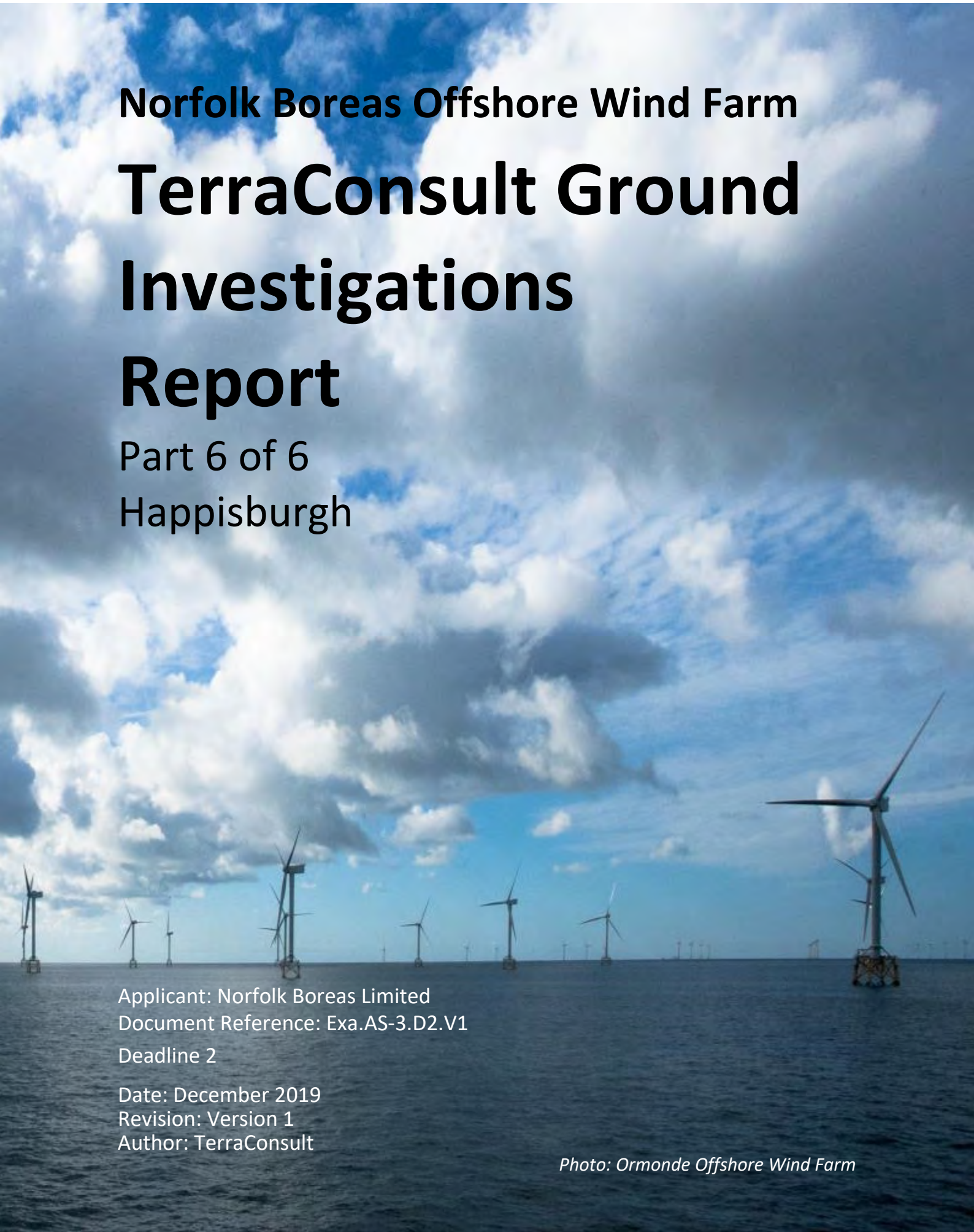
VATTENFALL



Norfolk Boreas Offshore Wind Farm

TerraConsult Ground Investigations Report

Part 6 of 6

Happisburgh

Applicant: Norfolk Boreas Limited
Document Reference: Exa.AS-3.D2.V1

Deadline 2

Date: December 2019
Revision: Version 1
Author: TerraConsult

Photo: Ormonde Offshore Wind Farm

Royal HaskoningDHV
Enhancing Society Together

VATTENFALL

Norfolk Vanguard Offshore Wind Farm

The Applicant Responses to First Written Questions

Appendix 16.7 – TerraConsult 2017 Ground Investigations Report: Happisburgh (Q16.8)

Applicant: Norfolk Vanguard Limited
Document Reference: ExA;WQApp16.7;10.D1.3
Deadline 1

Date: January 2019

Photo: Kentish Flats Offshore Wind Farm

TerraConsult

November 2017
Report No 3318-R006-3

East Anglia (North) Offshore Wind Farm

Landfall Site Investigation

Carried out for:

Gutteridge, Haskins and Davey Ltd (GHD)

East Anglia (North) Offshore Wind Farm

Landfall Site Investigation

Date: November 2017

Report No 3318-R006-3

Prepared for:

Gutteridge, Haskins & Davey Ltd
The Studio,
51 Brookfield Road,
Cheadle,
SK8 1ES

Engineer:

Gutteridge, Haskins & Davey Ltd
The Studio,
51 Brookfield Road,
Cheadle,
SK8 1ES

By:

Bold Business Centre
Bold Lane, Sutton
St. Helens,
Merseyside
WA9 4TX

Tel: 01925 291111
Fax: 01925 291191
www.terraconsult.co.uk

DOCUMENT INFORMATION AND CONTROL SHEET

Document Status and Approval Schedule

Report No.	Title
3318-R005-01	East Anglia (North) Offshore Wind Farm Landfall Site Investigation

Prepared by:	**Victoria Smith**	*Victoria Smith*	**Engineering Geologist**
Approved by:	**Derek Daniels**	[redacted]	**Operations Manager**
Date:	**03/11/17**		

Issue:	Date:	Description:	Prepared by:
1	11/10/17	Draft for Approval	VS
2	01/11/17	Final	DD
3	03/11/17	Final (minor amendments)	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.

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bsi. ISO 9001 Quality Management FS573193

bsi. ISO 14001 Environmental Management EMS573194

East Anglia (North) Offshore Wind Farm

Landfall Site Investigation
CONTENTS

DRAWINGS

APPENDICES

East Anglia (North) Offshore Wind Farm

Landfall Site Investigation

1 INTRODUCTION

TerraConsult Limited (TCL) was commissioned by Gutteridge, Haskins and Davey Ltd (GHD) to carry out a ground investigation for two coastal options for the proposed cable route (Landfall A and Landfall B) to the south of Happisburgh, 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 03/07/17 and 19/07/17.

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 sites are located approximately 1 km (Landfall B) and 1.8 km (Landfall A) to the south east of Happisburgh, Norfolk. The Landfall A site is approximately located between Ordnance Survey National Grid Reference TG 396 301 and TG 394 296. The Landfall B site is approximately located between Ordnance Survey National Grid Reference TG 389 303 and TG 386 301.

A site location plan is presented as drawing reference 3318(LF)D001-1.

2.2 Published Geology

The online British Geological Survey (BGS) 1:50,000 scale map shows the sites to be underlain by the Happisburgh Glacigenic Formation sand and gravel, and the Bacton Green Till Member glacial diamicton and glaciolacustrine silts.

Beneath these is the Crag Group bedrock comprising of sand and gravel.

3 FIELDWORK

3.1 General

Fieldwork was undertaken between 03/07/17 and 19/07/17. 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-LIA-01
Cable percussion, SPTs, variable head permeability test	BH17-LIA-02
Cable percussion, SPTs, variable head permeability test	BH17-LIA-03
Cable percussion, SPTs, variable head permeability test, install	BH17-LIA-04
Cable percussion, SPTs, variable head permeability test	BH17-LIA-05
Cable percussion, SPTs, variable head permeability test, install	BH17-LIB-01
Cable percussion, SPTs, variable head permeability test	BH17-LIB-02
Cable percussion, SPTs, variable head permeability test	BH17-LIB-03
Cable percussion, SPTs, variable head permeability test, install	BH17-LIB-04
Cable percussion, SPTs, variable head permeability test	BH17-LIB-05

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-L1A-01	CP	15.00	639341.81	329922.11	4.14	04/07/17	05/07/17
BH17-L1A-02	CP	14.00	639485.00	329738.21	3.25	03/07/17	04/07/17
BH17-L1A-03	CP	18.00	639479.54	329911.26	3.66	06/07/17	07/07/17
BH17-L1A-04	CP	20.00	639551.64	329979.62	5.79	11/07/17	12/07/17
BH17-L1A-05	CP	8.00	639665.41	330085.17	1.91	19/07/17	19/07/17
BH17-L1B-01	CP	20.45	638643.01	330317.53	11.58	06/07/17	07/07/17
BH17-L1B-02	CP	19.45	638719.03	330167.24	11.42	10/07/17	11/07/17
BH17-L1B-03	CP	20.00	638828.69	330276.05	12.42	10/07/17	11/07/17
BH17-L1B-04	CP	16.00	638976.43	330391.52	7.79	11/07/17	12/07/17

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.

After completing BH17-LIA-05, location BH17-LIB-05 was cancelled by GHD due to the ground conditions and difficulty with access.

Exploratory hole location plans are presented as drawings 3318(LF1A)D002-1 and 3318(LF1B)D002-1.

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-L1A-04	SP	1	50	20.00	-14.21	10.00	20.00
BH17-L1B-01	SP	1	50	20.00	-8.42	10.00	20.00
BH17-L1B-04	SP	1	50	16.00	-8.21	13.50	16.00

Under instruction from GHD, BH17-LIA-01 was not installed as proposed.

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	4	BS1377: Part 2: 4.3 & 5.3	
Particle Size Distribution	4	BS1377: Part 2: 9.2	
BRE SD1 suite	2	BRE SD1	
One Dimensional Consolidation	2	BS1377: Part 5: 3	
Triaxial 100mm singl stage	3	BS1377: Part 7: 8	

4.2 Geoenvironmental Testing

The testing was scheduled by GHD and carried out by Consept 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(LF)D001-1 Site Location Plan
3318(LF1A)D002-1 Exploratory Hole Location Plan
3318(LF1B)D002-1 Exploratory Hole Location Plan

Site Location Plan

TerraConsult

Address:
East Anglia

Notes:

AGS		Project:	East Anglia (North) Offshore Wind Farm	Drawing No:
Issue:	FINAL	Project No:	3318	**3318(LF)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(L1A)D002-1
Scale:	1:3000	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(L1B)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	04-07-17	04-07-17	MJ	Hand tools	n/a	n/a	04-07-17	VS	
CP	0.00	15.00	04-07-17	05-07-17	MJ	Dando 2000	n/a	n/a	05-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 639341.81
mN: 329922.11
mAOD: 4.14
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
			3.84	(0.30) 0.30	Soft dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
					Stiff to very stiff dark orangish brown mottled light grey sandy CLAY. Rare gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments, black mottling and rootlets. (BACTON GREEN TILL MEMBER)			0.50 0.50	D1 ES1	
				(1.70)				1.00 1.00	D2 ES2	
								1.50 1.50 - 1.95	ES3 U1	25 (100%)
			2.14	2.00	Firm dark orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasionally mottled light grey and light greyish brown. (BACTON GREEN TILL MEMBER)	Dry		2.00 2.00	D3 ES4	
								2.50 2.50 - 2.95	S D4	N=10 (1,1/2,2,3,3)
				(2.00)						
								3.50 - 3.95	U2	45 (100%)
			0.14	4.00	Firm to stiff dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (BACTON GREEN TILL MEMBER)					
				(0.50)						
			-0.36	4.50	Medium dense light brown slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (BACTON GREEN TILL MEMBER)	Dry	4.50	4.50 4.50 - 4.95	S D6	N=10 (1,2/2,2,3,3)
				(1.00)						
			-1.36	5.50	Medium dense dark grey slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (BACTON GREEN TILL MEMBER)	Dry	5.50	5.50 5.50 - 5.95	S D7	N=11 (2,3/2,3,3,3)
				(1.50)						
			-2.86	7.00	Medium dense light greyish brown slightly gravelly silty fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. (BACTON GREEN TILL MEMBER)	Dry	7.00	7.00 7.00 - 7.45	C B1	N=13 (2,2/3,3,3,4)
				(1.50)						
			-4.36	8.50	Loose light grey slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (BACTON GREEN TILL MEMBER)	Dry	8.50	8.50 8.50 - 8.95	C B2	N=9 (3,4/2,2,2,3)
				(1.50)						
			-5.86	10.00		Dry	10.00	10.00	C	N=14 (2,2/3,3,3,5)
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
4.50	3.40		

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	1.50	1.50

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-L1A-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	04-07-17	04-07-17	MJ	Hand tools	n/a	n/a	04-07-17	VS	
CP	0.00	15.00	04-07-17	05-07-17	MJ	Dando 2000	n/a	n/a	05-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	639341.81
mN:	329922.11
mAOD:	4.14
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
				(1.00)	Medium dense dark grey slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (BACTON GREEN TILL MEMBER)			10.00 - 10.45	B3	
			-6.86	11.00						
				(4.00)	Medium dense light brown slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (BACTON GREEN TILL MEMBER)	Dry	11.50	11.50 11.50 - 11.95	S D8	N=10 (4,6/3,2,2,3)
			-10.86	15.00	Borehole ends at 15.00m (Blowing sands)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck: Rose to: Casing: Sealed:

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-L1A-01

Sheet 2 of 2

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	03-07-17	03-07-17	MJ	Hand tools	n/a	n/a	03-07-17	VS	
CP	0.00	14.00	03-07-17	04-07-17	MJ	Dando 2000	n/a	n/a	04-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 639485.00
mN: 329738.21
mAOD: 3.25
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 brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.					
			2.95	0.30	(TOPSOIL)					
					Stiff dark orangish brown mottled light grey slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasionally mottled dark brown and black and occasional rootlets.			0.50 0.50	D1 ES1	
				(1.50)	(HEAD)			1.00 1.00	D2 ES2	
								1.50 1.50 - 1.95	ES3 U1	25 (100%)
			1.45	1.80	Soft to firm dark greyish brown slightly sandy CLAY.					
					(HEAD)			2.00 2.00	D3 ES4	
				(0.90)						
					2.50 - 2.70 m: Mottles orangish brown	Dry	2.50	2.50 2.50 - 2.95	S D4	N=12 (1,2/2,3,3,4)
			0.55	2.70	Medium dense dark yellowish brown silty fine to coarse SAND. Occasional fine to coarse gravel sized pockets of dark brown sandy CLAY.					
					(HAPPISBURGH GLACIGENIC FORMATION)	Dry	3.50	3.50 3.50 - 3.95	S D5	N=15 (2,3/3,4,4,4)
					4.30 - 7.00 m: Becomes slightly gravelly with subangular to subrounded fine to coarse flint					
						Dry	4.50	4.50 4.50 - 4.95	C B1	N=24 (2,3/4,5,6,9)
				(4.30)						
						Dry	5.50	5.50 5.50 - 5.95	S D6	N=9 (1,2/1,2,3,3)
			-3.75	7.00	Medium dense dark greyish brown silty micaceous fine SAND.	Dry	7.00	7.00 7.00 - 7.45	S D7	N=12 (1,2/2,3,3,4)
					(HAPPISBURGH GLACIGENIC FORMATION)					
				(1.00)						
			-4.75	8.00	Medium dense dark greyish brown silty fine to coarse SAND.					
					(HAPPISBURGH GLACIGENIC FORMATION)	Dry	8.50	8.50 8.50	S D8	N=17 (2,3/3,3,5,6)
				(2.00)						
			-6.75	10.00		Dry	10.00	10.00	S	N=12 (2,3/2,3,4,3)
Inst						Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
4.00	3.10	4.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	3.00	3.00
150	10.00	10.00

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-L1A-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	03-07-17	03-07-17	MJ	Hand tools	n/a	n/a	03-07-17	VS	
CP	0.00	14.00	03-07-17	04-07-17	MJ	Dando 2000	n/a	n/a	04-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 639485.00
mN: 329738.21
mAOD: 3.25
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
					Medium dense light grey brown mottled dark greyish brown silty fine to coarse SAND. (HAPPISBURGH GLACIGENIC FORMATION)			10.00 - 10.45	D9	
						Dry	11.50	11.50	S	N=12 (2,2/2,3,3,4)
								11.50 - 11.95	D10	
				(4.00)						
						Dry	13.00	13.00	S	N=19 (3,2/3,4,6,6)
								13.00 - 13.45	D11	
			-10.75	14.00	Borehole ends at 14.00m (Target depth)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck: Rose to: Casing: Sealed:

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-L1A-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	06-07-17	06-07-17	MJ	Hand tools	n/a	n/a	06-07-17	VS	
CP	0.00	18.00	06-07-17	07-07-17	MJ	Dando 2000	n/a	n/a	07-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 639479.54
mN: 329911.26
mAOD: 3.66
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 brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint.					
			3.36	0.30	(TOPSOIL)					
					Soft to firm dark orangish brown mottled light grey sandy CLAY. Rare subangular to subrounded fine to coarse flint gravel.			0.50	D1	
				(0.80)	(BACTON GREEN TILL MEMBER)			0.50	ES1	
								1.00	D2	
			2.56	1.10				1.00	ES1	
					Firm to stiff dark orangish brown mottled light greyish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. Occasional shell fragments.			1.00	ES2	
					(BACTON GREEN TILL MEMBER)			1.50	ES3	30 (100%)
								1.50 - 1.95	U1	
								2.00	D3	
				(2.30)				2.00	ES4	
						Dry		2.50	S	N=9 (1,2/2,2,2,3)
								2.50 - 2.95	D4	
	▼		0.26	3.40	Firm to stiff dark grey slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments.			3.50 - 3.95	U2	38 (100%)
					(BACTON GREEN TILL MEMBER)			4.00	D5	
						Dry		4.50	S	N=12 (1,1/2,3,3,4)
								4.50 - 4.95	D6	
				(3.60)				5.50 - 5.95	U3	45 (100%)
								6.00	D7	
	▽		-3.34	7.00	Medium dense light grey silty fine to coarse SAND.	Dry		7.00	S	N=11 (2,2/3,2,3,3)
					(PROBABLE CRAG GROUP)			7.00 - 7.45	D8	
						Dry	8.50	8.50	S	N=13 (2,3/3,3,4,3)
								8.50 - 8.95	D9	
				(6.00)		Dry	10.00	10.00	C	N=17 (3,6/7,4,3,3)
Inst						Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
7.00	3.60		

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	7.00	7.00

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-L1A-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	06-07-17	06-07-17	MJ	Hand tools	n/a	n/a	06-07-17	VS	
CP	0.00	18.00	06-07-17	07-07-17	MJ	Dando 2000	n/a	n/a	07-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 639479.54
mN: 329911.26
mAOD: 3.66
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
					10.00 - 10.50 m: Becomes slightly gravelly with subangular to subrounded fine to coarse flint			10.00 - 10.45	B1	
						Dry	11.50	11.50 11.50 - 11.95	S D10	N=10 (2,3/2,2,3,3)
			-9.34	13.00	Very dense to dense light grey silty fine to medium SAND. (PROBABLE CRAG GROUP)	Dry	13.00	13.00 13.00 - 13.45	S D11	N=49 (3,5/9,12,12,16)
						Dry	14.50	14.50 14.50 - 14.95	S D12	50 (6,7/50 for 235mm)
				(5.00)						
						Dry	16.00	16.00 16.00 - 16.45	S D13	50 (6,9/13,17,20,)
						Dry	17.50	17.50 17.50 - 17.95	S D14	50 (8,13/50 for 285mm)
			-14.34	18.00	Borehole ends at 18.00m (Blowing sands)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck: Rose to: Casing: Sealed:

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-L1A-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	11-07-17	11-07-17	MJ	Hand tools	n/a	n/a	11-07-17	VS	
CP	0.00	20.00	11-07-17	12-07-17	MJ	Dando 2000	n/a	n/a	12-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 639551.64
mN: 329979.62
mAOD: 5.79
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 brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.					
			5.49	0.30	(TOPSOIL)					
					Medium dense dark orangish brown clayey fine to medium SAND. Rare gravel of subangular to subrounded fine to coarse flint. (HAPPISBURGH GLACIGENIC FORMATION)			0.50 0.50	D1 ES1	
				(1.50)				1.00 1.00	D2 ES2	
						Dry	1.50	1.50 1.50 1.50 - 1.95	S ES3 D3	N=10 (1,2/2,2,3,3)
			3.99	1.80	Firm dark orangish brown mottled light grey and occasionally mottled dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (HAPPISBURGH GLACIGENIC FORMATION)			2.00	ES4	
								2.50 - 2.95	U1	28 (100%)
				(2.30)				3.00	D4	
						Dry	3.00	3.50 3.50 - 3.95	S D5	N=12 (2,3/2,3,3,4)
			1.69	4.10	Firm to stiff dark greyish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. Occasional bands and mottling with dark orangish brown. Occasional shell fragments. (HAPPISBURGH GLACIGENIC FORMATION)			4.50 - 4.95	U2	50 (100%)
					5.00 - 10.00 m: Becomes stiff to very stiff			5.00	D6	
						Dry	3.00	5.50 5.50 - 5.95	S D7	N=19 (2,3/4,4,5,6)
								6.50	D8	
				(5.90)				7.00 - 7.45	U3	65 (100%)
								7.50	D9	
						Dry	3.00	8.50 8.50 - 8.95	S D10	N=26 (3,4/5,6,7,8)
	Inst		-4.21	10.00		Water	Casing	10.00 - 10.45	D1	80 (0%)

Groundwater entries:				Diameter & casing:			Depth related remarks:			Chiselling details:			
Struck:	Rose to:	Casing:	Sealed:	Dia (mm):	Depth:	Casing:	From:	To:	Remarks:	From:	to:	Duration:	Tool:
10.0 0	5.10	3.00		200	3.00	3.00							

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-L1A-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	11-07-17	11-07-17	MJ	Hand tools	n/a	n/a	11-07-17	VS	
CP	0.00	20.00	11-07-17	12-07-17	MJ	Dando 2000	n/a	n/a	12-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	639551.64
mN:	329979.62
mAOD:	5.79
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Water	Casing	Depth	Type & No	Results/Remarks
					Loose becoming medium dense and very dense dark grey silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (PROBABLE CRAG GROUP)			10.00 - 10.45	U4	
					10.00 - 10.40 m: Occasional fine to coarse pockets of dark greyish brown sandy CLAY					
					11.50 - 14.00 m: Becomes fine to medium SAND	Dry	11.50	11.50 11.50 - 11.95	S D11	N=8 (1,1/2,2,2,2)
						Dry	13.00	13.00 13.00 - 13.95	S D12	N=14 (2,2/3,3,4,4)
						Dry	14.50	14.50 14.50 - 14.95	S D13	N=17 (1,2/3,4,5,5)
				(10.00)						
						Dry	16.00	16.00 16.00 - 16.45	S D14	N=41 (4,6/9,10,10,12)
						Dry	17.50	17.50 17.50 - 17.95	S D15	50 (5,9/50 for 235mm)
						Dry	19.00	19.00 19.00 - 19.45	S D16	50 (7,14/50 for 160mm)
SP Inst			-14.21	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

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-L1A-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	19-07-17	19-07-17	MJ	Hand tools	n/a	n/a	19-07-17	VS	
CP	0.00	8.00	19-07-17	19-07-17	MJ	Dando 2000	n/a	n/a	19-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 639665.41
mN: 330085.17
mAOD: 1.91
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
					Dark yellowish brown slightly silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (LOWESTOFT FORMATION)			0.50	ES1	
				(1.80)				1.00	D1	
								1.00	ES2	
						Dry		1.50	C	N=8 (1,0/1,2,2,3)
								1.50	ES3	
			0.11	1.80				1.50 - 1.95	B1	
			-0.09	2.00	Soft to firm dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. Occasional shell fragments and occasionally laminated. (BACTON GREEN TILL MEMBER)			2.00	D2	
								2.00	ES4	
					Firm to stiff dark grey slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments. (BACTON GREEN TILL MEMBER)			2.50 - 2.95	UNR	50 (0%)
								3.00 - 3.45	D3	
				(2.60)						
						Dry	3.00	4.00	S	N=10 (1,1/2,2,3,3)
								4.00 - 4.45	D4	
			-2.69	4.60	Medium dense dark grey gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments. (BACTON GREEN TILL MEMBER)					
						Dry	5.00	5.00	S	N=29 (2,3/5,7,8,9)
								5.00 - 5.45	B3	
								5.00 - 5.45	D5	
				(3.40)						
						Dry	6.50	6.50	S	N=32 (3,4/6,8,9,9)
								6.50 - 6.95	D6	
			-6.09	8.00	Borehole ends at 8.00m (Target depth)	Dry	7.80	8.00	S	N=34 (4,5/7,8,9,10)
								8.00 - 8.45	D7	
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
4.60	2.30	3.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
150	8.00	8.00

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-L1A-05

Sheet 1 of 1

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	06-07-17	06-07-17	TM	Hand tools	n/a	n/a	06-07-17	VS	
CP	0.00	20.45	06-07-17	07-07-17	TM	Dando 2000	n/a	n/a	07-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	638643.01
mN:	330317.53
mAOD:	11.58
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 brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.					
			11.28	0.30	(TOPSOIL)					
					Dark orangish brown slightly gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets.			0.50	D1	
				(0.70)	(HAPPISBURGH GLACIGENIC FORMATION)			0.50	ES1	
								0.50 - 1.00	B1	
			10.58	1.00	Light orangish brown slightly gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint.			1.00	D2	
				(0.50)	(HAPPISBURGH GLACIGENIC FORMATION)			1.00	ES2	
			10.08	1.50	Loose light orangish brown slightly silty clayey fine to medium SAND. Occasional fine to coarse pockets of light orangish brown sandy CLAY.	Dry		1.50	S	N=8 (1,1/2,2,2,2)
					(HAPPISBURGH GLACIGENIC FORMATION)			1.50	ES3	
								1.50 - 1.95	D3	
								1.50 - 2.00	B2	
								2.00	ES4	
								2.50	D4	
				(2.50)				2.50 - 2.95	D9	
						Dry	3.00	3.00	S	N=5 (1,2/1,2,1,1)
								3.00 - 3.45	D5	
			7.58	4.00	Medium dense light brown gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments.			4.00	D6	
					(HAPPISBURGH GLACIGENIC FORMATION)	Dry	4.50	4.50	S	N=17 (2,3/4,4,4,5)
								4.50 - 4.95	B3	
								4.50 - 4.95	D7	
				(3.80)		Dry	6.00	6.00	S	N=21 (2,2/4,5,5,7)
								6.00 - 6.45	D8	
						Dry	7.50	7.50	S	N=22 (3,55/5,5,6,6)
			3.78	7.80	Firm to stiff dark orangish brown occasionally mottled dark reddish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. Occasional thin dark greyish brown laminations. Occasional shell fragments.			8.00	D10	40 (90%)
					(HAPPISBURGH GLACIGENIC FORMATION)			8.00 - 8.45	U1	
								8.50	D11	
				(1.70)						
			2.08	9.50	Stiff to very stiff dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint.	Dry	9.00	9.50	S	N=38 (4,6/8,9,9,12)
				(0.80)	(HAPPISBURGH GLACIGENIC FORMATION)			9.50 - 9.95	D12	
Inst						Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	6.50	6.50

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-L1B-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	06-07-17	06-07-17	TM	Hand tools	n/a	n/a	06-07-17	VS	
CP	0.00	20.45	06-07-17	07-07-17	TM	Dando 2000	n/a	n/a	07-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE: 638643.01
mN: 330317.53
mAOD: 11.58
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
			1.28	10.30	Stiff to very stiff dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (HAPPISBURGH GLACIGENIC FORMATION)					
					Dense to very dense light greyish brown mottled light orangish brown silty fine to medium SAND. (CRAG GROUP)			10.50 - 11.50	B4	
						Dry	11.00	11.00	S	50 (4,7/12,20,18,)
								11.00 - 11.45	D13	
				(3.70)						
						Dry	12.50	12.50	S	N=41 (5,8/8,10,11,12)
								12.50 - 12.95	D14	
			-2.42	14.00	Dense light greyish brown silty micaceous fine SAND. (CRAG GROUP)	Dry	14.00	14.00	S	N=34 (2,5/6,7,9,12)
								14.00 - 14.45	D15	
						Dry	15.50	15.50	S	N=32 (3,4/7,7,9,9)
								15.50 - 15.95	D16	
						Dry	17.00	17.00	S	N=48 (3,6/10,10,12,16)
				(6.45)				17.00 - 17.45	D17	
								18.00 - 20.00	D5	
						Dry	18.50	18.50	S	N=41 (5,6/8,9,12,12)
								18.50 - 18.95	D18	
	SP Inst					Dry	20.00	20.00	S	50 (3,7/50 for 160mm)
						Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

Dia (mm):	Depth:	Casing:

Depth related remarks:

From:	To:	Remarks:
20.0	20.4	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-L1B-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	06-07-17	06-07-17	TM	Hand tools	n/a	n/a	06-07-17	VS	
CP	0.00	20.45	06-07-17	07-07-17	TM	Dando 2000	n/a	n/a	07-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	638643.01
mN:	330317.53
mAOD:	11.58
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
					Dense light greyish brown silty micaceous fine SAND. (CRAG GROUP)			20.00 - 20.45	D19	
			-8.87	20.45	Borehole ends at 20.45m (Target depth)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck: Rose to: Casing: Sealed:

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-L1B-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	10-07-17	10-07-17	TM	Hand tools	n/a	n/a	10-07-17	VS	
CP	0.00	19.45	10-07-17	11-07-17	TM	Dando 2000	n/a	n/a	11-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	638719.03
mN:	330167.24
mAOD:	11.42
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 brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint.					
			11.12	0.30	(TOPSOIL)					
					Light orangish brown slightly gravelly slightly silty fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. Coarse gravel sized pockets of reddish brown slightly silty fine to medium SAND.			0.50	D1	
								0.50	ES1	
								0.50 - 1.00	B1	
				(1.20)	Occasional rootlets.					
					(HAPPISBURGH GLACIGENIC FORMATION)			1.00	D2	
								1.00	ES2	
			9.92	1.50		Dry		1.50	S	N=24 (2,3/5,5,7,7)
					Medium dense dark orangish brown fine to coarse SAND.			1.50	ES3	
				(0.50)	(HAPPISBURGH GLACIGENIC FORMATION)			1.50 - 1.95	D3	
			9.42	2.00				2.00	ES4	
					Firm dark orangish brown and greenish grey slightly sandy CLAY. Occasional mottling with dark reddish brown. Occasionally laminated with fine to coarse SAND.					
				(1.00)	(HAPPISBURGH GLACIGENIC FORMATION)			2.50	D4	
			8.42	3.00		Dry	3.00	3.00	S	N=40 (3,4/6,8,11,15)
					Dense dark orangish brown fine to coarse SAND. Rare fine to medium gravel sized pockets of dark orangish brown mottled light grey clayey SAND. Rare shell fragments.			3.00 - 3.45	D1	
					(HAPPISBURGH GLACIGENIC FORMATION)					
								4.00 - 4.50	B5	
					4.50 - 5.00 m: Becomes fine to medium SAND	Dry	4.50	4.50	S	N=32 (2,4/5,7,9,11)
								4.50 - 4.95	D6	
				(5.90)		Dry	6.00	6.00	S	N=28 (2,5/6,6,8,8)
								6.00 - 6.45	D7	
					7.50 - 8.90 m: Occasionally mottles dark grey	Dry	7.50	7.50	S	N=33 (4,6/6,8,9,10)
								7.50 - 7.95	D8	
			2.52	8.90				8.90	D9	
			2.42	9.00	Soft dark orangish brown sandy CLAY	Dry	9.00	9.00	S	N=12 (2,2/2,3,3,4)
					(HAPPISBURGH GLACIGENIC FORMATION)			9.00 - 9.45	D10	
					Medium dense dark orangish brown fine to coarse SAND. Rare gravel sized pockets of dark orangish brown mottled light grey clayey SAND. Rare shell fragments.					
				(1.50)	(HAPPISBURGH GLACIGENIC FORMATION)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	9.00	9.00

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-L1B-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	10-07-17	10-07-17	TM	Hand tools	n/a	n/a	10-07-17	VS	
CP	0.00	19.45	10-07-17	11-07-17	TM	Dando 2000	n/a	n/a	11-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE: 638719.03
mN: 330167.24
mAOD: 11.42
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
			0.92	10.50	Medium dense dark orangish brown fine to coarse SAND. Rare gravel sized pockets of dark orangish brown mottled light grey clayey SAND. Rare shell fragments. (HAPPISBURGH GLACIGENIC FORMATION)	Dry	9.00	10.50 10.50	S D11	N=22 (2,2/4,5,6,7)
				(1.70)	Medium dense dark orangish brown slightly clayey slightly silty SAND. Fine to medium sized pockets of soft dark orangish brown CLAY. (HAPPISBURGH GLACIGENIC FORMATION)					
			-0.78	12.20		Dry		12.00 12.00 - 12.45	S D12	N=38 (4,4/6,7,11,14)
					Firm to stiff dark greyish brown slightly sandy CLAY. Occasional shell fragments. Rare subangular to subrounded fine to coarse flint gravel. (HAPPISBURGH GLACIGENIC FORMATION)			13.50 - 13.95 13.50 - 13.95 13.50 - 13.95	B3 D13 UNR	40 (0%)
				(5.30)		Dry	14.00	14.50 14.50 - 14.95	S D14	N=39 (2,3/5,8,11,15)
						Dry	16.00	16.00 16.00 - 16.45	S D15	N=14 (2,2/3,3,4,4)
			-6.08	17.50	Dark grey slightly silty fine to medium SAND. Occasional shell fragments. Occasional fine to coarse gravel sized pockets of dark grey sandy CLAY. (HAPPISBURGH GLACIGENIC FORMATION)			17.50 - 17.95 17.50 - 17.95	D16 UNR	20 (0%)
				(1.95)				18.50	D17	
						Dry	19.00	19.00 19.00 - 19.45	C B4	N=1 (1,0/1,0,0,0)
			-8.03	19.45	Borehole ends at 19.45m (Blowing sands)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
14.8	14.0	15.0	14.0
0	2	0	0
17.7	17.8	17.5	
0	9	0	

Diameter & casing:

Dia (mm):	Depth:	Casing:

Depth related remarks:

From:	To:	Remarks:
17.5	17.9	Sand.
0	5	
19.0	19.4	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-L1B-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	10-07-17	10-07-17	MJ	Hand tools	n/a	n/a	10-07-17	VS	
CP	0.00	20.00	10-07-17	11-07-17	MJ	Dando 2000	n/a	n/a	11-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 638828.69
mN: 330276.05
mAOD: 12.42
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
			12.12	(0.30) 0.30	Soft dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
					Medium dense light orangish brown slightly silty fine to medium SAND. Rare subangular to subrounded fine to coarse flint gravel. Fine to medium gravel sized pockets of dark reddish brown slightly silty clayey SAND. (HAPPISBURGH GLACIGENIC FORMATION)			0.50	D1	
								0.50	ES1	
								1.00	D2	
								1.00	ES2	
						Dry	1.40	1.50	S	N=19 (2,4/4,4,5,6)
								1.50	ES3	
								1.50 - 1.95	D3	
								2.00	ES4	
						Dry	2.40	2.50	S	N=25 (3,4/5,6,6,8)
								2.50 - 2.95	D4	
						Dry	3.40	3.50	S	N=20 (2,3/4,4,6,6)
								3.50 - 3.95	D5	
						Dry	4.50	4.50	S	N=23 (1,3/5,5,6,7)
								4.50 - 4.95	D6	
						Dry	5.50	5.50	S	N=31 (3,5/6,8,8,9)
								5.50 - 5.95	D7	
				(11.20)						
								6.50	D8	
					7.00 - 8.95 m: Becomes dark yellowish brown	Dry	7.00	7.00	S	N=26 (2,4/5,5,7,9)
								7.00 - 7.45	D9	
								8.00	D10	
						Dry	8.50	8.50	S	N=27 (3,5/5,6,8,8)
								8.50 - 8.95	D11	
								9.50	D12	
	Inst					Dry	10.00	10.00	S	N=31 (4,6/6,7,9,9)

Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

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-L1B-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	10-07-17	10-07-17	MJ	Hand tools	n/a	n/a	10-07-17	VS	
CP	0.00	20.00	10-07-17	11-07-17	MJ	Dando 2000	n/a	n/a	11-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 638828.69
mN: 330276.05
mAOD: 12.42
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
					10.00 - 11.50 m: Becomes dark orangish brown			10.00 - 10.45	D13	
			0.92	11.50	Dense dark orangish brown gravelly silty fine to medium SAND. Gravel of subangular to subrounded fine to medium flint. Occasional fine to coarse gravel sized pockets of dark orangish brown sandy CLAY. (HAPPISBURGH GLACIGENIC FORMATION)	Dry	11.50	11.50 11.50 - 11.95	S D14	N=38 (3,5/7,8,10,13)
				(1.50)						
	▼		-0.58	13.00	Very dense dark orangish brown gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (HAPPISBURGH GLACIGENIC FORMATION)	Dry		13.00 13.00 - 13.45	C B1	N=50 (4,7/10,12,13,15)
				(0.80)						
			-1.38	13.80	Very dense dark greyish brown occasionally dark grey silty fine to coarse SAND. Fine to coarse gravel sized pockets of dark greyish brown sandy CLAY. (HAPPISBURGH GLACIGENIC FORMATION)	Dry		14.50 14.50 - 14.95	S D15	50 (5,10/50 for 220mm)
				(2.20)						
			-3.58	16.00	Very dense dark grey silty fine to coarse SAND. Rare gravel of subangular to subrounded fine to medium flint. Rare shell fragments. (CRAG GROUP)	Dry		16.00 16.00 - 16.45	S D16	50 (4,8/50 for 235mm)
						Dry	17.50	17.50 17.50 - 17.95 17.50 - 17.95	S D111 D17	50 (6,10/50 for 225mm)
	▽			(4.00)						
					19.00 - 20.00 m: Becomes slightly gravelly with subangular to subrounded fine to coarse flint	Dry	19.00	19.00 19.00 - 19.45	C B2	50 (10,14/50 for 140mm)
Inst			-7.58	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
18.0	12.9	18.0	
0	0	0	

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-L1B-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	11-07-17	11-07-17	TM	Hand tools	n/a	n/a	11-07-17	VS	
CP	0.00	16.00	11-07-17	12-07-17	TM	Dando 2000	n/a	n/a	12-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE: 638976.43
mN: 330391.52
mAOD: 7.79
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
			7.49	(0.30) 0.30	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
				(1.20)	Dark orangish brown slightly clayey slightly gravelly fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. (HAPPISBURGH GLACIGENIC FORMATION)			0.50 0.50 0.50 - 1.00 1.00 1.00	D1 ES1 B1 D2 ES2	
			6.29	1.50	Soft dark orangish brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint. Fine to coarse sized pockets of light brownish white CLAY. (HAPPISBURGH GLACIGENIC FORMATION)	Dry		1.50 1.50 1.50 - 1.95 1.50 - 2.00 2.00	S ES3 D3 B2 ES4	N=8 (1,1/1,2,2,3)
				(1.50)						
			4.79	3.00	Very dense light greyish brown slightly silty slightly gravelly fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments. Occasionally mottled dark orangish brown. (HAPPISBURGH GLACIGENIC FORMATION)	Dry	3.00	3.00 3.00 - 3.45 3.00 - 4.00	S D4 B3	N=39 (1,3/5,8,11,15)
						Dry	4.50	4.50 4.50 - 4.95	S D5	50 (2,6/50 for 225mm)
				(5.20)						
						Dry	6.00	6.00 6.00 - 6.45	S D6	N=50 (3,5/7,11,15,17)
	▼					Dry	7.50	7.50 7.50 - 7.95	S D7	50 (3,6/50 for 225mm)
			-0.41	8.20	Firm dark orangish brown mottled dark grey slightly sandy CLAY. Occasional laminations and dark brown staining. (HAPPISBURGH GLACIGENIC FORMATION)			8.20	D8	
	▼			(0.80)						
	▽		-1.21	9.00	Medium dense light orangish brown slightly silty slightly gravelly fine to medium SAND. Gravel of subangular to subrounded fine to medium flint. (HAPPISBURGH GLACIGENIC FORMATION)	Dry	9.00	9.00 9.00 - 9.45	S D9	N=14 (2,2/2,3,4,5)
				(1.00)						
Inst			-2.21	10.00		Water	Casing	10.00 Depth	D10 Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
8.80	7.30	8.20	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	8.50	8.50
150	16.00	16.00

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-L1B-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	11-07-17	11-07-17	TM	Hand tools	n/a	n/a	11-07-17	VS	
CP	0.00	16.00	11-07-17	12-07-17	TM	Dando 2000	n/a	n/a	12-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	638976.43
mN:	330391.52
mAOD:	7.79
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)	Dark orangish brown slightly silty slightly gravelly fine to coarse SAND. Gravel of fine-medium flint. Occasional clay pockets and shell fragments. (HAPPISBURGH GLACIGENIC FORMATION)					
			-2.51	10.30	Firm to stiff dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium. Frequent shell fragments. Occasional dark orangish brown mottling. (HAPPISBURGH GLACIGENIC FORMATION)	Dry	10.50	10.50	S	N=19 (2,3/3,4,5,7)
								10.50 - 10.95	D11	
								10.80	D12	
					10.80 - 11.45 m: Becomes stiff to very stiff			11.00 - 11.45	U1	73 (80%)
								11.50	D13	
								11.60 - 12.05	U2	60 (80%)
				(3.10)						
								12.10	D14	
						Dry	12.00	12.50	S	N=22 (2,3/4,5,6,7)
								12.50 - 12.95	D15	
	▽		-5.61	13.40				13.40	D16	
			-5.71	13.50	Firm to stiff dark orangish brown slightly gravelly slightly sandy CLAY. (HAPPISBURGH GLACIGENIC FORMATION)	Dry	12.00	13.50	S	N=35 (3,3/6,7,9,13)
								13.50 - 13.95	D17	
					Dense dark yellowish brown slightly silty slightly gravelly SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional fine to coarse gravel sized pockets of dark orangish brown sandy CLAY. (HAPPISBURGH GLACIGENIC FORMATION)					
				(2.50)						
						Dry		15.00	S	32 (2,2/32 for 225mm)
								15.00 - 15.45	D18	
	SP		-8.21	16.00	Borehole ends at 16.00m (Blowing sands)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
13.5	8.50	12.0	
0		0	

Diameter & casing:

Dia (mm):	Depth:	Casing:

Depth related remarks:

From:	To:	Remarks:
15.0	15.4	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-L1B-04

APPENDIX B
Photographs

BH17-LIA-01

0.50 m

4.50 m

7.00 m

BH17-LIA-02

1.00 m

3.50 m

7.00 m micaceous sand

11.50 m

BH17-LIA-03

2.00 m

4.00 m

BH17-LIA-04

0.50 m

3.00 m

5.00 m

11.50 m micaceous sand

14.50 m

BH17-LIA-05

0.50 m

1.80 m

BH17-LIB-01

1.00 m

4.00 m

8.50 m

10.50 m

14.00 m micaceous sand

BH17-LIB-02

0.50 m

2.50 m

7.50 m

8.90 m

13.50 m

17.50 m

BH17-LIB-03

4.50 m

7.00 m

11.50 m

16.00 m

BH17-LIB-04

0.50 m

3.00 m

8.20 m

10.80 m

13.50 m

APPENDIX C
In Situ Testing Results

Variable head permeability test

Variable Head Permeability Test Results

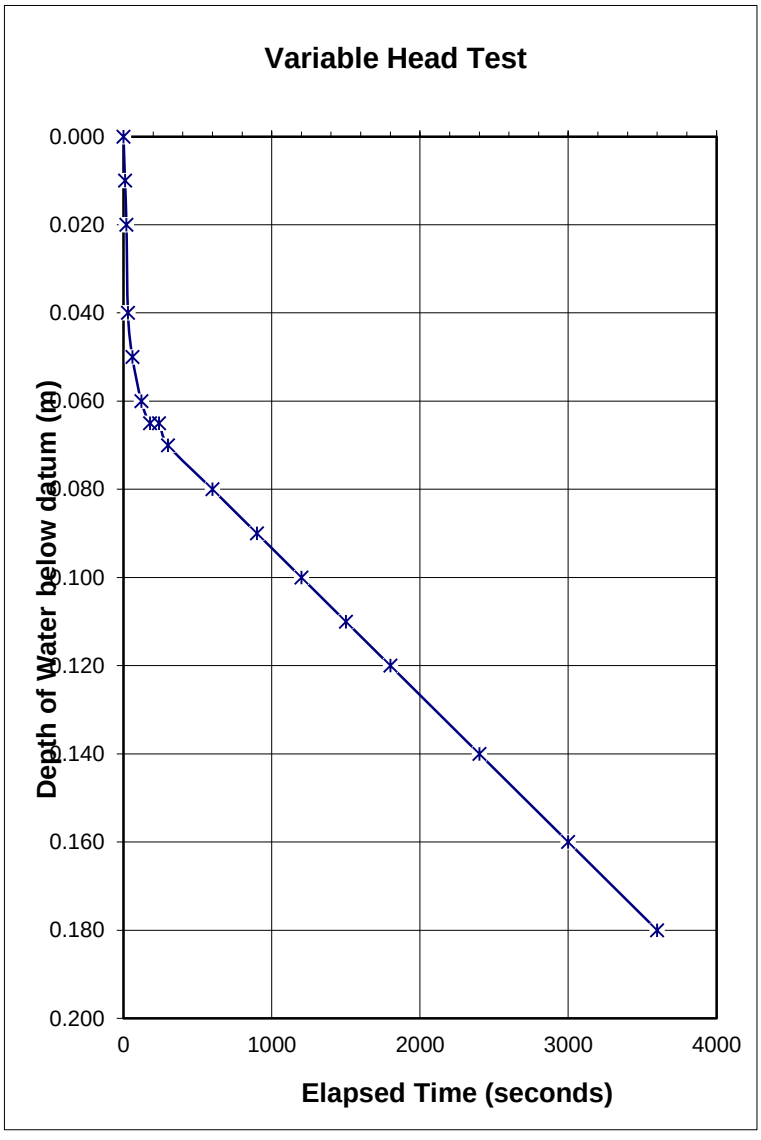
TerraConsult

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	6.50

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	6.50
Final Head (h(t)) at (t)	6.32
Length of Response Zone *(L)*	1.00
Cross Sectional Area *(S)*	0.0177

Description	Silty slightly gravelly SAND.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.000	6.50
10	0.010	6.49
20	0.020	6.48
30	0.040	6.46
60	0.050	6.45
120	0.060	6.44
180	0.065	6.44
240	0.065	6.44
300	0.070	6.43
600	0.080	6.42
900	0.090	6.41
1200	0.100	6.40
1500	0.110	6.39
1800	0.120	6.38
2400	0.140	6.36
3000	0.160	6.34
3600	0.180	6.32



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

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

$$= \frac{6.28}{2.59}$$

$$= 2.43$$

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 = 5.68E-08 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-L1A-01**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

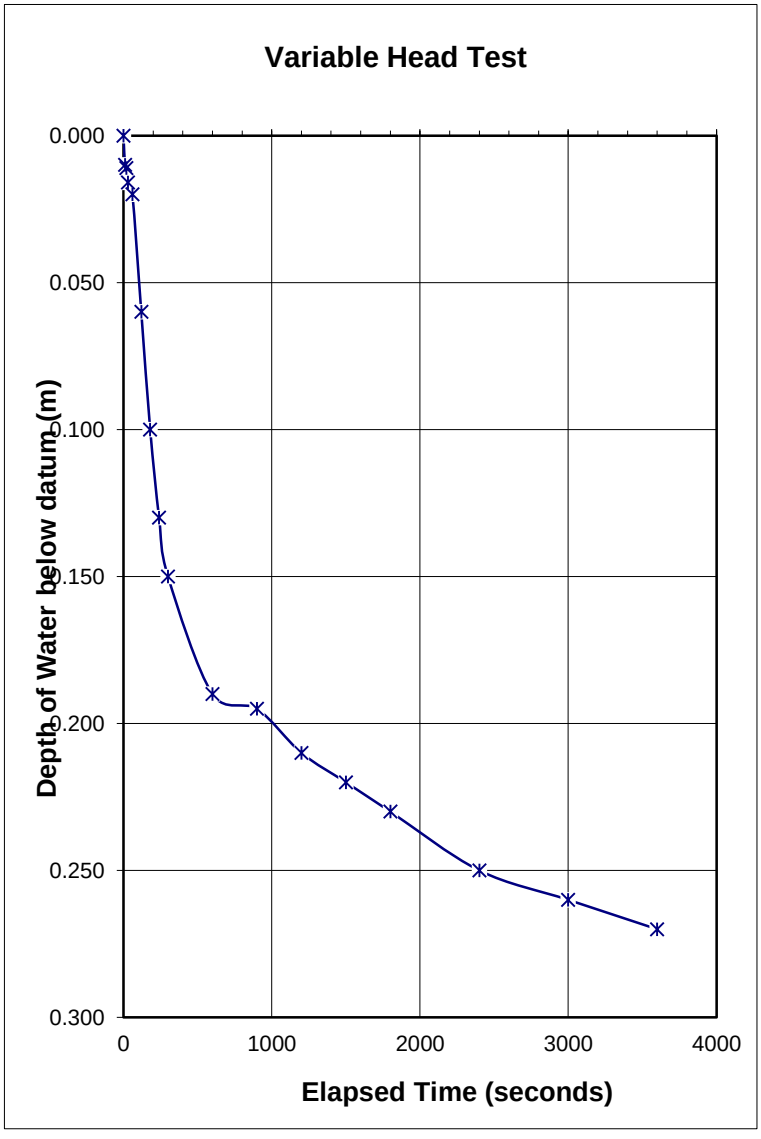
TerraConsult

Static water level (m)	7.00
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	8.50
Bottom of Response Zone	9.50

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	9.50
Final Head (h(t)) at (t)	9.23
Length of Response Zone *(L)*	1.00
Cross Sectional Area *(S)*	0.0177

Description	Silty SAND.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.000	9.50
10	0.010	9.49
20	0.011	9.49
30	0.016	9.48
60	0.020	9.48
120	0.060	9.44
180	0.100	9.40
240	0.130	9.37
300	0.150	9.35
600	0.190	9.31
900	0.195	9.31
1200	0.210	9.29
1500	0.220	9.28
1800	0.230	9.27
2400	0.250	9.25
3000	0.260	9.24
3600	0.270	9.23



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

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

$$= \frac{6.28}{2.59}$$

$$= 2.43$$

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 = 5.83E-08 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-L1A-03**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

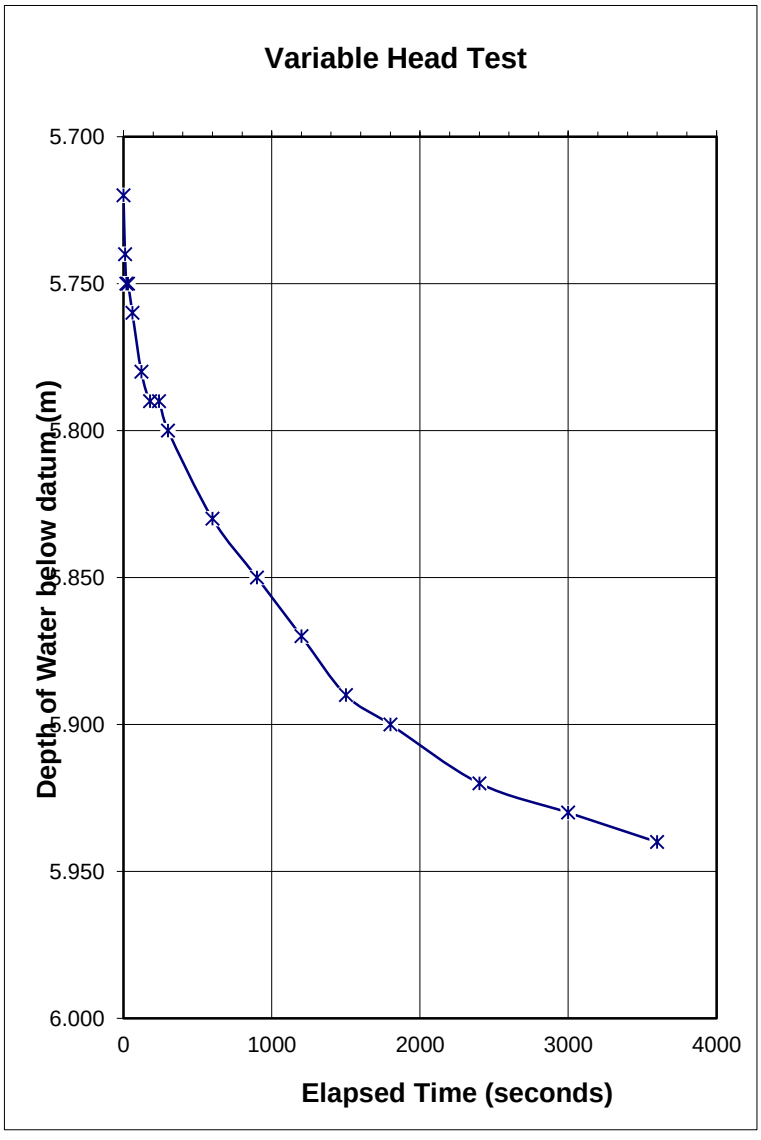
TerraConsult

Static water level (m)	14.02
Internal Diameter *(D)*	0.15
Length of Standpipe below Ground Level (m)	0.00
Height of Water above Ground Level (m)	0.34
Length of Standpipe above Ground Level (m)	0.34
Water level at start of test (m)	0.00
Top of Response Zone	14.00
Bottom of Response Zone	15.00

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	9.28
Final Head (h(t)) at (t)	9.06
Length of Response Zone *(L)*	1.00
Cross Sectional Area *(S)*	0.0177

Description	Silty slightly sandy CLAY.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	5.720	9.62
10	5.740	9.60
20	5.750	9.59
30	5.750	9.59
60	5.760	9.58
120	5.780	9.56
180	5.790	9.55
240	5.790	9.55
300	5.800	9.54
600	5.830	9.51
900	5.850	9.49
1200	5.870	9.47
1500	5.890	9.45
1800	5.900	9.44
2400	5.920	9.42
3000	5.930	9.41
3600	5.940	9.40



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

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

$$= \frac{6.28}{2.59}$$

$$= 2.43$$

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 = 4.86E-08 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-L1B-02**
Checked by:	DD	Client:	GHD	

APPENDIX D
Instrumentation Sampling and Monitoring Records

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

TerraConsult

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 ^oC
BH17-LIA-04	10/08/17	KW	51	14.80	4.46	Y				1024	NM	0.0	0.0	0.0	0.0000	1.4	0.0000	18.8	0	0	NM	Sunny, dry	18
	22/08/17	VS	51	18.43	5.98	N				1018	NM	0.0	0.0	0.0	0.0000	1.3	0.0000	19.5	0	0	NM	Sunny, dry	18
	31/08/17	VS	51	18.08	4.96	N				1016	NM	0.0	0.0	0.0	0.0000	0.4	0.0000	20.6	0	0	NM	Sunny, dry	18
BH17-LIB-01	10/08/17	KW	51	15.39	10.23	Y				1024	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.5	0	0	NM	Sunny, dry	18
	22/08/17	VS	51	15.24	10.44	Y				1017	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.6	0	0	NM	Sunny, dry	18
	31/08/17	VS	51	15.03	10.40	N				1015	NM	0.0	0.0	0.0	0.0000	1.6	0.0000	18.6	0	0	NM	Sunny, dry	18
BH17-LIB-04	10/08/17	KW	51	16.25	6.75	Y				1024	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.6	0	0	NM	Sunny, dry	18
	22/08/17	VS	51	16.24	7.40	N				1016	NM	0.0	0.0	0.0	0.0000	0.0	0.0000	21.4	0	0	NM	Sunny, dry	18
	31/08/17	VS	51	15.88	6.80	N				1015	NM	0.0	0.0	0.0	0.0000	0.0	0.0000	20.8	0	0	NM	Sunny, dry	18

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

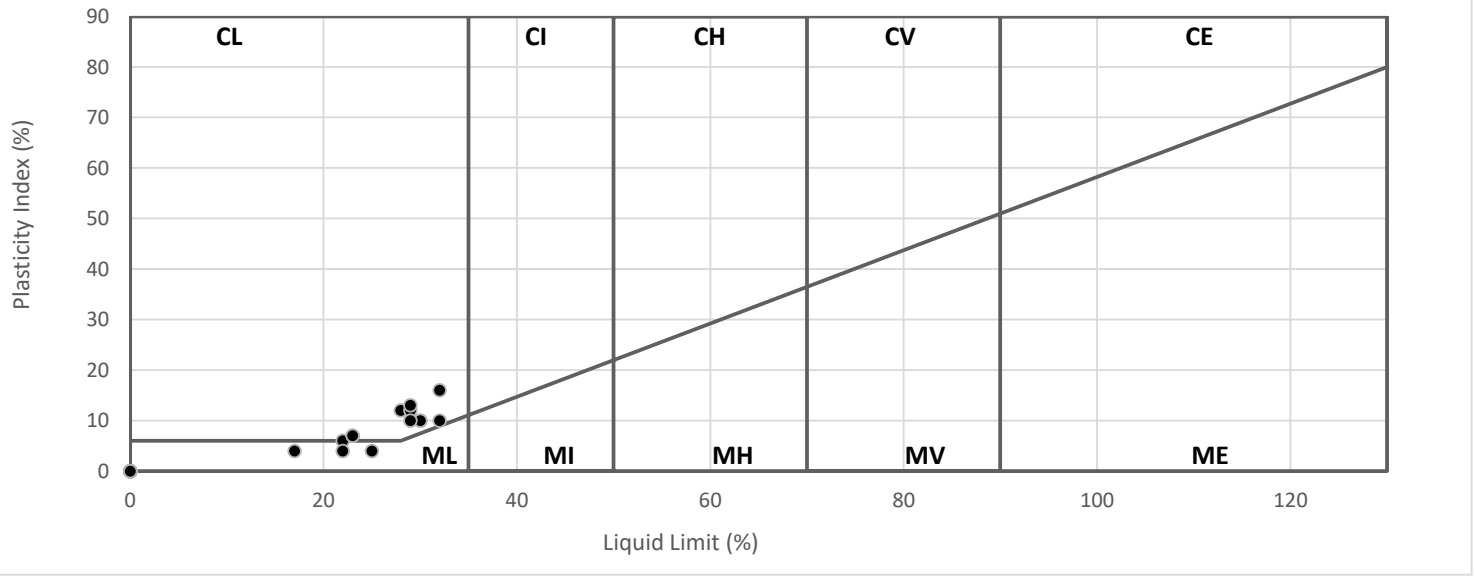
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX
(BS 1377 : Part 2 : 1990 Method 5)

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-L1A-02	2	D	1.00	-		26	32	22	10	100	CL Low Plasticity
BH17-L1A-04	4	D	3.00	-		16	29	19	10	100	CL Low Plasticity
BH17-L1B-01	12	D	9.50	-	9.95	25	29	16	13	100	CL Low Plasticity
BH17-L1B-04	3	D	1.50	-	1.95	24		NP		100	
				-							
				-							
				-							
				-							
				-							
				-							
				-							

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

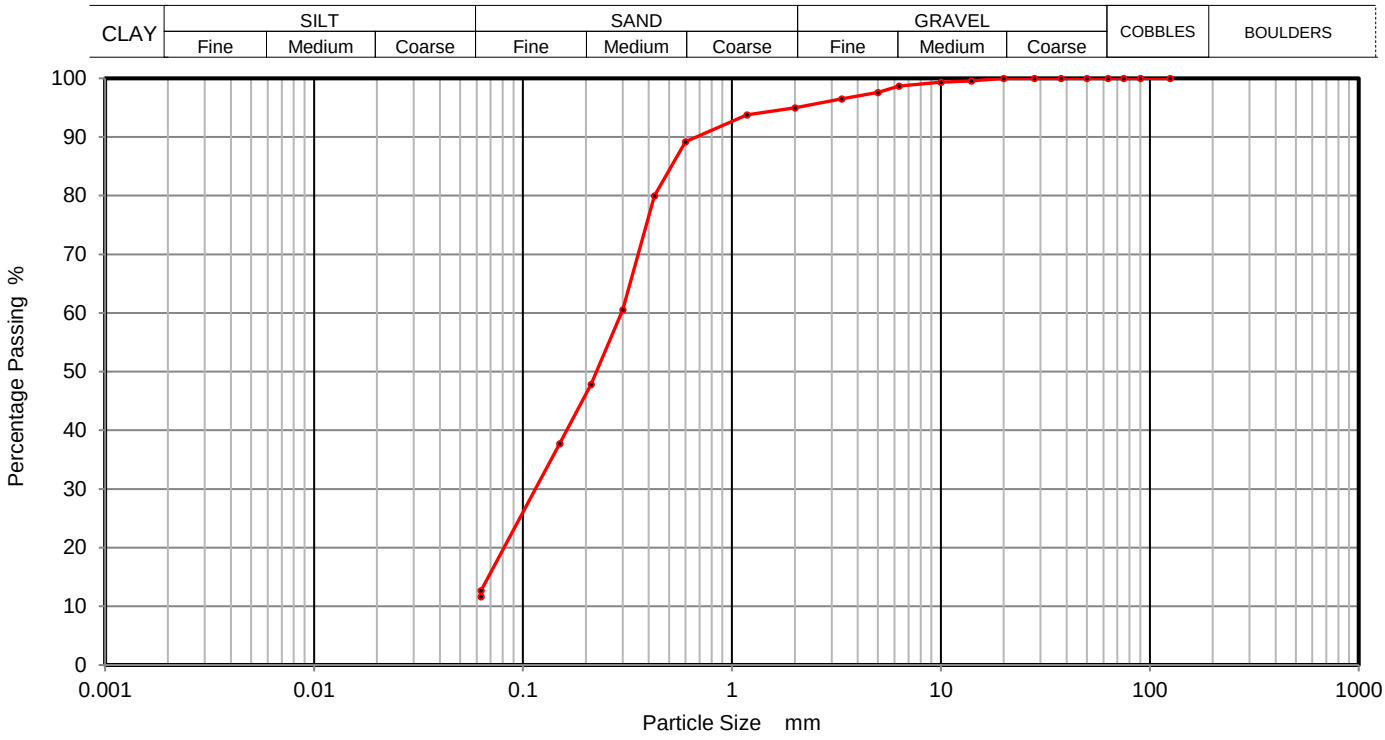
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



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-L1A-01**
Site Name	**E Anglia Wind Farm - Cable Route**	Sample No.	**7**
Soil Description	Brown slightly fine to medium gravelly silty fine to coarse SAND	Depth Top	**5.50**
		Depth Base	**5.95**
		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	99		
5	98		
3.35	96		
2	95		
1.18	94		
0.6	89		
0.425	80		
0.3	61		
0.212	48		
0.15	38		
0.063	13		

Sample Proportions	% dry mass
Cobbles	0
Gravel	5
Sand	82
Silt and Clay	13

Grading Analysis	
Uniformity Coefficient	

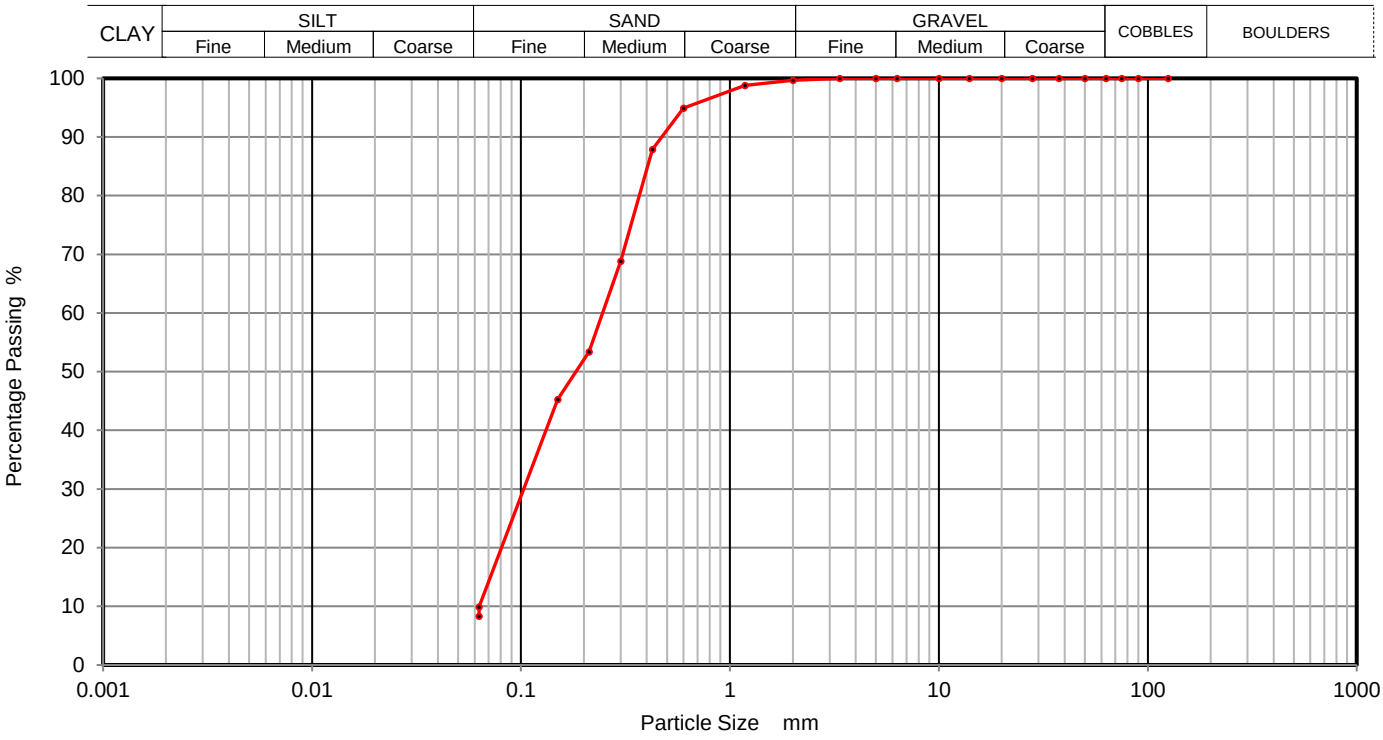
Remarks

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-L1A-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	8
Soil Description	Brown silty fine to coarse SAND	Depth Top	7.00
		Depth Base	7.45
		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	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	95		
0.425	88		
0.3	69		
0.212	53		
0.15	45		
0.063	10		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	90
Silt and Clay	10

Grading Analysis	
Uniformity Coefficient	

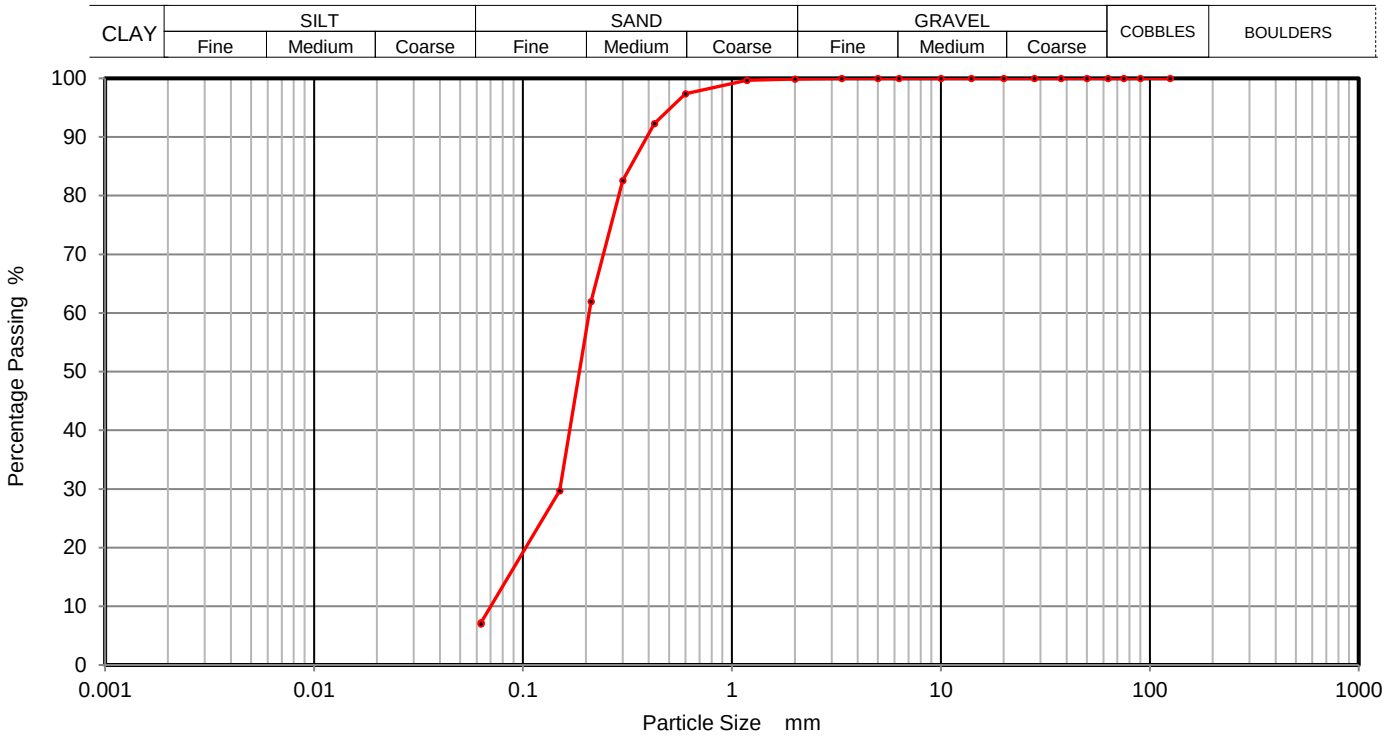
Remarks

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	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	36525
		Borehole/Pit No.	BH17-L1B-02
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Brown slightly silty fine to coarse SAND	Depth Top	3.00
		Depth Base	3.45
		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	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	97		
0.425	92		
0.3	83		
0.212	62		
0.15	30		
0.063	7		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	93
Silt and Clay	7

Grading Analysis	
Uniformity Coefficient	

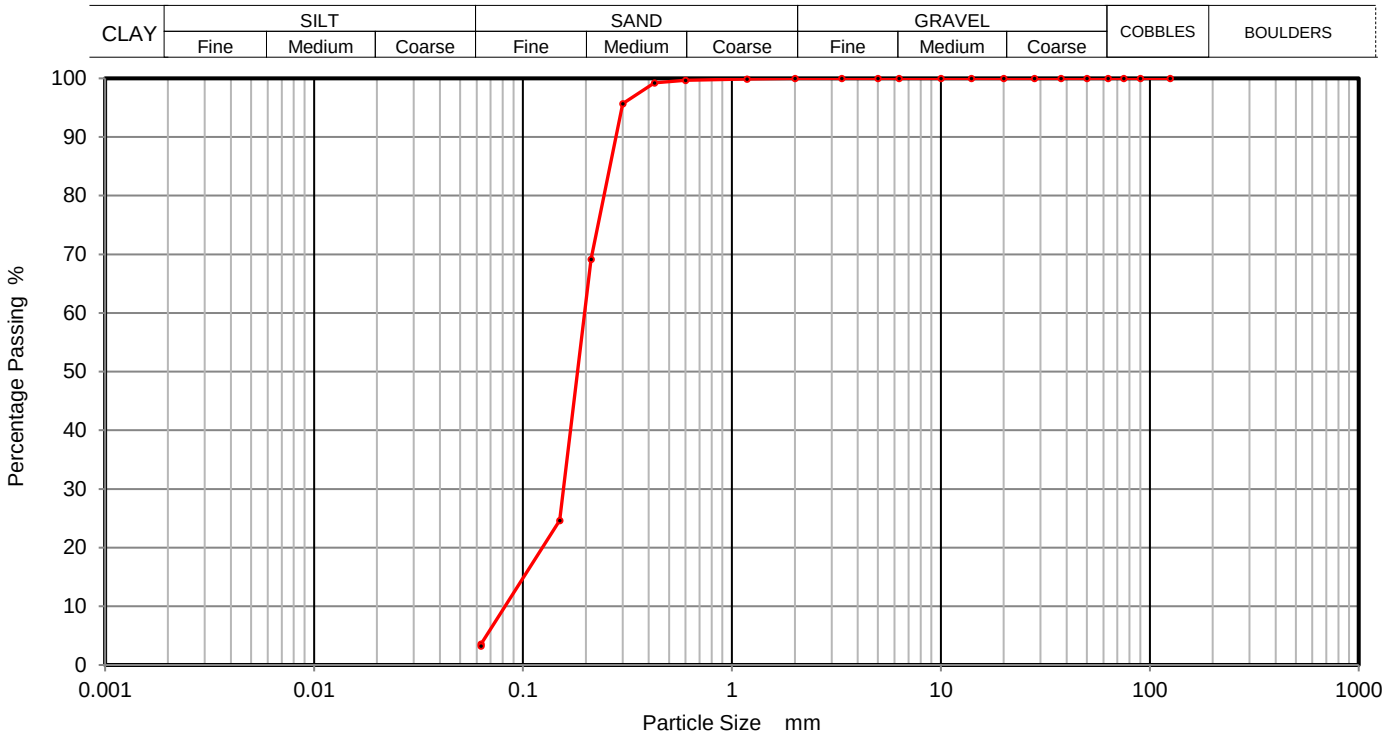
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	20/09/2017	Sean Penn	[redacted]
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-L1B-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	7
Soil Description	Brown slightly silty fine to medium SAND	Depth Top	5.50
		Depth Base	5.95
		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	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	96		
0.212	69		
0.15	25		
0.063	4		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	96
Silt and Clay	4

Grading Analysis	
Uniformity Coefficient	

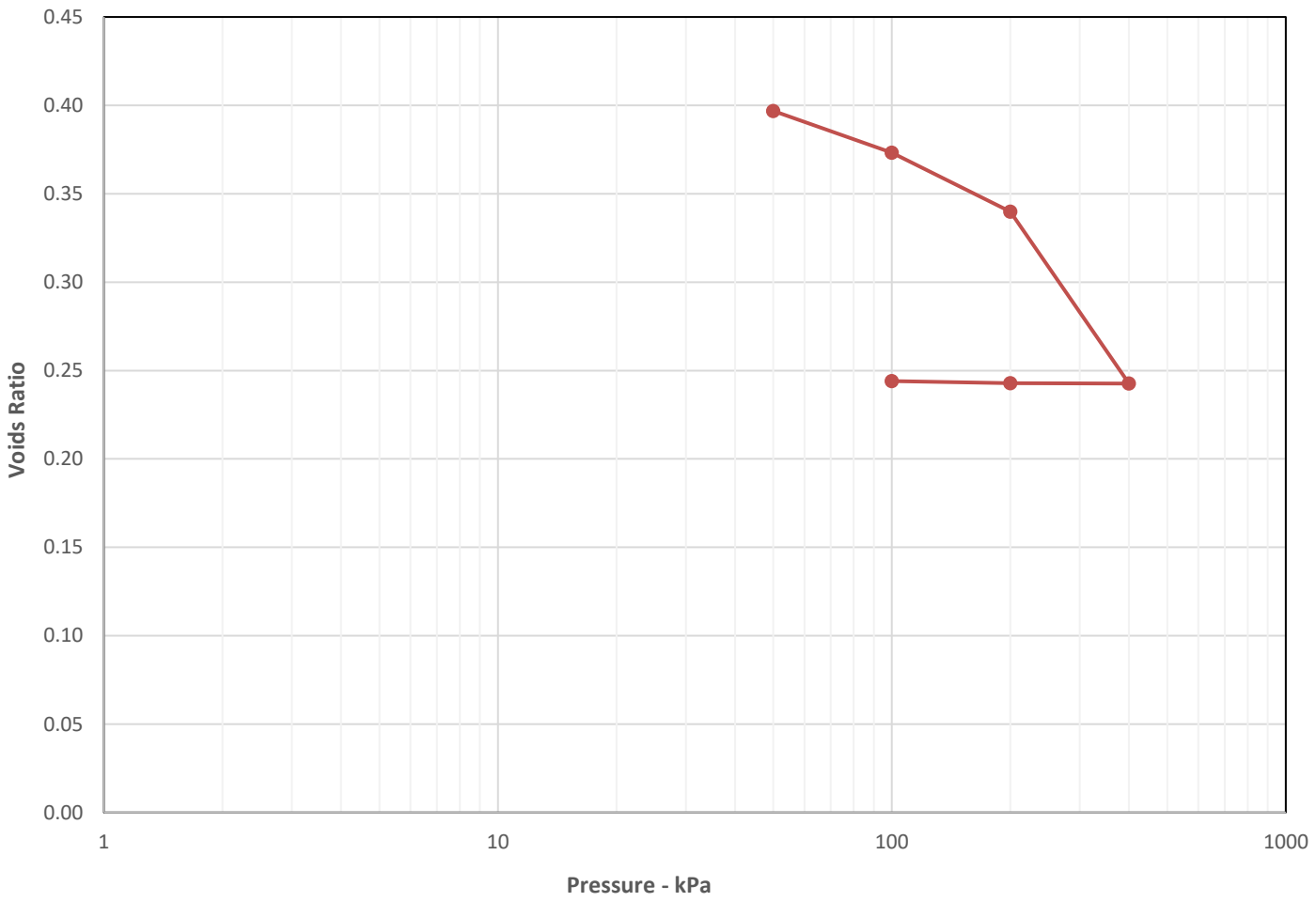
Remarks

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-L1A-04
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Brown silty sandy CLAY	Depth Top (m)	2.50
		Depth Base (m)	2.95
Lab Temperature	20°c	Sample Location	Middle
Remarks	Cv Calculated Using T90	Sample Type	U

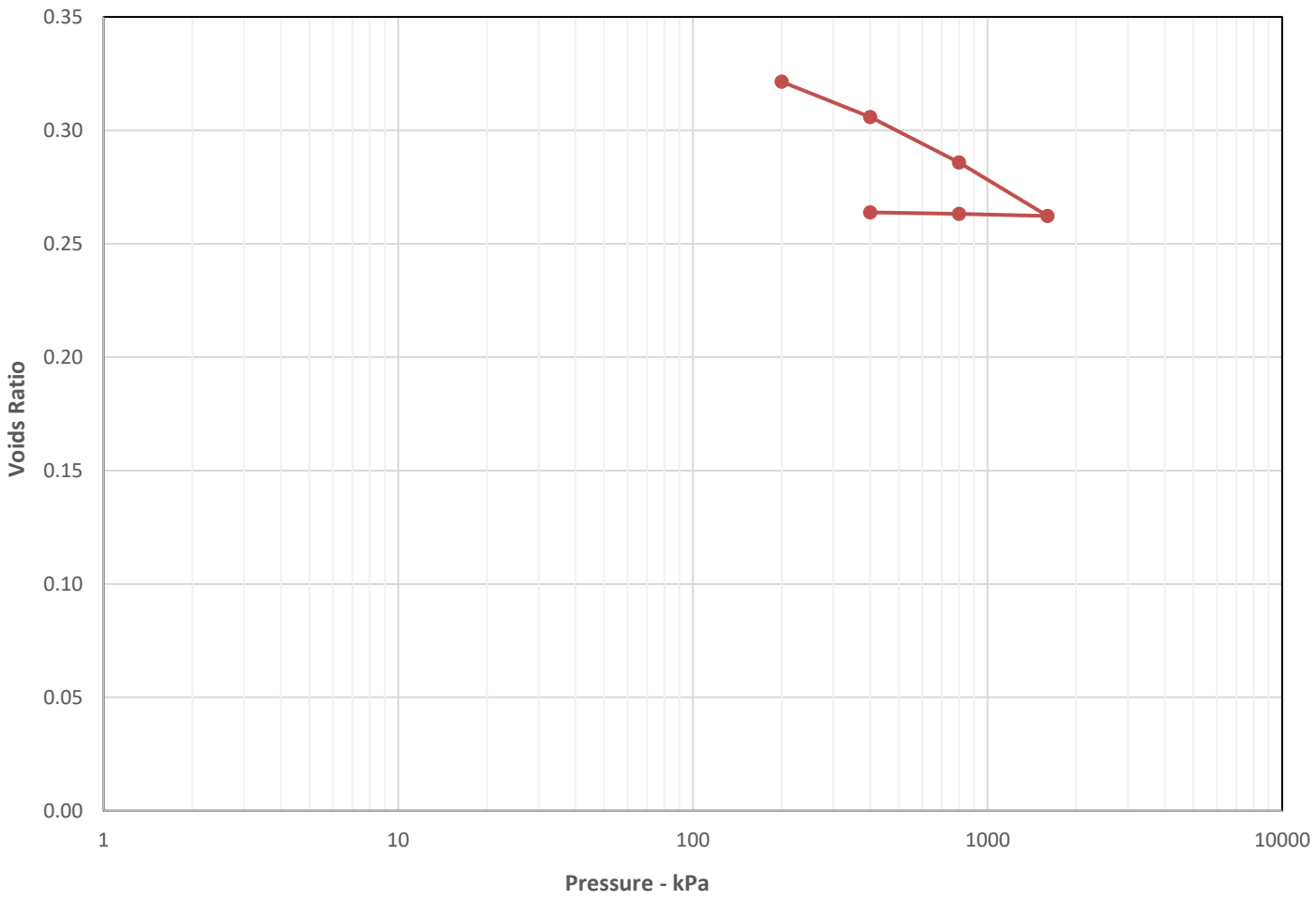


Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	18	0	-	50	0.79	13		-			
Bulk Density (Mg/m3)	2.16	50	-	100	0.34	12		-			
Dry Density (Mg/m3)	1.82	100	-	200	0.24	8.1		-			
Voids Ratio	0.4547	200	-	400	0.4	2.9		-			
Degree of saturation	107.8	400	-	200	0.00062	7.6		-			
Height (mm)	18.77	200	-	100	0.0094	21		-			
Diameter (mm)	74.96		-					-			
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	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3	Contract Number	36525
		Borehole/Trialpit No.	BH17-L1B-04
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Grey sandy silty CLAY	Depth Top (m)	11.00
		Depth Base (m)	11.45
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 (%)	16	0	-	200	0.23	3		-			
Bulk Density (Mg/m3)	2.21	200	-	400	0.059	8.6		-			
Dry Density (Mg/m3)	1.91	400	-	800	0.038	7.9		-			
Voids Ratio	0.3845	800	-	1600	0.0	7.6		-			
Degree of saturation	107.7	1600	-	800	0.00089	12		-			
Height (mm)	19.97	800	-	400	0.0014	9.1		-			
Diameter (mm)	49.95		-					-			
Particle Density (Mg/m3)	2.65		-					-			

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

UKAS TESTING 2788

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

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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 1 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

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 :
Chelsea Entwistle
Senior Customer Service Advisor

Issued by :
Aislinn Arthey
Customer Service Ad

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

Soil Analysed as Soil
BRE SD1 (SE)

					Concept Reference	684646 001	684646 002
					Customer Sample Reference	17-L1A-02 D3 @ 2.00m	17-L1B-02 D3 @ 14.00m
					Date Sampled	Deviating	10-JUL-2017
					Matrix Class	Sandy Soil	Sandy Soil
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l		<0.01	<0.01
(Water soluble) Cl-	T710	A40	0.01	g/l		<0.01	<0.01
Magnesium	T112	A40	1	mg/l		**2**	**6**
(Water soluble) NO3	T710	A40	0.01	g/l		<0.01	<0.01
pH	T7	A40				**8.2**	**7.9**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l		**0.02**	**0.26**
SO4(Total)	T102	A40	0.02	%		<0.02	**0.09**
Sulphur (total)	T6	A40	0.01	%		<0.01	**0.23**
Moisture @105C	T162	AR	0.1	%		**13**	**11**
Retained on 2mm	T2	A40	0.1	%		**0.3**	**0.6**

Index to symbols used in Supplement 1 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

001 - The date of sampling has not been provided and therefore the time from sampling to analysis is unknown. It is possible therefore that the results provided may be compromised
Retained on 2mm is removed before analysis
Supplement 1 Report reissued to include only samples 001 and 002

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	N	001-002
(Water soluble) Cl-	T710	A40	0.01	g/l	N	001-002
Magnesium	T112	A40	1	mg/l	N	001-002
(Water soluble) NO3	T710	A40	0.01	g/l	N	001-002
pH	T7	A40			M	001-002
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	M	001-002
SO4(Total)	T102	A40	0.02	%	M	001-002
Sulphur (total)	T6	A40	0.01	%	M	001-002
Moisture @105C	T162	AR	0.1	%	N	001-002
Retained on 2mm	T2	A40	0.1	%	N	001-002

APPENDIX F
Geoenvironmental Laboratory Test Results

Report References: 672447

675177

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 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 Adv

[redacted]

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

Soil Analysed as Soil
Miscellaneous

				Concept Reference	**672447 002**	**672447 006**	**672447 010**	**672447 018**	**672447 022**
				Customer Sample Reference	**BH17-L1B-03 ES2 @ 1.00m**	**BH17-L1B-02 ES2 @ 1.00m**	**BH17-L1A-02 ES2 @ 1.00m**	**BH17-L1B-01 ES2 @ 1.00m**	**BH17-L1A-03 ES2 @ 1.00m**
				Date Sampled	**10-JUL-2017**	**06-JUL-2017**	**03-JUL-2017**	**06-JUL-2017**	**06-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Clay**	**Sandy Soil**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T257	A40	2	mg/kg	**2**	**4**	**6**	**13**	**8**
Barium	T257	A40	2	mg/kg	**8**	**21**	**55**	**35**	**54**
Beryllium	T245	A40	0.5	mg/kg	<0.5	<0.5	**0.7**	**0.6**	**0.7**
Boron (water-soluble)	T82	A40	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	T257	A40	0.1	mg/kg	<0.1	<0.1	<0.1	**0.1**	<0.1
Chromium	T257	A40	0.5	mg/kg	**4.5**	**8.0**	**18**	**18**	**20**
Copper	T257	A40	2	mg/kg	**3**	**5**	**10**	**12**	**10**
Lead	T257	A40	2	mg/kg	**3**	**7**	**12**	**12**	**12**
Mercury	T245	A40	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel	T257	A40	0.5	mg/kg	**3.7**	**5.7**	**16**	**18**	**20**
Selenium	T257	A40	3	mg/kg	<3	<3	<3	<3	<3
Vanadium	T257	A40	0.1	mg/kg	**6.7**	**12**	**26**	**32**	**28**
Zinc	T257	A40	2	mg/kg	**10**	**19**	**30**	**39**	**32**
Soil Organic Matter	T287	A40	0.1	%	<0.1	-	**0.3**	-	-
Moisture @105C	T162	AR	0.1	%	**4.4**	**2.7**	**12**	**11**	**11**
Retained on 2mm	T2	A40	0.1	%	<0.1	<0.1	**5.1**	<0.1	**1.6**

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

Soil Analysed as Soil
Miscellaneous

				Concept Reference	**672447 058**	**672447 062**	**672447 070**
				Customer Sample Reference	**BH17-L1B-04 ES2 @ 1.00m**	**BH17-L1A-04 ES2 @ 1.00m**	**BH17-L1A-05 ES2 @ 1.00m**
				Date Sampled	**11-JUL-2017**	**11-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Arsenic	T257	A40	2	mg/kg	**6**	**6**	**6**
Barium	T257	A40	2	mg/kg	**28**	**26**	**16**
Beryllium	T245	A40	0.5	mg/kg	<0.5	<0.5	<0.5
Boron (water-soluble)	T82	A40	1	mg/kg	<1	<1	**2**
Cadmium	T257	A40	0.1	mg/kg	**0.1**	<0.1	<0.1
Chromium	T257	A40	0.5	mg/kg	**8.6**	**12**	**13**
Copper	T257	A40	2	mg/kg	**6**	**8**	**10**
Lead	T257	A40	2	mg/kg	**8**	**10**	**7**
Mercury	T245	A40	1.0	mg/kg	<1.0	<1.0	<1.0
Nickel	T257	A40	0.5	mg/kg	**9.6**	**12**	**17**
Selenium	T257	A40	3	mg/kg	<3	<3	<3
Vanadium	T257	A40	0.1	mg/kg	**16**	**19**	**19**
Zinc	T257	A40	2	mg/kg	**25**	**28**	**29**
Soil Organic Matter	T287	A40	0.1	%	**0.7**	**0.2**	**0.3**
Moisture @105C	T162	AR	0.1	%	**10**	**15**	**12**
Retained on 2mm	T2	A40	0.1	%	**8.6**	<0.1	**0.6**

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

Soil Analysed as Soil
Asbestos

Concept Reference	672447 001	672447 009	672447 010	672447 057	672447 061	672447 069
Customer Sample Reference	BH17-L1B-03 ES1 @ 0.50m	BH17-L1A-02 ES1 @ 0.50m	BH17-L1A-02 ES2 @ 1.00m	BH17-L1B-04 ES1 @ 0.50m	BH17-L1A-04 ES1 @ 0.50m	BH17-L1A-05 ES1 @ 0.50m
Date Sampled	10-JUL-2017	03-JUL-2017	03-JUL-2017	11-JUL-2017	11-JUL-2017	25-JUL-2017
Matrix Class			Clay			

Determinand	Method	Test Sample	LOD	Units						
Asbestos ID	T27	A40			Asbestos not detected	Asbestos not detected	Asbestos not detected	Asbestos not detected	Asbestos not detected	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 002	672447 010	672447 058	672447 062	672447 070
Customer Sample Reference	BH17-L1B-03 ES2 @ 1.00m	BH17-L1A-02 ES2 @ 1.00m	BH17-L1B-04 ES2 @ 1.00m	BH17-L1A-04 ES2 @ 1.00m	BH17-L1A-05 ES2 @ 1.00m
Date Sampled	10-JUL-2017	03-JUL-2017	11-JUL-2017	11-JUL-2017	25-JUL-2017
Matrix Class	Sandy Soil	Clay	Sandy Soil	Sandy Soil	Clay

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

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

Soil Analysed as Soil
TPH CWG

				Concept Reference	**672447 002**	**672447 010**	**672447 058**	**672447 062**	**672447 070**
				Customer Sample Reference	**BH17-L1B-03 ES2 @ 1.00m**	**BH17-L1A-02 ES2 @ 1.00m**	**BH17-L1B-04 ES2 @ 1.00m**	**BH17-L1A-04 ES2 @ 1.00m**	**BH17-L1A-05 ES2 @ 1.00m**
				Date Sampled	**10-JUL-2017**	**03-JUL-2017**	**11-JUL-2017**	**11-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Benzene	T209	AR	10	µg/kg	<10	<10	<10	<10	<10
Toluene	T209	AR	10	µg/kg	<10	<10	<10	<10	<10
EthylBenzene	T209	AR	10	µg/kg	<10	<10	<10	<10	<10
M/P Xylene	T209	AR	10	µg/kg	<10	<10	<10	<10	<10
O Xylene	T209	AR	10	µg/kg	<10	<10	<10	<10	<10
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	<10	<10	<10	<10	**3**
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2	<2
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2	<2
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2	<2
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2	<2
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2	<2
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2	<2
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2	<2
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2	<2
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2	<2
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2	<2
TPH (Aliphatic+Aromatic) C10-C25 (Sum)	T85	AR	4	mg/kg	(62) <5	(62) <5	(62) <5	(62) <5	(62) <5
TPH (Aliphatic+Aromatic) C25-C40 (Sum)	T85	AR	4	mg/kg	(62) <5	(62) <5	(62) <5	(62) <5	(62) <5

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

Soil Analysed as Soil
Organochlorine insecticides

				Concept Reference	**672447 002**	**672447 010**	**672447 058**	**672447 062**	**672447 070**
				Customer Sample Reference	**BH17-L1B-03 ES2 @ 1.00m**	**BH17-L1A-02 ES2 @ 1.00m**	**BH17-L1B-04 ES2 @ 1.00m**	**BH17-L1A-04 ES2 @ 1.00m**	**BH17-L1A-05 ES2 @ 1.00m**
				Date Sampled	**10-JUL-2017**	**03-JUL-2017**	**11-JUL-2017**	**11-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	T1	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Aldrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor epoxide	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Chlordane	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulphan	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
DDE	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Dieldrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
DDD	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
DDT	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01

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

Soil Analysed as Soil
Organophosphorous insecticides

				Concept Reference	**672447 002**	**672447 010**	**672447 058**	**672447 062**	**672447 070**
				Customer Sample Reference	**BH17-L1B-03 ES2 @ 1.00m**	**BH17-L1A-02 ES2 @ 1.00m**	**BH17-L1B-04 ES2 @ 1.00m**	**BH17-L1A-04 ES2 @ 1.00m**	**BH17-L1A-05 ES2 @ 1.00m**
				Date Sampled	**10-JUL-2017**	**03-JUL-2017**	**11-JUL-2017**	**11-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Dichlorvos	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Mevinphos	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Dimethoate	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Diazinon	T16	AR	0.01	mg/kg	<0.01	**0.01**	<0.01	<0.01	**0.01**
Pirimiphos methyl	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Malathion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Fenitrothion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Parathion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Azinphos methyl	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01

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

Soil Analysed as Soil
Triazines Suite

				Concept Reference	**672447 002**	**672447 010**	**672447 058**	**672447 062**	**672447 070**
				Customer Sample Reference	**BH17-L1B-03 ES2 @ 1.00m**	**BH17-L1A-02 ES2 @ 1.00m**	**BH17-L1B-04 ES2 @ 1.00m**	**BH17-L1A-04 ES2 @ 1.00m**	**BH17-L1A-05 ES2 @ 1.00m**
				Date Sampled	**10-JUL-2017**	**03-JUL-2017**	**11-JUL-2017**	**11-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Simazine	T16	AR	0.01	mg/kg	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01
Atrazine	T16	AR	0.01	mg/kg	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01
Propazine	T16	AR	0.01	mg/kg	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01
Trietazine	T16	AR	0.01	mg/kg	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01
Prometryn	T16	AR	0.01	mg/kg	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01
Terbutryn	T16	AR	0.01	mg/kg	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01	(64) <0.01

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

Soil Analysed as Soil
Urons

				Concept Reference	**672447 002**	**672447 010**	**672447 058**	**672447 062**	**672447 070**
				Customer Sample Reference	**BH17-L1B-03 ES2 @ 1.00m**	**BH17-L1A-02 ES2 @ 1.00m**	**BH17-L1B-04 ES2 @ 1.00m**	**BH17-L1A-04 ES2 @ 1.00m**	**BH17-L1A-05 ES2 @ 1.00m**
				Date Sampled	**10-JUL-2017**	**03-JUL-2017**	**11-JUL-2017**	**11-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Chlorotoluron	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Diuron	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Isoproturon	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Linuron	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Monuron	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<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 002	672447 010	672447 058	672447 062	672447 070
	Customer Sample Reference	BH17-L1B-03 ES2 @ 1.00m	BH17-L1A-02 ES2 @ 1.00m	BH17-L1B-04 ES2 @ 1.00m	BH17-L1A-04 ES2 @ 1.00m	BH17-L1A-05 ES2 @ 1.00m
	Date Sampled	10-JUL-2017	03-JUL-2017	11-JUL-2017	11-JUL-2017	25-JUL-2017
	Matrix Class	Sandy Soil	Clay	Sandy Soil	Sandy Soil	Clay
Determinand	Method / Test Sample / LOD / Units					
Mecoprop	T16 / AR / 0.01 / mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Phenoxy Acetic acid herbicide: MCPA	T16 / AR / 0.01 / mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Dichlorprop	T16 / AR / 0.01 / mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Phenoxy Acetic acid herbicide: 2,4-D	T16 / AR / 0.01 / mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Fenoprop	T16 / AR / 0.01 / mg/kg	(36) <0.02	(36) <0.02	(36) <0.02	(36) <0.02	(36) <0.02
Phenoxy Acetic acid herbicide: 2,4,5-T	T16 / AR / 0.01 / mg/kg	(36) <0.02	(36) <0.02	(36) <0.02	(36) <0.02	(36) <0.02

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

Soil Analysed as Soil
Phenols (Speciated)

	Concept Reference	672447 002	672447 010	672447 058	672447 062	672447 070
	Customer Sample Reference	BH17-L1B-03 ES2 @ 1.00m	BH17-L1A-02 ES2 @ 1.00m	BH17-L1B-04 ES2 @ 1.00m	BH17-L1A-04 ES2 @ 1.00m	BH17-L1A-05 ES2 @ 1.00m
	Date Sampled	10-JUL-2017	03-JUL-2017	11-JUL-2017	11-JUL-2017	25-JUL-2017
	Matrix Class	Sandy Soil	Clay	Sandy Soil	Sandy Soil	Clay
Determinand	Method / Test Sample / LOD / Units					
Resorcinol	T17 / AR / 0.05 / mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Catechol	T17 / AR / 0.05 / mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Phenol	T17 / AR / 0.1 / mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Cresols	T17 / AR / 0.05 / mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Xylenols	T17 / AR / 0.05 / mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Naphthols	T17 / AR / 0.05 / mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Trimethyl phenol	T17 / AR / 0.05 / mg/kg	(62) <0.10	(62) <0.10	(62) <0.10	(62) <0.10	(62) <0.10
Total Phenols	T17 / AR / 0.1 / mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

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

Value	Description
AR	As Received
A40	Assisted dried < 40C
36	LOD Raised due to low Matrix spike recovery
62	LOD was raised due to the method performance of the analytical procedure used
64	Analysis was performed by an alternative technique
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos subcontracted to REC Limited
Mercury - 010 - 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
OCP, OPP and PAAH analysis transferred to Concept Life Sciences Manchester
Supplement 1A report reissued to include only samples 001, 002, 006, 009, 010, 018, 022, 057, 058, 061, 062, 069, and 070
002, 010, 058, 062 & 070 - BTEX - Samples submitted for GC/MS (Headspace) analysis were submitted in inappropriate containers. It is possible therefore that the results provided may be compromised.
OCP & OPP - 002, 010, 058 & 062 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
Retained on 2mm is removed before analysis
Urons and Triazines analysis transferred to Concept Life Sciences Cambridge
TPH, PAH & BTEX - 002, 010, 026, 030, 058 & 062 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.

Speciated phenols - 002, 010, 058, 062 & 070 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Arsenic	T257	A40	2	mg/kg	M	002,006,010,018,022,058,062,070
Barium	T257	A40	2	mg/kg	U	002,006,010,018,022,058,062,070
Beryllium	T245	A40	0.5	mg/kg	U	002,006,010,018,022,058,062,070
Boron (water-soluble)	T82	A40	1	mg/kg	N	002,006,010,018,022,058,062,070
Cadmium	T257	A40	0.1	mg/kg	M	002,006,010,018,022,058,062,070
Chromium	T257	A40	0.5	mg/kg	M	002,006,010,018,022,058,062,070
Copper	T257	A40	2	mg/kg	M	002,006,010,018,022,058,062,070
Lead	T257	A40	2	mg/kg	M	002,006,010,018,022,058,062,070
Mercury	T245	A40	1.0	mg/kg	U	002,006,010,018,022,058,062,070
Nickel	T257	A40	0.5	mg/kg	M	002,006,010,018,022,058,062,070
Selenium	T257	A40	3	mg/kg	U	002,006,010,018,022,058,062,070
Vanadium	T257	A40	0.1	mg/kg	U	002,006,010,018,022,058,062,070
Zinc	T257	A40	2	mg/kg	M	002,006,010,018,022,058,062,070
Soil Organic Matter	T287	A40	0.1	%	N	002,010,058,062,070
Moisture @105C	T162	AR	0.1	%	N	002,006,010,018,022,058,062,070
Retained on 2mm	T2	A40	0.1	%	N	002,006,010,018,022,058,062,070
Asbestos ID	T27	A40			SU	001,009-010,057,061,069
Naphthalene	T16	AR	0.1	mg/kg	U	002,010,058,062,070
Acenaphthylene	T16	AR	0.1	mg/kg	U	002,010,058,062,070
Acenaphthene	T16	AR	0.1	mg/kg	M	002,010,058,062,070
Fluorene	T16	AR	0.1	mg/kg	M	002,010,058,062,070
Phenanthrene	T16	AR	0.1	mg/kg	U	002,010,058,062,070
Anthracene	T16	AR	0.1	mg/kg	M	002,010,058,062,070
Fluoranthene	T16	AR	0.1	mg/kg	N	002,010,058,062,070
Pyrene	T16	AR	0.1	mg/kg	N	002,010,058,062,070
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	M	002,010,058,062,070
Chrysene	T16	AR	0.1	mg/kg	M	002,010,058,062,070
Benzo(b)fluoranthene	T16	AR	0.1	mg/kg	U	002,010,058,062,070
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	N	002,010,058,062,070
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	M	002,010,058,062,070
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	M	002,010,058,062,070
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	M	002,010,058,062,070
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	M	002,010,058,062,070
PAH(total)	T16	AR	0.1	mg/kg	U	002,010,058,062,070
Benzene	T209	AR	10	µg/kg	M	002,010,058,062,070
Toluene	T209	AR	10	µg/kg	M	002,010,058,062,070
EthylBenzene	T209	AR	10	µg/kg	M	002,010,058,062,070
M/P Xylene	T209	AR	10	µg/kg	M	002,010,058,062,070
O Xylene	T209	AR	10	µg/kg	M	002,010,058,062,070
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	U	002,010,058,062,070
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	N	002,010,058,062,070
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	N	002,010,058,062,070
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	N	002,010,058,062,070
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	N	002,010,058,062,070

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	N	002,010,058,062,070
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	N	002,010,058,062,070
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	N	002,010,058,062,070
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	N	002,010,058,062,070
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	N	002,010,058,062,070
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	N	002,010,058,062,070
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	N	002,010,058,062,070
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	N	002,010,058,062,070
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	N	002,010,058,062,070
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	N	002,010,058,062,070
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	N	002,010,058,062,070
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	N	002,010,058,062,070
TPH (Aliphatic+Aromatic) C10-C25 (Sum)	T85	AR	4	mg/kg	N	002,010,058,062,070
TPH (Aliphatic+Aromatic) C25-C40 (Sum)	T85	AR	4	mg/kg	N	002,010,058,062,070
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Hexachlorobenzene	T1	AR	0.01	mg/kg	U	002,010,058,062,070
Heptachlor	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Aldrin	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Heptachlor epoxide	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Chlordane	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Endosulphan	T16	AR	0.01	mg/kg	U	002,010,058,062,070
DDE	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Dieldrin	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Endrin	T16	AR	0.01	mg/kg	U	002,010,058,062,070
DDD	T16	AR	0.01	mg/kg	U	002,010,058,062,070
DDT	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Dichlorvos	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Mevinphos	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Dimethoate	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Diazinon	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Pirimiphos methyl	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Malathion	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Fenitrothion	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Parathion	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Azinphos methyl	T16	AR	0.01	mg/kg	U	002,010,058,062,070
Simazine	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Atrazine	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Propazine	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Trietazine	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Prometryn	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Terbutryn	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Chlorotoluron	T310	AR	0.01	mg/kg	N	002,010,058,062,070
Diuron	T310	AR	0.01	mg/kg	N	002,010,058,062,070
Isoproturon	T310	AR	0.01	mg/kg	N	002,010,058,062,070
Linuron	T310	AR	0.01	mg/kg	N	002,010,058,062,070
Monuron	T310	AR	0.01	mg/kg	N	002,010,058,062,070
Mecoprop	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Dichlorprop	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Fenoprop	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	N	002,010,058,062,070
Resorcinol	T17	AR	0.05	mg/kg	M	002,010,058,062,070
Catechol	T17	AR	0.05	mg/kg	N	002,010,058,062,070
Phenol	T17	AR	0.1	mg/kg	M	002,010,058,062,070
Cresols	T17	AR	0.05	mg/kg	M	002,010,058,062,070
Xylenols	T17	AR	0.05	mg/kg	M	002,010,058,062,070
Naphthols	T17	AR	0.05	mg/kg	N	002,010,058,062,070
Trimethyl phenol	T17	AR	0.05	mg/kg	M	002,010,058,062,070
Total Phenols	T17	AR	0.1	mg/kg	N	002,010,058,062,070

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 1D 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

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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

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

Issued by :
Aislinn Arthey
Customer Service Advi

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

Water Analysed as Water
Heavy Metals (9)

				Concept Reference	**675177 009**	**675177 010**	**675177 011**
				Customer Sample Reference	**BH17-L1A-04**	**BH17-L1B-01**	**BH17-L1B-04**
				Date Sampled	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
As (Dissolved)	T281	F	0.0002	mg/l	**0.0039**	**0.0036**	(110) <0.0020
Cd (Dissolved)	T281	F	0.00002	mg/l	<0.00002	<0.00002	(110) <0.00020
Cr (Dissolved)	T281	F	0.001	mg/l	<0.001	<0.001	(110) <0.010
Cu (Dissolved)	T281	F	0.0005	mg/l	<0.0005	<0.0005	(110) <0.0050
Pb (Dissolved)	T281	F	0.0003	mg/l	<0.0003	<0.0003	(110) <0.0030
Hg (Dissolved)	T281	F	0.00005	mg/l	<0.00005	<0.00005	(110) <0.00050
Ni (Dissolved)	T281	F	0.001	mg/l	**0.003**	**0.002**	**0.010**
Se (Dissolved)	T281	F	0.0005	mg/l	**0.0006**	<0.0005	(110) <0.0050
Zn (Dissolved)	T281	F	0.002	mg/l	<0.002	<0.002	(110) <0.020

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

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

				Concept Reference	**675177 009**	**675177 010**	**675177 011**
				Customer Sample Reference	**BH17-L1A-04**	**BH17-L1B-01**	**BH17-L1B-04**
				Date Sampled	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Naphthalene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Acenaphthylene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Acenaphthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Fluorene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Phenanthrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Benzo(a)Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Chrysene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Benzo(a)Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01
PAH(total)	T149	AR	0.01	µg/l	<0.01	<0.01	<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 009**	**675177 010**	**675177 011**
				Customer Sample Reference	**BH17-L1A-04**	**BH17-L1B-01**	**BH17-L1B-04**
				Date Sampled	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Benzene	T54	AR	1	µg/l	<1	<1	<1
EthylBenzene	T54	AR	1	µg/l	<1	<1	<1
M/P Xylene	T54	AR	1	µg/l	<1	<1	<1
Methyl tert-Butyl Ether	T54	AR	1	µg/l	<1	<1	<1
O Xylene	T54	AR	1	µg/l	<1	<1	<1
Toluene	T54	AR	1	µg/l	<1	<1	<1
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	**0.03**	**0.02**	**0.03**
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01	**0.03**
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	<0.01	**0.02**	**0.02**
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	<0.01	**0.01**	**0.02**

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

Water Analysed as Water
Organochlorine insecticides

				Concept Reference	**675177 009**	**675177 010**	**675177 011**
				Customer Sample Reference	**BH17-L1A-04**	**BH17-L1B-01**	**BH17-L1B-04**
				Date Sampled	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Hexachlorocyclohexane	T16	AR	0.01	µg/l	(36) <0.02	(36) <0.02	(36) <0.02
Hexachlorobenzene	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Heptachlor	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Aldrin	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Heptachlor epoxide	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Chlordane	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Endosulphan	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
DDE	T16	AR	0.01	µg/l	<0.02	<0.02	<0.02
Dieldrin	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Endrin	T16	AR	0.01	µg/l	(36) <0.02	(36) <0.02	(36) <0.02
DDD	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
DDT	T16	AR	0.01	µg/l	(36) <0.02	(36) <0.02	(36) <0.02

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

Water Analysed as Water
Organophosphorous insecticides

Concept Reference	**675177 009**	**675177 010**	**675177 011**
Customer Sample Reference	**BH17-L1A-04**	**BH17-L1B-01**	**BH17-L1B-04**
Date Sampled	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**

Determinand	Method	Test Sample	LOD	Units			
Dichlorvos	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Mevinphos	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Dimethoate	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Diazinon	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Pirimiphos methyl	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Malathion	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Fenitrothion	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Parathion	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01
Azinphos methyl	T16	AR	0.01	µg/l	(36) <0.02	(36) <0.02	(36) <0.02

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

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

Notes

Supplement 1D report reissued to include only samples 009, 010 and 011
OCP and OPP transferred to Concept Life Sciences Manchester

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
As (Dissolved)	T281	F	0.0002	mg/l	U	009-011
Cd (Dissolved)	T281	F	0.00002	mg/l	U	009-011
Cr (Dissolved)	T281	F	0.001	mg/l	U	009-011
Cu (Dissolved)	T281	F	0.0005	mg/l	U	009-011
Pb (Dissolved)	T281	F	0.0003	mg/l	U	009-011
Hg (Dissolved)	T281	F	0.00005	mg/l	U	009-011
Ni (Dissolved)	T281	F	0.001	mg/l	U	009-011
Se (Dissolved)	T281	F	0.0005	mg/l	U	009-011
Zn (Dissolved)	T281	F	0.002	mg/l	U	009-011
Naphthalene	T149	AR	0.01	µg/l	U	009-011
Acenaphthylene	T149	AR	0.01	µg/l	U	009-011
Acenaphthene	T149	AR	0.01	µg/l	U	009-011
Fluorene	T149	AR	0.01	µg/l	U	009-011
Phenanthrene	T149	AR	0.01	µg/l	U	009-011
Anthracene	T149	AR	0.01	µg/l	U	009-011
Fluoranthene	T149	AR	0.01	µg/l	U	009-011
Pyrene	T149	AR	0.01	µg/l	U	009-011

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Benzo(a)Anthracene	T149	AR	0.01	µg/l	U	009-011
Chrysene	T149	AR	0.01	µg/l	U	009-011
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	N	009-011
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	U	009-011
Benzo(a)Pyrene	T149	AR	0.01	µg/l	U	009-011
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	U	009-011
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	U	009-011
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	U	009-011
PAH(total)	T149	AR	0.01	µg/l	N	009-011
Benzene	T54	AR	1	µg/l	U	009-011
EthylBenzene	T54	AR	1	µg/l	U	009-011
M/P Xylene	T54	AR	1	µg/l	U	009-011
Methyl tert-Butyl Ether	T54	AR	1	µg/l	U	009-011
O Xylene	T54	AR	1	µg/l	U	009-011
Toluene	T54	AR	1	µg/l	U	009-011
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	N	009-011
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	N	009-011
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	N	009-011
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	N	009-011
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	N	009-011
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	N	009-011
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	N	009-011
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	N	009-011
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	N	009-011
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	N	009-011
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	N	009-011
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	N	009-011
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	N	009-011
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	N	009-011
Hexachlorocyclohexane	T16	AR	0.01	µg/l	N	009-011
Hexachlorobenzene	T16	AR	0.01	µg/l	N	009-011
Heptachlor	T16	AR	0.01	µg/l	N	009-011
Aldrin	T16	AR	0.01	µg/l	N	009-011
Heptachlor epoxide	T16	AR	0.01	µg/l	N	009-011
Chlordane	T16	AR	0.01	µg/l	N	009-011
Endosulphan	T16	AR	0.01	µg/l	N	009-011
DDE	T16	AR	0.01	µg/l	N	009-011
Dieldrin	T16	AR	0.01	µg/l	N	009-011
Endrin	T16	AR	0.01	µg/l	N	009-011
DDD	T16	AR	0.01	µg/l	N	009-011
DDT	T16	AR	0.01	µg/l	N	009-011
Dichlorvos	T16	AR	0.01	µg/l	N	009-011
Mevinphos	T16	AR	0.01	µg/l	N	009-011
Dimethoate	T16	AR	0.01	µg/l	N	009-011
Diazinon	T16	AR	0.01	µg/l	N	009-011
Pirimiphos methyl	T16	AR	0.01	µg/l	N	009-011
Malathion	T16	AR	0.01	µg/l	N	009-011
Fenitrothion	T16	AR	0.01	µg/l	N	009-011
Parathion	T16	AR	0.01	µg/l	N	009-011
Azinphos methyl	T16	AR	0.01	µg/l	N	009-011

APPENDIX G
Calibration Certificates

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

SPT Calibration Report

www.equipegroup.com

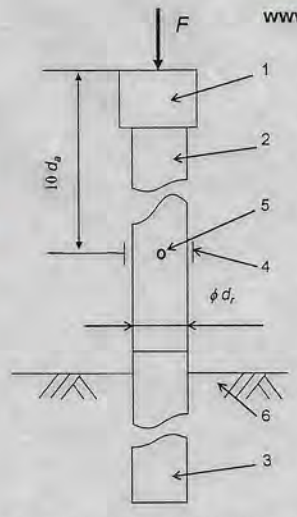
Hammer Energy Measurement Report

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

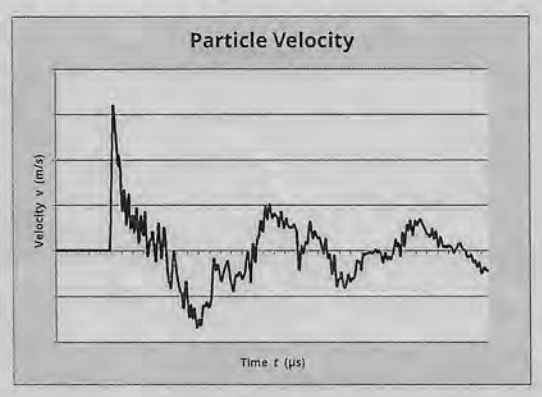


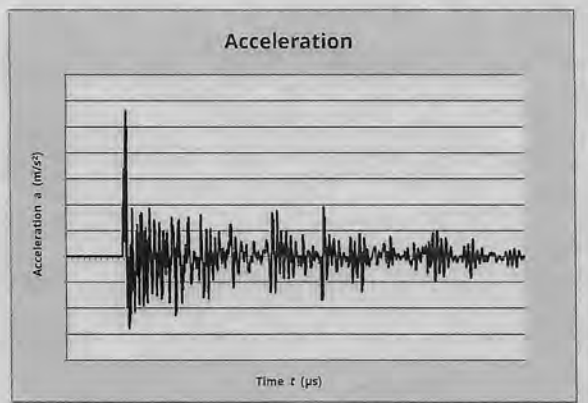
Key

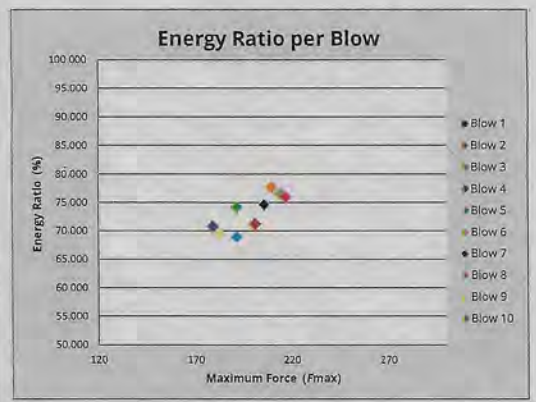
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

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 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

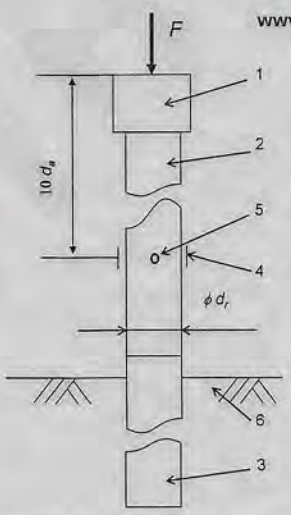
Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	SI DRILLING
Test No	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

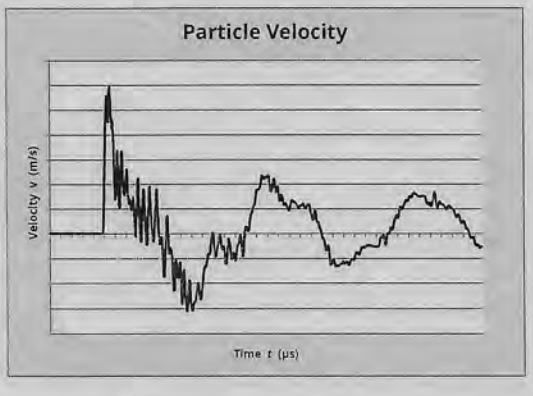
Diameter	d_r = 0.052 m
Length of the instrumented rod	0.558 m
Area	A = 11.61 cm^2
Modulus	E_a = 206843 MPa

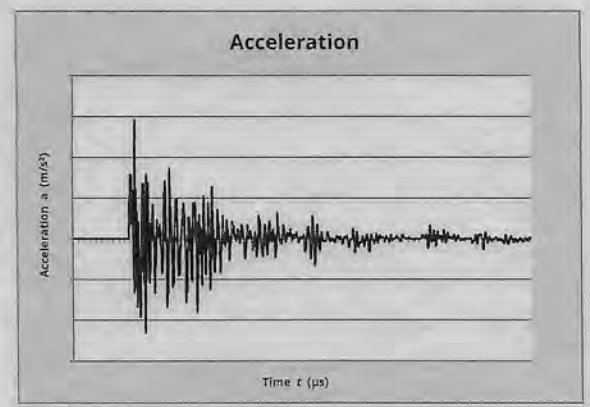


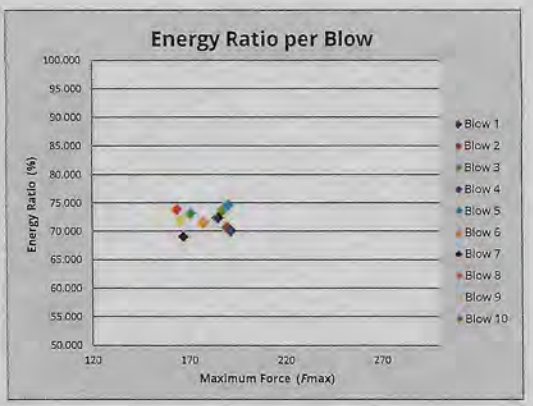
Key
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

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 cm²
Modulus	E_a = 206843 MPa

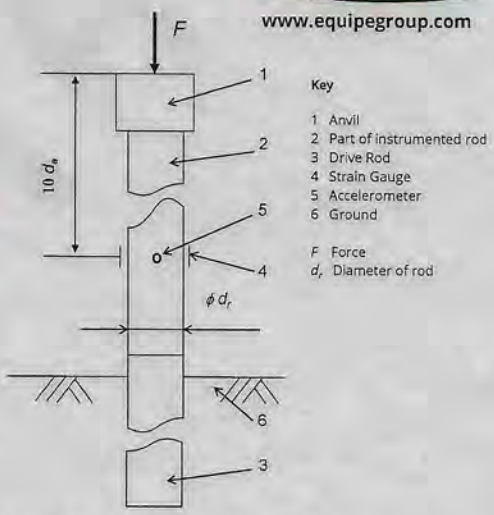
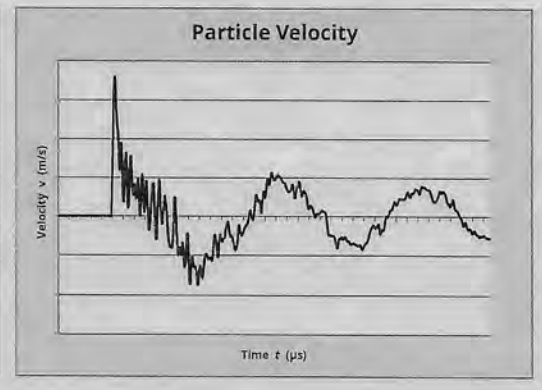
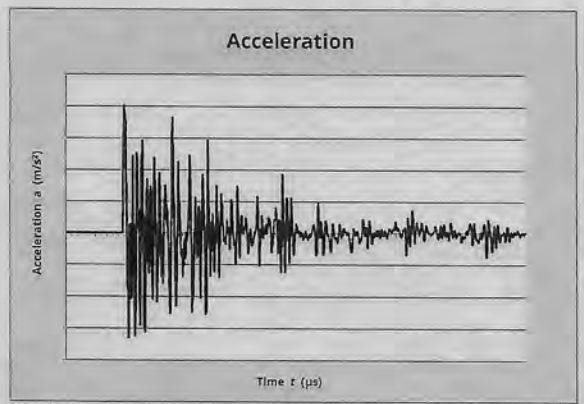
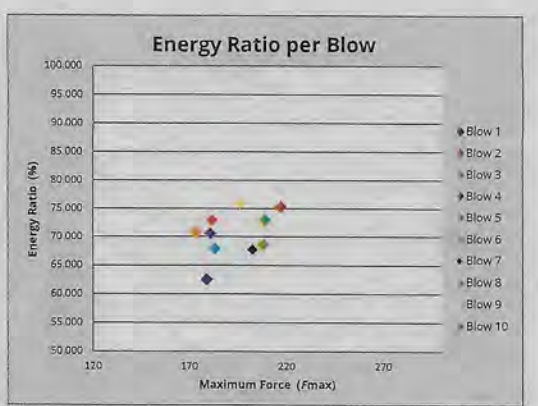


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011







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
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

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

TerraConsult (South) Limited
Dugard House
Peartree Road
Colchester, Essex
CO3 0UL

Tel: +44 (0) 1206 585600

TerraConsult Limited
Bold Business Centre
Bold Lane, Sutton
St. Helens
WA9 4TX

Tel: +44 (0) 1925 291111
Fax: +44 (0) 1925 291191

Email: mailbox@terraconsult.co.uk
Website: www.terraconsult.co.uk

smas worksafe contractor www.smasltd.com

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EMS 573194

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