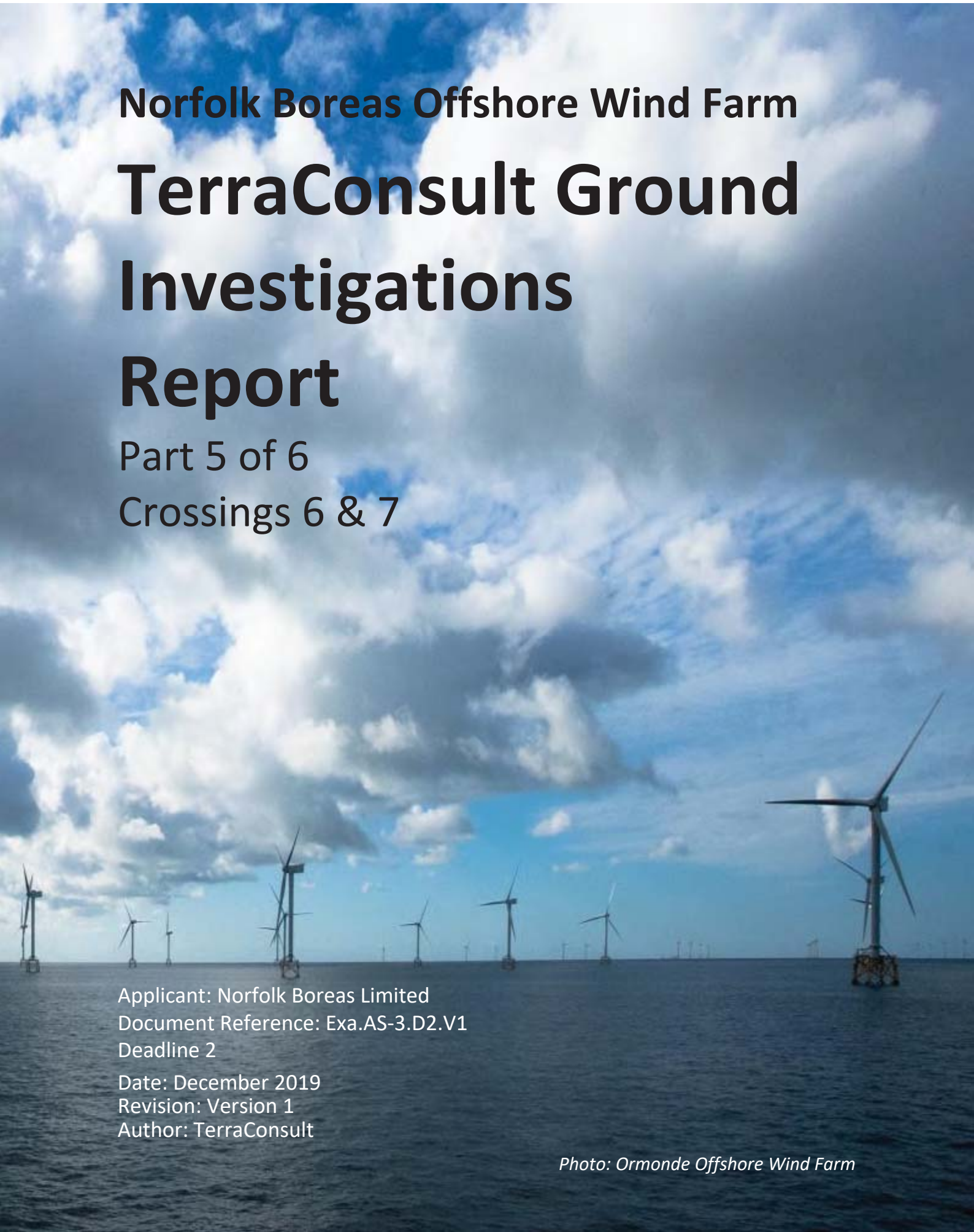
VATTENFALL



Norfolk Boreas Offshore Wind Farm

TerraConsult Ground Investigations Report

Part 5 of 6

Crossings 6 & 7

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

TerraConsult

November 2017
Report No 3318-R005-2

East Anglia (North) Offshore Wind Farm

Crossings 6 & 7 Site Investigation

Carried out for:

Gutteridge, Haskins and Davey Ltd (GHD)

East Anglia (North) Offshore Wind Farm

Crossings 6 & 7 Site Investigation

Date: November 2017

Report No 3318-R005-2

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-R005-2	East Anglia (North) Offshore Wind Farm Crossings 6 & 7 Site Investigation

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

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

DISCLAIMER

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

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

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

East Anglia (North) Offshore Wind Farm

Crossings 6 & 7 Site Investigation
CONTENTS

DRAWINGS

APPENDICES

East Anglia (North) Offshore Wind Farm

Crossings 6 & 7 Site Investigation

1 INTRODUCTION

TerraConsult Limited (TCL) was commissioned by Gutteridge, Haskins and Davey Ltd (GHD) to carry out a ground investigation for the proposed cable route crossing of the A149, Cromer Road (Crossing 6) and the railway line (Crossing 7), near North Walsham, 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 13/07/17 and 28/07/17.

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

Crossing 6 is located approximately 2.2 km north-west of the centre North Walsham, Norfolk. The approximate location of Crossing 6 is located between Ordnance Survey National Grid Reference TG 266 315 and TG 261 312.

Crossing 7 is located approximately 1.8 km north west of the centre of North Walsham, Norfolk. The approximate location of Crossing 7 is located between Ordnance Survey National Grid Reference TG 268 316 and TG 267 314.

Site location plans are presented as drawings reference 3318(C6)D001-1 and 3318(C7)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 Briton's Lane Formation sand and gravel.

Beneath these lies the Wroxham Crag Formation bedrock comprising of sand and gravel.

3 FIELDWORK

3.1 General

Fieldwork was undertaken between 20/07/17 and 28/07/17. 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-C6-01
Cable percussion, SPTs, variable head permeability test	BH17-C6-02
Cable percussion, SPTs, variable head permeability test, install	BH17-C6-03
Cable percussion, SPTs, variable head permeability test	BH17-C6-04
Cable percussion, SPTs, variable head permeability test, install	BH17-C7-01
Cable percussion, SPTs, variable head permeability test	BH17-C7-02
Cable percussion, SPTs, variable head permeability test, install	BH17-C7-03
Cable percussion, SPTs, variable head permeability test	BH17-C7-04

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

3.2 Exploratory Holes

The exploratory holes were logged by an engineer in accordance with the recommendations of BS5930:2015, which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1. Methods of formation and geological descriptions, together with sample records, in situ test results and observations made during formation of the exploratory hole are given in the logs presented in Appendix A and should be read in conjunction with the Key included therein. 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-C6-01	CP	15.45	626336.80	331280.87	34.59	14/07/2017	17/07/2017
BH17-C6-02	CP	15.45	626383.55	331326.99	35.22	13/07/2017	14/07/2017
BH17-C6-03	CP	15.00	636508.14	331291.05	35.66	14/07/2017	14/07/2017
BH17-C6-04	CP	15.00	626550.48	331321.08	35.39	14/07/2017	17/07/2017
BH17-C7-01	CP	20.00	626749.29	331461.97	34.10	27/07/2017	28/07/2017
BH17-C7-02	CP	20.00	626792.09	331492.52	32.74	25/07/2017	25/07/2017
BH17-C7-03	CP	20.00	626802.16	331579.34	28.11	20/07/2017	21/07/2017
BH17-C7-04	CP	20.00	626845.20	331611.63	25.84	24/07/2017	25/07/2017

Type: CP – cable percussion;

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

Exploratory hole location plans are presented as drawings 3318(C6)D002-1 and 3318(C7)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-C6-01	Standpipe	BH17-C6-01	50	15.45	19.14	5.00	15.00
BH17-C6-03	Standpipe	BH17-C6-03	50	15.00	20.66	10.00	15.00
BH17-C7-01	Standpipe	BH17-C7-01	50	20	14.10	12.7	20
BH17-C7-03	Standpipe	BH17-C7-03	50	20	8.11	19.7	20

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

3.6 Surveying

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

4 LABORATORY TESTING

4.1 Geotechnical Testing

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

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

4.2 Geoenvironmental Testing

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

5 REFERENCES

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

BRE Special Digest 1: 2005 Concrete in aggressive ground.

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

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

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

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

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

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

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

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

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

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

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

6 LICENCES

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

Ordnance Survey Reproduction Licence Number. 100035365

DRAWINGS

3318(C6)D001-1 Site Location Plan
3318(C7)D001-1 Site Location Plan
3318(C6)D002-1 Exploratory Hole Location Plan
3318(C7)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(C6)D001-1
Scale:	1:25000	Client:	GHD Ltd	

Site Location Plan

TerraConsult

Address:
East Anglia

Notes:

AGS		Project:	East Anglia (North) Offshore Wind Farm	Drawing No:
Issue:	FINAL	Project No:	3318	3318(C7)D001-1
Scale:	1:25000	Client:	GHD Ltd	

Exploratory Hole Location Plan

TerraConsult

Legend Key

Locations By Type - CP

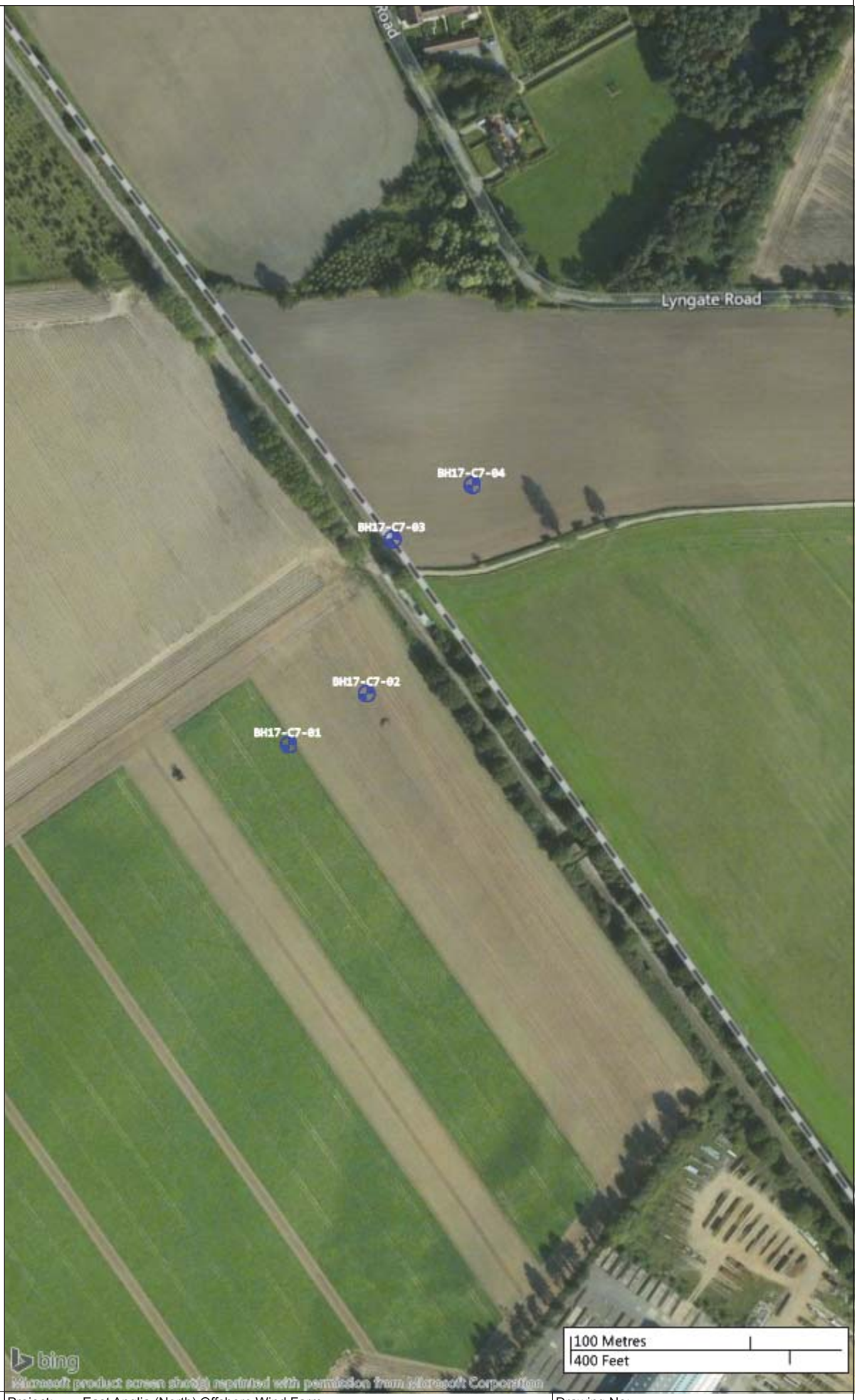
Issue:	FINAL	Project: East Anglia (North) Offshore Wind Farm	Drawing No:
Scale:	1:3000	Project No: 3318	3318(C6)D002-1
		Client: GHD Ltd	

Exploratory Hole Location Plan

TerraConsult

Legend Key

Locations By Type - CP



Issue:	FINAL	Project: East Anglia (North) Offshore Wind Farm	Drawing No:
Scale:	1:3000	Project No: 3318	3318(C7)D002-1
		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	14-07-17	14-07-17	TM	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.45	14-07-17	17-07-17	TM	Dando 2000	n/a	n/a	17-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	626336.80
mN:	331280.87
mAOD:	34.59
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.50)	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
			34.09	0.50	Soft dark orangish brown slightly gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)			0.50	D1	
								0.50	ES1	
				(0.60)				0.50 - 1.00	B1	
					0.90 - 1.10 m: Becomes slightly clayey fine to coarse SAND			1.00	D2	
			33.49	1.10	Medium dense dark yellowish brown slightly silty fine to coarse SAND and fine to coarse GRAVEL. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)			1.00	ES2	
						Dry	1.50	1.50	C	N=14 (1,2/2,2,4,6)
								1.50	D3	
								1.50	ES3	
				(1.90)				2.00	D4	
								2.00	ES4	
			31.59	3.00	Medium dense light yellowish brown gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)	Dry	3.00	3.00	C	N=12 (1,1/2,2,4,4)
								3.00	D5	
				(2.00)	*4.00 - 5.00 m: Becomes dark yellowish brown*			4.00	D6	
						Dry		4.50	C	N=8 (1,2/1,2,2,3)
			29.59	5.00	Soft light orangish brown mottled dark orangish brown and light grey sandy CLAY. (GLACIOFLUVIAL DEPOSITS)			5.00	D7	
				(1.00)						
			28.59	6.00	Loose dark greyish brown clayey fine to medium SAND. Occasionally mottled dark orangish brown. (GLACIOFLUVIAL DEPOSITS)	Dry	6.00	6.00	S	N=9 (1,2/2,2,2,3)
								6.00 - 6.45	D8	
				(1.50)						
			27.09	7.50	Loose locally medium dense dark orangish brown very silty fine to medium SAND. (GLACIOFLUVIAL DEPOSITS)	Dry	7.50	7.50	S	N=8 (1,1/2,1,2,3)
								7.50 - 7.95	D9	
						Dry	9.00	9.00	S	N=11 (1,2/2,2,3,4)
								9.00 - 9.45	D10	
Inst						Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
8.50	7.83	8.50	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	4.50	4.50
150	14.50	14.50

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-C6-01

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	14-07-17	14-07-17	TM	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.45	14-07-17	17-07-17	TM	Dando 2000	n/a	n/a	17-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	626336.80
mN:	331280.87
mAOD:	34.59
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
				(7.95)		Dry	10.50	10.50 10.50 - 10.95	S B3	N=6 (1,1/2,1,1,2)
						Dry	12.00	12.00 12.00 - 12.45	S D11	N=6 (1,/1,2,1,2)
						Dry	13.00	13.50 13.50 - 13.95	S D12	N=8 (2,2/1,2,2,3)
	SP				*14.90 - 15.00 m: Becomes dark greyish brown*	Dry	14.00	15.00 15.00 - 15.45	S D13	N=12 (2,2/2,3,3,4)
			19.14	15.45	Borehole ends at 15.45m (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-C6-01

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	13-07-17	13-07-17	TM	Hand tools	n/a	n/a	13-07-17	VS	
CP	0.00	15.45	13-07-17	14-07-17	TM	Dando 2000	n/a	n/a	14-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	626383.55
mN:	331326.99
mAOD:	35.22
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
			34.82	0.40	Dark orangish brown slightly gravelly slightly silty clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets. (GLACIOFLUVIAL DEPOSITS)			0.50 0.50 0.50 - 1.00	D1 ES1 B1	
				(1.10)				1.00 1.00	D2 ES2	
			33.72	1.50	Medium dense dark orangish brown slightly gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional pockets of dark brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)	Dry		1.50 1.50 1.50 - 1.95 1.50 - 2.00	C ES3 D3 B2	N=27 (2,4/5,6,8,8)
				(0.50)				2.00	ES4	
			33.22	2.00	Medium dense dark orangish brown slightly silty very gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to medium flint. (GLACIOFLUVIAL DEPOSITS)					
						Dry	3.00	3.00 3.00 3.00 - 3.45	C D4 B3	N=14 (1,2/2,3,4,5)
				(3.00)				4.00	D5	
						Dry	4.50	4.50	C	N=13 (2,3/3,3,3,4)
			30.22	5.00	Light yellowish brown gravelly silty fine to coarse SAND. Rare fine to coarse pockets of dark orangish brown slightly sandy CLAY. (GLACIOFLUVIAL DEPOSITS)			5.00	D6	
				(1.00)						
			29.22	6.00	Soft dark orangish brown sandy CLAY. Occasionally mottled dark reddish brown. (GLACIOFLUVIAL DEPOSITS)	Dry	6.00	6.00 6.00	C D7	N=6 (1,1/1,2,1,2)
				(1.00)						
			28.22	7.00	Medium dense dark orangish brown slightly silty clayey fine to coarse SAND. (GLACIOFLUVIAL DEPOSITS)			7.00 - 8.00	B4	
	▼			(1.00)		Dry	7.50	7.50 7.50 - 7.95	S D8	N=10 (1,1/1,2,3,4)
	▽		27.22	8.00	Firm dark orangish brown sandy CLAY. Occasionally mottled dark reddish brown. (GLACIOFLUVIAL DEPOSITS)					
						Dry	9.00	9.00 9.00 - 9.45	S D10	N=8 (1,2/1,1,2,4)
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
8.00	7.60	8.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	6.00	6.00
150	14.50	14.50

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

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

Log issue: FINAL

Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm

Project No: 3318

Client: GHD Ltd

Exploratory position reference:

BH17-C6-02

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	13-07-17	13-07-17	TM	Hand tools	n/a	n/a	13-07-17	VS	
CP	0.00	15.45	13-07-17	14-07-17	TM	Dando 2000	n/a	n/a	14-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE: 626383.55
mN: 331326.99
mAOD: 35.22
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
				(7.45)		Dry	10.00	10.50	S	N=14 (1,1/1,3,4,6)
					12.00 - 15.00 m: Mottles dark greyish brown	Dry	12.00	12.00 12.00 - 12.45	S D11	N=9 (1,2/1,2,3,3)
						Dry	13.00	13.50 13.50 - 13.95	S D12	N=11 (1,2/2,3,3,3)
						Dry	14.50	15.00 15.00 - 15.45	S D13	N=13 (2,3/3,3,3,4)
			19.77	15.45	Borehole ends at 15.45m (Target depth)	13.00 9.00	0.00 14.50	15.45 15.45		14/07/2017 00:00:00 14/07/2017 01:00:00
	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-C6-02

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	14-07-17	14-07-17	MJ	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.00	14-07-17	14-07-17	MJ	Dando 2000	n/a	n/a	14-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 626508.14
mN: 331291.05
mAOD: 35.66
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
				(0.50)	Soft dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
			35.16	0.50	Medium dense dark orangish brown silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasionally fine to coarse pockets of dark brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)			0.50 0.50	D1 ES1	
								1.00 1.00	D2 ES2	
				(2.00)		Dry	1.40	1.50 1.50 1.50 - 1.95	C ES3 B1	N=16 (2,3/4,4,4,4)
								2.00	ES4	
			33.16	2.50	Medium dense dark yellowish brown slightly silty very gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)	Dry	2.50	2.50 2.50 - 2.95	C B2	N=18 (3,5/4,4,5,5)
						Dry	5.50	3.50 3.50 - 3.95	C B3	N=24 (4,5/6,6,6,6)
				(3.00)						
						Dry	4.50	4.50 4.50 - 4.95	C B4	N=19 (2,3/4,4,5,6)
			30.16	5.50	Medium dense dark yellowish brown slightly silty very gravelly fine to coarse SAND and Gravel. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)	Dry	5.50	5.50 5.50 - 5.95	C B5	N=27 (3,4/5,7,7,8)
				(0.50)						
			29.66	6.00	Firm dark orangish brown mottled dark reddish brown slightly gravelly slightly silty sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)			6.50	D3	
				(2.00)				7.00 - 7.45	U1	36 (100%)
								7.50	D4	
			27.66	8.00	Firm dark gravelly brown occasionally mottled dark orangish brown and dark reddish brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)					
						Dry	8.00	8.50 8.50 - 8.95	S D5	N=12 (1,2/2,3,3,4)
				(2.00)						
Inst			25.66	10.00		Dry	10.00	10.00	S	N=34 (3,5/6,9,9,10)

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
10.0	9.10	8.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
150	15.00	15.00

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-C6-03

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	14-07-17	14-07-17	MJ	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.00	14-07-17	14-07-17	MJ	Dando 2000	n/a	n/a	14-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626508.14
mN:	331291.05
mAOD:	35.66
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
					Dense becoming very dense dark orangish brown slightly gravelly silty fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)			10.00 - 10.45	D6	
						Dry		11.50 11.50 - 11.95	S D7	N=37 (2,6/8,9,10,10)
				(5.00)						
						Dry		13.00 13.00 - 13.45	S D8	N=38 (4,5/7,9,10,12)
						Dry		14.50 14.50 - 14.95	S D9	50 (5,9/50 for 255mm)
	SP		20.66	15.00	Borehole ends at 15.00m (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-C6-03

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	14-07-17	14-07-17	MJ	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.00	14-07-17	17-07-17	MJ	Dando 2000	n/a	n/a	17-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 626550.48
mN: 331321.08
mAOD: 35.39
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
			34.99	0.40	Firm to stiff dark orangish brown mottled light grey and dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded medium to coarse flint. Occasional black organic staining. (GLACIOFLUVIAL DEPOSITS)			0.50 0.50	D1 ES1	
				(0.90)				1.00 1.00	D2 ES2	
			34.09	1.30	Medium dense dark orangish brown gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Fine to coarse gravel sized and cobble sized pockets of dark brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)	Dry	1.00	1.50 1.50 1.50 - 1.95	C ES3 B1	N=15 (2,3/3,4,4,4)
				(1.20)	*2.00 - 2.50 m: Clay pockets become frequent and mottle light grey*			2.00	ES4	
			32.89	2.50	Medium dense dark greyish brown gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)	Dry	2.40	2.50 2.50 - 2.95	C B2	N=27 (3,4/6,6,7,8)
				(2.00)		Dry	3.95	3.50 3.50 - 3.95	C B3	N=25 (3,6/5,6,7,7)
			30.89	4.50	Medium dense dark orangish brown gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Medium to coarse gravel sized pockets of dark orangish brown silty slightly sandy CLAY. (GLACIOFLUVIAL DEPOSITS)	Dry	4.95	4.50 4.50 - 4.95	C B4	N=30 (4,5/6,7,8,9)
				(1.30)		Dry	5.50	5.50	C	N=21 (8,5/6,6,5,4)
			29.59	5.80	Medium dense dark grey mottled dark orangish brown and black organic staining silty clayey fine to medium SAND. Rare gravel. (GLACIOFLUVIAL DEPOSITS)			6.00	D3	
					7.00 - 15.00 m: Becomes dark orangish brown			7.00 - 7.45 7.00 - 7.45	B5 UNR	40 (0%)
						Dry	6.00	7.50 7.50 - 7.95	S D4	N=19 (2,2/3,5,5,6)
								8.50	D5	
						Dry	6.00	9.00 9.00 - 9.50	S D6	N=14 (2,2/3,3,4,4)
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
10.0	8.90	6.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
150	12.00	12.00

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-C6-04

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	14-07-17	14-07-17	MJ	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.00	14-07-17	17-07-17	MJ	Dando 2000	n/a	n/a	17-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626550.48
mN:	331321.08
mAOD:	35.39
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
				(9.20)	*10.00 - 15.00 m: Rare gravel of subangular to subrounded fine to coarse flint*	Dry	10.40	10.50 10.50 - 10.95	S D7	N=12 (1,2/3,3,3,3)
					12.00 - 15.00 m: Becomes slightly clayey	Dry	12.00	12.00 12.00 - 12.45	S D8	N=23 (3,4/6,6,5,6)
						Dry	13.40	13.50 13.50 - 13.95	S D9	N=35 (4,6/7,9,9,10)
			20.39	15.00	Borehole ends at 15.00m (Target depth)	Dry	14.80	15.00 15.00 - 15.45	S D10	N=40 (3,6/8,9,10,13)
	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-C6-04

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	27-07-17	27-07-17	MJ	Hand tools	n/a	n/a	27-07-17	VS	
CP	0.00	20.00	27-07-17	28-07-17	MJ	Dando 2000	n/a	n/a	28-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 626749.29
mN: 331461.97
mAOD: 34.10
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel subangular to subrounded fine to coarse flint. Occasional rootlets. (TOPSOIL)					
			33.70	0.40	Dark orangish brown fine to coarse SAND. (GLACIOFLUVIAL DEPOSITS)			0.50 0.50	D1 ES1	
				(1.10)				1.00 1.00	D2 ES2	
			32.60	1.50	Medium dense dark orangish brown fine to medium SAND. (GLACIOFLUVIAL DEPOSITS)	Dry		1.50 1.50 1.50	S D3 ES3	N=13 (1,3/3,4,3,3)
								2.00	ES4	
				(2.00)		Dry	2.50	2.50 2.50 - 2.95	S D4	N=16 (2,2/3,3,4,6)
			30.60	3.50	Medium dense dark orangish brown slightly clayey silty fine to medium SAND. (GLACIOFLUVIAL DEPOSITS)	Dry	3.50	3.50 3.50 - 3.95	S D5	N=21 (2,3/4,5,6,6)
				(0.40)						
			30.20	3.90	Medium dense dark orangish brown gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Rare Cobbles of flint. (GLACIOFLUVIAL DEPOSITS)	Dry	4.50	4.50 4.50 - 4.95	C B1	N=28 (3,5/6,7,7,8)
				(1.80)						
						Dry	5.50	5.50 5.50 - 5.95	C B2	N=19 (5,6/5,5,4,5)
			28.40	5.70	Firm light greyish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Frequent local dark orangish brown staining. (GLACIOFLUVIAL DEPOSITS)			6.00	D6	
				(1.80)						
								7.00 - 7.45	U1	40 (100%)
			26.60	7.50	Firm light orangish grey slightly sandy CLAY. (GLACIOFLUVIAL DEPOSITS)			7.50	D7	
				(2.00)		Dry	8.00	8.50 8.50 - 8.95	S D8	N=13 (1,2/3,3,3,4)
			24.60	9.50	Firm light brownish grey slightly sandy CLAY. (GLACIOFLUVIAL DEPOSITS)					
	Inst					Water	Casing	10.00 - 10.45 Depth	U2 Type & No	60 (100%) Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

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

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

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

Log issue: FINAL
Scale: 1:50

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

Exploratory position reference:

BH17-C7-01

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	27-07-17	27-07-17	MJ	Hand tools	n/a	n/a	27-07-17	VS	
CP	0.00	20.00	27-07-17	28-07-17	MJ	Dando 2000	n/a	n/a	28-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626749.29
mN:	331461.97
mAOD:	34.10
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
					Firm light brownish grey slightly sandy CLAY. (GLACIOFLUVIAL DEPOSITS)			10.50	D9	
				(3.20)		Dry	10.00	11.50 11.50 - 11.95	S D10	N=17 (2,3/3,4,4,6)
	▼		21.40	12.70	Medium dense dark brownish grey silty fine to medium SAND. (WROXHAM CRAG FORMATION)	Dry	10.00	13.00	S	N=14 (3,2/3,3,4,4)
						Dry	14.50	14.50 14.50 - 14.95	S D12	N=13 (2,2/3,3,3,4)
				(6.30)		Dry	16.00	16.00 16.00 - 16.45	S D13	N=22 (3,3/5,5,6,6)
						Dry	17.50	17.50 17.50 - 17.95	S D14	N=35 (2,3/7,8,9,11)
			15.10	19.00	Very dense dark grey silty fine to medium SAND. Rare gravel. (WROXHAM CRAG FORMATION)	Dry	19.00	19.00 19.00 - 19.45	S D15	50 (3,5/50 for 170mm)
				(1.00)						
SP Inst			14.10	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
13.0	12.9	10.0	

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-C7-01

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	25-07-17	25-07-17	MJ	Hand tools	n/a	n/a	25-07-17	VS	
CP	0.00	20.00	25-07-17	25-07-17	MJ	Dando 2000	n/a	n/a	25-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 626792.09
mN: 331492.52
mAOD: 32.74
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel subangular to subrounded fine to coarse flint. Occasional rootlets. (TOPSOIL)					
			32.34	0.40	Medium dense dark orangish brown clayey gravelly fine to coarse SAND. Gravel subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)			0.50	D1	
								0.50	ES1	
								0.50	ES1	
								0.50	ES1	
								1.00	D2	
								1.00	ES2	
								1.00	ES2	
								1.00	ES2	
						Dry	1.40	1.50	C	N=21 (2,3/5,5,6,5)
				(2.60)				1.50	ES3	
								1.50	ES3	
								1.50 - 1.95	B1	
								2.00	ES2	
								2.00	ES4	
								2.00	ES4	
						Dry	2.50	2.50	C	N=22 (1,3/4,5,6,7)
								2.50 - 2.95	B2	
			29.74	3.00	Soft orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. (GLACIOFLUVIAL DEPOSITS)					
				(0.90)		Dry	3.30	3.50	S	N=10 (1,2/2,2,3,3)
								3.50 - 3.95	D3	
			28.84	3.90	Medium dense dark orangish brown slightly clayey slightly silty fine to coarse SAND. Fine to coarse gravel sized pockets of dark brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)					
						Dry	4.40	4.50	S	N=13 (2,3/2,3,4,4)
				(1.60)				4.50 - 4.95	D4	
			27.24	5.50	Firm orangish brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)	Dry	5.50	5.50	S	N=15 (1,1/3,3,4,5)
								5.50 - 5.95	D5	
				(1.30)						
			25.94	6.80	Firm to stiff brownish grey locally mottled greyish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasionally stained orangish brown. (GLACIOFLUVIAL DEPOSITS)			6.90	D6	
								7.00 - 7.45	U1	40 (100%)
								7.50	D7	
						Dry	7.50	8.50	S	N=12 (1,2/2,3,3,4)
				(3.70)				8.50 - 8.95	D8	
Inst						Water	Casing	Depth	Type & No	Results
								10.00 - 10.45	U2	75 (100%)

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	7.00	7.00
150	19.00	19.00

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-C7-02

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	25-07-17	25-07-17	MJ	Hand tools	n/a	n/a	25-07-17	VS	
CP	0.00	20.00	25-07-17	25-07-17	MJ	Dando 2000	n/a	n/a	25-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626792.09
mN:	331492.52
mAOD:	32.74
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
			22.24	10.50	Firm to stiff brownish grey locally mottled greyish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasionally stained orangish brown. (GLACIOFLUVIAL DEPOSITS)			10.50	D9	
			22.14	10.60	Firm brownish grey slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium chalk and flint. (GLACIOFLUVIAL DEPOSITS)					
					Loose becoming medium dense dark orangish brown silty fine to medium SAND. (GLACIOFLUVIAL DEPOSITS)	Dry	11.50	11.50 11.50 - 11.95	S D10	N=9 (1,1/2,2,2,3)
				(6.90)		Dry	13.00	13.00 13.00 - 13.45	S D11	N=11 (1,2/2,3,3,3)
						Dry	14.50	14.50 14.50 - 14.95	S D12	N=27 (2,2/5,6,7,9)
						Dry	16.00	16.00 16.00 - 16.45	S D13	N=34 (2,3/5,7,9,13)
			15.24	17.50	Dense dark greyish brown slightly gravelly slightly silty medium to coarse SAND. Gravel of subangular to subrounded fine to medium flint. (WROXHAM CRAG FORMATION)	Dry	17.50	17.50 17.50 - 17.95	S D14	N=41 (3,5/6,9,10,16)
				(2.50)		Dry	19.00	19.00 19.00 - 19.45	S D15	50 (4,9/12,17,21,)
Inst			12.74	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	20.00 Depth	D16 Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
11.30	8.10	11.30	

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-C7-02

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	20-07-17	20-07-17	MJ	Hand tools	n/a	n/a	20-07-17	VS	
CP	0.00	20.00	20-07-17	21-07-17	MJ	Dando 2000	n/a	n/a	21-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 626802.16
mN: 331579.34
mAOD: 28.11
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark orangish brown slightly sandy slightly silty CLAY. Rare subangular to subrounded fine flint gravel. Frequent rootlets. (TOPSOIL)					
			27.71	0.40	Firm dark orangish brown mottled light grey and dark reddish brown sandy CLAY. Rare subangular to subrounded fine flint gravel. Occasional laminations of fine to medium SAND. Occasional rootlets. (BRICKEARTH)			0.50 0.50	D1 ES1	
				(1.00)				1.00 1.00	D2 ES2	
			26.71	1.40	Loose becoming medium dense dark orangish brown slightly clayey silty fine to medium SAND. Occasionally mottled dark reddish brown. (BRICKEARTH)	Dry		1.50 1.50 1.50 - 1.95	S ES3 D3	N=7 (1,1/1,2,2,2)
								2.00 2.00 - 2.40	ES4 B1	
						Dry	2.50	2.50 2.50 - 2.95	S D4	N=7 (1,0/1,1,2,3)
				(4.50)		Dry	3.50	3.50 3.50 - 3.95	S D5	N=10 (1,2/2,2,3,3)
						Dry	4.50	4.50 4.50 - 4.95	S D6	N=16 (1,2/3,4,4,5)
					5.50 - 5.90 m: Becomes clayey	Dry	5.50	5.50 5.50 - 5.95	S D7	N=14 (2,2/3,3,4,4)
			22.21	5.90	Firm dark brownish grey occasionally mottled dark orangish brown slightly sandy slightly gravelly CLAY. Gravel subangular to subrounded fine to coarse chalk and rare flint. (BRICKEARTH)			6.50	D8	
								7.00 - 7.45	U1	38 (100%)
				(3.10)				7.50	D9	
					8.50 - 9.00 m: Becomes sandy and soft	Dry	6.00	8.50 8.50 - 8.95	S D10	N=22 (3,3/4,5,6,7)
			19.11	9.00	Medium dense dark grey silty slightly clayey fine to medium SAND. Occasional pockets of dark grey gravelly CLAY with chalk gravel. (BRICKEARTH)			9.50 - 9.90	B2	
				(2.00)		Dry	10.00	10.00	S	N=29 (2,3/3,7,9,10)
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
9.00	8.40	6.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	6.00	6.00
150	16.00	16.00

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-C7-03

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	20-07-17	20-07-17	MJ	Hand tools	n/a	n/a	20-07-17	VS	
CP	0.00	20.00	20-07-17	21-07-17	MJ	Dando 2000	n/a	n/a	21-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626802.16
mN:	331579.34
mAOD:	28.11
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 dark grey silty slightly clayey fine to medium SAND. Occasional pockets of dark grey gravelly CLAY with chalk gravel. (BRICKEARTH)			10.00 - 10.45	D11	
			17.11	11.00	Dense to very dense dark brown grey silty fine to medium SAND. (BRICKEARTH)	Dry	11.50	11.50	S	N=42 (3,5/6,9,13,14)
								11.50 - 11.95	D12	
						Dry	13.00	13.00	S	63 (5,9/63 for 215mm)
								13.00 - 13.45	D13	
				(5.30)						
						Dry	14.50	14.50	S	50 (5,9/50 for 215mm)
								14.50 - 14.95	D14	
						Dry	16.00	16.00	S	N=43 (3,6/14,12,9,8)
			11.81	16.30	Stiff dark grey slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (BRICKEARTH)			16.00 - 16.45	D15	
								17.00	D16	
								17.50 - 17.95	U2	70 (100%)
				(3.40)				18.00	D17	
						Dry	16.00	19.00	S	N=34 (4,5/7,8,9,10)
								19.00 - 19.45	D111	
								19.00 - 19.45	D18	
	▽		8.41	19.70						
				(0.30)	Dark grey gravelly slightly silty SAND. Gravel of subangular to subrounded fine to coarse flint. Pockets of dark grey CLAY.					
SP Inst			8.11	20.00		Water	Casing	20.00 Depth	B3 Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
19.7	8.90	16.5	

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-C7-03

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	20-07-17	20-07-17	MJ	Hand tools	n/a	n/a	20-07-17	VS	
CP	0.00	20.00	20-07-17	21-07-17	MJ	Dando 2000	n/a	n/a	21-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626802.16
mN:	331579.34
mAOD:	28.11
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
					(WROXHAM CRAG FORMATION)					
					Borehole ends at 20.00m (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-C7-03

Sheet 3 of 3

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	24-07-17	24-07-17	MJ	Hand tools	n/a	n/a	24-07-17	VS	
CP	0.00	20.00	24-07-17	25-07-17	MJ	Dando 2000	n/a	n/a	25-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626845.20
mN:	331611.63
mAOD:	25.84
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark orangish brown slightly sandy slightly silty CLAY. Rare subangular to subrounded fine flint gravel. Frequent rootlets. (TOPSOIL)					
			25.44	0.40	Stiff dark orangish brown slightly sandy CLAY. Occasionally mottled light grey. (BRICKEARTH)			0.50 0.50	D1 ES1	
				(0.60)						
			24.84	1.00	Loose becoming medium dense light orangish brown slightly clayey silty fine to medium SAND. Rare gravel of subangular to subrounded fine to coarse flint. Occasional fine to coarse gravel and cobble sized pockets of dark brown mottled light grey and reddish brown sandy CLAY. (BRICKEARTH)			1.00 1.00	D2 ES2	
						Dry		1.50 1.50 1.50 - 1.95	S ES3 D3	N=9 (1,1/2,2,2,3)
								2.00	ES4	
						Dry	2.40	2.50 2.50 - 2.95	S D4	N=11 (1,2/2,3,3,3)
						Dry	3.40	3.50 3.50 - 3.95	S D5	N=17 (1,2/3,4,4,6)
				(5.40)						
					4.50 - 5.50 m: Becomes fine sand	Dry	4.50	4.50 4.50 - 4.95	S D6	N=22 (2,3/5,5,6,6)
						Dry	5.50	5.50 5.50 - 5.95	S D7	N=18 (1,2/3,4,5,6)
			19.44	6.40	Medium dense dark orangish brown gravelly silty slightly clayey fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (BRICKEARTH)					
				(1.30)		Dry	7.00	7.00 7.00 - 7.45	C B1	N=19 (2,3/5,4,5,5)
			18.14	7.70	Firm to stiff dark brownish grey mottled dark orangish brown and dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Rare shell fragments. (BRICKEARTH)			8.00	D8	
								8.50 - 8.95 8.50 - 8.95	B2 UNR	40 (0%)
				(2.30)						
	Inst		15.84	10.00		Dry	8.00	10.00	S	N=8 (1,2/2,2,2,2)

Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
10.0	5.10	8.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	8.00	8.00
150	17.00	17.00

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-C7-04

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	24-07-17	24-07-17	MJ	Hand tools	n/a	n/a	24-07-17	VS	
CP	0.00	20.00	24-07-17	25-07-17	MJ	Dando 2000	n/a	n/a	25-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626845.20
mN:	331611.63
mAOD:	25.84
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
					Loose becoming medium dense dark grey silty fine to coarse SAND. Rare subangular to subrounded fine to medium flint. (WROXHAM CRAG FORMATION)			10.00 - 10.45	D9	
						Dry	11.40	11.50	S	N=7 (1,0/1,2,2,2)
								11.50 - 11.95	D10	
						Dry	13.00	13.00	S	N=20 (1,3/3,4,6,7)
								13.00 - 13.45	D11	
				(6.70)						
						Dry	14.40	14.50	S	N=18 (1,2/2,4,5,7)
								14.50 - 14.95	D12	
						Dry	16.00	16.00	S	N=31 (2,2/4,4,10,13)
								16.00 - 16.45	D13	
			9.14	16.70	Firm to stiff dark brownish grey slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (WROXHAM CRAG FORMATION)			17.50 - 17.95	U2	68 (100%)
								18.00	D14	
				(3.30)						
						Dry	17.00	19.00	S	N=29 (3,4/5,7,8,9)
								19.00 - 19.45	D15	
Inst			5.84	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	20.00	D16	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:

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-C7-04

APPENDIX B
Photographs

BH17-C6-01

0.50 m

1.50 m

5.00 m

7.50 m

10.50 m

BH17-C6-02

1.50 m

3.00 m

5.00 m


ath, Norwich, Norfolk NR13 6QP
271 Mobile: +44 (0)7785 313447
g.co.uk
DATE: 14.7.17
DEPTH: 7.0-8.0
SAMPLE No: B4

7.00 m

15.00 m

BH17-C6-03

3.50 m

5.50 m

6.50 m

8.50 m

10.00 m

BH17-C6-04

0.50 m

4.50 m pockets of clay

7.00 m

15.00 m

BH17-C7-01

0.50 m

5.70 m

12.70 m

BH17-C7-02

4.50 m

6.90 m

11.50 m

17.50 m

20.00 m

BH17-C7-03

0.50 m

4.50 m

5.50 m

6.50 m

9.50 m

13.00 m

17.00 m

20.00 m

BH17-C7-04

1.00 m

7.00 m

8.00 m

10.00 m

18.00 m

APPENDIX C
In Situ Testing Results

Variable head permeability test

Variable Head Permeability Test Results

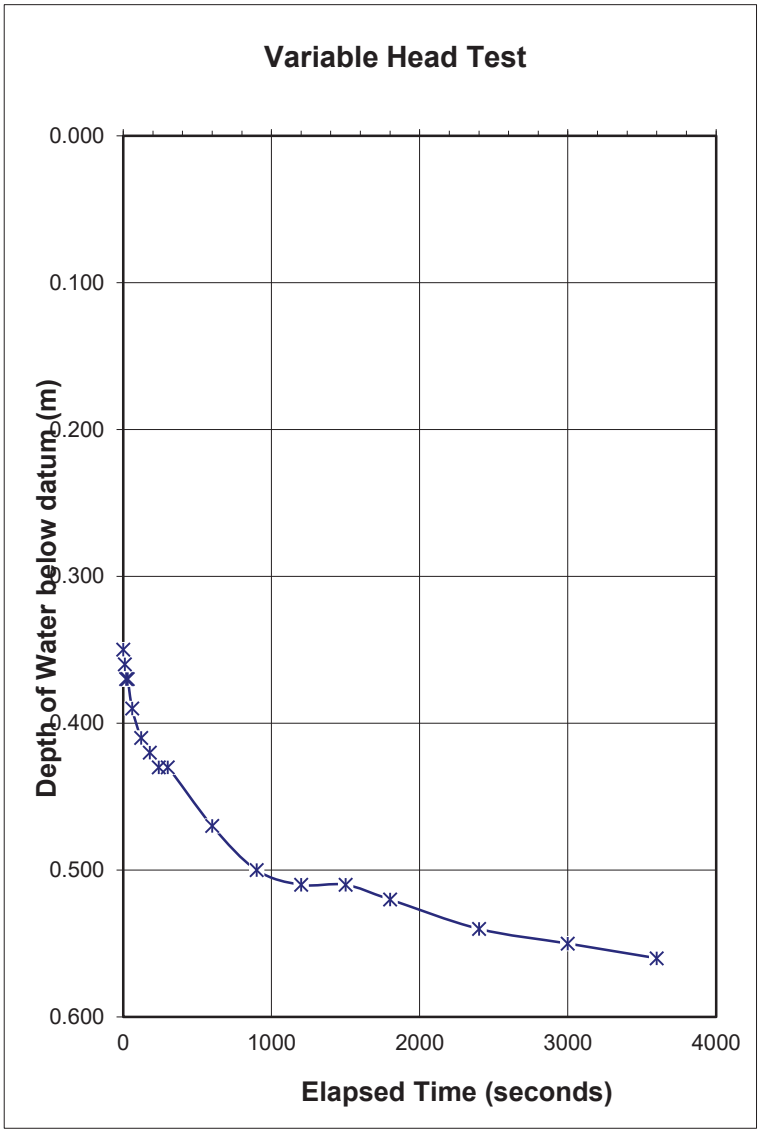
TerraConsult

Static water level (m)	7.83
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)	0.35
Top of Response Zone	8.00
Bottom of Response Zone	8.50

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	8.15
Final Head (h(t)) at (t)	7.94
Length of Response Zone *(L)*	0.50
Cross Sectional Area *(S)*	0.0177

Description	Silty SAND.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.350	8.15
10	0.360	8.14
20	0.370	8.13
30	0.370	8.13
60	0.390	8.11
120	0.410	8.09
180	0.420	8.08
240	0.430	8.07
300	0.430	8.07
600	0.470	8.03
900	0.500	8.00
1200	0.510	7.99
1500	0.510	7.99
1800	0.520	7.98
2400	0.540	7.96
3000	0.550	7.95
3600	0.560	7.94



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

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

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

$$= 1.66$$

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

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

k = 7.74E-08 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C6-01**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

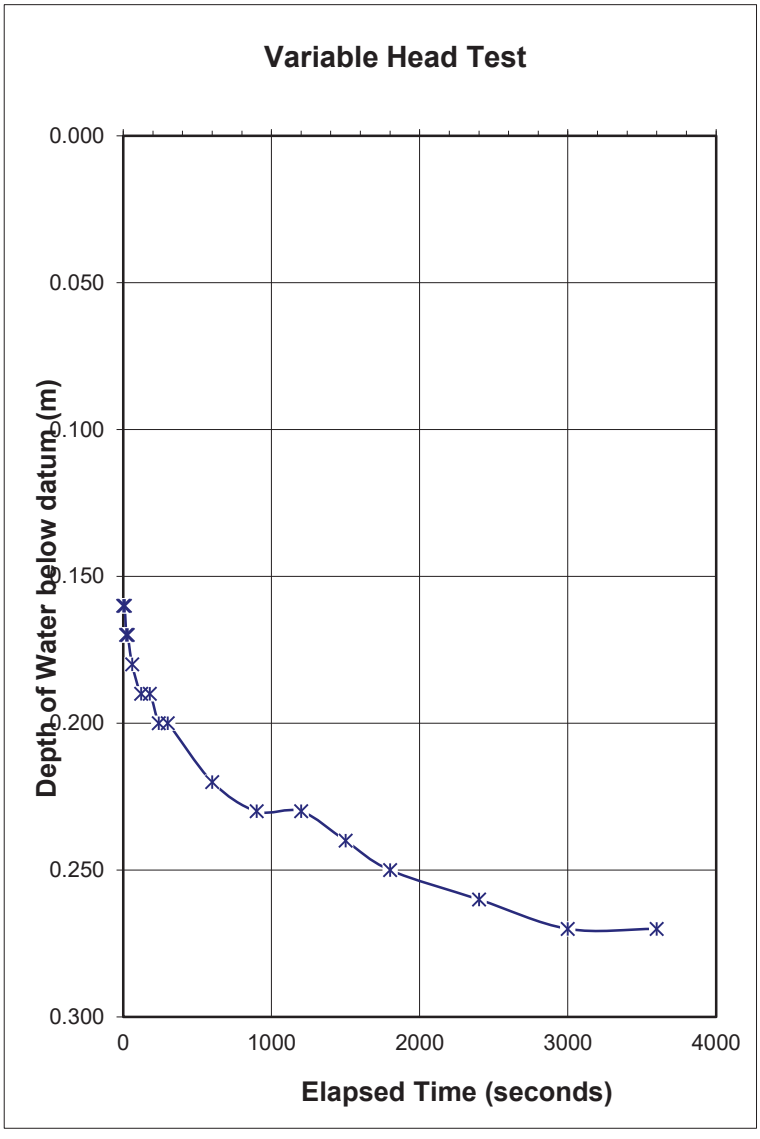
TerraConsult

Static water level (m)	7.60
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)	0.16
Top of Response Zone	7.50
Bottom of Response Zone	8.00

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	7.84
Final Head (h(t)) at (t)	7.73
Length of Response Zone *(L)*	0.50
Cross Sectional Area *(S)*	0.0177

Description	Slightly silty clayey SAND.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.160	7.84
10	0.160	7.84
20	0.170	7.83
30	0.170	7.83
60	0.180	7.82
120	0.190	7.81
180	0.190	7.81
240	0.200	7.80
300	0.200	7.80
600	0.220	7.78
900	0.230	7.77
1200	0.230	7.77
1500	0.240	7.76
1800	0.250	7.75
2400	0.260	7.74
3000	0.270	7.73
3600	0.270	7.73



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

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

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

$$= 1.66$$

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

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

k = 4.19E-08 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C6-02**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

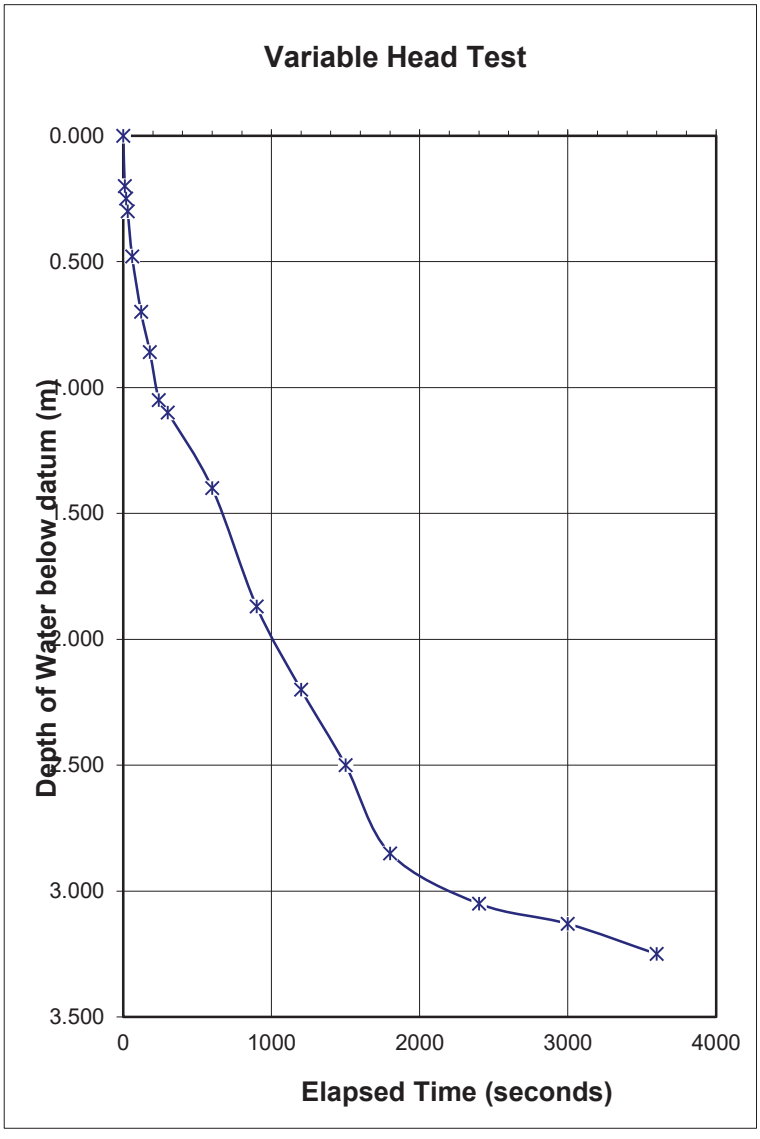
TerraConsult

Static water level (m)	9.20
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	10.00
Bottom of Response Zone	11.00

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	11.00
Final Head (h(t)) at (t)	7.75
Length of Response Zone *(L)*	1.00
Cross Sectional Area *(S)*	0.0177

Description	Sandy CLAY.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.000	11.00
10	0.200	10.80
20	0.250	10.75
30	0.300	10.70
60	0.480	10.52
120	0.700	10.30
180	0.860	10.14
240	1.050	9.95
300	1.100	9.90
600	1.400	9.60
900	1.870	9.13
1200	2.200	8.80
1500	2.500	8.50
1800	2.850	8.15
2400	3.050	7.95
3000	3.130	7.87
3600	3.250	7.75



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 = 7.09E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C6-03**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

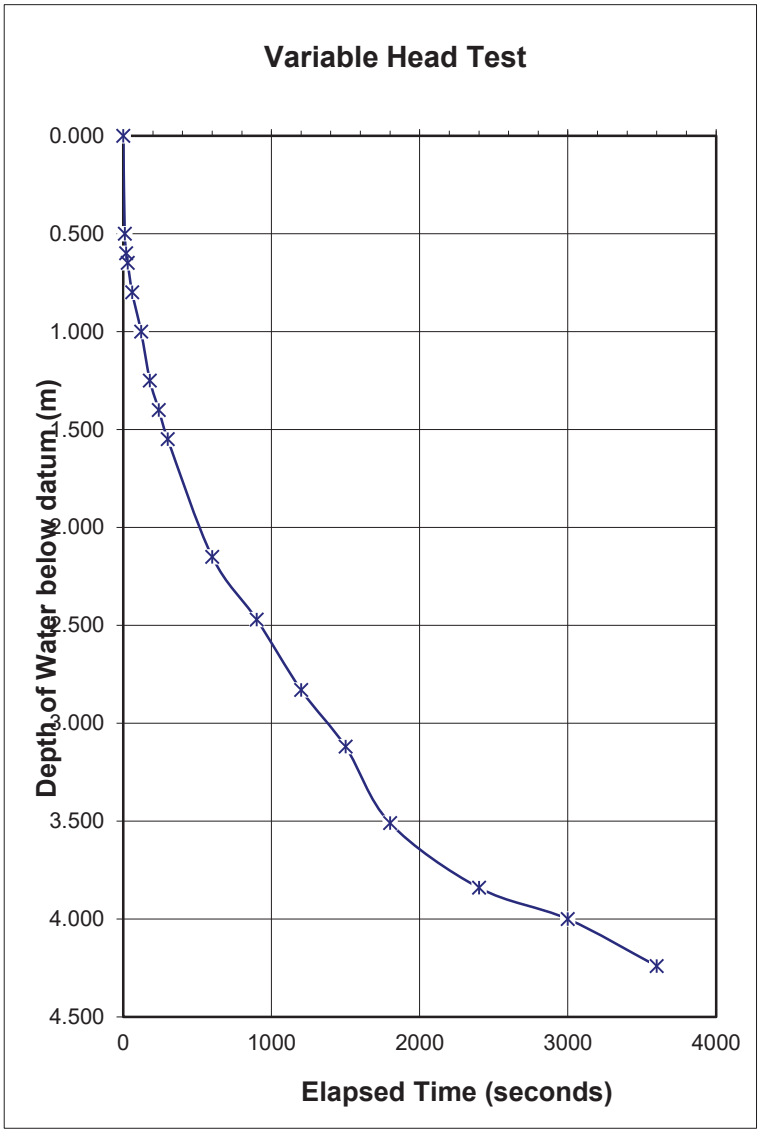
TerraConsult

Static water level (m)	9.00
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	10.00
Bottom of Response Zone	11.00

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	11.00
Final Head (h(t)) at (t)	6.76
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	11.00
10	0.500	10.50
20	0.600	10.40
30	0.650	10.35
60	0.800	10.20
120	1.000	10.00
180	1.250	9.75
240	1.400	9.60
300	1.550	9.45
600	2.150	8.85
900	2.470	8.53
1200	2.830	8.17
1500	3.120	7.88
1800	3.510	7.49
2400	3.840	7.16
3000	4.000	7.00
3600	4.240	6.76



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 = 9.85E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C6-04**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

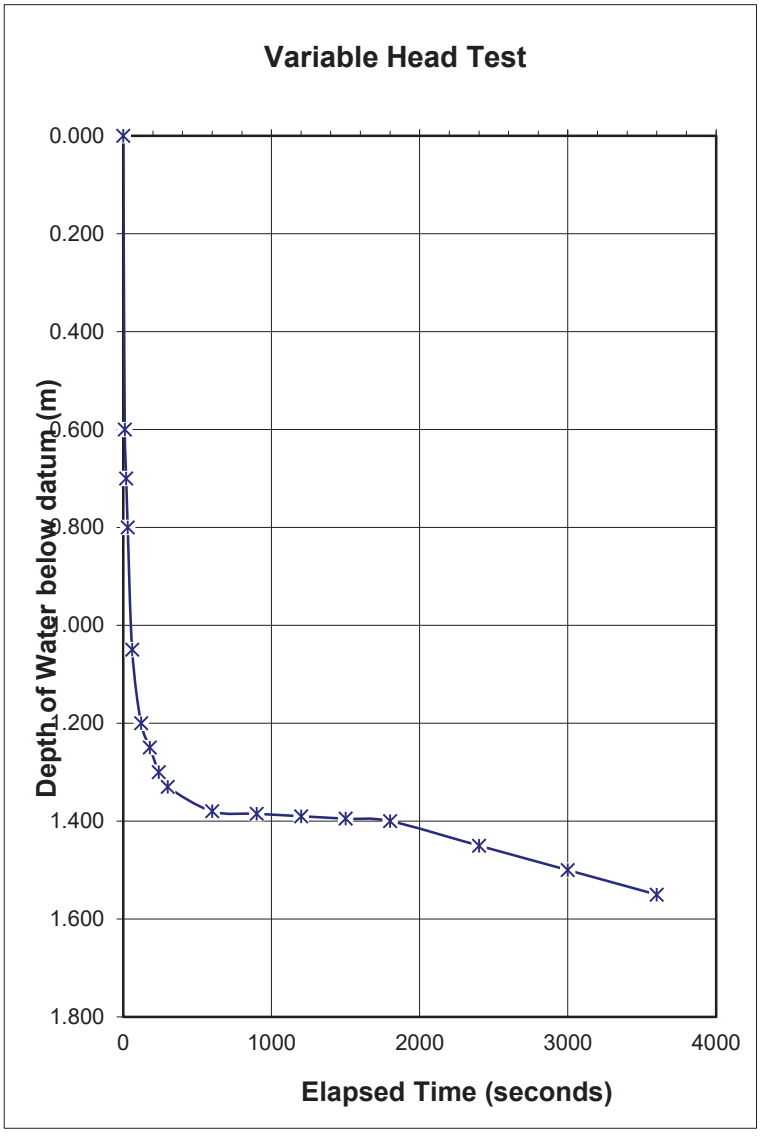
TerraConsult

Static water level (m)	5.10
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	10.00
Bottom of Response Zone	11.00

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	11.00
Final Head (h(t)) at (t)	9.45
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	11.00
10	0.600	10.40
20	0.700	10.30
30	0.800	10.20
60	1.050	9.95
120	1.200	9.80
180	1.250	9.75
240	1.300	9.70
300	1.330	9.67
600	1.380	9.62
900	1.385	9.62
1200	1.390	9.61
1500	1.395	9.61
1800	1.400	9.60
2400	1.450	9.55
3000	1.500	9.50
3600	1.550	9.45



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

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

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

$$= 2.43$$

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 = 3.07E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C7-04**
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 °C
BH17-C6-01	11/08/17	KW	51	12.74	6.74	Y				1018	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.9	0	0	NM	Sunny, dry	21
	22/08/17	VS	51	11.96	6.70	N				1015	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.8	0	0	NM	Sunny, dry	19
	31/08/17	VS	51	11.82	6.76	N				1013	NM	0.0	0.0	0.0	0.0000	0.4	0.0000	20	0	0	NM	Sunny, dry	18
	14/09/17	VS	51	11.90	6.77	N				995	NM	0.0	0.0	0.0	0.0000	0.0	0.0000	20.9	0	0	NM	Showers	15
BH17-C6-03	10/08/17	KW	51	14.65	8.71	Y				1020	NM	0.0	0.0	0.0	0.0000	0.0	0.0000	20.6	0	0	NM	Sunny, dry	20
	22/08/17	VS	51	14.40	8.69	N				1015	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.4	0	0	NM	Sunny, dry	19
	31/08/17	VS	51	14.40	8.73	N				1013	NM	0.0	0.0	0.0	0.0000	0.2	0.0000	20.9	0	0	NM	Sunny, dry	18
	14/09/17	VS	51	14.38	8.79	N				995	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.5	0	0	NM	Showers	15
BH17-C7-01	10/08/17	KW	51	17.36	8.80	Y				1020	NM	0.0	0.0	0.0	0.0000	0.2	0.0000	20.3	0	0	NM	Sunny, dry	20
	22/08/17	VS	51	19.68	8.80	N				1014	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	21	0	0	NM	Sunny, dry	19
	31/08/17	VS	51	19.46	8.86	N				1013	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.7	0	0	NM	Sunny, dry	18
	14/09/17	VS	51	17.16	8.91	N				995	NM	0.0	0.0	0.0	0.0000	0.7	0.0000	19.5	0	0	NM	Showers	15
BH17-C7-03	10/08/17	KW	51	18.48	3.71	Y				1020	NM	0.0	0.0	0.0	0.0000	0.5	0.0000	20.2	0	0	NM	Sunny, dry	20
	22/08/17	VS	51	18.41	3.43	N				1014	NM	0.0	0.0	0.0	0.0000	0.2	0.0000	21.2	0	0	NM	Sunny, dry	19
	31/08/17	VS	51	18.32	3.54	N				1014	NM	0.0	0.0	0.0	0.0000	0.6	0.0000	20.3	0	0	NM	Sunny, dry	18
	14/09/17	VS	51	18.21	3.61	N				997	NM	0.0	0.0	0.0	0.0000	0.6	0.0000	20.2	0	0	NM	Showers	15

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

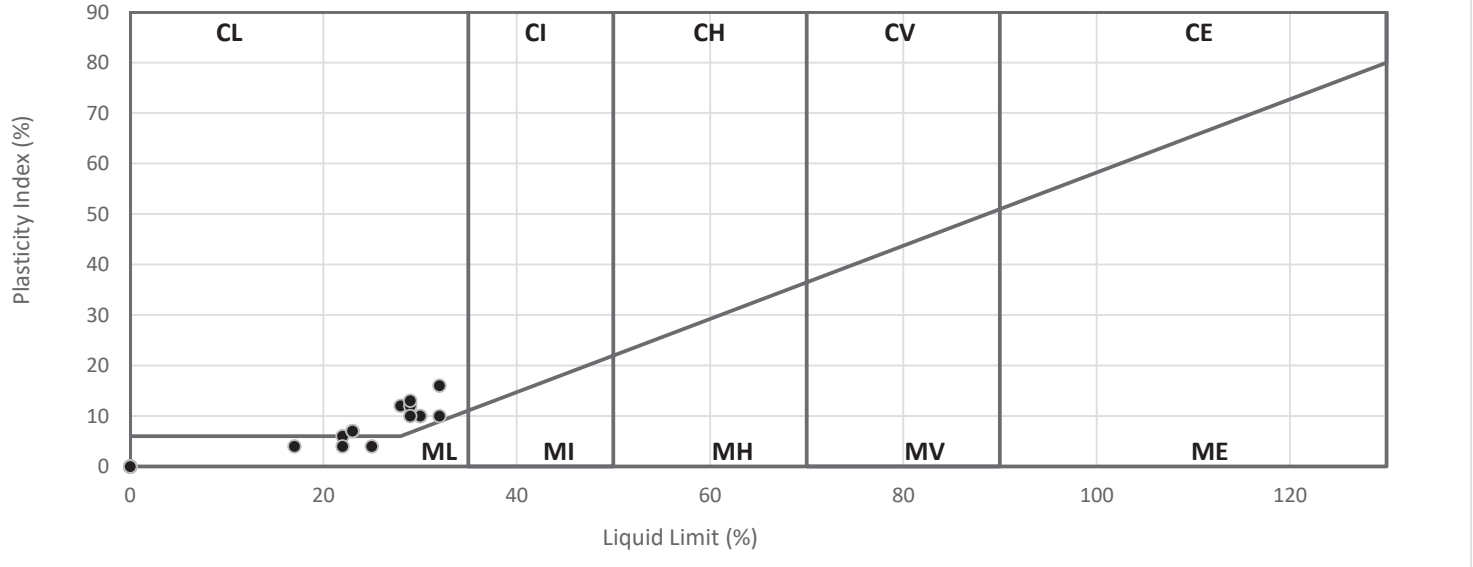
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX
(BS 1377 : Part 2 : 1990 Method 5)

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-C6-01	7	D	5.00	-		19	23	16	7	100	CL Low Plasticity
BH17-C6-02	7	D	6.00	-		18	23	16	7	100	CL Low Plasticity
BH17-C6-03	5	D	8.50	-	8.95	37		NP		100	
BH17-C7-02	5	D	5.50	-	5.95	26	25	21	4	100	ML Low Plasticity
BH17-C7-04	8	D	8.00	-		17	22	18	4	100	ML Low Plasticity
				-							
				-							
				-							

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

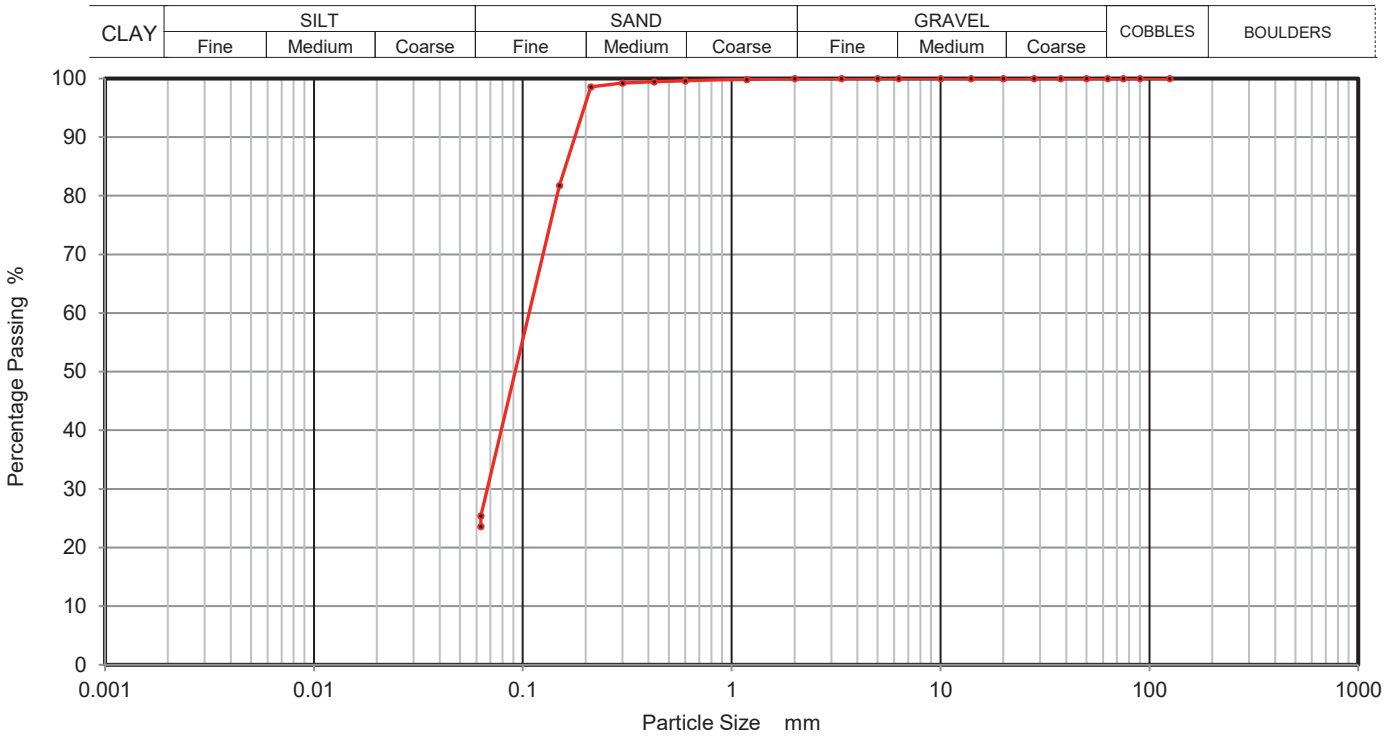
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



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

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	36525
		Borehole/Pit No.	BH17-C6-01
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	10
Soil Description	Brown silty fine to medium SAND	Depth Top	9.00
		Depth Base	9.45
		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	100		
0.425	99		
0.3	99		
0.212	99		
0.15	82		
0.063	25		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	75
Silt and Clay	25

Grading Analysis	
Uniformity Coefficient	

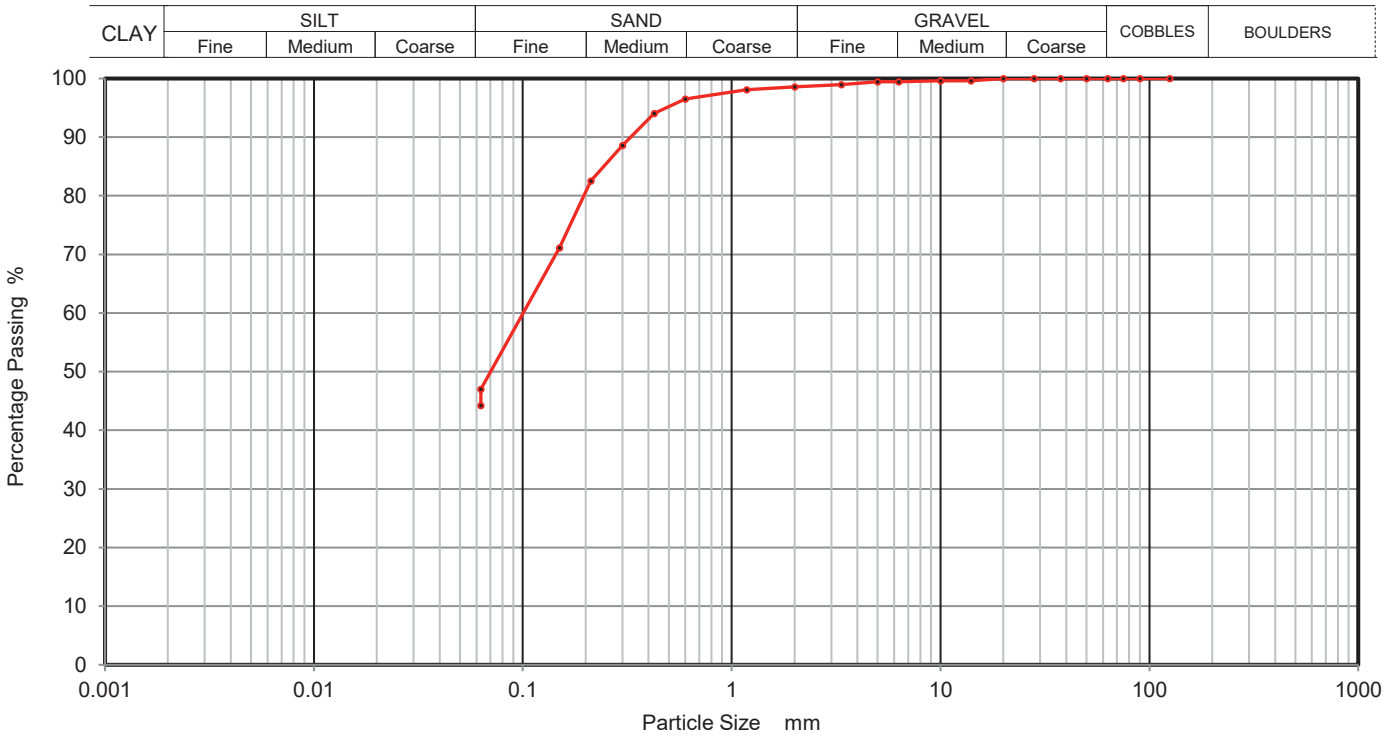
Remarks

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-C6-04
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	3
Soil Description	Brown slightly fine to medium gravelly slightly clayey silty fine to coarse SAND	Depth Top	6.00
		Depth Base	
		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	99		
5	99		
3.35	99		
2	99		
1.18	98		
0.6	97		
0.425	94		
0.3	89		
0.212	83		
0.15	71		
0.063	47		

Sample Proportions	% dry mass
Cobbles	0
Gravel	1
Sand	52
Silt and Clay	47

Grading Analysis	
Uniformity Coefficient	

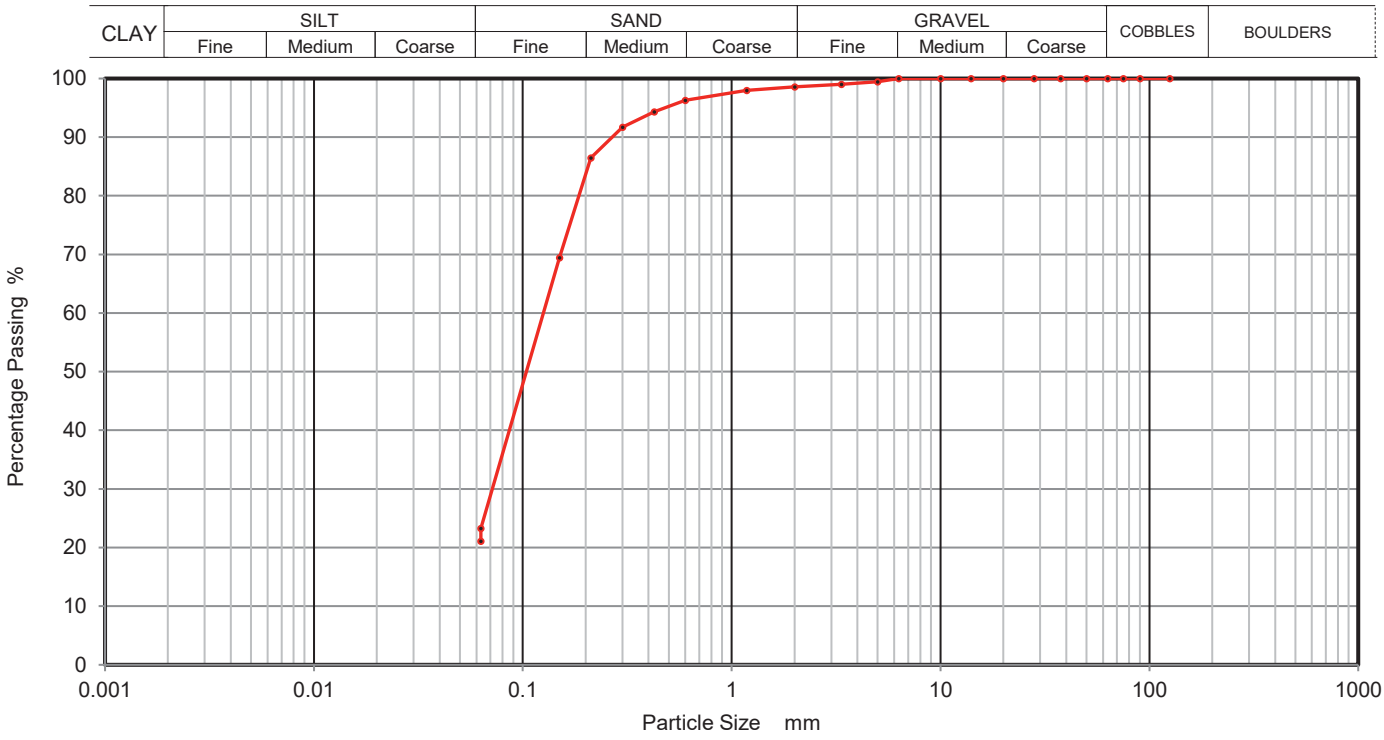
Remarks

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-C7-01
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	12
Soil Description	Brown slightly fine gravelly silty fine to coarse SAND	Depth Top	14.50
		Depth Base	14.95
		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	99		
3.35	99		
2	99		
1.18	98		
0.6	96		
0.425	94		
0.3	92		
0.212	86		
0.15	69		
0.063	23		

Sample Proportions	% dry mass
Cobbles	0
Gravel	1
Sand	76
Silt and Clay	23

Grading Analysis	
Uniformity Coefficient	

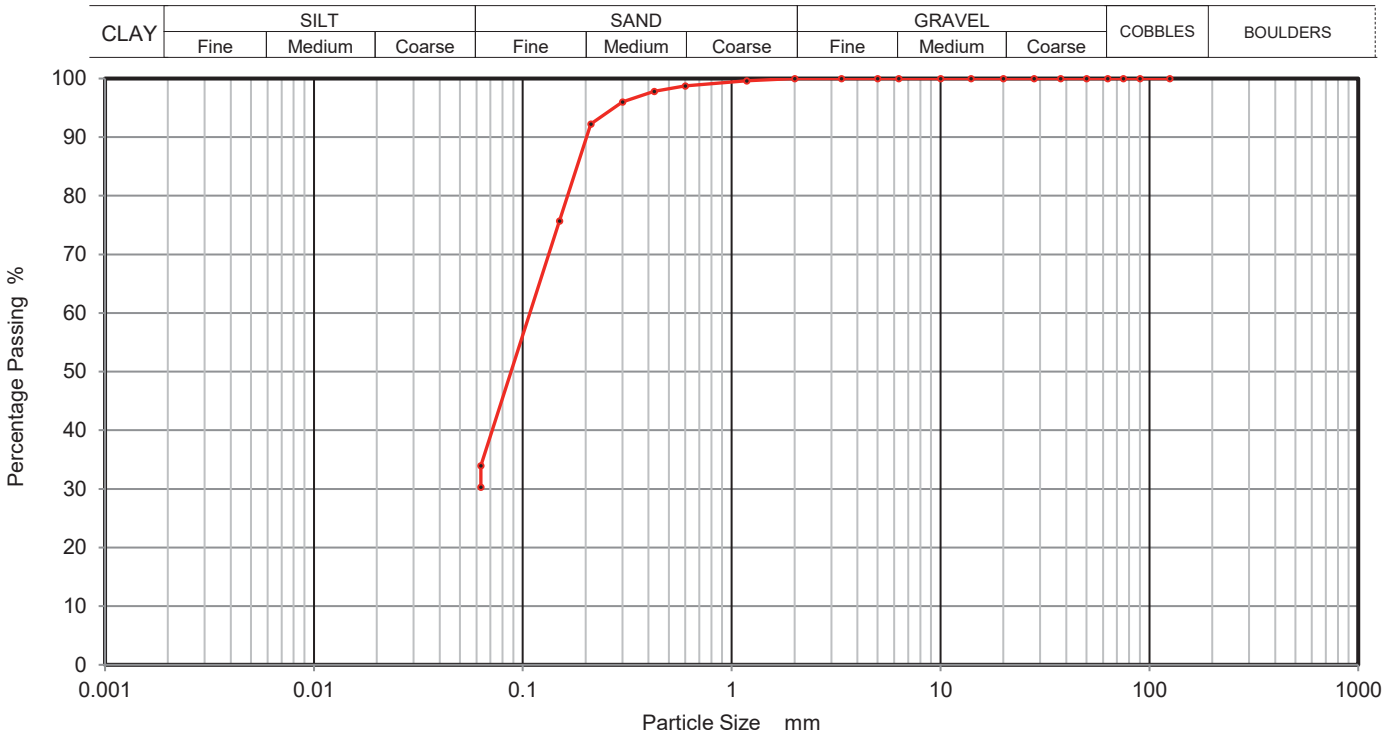
Remarks

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-C7-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	3
Soil Description	Brown silty fine to coarse SAND	Depth Top	1.50
		Depth Base	1.95
		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	99		
0.425	98		
0.3	96		
0.212	92		
0.15	76		
0.063	34		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	66
Silt and Clay	34

Grading Analysis	
Uniformity Coefficient	

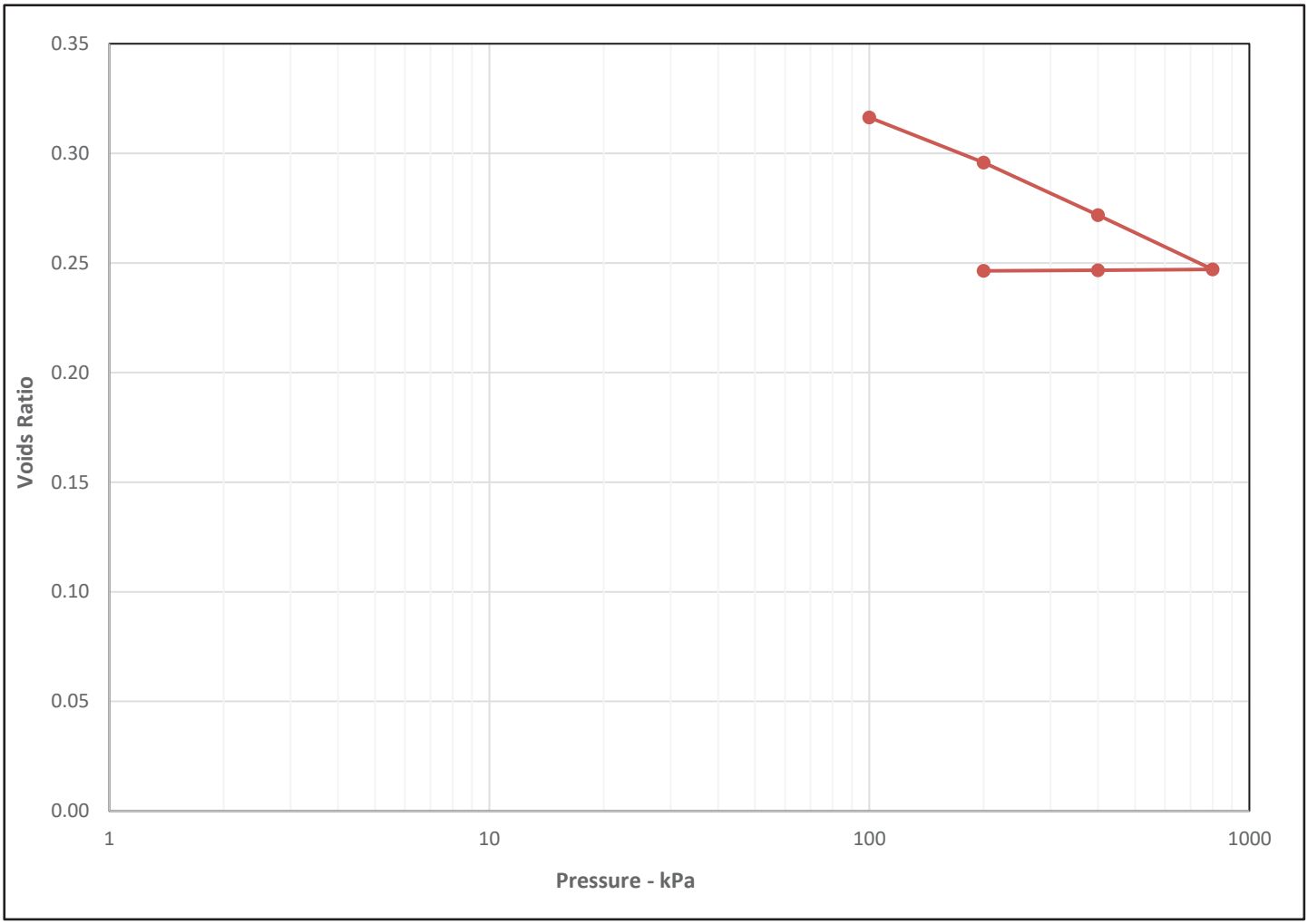
Remarks

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-C6-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Brown silty sandy CLAY	Depth Top (m)	7.00
		Depth Base (m)	7.45
Lab Temperature	20°c	Sample Location	Middle
Remarks	Cv Calculated Using T90	Sample Type	U

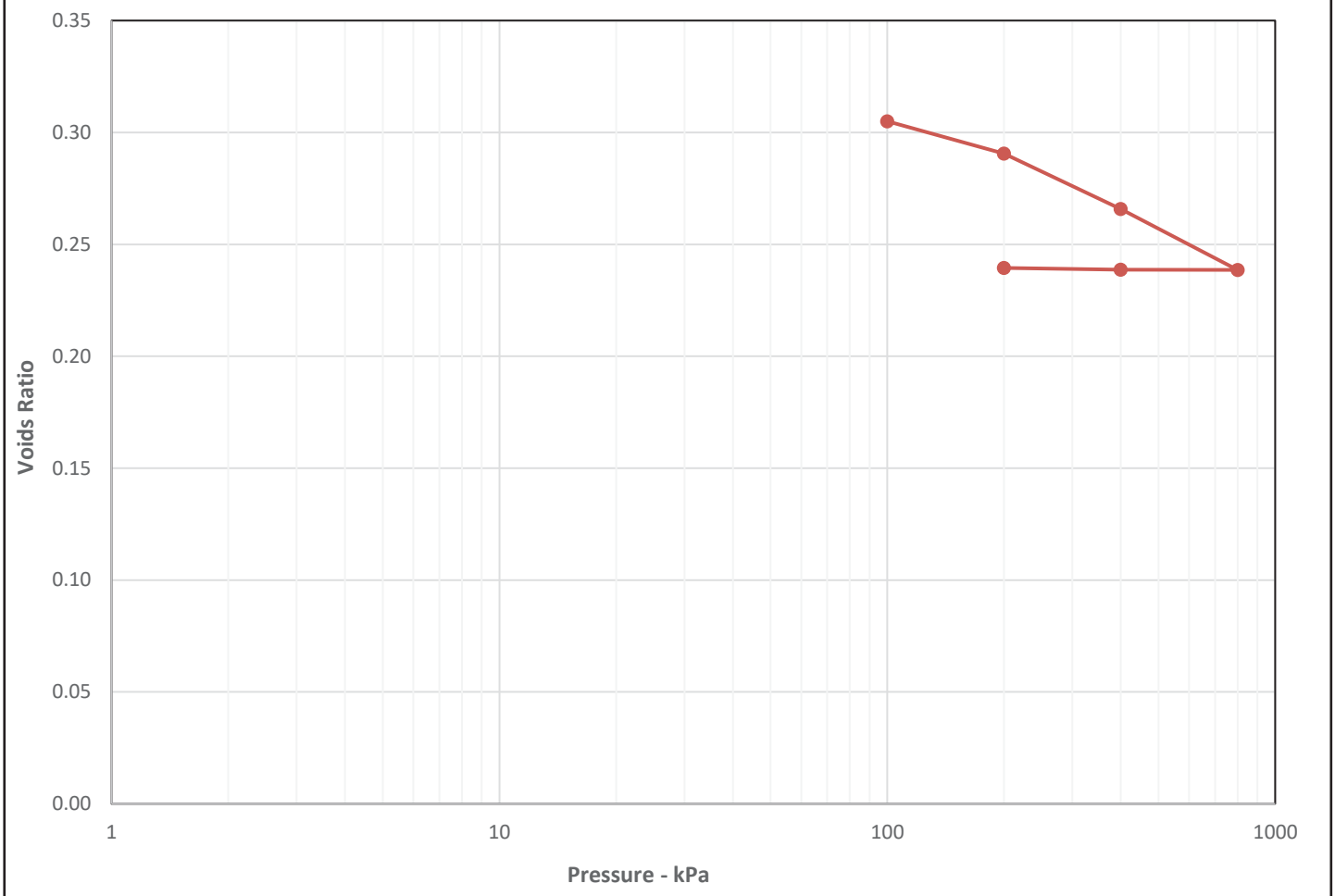


Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	18	0	-	100	0.6	5.8		-			
Bulk Density (Mg/m3)	2.24	100	-	200	0.16	6.1		-			
Dry Density (Mg/m3)	1.89	200	-	400	0.092	11		-			
Voids Ratio	0.3999	400	-	800	0.0	11		-			
Degree of saturation	122.2	800	-	400	-0.00099	26		-			
Height (mm)	19.83	400	-	200	-0.00085	10		-			
Diameter (mm)	74.9		-					-			
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-C7-01
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	2
Soil Description	Brown silty sandy CLAY	Depth Top (m)	10.00
		Depth Base (m)	10.45
Lab Temperature	20°c	Sample Location	Middle
Remarks	Cv Calculated Using T90	Sample Type	U

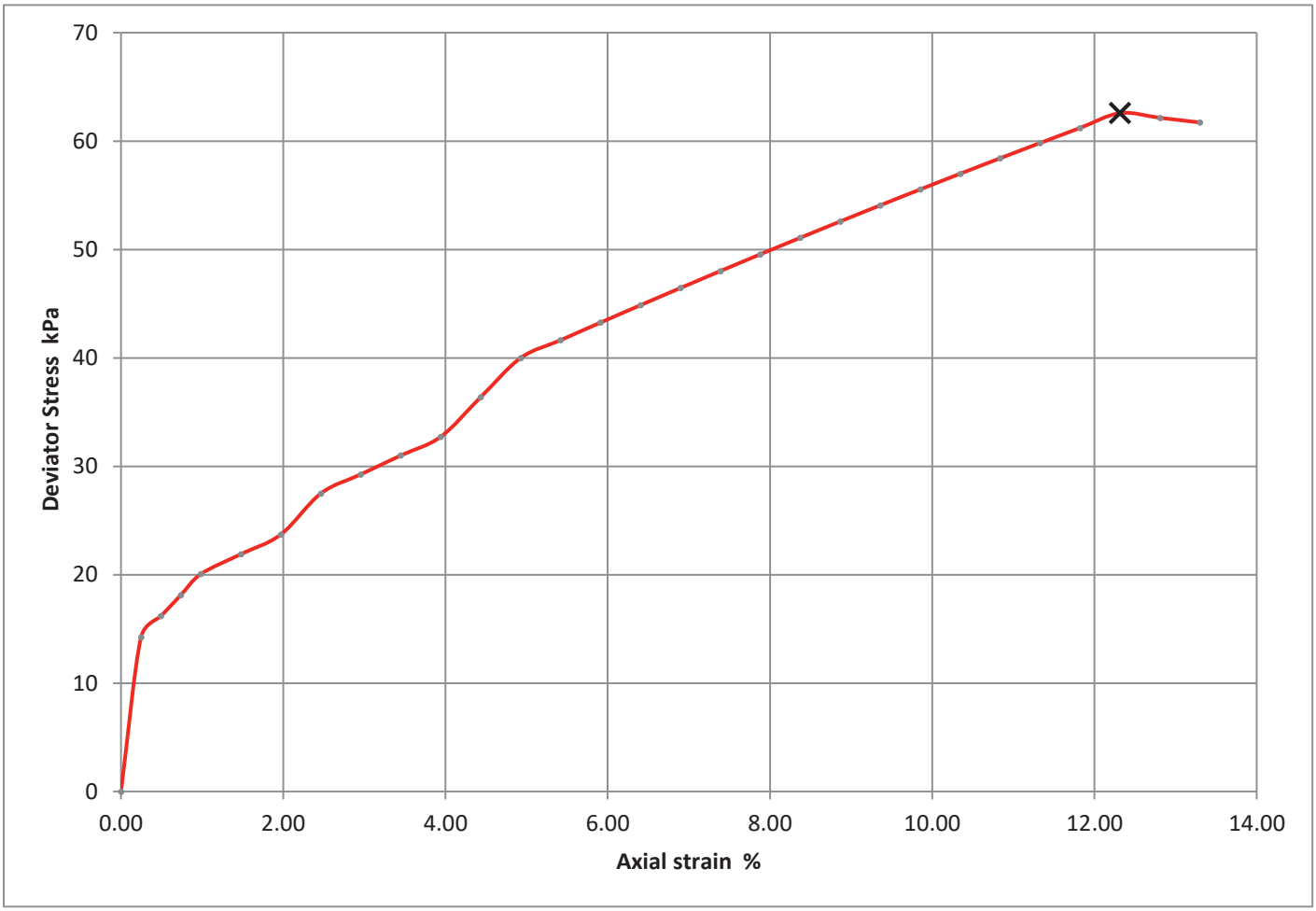


Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	17	0	-	100	0.63	3.5		-			
Bulk Density (Mg/m3)	2.23	100	-	200	0.11	6.1		-			
Dry Density (Mg/m3)	1.90	200	-	400	0.096	7.4		-			
Voids Ratio	0.3926	400	-	800	0.1	8.4		-			
Degree of saturation	116.8	800	-	400	0.00028	18		-			
Height (mm)	19.77	400	-	200	0.0028	5.6		-			
Diameter (mm)	74.91		-					-			
Particle Density (Mg/m3)	2.65		-					-			

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

UKAS TESTING 2788

GSTL	Single Stage Unconsolidated-Undrained Triaxial Test BS 1377 : 1990 Part 7 : 8	Contract Number	36525
		Borehole/Pit No.	BH17-C6-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Brown silty sandy CLAY	Depth Top (m)	7.00
		Depth Base (m)	7.45
		Sample Type	U



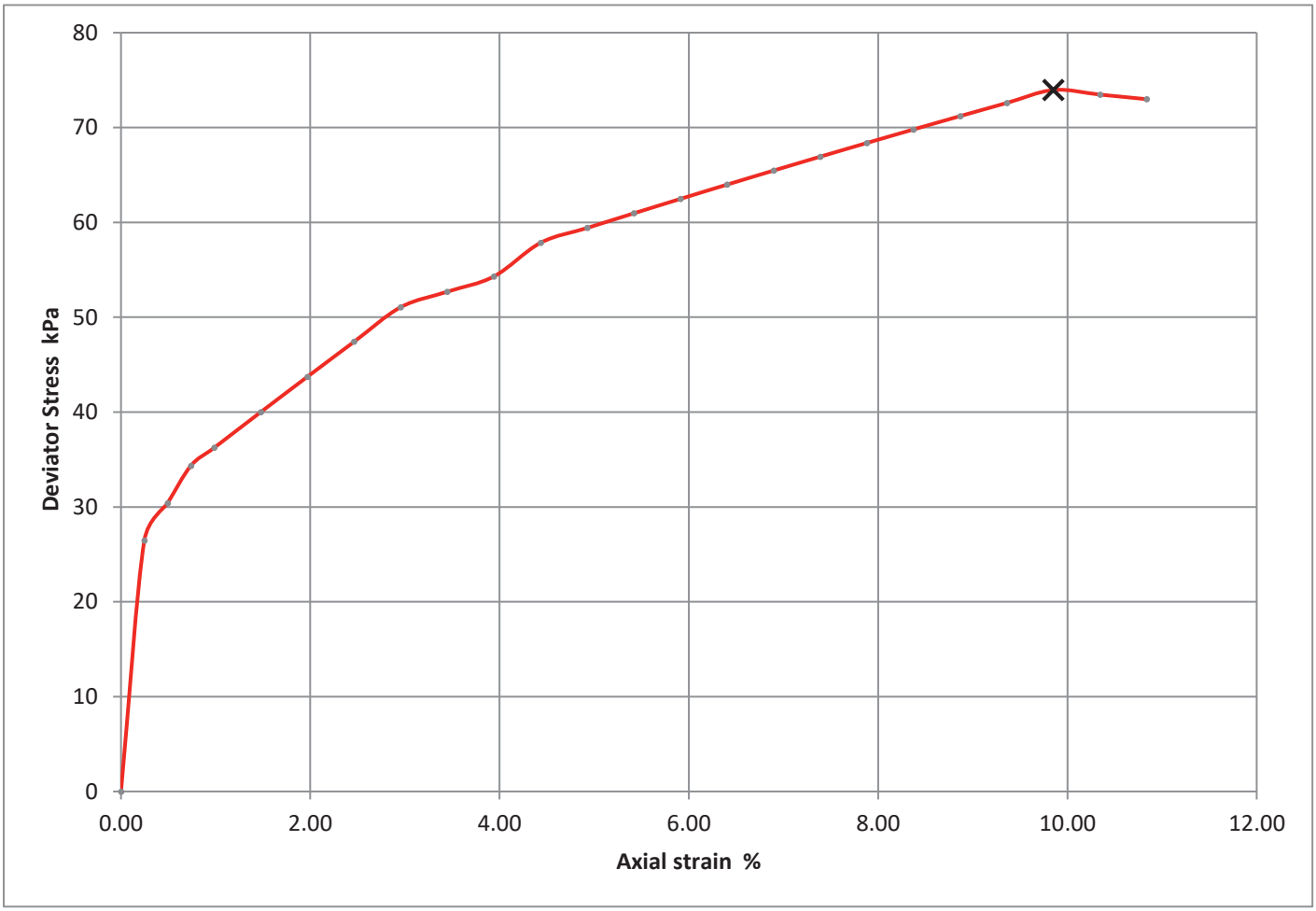
Moisture Content (%)	17
Bulk Density (Mg/m^3)	2.25
Dry Density (Mg/m^3)	1.92
Specimen Length (mm)	203
Specimen Diameter (mm)	102
Cell Pressure (kPa)	140
Deviator Stress (kPa)	63
Undrained Shear Strength (kPa)	31
Failure Strain (%)	12.3
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	3.00

Specimen Post Test	Sample Split
PICTURE NOT AVAILABLE	PICTURE NOT AVAILABLE

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

UKAS TESTING 2788

GSTL	Single Stage Unconsolidated-Undrained Triaxial Test BS 1377 : 1990 Part 7 : 8	Contract Number	36525
		Borehole/Pit No.	BH17-C7-01
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Brown fine to coarse gravelly silty CLAY	Depth Top (m)	7.00
		Depth Base (m)	7.45
		Sample Type	U



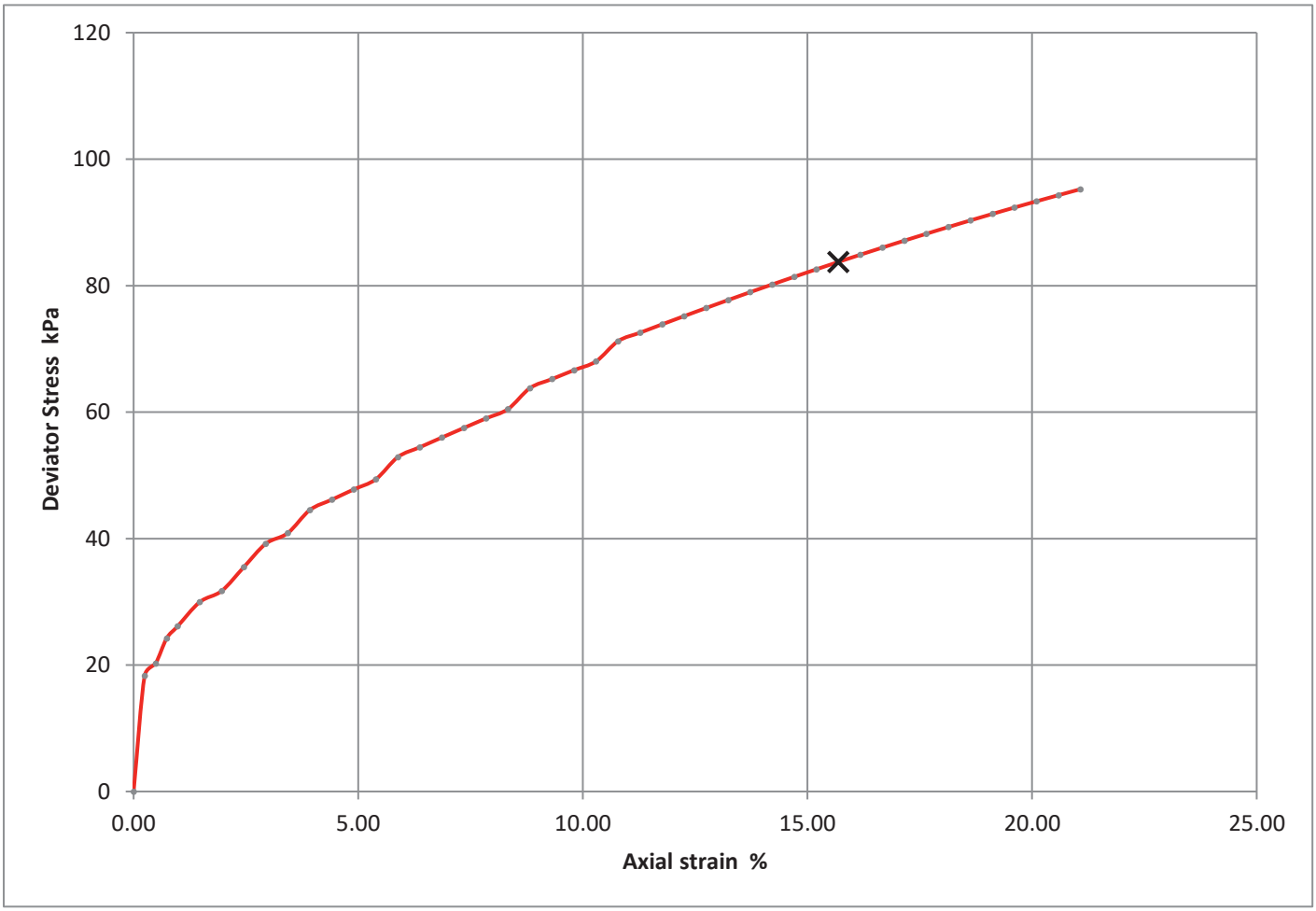
Moisture Content (%)	15
Bulk Density (Mg/m^3)	2.23
Dry Density (Mg/m^3)	1.94
Specimen Length (mm)	203
Specimen Diameter (mm)	102
Cell Pressure (kPa)	200
Deviator Stress (kPa)	74
Undrained Shear Strength (kPa)	37
Failure Strain (%)	9.9
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	3.00

Specimen Post Test	Sample Split
PICTURE NOT AVAILABLE	PICTURE NOT AVAILABLE

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

UKAS TESTING 2788

GSTL	Single Stage Unconsolidated-Undrained Triaxial Test BS 1377 : 1990 Part 7 : 8	Contract Number	36525
		Borehole/Pit No.	BH17-C7-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Grey/brown slightly sandy fine to medium gravelly silty CLAY	Depth Top (m)	7.00
		Depth Base (m)	7.45
		Sample Type	U



Moisture Content (%)	15
Bulk Density (Mg/m^3)	2.31
Dry Density (Mg/m^3)	2.01
Specimen Length (mm)	204
Specimen Diameter (mm)	102
Cell Pressure (kPa)	140
Deviator Stress (kPa)	84
Undrained Shear Strength (kPa)	42
Failure Strain (%)	15.7
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	3.00

Specimen Post Test	Sample Split
PICTURE NOT AVAILABLE	PICTURE NOT AVAILABLE

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

UKAS TESTING 2788

CONCEPT LIFE SCIENCES
DELIVER NO 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 1E 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 Advis

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

Soil Analysed as Soil
BRE SD1 (SE)

Concept Reference	**684646 008**	**684646 009**
Customer Sample Reference	**BH17-C6-01 D7 @ 5.00m**	**17-C7-03 D8 @ 6.50m**
Date Sampled	**Deviating**	**Deviating**
Matrix Class	**Sandy Soil**	**Clay**

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	**0.02**
Magnesium	T112	A40	1	mg/l	<1	**3**
(Water soluble) NO3	T710	A40	0.01	g/l	<0.01	<0.01
pH	T7	A40			**8.1**	**8.3**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	**0.02**	**0.03**
SO4(Total)	T102	A40	0.02	%	<0.02	**0.02**
Sulphur (total)	T6	A40	0.01	%	<0.01	**0.01**
Moisture @105C	T162	AR	0.1	%	**16**	**14**
Retained on 2mm	T2	A40	0.1	%	**2.3**	**2.4**

Index to symbols used in Supplement 1E 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

Supplement 1E Report reissued to include only samples 008 and 009
Retained on 2mm is removed before analysis
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

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	N	008-009
(Water soluble) Cl-	T710	A40	0.01	g/l	N	008-009
Magnesium	T112	A40	1	mg/l	N	008-009
(Water soluble) NO3	T710	A40	0.01	g/l	N	008-009
pH	T7	A40			M	008-009
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	M	008-009
SO4(Total)	T102	A40	0.02	%	M	008-009
Sulphur (total)	T6	A40	0.01	%	M	008-009
Moisture @105C	T162	AR	0.1	%	N	008-009
Retained on 2mm	T2	A40	0.1	%	N	008-009

APPENDIX F
Geoenvironmental Laboratory Test Results

Report References: 672447

674086

675177

CONCEPT LIFE SCIENCES

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 1C 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 Advis

[redacted]

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

Soil Analysed as Soil
Miscellaneous

				Concept Reference	**672447 026**	**672447 030**	**672447 034**	**672447 038**	**672447 042**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C6-04 ES2 @ 1.00m**	**BH17-C6-01 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**17-JUL-2017**	**18-JUL-2017**	**20-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Clay**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T257	A40	2	mg/kg	**8**	**7**	**10**	**9**	**8**
Barium	T257	A40	2	mg/kg	**41**	**33**	**38**	**32**	**25**
Beryllium	T245	A40	0.5	mg/kg	<0.5	<0.5	**0.7**	<0.5	**0.5**
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	**13**	**12**	**19**	**13**	**11**
Copper	T257	A40	2	mg/kg	**11**	**7**	**14**	**7**	**8**
Lead	T257	A40	2	mg/kg	**27**	**14**	**12**	**9**	**8**
Mercury	T245	A40	1.0	mg/kg	**1.3**	<1.0	<1.0	<1.0	<1.0
Nickel	T257	A40	0.5	mg/kg	**9.1**	**9.0**	**17**	**10**	**9.6**
Selenium	T257	A40	3	mg/kg	<3	<3	<3	<3	<3
Vanadium	T257	A40	0.1	mg/kg	**19**	**19**	**31**	**20**	**18**
Zinc	T257	A40	2	mg/kg	**32**	**27**	**37**	**24**	**24**
Soil Organic Matter	T287	A40	0.1	%	**1.4**	**0.9**	-	-	**0.2**
Moisture @105C	T162	AR	0.1	%	**8.8**	**7.1**	**15**	**3.7**	**16**
Retained on 2mm	T2	A40	0.1	%	**1.0**	**5.5**	**8.1**	**6.5**	**1.3**

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

Soil Analysed as Soil
Miscellaneous

				Concept Reference	**672447 054**	**672447 066**	**672447 074**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**	**BH17-C7-04 ES2 @ 1.00m**	**BH17-C7-01 ES2 @ 1.00m**
				Date Sampled	**25-JUL-2017**	**24-JUL-2017**	**27-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Arsenic	T257	A40	2	mg/kg	**10**	**5**	**3**
Barium	T257	A40	2	mg/kg	**29**	**23**	**14**
Beryllium	T245	A40	0.5	mg/kg	<0.5	<0.5	<0.5
Boron (water-soluble)	T82	A40	1	mg/kg	<1	<1	<1
Cadmium	T257	A40	0.1	mg/kg	<0.1	<0.1	<0.1
Chromium	T257	A40	0.5	mg/kg	**33**	**6.1**	**5.9**
Copper	T257	A40	2	mg/kg	**8**	**3**	**3**
Lead	T257	A40	2	mg/kg	**10**	**4**	**4**
Mercury	T245	A40	1.0	mg/kg	<1.0	<1.0	<1.0
Nickel	T257	A40	0.5	mg/kg	**11**	**5.1**	**5.6**
Selenium	T257	A40	3	mg/kg	<3	<3	<3
Vanadium	T257	A40	0.1	mg/kg	**20**	**13**	**8.6**
Zinc	T257	A40	2	mg/kg	**25**	**12**	**11**
Soil Organic Matter	T287	A40	0.1	%	**0.5**	-	-
Moisture @105C	T162	AR	0.1	%	**7.5**	**6.0**	**5.0**
Retained on 2mm	T2	A40	0.1	%	**40.6**	**2.6**	<0.1

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

Soil Analysed as Soil
Asbestos

	Concept Reference	672447 025	672447 029	672447 041	672447 053
	Customer Sample Reference	BH17-C6-03 ES1 @ 0.50m	BH17-C6-02 ES1 @ 0.50m	BH17-C7-03 ES1 @ 0.50m	BH17-C7-02 ES1 @ 0.50m
	Date Sampled	14-JUL-2017	13-JUL-2017	20-JUL-2017	25-JUL-2017
Determinand	Method / Test Sample / LOD / Units				
Asbestos ID	T27 / A40	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)

Determinand	Method	Test Sample	LOD	Units	672447 026 BH17-C6-03 ES2 @ 1.00m	672447 030 BH17-C6-02 ES2 @ 1.00m	672447 042 BH17-C7-03 ES2 @ 1.00m	672447 054 BH17-C7-02 ES2 @ 1.00m
Date Sampled					14-JUL-2017	13-JUL-2017	20-JUL-2017	25-JUL-2017
Matrix Class					Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil
Naphthalene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Phenanthrene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Anthracene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluoranthene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Pyrene	T16	AR	0.1	mg/kg	<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
Chrysene	T16	AR	0.1	mg/kg	<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
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	<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
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	<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
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
PAH(total)	T16	AR	0.1	mg/kg	<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 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Benzene	T209	AR	10	µg/kg	<10	<10	<10	<10
Toluene	T209	AR	10	µg/kg	<10	<10	<10	<10
EthylBenzene	T209	AR	10	µg/kg	<10	<10	<10	<10
M/P Xylene	T209	AR	10	µg/kg	<10	<10	<10	<10
O Xylene	T209	AR	10	µg/kg	<10	<10	<10	<10
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	<10	<10	<10	<10
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	<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
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	<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
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	<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
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	**2**	<2	<2	<2
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	**2**	<2	<2	<2
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (Aliphatic+Aromatic) C10-C25 (Sum)	T85	AR	4	mg/kg	(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

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

Soil Analysed as Soil
Organochlorine insecticides

				Concept Reference	**672447 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	T1	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Heptachlor	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Aldrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Heptachlor epoxide	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Chlordane	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Endosulphan	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
DDE	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Dieldrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Endrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
DDD	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
DDT	T16	AR	0.01	mg/kg	<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 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Dichlorvos	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Mevinphos	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Dimethoate	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Diazinon	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Pirimiphos methyl	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Malathion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Fenitrothion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Parathion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Azinphos methyl	T16	AR	0.01	mg/kg	<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 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
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
Atrazine	T16	AR	0.01	mg/kg	(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
Trietazine	T16	AR	0.01	mg/kg	(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
Terbutryn	T16	AR	0.01	mg/kg	(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 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Chlorotoluron	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Diuron	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Isoproturon	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Linuron	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Monuron	T310	AR	0.01	mg/kg	<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 026	672447 030	672447 042	672447 054
	Customer Sample Reference	BH17-C6-03 ES2 @ 1.00m	BH17-C6-02 ES2 @ 1.00m	BH17-C7-03 ES2 @ 1.00m	BH17-C7-02 ES2 @ 1.00m
	Date Sampled	14-JUL-2017	13-JUL-2017	20-JUL-2017	25-JUL-2017
	Matrix Class	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil

Determinand	Method	Test Sample	LOD	Units				
Mecoprop	T16	AR	0.01	mg/kg	<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
Dichlorprop	T16	AR	0.01	mg/kg	<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
Fenoprop	T16	AR	0.01	mg/kg	(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

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

Soil Analysed as Soil
Phenols (Speciated)

	Concept Reference	672447 026	672447 030	672447 042	672447 054
	Customer Sample Reference	BH17-C6-03 ES2 @ 1.00m	BH17-C6-02 ES2 @ 1.00m	BH17-C7-03 ES2 @ 1.00m	BH17-C7-02 ES2 @ 1.00m
	Date Sampled	14-JUL-2017	13-JUL-2017	20-JUL-2017	25-JUL-2017
	Matrix Class	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil

Determinand	Method	Test Sample	LOD	Units				
Resorcinol	T17	AR	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05
Catechol	T17	AR	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05
Phenol	T17	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Cresols	T17	AR	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05
Xylenols	T17	AR	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05
Naphthols	T17	AR	0.05	mg/kg	<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
Total Phenols	T17	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1

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

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

Notes

026, 030, 042, 054, - 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 - 026, 030, 042 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
Supplement 1C report reissued to include only samples 025, 026, 029, 030, 034, 038, 041, 042, 053, 054, 066 and 074
TPH, PAH & BTEX - 026, 030 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
OCP, OPP and PAAH analysis transferred to Concept Life Sciences Manchester
Speciated phenols - 026, 030, 042, 054- These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
Asbestos subcontracted to REC Limited
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except TPH c5-c35 aro/ali split, Urons, Triazines, OCP/OPP and PAAH
Retained on 2mm is removed before analysis

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Arsenic	T257	A40	2	mg/kg	M	026,030,034,038,042,054,066,074
Barium	T257	A40	2	mg/kg	U	026,030,034,038,042,054,066,074
Beryllium	T245	A40	0.5	mg/kg	U	026,030,034,038,042,054,066,074
Boron (water-soluble)	T82	A40	1	mg/kg	N	026,030,034,038,042,054,066,074
Cadmium	T257	A40	0.1	mg/kg	M	026,030,034,038,042,054,066,074
Chromium	T257	A40	0.5	mg/kg	M	026,030,034,038,042,054,066,074
Copper	T257	A40	2	mg/kg	M	026,030,034,038,042,054,066,074
Lead	T257	A40	2	mg/kg	M	026,030,034,038,042,054,066,074
Mercury	T245	A40	1.0	mg/kg	U	026,030,034,038,042,054,066,074
Nickel	T257	A40	0.5	mg/kg	M	026,030,034,038,042,054,066,074
Selenium	T257	A40	3	mg/kg	U	026,030,034,038,042,054,066,074
Vanadium	T257	A40	0.1	mg/kg	U	026,030,034,038,042,054,066,074
Zinc	T257	A40	2	mg/kg	M	026,030,034,038,042,054,066,074
Soil Organic Matter	T287	A40	0.1	%	N	026,030,042,054
Moisture @105C	T162	AR	0.1	%	N	026,030,034,038,042,054,066,074
Retained on 2mm	T2	A40	0.1	%	N	026,030,034,038,042,054,066,074
Asbestos ID	T27	A40			SU	025,029,041,053
Naphthalene	T16	AR	0.1	mg/kg	U	026,030,042,054
Acenaphthylene	T16	AR	0.1	mg/kg	U	026,030,042,054
Acenaphthene	T16	AR	0.1	mg/kg	M	026,030,042,054
Fluorene	T16	AR	0.1	mg/kg	M	026,030,042,054
Phenanthrene	T16	AR	0.1	mg/kg	U	026,030,042,054
Anthracene	T16	AR	0.1	mg/kg	M	026,030,042,054
Fluoranthene	T16	AR	0.1	mg/kg	N	026,030,042,054
Pyrene	T16	AR	0.1	mg/kg	N	026,030,042,054
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	M	026,030,042,054
Chrysene	T16	AR	0.1	mg/kg	M	026,030,042,054
Benzo(b)fluoranthene	T16	AR	0.1	mg/kg	U	026,030,042,054
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	N	026,030,042,054
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	M	026,030,042,054
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	M	026,030,042,054
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	M	026,030,042,054
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	M	026,030,042,054
PAH(total)	T16	AR	0.1	mg/kg	U	026,030,042,054
Benzene	T209	AR	10	µg/kg	M	026,030,042,054
Toluene	T209	AR	10	µg/kg	M	026,030,042,054
EthylBenzene	T209	AR	10	µg/kg	M	026,030,042,054
M/P Xylene	T209	AR	10	µg/kg	M	026,030,042,054
O Xylene	T209	AR	10	µg/kg	M	026,030,042,054
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	U	026,030,042,054
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	N	026,030,042,054

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (Aliphatic+Aromatic) C10-C25 (Sum)	T85	AR	4	mg/kg	N	026,030,042,054
TPH (Aliphatic+Aromatic) C25-C40 (Sum)	T85	AR	4	mg/kg	N	026,030,042,054
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	U	026,030,042,054
Hexachlorobenzene	T1	AR	0.01	mg/kg	U	026,030,042,054
Heptachlor	T16	AR	0.01	mg/kg	U	026,030,042,054
Aldrin	T16	AR	0.01	mg/kg	U	026,030,042,054
Heptachlor epoxide	T16	AR	0.01	mg/kg	U	026,030,042,054
Chlordane	T16	AR	0.01	mg/kg	U	026,030,042,054
Endosulphan	T16	AR	0.01	mg/kg	U	026,030,042,054
DDE	T16	AR	0.01	mg/kg	U	026,030,042,054
Dieldrin	T16	AR	0.01	mg/kg	U	026,030,042,054
Endrin	T16	AR	0.01	mg/kg	U	026,030,042,054
DDD	T16	AR	0.01	mg/kg	U	026,030,042,054
DDT	T16	AR	0.01	mg/kg	U	026,030,042,054
Dichlorvos	T16	AR	0.01	mg/kg	U	026,030,042,054
Mevinphos	T16	AR	0.01	mg/kg	U	026,030,042,054
Dimethoate	T16	AR	0.01	mg/kg	U	026,030,042,054
Diazinon	T16	AR	0.01	mg/kg	U	026,030,042,054
Pirimiphos methyl	T16	AR	0.01	mg/kg	U	026,030,042,054
Malathion	T16	AR	0.01	mg/kg	U	026,030,042,054
Fenitrothion	T16	AR	0.01	mg/kg	U	026,030,042,054
Parathion	T16	AR	0.01	mg/kg	U	026,030,042,054
Azinphos methyl	T16	AR	0.01	mg/kg	U	026,030,042,054
Simazine	T16	AR	0.01	mg/kg	N	026,030,042,054
Atrazine	T16	AR	0.01	mg/kg	N	026,030,042,054
Propazine	T16	AR	0.01	mg/kg	N	026,030,042,054
Trietazine	T16	AR	0.01	mg/kg	N	026,030,042,054
Prometryn	T16	AR	0.01	mg/kg	N	026,030,042,054
Terbutryn	T16	AR	0.01	mg/kg	N	026,030,042,054
Chlorotoluron	T310	AR	0.01	mg/kg	N	026,030,042,054
Diuron	T310	AR	0.01	mg/kg	N	026,030,042,054
Isoproturon	T310	AR	0.01	mg/kg	N	026,030,042,054
Linuron	T310	AR	0.01	mg/kg	N	026,030,042,054
Monuron	T310	AR	0.01	mg/kg	N	026,030,042,054
Mecoprop	T16	AR	0.01	mg/kg	N	026,030,042,054
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	N	026,030,042,054
Dichlorprop	T16	AR	0.01	mg/kg	N	026,030,042,054
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	N	026,030,042,054
Fenoprop	T16	AR	0.01	mg/kg	N	026,030,042,054
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	N	026,030,042,054
Resorcinol	T17	AR	0.05	mg/kg	M	026,030,042,054
Catechol	T17	AR	0.05	mg/kg	N	026,030,042,054
Phenol	T17	AR	0.1	mg/kg	M	026,030,042,054
Cresols	T17	AR	0.05	mg/kg	M	026,030,042,054
Xylenols	T17	AR	0.05	mg/kg	M	026,030,042,054
Naphthols	T17	AR	0.05	mg/kg	N	026,030,042,054
Trimethyl phenol	T17	AR	0.05	mg/kg	M	026,030,042,054
Total Phenols	T17	AR	0.1	mg/kg	N	026,030,042,054

CONCEPT LIFE SCIENCES
DELIVER NO 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 1C to Report Number 674086-1

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-001839
Customer Site Reference: Norfolk Vanguard Cable Route
Date Job Received at Concept: 08-Aug-2017
Date Analysis Started: 09-Aug-2017
Date Analysis Completed: 22-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: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
CLEA metals, Braintree

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Arsenic	T257	A40	2	mg/kg	**43**
Barium	T257	A40	2	mg/kg	**75**
Beryllium	T245	A40	0.5	mg/kg	**1.1**
Boron (water-soluble)	T82	A40	1	mg/kg	<1
Cadmium	T257	A40	0.1	mg/kg	**0.2**
Chromium	T257	A40	0.5	mg/kg	**23**
Copper	T257	A40	2	mg/kg	**13**
Lead	T257	A40	2	mg/kg	**14**
Mercury	T245	A40	1.0	mg/kg	<1.0
Nickel	T257	A40	0.5	mg/kg	**26**
Selenium	T257	A40	3	mg/kg	<3
Vanadium	T257	A40	0.1	mg/kg	**47**
Zinc	T257	A40	2	mg/kg	**45**
Soil Organic Matter	T287	A40	0.1	%	**0.2**
Moisture @105C	T162	AR	0.1	%	**15**
Retained on 2mm	T2	A40	0.1	%	**3.3**

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Asbestos

				Concept Reference	**674086 013**
				Customer Sample Reference	**BH17-C7-02 ES1 @ 0.50m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Asbestos ID	T27	A40			Asbestos not detected

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

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

Concept Reference	**674086 014**
Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
Date Sampled	**27-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
Naphthalene	T16	AR	0.1	mg/kg	<0.1
Acenaphthylene	T16	AR	0.1	mg/kg	<0.1
Acenaphthene	T16	AR	0.1	mg/kg	<0.1
Fluorene	T16	AR	0.1	mg/kg	<0.1
Phenanthrene	T16	AR	0.1	mg/kg	<0.1
Anthracene	T16	AR	0.1	mg/kg	<0.1
Fluoranthene	T16	AR	0.1	mg/kg	**0.1**
Pyrene	T16	AR	0.1	mg/kg	**0.1**
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	<0.1
Chrysene	T16	AR	0.1	mg/kg	<0.1
Benzo(b)fluoranthene	T16	AR	0.1	mg/kg	<0.1
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	**0.1**
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	**0.1**
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	<0.1
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	<0.1
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	<0.1
PAH(total)	T16	AR	0.1	mg/kg	**0.5**

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
TPH CWG

Concept Reference	**674086 014**
Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
Date Sampled	**27-JUL-2017**
Matrix Class	**Clay**

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

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Phenols (Speciated)

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Resorcinol	T17	AR	0.05	mg/kg	<0.05
Catechol	T17	AR	0.05	mg/kg	<0.05
Phenol	T17	AR	0.1	mg/kg	<0.1
Cresols	T17	AR	0.05	mg/kg	<0.05
Xylenols	T17	AR	0.05	mg/kg	<0.05
Naphthols	T17	AR	0.05	mg/kg	<0.05
Trimethyl phenol	T17	AR	0.05	mg/kg	<0.05
Total Phenols	T17	AR	0.1	mg/kg	<0.1

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Organochlorine insecticides

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	<0.01
Hexachlorobenzene	T1	AR	0.01	mg/kg	<0.01
Heptachlor	T16	AR	0.01	mg/kg	(131) <0.01
Aldrin	T16	AR	0.01	mg/kg	<0.01
Heptachlor epoxide	T16	AR	0.01	mg/kg	<0.01
Chlordane	T16	AR	0.01	mg/kg	<0.01
Endosulphan	T16	AR	0.01	mg/kg	<0.01
DDE	T16	AR	0.01	mg/kg	<0.01
Dieldrin	T16	AR	0.01	mg/kg	<0.01
Endrin	T16	AR	0.01	mg/kg	<0.01
DDD	T16	AR	0.01	mg/kg	<0.01
DDT	T16	AR	0.01	mg/kg	(131) <0.01

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Organophosphorous insecticides

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Dichlorvos	T16	AR	0.01	mg/kg	<0.01
Mevinphos	T16	AR	0.01	mg/kg	<0.01
Dimethoate	T16	AR	0.01	mg/kg	<0.01
Diazinon	T16	AR	0.01	mg/kg	<0.01
Pirimiphos methyl	T16	AR	0.01	mg/kg	<0.01
Malathion	T16	AR	0.01	mg/kg	<0.01
Fenitrothion	T16	AR	0.01	mg/kg	<0.01
Parathion	T16	AR	0.01	mg/kg	<0.01
Azinphos methyl	T16	AR	0.01	mg/kg	<0.01

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Triazines Suite

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Simazine	T16	AR	0.01	mg/kg	(64) <0.01
Atrazine	T16	AR	0.01	mg/kg	(64) <0.01
Propazine	T16	AR	0.01	mg/kg	(64) <0.01
Trietazine	T16	AR	0.01	mg/kg	(64) <0.01
Prometryn	T16	AR	0.01	mg/kg	(64) <0.01
Terbutryn	T16	AR	0.01	mg/kg	(64) <0.01

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Urons

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Chlorotoluron	T310	AR	0.01	mg/kg	<0.01
Diuron	T310	AR	0.01	mg/kg	<0.01
Isoproturon	T310	AR	0.01	mg/kg	<0.01
Linuron	T310	AR	0.01	mg/kg	<0.01
Monuron	T310	AR	0.01	mg/kg	<0.01

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Phenoxy Acetic acid herbicides

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Mecoprop	T16	AR	0.01	mg/kg	(100) <0.05
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	(100) <0.05
Dichlorprop	T16	AR	0.01	mg/kg	(100) <0.05
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	(100) <0.05
Fenoprop	T16	AR	0.01	mg/kg	(100) <0.05
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	(100) <0.05

Index to symbols used in Supplement 1C to Report Number 674086-1

Value	Description
A40	Assisted dried < 40C
AR	As Received
131	Result is outside of the scope of accreditation due to a QC Failure
100	LOD determined by sample aliquot used for analysis
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
Retained on 2mm is removed before analysis
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except TPH c5-c40 aro/ali split, OCP, OPP and PAAH
Triazines & Urons analysis transferred to Concept Life Sciences Cambridge
OCP, OPP and PAAH analysis transferred to Concept Life Sciences Manchester
Supplement 1C Report reissued to include only samples 013 and 014

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Arsenic	T257	A40	2	mg/kg	M	014
Barium	T257	A40	2	mg/kg	U	014
Beryllium	T245	A40	0.5	mg/kg	U	014
Boron (water-soluble)	T82	A40	1	mg/kg	N	014
Cadmium	T257	A40	0.1	mg/kg	M	014
Chromium	T257	A40	0.5	mg/kg	M	014
Copper	T257	A40	2	mg/kg	M	014
Lead	T257	A40	2	mg/kg	M	014
Mercury	T245	A40	1.0	mg/kg	U	014
Nickel	T257	A40	0.5	mg/kg	M	014
Selenium	T257	A40	3	mg/kg	U	014
Vanadium	T257	A40	0.1	mg/kg	U	014
Zinc	T257	A40	2	mg/kg	M	014
Soil Organic Matter	T287	A40	0.1	%	N	014
Moisture @105C	T162	AR	0.1	%	N	014
Retained on 2mm	T2	A40	0.1	%	N	014
Asbestos ID	T27	A40			SU	013
Naphthalene	T16	AR	0.1	mg/kg	U	014
Acenaphthylene	T16	AR	0.1	mg/kg	U	014
Acenaphthene	T16	AR	0.1	mg/kg	M	014
Fluorene	T16	AR	0.1	mg/kg	M	014
Phenanthrene	T16	AR	0.1	mg/kg	U	014
Anthracene	T16	AR	0.1	mg/kg	M	014
Fluoranthene	T16	AR	0.1	mg/kg	N	014
Pyrene	T16	AR	0.1	mg/kg	N	014
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	M	014
Chrysene	T16	AR	0.1	mg/kg	M	014
Benzo(b)fluoranthene	T16	AR	0.1	mg/kg	U	014
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	N	014
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	M	014
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	M	014
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	M	014
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	M	014

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
PAH(total)	T16	AR	0.1	mg/kg	U	014
Benzene	T209	AR	10	µg/kg	M	014
Toluene	T209	AR	10	µg/kg	M	014
EthylBenzene	T209	AR	10	µg/kg	M	014
M/P Xylene	T209	AR	10	µg/kg	M	014
O Xylene	T209	AR	10	µg/kg	M	014
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	U	014
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	N	014
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	N	014
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	N	014
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	N	014
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	N	014
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	N	014
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	N	014
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	N	014
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	N	014
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	N	014
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	N	014
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	N	014
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	N	014
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	N	014
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	N	014
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	N	014
TPH (Aliphatic+Aromatic) C10-C25 (Sum)	T85	AR	4	mg/kg	N	014
TPH (Aliphatic+Aromatic) C25-C40 (Sum)	T85	AR	4	mg/kg	N	014
Resorcinol	T17	AR	0.05	mg/kg	M	014
Catechol	T17	AR	0.05	mg/kg	N	014
Phenol	T17	AR	0.1	mg/kg	M	014
Cresols	T17	AR	0.05	mg/kg	M	014
Xylenols	T17	AR	0.05	mg/kg	M	014
Naphthols	T17	AR	0.05	mg/kg	N	014
Trimethyl phenol	T17	AR	0.05	mg/kg	M	014
Total Phenols	T17	AR	0.1	mg/kg	N	014
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	U	014
Hexachlorobenzene	T1	AR	0.01	mg/kg	U	014
Heptachlor	T16	AR	0.01	mg/kg	U	014
Aldrin	T16	AR	0.01	mg/kg	U	014
Heptachlor epoxide	T16	AR	0.01	mg/kg	U	014
Chlordane	T16	AR	0.01	mg/kg	U	014
Endosulphan	T16	AR	0.01	mg/kg	U	014
DDE	T16	AR	0.01	mg/kg	U	014
Dieldrin	T16	AR	0.01	mg/kg	U	014
Endrin	T16	AR	0.01	mg/kg	U	014
DDD	T16	AR	0.01	mg/kg	U	014
DDT	T16	AR	0.01	mg/kg	U	014
Dichlorvos	T16	AR	0.01	mg/kg	U	014
Mevinphos	T16	AR	0.01	mg/kg	U	014
Dimethoate	T16	AR	0.01	mg/kg	U	014
Diazinon	T16	AR	0.01	mg/kg	U	014
Pirimiphos methyl	T16	AR	0.01	mg/kg	U	014
Malathion	T16	AR	0.01	mg/kg	U	014
Fenitrothion	T16	AR	0.01	mg/kg	U	014
Parathion	T16	AR	0.01	mg/kg	U	014
Azinphos methyl	T16	AR	0.01	mg/kg	U	014
Simazine	T16	AR	0.01	mg/kg	N	014
Atrazine	T16	AR	0.01	mg/kg	N	014
Propazine	T16	AR	0.01	mg/kg	N	014
Trietazine	T16	AR	0.01	mg/kg	N	014
Prometryn	T16	AR	0.01	mg/kg	N	014
Terbutryn	T16	AR	0.01	mg/kg	N	014
Chlorotoluron	T310	AR	0.01	mg/kg	N	014
Diuron	T310	AR	0.01	mg/kg	N	014
Isoproturon	T310	AR	0.01	mg/kg	N	014
Linuron	T310	AR	0.01	mg/kg	N	014
Monuron	T310	AR	0.01	mg/kg	N	014
Mecoprop	T16	AR	0.01	mg/kg	N	014
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	N	014
Dichlorprop	T16	AR	0.01	mg/kg	N	014
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	N	014
Fenoprop	T16	AR	0.01	mg/kg	N	014

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	N	014

CONCEPT LIFE SCIENCES

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

Concept Life Sciences

Certificate of Analysis

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

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

Date of Report: 16-Oct-2017

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

Customer Contact: Mr Derek Daniels

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

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

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

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

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

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

UKAS TESTING
1549

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

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

Issued by :
Aislinn Arthey
Customer Service A

Waste Acceptance Criteria

Customer Sample Reference : BH17-C6-03 ES2 @ 1.00m
SAL Sample Reference : 672447 026
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 14-JUL-2017
Matrix Class : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	7.3		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	2.9			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.8	3.0	5.0	6.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	8.8			
Retained on 2mm	Grav	0.1	%	N	1.0			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0069	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.074	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	87	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.041	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	51	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	5.2	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.014	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	55	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	250	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.055	4.0	50.0	200.0

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

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

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

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

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

Waste Acceptance Criteria

Customer Sample Reference : BH17-C6-02 ES2 @ 1.00m
SAL Sample Reference : 672447 030
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 13-JUL-2017
Matrix Class : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	7.5		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	2.3			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.5	3.0	5.0	6.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	7.1			
Retained on 2mm	Grav	0.1	%	N	5.5			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0063	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.023	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	45	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.050	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	60	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	6.4	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	39	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	160	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.077	4.0	50.0	200.0

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

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

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

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

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

Waste Acceptance Criteria

Customer Sample Reference : BH17-C7-03 ES2 @ 1.00m
SAL Sample Reference : 672447 042
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 20-JUL-2017
Matrix Class : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	8.2		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	1.3			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.1	3.0	5.0	6.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	16			
Retained on 2mm	Grav	0.1	%	N	1.3			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.013	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.14	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	320	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.011	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.084	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	62	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	5.1	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	0.0067	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.020	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.013	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	110	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	1300	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.050	4.0	50.0	200.0

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

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

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

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

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

Waste Acceptance Criteria

Customer Sample Reference : BH17-C7-02 ES2 @ 1.00m
SAL Sample Reference : 672447 054
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 25-JUL-2017
Matrix Class : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	8.0		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	1.8			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.3	3.0	5.0	6.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	7.5			
Retained on 2mm	Grav	0.1	%	N	40.6			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0048	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.025	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	35	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.021	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	61	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	3.6	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.016	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	27	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	280	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.030	4.0	50.0	200.0

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

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

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

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

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

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

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

				Concept Reference	**672447 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Test Sample	**AR**	**AR**	**AR**	**AR**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Naphthalene	GC/MS	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	GC/MS	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Acenaphthene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Fluorene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Phenanthrene	GC/MS	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Anthracene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Fluoranthene	GC/MS	0.1	mg/kg	N	<0.1	<0.1	<0.1	<0.1
Pyrene	GC/MS	0.1	mg/kg	N	<0.1	<0.1	<0.1	<0.1
Benzo(a)Anthracene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Chrysene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	GC/MS	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	GC/MS	0.1	mg/kg	N	<0.1	<0.1	<0.1	<0.1
Benzo(a)Pyrene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Indeno(123-cd)Pyrene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)Anthracene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)Perylene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Polyaromatic Hydrocarbons (Total)	GC/MS	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Coronene	GC/MS (MCERTS)	0.1	mg/kg	N	<0.1	<0.1	<0.1	<0.1

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

Soil Analysed as Soil
BTEX

				Concept Reference	**672447 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Test Sample	**AR**	**AR**	**AR**	**AR**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10

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

Soil Analysed as Soil
PCBs EC7 (SE)

				Concept Reference	**672447 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Test Sample	**AR**	**AR**	**AR**	**AR**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Polychlorinated biphenyl BZ#28	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#52	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#101	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#118	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#153	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#138	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#180	GC/MS	20	µg/kg	M	<20	<20	<20	<20

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

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

Notes

Supplement 1B report reissued to include only samples 026, 030, 042 and 054
026, 030, 042, 054, - BTEX - Samples submitted for GC/MS (Headspace) analysis were submitted in inappropriate containers. It is possible therefore that the results provided may be compromised.
Retained on 2mm is removed before analysis
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except ANC
pH, LOI & TOC were performed on assisted dried samples (<40 degree centigrade). All other results relate to samples as received.
TPH, PAH, PCB & BTEX - 026, 030 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.

CONCEPT LIFE SCIENCES

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 674086-1 A

Date of Report: 17-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-001839
Customer Site Reference: Norfolk Vanguard Cable Route
Date Job Received at Concept: 08-Aug-2017
Date Analysis Started: 09-Aug-2017
Date Analysis Completed: 22-Aug-2017

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

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

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

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

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

UKAS TESTING
1549

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

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

Issued by :
Aislinn Arthey
Customer Service

[redacted]

Waste Acceptance Criteria

Customer Sample Reference : BH17-C7-02 ES2 @ 1.00m
SAL Sample Reference : 674086 014
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 27-JUL-2017
Matrix Class : Clay

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	8.2		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	3.0			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.1	3.0	5.0	6.0
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
Coronene	GC/MS (MCERTS)	0.1	mg/kg	N	<0.1			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	15			
Retained on 2mm	Grav	0.1	%	N	3.3			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0024	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.11	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	37	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	150	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	10	**10.0**	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.025	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	26	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	620	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	<0.020	4.0	50.0	200.0

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

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

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

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

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

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

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

Concept Reference	**674086 014**
Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
Test Sample	**AR**
Date Sampled	**27-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	LOD	Units	Symbol	
Naphthalene	GC/MS	0.1	mg/kg	U	<0.1
Acenaphthylene	GC/MS	0.1	mg/kg	U	<0.1
Acenaphthene	GC/MS	0.1	mg/kg	M	<0.1
Fluorene	GC/MS	0.1	mg/kg	M	<0.1
Phenanthrene	GC/MS	0.1	mg/kg	U	<0.1
Anthracene	GC/MS	0.1	mg/kg	M	<0.1
Fluoranthene	GC/MS	0.1	mg/kg	N	**0.1**
Pyrene	GC/MS	0.1	mg/kg	N	**0.1**
Benzo(a)Anthracene	GC/MS	0.1	mg/kg	M	<0.1
Chrysene	GC/MS	0.1	mg/kg	M	<0.1
Benzo(b)fluoranthene	GC/MS	0.1	mg/kg	U	<0.1
Benzo(k)fluoranthene	GC/MS	0.1	mg/kg	N	**0.1**
Benzo(a)Pyrene	GC/MS	0.1	mg/kg	M	**0.1**
Indeno(123-cd)Pyrene	GC/MS	0.1	mg/kg	M	<0.1
Dibenzo(ah)Anthracene	GC/MS	0.1	mg/kg	M	<0.1
Benzo(ghi)Perylene	GC/MS	0.1	mg/kg	M	<0.1
Polyaromatic Hydrocarbons (Total)	GC/MS	0.1	mg/kg	U	**0.5**

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
BTEX

Concept Reference	**674086 014**
Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
Test Sample	**AR**
Date Sampled	**27-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	LOD	Units	Symbol	
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
PCBs EC7 (SE)

Concept Reference	**674086 014**
Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
Test Sample	**AR**
Date Sampled	**27-JUL-2017**
Matrix Class	**Clay**

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

Index to symbols used in Supplement 1A to Report Number 674086-1 A

Value	Description
A40	Assisted dried < 40C
2:1	Leachate to BS EN 12457-3 (2:1)
AR	As Received
8:1	Leachate to BS EN 12457-3 (8:1)
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

pH, LOI & TOC were performed on assisted dried samples (<40 degree centigrade). All other results relate to samples as received.
Retained on 2mm is removed before analysis
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except ANC
Supplement 1A Report reissued to include only sample 014

CONCEPT LIFE SCIENCES

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 1C to Report Number 675177-1

Date of Report: 18-Oct-2017

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

Customer Contact: Victoria Smith

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

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

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

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

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

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

UKAS TESTING
1549

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

Issued by :
Aislinn Arthey
Customer Service Advi

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

Water Analysed as Water
Heavy Metals (9)

				Concept Reference	**675177 005**	**675177 006**	**675177 007**	**675177 008**
				Customer Sample Reference	**BH17-C6-01**	**BH17-C6-03**	**BH17-C7-01**	**BH17-C7-03**
				Date Sampled	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
As (Dissolved)	T281	F	0.0002	mg/l	**0.0003**	**0.0005**	**0.0007**	**0.0011**
Cd (Dissolved)	T281	F	0.00002	mg/l	<0.00002	<0.00002	<0.00002	<0.00002
Cr (Dissolved)	T281	F	0.001	mg/l	<0.001	<0.001	<0.001	<0.001
Cu (Dissolved)	T281	F	0.0005	mg/l	**0.0015**	**0.0008**	**0.0007**	**0.0006**
Pb (Dissolved)	T281	F	0.0003	mg/l	<0.0003	<0.0003	<0.0003	<0.0003
Hg (Dissolved)	T281	F	0.00005	mg/l	<0.00005	<0.00005	<0.00005	<0.00005
Ni (Dissolved)	T281	F	0.001	mg/l	**0.001**	<0.001	**0.002**	**0.002**
Se (Dissolved)	T281	F	0.0005	mg/l	**0.0012**	<0.0005	**0.0012**	<0.0005
Zn (Dissolved)	T281	F	0.002	mg/l	**0.003**	<0.002	<0.002	**0.045**

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

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

				Concept Reference	**675177 005**	**675177 006**	**675177 007**	**675177 008**
				Customer Sample Reference	**BH17-C6-01**	**BH17-C6-03**	**BH17-C7-01**	**BH17-C7-03**
				Date Sampled	**10-AUG-2017**	**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	<0.01
Acenaphthylene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Acenaphthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Fluorene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Phenanthrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(a)Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Chrysene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(a)Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
PAH(total)	T149	AR	0.01	µg/l	<0.01	<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 005**	**675177 006**	**675177 007**	**675177 008**
				Customer Sample Reference	**BH17-C6-01**	**BH17-C6-03**	**BH17-C7-01**	**BH17-C7-03**
				Date Sampled	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Benzene	T54	AR	1	µg/l	<1	<1	<1	<1
EthylBenzene	T54	AR	1	µg/l	<1	<1	<1	<1
M/P Xylene	T54	AR	1	µg/l	<1	<1	<1	<1
Methyl tert-Butyl Ether	T54	AR	1	µg/l	<1	<1	<1	<1
O Xylene	T54	AR	1	µg/l	<1	<1	<1	<1
Toluene	T54	AR	1	µg/l	<1	<1	<1	<1
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01	<0.01
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01	<0.01
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	<0.01	**0.01**	<0.01	<0.01
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	**0.02**	**0.02**	**0.02**	**0.03**
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01	**0.02**	<0.01
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01	<0.01
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01	<0.01
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01	**0.02**	**0.02**

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

Water Analysed as Water
Organochlorine insecticides

				Concept Reference	**675177 005**	**675177 006**	**675177 007**	**675177 008**
				Customer Sample Reference	**BH17-C6-01**	**BH17-C6-03**	**BH17-C7-01**	**BH17-C7-03**
				Date Sampled	**10-AUG-2017**	**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	(36) <0.02
Hexachlorobenzene	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Heptachlor	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Aldrin	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Heptachlor epoxide	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Chlordane	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Endosulphan	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
DDE	T16	AR	0.01	µg/l	<0.02	<0.02	<0.02	<0.02
Dieldrin	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Endrin	T16	AR	0.01	µg/l	(36) <0.02	(36) <0.02	(36) <0.02	(36) <0.02
DDD	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
DDT	T16	AR	0.01	µg/l	(36) <0.02	(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 005**	**675177 006**	**675177 007**	**675177 008**
					Customer Sample Reference	**BH17-C6-01**	**BH17-C6-03**	**BH17-C7-01**	**BH17-C7-03**
					Date Sampled	**10-AUG-2017**	**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	<0.01
Mevinphos	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Dimethoate	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Diazinon	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Pirimiphos methyl	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Malathion	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Fenitrothion	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Parathion	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Azinphos methyl	T16	AR	0.01	µg/l		(36) <0.02	(36) <0.02	(36) <0.02	(36) <0.02

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

Value	Description
F	Filtered
AR	As Received
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 1C report reissued to include only samples 005, 006, 007 and 008
OCP and OPP transferred to Concept Life Sciences Manchester

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
As (Dissolved)	T281	F	0.0002	mg/l	U	005-008
Cd (Dissolved)	T281	F	0.00002	mg/l	U	005-008
Cr (Dissolved)	T281	F	0.001	mg/l	U	005-008
Cu (Dissolved)	T281	F	0.0005	mg/l	U	005-008
Pb (Dissolved)	T281	F	0.0003	mg/l	U	005-008
Hg (Dissolved)	T281	F	0.00005	mg/l	U	005-008
Ni (Dissolved)	T281	F	0.001	mg/l	U	005-008
Se (Dissolved)	T281	F	0.0005	mg/l	U	005-008
Zn (Dissolved)	T281	F	0.002	mg/l	U	005-008
Naphthalene	T149	AR	0.01	µg/l	U	005-008
Acenaphthylene	T149	AR	0.01	µg/l	U	005-008
Acenaphthene	T149	AR	0.01	µg/l	U	005-008
Fluorene	T149	AR	0.01	µg/l	U	005-008
Phenanthrene	T149	AR	0.01	µg/l	U	005-008
Anthracene	T149	AR	0.01	µg/l	U	005-008
Fluoranthene	T149	AR	0.01	µg/l	U	005-008
Pyrene	T149	AR	0.01	µg/l	U	005-008

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Benzo(a)Anthracene	T149	AR	0.01	µg/l	U	005-008
Chrysene	T149	AR	0.01	µg/l	U	005-008
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	N	005-008
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	U	005-008
Benzo(a)Pyrene	T149	AR	0.01	µg/l	U	005-008
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	U	005-008
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	U	005-008
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	U	005-008
PAH(total)	T149	AR	0.01	µg/l	N	005-008
Benzene	T54	AR	1	µg/l	U	005-008
EthylBenzene	T54	AR	1	µg/l	U	005-008
M/P Xylene	T54	AR	1	µg/l	U	005-008
Methyl tert-Butyl Ether	T54	AR	1	µg/l	U	005-008
O Xylene	T54	AR	1	µg/l	U	005-008
Toluene	T54	AR	1	µg/l	U	005-008
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	N	005-008
Hexachlorocyclohexane	T16	AR	0.01	µg/l	N	005-008
Hexachlorobenzene	T16	AR	0.01	µg/l	N	005-008
Heptachlor	T16	AR	0.01	µg/l	N	005-008
Aldrin	T16	AR	0.01	µg/l	N	005-008
Heptachlor epoxide	T16	AR	0.01	µg/l	N	005-008
Chlordane	T16	AR	0.01	µg/l	N	005-008
Endosulphan	T16	AR	0.01	µg/l	N	005-008
DDE	T16	AR	0.01	µg/l	N	005-008
Dieldrin	T16	AR	0.01	µg/l	N	005-008
Endrin	T16	AR	0.01	µg/l	N	005-008
DDD	T16	AR	0.01	µg/l	N	005-008
DDT	T16	AR	0.01	µg/l	N	005-008
Dichlorvos	T16	AR	0.01	µg/l	N	005-008
Mevinphos	T16	AR	0.01	µg/l	N	005-008
Dimethoate	T16	AR	0.01	µg/l	N	005-008
Diazinon	T16	AR	0.01	µg/l	N	005-008
Pirimiphos methyl	T16	AR	0.01	µg/l	N	005-008
Malathion	T16	AR	0.01	µg/l	N	005-008
Fenitrothion	T16	AR	0.01	µg/l	N	005-008
Parathion	T16	AR	0.01	µg/l	N	005-008
Azinphos methyl	T16	AR	0.01	µg/l	N	005-008

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

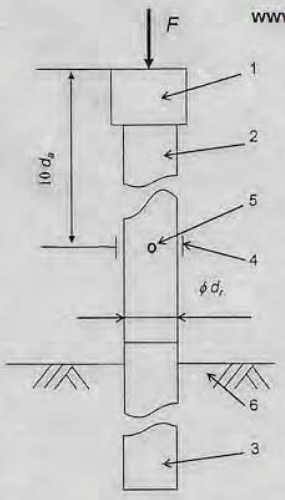
Hammer Energy Measurement Report

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

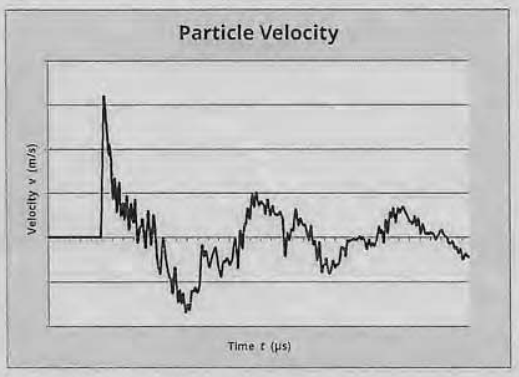
Diameter	d_r =	0.052 m
Length of the instrumented rod		0.558 m
Area	A =	11.61 cm^2
Modulus	E_a =	206843 MPa

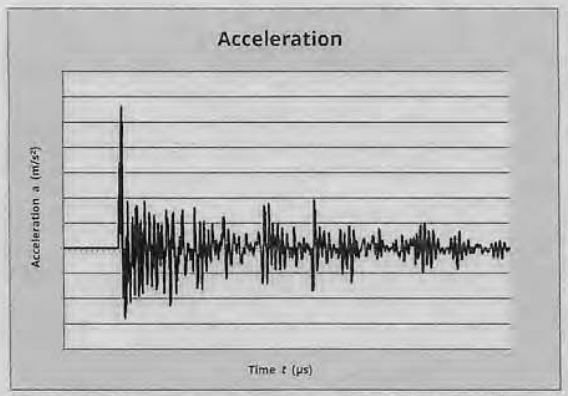


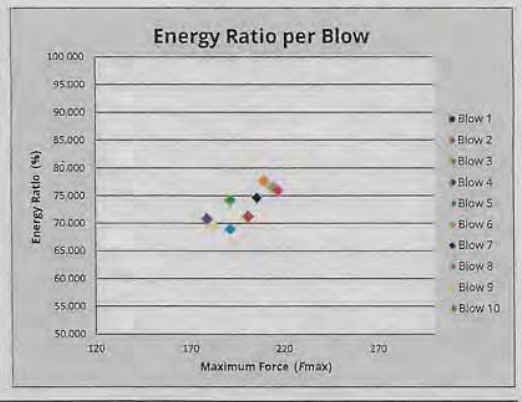
Key
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

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 by [redacted] Date 10/01/2017

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

SPT Calibration Report

www.equipegroup.com

Hammer Energy Measurement Report

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

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

Characteristics of the instrumented rod

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

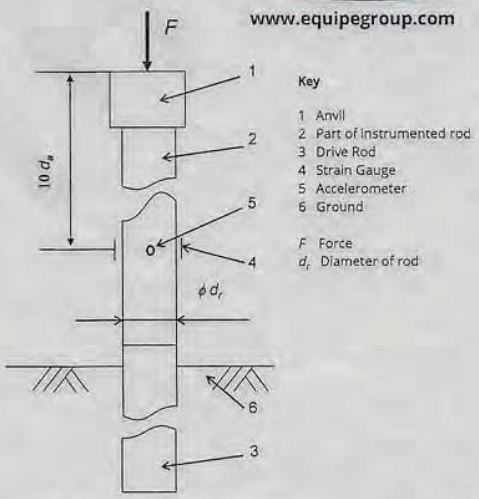
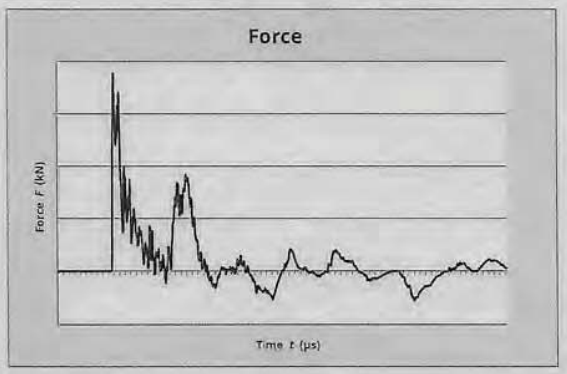
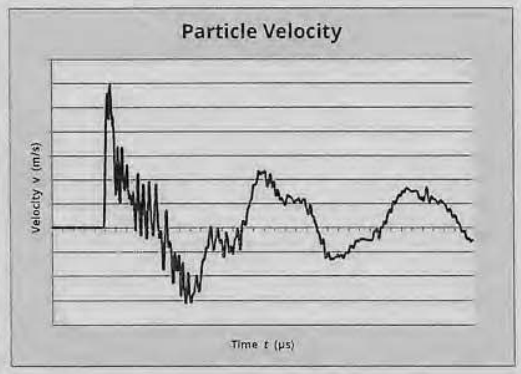
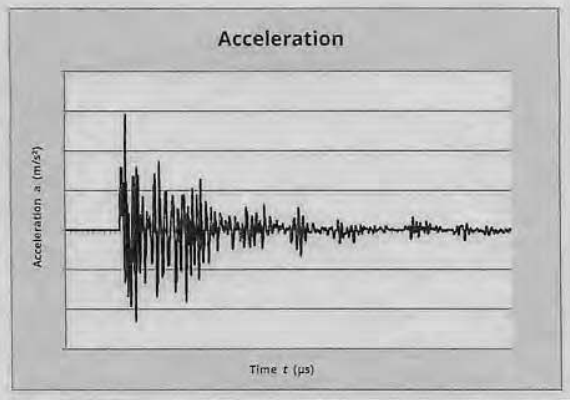
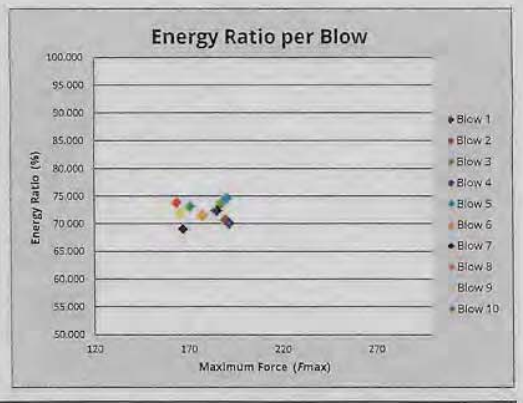


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









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 by [redacted]	Date 10/01/2017

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

SPT Calibration Report

www.equipegroup.com

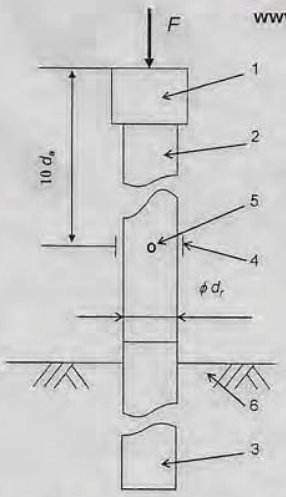
Hammer Energy Measurement Report

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

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

Characteristics of the instrumented rod

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

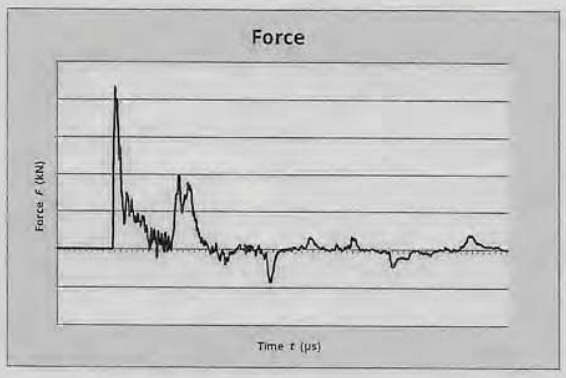


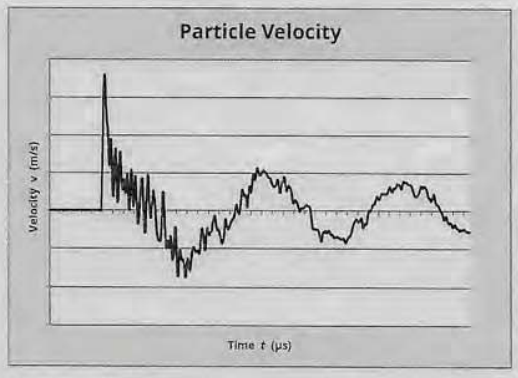
Key

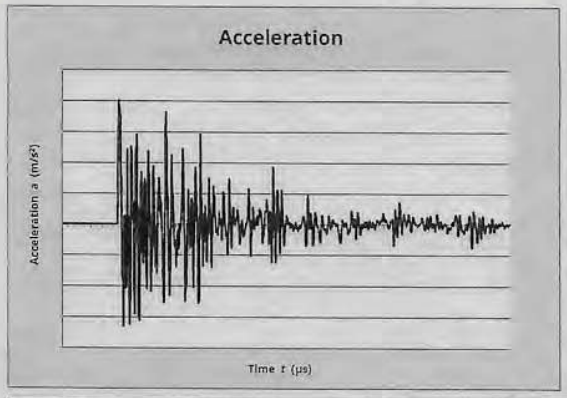
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

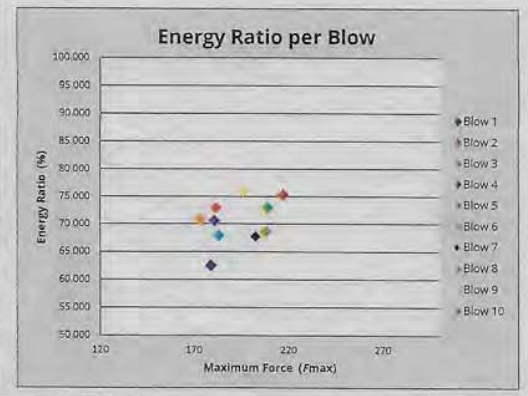
F Force
d_r Diameter of rod

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









Observations:
1.

E_{meas} = **0.343** 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

bsi. ISO 9001 Quality Management FS 573193

bsi. ISO 14001 Environmental Management EMS 573194

smas worksafe consultant www.smasltd.com

TerraConsult

From:	Gemma Keenan
To:	Tracey Williams
Cc:	Norfolk Vanguard; Sian Evans; rebecca.sherwood@vattenfall.com; "ruari.lean@vattenfall.com"; Josh Taylor (josh.taylor@wbd-uk.com)
Subject:	Norfolk Vanguard - Email 12 of 18 Deadline 1 Submissions
Date:	16 January 2019 14:58:42
Attachments:	ExA;WQApp16.6;10.D1.3 Norfolk Vanguard WQ Appendix 16.6 Crossing 6-7 GI.pdf

Dear Tracey

This is email 12 of 18 of the Applicant's submission for Norfolk Vanguard Examination Deadline 1.

We enclose the following documents:

Appendix to Written Questions:

- Appendix 16.6 TerraConsult Crossing 6&7

Please could you kindly confirm receipt.

Best Regards

Gemma Keenan BSc, MIEMA, CEnv
Senior Environmental Consultant

T +44 131 561 2265 | **E** gemma.keenan@rhdhv.com | **W** www.royalhaskoningdhv.com
HaskoningDHV UK Ltd., a company of **Royal HaskoningDHV** | 74/2 Commercial Quay, Commercial Street, Leith, Edinburgh, EH6 6LX. United Kingdom.
Registered Office: Rightwell House, Bretton, Peterborough PE3 8DW | Registered in England 1336844

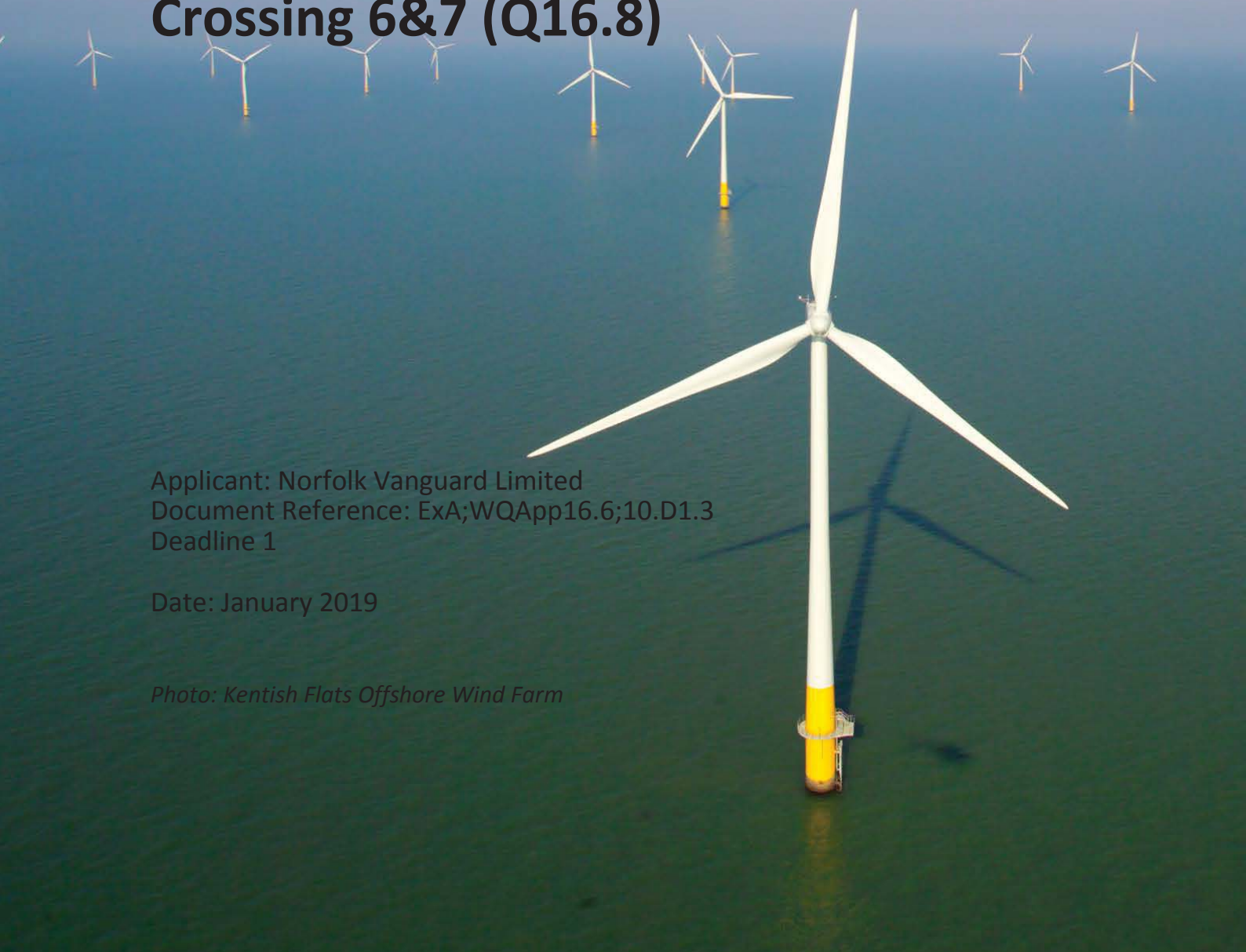
Royal HaskoningDHV
Enhancing Society Together

VATTENFALL

Norfolk Vanguard Offshore Wind Farm

The Applicant Responses to First Written Questions

Appendix 16.6 – TerraConsult 2017 Ground Investigations Report: Crossing 6&7 (Q16.8)



Applicant: Norfolk Vanguard Limited
Document Reference: ExA;WQApp16.6;10.D1.3
Deadline 1

Date: January 2019

Photo: Kentish Flats Offshore Wind Farm

TerraConsult

November 2017
Report No 3318-R005-2

East Anglia (North) Offshore Wind Farm

Crossings 6 & 7 Site Investigation

Carried out for:

Gutteridge, Haskins and Davey Ltd (GHD)

East Anglia (North) Offshore Wind Farm

Crossings 6 & 7 Site Investigation

Date: November 2017

Report No 3318-R005-2

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-R005-2	East Anglia (North) Offshore Wind Farm Crossings 6 & 7 Site Investigation

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

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

DISCLAIMER

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

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

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

East Anglia (North) Offshore Wind Farm

Crossings 6 & 7 Site Investigation
CONTENTS

DRAWINGS

APPENDICES

East Anglia (North) Offshore Wind Farm

Crossings 6 & 7 Site Investigation

1 INTRODUCTION

TerraConsult Limited (TCL) was commissioned by Gutteridge, Haskins and Davey Ltd (GHD) to carry out a ground investigation for the proposed cable route crossing of the A149, Cromer Road (Crossing 6) and the railway line (Crossing 7), near North Walsham, 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 13/07/17 and 28/07/17.

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

Crossing 6 is located approximately 2.2 km north-west of the centre North Walsham, Norfolk. The approximate location of Crossing 6 is located between Ordnance Survey National Grid Reference TG 266 315 and TG 261 312.

Crossing 7 is located approximately 1.8 km north west of the centre of North Walsham, Norfolk. The approximate location of Crossing 7 is located between Ordnance Survey National Grid Reference TG 268 316 and TG 267 314.

Site location plans are presented as drawings reference 3318(C6)D001-1 and 3318(C7)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 Briton's Lane Formation sand and gravel.

Beneath these lies the Wroxham Crag Formation bedrock comprising of sand and gravel.

3 FIELDWORK

3.1 General

Fieldwork was undertaken between 20/07/17 and 28/07/17. 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-C6-01
Cable percussion, SPTs, variable head permeability test	BH17-C6-02
Cable percussion, SPTs, variable head permeability test, install	BH17-C6-03
Cable percussion, SPTs, variable head permeability test	BH17-C6-04
Cable percussion, SPTs, variable head permeability test, install	BH17-C7-01
Cable percussion, SPTs, variable head permeability test	BH17-C7-02
Cable percussion, SPTs, variable head permeability test, install	BH17-C7-03
Cable percussion, SPTs, variable head permeability test	BH17-C7-04

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

3.2 Exploratory Holes

The exploratory holes were logged by an engineer in accordance with the recommendations of BS5930:2015, which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1. Methods of formation and geological descriptions, together with sample records, in situ test results and observations made during formation of the exploratory hole are given in the logs presented in Appendix A and should be read in conjunction with the Key included therein. 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-C6-01	CP	15.45	626336.80	331280.87	34.59	14/07/2017	17/07/2017
BH17-C6-02	CP	15.45	626383.55	331326.99	35.22	13/07/2017	14/07/2017
BH17-C6-03	CP	15.00	636508.14	331291.05	35.66	14/07/2017	14/07/2017
BH17-C6-04	CP	15.00	626550.48	331321.08	35.39	14/07/2017	17/07/2017
BH17-C7-01	CP	20.00	626749.29	331461.97	34.10	27/07/2017	28/07/2017
BH17-C7-02	CP	20.00	626792.09	331492.52	32.74	25/07/2017	25/07/2017
BH17-C7-03	CP	20.00	626802.16	331579.34	28.11	20/07/2017	21/07/2017
BH17-C7-04	CP	20.00	626845.20	331611.63	25.84	24/07/2017	25/07/2017

Type: CP – cable percussion;

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

Exploratory hole location plans are presented as drawings 3318(C6)D002-1 and 3318(C7)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-C6-01	Standpipe	BH17-C6-01	50	15.45	19.14	5.00	15.00
BH17-C6-03	Standpipe	BH17-C6-03	50	15.00	20.66	10.00	15.00
BH17-C7-01	Standpipe	BH17-C7-01	50	20	14.10	12.7	20
BH17-C7-03	Standpipe	BH17-C7-03	50	20	8.11	19.7	20

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

3.6 Surveying

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

4 LABORATORY TESTING

4.1 Geotechnical Testing

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

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

4.2 Geoenvironmental Testing

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

5 REFERENCES

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

BRE Special Digest 1: 2005 Concrete in aggressive ground.

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

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

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

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

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

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

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

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

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

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

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

6 LICENCES

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

Ordnance Survey Reproduction Licence Number. 100035365

DRAWINGS

3318(C6)D001-1 Site Location Plan
3318(C7)D001-1 Site Location Plan
3318(C6)D002-1 Exploratory Hole Location Plan
3318(C7)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(C6)D001-1
Scale:	1:25000	Client:	GHD Ltd	

Site Location Plan

TerraConsult

Address:
East Anglia

Notes:

AGS		Project:	East Anglia (North) Offshore Wind Farm	Drawing No:
Issue:	FINAL	Project No:	3318	3318(C7)D001-1
Scale:	1:25000	Client:	GHD Ltd	

Exploratory Hole Location Plan

TerraConsult

Legend Key

Locations By Type - CP

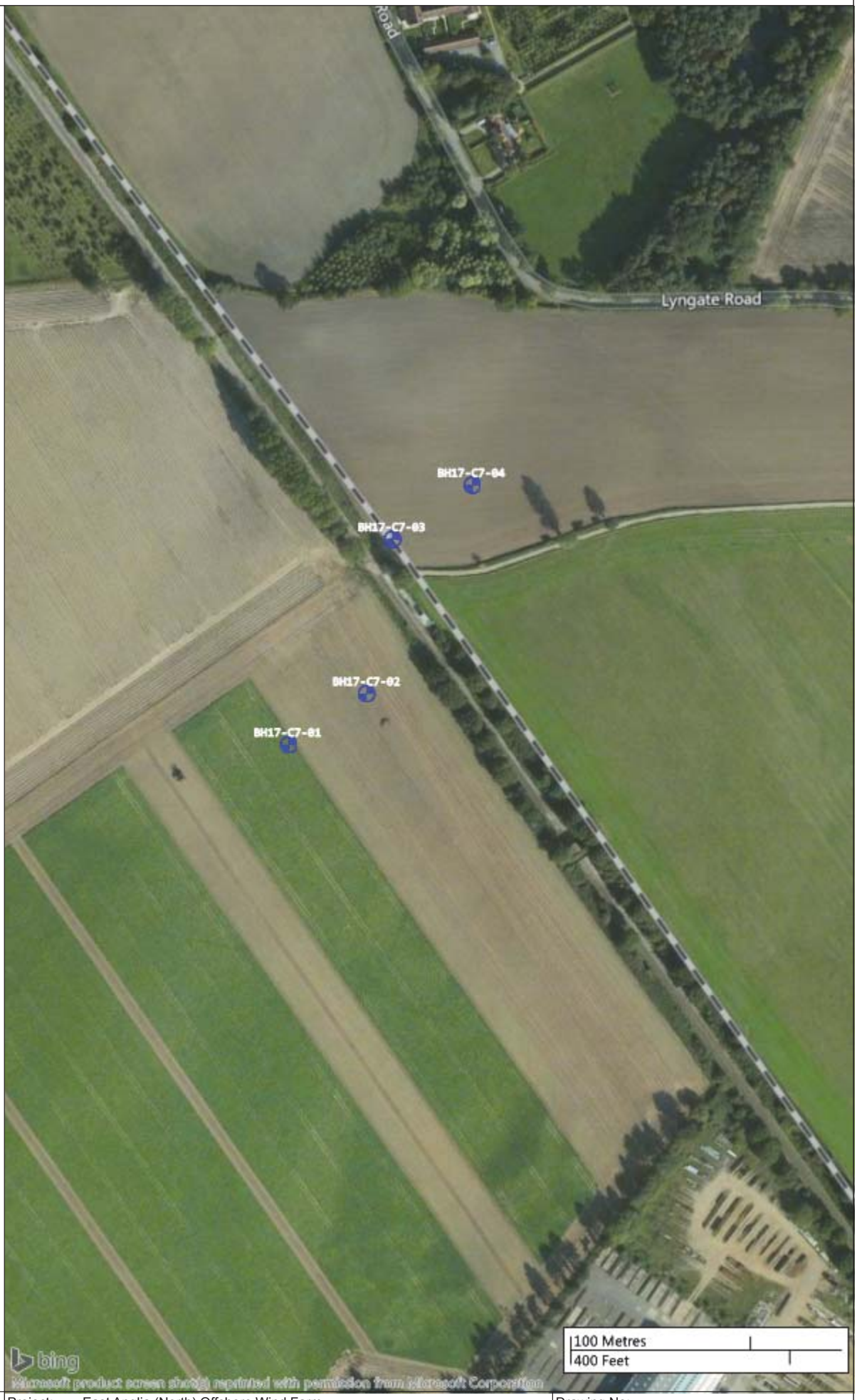
Issue:	FINAL	Project: East Anglia (North) Offshore Wind Farm	Drawing No:
Scale:	1:3000	Project No: 3318	3318(C6)D002-1
		Client: GHD Ltd	

Exploratory Hole Location Plan

TerraConsult

Legend Key

Locations By Type - CP



Issue:	FINAL	Project: East Anglia (North) Offshore Wind Farm	Drawing No:
Scale:	1:3000	Project No: 3318	3318(C7)D002-1
		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	14-07-17	14-07-17	TM	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.45	14-07-17	17-07-17	TM	Dando 2000	n/a	n/a	17-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	626336.80
mN:	331280.87
mAOD:	34.59
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.50)	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
			34.09	0.50	Soft dark orangish brown slightly gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)			0.50	D1	
								0.50	ES1	
				(0.60)				0.50 - 1.00	B1	
					0.90 - 1.10 m: Becomes slightly clayey fine to coarse SAND			1.00	D2	
			33.49	1.10	Medium dense dark yellowish brown slightly silty fine to coarse SAND and fine to coarse GRAVEL. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)			1.00	ES2	
						Dry	1.50	1.50	C	N=14 (1,2/2,2,4,6)
								1.50	D3	
								1.50	ES3	
				(1.90)				2.00	D4	
								2.00	ES4	
			31.59	3.00	Medium dense light yellowish brown gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)	Dry	3.00	3.00	C	N=12 (1,1/2,2,4,4)
								3.00	D5	
				(2.00)	*4.00 - 5.00 m: Becomes dark yellowish brown*			4.00	D6	
						Dry		4.50	C	N=8 (1,2/1,2,2,3)
			29.59	5.00	Soft light orangish brown mottled dark orangish brown and light grey sandy CLAY. (GLACIOFLUVIAL DEPOSITS)			5.00	D7	
				(1.00)						
			28.59	6.00	Loose dark greyish brown clayey fine to medium SAND. Occasionally mottled dark orangish brown. (GLACIOFLUVIAL DEPOSITS)	Dry	6.00	6.00	S	N=9 (1,2/2,2,2,3)
								6.00 - 6.45	D8	
				(1.50)						
			27.09	7.50	Loose locally medium dense dark orangish brown very silty fine to medium SAND. (GLACIOFLUVIAL DEPOSITS)	Dry	7.50	7.50	S	N=8 (1,1/2,1,2,3)
								7.50 - 7.95	D9	
						Dry	9.00	9.00	S	N=11 (1,2/2,2,3,4)
								9.00 - 9.45	D10	
Inst						Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
8.50	7.83	8.50	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	4.50	4.50
150	14.50	14.50

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-C6-01

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	14-07-17	14-07-17	TM	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.45	14-07-17	17-07-17	TM	Dando 2000	n/a	n/a	17-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	626336.80
mN:	331280.87
mAOD:	34.59
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
				(7.95)		Dry	10.50	10.50 10.50 - 10.95	S B3	N=6 (1,1/2,1,1,2)
						Dry	12.00	12.00 12.00 - 12.45	S D11	N=6 (1,/1,2,1,2)
						Dry	13.00	13.50 13.50 - 13.95	S D12	N=8 (2,2/1,2,2,3)
	SP				*14.90 - 15.00 m: Becomes dark greyish brown*	Dry	14.00	15.00 15.00 - 15.45	S D13	N=12 (2,2/2,3,3,4)
			19.14	15.45	Borehole ends at 15.45m (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-C6-01

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	13-07-17	13-07-17	TM	Hand tools	n/a	n/a	13-07-17	VS	
CP	0.00	15.45	13-07-17	14-07-17	TM	Dando 2000	n/a	n/a	14-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	626383.55
mN:	331326.99
mAOD:	35.22
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
			34.82	0.40	Dark orangish brown slightly gravelly slightly silty clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets. (GLACIOFLUVIAL DEPOSITS)			0.50 0.50 0.50 - 1.00	D1 ES1 B1	
				(1.10)				1.00 1.00	D2 ES2	
			33.72	1.50	Medium dense dark orangish brown slightly gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional pockets of dark brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)	Dry		1.50 1.50 1.50 - 1.95 1.50 - 2.00	C ES3 D3 B2	N=27 (2,4/5,6,8,8)
				(0.50)				2.00	ES4	
			33.22	2.00	Medium dense dark orangish brown slightly silty very gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to medium flint. (GLACIOFLUVIAL DEPOSITS)					
						Dry	3.00	3.00 3.00 3.00 - 3.45	C D4 B3	N=14 (1,2/2,3,4,5)
				(3.00)				4.00	D5	
						Dry	4.50	4.50	C	N=13 (2,3/3,3,3,4)
			30.22	5.00	Light yellowish brown gravelly silty fine to coarse SAND. Rare fine to coarse pockets of dark orangish brown slightly sandy CLAY. (GLACIOFLUVIAL DEPOSITS)			5.00	D6	
				(1.00)						
			29.22	6.00	Soft dark orangish brown sandy CLAY. Occasionally mottled dark reddish brown. (GLACIOFLUVIAL DEPOSITS)	Dry	6.00	6.00 6.00	C D7	N=6 (1,1/1,2,1,2)
				(1.00)						
			28.22	7.00	Medium dense dark orangish brown slightly silty clayey fine to coarse SAND. (GLACIOFLUVIAL DEPOSITS)			7.00 - 8.00	B4	
	▼			(1.00)		Dry	7.50	7.50 7.50 - 7.95	S D8	N=10 (1,1/1,2,3,4)
	▽		27.22	8.00	Firm dark orangish brown sandy CLAY. Occasionally mottled dark reddish brown. (GLACIOFLUVIAL DEPOSITS)					
						Dry	9.00	9.00 9.00 - 9.45	S D10	N=8 (1,2/1,1,2,4)
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
8.00	7.60	8.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	6.00	6.00
150	14.50	14.50

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

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

Log issue: FINAL

Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm

Project No: 3318

Client: GHD Ltd

Exploratory position reference:

BH17-C6-02

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	13-07-17	13-07-17	TM	Hand tools	n/a	n/a	13-07-17	VS	
CP	0.00	15.45	13-07-17	14-07-17	TM	Dando 2000	n/a	n/a	14-07-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE: 626383.55
mN: 331326.99
mAOD: 35.22
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
				(7.45)		Dry	10.00	10.50	S	N=14 (1,1/1,3,4,6)
					12.00 - 15.00 m: Mottles dark greyish brown	Dry	12.00	12.00 12.00 - 12.45	S D11	N=9 (1,2/1,2,3,3)
						Dry	13.00	13.50 13.50 - 13.95	S D12	N=11 (1,2/2,3,3,3)
						Dry	14.50	15.00 15.00 - 15.45	S D13	N=13 (2,3/3,3,3,4)
			19.77	15.45	Borehole ends at 15.45m (Target depth)	13.00 9.00	0.00 14.50	15.45 15.45		14/07/2017 00:00:00 14/07/2017 01:00:00
	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-C6-02

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	14-07-17	14-07-17	MJ	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.00	14-07-17	14-07-17	MJ	Dando 2000	n/a	n/a	14-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 626508.14
mN: 331291.05
mAOD: 35.66
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
				(0.50)	Soft dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
			35.16	0.50	Medium dense dark orangish brown silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasionally fine to coarse pockets of dark brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)			0.50 0.50	D1 ES1	
								1.00 1.00	D2 ES2	
				(2.00)		Dry	1.40	1.50 1.50 1.50 - 1.95	C ES3 B1	N=16 (2,3/4,4,4,4)
								2.00	ES4	
			33.16	2.50	Medium dense dark yellowish brown slightly silty very gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)	Dry	2.50	2.50 2.50 - 2.95	C B2	N=18 (3,5/4,4,5,5)
						Dry	5.50	3.50 3.50 - 3.95	C B3	N=24 (4,5/6,6,6,6)
				(3.00)						
						Dry	4.50	4.50 4.50 - 4.95	C B4	N=19 (2,3/4,4,5,6)
			30.16	5.50	Medium dense dark yellowish brown slightly silty very gravelly fine to coarse SAND and Gravel. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)	Dry	5.50	5.50 5.50 - 5.95	C B5	N=27 (3,4/5,7,7,8)
				(0.50)						
			29.66	6.00	Firm dark orangish brown mottled dark reddish brown slightly gravelly slightly silty sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)			6.50	D3	
				(2.00)				7.00 - 7.45	U1	36 (100%)
								7.50	D4	
			27.66	8.00	Firm dark gravelly brown occasionally mottled dark orangish brown and dark reddish brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)					
						Dry	8.00	8.50 8.50 - 8.95	S D5	N=12 (1,2/2,3,3,4)
				(2.00)						
Inst			25.66	10.00		Dry	10.00	10.00	S	N=34 (3,5/6,9,9,10)

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
10.0	9.10	8.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
150	15.00	15.00

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-C6-03

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	14-07-17	14-07-17	MJ	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.00	14-07-17	14-07-17	MJ	Dando 2000	n/a	n/a	14-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626508.14
mN:	331291.05
mAOD:	35.66
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
					Dense becoming very dense dark orangish brown slightly gravelly silty fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)			10.00 - 10.45	D6	
						Dry		11.50 11.50 - 11.95	S D7	N=37 (2,6/8,9,10,10)
				(5.00)						
						Dry		13.00 13.00 - 13.45	S D8	N=38 (4,5/7,9,10,12)
						Dry		14.50 14.50 - 14.95	S D9	50 (5,9/50 for 255mm)
	SP		20.66	15.00	Borehole ends at 15.00m (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-C6-03

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	14-07-17	14-07-17	MJ	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.00	14-07-17	17-07-17	MJ	Dando 2000	n/a	n/a	17-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 626550.48
mN: 331321.08
mAOD: 35.39
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (TOPSOIL)					
			34.99	0.40	Firm to stiff dark orangish brown mottled light grey and dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded medium to coarse flint. Occasional black organic staining. (GLACIOFLUVIAL DEPOSITS)			0.50 0.50	D1 ES1	
				(0.90)				1.00 1.00	D2 ES2	
			34.09	1.30	Medium dense dark orangish brown gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Fine to coarse gravel sized and cobble sized pockets of dark brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)	Dry	1.00	1.50 1.50 1.50 - 1.95	C ES3 B1	N=15 (2,3/3,4,4,4)
				(1.20)	*2.00 - 2.50 m: Clay pockets become frequent and mottle light grey*			2.00	ES4	
			32.89	2.50	Medium dense dark greyish brown gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)	Dry	2.40	2.50 2.50 - 2.95	C B2	N=27 (3,4/6,6,7,8)
				(2.00)		Dry	3.95	3.50 3.50 - 3.95	C B3	N=25 (3,6/5,6,7,7)
			30.89	4.50	Medium dense dark orangish brown gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Medium to coarse gravel sized pockets of dark orangish brown silty slightly sandy CLAY. (GLACIOFLUVIAL DEPOSITS)	Dry	4.95	4.50 4.50 - 4.95	C B4	N=30 (4,5/6,7,8,9)
				(1.30)		Dry	5.50	5.50	C	N=21 (8,5/6,6,5,4)
			29.59	5.80	Medium dense dark grey mottled dark orangish brown and black organic staining silty clayey fine to medium SAND. Rare gravel. (GLACIOFLUVIAL DEPOSITS)			6.00	D3	
					7.00 - 15.00 m: Becomes dark orangish brown			7.00 - 7.45 7.00 - 7.45	B5 UNR	40 (0%)
						Dry	6.00	7.50 7.50 - 7.95	S D4	N=19 (2,2/3,5,5,6)
								8.50	D5	
						Dry	6.00	9.00 9.00 - 9.50	S D6	N=14 (2,2/3,3,4,4)
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
10.0	8.90	6.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
150	12.00	12.00

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-C6-04

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	14-07-17	14-07-17	MJ	Hand tools	n/a	n/a	14-07-17	VS	
CP	0.00	15.00	14-07-17	17-07-17	MJ	Dando 2000	n/a	n/a	17-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626550.48
mN:	331321.08
mAOD:	35.39
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
				(9.20)	*10.00 - 15.00 m: Rare gravel of subangular to subrounded fine to coarse flint*	Dry	10.40	10.50 10.50 - 10.95	S D7	N=12 (1,2/3,3,3,3)
					12.00 - 15.00 m: Becomes slightly clayey	Dry	12.00	12.00 12.00 - 12.45	S D8	N=23 (3,4/6,6,5,6)
						Dry	13.40	13.50 13.50 - 13.95	S D9	N=35 (4,6/7,9,9,10)
			20.39	15.00	Borehole ends at 15.00m (Target depth)	Dry	14.80	15.00 15.00 - 15.45	S D10	N=40 (3,6/8,9,10,13)
	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-C6-04

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	27-07-17	27-07-17	MJ	Hand tools	n/a	n/a	27-07-17	VS	
CP	0.00	20.00	27-07-17	28-07-17	MJ	Dando 2000	n/a	n/a	28-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 626749.29
mN: 331461.97
mAOD: 34.10
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel subangular to subrounded fine to coarse flint. Occasional rootlets. (TOPSOIL)					
			33.70	0.40	Dark orangish brown fine to coarse SAND. (GLACIOFLUVIAL DEPOSITS)			0.50 0.50	D1 ES1	
				(1.10)				1.00 1.00	D2 ES2	
			32.60	1.50	Medium dense dark orangish brown fine to medium SAND. (GLACIOFLUVIAL DEPOSITS)	Dry		1.50 1.50 1.50	S D3 ES3	N=13 (1,3/3,4,3,3)
								2.00	ES4	
				(2.00)		Dry	2.50	2.50 2.50 - 2.95	S D4	N=16 (2,2/3,3,4,6)
			30.60	3.50	Medium dense dark orangish brown slightly clayey silty fine to medium SAND. (GLACIOFLUVIAL DEPOSITS)	Dry	3.50	3.50 3.50 - 3.95	S D5	N=21 (2,3/4,5,6,6)
				(0.40)						
			30.20	3.90	Medium dense dark orangish brown gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Rare Cobbles of flint. (GLACIOFLUVIAL DEPOSITS)	Dry	4.50	4.50 4.50 - 4.95	C B1	N=28 (3,5/6,7,7,8)
				(1.80)						
						Dry	5.50	5.50 5.50 - 5.95	C B2	N=19 (5,6/5,5,4,5)
			28.40	5.70	Firm light greyish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Frequent local dark orangish brown staining. (GLACIOFLUVIAL DEPOSITS)			6.00	D6	
				(1.80)						
								7.00 - 7.45	U1	40 (100%)
			26.60	7.50	Firm light orangish grey slightly sandy CLAY. (GLACIOFLUVIAL DEPOSITS)			7.50	D7	
				(2.00)		Dry	8.00	8.50 8.50 - 8.95	S D8	N=13 (1,2/3,3,3,4)
			24.60	9.50	Firm light brownish grey slightly sandy CLAY. (GLACIOFLUVIAL DEPOSITS)					
	Inst					Water	Casing	10.00 - 10.45 Depth	U2 Type & No	60 (100%) Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

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

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

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

Log issue: FINAL
Scale: 1:50

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

Exploratory position reference:

BH17-C7-01

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	27-07-17	27-07-17	MJ	Hand tools	n/a	n/a	27-07-17	VS	
CP	0.00	20.00	27-07-17	28-07-17	MJ	Dando 2000	n/a	n/a	28-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626749.29
mN:	331461.97
mAOD:	34.10
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
					Firm light brownish grey slightly sandy CLAY. (GLACIOFLUVIAL DEPOSITS)			10.50	D9	
				(3.20)		Dry	10.00	11.50 11.50 - 11.95	S D10	N=17 (2,3/3,4,4,6)
	▼		21.40	12.70	Medium dense dark brownish grey silty fine to medium SAND. (WROXHAM CRAG FORMATION)	Dry	10.00	13.00	S	N=14 (3,2/3,3,4,4)
						Dry	14.50	14.50 14.50 - 14.95	S D12	N=13 (2,2/3,3,3,4)
				(6.30)		Dry	16.00	16.00 16.00 - 16.45	S D13	N=22 (3,3/5,5,6,6)
						Dry	17.50	17.50 17.50 - 17.95	S D14	N=35 (2,3/7,8,9,11)
			15.10	19.00	Very dense dark grey silty fine to medium SAND. Rare gravel. (WROXHAM CRAG FORMATION)	Dry	19.00	19.00 19.00 - 19.45	S D15	50 (3,5/50 for 170mm)
				(1.00)						
SP Inst			14.10	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
13.0	12.9	10.0	

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-C7-01

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	25-07-17	25-07-17	MJ	Hand tools	n/a	n/a	25-07-17	VS	
CP	0.00	20.00	25-07-17	25-07-17	MJ	Dando 2000	n/a	n/a	25-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 626792.09
mN: 331492.52
mAOD: 32.74
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel subangular to subrounded fine to coarse flint. Occasional rootlets. (TOPSOIL)					
			32.34	0.40	Medium dense dark orangish brown clayey gravelly fine to coarse SAND. Gravel subangular to subrounded fine to coarse flint. (GLACIOFLUVIAL DEPOSITS)			0.50	D1	
								0.50	ES1	
								0.50	ES1	
								0.50	ES1	
								1.00	D2	
								1.00	ES2	
								1.00	ES2	
								1.00	ES2	
						Dry	1.40	1.50	C	N=21 (2,3/5,5,6,5)
				(2.60)				1.50	ES3	
								1.50	ES3	
								1.50 - 1.95	B1	
								2.00	ES2	
								2.00	ES4	
								2.00	ES4	
						Dry	2.50	2.50	C	N=22 (1,3/4,5,6,7)
								2.50 - 2.95	B2	
			29.74	3.00	Soft orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. (GLACIOFLUVIAL DEPOSITS)					
				(0.90)		Dry	3.30	3.50	S	N=10 (1,2/2,2,3,3)
								3.50 - 3.95	D3	
			28.84	3.90	Medium dense dark orangish brown slightly clayey slightly silty fine to coarse SAND. Fine to coarse gravel sized pockets of dark brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)					
						Dry	4.40	4.50	S	N=13 (2,3/2,3,4,4)
				(1.60)				4.50 - 4.95	D4	
			27.24	5.50	Firm orangish brown sandy CLAY. (GLACIOFLUVIAL DEPOSITS)	Dry	5.50	5.50	S	N=15 (1,1/3,3,4,5)
								5.50 - 5.95	D5	
				(1.30)						
			25.94	6.80	Firm to stiff brownish grey locally mottled greyish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasionally stained orangish brown. (GLACIOFLUVIAL DEPOSITS)			6.90	D6	
								7.00 - 7.45	U1	40 (100%)
								7.50	D7	
						Dry	7.50	8.50	S	N=12 (1,2/2,3,3,4)
				(3.70)				8.50 - 8.95	D8	
Inst						Water	Casing	Depth	Type & No	Results
								10.00 - 10.45	U2	75 (100%)

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	7.00	7.00
150	19.00	19.00

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-C7-02

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	25-07-17	25-07-17	MJ	Hand tools	n/a	n/a	25-07-17	VS	
CP	0.00	20.00	25-07-17	25-07-17	MJ	Dando 2000	n/a	n/a	25-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626792.09
mN:	331492.52
mAOD:	32.74
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
			22.24	10.50	Firm to stiff brownish grey locally mottled greyish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasionally stained orangish brown. (GLACIOFLUVIAL DEPOSITS)			10.50	D9	
			22.14	10.60	Firm brownish grey slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium chalk and flint. (GLACIOFLUVIAL DEPOSITS)					
					Loose becoming medium dense dark orangish brown silty fine to medium SAND. (GLACIOFLUVIAL DEPOSITS)	Dry	11.50	11.50 11.50 - 11.95	S D10	N=9 (1,1/2,2,2,3)
				(6.90)		Dry	13.00	13.00 13.00 - 13.45	S D11	N=11 (1,2/2,3,3,3)
						Dry	14.50	14.50 14.50 - 14.95	S D12	N=27 (2,2/5,6,7,9)
						Dry	16.00	16.00 16.00 - 16.45	S D13	N=34 (2,3/5,7,9,13)
			15.24	17.50	Dense dark greyish brown slightly gravelly slightly silty medium to coarse SAND. Gravel of subangular to subrounded fine to medium flint. (WROXHAM CRAG FORMATION)	Dry	17.50	17.50 17.50 - 17.95	S D14	N=41 (3,5/6,9,10,16)
				(2.50)		Dry	19.00	19.00 19.00 - 19.45	S D15	50 (4,9/12,17,21,)
Inst			12.74	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	20.00 Depth	D16 Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
11.30	8.10	11.30	

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-C7-02

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	20-07-17	20-07-17	MJ	Hand tools	n/a	n/a	20-07-17	VS	
CP	0.00	20.00	20-07-17	21-07-17	MJ	Dando 2000	n/a	n/a	21-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE: 626802.16
mN: 331579.34
mAOD: 28.11
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark orangish brown slightly sandy slightly silty CLAY. Rare subangular to subrounded fine flint gravel. Frequent rootlets. (TOPSOIL)					
			27.71	0.40	Firm dark orangish brown mottled light grey and dark reddish brown sandy CLAY. Rare subangular to subrounded fine flint gravel. Occasional laminations of fine to medium SAND. Occasional rootlets. (BRICKEARTH)			0.50 0.50	D1 ES1	
				(1.00)				1.00 1.00	D2 ES2	
			26.71	1.40	Loose becoming medium dense dark orangish brown slightly clayey silty fine to medium SAND. Occasionally mottled dark reddish brown. (BRICKEARTH)	Dry		1.50 1.50 1.50 - 1.95	S ES3 D3	N=7 (1,1/1,2,2,2)
								2.00 2.00 - 2.40	ES4 B1	
						Dry	2.50	2.50 2.50 - 2.95	S D4	N=7 (1,0/1,1,2,3)
				(4.50)		Dry	3.50	3.50 3.50 - 3.95	S D5	N=10 (1,2/2,2,3,3)
						Dry	4.50	4.50 4.50 - 4.95	S D6	N=16 (1,2/3,4,4,5)
					5.50 - 5.90 m: Becomes clayey	Dry	5.50	5.50 5.50 - 5.95	S D7	N=14 (2,2/3,3,4,4)
			22.21	5.90	Firm dark brownish grey occasionally mottled dark orangish brown slightly sandy slightly gravelly CLAY. Gravel subangular to subrounded fine to coarse chalk and rare flint. (BRICKEARTH)			6.50	D8	
								7.00 - 7.45	U1	38 (100%)
				(3.10)				7.50	D9	
					8.50 - 9.00 m: Becomes sandy and soft	Dry	6.00	8.50 8.50 - 8.95	S D10	N=22 (3,3/4,5,6,7)
			19.11	9.00	Medium dense dark grey silty slightly clayey fine to medium SAND. Occasional pockets of dark grey gravelly CLAY with chalk gravel. (BRICKEARTH)			9.50 - 9.90	B2	
				(2.00)		Dry	10.00	10.00	S	N=29 (2,3/3,7,9,10)
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
9.00	8.40	6.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	6.00	6.00
150	16.00	16.00

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-C7-03

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	20-07-17	20-07-17	MJ	Hand tools	n/a	n/a	20-07-17	VS	
CP	0.00	20.00	20-07-17	21-07-17	MJ	Dando 2000	n/a	n/a	21-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626802.16
mN:	331579.34
mAOD:	28.11
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 dark grey silty slightly clayey fine to medium SAND. Occasional pockets of dark grey gravelly CLAY with chalk gravel. (BRICKEARTH)			10.00 - 10.45	D11	
			17.11	11.00	Dense to very dense dark brown grey silty fine to medium SAND. (BRICKEARTH)	Dry	11.50	11.50	S	N=42 (3,5/6,9,13,14)
								11.50 - 11.95	D12	
						Dry	13.00	13.00	S	63 (5,9/63 for 215mm)
								13.00 - 13.45	D13	
				(5.30)						
						Dry	14.50	14.50	S	50 (5,9/50 for 215mm)
								14.50 - 14.95	D14	
						Dry	16.00	16.00	S	N=43 (3,6/14,12,9,8)
			11.81	16.30	Stiff dark grey slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (BRICKEARTH)			16.00 - 16.45	D15	
								17.00	D16	
								17.50 - 17.95	U2	70 (100%)
				(3.40)				18.00	D17	
						Dry	16.00	19.00	S	N=34 (4,5/7,8,9,10)
								19.00 - 19.45	D111	
								19.00 - 19.45	D18	
	▽		8.41	19.70						
				(0.30)	Dark grey gravelly slightly silty SAND. Gravel of subangular to subrounded fine to coarse flint. Pockets of dark grey CLAY.					
SP Inst			8.11	20.00		Water	Casing	20.00 Depth	B3 Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
19.7	8.90	16.5	

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-C7-03

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	20-07-17	20-07-17	MJ	Hand tools	n/a	n/a	20-07-17	VS	
CP	0.00	20.00	20-07-17	21-07-17	MJ	Dando 2000	n/a	n/a	21-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626802.16
mN:	331579.34
mAOD:	28.11
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
					(WROXHAM CRAG FORMATION)					
					Borehole ends at 20.00m (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-C7-03

Sheet 3 of 3

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	24-07-17	24-07-17	MJ	Hand tools	n/a	n/a	24-07-17	VS	
CP	0.00	20.00	24-07-17	25-07-17	MJ	Dando 2000	n/a	n/a	25-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626845.20
mN:	331611.63
mAOD:	25.84
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.40)	Soft dark orangish brown slightly sandy slightly silty CLAY. Rare subangular to subrounded fine flint gravel. Frequent rootlets. (TOPSOIL)					
			25.44	0.40	Stiff dark orangish brown slightly sandy CLAY. Occasionally mottled light grey. (BRICKEARTH)			0.50 0.50	D1 ES1	
				(0.60)						
			24.84	1.00	Loose becoming medium dense light orangish brown slightly clayey silty fine to medium SAND. Rare gravel of subangular to subrounded fine to coarse flint. Occasional fine to coarse gravel and cobble sized pockets of dark brown mottled light grey and reddish brown sandy CLAY. (BRICKEARTH)			1.00 1.00	D2 ES2	
						Dry		1.50 1.50 1.50 - 1.95	S ES3 D3	N=9 (1,1/2,2,2,3)
								2.00	ES4	
						Dry	2.40	2.50 2.50 - 2.95	S D4	N=11 (1,2/2,3,3,3)
						Dry	3.40	3.50 3.50 - 3.95	S D5	N=17 (1,2/3,4,4,6)
				(5.40)						
					4.50 - 5.50 m: Becomes fine sand	Dry	4.50	4.50 4.50 - 4.95	S D6	N=22 (2,3/5,5,6,6)
						Dry	5.50	5.50 5.50 - 5.95	S D7	N=18 (1,2/3,4,5,6)
			19.44	6.40	Medium dense dark orangish brown gravelly silty slightly clayey fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (BRICKEARTH)					
				(1.30)		Dry	7.00	7.00 7.00 - 7.45	C B1	N=19 (2,3/5,4,5,5)
			18.14	7.70	Firm to stiff dark brownish grey mottled dark orangish brown and dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Rare shell fragments. (BRICKEARTH)			8.00	D8	
								8.50 - 8.95 8.50 - 8.95	B2 UNR	40 (0%)
				(2.30)						
	Inst		15.84	10.00		Dry	8.00	10.00	S	N=8 (1,2/2,2,2,2)

Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
10.0	5.10	8.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	8.00	8.00
150	17.00	17.00

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-C7-04

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	24-07-17	24-07-17	MJ	Hand tools	n/a	n/a	24-07-17	VS	
CP	0.00	20.00	24-07-17	25-07-17	MJ	Dando 2000	n/a	n/a	25-07-17	VS	SPT hammer ID: SI 3 E(r)% 75

Location details:

mE:	626845.20
mN:	331611.63
mAOD:	25.84
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
					Loose becoming medium dense dark grey silty fine to coarse SAND. Rare subangular to subrounded fine to medium flint. (WROXHAM CRAG FORMATION)			10.00 - 10.45	D9	
						Dry	11.40	11.50	S	N=7 (1,0/1,2,2,2)
								11.50 - 11.95	D10	
						Dry	13.00	13.00	S	N=20 (1,3/3,4,6,7)
								13.00 - 13.45	D11	
				(6.70)						
						Dry	14.40	14.50	S	N=18 (1,2/2,4,5,7)
								14.50 - 14.95	D12	
						Dry	16.00	16.00	S	N=31 (2,2/4,4,10,13)
								16.00 - 16.45	D13	
			9.14	16.70	Firm to stiff dark brownish grey slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (WROXHAM CRAG FORMATION)			17.50 - 17.95	U2	68 (100%)
								18.00	D14	
				(3.30)						
						Dry	17.00	19.00	S	N=29 (3,4/5,7,8,9)
								19.00 - 19.45	D15	
Inst			5.84	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	20.00	D16	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:

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-C7-04

APPENDIX B
Photographs

BH17-C6-01

0.50 m

1.50 m

5.00 m

7.50 m

10.50 m

BH17-C6-02

1.50 m

3.00 m

5.00 m


ath, Norwich, Norfolk NR13 6QP
271 Mobile: +44 (0)7785 313447
g.co.uk
DATE: 14.7.17
DEPTH: 7.0-8.0
SAMPLE No: B4

7.00 m

15.00 m

BH17-C6-03

3.50 m

5.50 m

6.50 m

8.50 m

10.00 m

BH17-C6-04

0.50 m

4.50 m pockets of clay

7.00 m

15.00 m

BH17-C7-01

0.50 m

5.70 m

12.70 m

BH17-C7-02

4.50 m

6.90 m

11.50 m

17.50 m

20.00 m

BH17-C7-03

0.50 m

4.50 m

5.50 m

6.50 m

9.50 m

13.00 m

17.00 m

20.00 m

BH17-C7-04

1.00 m

7.00 m

8.00 m

10.00 m

18.00 m

APPENDIX C
In Situ Testing Results

Variable head permeability test

Variable Head Permeability Test Results

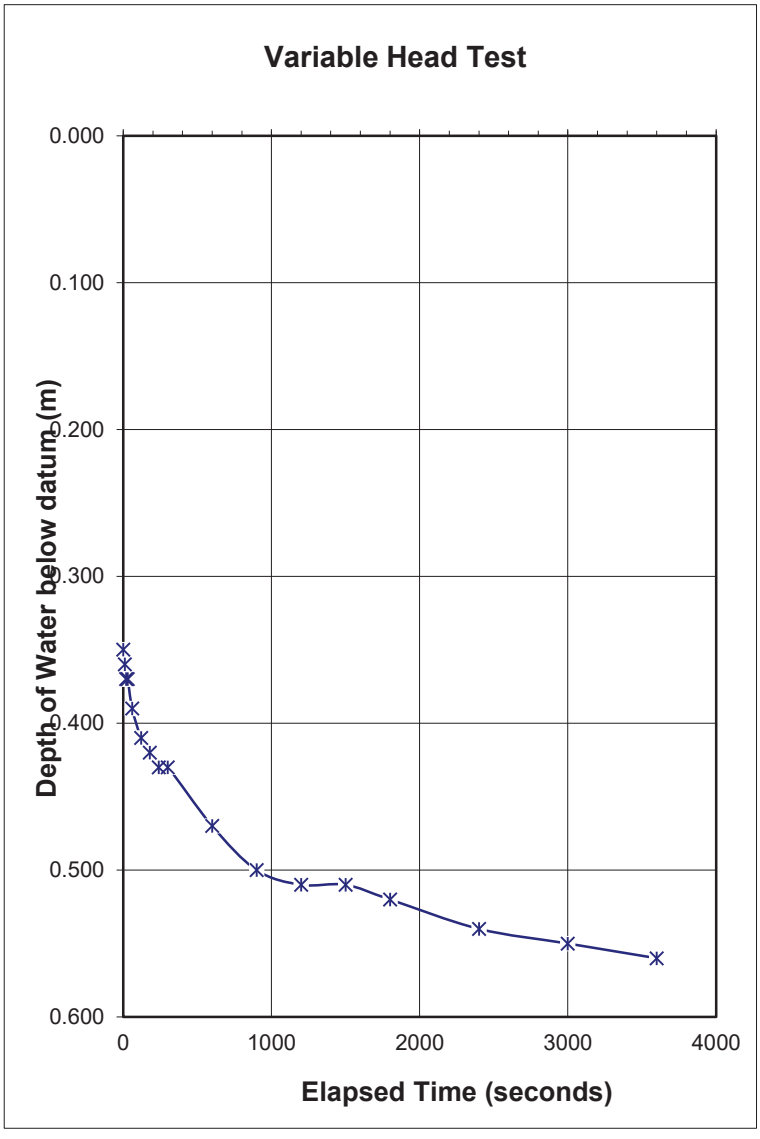
TerraConsult

Static water level (m)	7.83
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)	0.35
Top of Response Zone	8.00
Bottom of Response Zone	8.50

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	8.15
Final Head (h(t)) at (t)	7.94
Length of Response Zone *(L)*	0.50
Cross Sectional Area *(S)*	0.0177

Description	Silty SAND.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.350	8.15
10	0.360	8.14
20	0.370	8.13
30	0.370	8.13
60	0.390	8.11
120	0.410	8.09
180	0.420	8.08
240	0.430	8.07
300	0.430	8.07
600	0.470	8.03
900	0.500	8.00
1200	0.510	7.99
1500	0.510	7.99
1800	0.520	7.98
2400	0.540	7.96
3000	0.550	7.95
3600	0.560	7.94



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

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

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

$$= 1.66$$

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

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

k = 7.74E-08 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C6-01**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

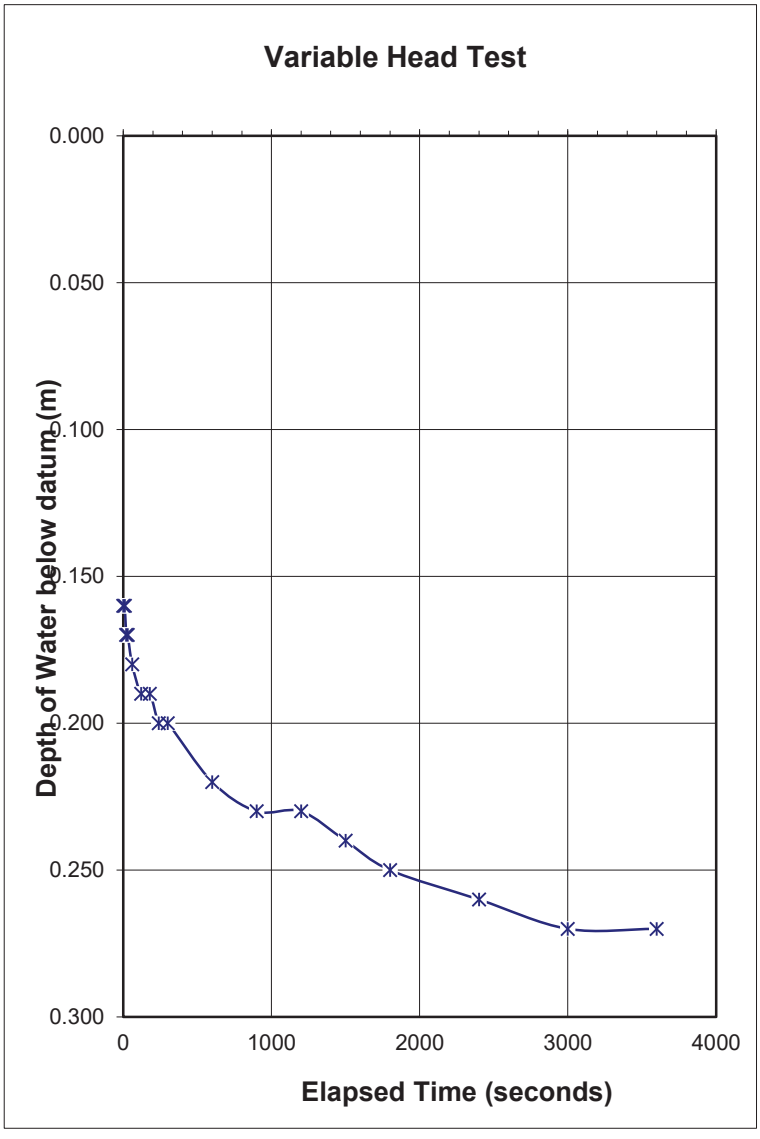
TerraConsult

Static water level (m)	7.60
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)	0.16
Top of Response Zone	7.50
Bottom of Response Zone	8.00

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	7.84
Final Head (h(t)) at (t)	7.73
Length of Response Zone *(L)*	0.50
Cross Sectional Area *(S)*	0.0177

Description	Slightly silty clayey SAND.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.160	7.84
10	0.160	7.84
20	0.170	7.83
30	0.170	7.83
60	0.180	7.82
120	0.190	7.81
180	0.190	7.81
240	0.200	7.80
300	0.200	7.80
600	0.220	7.78
900	0.230	7.77
1200	0.230	7.77
1500	0.240	7.76
1800	0.250	7.75
2400	0.260	7.74
3000	0.270	7.73
3600	0.270	7.73



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

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

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

$$= 1.66$$

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

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

k = 4.19E-08 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C6-02**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

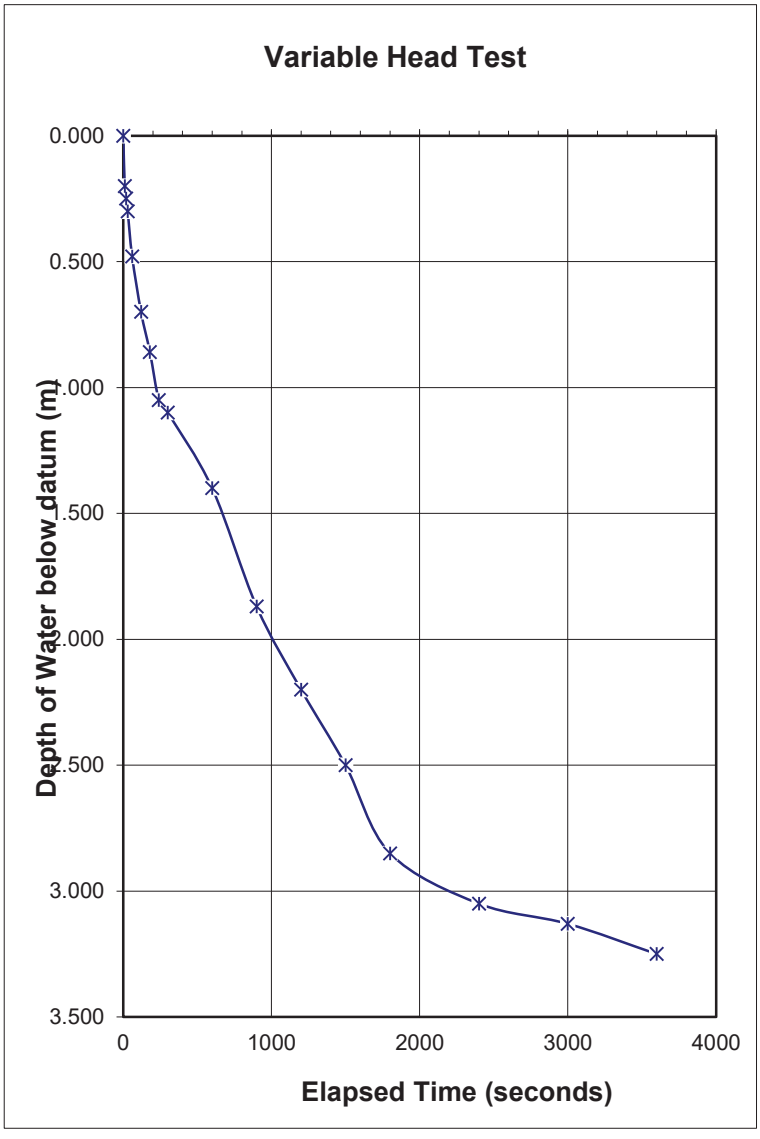
TerraConsult

Static water level (m)	9.20
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	10.00
Bottom of Response Zone	11.00

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	11.00
Final Head (h(t)) at (t)	7.75
Length of Response Zone *(L)*	1.00
Cross Sectional Area *(S)*	0.0177

Description	Sandy CLAY.

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.000	11.00
10	0.200	10.80
20	0.250	10.75
30	0.300	10.70
60	0.480	10.52
120	0.700	10.30
180	0.860	10.14
240	1.050	9.95
300	1.100	9.90
600	1.400	9.60
900	1.870	9.13
1200	2.200	8.80
1500	2.500	8.50
1800	2.850	8.15
2400	3.050	7.95
3000	3.130	7.87
3600	3.250	7.75



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 = 7.09E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C6-03**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

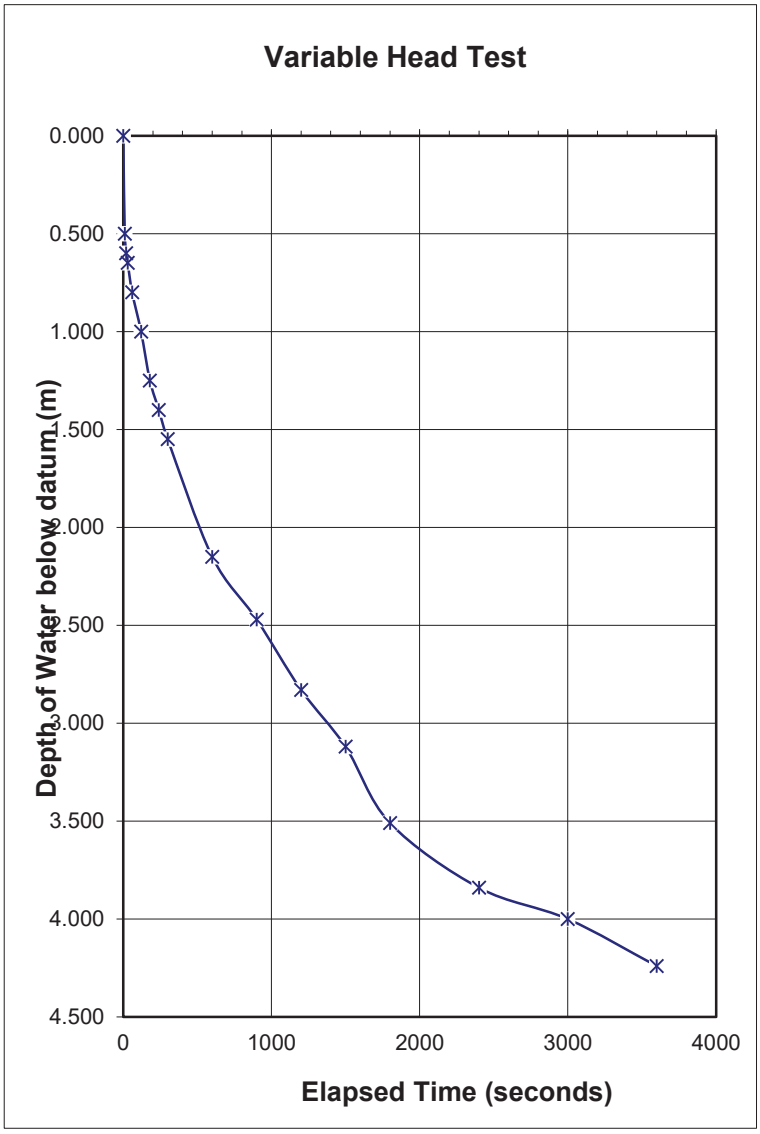
TerraConsult

Static water level (m)	9.00
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	10.00
Bottom of Response Zone	11.00

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	11.00
Final Head (h(t)) at (t)	6.76
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	11.00
10	0.500	10.50
20	0.600	10.40
30	0.650	10.35
60	0.800	10.20
120	1.000	10.00
180	1.250	9.75
240	1.400	9.60
300	1.550	9.45
600	2.150	8.85
900	2.470	8.53
1200	2.830	8.17
1500	3.120	7.88
1800	3.510	7.49
2400	3.840	7.16
3000	4.000	7.00
3600	4.240	6.76



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 = 9.85E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C6-04**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

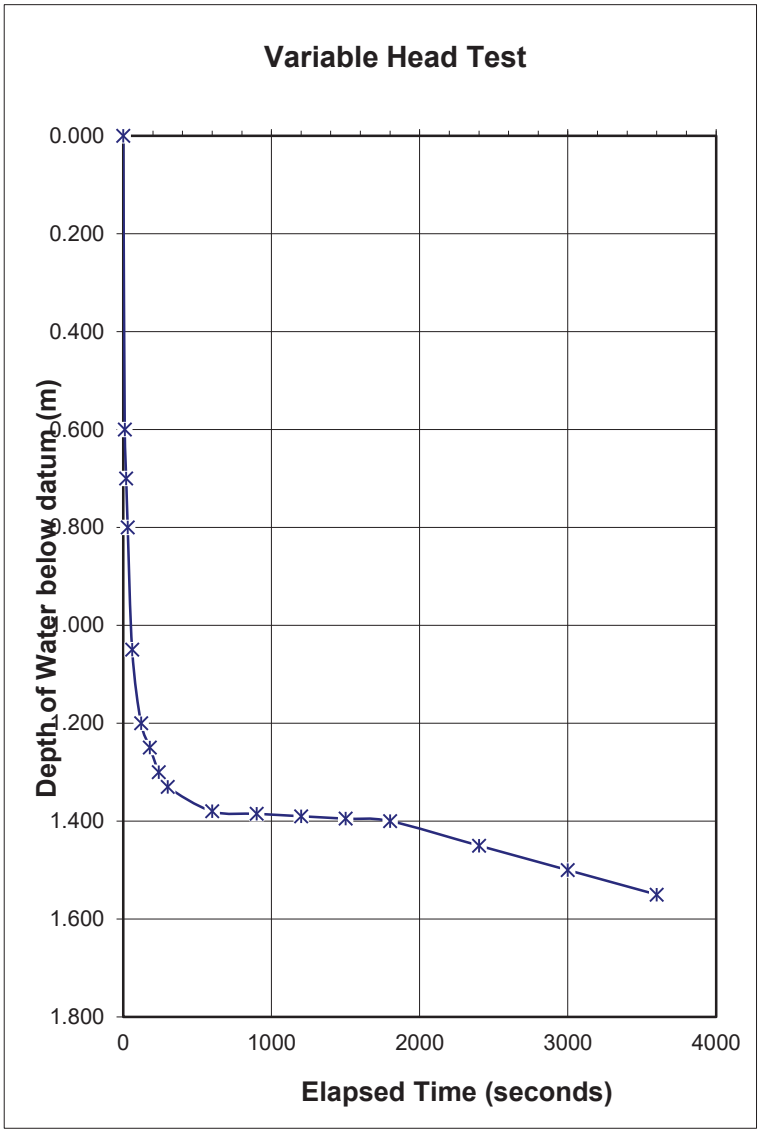
TerraConsult

Static water level (m)	5.10
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	10.00
Bottom of Response Zone	11.00

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	11.00
Final Head (h(t)) at (t)	9.45
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	11.00
10	0.600	10.40
20	0.700	10.30
30	0.800	10.20
60	1.050	9.95
120	1.200	9.80
180	1.250	9.75
240	1.300	9.70
300	1.330	9.67
600	1.380	9.62
900	1.385	9.62
1200	1.390	9.61
1500	1.395	9.61
1800	1.400	9.60
2400	1.450	9.55
3000	1.500	9.50
3600	1.550	9.45



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

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

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

$$= 2.43$$

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 = 3.07E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C7-04**
Checked by:	DD	Client:	GHD	

APPENDIX D
Instrumentation Sampling and Monitoring Records

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

Site: **East Anglia OWF**

GROUND GAS AND GROUNDWATER MONITORING DATA

Location	Date	Monitored by	Well Details		Groundwater					Gas											Weather	
			Standpipe diameter (mm)	Depth to Base (m bgl)	Water Depth (m bgl)	Water Sample Taken?	Water Temp oC	Odour	Colour	Atmospheric Pressure (mbar)	Atmospheric Pressure Comment	Relative Pressure (Pa)	Flow (l/h)	CH_4 (% v/v)	GSV CH_4 (l/hr)	CO_2 (% v/v)	GSV CO_2 (l/hr)	O_2 (% v/v)	CO (ppm)	H2S (ppm)	VOC (ppm)	Conditions	Ambient Temp °C
BH17-C6-01	11/08/17	KW	51	12.74	6.74	Y				1018	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.9	0	0	NM	Sunny, dry	21
	22/08/17	VS	51	11.96	6.70	N				1015	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.8	0	0	NM	Sunny, dry	19
	31/08/17	VS	51	11.82	6.76	N				1013	NM	0.0	0.0	0.0	0.0000	0.4	0.0000	20	0	0	NM	Sunny, dry	18
	14/09/17	VS	51	11.90	6.77	N				995	NM	0.0	0.0	0.0	0.0000	0.0	0.0000	20.9	0	0	NM	Showers	15
BH17-C6-03	10/08/17	KW	51	14.65	8.71	Y				1020	NM	0.0	0.0	0.0	0.0000	0.0	0.0000	20.6	0	0	NM	Sunny, dry	20
	22/08/17	VS	51	14.40	8.69	N				1015	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.4	0	0	NM	Sunny, dry	19
	31/08/17	VS	51	14.40	8.73	N				1013	NM	0.0	0.0	0.0	0.0000	0.2	0.0000	20.9	0	0	NM	Sunny, dry	18
	14/09/17	VS	51	14.38	8.79	N				995	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.5	0	0	NM	Showers	15
BH17-C7-01	10/08/17	KW	51	17.36	8.80	Y				1020	NM	0.0	0.0	0.0	0.0000	0.2	0.0000	20.3	0	0	NM	Sunny, dry	20
	22/08/17	VS	51	19.68	8.80	N				1014	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	21	0	0	NM	Sunny, dry	19
	31/08/17	VS	51	19.46	8.86	N				1013	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	20.7	0	0	NM	Sunny, dry	18
	14/09/17	VS	51	17.16	8.91	N				995	NM	0.0	0.0	0.0	0.0000	0.7	0.0000	19.5	0	0	NM	Showers	15
BH17-C7-03	10/08/17	KW	51	18.48	3.71	Y				1020	NM	0.0	0.0	0.0	0.0000	0.5	0.0000	20.2	0	0	NM	Sunny, dry	20
	22/08/17	VS	51	18.41	3.43	N				1014	NM	0.0	0.0	0.0	0.0000	0.2	0.0000	21.2	0	0	NM	Sunny, dry	19
	31/08/17	VS	51	18.32	3.54	N				1014	NM	0.0	0.0	0.0	0.0000	0.6	0.0000	20.3	0	0	NM	Sunny, dry	18
	14/09/17	VS	51	18.21	3.61	N				997	NM	0.0	0.0	0.0	0.0000	0.6	0.0000	20.2	0	0	NM	Showers	15

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

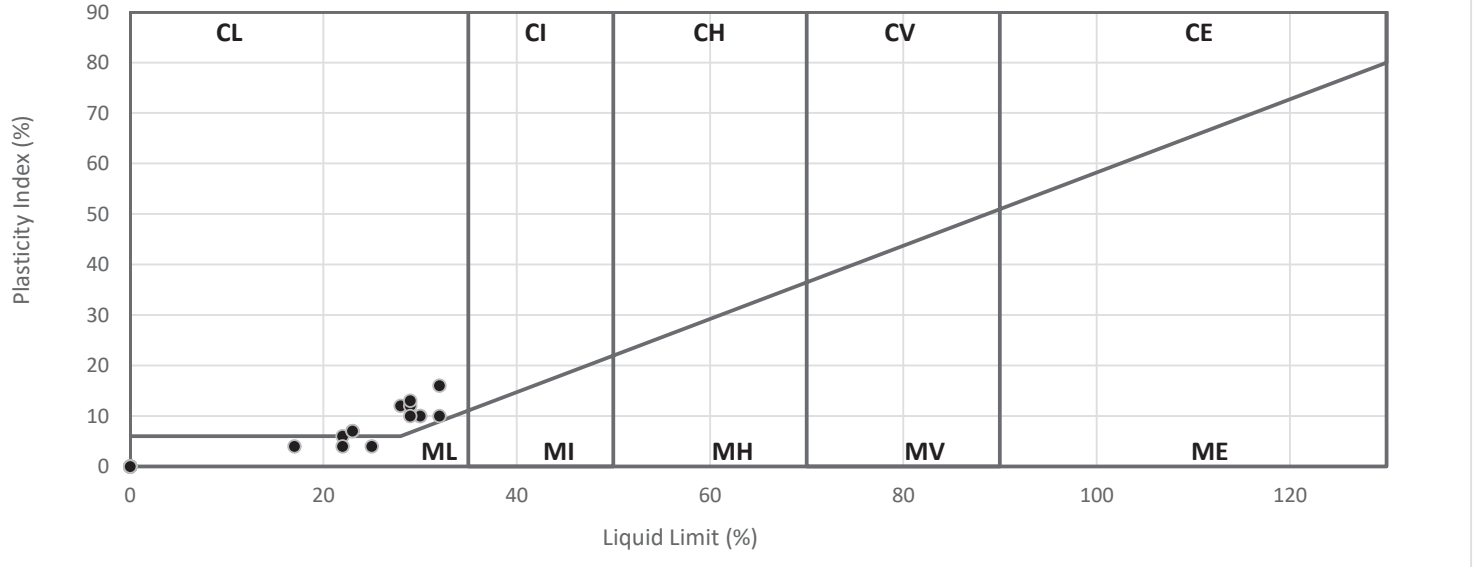
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX
(BS 1377 : Part 2 : 1990 Method 5)

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-C6-01	7	D	5.00	-		19	23	16	7	100	CL Low Plasticity
BH17-C6-02	7	D	6.00	-		18	23	16	7	100	CL Low Plasticity
BH17-C6-03	5	D	8.50	-	8.95	37		NP		100	
BH17-C7-02	5	D	5.50	-	5.95	26	25	21	4	100	ML Low Plasticity
BH17-C7-04	8	D	8.00	-		17	22	18	4	100	ML Low Plasticity
				-							
				-							
				-							

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

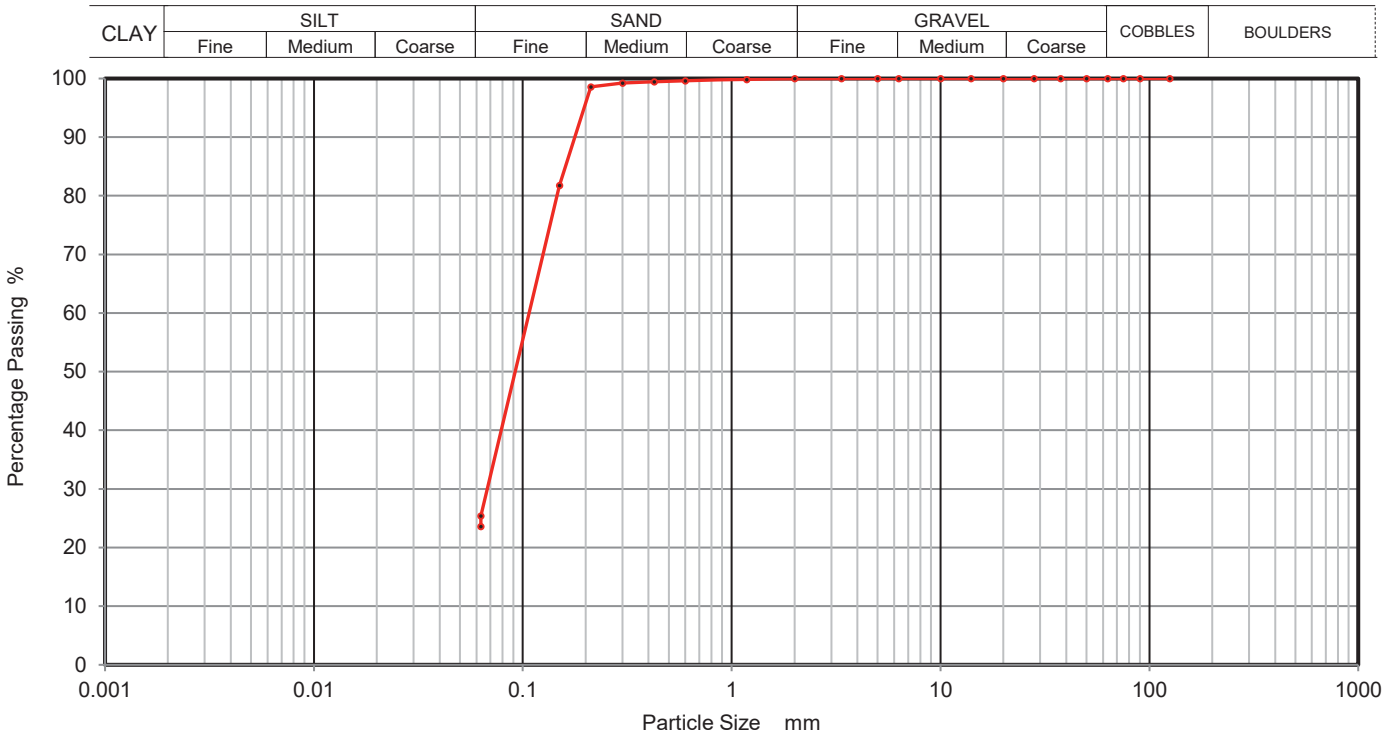
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



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

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	36525
		Borehole/Pit No.	BH17-C6-01
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	10
Soil Description	Brown silty fine to medium SAND	Depth Top	9.00
		Depth Base	9.45
		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	100		
0.425	99		
0.3	99		
0.212	99		
0.15	82		
0.063	25		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	75
Silt and Clay	25

Grading Analysis	
Uniformity Coefficient	

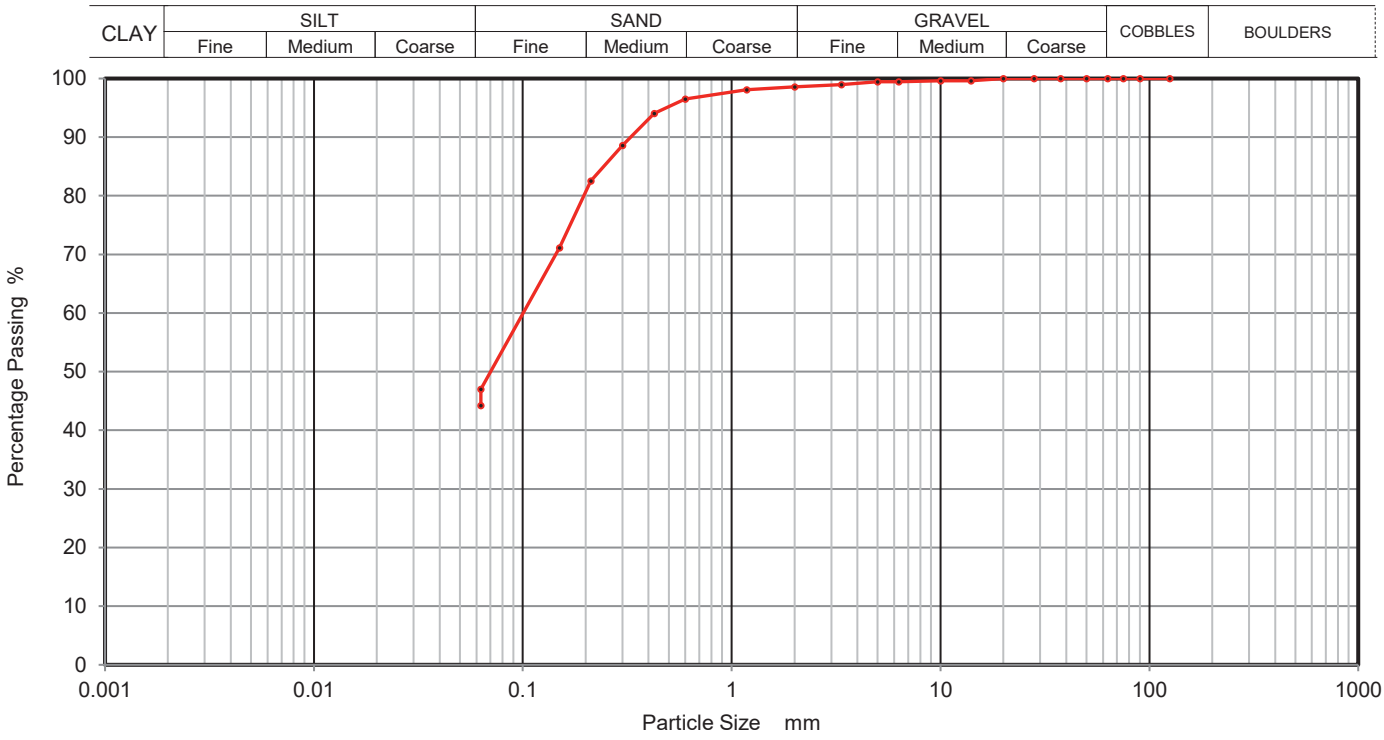
Remarks

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-C6-04
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	3
Soil Description	Brown slightly fine to medium gravelly slightly clayey silty fine to coarse SAND	Depth Top	6.00
		Depth Base	
		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	99		
5	99		
3.35	99		
2	99		
1.18	98		
0.6	97		
0.425	94		
0.3	89		
0.212	83		
0.15	71		
0.063	47		

Sample Proportions	% dry mass
Cobbles	0
Gravel	1
Sand	52
Silt and Clay	47

Grading Analysis	
Uniformity Coefficient	

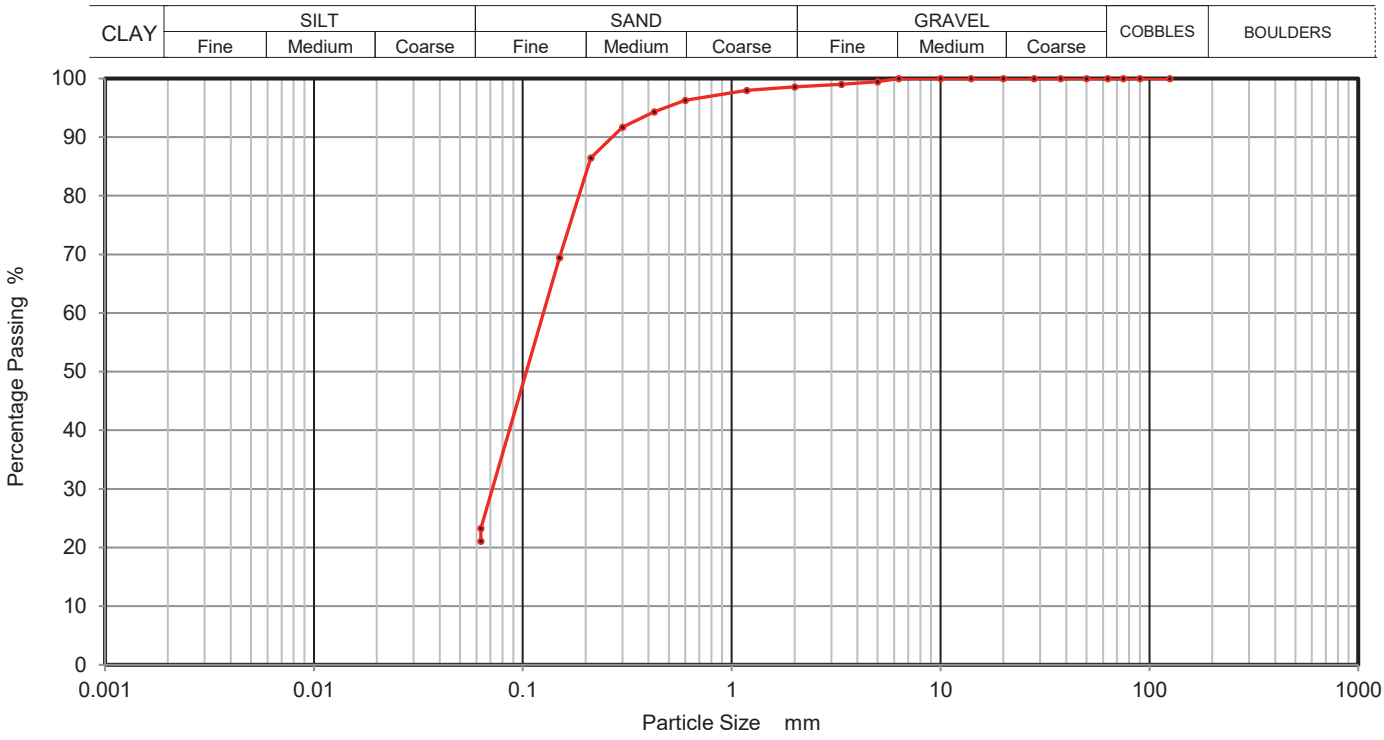
Remarks

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-C7-01
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	12
Soil Description	Brown slightly fine gravelly silty fine to coarse SAND	Depth Top	14.50
		Depth Base	14.95
		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	99		
3.35	99		
2	99		
1.18	98		
0.6	96		
0.425	94		
0.3	92		
0.212	86		
0.15	69		
0.063	23		

Sample Proportions	% dry mass
Cobbles	0
Gravel	1
Sand	76
Silt and Clay	23

Grading Analysis	
Uniformity Coefficient	

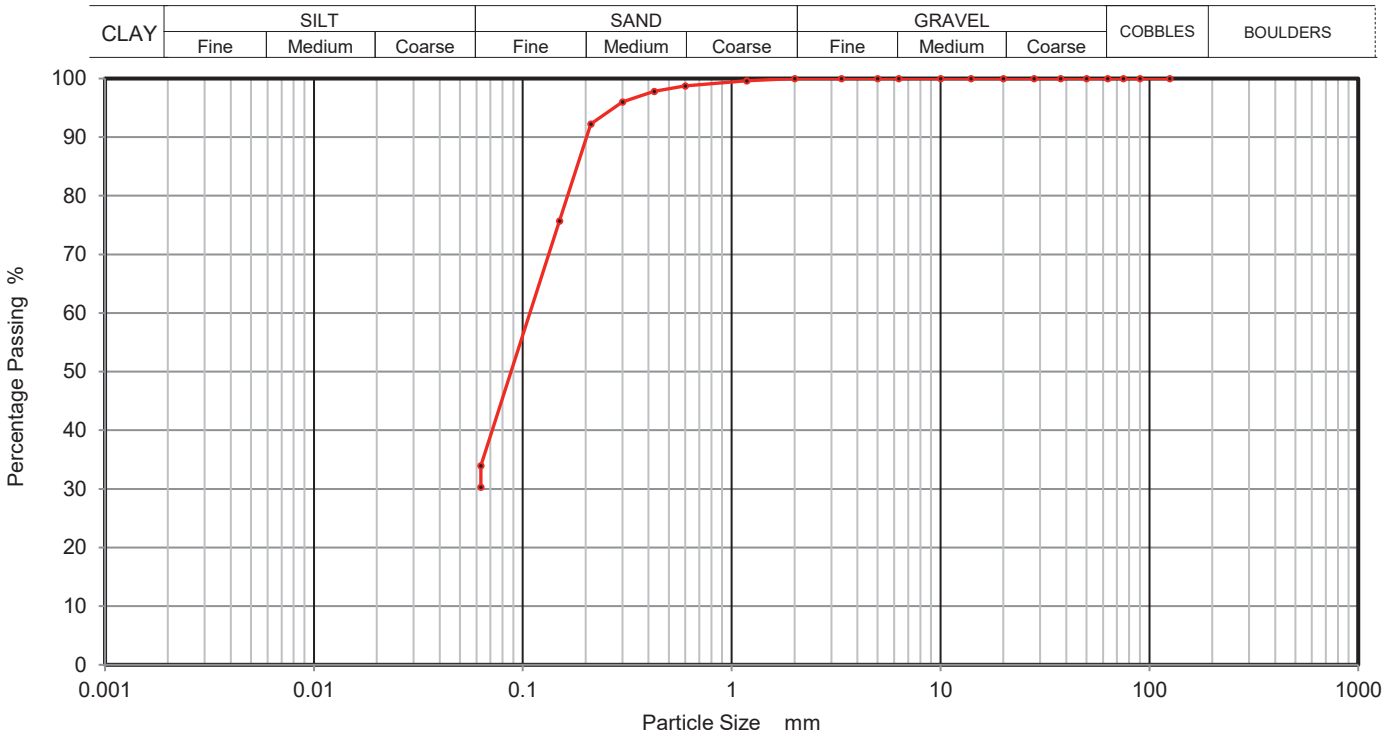
Remarks

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-C7-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	3
Soil Description	Brown silty fine to coarse SAND	Depth Top	1.50
		Depth Base	1.95
		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	99		
0.425	98		
0.3	96		
0.212	92		
0.15	76		
0.063	34		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	66
Silt and Clay	34

Grading Analysis	
Uniformity Coefficient	

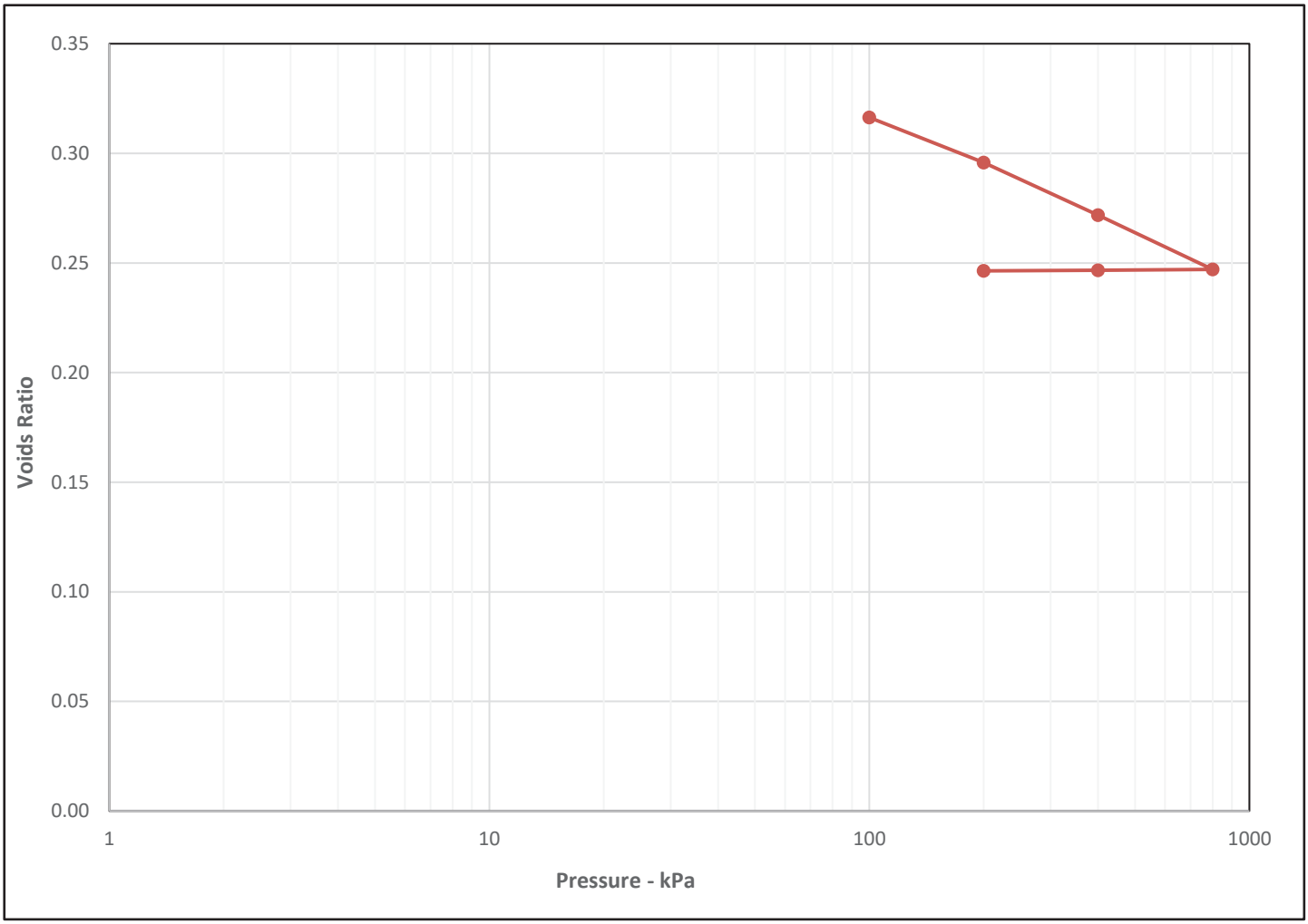
Remarks

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-C6-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Brown silty sandy CLAY	Depth Top (m)	7.00
		Depth Base (m)	7.45
Lab Temperature	20°c	Sample Location	Middle
Remarks	Cv Calculated Using T90	Sample Type	U

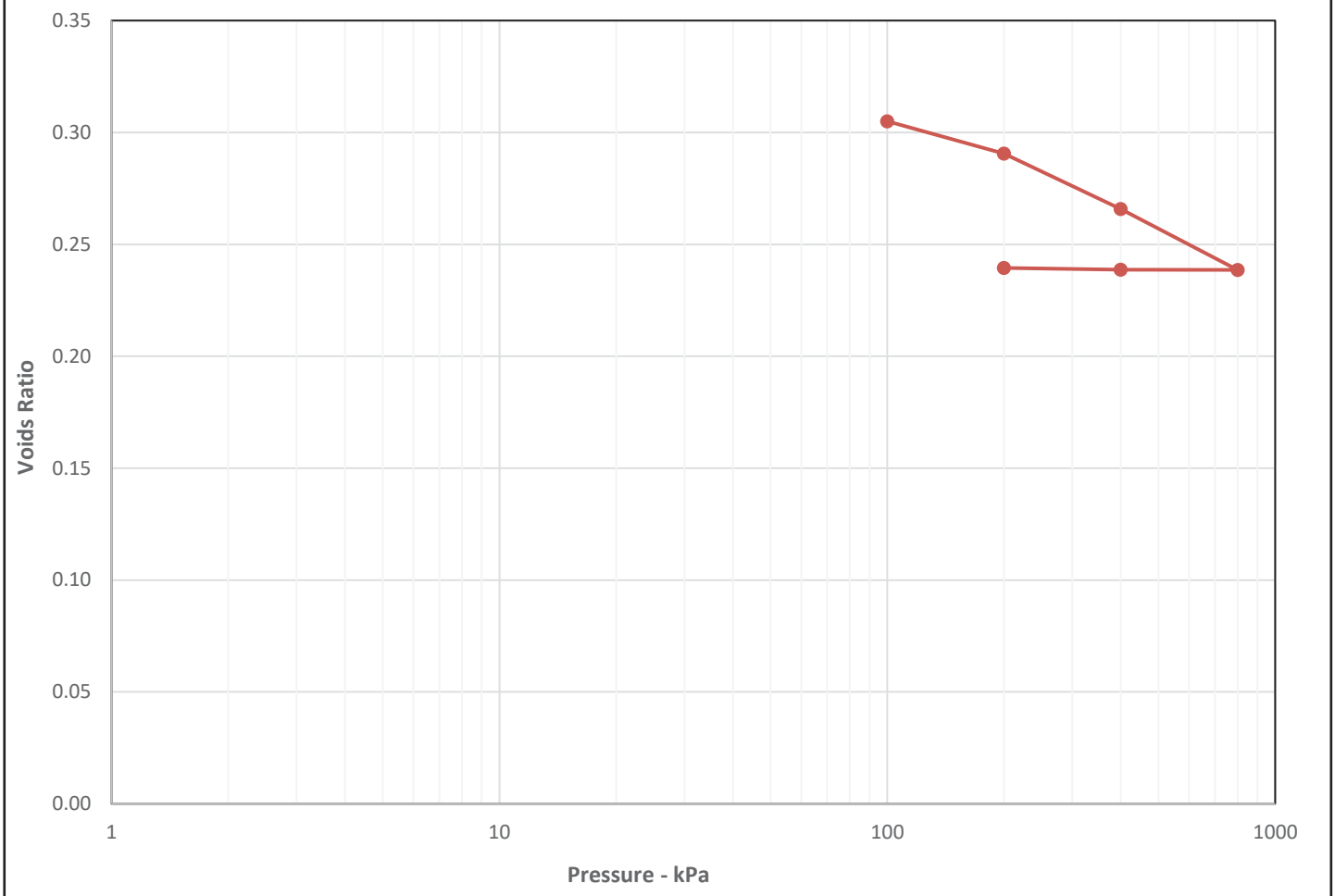


Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	18	0	-	100	0.6	5.8		-			
Bulk Density (Mg/m3)	2.24	100	-	200	0.16	6.1		-			
Dry Density (Mg/m3)	1.89	200	-	400	0.092	11		-			
Voids Ratio	0.3999	400	-	800	0.0	11		-			
Degree of saturation	122.2	800	-	400	-0.00099	26		-			
Height (mm)	19.83	400	-	200	-0.00085	10		-			
Diameter (mm)	74.9		-					-			
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-C7-01
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	2
Soil Description	Brown silty sandy CLAY	Depth Top (m)	10.00
		Depth Base (m)	10.45
Lab Temperature	20°c	Sample Location	Middle
Remarks	Cv Calculated Using T90	Sample Type	U

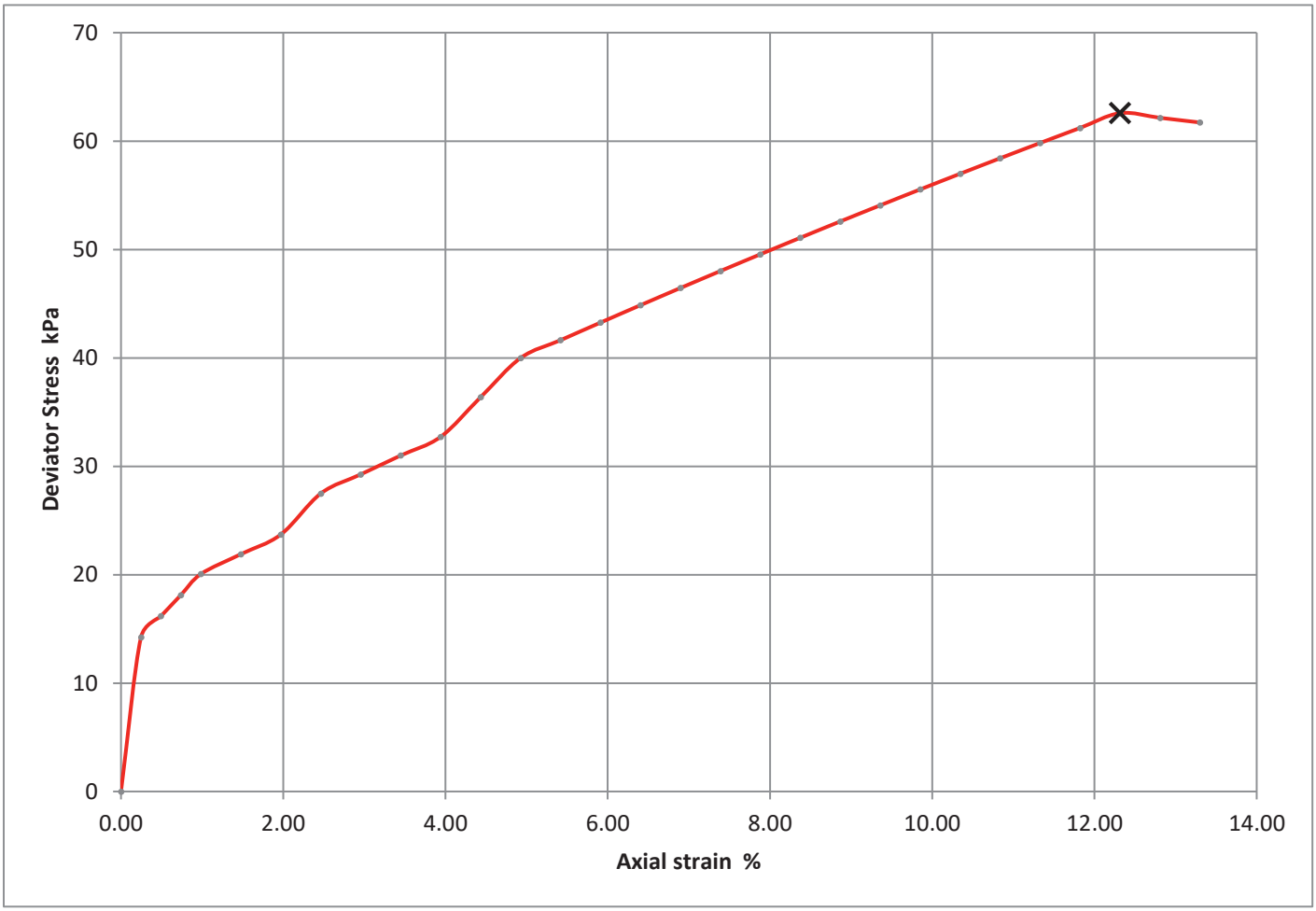


Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	17	0	-	100	0.63	3.5		-			
Bulk Density (Mg/m3)	2.23	100	-	200	0.11	6.1		-			
Dry Density (Mg/m3)	1.90	200	-	400	0.096	7.4		-			
Voids Ratio	0.3926	400	-	800	0.1	8.4		-			
Degree of saturation	116.8	800	-	400	0.00028	18		-			
Height (mm)	19.77	400	-	200	0.0028	5.6		-			
Diameter (mm)	74.91		-					-			
Particle Density (Mg/m3)	2.65		-					-			

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

UKAS TESTING 2788

GSTL	Single Stage Unconsolidated-Undrained Triaxial Test BS 1377 : 1990 Part 7 : 8	Contract Number	36525
		Borehole/Pit No.	BH17-C6-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Brown silty sandy CLAY	Depth Top (m)	7.00
		Depth Base (m)	7.45
		Sample Type	U



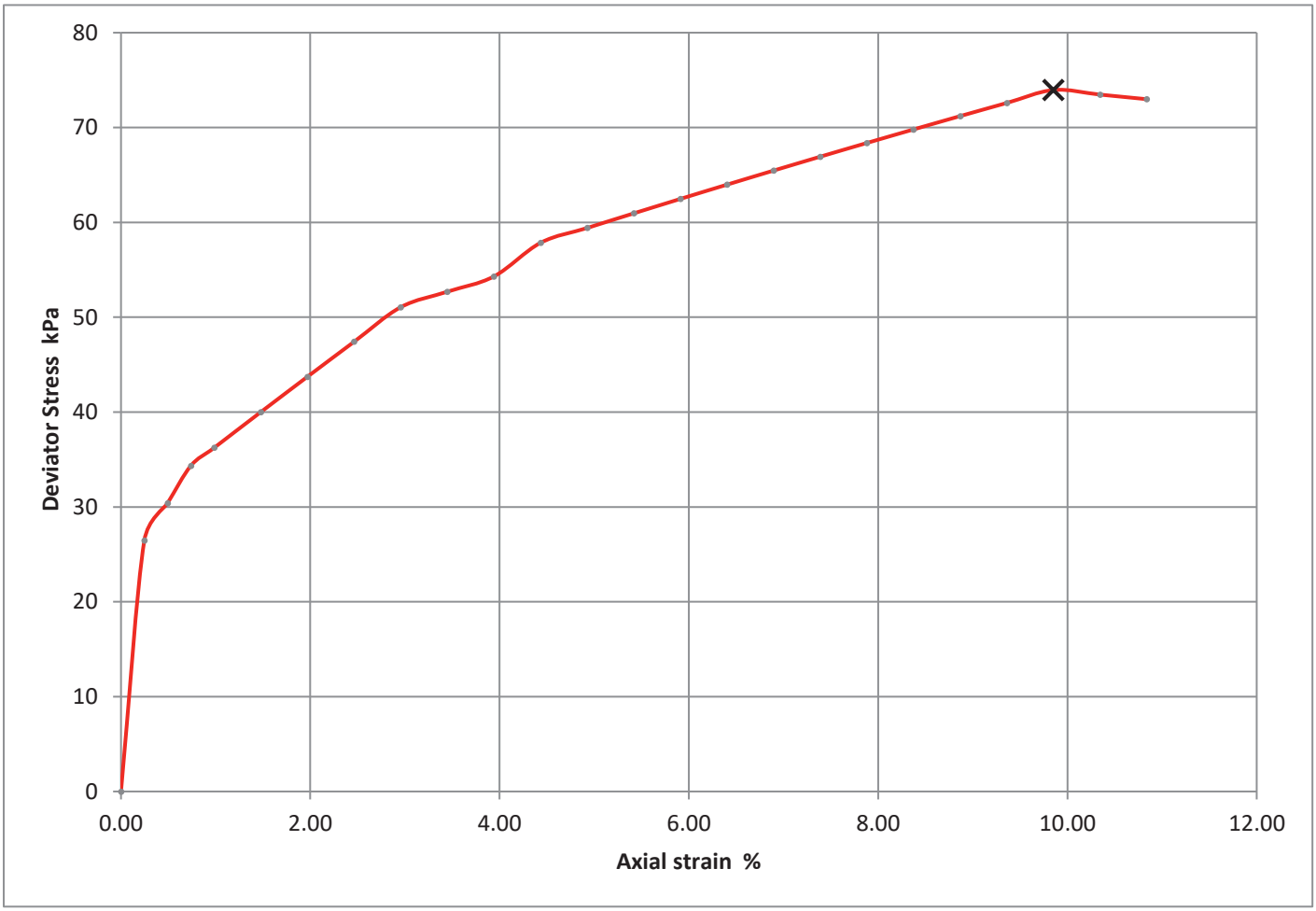
Moisture Content (%)	17
Bulk Density (Mg/m^3)	2.25
Dry Density (Mg/m^3)	1.92
Specimen Length (mm)	203
Specimen Diameter (mm)	102
Cell Pressure (kPa)	140
Deviator Stress (kPa)	63
Undrained Shear Strength (kPa)	31
Failure Strain (%)	12.3
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	3.00

Specimen Post Test	Sample Split
PICTURE NOT AVAILABLE	PICTURE NOT AVAILABLE

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

UKAS TESTING 2788

GSTL	Single Stage Unconsolidated-Undrained Triaxial Test BS 1377 : 1990 Part 7 : 8	Contract Number	36525
		Borehole/Pit No.	BH17-C7-01
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Brown fine to coarse gravelly silty CLAY	Depth Top (m)	7.00
		Depth Base (m)	7.45
		Sample Type	U



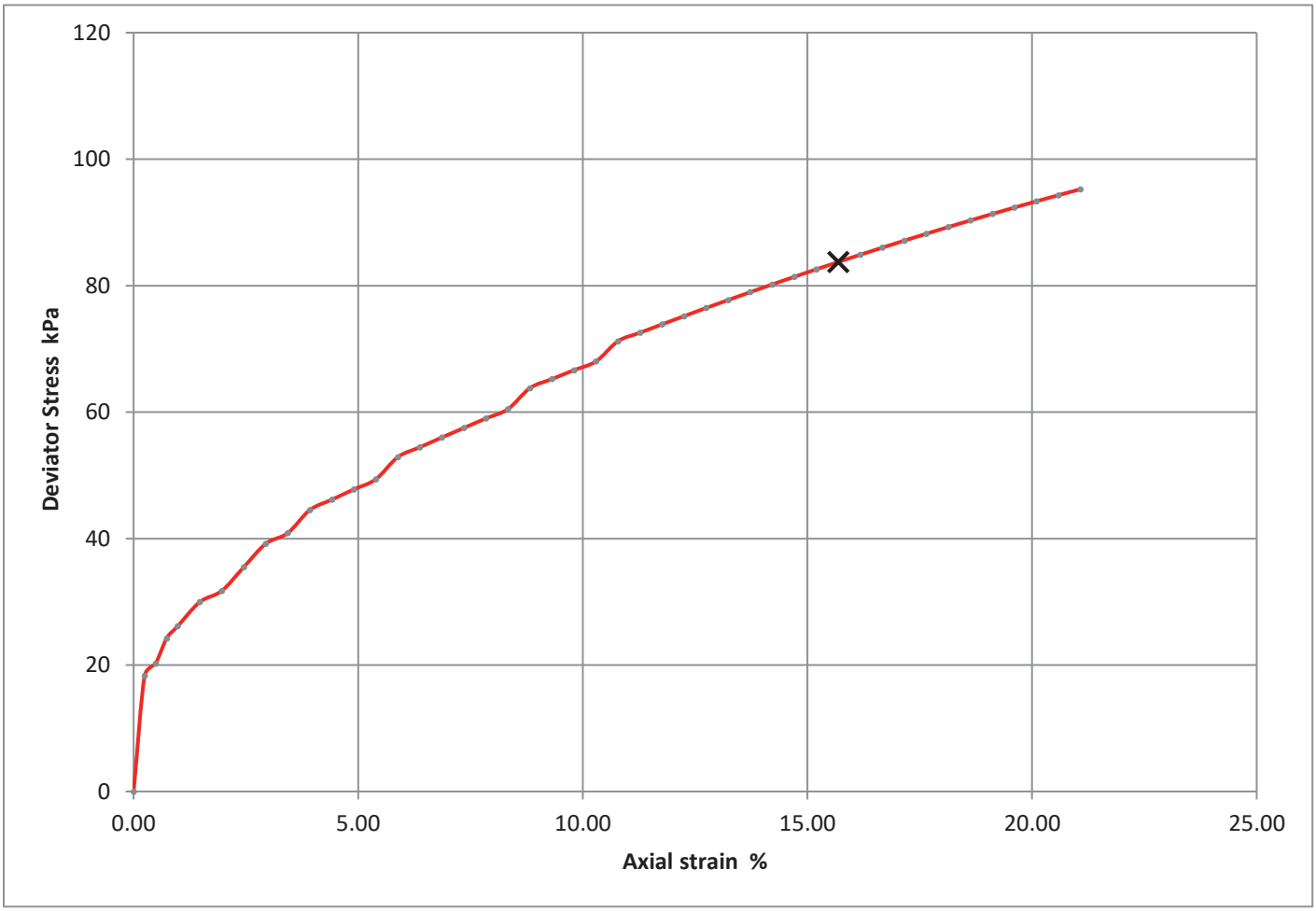
Moisture Content (%)	15
Bulk Density (Mg/m^3)	2.23
Dry Density (Mg/m^3)	1.94
Specimen Length (mm)	203
Specimen Diameter (mm)	102
Cell Pressure (kPa)	200
Deviator Stress (kPa)	74
Undrained Shear Strength (kPa)	37
Failure Strain (%)	9.9
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	3.00

Specimen Post Test	Sample Split
PICTURE NOT AVAILABLE	PICTURE NOT AVAILABLE

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

UKAS TESTING 2788

GSTL	Single Stage Unconsolidated-Undrained Triaxial Test BS 1377 : 1990 Part 7 : 8	Contract Number	36525
		Borehole/Pit No.	BH17-C7-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Grey/brown slightly sandy fine to medium gravelly silty CLAY	Depth Top (m)	7.00
		Depth Base (m)	7.45
		Sample Type	U



Moisture Content (%)	15
Bulk Density (Mg/m^3)	2.31
Dry Density (Mg/m^3)	2.01
Specimen Length (mm)	204
Specimen Diameter (mm)	102
Cell Pressure (kPa)	140
Deviator Stress (kPa)	84
Undrained Shear Strength (kPa)	42
Failure Strain (%)	15.7
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	3.00

Specimen Post Test	Sample Split
PICTURE NOT AVAILABLE	PICTURE NOT AVAILABLE

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

UKAS TESTING 2788

CONCEPT LIFE SCIENCES
DELIVER NO 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 1E 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 Advis

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

Soil Analysed as Soil
BRE SD1 (SE)

Concept Reference	**684646 008**	**684646 009**
Customer Sample Reference	**BH17-C6-01 D7 @ 5.00m**	**17-C7-03 D8 @ 6.50m**
Date Sampled	**Deviating**	**Deviating**
Matrix Class	**Sandy Soil**	**Clay**

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	**0.02**
Magnesium	T112	A40	1	mg/l	<1	**3**
(Water soluble) NO3	T710	A40	0.01	g/l	<0.01	<0.01
pH	T7	A40			**8.1**	**8.3**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	**0.02**	**0.03**
SO4(Total)	T102	A40	0.02	%	<0.02	**0.02**
Sulphur (total)	T6	A40	0.01	%	<0.01	**0.01**
Moisture @105C	T162	AR	0.1	%	**16**	**14**
Retained on 2mm	T2	A40	0.1	%	**2.3**	**2.4**

Index to symbols used in Supplement 1E 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

Supplement 1E Report reissued to include only samples 008 and 009
Retained on 2mm is removed before analysis
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

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	N	008-009
(Water soluble) Cl-	T710	A40	0.01	g/l	N	008-009
Magnesium	T112	A40	1	mg/l	N	008-009
(Water soluble) NO3	T710	A40	0.01	g/l	N	008-009
pH	T7	A40			M	008-009
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	M	008-009
SO4(Total)	T102	A40	0.02	%	M	008-009
Sulphur (total)	T6	A40	0.01	%	M	008-009
Moisture @105C	T162	AR	0.1	%	N	008-009
Retained on 2mm	T2	A40	0.1	%	N	008-009

APPENDIX F
Geoenvironmental Laboratory Test Results

Report References: 672447

674086

675177

CONCEPT LIFE SCIENCES

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 1C 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 Advis

[redacted]

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

Soil Analysed as Soil
Miscellaneous

				Concept Reference	**672447 026**	**672447 030**	**672447 034**	**672447 038**	**672447 042**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C6-04 ES2 @ 1.00m**	**BH17-C6-01 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**17-JUL-2017**	**18-JUL-2017**	**20-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Clay**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T257	A40	2	mg/kg	**8**	**7**	**10**	**9**	**8**
Barium	T257	A40	2	mg/kg	**41**	**33**	**38**	**32**	**25**
Beryllium	T245	A40	0.5	mg/kg	<0.5	<0.5	**0.7**	<0.5	**0.5**
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	**13**	**12**	**19**	**13**	**11**
Copper	T257	A40	2	mg/kg	**11**	**7**	**14**	**7**	**8**
Lead	T257	A40	2	mg/kg	**27**	**14**	**12**	**9**	**8**
Mercury	T245	A40	1.0	mg/kg	**1.3**	<1.0	<1.0	<1.0	<1.0
Nickel	T257	A40	0.5	mg/kg	**9.1**	**9.0**	**17**	**10**	**9.6**
Selenium	T257	A40	3	mg/kg	<3	<3	<3	<3	<3
Vanadium	T257	A40	0.1	mg/kg	**19**	**19**	**31**	**20**	**18**
Zinc	T257	A40	2	mg/kg	**32**	**27**	**37**	**24**	**24**
Soil Organic Matter	T287	A40	0.1	%	**1.4**	**0.9**	-	-	**0.2**
Moisture @105C	T162	AR	0.1	%	**8.8**	**7.1**	**15**	**3.7**	**16**
Retained on 2mm	T2	A40	0.1	%	**1.0**	**5.5**	**8.1**	**6.5**	**1.3**

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

Soil Analysed as Soil
Miscellaneous

				Concept Reference	**672447 054**	**672447 066**	**672447 074**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**	**BH17-C7-04 ES2 @ 1.00m**	**BH17-C7-01 ES2 @ 1.00m**
				Date Sampled	**25-JUL-2017**	**24-JUL-2017**	**27-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Arsenic	T257	A40	2	mg/kg	**10**	**5**	**3**
Barium	T257	A40	2	mg/kg	**29**	**23**	**14**
Beryllium	T245	A40	0.5	mg/kg	<0.5	<0.5	<0.5
Boron (water-soluble)	T82	A40	1	mg/kg	<1	<1	<1
Cadmium	T257	A40	0.1	mg/kg	<0.1	<0.1	<0.1
Chromium	T257	A40	0.5	mg/kg	**33**	**6.1**	**5.9**
Copper	T257	A40	2	mg/kg	**8**	**3**	**3**
Lead	T257	A40	2	mg/kg	**10**	**4**	**4**
Mercury	T245	A40	1.0	mg/kg	<1.0	<1.0	<1.0
Nickel	T257	A40	0.5	mg/kg	**11**	**5.1**	**5.6**
Selenium	T257	A40	3	mg/kg	<3	<3	<3
Vanadium	T257	A40	0.1	mg/kg	**20**	**13**	**8.6**
Zinc	T257	A40	2	mg/kg	**25**	**12**	**11**
Soil Organic Matter	T287	A40	0.1	%	**0.5**	-	-
Moisture @105C	T162	AR	0.1	%	**7.5**	**6.0**	**5.0**
Retained on 2mm	T2	A40	0.1	%	**40.6**	**2.6**	<0.1

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

Soil Analysed as Soil
Asbestos

	Concept Reference	672447 025	672447 029	672447 041	672447 053
	Customer Sample Reference	BH17-C6-03 ES1 @ 0.50m	BH17-C6-02 ES1 @ 0.50m	BH17-C7-03 ES1 @ 0.50m	BH17-C7-02 ES1 @ 0.50m
	Date Sampled	14-JUL-2017	13-JUL-2017	20-JUL-2017	25-JUL-2017
Determinand	Method / Test Sample / LOD / Units				
Asbestos ID	T27 / A40	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)

Determinand	Method	Test Sample	LOD	Units	672447 026 BH17-C6-03 ES2 @ 1.00m	672447 030 BH17-C6-02 ES2 @ 1.00m	672447 042 BH17-C7-03 ES2 @ 1.00m	672447 054 BH17-C7-02 ES2 @ 1.00m
Date Sampled					14-JUL-2017	13-JUL-2017	20-JUL-2017	25-JUL-2017
Matrix Class					Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil
Naphthalene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Phenanthrene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Anthracene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluoranthene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Pyrene	T16	AR	0.1	mg/kg	<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
Chrysene	T16	AR	0.1	mg/kg	<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
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	<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
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	<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
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
PAH(total)	T16	AR	0.1	mg/kg	<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 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Benzene	T209	AR	10	µg/kg	<10	<10	<10	<10
Toluene	T209	AR	10	µg/kg	<10	<10	<10	<10
EthylBenzene	T209	AR	10	µg/kg	<10	<10	<10	<10
M/P Xylene	T209	AR	10	µg/kg	<10	<10	<10	<10
O Xylene	T209	AR	10	µg/kg	<10	<10	<10	<10
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	<10	<10	<10	<10
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	<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
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	<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
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	<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
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	**2**	<2	<2	<2
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	**2**	<2	<2	<2
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	<2	<2	<2	<2
TPH (Aliphatic+Aromatic) C10-C25 (Sum)	T85	AR	4	mg/kg	(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

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

Soil Analysed as Soil
Organochlorine insecticides

				Concept Reference	**672447 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	T1	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Heptachlor	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Aldrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Heptachlor epoxide	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Chlordane	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Endosulphan	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
DDE	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Dieldrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Endrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
DDD	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
DDT	T16	AR	0.01	mg/kg	<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 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Dichlorvos	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Mevinphos	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Dimethoate	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Diazinon	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Pirimiphos methyl	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Malathion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Fenitrothion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Parathion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Azinphos methyl	T16	AR	0.01	mg/kg	<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 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
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
Atrazine	T16	AR	0.01	mg/kg	(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
Trietazine	T16	AR	0.01	mg/kg	(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
Terbutryn	T16	AR	0.01	mg/kg	(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 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Chlorotoluron	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Diuron	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Isoproturon	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Linuron	T310	AR	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01
Monuron	T310	AR	0.01	mg/kg	<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 026	672447 030	672447 042	672447 054
	Customer Sample Reference	BH17-C6-03 ES2 @ 1.00m	BH17-C6-02 ES2 @ 1.00m	BH17-C7-03 ES2 @ 1.00m	BH17-C7-02 ES2 @ 1.00m
	Date Sampled	14-JUL-2017	13-JUL-2017	20-JUL-2017	25-JUL-2017
	Matrix Class	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil

Determinand	Method	Test Sample	LOD	Units				
Mecoprop	T16	AR	0.01	mg/kg	<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
Dichlorprop	T16	AR	0.01	mg/kg	<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
Fenoprop	T16	AR	0.01	mg/kg	(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

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

Soil Analysed as Soil
Phenols (Speciated)

	Concept Reference	672447 026	672447 030	672447 042	672447 054
	Customer Sample Reference	BH17-C6-03 ES2 @ 1.00m	BH17-C6-02 ES2 @ 1.00m	BH17-C7-03 ES2 @ 1.00m	BH17-C7-02 ES2 @ 1.00m
	Date Sampled	14-JUL-2017	13-JUL-2017	20-JUL-2017	25-JUL-2017
	Matrix Class	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil

Determinand	Method	Test Sample	LOD	Units				
Resorcinol	T17	AR	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05
Catechol	T17	AR	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05
Phenol	T17	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Cresols	T17	AR	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05
Xylenols	T17	AR	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05
Naphthols	T17	AR	0.05	mg/kg	<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
Total Phenols	T17	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1

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

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

Notes

026, 030, 042, 054, - 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 - 026, 030, 042 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
Supplement 1C report reissued to include only samples 025, 026, 029, 030, 034, 038, 041, 042, 053, 054, 066 and 074
TPH, PAH & BTEX - 026, 030 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
OCP, OPP and PAAH analysis transferred to Concept Life Sciences Manchester
Speciated phenols - 026, 030, 042, 054- These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
Asbestos subcontracted to REC Limited
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except TPH c5-c35 aro/ali split, Urons, Triazines, OCP/OPP and PAAH
Retained on 2mm is removed before analysis

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Arsenic	T257	A40	2	mg/kg	M	026,030,034,038,042,054,066,074
Barium	T257	A40	2	mg/kg	U	026,030,034,038,042,054,066,074
Beryllium	T245	A40	0.5	mg/kg	U	026,030,034,038,042,054,066,074
Boron (water-soluble)	T82	A40	1	mg/kg	N	026,030,034,038,042,054,066,074
Cadmium	T257	A40	0.1	mg/kg	M	026,030,034,038,042,054,066,074
Chromium	T257	A40	0.5	mg/kg	M	026,030,034,038,042,054,066,074
Copper	T257	A40	2	mg/kg	M	026,030,034,038,042,054,066,074
Lead	T257	A40	2	mg/kg	M	026,030,034,038,042,054,066,074
Mercury	T245	A40	1.0	mg/kg	U	026,030,034,038,042,054,066,074
Nickel	T257	A40	0.5	mg/kg	M	026,030,034,038,042,054,066,074
Selenium	T257	A40	3	mg/kg	U	026,030,034,038,042,054,066,074
Vanadium	T257	A40	0.1	mg/kg	U	026,030,034,038,042,054,066,074
Zinc	T257	A40	2	mg/kg	M	026,030,034,038,042,054,066,074
Soil Organic Matter	T287	A40	0.1	%	N	026,030,042,054
Moisture @105C	T162	AR	0.1	%	N	026,030,034,038,042,054,066,074
Retained on 2mm	T2	A40	0.1	%	N	026,030,034,038,042,054,066,074
Asbestos ID	T27	A40			SU	025,029,041,053
Naphthalene	T16	AR	0.1	mg/kg	U	026,030,042,054
Acenaphthylene	T16	AR	0.1	mg/kg	U	026,030,042,054
Acenaphthene	T16	AR	0.1	mg/kg	M	026,030,042,054
Fluorene	T16	AR	0.1	mg/kg	M	026,030,042,054
Phenanthrene	T16	AR	0.1	mg/kg	U	026,030,042,054
Anthracene	T16	AR	0.1	mg/kg	M	026,030,042,054
Fluoranthene	T16	AR	0.1	mg/kg	N	026,030,042,054
Pyrene	T16	AR	0.1	mg/kg	N	026,030,042,054
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	M	026,030,042,054
Chrysene	T16	AR	0.1	mg/kg	M	026,030,042,054
Benzo(b)fluoranthene	T16	AR	0.1	mg/kg	U	026,030,042,054
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	N	026,030,042,054
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	M	026,030,042,054
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	M	026,030,042,054
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	M	026,030,042,054
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	M	026,030,042,054
PAH(total)	T16	AR	0.1	mg/kg	U	026,030,042,054
Benzene	T209	AR	10	µg/kg	M	026,030,042,054
Toluene	T209	AR	10	µg/kg	M	026,030,042,054
EthylBenzene	T209	AR	10	µg/kg	M	026,030,042,054
M/P Xylene	T209	AR	10	µg/kg	M	026,030,042,054
O Xylene	T209	AR	10	µg/kg	M	026,030,042,054
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	U	026,030,042,054
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	N	026,030,042,054
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	N	026,030,042,054

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	N	026,030,042,054
TPH (Aliphatic+Aromatic) C10-C25 (Sum)	T85	AR	4	mg/kg	N	026,030,042,054
TPH (Aliphatic+Aromatic) C25-C40 (Sum)	T85	AR	4	mg/kg	N	026,030,042,054
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	U	026,030,042,054
Hexachlorobenzene	T1	AR	0.01	mg/kg	U	026,030,042,054
Heptachlor	T16	AR	0.01	mg/kg	U	026,030,042,054
Aldrin	T16	AR	0.01	mg/kg	U	026,030,042,054
Heptachlor epoxide	T16	AR	0.01	mg/kg	U	026,030,042,054
Chlordane	T16	AR	0.01	mg/kg	U	026,030,042,054
Endosulphan	T16	AR	0.01	mg/kg	U	026,030,042,054
DDE	T16	AR	0.01	mg/kg	U	026,030,042,054
Dieldrin	T16	AR	0.01	mg/kg	U	026,030,042,054
Endrin	T16	AR	0.01	mg/kg	U	026,030,042,054
DDD	T16	AR	0.01	mg/kg	U	026,030,042,054
DDT	T16	AR	0.01	mg/kg	U	026,030,042,054
Dichlorvos	T16	AR	0.01	mg/kg	U	026,030,042,054
Mevinphos	T16	AR	0.01	mg/kg	U	026,030,042,054
Dimethoate	T16	AR	0.01	mg/kg	U	026,030,042,054
Diazinon	T16	AR	0.01	mg/kg	U	026,030,042,054
Pirimiphos methyl	T16	AR	0.01	mg/kg	U	026,030,042,054
Malathion	T16	AR	0.01	mg/kg	U	026,030,042,054
Fenitrothion	T16	AR	0.01	mg/kg	U	026,030,042,054
Parathion	T16	AR	0.01	mg/kg	U	026,030,042,054
Azinphos methyl	T16	AR	0.01	mg/kg	U	026,030,042,054
Simazine	T16	AR	0.01	mg/kg	N	026,030,042,054
Atrazine	T16	AR	0.01	mg/kg	N	026,030,042,054
Propazine	T16	AR	0.01	mg/kg	N	026,030,042,054
Trietazine	T16	AR	0.01	mg/kg	N	026,030,042,054
Prometryn	T16	AR	0.01	mg/kg	N	026,030,042,054
Terbutryn	T16	AR	0.01	mg/kg	N	026,030,042,054
Chlorotoluron	T310	AR	0.01	mg/kg	N	026,030,042,054
Diuron	T310	AR	0.01	mg/kg	N	026,030,042,054
Isoproturon	T310	AR	0.01	mg/kg	N	026,030,042,054
Linuron	T310	AR	0.01	mg/kg	N	026,030,042,054
Monuron	T310	AR	0.01	mg/kg	N	026,030,042,054
Mecoprop	T16	AR	0.01	mg/kg	N	026,030,042,054
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	N	026,030,042,054
Dichlorprop	T16	AR	0.01	mg/kg	N	026,030,042,054
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	N	026,030,042,054
Fenoprop	T16	AR	0.01	mg/kg	N	026,030,042,054
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	N	026,030,042,054
Resorcinol	T17	AR	0.05	mg/kg	M	026,030,042,054
Catechol	T17	AR	0.05	mg/kg	N	026,030,042,054
Phenol	T17	AR	0.1	mg/kg	M	026,030,042,054
Cresols	T17	AR	0.05	mg/kg	M	026,030,042,054
Xylenols	T17	AR	0.05	mg/kg	M	026,030,042,054
Naphthols	T17	AR	0.05	mg/kg	N	026,030,042,054
Trimethyl phenol	T17	AR	0.05	mg/kg	M	026,030,042,054
Total Phenols	T17	AR	0.1	mg/kg	N	026,030,042,054

CONCEPT LIFE SCIENCES
DELIVER NO 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 1C to Report Number 674086-1

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-001839
Customer Site Reference: Norfolk Vanguard Cable Route
Date Job Received at Concept: 08-Aug-2017
Date Analysis Started: 09-Aug-2017
Date Analysis Completed: 22-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: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
CLEA metals, Braintree

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Arsenic	T257	A40	2	mg/kg	**43**
Barium	T257	A40	2	mg/kg	**75**
Beryllium	T245	A40	0.5	mg/kg	**1.1**
Boron (water-soluble)	T82	A40	1	mg/kg	<1
Cadmium	T257	A40	0.1	mg/kg	**0.2**
Chromium	T257	A40	0.5	mg/kg	**23**
Copper	T257	A40	2	mg/kg	**13**
Lead	T257	A40	2	mg/kg	**14**
Mercury	T245	A40	1.0	mg/kg	<1.0
Nickel	T257	A40	0.5	mg/kg	**26**
Selenium	T257	A40	3	mg/kg	<3
Vanadium	T257	A40	0.1	mg/kg	**47**
Zinc	T257	A40	2	mg/kg	**45**
Soil Organic Matter	T287	A40	0.1	%	**0.2**
Moisture @105C	T162	AR	0.1	%	**15**
Retained on 2mm	T2	A40	0.1	%	**3.3**

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Asbestos

				Concept Reference	**674086 013**
				Customer Sample Reference	**BH17-C7-02 ES1 @ 0.50m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Asbestos ID	T27	A40			Asbestos not detected

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

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

Concept Reference	**674086 014**
Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
Date Sampled	**27-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
Naphthalene	T16	AR	0.1	mg/kg	<0.1
Acenaphthylene	T16	AR	0.1	mg/kg	<0.1
Acenaphthene	T16	AR	0.1	mg/kg	<0.1
Fluorene	T16	AR	0.1	mg/kg	<0.1
Phenanthrene	T16	AR	0.1	mg/kg	<0.1
Anthracene	T16	AR	0.1	mg/kg	<0.1
Fluoranthene	T16	AR	0.1	mg/kg	**0.1**
Pyrene	T16	AR	0.1	mg/kg	**0.1**
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	<0.1
Chrysene	T16	AR	0.1	mg/kg	<0.1
Benzo(b)fluoranthene	T16	AR	0.1	mg/kg	<0.1
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	**0.1**
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	**0.1**
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	<0.1
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	<0.1
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	<0.1
PAH(total)	T16	AR	0.1	mg/kg	**0.5**

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
TPH CWG

Concept Reference	**674086 014**
Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
Date Sampled	**27-JUL-2017**
Matrix Class	**Clay**

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

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Phenols (Speciated)

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Resorcinol	T17	AR	0.05	mg/kg	<0.05
Catechol	T17	AR	0.05	mg/kg	<0.05
Phenol	T17	AR	0.1	mg/kg	<0.1
Cresols	T17	AR	0.05	mg/kg	<0.05
Xylenols	T17	AR	0.05	mg/kg	<0.05
Naphthols	T17	AR	0.05	mg/kg	<0.05
Trimethyl phenol	T17	AR	0.05	mg/kg	<0.05
Total Phenols	T17	AR	0.1	mg/kg	<0.1

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Organochlorine insecticides

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	<0.01
Hexachlorobenzene	T1	AR	0.01	mg/kg	<0.01
Heptachlor	T16	AR	0.01	mg/kg	(131) <0.01
Aldrin	T16	AR	0.01	mg/kg	<0.01
Heptachlor epoxide	T16	AR	0.01	mg/kg	<0.01
Chlordane	T16	AR	0.01	mg/kg	<0.01
Endosulphan	T16	AR	0.01	mg/kg	<0.01
DDE	T16	AR	0.01	mg/kg	<0.01
Dieldrin	T16	AR	0.01	mg/kg	<0.01
Endrin	T16	AR	0.01	mg/kg	<0.01
DDD	T16	AR	0.01	mg/kg	<0.01
DDT	T16	AR	0.01	mg/kg	(131) <0.01

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Organophosphorous insecticides

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Dichlorvos	T16	AR	0.01	mg/kg	<0.01
Mevinphos	T16	AR	0.01	mg/kg	<0.01
Dimethoate	T16	AR	0.01	mg/kg	<0.01
Diazinon	T16	AR	0.01	mg/kg	<0.01
Pirimiphos methyl	T16	AR	0.01	mg/kg	<0.01
Malathion	T16	AR	0.01	mg/kg	<0.01
Fenitrothion	T16	AR	0.01	mg/kg	<0.01
Parathion	T16	AR	0.01	mg/kg	<0.01
Azinphos methyl	T16	AR	0.01	mg/kg	<0.01

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Triazines Suite

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Simazine	T16	AR	0.01	mg/kg	(64) <0.01
Atrazine	T16	AR	0.01	mg/kg	(64) <0.01
Propazine	T16	AR	0.01	mg/kg	(64) <0.01
Trietazine	T16	AR	0.01	mg/kg	(64) <0.01
Prometryn	T16	AR	0.01	mg/kg	(64) <0.01
Terbutryn	T16	AR	0.01	mg/kg	(64) <0.01

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Urons

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Chlorotoluron	T310	AR	0.01	mg/kg	<0.01
Diuron	T310	AR	0.01	mg/kg	<0.01
Isoproturon	T310	AR	0.01	mg/kg	<0.01
Linuron	T310	AR	0.01	mg/kg	<0.01
Monuron	T310	AR	0.01	mg/kg	<0.01

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Phenoxy Acetic acid herbicides

				Concept Reference	**674086 014**
				Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
				Date Sampled	**27-JUL-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Mecoprop	T16	AR	0.01	mg/kg	(100) <0.05
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	(100) <0.05
Dichlorprop	T16	AR	0.01	mg/kg	(100) <0.05
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	(100) <0.05
Fenoprop	T16	AR	0.01	mg/kg	(100) <0.05
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	(100) <0.05

Index to symbols used in Supplement 1C to Report Number 674086-1

Value	Description
A40	Assisted dried < 40C
AR	As Received
131	Result is outside of the scope of accreditation due to a QC Failure
100	LOD determined by sample aliquot used for analysis
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
Retained on 2mm is removed before analysis
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except TPH c5-c40 aro/ali split, OCP, OPP and PAAH
Triazines & Urons analysis transferred to Concept Life Sciences Cambridge
OCP, OPP and PAAH analysis transferred to Concept Life Sciences Manchester
Supplement 1C Report reissued to include only samples 013 and 014

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Arsenic	T257	A40	2	mg/kg	M	014
Barium	T257	A40	2	mg/kg	U	014
Beryllium	T245	A40	0.5	mg/kg	U	014
Boron (water-soluble)	T82	A40	1	mg/kg	N	014
Cadmium	T257	A40	0.1	mg/kg	M	014
Chromium	T257	A40	0.5	mg/kg	M	014
Copper	T257	A40	2	mg/kg	M	014
Lead	T257	A40	2	mg/kg	M	014
Mercury	T245	A40	1.0	mg/kg	U	014
Nickel	T257	A40	0.5	mg/kg	M	014
Selenium	T257	A40	3	mg/kg	U	014
Vanadium	T257	A40	0.1	mg/kg	U	014
Zinc	T257	A40	2	mg/kg	M	014
Soil Organic Matter	T287	A40	0.1	%	N	014
Moisture @105C	T162	AR	0.1	%	N	014
Retained on 2mm	T2	A40	0.1	%	N	014
Asbestos ID	T27	A40			SU	013
Naphthalene	T16	AR	0.1	mg/kg	U	014
Acenaphthylene	T16	AR	0.1	mg/kg	U	014
Acenaphthene	T16	AR	0.1	mg/kg	M	014
Fluorene	T16	AR	0.1	mg/kg	M	014
Phenanthrene	T16	AR	0.1	mg/kg	U	014
Anthracene	T16	AR	0.1	mg/kg	M	014
Fluoranthene	T16	AR	0.1	mg/kg	N	014
Pyrene	T16	AR	0.1	mg/kg	N	014
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	M	014
Chrysene	T16	AR	0.1	mg/kg	M	014
Benzo(b)fluoranthene	T16	AR	0.1	mg/kg	U	014
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	N	014
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	M	014
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	M	014
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	M	014
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	M	014

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
PAH(total)	T16	AR	0.1	mg/kg	U	014
Benzene	T209	AR	10	µg/kg	M	014
Toluene	T209	AR	10	µg/kg	M	014
EthylBenzene	T209	AR	10	µg/kg	M	014
M/P Xylene	T209	AR	10	µg/kg	M	014
O Xylene	T209	AR	10	µg/kg	M	014
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	U	014
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	N	014
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	N	014
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	N	014
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	N	014
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	N	014
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	N	014
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	N	014
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	N	014
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	N	014
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	N	014
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	N	014
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	N	014
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	N	014
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	N	014
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	N	014
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	N	014
TPH (Aliphatic+Aromatic) C10-C25 (Sum)	T85	AR	4	mg/kg	N	014
TPH (Aliphatic+Aromatic) C25-C40 (Sum)	T85	AR	4	mg/kg	N	014
Resorcinol	T17	AR	0.05	mg/kg	M	014
Catechol	T17	AR	0.05	mg/kg	N	014
Phenol	T17	AR	0.1	mg/kg	M	014
Cresols	T17	AR	0.05	mg/kg	M	014
Xylenols	T17	AR	0.05	mg/kg	M	014
Naphthols	T17	AR	0.05	mg/kg	N	014
Trimethyl phenol	T17	AR	0.05	mg/kg	M	014
Total Phenols	T17	AR	0.1	mg/kg	N	014
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	U	014
Hexachlorobenzene	T1	AR	0.01	mg/kg	U	014
Heptachlor	T16	AR	0.01	mg/kg	U	014
Aldrin	T16	AR	0.01	mg/kg	U	014
Heptachlor epoxide	T16	AR	0.01	mg/kg	U	014
Chlordane	T16	AR	0.01	mg/kg	U	014
Endosulphan	T16	AR	0.01	mg/kg	U	014
DDE	T16	AR	0.01	mg/kg	U	014
Dieldrin	T16	AR	0.01	mg/kg	U	014
Endrin	T16	AR	0.01	mg/kg	U	014
DDD	T16	AR	0.01	mg/kg	U	014
DDT	T16	AR	0.01	mg/kg	U	014
Dichlorvos	T16	AR	0.01	mg/kg	U	014
Mevinphos	T16	AR	0.01	mg/kg	U	014
Dimethoate	T16	AR	0.01	mg/kg	U	014
Diazinon	T16	AR	0.01	mg/kg	U	014
Pirimiphos methyl	T16	AR	0.01	mg/kg	U	014
Malathion	T16	AR	0.01	mg/kg	U	014
Fenitrothion	T16	AR	0.01	mg/kg	U	014
Parathion	T16	AR	0.01	mg/kg	U	014
Azinphos methyl	T16	AR	0.01	mg/kg	U	014
Simazine	T16	AR	0.01	mg/kg	N	014
Atrazine	T16	AR	0.01	mg/kg	N	014
Propazine	T16	AR	0.01	mg/kg	N	014
Trietazine	T16	AR	0.01	mg/kg	N	014
Prometryn	T16	AR	0.01	mg/kg	N	014
Terbutryn	T16	AR	0.01	mg/kg	N	014
Chlorotoluron	T310	AR	0.01	mg/kg	N	014
Diuron	T310	AR	0.01	mg/kg	N	014
Isoproturon	T310	AR	0.01	mg/kg	N	014
Linuron	T310	AR	0.01	mg/kg	N	014
Monuron	T310	AR	0.01	mg/kg	N	014
Mecoprop	T16	AR	0.01	mg/kg	N	014
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	N	014
Dichlorprop	T16	AR	0.01	mg/kg	N	014
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	N	014
Fenoprop	T16	AR	0.01	mg/kg	N	014

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	N	014

CONCEPT LIFE SCIENCES

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

Concept Life Sciences

Certificate of Analysis

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

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

Date of Report: 16-Oct-2017

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

Customer Contact: Mr Derek Daniels

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

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

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

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

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

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

UKAS TESTING
1549

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

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

Issued by :
Aislinn Arthey
Customer Service A

Waste Acceptance Criteria

Customer Sample Reference : BH17-C6-03 ES2 @ 1.00m
SAL Sample Reference : 672447 026
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 14-JUL-2017
Matrix Class : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	7.3		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	2.9			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.8	3.0	5.0	6.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	8.8			
Retained on 2mm	Grav	0.1	%	N	1.0			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0069	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.074	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	87	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.041	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	51	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	5.2	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.014	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	55	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	250	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.055	4.0	50.0	200.0

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

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

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

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

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

Waste Acceptance Criteria

Customer Sample Reference : BH17-C6-02 ES2 @ 1.00m
SAL Sample Reference : 672447 030
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 13-JUL-2017
Matrix Class : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	7.5		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	2.3			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.5	3.0	5.0	6.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	7.1			
Retained on 2mm	Grav	0.1	%	N	5.5			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0063	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.023	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	45	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.050	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	60	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	6.4	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	39	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	160	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.077	4.0	50.0	200.0

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

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

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

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

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

Waste Acceptance Criteria

Customer Sample Reference : BH17-C7-03 ES2 @ 1.00m
SAL Sample Reference : 672447 042
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 20-JUL-2017
Matrix Class : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	8.2		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	1.3			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.1	3.0	5.0	6.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	16			
Retained on 2mm	Grav	0.1	%	N	1.3			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.013	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.14	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	320	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.011	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.084	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	62	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	5.1	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	0.0067	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.020	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.013	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	110	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	1300	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.050	4.0	50.0	200.0

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

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

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

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

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

Waste Acceptance Criteria

Customer Sample Reference : BH17-C7-02 ES2 @ 1.00m
SAL Sample Reference : 672447 054
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 25-JUL-2017
Matrix Class : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	8.0		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	1.8			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.3	3.0	5.0	6.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	7.5			
Retained on 2mm	Grav	0.1	%	N	40.6			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0048	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.025	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	35	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.021	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	61	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	3.6	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.016	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	27	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	280	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.030	4.0	50.0	200.0

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

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

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

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

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

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

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

				Concept Reference	**672447 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Test Sample	**AR**	**AR**	**AR**	**AR**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Naphthalene	GC/MS	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	GC/MS	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Acenaphthene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Fluorene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Phenanthrene	GC/MS	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Anthracene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Fluoranthene	GC/MS	0.1	mg/kg	N	<0.1	<0.1	<0.1	<0.1
Pyrene	GC/MS	0.1	mg/kg	N	<0.1	<0.1	<0.1	<0.1
Benzo(a)Anthracene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Chrysene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	GC/MS	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	GC/MS	0.1	mg/kg	N	<0.1	<0.1	<0.1	<0.1
Benzo(a)Pyrene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Indeno(123-cd)Pyrene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)Anthracene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)Perylene	GC/MS	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Polyaromatic Hydrocarbons (Total)	GC/MS	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Coronene	GC/MS (MCERTS)	0.1	mg/kg	N	<0.1	<0.1	<0.1	<0.1

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

Soil Analysed as Soil
BTEX

				Concept Reference	**672447 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Test Sample	**AR**	**AR**	**AR**	**AR**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10

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

Soil Analysed as Soil
PCBs EC7 (SE)

				Concept Reference	**672447 026**	**672447 030**	**672447 042**	**672447 054**
				Customer Sample Reference	**BH17-C6-03 ES2 @ 1.00m**	**BH17-C6-02 ES2 @ 1.00m**	**BH17-C7-03 ES2 @ 1.00m**	**BH17-C7-02 ES2 @ 1.00m**
				Test Sample	**AR**	**AR**	**AR**	**AR**
				Date Sampled	**14-JUL-2017**	**13-JUL-2017**	**20-JUL-2017**	**25-JUL-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Polychlorinated biphenyl BZ#28	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#52	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#101	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#118	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#153	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#138	GC/MS	20	µg/kg	M	<20	<20	<20	<20
Polychlorinated biphenyl BZ#180	GC/MS	20	µg/kg	M	<20	<20	<20	<20

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

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

Notes

Supplement 1B report reissued to include only samples 026, 030, 042 and 054
026, 030, 042, 054, - BTEX - Samples submitted for GC/MS (Headspace) analysis were submitted in inappropriate containers. It is possible therefore that the results provided may be compromised.
Retained on 2mm is removed before analysis
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except ANC
pH, LOI & TOC were performed on assisted dried samples (<40 degree centigrade). All other results relate to samples as received.
TPH, PAH, PCB & BTEX - 026, 030 - These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.

CONCEPT LIFE SCIENCES

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 674086-1 A

Date of Report: 17-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-001839
Customer Site Reference: Norfolk Vanguard Cable Route
Date Job Received at Concept: 08-Aug-2017
Date Analysis Started: 09-Aug-2017
Date Analysis Completed: 22-Aug-2017

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

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

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

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

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

UKAS TESTING
1549

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

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

Issued by :
Aislinn Arthey
Customer Service

[redacted]

Waste Acceptance Criteria

Customer Sample Reference : BH17-C7-02 ES2 @ 1.00m
SAL Sample Reference : 674086 014
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 27-JUL-2017
Matrix Class : Clay

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	8.2		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	3.0			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.1	3.0	5.0	6.0
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
Coronene	GC/MS (MCERTS)	0.1	mg/kg	N	<0.1			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	15			
Retained on 2mm	Grav	0.1	%	N	3.3			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0024	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.11	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	37	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	150	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	10	**10.0**	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.025	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	26	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	620	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	<0.020	4.0	50.0	200.0

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

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

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

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

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

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

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

Concept Reference	**674086 014**
Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
Test Sample	**AR**
Date Sampled	**27-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	LOD	Units	Symbol	
Naphthalene	GC/MS	0.1	mg/kg	U	<0.1
Acenaphthylene	GC/MS	0.1	mg/kg	U	<0.1
Acenaphthene	GC/MS	0.1	mg/kg	M	<0.1
Fluorene	GC/MS	0.1	mg/kg	M	<0.1
Phenanthrene	GC/MS	0.1	mg/kg	U	<0.1
Anthracene	GC/MS	0.1	mg/kg	M	<0.1
Fluoranthene	GC/MS	0.1	mg/kg	N	**0.1**
Pyrene	GC/MS	0.1	mg/kg	N	**0.1**
Benzo(a)Anthracene	GC/MS	0.1	mg/kg	M	<0.1
Chrysene	GC/MS	0.1	mg/kg	M	<0.1
Benzo(b)fluoranthene	GC/MS	0.1	mg/kg	U	<0.1
Benzo(k)fluoranthene	GC/MS	0.1	mg/kg	N	**0.1**
Benzo(a)Pyrene	GC/MS	0.1	mg/kg	M	**0.1**
Indeno(123-cd)Pyrene	GC/MS	0.1	mg/kg	M	<0.1
Dibenzo(ah)Anthracene	GC/MS	0.1	mg/kg	M	<0.1
Benzo(ghi)Perylene	GC/MS	0.1	mg/kg	M	<0.1
Polyaromatic Hydrocarbons (Total)	GC/MS	0.1	mg/kg	U	**0.5**

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
BTEX

Concept Reference	**674086 014**
Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
Test Sample	**AR**
Date Sampled	**27-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	LOD	Units	Symbol	
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10

Concept Reference: 674086
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
PCBs EC7 (SE)

Concept Reference	**674086 014**
Customer Sample Reference	**BH17-C7-02 ES2 @ 1.00m**
Test Sample	**AR**
Date Sampled	**27-JUL-2017**
Matrix Class	**Clay**

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

Index to symbols used in Supplement 1A to Report Number 674086-1 A

Value	Description
A40	Assisted dried < 40C
2:1	Leachate to BS EN 12457-3 (2:1)
AR	As Received
8:1	Leachate to BS EN 12457-3 (8:1)
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

pH, LOI & TOC were performed on assisted dried samples (<40 degree centigrade). All other results relate to samples as received.
Retained on 2mm is removed before analysis
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except ANC
Supplement 1A Report reissued to include only sample 014

CONCEPT LIFE SCIENCES

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 1C to Report Number 675177-1

Date of Report: 18-Oct-2017

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

Customer Contact: Victoria Smith

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

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

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

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

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

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

UKAS TESTING
1549

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

Issued by :
Aislinn Arthey
Customer Service Advi

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

Water Analysed as Water
Heavy Metals (9)

				Concept Reference	**675177 005**	**675177 006**	**675177 007**	**675177 008**
				Customer Sample Reference	**BH17-C6-01**	**BH17-C6-03**	**BH17-C7-01**	**BH17-C7-03**
				Date Sampled	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
As (Dissolved)	T281	F	0.0002	mg/l	**0.0003**	**0.0005**	**0.0007**	**0.0011**
Cd (Dissolved)	T281	F	0.00002	mg/l	<0.00002	<0.00002	<0.00002	<0.00002
Cr (Dissolved)	T281	F	0.001	mg/l	<0.001	<0.001	<0.001	<0.001
Cu (Dissolved)	T281	F	0.0005	mg/l	**0.0015**	**0.0008**	**0.0007**	**0.0006**
Pb (Dissolved)	T281	F	0.0003	mg/l	<0.0003	<0.0003	<0.0003	<0.0003
Hg (Dissolved)	T281	F	0.00005	mg/l	<0.00005	<0.00005	<0.00005	<0.00005
Ni (Dissolved)	T281	F	0.001	mg/l	**0.001**	<0.001	**0.002**	**0.002**
Se (Dissolved)	T281	F	0.0005	mg/l	**0.0012**	<0.0005	**0.0012**	<0.0005
Zn (Dissolved)	T281	F	0.002	mg/l	**0.003**	<0.002	<0.002	**0.045**

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

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

				Concept Reference	**675177 005**	**675177 006**	**675177 007**	**675177 008**
				Customer Sample Reference	**BH17-C6-01**	**BH17-C6-03**	**BH17-C7-01**	**BH17-C7-03**
				Date Sampled	**10-AUG-2017**	**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	<0.01
Acenaphthylene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Acenaphthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Fluorene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Phenanthrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(a)Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Chrysene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(a)Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
PAH(total)	T149	AR	0.01	µg/l	<0.01	<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 005**	**675177 006**	**675177 007**	**675177 008**
				Customer Sample Reference	**BH17-C6-01**	**BH17-C6-03**	**BH17-C7-01**	**BH17-C7-03**
				Date Sampled	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**	**10-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Benzene	T54	AR	1	µg/l	<1	<1	<1	<1
EthylBenzene	T54	AR	1	µg/l	<1	<1	<1	<1
M/P Xylene	T54	AR	1	µg/l	<1	<1	<1	<1
Methyl tert-Butyl Ether	T54	AR	1	µg/l	<1	<1	<1	<1
O Xylene	T54	AR	1	µg/l	<1	<1	<1	<1
Toluene	T54	AR	1	µg/l	<1	<1	<1	<1
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020	<0.020	<0.020
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01	<0.01
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01	<0.01
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	<0.01	**0.01**	<0.01	<0.01
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	**0.02**	**0.02**	**0.02**	**0.03**
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01	**0.02**	<0.01
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01	<0.01
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01	<0.01	<0.01
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01	**0.02**	**0.02**

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

Water Analysed as Water
Organochlorine insecticides

				Concept Reference	**675177 005**	**675177 006**	**675177 007**	**675177 008**
				Customer Sample Reference	**BH17-C6-01**	**BH17-C6-03**	**BH17-C7-01**	**BH17-C7-03**
				Date Sampled	**10-AUG-2017**	**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	(36) <0.02
Hexachlorobenzene	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Heptachlor	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Aldrin	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Heptachlor epoxide	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Chlordane	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Endosulphan	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
DDE	T16	AR	0.01	µg/l	<0.02	<0.02	<0.02	<0.02
Dieldrin	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
Endrin	T16	AR	0.01	µg/l	(36) <0.02	(36) <0.02	(36) <0.02	(36) <0.02
DDD	T16	AR	0.01	µg/l	<0.01	<0.01	<0.01	<0.01
DDT	T16	AR	0.01	µg/l	(36) <0.02	(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 005**	**675177 006**	**675177 007**	**675177 008**
					Customer Sample Reference	**BH17-C6-01**	**BH17-C6-03**	**BH17-C7-01**	**BH17-C7-03**
					Date Sampled	**10-AUG-2017**	**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	<0.01
Mevinphos	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Dimethoate	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Diazinon	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Pirimiphos methyl	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Malathion	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Fenitrothion	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Parathion	T16	AR	0.01	µg/l		<0.01	<0.01	<0.01	<0.01
Azinphos methyl	T16	AR	0.01	µg/l		(36) <0.02	(36) <0.02	(36) <0.02	(36) <0.02

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

Value	Description
F	Filtered
AR	As Received
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 1C report reissued to include only samples 005, 006, 007 and 008
OCP and OPP transferred to Concept Life Sciences Manchester

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
As (Dissolved)	T281	F	0.0002	mg/l	U	005-008
Cd (Dissolved)	T281	F	0.00002	mg/l	U	005-008
Cr (Dissolved)	T281	F	0.001	mg/l	U	005-008
Cu (Dissolved)	T281	F	0.0005	mg/l	U	005-008
Pb (Dissolved)	T281	F	0.0003	mg/l	U	005-008
Hg (Dissolved)	T281	F	0.00005	mg/l	U	005-008
Ni (Dissolved)	T281	F	0.001	mg/l	U	005-008
Se (Dissolved)	T281	F	0.0005	mg/l	U	005-008
Zn (Dissolved)	T281	F	0.002	mg/l	U	005-008
Naphthalene	T149	AR	0.01	µg/l	U	005-008
Acenaphthylene	T149	AR	0.01	µg/l	U	005-008
Acenaphthene	T149	AR	0.01	µg/l	U	005-008
Fluorene	T149	AR	0.01	µg/l	U	005-008
Phenanthrene	T149	AR	0.01	µg/l	U	005-008
Anthracene	T149	AR	0.01	µg/l	U	005-008
Fluoranthene	T149	AR	0.01	µg/l	U	005-008
Pyrene	T149	AR	0.01	µg/l	U	005-008

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Benzo(a)Anthracene	T149	AR	0.01	µg/l	U	005-008
Chrysene	T149	AR	0.01	µg/l	U	005-008
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	N	005-008
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	U	005-008
Benzo(a)Pyrene	T149	AR	0.01	µg/l	U	005-008
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	U	005-008
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	U	005-008
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	U	005-008
PAH(total)	T149	AR	0.01	µg/l	N	005-008
Benzene	T54	AR	1	µg/l	U	005-008
EthylBenzene	T54	AR	1	µg/l	U	005-008
M/P Xylene	T54	AR	1	µg/l	U	005-008
Methyl tert-Butyl Ether	T54	AR	1	µg/l	U	005-008
O Xylene	T54	AR	1	µg/l	U	005-008
Toluene	T54	AR	1	µg/l	U	005-008
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	N	005-008
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	N	005-008
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	N	005-008
Hexachlorocyclohexane	T16	AR	0.01	µg/l	N	005-008
Hexachlorobenzene	T16	AR	0.01	µg/l	N	005-008
Heptachlor	T16	AR	0.01	µg/l	N	005-008
Aldrin	T16	AR	0.01	µg/l	N	005-008
Heptachlor epoxide	T16	AR	0.01	µg/l	N	005-008
Chlordane	T16	AR	0.01	µg/l	N	005-008
Endosulphan	T16	AR	0.01	µg/l	N	005-008
DDE	T16	AR	0.01	µg/l	N	005-008
Dieldrin	T16	AR	0.01	µg/l	N	005-008
Endrin	T16	AR	0.01	µg/l	N	005-008
DDD	T16	AR	0.01	µg/l	N	005-008
DDT	T16	AR	0.01	µg/l	N	005-008
Dichlorvos	T16	AR	0.01	µg/l	N	005-008
Mevinphos	T16	AR	0.01	µg/l	N	005-008
Dimethoate	T16	AR	0.01	µg/l	N	005-008
Diazinon	T16	AR	0.01	µg/l	N	005-008
Pirimiphos methyl	T16	AR	0.01	µg/l	N	005-008
Malathion	T16	AR	0.01	µg/l	N	005-008
Fenitrothion	T16	AR	0.01	µg/l	N	005-008
Parathion	T16	AR	0.01	µg/l	N	005-008
Azinphos methyl	T16	AR	0.01	µg/l	N	005-008

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

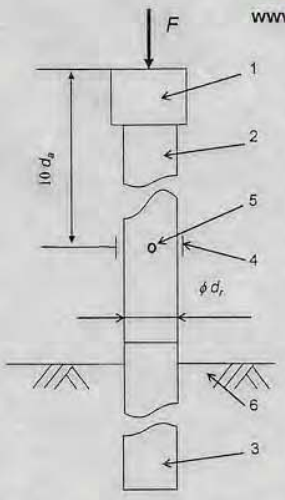
Hammer Energy Measurement Report

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

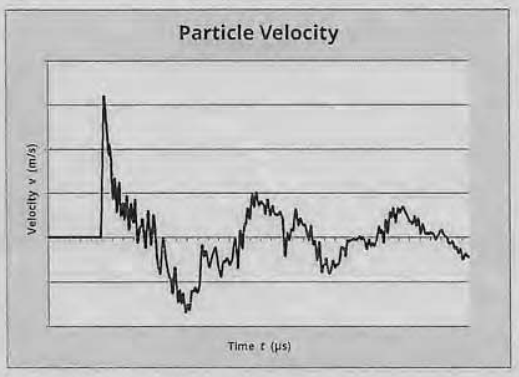
Diameter	d_r =	0.052 m
Length of the instrumented rod		0.558 m
Area	A =	11.61 cm^2
Modulus	E_a =	206843 MPa

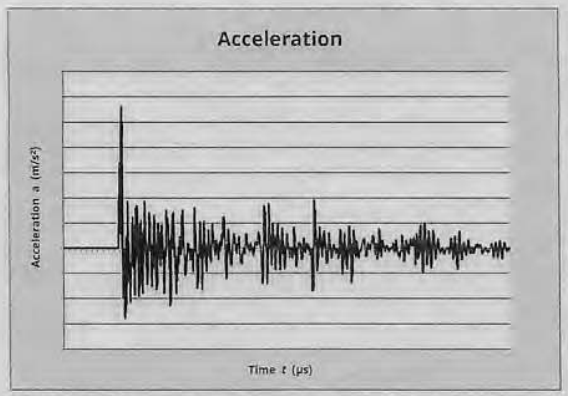


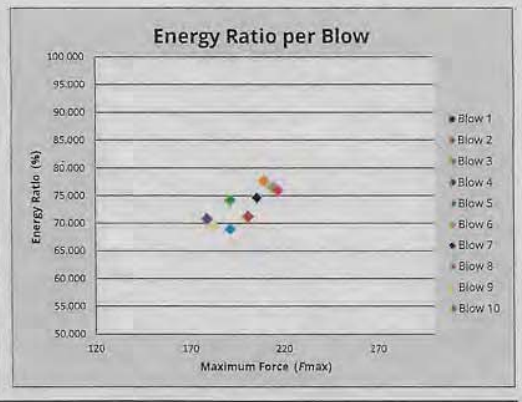
Key
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

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 by [redacted] Date 10/01/2017

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

SPT Calibration Report

www.equipegroup.com

Hammer Energy Measurement Report

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

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

Characteristics of the instrumented rod

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

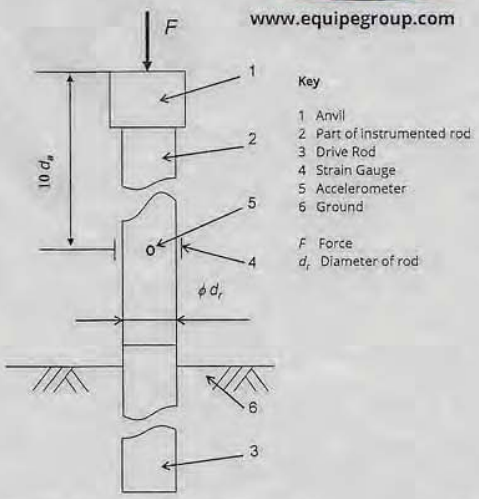
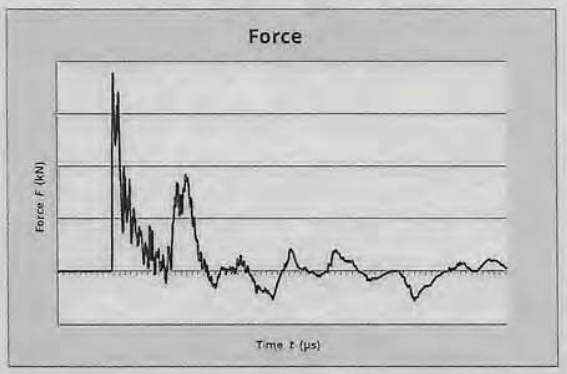
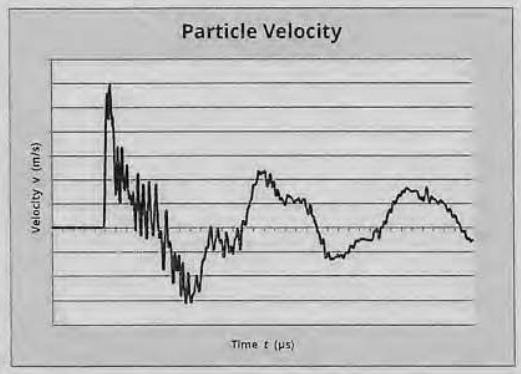
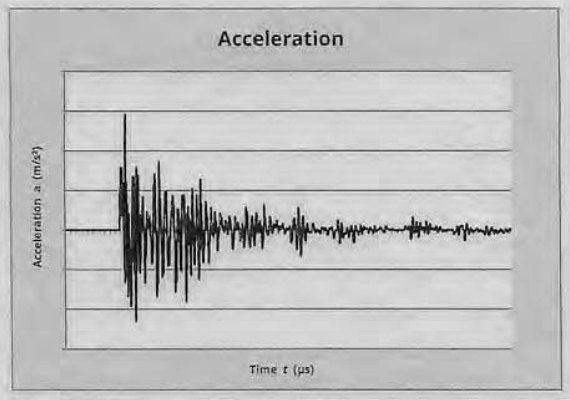
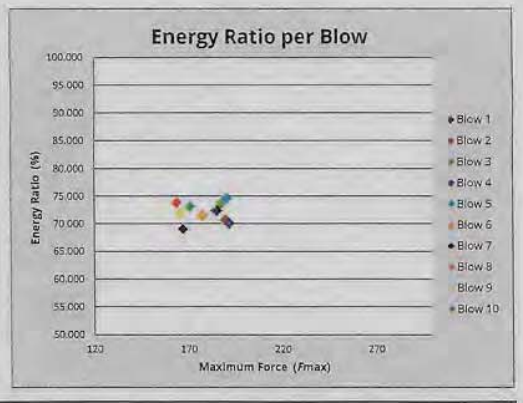


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









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 by [redacted]	Date 10/01/2017

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

SPT Calibration Report

www.equipegroup.com

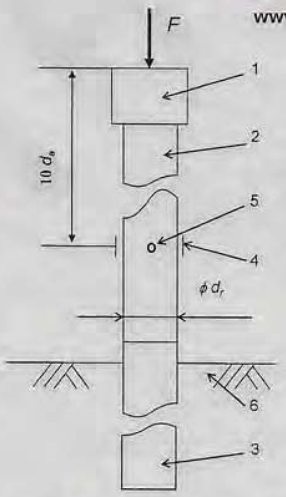
Hammer Energy Measurement Report

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

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

Characteristics of the instrumented rod

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

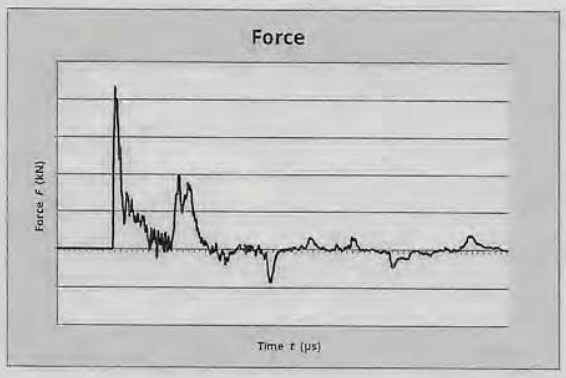


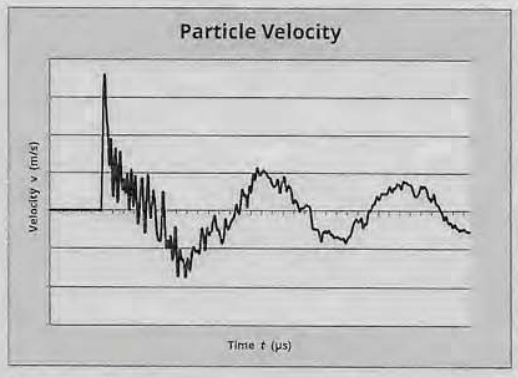
Key

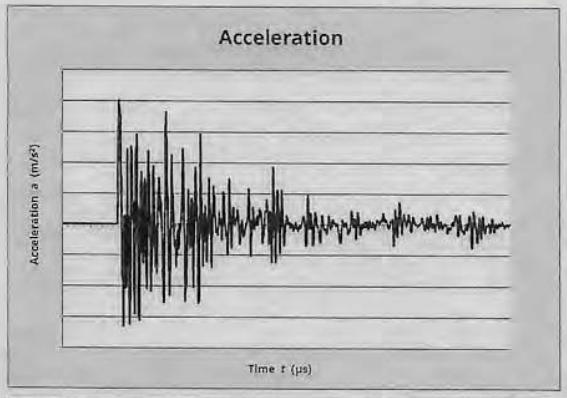
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

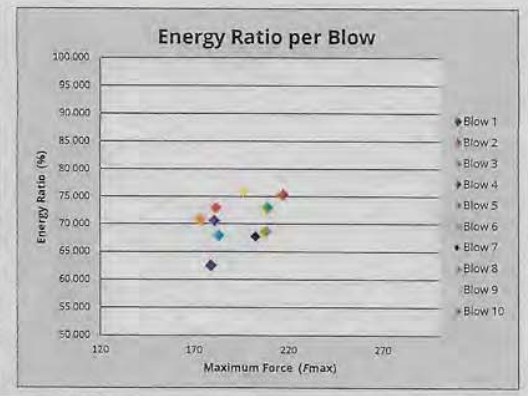
F Force
d_r Diameter of rod

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









Observations:
1.

E_{meas} = **0.343** 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

bsi. ISO 9001 Quality Management FS 573193

bsi. ISO 14001 Environmental Management EMS 573194

smas worksafe consultant www.smasltd.com

TerraConsult