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 8 of 18 Deadline 1 Submissions
Date:	16 January 2019 15:24:34
Attachments:	ExA;WQApp16.2;10.D1.3 Norfolk Vanguard WQ Appendix 16.2 Crossing 1 GI.pdf

Dear Tracey

This is email 8 of 18 of the Applicant's submission for Norfolk Vanguard Examination Deadline 1.

We enclose the following documents:

Appendices to Written Questions:

- Appendix 16.2 TerraConsult Crossing 1

Please could you kindly confirm receipt.

Best Regards

Gemma Keenan BSc, MIEMA, CEnv
Senior Environmental Consultant

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VATTENFALL

Norfolk Vanguard Offshore Wind Farm

The Applicant Responses to First Written Questions

Appendix 16.2 – TerraConsult 2017 Ground Investigations Report: Crossing 1 (Q16.8)

Applicant: Norfolk Vanguard Limited
Document Reference: ExA;WQApp16.2;10.D1.3
Deadline 1

Date: January 2019

Photo: Kentish Flats Offshore Wind Farm

TerraConsult

November 2017
Report No 3318-R001-2

East Anglia (North) Offshore Wind Farm

Crossing 1 Site Investigation

Carried out for:

Gutteridge, Haskins and Davey Ltd (GHD)

East Anglia (North) Offshore Wind Farm

Crossing 1 Site Investigation

Date: November 2017

Report No 3318-R001-2

Prepared for:

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DOCUMENT INFORMATION AND CONTROL SHEET

Document Status and Approval Schedule

Report No.	Title
3318-R001-2	East Anglia (North) Offshore Wind Farm Crossing 1 Site Investigation

Prepared by:	**Victoria Smith**	*Victoria Smith*	**Engineering Geologist**
Approved by:	**D Daniels**		**Operations Manager**
Date:	**03/11/17**		

Issue:	Date:	Description:	Prepared by:
1	11/10/17	Draft for Approval	VS
2	03/11/17	Final	DD

DISCLAIMER

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

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

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

East Anglia (North) Offshore Wind Farm

Crossing 1 Site Investigation
CONTENTS

DRAWINGS

APPENDICES

East Anglia (North) Offshore Wind Farm

Crossing 1

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 the A47 near Dereham, 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 28/07/17 and 03/08/17.

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

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

2 SITE DESCRIPTION

2.1 Location and Topography

The site is located approximately 3.9 km west of the centre of Dereham, Norfolk. The approximate location of Crossing 1 is located between Ordnance Survey National Grid References TF 946 129 and TF 946 127. A site location plan is presented as drawing 3318(C1)D001-1.

2.2 Published Geology

The online British Geological Survey (BGS) 1:50,000 scale map shows the site to be underlain by glacial till of the Lowestoft Formation below which lies the White Chalk Subgroup.

3 FIELDWORK

3.1 General

Fieldwork was undertaken between 28/07/17 and 03/08/17. 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, install	BH17-C1-01
Cable percussion, SPTs, variable head perm test	BH17-C1-02
Cable percussion, SPTs, variable head perm test, install	BH17-C1-03
Cable percussion, SPTs	BH17-C1-04

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

3.2 Exploratory Holes

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

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

Table 2: Summary of Exploratory Positions

Exploratory position:	Type:	Final depth (m):	Easting (mE):	Northing (mN):	Level (mAOD):	Start date:	End date:
BH17-C1-01	CP	9.60	594695.52	312868.66	45.00	28/07/2017	28/07/2017
BH17-C1-02	CP	15.00	594670.58	312839.54	45.20	31/07/2017	31/07/2017
BH17-C1-03	CP	9.80	594667.09	312794.73	46.06	01/08/2017	02/08/2017
BH17-C1-04	CP	15.45	594636.58	312774.60	46.31	02/08/2017	03/08/2017

Type: CP – cable percussion

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

An exploratory hole location plan is presented as drawing 3318(C1)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 out 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-C1-04	Standpipe	BH17-C1-04	50	15.45	32.5	9.50	12.50

Under instruction from GHD, BH17-C1-01 was not installed as proposed.

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

3.6 Surveying

On completion of the fieldworks, all exploratory positions were surveyed by use of a dGPS. 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	1	BS1377: Part 2: 4.3 & 5.3	
Particle size distribution	2	BS1377: Part 2: 9.2	
BRE SD1 suite	1	BRE SD1	
One dimensional consolidation	1	BS1377: Part 5: 3	
Triaxial 100mm single stage	2	BS1377: Part 7: 8	

4.2 Geoenvironmental Testing

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

5 REFERENCES

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

BRE Special Digest 1: 2005 Concrete in aggressive ground.

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

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

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

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

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

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

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

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

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

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

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

6 LICENCES

DRAWINGS

3318(C1)D001-1 Site Location Plan
3318(C1)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(C1)D001-1**
Scale:	1:25000	Client:	GHD Ltd	

Exploratory Hole Location Plan

TerraConsult

Legend Key

Locations By Type - CP

AGS		Project:	East Anglia (North) Offshore Wind Farm	Drawing No:
Issue:	FINAL	Project No:	3318	3318(C1)D002-1
Scale:	1:3000	Client:	GHD Ltd	

APPENDICES

APPENDIX A
Exploratory Hole Records

Key sheet

Boreholes

Exploratory Hole Key Sheet

TerraConsult

SAMPLES:

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

TESTS:

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

DRILLING RECORDS:

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

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

GROUNDWATER:

▼ Groundwater strike

▽ Groundwater level after standing period

DEPTH REMARKS:

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

INSTRUMENTATION:

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

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

EXPLORATORY HOLE TYPE:

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

AGS

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

Project No: **3318**

Client: **GHD Ltd**

Reference

KEY SHEET

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	28-07-17	28-07-17	TM	Hand tools	n/a	n/a	28-07-17	FN	
CP	0.00	9.60	28-07-17	28-07-17	TM	Dando 2000	n/a	n/a	28-07-17	FN	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE: 594695.52
mN: 312868.66
mAOD: 45.00
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(0.30)	Soft orangish brown slightly gravelly sandy silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Frequent rootlets.			0.05	ES1	
			44.70	0.30	(TOPSOIL)					
				(0.70)	Soft orangish brown slightly gravelly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse flint. (LOWESTOFT FORMATION)			0.50 0.50 0.50 - 1.00	D1 ES1 B1	
			44.00	1.00	Firm light orangish brown mottled grey slightly sandy silty CLAY. (LOWESTOFT FORMATION)			1.00 1.00	D2 ES2	
				(1.50)		Dry		1.50 1.50 1.50 2.00 2.00	C D3 ES3 D4 ES4	N=17 (2,2/4,4,4,5)
			42.50	2.50	Firm light greyish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. (LOWESTOFT FORMATION)			2.50 - 2.95	D5	
				(0.95)				3.00 - 3.45	U1	50 (80%)
			41.55	3.45	Firm to stiff light greyish brown slightly silty gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasional siltstones.			3.45	D6	
				(1.05)	(LOWESTOFT FORMATION)					
			40.50	4.50	Firm light greyish brown slightly sandy gravelly silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. (LOWESTOFT FORMATION)	Dry	3.00	4.50 4.50 - 4.95	S B2	30 (4,4/30 for 75mm)
				(1.50)						
			39.00	6.00	Firm light grey slightly sandy gravelly silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. (LOWESTOFT FORMATION)			6.00 - 6.45 6.00 - 6.45	B3 UNR	40 (0%)
				(1.50)						
			37.50	7.50	Stiff to very stiff dark grey slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk. (LOWESTOFT FORMATION)	Dry	5.50	7.50 7.50 - 7.95	S D7	N=22 (2,2/4,5,6,7)
				(2.00)				9.00 - 9.45	U3	
			35.50	9.50	Stiff light grey slightly sandy gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint. (LOWESTOFT FORMATION)			9.50	D8	
			35.40	9.60	Borehole ends at 9.60m (Artesian water)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
9.60	0.63	5.50	

Diameter & casing:

Dia (mm):	Depth:	Casing:
150	9.00	9.00

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

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

Log issue: FINAL
Scale: 1:50

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

Exploratory position reference:

BH17-C1-01

Sheet 1 of 1

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	31-07-17	31-07-17	GB	Hand tools	n/a	n/a	31-07-17	FN	
CP	0.00	15.00	31-07-17	31-07-17	GB	Dando 2000	n/a	n/a	31-07-17	FN	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE:	594670.58
mN:	312839.54
mAOD:	45.20
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 orangish brown slightly gravelly sandy silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Frequent rootlets. (TOPSOIL)					
			44.80	0.40	Firm orangish brown slightly gravelly sandy silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. (LOWESTOFT FORMATION)			0.50 0.50 0.50 - 1.00	D1 ES1 B1	
				(1.10)	*1.00 - 1.50 m: Becomes firm*			1.00 1.00	D2 ES2	
	▼		43.70	1.50				1.50 1.50 1.50 - 1.95	D3 ES3 UNR	37 (0%)
			43.50	1.70	Firm dark orangish brown mottled dark brown slightly gravelly slightly sandy silty CLAY. Gravel of subangular to subrounded fine to coarse flint. (LOWESTOFT FORMATION)					
					Firm light grey mottled dark grey slightly gravelly very sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional light orangish brown staining. (LOWESTOFT FORMATION)	Dry		2.00 2.00 2.00 2.00 - 2.45	C D4 ES4 B2	N=13 (2,2/3,3,3,4)
	▼			(1.30)						
			42.20	3.00		Dry	3.00	3.00 3.00 - 3.45	S D5	N=22 (1,3/4,6,6,6)
				(0.40)	Firm to stiff light grey mottled dark grey silty CLAY. Occasional gravel sized lenses of dark orangish brown fine to coarse SAND. (LOWESTOFT FORMATION)					
	▽		41.80	3.40	Very soft light brownish grey slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to medium mixed lithologies. Occasional light orangish brown staining. (LOWESTOFT FORMATION)			4.00	D6	
				(0.90)						
			40.90	4.30	Stiff light brownish grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to medium chalk and flint. (LOWESTOFT FORMATION)	Dry	4.50	4.50 4.50 - 4.95	S D7	N=14 (1,2/3,3,4,4)
				(3.20)				6.00 - 6.45 6.00 - 6.45	D8 U2	45 (80%)
					6.45 - 7.50 m: Becomes stiff to very stiff					
			37.70	7.50	Firm light whitish grey slightly gravelly CLAY. Gravel of subangular to subrounded fine to medium chalk and occasional flint. (LOWESTOFT FORMATION)	Dry	7.50	7.50 7.50 - 7.95	S D9	N=21 (1,3/4,5,5,7)
				(1.95)						
								9.00 - 9.45 9.00 - 9.45	D10 U3	42 (80%)
			35.75	9.45	Stiff light grey slightly gravelly CLAY. Gravel of subangular to subrounded fine to medium chalk. (LOWESTOFT FORMATION)					
Inst						Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
1.70	1.40		
3.50	2.40	3.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
150	7.50	7.50

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-C1-02

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	31-07-17	31-07-17	GB	Hand tools	n/a	n/a	31-07-17	FN	
CP	0.00	15.00	31-07-17	31-07-17	GB	Dando 2000	n/a	n/a	31-07-17	FN	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE:	594670.58
mN:	312839.54
mAOD:	45.20
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
					Stiff light grey slightly gravelly CLAY. Gravel of subangular to subrounded fine to medium chalk. (LOWESTOFT FORMATION)	Dry	7.50	10.50 10.50 - 10.95	S D11	N=27 (3,5/5,6,8,8)
				(3.00)						
								12.00 - 12.45	U4	66 (80%)
			32.75	12.45	Stiff to very stiff dark grey slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk. (LOWESTOFT FORMATION)	Dry	7.50	13.50 13.50 - 13.95	S D13	N=27 (3,4/5,6,8,8)
				(2.55)						
					14.50 - 15.00 m: Becomes soft to firm			14.50 - 14.95 14.50 - 14.95	B3 UNR	100 (0%)
			30.20	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-C1-02

Sheet 2 of 2

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	01-08-17	01-08-17	GB	Hand tools	n/a	n/a	01-08-17	FN	
CP	0.00	9.80	01-08-17	02-08-17	GB	Dando 2000	n/a	n/a	02-08-17	FN	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE:	594667.09
mN:	312794.73
mAOD:	46.06
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. Occasional rootlets (TOPSOIL)					
			45.66	0.40				0.50	D1	
				(0.50)	Soft dark brown mottled dark orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (LOWESTOFT FORMATION)			0.50 0.60 - 0.80	ES1 B1	
			45.16	0.90				1.00	D2	
				(1.00)	Stiff dark greyish brown mottled dark orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasional cobbles (<85mm) of flint. Rare gravel sized pockets of dark orangish brown clayey SAND. (LOWESTOFT FORMATION)	Dry	1.50	1.00 1.50 1.50 1.50 - 1.95	ES2 C ES3 B2	N=51 (3,4/5,6,11,29)
			44.16	1.90				2.00	D3	
				(1.60)	Stiff to very stiff dark brownish grey slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk. Rare gravel sized pockets of dark orangish brown fine to coarse SAND. (LOWESTOFT FORMATION)			2.00 3.00 - 3.45	ES4 U1	70 (90%)
			42.56	3.50				3.50	D4	
					Stiff dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. (LOWESTOFT FORMATION)					
					4.50 - 6.50 m: Occasional gravel sized pockets of dark brown sandy CLAY	Dry	3.00	4.50 4.50 - 4.95	S D5	N=18 (2,3/3,4,5,6)
								6.00 - 6.45	U2	85 (100%)
				(6.00)	*6.50 - 7.50 m: Becomes stiff to very stiff*			6.50	D6	
						Dry	3.00	7.50 7.50 - 7.95	S D7	N=31 (2,4/5,7,9,10)
								9.00 - 9.45	U3	80 (90%)
			36.56	9.50						
				(0.30)	White grey slightly silty sandy GRAVEL. Gravel of subangular to subrounded fine to coarse white chalk and black flint. (LOWESTOFT FORMATION)					
			36.26	9.80	~~Borehole ends at 9.80m (Locked casing)~~					
Inst						Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
8.20	3.04	3.00	
9.50	3.24	8.70	

Diameter & casing:

Dia (mm):	Depth:	Casing:
150	3.00	3.00
150	9.80	9.80

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:
9.80	9.80	00:30	

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-C1-03

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	02-08-17	02-08-17	GB	Hand tools	n/a	n/a	02-08-17	FN	
CP	0.00	15.45	02-08-17	03-08-17	GB	Dando 2000	n/a	n/a	03-08-17	FN	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE:	594636.58
mN:	312774.60
mAOD:	46.31
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Water	Casing	Depth	Type & No	Results/Remarks
					Samples & In Situ Testing					
			45.91	(0.40) 0.40	Soft to firm dark greyish brown mottled orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint and rare chalk. (TOPSOIL)			0.50 0.50 0.60 - 0.80	D1 ES1 B1	
				(1.10)	Soft to firm dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. (LOWESTOFT FORMATION)			1.00 1.00	D2 ES2	
			44.81	1.50		Dry	1.50	1.50 1.50	S ES3	N=12 (1,1/2,3,3,4)
			44.51	(0.30) 1.80	Firm light greyish brown mottled dark orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. (LOWESTOFT FORMATION)			1.50 - 1.95	D3	
				(1.90)	Medium dense dark orangish brown slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (LOWESTOFT FORMATION)			2.00 2.00	D4 ES4	
	▼				*3.00 - 3.70 m: Becomes light orangish brown*	Dry	3.00	3.00 3.00 - 3.45	S D5	N=24 (1,2/4,6,7,7)
			42.61	3.70	Firm to stiff light grey slightly sandy CLAY. (LOWESTOFT FORMATION)			4.00	D6	
								4.50 - 4.95	U1	100 (70%)
					5.00 - 8.00 m: Becomes stiff			5.00	D7	
						Dry	4.00	6.00 6.00 - 6.45	S D8	N=16 (3,3/3,4,4,5)
				(5.90)						
								7.50 - 7.95	U2	100 (60%)
					8.00 - 9.60 m: Becomes very stiff			8.00	D9	
						Dry	4.00	9.00 9.00 - 9.45	S D10	N=21 (3,4/4,5,6,6)
	▽		36.71	9.60	Medium dense light grey slightly silty sandy subangular to subrounded fine to coarse flint and chalk GRAVEL. Gravel sized pockets of light grey					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
9.60	3.18	4.00	12.8
			0

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	4.00	4.00
150	12.80	12.80

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-C1-04

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	02-08-17	02-08-17	GB	Hand tools	n/a	n/a	02-08-17	FN	
CP	0.00	15.45	02-08-17	03-08-17	GB	Dando 2000	n/a	n/a	03-08-17	FN	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE:	594636.58
mN:	312774.60
mAOD:	46.31
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
					slightly sandy CLAY. (LOWESTOFT FORMATION)					
						Dry	10.50	10.50 10.50 - 10.95	C B2	N=22 (1,2/4,5,6,7)
				(2.40)						
			34.31	12.00	Dense light orangish brown very sandy slightly clayey subangular to subrounded fine to coarse flint and chalk GRAVEL. (LOWESTOFT FORMATION)	Dry	12.00	12.00 12.00 - 12.45	C B3	N=45 (2,5/8,10,12,15)
				(0.50)						
	SP		33.81	12.50	Stiff dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and rare flint. (LOWESTOFT FORMATION)			13.50 - 13.95	U3	100 (80%)
				(2.95)				14.00	D11	
					14.80 - 15.00 m: Becomes firm to stiff	Dry	12.80	15.00 15.00 - 15.45	S D12	N=36 (2,4/7,8,10,11)
			30.86	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-C1-04

APPENDIX B
Photographs

BH17-C1-01

1.50 m

2.50 m

6.00 m

9.50 m

BH17-C1-02

1.50 m

2.00 m

4.00 m

9.45 m

14.50 m

BH17-C1-03

0.50 m

2.00 m

4.50 m

7.50 m

9.50 m

BH17-C1-04

2.00 m

5.00 m

9.00 m

14.00 m

APPENDIX C
In Situ Testing Results

Variable head permeability test

Variable Head Permeability Test Results

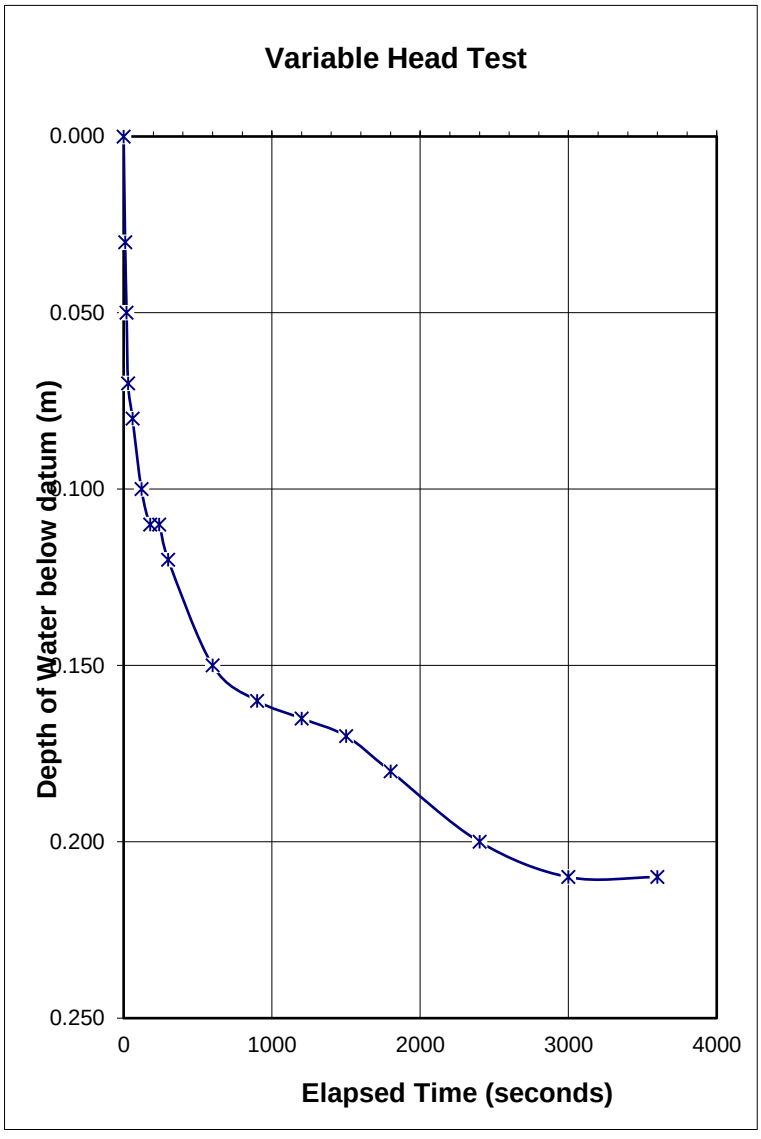
TerraConsult

Static water level (m)	2.40
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	3.00
Bottom of Response Zone	3.50

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	3.50
Final Head (h(t)) at (t)	3.29
Length of Response Zone *(L)*	0.50
Cross Sectional Area *(S)*	0.0177

Description	Clayey GRAVEL

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.000	3.50
10	0.030	3.47
20	0.050	3.45
30	0.070	3.43
60	0.080	3.42
120	0.100	3.40
180	0.110	3.39
240	0.110	3.39
300	0.120	3.38
600	0.150	3.35
900	0.160	3.34
1200	0.165	3.34
1500	0.170	3.33
1800	0.180	3.32
2400	0.200	3.30
3000	0.210	3.29
3600	0.210	3.29



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

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

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

$$= 1.66$$

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

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

k = 1.83E-07 m/s

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
		Project No:	3318	**BH17-C1-02**
Checked by:	DD	Client:	GHD	

Variable Head Permeability Test Results

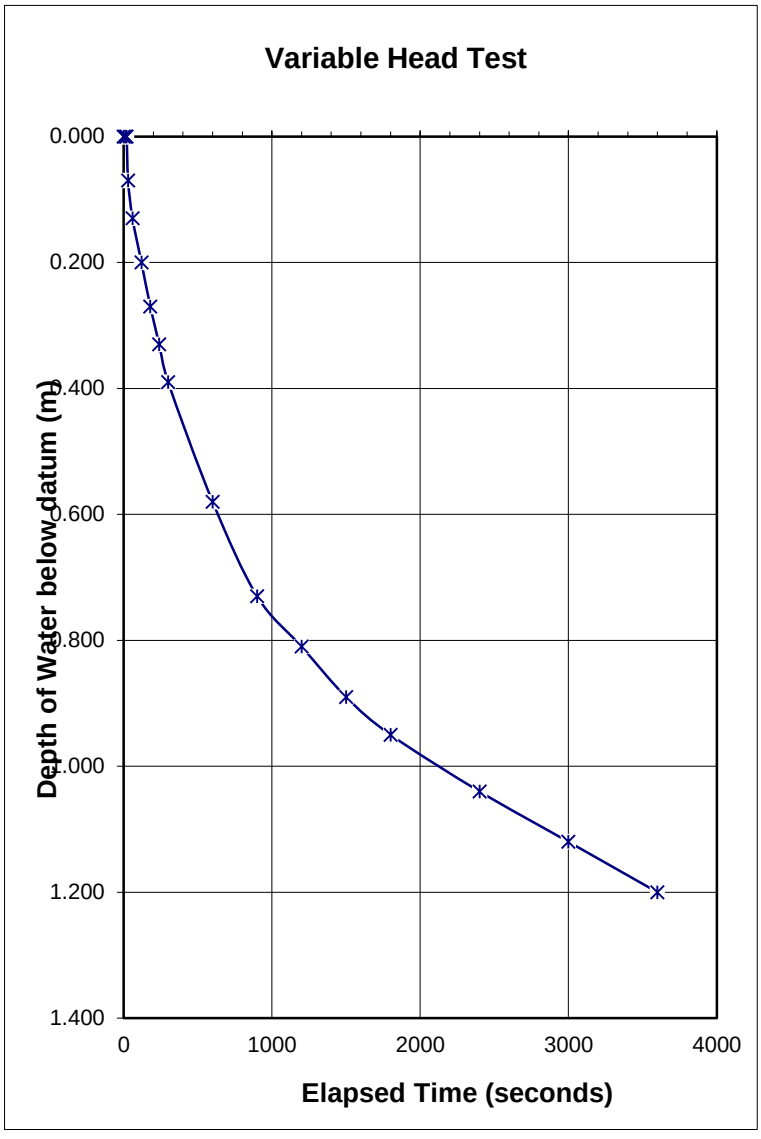
TerraConsult

Static water level (m)	1.96
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	3.00
Bottom of Response Zone	8.20

	Test 1
Time (t0)	0
Time (t)	3600
Head of Water	
Initial Head (h0) at (t0)	8.20
Final Head (h(t)) at (t)	7.00
Length of Response Zone *(L)*	5.20
Cross Sectional Area *(S)*	0.0177

Description	Grey CLAY and chalk GRAVEL

Elapsed Time (seconds)	Water below Datum	Head of Water
0	0.000	8.20
10	0.000	8.20
20	0.000	8.20
30	0.070	8.13
60	0.130	8.07
120	0.200	8.00
180	0.270	7.93
240	0.330	7.87
300	0.390	7.81
600	0.580	7.62
900	0.730	7.47
1200	0.810	7.39
1500	0.890	7.31
1800	0.950	7.25
2400	1.040	7.16
3000	1.120	7.08
3600	1.200	7.00



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

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

$$= \frac{32.67}{4.24}$$

$$= 7.71$$

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

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

k = 1.01E-07 m/s

Calculated by: JMT Checked by: DD

Calculated by:	JMT	Project:	East Anglia (North) Offshore Wind Farm	Exploratory position reference:
Checked by:	DD	Project No:	3318	**BH17-C1-03**
		Client:	GHD	

APPENDIX D
Instrumentation Sampling and Monitoring Records

No: 3318

GROUNDWATER AND GROUND GAS MONITORING

TerraConsult

Site: East Anglia OWF

GROUND GAS AND GROUNDWATER MONITORING DATA

Location	Date	Monitored by	Well Details		Groundwater					Gas											Weather	
			Standpipe diameter (mm)	Depth to Base (m bgl)	Water Depth (m bgl)	Water Sample Taken?	Water Temp oC	Odour	Colour	Atmospheric Pressure (mbar)	Atmospheric Pressure Comment	Relative Pressure (Pa)	Flow (l/h)	CH_4 (% v/v)	GSV CH_4 (l/hr)	CO_2 (% v/v)	GSV CO_2 (l/hr)	O_2 (% v/v)	CO (ppm)	H2S (ppm)	VOC (ppm)	Conditions	Ambient Temp ^oC
BH17-C1-04	22/08/17	VS	51	12.54	1.54	Y				1016	NM	0.0	0.0	0.0	0.0000	0.8	0.0000	81.9	0	0	NM	Sunny, dry	22
	31/08/17	VS	51	12.51	1.59	N				1010	NM	0.0	0.0	0.0	0.0000	0.9	0.0000	20.7	0	0	NM	Sunny, dry	19
	15/09/17	VS	51	12.52	1.52	N				1006	NM	0.0	0.0	0.0	0.0000	0.0	0.0000	20.1	0	0	NM	Sunny spells	16

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

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

APPENDIX E
Geotechnical Laboratory Test Results

Report References: GSTL 35625

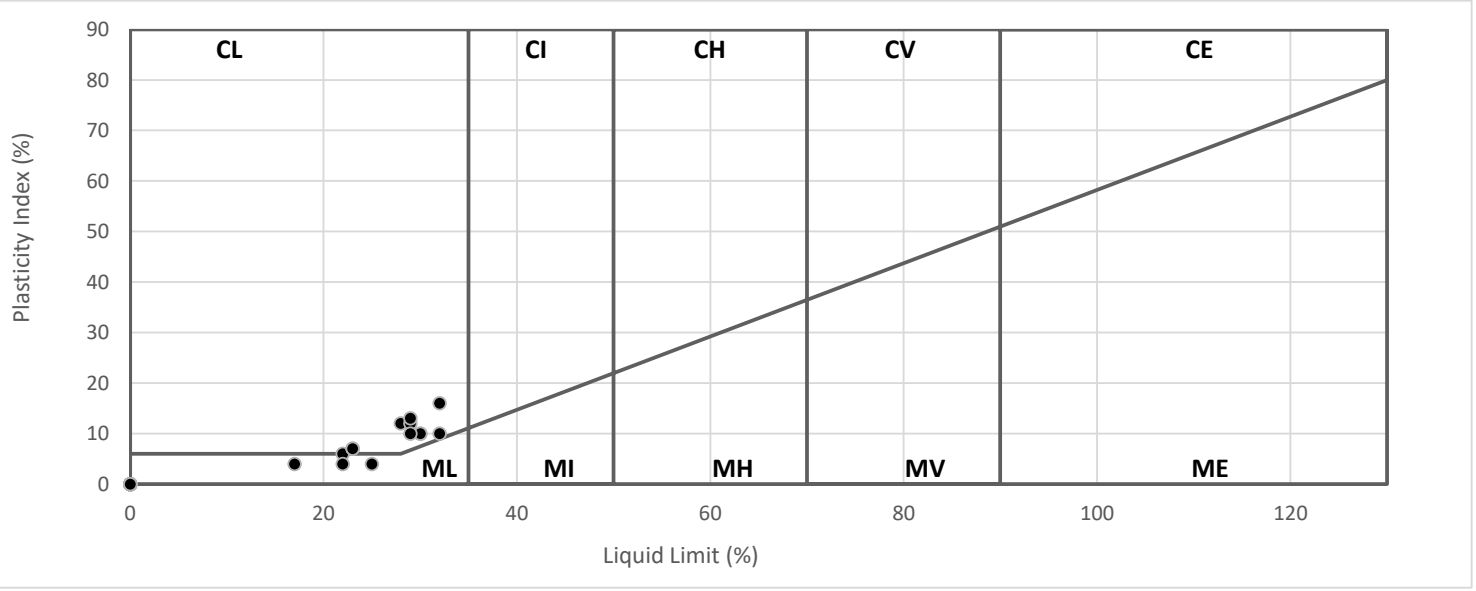
CLS 684646

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

Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing .425mm %	Remarks
BH17-C1-03	5	D	4.50	-	4.95	25	30	20	10	75	CL Low Plasticity
				-							
				-							
				-							
				-							
				-							
				-							
				-							

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

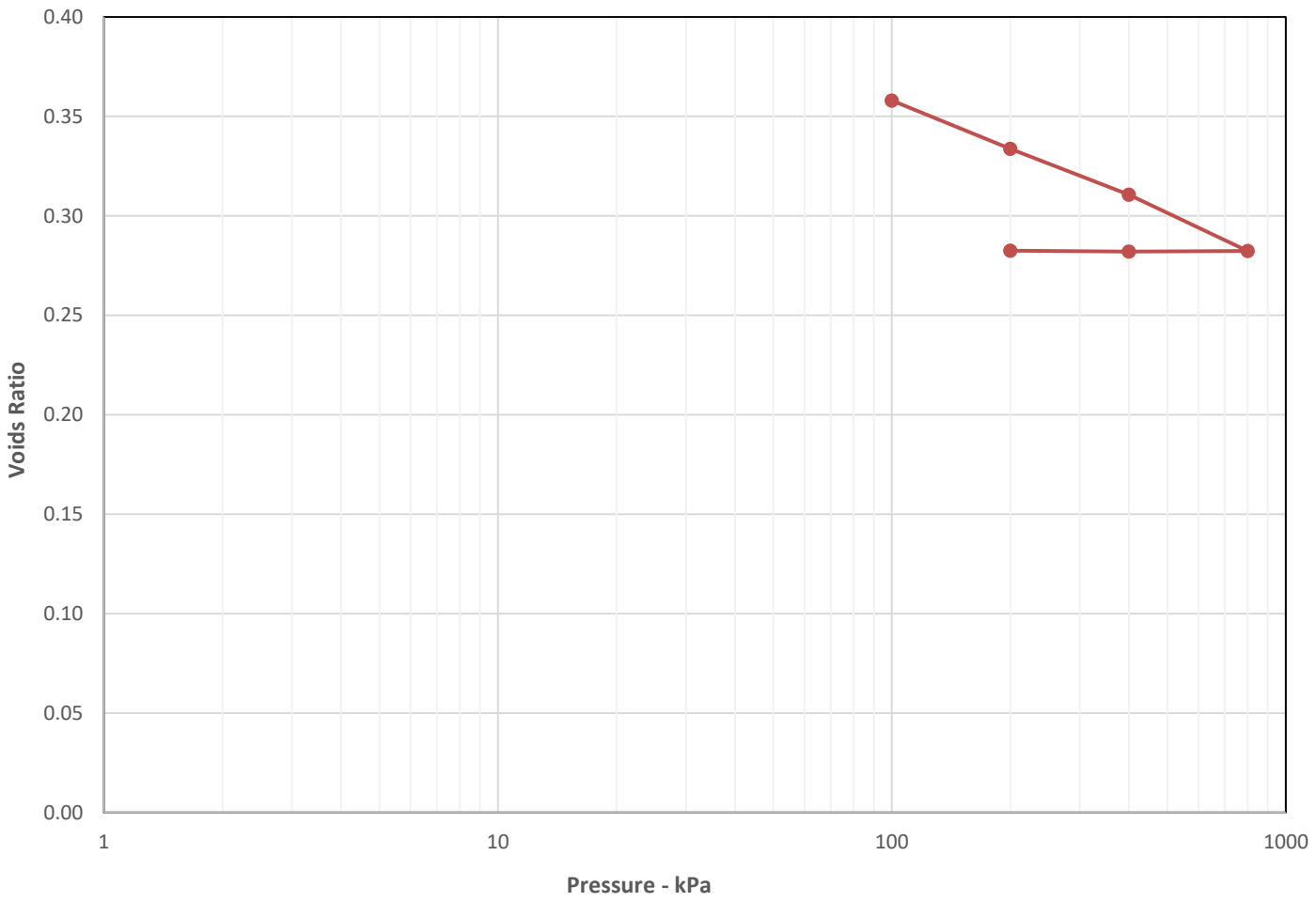
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



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

UKAS TESTING 2788

GSTL	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3	Contract Number	36525
		Borehole/Trialpit No.	BH17-C1-02
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	2
Soil Description	Grey/brown slightly sandy fine gravelly silty CLAY	Depth Top (m)	6.00
		Depth Base (m)	6.45
Lab Temperature	20°c	Sample Location	Middle
Remarks	Cv Calculated Using T90	Sample Type	U

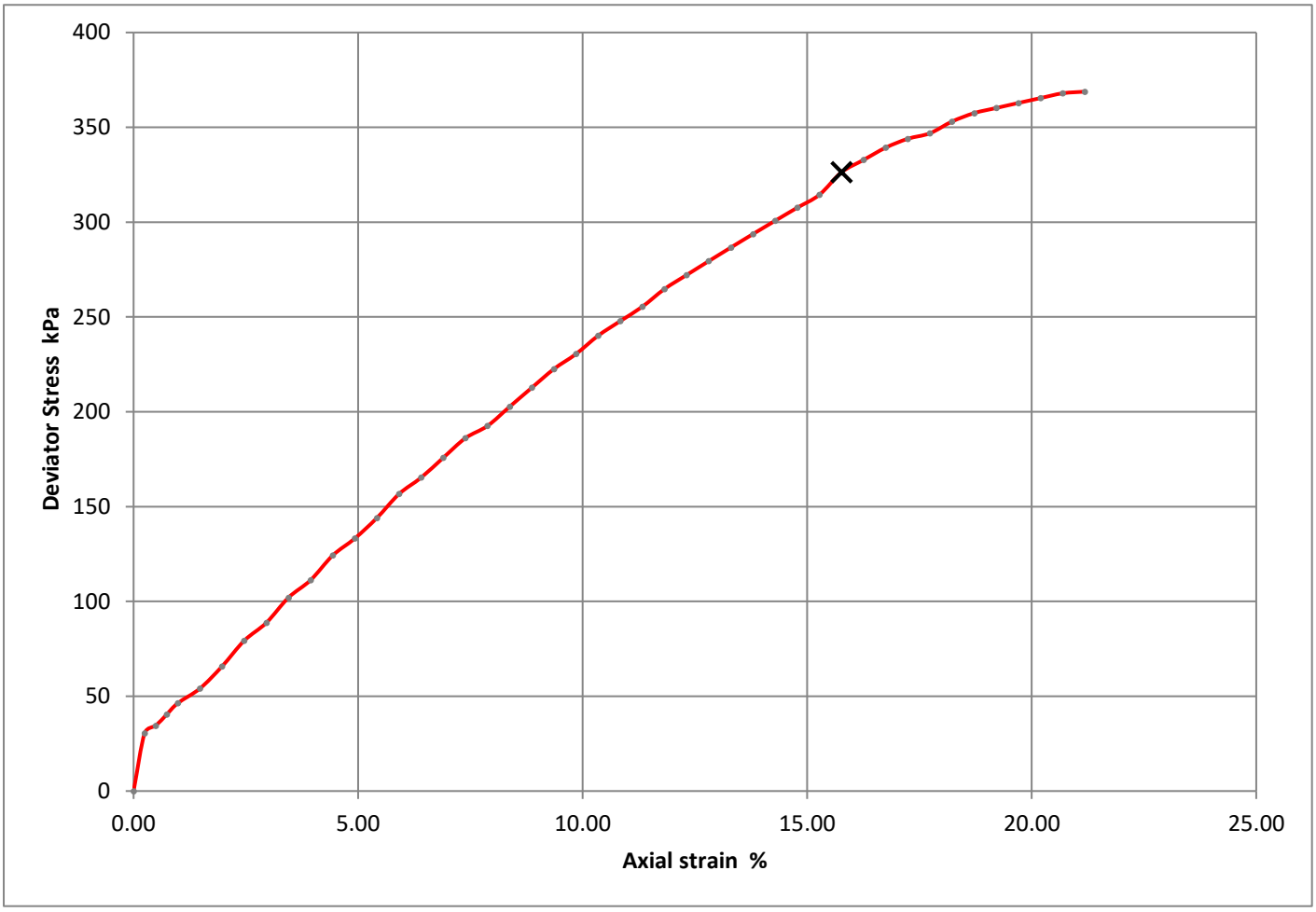


Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	15	0	-	100	0.33	9		-			
Bulk Density (Mg/m3)	2.17	100	-	200	0.18	12		-			
Dry Density (Mg/m3)	1.89	200	-	400	0.086	14		-			
Voids Ratio	0.4039	400	-	800	0.1	11		-			
Degree of saturation	98.0	800	-	400	-0.00055	12		-			
Height (mm)	19.75	400	-	200	0.0019	7.8		-			
Diameter (mm)	74.84		-					-			
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-C1-04
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Light grey silty CLAY	Depth Top (m)	4.50
		Depth Base (m)	4.95
		Sample Type	U



Moisture Content (%)	15
Bulk Density (Mg/m^3)	2.29
Dry Density (Mg/m^3)	1.99
Specimen Length (mm)	203
Specimen Diameter (mm)	102
Cell Pressure (kPa)	90
Deviator Stress (kPa)	326
Undrained Shear Strength (kPa)	163
Failure Strain (%)	15.8
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
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Concept Life Sciences

Certificate of Analysis

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Fax : 01376 552923

Report Number: Supplement 1A 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[redacted]

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

Soil Analysed as Soil
BRE SD1 (SE)

Concept Reference	**684646 003**
Customer Sample Reference	**17-C1-01 D6 @ 3.45m**
Date Sampled	**28-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	<0.01
(Water soluble) Cl-	T710	A40	0.01	g/l	<0.01
Magnesium	T112	A40	1	mg/l	<1
(Water soluble) NO3	T710	A40	0.01	g/l	<0.01
pH	T7	A40			**8.2**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	**0.01**
SO4(Total)	T102	A40	0.02	%	**0.03**
Sulphur (total)	T6	A40	0.01	%	**0.02**
Moisture @105C	T162	AR	0.1	%	**15**
Retained on 2mm	T2	A40	0.1	%	**19.2**

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

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

Notes

Retained on 2mm is removed before analysis
Supplement 1A Report reissued to include only sample 003

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	N	003
(Water soluble) Cl-	T710	A40	0.01	g/l	N	003
Magnesium	T112	A40	1	mg/l	N	003
(Water soluble) NO3	T710	A40	0.01	g/l	N	003
pH	T7	A40			M	003
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	M	003
SO4(Total)	T102	A40	0.02	%	M	003
Sulphur (total)	T6	A40	0.01	%	M	003
Moisture @105C	T162	AR	0.1	%	N	003
Retained on 2mm	T2	A40	0.1	%	N	003

CONCEPT LIFE SCIENCES
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Concept Life Sciences

Certificate of Analysis

3 Crittall Drive
Springwood Industrial Estate
Braintree
Essex
CM7 2RT
Tel : 01376 560120
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Report Number: Supplement 1A 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 003**
Customer Sample Reference	**17-C1-01 D6 @ 3.45m**
Date Sampled	**28-JUL-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	<0.01
(Water soluble) Cl-	T710	A40	0.01	g/l	<0.01
Magnesium	T112	A40	1	mg/l	<1
(Water soluble) NO3	T710	A40	0.01	g/l	<0.01
pH	T7	A40			**8.2**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	**0.01**
SO4(Total)	T102	A40	0.02	%	**0.03**
Sulphur (total)	T6	A40	0.01	%	**0.02**
Moisture @105C	T162	AR	0.1	%	**15**
Retained on 2mm	T2	A40	0.1	%	**19.2**

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

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

Notes

Retained on 2mm is removed before analysis
Supplement 1A Report reissued to include only sample 003

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	N	003
(Water soluble) Cl-	T710	A40	0.01	g/l	N	003
Magnesium	T112	A40	1	mg/l	N	003
(Water soluble) NO3	T710	A40	0.01	g/l	N	003
pH	T7	A40			M	003
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	M	003
SO4(Total)	T102	A40	0.02	%	M	003
Sulphur (total)	T6	A40	0.01	%	M	003
Moisture @105C	T162	AR	0.1	%	N	003
Retained on 2mm	T2	A40	0.1	%	N	003

APPENDIX F
Geoenvironmental Laboratory Test Results

Report References: CLS674086

CLS675010

CLS677583

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Concept Life Sciences

Certificate of Analysis

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

Report Number: Supplement 2 to Report Number 674086-1

Date of Report: 03-Nov-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 Advi

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

Soil Analysed as Soil
CLEA metals, Braintree

Concept Reference	**674086 002**
Customer Sample Reference	**BH17-C1-04 ES2 @ 1.00m**
Date Sampled	**02-AUG-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
Arsenic	T257	A40	2	mg/kg	**8**
Barium	T257	A40	2	mg/kg	**72**
Beryllium	T245	A40	0.5	mg/kg	**0.7**
Boron (water-soluble)	T82	A40	1	mg/kg	<1
Cadmium	T257	A40	0.1	mg/kg	<0.1
Chromium	T257	A40	0.5	mg/kg	**22**
Copper	T257	A40	2	mg/kg	**8**
Lead	T257	A40	2	mg/kg	**12**
Mercury	T245	A40	1.0	mg/kg	<1.0
Nickel	T257	A40	0.5	mg/kg	**15**
Selenium	T257	A40	3	mg/kg	<3
Vanadium	T257	A40	0.1	mg/kg	**30**
Zinc	T257	A40	2	mg/kg	**29**
Moisture @105C	T162	AR	0.1	%	**12**
Retained on 2mm	T2	A40	0.1	%	**13.4**

Index to symbols used in Supplement 2 to Report Number 674086-1

Value	Description
A40	Assisted dried < 40C
AR	As Received
64	Analysis was performed by an alternative technique
100	LOD determined by sample aliquot used for analysis
131	Result is outside of the scope of accreditation due to a QC Failure
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Supplement 2 Report reissued to include only sample 002
Retained on 2mm is removed before analysis

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Arsenic	T257	A40	2	mg/kg	M	002
Barium	T257	A40	2	mg/kg	U	002
Beryllium	T245	A40	0.5	mg/kg	U	002
Boron (water-soluble)	T82	A40	1	mg/kg	N	002
Cadmium	T257	A40	0.1	mg/kg	M	002
Chromium	T257	A40	0.5	mg/kg	M	002
Copper	T257	A40	2	mg/kg	M	002
Lead	T257	A40	2	mg/kg	M	002
Mercury	T245	A40	1.0	mg/kg	U	002
Nickel	T257	A40	0.5	mg/kg	M	002
Selenium	T257	A40	3	mg/kg	U	002
Vanadium	T257	A40	0.1	mg/kg	U	002
Zinc	T257	A40	2	mg/kg	M	002
Moisture @105C	T162	AR	0.1	%	N	002
Retained on 2mm	T2	A40	0.1	%	N	002

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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 675010-1

Date of Report: 17-Oct-2017

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

Customer Contact: Mr Jimmy Thorburn

Customer Job Reference: 3318
Customer Purchase Order: PO-001839
Customer Site Reference: Norfolk Vanguard Cable Route
Date Job Received at Concept: 03-Aug-2017
Date Analysis Started: 15-Aug-2017
Date Analysis Completed: 06-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 :
Aislinn Arthey
Customer Service Advisor

Issued by :
Aislinn Arthey
Customer Service Advi

Concept Reference: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
CLEA metals, Braintree

				Concept Reference	**675010 006**	**675010 014**
				Customer Sample Reference	**BH17-C1-01 ES2 @ 1.00m**	**BH17-C1-03 ES2 @ 1.00m**
				Date Sampled	**01-AUG-2017**	**02-AUG-2017**
				Matrix Class	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Arsenic	T257	A40	2	mg/kg	**51**	**20**
Barium	T257	A40	2	mg/kg	**100**	**120**
Beryllium	T245	A40	0.5	mg/kg	**0.5**	**1.4**
Boron (water-soluble)	T82	A40	1	mg/kg	<1	<1
Cadmium	T257	A40	0.1	mg/kg	**0.2**	**0.4**
Chromium	T257	A40	0.5	mg/kg	**16**	**30**
Copper	T257	A40	2	mg/kg	**7**	**20**
Lead	T257	A40	2	mg/kg	**11**	**19**
Mercury	T245	A40	1.0	mg/kg	<1.0	<1.0
Nickel	T257	A40	0.5	mg/kg	**11**	**43**
Selenium	T257	A40	3	mg/kg	<3	<3
Vanadium	T257	A40	0.1	mg/kg	**26**	**48**
Zinc	T257	A40	2	mg/kg	**33**	**70**
Moisture @105C	T162	AR	0.1	%	**16**	**14**
Retained on 2mm	T2	A40	0.1	%	**9.5**	**3.2**

Concept Reference: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Asbestos

				Concept Reference	**675010 013**	
				Customer Sample Reference	**BH17-C1-03 ES1 @ 0.50m**	
				Date Sampled	**02-AUG-2017**	
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Asbestos ID	T27	A40			Asbestos not detected	

Concept Reference: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Miscellaneous

				Concept Reference	**675010 014**	
				Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**	
				Date Sampled	**02-AUG-2017**	
				Matrix Class	**Clay**	
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Soil Organic Matter	T287	A40	0.1	%	**0.3**	

Concept Reference: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

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

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Date Sampled	**02-AUG-2017**
Matrix Class	**Clay**

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

Concept Reference: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
TPH CWG

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Date Sampled	**02-AUG-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: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Organochlorine insecticides

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Date Sampled	**02-AUG-2017**
Matrix Class	**Clay**

Determinand	Method	Test Sample	LOD	Units	
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	(162) <0.02
Hexachlorobenzene	T1	AR	0.01	mg/kg	<0.01
Heptachlor	T16	AR	0.01	mg/kg	(162) <0.02
Aldrin	T16	AR	0.01	mg/kg	(162) <0.02
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	(162,131) <0.02

Concept Reference: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Organophosphorous insecticides

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Date Sampled	**02-AUG-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: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Triazines Suite

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Date Sampled	**02-AUG-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: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Phenoxy Acetic acid herbicides

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Date Sampled	**02-AUG-2017**
Matrix Class	**Clay**

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

Concept Reference: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Phenols (Speciated)

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Date Sampled	**02-AUG-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: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Urons

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Date Sampled	**02-AUG-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

Index to symbols used in Supplement 1C to Report Number 675010-1

Value	Description
A40	Assisted dried < 40C
AR	As Received
131	Result is outside of the scope of accreditation due to a QC Failure
64	Analysis was performed by an alternative technique

162	LOD determined by matrix spike recovery
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

Supplement 1C report reissued to include only samples 006, 013 and 014
Triazines and Urons transferred to Concept life Sciences Cambridge
014 - BTEX, PAH, OCP, OPP, Speciated Phenols: Due to lab error, These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except TPH c5-c40 aro/ali split, OCP/OPP and PAAH
Asbestos subcontracted to REC Limited
OCP, OPP and PAAH transferred to Concept Life Sciences Cambridge
Retained on 2mm is removed before analysis
BTEX: Samples submitted for GC/MS (Headspace) analysis were submitted in inappropriate containers. It is possible therefore that the results provided may be compromised.

Method Index

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

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Arsenic	T257	A40	2	mg/kg	M	006,014
Barium	T257	A40	2	mg/kg	U	006,014
Beryllium	T245	A40	0.5	mg/kg	U	006,014
Boron (water-soluble)	T82	A40	1	mg/kg	N	006,014
Cadmium	T257	A40	0.1	mg/kg	M	006,014
Chromium	T257	A40	0.5	mg/kg	M	006,014
Copper	T257	A40	2	mg/kg	M	006,014
Lead	T257	A40	2	mg/kg	M	006,014
Mercury	T245	A40	1.0	mg/kg	U	006,014
Nickel	T257	A40	0.5	mg/kg	M	006,014
Selenium	T257	A40	3	mg/kg	U	006,014
Vanadium	T257	A40	0.1	mg/kg	U	006,014
Zinc	T257	A40	2	mg/kg	M	006,014
Moisture @105C	T162	AR	0.1	%	N	006,014
Retained on 2mm	T2	A40	0.1	%	N	006,014
Asbestos ID	T27	A40			SU	013
Soil Organic Matter	T287	A40	0.1	%	N	014
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

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

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Total Phenols	T17	AR	0.1	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

CONCEPT LIFE SCIENCES
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Concept Life Sciences

Certificate of Analysis

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

Report Number: Supplement 1A to Report Number 675010-1

Date of Report: 17-Oct-2017

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

Customer Contact: Mr Jimmy Thorburn

Customer Job Reference: 3318
Customer Purchase Order: PO-001839
Customer Site Reference: Norfolk Vanguard Cable Route
Date Job Received at Concept: 03-Aug-2017
Date Analysis Started: 15-Aug-2017
Date Analysis Completed: 06-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 :
Aislinn Arthey
Customer Service Advisor

Issued by :
Aislinn Arthey
Customer Service

[redacted]

Waste Acceptance Criteria

Customer Sample Reference : BH17-C1-03 ES2 @ 1.00m
SAL Sample Reference : 675010 014
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 87.5
Date Sampled : 02-AUG-2017
Matrix Class : Clay

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	8.1		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	3.3			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.2	3.0	5.0	6.0
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
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		
Coronene	GC/MS (MCERTS)	0.1	mg/kg	N	<0.1			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	14			
Retained on 2mm	Grav	0.1	%	N	3.2			

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	<0.0020	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.036	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	12	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	0.027	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	90	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	6.2	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	0.012	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	22	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	560	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.032	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: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

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

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Test Sample	**AR**
Date Sampled	**02-AUG-2017**
Matrix Class	**Clay**

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

Concept Reference: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
BTEX

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Test Sample	**AR**
Date Sampled	**02-AUG-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: 675010
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
PCBs EC7 (SE)

Concept Reference	**675010 014**
Customer Sample Reference	**BH17-C1-03 ES2 @ 1.00m**
Test Sample	**AR**
Date Sampled	**02-AUG-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 675010-1

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

Notes

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

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Concept Life Sciences

Certificate of Analysis

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Report Number: Supplement 1A to Report Number 677853-1

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: 24-Aug-2017
Date Analysis Started: 25-Aug-2017
Date Analysis Completed: 04-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

Report checked and authorised by :
Aislinn Arthey
Customer Service Advisor

Issued by :
Aislinn Arthey
Customer Service Adv

Concept Reference: 677853
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Heavy Metals (9)

Concept Reference	**677853 001**
Customer Sample Reference	**C1-04**
Date Sampled	**22-AUG-2017**

Determinand	Method	Test Sample	LOD	Units	
As (Dissolved)	T281	F	0.0002	mg/l	**0.0003**
Cd (Dissolved)	T281	F	0.00002	mg/l	<0.00002
Cr (Dissolved)	T281	F	0.001	mg/l	<0.001
Cu (Dissolved)	T281	F	0.0005	mg/l	**0.0011**
Pb (Dissolved)	T281	F	0.0003	mg/l	<0.0003
Hg (Dissolved)	T281	F	0.00005	mg/l	<0.00005
Ni (Dissolved)	T281	F	0.001	mg/l	<0.001
Se (Dissolved)	T281	F	0.0005	mg/l	**0.0029**
Zn (Dissolved)	T281	F	0.002	mg/l	**0.006**

Concept Reference: 677853
Project Site: East Anglia OWF
Customer Reference: 3318

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

Concept Reference	**677853 001**
Customer Sample Reference	**C1-04**
Date Sampled	**22-AUG-2017**

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

Concept Reference: 677853
Project Site: East Anglia OWF
Customer Reference: 3318

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

				Concept Reference	**677853 001**
				Customer Sample Reference	**C1-04**
				Date Sampled	**22-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Benzene	T54	AR	1	µg/l	<1
Toluene	T54	AR	1	µg/l	<1
EthylBenzene	T54	AR	1	µg/l	<1
M/P Xylene	T54	AR	1	µg/l	<1
O Xylene	T54	AR	1	µg/l	<1
Methyl tert-Butyl Ether	T54	AR	1	µg/l	<1
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	<0.020
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	<0.020
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	<0.020
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	<0.020
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	<0.020
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	<0.020
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	<0.01
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	<0.01
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	<0.01
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	<0.01
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	<0.01
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	**0.02**
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	**0.02**
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	**0.02**

Concept Reference: 677853
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Organochlorine insecticides

				Concept Reference	**677853 001**
				Customer Sample Reference	**C1-04**
				Date Sampled	**22-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Hexachlorocyclohexane	T16	AR	0.01	µg/l	<0.01
Hexachlorobenzene	T16	AR	0.01	µg/l	<0.01
Heptachlor	T16	AR	0.01	µg/l	<0.01
Aldrin	T16	AR	0.01	µg/l	<0.01
Heptachlor epoxide	T16	AR	0.01	µg/l	<0.01
Chlordane	T16	AR	0.01	µg/l	<0.01
Endosulphan	T16	AR	0.01	µg/l	<0.01
DDE	T16	AR	0.01	µg/l	<0.01
Dieldrin	T16	AR	0.01	µg/l	<0.01
Endrin	T16	AR	0.01	µg/l	<0.01
DDD	T16	AR	0.01	µg/l	<0.01
DDT	T16	AR	0.01	µg/l	(36) <0.02

Concept Reference: 677853
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Organophosphorous insecticides

Concept Reference	**677853 001**
Customer Sample Reference	**C1-04**
Date Sampled	**22-AUG-2017**

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

Index to symbols used in Supplement 1A to Report Number 677853-1

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

Notes

Supplement 1A Report Reissued to include only sample 001
OCP and OPP analysis transferred to Concept Life Sciences Manchester

Method Index

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

Accreditation Summary

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

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

APPENDIX G
Calibration Certificates

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

SPT Calibration Report

EQUIPE GROUP
www.equipegroup.com

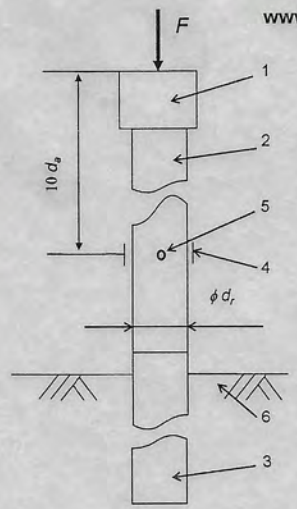
Hammer Energy Measurement Report

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

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

Characteristics of the instrumented rod

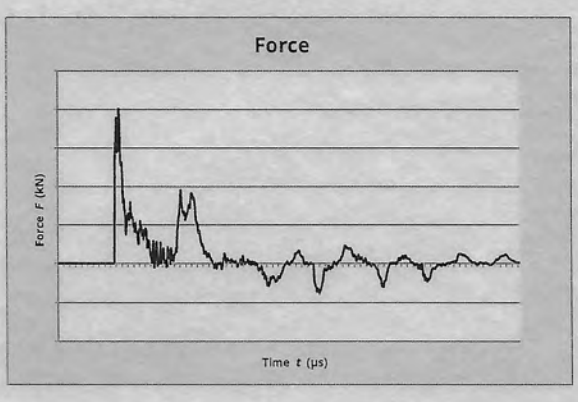
Diameter	d_r = 0.052 m
Length of the instrumented rod	0.558 m
Area	A = 11.61 cm^2
Modulus	E_a = 206843 MPa

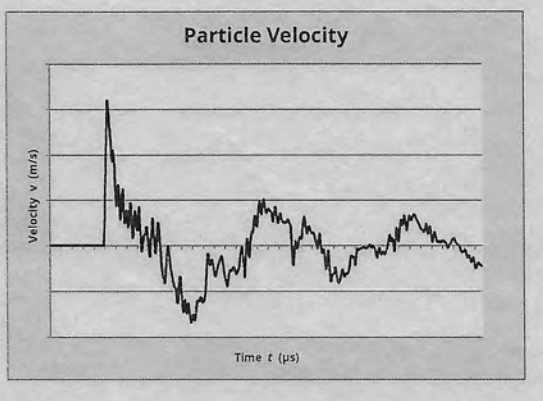


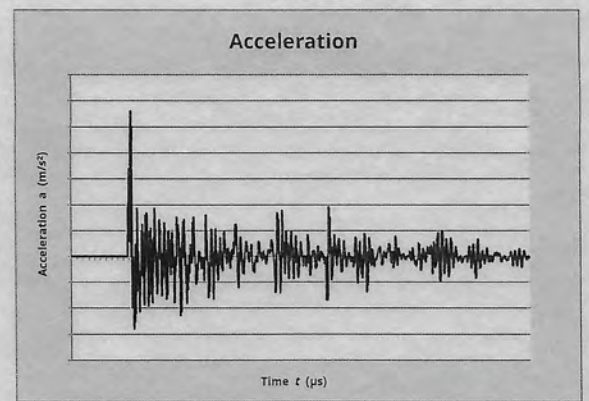
Key
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

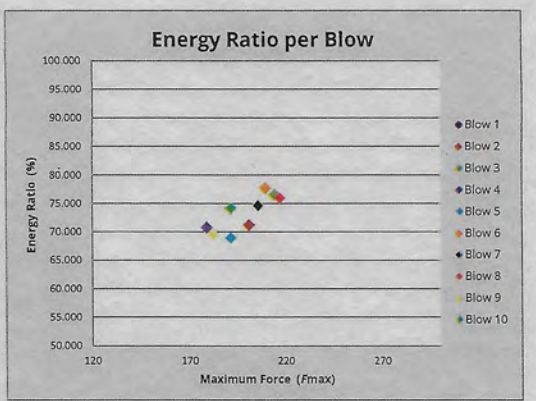
F Force
d_r Diameter of rod

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









Observations:
1.

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

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

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

Equipe SPT Analyzer Operators: KS

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

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

SPT Calibration Report

www.equipegroup.com

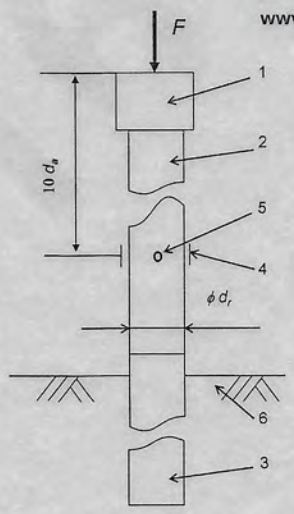
Hammer Energy Measurement Report

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

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

Characteristics of the instrumented rod

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

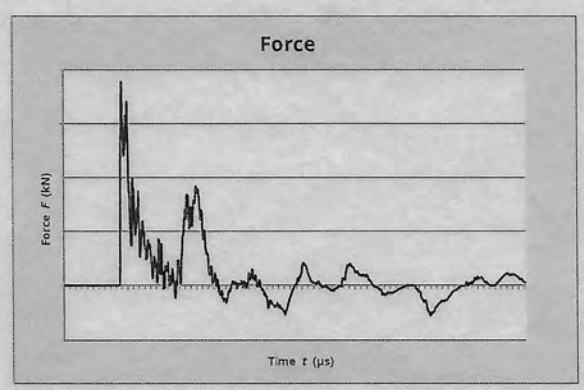


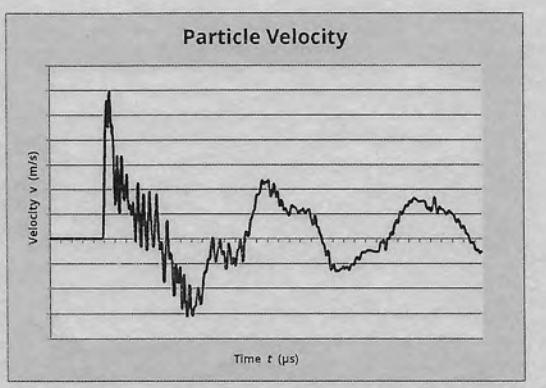
Key

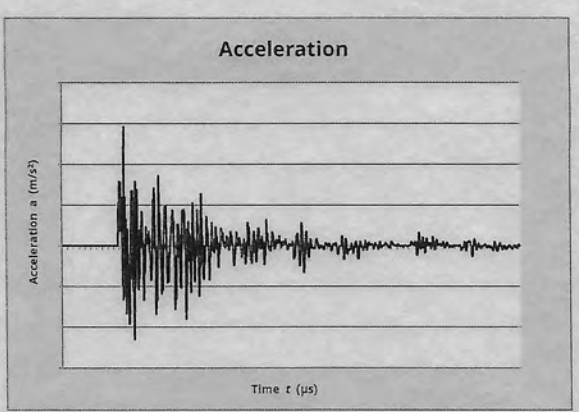
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

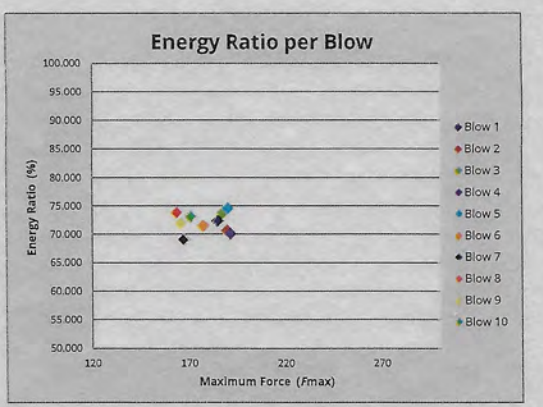
F Force
d_r Diameter of rod

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









Observations:
1.

E_{meas} =	**0.351** kN-m
E_{theor} =	**0.473** kN-m

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

Equipe SPT Analyzer Operators: KS

Prepared by:	[redacted]	**Checked**	[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

EQUIPE GROUP
www.equipegroup.com

Hammer Energy Measurement Report

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

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

Characteristics of the instrumented rod

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

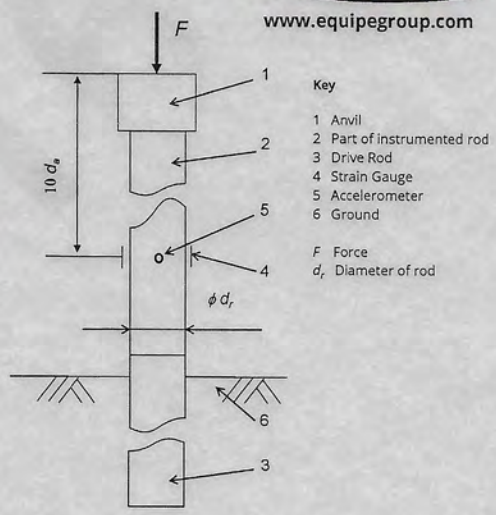
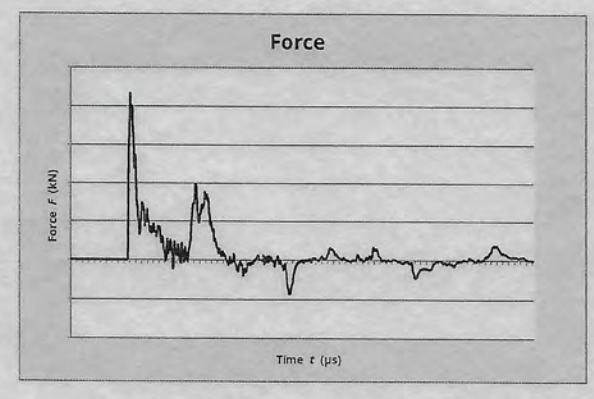
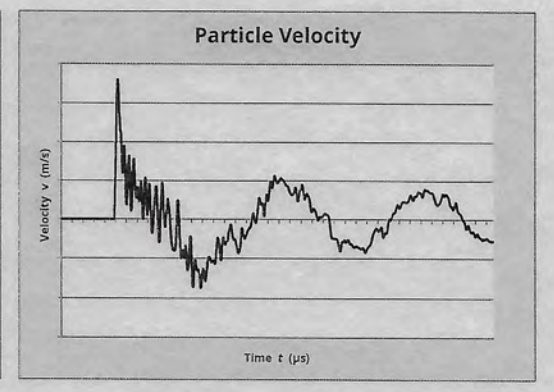
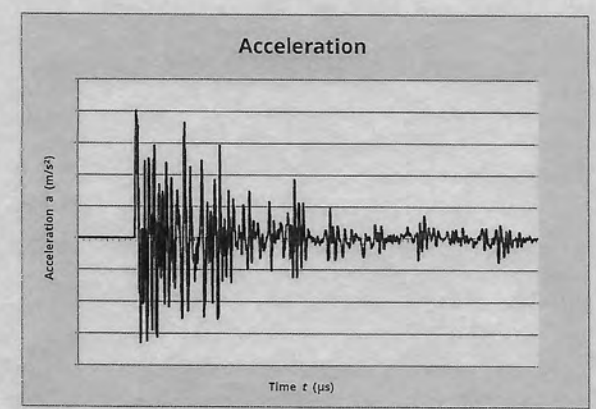
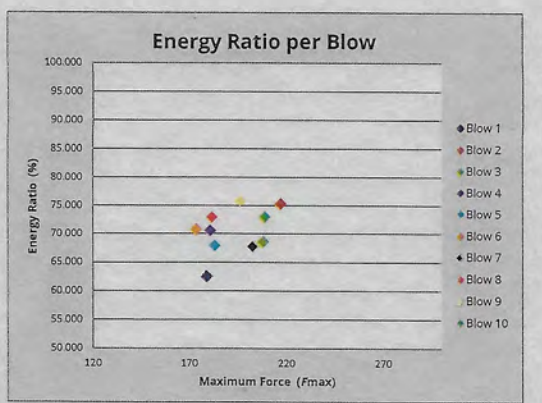


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

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

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

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

Equipe SPT Analyzer Operators: KS

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

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
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

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bsi. ISO 14001 Environmental Management EMS 573194

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