A40	0.1	mg/kg	**44**	**49**
Zinc	T257	A40	2	mg/kg	**60**	**63**
Soil Organic Matter	T287	A40	0.1	%	-	**0.5**
Moisture @105C	T162	AR	0.1	%	**18**	**14**
Retained on 2mm	T2	A40	0.1	%	**3.7**	**2.8**

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Asbestos

				Concept Reference	**672447 049**	
				Customer Sample Reference	**BH17-C2-02 ES1 @ 0.50m**	
				Date Sampled	**20-JUL-2017**	
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Asbestos ID	T27	A40			Asbestos not detected	

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Total and Speciated USEPA16 PAH (SE) (MCERTS)

Concept Reference	**672447 050**
Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
Date Sampled	**20-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
Naphthalene	T16	AR	0.1	mg/kg	<0.1
Acenaphthylene	T16	AR	0.1	mg/kg	<0.1
Acenaphthene	T16	AR	0.1	mg/kg	<0.1
Fluorene	T16	AR	0.1	mg/kg	<0.1
Phenanthrene	T16	AR	0.1	mg/kg	<0.1
Anthracene	T16	AR	0.1	mg/kg	<0.1
Fluoranthene	T16	AR	0.1	mg/kg	<0.1
Pyrene	T16	AR	0.1	mg/kg	<0.1
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	<0.1
Chrysene	T16	AR	0.1	mg/kg	<0.1
Benzo(b)fluoranthene	T16	AR	0.1	mg/kg	<0.1
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	<0.1
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	<0.1
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	<0.1
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	<0.1
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	<0.1
PAH(total)	T16	AR	0.1	mg/kg	<0.1

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
TPH CWG

Concept Reference	**672447 050**
Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
Date Sampled	**20-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
Benzene	T209	AR	10	µg/kg	<10
Toluene	T209	AR	10	µg/kg	<10
EthylBenzene	T209	AR	10	µg/kg	<10
M/P Xylene	T209	AR	10	µg/kg	<10
O Xylene	T209	AR	10	µg/kg	<10
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	<10
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	<0.010
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	<0.010
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	<0.010
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	<0.010
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	<0.010
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	<0.010
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	<2
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	<2
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	<2
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	<2
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	<2
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	<2
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	<2
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	<2
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	<2
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	<2
TPH (Aliphatic+Aromatic) C10-C25 (Sum)	T85	AR	4	mg/kg	(62) <5
TPH (Aliphatic+Aromatic) C25-C40 (Sum)	T85	AR	4	mg/kg	(62) <5

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Organochlorine insecticides

				Concept Reference	**672447 050**
				Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
				Date Sampled	**20-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	<0.01
Hexachlorobenzene	T1	AR	0.01	mg/kg	<0.01
Heptachlor	T16	AR	0.01	mg/kg	<0.01
Aldrin	T16	AR	0.01	mg/kg	<0.01
Heptachlor epoxide	T16	AR	0.01	mg/kg	<0.01
Chlordane	T16	AR	0.01	mg/kg	<0.01
Endosulphan	T16	AR	0.01	mg/kg	<0.01
DDE	T16	AR	0.01	mg/kg	<0.01
Dieldrin	T16	AR	0.01	mg/kg	<0.01
Endrin	T16	AR	0.01	mg/kg	<0.01
DDD	T16	AR	0.01	mg/kg	<0.01
DDT	T16	AR	0.01	mg/kg	<0.01

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Organophosphorous insecticides

				Concept Reference	**672447 050**
				Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
				Date Sampled	**20-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Dichlorvos	T16	AR	0.01	mg/kg	<0.01
Mevinphos	T16	AR	0.01	mg/kg	<0.01
Dimethoate	T16	AR	0.01	mg/kg	<0.01
Diazinon	T16	AR	0.01	mg/kg	<0.01
Pirimiphos methyl	T16	AR	0.01	mg/kg	<0.01
Malathion	T16	AR	0.01	mg/kg	<0.01
Fenitrothion	T16	AR	0.01	mg/kg	<0.01
Parathion	T16	AR	0.01	mg/kg	<0.01
Azinphos methyl	T16	AR	0.01	mg/kg	<0.01

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Triazines Suite

				Concept Reference	**672447 050**
				Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
				Date Sampled	**20-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Simazine	T16	AR	0.01	mg/kg	(64) <0.01
Atrazine	T16	AR	0.01	mg/kg	(64) <0.01
Propazine	T16	AR	0.01	mg/kg	(64) <0.01
Trietazine	T16	AR	0.01	mg/kg	(64) <0.01
Prometryn	T16	AR	0.01	mg/kg	(64) <0.01
Terbutryn	T16	AR	0.01	mg/kg	(64) <0.01

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Urons

Concept Reference	**672447 050**
Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
Date Sampled	**20-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
Chlorotoluron	T310	AR	0.01	mg/kg	<0.01
Diuron	T310	AR	0.01	mg/kg	<0.01
Isoproturon	T310	AR	0.01	mg/kg	<0.01
Linuron	T310	AR	0.01	mg/kg	<0.01
Monuron	T310	AR	0.01	mg/kg	<0.01

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Phenoxy Acetic acid herbicides

Concept Reference	**672447 050**
Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
Date Sampled	**20-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
Mecoprop	T16	AR	0.01	mg/kg	<0.01
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	<0.01
Dichlorprop	T16	AR	0.01	mg/kg	<0.01
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	<0.01
Fenoprop	T16	AR	0.01	mg/kg	(36) <0.02
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	(36) <0.02

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Phenols (Speciated)

Concept Reference	**672447 050**
Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
Date Sampled	**20-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
Resorcinol	T17	AR	0.05	mg/kg	<0.05
Catechol	T17	AR	0.05	mg/kg	<0.05
Phenol	T17	AR	0.1	mg/kg	<0.1
Cresols	T17	AR	0.05	mg/kg	<0.05
Xylenols	T17	AR	0.05	mg/kg	<0.05
Naphthols	T17	AR	0.05	mg/kg	<0.05
Trimethyl phenol	T17	AR	0.05	mg/kg	(62) <0.10
Total Phenols	T17	AR	0.1	mg/kg	<0.1

Index to symbols used in Supplement 1E to Report Number 672447-1

Value	Description
A40	Assisted dried < 40C
AR	As Received
64	Analysis was performed by an alternative technique
36	LOD Raised due to low Matrix spike recovery

62	LOD was raised due to the method performance of the analytical procedure used
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

050 - BTEX - Samples submitted for GC/MS (Headspace) analysis were submitted in inappropriate containers. It is possible therefore that the results provided may be compromised.
Speciated phenols - 050 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
Supplement 1E report reissued to include only samples 045, 049 and 050
Asbestos subcontracted to REC Limited
OCP & OPP - 050 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except TPH c5-c35 aro/ali split, Urons, Triazines, OCP/OPP and PAAH
Retained on 2mm is removed before analysis
Urons and Triazines analysis transferred to Concept Life Sciences Cambridge
OCP, OPP and PAAH analysis transferred to Concept Life Sciences Manchester

Method Index

Value	Description
T245	ICP/OES (Aqua Regia Extraction)
T257	ICP/OES (SIM) (Aqua Regia Extraction)
T310	LC/MS/MS
T162	Grav (1 Dec) (105 C)
T16	GC/MS
T209	GC/MS (Head Space)(MCERTS)
T287	Calc TOC/0.58
T219	GC/FID (SE)
T2	Grav
T27	PLM
T82	ICP/OES (Sim)
T85	Calc
T1	GC/MS (HR)
T17	HPLC
T54	GC/MS (Headspace)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Arsenic	T257	A40	2	mg/kg	M	045,050
Barium	T257	A40	2	mg/kg	U	045,050
Beryllium	T245	A40	0.5	mg/kg	U	045,050
Boron (water-soluble)	T82	A40	1	mg/kg	N	045,050
Cadmium	T257	A40	0.1	mg/kg	M	045,050
Chromium	T257	A40	0.5	mg/kg	M	045,050
Copper	T257	A40	2	mg/kg	M	045,050
Lead	T257	A40	2	mg/kg	M	045,050
Mercury	T245	A40	1.0	mg/kg	U	045,050
Nickel	T257	A40	0.5	mg/kg	M	045,050
Selenium	T257	A40	3	mg/kg	U	045,050
Vanadium	T257	A40	0.1	mg/kg	U	045,050
Zinc	T257	A40	2	mg/kg	M	045,050
Soil Organic Matter	T287	A40	0.1	%	N	050
Moisture @105C	T162	AR	0.1	%	N	045,050
Retained on 2mm	T2	A40	0.1	%	N	045,050
Asbestos ID	T27	A40			SU	049
Naphthalene	T16	AR	0.1	mg/kg	U	050
Acenaphthylene	T16	AR	0.1	mg/kg	U	050
Acenaphthene	T16	AR	0.1	mg/kg	M	050
Fluorene	T16	AR	0.1	mg/kg	M	050
Phenanthrene	T16	AR	0.1	mg/kg	U	050
Anthracene	T16	AR	0.1	mg/kg	M	050
Fluoranthene	T16	AR	0.1	mg/kg	N	050
Pyrene	T16	AR	0.1	mg/kg	N	050
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	M	050
Chrysene	T16	AR	0.1	mg/kg	M	050
Benzo(b)fluoranthene	T16	AR	0.1	mg/kg	U	050

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	N	050
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	M	050
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	M	050
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	M	050
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	M	050
PAH(total)	T16	AR	0.1	mg/kg	U	050
Benzene	T209	AR	10	µg/kg	M	050
Toluene	T209	AR	10	µg/kg	M	050
EthylBenzene	T209	AR	10	µg/kg	M	050
M/P Xylene	T209	AR	10	µg/kg	M	050
O Xylene	T209	AR	10	µg/kg	M	050
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	U	050
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	N	050
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	N	050
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	N	050
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	N	050
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	N	050
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	N	050
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	N	050
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	N	050
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	N	050
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	N	050
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	N	050
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	N	050
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	N	050
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	N	050
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	N	050
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	N	050
TPH (Aliphatic+Aromatic) C10-C25 (Sum)	T85	AR	4	mg/kg	N	050
TPH (Aliphatic+Aromatic) C25-C40 (Sum)	T85	AR	4	mg/kg	N	050
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	U	050
Hexachlorobenzene	T1	AR	0.01	mg/kg	U	050
Heptachlor	T16	AR	0.01	mg/kg	U	050
Aldrin	T16	AR	0.01	mg/kg	U	050
Heptachlor epoxide	T16	AR	0.01	mg/kg	U	050
Chlordane	T16	AR	0.01	mg/kg	U	050
Endosulphan	T16	AR	0.01	mg/kg	U	050
DDE	T16	AR	0.01	mg/kg	U	050
Dieldrin	T16	AR	0.01	mg/kg	U	050
Endrin	T16	AR	0.01	mg/kg	U	050
DDD	T16	AR	0.01	mg/kg	U	050
DDT	T16	AR	0.01	mg/kg	U	050
Dichlorvos	T16	AR	0.01	mg/kg	U	050
Mevinphos	T16	AR	0.01	mg/kg	U	050
Dimethoate	T16	AR	0.01	mg/kg	U	050
Diazinon	T16	AR	0.01	mg/kg	U	050
Pirimiphos methyl	T16	AR	0.01	mg/kg	U	050
Malathion	T16	AR	0.01	mg/kg	U	050
Fenitrothion	T16	AR	0.01	mg/kg	U	050
Parathion	T16	AR	0.01	mg/kg	U	050
Azinphos methyl	T16	AR	0.01	mg/kg	U	050
Simazine	T16	AR	0.01	mg/kg	N	050
Atrazine	T16	AR	0.01	mg/kg	N	050
Propazine	T16	AR	0.01	mg/kg	N	050
Trietazine	T16	AR	0.01	mg/kg	N	050
Prometryn	T16	AR	0.01	mg/kg	N	050
Terbutryn	T16	AR	0.01	mg/kg	N	050
Chlorotoluron	T310	AR	0.01	mg/kg	N	050
Diuron	T310	AR	0.01	mg/kg	N	050
Isoproturon	T310	AR	0.01	mg/kg	N	050
Linuron	T310	AR	0.01	mg/kg	N	050
Monuron	T310	AR	0.01	mg/kg	N	050
Mecoprop	T16	AR	0.01	mg/kg	N	050
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	N	050
Dichlorprop	T16	AR	0.01	mg/kg	N	050
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	N	050
Fenoprop	T16	AR	0.01	mg/kg	N	050
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	N	050
Resorcinol	T17	AR	0.05	mg/kg	M	050
Catechol	T17	AR	0.05	mg/kg	N	050

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Phenol	T17	AR	0.1	mg/kg	M	050
Cresols	T17	AR	0.05	mg/kg	M	050
Xylenols	T17	AR	0.05	mg/kg	M	050
Naphthols	T17	AR	0.05	mg/kg	N	050
Trimethyl phenol	T17	AR	0.05	mg/kg	M	050
Total Phenols	T17	AR	0.1	mg/kg	N	050

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

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Concept Life Sciences

Certificate of Analysis

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Report Number: Supplement 1D to Report Number 672447-1 A

Date of Report: 16-Oct-2017

Customer: TerraConsult Limited
Unit 34
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

Customer Contact: Mr Derek Daniels

Customer Job Reference: 3318
Customer Purchase Order: PO-001748
Customer Site Reference: Norfolk Vanguard Cable Route
Date Job Received at Concept: 13-Jul-2017
Date Analysis Started: 03-Aug-2017
Date Analysis Completed: 11-Aug-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked and authorised by :
Claire Brown Crociquia
Customer Service Manager

Issued by :
Aislinn Arthey
Customer Service

[redacted]

Waste Acceptance Criteria

Customer Sample Reference : BH17-C2-02 ES2 @ 1.00m
SAL Sample Reference : 672447 050
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 20-JUL-2017
Matrix Class : Clay

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	8.3		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	4.0			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.3	3.0	5.0	6.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	4			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	14			
Retained on 2mm	Grav	0.1	%	N	2.8			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0024	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.065	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	28	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.055	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	62	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	5.6	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.013	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.011	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	22	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	630	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.034	4.0	50.0	200.0

From: EC Directive 99/31/EC and Landfill Regulations 2002 (as ammended)

Notes:- Cumulative release at L/S=10 (mg/kg of dry matter) in accordance with BS EN 12457. Soil leaching procedure is not covered by our UKAS accreditation

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

Landfill WAC analysis (specifically leaching test results) should not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Total and Speciated USEPA16 PAH (SE) (MCERTS)

				Concept Reference	**672447 050**
				Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
				Test Sample	**AR**
				Date Sampled	**20-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**	
Naphthalene	GC/MS	0.1	mg/kg	U	<0.1
Acenaphthylene	GC/MS	0.1	mg/kg	U	<0.1
Acenaphthene	GC/MS	0.1	mg/kg	M	<0.1
Fluorene	GC/MS	0.1	mg/kg	M	<0.1
Phenanthrene	GC/MS	0.1	mg/kg	U	<0.1
Anthracene	GC/MS	0.1	mg/kg	M	<0.1
Fluoranthene	GC/MS	0.1	mg/kg	N	<0.1
Pyrene	GC/MS	0.1	mg/kg	N	<0.1
Benzo(a)Anthracene	GC/MS	0.1	mg/kg	M	<0.1
Chrysene	GC/MS	0.1	mg/kg	M	<0.1
Benzo(b)fluoranthene	GC/MS	0.1	mg/kg	U	<0.1
Benzo(k)fluoranthene	GC/MS	0.1	mg/kg	N	<0.1
Benzo(a)Pyrene	GC/MS	0.1	mg/kg	M	<0.1
Indeno(123-cd)Pyrene	GC/MS	0.1	mg/kg	M	<0.1
Dibenzo(ah)Anthracene	GC/MS	0.1	mg/kg	M	<0.1
Benzo(ghi)Perylene	GC/MS	0.1	mg/kg	M	<0.1
Polyaromatic Hydrocarbons (Total)	GC/MS	0.1	mg/kg	U	<0.1
Coronene	GC/MS (MCERTS)	0.1	mg/kg	N	<0.1

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
BTEX

				Concept Reference	**672447 050**
				Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
				Test Sample	**AR**
				Date Sampled	**20-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**	
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10

Concept Reference: 672447
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
PCBs EC7 (SE)

Concept Reference	**672447 050**
Customer Sample Reference	**BH17-C2-02 ES2 @ 1.00m**
Test Sample	**AR**
Date Sampled	**20-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	LOD	Units	Symbol	
Polychlorinated biphenyl BZ#28	GC/MS	20	µg/kg	M	<20
Polychlorinated biphenyl BZ#52	GC/MS	20	µg/kg	M	<20
Polychlorinated biphenyl BZ#101	GC/MS	20	µg/kg	M	<20
Polychlorinated biphenyl BZ#118	GC/MS	20	µg/kg	M	<20
Polychlorinated biphenyl BZ#153	GC/MS	20	µg/kg	M	<20
Polychlorinated biphenyl BZ#138	GC/MS	20	µg/kg	M	<20
Polychlorinated biphenyl BZ#180	GC/MS	20	µg/kg	M	<20

Index to symbols used in Supplement 1D to Report Number 672447-1 A

Value	Description
8:1	Leachate to BS EN 12457-3 (8:1)
A40	Assisted dried < 40C
AR	As Received
2:1	Leachate to BS EN 12457-3 (2:1)
110	LOD raised due to low internal standard recovery.
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Supplement 1D report reissued to include only sample 050
050 - BTEX - Samples submitted for GC/MS (Headspace) analysis were submitted in inappropriate containers. It is possible therefore that the results provided may be compromised.
pH, LOI & TOC were performed on assisted dried samples (<40 degree centigrade). All other results relate to samples as received.
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except ANC
Retained on 2mm is removed before analysis

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of Concept Life Sciences Analytical & Development Services Limited registered in England and Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

3 Crittall Drive
Springwood Industrial Estate
Braintree
Essex
CM7 2RT
Tel : 01376 560120
Fax : 01376 552923

Report Number: Supplement 1A to Report Number 675177-1

Date of Report: 18-Oct-2017

Customer: TerraConsult (South) Limited
Suite F17 Dugard House
Peartree Road
Colchester
Essex
CO3 0UL

Customer Contact: Victoria Smith

Customer Job Reference: 3318
Customer Site Reference: East Anglia OWF
Date Job Received at Concept: 11-Aug-2017
Date Analysis Started: 14-Aug-2017
Date Analysis Completed: 25-Aug-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

Report checked and authorised by :
Claire Brown Crociquia
Customer Service Manager

Issued by :
Aislinn Arthey
Customer Service Adv

[redacted]

Concept Reference: 675177
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Heavy Metals (9)

Concept Reference	**675177 001**	**675177 002**
Customer Sample Reference	**BH17-C2-01**	**BH17-C2-03**
Date Sampled	**11-AUG-2017**	**11-AUG-2017**

Determinand	Method	Test Sample	LOD	Units		
As (Dissolved)	T281	F	0.0002	mg/l	**0.0002**	**0.0002**
Cd (Dissolved)	T281	F	0.00002	mg/l	<0.00002	<0.00002
Cr (Dissolved)	T281	F	0.001	mg/l	<0.001	<0.001
Cu (Dissolved)	T281	F	0.0005	mg/l	**0.0005**	<0.0005
Pb (Dissolved)	T281	F	0.0003	mg/l	<0.0003	<0.0003
Hg (Dissolved)	T281	F	0.00005	mg/l	<0.00005	<0.00005
Ni (Dissolved)	T281	F	0.001	mg/l	**0.001**	**0.001**
Se (Dissolved)	T281	F	0.0005	mg/l	**0.0006**	**0.0024**
Zn (Dissolved)	T281	F	0.002	mg/l	<0.002	<0.002

Concept Reference: 675177
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Total and Speciated USEPA16 PAH (SE)

Concept Reference	**675177 001**	**675177 002**
Customer Sample Reference	**BH17-C2-01**	**BH17-C2-03**
Date Sampled	**11-AUG-2017**	**11-AUG-2017**

Determinand	Method	Test Sample	LOD	Units		
Naphthalene	T149	AR	0.01	µg/l	**0.08**	<0.01
Acenaphthylene	T149	AR	0.01	µg/l	**0.04**	<0.01
Acenaphthene	T149	AR	0.01	µg/l	**0.05**	<0.01
Fluorene	T149	AR	0.01	µg/l	**0.03**	<0.01
Phenanthrene	T149	AR	0.01	µg/l	**0.02**	<0.01
Anthracene	T149	AR	0.01	µg/l	**0.01**	<0.01
Fluoranthene	T149	AR	0.01	µg/l	**0.01**	<0.01
Pyrene	T149	AR	0.01	µg/l	**0.01**	<0.01
Benzo(a)Anthracene	T149	AR	0.01	µg/l	**0.01**	<0.01
Chrysene	T149	AR	0.01	µg/l	<0.01	<0.01
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01
Benzo(a)Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	<0.01	<0.01
PAH(total)	T149	AR	0.01	µg/l	**0.25**	<0.01

Concept Reference: 675177
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
TPH (CWG) with MTBE & BTEX SE

				Concept Reference	**675177 001**	**675177 002**
				Customer Sample Reference	**BH17-C2-01**	**BH17-C2-03**
				Date Sampled	**11-AUG-2017**	**11-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Benzene	T54	AR	1	µg/l	<1	<1
EthylBenzene	T54	AR	1	µg/l	<1	<1
M/P Xylene	T54	AR	1	µg/l	<1	<1
Methyl tert-Butyl Ether	T54	AR	1	µg/l	<1	<1
O Xylene	T54	AR	1	µg/l	<1	<1
Toluene	T54	AR	1	µg/l	<1	<1
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	<0.01	**0.01**
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	<0.01	**0.02**
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	<0.01	**0.01**
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	**0.01**	**0.03**
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	**0.02**	**0.03**

Concept Reference: 675177
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Organochlorine insecticides

				Concept Reference	**675177 001**	**675177 002**
				Customer Sample Reference	**BH17-C2-01**	**BH17-C2-03**
				Date Sampled	**11-AUG-2017**	**11-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Hexachlorocyclohexane	T16	AR	0.01	µg/l	(100,36) <0.04	(36) <0.02
Hexachlorobenzene	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Heptachlor	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Aldrin	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Heptachlor epoxide	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Chlordane	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Endosulphan	T16	AR	0.01	µg/l	(100) <0.02	<0.01
DDE	T16	AR	0.01	µg/l	(100) <0.02	<0.02
Dieldrin	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Endrin	T16	AR	0.01	µg/l	(100,36) <0.04	(36) <0.02
DDD	T16	AR	0.01	µg/l	(100) <0.02	<0.01
DDT	T16	AR	0.01	µg/l	(100,36) <0.04	(36) <0.01

Concept Reference: 675177
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Organophosphorous insecticides

					Concept Reference	675177 001	675177 002
					Customer Sample Reference	BH17-C2-01	BH17-C2-03
					Date Sampled	11-AUG-2017	11-AUG-2017
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Dichlorvos	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Mevinphos	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Dimethoate	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Diazinon	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Pirimiphos methyl	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Malathion	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Fenitrothion	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Parathion	T16	AR	0.01	µg/l	(100) <0.02	<0.01
Azinphos methyl	T16	AR	0.01	µg/l	(100,36) <0.04	(36) <0.02

Index to symbols used in Supplement 1A to Report Number 675177-1

Value	Description
F	Filtered
AR	As Received
110	LOD raised due to low internal standard recovery.
36	LOD Raised due to low Matrix spike recovery
100	LOD determined by sample aliquot used for analysis
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Supplement 1A report reissued to include only samples 001 and 002
OCP and OPP transferred to Concept Life Sciences Manchester

Method Index

Value	Description
T219	GC/FID (SE)
T281	ICP/MS (Filtered)
T54	GC/MS (Headspace)
T16	GC/MS
T149	GC/MS (SIR)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
As (Dissolved)	T281	F	0.0002	mg/l	U	001-002
Cd (Dissolved)	T281	F	0.00002	mg/l	U	001-002
Cr (Dissolved)	T281	F	0.001	mg/l	U	001-002
Cu (Dissolved)	T281	F	0.0005	mg/l	U	001-002
Pb (Dissolved)	T281	F	0.0003	mg/l	U	001-002
Hg (Dissolved)	T281	F	0.00005	mg/l	U	001-002
Ni (Dissolved)	T281	F	0.001	mg/l	U	001-002
Se (Dissolved)	T281	F	0.0005	mg/l	U	001-002
Zn (Dissolved)	T281	F	0.002	mg/l	U	001-002
Naphthalene	T149	AR	0.01	µg/l	U	001-002
Acenaphthylene	T149	AR	0.01	µg/l	U	001-002
Acenaphthene	T149	AR	0.01	µg/l	U	001-002
Fluorene	T149	AR	0.01	µg/l	U	001-002
Phenanthrene	T149	AR	0.01	µg/l	U	001-002
Anthracene	T149	AR	0.01	µg/l	U	001-002
Fluoranthene	T149	AR	0.01	µg/l	U	001-002
Pyrene	T149	AR	0.01	µg/l	U	001-002

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Benzo(a)Anthracene	T149	AR	0.01	µg/l	U	001-002
Chrysene	T149	AR	0.01	µg/l	U	001-002
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	N	001-002
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	U	001-002
Benzo(a)Pyrene	T149	AR	0.01	µg/l	U	001-002
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	U	001-002
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	U	001-002
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	U	001-002
PAH(total)	T149	AR	0.01	µg/l	N	001-002
Benzene	T54	AR	1	µg/l	U	001-002
EthylBenzene	T54	AR	1	µg/l	U	001-002
M/P Xylene	T54	AR	1	µg/l	U	001-002
Methyl tert-Butyl Ether	T54	AR	1	µg/l	U	001-002
O Xylene	T54	AR	1	µg/l	U	001-002
Toluene	T54	AR	1	µg/l	U	001-002
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	N	001-002
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	N	001-002
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	N	001-002
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	N	001-002
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	N	001-002
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	N	001-002
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	N	001-002
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	N	001-002
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	N	001-002
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	N	001-002
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	N	001-002
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	N	001-002
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	N	001-002
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	N	001-002
Hexachlorocyclohexane	T16	AR	0.01	µg/l	N	001-002
Hexachlorobenzene	T16	AR	0.01	µg/l	N	001-002
Heptachlor	T16	AR	0.01	µg/l	N	001-002
Aldrin	T16	AR	0.01	µg/l	N	001-002
Heptachlor epoxide	T16	AR	0.01	µg/l	N	001-002
Chlordane	T16	AR	0.01	µg/l	N	001-002
Endosulphan	T16	AR	0.01	µg/l	N	001-002
DDE	T16	AR	0.01	µg/l	N	001-002
Dieldrin	T16	AR	0.01	µg/l	N	001-002
Endrin	T16	AR	0.01	µg/l	N	001-002
DDD	T16	AR	0.01	µg/l	N	001-002
DDT	T16	AR	0.01	µg/l	N	001-002
Dichlorvos	T16	AR	0.01	µg/l	N	001-002
Mevinphos	T16	AR	0.01	µg/l	N	001-002
Dimethoate	T16	AR	0.01	µg/l	N	001-002
Diazinon	T16	AR	0.01	µg/l	N	001-002
Pirimiphos methyl	T16	AR	0.01	µg/l	N	001-002
Malathion	T16	AR	0.01	µg/l	N	001-002
Fenitrothion	T16	AR	0.01	µg/l	N	001-002
Parathion	T16	AR	0.01	µg/l	N	001-002
Azinphos methyl	T16	AR	0.01	µg/l	N	001-002

APPENDIX G
Calibration Certificates

SPT hammer(s)	SI 3, SI 4, SI 5
Gas monitor(s)	GFM 435 s/n 11378

SPT Calibration Report

EQUIPE GROUP
www.equipegroup.com

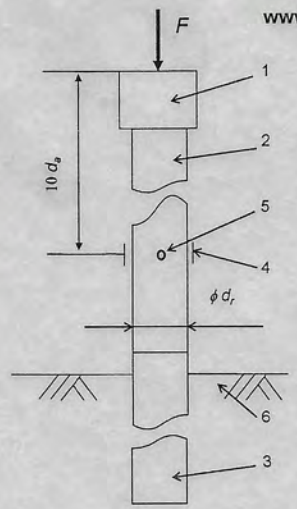
Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	SI DRILLING
Test No	EQU1695
Test Depth (m)	8.70
Date of Test	29 December 2016
Valid until	29 December 2017
Hammer ID	SI 3

Mass of the hammer	m = 63.5kg
Falling height	h = 0.76m
E_{theor} =	$m \times g \times h$ = 473J

Characteristics of the instrumented rod

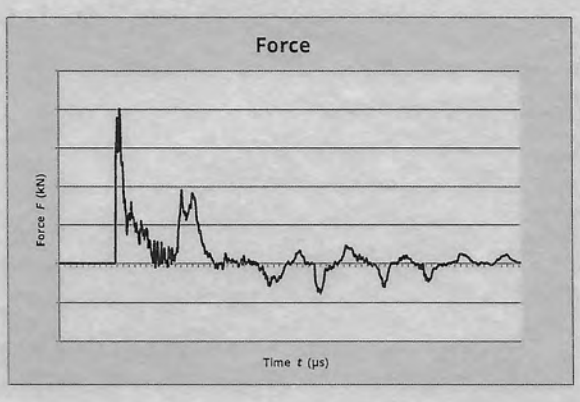
Diameter	d_r = 0.052 m
Length of the instrumented rod	0.558 m
Area	A = 11.61 cm^2
Modulus	E_a = 206843 MPa

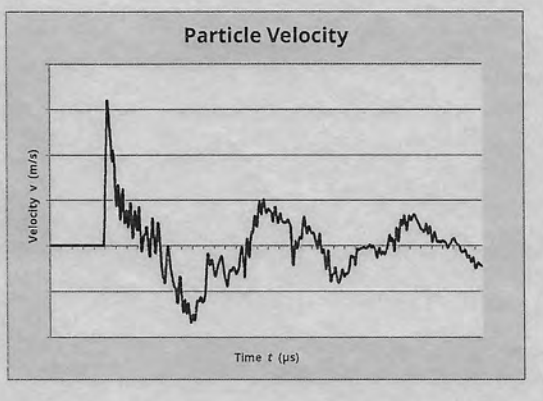


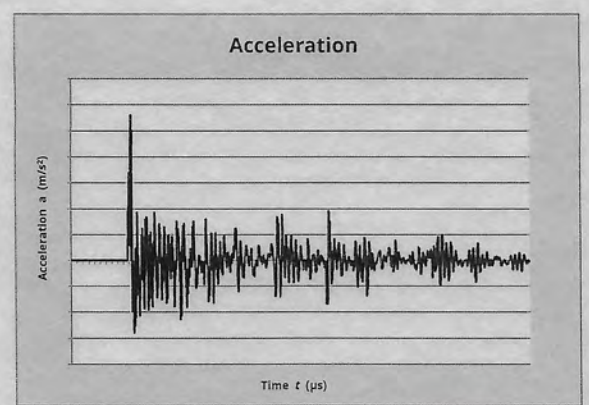
Key
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

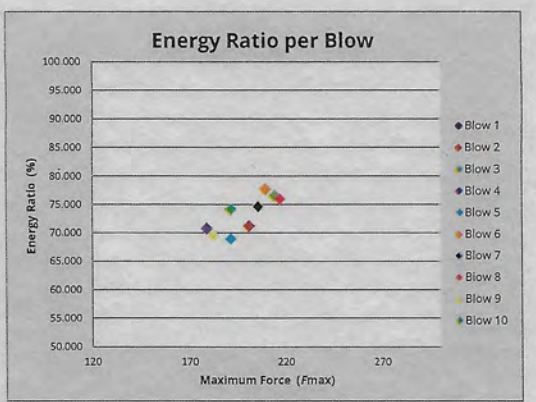
F Force
d_r Diameter of rod

Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

E_{meas} =	**0.355** kN-m
E_{theor} =	**0.473** kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$: **75.14%**

Equipe SPT Analyzer Operators: KS

Prepared by:	[redacted]	**Checked by**	[redacted]	**Date** 10/01/2017

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

SPT Calibration Report

www.equipegroup.com

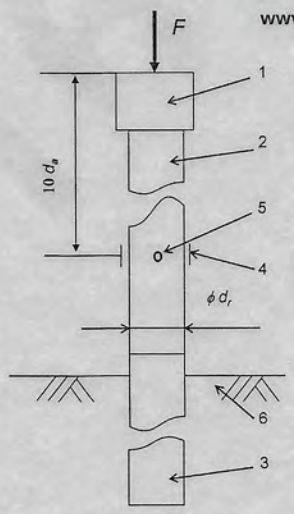
Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	SI DRILLING
Test No	EQU1694
Test Depth (m)	8.70
Date of Test	29 December 2016
Valid until	29 December 2017
Hammer ID	4 CUT DOWN

Mass of the hammer m = 63.5kg
Falling height h = 0.76m
E_{theor} = $m \times g \times h$ = 473J

Characteristics of the instrumented rod

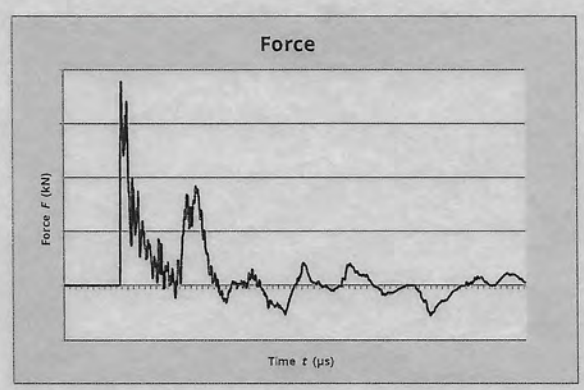
Diameter	d_r = 0.052 m
Length of the instrumented rod	0.558 m
Area	A = 11.61 cm^2
Modulus	E_a = 206843 MPa

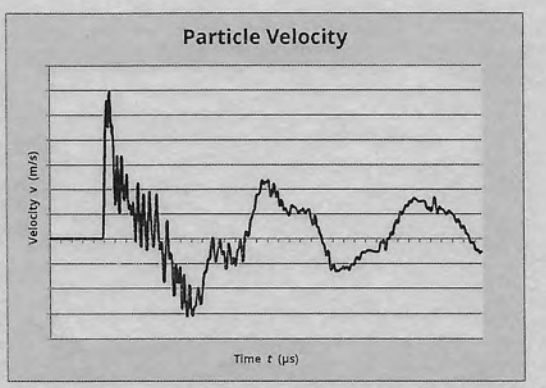


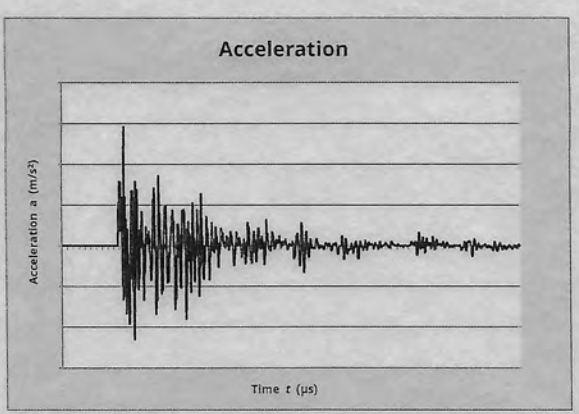
Key
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

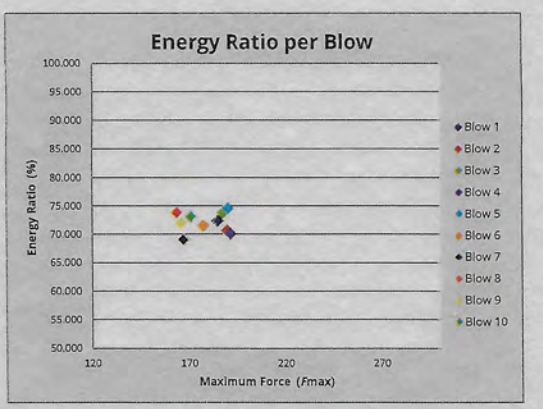
F Force
d_r Diameter of rod

Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

E_{meas} = **0.351** kN-m

E_{theor} = **0.473** kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$: **74.14%**

Equipe SPT Analyzer Operators: KS

Prepared by: [redacted]	Checked b [redacted]	Date 10/01/2017

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

SPT Calibration Report

www.equipegroup.com

Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	SI DRILLING
Test No	EQU1690
Test Depth (m)	8.70
Date of Test	29 December 2016
Valid until	29 December 2017
Hammer ID	SI 05

Mass of the hammer	m = 63.5kg
Falling height	h = 0.76m
E_{theor} =	$m \times g \times h$ = 473J

Characteristics of the instrumented rod

Diameter	d_r = 0.052 m
Length of the instrumented rod	0.558 m
Area	A = 11.61 cm^2
Modulus	E_a = 206843 MPa

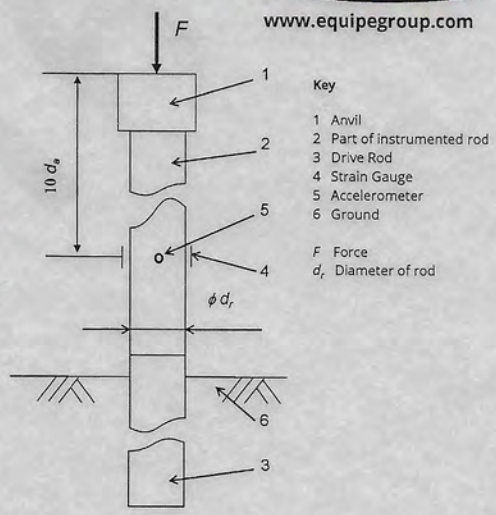
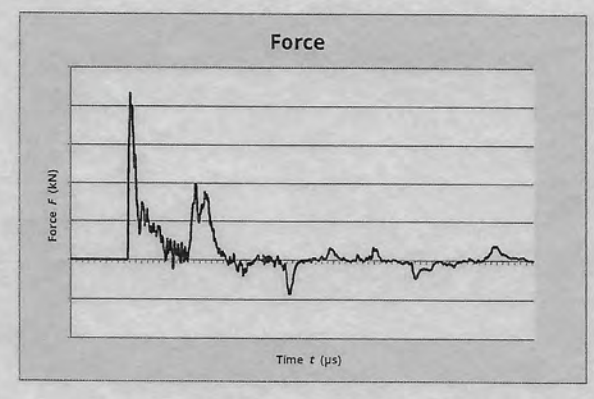
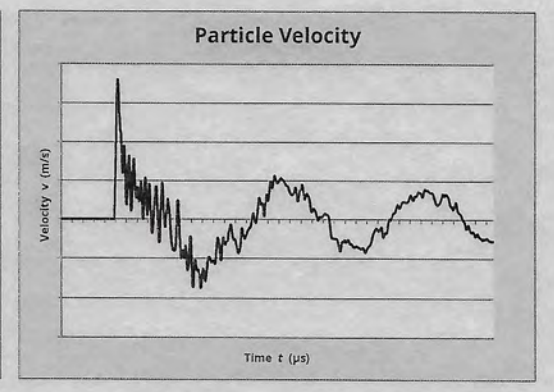
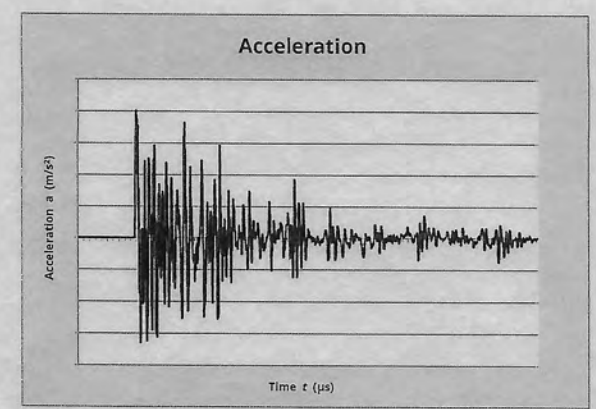
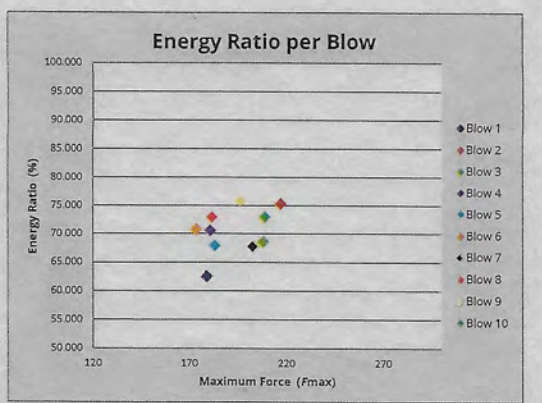


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

E_{meas} = **0.343** kN-m

E_{theor} = **0.473** kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$: **72.53%**

Equipe SPT Analyzer Operators: KS

Prepared by:	[redacted]	Checked by	[redacted]	Date	10/01/2017

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
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TEST DATE AND CONDITIONS		
Date	21/06/2017	
Atmospheric Pressure	997	mB
Ambient Temperature	23.0	°C
Environics Serial No.	5089	

GAS DATA LTD
Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB
Tel 02476303311 Fax 02476307711

GFM435 Final Inspection & Calibration Check Certificate

Customer	**Terraconsult (South) Ltd**
Certificate Number	**119385**
Order Number	**317112**

Serial Number	**11378**	**Recalibration DUE Date**	
Software Version	**G435-00.0024/0004**	***21/06/2018***	

Instrument Checks					
Keyboard	✓		**Display Contrast**	✓	
Pump Flow In	**400**	*Accept > 200 cc/min*	**Pump Flow @ -200mB**	**200**	*Accept > 200 cc/min*
Clock Set / Running	✓		**Labels Fitted**	✓	

Gas Checks						
Sensor	***CH_4***		***CO_2***		***O_2***	
	Instrument Gas Readings %	**True Gas Value %**	**Instrument Gas Readings %**	**True Gas Value %**	**Instrument Gas Readings %**	**True Gas Value %**
	59.7	*60*	**39.7**	*40*	**20.8**	*20.9*
	Accept +/- 3.0		*Accept +/- 3.0*		*Accept +/- 0.5*	
	5.0	*5*	**4.8**	*5*	**6.0**	*6*
	Accept +/- 0.3		*Accept +/- 0.3*		*Accept +/- 0.3*	
Zero Reading 100% N_2	**0.0**	*0.0*	**0.0**	*0.0*	**0.0**	*0.0*
	Accept +/- 0.0		*Accept +/- 0.0*		*Accept + 0.1*	

Optional Gas Checks						
Applied Gas & Range of GFM		**Concentration Tested @ *(ppm)***	**Instrument Readings *(ppm)***			
Gas Type	**Range *(ppm)***		**Zero Reading**		**Instrument Gas Reading**	
H2S	**5000**	*1500*	**0**	*Accept +/-0.0*	**1500**	*Accept +/-5.0*
CO	**2000**	*1000*	**0**	*Accept +/-0.0*	**1000**	*Accept +/-5.0*
				Accept +/-0.0		*Accept +/-5.0*
				Accept +/-0.0		*Accept +/-5.0*
Hexane	**2.0%**	*2.0%*	**0**	*Accept +/-0.0*	**1.99**	*Accept +/-10.0*

Cross Gas Effects							
Applied Gas *(ppm)*		**Instrument Readings *(ppm)***					
Gas Type	**Concentration**	**Toxic 1: *H2S***		**Toxic 2: *CO***		**Toxic 3: *Hex***	**Toxic 4:**
H2S	*1500*	**1500**		**0**		**0**	
CO	*1000*	**60**		**1000**		**0**	
Hexane	*2.0%*	**0**		**0**		**1.99**	

Pressure Checks			
Atmospheric Pressure [AP] *(mB)*			
Current Atmospheric Pressure *(mB)*	**Instrument Atmospheric Pressure Reading *(mB)***		
All Ports Open to Atmosphere	*Open Ports*	**997**	*Accept +/- 2.0*
AP Port *(Internal)*	*+800 mB*	**801**	*Accept +/- 5.0*
AP Port *(Internal)*	*+1200mb*	**1199**	*Accept +/- 5.0*

Flow Checks					
Borehole Flow	**Instrument Flow Reading *(l/h)***		**Differential Pressure**		
Applied Flow Reading *(l/h)*			**Instrument DP Reading *(Pa)***		**Applied DP Pressure *(Pa)***
-30.0	**-29.8**	*Accept +/-3.0*	**-272**	*Accept +/-50*	*-276*
-3.0	**-3.1**	*Accept +/-1.0*	**-15**	*Accept +/-6.0*	*-14*
0.0	**0.0**	*Accept +/-0.0*	**0.0**	*Accept +/-0.5*	*0.0*
+3.0	**3.0**	*Accept +/-0.5*	**13**	*Accept +/-3.0*	*14*
+30.0	**30.0**	*Accept +/-3.0*	**294**	*Accept +/-50*	*295*
+60.0	**58.5**	*Accept +/-6.0*	**843**	*Accept +/-130*	*876*
+90.0	**85.9**	*Accept +/-9.0*	**1616**	*Accept +/-250*	*1717*

All test performed with equipment that is traceable to National Standards unless otherwise stated







TerraConsult

Leaders in
waste management
environmental &
ground engineering
consultancy

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