Report No A1077-11

SANDSEND SLOPE STABILISATION

WHITBY, NORTH YORKSHIRE

FACTUAL REPORT ON GROUND INVESTIGATION

Carried out for:
Balfour Beatty Living Places

Engineer:
Haskoning Ltd

December 2011

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Soil Mechanics part of Environmental Scientifics Group

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Employer:

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Engineer:

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Issue No	Date	Details
1	December 2011	Report as submitted

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1 INTRODUCTION

In September 2011 Soil Mechanics was commissioned by Balfour Beatty Living Places to carry out a ground investigation at Sandsend, near Whitby in North Yorkshire, under the direction of their technical advisors, Haskoning Ltd. The investigation was required to obtain geotechnical and geoenvironmental information for proposed stabilisation measures in an area of cliff slope instability on the landward side of the A174 Sandsend Road.

The scope of the investigation, which was specified by Haskoning comprised cable percussion and rotary drilled boreholes, dynamic sampling and laboratory testing. The investigation was carried out in accordance with the contract specification, Eurocode 7 and relevant related standards identified below (see also References). The fieldwork was carried out between 3 and 10 October 2011.

This report presents the factual records of the fieldwork and laboratory testing. The data is also presented separately in digital format following AGS (2005).

2 THE SITE AND GEOLOGY

2.1 The Site

The site comprises an approximately 1 km length of coastline between Sandsend and Whitby, see Site Location Plan in Enclosure F. The area of slope instability is about 200 m long and centred at National Grid reference NZ 867 123.

2.2 Published Geology

The published geological map covering the site, combined BGS Sheets 35 and 44 (1998), show Glacial Till overlying the Whitby Mudstone Formation of the Lias Group.

3 FIELDWORK

3.1 General

The fieldwork was carried out in general accordance with BS 5930+A2 (2010), BS EN 1997-2 (2007) and BS EN ISO 22475-1 (2006).

The exploratory hole locations were selected by Haskoning and were set out by Soil Mechanics and Haskoning from local features. The co-ordinates and reduced levels were surveyed by Soil Mechanics to National Grid and Ordnance Datum. The exploratory hole locations are shown on the Site Plan in Enclosure F.

3.2 Exploratory Holes

The exploratory holes are listed in the following table.

SUMMARY OF EXPLORATORY HOLES

TYPE	QUANTITY	MAXIMUM DEPTH (m)	REMARKS
Cable Percussion Boring extended by Rotary Core Drilling	6	40.7	BH1 to 3 carried out above the slip area, and BH4 to 6 at road level (assumed slip toe).
Dynamic Sampling	5	4.2	WS1 to 5 carried out at beach level spaced along approximately 900 m of coastline.

The exploratory hole records are presented in Enclosure A and should be read in conjunction with the Key which is included in that enclosure. The records provide descriptions of the materials encountered in accordance with BS EN ISO 14688-1 (2002) and 14689-1 (2003), for soils and rocks respectively, as amplified by BS 5930+A2 (2010). The records also give details of the samples taken together with observations made during boring, drilling and dynamic sampling. Standard penetration tests (SPT) were carried out in accordance with BS EN ISO 22476-3 (2005) and the results are included on the borehole records. The SPT hammer energy ratio calibration certificates are also included in Enclosure A.

Photographs of the cores recovered from the rotary drilling are presented in Enclosure E.

On completion of the fieldwork geotechnical samples were transported to the Doncaster laboratory of Soil Mechanics for temporary retention and testing. Geoenvironmental samples were transported from site directly to the ESG Scientifics laboratory.

3.3 Instrumentation

The instruments installed in the exploratory holes are shown on the logs and detailed in Enclosure B. Soil Mechanics was not required to carry out any monitoring of these.

4 LABORATORY TESTING

4.1 Geotechnical Testing

The testing was scheduled by Haskoning and was carried out in accordance with BS 1377 (1990) unless otherwise stated. The testing is summarised below and the results are presented in Enclosure C.

SUMMARY OF GEOTECHNICAL LABORATORY TESTING

TYPE	REMARKS
Moisture Content Determination	
Atterberg Limit Determination	
Particle Size Distribution Analysis	
pH and Water Soluble Sulphate Content of Soils	
Unconsolidated Undrained Triaxial Compression	
Consolidated Undrained Triaxial Compression	
Shear Strength by Direct Shear (Shearbox)	
Residual Shear Strength (Ring Shear)	
Laboratory Vane Shear Strength	
One Dimensional Oedometer Consolidation	
Dry Density / Moisture Content Relationship	
Moisture Condition Value (MCV) / Moisture Content Relationship	

4.2 Geoenvironmental Testing

The testing was scheduled by Haskoning and was carried out by ESG Scientifics. The results are presented in Enclosure D.

Prepared By	**P Hepton BSc PhD**
Reviewed By	**L K Rodger BSc MSc CGeol CSci FGS**
Approved for Issue By	

REFERENCES

AGS : 2005 : Electronic transfer of geotechnical and geoenvironmental data (Edition 3.1 including addendum May 2005). Association of Geotechnical and Geoenvironmental Specialists.

BGS England and Wales Sheet 35 and 44 : 1998 : Whitby and Scalby. 1:50 000 geological map (solid and drift). British Geological Survey

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

BS 5930+A2 : 2010 : Code of practice for site investigations (Amendment 2). British Standards Institution.

BS EN 1997-2 : 2007 : Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. 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 14689-1 : 2003 : Geotechnical investigation and testing - Identification and classification of rock - Part 1 Identification and description. British Standards Institution.

BS EN ISO 22475-1 : 2006 : Geotechnical investigation and testing – Sampling methods and groundwater measurements - Part 1 Technical principles for execution. British Standards Institution.

BS EN ISO 22476-3 : 2005 : Geotechnical investigation and testing - Field testing - Part 3 Standard penetration test. British Standards Institution.

ENCLOSURE A

EXPLORATORY HOLE RECORDS

Key to Exploratory Hole Records	Key
SPT Hammer Energy Reports	Calibration certificates for DC1 and JB15
Borehole Logs	BH1 to 6
Dynamic Sampler Hole Logs	WS1 to 5

Key to Exploratory Hole Records

SAMPLES

Undisturbed

U	Driven tube sample	nominally 100 mm diameter and full recovery unless otherwise stated
UT	Driven thin wall 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	
CS	Core sample (from rotary core) taken for laboratory testing	
AMAL	Amalgamated sample	

Disturbed

D	Small sample
B	Bulk sample

Other

W	Water sample
G	Gas sample
	Environmental chemistry samples (in more than one container where appropriate)
ES	Soil sample
EW	Water sample

Comments Sample reference numbers are assigned to every sample taken. A sample reference of 'NR' indicates that attempt was made to take a tube sample, however, there was no recovery.

Monitoring samples taken after completion of hole construction are not shown on the exploratory hole logs.

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 75 mm unless stated otherwise and any penetration under self weight in mm (SW) is noted. Where the full 300 mm 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 the total blow count beyond the seating drive is given (without the N = prefix).

IV	*in situ* Vane shear strength, peak (p) and remoulded (r)
HV	Hand vane shear strength, peak (p) and remoulded (r)
PP	Pocket penetrometer test, converted to shear strength
KFH, KRH, KPI	Permeability tests (KFH = falling head, KRH = rising head; KPI = packer inflow); results provided in Field Records column (one value per stage for packer tests)

DRILLING RECORDS

The mechanical indices (TCR/SCR/RQD & If) are defined in BS 5930+A2 (2010)

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
If	Fracture spacing, mm. Minimum, typical and maximum spacings are presented. The term non-intact (NI) is used where the core is fragmented.

Flush returns, estimated percentage with colour where relevant, are given in the Records column

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

Notes:
See report text for full references of standards

Project SANDSEND SLOPE STABILISATION
Project No. A1077-11
Carried out for Balfour Beatty Living Places

Key

Key to Exploratory Hole Records

INSTALLATION

Standpipe/ piezometer

Details of standpipe/piezometer 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 in the Legend column at the depth of the response zone:

SP	Standpipe
SPIE	Standpipe piezometer
PPIE	Pneumatic piezometer
EPIE	Electronic piezometer

Inclinometer or Slip Indicator

The installation of vertical profiling instruments is indicated on the Record. The base of tubing is shown in the Legend column.

The type of instrument installed is indicated by a code in the Legend column at the base of the tubing:

ICE	Biaxial inclinometer
ICM	Inclinometer tubing for use with probe
SLIP	Slip indicator

Settlement Points or Pressure Cells

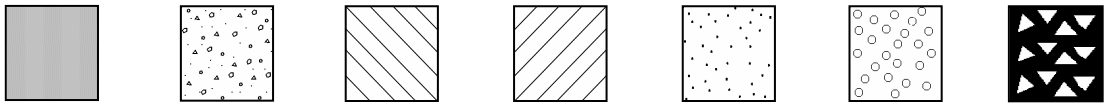
The installation of single point instruments is indicated on the Record. The location of the measuring device is shown in the Legend column.

The type of instrument installed is indicated by a code in the Legend column:

ESET	Electronic settlement cell/gauge
ETM	Magnetic extensometer settlement point
EPCE	Electronic embedment pressure cell
PPCE	Electronic push in pressure cell

INSTALLATION LEGENDS

A legend describing the installation is shown in the rightmost column. Legends additional to BS5930 are used to describe the backfill materials as indicated below.



NOTES

1 Soils and rocks are described in accordance with BS EN ISO 14688-1 (2002) and 14689-1 (2003) respectively as amplified by BS 5930+A2 (2010).

2 For fine soils consistency determined in the field by the logger is reported for those strata where undisturbed samples are available. The consistency is qualified and given (in brackets) when, in the opinion of the logger, the sample is disturbed but the assessed consistency is reasonably representative of the in situ conditions; in these circumstances it will normally underestimate consistency in situ. No consistency is given where the samples available are too disturbed to allow a reasonable assessment.

3 Evidence of the occurrence of very coarse particles (cobbles and boulders) is presented on the logs, however, because of their size in relation to the exploratory hole these records may not be fully representative of their size and frequency in the ground mass.

4 The declination of bedding and joints is given with respect to the normal to the core axis. Thus in a vertical borehole this will be the dip.

5 The assessment of SCR, RQD and Fracture Spacing excludes artificial fractures

6 Strata legends are in accordance with BS 5930+A2 (2010).

7 Water level observations of discernible entries during the advancing of the exploratory hole are given at the foot of the log and in the Legend column. The term "none observed" is used where no discrete entries are identified although this does not necessarily indicate that the hole has not been advanced below groundwater level. Under certain conditions groundwater cannot be observed, for instance, drilling with water flush or overwater, or boring at a rate much faster than water can make its way into the borehole (ref BS5930+A2:2010, Clause 47.2.7). In addition, where appropriate, water levels in the hole at the time of recovering individual samples or carrying out in situ tests and at shift changes are given in the Records column.

8 The borehole logs present the results of Standard Penetration Tests recorded in the field without correction or interpretation. However, in certain ground conditions (eg high hydraulic head or where very coarse particles are present) some judgement may be necessary in considering whether the results are representative of in situ mass conditions.

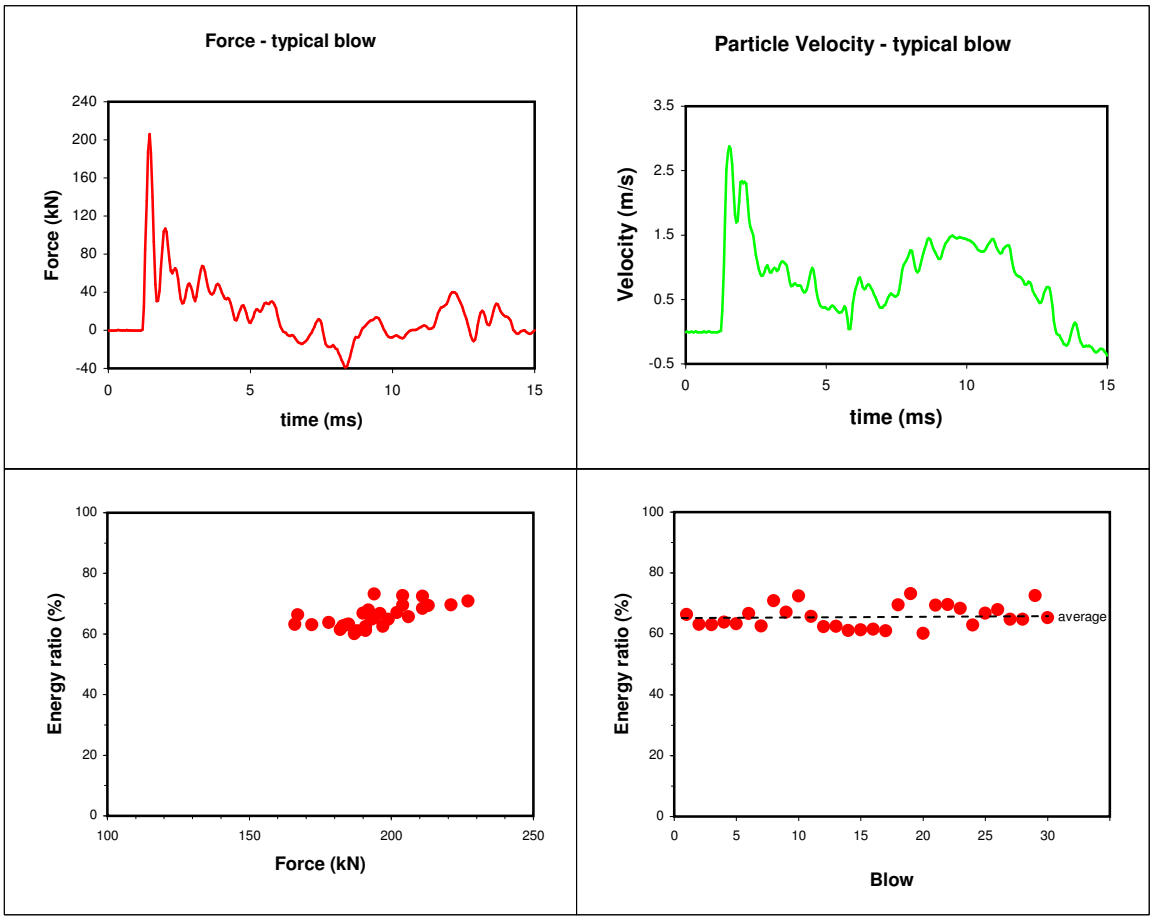
Updated March 2011

Hammer Energy Report

Soil Mechanics

Date of test:	25/11/2010	**Hammer ID:**	DC1
		Hammer mass (*m*)	63.5 kg
Instrumented rod:		**Fall height (*h*)**	0.76 m
Type	BW	**Test type:**	SPT
Cross-sectional area (*A*a)	11.30 cm^2	**Manufacturer:**	Archway
Young's modulus (*E*a)	207000 MPa	**Model:**	Automatic Trip Hammer
Length	0.60 m		
		Rig:	Dando 3000
Test rod type:	BW	**Rig ID:**	CT3
		Type:	Cable Percussion
		Foreman:	D Clay

Remarks:
Data obtained from test carried out in BH1, located in SM Doncaster yard. Test carried out at depth of 9.20 mbgl, with a total blow count of 30. Energy determined from every blow.



Theoretical energy (E_{theor}) = *m x g x h* = **0.473 kN-m (473 J)**

Measured energy (E_{meas}) *average of 30 blows* = **0.311 kN-m**

Energy ratio = $\frac{E_{meas}}{E_{theor}}$ = **66 %**

Test carried out by: Rob Cooke

Signed for issue:

Test carried out in accordance with BS EN ISO 22476-3:2005

Equipment used: SPT Analyzer Serial No. 4032T

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

J.B. Site Investigations
Windmill Way West
Ramparts Business Park
BERWICK-upon-TWEED
TD15 1TB

SPT Hammer Ref:	JB.15
Test Date:	24/06/2011
Report Date:	
File Name:	JB15.spt
Test Operator:	AH

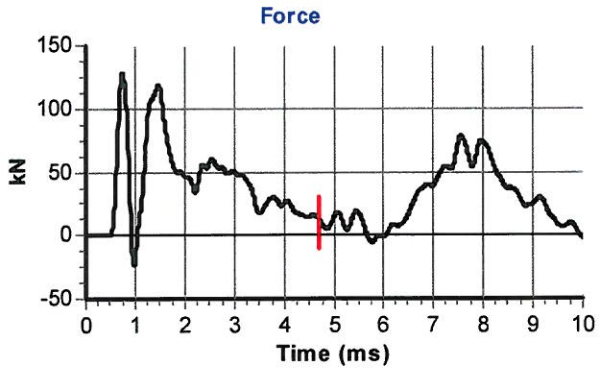
Instrumented Rod Data

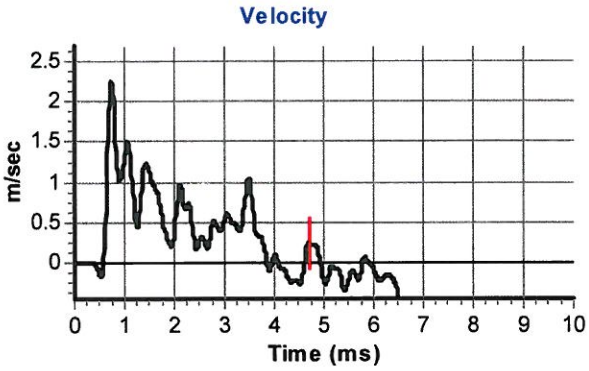
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	6454
Accelerometer No.2:	6456

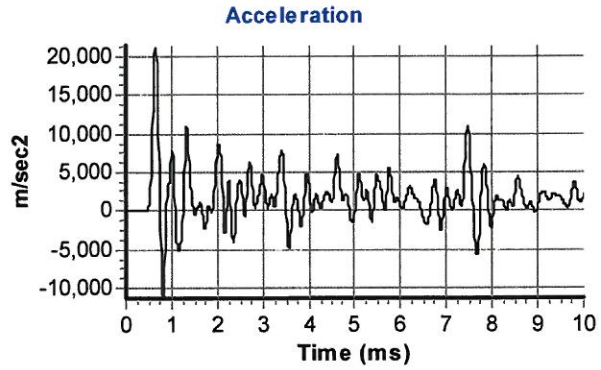
SPT Hammer Information

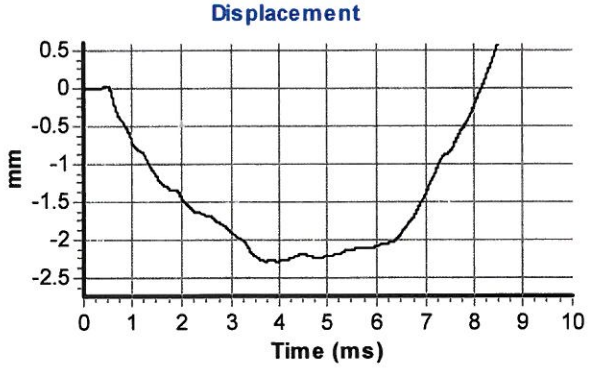
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.0

Comments / Location









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	277

Energy Ratio E_r (%): **59**

Signed: Jeff Burnlees

Title: Proprietor

The recommended calibration interval is 12 months

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH/JMH **Checked** PH	**Start** 05/10/2011 **End** 06/10/2011	**Equipment, Methods and Remarks** Dando 3000 and Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from**	**to**	**Diameter**	**Casing Depth**	**Ground Level**	+44.48 mOD
			0.00m	24.60m	200mm	24.60m	**Coordinates**	E 486765.86
			24.60m	34.10m	121mm	24.60m	**National Grid**	N 512240.04
							Chainage	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.10	D 1	0.00-1.20 m Hand excavated inspection pit.		
0.10-0.50	B 2			
0.50	D 3			
0.50-1.00	B 4			
1.00	ES 4A			
1.20-1.65	U 5	22 blows		
1.65-1.85	D 6			
2.00-2.45	D 7			
2.00-2.45	B 8			
2.00	ES 8A			
3.00-3.45	U 9	28 blows 400 mm rec		
3.45-3.65	D 10			
4.00-4.45	D 11			
4.00-4.45	B 12			
4.45-4.90	SPT S	N=6 (1,1/1,2,2,1)	3.10	dry
5.00-5.45	U 13	24 blows	3.40	dry
5.45-5.65	D 14			
5.65-6.10	SPT S	N=12 (1,2/2,3,3,4)	3.10	dry
5.65-6.10	D 15			
5.65-6.10	B 16			
6.50-6.95	U 17	28 blows	6.10	dry
6.95-7.15	D 18			
7.15-7.60	SPT S	N=12 (5,3/2,3,3,4)	6.10	dry
7.15-7.60	D 19			
7.15-7.60	B 20			
8.00-8.45	U 21	27 blows 400 mm rec	7.60	dry
8.45-8.65	D 22			
8.65-9.10	SPT S	N=15 (2,2/3,3,4,5)	7.60	dry
8.65-9.10	D 23			
8.65-9.10	B 24			
9.50-9.95	U 25	27 blows	9.10	dry
9.95-10.15	D 26			

Strata

Description	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
Orangish and light brown sandy slightly gravelly CLAY with frequent rootlets. Gravel is subangular fine of coal and mudstone. (TOPSOIL)	(0.50)		
	0.50 *+43.98*		
Firm orangish yellow and brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to medium of various lithologies.	(1.10)		
	1.60 *+42.88*		
Firm, becoming stiff below 6.00m, dark brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium, locally coarse, of various lithologies predominantly sandstone and quartzite. (GLACIAL TILL)			
7.00-7.15 m 1 No. sandstone cobble	(8.40)		

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH1

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH/JMH **Checked** PH	**Start** 05/10/2011 **End** 06/10/2011	**Equipment, Methods and Remarks** Dando 3000 and Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** 0.00m 24.60m	**to** 24.60m 34.10m	**Diameter** 200mm 121mm	**Casing Depth** 24.60m 24.60m	**Ground Level** +44.48 mOD **Coordinates** E 486765.86 **National Grid** N 512240.04 **Chainage**		

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
10.15-10.60	SPT S	N=17 (2,2/3,4,4,6)	9.10	dry
10.15-10.60	D 27			
10.15-10.60	B 28			
11.00-11.45	U 29	33 blows	10.60	dry
11.45-11.65	D 30			
11.65-12.10	SPT S	N=19 (2,3/4,4,5,6)	10.60	dry
11.65-12.10	D 31			
11.65-12.10	B 32			
12.50-12.95	U 33	34 blows	12.10	dry
12.95-13.15	D 34			
13.15-13.60	SPT S	N=19 (2,3/3,5,5,6)	12.10	dry
13.15-13.60	D 35			
13.15-13.60	B 36			
14.00-14.45	U 37	32 blows	13.60	dry
14.45-14.65	D 38			
14.65-15.10	SPT S	N=24 (2,4/5,6,6,7)	13.60	dry
14.65-15.10	D 39			
14.65-15.10	B 40			
15.50-15.95	U 41	41 blows	15.10	dry
15.95-16.15	D 42			
16.15-16.60	SPT S	N=24 (4,5/4,6,6,8)	15.10	15.70
16.15-16.60	D 43			
16.15-16.60	B 44			
17.00-17.45	U 45	45 blows	16.60	dry
17.45-17.65	D 46			
17.65-18.10	SPT S	N=33 (4,5/6,7,10,10)	16.60	dry
17.65-18.10	D 47			
17.65-18.10	B 48			
18.10	D 49			
18.50-18.95	SPT C	N=26 (3,4/5,6,6,9)	18.10	dry
18.50-18.95	B 50			
18.70	D 51			
19.50-19.95	U 52	60 blows	19.40	dry
19.95-20.15	D 53			

Strata

Description (Continued from Sheet 1)

Stiff reddish brown, locally greyish brown, slightly sandy slightly gravelly, locally grading to gravelly, CLAY. Gravel is angular to subrounded fine to medium of various lithologies predominantly mudstone. (GLACIAL TILL)

11.40 m 1 No. cobble of mudstone

Light brown silty fine to medium SAND. (GLACIAL TILL)

Stiff dark brown thinly laminated fissured slightly sandy slightly gravelly CLAY. Fissures are very closely spaced, randomly orientated, smooth, polished. Gravel is angular to subrounded fine to medium of various lithologies with occasional 15mm pockets of light brown fine sand. (GLACIAL TILL)

Dark brown sandy very clayey angular to subrounded fine to medium GRAVEL of various lithologies predominantly mudstone. (Possibly weathered MUDSTONE)

16.50 m 1 No. cobble of mudstone

Stiff dark brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to medium, locally coarse, of various lithologies predominantly mudstone. (Possibly weathered MUDSTONE)

Medium dense dark brown sandy clayey GRAVEL. Gravel is angular to rounded fine to coarse of various lithologies predominantly mudstone. (Possibly weathered MUDSTONE)

Stiff to very stiff dark brown, becoming greyish brown below 20.50m, slightly sandy slightly gravelly CLAY. Gravel is angular to rounded fine to medium of various lithologies predominantly mudstone and sandstone. (GLACIAL TILL)

Stratum continues to 23.90 m

Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
10.00 *+34.48*		
(4.25)		
14.25 *+30.23*		
14.45 *+30.03*		
(1.55)		
16.00 *+28.48*		
16.20 *+28.28*		
(1.90)		
18.10 *+26.38*		
(0.60)		
18.70 *+25.78*		

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	16.00	Rose to 15.70 m after 20 minutes.	-

Depth Related Remarks *

From **to (m)**

Chiselling

Depths (m) **Time** **Tools used**

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH1

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH/JMH **Checked** PH	**Start** 05/10/2011 **End** 06/10/2011	**Equipment, Methods and Remarks** Dando 3000 and Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** 0.00m 24.60m	**to** 24.60m 34.10m	**Diameter** 200mm 121mm	**Casing Depth** 24.60m 24.60m	**Ground Level** +44.48 mOD **Coordinates** E 486765.86 **National Grid** N 512240.04 **Chainage**

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
20.15-20.60	SPT S	N=38 (4,6/8,9,10,11)	19.40	dry
20.15-20.60	D 54			
20.15-20.60	B 55			
21.00-21.45	U 56	70 blows	19.40	dry
21.45-21.65	D 57			
21.65-22.10	SPT S	N=29 (11,7/6,7,8,8)	19.40	dry
21.65-22.10	D 58			
21.65-22.10	B 59			
22.50-22.95	U 60	60 blows 400 mm rec	19.40	dry
22.95-23.15	D 61			
23.15-23.60	SPT S	N=33 (4,6/7,8,9,9)	19.40	dry
23.15-23.60	D 62			
23.15-23.60	B 63			
23.90	D 64			
			05/10/2011	
			19.40	dry
24.60-24.86	SPT S	50 (7,10/18,32 for 35mm)	19.40	dry
24.60-24.86	D 65		06/10/2011	1030
			19.40	22.30
24.60-25.60	55 0 0	NA NA NA		
25.60-26.60	100 52 43	NI 90 300		
26.60-28.10	100 81 29			
28.10-29.60	100 77 73	NI 120 360		
		Flush: 24.60-34.10 air mist, 100 %		

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water

Strata

Description (Continued from Sheet 2)

Stiff to very stiff dark brown, becoming greyish brown below 20.50m, slightly sandy slightly gravelly CLAY. Gravel is angular to rounded fine to medium of various lithologies predominantly mudstone and sandstone. (GLACIAL TILL)

(5.20)

23.90 +20.58

Light grey, locally dark grey, thinly laminated silty MUDSTONE. Recovered as angular to subangular fine to coarse gravel.

(0.96)

24.60-25.05 m AZCL

24.86 +19.62

Extremely weak thinly laminated grey MUDSTONE. Weathering is complete loss of structure to gravelly clay.

(0.69)

25.55 +18.93

25.55-25.89 m NI

Weak thinly laminated grey SILTSTONE with rare brown sandstone bands. Weathering is an orangish brown discolouration on fracture surfaces penetrating up to 5mm and localised reduction in strength to very weak. Fractures are subhorizontal, very closely to medium spaced, planar, smooth.

(1.30)

26.34-26.50 m 1no. vertical, planar, smooth fracture

26.50-26.64 m NI

26.85 +17.63

Weak thinly inter-laminated grey SILTSTONE and light brown fine grained SANDSTONE. Weathering is an orangish brown discolouration on fracture surfaces penetrating up to 2mm. Fractures are subhorizontal, very closely to closely spaced, planar, smooth.

(0.55)

27.40 +17.08

27.60-27.63 m NI

27.74-27.78 m recovered as sandy clay

(0.50)

27.90 +16.58

27.99-28.05 m NI

Weak thinly laminated grey SILTSTONE with rare brown sandstone bands. Weathering is an orangish brown discolouration on fracture surfaces penetrating up to 5mm and localised reduction in strength to very weak. Fractures are subhorizontal, very closely to medium spaced, planar, smooth.

28.64-28.70 m NI

(2.00)

29.08-29.17 m NI

Medium strong thinly laminated brown and grey medium grained SANDSTONE. Weathering is an orangish brown

29.50-29.95 m 1no. subvertical, planar, rough fracture

29.55-29.60 m NI

29.90 +14.58

Stratum continues to 30.50 m

Depth, *Level* (Thickness)	Legend	Backfill/ Instruments

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole BH1

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH/JMH **Checked** PH	**Start** 05/10/2011 **End** 06/10/2011	**Equipment, Methods and Remarks** Dando 3000 and Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** / **to** / **Diameter** / **Casing Depth** 0.00m / 24.60m / 200mm / 24.60m 24.60m / 34.10m / 121mm / 24.60m	**Ground Level** +44.48 mOD **Coordinates** E 486765.86 **National Grid** N 512240.04 **Chainage**			

Samples and Tests

Strata

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Description (Continued from Sheet 3)	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
29.60-31.10	92 80 70	NI 50 240				29.60-29.72 m AZCL 27.90m - 29.90m : discolouration on fracture surfaces penetrating up to 30mm. Fractures are: 1) subhorizontal, closely to medium spaced, planar, smooth. 2) 50 degrees, medium spaced, planar, rough. 30.32-30.38 m NI 30.38-30.50 m recovered as gravelly clay	(0.60) 30.50 *+13.98*		
		NI 70 180				29.90m - 30.50m : Weak thinly laminated grey SILTSTONE. Weathering is an orangish brown discolouration on fracture surfaces penetrating up to 5mm. Fractures are subhorizontal, closely spaced, planar, smooth. 31.10-31.30 m 1no. vertical, planar, rough fracture 31.30-31.38 m NI	(1.00) 31.50 *+12.98*		
31.10-32.60	100 35 20					Weak thinly laminated grey fine grained SANDSTONE. Weathering is an orangish brown discolouration on fracture surfaces penetrating up to 10mm. Fractures are subhorizontal, closely spaced, planar, smooth. 32.60-33.00 m AZCL	(2.60)		
32.60-34.10	73 35 7	NI NI 100		06/10/2011 24.60		Extremely weak thinly laminated grey MUDSTONE. Weathering is loss of structure to gravel and localised orangish brown discolouration on fracture surfaces. Fractures are: 1) recovered as non-intact 2) subhorizontal, very closely to closely spaced, planar, rough. 33.12-33.44 m 1no. 75 degree planar, rough fracture	34.10 *+10.38*		
						EXPLORATORY HOLE ENDS AT 34.10 m			

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH1

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH/JMH **Checked** PH	**Start** 03/10/2011 **End** 05/10/2011	**Equipment, Methods and Remarks** Dando 3000 and Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** / **to** / **Diameter** / **Casing Depth** 0.00m – 17.00m – 200mm – 17.00m 17.00m – 26.20m – 150mm – 26.20m 26.20m – 40.20m – 121mm – 26.20m	**Ground Level** +45.56 mOD **Coordinates** E 486709.85 **National Grid** N 512274.24 **Chainage**

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.10	D 1	0.00-1.20 m Hand excavated inspection pit.		
0.50	D 2			
0.50-1.00	B 3			
1.00	ES 3A			
1.20-1.65	U 4	38 blows		dry
1.65-1.85	D 5			
2.00-2.45	SPT S	N=7 (1,1/1,2,2,2)	1.60	dry
2.00-2.45	D 6			
2.00	ES 6A			
2.00-2.45	B 7			
3.00-3.45	U 8	50 blows		dry
3.45-3.65	D 9			
4.00-4.45	SPT S	N=11 (1,2/3,2,3,3)	3.10	dry
4.00-4.45	D 10			
4.00-4.45	B 11			
5.00-5.45	U 12	30 blows 400 mm rec	4.60	dry
5.45-5.65	D 13			
6.00-6.45	SPT S	N=11 (1,2/2,2,3,4)	5.80	dry
6.00-6.45	D 14			
6.00-6.45	B 15			
7.00-7.45	U 16	38 blows	5.80	dry
7.45-7.65	D 17			
8.00-8.45	U 18	29 blows	7.60	dry
8.45-8.65	D 19			
9.00-9.45	U 20	35 blows	7.60	dry
9.45-9.65	D 21			

Strata

Description	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
Orangish brown slightly sandy CLAY. Sand is fine to coarse. (TOPSOIL)	(0.50)		
Stiff orangish brown, becoming dark brown below 3.00m, slightly sandy slightly gravelly CLAY. Gravel is angular to rounded fine to coarse of various lithologies. (GLACIAL TILL)	0.50 *+45.06*		
5.45-5.60 m pocket of dark brown very sandy slightly gravelly clay. Gravel is subangular to subrounded fine to medium of various lithologies	(15.20)		
Stratum continues to 15.70 m			

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH2

Borehole Log

Soil Mechanics

Drilled	DC/CL	**Start**	03/10/2011	**Equipment, Methods and Remarks**		**Depth from**	**to**	**Diameter**	**Casing Depth**
Logged	CH/JMH	**End**	05/10/2011	Dando 3000 and Beretta T51.		0.00m	17.00m	200mm	17.00m
Checked	PH			Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush.		17.00m	26.20m	150mm	26.20m
				SPT: hammer ID DC1, rods BW.		26.20m	40.20m	121mm	26.20m

Ground Level +45.56 mOD
Coordinates E 486709.85
National Grid N 512274.24
Chainage

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
10.00-10.45	U 22	35 blows	7.60	dry
10.45-10.65	D 23			
11.00-11.45	U 24	30 blows	7.60	dry
11.45-11.65	D 25			
12.00-12.45	U 26	36 blows	7.60	dry
12.45-12.65	D 27			
13.00-13.65	B 28			
13.00-13.45	U NR	55 blows No recovery	7.60	dry
14.00-14.45	U 29	35 blows	7.60	dry
14.45-14.65	D 30			
15.00-15.45	U 31	40 blows 400 mm rec	7.60	dry
15.45-15.65	D 32			
15.70	D 33			
15.90	W 36			
16.00-16.45	U 34	40 blows 400 mm rec		
16.45-16.65	D 35		03/10/2011 7.60	dry
			04/10/2011 7.60	0800 13.70
17.00-17.45	U 37	30 blows 400 mm rec	17.00	15.20
17.45-17.65	D 38			
17.90	W 39			
18.00-18.45	SPT S	N=37 (3,5/9,9,10,9)	18.00	14.50
18.00-18.45	D 40			
18.00-18.45	B 41			
18.50	D 42			
19.00-19.45	U 43	55 blows	18.80	dry
19.45-19.65	D 44			

Strata

Description (Continued from Sheet 1)

Stiff orangish brown, becoming dark brown below 3.00m, slightly sandy slightly gravelly CLAY. Gravel is angular to rounded fine to coarse of various lithologies. (GLACIAL TILL)

10.50 m very sandy

12.00 m very sandy

Dark brown sandy very clayey GRAVEL. Gravel is angular to rounded fine to coarse of various lithologies predominantly mudstone and sandstone. (GLACIAL TILL)

Stiff dark brown, locally orange and brown, sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to medium of various lithologies. (GLACIAL TILL)

Orange brown very sandy clayey angular to subrounded fine to medium GRAVEL of various lithologies, predominantly quartzite and flint. (GLACIAL TILL)

Dark brown thinly laminated fissured slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of various lithologies. Fissures are very closely spaced, randomly orientated, smooth, polished. (GLACIAL TILL)

Stiff, locally very stiff, dark brown

Stratum continues to 25.40 m

Depth, *Level* (Thickness)		Legend	Backfill/ Instruments
15.70	+29.86		
15.90	+29.66		
(2.00)			
17.90	+27.66		
(0.60)			
18.50	+27.06		
(0.50)			
19.00	+26.56		

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	15.90	Rose to 14.90 m after 20 minutes.	-
2	17.90	Rose to 14.30 m after 20 minutes. Medium inflow.	-

Depth Related Remarks *
From to (m)

Chiselling
Depths (m) Time Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION
Project No. A1077-11
Carried out for Balfour Beatty Living Places

Borehole
BH2

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH/JMH **Checked** PH	**Start** 03/10/2011 **End** 05/10/2011	**Equipment, Methods and Remarks** Dando 3000 and Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** / **to** / **Diameter** / **Casing Depth** 0.00m / 17.00m / 200mm / 17.00m 17.00m / 26.20m / 150mm / 26.20m 26.20m / 40.20m / 121mm / 26.20m	**Ground Level** +45.56 mOD **Coordinates** E 486709.85 **National Grid** N 512274.24 **Chainage**

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
20.00-20.45	U 45	43 blows 400 mm rec	19.60	dry
20.45-20.65	D 46			
21.00-21.45	U 47	50 blows 400 mm rec	19.60	dry
21.45-21.65	D 48			
22.00-22.45	U 49	60 blows 350 mm rec	19.60	dry
22.45-22.65	D 50			
23.00-23.45	U 51	70 blows 400 mm rec	19.60	dry
23.45-23.65	D 52			
24.00-24.45	U 53	65 blows	19.60	dry
24.45-24.65	D 54			
25.00-25.45	U 55	65 blows 400 mm rec	19.60	dry
25.45-25.65	D 56			
26.10-26.29	SPT S	50 (16,9 for 40mm/50)	04/10/2011 19.60	dry
26.10-26.30	D 57		~~19.60~~	
			05/10/2011 19.60	0800 dry
26.20-27.20	66 64 54			
27.20-28.50	85 30 23	NI 110 240		
28.50-30.20	85 69 59			

Strata

Description (Continued from Sheet 2)

slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium, occasionally coarse, of various lithologies predominantly mudstone. (GLACIAL TILL)

Very weak light grey and green, locally weathered orange, thinly laminated MUDSTONE. Recovered as angular to subangular fine to coarse gravel. (Weathered MUDSTONE)

26.20-26.54 m AZCL

Weak locally very weak thinly laminated brown fine grained SANDSTONE. Weathering is localised loss of structure to gravelly clay. Fractures are subhorizontal, closely to medium spaced, planar, rough to smooth.

26.97-27.20 m 1no 75 degree, planar, rough fracture
27.20-27.60 m AZCL
27.60-27.67 m NI
27.96-28.10 m recovered as gravelly clay
28.30-28.47 m recovered as gravelly clay
28.53-28.70 m 1no subvertical, planar, rough fracture
28.70-28.75 m AZCL
28.75-29.10 m NI
29.20-29.39 m 1no. vertical, planar, smooth fracture
29.69-29.95 m 1no 70 degree.

Stratum continues to 32.00 m

Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
(6.40)		SPIE
25.40 *+20.16*		
(0.90)		
26.30 *+19.26*		
(3.65)		
29.95 *+15.61*		

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used
25.90 -26.10	30 mins	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION
Project No. A1077-11
Carried out for Balfour Beatty Living Places

Borehole BH2

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH/JMH **Checked** PH	**Start** 03/10/2011 **End** 05/10/2011	**Equipment, Methods and Remarks** Dando 3000 and Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** / **to** / **Diameter** / **Casing Depth** 0.00m / 17.00m / 200mm / 17.00m 17.00m / 26.20m / 150mm / 26.20m 26.20m / 40.20m / 121mm / 26.20m	**Ground Level** +45.56 mOD **Coordinates** E 486709.85 **National Grid** N 512274.24 **Chainage**

Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
30.20-31.70	73 36 36	NI 120 270			
31.70-33.20	100 81 75	100 150 220			
33.20-34.70	67 42 22		Flush: 26.20-40.20 air mist, 100 %		
34.70-36.20	73 26 0				
36.20-37.70	80 21 7	NI 70 150			
37.70-39.20	97 67 7				
39.20-40.70	91 45 17				

Strata

Description (Continued from Sheet 3)

Very weak thinly laminated grey fine grained SANDSTONE. Fractures are subhorizontal, closely to medium spaced, planar, smooth.

planar, smooth fracture

30.92-31.16 m NI

31.07-31.52 m 1no subvertical, planar, rough fracture

31.52-31.64 m NI

(2.05)

32.00 *+13.56*

Extremely weak thinly laminated grey MUDSTONE. Fractures are subhorizontal, closely to medium spaced, planar, smooth.

32.64-32.81 m 1no. 65 degree, planar, smooth fracture

(1.10)

33.10 *+12.46*

Very weak to extremely weak thinly laminated grey MUDSTONE. Weathering is localised loss of structure to gravel. Fractures are subhorizontal, very closely to closely spaced, planar rough to smooth.

33.10-33.20 m NI

33.20-33.70 m AZCL

33.88-34.00 m NI

34.07-34.12 m NI

34.43-34.46 m NI

34.70-34.88 m AZCL

34.88-34.92 m NI

35.14-35.16 m NI

35.38-35.67 m NI

35.67-35.98 m 1no. subvertical, undulating, smooth fracture

35.77-35.80 m NI

35.98-36.03 m NI

36.20-36.50 m AZCL

36.50-36.65 m NI

36.65-37.00 m multiple randomly orientated fractures

(7.60)

37.24-37.44 m NI

37.44-37.58 m recovered as gravelly clay

37.70-37.75 m AZCL

38.28-38.44 m 1no 75 degree, planar, smooth fracture

38.44-38.54 m NI

38.91-38.98 m NI

38.98-39.20 m 1no. vertical, planar, rough fracture

39.20-39.33 m AZCL

39.46-39.50 m NI

39.59-39.62 m NI

Stratum continues to 40.70 m

Depth, *Level* (Thickness) / **Legend** / **Backfill/ Instruments**

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole **BH2**

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH/JMH **Checked** PH	**Start** 03/10/2011 **End** 05/10/2011	**Equipment, Methods and Remarks** Dando 3000 and Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from**	**to**	**Diameter**	**Casing Depth**	**Ground Level**	+45.56 mOD
			0.00m	17.00m	200mm	17.00m	**Coordinates**	E 486709.85
			17.00m	26.20m	150mm	26.20m	**National Grid**	N 512274.24
			26.20m	40.20m	121mm	26.20m	**Chainage**	

Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
				05/10/2011	
				26.20	dry

Strata

Description (Continued from Sheet 4)		Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
Very weak to extremely weak thinly laminated grey MUDSTONE. Weathering is localised loss of structure to gravel. Fractures are subhorizontal, very closely to closely spaced, planar rough to smooth.	39.96-40.01 m NI 40.23-40.32 m NI 40.48-40.55 m NI	40.70 *+4.86*		
EXPLORATORY HOLE ENDS AT 40.70 m				

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH2

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH **Checked** PH	**Start** 06/10/2011 **End** 10/10/2011	**Equipment, Methods and Remarks** Dando 3000 & Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** 0.00m 21.10m	**to** 21.10m 40.10m	**Diameter** 200mm 121mm	**Casing Depth** 21.10m 21.10m	**Ground Level** +45.95 mOD **Coordinates** E 486620.13 **National Grid** N 512295.06 **Chainage**

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.10	D 1	0.00-1.20 m Hand excavated inspection pit.		
0.10-0.50	B 2			
0.30	ES 2A			
0.50-1.00	B 3			
1.20-1.65	U 4	31 blows		dry
1.65-1.85	D 5			
1.85-2.30	SPT S	N=11 (1,1/2,2,3,4)		dry
1.85-2.30	D 6			
1.85-2.30	B 7			
2.00	ES 7A			
2.50-2.95	U 8	38 blows	1.60	dry
2.95-3.15	D 9			
3.15-3.60	SPT S	N=18 (2,3/4,4,5,5)	1.60	dry
3.15-3.60	D 10			
3.15-3.60	B 11			
4.00-4.45	U 12	28 blows	3.10	dry
4.45-4.65	D 13			
4.65-5.10	SPT S	N=10 (1,2/2,2,3,3)	3.10	dry
4.65-5.10	D 14			
4.65-5.10	B 15			
5.50-5.95	U 16	28 blows	4.50	dry
5.95-6.15	D 17			
6.15-6.60	SPT S	N=10 (1,2/2,2,3,3)	4.50	dry
6.15-6.60	D 18			
6.15-6.60	B 19			
7.00-7.45	U 20	Blows not recorded		
7.45-7.65	D 21			
7.65-8.10	SPT S	N=10 (1,2/2,2,3,3)	6.10	dry
7.65-8.10	D 22			
7.65-8.10	B 23			
8.50-8.95	U 24	28 blows	7.60	dry
8.95-9.15	D 25			
9.15-9.60	SPT S	N=15 (1,2/3,3,4,5)	7.60	dry
9.15-9.60	D 26			
9.15-9.60	B 27			

Strata

Description	Depth, *Level* (Thickness)
Orangish brown very sandy CLAY. (TOPSOIL)	(0.50)
Light brownish and orange slightly gravelly sandy CLAY.	0.50 *+45.45* (0.90)
Stiff, becoming firm below 4.50m, reddish brown, locally dark brown, slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium, occasionally coarse, of various lithologies predominantly mudstone. (GLACIAL TILL)	1.40 *+44.55* (9.40)
9.15 m 1 No. quartzite cobble	
Stratum continues to 10.80 m	

Legend

Backfill/ Instruments

SPIE

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH3

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH **Checked** PH	**Start** 06/10/2011 **End** 10/10/2011	**Equipment, Methods and Remarks** Dando 3000 & Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** / **to** / **Diameter** / **Casing Depth** 0.00m / 21.10m / 200mm / 21.10m 21.10m / 40.10m / 121mm / 21.10m	**Ground Level** +45.95 mOD **Coordinates** E 486620.13 **National Grid** N 512295.06 **Chainage**			

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
10.00-10.45	U 28	34 blows	9.10	dry
10.45-10.65	D 29			
10.65-10.93	SPT S	50 (2,18/25,25 for 50mm)	9.10	dry
10.65-10.90	D 30			
10.65-10.90	B 31			
11.20	D 32			
11.50-11.95	SPT S	N=26 (3,4/4,6,8,8)	10.60	dry
11.50-11.95	D 33			
11.50-11.95	B 34			
12.50-12.95	SPT S	N=26 (3,5/5,6,7,8)	10.60	dry
12.50-12.95	D 35			
12.50-12.95	B 36			
13.50-13.95	SPT S	N=31 (3,4/5,8,8,10)	10.60	dry
13.50-13.95	D 37			
13.50-13.95	B 38			
14.50-14.95	U 39	45 blows	13.60	dry
14.95-15.15	D 40			
15.15-15.60	SPT S	N=26 (3,5/7,6,6,7)	13.60	14.40
15.15-15.60	D 41			
15.15-15.60	B 42			
16.00-16.45	U 43	45 blows	15.80	dry
16.45-16.55	D 44			
16.65-17.10	SPT S	N=28 (3,4/6,6,7,9)	15.80	dry
16.65-17.10	D 45			
16.65-17.10	B 46			
17.50-17.95	U 47	60 blows	16.60	dry
17.95-18.15	D 48			
18.15-18.60	SPT S	N=35 (4,5/7,9,9,10)	16.60	dry
18.15-18.60	D 49			
18.15-18.60	B 50			
19.00-19.45	U 51	62 blows	18.10	dry
19.45-19.65	D 52			
19.65-20.10	SPT S	N=35 (4,5/7,8,9,11)	18.10	dry
19.65-20.10	D 53			
19.65-20.10	B 54		06/10/2011	

Strata

Description (Continued from Sheet 1)

Stiff, becoming firm below 4.50m, reddish brown, locally dark brown, slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium, occasionally coarse, of various lithologies predominantly mudstone. (GLACIAL TILL)

10.60 m 1 No. sandstone cobble

Stiff to very stiff orangish light grey slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium of mudstone and siltstone. Below 12.50m, becoming dark grey with bands up to 15mm thick of weathered black vitreous coal.

Stiff to very stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of various lithologies predominantly mudstone. (GLACIAL TILL)

Dark brownish grey silty slightly gravelly CLAY. Gravel is subangular to subrounded fine of mudstone. (GLACIAL TILL)

Very stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium, rarely coarse, of various lithologies predominantly mudstone. (GLACIAL TILL)

16.50 m 1 No. cobble of limestone

Stratum continues to 20.10 m

Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
10.80 *+35.15*		
(3.10)		
13.90 *+32.05*		1
(1.00)		
14.90 *+31.05*		1
(0.30)		
15.20 *+30.75*		SPIE
(4.90)		

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	14.90	Rose to 14.40 m after 20 minutes. Slow inflow.	-

Depth Related Remarks *

From / to (m)

Chiselling

Depths (m)	Time	Tools used
10.90 -11.10	30 mins	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole BH3

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH **Checked** PH	**Start** 06/10/2011 **End** 10/10/2011	**Equipment, Methods and Remarks** Dando 3000 & Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** / **to** / **Diameter** / **Casing Depth** 0.00m / 21.10m / 200mm / 21.10m 21.10m / 40.10m / 121mm / 21.10m	**Ground Level** +45.95 mOD **Coordinates** E 486620.13 **National Grid** N 512295.06 **Chainage**	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
20.10	D 55		19.60	dry
20.50-21.00	B 56		07/10/2011 19.60	0800 dry
			07/10/2011 19.60	dry
21.20-21.62 21.20-21.60	38 20 0	SPT S 50 (8,8/ 12,13,15,10 for 45mm) D 57	19.60 10/10/2011 19.60	dry 0800 7.90
21.10-22.10				
22.10-23.60	95 33 11	NI NI 170		
23.60-25.10	73 53 39	NI 250 410		
25.10-26.60	100 57 57	500 500 500		
26.60-28.10	87 23 23	NI NI 150		
28.10-29.60	100 71 59	NI 100 150		

Strata

Description (Continued from Sheet 2)

Very stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium, rarely coarse, of various lithologies predominantly mudstone. (GLACIAL TILL)

Very weak greyish yellow thinly laminated MUDSTONE. Generally recovered as angular to subangular fine to medium gravelly clay. (Weathered MUDSTONE)

21.10-21.62 m AZCL

Medium strong to weak thinly laminated brown fine to medium grained SANDSTONE with occasional grey siltstone bands. Weathering is loss of structure to gravel and orangish brown discolouration on fracture surfaces. Fractures are: 1 No. recovered as NI. 2 No. subhorizontal, very closely to closely spaced, planar, smooth.

21.62-21.90 m recovered as slightly gravelly sandy clay
22.10-22.17 m AZCL
22.17-22.20 m NI
22.24-22.40 m 1 No. vertical planar smooth fracture
22.75-22.98 m NI
23.00-23.50 m 1 No. subvertical undulating rough fracture
23.04-23.27 m NI

Weak to very weak thinly laminated grey SILTSTONE with occasional brown fine grained sandstone. Weathering is localised loss of structure to gravel. Fractures are subhorizontal, closely to medium spaced, planar, smooth.

24.05-24.19 m 1 No. ** ** incipient fracture
24.41-24.70 m recovered as gravel
24.70-25.10 m AZCL
25.50-25.60 m NI

Very weak thinly laminated grey MUDSTONE.

Weak to very weak thinly laminated brown medium grained SANDSTONE. Weathering is loss of structure to gravel. Fractures are: 1 No. recovered as NI. 2 No. subvertical, undulating, rough.

26.60-26.90 m AZCL

Weak thinly laminated brown fine grained SANDSTONE with occasional siltstone bands. Fractures are: 1 No. subhorizontal, very closely to closely spaced, planar, smooth. 2 No. subvertical, undulating, rough.

28.10-28.14 m NI
28.24-28.27 m NI
28.43-28.48 m NI
29.53-29.60 m NI
29.60-29.90 m AZCL
29.90-30.00 m NI

Stratum continues to 30.10 m

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water

Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
20.10 *+25.85*		
(1.00)		
21.10 *+24.85*		
(2.50)		
23.60 *+22.35*		
(2.05)		
25.65 *+20.30*		
(0.50)		
26.15 *+19.80*		
(1.95)		
28.10 *+17.85*		
(2.00)		

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION
Project No. A1077-11
Carried out for Balfour Beatty Living Places

Borehole BH3

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH **Checked** PH	**Start** 06/10/2011 **End** 10/10/2011	**Equipment, Methods and Remarks** Dando 3000 & Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** 0.00m 21.10m	**to** 21.10m 40.10m	**Diameter** 200mm 121mm	**Casing Depth** 21.10m 21.10m	**Ground Level** +45.95 mOD **Coordinates** E 486620.13 **National Grid** N 512295.06 **Chainage**

Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
29.60-31.10	80 53 35		Flush: 21.10-40.10 air mist, 100 %		
31.10-32.60	87 39 39	NI 200 400			
32.60-34.10	100 63 27				
34.10-35.60	77 43 37				
35.60-37.10	93 73 23	NI 80 240			
37.10-38.60	100 43 17				
38.60-40.10	100 64 20			10/10/2011	

Strata

Description (Continued from Sheet 3)

Weak thinly laminated brown fine grained SANDSTONE with occasional siltstone bands. Fractures are: 1 No. subhorizontal, very closely to closely spaced, planar, smooth. 2 No. subvertical, undulating, rough.

30.67-30.71 m 1 No. 45deg. stepped smooth fracture

Very weak thinly laminated grey MUDSTONE. Weathering is loss of structure to gravel and occasional orange to brown discolouration on fracture surfaces.

31.05-31.10 m NI
31.10-31.30 m AZCL
31.30-31.42 m NI
31.75-31.84 m NI
31.75-31.95 m 1 No. vertical planar smooth fracture
31.95-32.00 m NI
32.30-32.60 m recovered as gravelly clay

Very weak, locally extremely weak, thinly laminated dark grey MUDSTONE. Weathering is localised loss of structure to gravelly clay. Fractures are: 1 No. subhorizontal, very closely to medium spaced, planar, rough to smooth. 2 No. subvertical, planar, smooth.

32.99-33.10 m NI
33.24-33.31 m NI
33.31-33.38 m recovered as gravelly clay
33.38-33.53 m 1 No. vertical rough fracture
34.02-34.10 m NI
34.10-34.45 m AZCL
34.45-34.54 m NI
34.77-34.79 m NI
35.10-35.60 m 1 No. 75deg. incipient fracture
35.35-35.42 m NI
35.60-35.70 m AZCL
35.84-35.90 m NI
36.00-36.06 m NI
36.55-36.59 m NI
36.76-36.84 m NI
37.24-37.28 m NI
38.05-38.39 m NI
38.50-38.60 m NI
38.65-38.69 m NI
39.06-39.11 m NI
39.63-39.70 m NI

Stratum continues to 40.10 m

Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
30.10 *+15.85*		
(2.55)		
32.65 *+13.30*		
(7.45)		

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION
Project No. A1077-11
Carried out for Balfour Beatty Living Places

Borehole BH3

Borehole Log

Soil Mechanics

Drilled DC/CL **Logged** CH **Checked** PH	**Start** 06/10/2011 **End** 10/10/2011	**Equipment, Methods and Remarks** Dando 3000 & Beretta T51. Cable percussion boring followed by rotary core drilling (PWF size) using air mist flush. SPT: hammer ID DC1, rods BW.	**Depth from** / **to** / **Diameter** / **Casing Depth** 0.00m / 21.10m / 200mm / 21.10m 21.10m / 40.10m / 121mm / 21.10m	**Ground Level** +45.95 mOD **Coordinates** E 486620.13 **National Grid** N 512295.06 **Chainage**	

Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
				21.10	

Strata

Description (Continued from Sheet 4)	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
Very weak, locally extremely weak, thinly laminated dark grey MUDSTONE. Weathering is localised loss of structure to gravelly clay. Fractures are: 1 No. subhorizontal, very closely to medium spaced, planar, rough to smooth. 2 No. subvertical, planar, smooth.	40.10 *+5.85*		
EXPLORATORY HOLE ENDS AT 40.10 m			

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH3

Borehole Log

Soil Mechanics

Drilled JB/PS **Logged** CH **Checked** PH	**Start** 04/10/2011 **End** 06/10/2011	**Equipment, Methods and Remarks** Dando 2000 and Geotech 6. Cable percussion boring followed by rotary core drilling (PWF size) using mud flush. SPT: hammer ID JB15, rods NWY.	**Depth from**	**to**	**Diameter**	**Casing Depth**	**Ground Level**	+14.59 mOD
			0.00m	5.00m	150mm	5.00m	**Coordinates**	E 486819.85
			5.00m	12.00m	146mm	5.30m	**National Grid**	N 512318.46
							Chainage	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.10	D 1	0.00-1.20 m Hand excavated inspection pit.		
0.10-0.15	B 2			
0.20	D 3			
0.20-0.30	B 4			
0.35	D 5			
0.35-0.65	B 6			
0.70	D 7			
0.80-1.10	B 8			
1.00	ES 8A			
1.20	D 9			
1.20-1.65	U NR	70 blows No recovery	1.20	dry
1.70	D 11			
2.00-2.45	SPT S	N=4 (1,1/1,1,1,1)	2.00	dry
2.00	D 12			
2.00-2.45	D 13			
2.00-2.50	B 14			
2.00	ES 14A			
3.00	D 15			
3.00-3.45	U 16	35 blows		
3.50	D 17			
4.00-4.45	SPT S	N=9 (1,2/2,2,3,2)	4.00	dry
4.00	D 18			
4.00-4.45	D 19			
4.00-4.50	B 20			
4.50	D 21			
4.50-4.70	B 22			
4.70-5.00	B 23		04/10/2011	
			4.50	dry
5.00-5.40	SPT S	50 (7,10/10,13,16,11 for 29mm)	5.00	dry
5.00-5.40	D 24		05/10/2011	0800
	NA		4.50	dry
	NA			
	NA			
5.00-8.07	93 44 44	Flush: 5.00-8.07 mud, 95 %		
	NI 110 270			
8.07-10.69	100 62 42	Flush: 8.07-10.69 mud, 90 %		

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water

Strata

Description		Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
MACADAM. (MADE GROUND) (Foreman's description)		0.10 *+14.49* 0.15 *+14.44*		
Dark grey sandy clayey GRAVEL. Gravel is angular to subangular fine to medium of ash, macadam and sandstone. Slight hydrocarbon odour. (MADE GROUND)		(0.50)		
Creamish yellow, becoming light grey, very sandy silty angular to subangular fine to medium GRAVEL of limestone. (MADE GROUND)		0.65 *+13.94*		
Firm orangish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of various lithologies including coal, ash and clinker. (MADE GROUND)		(2.65)		
Orangish dark grey sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mudstone and sandstone. (Weathered MUDSTONE)		3.30 *+11.29* (1.20)		
Dark grey thinly laminated MUDSTONE. Recovered as angular to subangular fine to coarse gravel.		4.50 *+10.09* (0.50)		
Extremely weak thinly laminated grey MUDSTONE. Recovered as gravelly clay.	5.00-5.22 m AZCL	5.00 *+9.59* (0.75)		
Extremely weak to very weak thinly laminated grey MUDSTONE. Weathering is an orangish brown discolouration on fracture surfaces and localised loss of structure to gravelly clay. Fractures are very closely to medium spaced, planar, smooth.	7.17-7.41 m 1no. 75 degree, undulating, smooth fracture 7.22-7.30 m NI 7.55-8.15 m recovered as gravelly clay 8.44-8.60 m 1no. 65 degree, planar, smooth fracture 8.95-9.25 m 1no. vertical, planar, smooth fracture	5.75 *+8.84* (6.25)		
Stratum continues to 12.00 m				

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
None observed (see Key Sheet)			

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used
4.70 -5.00	60 mins	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH4

Borehole Log

Soil Mechanics

Drilled JB/PS **Logged** CH **Checked** PH	**Start** 04/10/2011 **End** 06/10/2011	**Equipment, Methods and Remarks** Dando 2000 and Geotech 6. Cable percussion boring followed by rotary core drilling (PWF size) using mud flush. SPT: hammer ID JB15, rods NWY.	**Depth from** / **to** / **Diameter** / **Casing Depth** 0.00m / 5.00m / 150mm / 5.00m 5.00m / 12.00m / 146mm / 5.30m	**Ground Level** +14.59 mOD **Coordinates** E 486819.85 **National Grid** N 512318.46 **Chainage**			

Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
				05/10/2011 5.30	dry
				06/10/2011 5.30	0800 0.00
10.69-12.00	100 36 0		Flush: 10.69-12.00 mud, 85 %		
				06/10/2011 5.30	dry

Strata

Description (Continued from Sheet 1)	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
Extremely weak to very weak thinly laminated grey MUDSTONE. Weathering is an orangish brown discolouration on fracture surfaces and localised loss of structure to gravelly clay. Fractures are very closely to medium spaced, planar, smooth. 10.00-10.17 m 1no. 65 degree, planar, smooth fracture 10.30-10.52 m 1no. vertical, planar, rough fracture 10.42-10.52 m NI 10.64-10.80 m recovered as gravelly clay 11.04-11.06 m NI 11.27-11.38 m recovered as gravelly clay 11.38-11.57 m 1no. 75 degree, planar, smooth fracture 11.87-12.00 m 1no. 75 degree, planar, smooth fracture			
EXPLORATORY HOLE ENDS AT 12.00 m	12.00 *+2.59*		

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

None observed (see Key Sheet)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH4

Borehole Log

Soil Mechanics

Drilled JB/PS **Logged** CH **Checked** PH	**Start** 05/10/2011 **End** 07/10/2011	**Equipment, Methods and Remarks** Dando 2000 and Geotech 6. Cable percussion boring followed by rotary core drilling (PWF size) using mud flush. SPT: hammer ID JB15, rods NWY.	**Depth from** / **to** / **Diameter** / **Casing Depth** 0.00m / 4.60m / 150mm / 4.60m 4.60m / 12.00m / 146mm / 4.60m	**Ground Level** +12.66 mOD **Coordinates** E 486705.88 **National Grid** N 512374.44 **Chainage**			

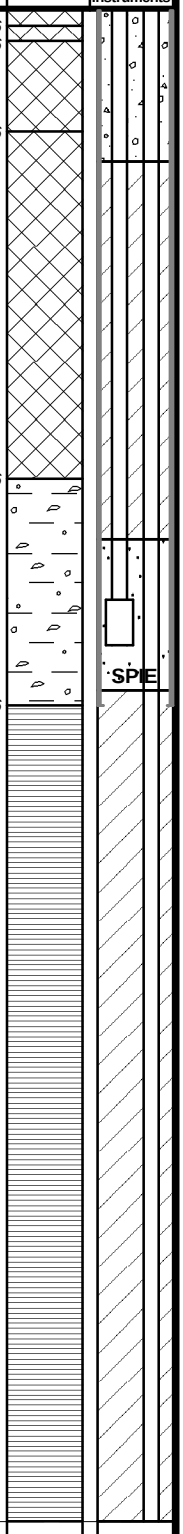
Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.10	D 1	0.00-1.20 m Hand excavated inspection pit.		
0.10-0.20	B 2			
0.30	D 3			
0.40-0.80	B 4			
0.90	D 5			
0.90-1.10	B 6			
1.20-1.65	SPT S	N=2 (1,1/0,1,1,0)		dry
1.20	D 7			
1.20-1.65	D 8			
1.20-1.70	B 9			
2.00-2.45	SPT S	N=5 (1,1/1,1,2,1)	2.00	dry
2.00	D 10			
2.00-2.45	D 11			
2.00-2.50	B 12			
3.00	D 13			
3.00-3.45	U 14	75 blows 350 mm rec	3.00	dry
3.50	D 15			
3.50-3.90	B 16			
4.00-4.44	SPT S	50 (8,11/12,17,21,- for 68mm)	3.00	dry
4.00	D 17			
4.00-4.35	D 18			
4.00-4.60	B 19		05/10/2011	
			3.00	dry
4.60-4.98	SPT S	50 (8,13/15,16,18,1 for 3mm)	3.00	dry
4.60-4.98	D 20		07/10/2011	0800
			3.00	dry
4.60-7.64	98 / 8 / 3	Flush: 4.60-7.80 mud flush, 100 %		
	NI / NI / 10			
7.64-8.10	100 / 0 / 0	Flush: 7.80-8.10 mud flush, 0 %		
8.10-9.38	100 / 15 / 10			

Strata

Description	Depth, *Level* (Thickness)
MACADAM (Foreman's description) (MADE GROUND)	0.10 *+12.56* 0.20 *+12.46*
Black very sandy silty angular to subangular fine to medium GRAVEL of ash and macadam. (MADE GROUND)	(0.60)
Light grey very sandy angular to subangular fine to medium GRAVEL of limestone. (MADE GROUND)	0.80 *+11.86*
Firm greyish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium of various lithologies including ash, coal and sandstone. (MADE GROUND)	(2.30)
Very stiff orangish grey slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium of mudstone. (Weathered MUDSTONE)	3.10 *+9.56* (1.50)
Extremely weak dark grey thinly laminated MUDSTONE. Fractures are very closely spaced, randomly orientated, locally stained orange, planar, smooth.	4.60 *+8.06*
4.60-4.66 m AZCL 4.66-4.83 m NI reduced to a gravelly clay 4.83-7.64 m generally NI reduced to angular fine to coarse gravel due to natural fractures	
7.64-8.10 m NI reduced to a gravelly clay	
8.10-8.29 m intact core 8.29-9.38 m NI reduced to angular fine to coarse gravel due to natural fractures	(7.40)
9.92-9.94 m NI	
Stratum continues to 12.00 m	

Legend



Backfill/ Instruments

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

None observed (see Key Sheet)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used
4.00 -4.60	60 mins	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH5

Borehole Log

Soil Mechanics

Drilled JB/PS **Logged** CH **Checked** PH	**Start** 05/10/2011 **End** 07/10/2011	**Equipment, Methods and Remarks** Dando 2000 and Geotech 6. Cable percussion boring followed by rotary core drilling (PWF size) using mud flush. SPT: hammer ID JB15, rods NWY.	**Depth from**	**to**	**Diameter**	**Casing Depth**	**Ground Level**	+12.66 mOD
			0.00m	4.60m	150mm	4.60m	**Coordinates**	E 486705.88
			4.60m	12.00m	146mm	4.60m	**National Grid**	N 512374.44
							Chainage	

Samples and Tests

Strata

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Description (Continued from Sheet 1)	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
9.38-12.00	100 95 32	NI 40 150	Flush: 8.10-12.00 mud flush, 100 %	07/10/2011 4.60	4.00	Extremely weak dark grey thinly laminated MUDSTONE. Fractures are very closely spaced, randomly orientated, locally stained orange, planar, smooth. 11.53-11.55 m NI 11.90-12.00 m EXPLORATORY HOLE ENDS AT 12.00 m	12.00 *+0.66*		SPIE

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

None observed (see Key Sheet)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH5

Borehole Log

Soil Mechanics

Drilled JB/PS **Logged** CH/JMH **Checked** PH	**Start** 03/10/2011 **End** 06/10/2011	**Equipment, Methods and Remarks** Dando 2000 and Geotech 6. Cable percussion boring followed by rotary core drilling (PWF size) using mud flush. SPT: hammer ID JB15, rods NWY.	**Depth from** / **to** / **Diameter** / **Casing Depth** 0.00m / 5.00m / 150mm / 5.00m 5.00m / 12.14m / 146mm / 5.00m	**Ground Level** +13.02 mOD **Coordinates** E 486739.83 **National Grid** N 512358.09 **Chainage**

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.10	D 1	0.00-1.20 m Hand excavated inspection pit.		
0.10-0.25	B 2			
0.30	D 3			
0.40-0.70	B 4			
0.75	D 5			
0.80-1.10	B 6			
1.00	ES 6A		03/10/2011	dry
1.20-1.58	SPT S	N=3 (1,0/1,1,0,1)		dry
1.20	D 7		04/10/2011	0800
1.20-1.65	D 8			dry
1.20-1.70	B 9			
2.00-2.45	SPT S	N=4 (1,1/1,1,1,1)	2.00	dry
2.00	D 10			
2.00	ES 10A			
2.00-2.45	D 11			
2.00-2.50	B 12			
3.00	D 13			
3.00-3.45	U 14	80 blows		
3.50	D 15			
3.50-3.90	B 16			
4.00-4.38	SPT S	50 (7,11/14,17,19)	4.00	dry
4.00	D 17			
4.00-4.39	D 18			
4.00-4.50	B 19			
			04/10/2011	
			4.50	dry
5.00-5.36	SPT S	50 (8,14/17,17,16 for 55mm)	5.00	dry
5.00-5.36	D 20		06/10/2011	0800
			4.50	dry
5.00-6.17	74 0 0	Flush: 5.00-6.17 mud, 100 %		
	NI 10 30			
6.17-9.14	100 53 29			
		Flush: 6.17-12.14 mud, 95 %		
	NI 70 450			

Strata

Description	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
MACADAM (Foreman's description) (MADE GROUND)	0.20 *+12.82*		
Black very sandy angular to subrounded fine to medium GRAVEL of ash, macadam and sandstone. (MADE GROUND)	0.25 *+12.77* (0.45)		
Creamish grey very sandy silty angular to subangular fine to medium GRAVEL of limestone. (MADE GROUND) — 1.20 m 1 No. sandstone cobble	0.70 *+12.32*		
Soft to firm brownish orangish slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium of coal and burnt shale. (MADE GROUND)	(2.70)		
Firm greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies. (GLACIAL TILL)	3.40 *+9.62* 3.50 *+9.52* (0.50)		
Dark grey very gravelly CLAY. Gravel is angular to subangular fine to coarse of mudstone. (Weathered MUDSTONE)	4.00 *+9.02*		
Very weak grey thinly laminated MUDSTONE. Recovered as angular to subangular fine to medium gravel. — 5.00-5.30 m AZCL	(1.36)		
Extremely weak thinly laminated grey MUDSTONE. Weathering is localised loss of structure to gravelly clay. Fractures are subhorizontal, extremely to very closely spaced, planar, rough. — 5.30-5.70 m recovered as gravelly clay; 5.70-6.10 m NI; 6.10-6.50 m recovered as gravelly clay	5.36 *+7.66* (2.19)		
Very weak locally extremely weak thinly laminated grey MUDSTONE. Weathering is localised loss of structure to gravelly clay. Fractures are subhorizontal, very closely to medium spaced, planar, smooth. — 7.82-7.97 m 1no. 55 degree, planar, smooth fracture; 8.15-8.48 m 1no. subvertical, planar, smooth fracture; 9.14-9.23 m NI; 9.76-9.79 m recovered as	7.55 *+5.47* (4.59)		
Stratum continues to 12.14 m			

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

None observed (see Key Sheet)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used
4.00 -5.00	60 mins	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH6

Borehole Log

Soil Mechanics

Drilled JB/PS **Logged** CH/JMH **Checked** PH	**Start** 03/10/2011 **End** 06/10/2011	**Equipment, Methods and Remarks** Dando 2000 and Geotech 6. Cable percussion boring followed by rotary core drilling (PWF size) using mud flush. SPT: hammer ID JB15, rods NWY.	**Depth from** / **to** 0.00m / 5.00m 5.00m / 12.14m	**Diameter** 150mm 146mm	**Casing Depth** 5.00m 5.00m	**Ground Level** +13.02 mOD **Coordinates** E 486739.83 **National Grid** N 512358.09 **Chainage**	

Samples and Tests

Strata

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Description (Continued from Sheet 1)	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
9.14-12.14	100 40 24					Very weak locally extremely weak thinly laminated grey MUDSTONE. Weathering is localised loss of structure to gravelly clay. Fractures are subhorizontal, very closely to medium spaced, planar, smooth. :: 9.76m - gravelly clay 10.11-10.19 m recovered as gravelly clay 10.47-10.67 m weak thinly laminated grey SILTSTONE band 11.84-11.96 m 1no. vertical, planar, smooth fracture 12.08-12.14 m NI			
				06/10/2011 5.00	5.02	EXPLORATORY HOLE ENDS AT 12.14 m	12.14 *+0.88*		
Depth	**TCR SCR RQD**	**If**	**Records/Samples**	**Date Casing**	**Time Water**				

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
None observed (see Key Sheet)			

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

BH6

Dynamic Sampler Hole Log

Soil Mechanics

Drilled CS **Logged** CH **Checked** PH	**Start** 11/10/2011 **End** 11/10/2011	**Equipment, Methods and Remarks** Dando Terrier 2002. Windowless sampling.	**Depth from** 0.00m **to** 1.30m **Diameter** 80mm **Casing Depth**	**Ground Level** +4.43 mOD **Coordinates** E 487176.62 **National Grid** N 512177.53 **Chainage**	

Samples and Tests

Strata

Depth	Type & No	Records	Date Casing	Time Water	Description	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
		0.00-1.20 m Hand excavated inspection pit.			Light brown medium to coarse SAND. (BEACH DEPOSITS)	(1.30)		
0.30 0.30-1.00	D 1 B 2		11/10/2011 dry					
1.30	D 3				1.30 m 1 No. rounded sandstone cobble EXPLORATORY HOLE ENDS AT 1.30 m	1.30 *+3.13*		
Depth	**Type & No**	**Records**	**Date Casing**	**Time Water**				

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

None observed (see Key Sheet)

Depth Related Remarks *

From	to (m)	
1.30		Hole terminated due to refusal.

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

WS1

Sheet 1 of 1

Dynamic Sampler Hole Log

Soil Mechanics

Drilled CS **Logged** CH **Checked** PH	**Start** 11/10/2011 **End** 11/10/2011	**Equipment, Methods and Remarks** Dando Terrier 2002. Windowless sampling.	**Depth from**	**to**	**Diameter**	**Casing Depth**	**Ground Level** +3.86 mOD **Coordinates** E 487089.81 **National Grid** N 512215.23 **Chainage**
			0.00m	1.30m	80mm		
			1.30m	2.30m	70mm		
			2.30m	4.30m	40mm		
			4.30m	5.00m	20mm		

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.30	D 1			
0.30-1.00	B 2			
0.60-2.10	B 5			
1.20	D 3			
1.50	D 4			
2.20	D 6			
2.80	D 7	*		
3.30	D 8			
			11/10/2011	

Strata

Description	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
Light brown slightly gravelly medium SAND. Gravel is fine to medium, occasionally coarse, of sandstone. (BEACH DEPOSITS) 1.00-1.60 m increase in gravel content	(1.60)		
Stiff dark grey and brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to medium of various lithologies. (GLACIAL TILL) 1.95-2.10 m band of firm dark brown sandy silt 2.80-3.10 m band of firm dark brown sandy silt	1.60 *+2.26* (1.70)		1
NO RECOVERY	3.30 *+0.56* (1.70)		
EXPLORATORY HOLE ENDS AT 5.00 m	5.00 *-1.14*		

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	2.00	-	-

Depth Related Remarks *

From	to (m)	
3.00		Hole collapsing.

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

AGS

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

WS2

Sheet 1 of 1

Dynamic Sampler Hole Log

Soil Mechanics

Drilled CS **Logged** CH **Checked** PH	**Start** 10/11/2011 **End** 10/11/2011	**Equipment, Methods and Remarks** Dando Terrier 2002. Windowless sampling.	**Depth from**	**to**	**Diameter**	**Casing Depth**	**Ground Level**	+3.98 mOD
			0.00m	1.30m	80mm		**Coordinates**	E 486809.97
			1.30m	2.00m	60mm		**National Grid**	N 512352.00
			2.00m	2.50m	-		**Chainage**	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.30	D 1			
0.30-1.00	B 2			
1.30-1.50	D 3			
1.80-2.00	D 4			
			10/11/2011	
2.50	D 5			

Strata

Description	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
Light brown gravelly medium to coarse SAND with occasional sand size shell fragments. (BEACH DEPOSITS)	(1.80)		
Multicoloured sandy subrounded to rounded fine to coarse GRAVEL of sandstone. (BEACH DEPOSITS)	1.80 *+2.18* (0.40)		
Dark grey and black slightly sandy gravelly CLAY. Gravel is angular fine to medium of mudstone. (Weathered MUDSTONE)	2.20 *+1.78* (0.30)		
EXPLORATORY HOLE ENDS AT 2.50 m	2.50 *+1.48*		

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

None observed (see Key Sheet)

Depth Related Remarks *

From	to (m)	
2.50		Hole terminated due to refusal.

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

AGS

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

WS3

Sheet 1 of 1

Dynamic Sampler Hole Log

Soil Mechanics

Drilled CS **Logged** CH **Checked** PH	**Start** 10/11/2011 **End** 10/11/2011	**Equipment, Methods and Remarks** Dando Terrier 2002. Windowless sampling.	**Depth from** to **Diameter** **Casing Depth** 0.00m 1.00m 80mm 1.00m 1.90m -	**Ground Level** +2.69 mOD **Coordinates** E 486649.56 **National Grid** N 512432.75 **Chainage**

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
		0.00-1.20 m Hand excavated inspection pit.		
0.40	D 1			
0.40-0.90	B 2			
0.90	D 3			
1.20-1.33	SPT S	50 (15/50 for 50mm)		
1.50	D 4			
			10/11/2011	

Strata

Description	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
Light brown gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to medium of various lithologies including brick. (BEACH DEPOSITS)	(1.00)		
Extremely weak dark grey, becoming light brown and orange, thinly laminated MUDSTONE.	1.00 *+1.69*		1
	(0.90)		
EXPLORATORY HOLE ENDS AT 1.90 m	1.90 *+0.79*		

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	1.00	-	-

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

AGS

Project SANDSEND SLOPE STABILISATION

Project No. A1077-11

Carried out for Balfour Beatty Living Places

Borehole

WS4

Dynamic Sampler Hole Log

Soil Mechanics

Drilled CS **Logged** CH **Checked** PH	**Start** 10/11/2011 **End** 10/11/2011	**Equipment, Methods and Remarks** Dando Terrier 2002. Windowless sampling.	**Depth from**	**to**	**Diameter**	**Casing Depth**	**Ground Level** +3.72 mOD **Coordinates** E 486380.62 **National Grid** N 512549.27 **Chainage**
			0.00m	1.30m	80mm		
			1.30m	2.20m	60mm		
			2.20m	4.00m	40mm		

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.40	D 1			
0.60-1.30	B 3			
0.80	D 2			
1.70	D 4			
2.20	D 5			
3.00-3.40	D 6	*		
			10/11/2011	

Strata

Description	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
Brown slightly sandy angular to rounded fine GRAVEL of various lithologies. (BEACH DEPOSITS)	(0.60)		
	0.60 *+3.12*		
Light brown gravelly medium to coarse SAND. Gravel is subangular to rounded fine to medium of various lithologies. (BEACH DEPOSITS)	(0.95)		1
	1.55 *+2.17*		
Stiff, locally firm, orangish brown slightly sandy slightly gravelly CLAY. (GLACIAL TILL) 1.80-1.90 m band of firm sandy silt	(2.65)		
EXPLORATORY HOLE ENDS AT 4.20 m 4.20 m fragments of medium mudstone gravel	4.20 *-0.48*		

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	1.30	-	-

Depth Related Remarks *

From	to (m)	
2.80		Hole collapsing.

Chiselling

Depths (m)	Time	Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project SANDSEND SLOPE STABILISATION
Project No. A1077-11
Carried out for Balfour Beatty Living Places

Borehole
WS5
Sheet 1 of 1

ENCLOSURE B
INSTRUMENTATION

Groundwater Installation Details

Hole No	Instrument ID	Installation Type	Date of Installation	Reference depth (mBGL)	Piezometer Diameter (mm)	Top of response zone (mBGL)	Base of response zone (mBGL)	Tubing Completion Details	Headworks	Remarks
BH2		SPIE	6 Oct 2011	21.00	19	20.50	21.50	None	Stop cock cover	
BH3	A	SPIE	11 Oct 2011	4.70	19	4.00	5.00	None	Stop cock cover	
BH3	B	SPIE	11 Oct 2011	15.70	19	15.00	16.00	None	Stop cock cover	
BH4		SPIE	6 Oct 2011	10.70	19	10.00	11.00	None	Stop cock cover	
BH5	A	SPIE	7 Oct 2011	4.20	19	3.50	4.50	None	Stop cock cover	
BH5	B	SPIE	7 Oct 2011	10.70	19	10.00	11.00	None	Stop cock cover	

Notes: Type: SP - Standpipe, SPIE - Standpipe Piezometer, HPIE - Hydraulic Piezometer, PPIE - Pneumatic Piezometer, EPIE - Electronic Piezometer Prepared: 01/12/2011 17:30

ENCLOSURE C

GEOTECHNICAL LABORATORY TEST RESULTS

INDEX PROPERTIES - SUMMARY OF RESULTS

Project No	Project Name
A1077-11	SANDSEND BOREHOLES, NORTH YORKSHIRE

Hole No.	Sample No.	Depth (m) from	Depth (m) to	type	Soil Description	p Mg/m^3	p_d Mg/m^3	w %	< 425 µm sieve %	W_L %	W_P %	I_P	p_s Mg/m^3	Remarks
BH1	5	1.20	1.65	U	Firm brown slightly sandy slightly gravelly CLAY.	2.11	1.78	19	76 s	40 a	18	22		
BH1	9	3.00	3.45	U	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.	2.18	1.89	15	80 s	31 a	15	16		
BH1	13	5.00	5.45	U	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.	2.26	1.98	14	81 s	31 a	14	17		
BH1	17	6.50	6.95	U	Firm brown slightly sandy slightly gravelly CLAY.	2.14	1.86	15	74 s	33 a	15	18		
BH1	21	8.00	8.45	U	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.			15	84 s	35 a	16	19		
BH1	25	9.50	9.95	U	Firm to stiff brown slightly sandy slightly gravelly CLAY.	2.24	1.95	15	83 s	32 a	15	17		
BH1	29	11.00	11.45	U	Firm to stiff brown slightly sandy slightly gravelly CLAY.			15	84 s	34 a	15	19		
BH1	33	12.50	12.95	U	Firm brown slightly sandy slightly gravelly CLAY.	2.19	1.91	15	79 s	32 a	15	17		
BH1	37	14.00	14.45	U	Firm greyish brown slightly sandy slightly gravelly CLAY.			23	97 s	37 a	17	20		
BH1	41	15.50	15.95	U	Stiff brown thinly laminated CLAY with thin laminations of sand becoming slightly sandy	2.11	1.77	19	91 s	36 a	17	19		
BH1	45	17.00	17.45	U	Stiff brown slightly sandy slightly gravelly CLAY.			17	94 s	37 a	17	20		
BH1	52	19.50	19.95	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.	2.24	2.00	12	87 s	31 a	15	16		
BH1	56	21.00	21.45	U	Stiff to very stiff brown slightly sandy slightly gravelly CLAY.			13	88 s	31 a	15	16		
BH1	60	22.50	23.95	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.	2.19	1.92	14	88 s	32 a	15	17		
BH2	4	1.20	1.65	U	Firm to stiff greyish brown and brownish grey slightly sandy slightly gravelly CLAY.	2.07	1.71	21	91 s	53 a	21	32		
BH2	8	3.00	3.45	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.	2.16	1.89	14	82 s	34 a	16	18		
BH2	12	5.00	5.45	U	Brown slightly sandy slightly gravelly CLAY.			14	87 s	31 a	15	16		
BH2	16	7.00	7.45	U	Stiff brown slightly sandy slightly gravelly CLAY.			15	88 s	30 a	15	15		
BH2	20	9.00	9.45	U	Firm to stiff brown slightly sandy slightly gravelly CLAY.			13	80 s	28 a	14	14		
BH2	24	11.00	11.45	U	Firm to stiff brown slightly sandy slightly gravelly CLAY.	2.22	1.93	15	86 s	33 a	15	18		
BH2	31	15.00	15.45	U	Firm to stiff brown slightly sandy slightly gravelly CLAY.			19	99 n	49 a	23	26		
BH2	37	17.00	17.45	U	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.	2.14	1.83	17	86 s	35 a	16	19		
BH2	43	19.00	19.45	U	Firm brown slightly sandy slightly gravelly CLAY.			15	79 s	31 a	16	15		
BH2	47	21.00	21.45	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.			14	81 s	31 a	15	16		
BH2	51	23.00	23.45	U	Firm brown slightly sandy slightly gravelly CLAY.	2.20	1.93	14	85 s	32 a	15	17		
BH2	55	25.00	25.45	U	Firm to stiff greyish brown and grey slightly sandy slightly gravelly CLAY.			16	88 s	35 a	16	19		
BH3	4	1.20	1.65	U	Firm to stiff greyish brown and grey slightly sandy slightly gravelly CLAY.	2.04	1.68	21	99 n	53 a	22	31		
BH3	8	2.50	2.95	U	Firm to very stiff brown slightly sandy slightly gravelly CLAY.	2.15	1.86	16	87 s	37 a	18	19		
BH3	16	5.50	5.95	U	Firm brown slightly sandy slightly gravelly CLAY.	2.17	1.85	17	70 s	32 a	15	17		
BH3	24	8.50	8.95	U	Firm greyish brown slightly sandy slightly gravelly CLAY.			17	86 s	34 a	15	19		
BH3	28	10.00	10.45	U	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.			14	69 s	33 a	16	17		
BH3	33	11.50	11.95	D	Grey slightly sandy CLAY.				100 n	31 a	17	14		

General notes: All above tests carried out to BS1377 : 1990 definitive method in all cases unless annotated otherwise. See individual test reports for further details.

Key :

p	bulk density, linear	W_L Liquid limit	W_P	Plastic limit	<425um preparation	p_s	particle density
p_d	dry density	a 4 point cone test	NP	non - plastic	n from natural soil	-g = gas jar	
w	moisture content	b 1 point cone test	I_P	Plasticity Index	s sieved specimen	-p = small pyknometer	

INDEX PROPERTIES - SUMMARY OF RESULTS

Project No	Project Name
A1077-11	SANDSEND BOREHOLES, NORTH YORKSHIRE

Hole No.	Sample No.	Depth (m) from	Depth (m) to	type	Soil Description	p Mg/m^3	p_d Mg/m^3	w %	< 425 µm sieve %	W_L %	W_P %	I_P	p_s Mg/m^3	Remarks
BH3	37	13.50	13.95	D	Brownish grey slightly sandy slightly gravelly CLAY.				91 s	35 a	16	19		
BH3	39	14.50	14.95	U	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.	2.21	1.94	14	87 s	29 a	14	15		
BH3	47	17.50	17.95	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.			12	85 s	32 a	13	19		
BH4	13	2.00	2.45	D	Brown slightly sandy slightly gravelly CLAY.			19	71 s	36 b	17	19		
BH4	16	3.00	3.45	U	Firm greyish brown slightly sandy slightly gravelly CLAY.	1.96	1.59	23	79 s	46 a	21	25		
BH4	19	4.00	4.45	D	Greyish brown slightly sandy slightly gravelly CLAY.			17	72 s	37 b	18	19		
BH4	21	4.50		D	Dark grey slightly gravelly CLAY. Gravel is mainly weak mudstone.			15	98 n	47 a	22	25		
BH4	24	5.00	5.40	D	Grey slightly sandy slightly gravelly silty CLAY.			14	98 s	44 a	25	19		
BH5	7	1.20		D	Dark brownish grey slightly gravelly sandy CLAY.				42 s	28 a	18	10		
BH5	8	1.20	1.65	D	Grey very gravelly slightly clayey SAND.			15						
BH5	11	2.00	2.45	D	Grey slightly sandy slightly gravelly CLAY.			17	74 s	35 a	19	16		
BH5	14	3.00	3.45	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.	1.87	1.53	22	82 s	44 a	22	22		
BH5	18	4.00	4.35	D	Brownish grey slightly gravelly CLAY.			10	78 s	36 a	22	14		
BH6	8	1.20	1.65	D	Greyish brown slightly gravelly sandy CLAY.			17	60 s	26 b	16	10		
BH6	10	2.00		D	Greyish brown slightly sandy gravelly CLAY.				38 s	28 a	18	10		
BH6	11	2.00	2.45	D	Brown slightly sandy slightly gravelly CLAY.			21						
BH6	14	3.00	3.45	U	Firm brownish grey slightly sandy slightly gravelly CLAY.	2.08	1.72	21	90 s	49 a	26	23		
BH6	18	4.00	4.39	D	Grey slightly gravelly silty CLAY.			10	80 s	37 a	22	15		
WS1	3	1.30		D	Brown very sandy COBBLE.			2.7	29 s	25 b	NP			
WS2	2	0.30	1.00	B	Brownish grey gravelly SAND.			4.4	64 n	23 b	NP			
WS2	7	2.80		D	Grey sandy clayey SILT.			18	100 n	26 a	17	9		
WS3	2	0.30	1.00	B	Brown gravelly SAND.			11	62 s	24 b	NP			
WS3	4	1.80	2.00	D	Brownish grey sandy GRAVEL.			3.8						
WS3	5	2.50	2.50	D	Brownish grey slightly sandy gravelly CLAY.			13	30 s	39 b	22	17		
WS4	2	0.40	0.90	B	Grey and brown very gravelly SAND.			13	32 s	22 b	NP			
WS4	4	1.50		D	Dark grey slightly sandy silty CLAY.			16	100 n	39 a	25	14		
WS5	2	0.80		D	Brown gravelly SAND.			14	27 s	24 b	NP			
WS5	6	3.00	3.40	D	Brown slightly sandy slightly gravelly CLAY.			18	95 s	34 a	16	18		

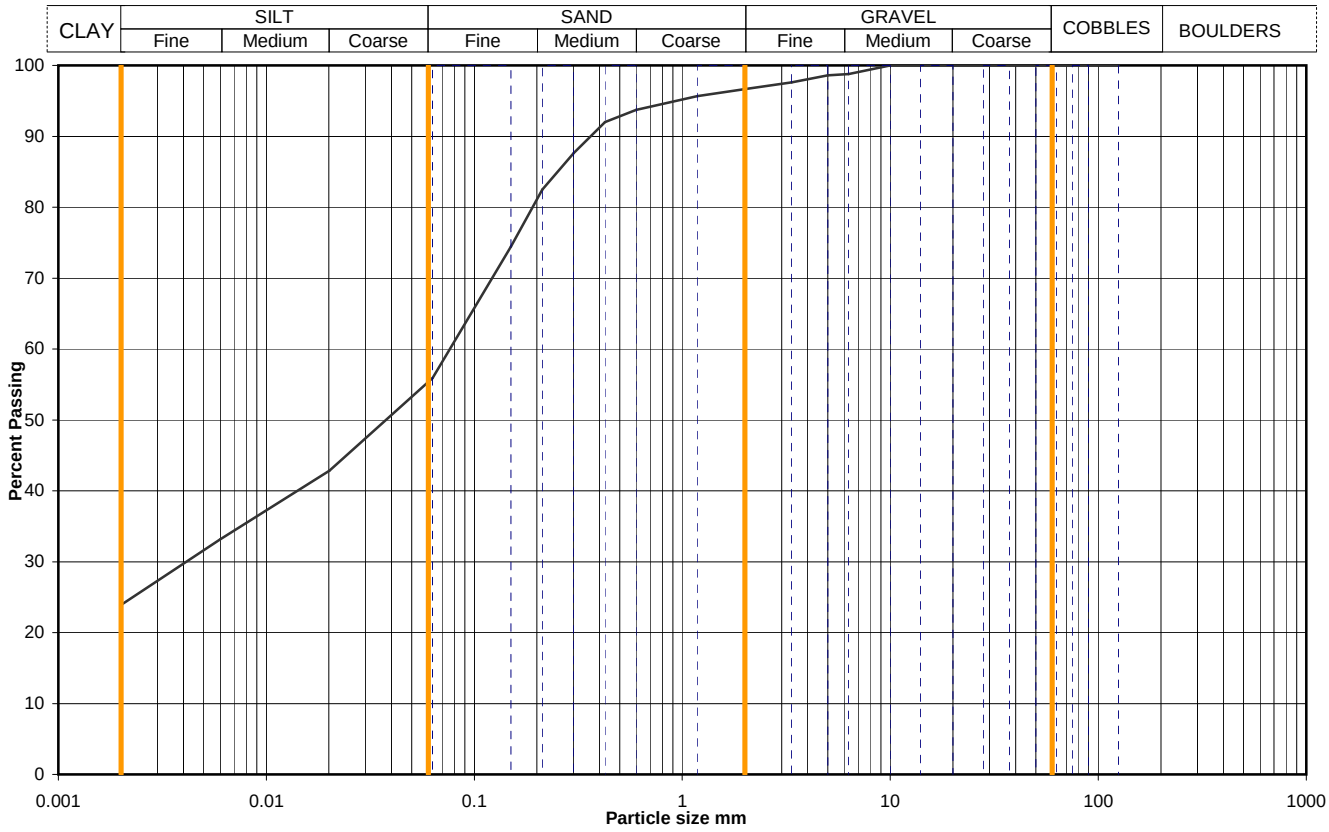
General notes: All above tests carried out to BS1377 : 1990 definitive method in all cases unless annotated otherwise. See individual test reports for further details.

Key :

p	bulk density, linear	W_L Liquid limit	W_P	Plastic limit	<425um preparation	p_s	particle density
p_d	dry density	a 4 point cone test	NP	non - plastic	n from natural soil	-g = gas jar	
w	moisture content	b 1 point cone test	I_P	Plasticity Index	s sieved specimen	-p = small pyknometer	

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	4	Type	B
			ID	ESGA1077-11201110100000000004		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	43
90	100	0.0060	33
75	100	0.0020	24
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5.0	99		
3.35	98		
2.00	97		
1.18	96	Particle density, Mg/m3	
0.600	94		
0.425	92	2.65 assumed	
0.300	88	Dry mass of sample, kg	
0.212	82		
0.150	74	13.5	
0.063	56		

Soil description	Dark brown slightly gravelly sandy CLAY with occasional rootlets.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	3	3
	Sand	41	41
	Silt	32	32
	Clay	24	24

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

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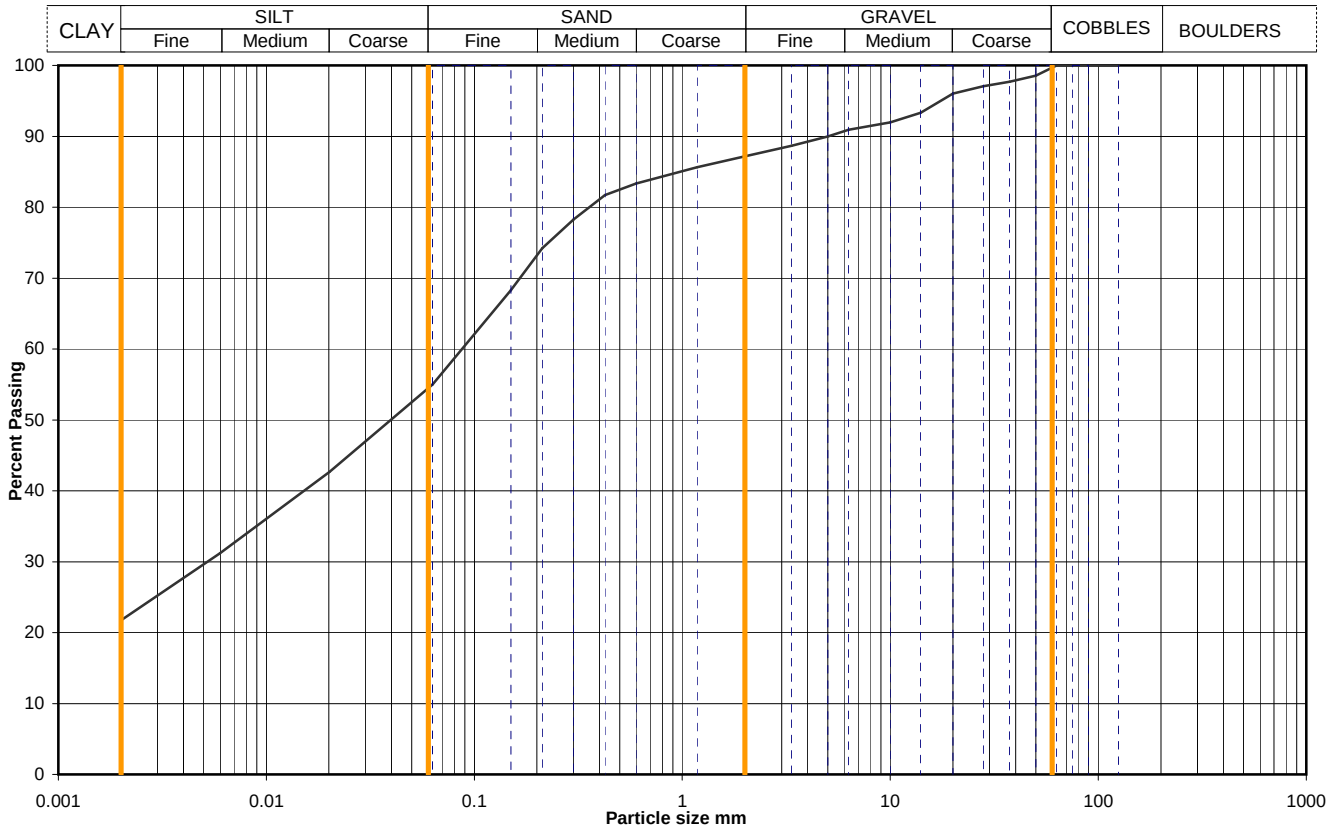
Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	8	Type	B
			ID	ESGA1077-11201110100000000009		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	43
90	100	0.0060	31
75	100	0.0020	22
63	100		
50	99		
37.5	98		
28	97		
20	96		
14	93		
10	92		
6.3	91		
5.0	90		
3.35	89		
2.00	87		
1.18	86	Particle density, Mg/m3	
0.600	83		
0.425	82	2.65 assumed	
0.300	78	Dry mass of sample, kg	
0.212	74		
0.150	68	12.5	
0.063	55		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	13	13
	Sand	33	33
	Silt	32	32
	Clay	22	22

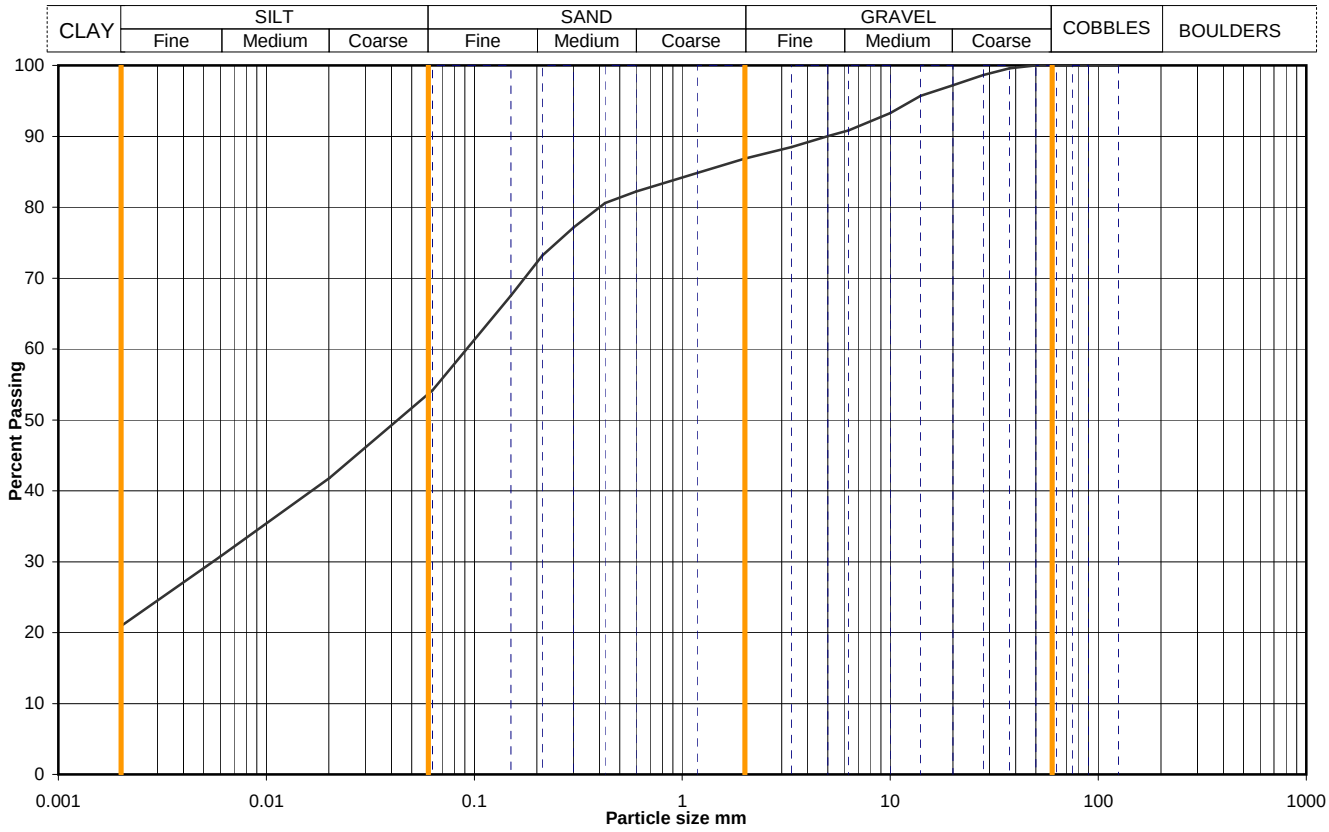
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 2**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	12	Type	B
			ID	ESGA1077-11201110100000000013		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	42
90	100	0.0060	31
75	100	0.0020	21
63	100		
50	100		
37.5	100		
28	99		
20	97		
14	96		
10	93		
6.3	91		
5.0	90		
3.35	88		
2.00	87		
1.18	85	Particle density, Mg/m3	
0.600	82		
0.425	81	2.65 assumed	
0.300	77	Dry mass of sample, kg	
0.212	73		
0.150	68	16.9	
0.063	54		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	13	13
	Sand	33	33
	Silt	33	33
	Clay	21	21

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

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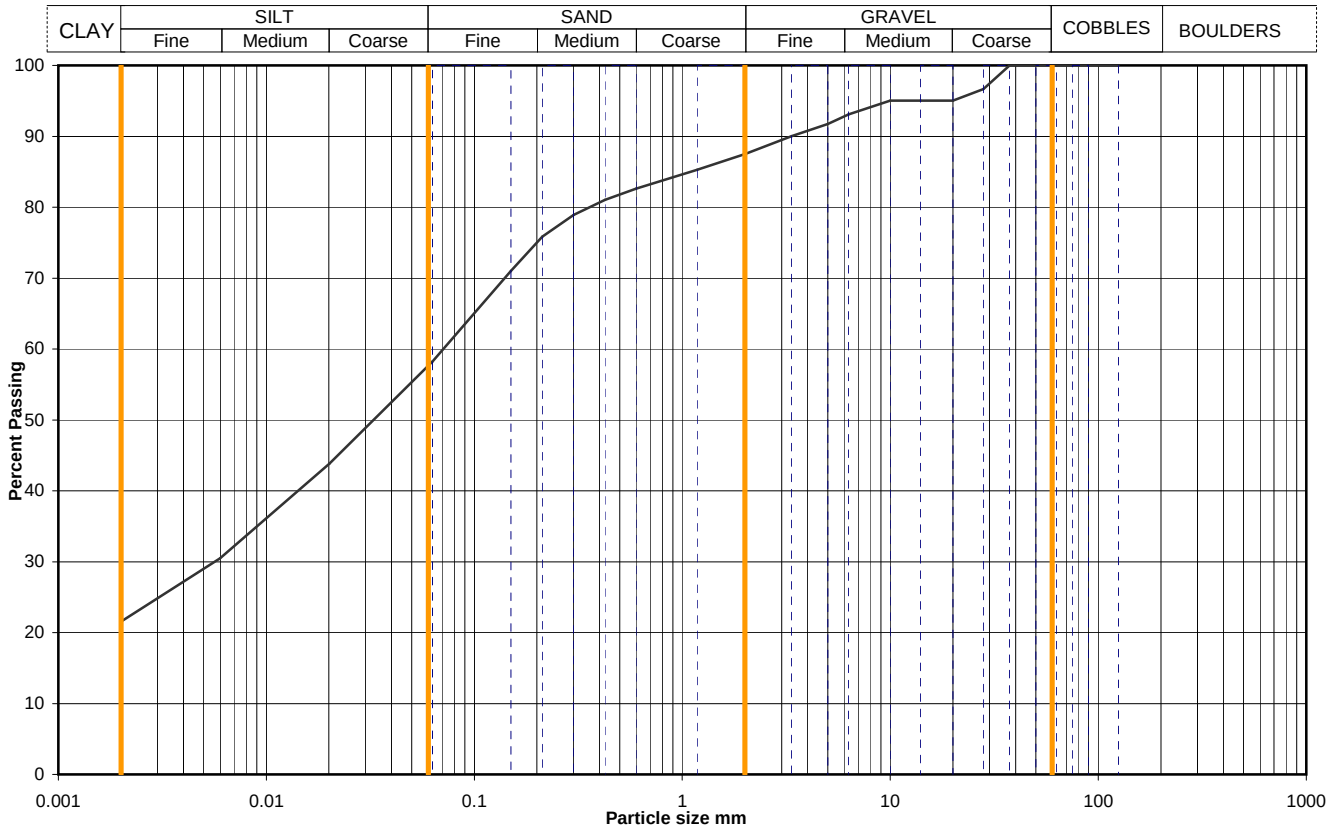
Figure **PSD 3**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	9.95		
			Samp No	26	Type	D
			ID	ESGA1077-11201110100000000027		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	44
90	100	0.0060	30
75	100	0.0020	22
63	100		
50	100		
37.5	100		
28	97		
20	95		
14	95		
10	95		
6.3	93		
5.0	92		
3.35	90		
2.00	87		
1.18	85	Particle density, Mg/m3	
0.600	83		
0.425	81	2.65 assumed	
0.300	79	Dry mass of sample, kg	
0.212	76		
0.150	71	1.7	
0.063	58		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	13	13
	Sand	30	30
	Silt	36	36
	Clay	21	21

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

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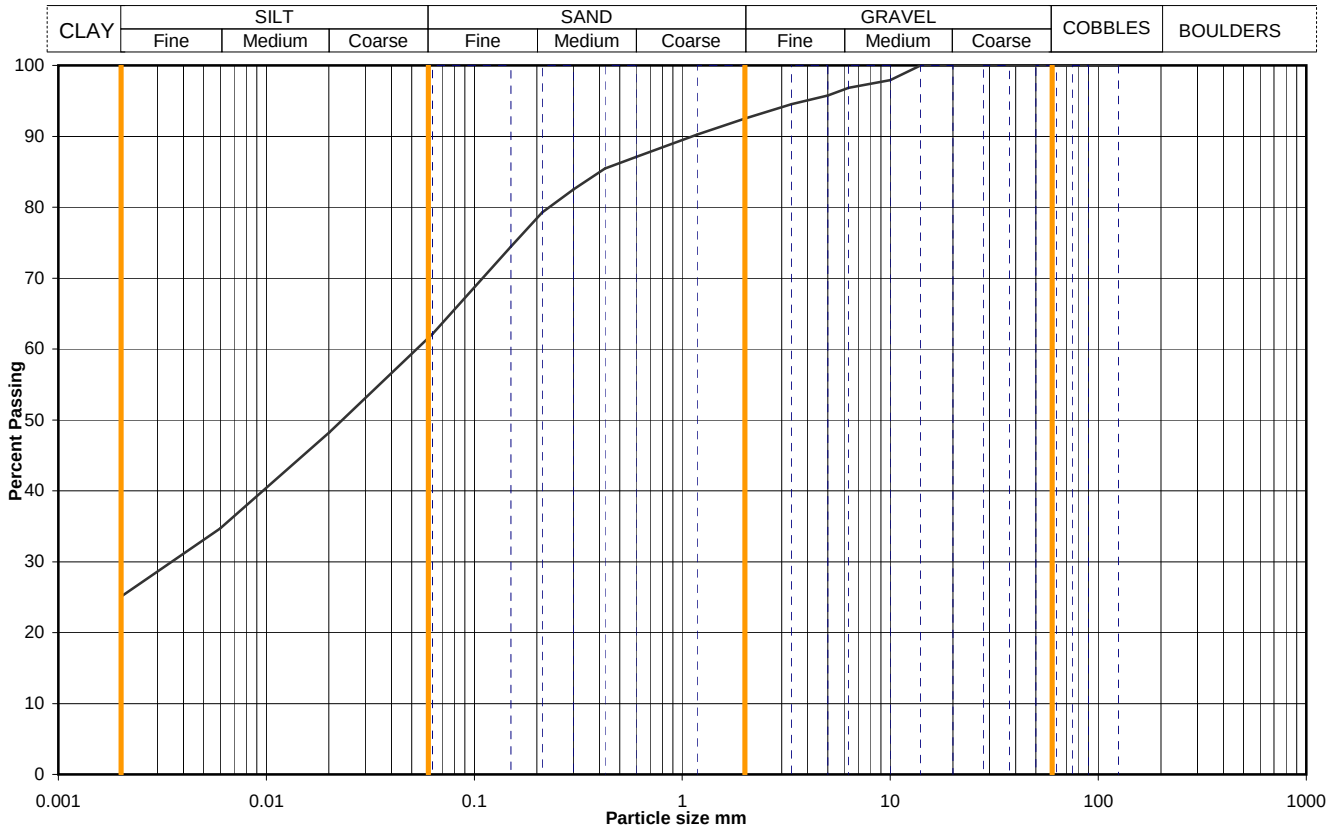
Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	13.15		
			Samp No	35	Type	D
			ID	ESGA1077-11201110100000000036		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	48
90	100	0.0060	35
75	100	0.0020	25
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	98		
6.3	97		
5.0	96		
3.35	95		
2.00	93		
1.18	90	Particle density, Mg/m3	
0.600	87		
0.425	85	2.65 assumed	
0.300	83	Dry mass of sample, kg	
0.212	79		
0.150	74	0.4	
0.063	62		

Soil description	Greyish brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	7	7
	Sand	31	31
	Silt	37	37
	Clay	25	25

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

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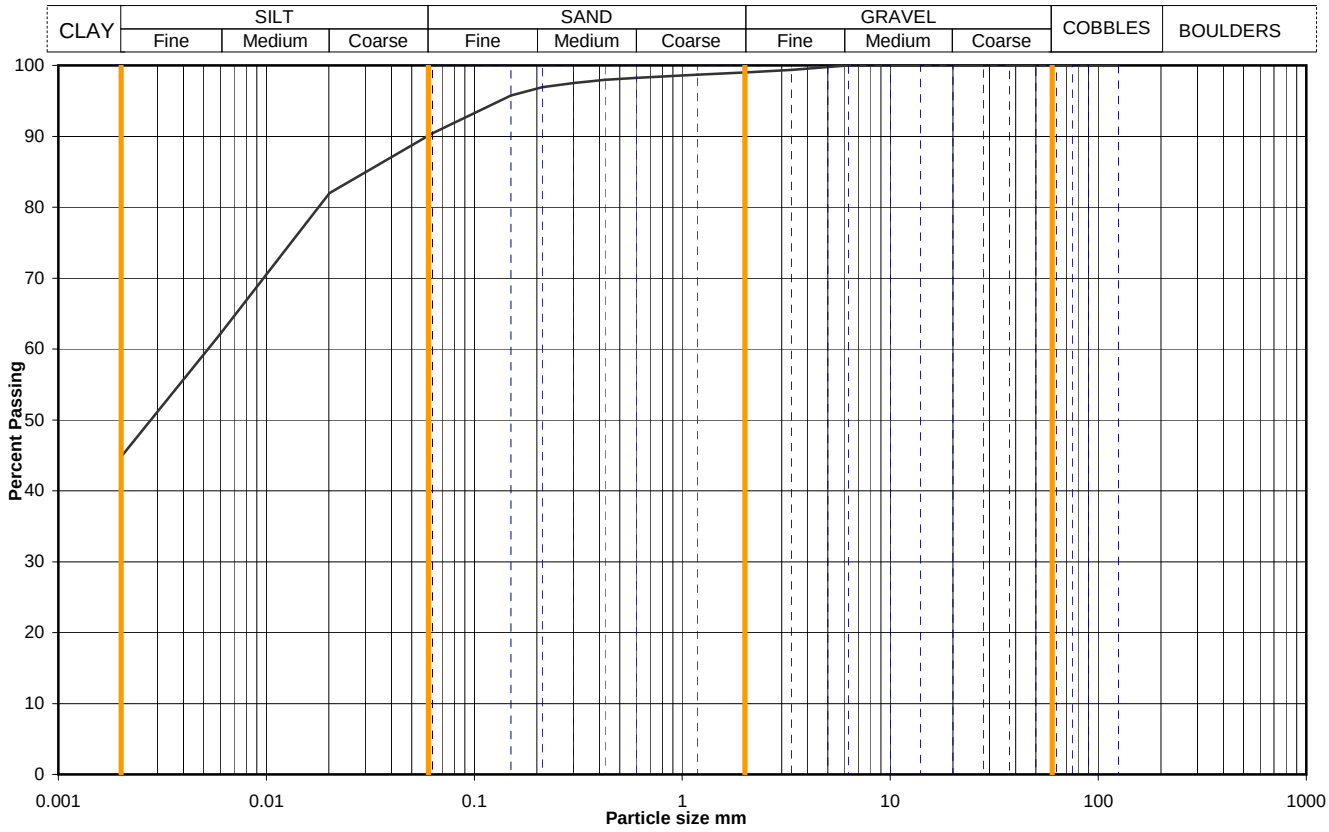
Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	14.45		
			Samp No	38	Type	D
			ID	ESGA1077-11201110100000000039		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	82
90	100	0.0060	62
75	100	0.0020	45
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	99		
2.00	99		
1.18	99	Particle density, Mg/m3	
0.600	98		
0.425	98	2.65 assumed	
0.300	98	Dry mass of sample, kg	
0.212	97		
0.150	96	1.5	
0.063	90		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	9	9
	Silt	45	45
	Clay	45	45

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

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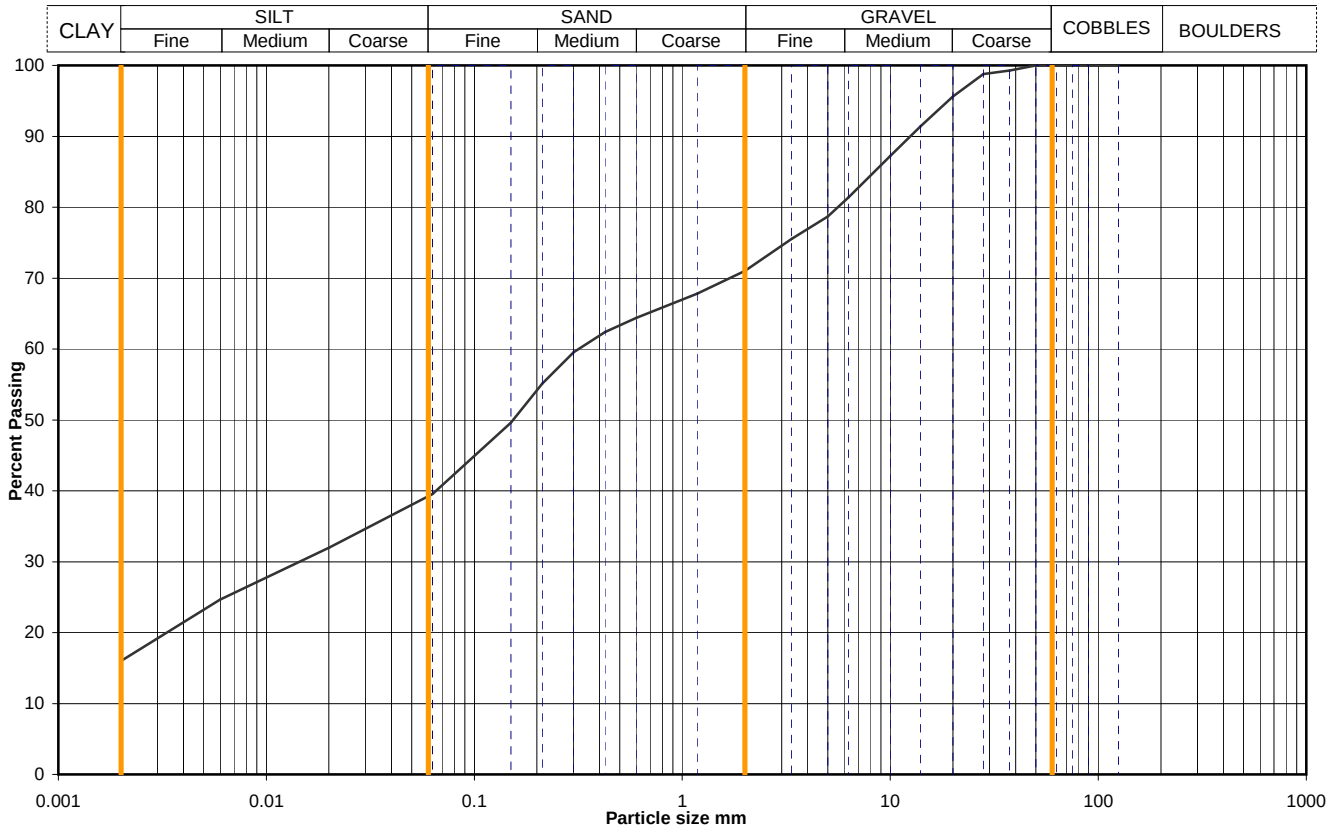
Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	16.15		
			Samp No	44	Type	B
			ID	ESGA1077-11201110100000000045		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	32
90	100	0.0060	25
75	100	0.0020	16
63	100		
50	100		
37.5	99		
28	99		
20	96		
14	91		
10	87		
6.3	81		
5.0	79		
3.35	76		
2.00	71		
1.18	68	Particle density, Mg/m3	
0.600	64		
0.425	62	2.65 assumed	
0.300	60	Dry mass of sample, kg	
0.212	55		
0.150	50	12.8	
0.063	40		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	29	29
	Sand	32	32
	Silt	23	23
	Clay	16	16

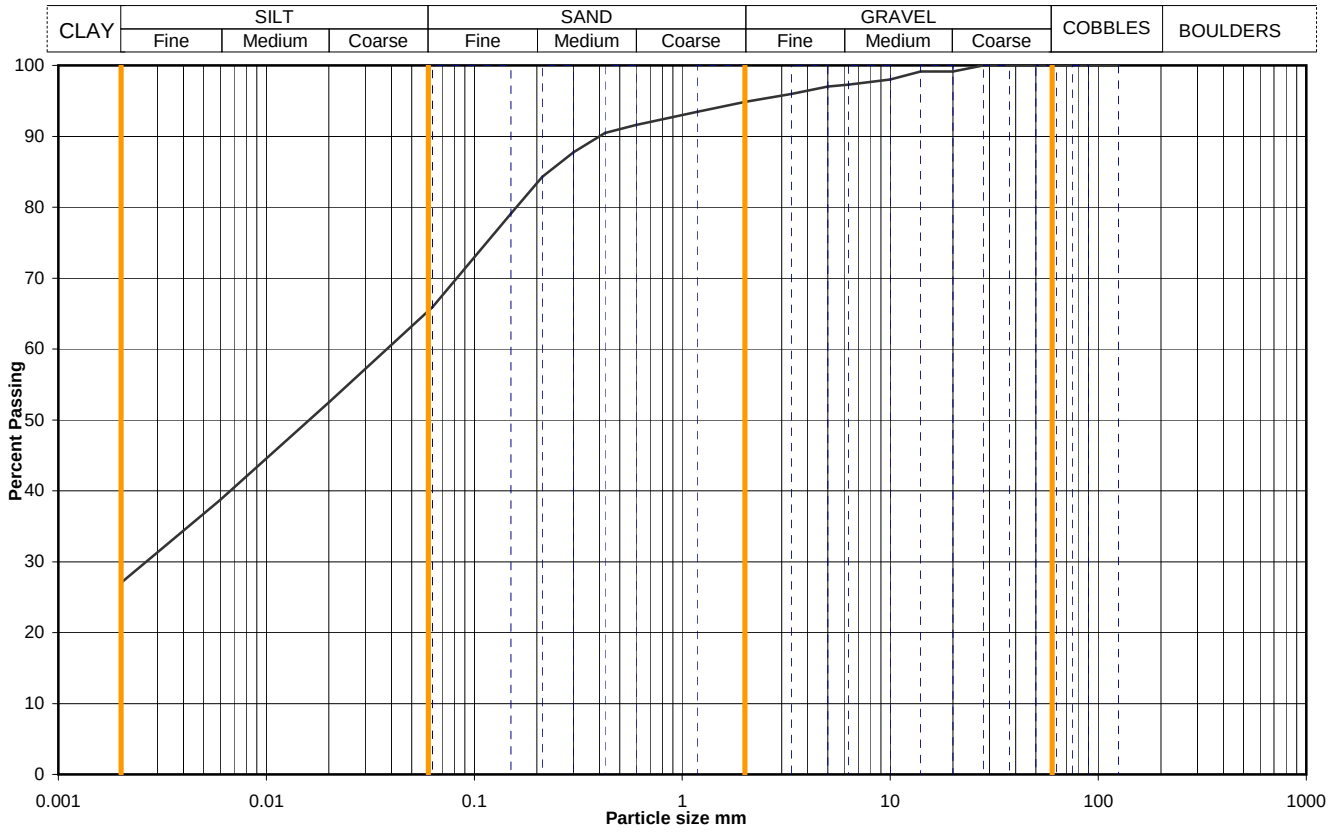
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 7**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	20.15		
			Samp No	55	Type	B
			ID	ESGA1077-11201110100000000056		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	53
90	100	0.0060	39
75	100	0.0020	27
63	100		
50	100		
37.5	100		
28	100		
20	99		
14	99		
10	98		
6.3	97		
5.0	97		
3.35	96		
2.00	95		
1.18	93	Particle density, Mg/m3	
0.600	92		
0.425	90	2.65 assumed	
0.300	88	Dry mass of sample, kg	
0.212	84		
0.150	79	6.1	
0.063	66		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	5	5
	Sand	29	29
	Silt	39	39
	Clay	27	27

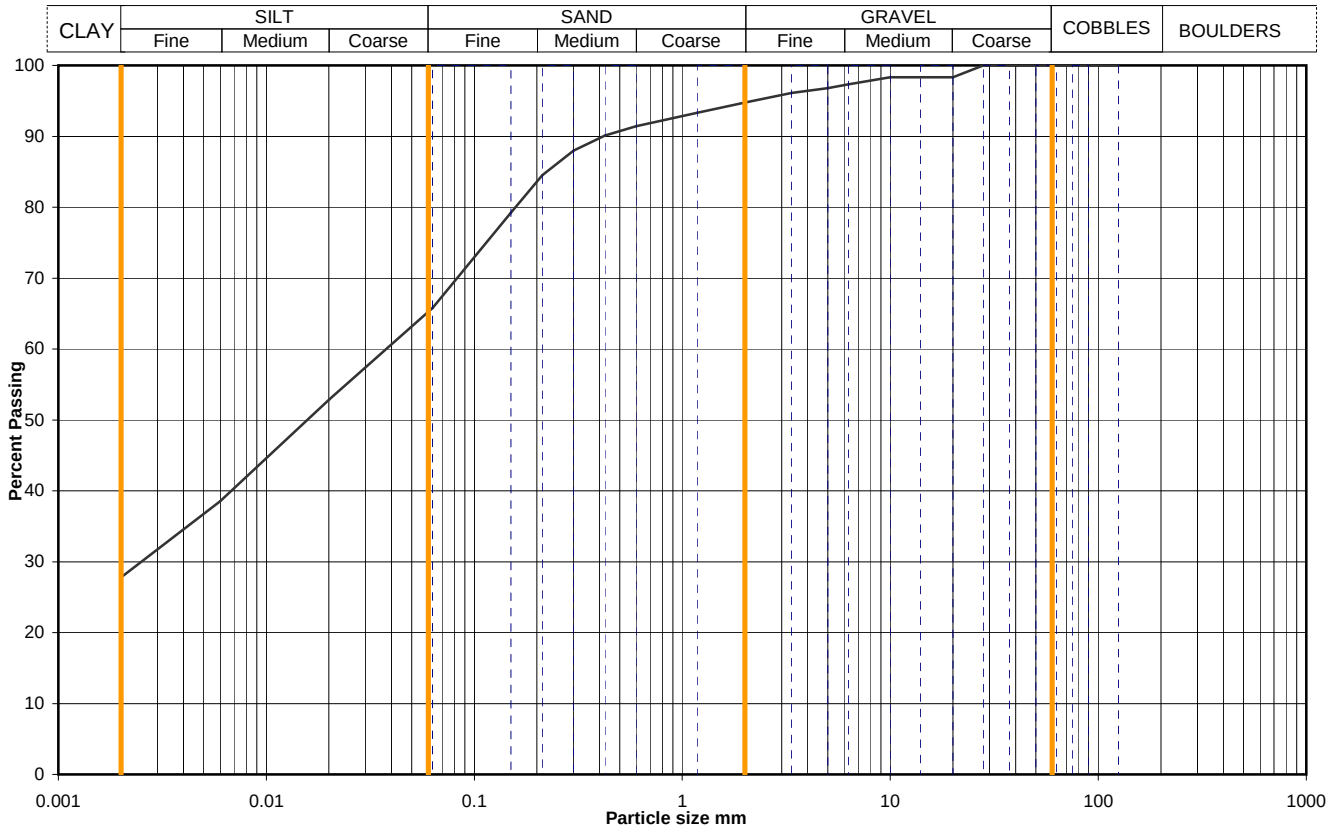
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 8**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	23.15		
			Samp No	63	Type	B
			ID	ESGA1077-11201110100000000064		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	53
90	100	0.0060	39
75	100	0.0020	28
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	98		
10	98		
6.3	97		
5.0	97		
3.35	96		
2.00	95		
1.18	93	Particle density, Mg/m3	
0.600	91		
0.425	90	2.65 assumed	
0.300	88	Dry mass of sample, kg	
0.212	84		
0.150	79	4.5	
0.063	66		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	5	5
	Sand	30	30
	Silt	37	37
	Clay	28	28

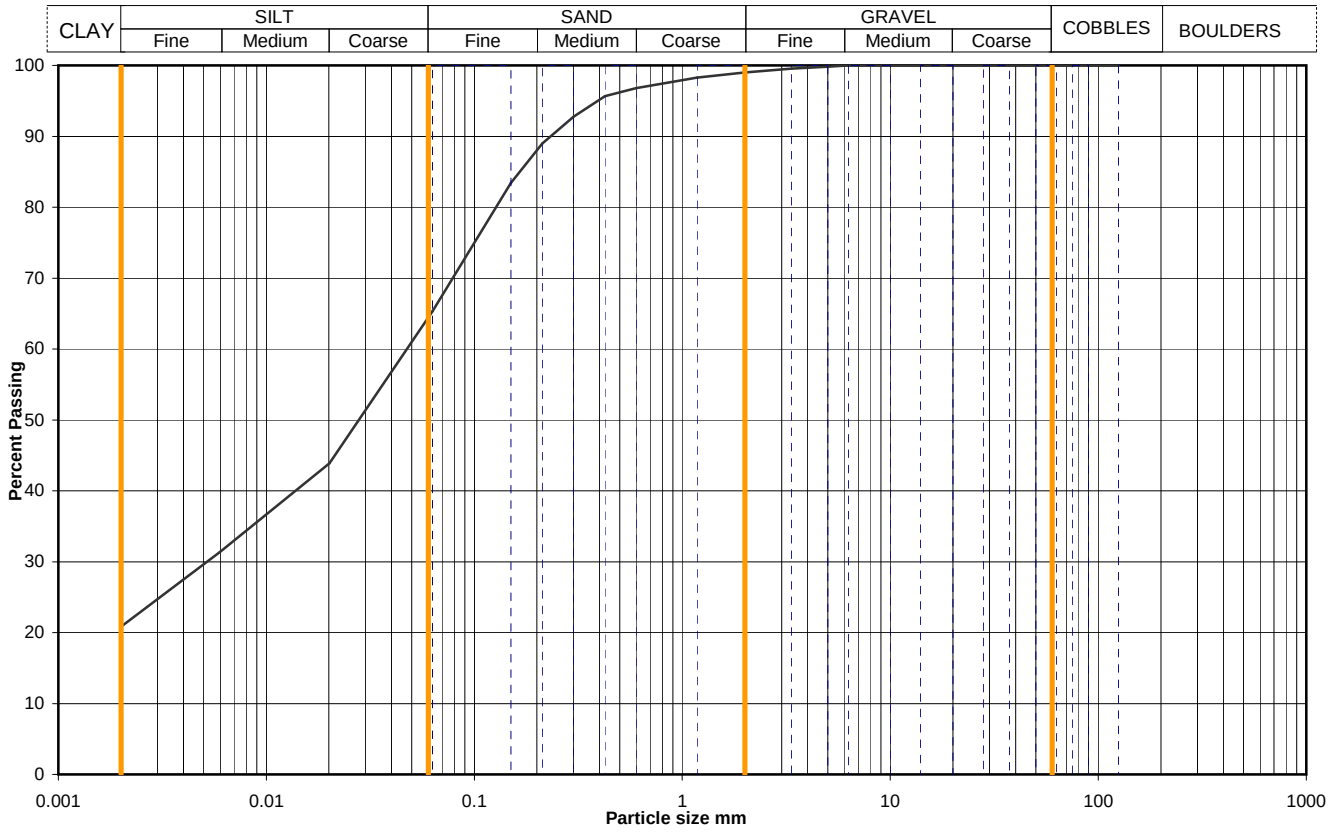
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 9**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	3	Type	B
			ID	ESGA1077-11201110100000000069		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	44
90	100	0.0060	31
75	100	0.0020	21
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	99		
1.18	98	Particle density, Mg/m3	
0.600	97		
0.425	96	2.65 assumed	
0.300	93	Dry mass of sample, kg	
0.212	89		
0.150	83	7.6	
0.063	65		

Soil description	Brown slightly gravelly sandy silty CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	35	35
	Silt	43	43
	Clay	21	21

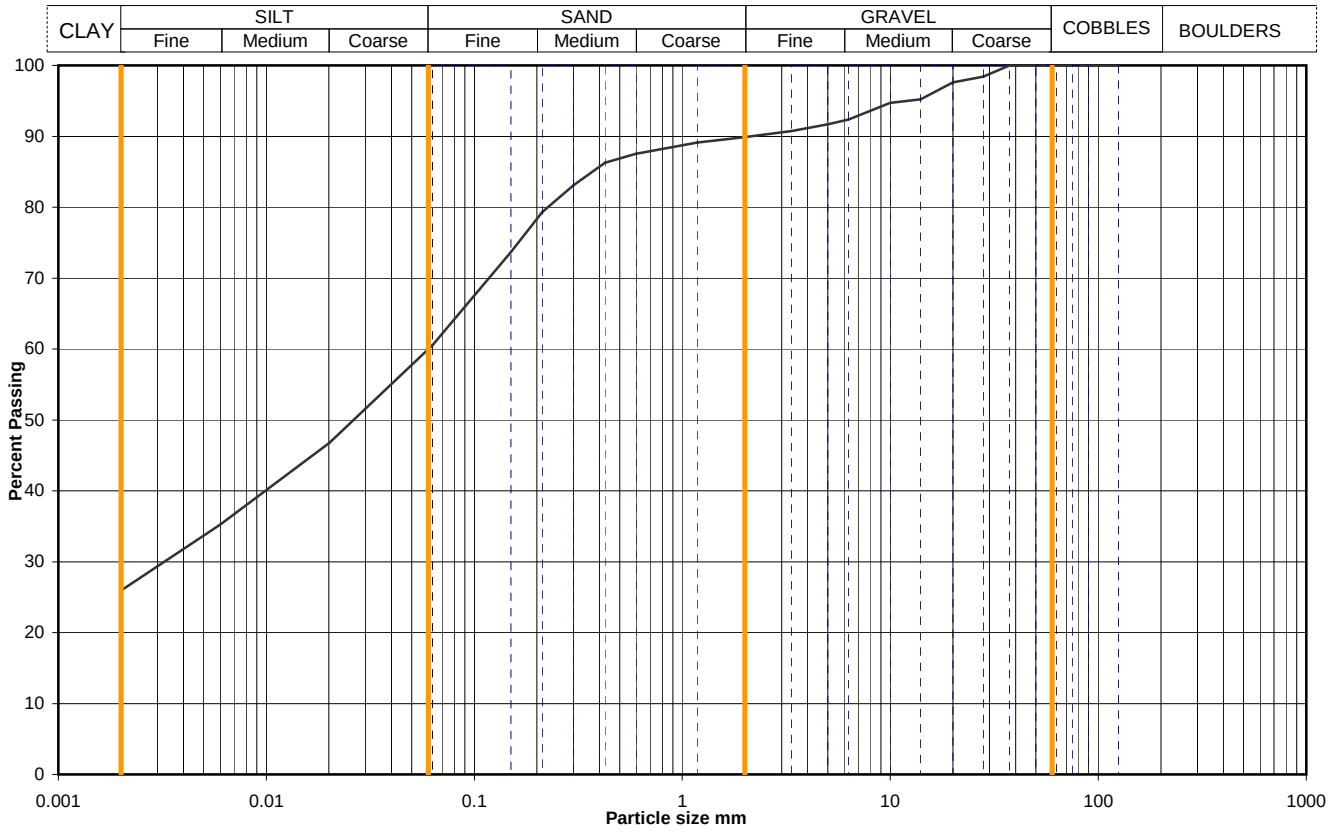
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 10**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	7	Type	B
			ID	ESGA1077-11201110100000000073		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	47
90	100	0.0060	35
75	100	0.0020	26
63	100		
50	100		
37.5	100		
28	98		
20	98		
14	95		
10	95		
6.3	92		
5.0	92		
3.35	91		
2.00	90		
1.18	89	Particle density, Mg/m3	
0.600	88		
0.425	86	2.65 assumed	
0.300	83	Dry mass of sample, kg	
0.212	79		
0.150	74	12.2	
0.063	61		

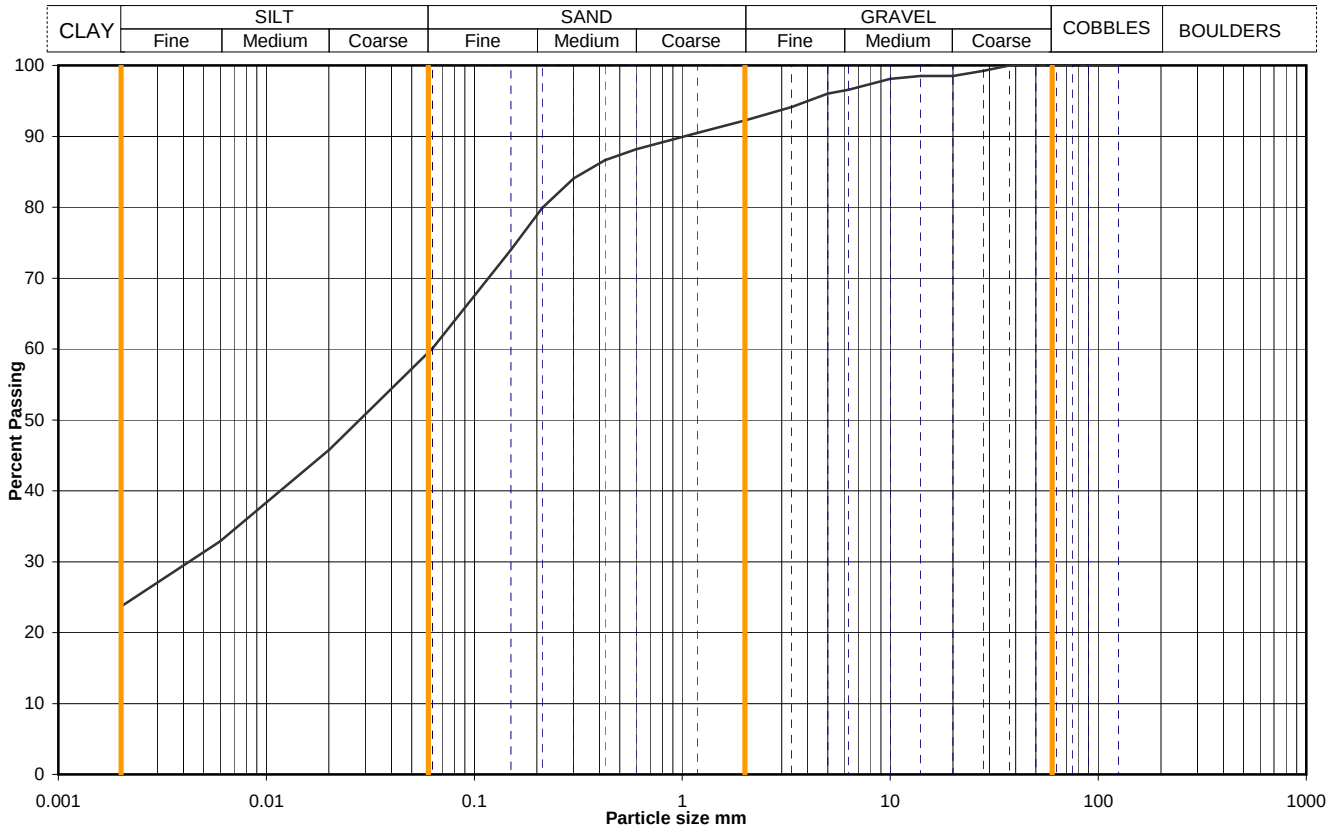
Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	10	10
	Sand	30	30
	Silt	34	34
	Clay	26	26

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	5.00		
			Samp No	12	Type	U
			ID	ESGA1077-11201110100000000078		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	46
90	100	0.0060	33
75	100	0.0020	24
63	100		
50	100		
37.5	100		
28	99		
20	98		
14	98		
10	98		
6.3	97		
5.0	96		
3.35	94		
2.00	92		
1.18	90	Particle density, Mg/m3	
0.600	88		
0.425	87	2.65 assumed	
0.300	84	Dry mass of sample, kg	
0.212	80		
0.150	74	3.8	
0.063	60		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	8	8
	Sand	33	33
	Silt	36	36
	Clay	23	23

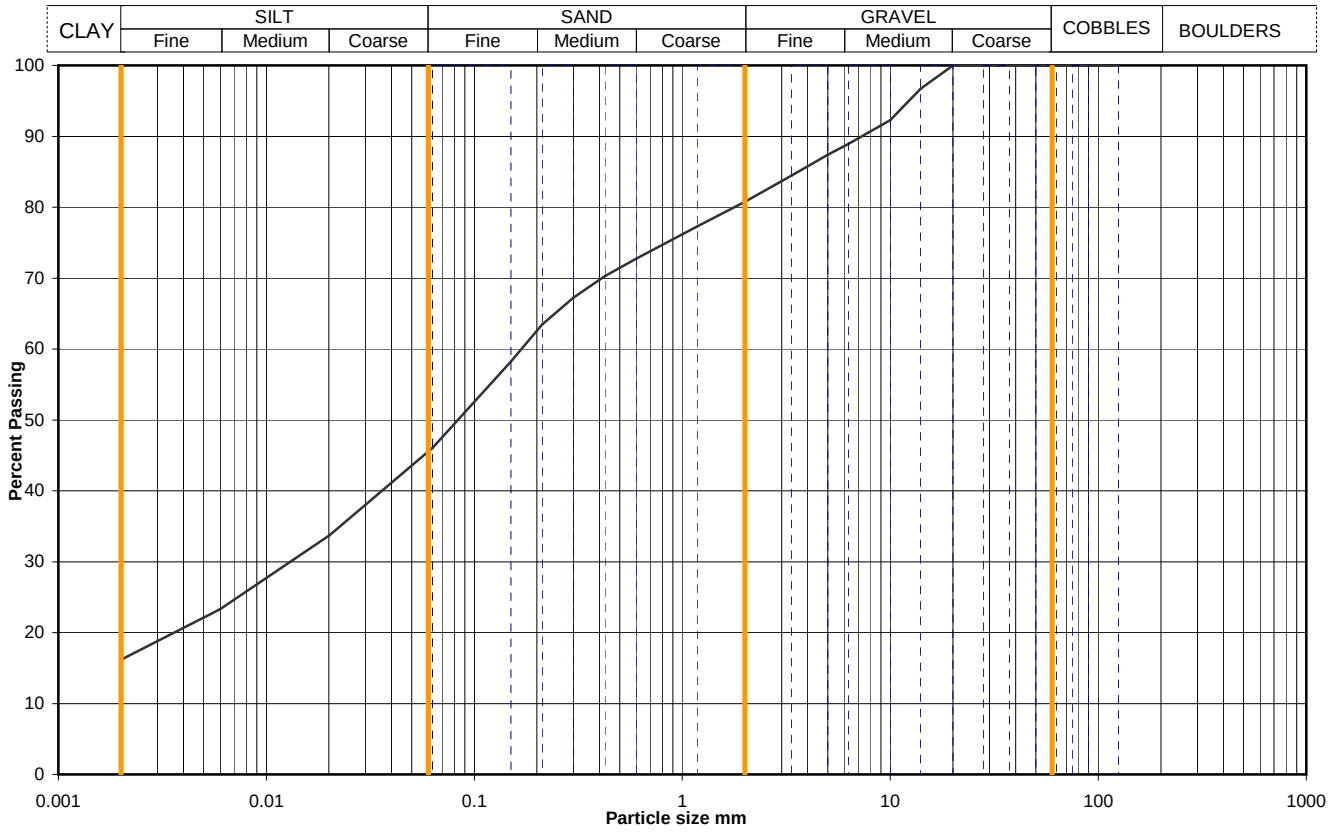
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 12**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	8.45		
			Samp No	19	Type	D
			ID	ESGA1077-11201110100000000085		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	34
90	100	0.0060	23
75	100	0.0020	16
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	92		
6.3	89		
5.0	87		
3.35	84		
2.00	81		
1.18	77	Particle density, Mg/m3	
0.600	73		
0.425	70	2.65 assumed	
0.300	67	Dry mass of sample, kg	
0.212	63		
0.150	58	1.5	
0.063	46		

Soil description	Brown slightly gravelly sandy CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	19	19
	Sand	35	35
	Silt	30	30
	Clay	16	16

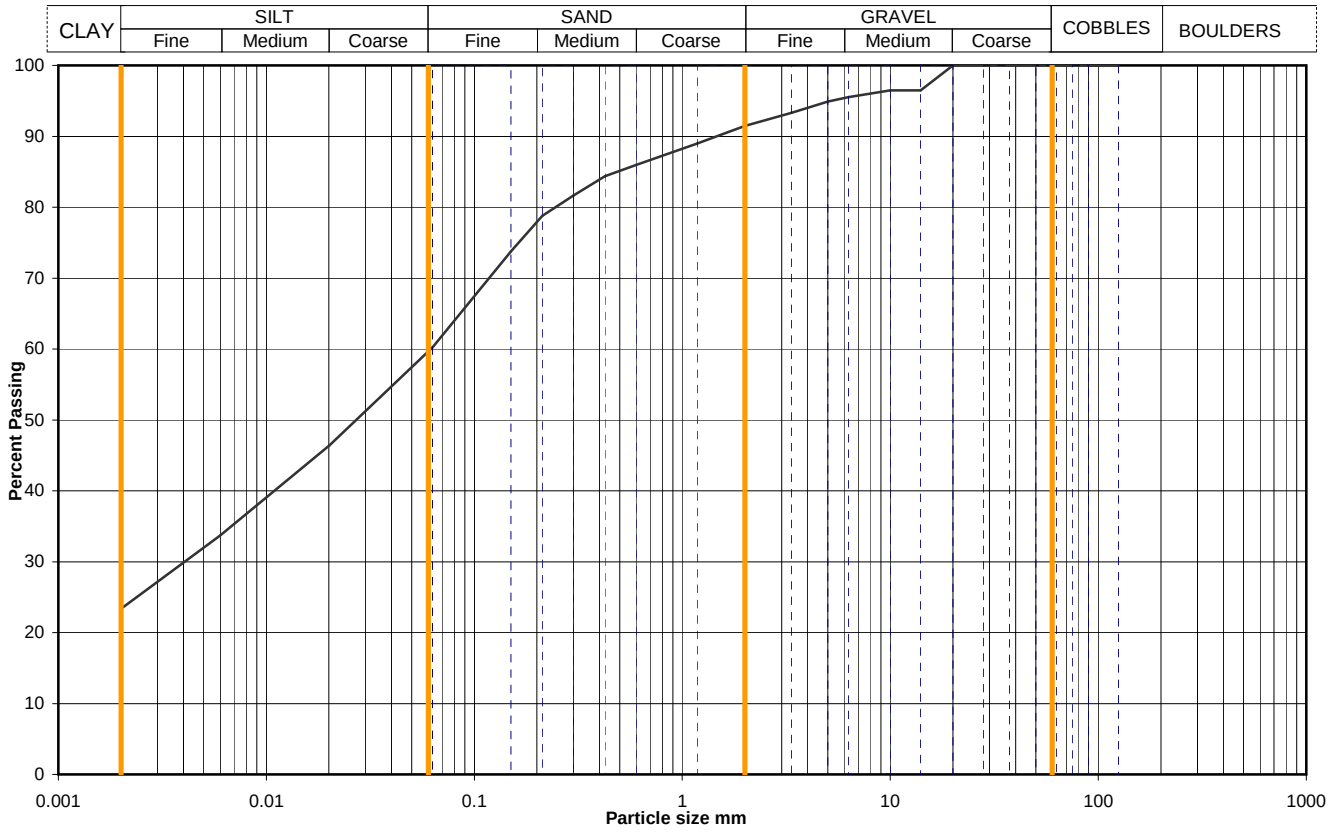
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 13**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	11.45		
			Samp No	25	Type	D
			ID	ESGA1077-11201110100000000091		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	46
90	100	0.0060	34
75	100	0.0020	23
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	96		
10	96		
6.3	96		
5.0	95		
3.35	93		
2.00	91		
1.18	89	Particle density, Mg/m3	
0.600	86		
0.425	84	2.65 assumed	
0.300	82	Dry mass of sample, kg	
0.212	79		
0.150	74	1.1	
0.063	60		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	9	9
	Sand	32	32
	Silt	36	36
	Clay	23	23

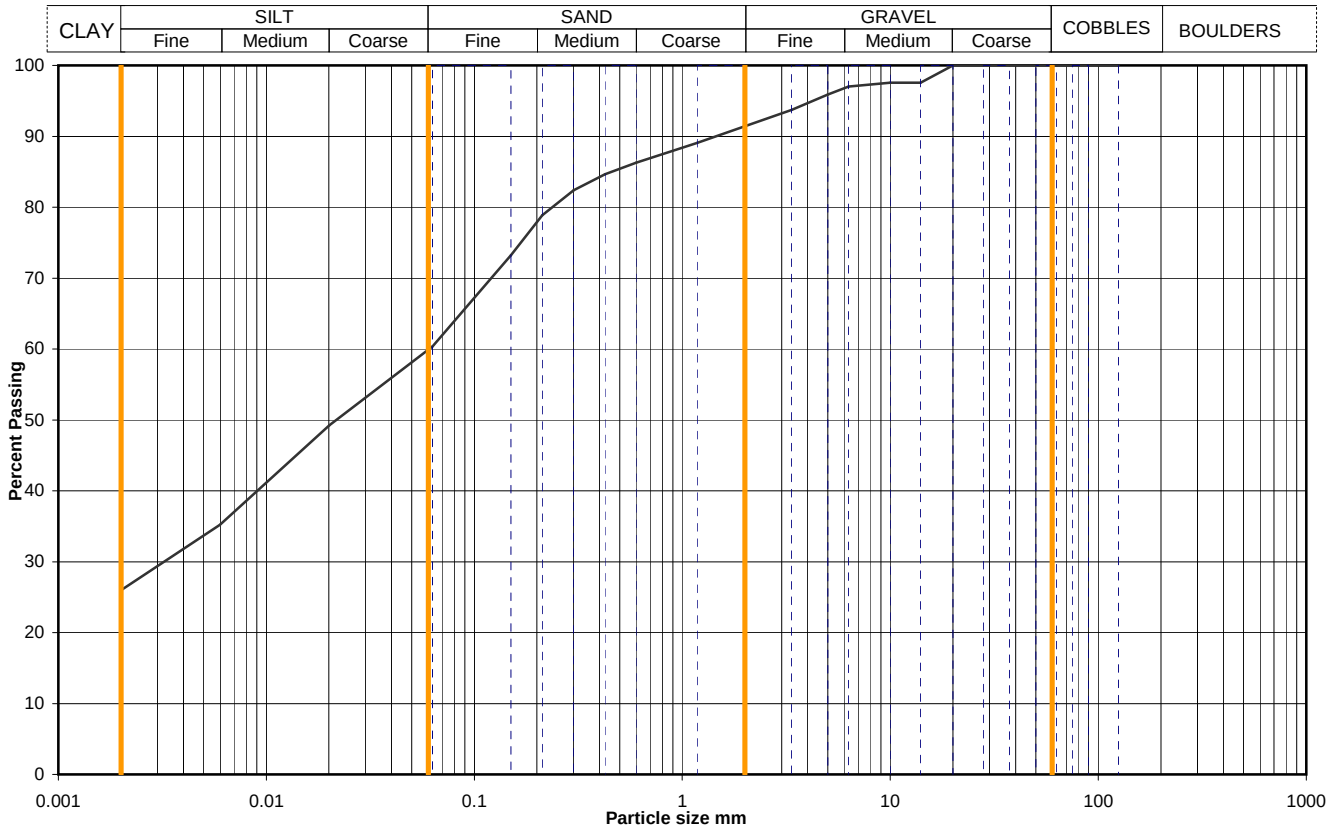
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 14**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	15.45		
			Samp No	32	Type	D
			ID	ESGA1077-11201110100000000099		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	49
90	100	0.0060	35
75	100	0.0020	26
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	98		
6.3	97		
5.0	96		
3.35	94		
2.00	91		
1.18	89	Particle density, Mg/m3	
0.600	86		
0.425	85	2.65 assumed	
0.300	82	Dry mass of sample, kg	
0.212	79		
0.150	73	1.4	
0.063	60		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	9	9
	Sand	32	32
	Silt	33	33
	Clay	26	26

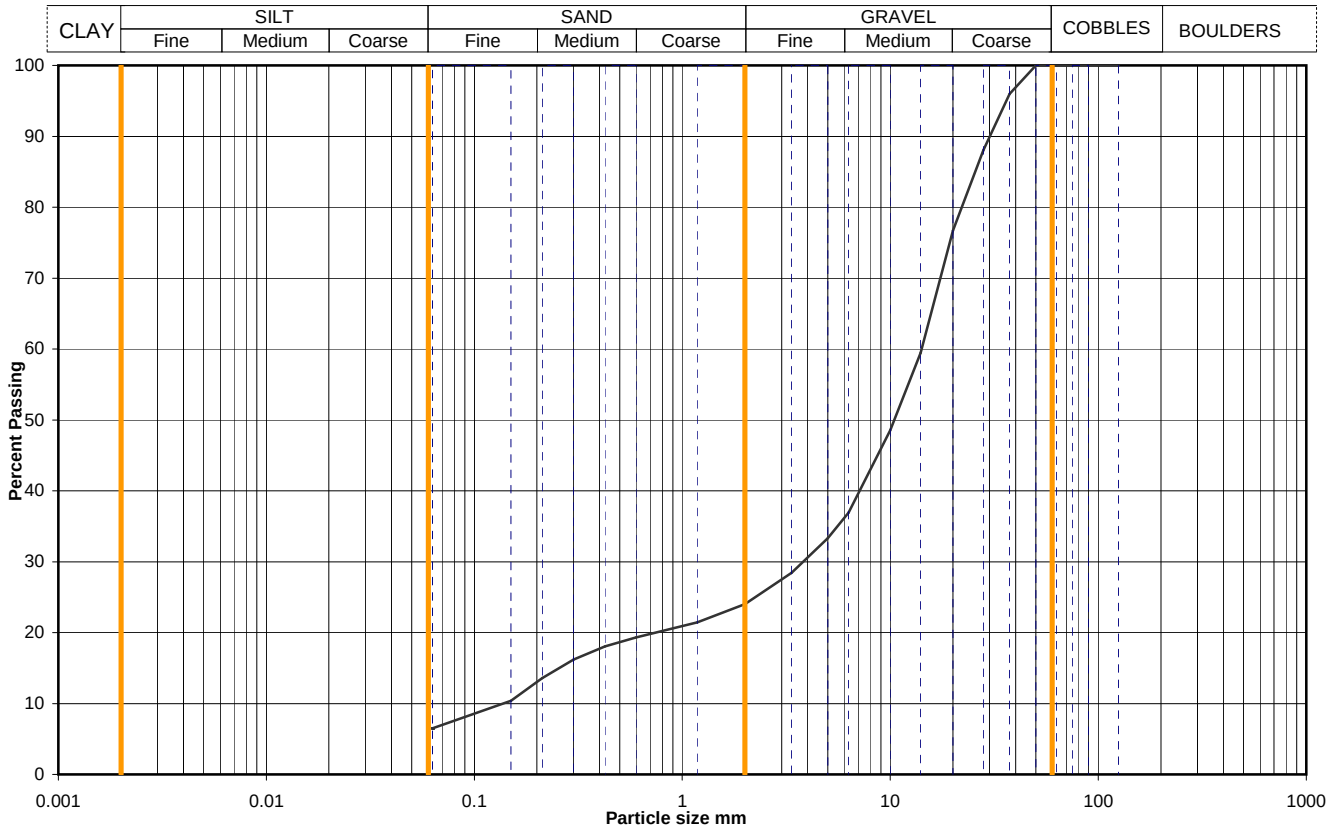
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 15**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	18.00		
			Samp No	41	Type	B
			ID	ESGA1077-11201110100000000108		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	96		
28	88		
20	77		
14	59		
10	49		
6.3	37		
5.0	33		
3.35	28		
2.00	24		
1.18	21		
0.600	19		
0.425	18		
0.300	16	Dry mass of sample, kg	
0.212	14		
0.150	10	15.9	
0.063	6		

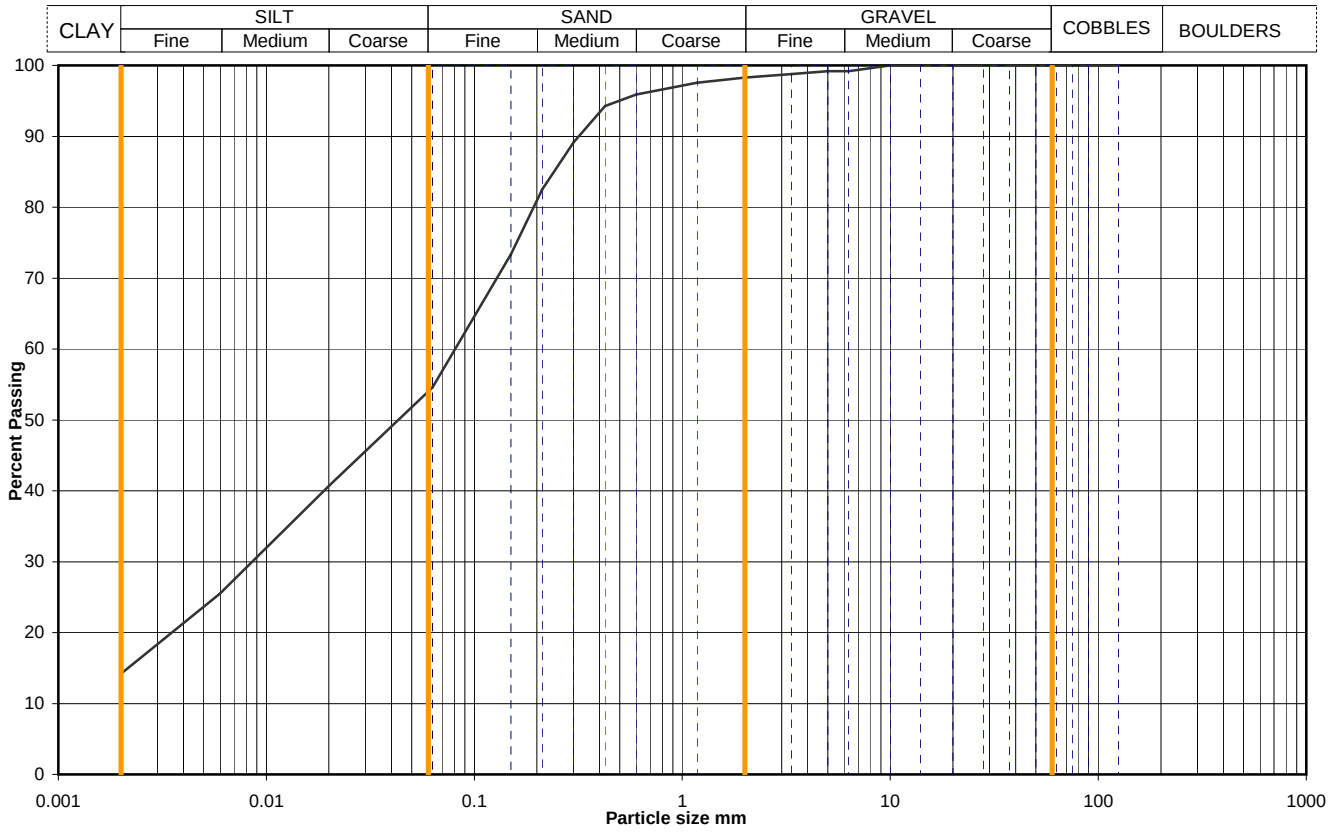
Soil description	Brown clayey sandy GRAVEL.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	76	76
	Sand	18	18
	Silt	silt+clay =	
	Clay	6	6

Uniformity Coefficient	D_{60} / D_{10}	103

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	3	Type	B
			ID	ESGA1077-11201110110000000128		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	41
90	100	0.0060	25
75	100	0.0020	14
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5.0	99		
3.35	99		
2.00	98		
1.18	98	Particle density, Mg/m3	
0.600	96		
0.425	94	2.65 assumed	
0.300	89	Dry mass of sample, kg	
0.212	83		
0.150	73	3.7	
0.063	55		

Soil description	Brown slightly gravelly sandy CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	2	2
	Sand	44	44
	Silt	40	40
	Clay	14	14

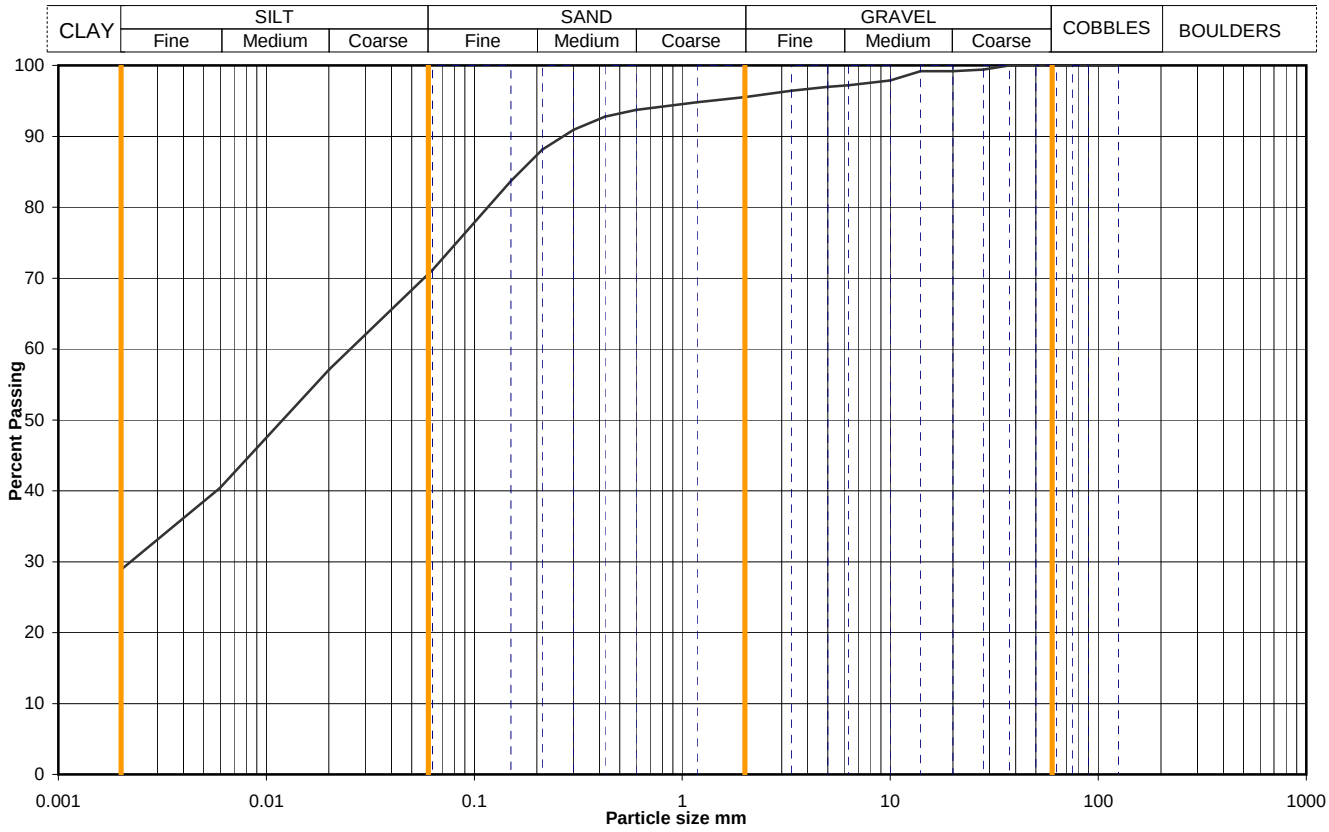
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 17**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.85		
			Samp No	7	Type	B
			ID	ESGA1077-11201110110000000132		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	57
90	100	0.0060	40
75	100	0.0020	29
63	100		
50	100		
37.5	100		
28	99		
20	99		
14	99		
10	98		
6.3	97		
5.0	97		
3.35	96		
2.00	96		
1.18	95	Particle density, Mg/m3	
0.600	94		
0.425	93	2.65 assumed	
0.300	91	Dry mass of sample, kg	
0.212	88		
0.150	84	11.4	
0.063	71		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	4	4
	Sand	25	25
	Silt	42	42
	Clay	29	29

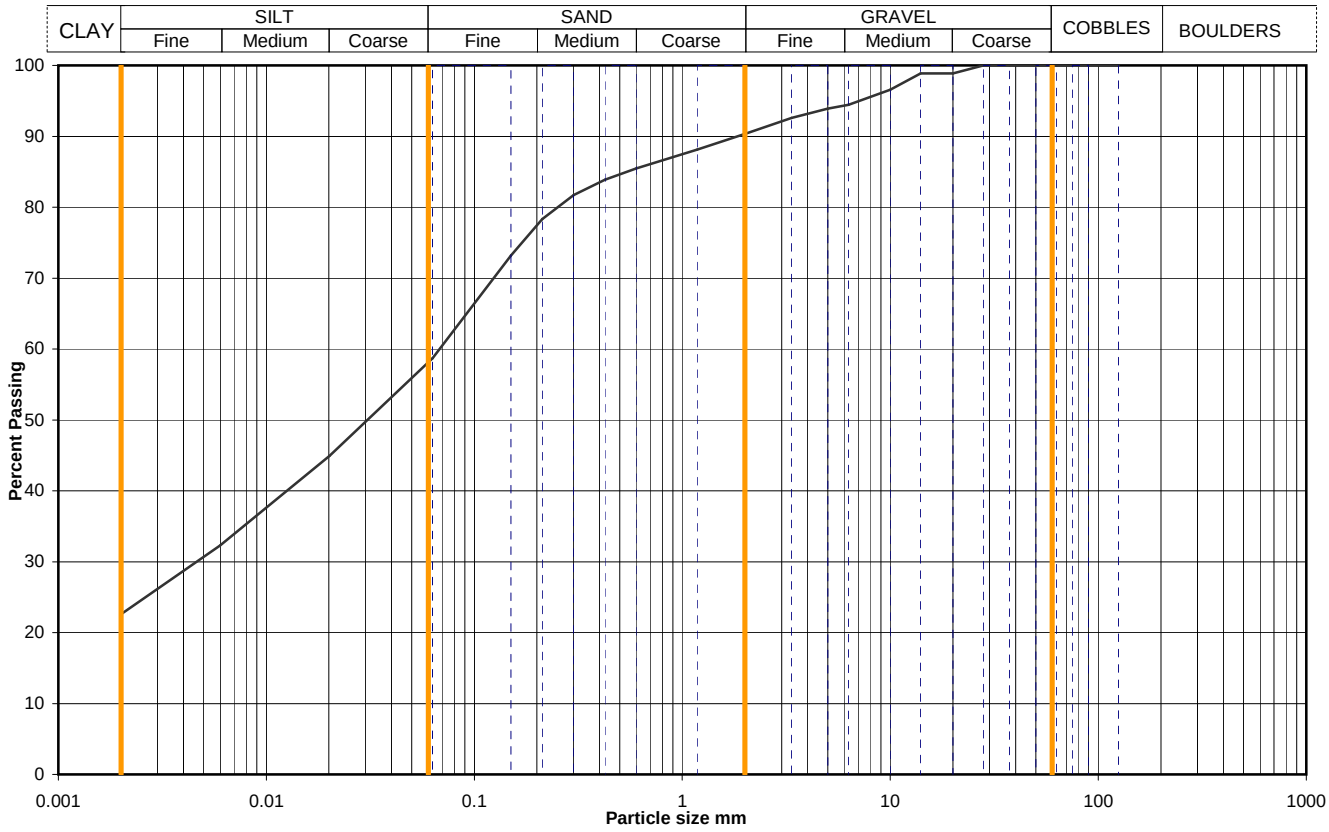
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 18**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.65		
			Samp No	15	Type	B
			ID	ESGA1077-11201110110000000140		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	45
90	100	0.0060	32
75	100	0.0020	23
63	100		
50	100		
37.5	100		
28	100		
20	99		
14	99		
10	97		
6.3	94		
5.0	94		
3.35	93		
2.00	90		
1.18	88	Particle density, Mg/m3	
0.600	85		
0.425	84	2.65 assumed	
0.300	82	Dry mass of sample, kg	
0.212	78		
0.150	73	16.8	
0.063	59		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	10	10
	Sand	32	32
	Silt	35	35
	Clay	23	23

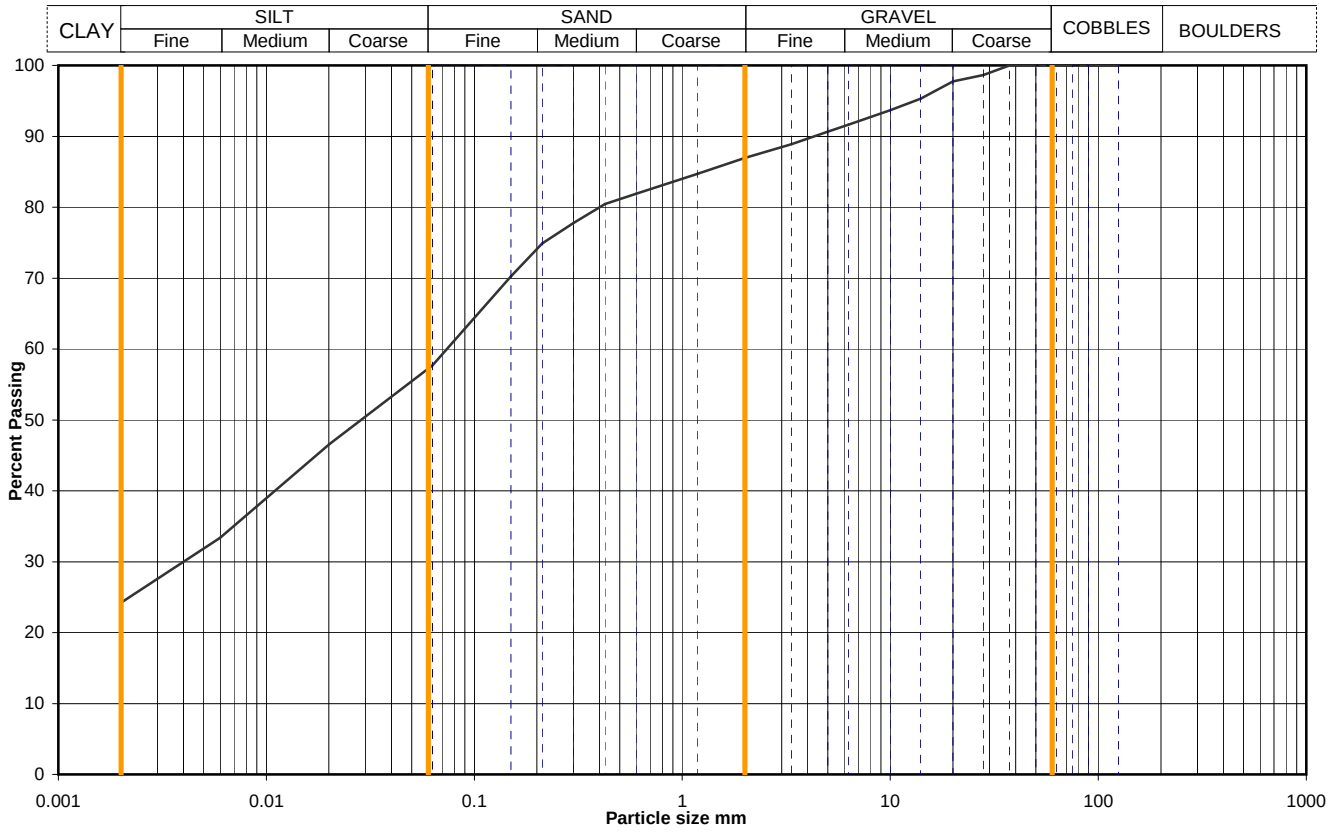
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 19**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	7.65		
			Samp No	23	Type	B
			ID	ESGA1077-11201110110000000148		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	47
90	100	0.0060	33
75	100	0.0020	24
63	100		
50	100		
37.5	100		
28	99		
20	98		
14	95		
10	94		
6.3	92		
5.0	91		
3.35	89		
2.00	87		
1.18	85	Particle density, Mg/m3	
0.600	82		
0.425	80	2.65 assumed	
0.300	78	Dry mass of sample, kg	
0.212	75		
0.150	70	16.4	
0.063	58		

Soil description	Greyish brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	13	13
	Sand	30	30
	Silt	33	33
	Clay	24	24

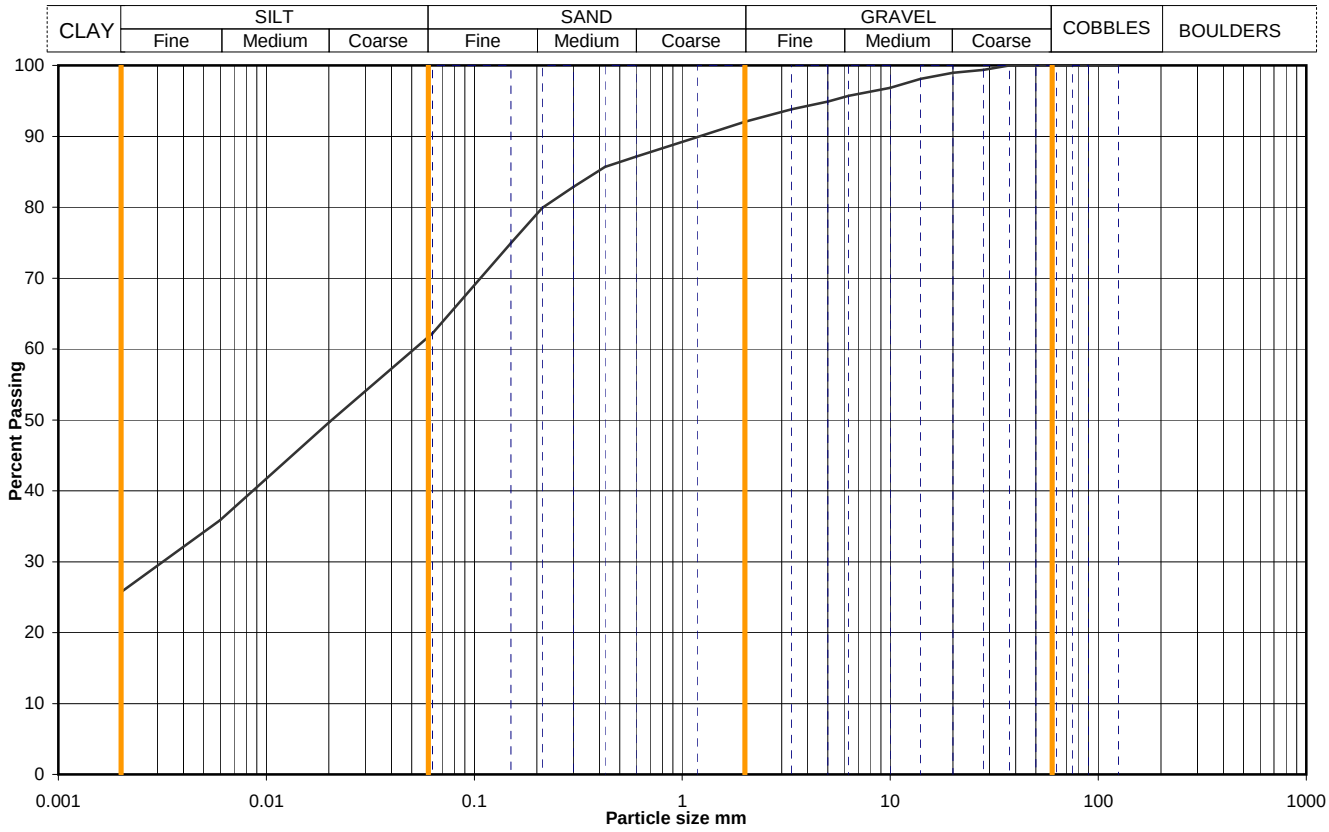
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 20**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	9.15		
			Samp No	27	Type	B
			ID	ESGA1077-11201110110000000152		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	50
90	100	0.0060	36
75	100	0.0020	26
63	100		
50	100		
37.5	100		
28	99		
20	99		
14	98		
10	97		
6.3	96		
5.0	95		
3.35	94		
2.00	92		
1.18	90	Particle density, Mg/m3	
0.600	87		
0.425	86	2.65 assumed	
0.300	83	Dry mass of sample, kg	
0.212	80		
0.150	75	14.6	
0.063	62		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	8	8
	Sand	30	30
	Silt	36	36
	Clay	26	26

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

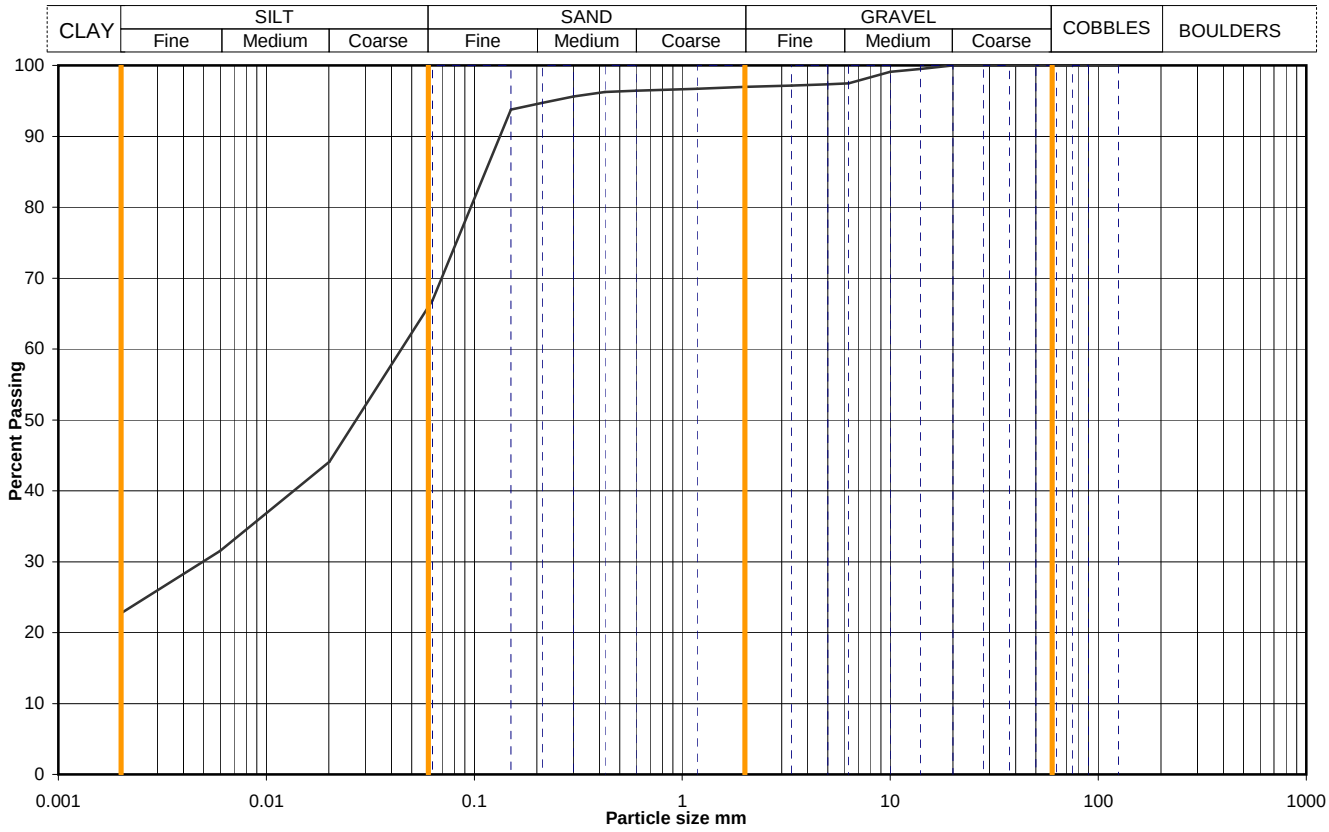
Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30

Figure **PSD 21**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	11.50		
			Samp No	34	Type	B
			ID	ESGA1077-11201110110000000159		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	44
90	100	0.0060	32
75	100	0.0020	23
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	99		
6.3	97		
5.0	97		
3.35	97		
2.00	97		
1.18	97	Particle density, Mg/m3	
0.600	96		
0.425	96	2.65 assumed	
0.300	96	Dry mass of sample, kg	
0.212	95		
0.150	94	14.6	
0.063	67		

Soil description	Light brownish grey slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	3	3
	Sand	31	31
	Silt	43	43
	Clay	23	23

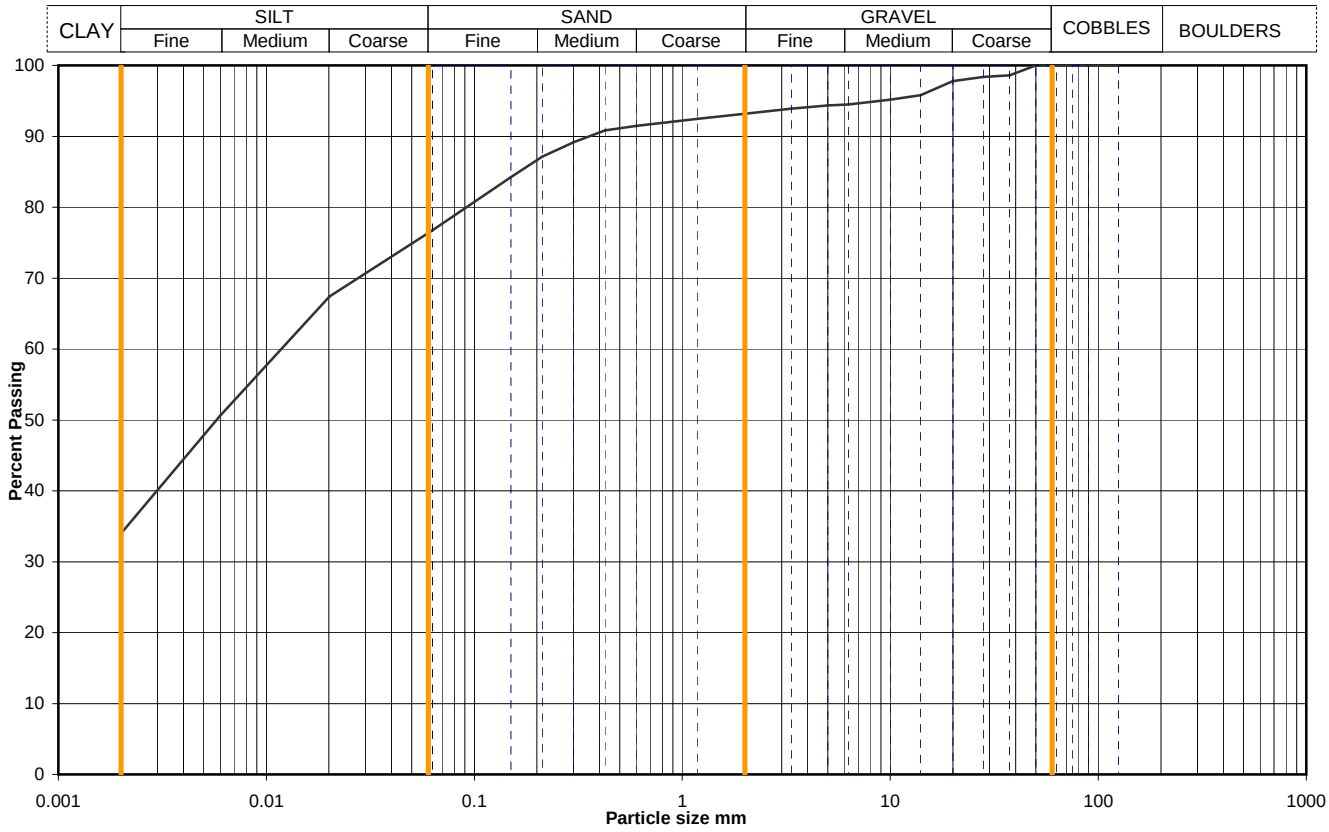
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 22**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	13.50		
			Samp No	38	Type	B
			ID	ESGA1077-11201110110000000163		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	67
90	100	0.0060	51
75	100	0.0020	34
63	100		
50	100		
37.5	99		
28	98		
20	98		
14	96		
10	95		
6.3	94		
5.0	94		
3.35	94		
2.00	93		
1.18	92	Particle density, Mg/m3	
0.600	91		
0.425	91	2.65 assumed	
0.300	89	Dry mass of sample, kg	
0.212	87		
0.150	84	13.1	
0.063	77		

Soil description	Brownish grey slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	7	7
	Sand	17	17
	Silt	42	42
	Clay	34	34

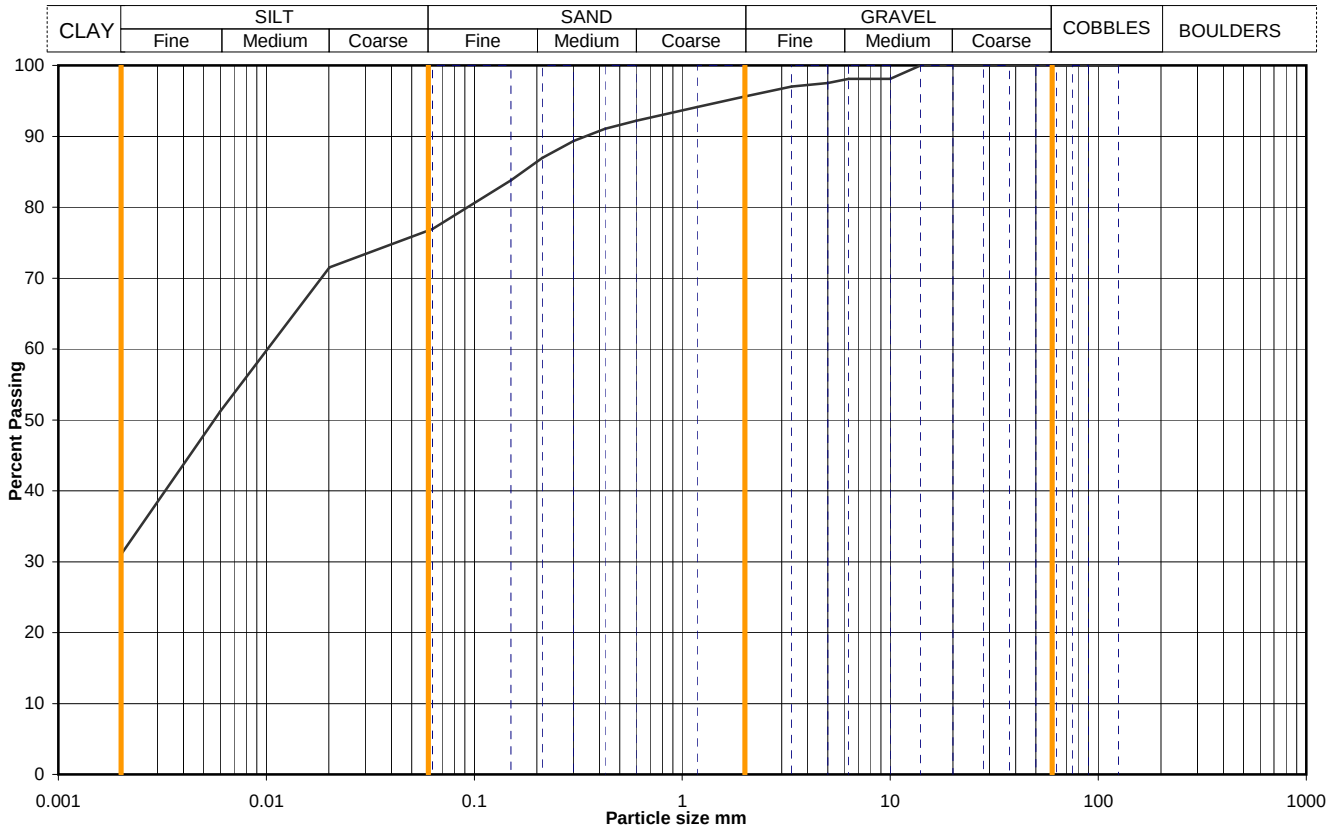
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 23**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	13.50		
			Samp No	37	Type	D
			ID	ESGA1077-11201110110000000162		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	72
90	100	0.0060	51
75	100	0.0020	31
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	98		
6.3	98		
5.0	98		
3.35	97		
2.00	96		
1.18	94	Particle density, Mg/m3	
0.600	92		
0.425	91	2.65 assumed	
0.300	89	Dry mass of sample, kg	
0.212	87		
0.150	84	0.4	
0.063	77		

Soil description	Brownish grey slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: pre dried, Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	4	4
	Sand	19	19
	Silt	46	46
	Clay	31	31

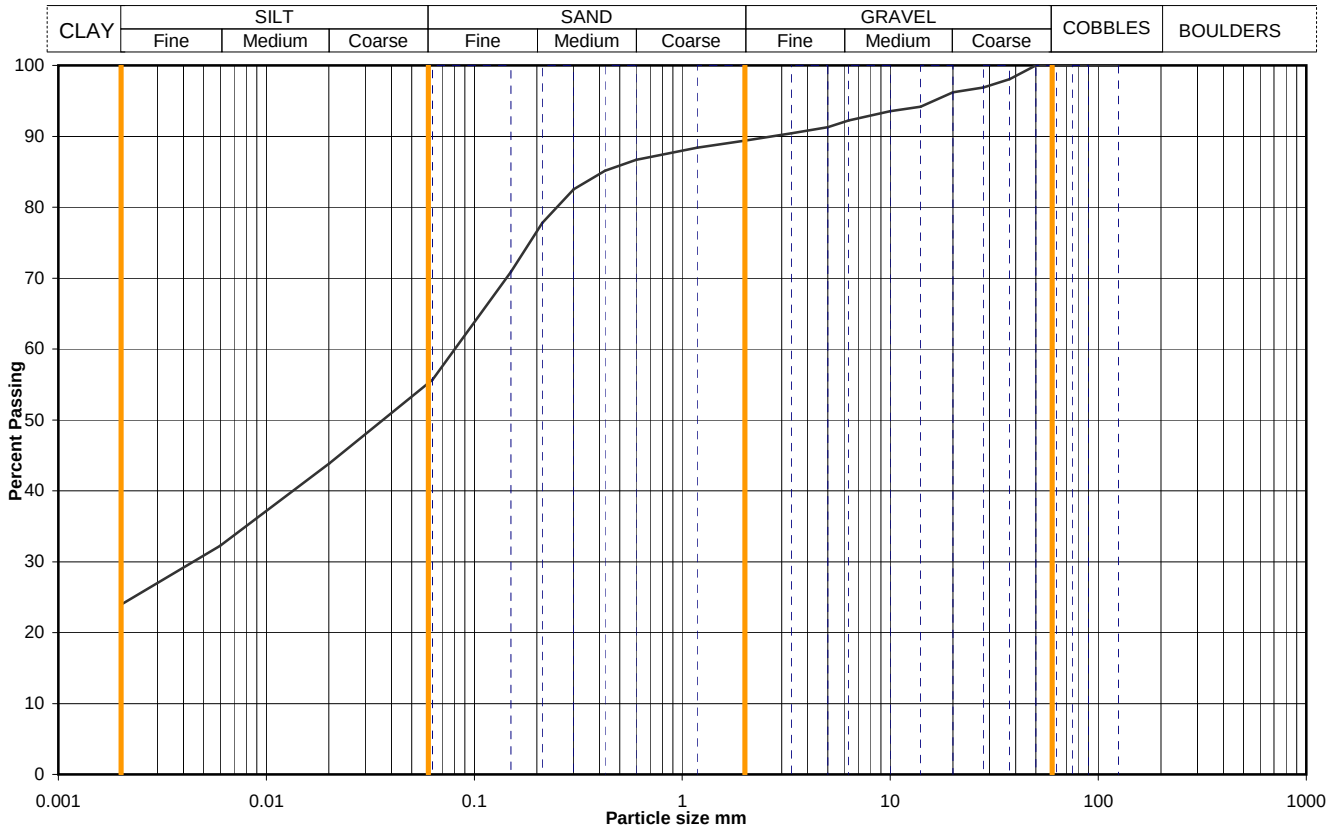
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 24**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	16.65		
			Samp No	46	Type	B
			ID	ESGA1077-11201110110000000170		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	44
90	100	0.0060	32
75	100	0.0020	24
63	100		
50	100		
37.5	98		
28	97		
20	96		
14	94		
10	94		
6.3	92		
5.0	91		
3.35	90		
2.00	89		
1.18	88	Particle density, Mg/m3	
0.600	87		
0.425	85	2.65 assumed	
0.300	83	Dry mass of sample, kg	
0.212	78		
0.150	71	15.0	
0.063	56		

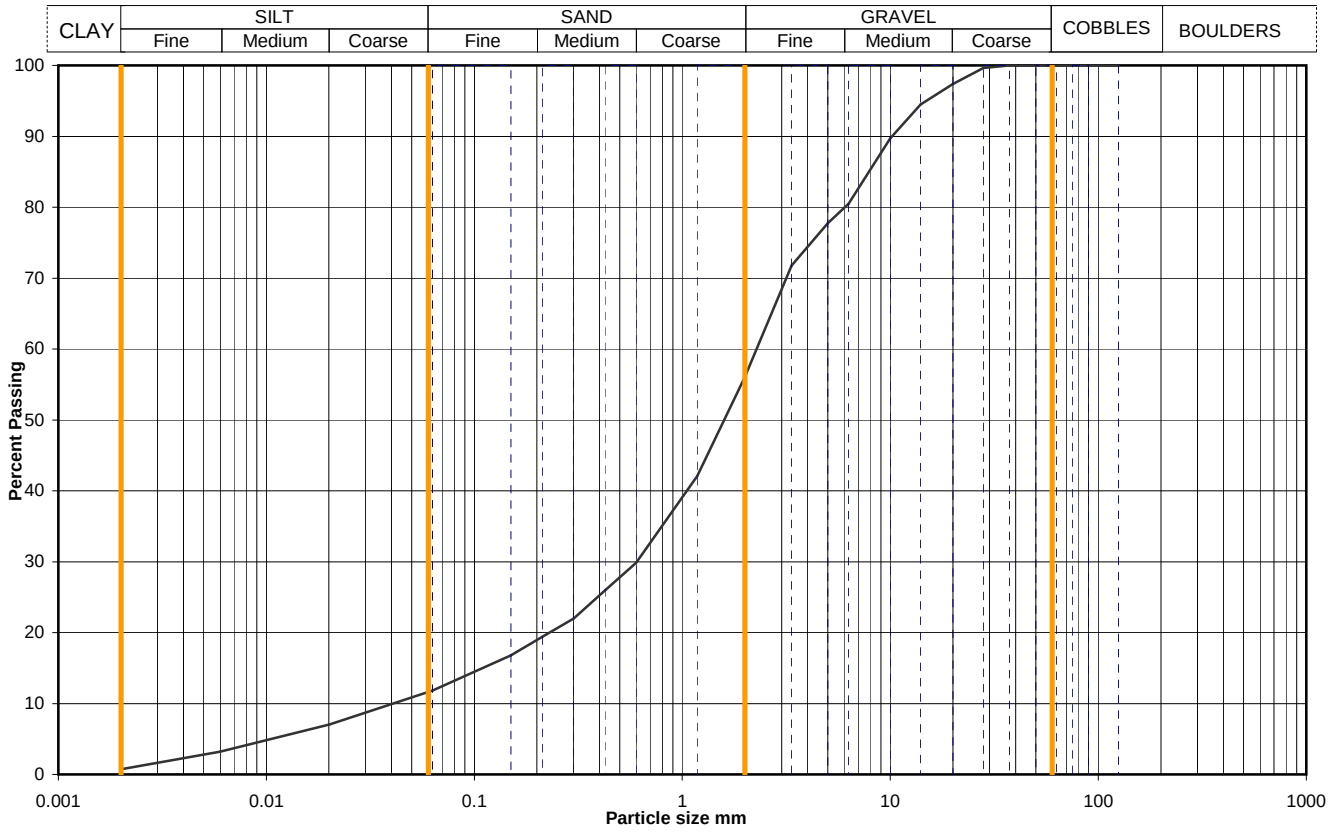
Soil description	Brownish grey slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	11	11
	Sand	34	34
	Silt	31	31
	Clay	24	24

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH4		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.20		
			Samp No	4	Type	B
			ID	ESGA1077-11201110110000000184		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	7
90	100	0.0060	3
75	100	0.0020	1
63	100		
50	100		
37.5	100		
28	100		
20	97		
14	95		
10	90		
6.3	81		
5.0	78		
3.35	72		
2.00	56		
1.18	42	Particle density, Mg/m3	
0.600	30		
0.425	26	2.65 assumed	
0.300	22	Dry mass of sample, kg	
0.212	19		
0.150	17	8.0	
0.063	12		

Soil description	Light grey sandy gravelly SILT.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	44	44
	Sand	44	44
	Silt	11	11
	Clay	1	1

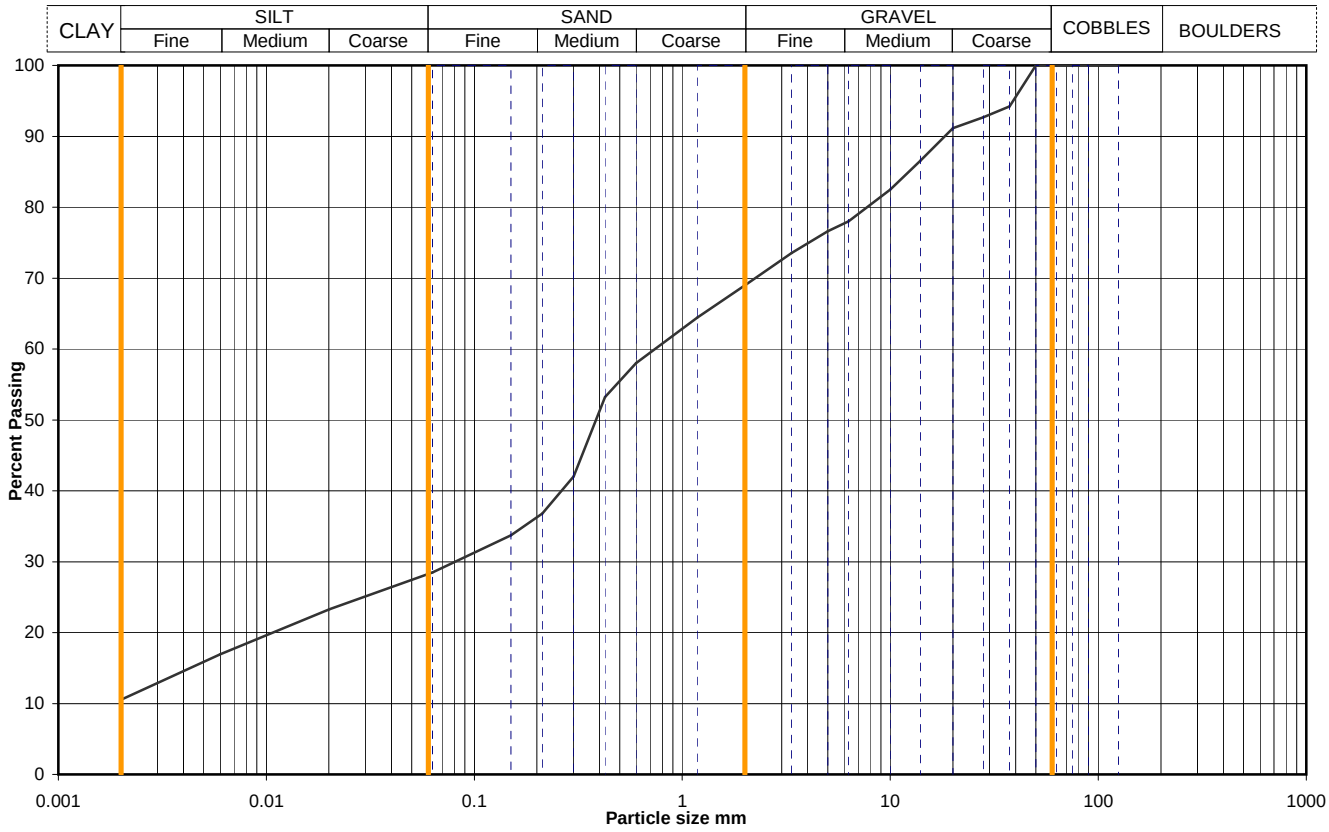
Uniformity Coefficient	D_{60} / D_{10}	56

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 26**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH4		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.80		
			Samp No	8	Type	B
			ID	ESGA1077-11201110110000000188		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	23
90	100	0.0060	17
75	100	0.0020	11
63	100		
50	100		
37.5	94		
28	93		
20	91		
14	87		
10	82		
6.3	78		
5.0	77		
3.35	74		
2.00	69		
1.18	64	Particle density, Mg/m3	
0.600	58		
0.425	53	2.65 assumed	
0.300	42	Dry mass of sample, kg	
0.212	37		
0.150	34	5.0	
0.063	28		

Soil description	Brown slightly gravelly sandy CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	31	31
	Sand	41	41
	Silt	18	18
	Clay	10	10

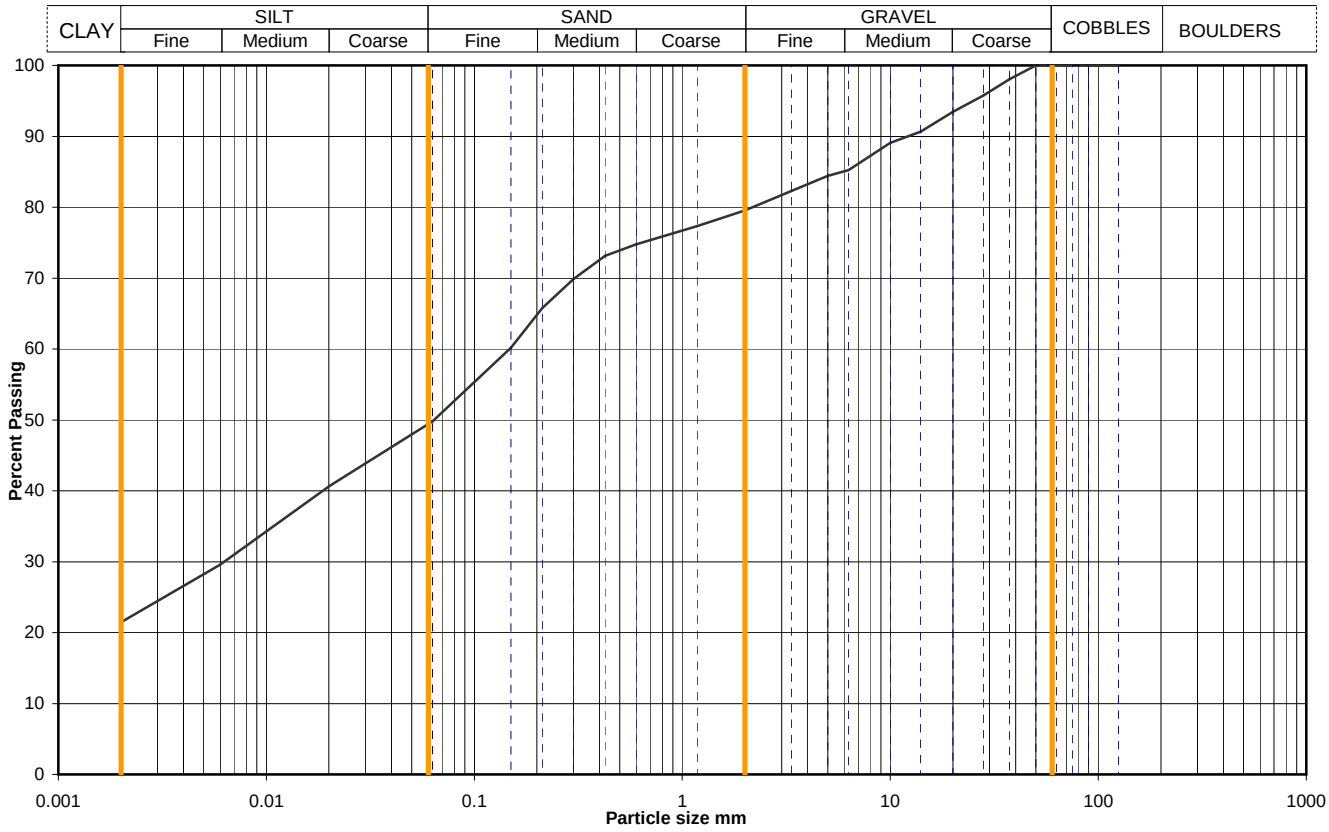
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 27**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH4		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	14	Type	B
			ID	ESGA1077-11201110110000000195		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	41
90	100	0.0060	30
75	100	0.0020	21
63	100		
50	100		
37.5	98		
28	96		
20	93		
14	91		
10	89		
6.3	85		
5.0	84		
3.35	82		
2.00	80		
1.18	77	Particle density, Mg/m3	
0.600	75		
0.425	73	2.65 assumed	
0.300	70	Dry mass of sample, kg	
0.212	66		
0.150	60	10.8	
0.063	50		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	20	20
	Sand	30	30
	Silt	28	28
	Clay	22	22

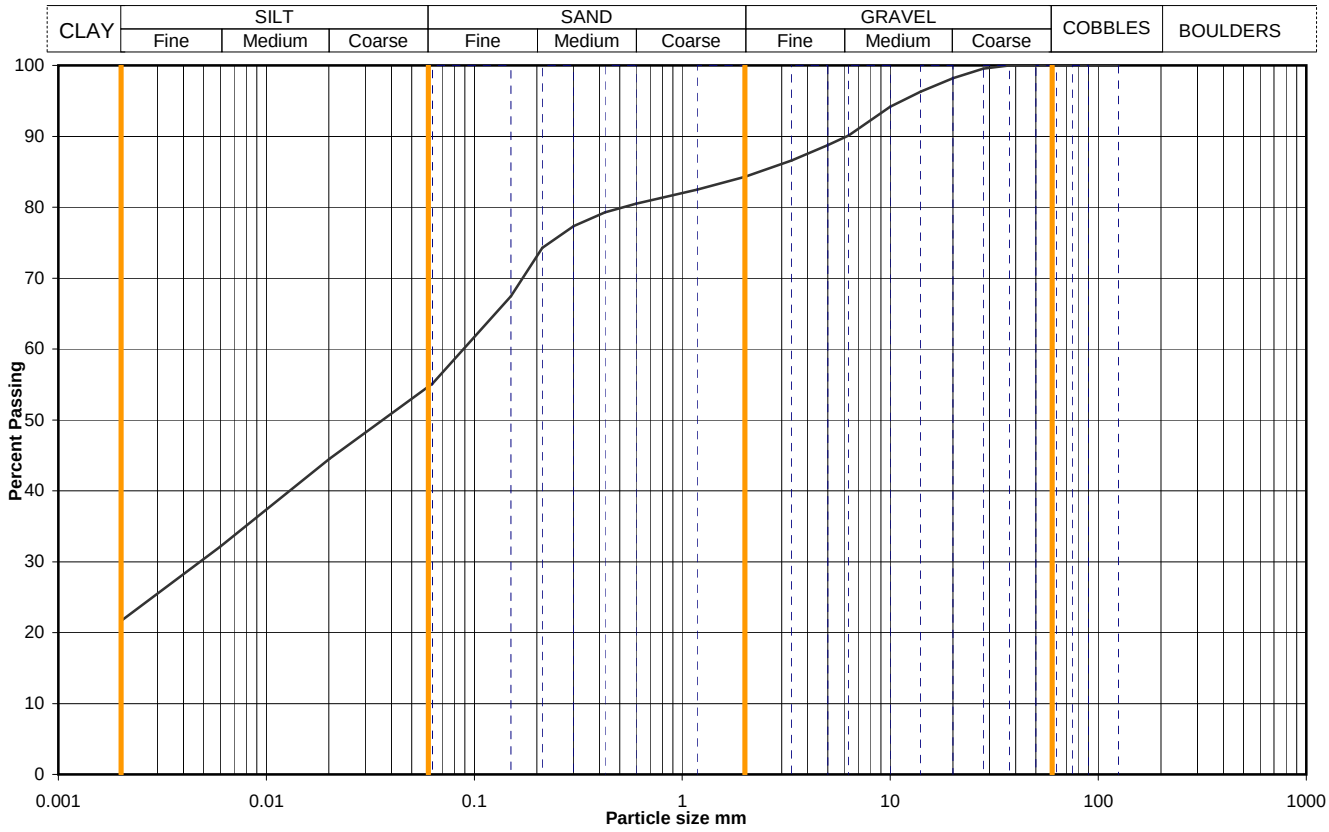
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 28**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH4		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	20	Type	B
			ID	ESGA1077-11201110110000000201		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	45
90	100	0.0060	32
75	100	0.0020	22
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	96		
10	94		
6.3	90		
5.0	89		
3.35	87		
2.00	84		
1.18	82	Particle density, Mg/m3	
0.600	80		
0.425	79	2.65 assumed	
0.300	77	Dry mass of sample, kg	
0.212	74		
0.150	67	9.1	
0.063	55		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	16	16
	Sand	30	30
	Silt	33	33
	Clay	21	21

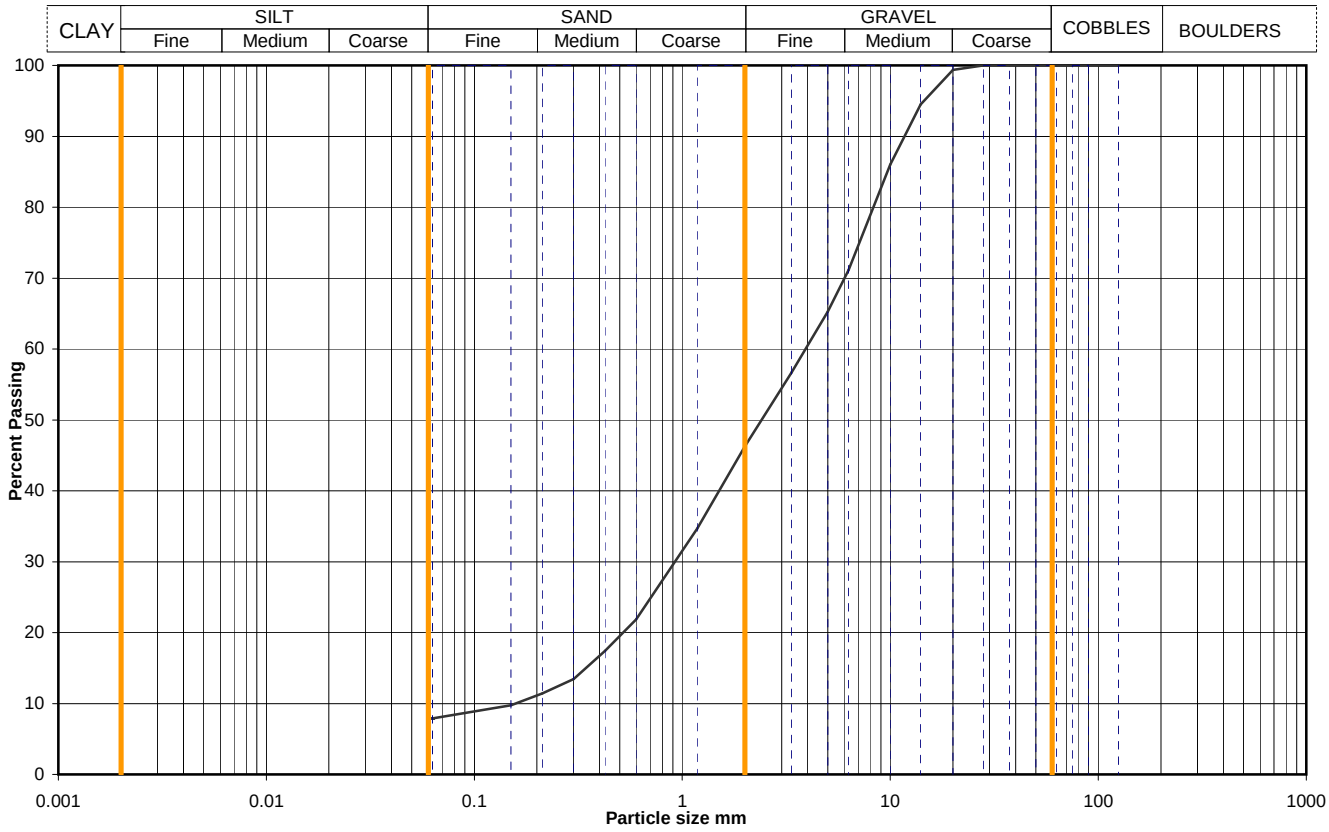
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:30	**Figure** **PSD 29**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.10		
			Samp No	2	Type	B
			ID	ESGA1077-11201110130000000250		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	99		
14	94		
10	86		
6.3	71		
5.0	65		
3.35	57		
2.00	46		
1.18	35		
0.600	22		
0.425	17		
0.300	13	Dry mass of sample, kg	
0.212	11		
0.150	10	11.8	
0.063	8		

Soil description	Dark grey very sandy clayey GRAVEL.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	54	54
	Sand	38	38
	Silt	silt+clay =	
	Clay	8	8

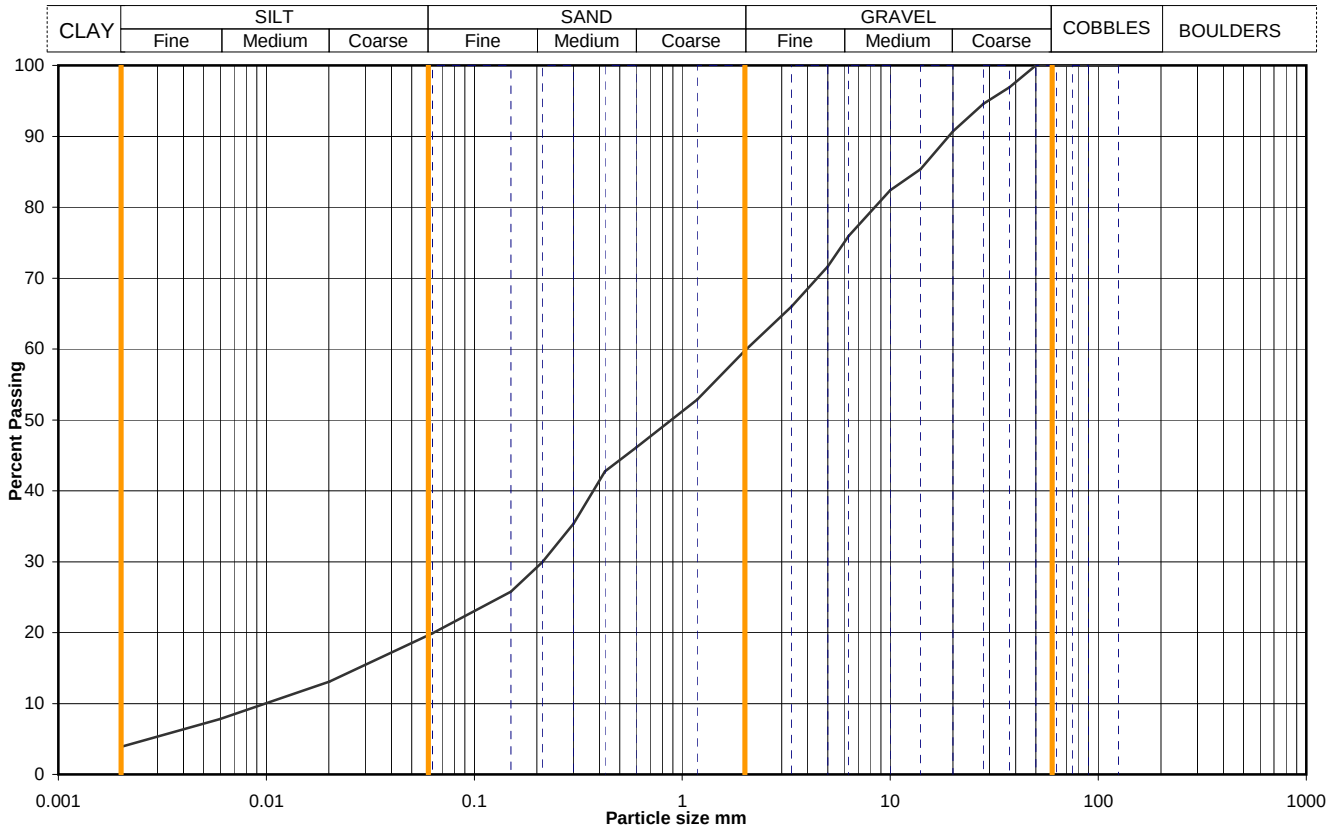
Uniformity Coefficient	D_{60} / D_{10}	25

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 30**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.90		
			Samp No	6	Type	B
			ID	ESGA1077-11201110130000000254		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	13
90	100	0.0060	8
75	100	0.0020	4
63	100		
50	100		
37.5	97		
28	95		
20	91		
14	85		
10	82		
6.3	76		
5.0	72		
3.35	66		
2.00	60		
1.18	53	Particle density, Mg/m3	
0.600	46		
0.425	43	2.65 assumed	
0.300	35	Dry mass of sample, kg	
0.212	30		
0.150	26	10.1	
0.063	20		

Soil description	Grey sandy gravelly SILT.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	40	40
	Sand	40	40
	Silt	16	16
	Clay	4	4

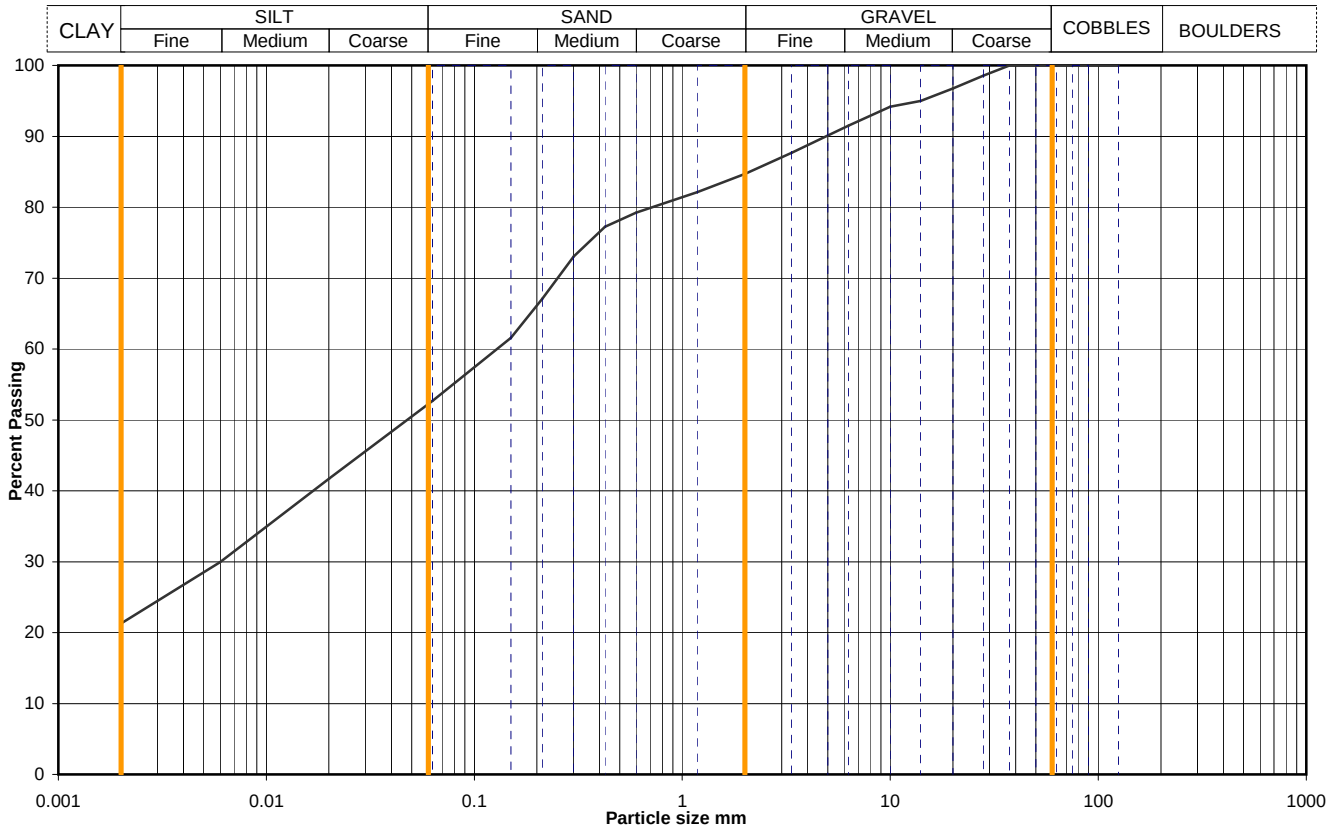
Uniformity Coefficient	D_{60} / D_{10}	206

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 31**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.20		
			Samp No	9	Type	B
			ID	ESGA1077-11201110130000000257		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	42
90	100	0.0060	30
75	100	0.0020	21
63	100		
50	100		
37.5	100		
28	99		
20	97		
14	95		
10	94		
6.3	92		
5.0	90		
3.35	88		
2.00	85		
1.18	82	Particle density, Mg/m3	
0.600	79		
0.425	77	2.65 assumed	
0.300	73	Dry mass of sample, kg	
0.212	67		
0.150	62	7.2	
0.063	53		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	15	15
	Sand	33	33
	Silt	31	31
	Clay	21	21

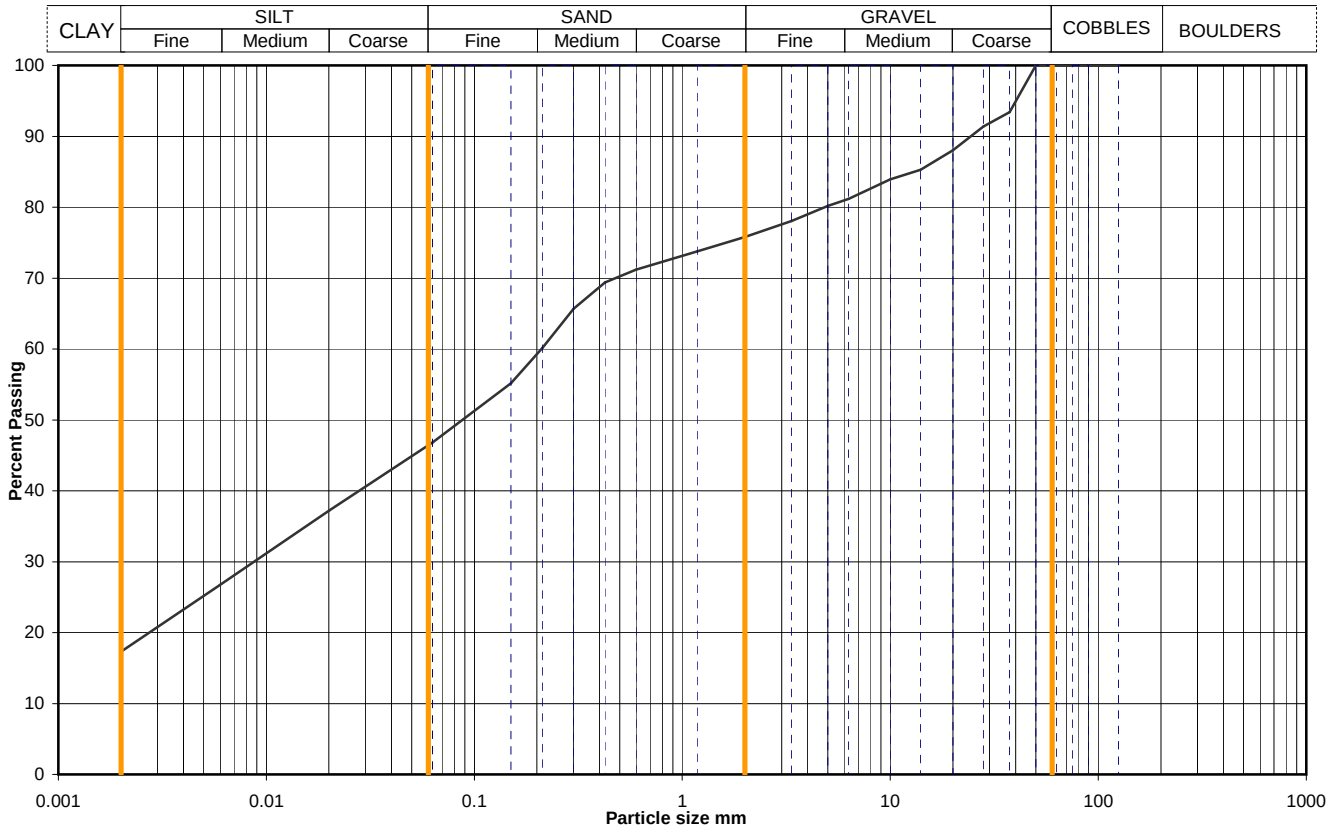
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 32**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	12	Type	B
			ID	ESGA1077-11201110130000000260		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	37
90	100	0.0060	27
75	100	0.0020	17
63	100		
50	100		
37.5	93		
28	91		
20	88		
14	85		
10	84		
6.3	81		
5.0	80		
3.35	78		
2.00	76		
1.18	74	Particle density, Mg/m3	
0.600	71		
0.425	69	2.65 assumed	
0.300	66	Dry mass of sample, kg	
0.212	60		
0.150	55	4.4	
0.063	47		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	24	24
	Sand	29	29
	Silt	29	29
	Clay	18	18

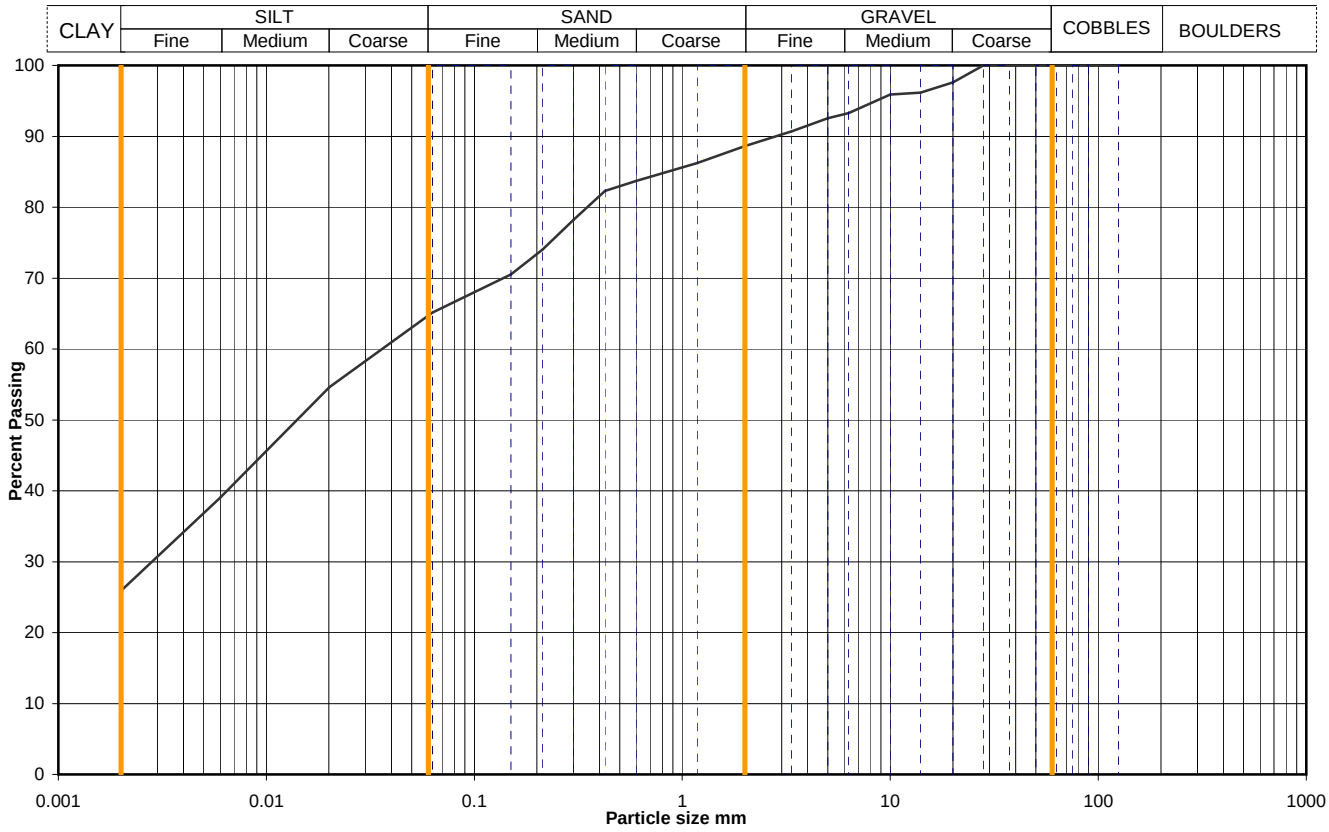
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 33**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.50		
			Samp No	16	Type	B
			ID	ESGA1077-11201110130000000264		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	55
90	100	0.0060	39
75	100	0.0020	26
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	96		
10	96		
6.3	93		
5.0	93		
3.35	91		
2.00	89		
1.18	86	Particle density, Mg/m3	
0.600	84		
0.425	82	2.65 assumed	
0.300	78	Dry mass of sample, kg	
0.212	74		
0.150	71	3.6	
0.063	65		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	11	11
	Sand	24	24
	Silt	39	39
	Clay	26	26

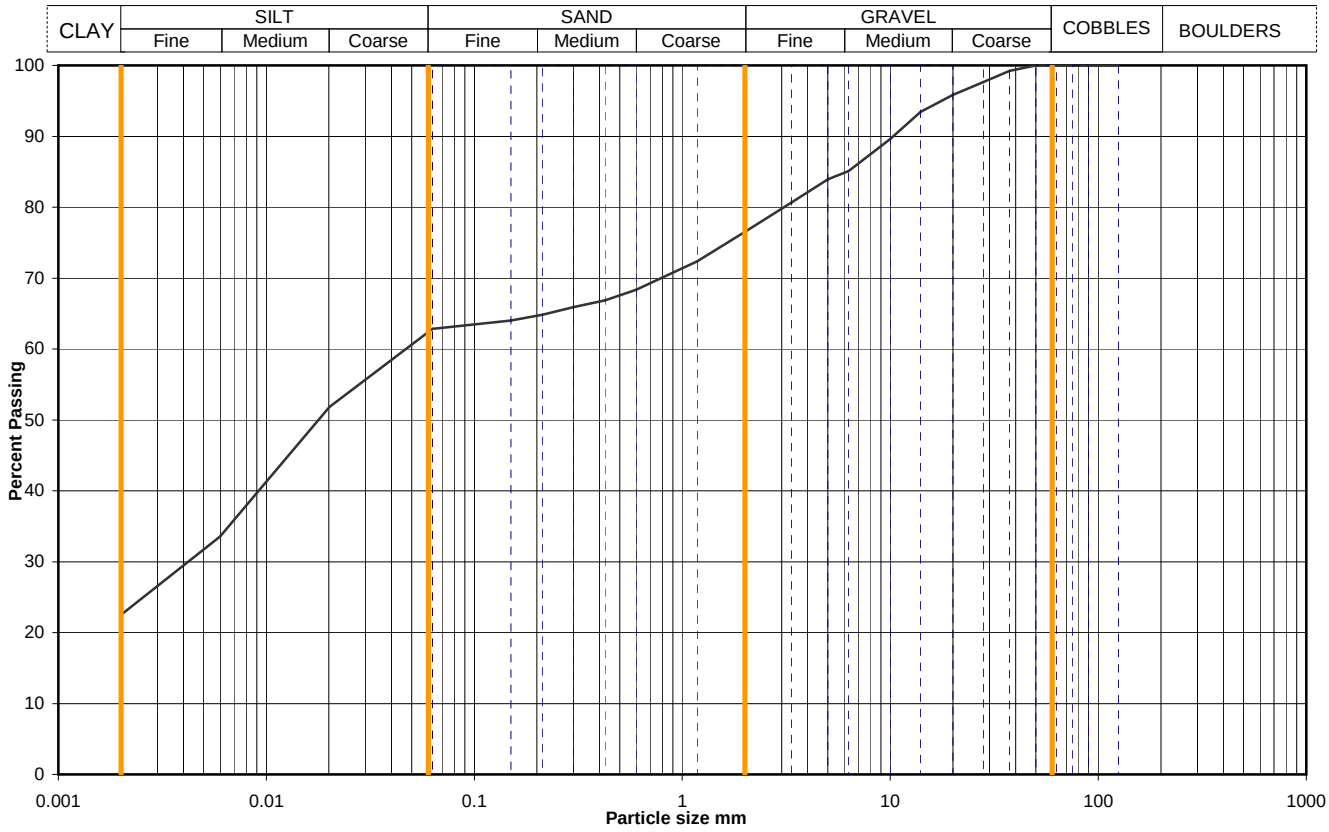
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 34**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	19	Type	B
			ID	ESGA1077-11201110130000000267		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	52
90	100	0.0060	34
75	100	0.0020	22
63	100		
50	100		
37.5	99		
28	98		
20	96		
14	93		
10	90		
6.3	85		
5.0	84		
3.35	81		
2.00	77		
1.18	72	Particle density, Mg/m3	
0.600	68		
0.425	67	2.65 assumed	
0.300	66	Dry mass of sample, kg	
0.212	65		
0.150	64	12.1	
0.063	63		

Soil description	Brownish grey slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	23	23
	Sand	14	14
	Silt	40	40
	Clay	23	23

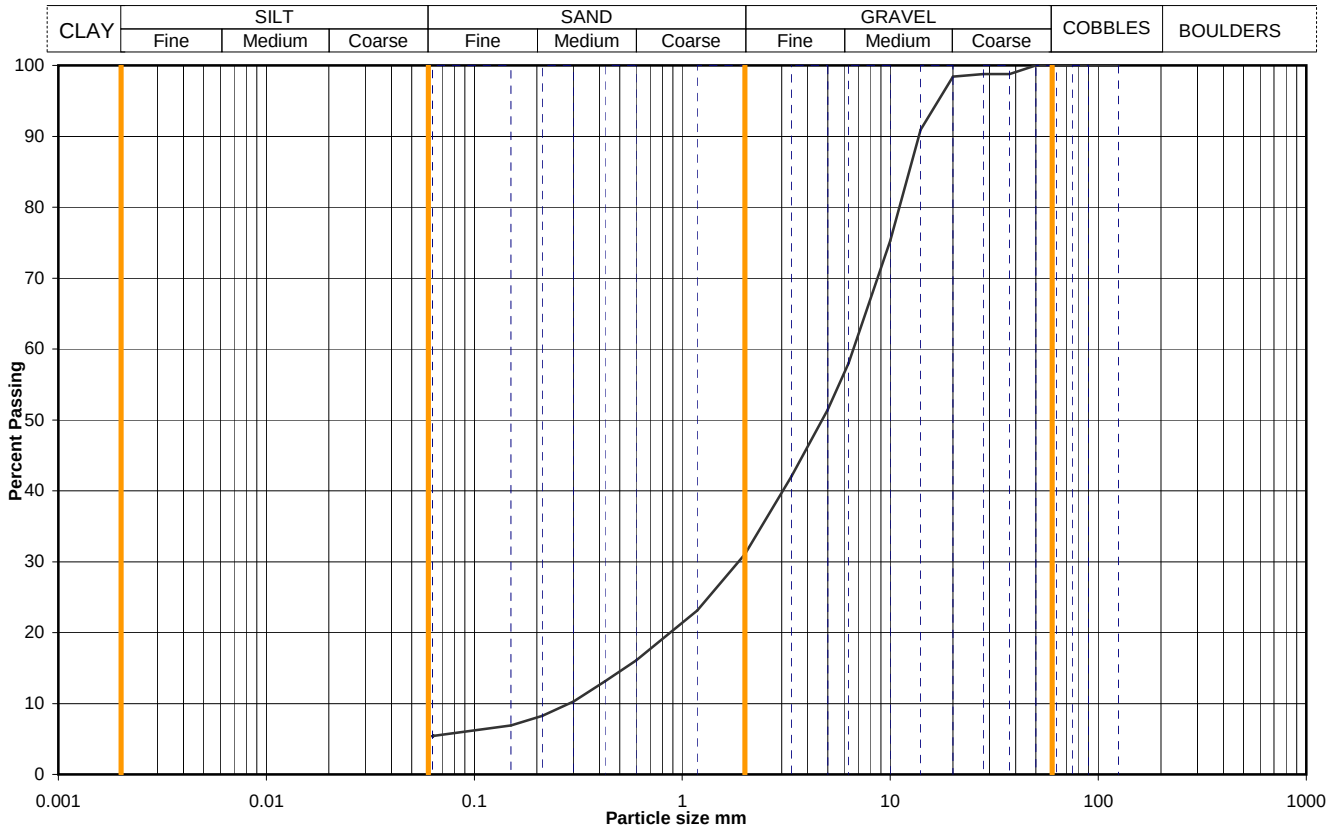
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 35**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH6		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.10		
			Samp No	2	Type	B
			ID	ESGA1077-11201110110000000207		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	99		
28	99		
20	98		
14	91		
10	75		
6.3	58		
5.0	51		
3.35	42		
2.00	31		
1.18	23		
0.600	16		
0.425	13		
0.300	10	Dry mass of sample, kg	
0.212	8		
0.150	7	15.4	
0.063	5		

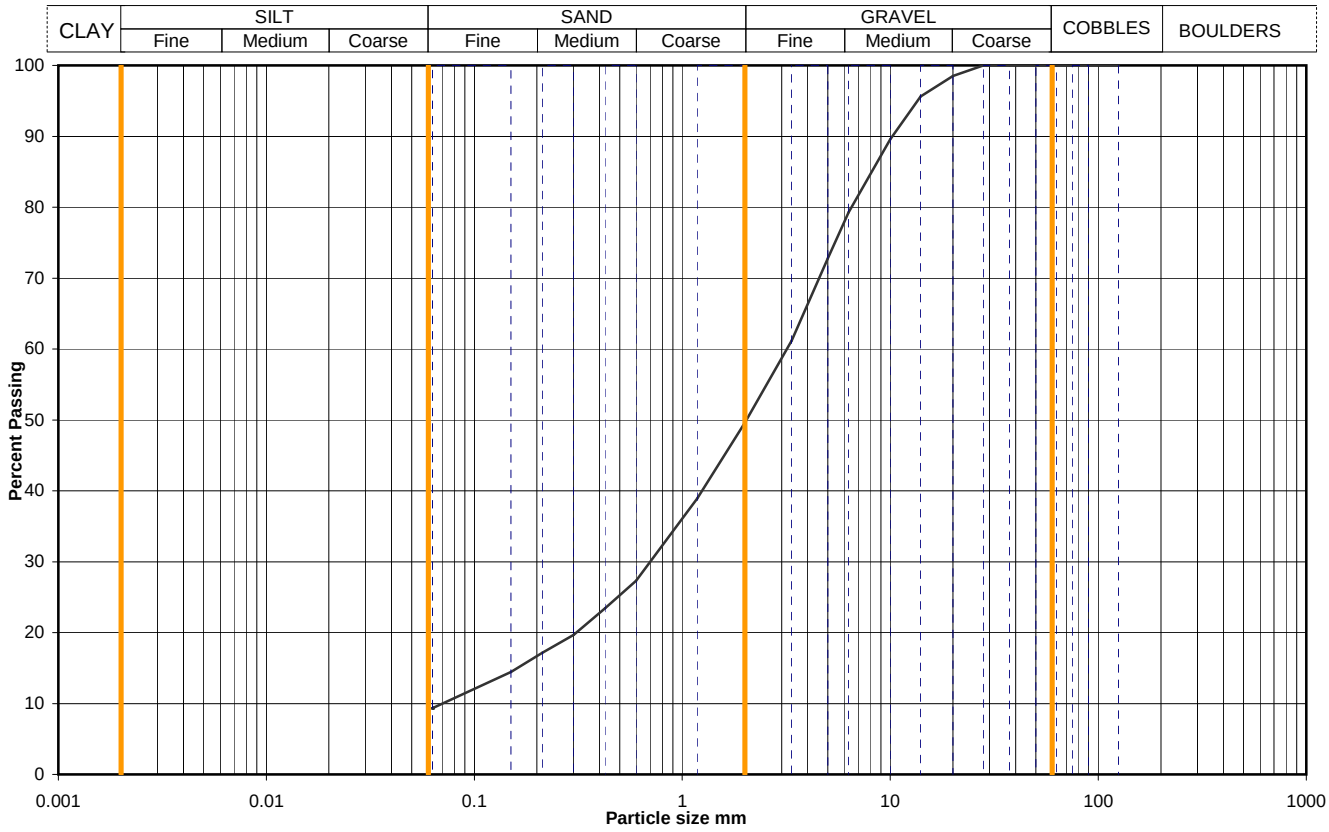
Soil description	Dark grey very sandy GRAVEL.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	69	69
	Sand	26	26
	Silt	silt+clay =	
	Clay	5	5

Uniformity Coefficient	D_{60} / D_{10}	23

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH6		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.40		
			Samp No	4	Type	B
			ID	ESGA1077-11201110110000000209		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	96		
10	90		
6.3	79		
5.0	73		
3.35	61		
2.00	50		
1.18	39		
0.600	27		
0.425	23		
0.300	20	Dry mass of sample, kg	
0.212	17		
0.150	14	13.2	
0.063	9		

Soil description	Grey silty very sandy GRAVEL.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	50	50
	Sand	40	40
	Silt	silt+clay =	
	Clay	10	10

Uniformity Coefficient	D_{60} / D_{10}	45

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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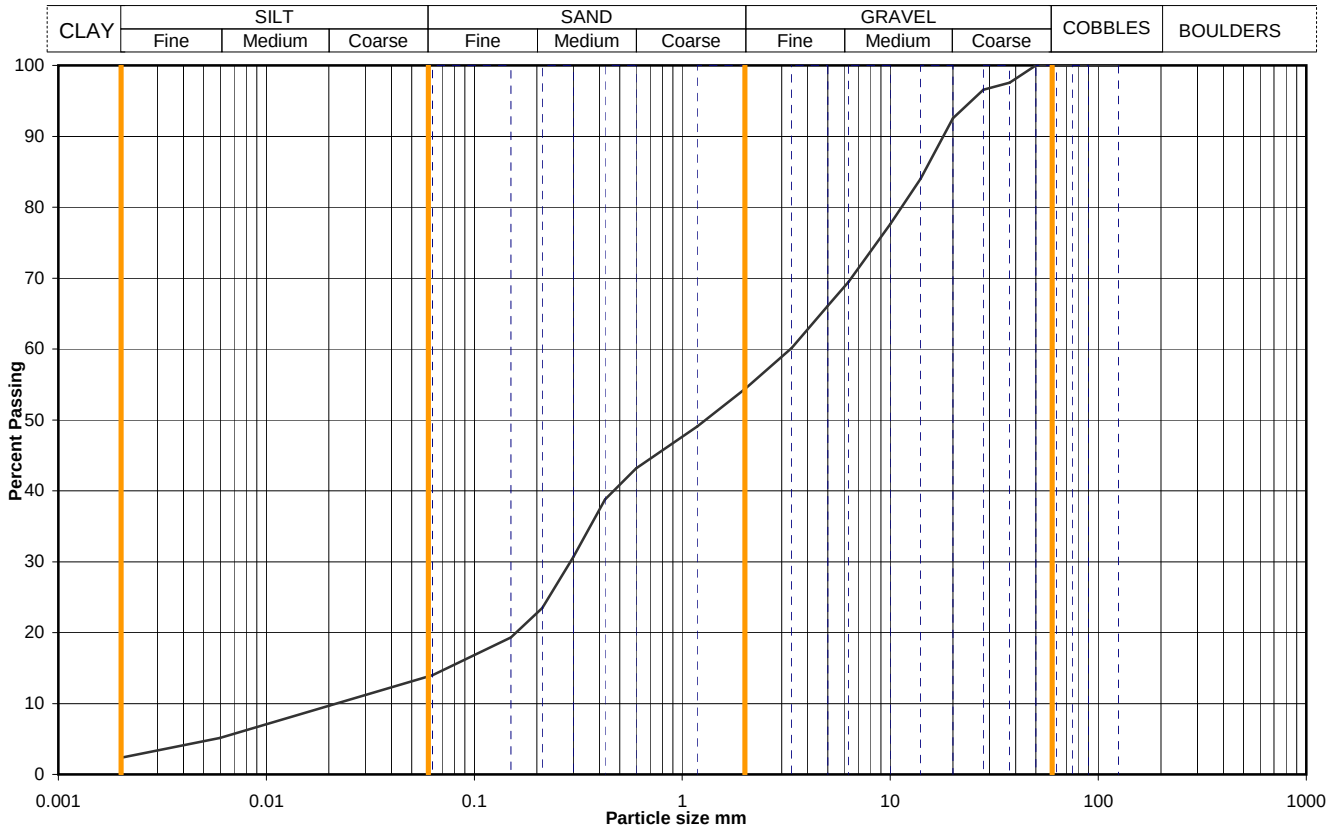
Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH6		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.80		
			Samp No	6	Type	B
			ID	ESGA1077-11201110110000000211		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	10
90	100	0.0060	5
75	100	0.0020	2
63	100		
50	100		
37.5	98		
28	97		
20	93		
14	84		
10	78		
6.3	69		
5.0	66		
3.35	60		
2.00	54		
1.18	49	Particle density, Mg/m3	
0.600	43		
0.425	39	2.65 assumed	
0.300	31	Dry mass of sample, kg	
0.212	23		
0.150	19	5.1	
0.063	14		

Soil description	Dark grey sandy gravelly SILT.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	46	46
	Sand	41	41
	Silt	11	11
	Clay	2	2

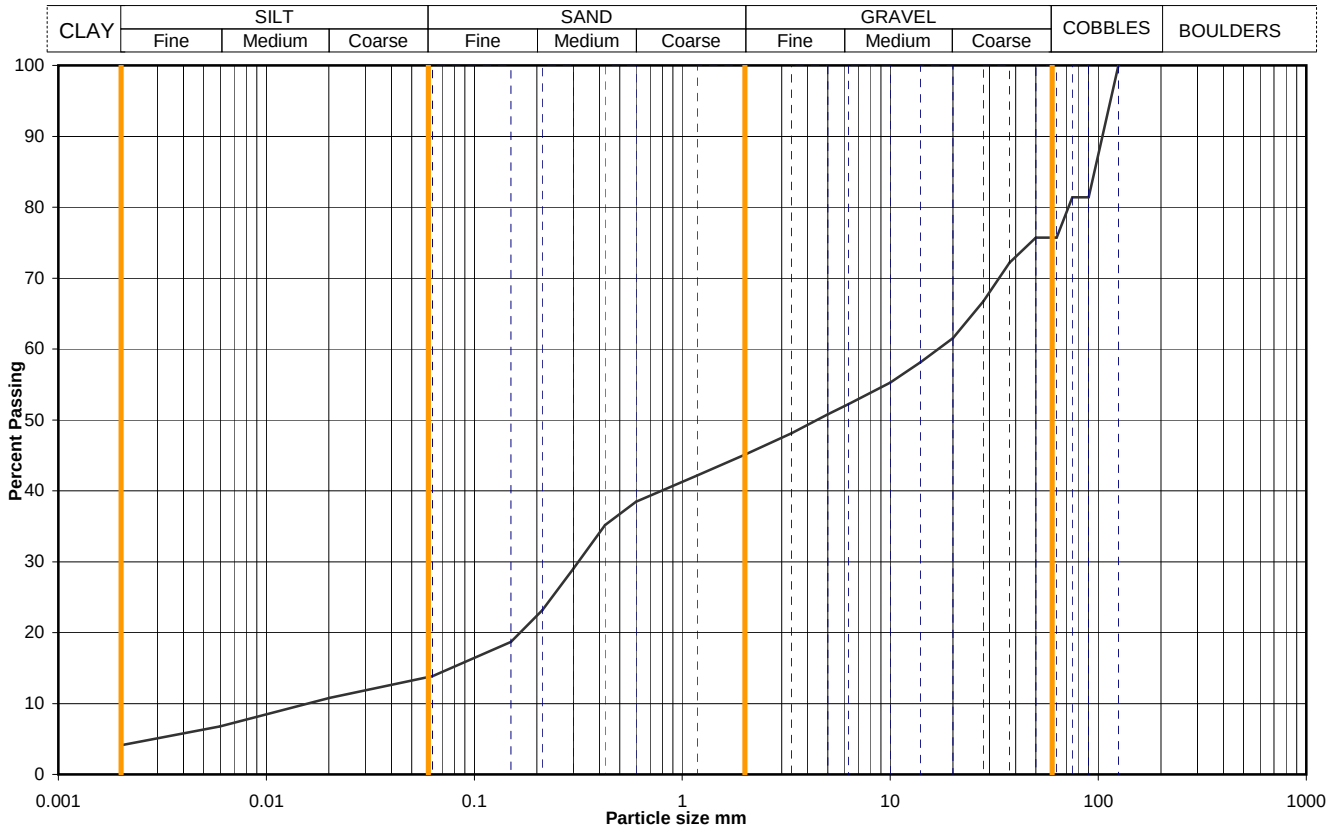
Uniformity Coefficient	D_{60} / D_{10}	152

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 38**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH6		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.20		
			Samp No	9	Type	B
			ID	ESGA1077-11201110110000000215		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	11
90	81	0.0060	7
75	81	0.0020	4
63	76		
50	76		
37.5	72		
28	67		
20	62		
14	58		
10	55		
6.3	52		
5.0	51		
3.35	48		
2.00	45		
1.18	42	Particle density, Mg/m3	
0.600	38		
0.425	35	2.65 assumed	
0.300	29	Dry mass of sample, kg	
0.212	23		
0.150	19	7.5	
0.063	14		

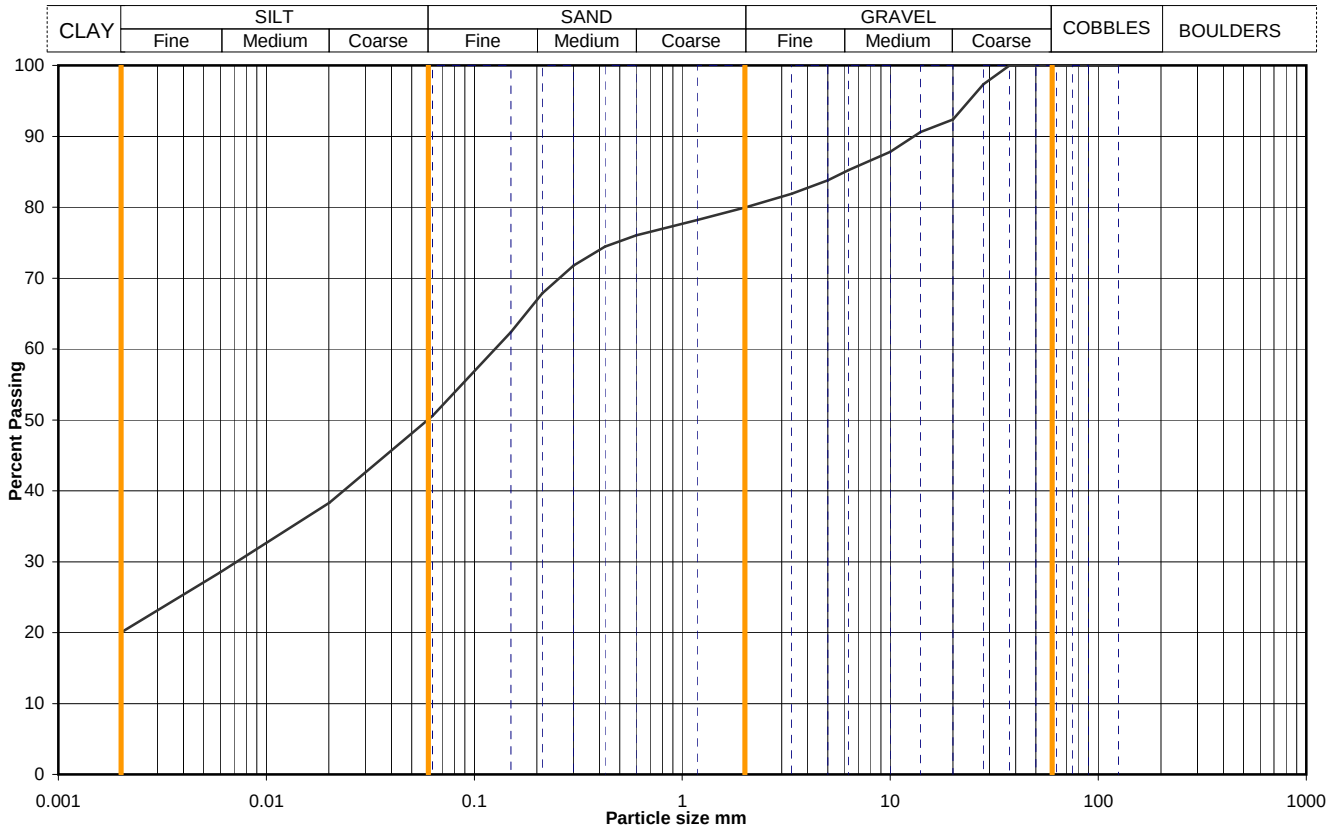
Soil description	Brown slightly sandy slightly gravelly CLAY with 2 cobbles.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	24	0
	Gravel	31	41
	Sand	31	41
	Silt	10	13
	Clay	4	5

Uniformity Coefficient	D_{60} / D_{10}	1068

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH6		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	12	Type	B
			ID	ESGA1077-11201110110000000219		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	38
90	100	0.0060	29
75	100	0.0020	20
63	100		
50	100		
37.5	100		
28	97		
20	92		
14	91		
10	88		
6.3	85		
5.0	84		
3.35	82		
2.00	80		
1.18	78	Particle density, Mg/m3	
0.600	76		
0.425	74	2.65 assumed	
0.300	72	Dry mass of sample, kg	
0.212	68		
0.150	62	4.2	
0.063	51		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	20	20
	Sand	30	30
	Silt	30	30
	Clay	20	20

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

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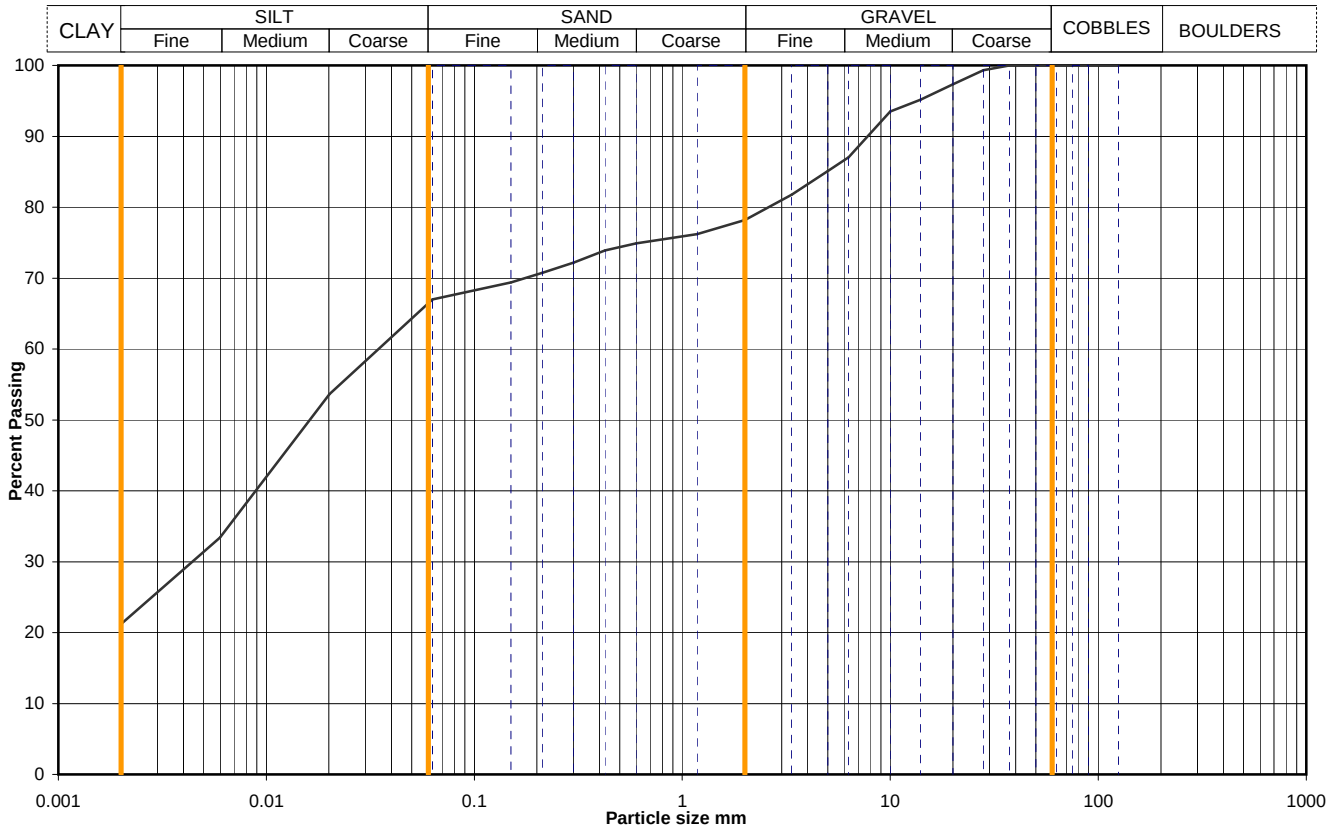
Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH6		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.50		
			Samp No	16	Type	B
			ID	ESGA1077-11201110110000000223		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	54
90	100	0.0060	33
75	100	0.0020	21
63	100		
50	100		
37.5	100		
28	99		
20	97		
14	95		
10	93		
6.3	87		
5.0	85		
3.35	82		
2.00	78		
1.18	76	Particle density, Mg/m3	
0.600	75		
0.425	74	2.65 assumed	
0.300	72	Dry mass of sample, kg	
0.212	71		
0.150	69	5.5	
0.063	67		

Soil description	Grey slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	22	22
	Sand	12	12
	Silt	45	45
	Clay	21	21

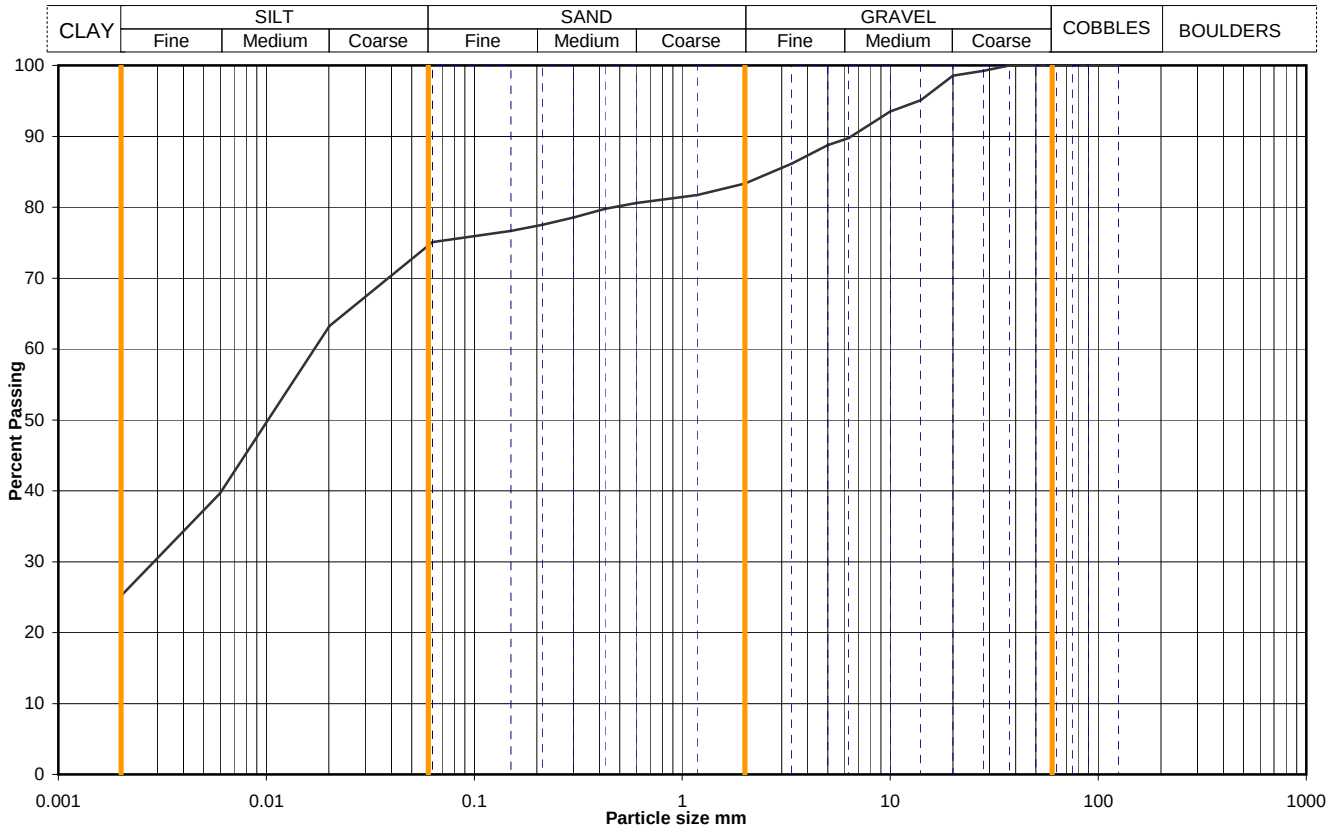
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 41**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	BH6		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	19	Type	B
			ID	ESGA1077-11201110110000000226		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	63
90	100	0.0060	40
75	100	0.0020	25
63	100		
50	100		
37.5	100		
28	99		
20	99		
14	95		
10	94		
6.3	90		
5.0	89		
3.35	86		
2.00	83		
1.18	82	Particle density, Mg/m3	
0.600	81		
0.425	80	2.65 assumed	
0.300	79	Dry mass of sample, kg	
0.212	78		
0.150	77	12.1	
0.063	75		

Soil description	Grey slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	17	17
	Sand	9	9
	Silt	49	49
	Clay	25	25

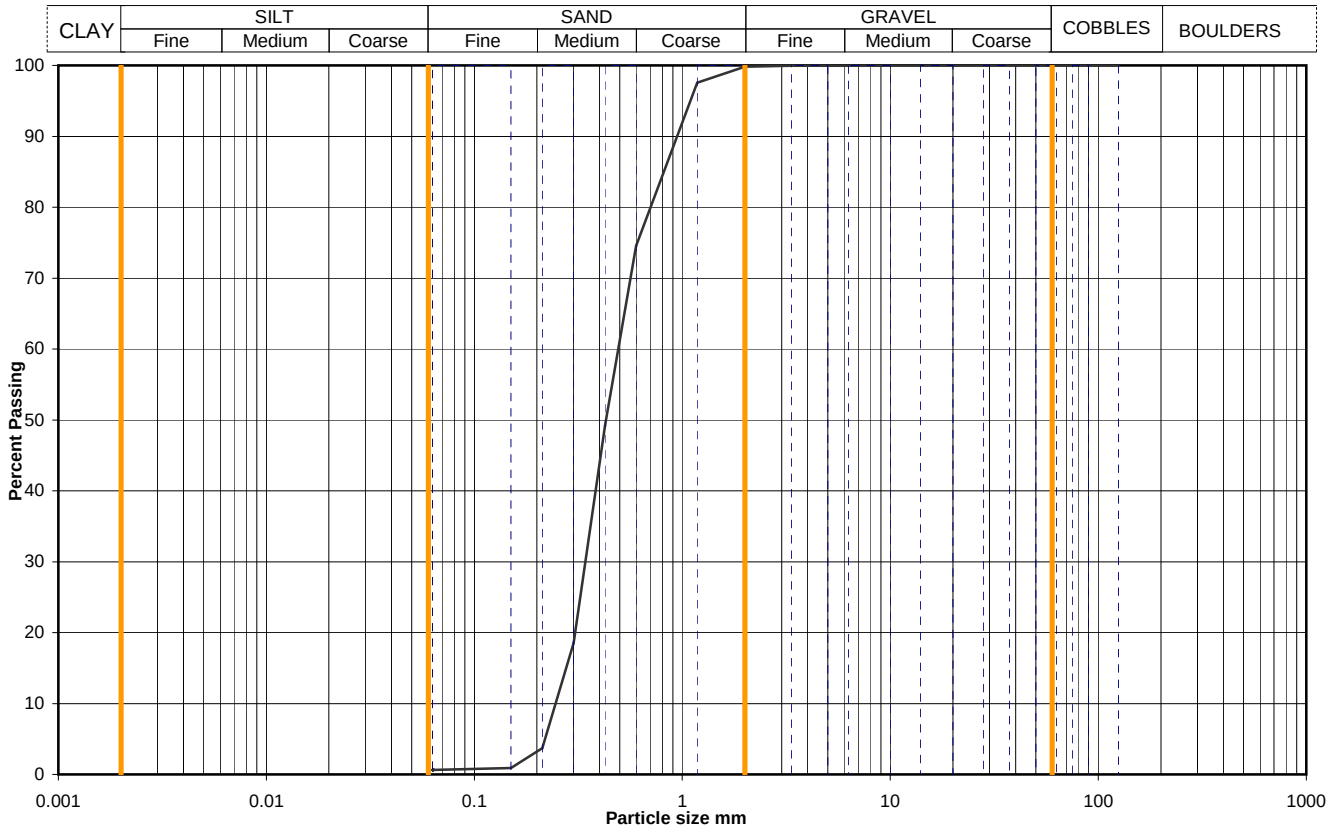
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 42**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	WS1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.30		
			Samp No	2	Type	B
			ID	ESGA1077-11201110130000000229		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	98		
0.600	75		
0.425	49		
0.300	19	Dry mass of sample, kg	
0.212	4		
0.150	1	3.0	
0.063	1		

Soil description	Brown SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	99	99
	Silt	silt+clay =	
	Clay	1	1

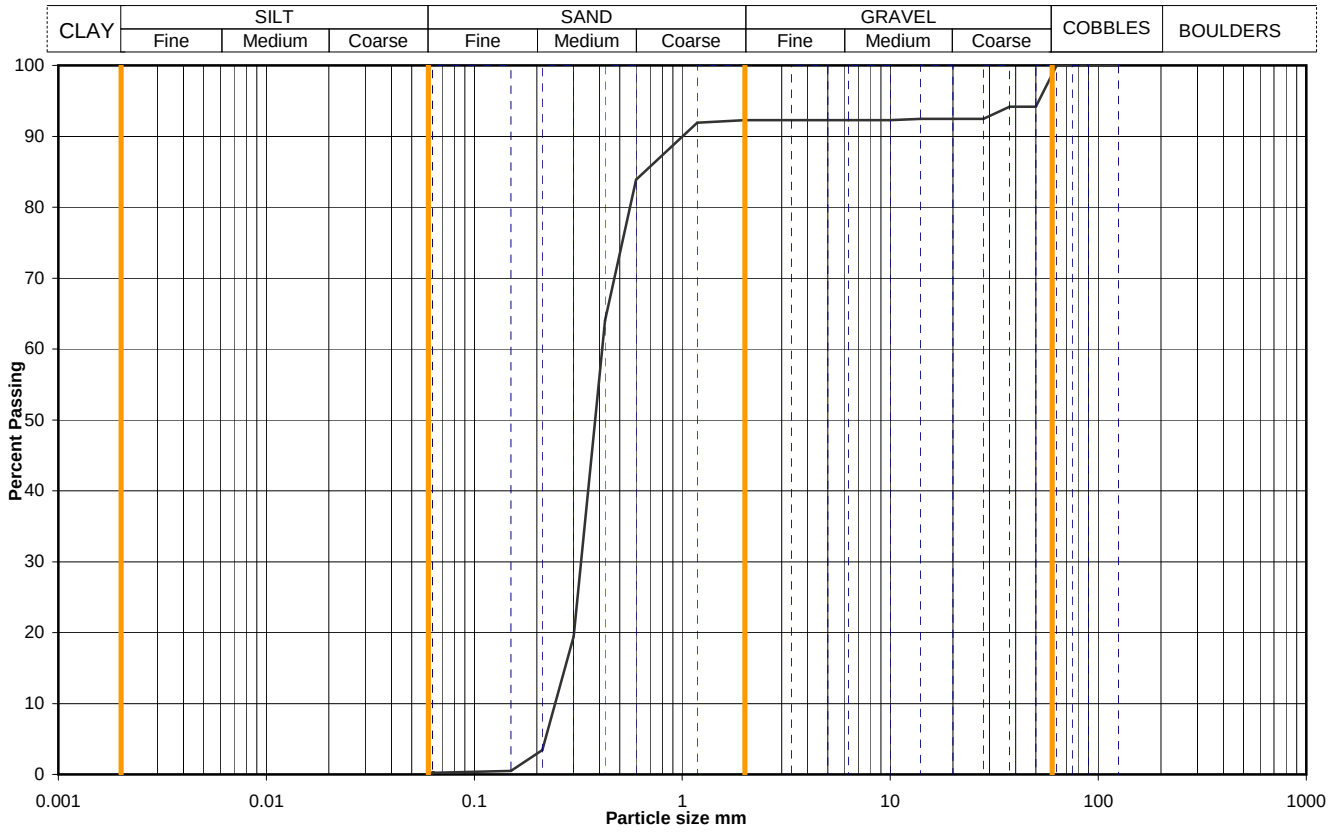
Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 43**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	WS2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.30		
			Samp No	2	Type	B
			ID	ESGA1077-11201110130000000270		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	94		
37.5	94		
28	92		
20	92		
14	92		
10	92		
6.3	92		
5.0	92		
3.35	92		
2.00	92		
1.18	92		
0.600	84		
0.425	64		
0.300	19	Dry mass of sample, kg	
0.212	3		
0.150	0	4.8	
0.063	0		

Soil description	Brownish grey gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	1	0
	Gravel	7	7
	Sand	92	93
	Silt	silt+clay =	
	Clay	0	0

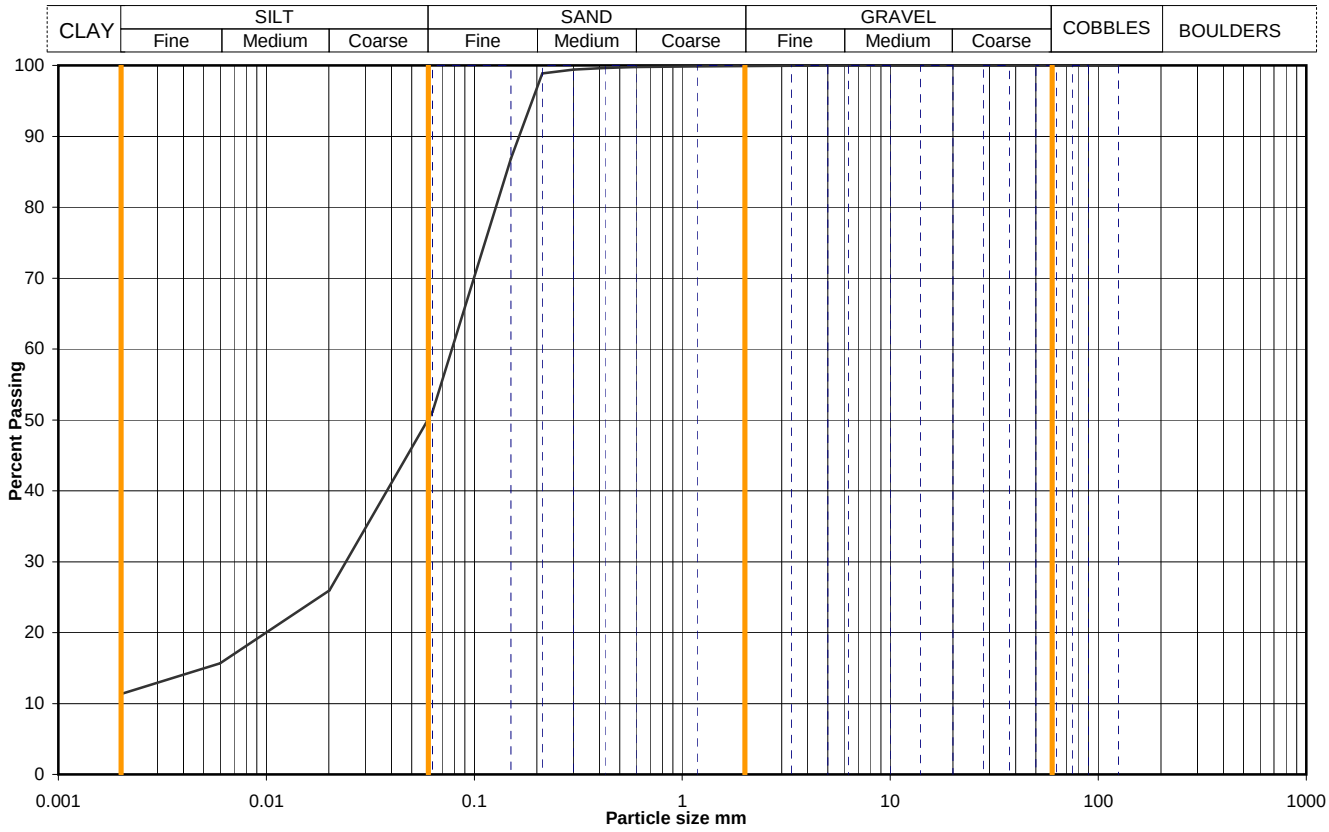
Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 44**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	WS2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.80		
			Samp No	7	Type	D
			ID	ESGA1077-11201110130000000275		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	26
90	100	0.0060	16
75	100	0.0020	11
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	100	Particle density, Mg/m3	
0.600	100		
0.425	100	2.65 assumed	
0.300	99	Dry mass of sample, kg	
0.212	99		
0.150	87	1.1	
0.063	51		

Soil description	Grey sandy clayey SILT.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	50	50
	Silt	39	39
	Clay	11	11

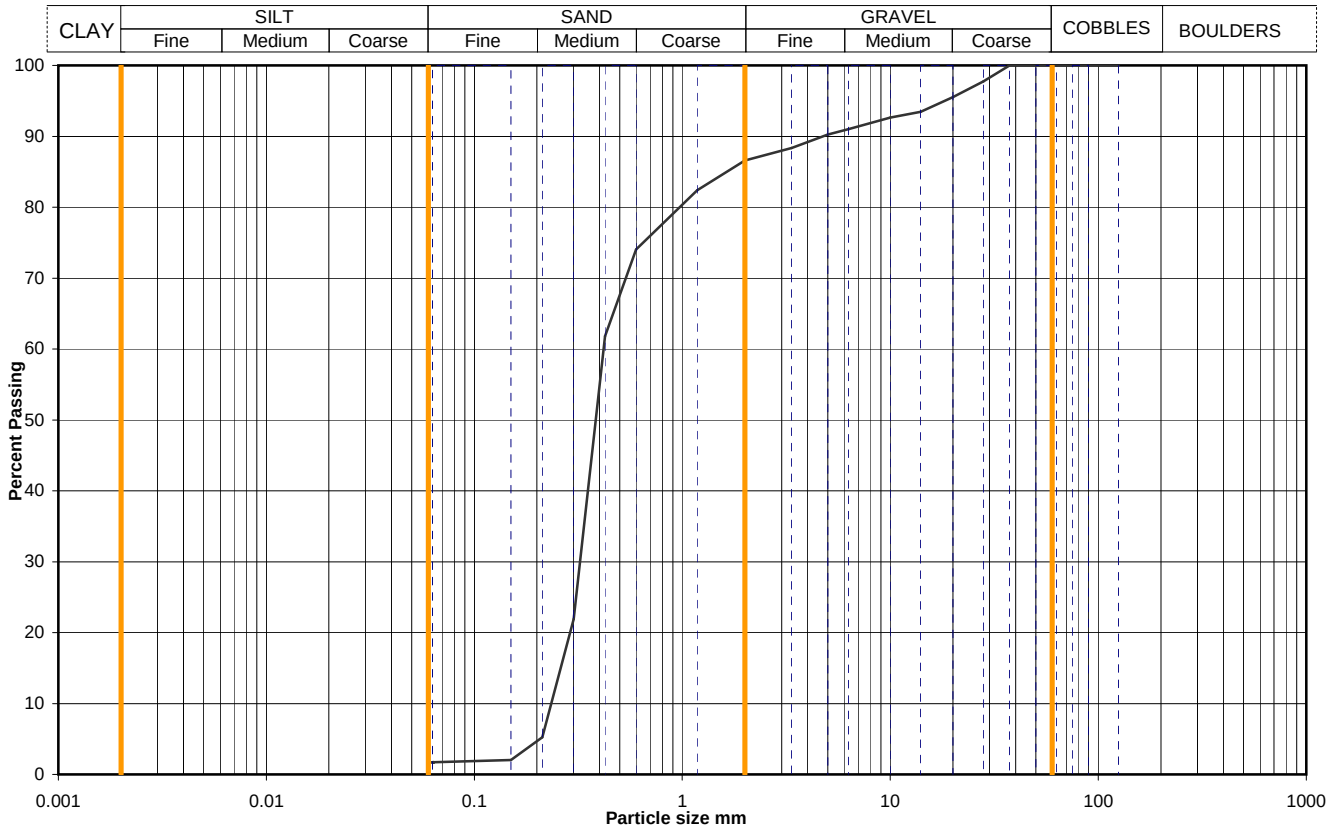
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 45**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	WS3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.30		
			Samp No	2	Type	B
			ID	ESGA1077-11201110130000000232		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	98		
20	96		
14	93		
10	93		
6.3	91		
5.0	90		
3.35	88		
2.00	87		
1.18	82		
0.600	74		
0.425	62		
0.300	22	Dry mass of sample, kg	
0.212	5	6.7	
0.150	2		
0.063	2		

Soil description	Brown gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	13	13
	Sand	85	85
	Silt	silt+clay =	
	Clay	2	2

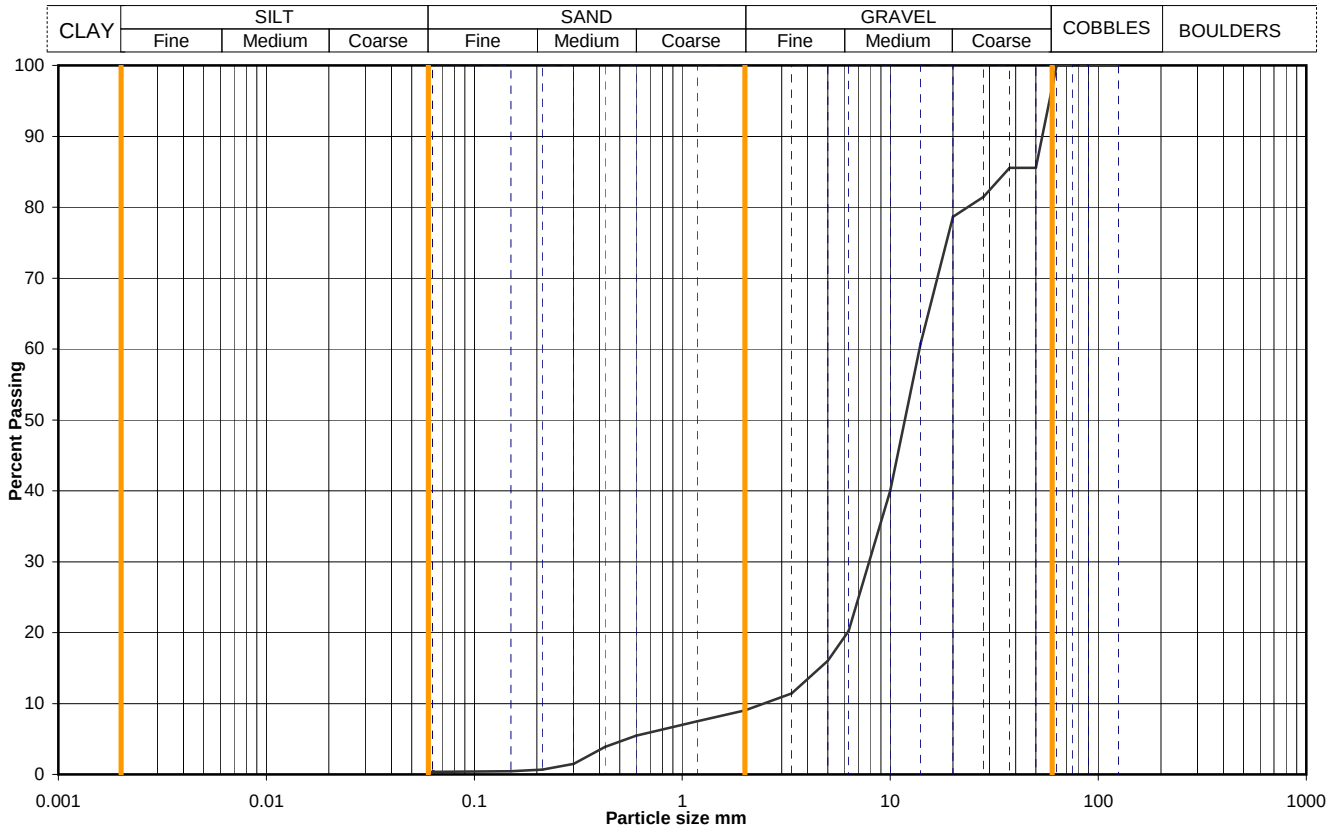
Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:31	**Figure** **PSD 46**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	WS3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.80		
			Samp No	4	Type	D
			ID	ESGA1077-11201110130000000234		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	86		
37.5	86		
28	81		
20	79		
14	61		
10	40		
6.3	20		
5.0	16		
3.35	11		
2.00	9		
1.18	8		
0.600	5		
0.425	4		
0.300	1	Dry mass of sample, kg	
0.212	1	1.8	
0.150	0		
0.063	0		

Soil description	Brownish grey sandy GRAVEL.		
Preparation / Pretreatment	Sieve: pre dried,		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	3	0
	Gravel	88	91
	Sand	9	9
	Silt	silt+clay =	
	Clay	0	0

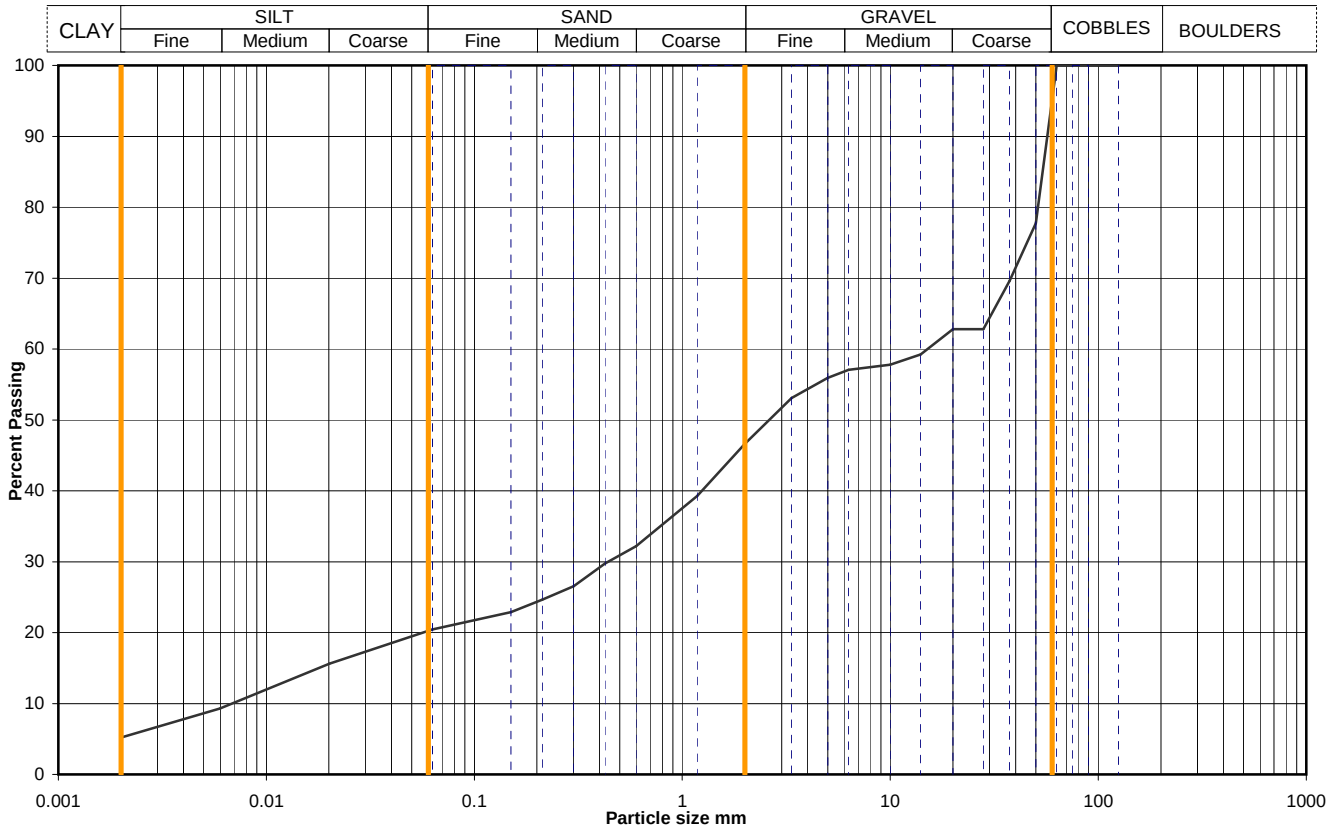
Uniformity Coefficient	D_{60} / D_{10}	6

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:24/11/2011 10:01	**Figure** **PSD 47**

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	WS3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.50		
			Samp No	5	Type	D
			ID	ESGA1077-11201110130000000235		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	16
90	100	0.0060	9
75	100	0.0020	5
63	100		
50	78		
37.5	70		
28	63		
20	63		
14	59		
10	58		
6.3	57		
5.0	56		
3.35	53		
2.00	47		
1.18	39	Particle density, Mg/m3	
0.600	32		
0.425	30	2.65 assumed	
0.300	27	Dry mass of sample, kg	
0.212	25		
0.150	23	1.0	
0.063	20		

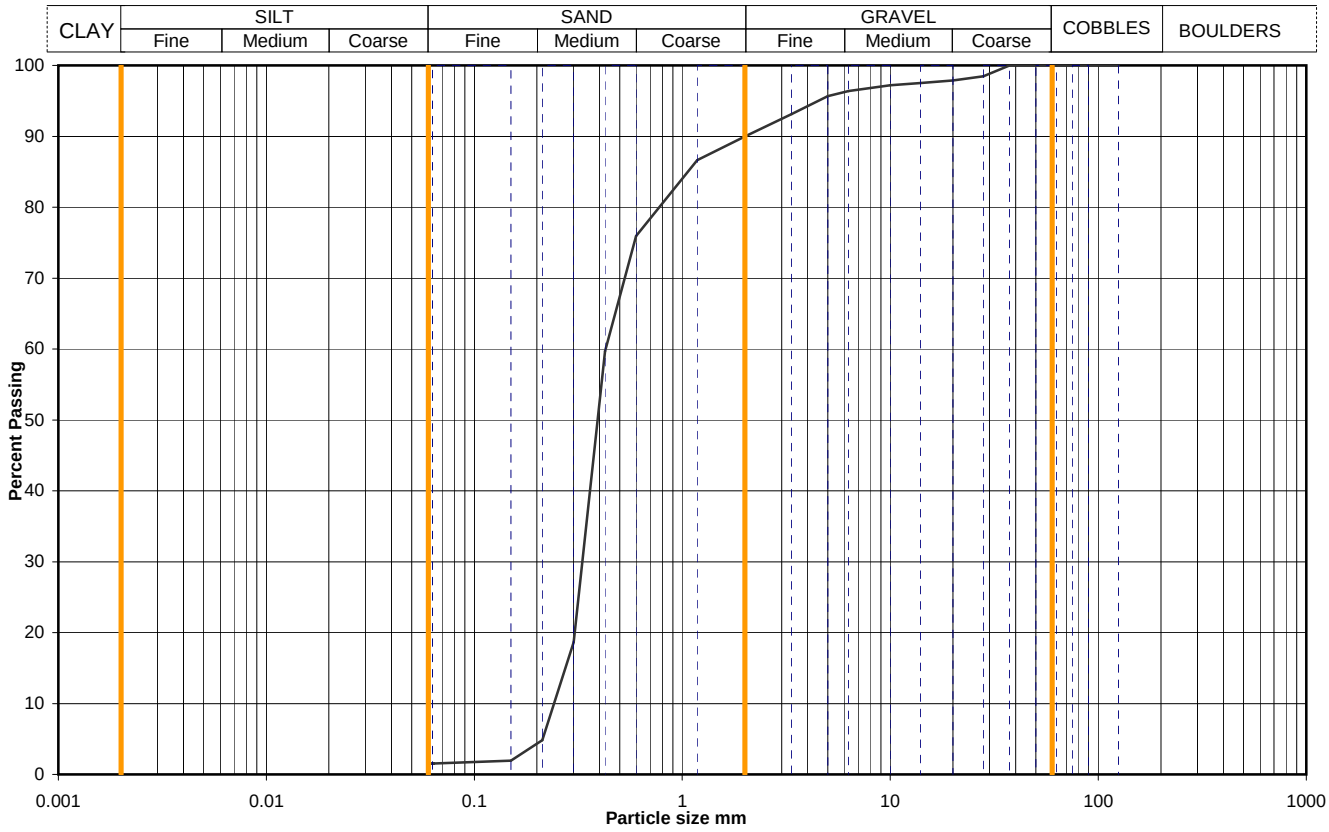
Soil description	Brownish grey slightly sandy gravelly CLAY.		
Preparation / Pretreatment	Sieve: pre dried, Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	5	0
	Gravel	48	51
	Sand	26	27
	Silt	15	16
	Clay	6	6

Uniformity Coefficient	D_{60} / D_{10}	2203

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	WS5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.60		
			Samp No	3	Type	B
			ID	ESGA1077-11201110130000000241		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	98		
20	98		
14	97		
10	97		
6.3	96		
5.0	96		
3.35	93		
2.00	90		
1.18	87		
0.600	76		
0.425	60		
0.300	19	Dry mass of sample, kg	
0.212	5		
0.150	2	3.7	
0.063	2		

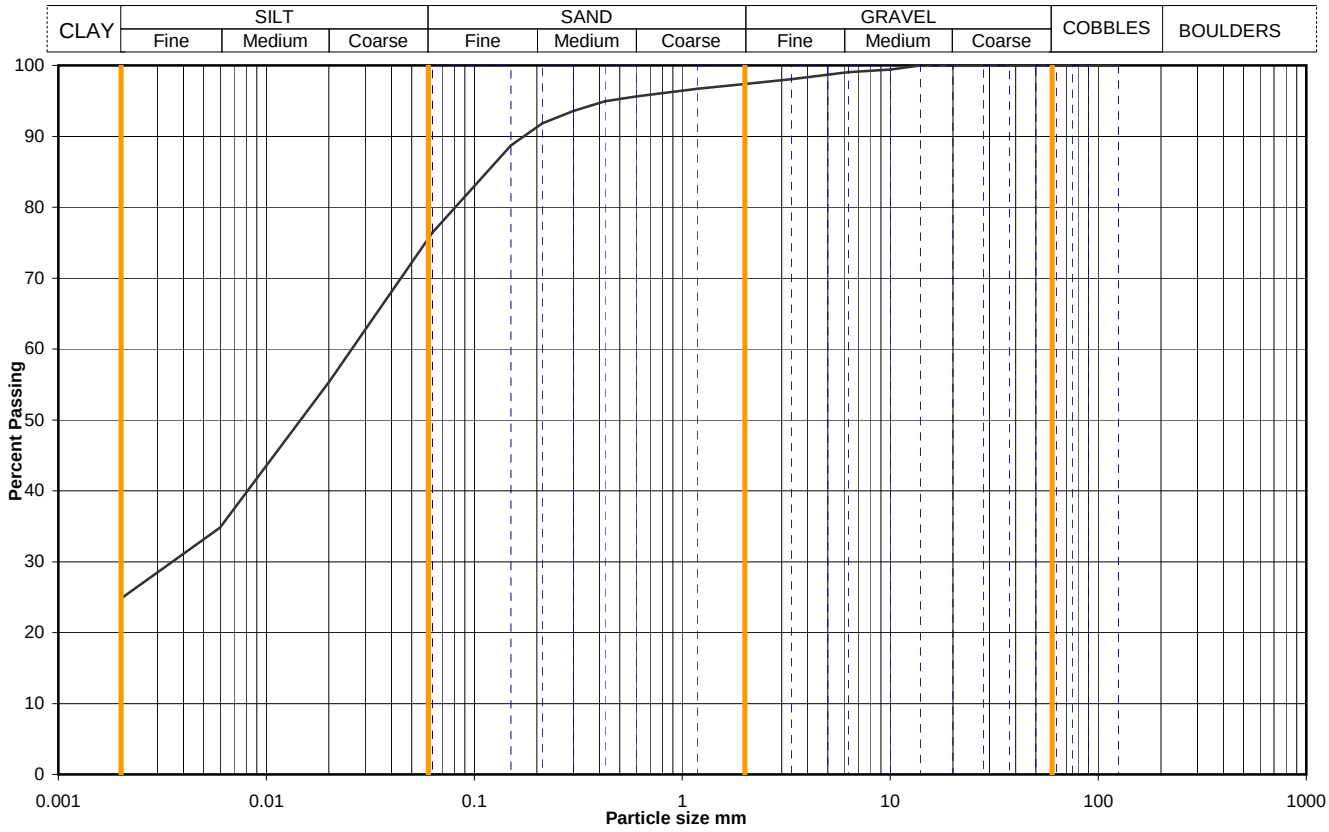
Soil description	Brown gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	10	10
	Sand	88	88
	Silt	silt+clay =	
	Clay	2	2

Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

Particle Size Distribution Analysis

Project No	A1077-11	Sample Details:	Hole No	WS5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00		
			Samp No	6	Type	D
			ID	ESGA1077-11201110130000000245		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	55
90	100	0.0060	35
75	100	0.0020	25
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	99		
5.0	99		
3.35	98		
2.00	97		
1.18	97	Particle density, Mg/m3	
0.600	96		
0.425	95	2.65 assumed	
0.300	94	Dry mass of sample, kg	
0.212	92		
0.150	89	1.0	
0.063	76		

Soil description	Brown slightly sandy slightly gravelly CLAY.		
Preparation / Pretreatment	Sieve: natural material Pipette: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<60mm
	Cobbles / boulders	0	0
	Gravel	3	3
	Sand	22	22
	Silt	50	50
	Clay	25	25

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.4 pipette

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TESTS WITHOUT MEASUREMENT OF PORE PRESSURE - SUMMARY OF RESULTS

Project No	Project Name
A1077-11	SANDSEND BOREHOLES, NORTH YORKSHIRE

Hole No.	Sample No.	Depth (m) from	Depth (m) to	type	Soil Description	Density bulk Mg/m³	Density dry Mg/m³	*w* %	Test type	Dia. mm	$\acute{o}_3$ kPa	At failure / end of stage: Axial strain %	$\acute{o}_1 - \acute{o}_3$ kPa	c_u kPa	MODE	Remarks
BH1	9	3.00	3.45	U	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.	2.18	1.89	15	UUM	102.6	50	5.9	115	58	P	
										102.6	70	7.9	127	64		
										102.6	90	19.7	154	77		
BH1	25	9.50	9.95	U	Firm to stiff brown slightly sandy slightly gravelly CLAY.	2.24	1.95	15	UUM	101.1	140	6.4	109	54	P	
										101.1	200	8.8	123	62		
										101.1	250	19.2	148	74		
BH1	45	17.00	17.45	U	Stiff brown slightly sandy slightly gravelly CLAY.	2.18	1.86	17	UUM	101.9	240	12.3	300	150	P	
										101.9	350	14.3	312	156		
										101.9	430	18.8	324	162		
BH1	56	21.00	21.45	U	Stiff to very stiff brown slightly sandy slightly gravelly CLAY.	2.20	1.94	13	UUM	102.6	300		385	193	P	20% axial strain achieved at 300kPa
										102.6	430	19.6	0	0		
										102.6	530		0	0		
BH2	8	3.00	3.45	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.	2.16	1.90	14	UUM	102.4	50	10.4	350	175	P	
										102.4	70	14.3	378	189		
										102.4	90	19.7	397	199		
BH2	16	7.00	7.45	U	Stiff brown slightly sandy slightly gravelly CLAY.	2.15	1.87	15	UUM	101.9	105	9.8	175	88	C	
										101.9	150	12.3	188	94		
										101.9	180	19.2	202	101		
BH2	34	16.00	16.45	U	Stiff brown slightly sandy slightly gravelly CLAY.	2.11	1.74	21	UUM	102.7	230	7.9	148	74	C	
										102.7	330	9.9	160	80		
										102.7	410	12.4	169	84		
BH2	47	21.00	21.45	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.	2.13	1.87	14	UUM	102.3	300	16.7	277	139	P	20% axial strain achieved at 430kPa
										102.3	430	19.7	297	148		
										102.3						
BH2	53	24.00	24.45	U	Stiff brown slightly sandy slightly gravelly CLAY.	2.16	1.90	14	UUM	101.6	340	16.8	366	183	P	20% axial strain achieved at 490kPa
										101.6	490	19.7	385	193		
										101.6	600		0	0		
BH3	8	2.50	2.95	U	Firm to very stiff brown slightly sandy slightly gravelly CLAY.	2.15	1.85	16	UUM	102.3	40	9.9	371	186	C	
										102.3	60	12.9	392	196		
										102.3	75	19.3	408	204		
BH3	16	5.50	5.95	U	Firm brown slightly sandy slightly gravelly CLAY.	2.17	1.86	17	UUM	103.2	85	4.9	83	41	P	
										103.2	120	6.4	92	46		
										103.2	150	19.8	124	62		
BH3	39	14.50	14.95	U	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.	2.21	1.95	14	UUM	103.1	150		270	135	P	20% axial strain achieved at 150kPa
										103.1	185	19.7	0	0		
										103.1	205		0	0		
BH3	51	19.00	19.45	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.	2.23	1.97	13	UUM	102.7	270		461	231	P	20% axial strain achieved at 270kPa
										102.7	390	19.7	0	0		
										102.7	485		0	0		

General notes: Tests carried out in accordance with BS1377: Part 7: 1990, clause 8 for single stage, clause 9 for multistage tests. Specimens nominally 2:1 height diameter ratio and tested at a rate of strain of 2%/minute, unless annotated otherwise. See individual test reports for further details.

Legend					
	UU - single stage test (may be in sets of specimens)	$\acute{o}_3$	cell pressure	Mode of failure	P plastic
	UUM - multistage test on a single specimen	$\acute{o}_1 - \acute{o}_3$	deviator stress		B brittle
	suffix R - remoulded or recompacted	c_u	undrained shear strength		C compound

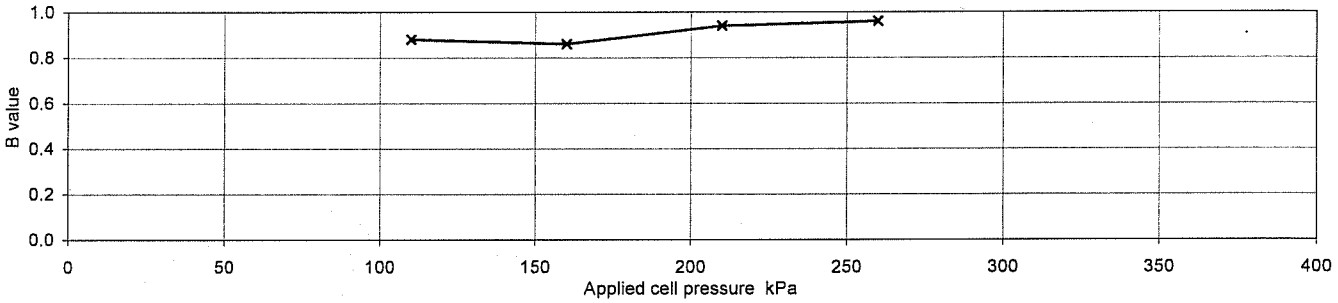
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	5.00-5.45		
			No	13	Type	U
			ID			
			Spec Ref			

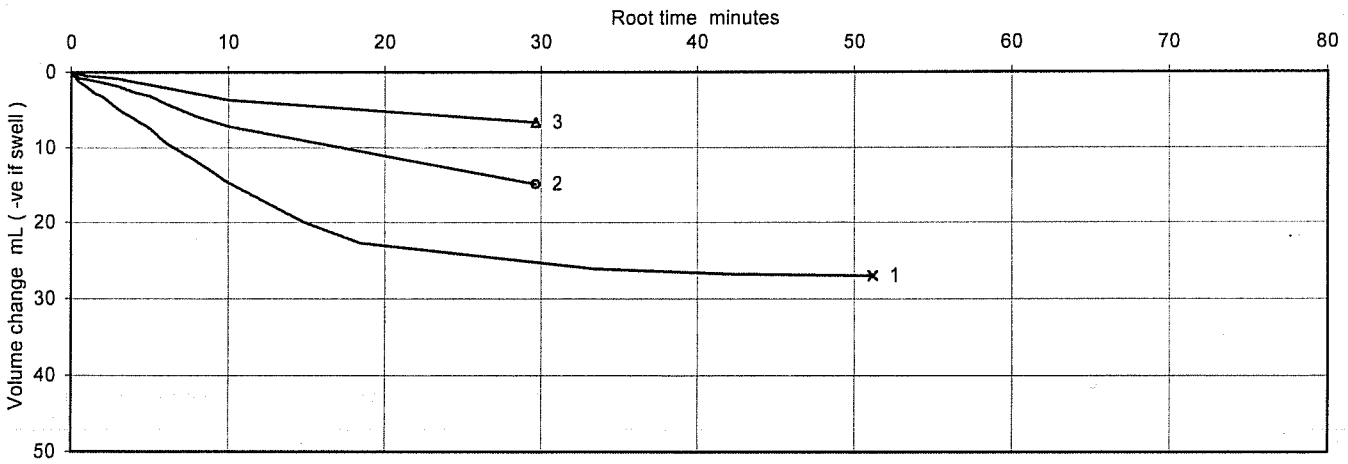
Specimen Details		
Initial		
Length	mm	203.85
Diameter	mm	101.92
Bulk Density	Mg/m³	2.26
Water Content	%	14
Dry density	Mg/m³	1.97
After test		
Bulk Density	Mg/m³	2.28
Water Content	%	13
Dry density	Mg/m³	2.01

Soil Description	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	260
Final pore water pressure	kPa	200
Final B Value		0.96



Consolidation Details	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		380	420	450	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		80	120	150	kPa
	Pore pressure at start of consolidation		368	376	376	kPa
	Pore pressure at end of consolidation		303	300	302	kPa
	Pore pressure dissipation at end of consolidation		96	100	97	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.62	0.55	0.70	m^2/year
	Coefficient of Compressibility	M_{vi}	0.25	0.12	0.06	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	4.7E-11	2.0E-11	1.2E-11	m/s

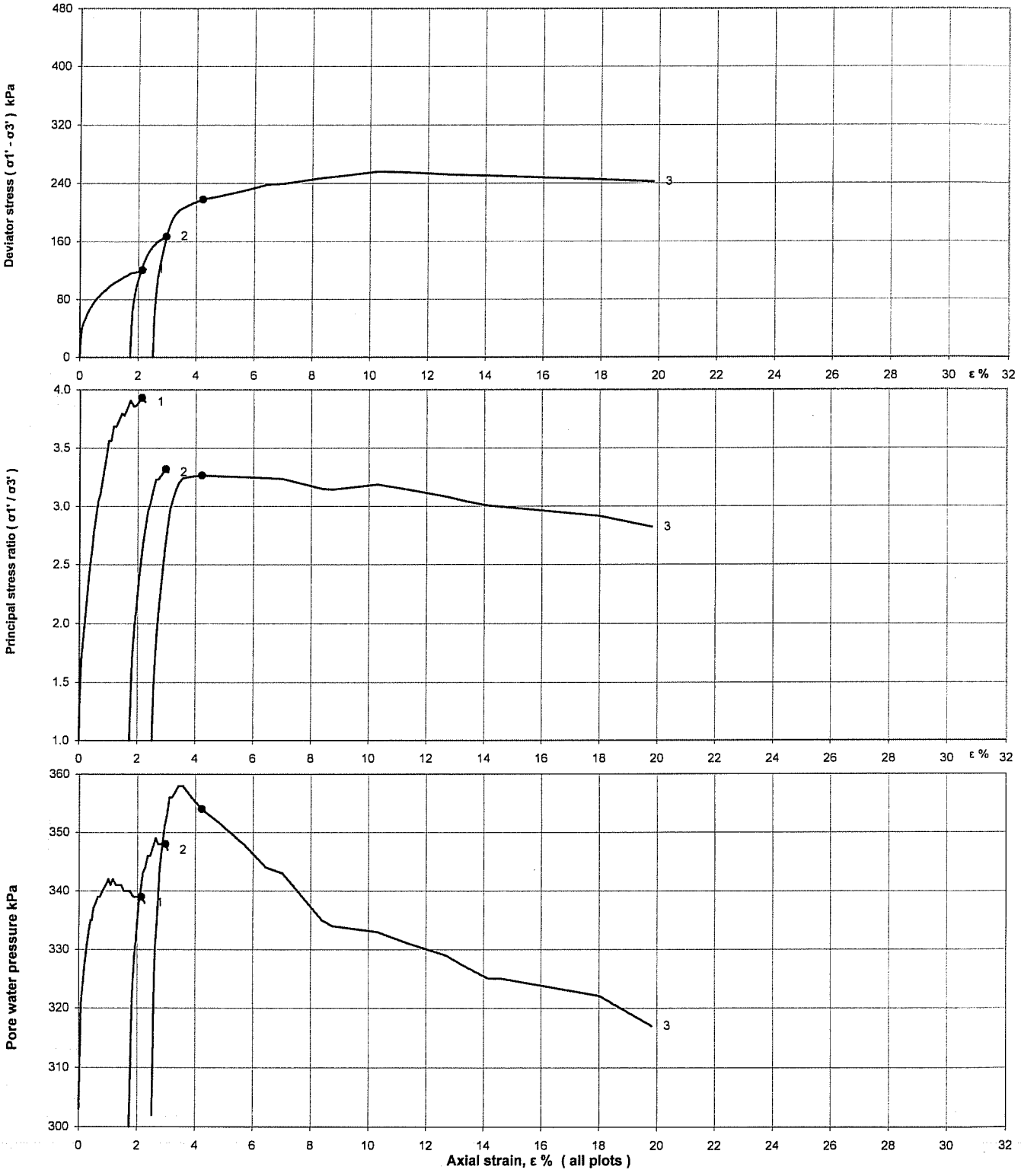


Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	5.00-5.45		
			No	13	Type	U
			ID			
			Spec Ref			

Shearing stages - graphical data

o failure points



Ref			Figure
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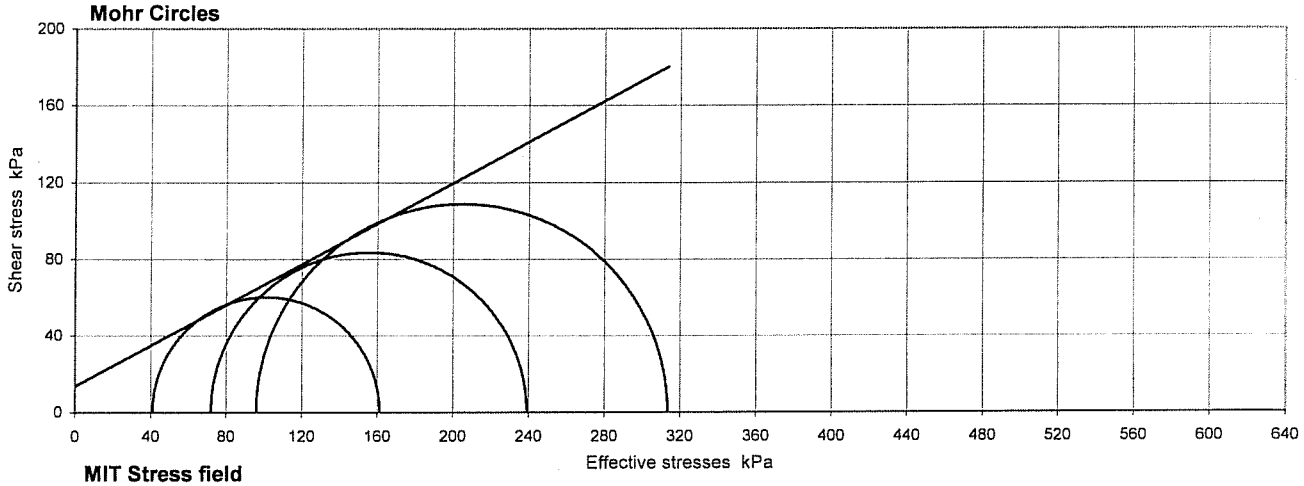
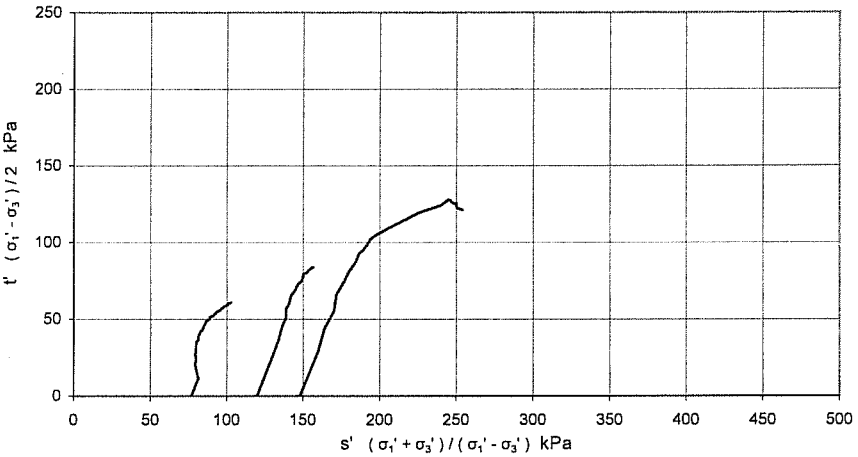
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	5.00-5.45		
			No	13	Type	U
			ID			
			Spec Ref			

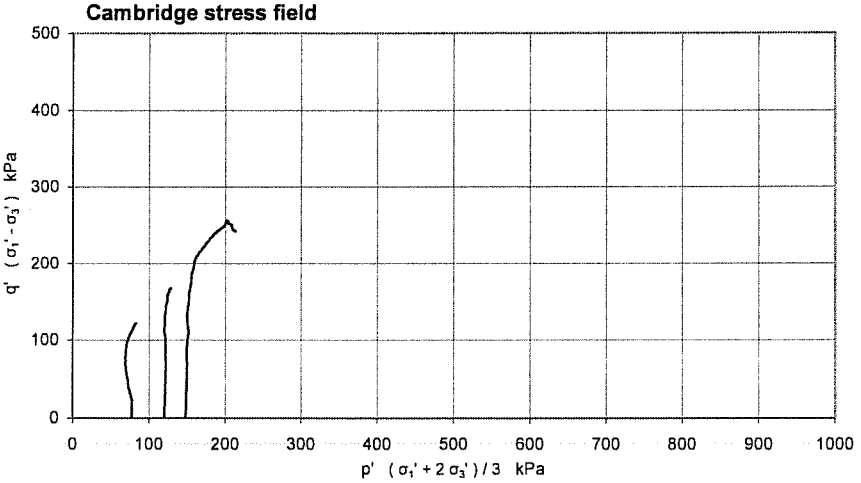
Mohr Circles



MIT Stress field



Cambridge stress field



Compression stages

Stage	1	2	3	
Cell pressure	380	420	450	kPa
Initial pwp	303	300	302	kPa
Initial σ_3'	77	120	148	kPa
Rate of strain	0.48	0.48	0.48	%/hr

Failure conditions

Criterion	Maximum effective principal stress ratio			
Axial strain	2.13	2.97	4.22	%
$(\sigma_1'/\sigma_3')_f$	3.932	3.320	3.266	
$(\sigma_1'-\sigma_3')_f$	120.2	167.0	217.6	kPa
u_f	339	348	354	kPa
$\sigma_3'_f$	41	72	96	kPa
$\sigma_1'_f$	161	239	314	kPa
A_f	0.30	0.29	0.24	
Time to failure	4.4	6.2	8.8	hrs

Shear Strength Parameters

at peak stress ratio

		Linear regression
c '	kPa	13.6
Ø '	degrees	28.0
		Manual re-assessment
c '	kPa	-
Ø '	degrees	-

Mode of failure

Notes : Deviator stresses corrected for area change, vertical side drains and 0.45 mm thick rubber membrane(s)

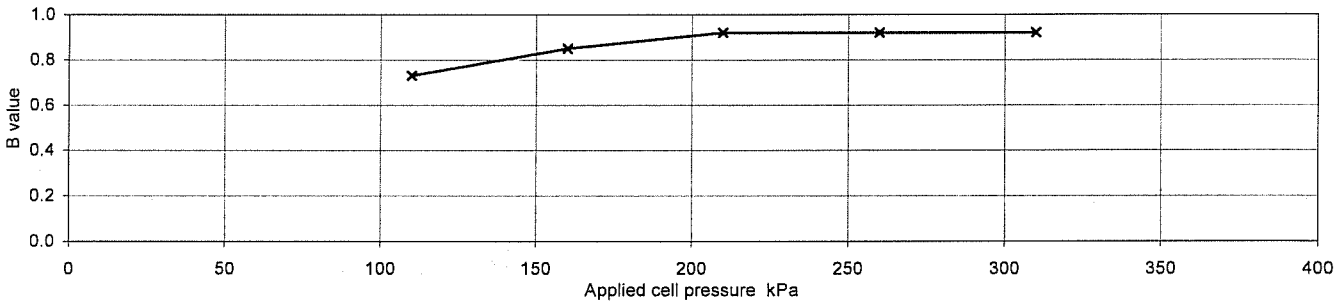
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	8.00-8.45		
			No	21	Type	U
			ID			
			Spec Ref			

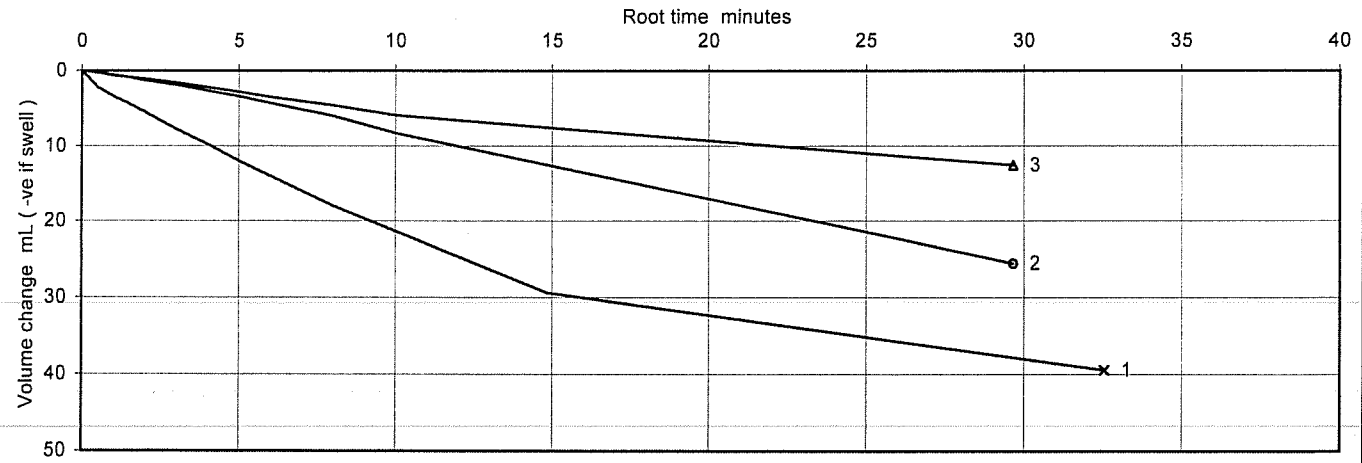
Specimen Details		
Initial		
Length	mm	204.04
Diameter	mm	103.12
Bulk Density	Mg/m³	2.20
Water Content	%	15
Dry density	Mg/m³	1.91
After test		
Bulk Density	Mg/m³	2.25
Water Content	%	13
Dry density	Mg/m³	1.99

Soil Description	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	310
Final pore water pressure	kPa	250
Final B Value		0.92



Consolidation Details	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		420	470	520	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		120	170	220	kPa
	Pore pressure at start of consolidation		406	406	419	kPa
	Pore pressure at end of consolidation		301	303	303	kPa
	Pore pressure dissipation at end of consolidation		100	98	97	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.66	0.25	0.49	m^2/year
	Coefficient of Compressibility	M_{vi}	0.22	0.15	0.07	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	4.4E-11	1.1E-11	9.9E-12	m/s



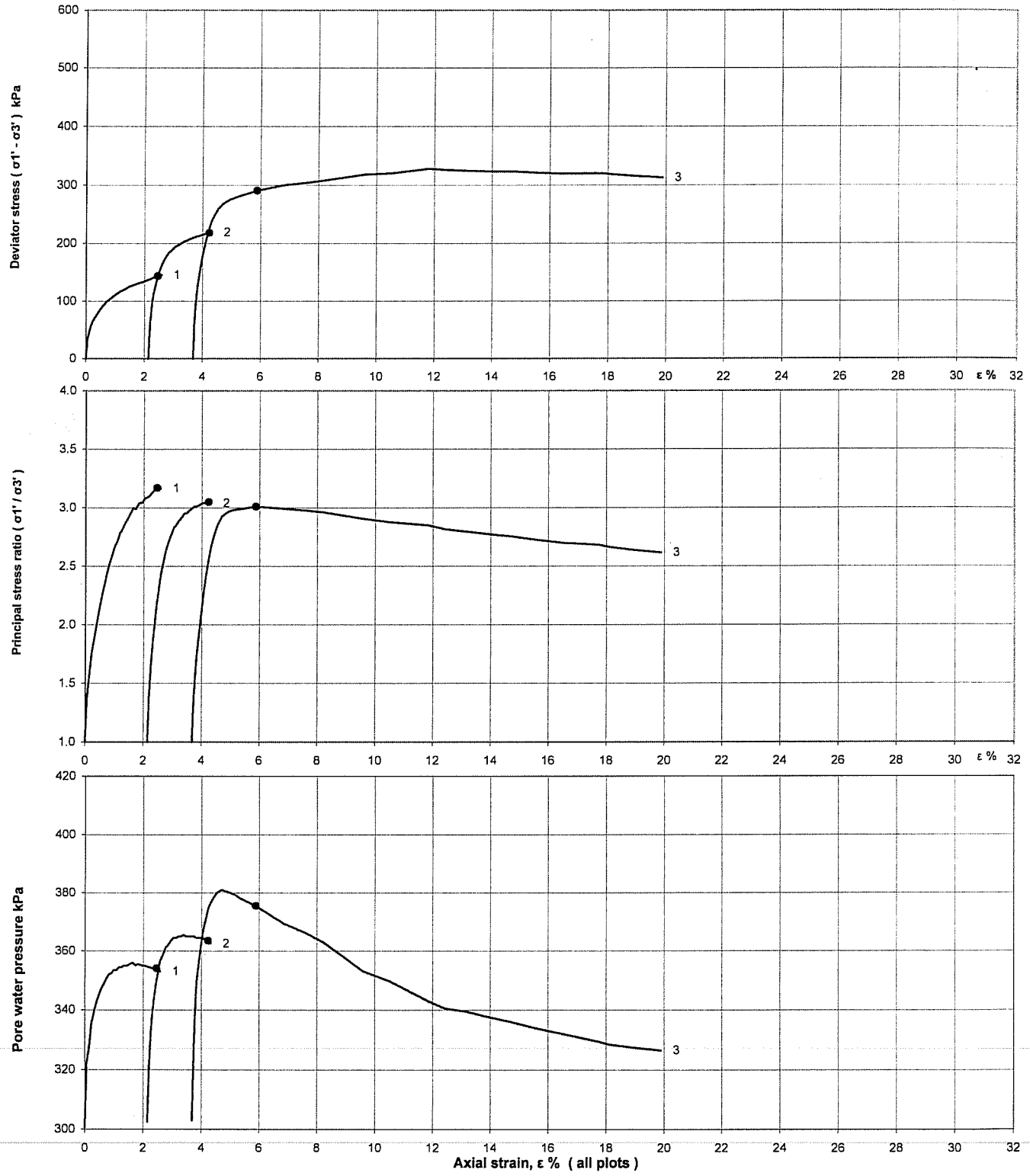
Ref			Figure
SLR8.1 Rev 85 May 09	Scientifics Group	Printed:10/11/2011 10:06	CUM 2 sheet 1 of 3

Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	8.00-8.45		
			No	21	Type	U
			ID			
			Spec Ref			

Shearing stages - graphical data

o failure points



Ref			Figure
SLR8.1 Rev 85 May 09	ESG Environmental Scientifics Group	Printed:10/11/2011 10:06	**CUM 2** sheet 2 of 3

Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	8.00-8.45		
			No	21	Type	U
			ID			
			Spec Ref			

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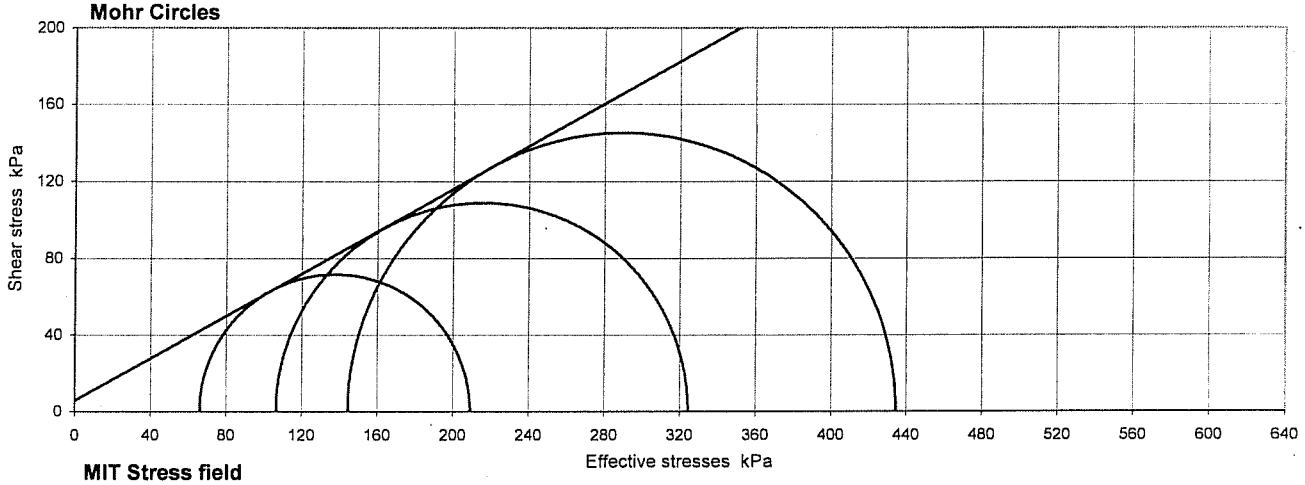
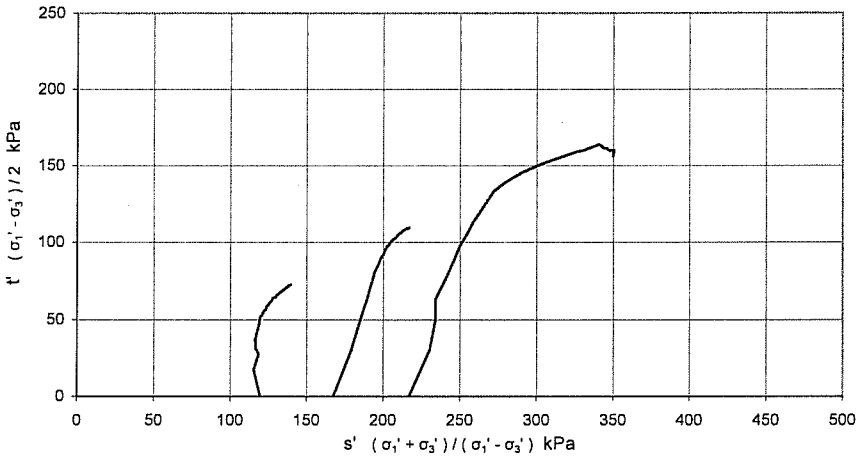
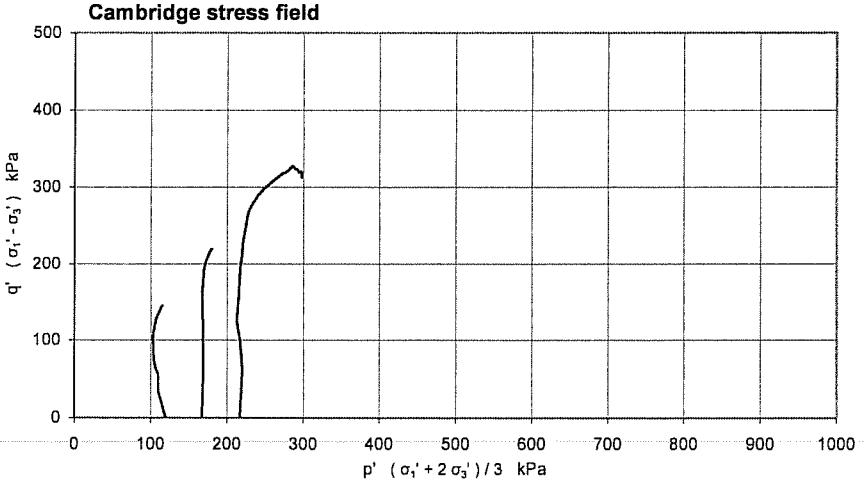


MIT Stress field



Cambridge stress field



Compression stages

Stage	1	2	3	
Cell pressure	420	470	520	kPa
Initial pwp	301	303	303	kPa
Initial σ_3'	120	168	217	kPa
Rate of strain	0.49	0.49	0.49	%/hr

Failure conditions

Criterion	Maximum effective principal stress ratio			
Axial strain	2.46	4.23	5.88	%
$(\sigma_1'/\sigma_3')_f$	3.168	3.047	3.008	
$(\sigma_1'-\sigma_3')_f$	143.1	218.0	290.2	kPa
u_f	354	364	376	kPa
$\sigma_3'_f$	66	107	145	kPa
$\sigma_1'_f$	209	325	435	kPa
A_f	0.37	0.28	0.25	
Time to failure	5.0	8.6	12.0	hrs

Shear Strength Parameters

at peak stress ratio

		Linear regression
c '	kPa	5.6
Ø '	degrees	28.9
		Manual re-assessment
c '	kPa	-
Ø '	degrees	-

Mode of failure

Notes : Deviator stresses corrected for area change, vertical side drains and 0.45 mm thick rubber membrane(s)

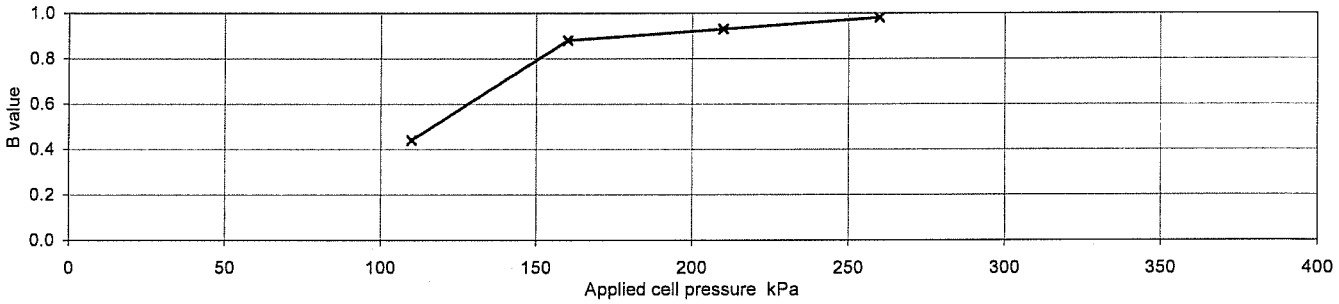
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	15.50-15.95		
			No	41	Type	U
			ID			
			Spec Ref			

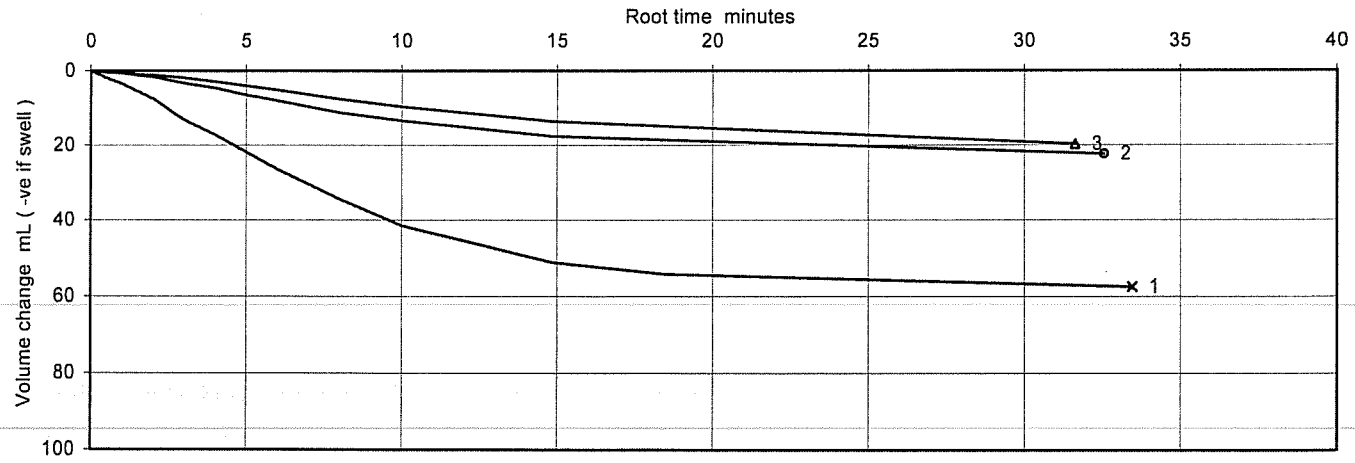
Specimen Details		
Initial		
Length	mm	205.22
Diameter	mm	103.64
Bulk Density	Mg/m³	2.11
Water Content	%	19
Dry density	Mg/m³	1.78
After test		
Bulk Density	Mg/m³	2.14
Water Content	%	17
Dry density	Mg/m³	1.84

Soil Description	Stiff brown thinly laminated CLAY with thin laminations of sand becoming slightly sandy slightly gravelly CLAY at base.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	260
Final pore water pressure	kPa	200
Final B Value		0.98



Consolidation Details	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		505	590	665	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		205	290	365	kPa
	Pore pressure at start of consolidation		491	487	496	kPa
	Pore pressure at end of consolidation		300	303	306	kPa
	Pore pressure dissipation at end of consolidation		100	99	97	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	1.37	0.97	0.63	m^2/year
	Coefficient of Compressibility	M_{vi}	0.17	0.07	0.06	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	7.2E-11	2.1E-11	1.2E-11	m/s

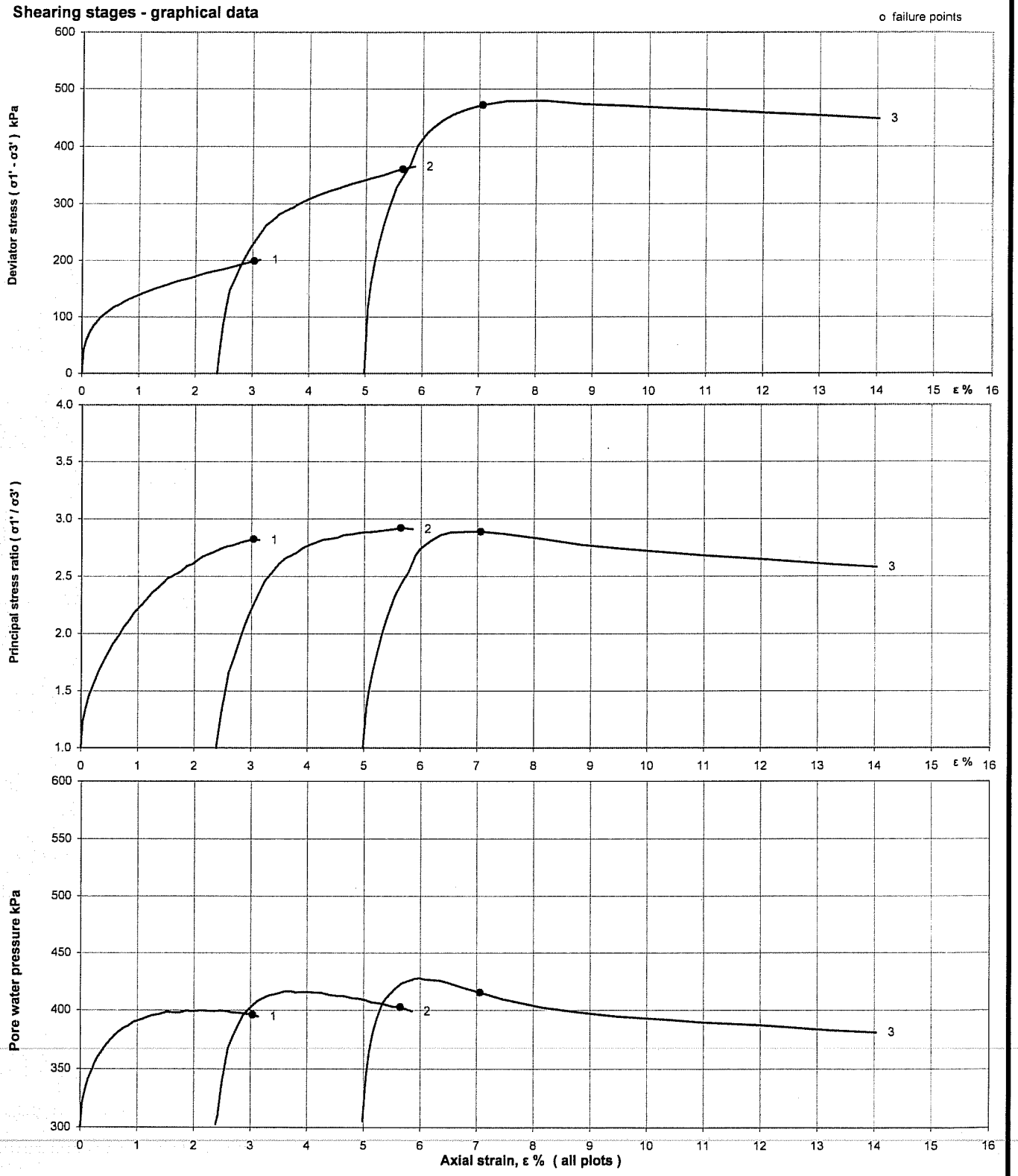


Ref			Figure
SLR8.1 Rev 85 May 09	Environmental Scientifics Group	Printed:10/11/2011 11:41	CUM 3 sheet 1 of 3

Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	15.50-15.95		
			No	41	Type	U
			ID			
			Spec Ref			

Shearing stages - graphical data

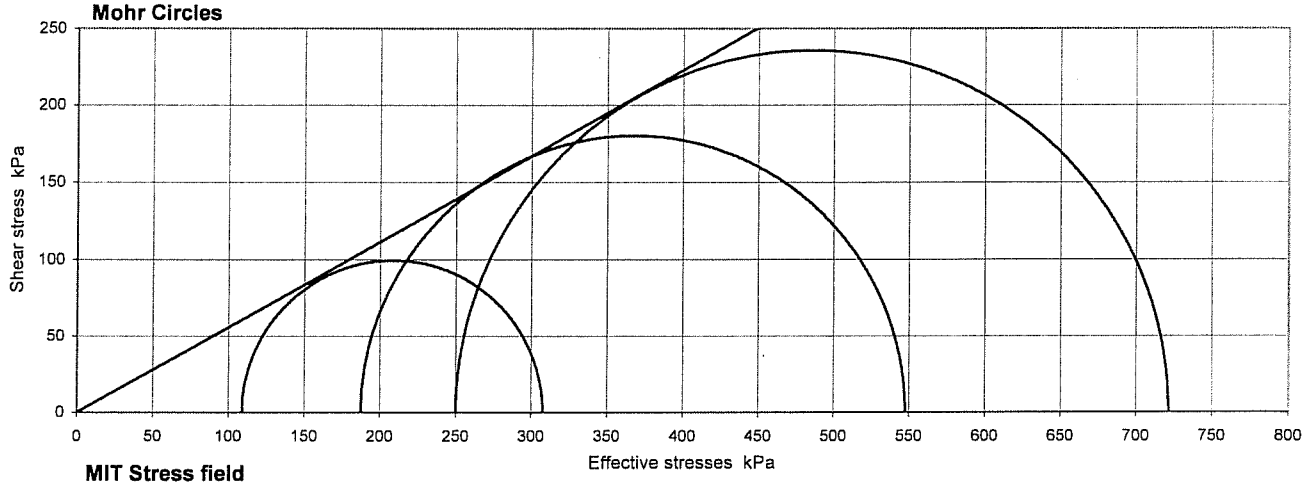


Ref			Figure
SLR8.1 Rev 85 May 09	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:10/11/2011 11:41	**CUM 3** sheet 2 of 3

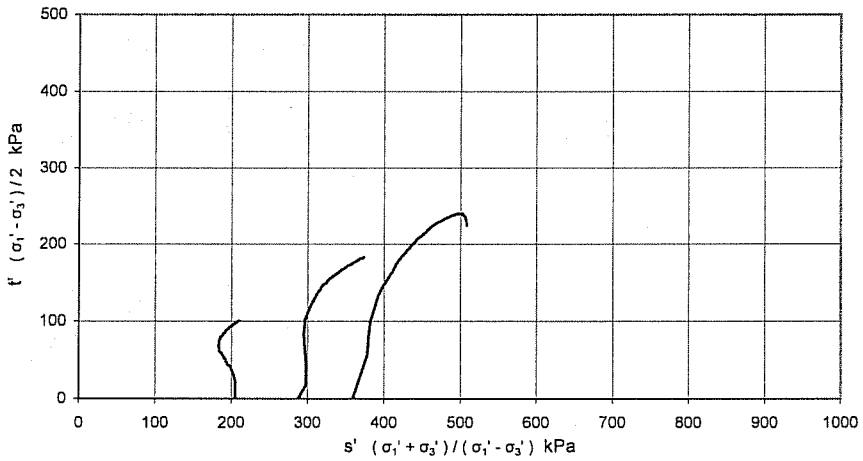
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	15.50-15.95		
			No	41	Type	U
			ID			
			Spec Ref			

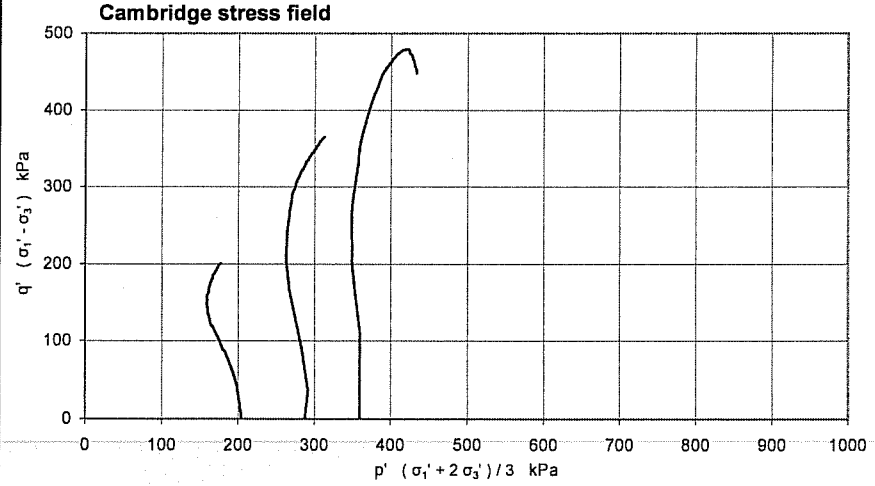
Mohr Circles



MIT Stress field



Cambridge stress field



Compression stages

Stage	1	2	3	
Cell pressure	505	590	665	kPa
Initial pwp	300	303	306	kPa
Initial σ_3'	205	288	360	kPa
Rate of strain	1.00	1.00	1.00	%/hr

Failure conditions

Criterion	Maximum effective principal stress ratio			
Axial strain	3.04	5.65	7.06	%
$(\sigma_1' / \sigma_3')_f$	2.822	2.920	2.887	
$(\sigma_1' - \sigma_3')_f$	198.6	360.1	471.6	kPa
u_f	396	403	415	kPa
$\sigma_3'_f$	109	188	250	kPa
$\sigma_1'_f$	308	548	722	kPa
A_f	0.48	0.28	0.23	
Time to failure	3.0	5.6	7.1	hrs

Shear Strength Parameters

at peak stress ratio

		Linear regression
c '	kPa	(-3.1)
Ø '	degrees	(29.5)
		Manual re-assessment
c '	kPa	0
Ø '	degrees	29.1

Mode of failure

Notes : Deviator stresses corrected for area change, vertical side drains and 0.45 mm thick rubber membrane(s)

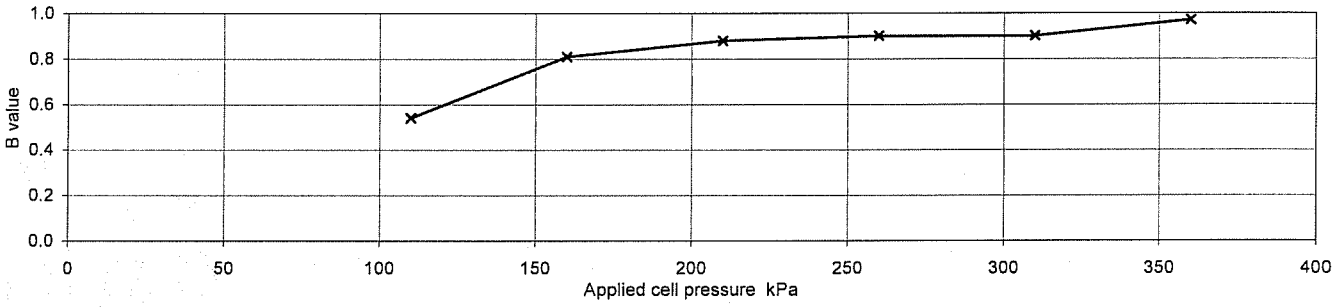
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	19.50-19.95		
			No	52	Type	U
			ID			
			Spec Ref			

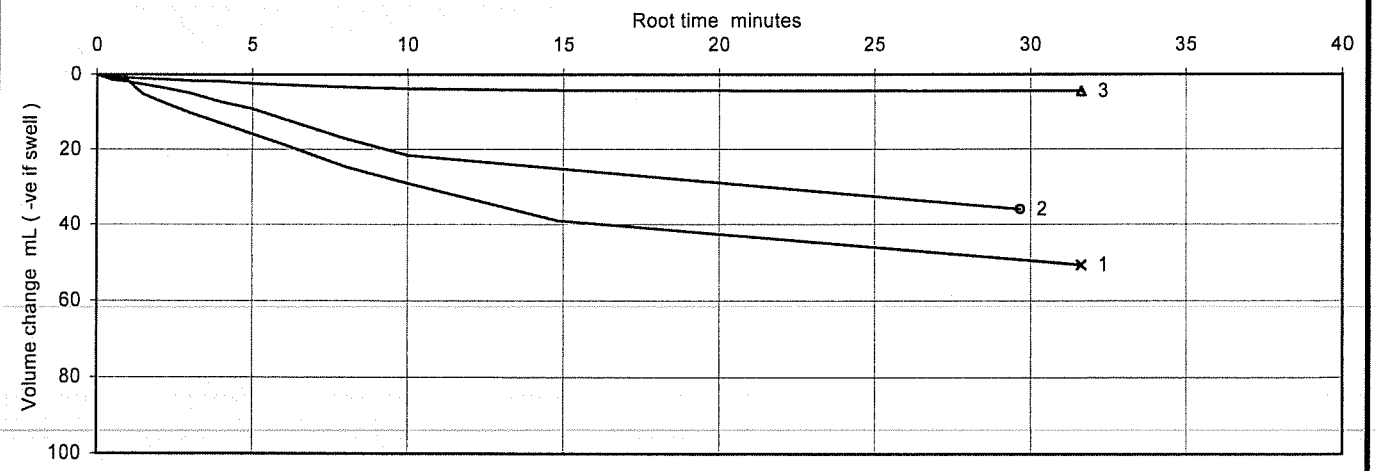
Specimen Details		
Initial		
Length	mm	204.42
Diameter	mm	101.75
Bulk Density	Mg/m³	2.24
Water Content	%	12
Dry density	Mg/m³	1.99
After test		
Bulk Density	Mg/m³	2.27
Water Content	%	11
Dry density	Mg/m³	2.04

Soil Description	Stiff greyish brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	360
Final pore water pressure	kPa	300
Final B Value		0.97



Consolidation Details	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		580	700	790	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		280	400	490	kPa
	Pore pressure at start of consolidation		563	521	536	kPa
	Pore pressure at end of consolidation		306	301	310	kPa
	Pore pressure dissipation at end of consolidation		98	100	96	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.74	0.83	1.99	m^2/year
	Coefficient of Compressibility	M_{vi}	0.12	0.10	0.01	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	2.6E-11	2.5E-11	7.5E-12	m/s

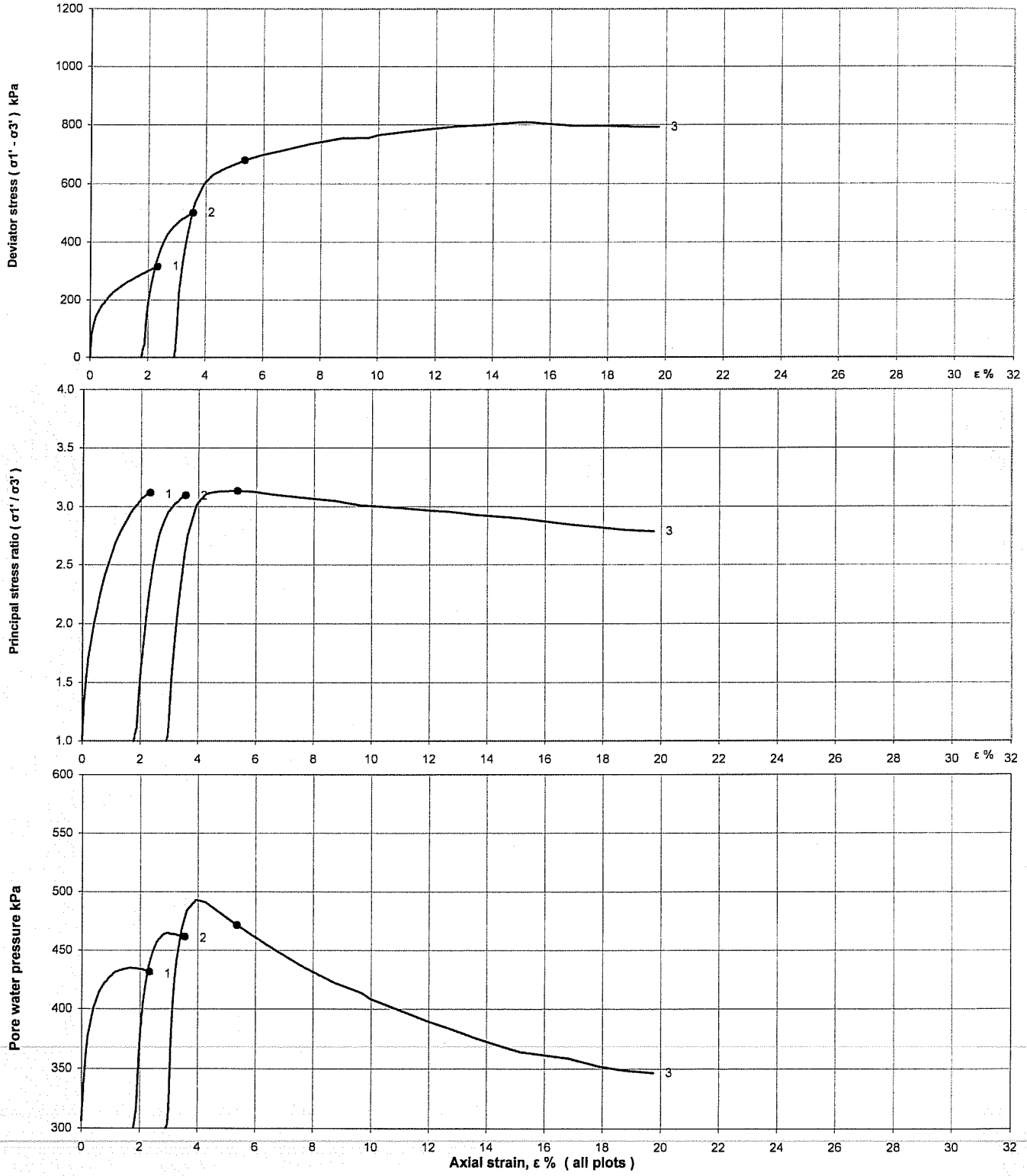


Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	19.50-19.95		
			No	52	Type	U
			ID			
			Spec Ref			

Shearing stages - graphical data

o failure points

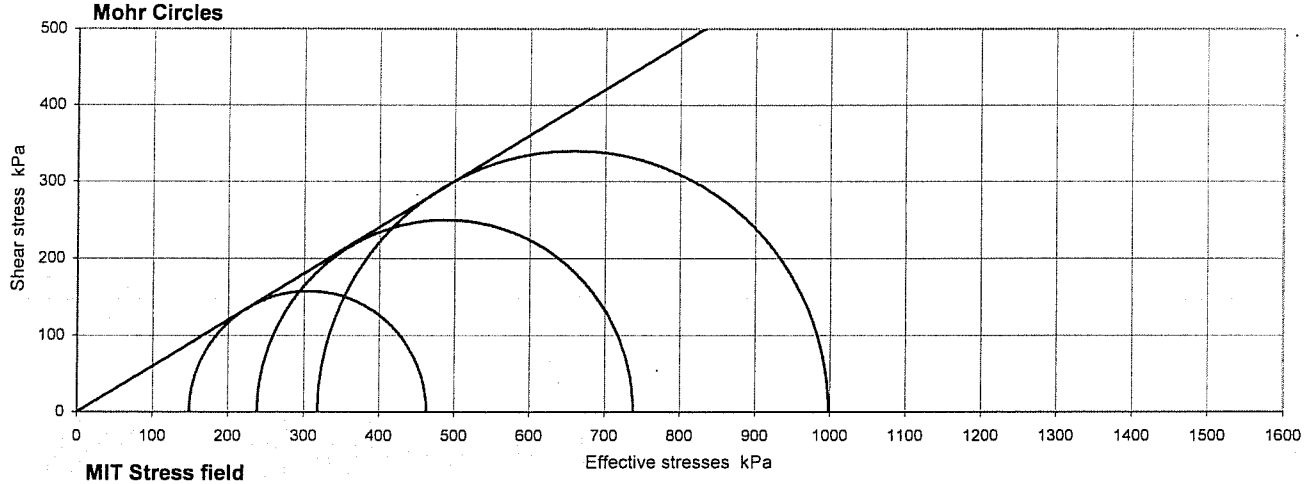


Ref			Figure
SLR8.1 Rev 85 May 09	ESG Environmental Scientifics Group	Printed:11/11/2011 11:09	**CUM 4** sheet 2 of 3

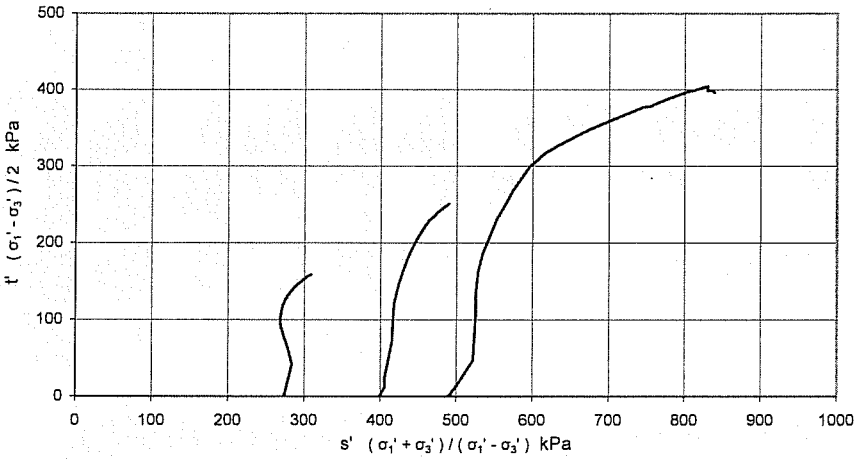
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	19.50-19.95		
			No	52	Type	U
			ID			
			Spec Ref			

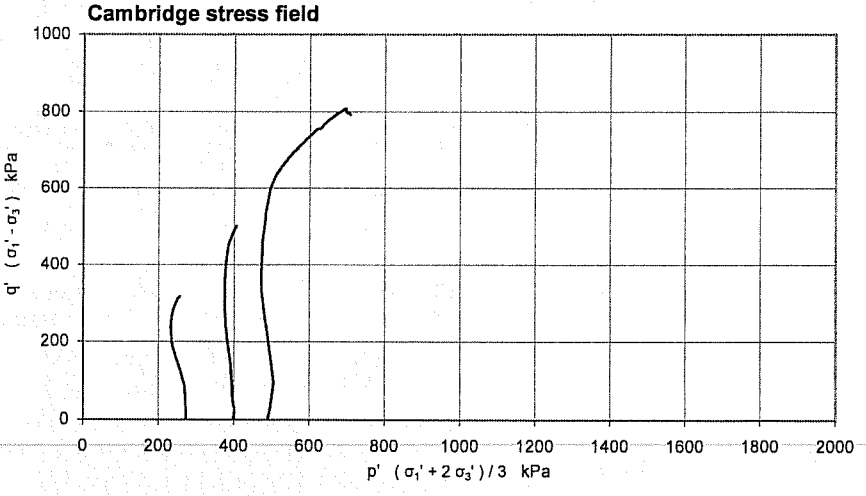
Mohr Circles



MIT Stress field



Cambridge stress field



Compression stages

Stage	1	2	3	
Cell pressure	580	700	790	kPa
Initial pwp	306	301	300	kPa
Initial σ_3'	274	400	490	kPa
Rate of strain	0.57	0.57	0.57	%/hr

Failure conditions

Criterion	Maximum effective principal stress ratio			
Axial strain	2.33	3.56	5.35	%
$(\sigma_1'/\sigma_3')_f$	3.118	3.094	3.133	
$(\sigma_1'-\sigma_3')_f$	314.5	499.4	679.4	kPa
u_f	432	462	472	kPa
$\sigma_3'_f$	149	239	319	kPa
$\sigma_1'_f$	463	738	998	kPa
A_f	0.40	0.32	0.25	
Time to failure	4.1	6.2	9.4	hrs

Shear Strength Parameters

at peak stress ratio

		Linear regression
c '	kPa	(-1.9)
Ø '	degrees	(31.2)
		Manual re-assessment
c '	kPa	0
Ø '	degrees	31.0

Mode of failure

Notes : Deviator stresses corrected for area change, vertical side drains and 0.9 mm thick rubber membrane(s)

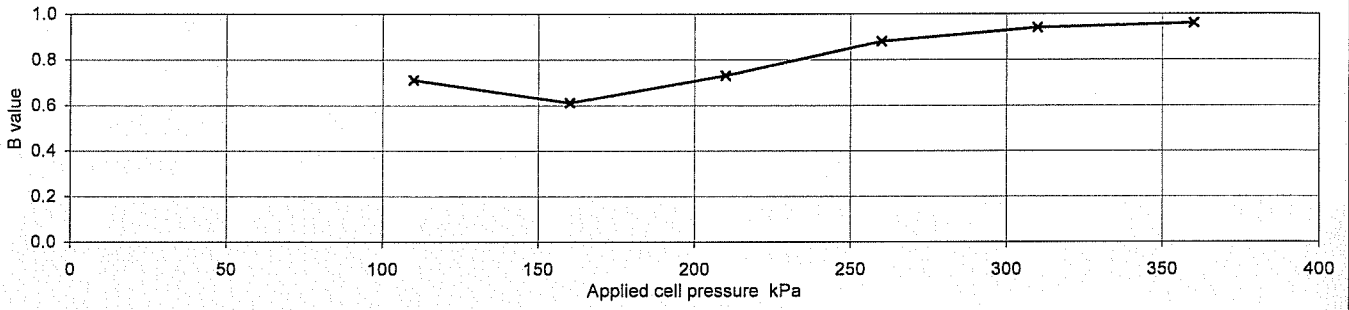
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.20-1.65		
			No	4	Type	U
			ID			
			Spec Ref			

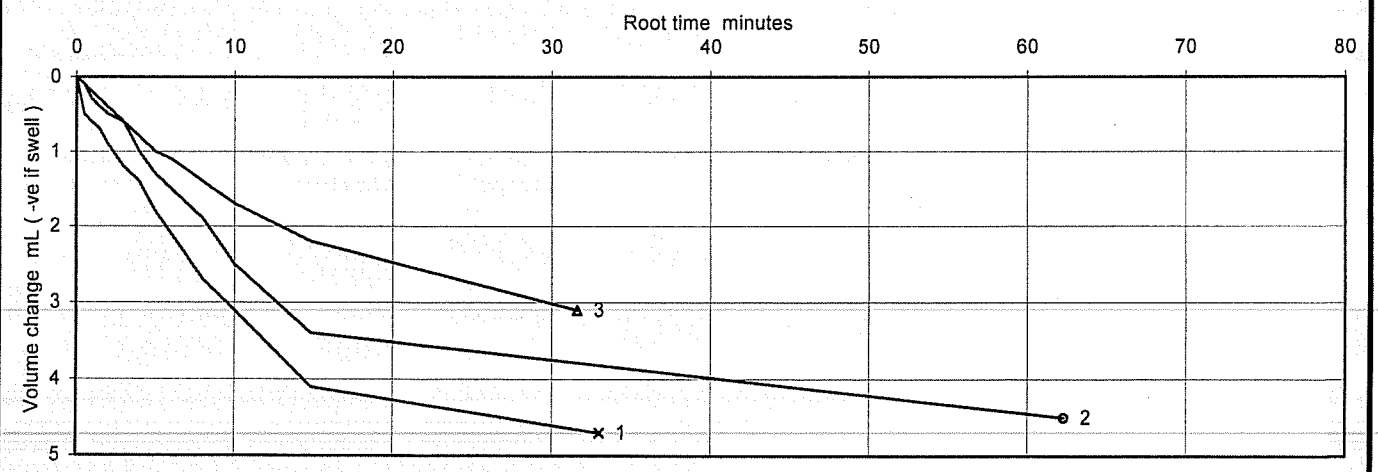
Specimen Details		
Initial		
Length	mm	204.29
Diameter	mm	101.26
Bulk Density	Mg/m³	2.07
Water Content	%	21
Dry density	Mg/m³	1.72
After test		
Bulk Density	Mg/m³	2.07
Water Content	%	22
Dry density	Mg/m³	1.69

Soil Description	Firm to stiff greyish brown and brownish grey slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	360
Final pore water pressure	kPa	300
Final B Value		0.96



Consolidation Details	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		375	385	395	kPa
	Back Pressure applied		350	350	350	kPa
	Effective Pressure		25	35	45	kPa
	Pore pressure at start of consolidation		362	361	362	kPa
	Pore pressure at end of consolidation		350	350	351	kPa
	Pore pressure dissipation at end of consolidation		100	100	96	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	1.01	0.62	0.57	m^2/year
	Coefficient of Compressibility	M_{vi}	0.24	0.24	0.17	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	7.6E-11	4.7E-11	3.0E-11	m/s

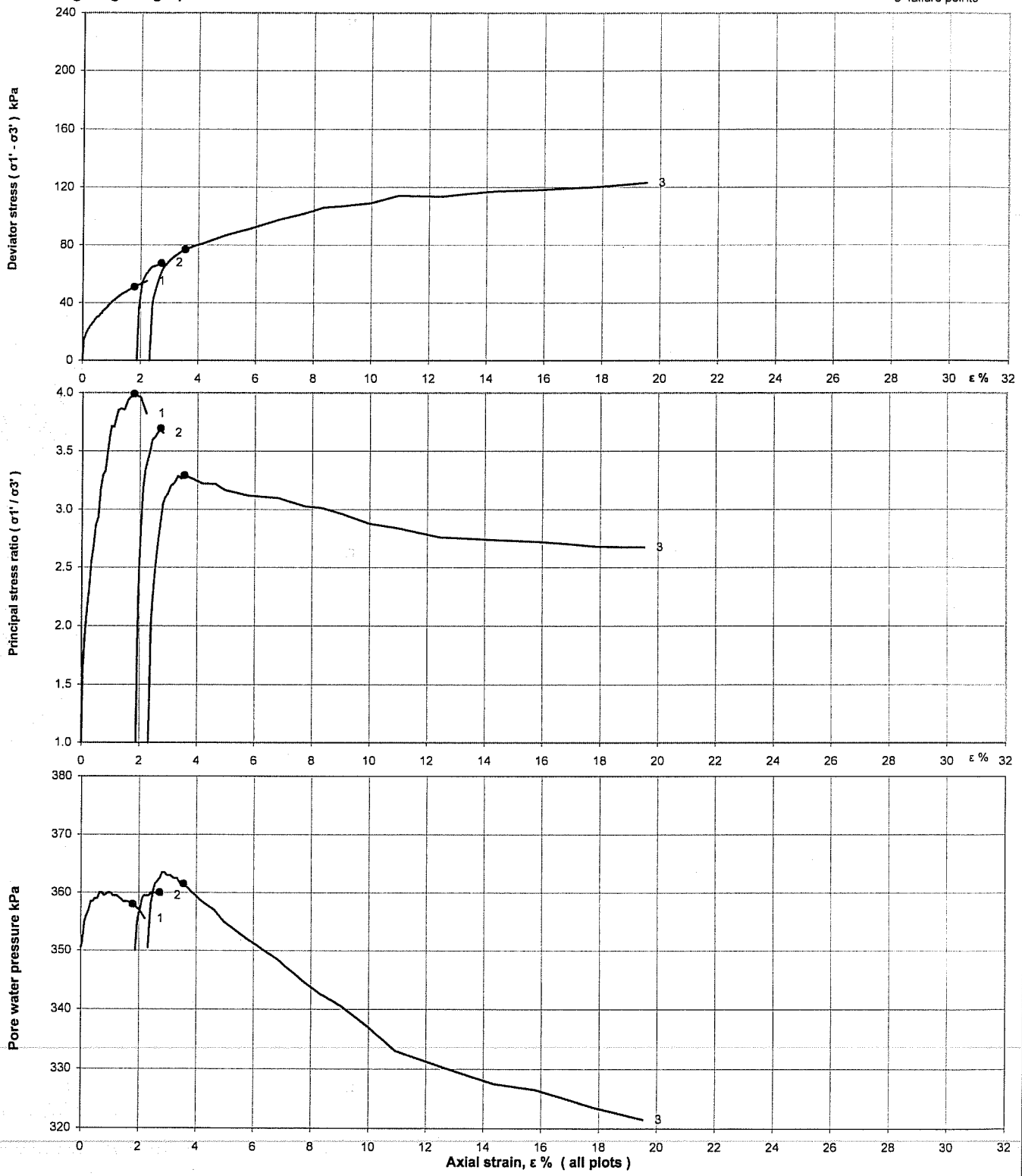


Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.20-1.65		
			No	4	Type	U
			ID			
			Spec Ref			

Shearing stages - graphical data

o failure points

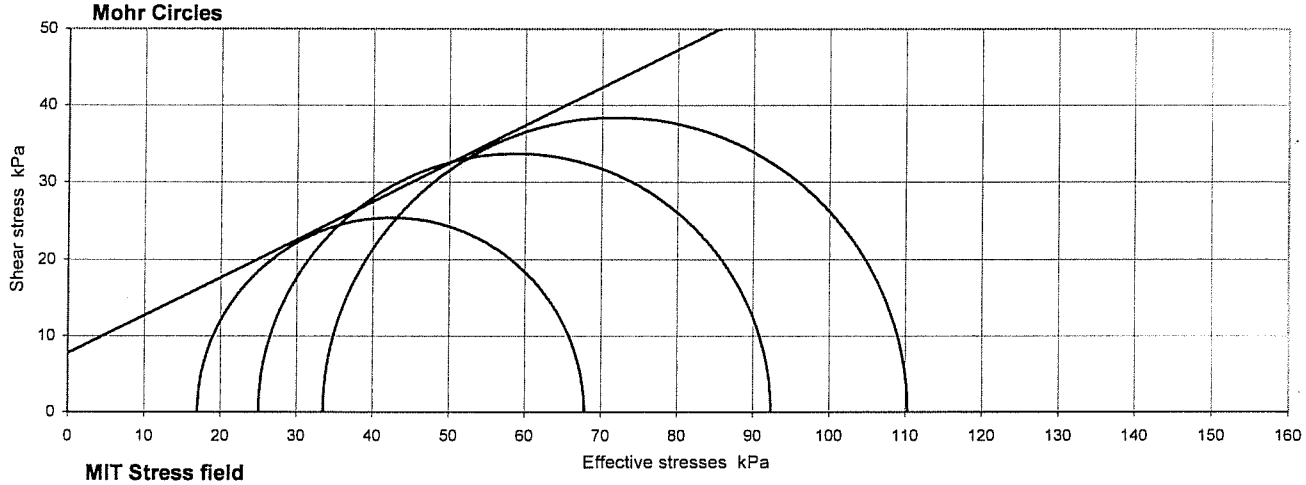


Ref			Figure
SLR8.1 Rev 85 May 09	SG Scientifics	Printed:18/11/2011 16:20	**CUM 5** sheet 2 of 3

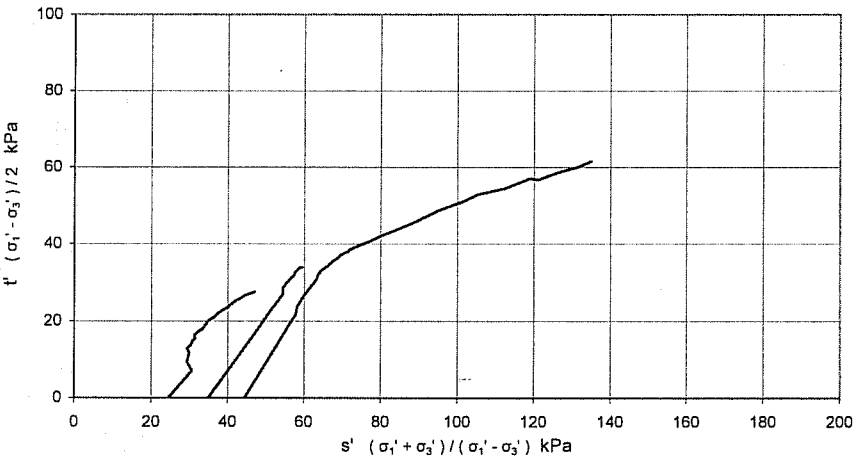
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.20-1.65		
			No	4	Type	U
			ID			
			Spec Ref			

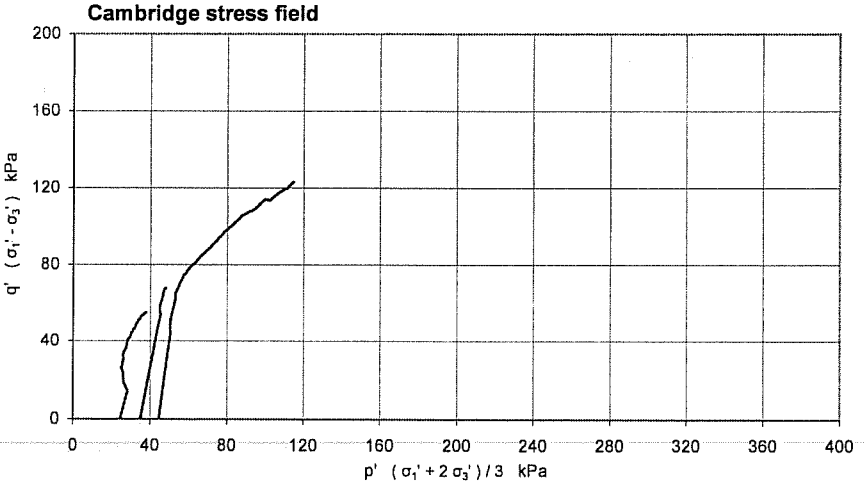
Mohr Circles



MIT Stress field



Cambridge stress field



Compression stages

Stage	1	2	3	
Cell pressure	375	385	395	kPa
Initial pwp	351	350	351	kPa
Initial σ_3'	25	35	45	kPa
Rate of strain	0.79	0.79	0.79	%/hr

Failure conditions

Criterion	Maximum effective principal stress ratio			
Axial strain	1.79	2.73	3.56	%
$(\sigma_1'/\sigma_3')_f$	3.990	3.695	3.292	
$(\sigma_1'-\sigma_3')_f$	50.8	67.4	76.8	kPa
u_f	358	360	362	kPa
$\sigma_3'_f$	17	25	34	kPa
$\sigma_1'_f$	68	92	110	kPa
A_f	0.15	0.15	0.14	
Time to failure	2.3	3.5	4.5	hrs

Shear Strength Parameters

at peak stress ratio

		Linear regression
c '	kPa	7.8
Ø '	degrees	26.3
		Manual re-assessment
c '	kPa	-
Ø '	degrees	-

Mode of failure

Notes : Deviator stresses corrected for area change, vertical side drains and 0.45 mm thick rubber membrane(s)

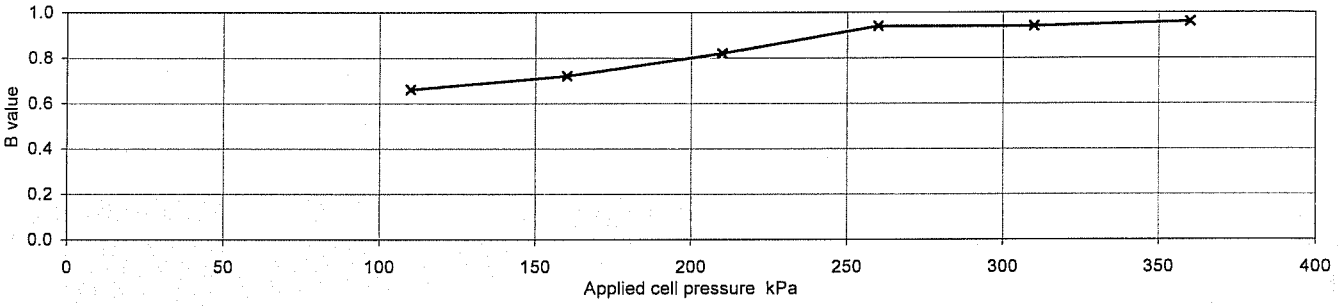
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	10.00-10.45		
			No	22	Type	U
			ID			
			Spec Ref			

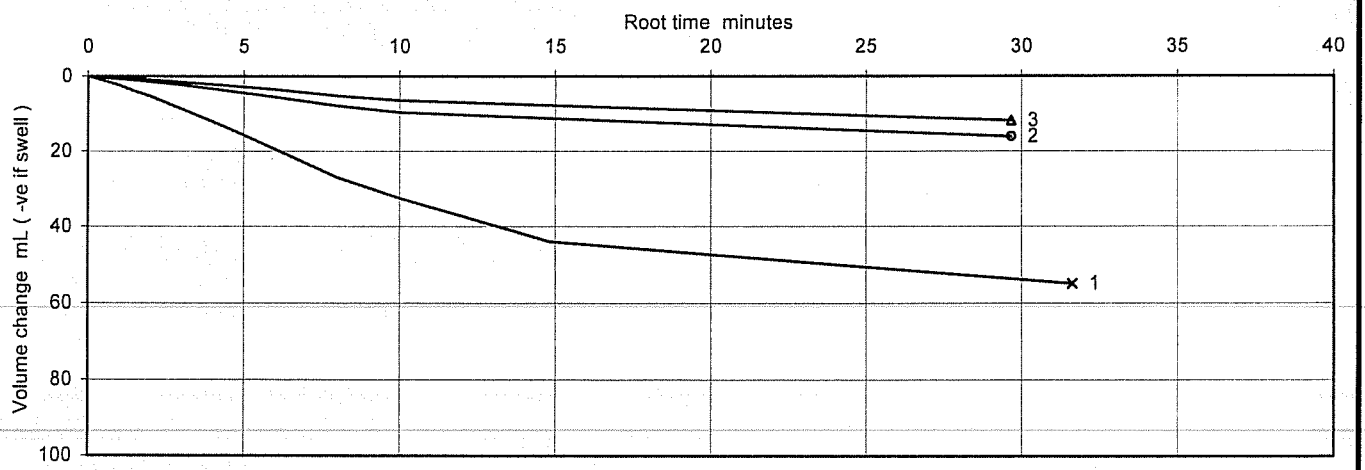
Specimen Details		
Initial		
Length	mm	203.69
Diameter	mm	103.43
Bulk Density	Mg/m³	2.18
Water Content	%	16
Dry density	Mg/m³	1.88
After test		
Bulk Density	Mg/m³	2.24
Water Content	%	14
Dry density	Mg/m³	1.97

Soil Description	Firm becoming soft to firm at base greyish brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	360
Final pore water pressure	kPa	300
Final B Value		0.96



Consolidation Details	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		450	510	565	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		150	210	265	kPa
	Pore pressure at start of consolidation		426	434	446	kPa
	Pore pressure at end of consolidation		300	302	302	kPa
	Pore pressure dissipation at end of consolidation		100	99	99	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.96	0.94	0.80	m^2/year
	Coefficient of Compressibility	M_{vi}	0.25	0.07	0.05	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	7.5E-11	2.1E-11	1.2E-11	m/s

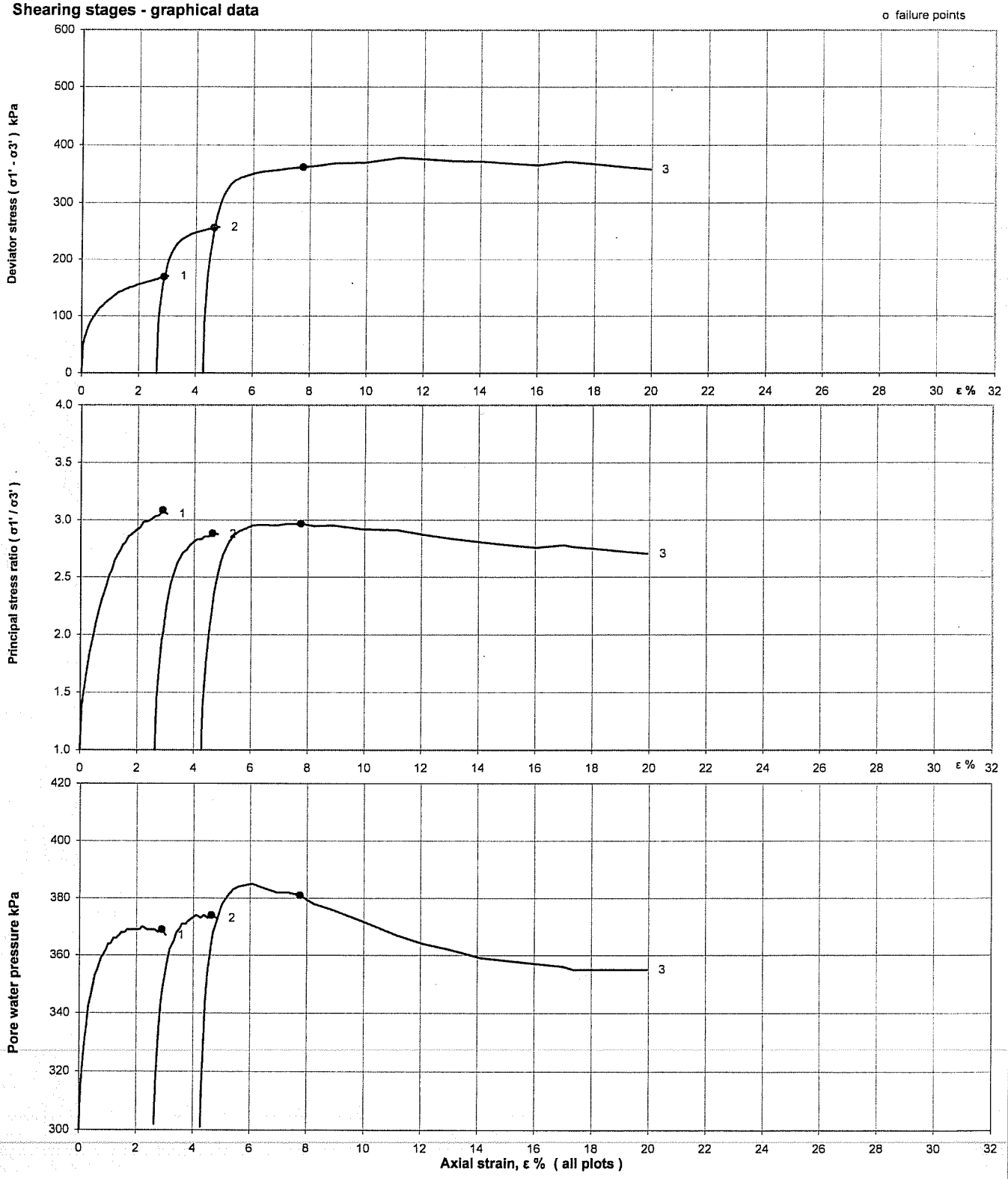


Ref			Figure
SLR8.1 Rev 85 May 09	Scientifics Group	Printed:11/11/2011 11:15	CUM 6 sheet 1 of 3

Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	10.00-10.45		
			No	22	Type	U
			ID			
			Spec Ref			

Shearing stages - graphical data

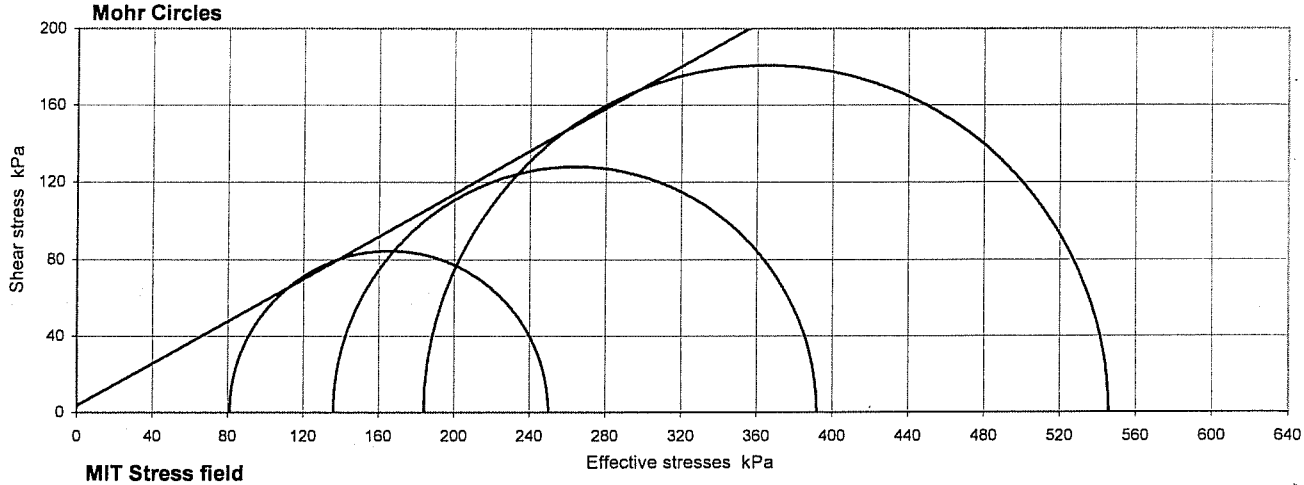


Ref			Figure
SLR8.1 Rev 85 May 09	ESG Environmental Scientifics Group	Printed:11/11/2011 11:15	**CUM 6** sheet 2 of 3

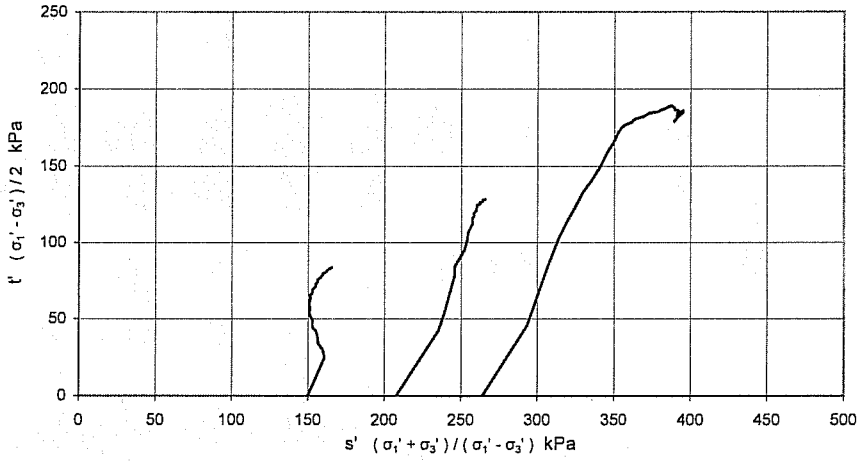
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	10.00-10.45		
			No	22	Type	U
			ID			
			Spec Ref			

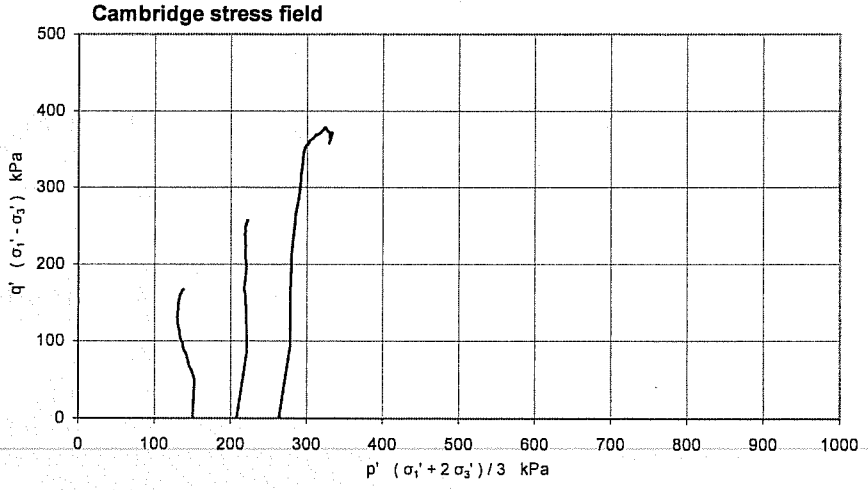
Mohr Circles



MIT Stress field



Cambridge stress field



Compression stages

Stage	1	2	3	
Cell pressure	450	510	565	kPa
Initial pwp	300	302	301	kPa
Initial σ_3'	150	208	264	kPa
Rate of strain	0.70	0.70	0.70	%/hr

Failure conditions

Criterion	Maximum effective principal stress ratio			
Axial strain	2.90	4.64	7.75	%
$(\sigma_1'/\sigma_3')_f$	3.085	2.881	2.966	
$(\sigma_1'-\sigma_3')_f$	168.9	255.9	361.8	kPa
u_f	369	374	381	kPa
$\sigma_3'_f$	81	136	184	kPa
$\sigma_1'_f$	250	392	546	kPa
A_f	0.41	0.28	0.22	
Time to failure	4.1	6.6	11.1	hrs

Shear Strength Parameters

at peak stress ratio

		Linear regression
c '	kPa	3.5
Ø '	degrees	28.9
		Manual re-assessment
c '	kPa	-
Ø '	degrees	-

Mode of failure

Notes : Deviator stresses corrected for area change, vertical side drains and 0.45 mm thick rubber membrane(s)

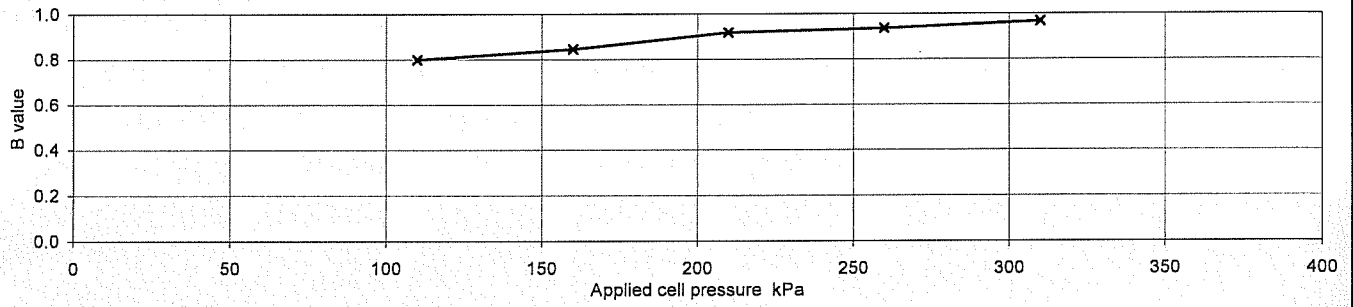
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	10.00-10.45		
			No	28	Type	U
			ID			
			Spec Ref			

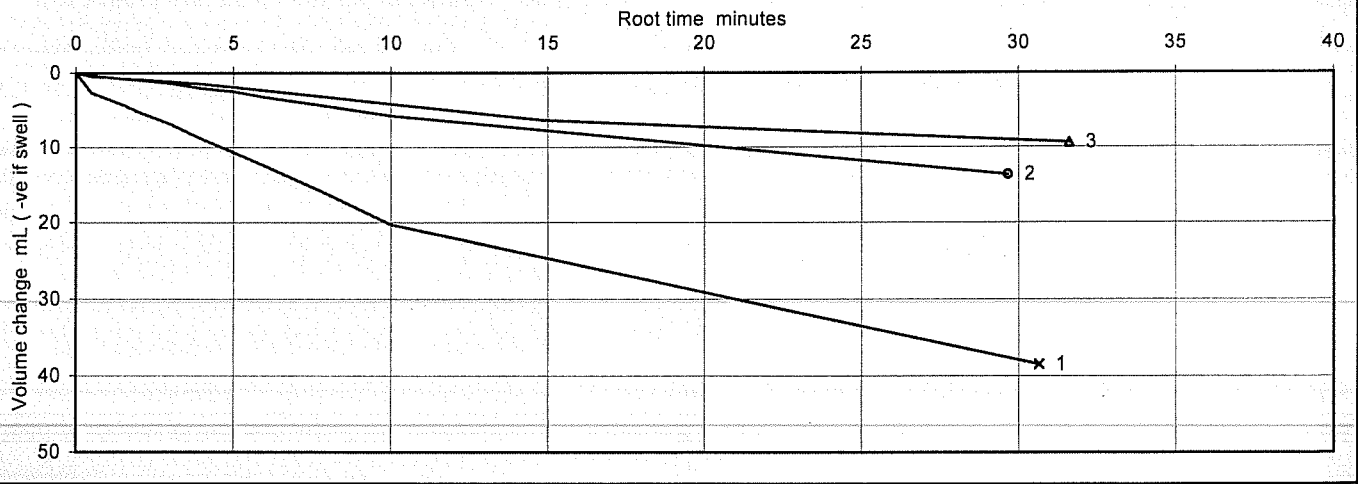
Specimen Details		
Initial		
Length	mm	204.74
Diameter	mm	102.64
Bulk Density	Mg/m³	2.21
Water Content	%	14
Dry density	Mg/m³	1.94
After test		
Bulk Density	Mg/m³	2.26
Water Content	%	13
Dry density	Mg/m³	2.01

Soil Description	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	310
Final pore water pressure	kPa	250
Final B Value		0.97



Consolidation Details	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		450	510	565	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		150	210	265	kPa
	Pore pressure at start of consolidation		437	420	427	kPa
	Pore pressure at end of consolidation		303	305	306	kPa
	Pore pressure dissipation at end of consolidation		98	96	95	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.56	0.41	0.46	m^2/year
	Coefficient of Compressibility	M_{vi}	0.17	0.07	0.05	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	3.0E-11	9.1E-12	6.8E-12	m/s

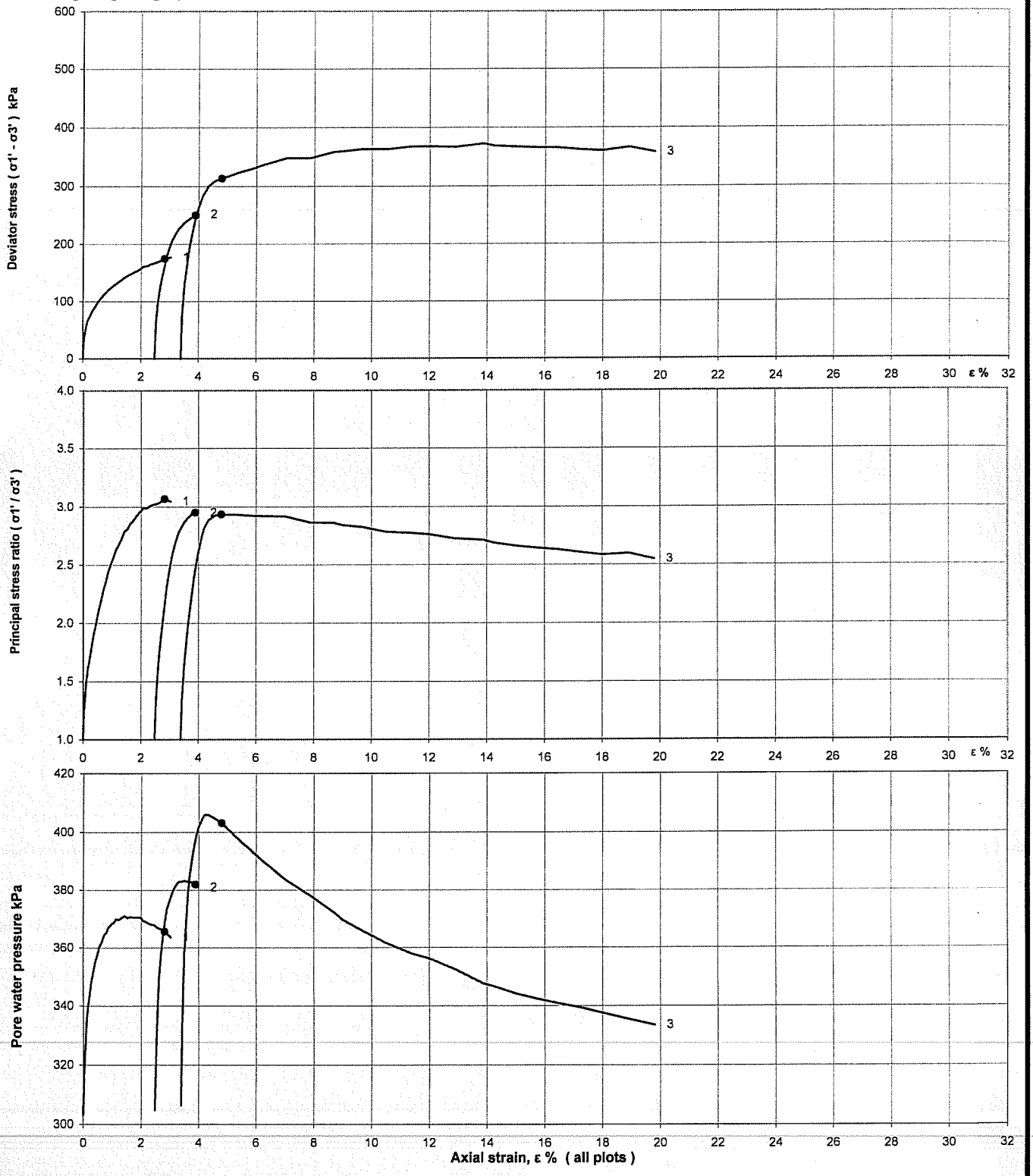


Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	10.00-10.45		
			No	28	Type	U
			ID			
			Spec Ref			

Shearing stages - graphical data

o failure points

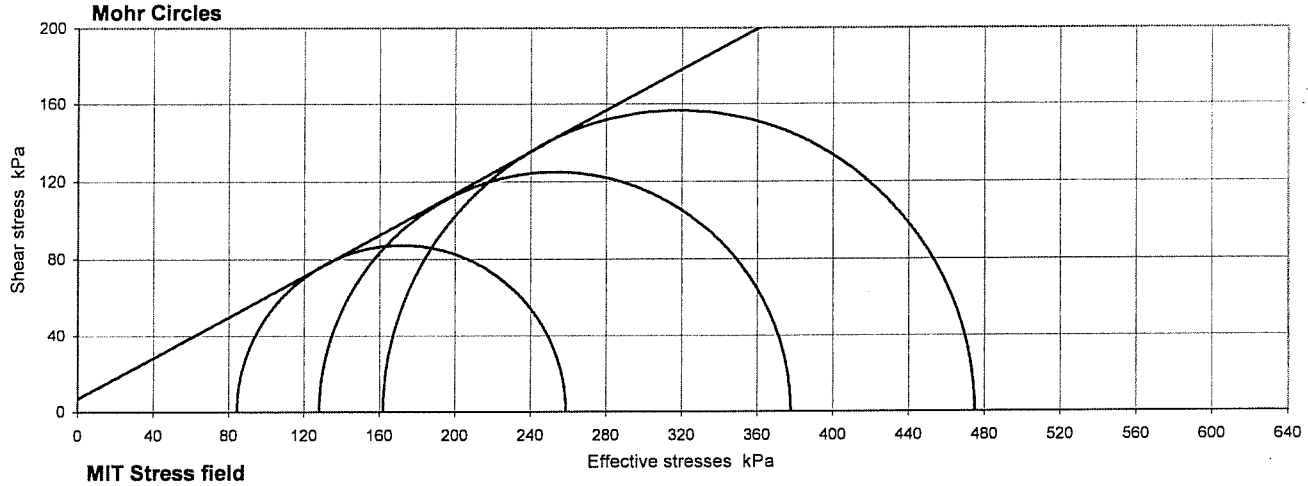


Ref			Figure
SLR8.1 Rev 85 May 09	Environmental Scientifics Group	Printed:14/11/2011 16:10	**CUM 7** sheet 2 of 3

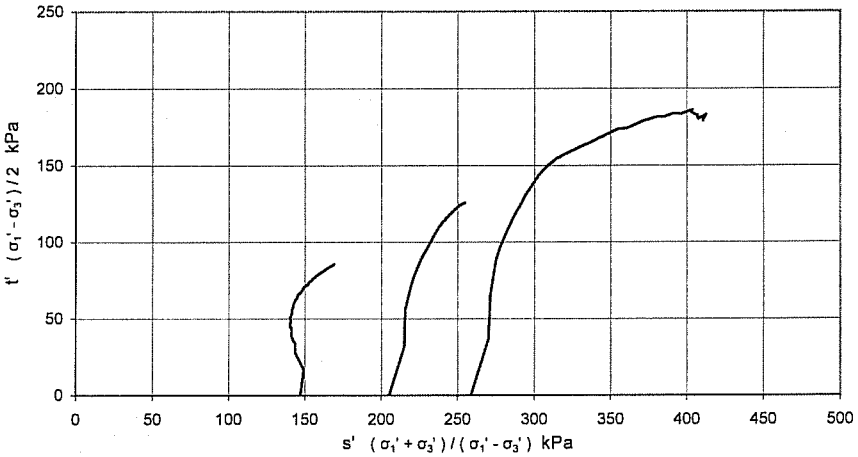
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	10.00-10.45		
			No	28	Type	U
			ID			
			Spec Ref			

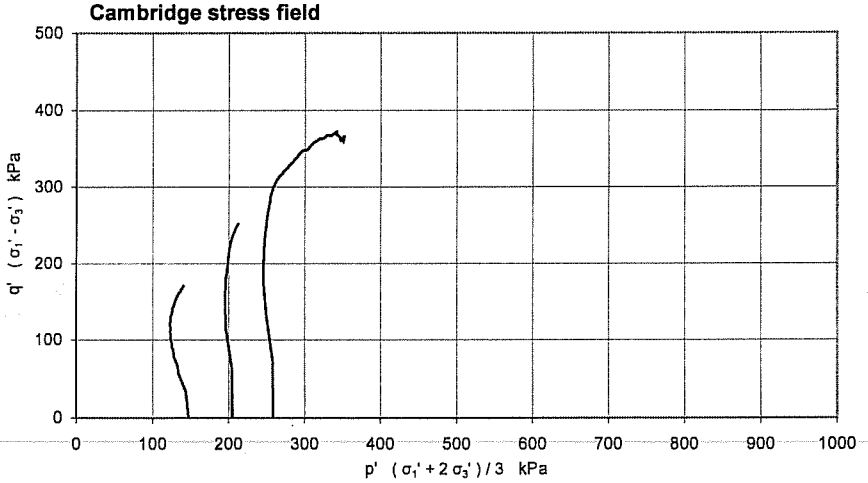
Mohr Circles



MIT Stress field



Cambridge stress field



Compression stages

Stage	1	2	3	
Cell pressure	450	510	565	kPa
Initial pwp	303	305	306	kPa
Initial σ_3'	147	205	259	kPa
Rate of strain	0.43	0.43	0.43	%/hr

Failure conditions

Criterion	Maximum effective principal stress ratio			
Axial strain	2.82	3.89	4.80	%
$(\sigma_1'/\sigma_3')_f$	3.066	2.950	2.933	
$(\sigma_1'-\sigma_3')_f$	174.4	249.7	312.9	kPa
u_f	366	382	403	kPa
$\sigma_3'_f$	84	128	162	kPa
$\sigma_1'_f$	259	378	475	kPa
A_f	0.36	0.31	0.31	
Time to failure	6.6	9.1	11.2	hrs

Shear Strength Parameters

at peak stress ratio

		Linear regression
c '	kPa	6.9
Ø '	degrees	28.1
		Manual re-assessment
c '	kPa	-
Ø '	degrees	-

Mode of failure

Notes : Deviator stresses corrected for area change, vertical side drains and 0.9 mm thick rubber membrane(s)

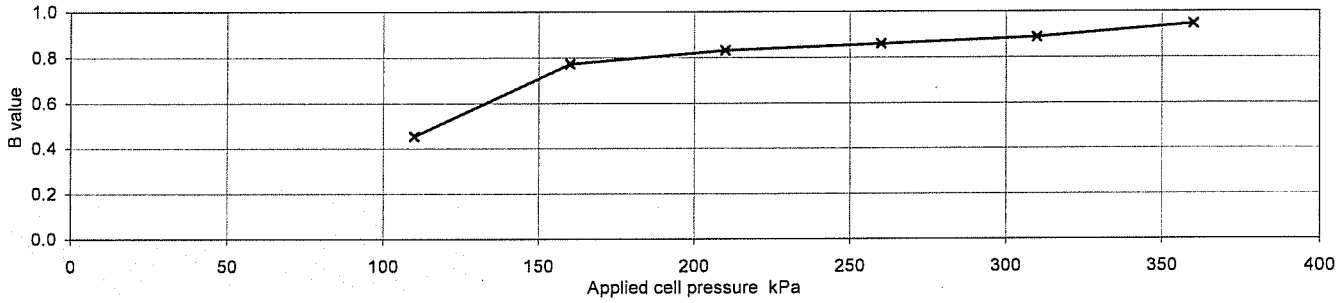
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH4		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00-3.45		
			No	16	Type	U
			ID			
			Spec Ref			

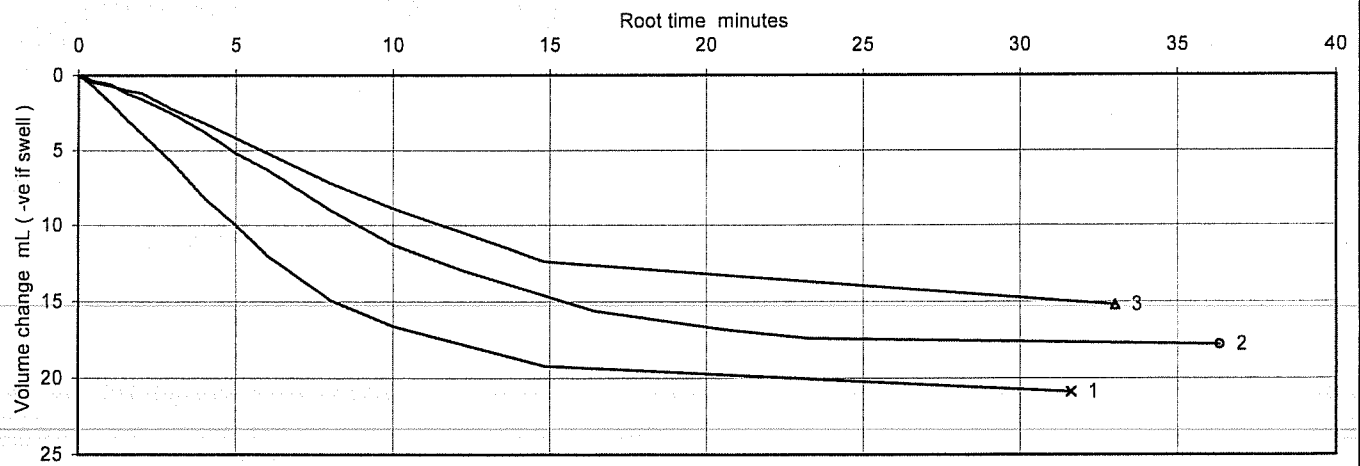
Specimen Details		
Initial		
Length	mm	204.09
Diameter	mm	102.86
Bulk Density	Mg/m³	1.96
Water Content	%	23
Dry density	Mg/m³	1.60
After test		
Bulk Density	Mg/m³	2.02
Water Content	%	23
Dry density	Mg/m³	1.65

Soil Description	Firm greyish brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	360
Final pore water pressure	kPa	300
Final B Value		0.95



Consolidation Details	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		400	420	440	kPa
	Back Pressure applied		350	350	350	kPa
	Effective Pressure		50	70	90	kPa
	Pore pressure at start of consolidation		385	393	401	kPa
	Pore pressure at end of consolidation		351	350	352	kPa
	Pore pressure dissipation at end of consolidation		99	99	97	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	2.01	0.98	0.83	m^2/year
	Coefficient of Compressibility	M_{vi}	0.36	0.25	0.19	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	2.2E-10	7.5E-11	4.8E-11	m/s



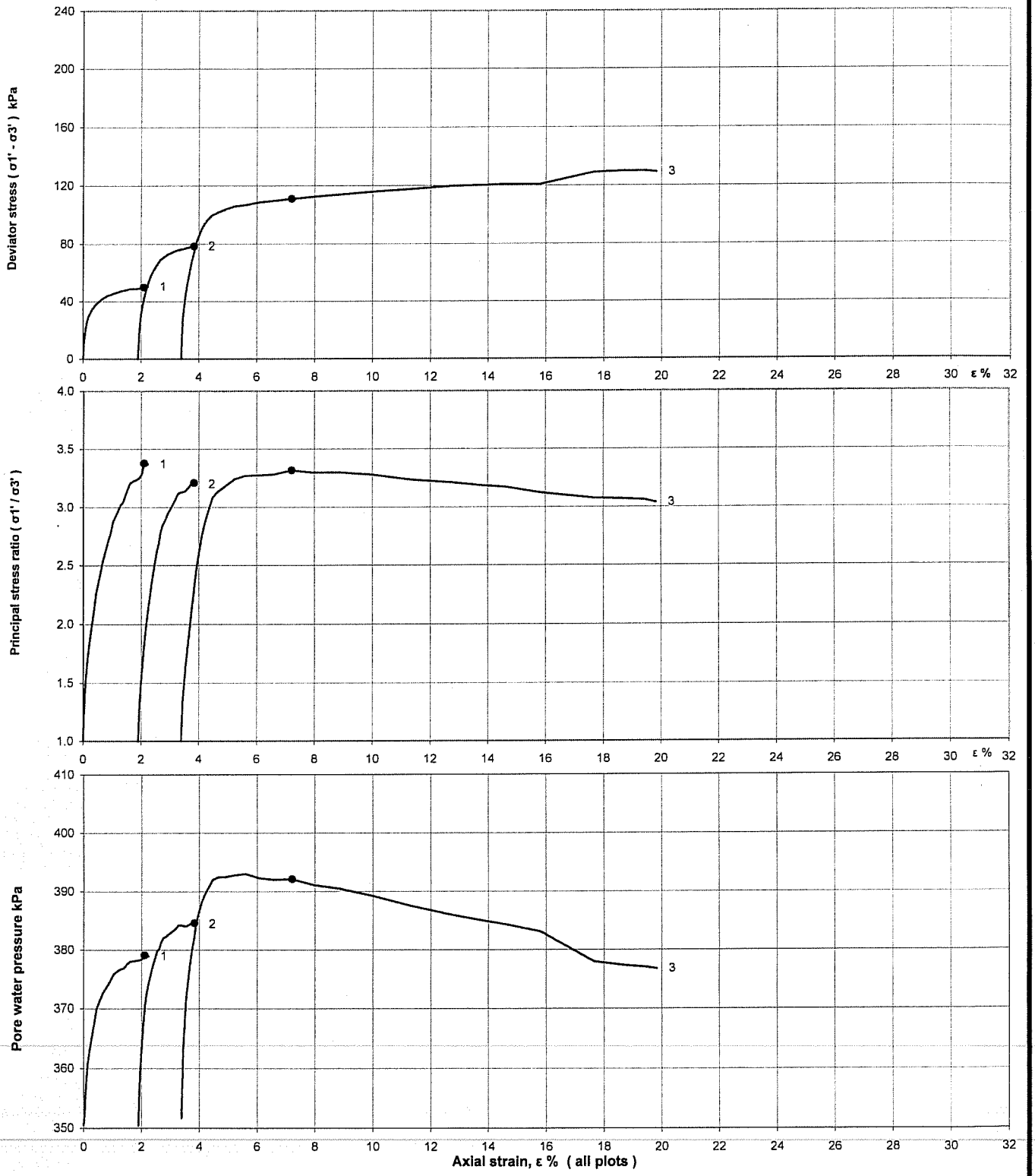
Ref			Figure
SLR8.1 Rev 85 May 09	Environmental Scientifics Group	Printed:15/11/2011 15:59	CUM 8 sheet 1 of 3

Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH4		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00-3.45		
			No	16	Type	U
			ID			
			Spec Ref			

Shearing stages - graphical data

o failure points

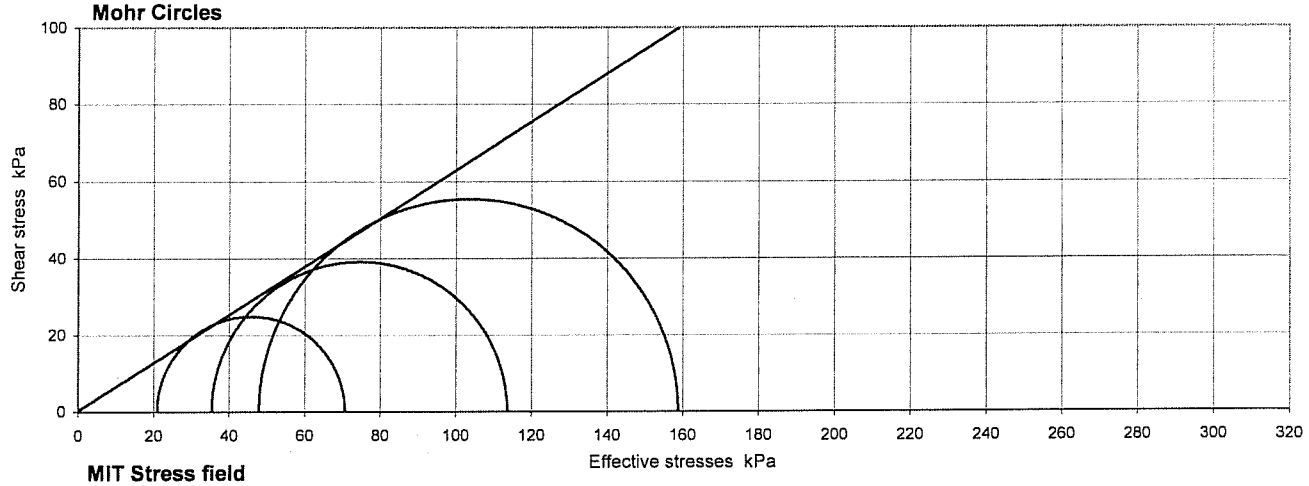


Ref			Figure
SLR8.1 Rev 85 May 09	SG Environmental Scientifics Group	Printed:15/11/2011 15:59	**CUM 8** sheet 2 of 3

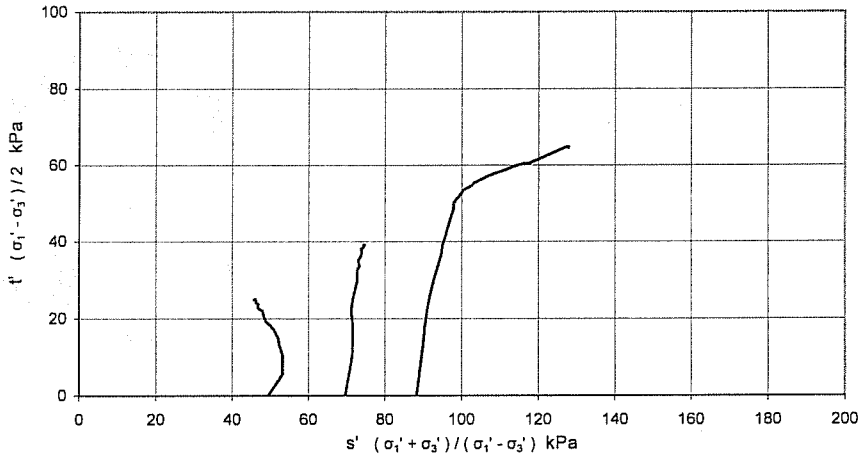
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH4		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00-3.45		
			No	16	Type	U
			ID			
			Spec Ref			

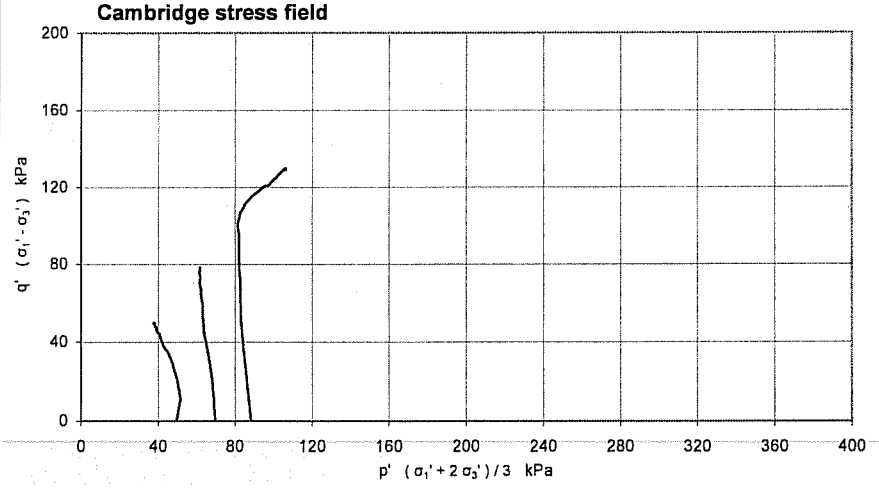
Mohr Circles



MIT Stress field



Cambridge stress field



Compression stages

Stage	1	2	3	
Cell pressure	400	420	440	kPa
Initial pwp	351	350	352	kPa
Initial σ_3'	50	70	88	kPa
Rate of strain	1.51	1.51	1.51	%/hr

Failure conditions

Criterion	Maximum effective principal stress ratio			
Axial strain	2.10	3.84	7.22	%
$(\sigma_1'/\sigma_3')_f$	3.378	3.209	3.315	
$(\sigma_1'-\sigma_3')_f$	49.7	78.2	110.9	kPa
u_f	379	385	392	kPa
$\sigma_3'_f$	21	35	48	kPa
$\sigma_1'_f$	71	114	159	kPa
A_f	0.58	0.44	0.36	
Time to failure	1.4	2.5	4.8	hrs

Shear Strength Parameters

at peak stress ratio

		Linear regression
c '	kPa	0.2
Ø '	degrees	32.1
		Manual re-assessment
c '	kPa	-
Ø '	degrees	-

Mode of failure

Notes : Deviator stresses corrected for area change, vertical side drains and 0.45 mm thick rubber membrane(s)

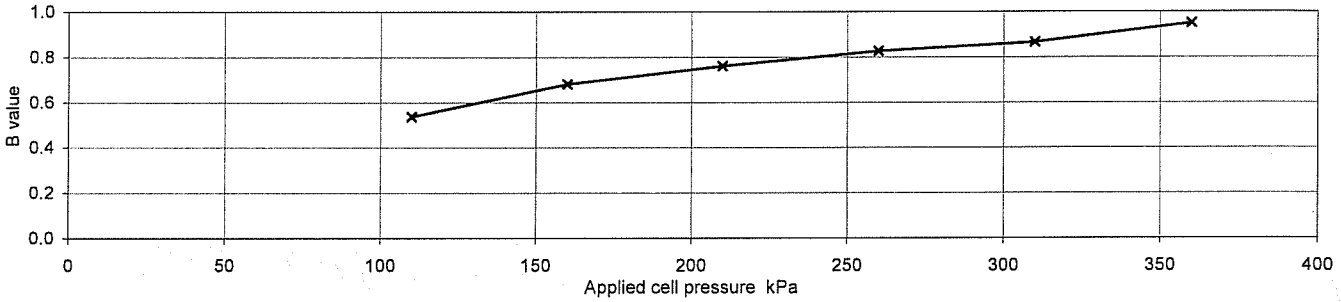
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00-3.45		
			No	14	Type	U
			ID			
			Spec Ref			

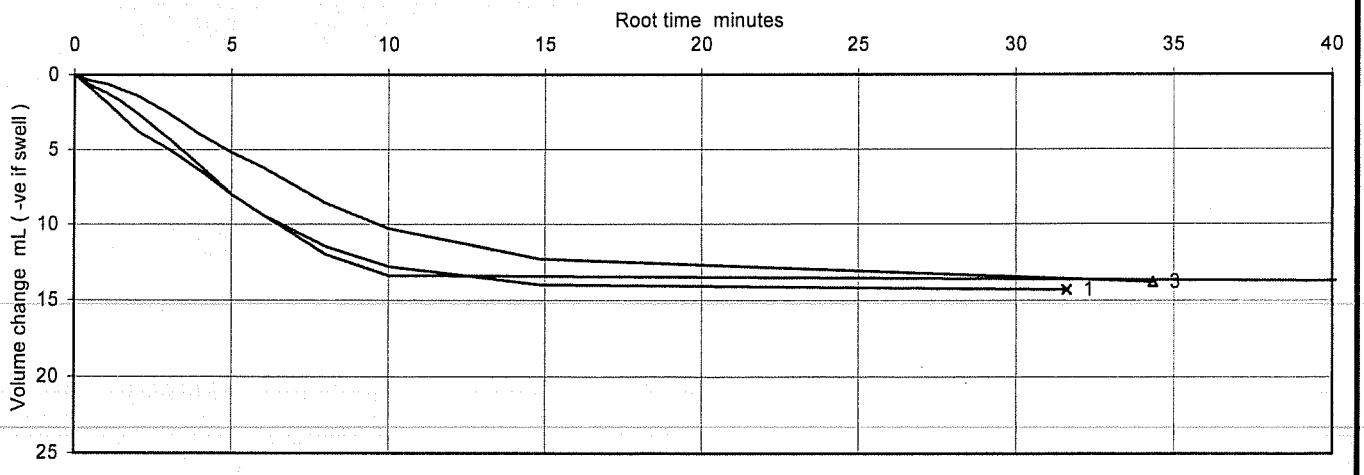
Specimen Details		
Initial		
Length	mm	174.16
Diameter	mm	103.45
Bulk Density	Mg/m³	1.87
Water Content	%	22
Dry density	Mg/m³	1.53
After test		
Bulk Density	Mg/m³	2.02
Water Content	%	23
Dry density	Mg/m³	1.63

Soil Description	Stiff greyish brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	360
Final pore water pressure	kPa	300
Final B Value		0.95



Consolidation Details	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		400	420	440	kPa
	Back Pressure applied		350	350	350	kPa
	Effective Pressure		50	70	90	kPa
	Pore pressure at start of consolidation		390	399	409	kPa
	Pore pressure at end of consolidation		350	350	350	kPa
	Pore pressure dissipation at end of consolidation		100	99	99	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	3.27	3.88	1.75	m^2/year
	Coefficient of Compressibility	M_{vi}	0.25	0.21	0.17	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	2.5E-10	2.5E-10	9.3E-11	m/s

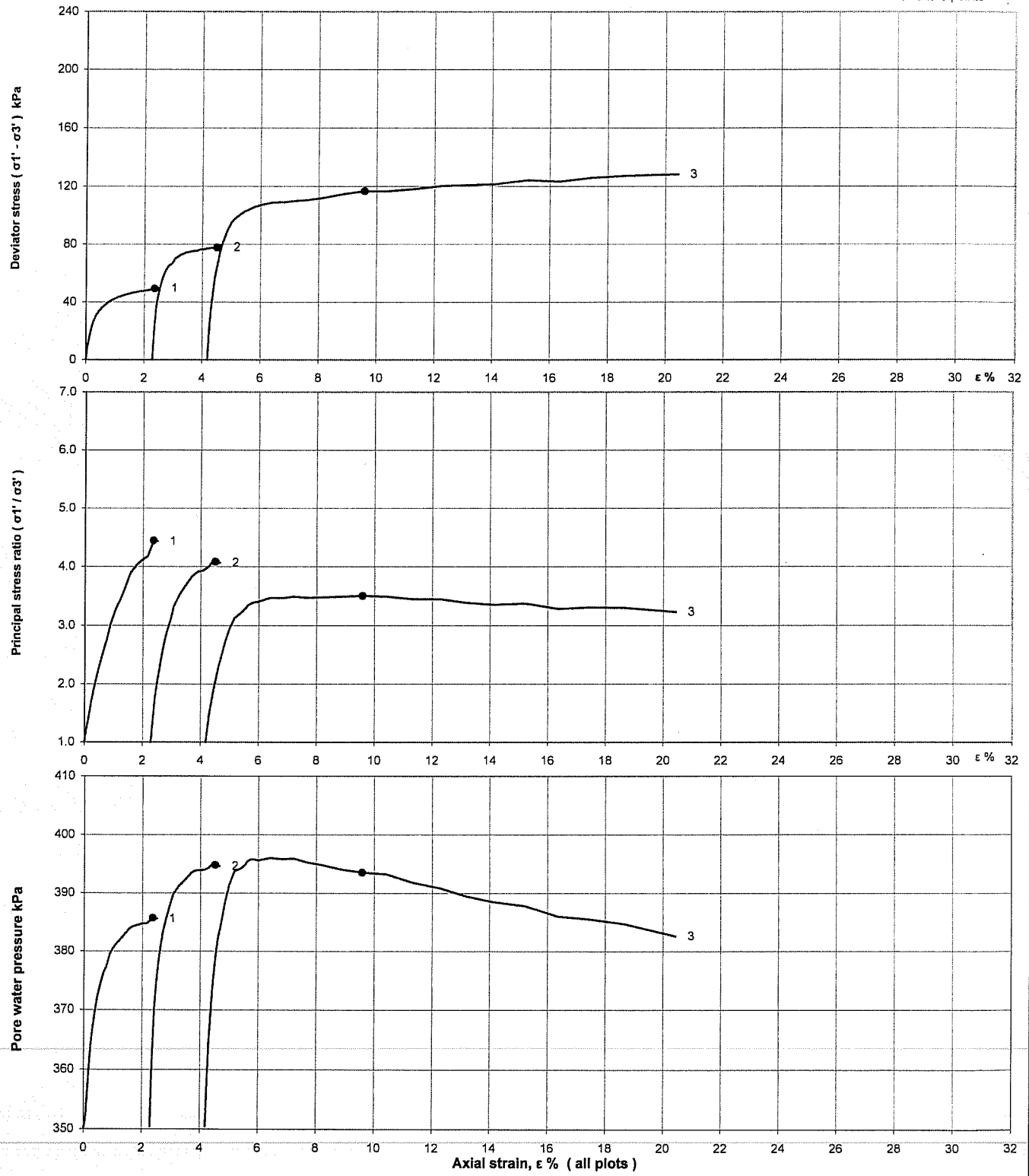


Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00-3.45		
			No	14	Type	U
			ID			
			Spec Ref			

Shearing stages - graphical data

o failure points

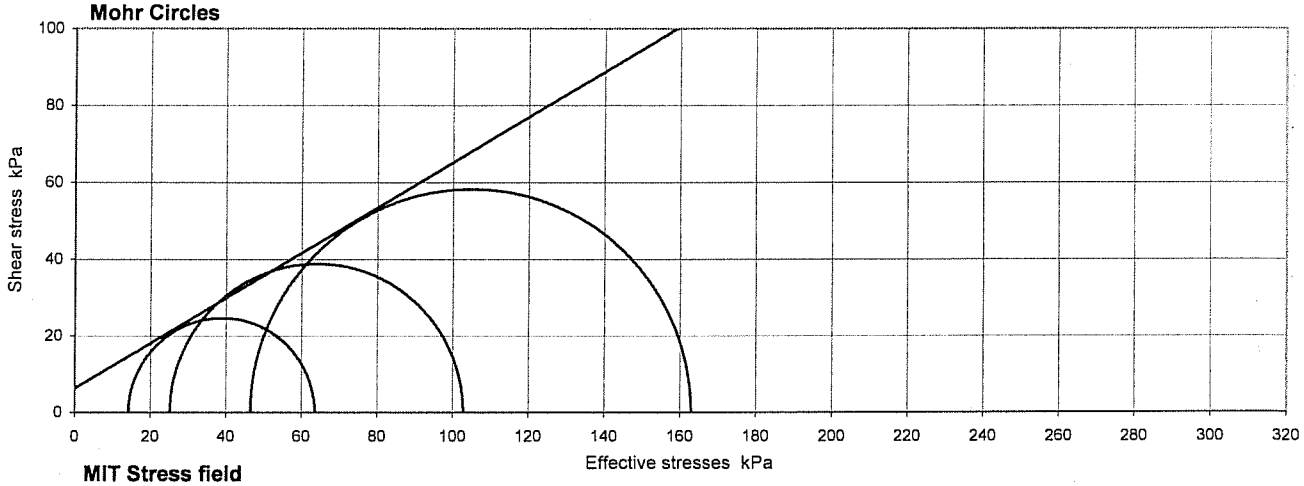


Ref			Figure
SLR8.1 Rev 85 May 09	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/11/2011 11:55	**CUM 9** sheet 2 of 3

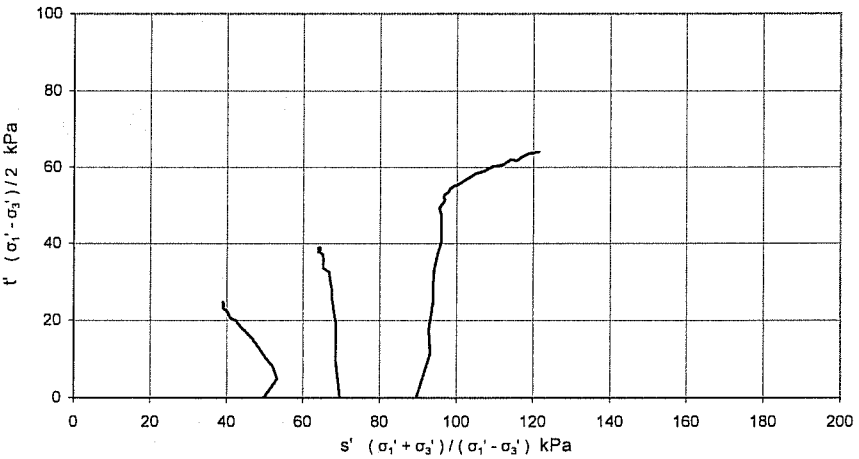
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH5		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00-3.45		
			No	14	Type	U
			ID			
			Spec Ref			

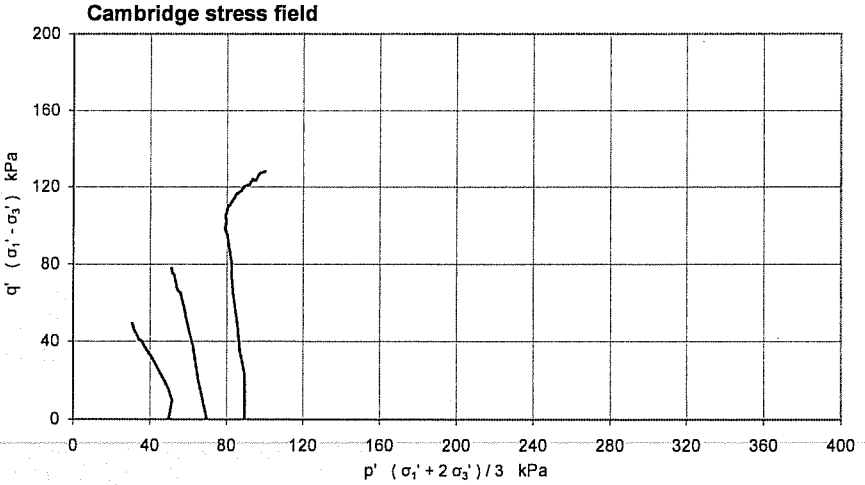
Mohr Circles



MIT Stress field



Cambridge stress field



Compression stages

Stage	1	2	3	
Cell pressure	400	420	440	kPa
Initial pwp	350	350	350	kPa
Initial σ_3'	50	70	90	kPa
Rate of strain	1.93	1.93	1.93	%/hr

Failure conditions

Criterion	Maximum effective principal stress ratio			
Axial strain	2.37	4.51	9.59	%
$(\sigma_1'/\sigma_3')_f$	4.442	4.078	3.505	
$(\sigma_1'-\sigma_3')_f$	49.2	77.6	116.5	kPa
u_f	386	395	394	kPa
$\sigma_3'_f$	14	25	47	kPa
$\sigma_1'_f$	64	103	163	kPa
A_f	0.72	0.57	0.37	
Time to failure	1.2	2.3	5.0	hrs

Shear Strength Parameters

at peak stress ratio

		Linear regression
c '	kPa	6.3
Ø '	degrees	30.5
		Manual re-assessment
c '	kPa	-
Ø '	degrees	-

Mode of failure

Notes : Deviator stresses corrected for area change, vertical side drains and 0.45 mm thick rubber membrane(s)

Test specimen contains natural break.

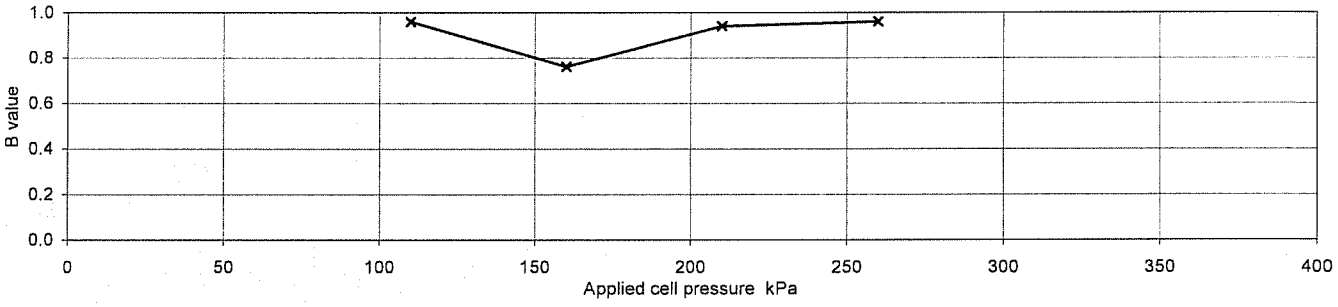
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH6		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00-3.45		
			No	14	Type	U
			ID			
			Spec Ref			

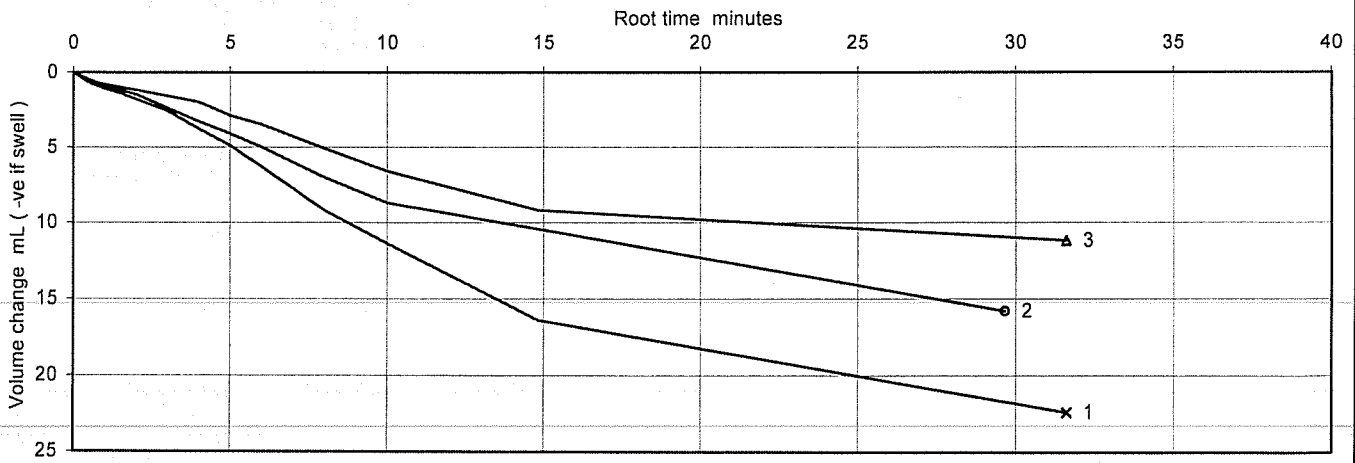
Specimen Details		
Initial		
Length	mm	202.63
Diameter	mm	103.04
Bulk Density	Mg/m³	2.08
Water Content	%	21
Dry density	Mg/m³	1.72
After test		
Bulk Density	Mg/m³	2.13
Water Content	%	20
Dry density	Mg/m³	1.78

Soil Description	Firm brownish grey slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	260
Final pore water pressure	kPa	200
Final B Value		0.96



Consolidation Details	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		350	370	390	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		50	70	90	kPa
	Pore pressure at start of consolidation		334	348	350	kPa
	Pore pressure at end of consolidation		300	300	300	kPa
	Pore pressure dissipation at end of consolidation		100	100	100	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.70	0.72	0.86	m^2/year
	Coefficient of Compressibility	M_{vi}	0.39	0.20	0.14	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	8.5E-11	4.4E-11	3.6E-11	m/s



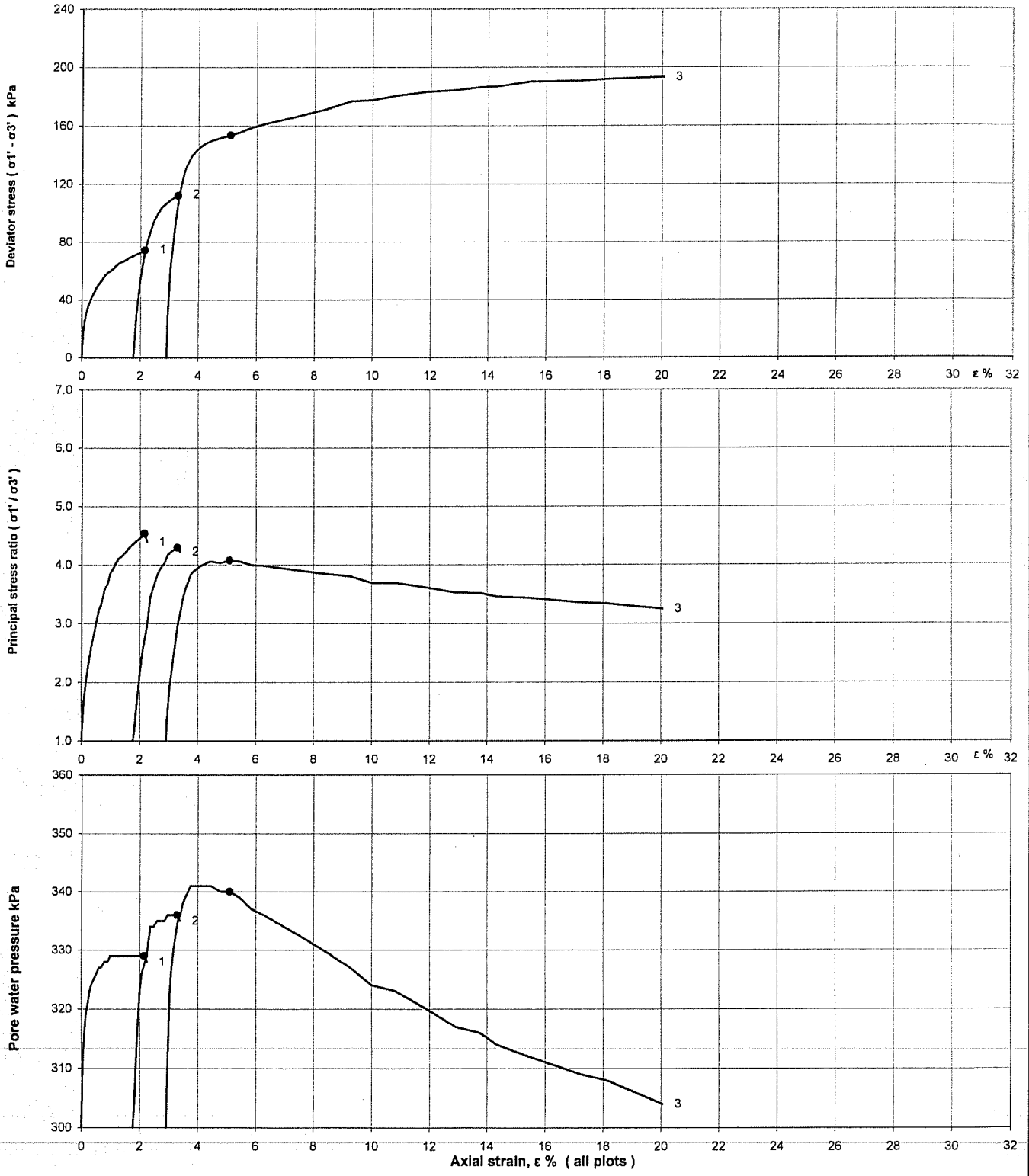
Ref			Figure
SLR8.1 Rev 85 May 09	Scientifics Group	Printed:11/11/2011 12:02	CUM 10 sheet 1 of 3

Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH6		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00-3.45		
			No	14	Type	U
			ID			
			Spec Ref			

Shearing stages - graphical data

o failure points

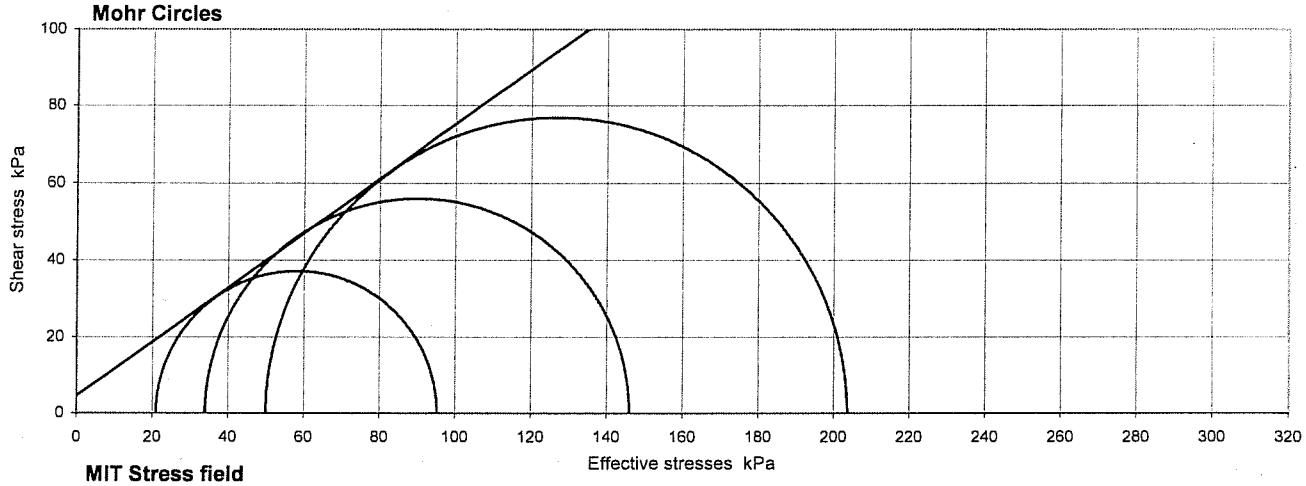


Ref			Figure
SLR8.1 Rev 85 May 09	Scientifics	Printed:11/11/2011 12:02	**CUM 10** sheet 2 of 3

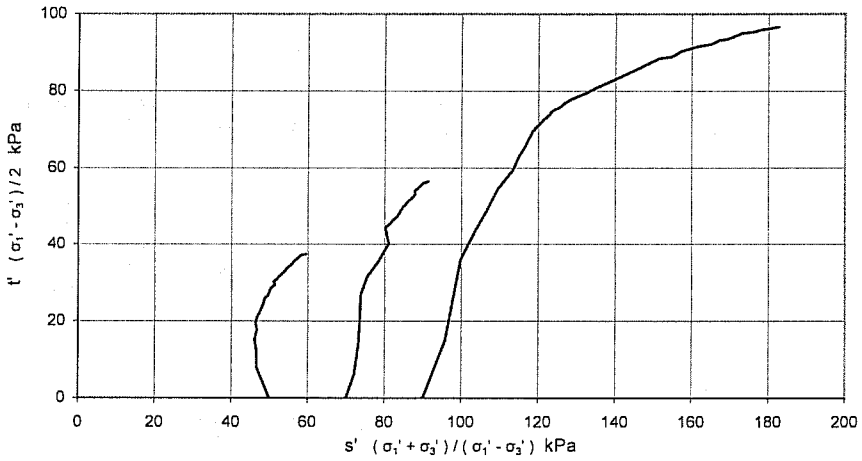
Consolidated Undrained Triaxial Compression test with Measurement of Pore Water Pressure
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	A1077-11	Sample Details:	Hole No	BH6		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00-3.45		
			No	14	Type	U
			ID			
			Spec Ref			

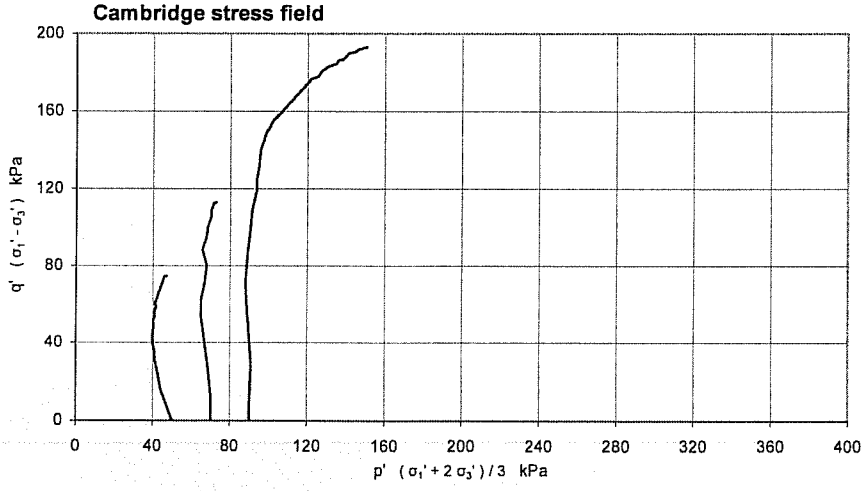
Mohr Circles



MIT Stress field



Cambridge stress field



Compression stages

Stage	1	2	3	
Cell pressure	350	370	390	kPa
Initial pwp	300	300	300	kPa
Initial σ_3'	50	70	90	kPa
Rate of strain	0.52	0.52	0.52	%/hr

Failure conditions

Criterion	Maximum effective principal stress ratio			
Axial strain	2.16	3.30	5.10	%
$(\sigma_1'/\sigma_3')_f$	4.535	4.295	4.073	
$(\sigma_1' - \sigma_3')_f$	74.2	112.0	153.6	kPa
u_f	329	336	340	kPa
$\sigma_3'_f$	21	34	50	kPa
$\sigma_1'_f$	95	146	204	kPa
A_f	0.39	0.32	0.26	
Time to failure	4.1	6.3	9.8	hrs

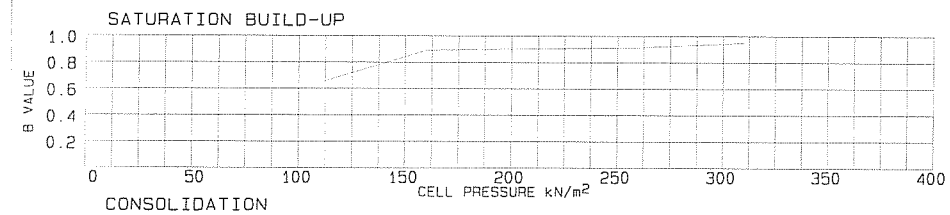
Shear Strength Parameters

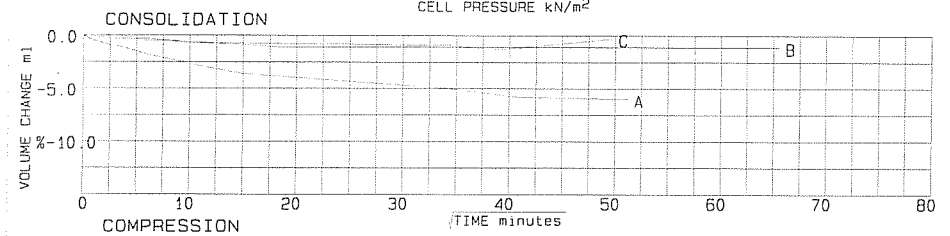
at peak stress ratio

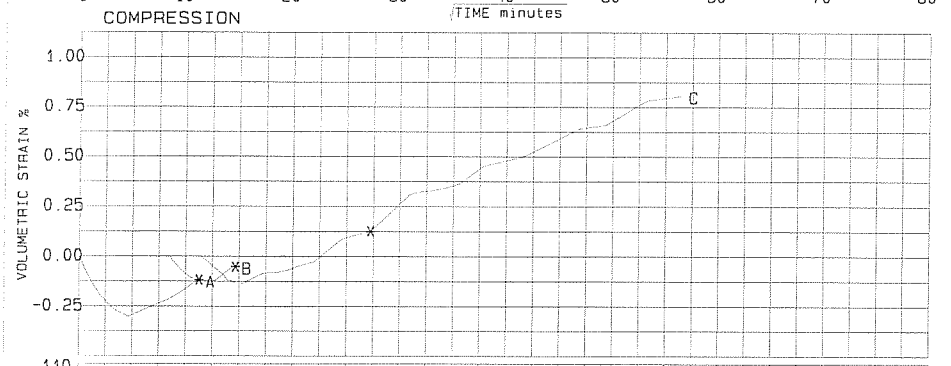
		Linear regression
c '	kPa	4.6
Ø '	degrees	35.3
		Manual re-assessment
c '	kPa	-
Ø '	degrees	-

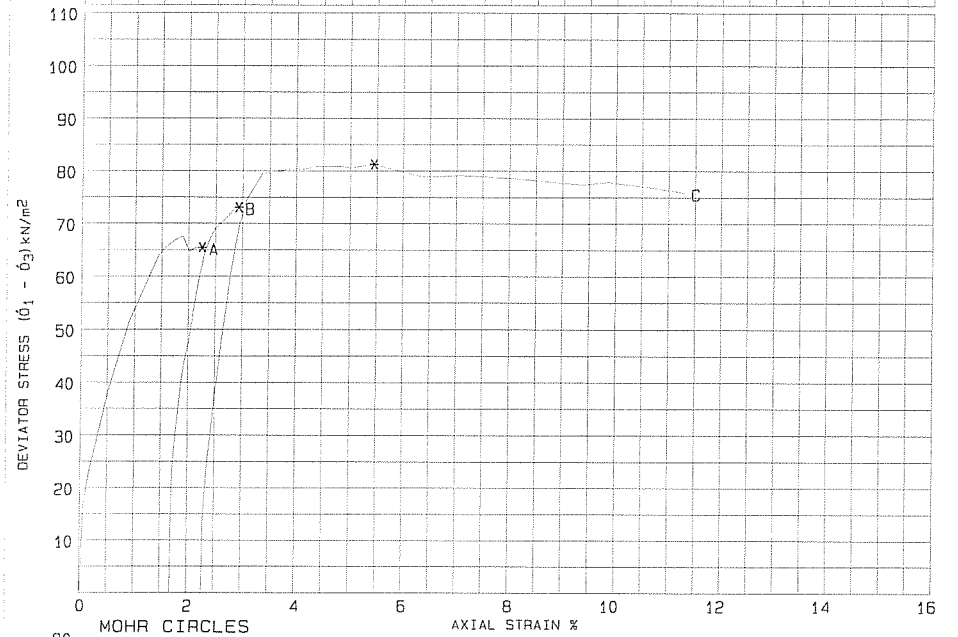
Mode of failure

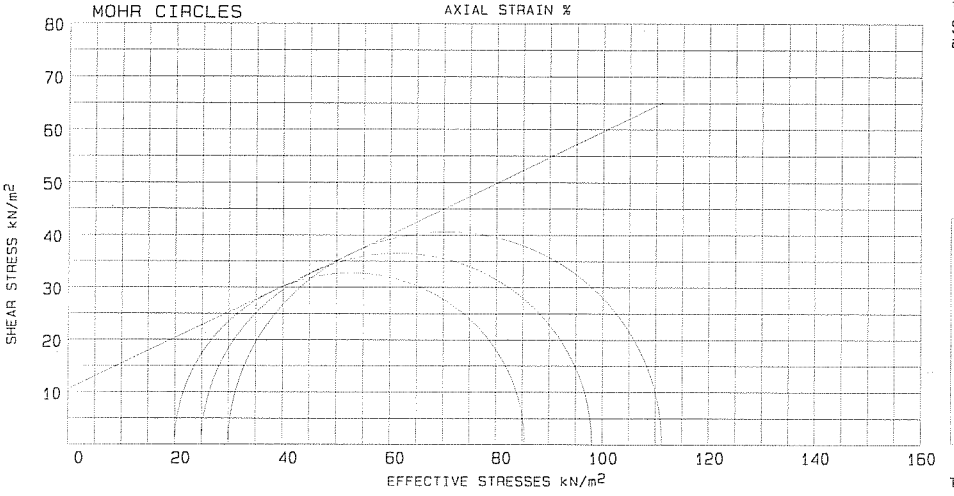
Notes : Deviator stresses corrected for area change, vertical side drains and 0.9 mm thick rubber membrane(s)











SPECIMEN			A	B	C
INITIAL	Density Mg/m3		2.11	2.10	2.10
	Moisture %		19	18	18
	Dry Density Mg/m3		1.78	1.77	1.77
AFTER CONSOLIDATION	Density Mg/m3		2.10	2.10	2.09
	Moisture %		18	18	18
	Dry Density Mg/m3		1.77	1.77	1.77
AFTER TEST	Density Mg/m3		2.10	2.10	2.08
	Moisture %		18	18	19
	Dry Density Mg/m3		1.77	1.77	1.75
SATURATION	Initial pwp	kN/m2	0	0	0
	Saturated pwp		249	249	249
	Final pwp pressure		260	260	260
	B value		0.95	0.95	0.95
CONSOLIDATION STAGE	Cell Pressure	kN/m2	320	325	330
	Back Pressure		300	300	300
	Initial pwp		309	303	305
	Final pwp		300	300	300
CONSOLIDATION PARAMETERS	C_{v_3} m2/year		0.43	0.64	0.67
	m_{v_3} m2/MN		0.42	0.21	0.03
COMPRESSION STAGE	Cell Pressure	kN/m2	320	325	330
	Back pressure		300	300	300
	Ó3'		20	25	30
	Rate of strain % per hour		0.13	0.13	0.13
FAILURE CONDITIONS	Axial Strain %		2.3	2.9	5.5
	Volumetric Strain %		-0.1	-0.1	0.1
	(Ó1 - Ó3)f	kN/m2	65	73	81
	Ó1'f		85	98	111
	Time to failure hours		17.4	22.5	41.9
	MODE OF FAILURE				

SHEAR STRENGTH PARAMETERS	C_D	$Ø_D$
BY LINEAR REGRESSION	11 kN/m2	26 o

NOTES

Saturation by application of cell/back pressure increments of 50 kN/m2 with a differential of 10 kN/m2.

Drainage during consolidation and shearing to top with Vertical side drains fitted

Stress/strain curves corrected for area change, side drains and .45 mm thick membrane

SOIL DESCRIPTION

Firm brown slightly sandy, slightly gravelly CLAY.

TYPE OF SPECIMEN: UNDISTURBED

SPECIMEN DIMENSIONS: 102.5mm dia x 203.9 mm long

Test carried out to BS 1377 : Part 8 : 1990 : Test 8

Consolidated Drained Triaxial Compression Test with measurement of volume change

Borehole No. BH1 Depth 1.20-1.65m

sample No. U5

SLR 8.8	Soil Mechanics	Location: SANDSEND BOREHOLES, NORTH YORKSHIRE	Loc. No. A1077-11	Fig.

Determination of shear strength by direct shear (Small shearbox apparatus)
(BS1377 : Part 7 : clause 4 : 1990)

Project No	A1077-11	Sample Details:	Hole No.	BH1	
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	12.50-12.95	
			Sample No	33	Type U
			ID		
			Spec Ref		

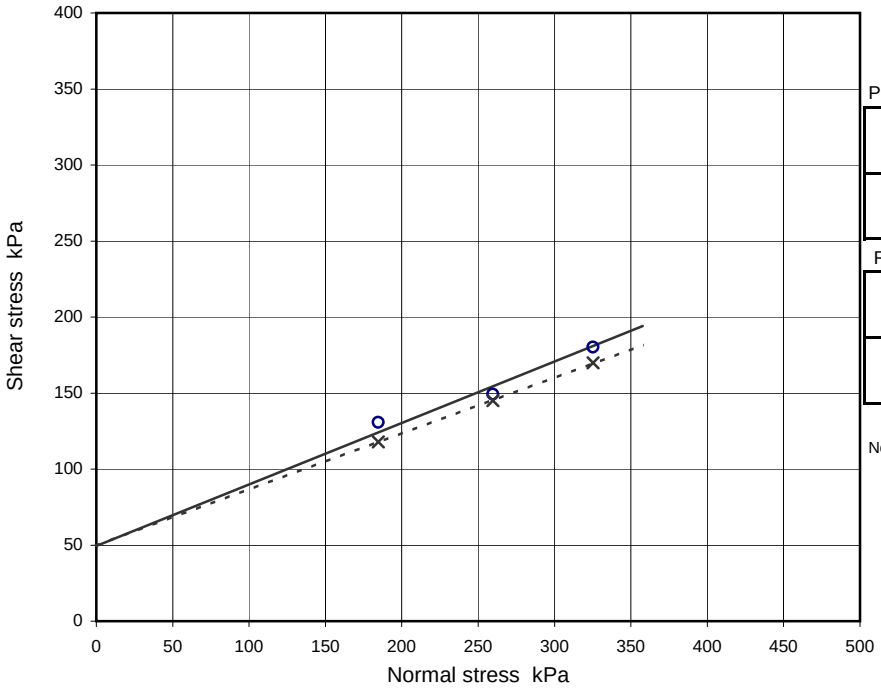
Soil Description	Firm to stiff brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	Undisturbed

Specimen(s) nominally 60mm x 60mm square
Test(s) carried out in submerged condition
Particle density, assumed 2.65 Mg/m^3

Specimen Details		No.	1	2	3	4	5	6
Initial	Height	mm	23.4	23.4	23.4			
	Bulk Density	Mg/m^3	2.20	2.18	2.20			
	Water Content	%	14.5	14.6	14.9			
	Dry density	Mg/m^3	1.92	1.90	1.92			
	Voids ratio		0.378	0.395	0.383			
	Degree of Saturation	%	102	98	103			
Consol^n	Consolidation / Normal Stress applied	kPa	**185**	**260**	**325**			
	Change in height during consolidation	mm	-0.872	-1.200	-1.334			
	Voids ratio after consolidation		0.326	0.324	0.304			
Shear see note 1	Voids ratio at end of test		0.246	0.252	0.220			
	Moisture content at end of test	%	9.3	9.5	8.3			
	Saturation at end of test	%	100	100	100			

Shearing stage

Rate of displacement	Peak	mm/min	0.005	0.005	0.005			
	Residual	mm/min	0.023	0.023	0.023			
Peak values, (o)	Relative displacement	mm	6.04	9.50	6.30			
	Shear stress	kPa	130.7	149.2	180.2			
Residual values, (x)	No. of reversals		2	2	2			
	Relative displacement	mm	20.00	30.00	10.00			
	Shear stress	kPa	118.0	145.2	169.8			



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	(64)	50
Ø '	degrees	(19½)	22

Residual strength, (x)

c'_R	kPa	50	-
$Ø'_R$	degrees	20	-

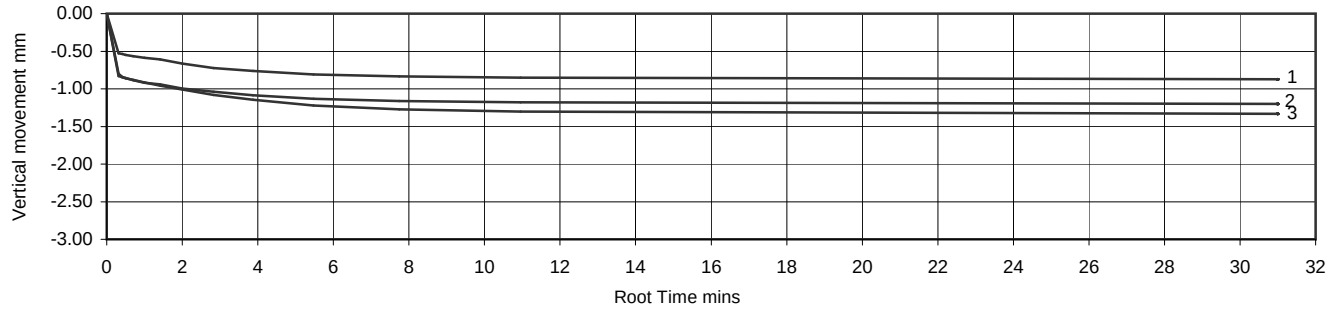
Notes :

1 After shear values based on BS1377. Pt 7 cl. 4.6.1.6 using δH calculated from consolidation and shear stages

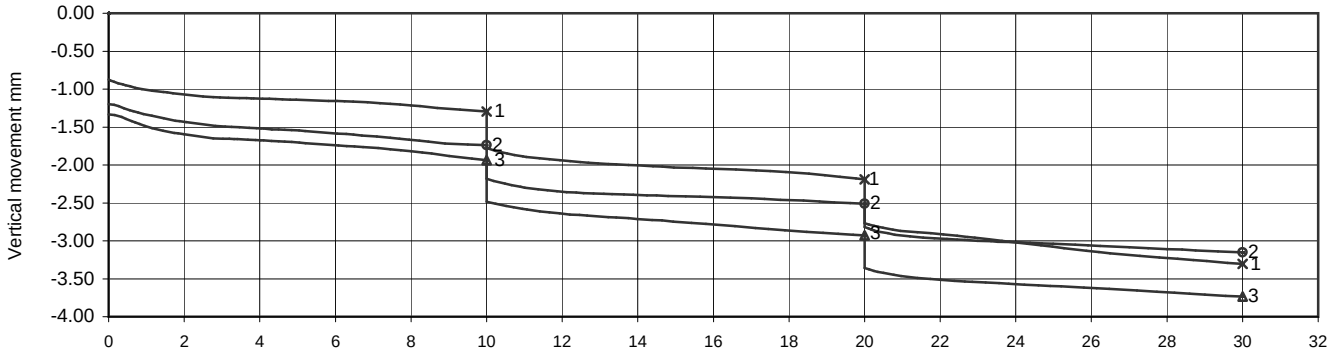
Determination of shear strength by direct shear (Small shearbox apparatus)
(BS1377 : Part 7 : clause 4 : 1990)

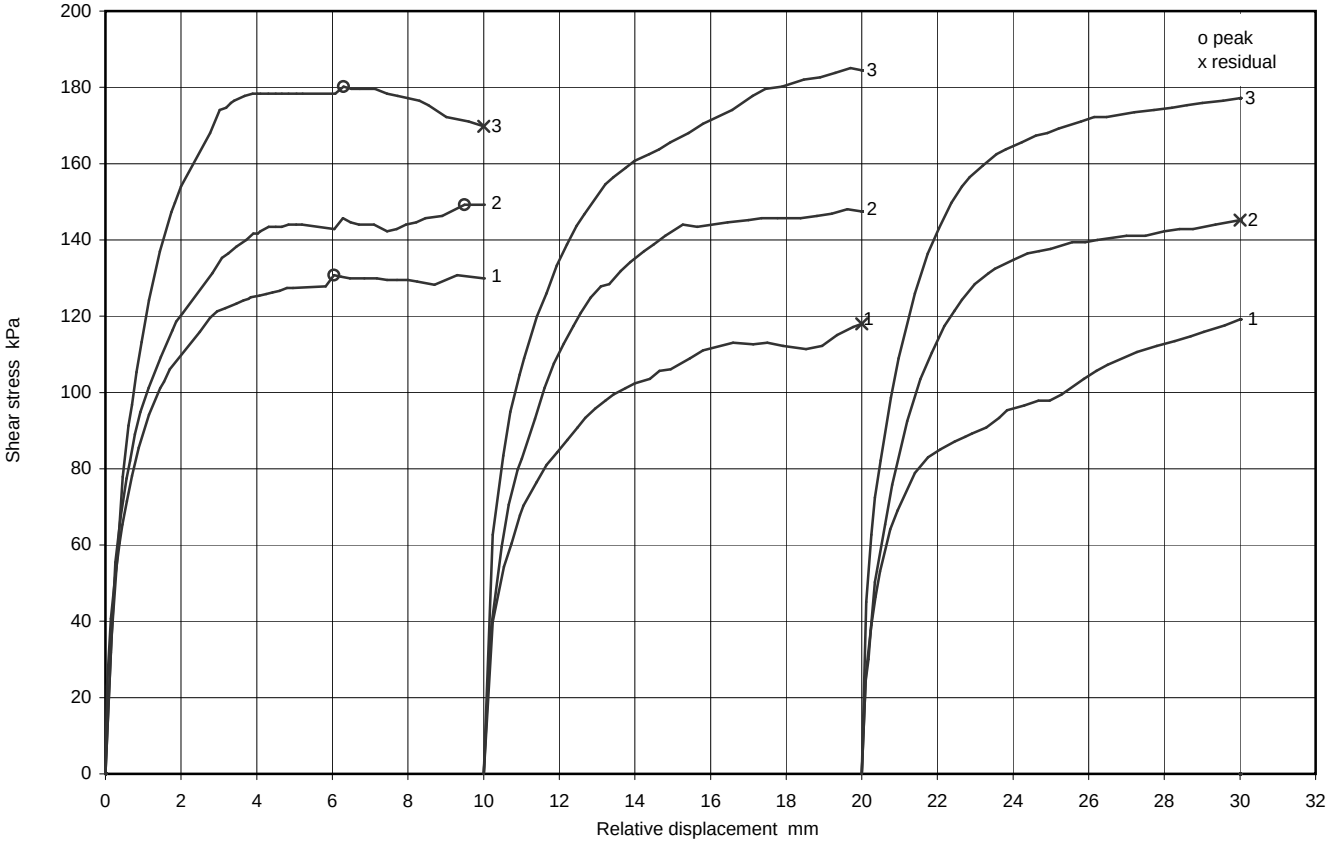
Project No	A1077-11	Sample Details:	Hole No.	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	12.50-12.95		
			Sample No	33	Type	U
			ID			
			Spec Ref			

Consolidation stage(s)



Shearing stage(s)





Ref		Figure
SLR7.4 Rev 85 Oct 10	ESG Environmental Scientifics Group UKAS TESTING 1157	Printed:18/11/2011 16:29	**SSB 1** sheet 2 of 2

Determination of shear strength by direct shear (Small shearbox apparatus)
(BS1377 : Part 7 : clause 4 : 1990)

Project No	A1077-11	Sample Details:	Hole No.	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	5.00-5.45		
			Sample No	12	Type	U
			ID			
			Spec Ref			

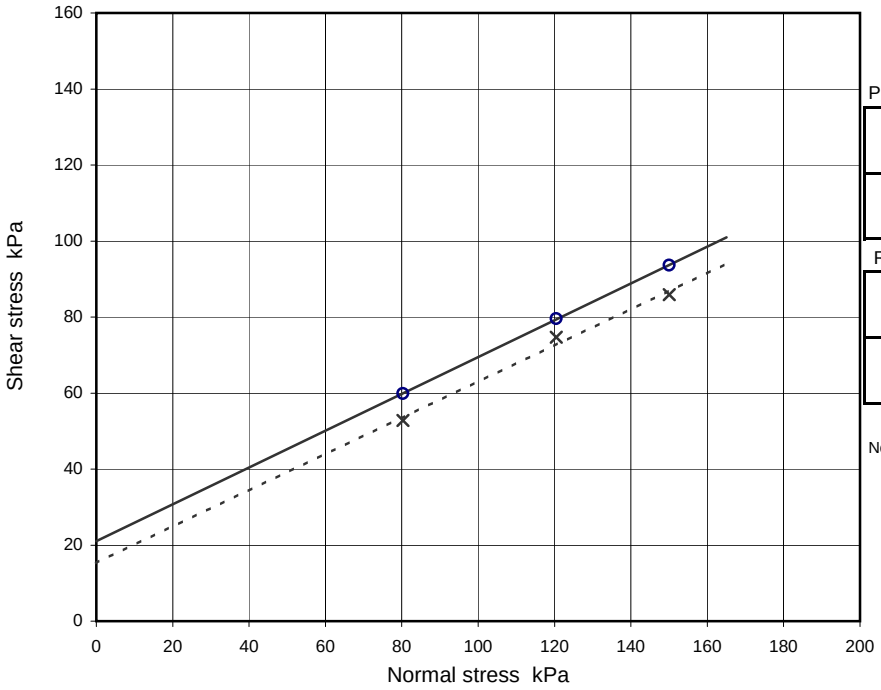
Soil Description	Firm brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	Undisturbed

Specimen(s) nominally 60mm x 60mm square
Test(s) carried out in submerged condition
Particle density, assumed 2.65 Mg/m^3

Specimen Details		No.	1	2	3	4	5	6
Initial	Height	mm	23.4	23.4	23.4			
	Bulk Density	Mg/m^3	2.17	2.17	2.19			
	Water Content	%	14.2	14.2	13.9			
	Dry density	Mg/m^3	1.90	1.90	1.92			
	Voids ratio		0.395	0.396	0.377			
	Degree of Saturation	%	95	95	98			
Consol^n	Consolidation / Normal Stress applied	kPa	**80**	**120**	**150**			
	Change in height during consolidation	mm	-0.436	-0.470	-0.582			
	Voids ratio after consolidation		0.369	0.368	0.343			
Shear see note 1	Voids ratio at end of test		0.303	0.354	0.309			
	Moisture content at end of test	%	11.4	13.4	11.7			
	Saturation at end of test	%	100	100	100			

Shearing stage

Rate of displacement	Peak	mm/min	0.009	0.009	0.009			
	Residual	mm/min	0.046	0.046	0.046			
Peak values, (o)	Relative displacement	mm	10.00	6.05	5.85			
	Shear stress	kPa	59.9	79.6	93.6			
Residual values, (x)	No. of reversals		2	2	2			
	Relative displacement	mm	30.00	28.43	28.75			
	Shear stress	kPa	52.8	74.7	85.9			



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	21	-
Ø '	degrees	26	-

Residual strength, (x)			
c'_R	kPa	15	-
$Ø'_R$	degrees	25½	-

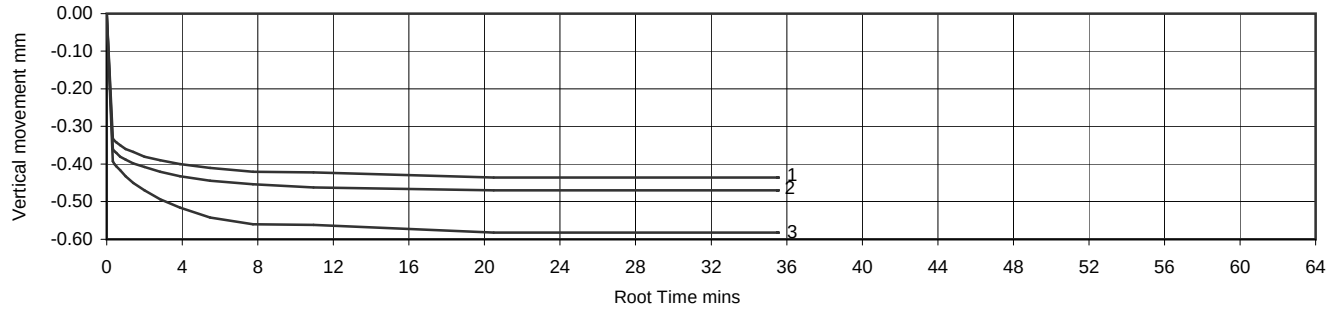
Notes :

1 After shear values based on BS1377. Pt 7 cl. 4.6.1.6 using δH calculated from consolidation and shear stages

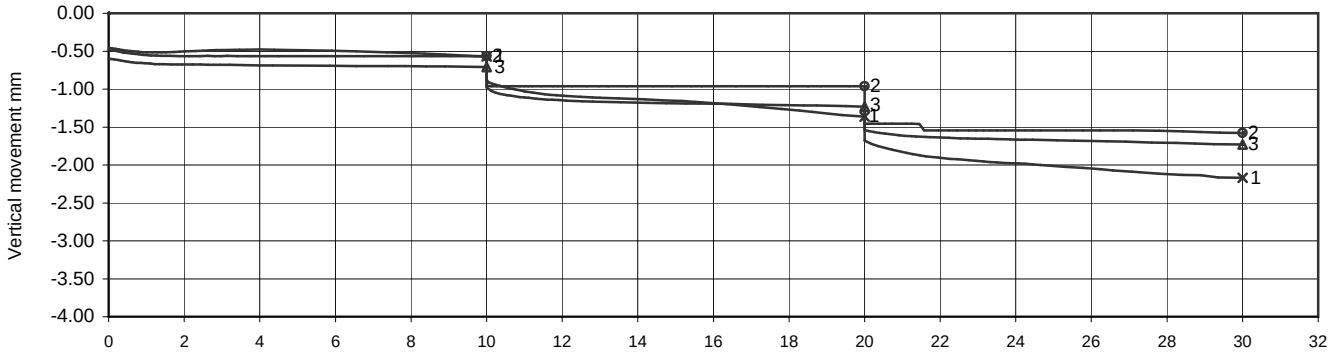
Determination of shear strength by direct shear (Small shearbox apparatus)
(BS1377 : Part 7 : clause 4 : 1990)

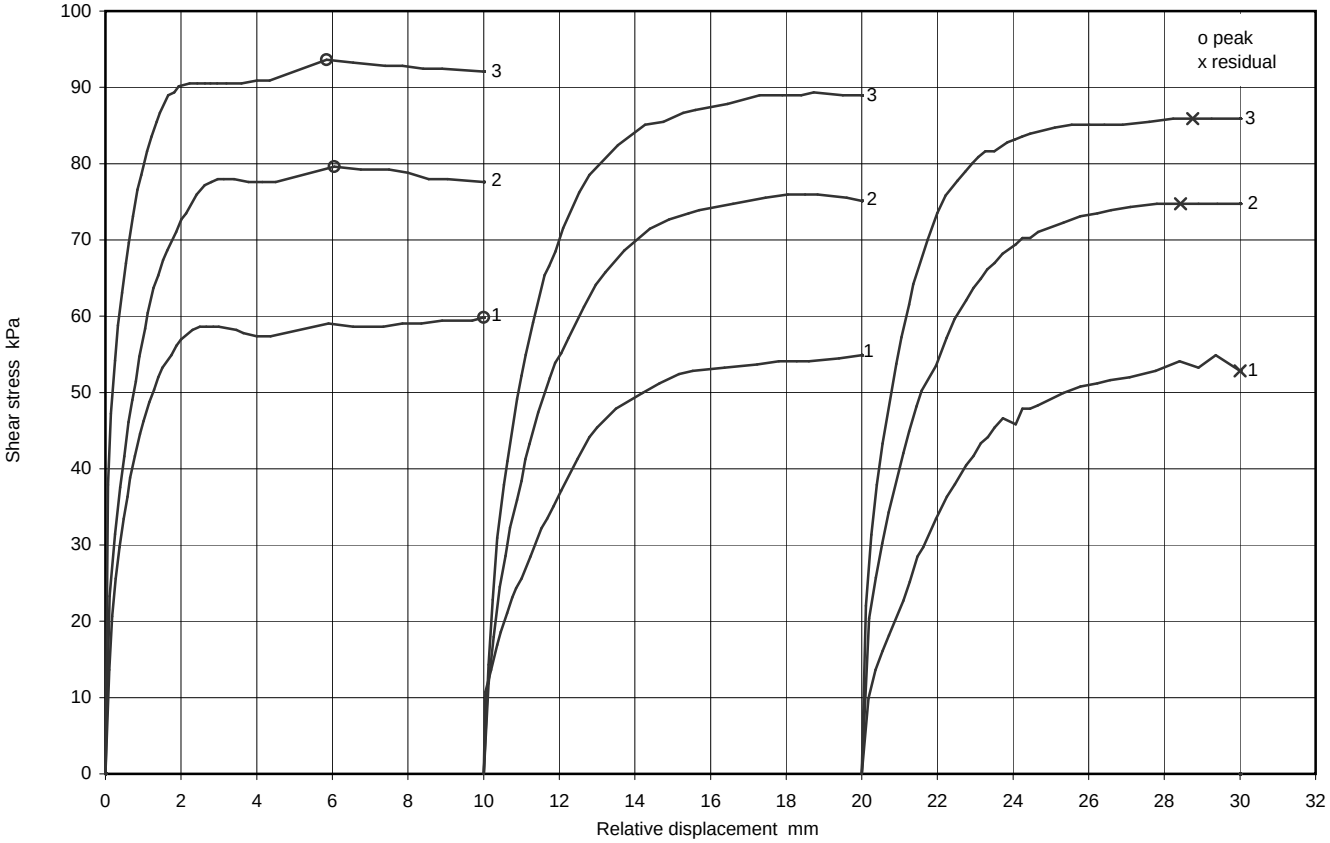
Project No	A1077-11	Sample Details:	Hole No.	BH2	
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	5.00-5.45	
			Sample No	12	Type U
			ID		
			Spec Ref		

Consolidation stage(s)



Shearing stage(s)





Ref SLR7.4 Rev 85 Oct 10	Soil Mechanics	UKAS TESTING 1157	Printed:18/11/2011 16:30	**Figure** **SSB 2** sheet 2 of 2

Determination of shear strength by direct shear (Small shearbox apparatus)
(BS1377 : Part 7 : clause 4 : 1990)

Project No	A1077-11	Sample Details:	Hole No.	BH2	
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	19.00-19.45	
			Sample No	43	Type U
			ID		
			Spec Ref		

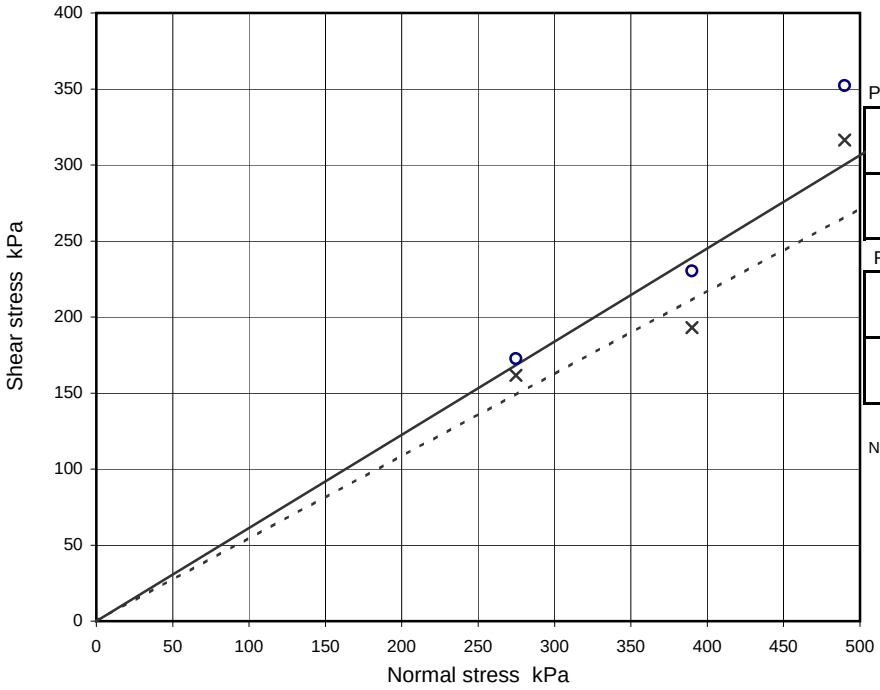
Soil Description	Firm brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	Undisturbed

Specimen(s) nominally 60mm x 60mm square
Test(s) carried out in submerged condition
Particle density, assumed 2.65 Mg/m^3

Specimen Details		No.	1	2	3	4	5	6
Initial	Height	mm	23.4	23.4	23.4			
	Bulk Density	Mg/m^3	2.18	2.20	2.18			
	Water Content	%	14.5	15.4	16.1			
	Dry density	Mg/m^3	1.91	1.90	1.88			
	Voids ratio		0.389	0.391	0.411			
	Degree of Saturation	%	99	104	104			
Consol^n	Consolidation / Normal Stress applied	kPa	**275**	**390**	**490**			
	Change in height during consolidation	mm	-1.028	-1.748	-1.808			
	Voids ratio after consolidation		0.328	0.287	0.302			
Shear see note 1	Voids ratio at end of test		0.272	0.183	0.175			
	Moisture content at end of test	%	10.3	6.9	6.6			
	Saturation at end of test	%	100	100	100			

Shearing stage

Rate of displacement	Peak	mm/min	0.003	0.003	0.003			
	Residual	mm/min	0.013	0.013	0.013			
Peak values, (o)	Relative displacement	mm	5.93	5.68	6.30			
	Shear stress	kPa	172.7	230.4	352.3			
Residual values, (x)	No. of reversals		2	2	2			
	Relative displacement	mm	30.60	20.00	10.00			
	Shear stress	kPa	161.6	193.1	316.4			



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	(-66.1)	0.0
Ø '	degrees	(39½)	31½

Residual strength, (x)			
c'_R	kPa	(-48.7)	0.0
$Ø'_R$	degrees	(35½)	28½

Notes :

1 After shear values based on BS1377. Pt 7 cl. 4.6.1.6 using δH calculated from consolidation and shear stages

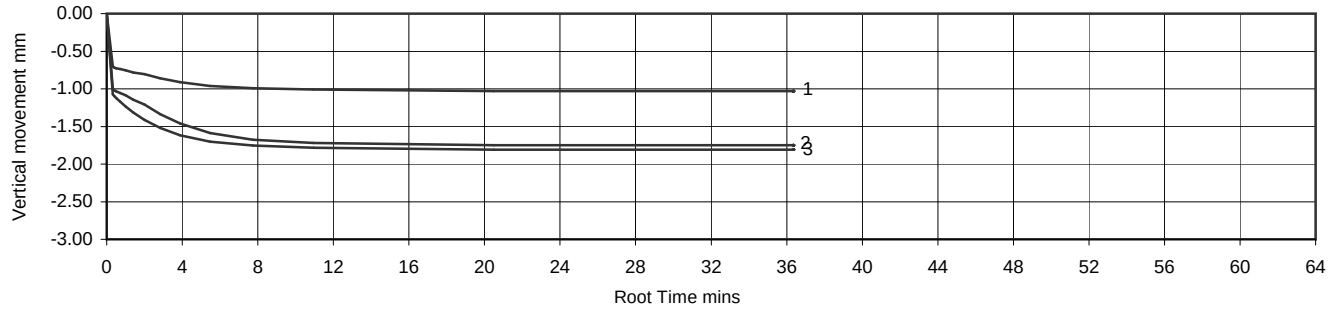
2 2 pieces of medium gravel found in specimen 3 after test.

3 Manual interpretation carried out for results for specimens 1 and 2 only, assuming c' and c'R = 0

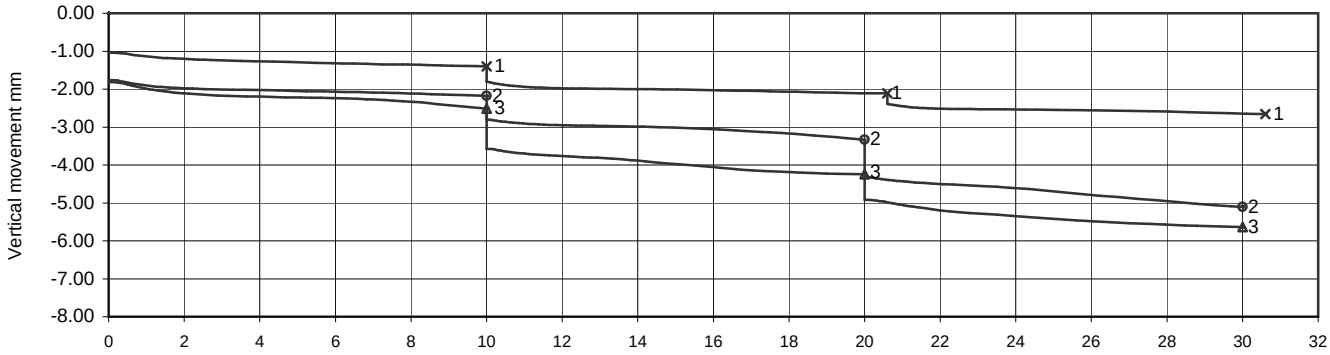
Determination of shear strength by direct shear (Small shearbox apparatus)
(BS1377 : Part 7 : clause 4 : 1990)

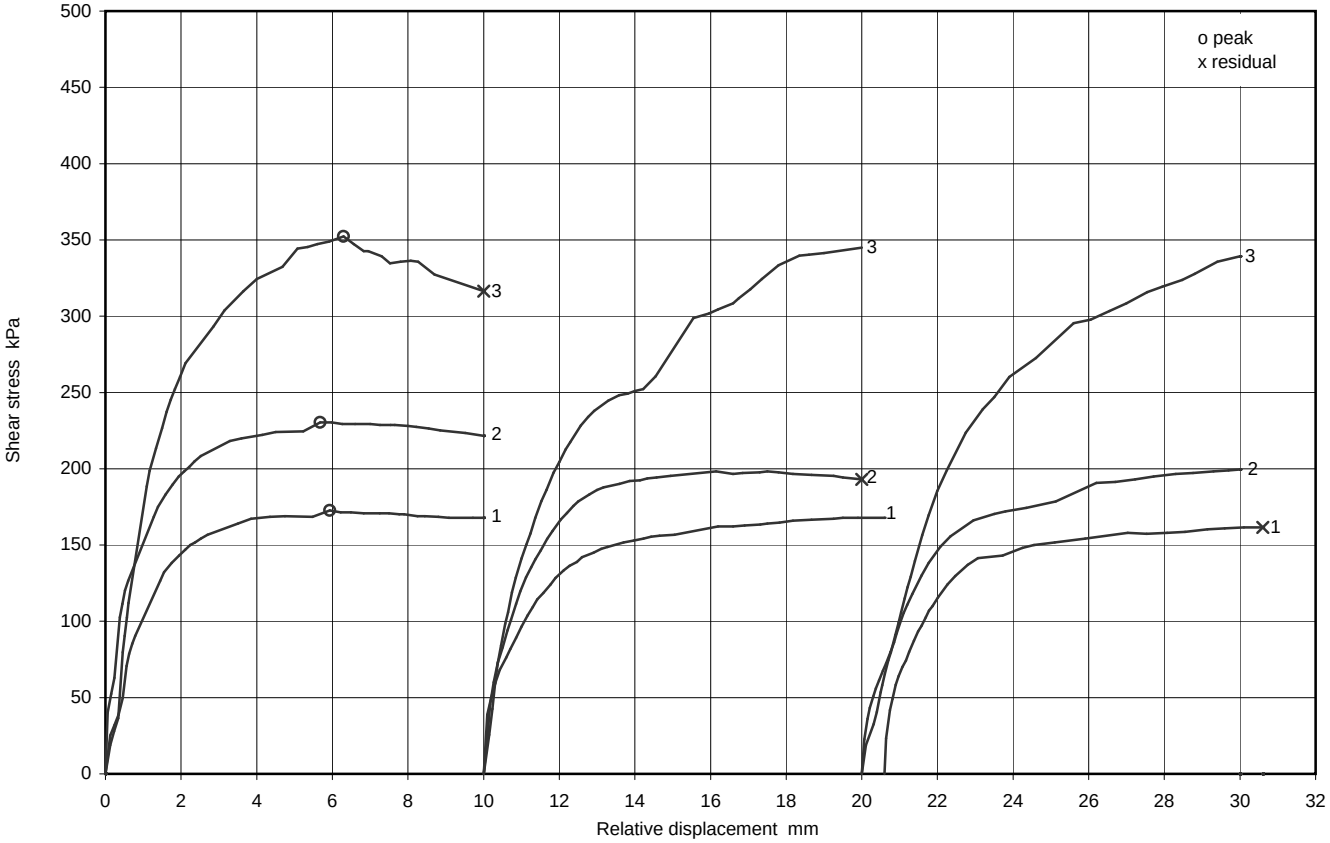
Project No	A1077-11	Sample Details:	Hole No.	BH2	
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	19.00-19.45	
			Sample No	43	Type U
			ID		
			Spec Ref		

Consolidation stage(s)



Shearing stage(s)





Ref			Figure
SLR7.4 Rev 85 Oct 10	Soil Mechanics	Printed:08/12/2011 12:47	**SSB 3** sheet 2 of 2

Determination of shear strength by direct shear (Small shearbox apparatus)
(BS1377 : Part 7 : clause 4 : 1990)

Project No	A1077-11	Sample Details:	Hole No.	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	23.00-23.45		
			Sample No	51	Type	U
			ID			
			Spec Ref			

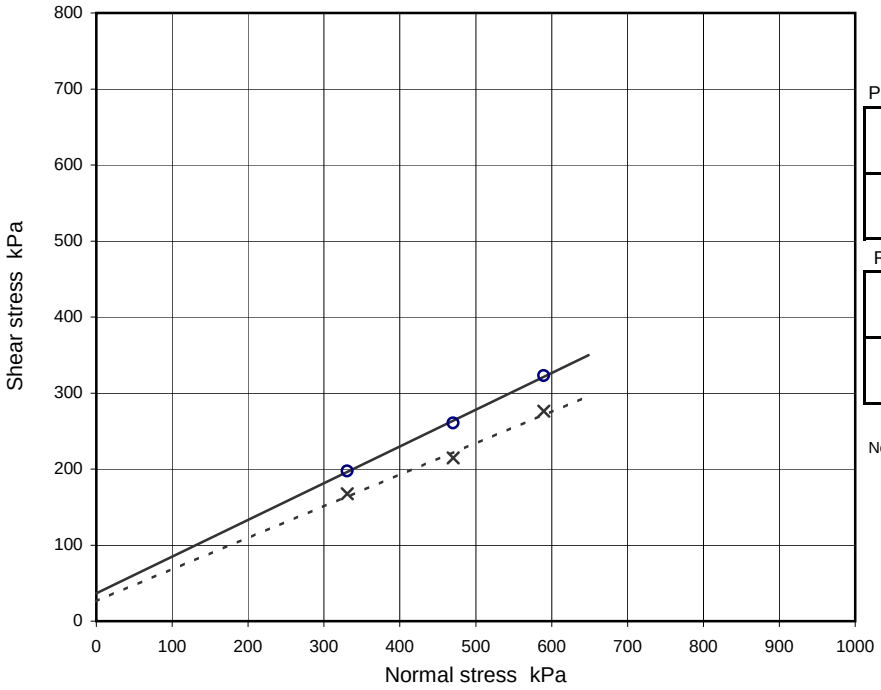
Soil Description	Firm to stiff brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	Undisturbed

Specimen(s) nominally 60mm x 60mm square
Test(s) carried out in submerged condition
Particle density, assumed 2.65 Mg/m^3

Specimen Details		No.	1	2	3	4	5	6
Initial	Height	mm	23.4	23.4	23.4			
	Bulk Density	Mg/m³	2.19	2.20	2.21			
	Water Content	%	13.6	13.6	13.6			
	Dry density	Mg/m³	1.93	1.94	1.95			
	Voids ratio		0.372	0.365	0.360			
	Degree of Saturation	%	96	98	100			
Consol^n	Consolidation / Normal Stress applied	kPa	**330**	**470**	**590**			
	Change in height during consolidation	mm	-0.906	-0.972	-1.280			
	Voids ratio after consolidation		0.319	0.308	0.286			
Shear see note 1	Voids ratio at end of test		0.282	0.211	0.126			
	Moisture content at end of test	%	10.6	8.0	4.7			
	Saturation at end of test	%	100	100	100			

Shearing stage

Rate of displacement	Peak	mm/min	0.003	0.003	0.003			
	Residual	mm/min	0.016	0.016	0.016			
Peak values, (o)	Relative displacement	mm	4.35	4.15	3.94			
	Shear stress	kPa	197.5	260.5	322.9			
Residual values, (x)	No. of reversals		2	2	3			
	Relative displacement	mm	28.95	30.00	40.00			
	Shear stress	kPa	167.5	214.5	276.1			



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	36	-
Ø '	degrees	26	-

Residual strength, (x)			
c '$_R$	kPa	26	-
Ø '$_R$	degrees	22½	-

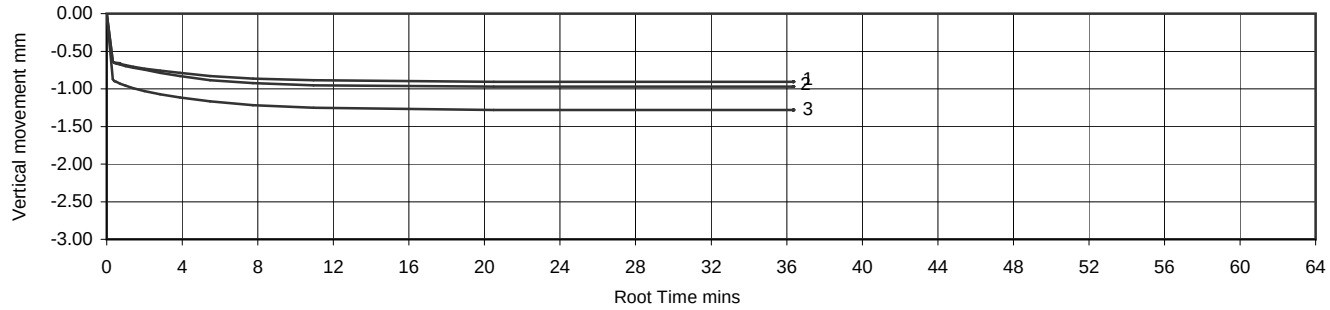
Notes :

1 After shear values based on BS1377. Pt 7 cl. 4.6.1.6 using δH calculated from consolidation and shear stages

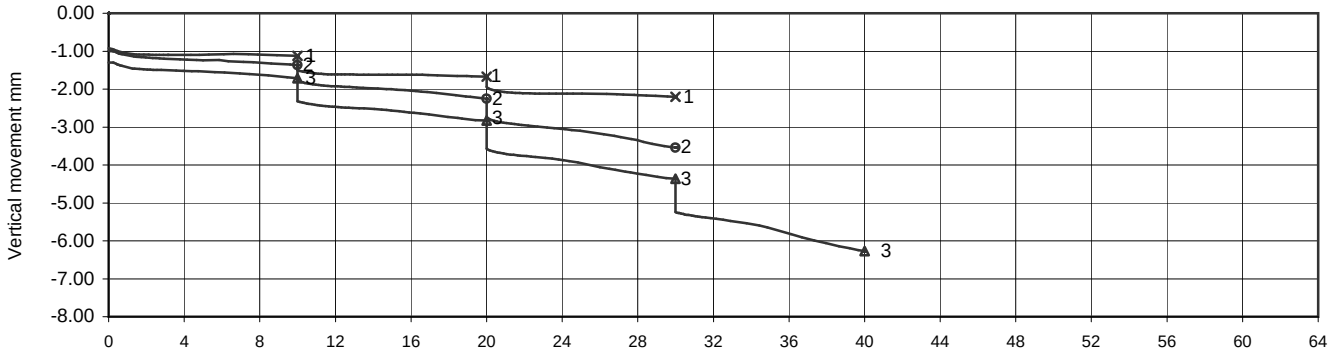
Determination of shear strength by direct shear (Small shearbox apparatus)
(BS1377 : Part 7 : clause 4 : 1990)

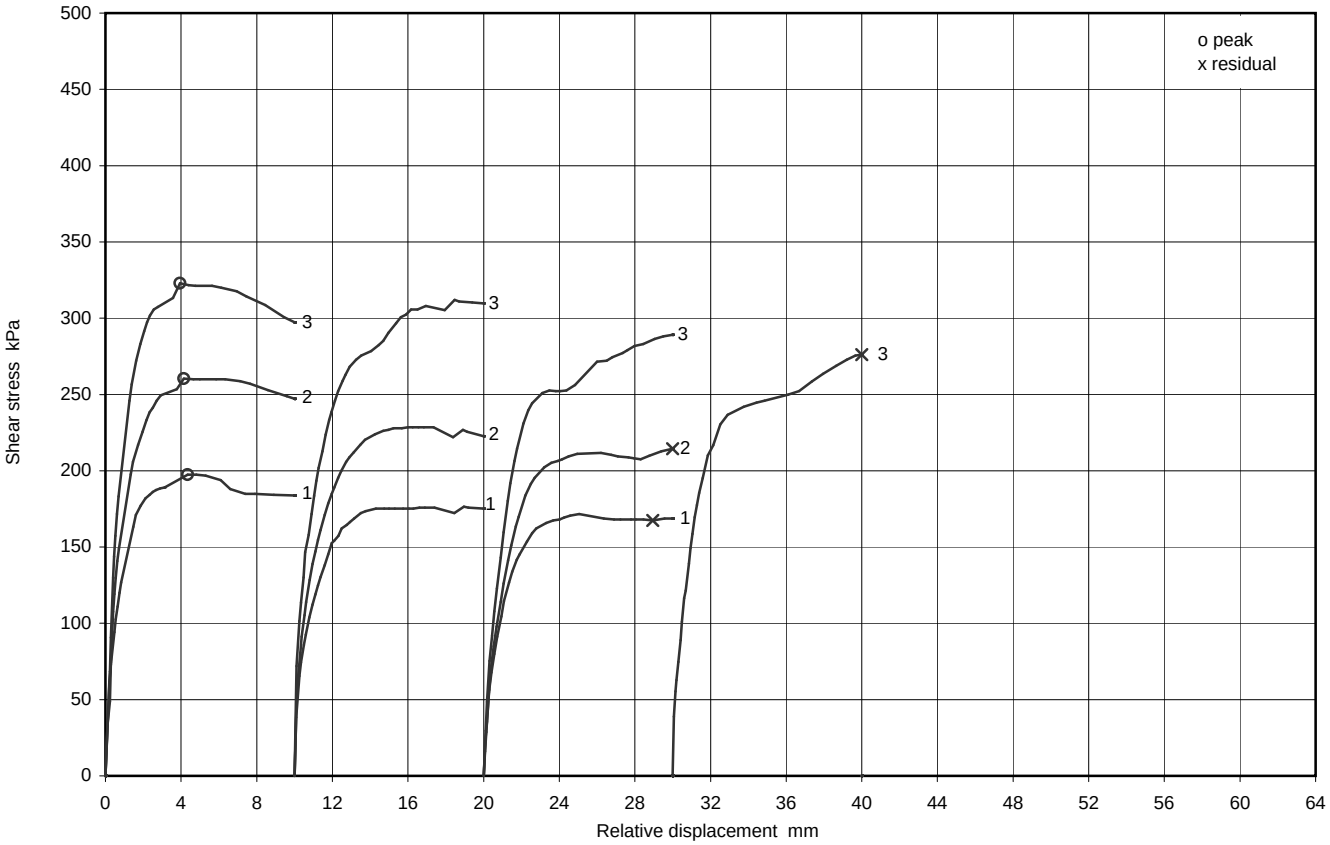
Project No	A1077-11	Sample Details:	Hole No.	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	23.00-23.45		
			Sample No	51	Type	U
			ID			
			Spec Ref			

Consolidation stage(s)



Shearing stage(s)





Ref			Figure
SLR7.4 Rev 85 Oct 10	Soil Mechanics	Printed:18/11/2011 16:32	**SSB 4** sheet 2 of 2

Determination of residual shear strength using the small ring shear apparatus
(BS1377 : Part 7 : clause 6 : 1990)

Project No	A1077-11	Sample Details:	Hole No.	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	15.00-15.45		
			Sample No	31	Type	U
			ID			
			Spec Ref			

Soil Description	Firm to stiff brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	-1.18mm material. Recompacted at as received moisture content.

Specimen Details

Initial height	mm	5.0
Initial Bulk Density	Mg/m³	2.38
Initial Moisture Content (trimmings)	%	13.1
Initial Dry Density	Mg/m³	2.10
Moisture content at end of test	%	16.3

Nominal dimensions

Outer diameter 100 mm

Inner diameter 70 mm

Test carried out in submerged condition

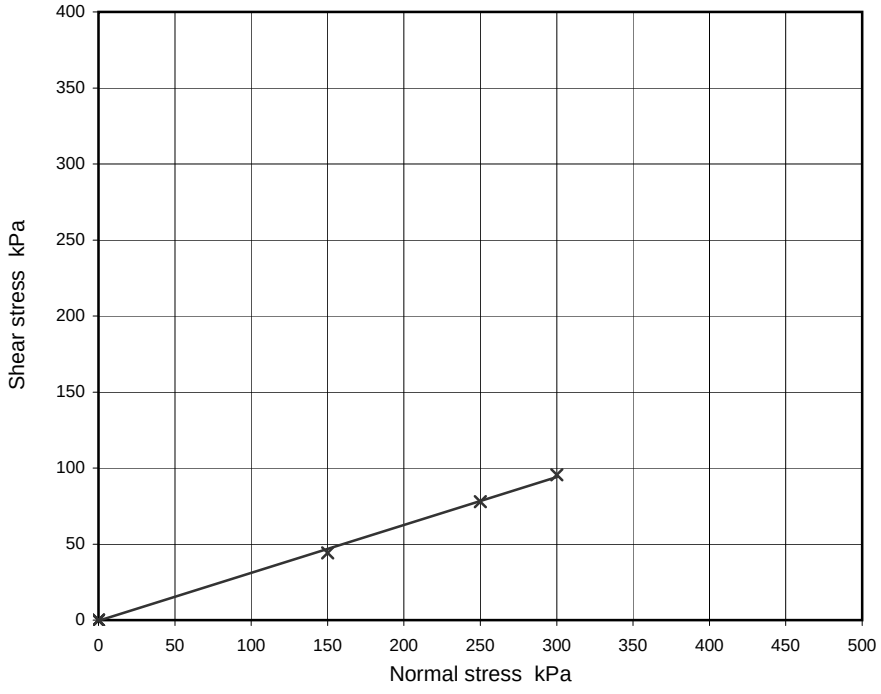
STAGE No.	**1**	**2**	**3**

Consolidation stage(s)

Consolidation / Normal Stress applied	kPa	**150**	**250**	**300**
Change in height during stage	mm	-0.178	-0.138	-0.060

Shearing stage(s)

Torque arm diameter		mm	150	150	150
Rate of displacement	Angular	°/min	0.120	0.120	0.120
	Average linear	mm/min	0.089	0.089	0.089
At residual state	Normal stress	kPa	150	250	300
	Mean linear displacement	mm	14.5	32.5	65.9
	Mean Shear stress	kPa	44.2	77.9	95.6



Residual Shear Strength Parameters

c '$_R$ is assumed to be zero, BS 1377

Ø '$_R$ **17.5** degrees

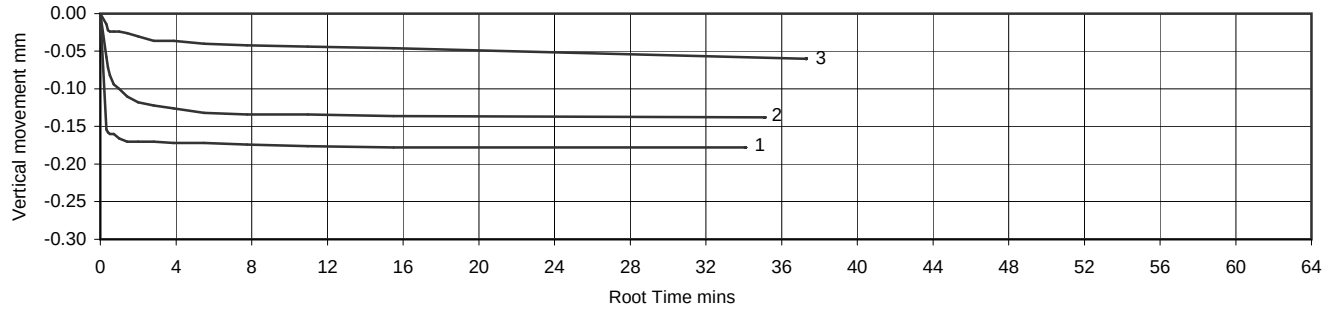
Notes :

1 Bulk and dry density values are based on nominal dimensions and are therefore indicative only.

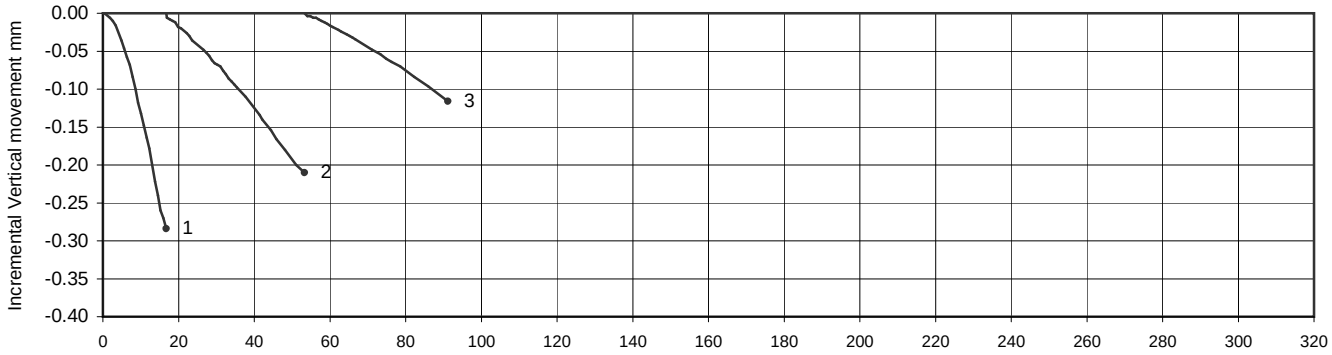
Determination of residual shear strength using the small ring shear apparatus
(BS1377 : Part 7 : clause 6 : 1990)

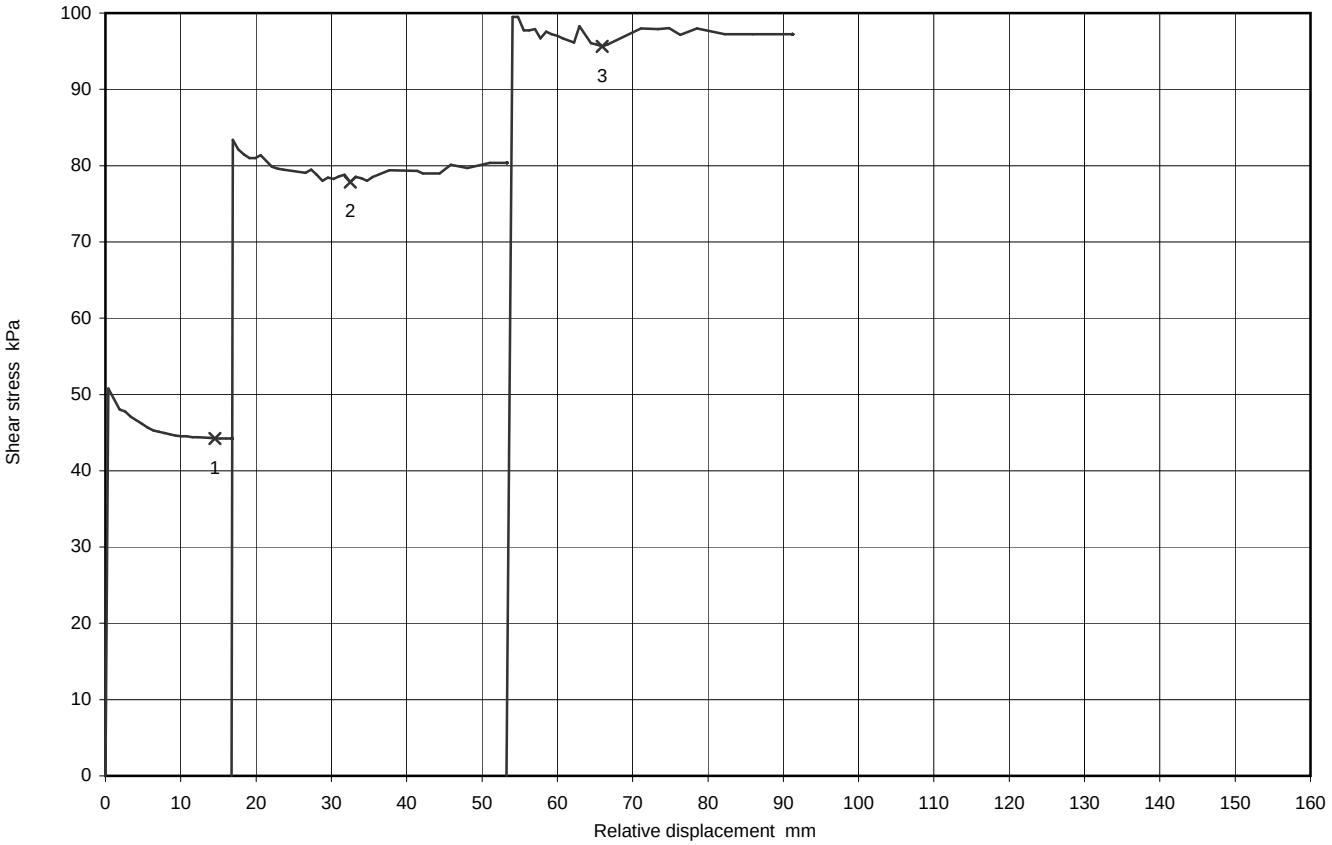
Project No	A1077-11	Sample Details:	Hole No.	BH2	
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	15.00-15.45	
			Sample No	31	Type U
			ID		
			Spec Ref		

Consolidation stage(s)



Shearing stage(s)





Ref			Figure
SLR7.6 Rev 85 Jan 11	ESG Environmental Scientifics Group	Printed:18/11/2011 16:36	**RS 1** sheet 2 of 2

UKAS TESTING 1157

Determination of residual shear strength using the small ring shear apparatus
(BS1377 : Part 7 : clause 6 : 1990)

Project No	A1077-11	Sample Details:	Hole No.	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	7.00-7.45		
			Sample No	20	Type	U
			ID			
			Spec Ref			

Soil Description	Firm brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	-1.18mm material. Recompacted at as received moisture content.

Specimen Details

Initial height	mm	5.0
Initial Bulk Density	Mg/m³	2.33
Initial Moisture Content (trimmings)	%	16.2
Initial Dry Density	Mg/m³	2.01
Moisture content at end of test	%	15.4

Nominal dimensions

Outer diameter 100 mm

Inner diameter 70 mm

Test carried out in submerged condition

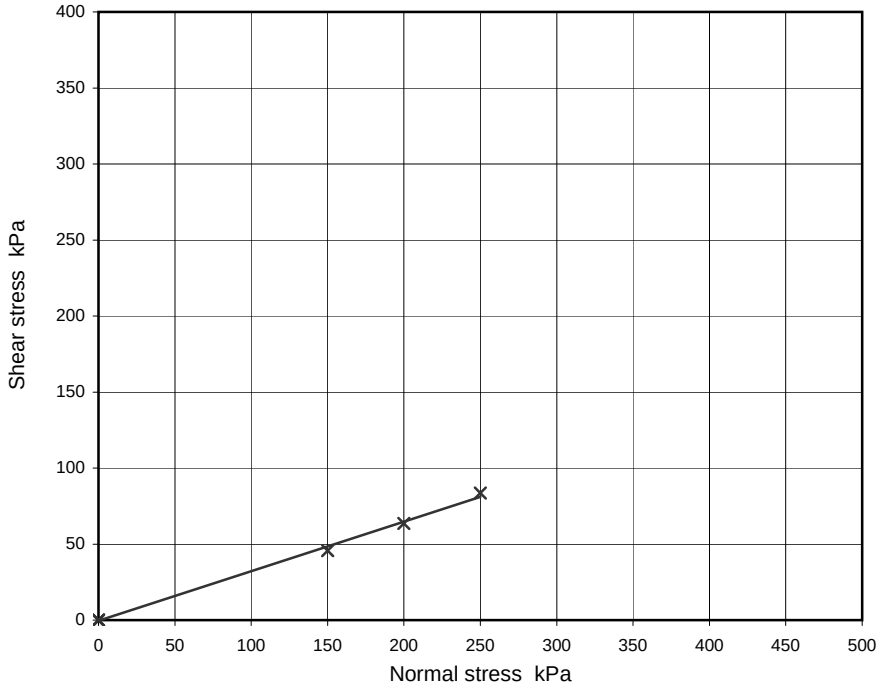
STAGE No.	**1**	**2**	**3**

Consolidation stage(s)

Consolidation / Normal Stress applied	kPa	**150**	**200**	**250**
Change in height during stage	mm	-0.204	-0.050	-0.036

Shearing stage(s)

Torque arm diameter		mm	150	150	150
Rate of displacement	Angular	°/min	0.120	0.120	0.120
	Average linear	mm/min	0.089	0.089	0.089
At residual state	Normal stress	kPa	150	200	250
	Mean linear displacement	mm	8.0	39.6	89.0
	Mean Shear stress	kPa	45.8	63.6	83.5



Residual Shear Strength Parameters

c '$_R$ is assumed to be zero, BS 1377

Ø '$_R$ **18.0** degrees

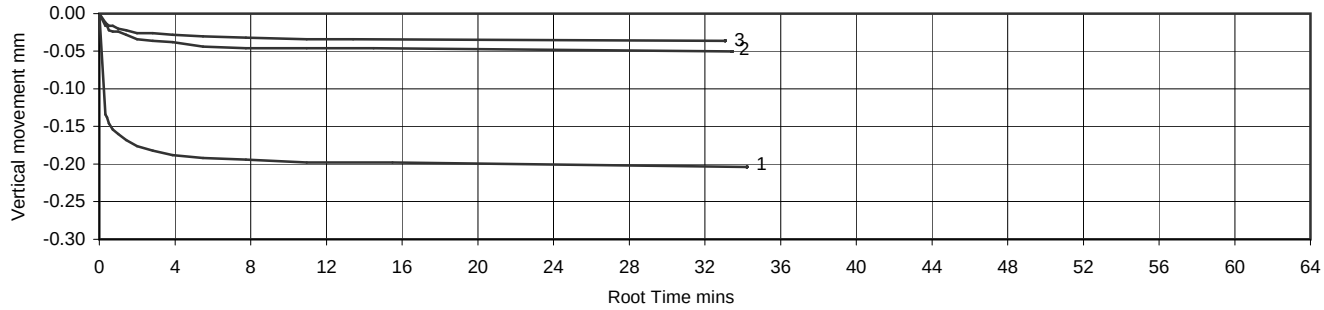
Notes :

1 Bulk and dry density values are based on nominal dimensions and are therefore indicative only.

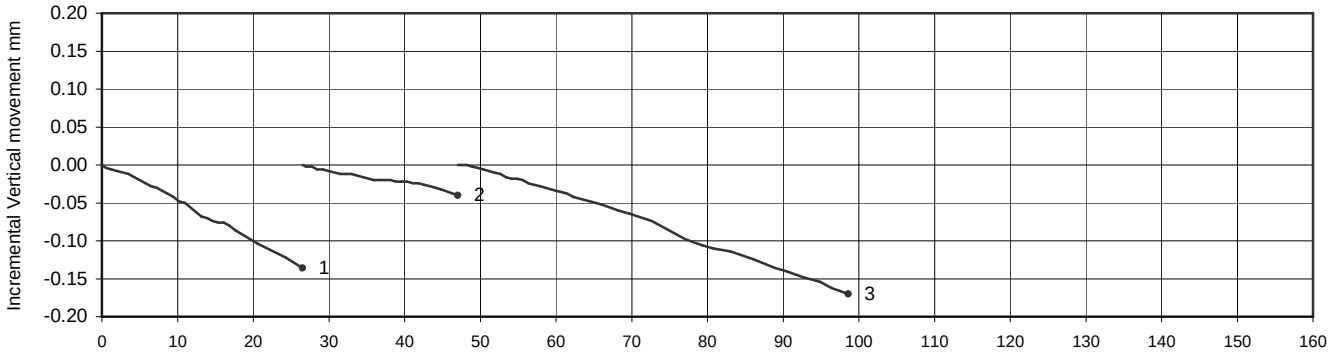
Determination of residual shear strength using the small ring shear apparatus
(BS1377 : Part 7 : clause 6 : 1990)

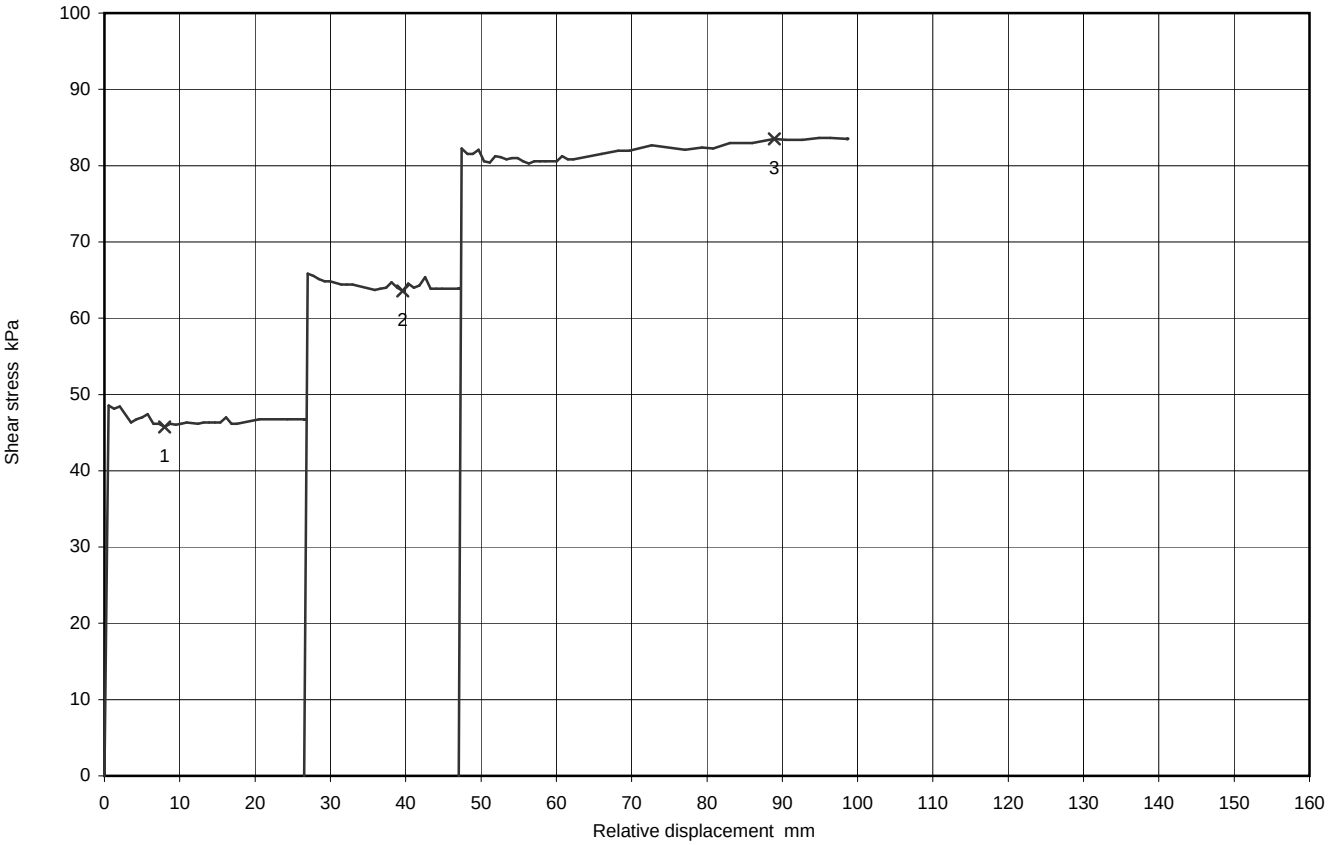
Project No	A1077-11	Sample Details:	Hole No.	BH3	
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	7.00-7.45	
			Sample No	20	Type U
			ID		
			Spec Ref		

Consolidation stage(s)



Shearing stage(s)





Ref SLR7.6 Rev 85 Jan 11	ESG Environmental Scientifics Group	Printed:18/11/2011 16:42	**Figure** **RS 2** sheet 2 of 2

Shear Strength by Laboratory Vane method - Summary of Results

Project No	Project Name
A1077-11	SANDSEND BOREHOLES, NORTH YORKSHIRE

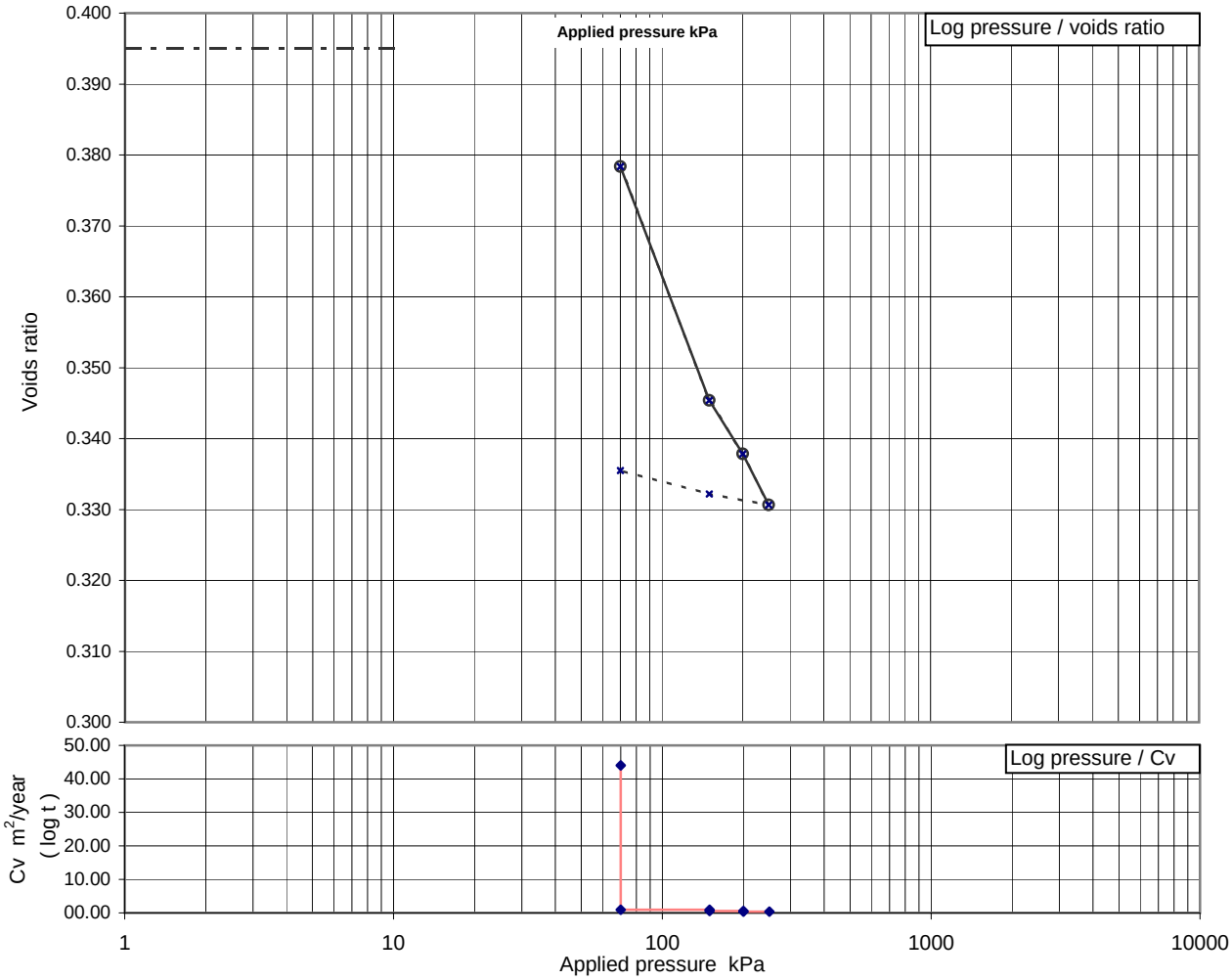
Hole No.	Sample				Soil Description	Moisture Content at test horizon %	Undrained shear strength kPa		Remarks
	No.	Depth (m) from	Depth (m) to	type			Undisturbed	Remoulded	
BH1	37	14.00	14.45	U	Firm greyish brown slightly sandy slightly gravelly CLAY.	23	53	0.6	
BH2	24	11.00	11.45	U	Firm to stiff brown slightly sandy slightly gravelly CLAY.	15	88	0	1 test carried out.
BH3	24	8.50	8.95	U	Firm brown slightly sandy slightly gravelly CLAY.	17	89	18	
BH3	43	16.00	16.45	U	Firm brown slightly sandy slightly gravelly CLAY.	15	79	11	

Notes :

1 Tests carried out in accordance with BS1377 : part 7 : 1990, clause 3
2 Shear strengths given are average of 3 tests unless otherwise stated
3 Tests carried out in 100mm diameter plastic sample tube using 12.7mm x 12.7mm vane

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00		
			Samp No	9	Type	U
			ID	ESGA1077-11201110100000000010		
			Spec Ref			



Soil description	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.
Preparation	Recompacted
Index properties (if available)	Liquid limit % 31 Plastic limit % 15

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m^3
Diameter	74.92		mm
Height	18.99	18.18	mm
Voids ratio	0.395	0.335	
Moisture content	15	13	%
Bulk density	2.19	2.25	Mg/m^3
Dry density	1.90	1.98	Mg/m^3
Saturation	102	105	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

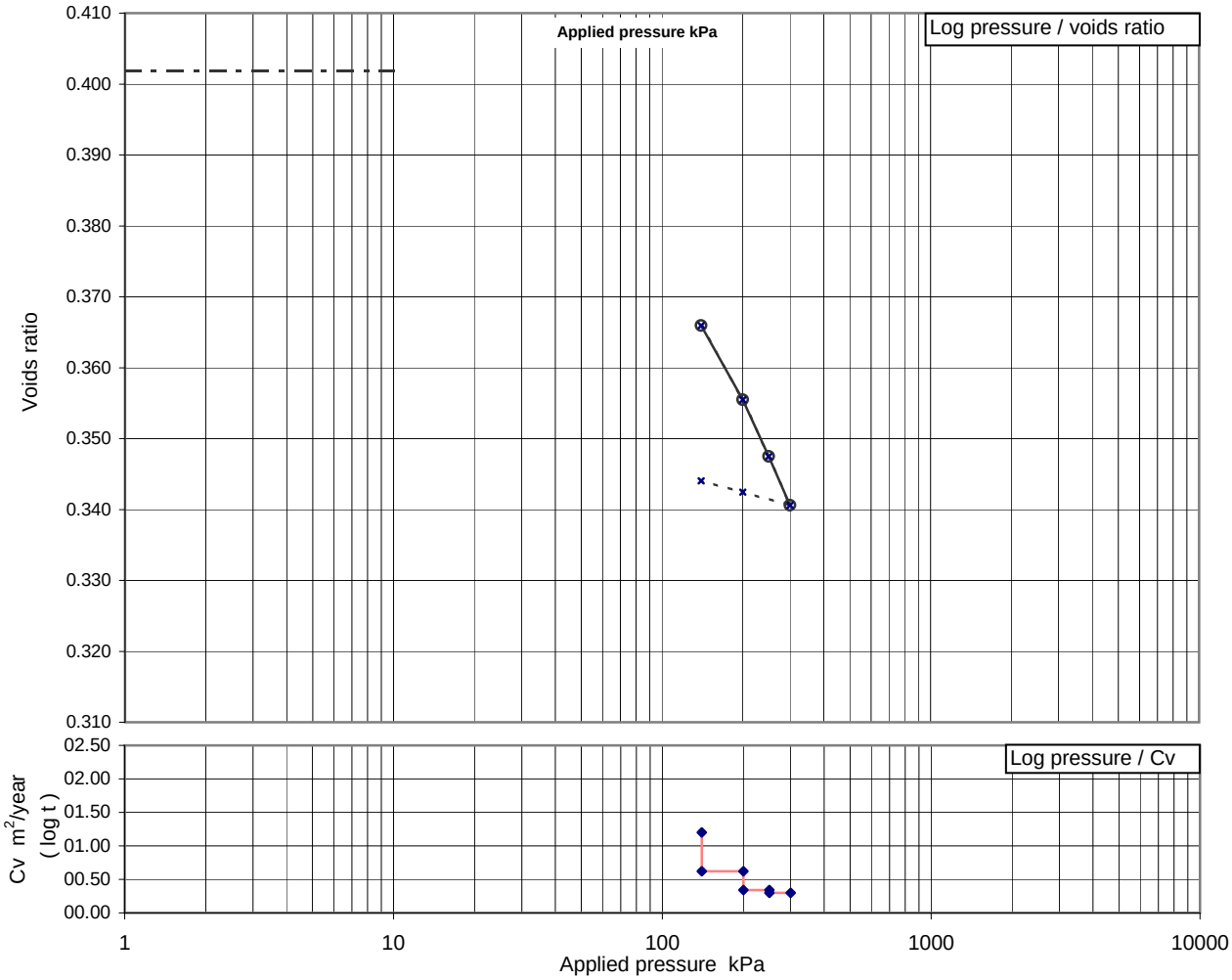
Notes : Recompacted using 2.5kg effort at as received moisture content.

Specimen taken 0 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m^2/MN	C_v ($t_{50, log}$) m^2/year	C_v ($t_{90, root}$) m^2/year	
0	0.3950				
70	0.3784	0.170	44	47	
150	0.3454	0.299	0.93	0.99	
200	0.3378	0.112	0.52	0.58	
250	0.3306	0.108	0.39	0.42	
150	0.3322	0.012	-	-	
70	0.3355	0.031	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	6.50		
			Samp No	17	Type	U
			ID	ESGA1077-11201110100000000018		
			Spec Ref			



Soil description: Firm brown slightly sandy slightly gravelly CLAY.

Preparation: Recompacted

Index properties (if available): Liquid limit % 33 | Plastic limit % 15

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m^3
Diameter	74.59		mm
Height	18.76	17.99	mm
Voids ratio	0.402	0.344	
Moisture content	15	14	%
Bulk density	2.18	2.24	Mg/m^3
Dry density	1.89	1.97	Mg/m^3
Saturation	101	105	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

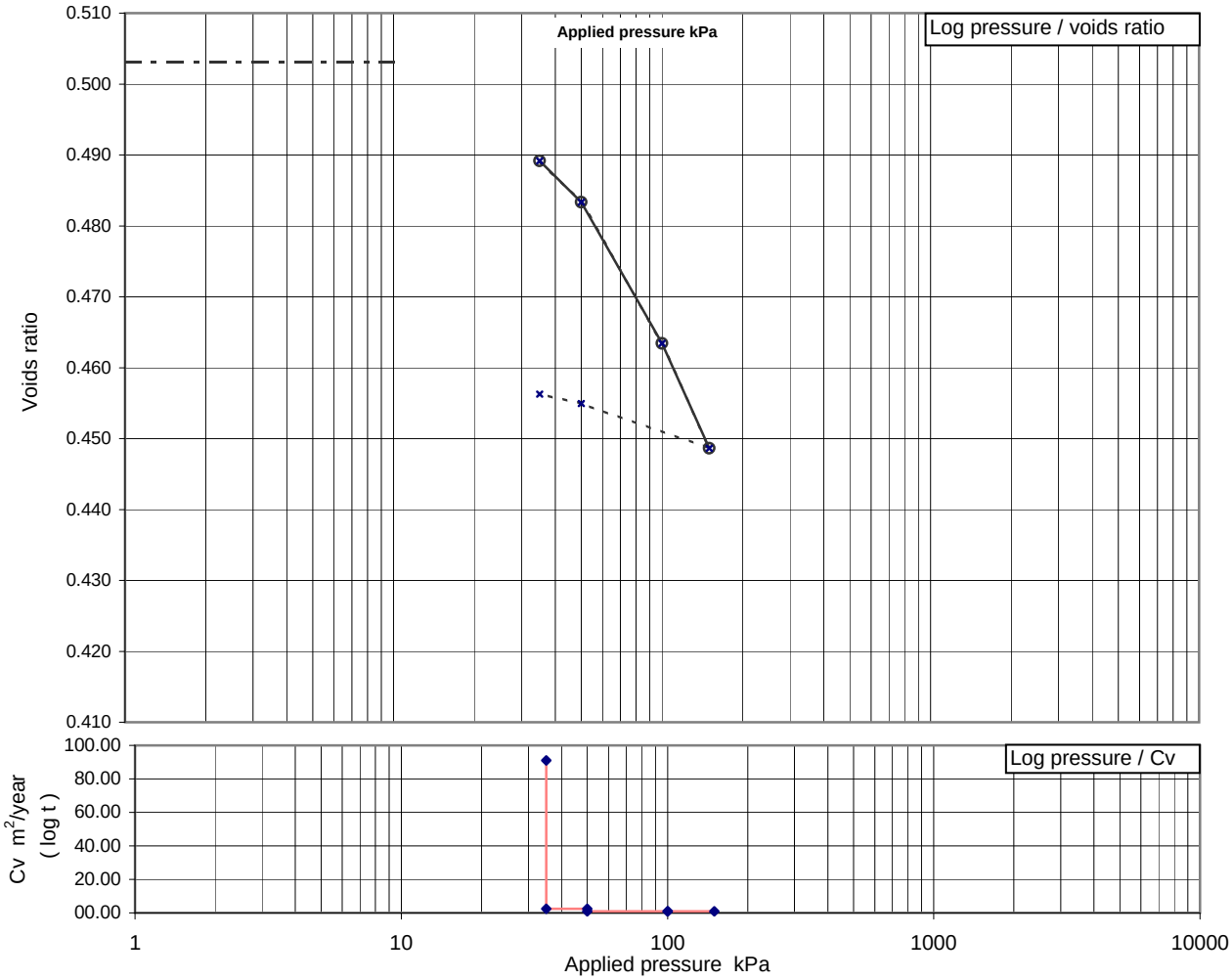
Notes : Recompacted using 2.5kg effort at as received moisture content.

Specimen taken 20 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m^2/MN	C_v ($t_{50, log}$) m^2/year	C_v ($t_{90, root}$) m^2/year	
0	0.4019				
140	0.3659	0.183	1.2	1.3	
200	0.3555	0.128	0.62	0.65	
250	0.3475	0.118	0.34	0.36	
300	0.3406	0.102	0.3	0.32	
200	0.3425	0.014	-	-	
140	0.3440	0.019	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.20		
			Samp No	4	Type	U
			ID	ESGA1077-11201110100000000070		
			Spec Ref			



Soil description	Firm to stiff greyish brown and brownish grey slightly sandy slightly gravelly CLAY.
Preparation	Recompacted
Index properties (if available)	Liquid limit % 53 Plastic limit % 21

	Initial	Final	
Specimen details			
Particle density	2.65	assumed	Mg/m^3
Diameter	74.95		mm
Height	19.02	18.43	mm
Voids ratio	0.503	0.456	
Moisture content	18	18	%
Bulk density	2.08	2.14	Mg/m^3
Dry density	1.76	1.82	Mg/m^3
Saturation	96	103	%
Average temperature for test	22		°C

Swelling pressure: not measured kPa

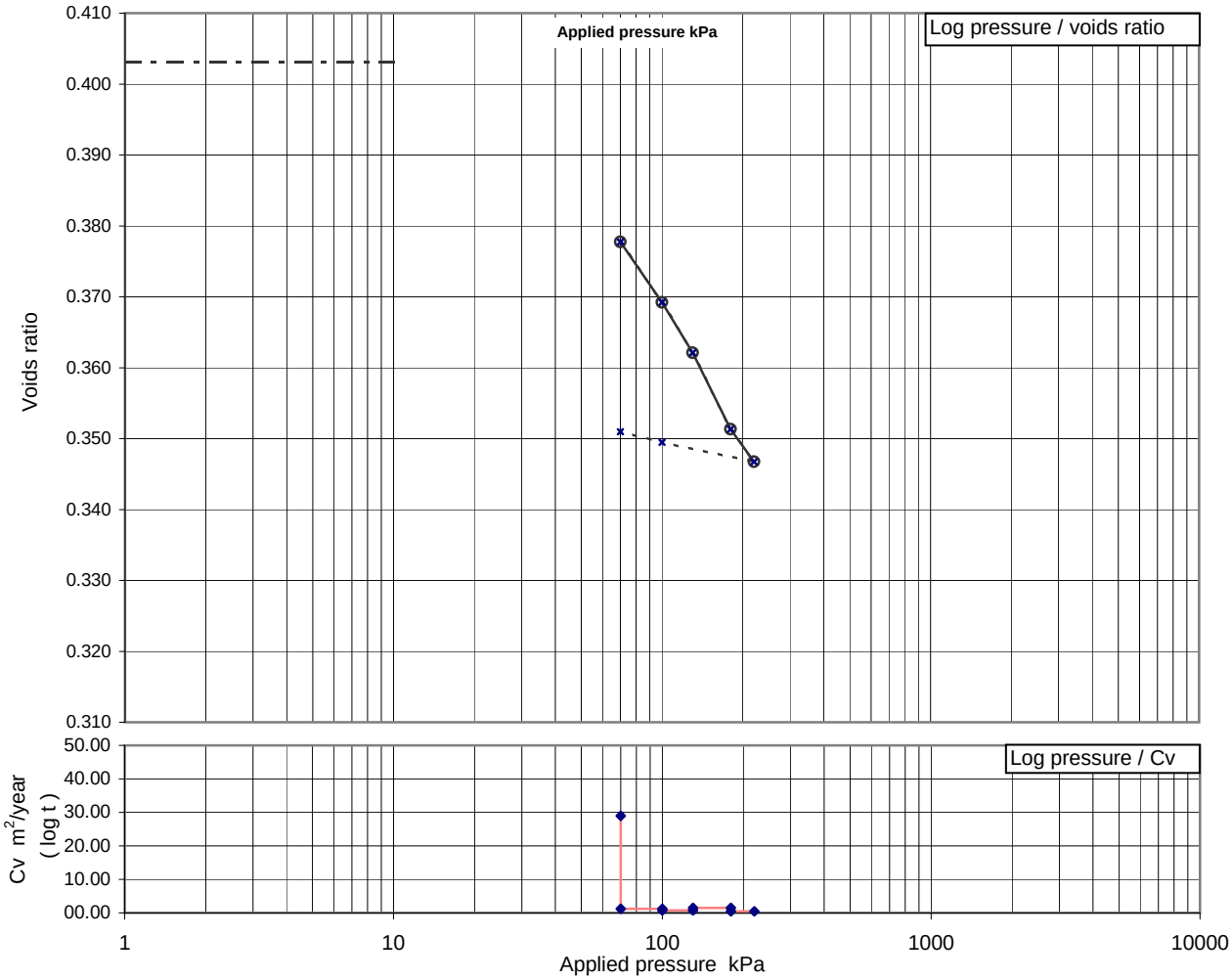
Notes : Recompacted using 2.5kg effort at as rceived moisture content.

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m^2/MN	C_v ($t_{50, log}$) m^2/year	C_v ($t_{90, root}$) m^2/year	
0	0.5031				
35	0.4892	0.266	91	78	
50	0.4833	0.262	2.4	2.4	
100	0.4634	0.268	0.93	1.2	
150	0.4486	0.202	0.86	0.88	
50	0.4549	0.044	-	-	
35	0.4563	0.062	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.00		
			Samp No	8	Type	U
			ID	ESGA1077-11201110100000000074		
			Spec Ref			



Soil description	Stiff greyish brown slightly sandy slightly gravelly CLAY.
Preparation	Recompacted
Index properties (if available)	Liquid limit % 34 Plastic limit % 16

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.98		mm
Height	18.92	18.21	mm
Voids ratio	0.403	0.351	
Moisture content	15	14	%
Bulk density	2.17	2.23	Mg/m³
Dry density	1.89	1.96	Mg/m³
Saturation	97	105	%
Average temperature for test	22		°C

Swelling pressure: not measured kPa

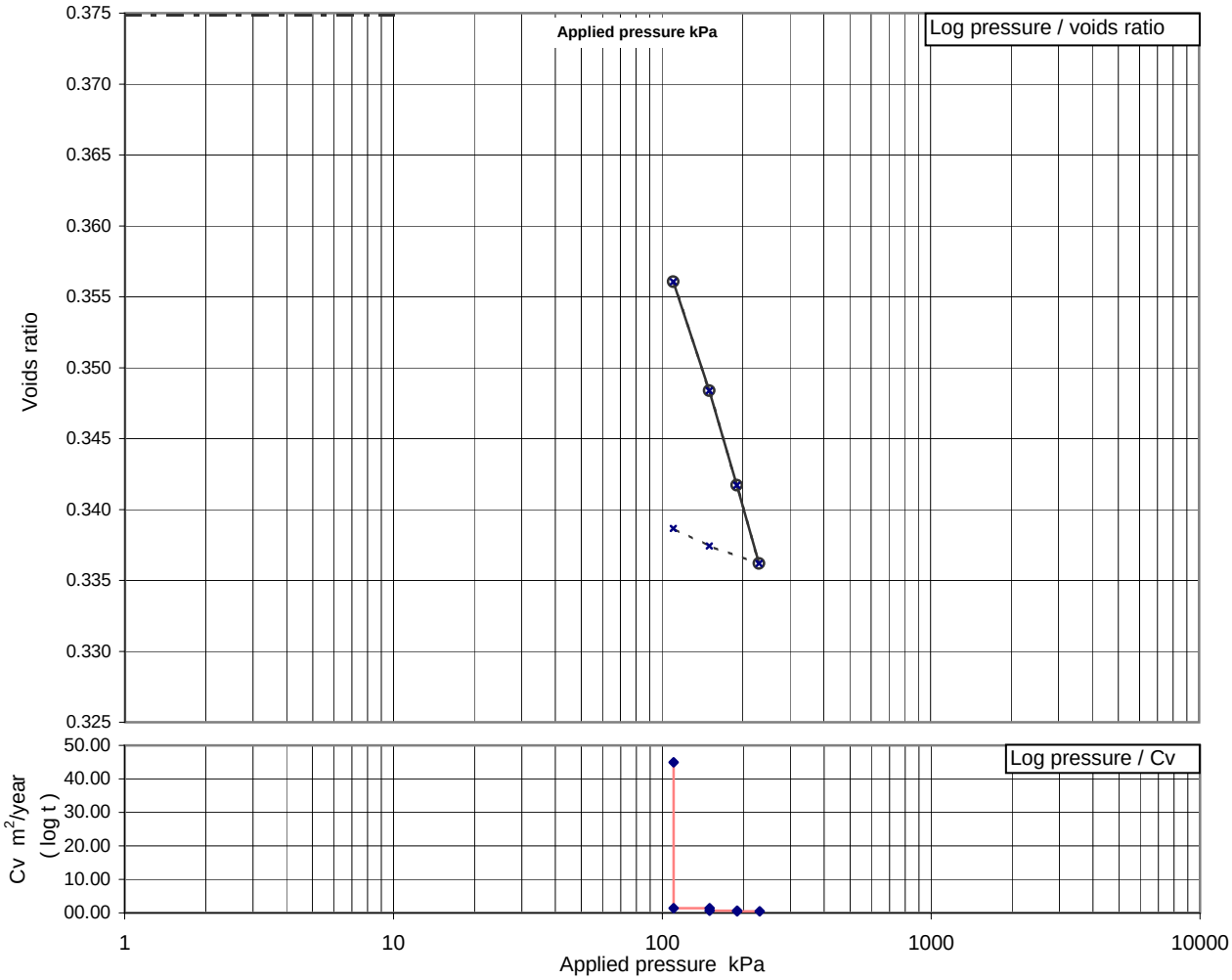
Notes : Recompacted using 2.5kg effort at as received moisture content.

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	0.4031				
70	0.3777	0.258	29	31	
100	0.3692	0.206	1.2	1.3	
130	0.3621	0.173	0.78	0.9	
180	0.3513	0.158	1.5	1.6	
220	0.3467	0.085	0.48	0.49	
100	0.3495	0.017	-	-	
70	0.3510	0.037	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	5.00		
			Samp No	12	Type	U
			ID	ESGA1077-11201110100000000078		
			Spec Ref			



Soil description: Brown slightly sandy slightly gravelly CLAY.

Preparation: Recompacted

Index properties (if available): Liquid limit % 31 | Plastic limit % 15

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	75.00		mm
Height	18.96	18.46	mm
Voids ratio	0.375	0.339	
Moisture content	14	13	%
Bulk density	2.21	2.25	Mg/m³
Dry density	1.93	1.98	Mg/m³
Saturation	102	105	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

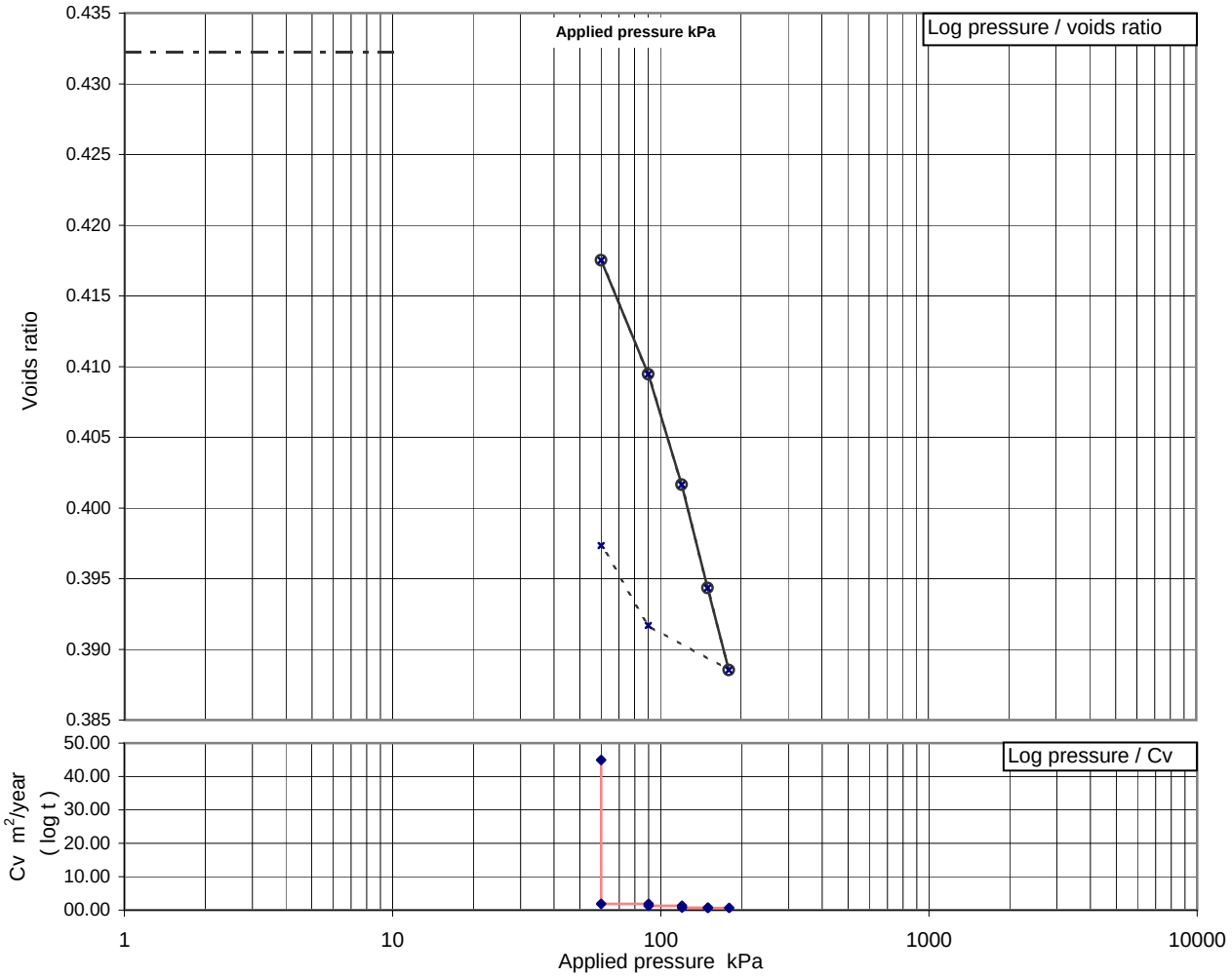
Notes : Recompacted using 2.5kg effort at as received moisture content.

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	0.3748				
110	0.3561	0.124	45	48	
150	0.3484	0.142	1.4	1.4	
190	0.3417	0.124	0.62	0.66	
230	0.3362	0.103	0.51	0.58	
150	0.3374	0.012	-	-	
110	0.3387	0.023	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.50		
			Samp No	8	Type	U
			ID	ESGA1077-11201110110000000133		
			Spec Ref			



Soil description	Firm to very stiff brown slightly sandy slightly gravelly CLAY.
Preparation	Recompacted
Index properties (if available)	Liquid limit % 37 Plastic limit % 18

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m^3
Diameter	74.96		mm
Height	19.02	18.56	mm
Voids ratio	0.432	0.397	
Moisture content	16	16	%
Bulk density	2.15	2.20	Mg/m^3
Dry density	1.85	1.90	Mg/m^3
Saturation	98	105	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

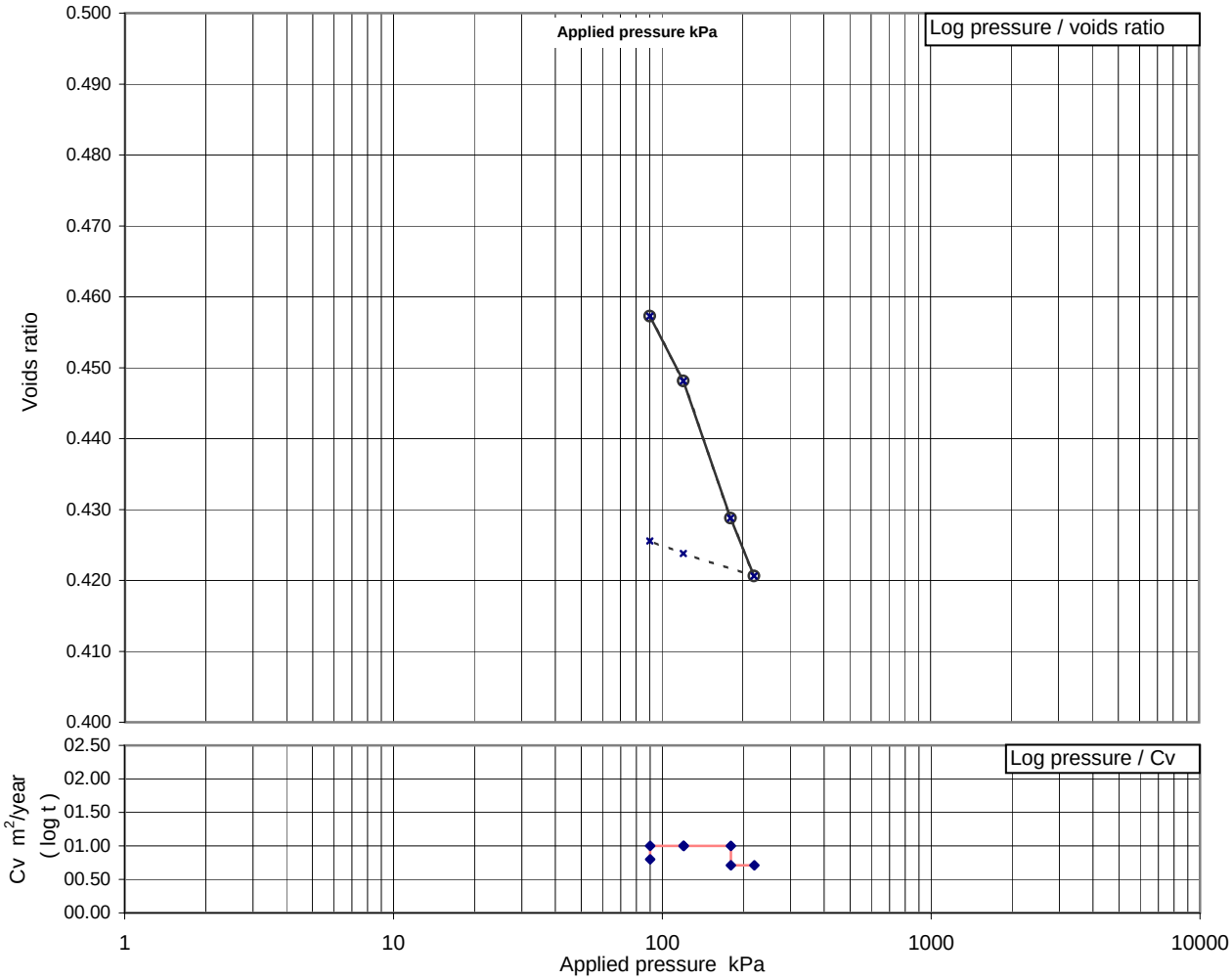
Notes : Recompacted using 2.5kg effort at as received moisture content.

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m^2/MN	C_v ($t_{50, log}$) m^2/year	C_v ($t_{90, root}$) m^2/year	
0	0.4322				
60	0.4175	0.171	45	54	
90	0.4095	0.189	1.9	1.8	
120	0.4016	0.185	1.3	1.3	
150	0.3943	0.174	0.79	0.88	
180	0.3885	0.139	0.61	0.66	
90	0.3917	0.025	-	-	
60	0.3973	0.135	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	12	Type	U
			ID	ESGA1077-112011101100000000137		
			Spec Ref			



Soil description: Firm brown slightly sandy slightly gravelly CLAY.

Preparation: Recompacted

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.88		mm
Height	18.97	17.79	mm
Voids ratio	0.521	0.426	
Moisture content	20	17	%
Bulk density	2.09	2.17	Mg/m³
Dry density	1.74	1.86	Mg/m³
Saturation	101	105	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

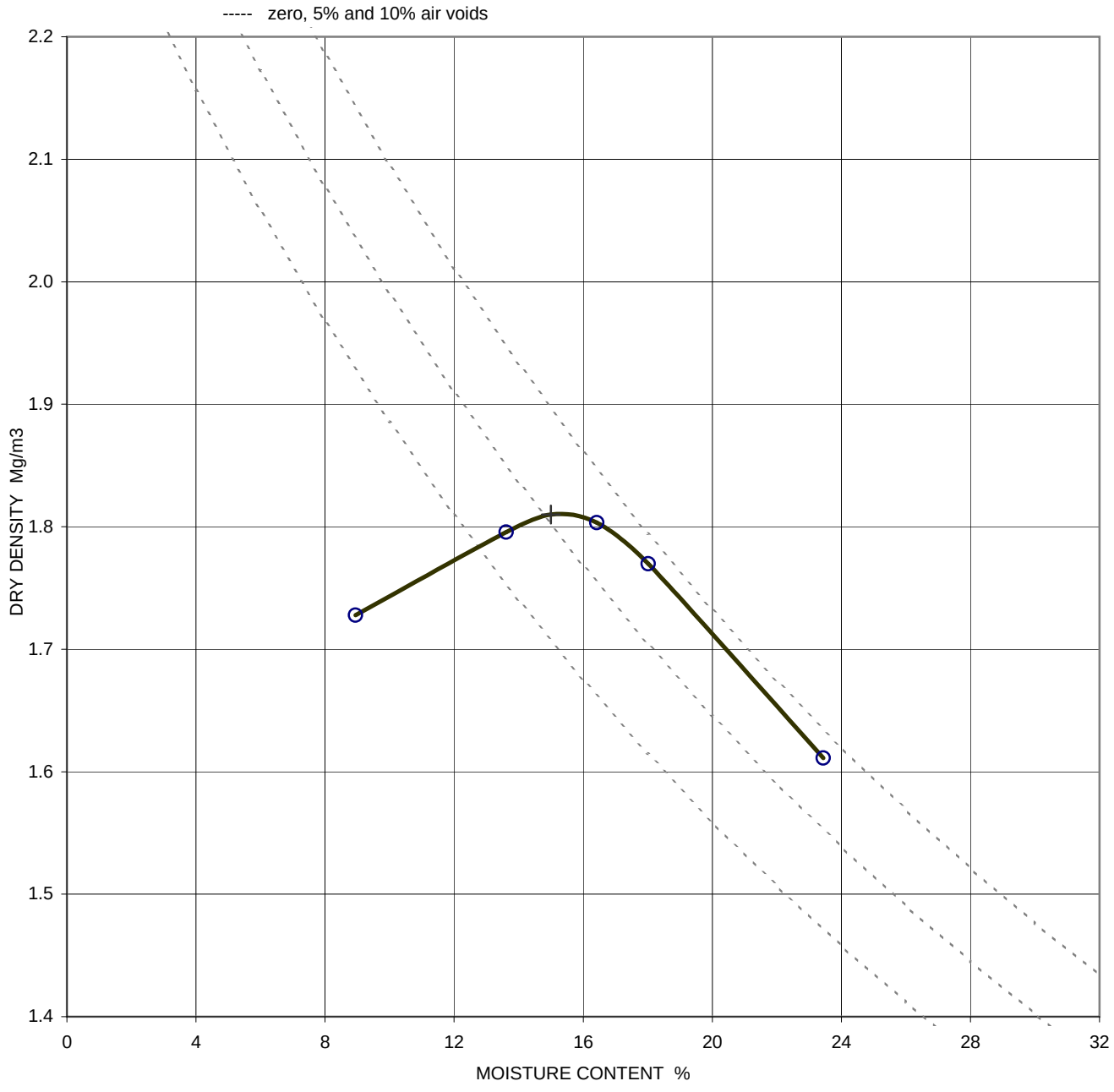
Notes : Recompacted using 2.5kg effort at as received moisture content.

Specimen taken 0 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	0.5206				
90	0.4572	0.463	0.8	0.84	
120	0.4481	0.209	1	1.1	
180	0.4288	0.222	1	1.1	
220	0.4206	0.143	0.71	0.82	
120	0.4238	0.023	-	-	
90	0.4256	0.041	-	-	

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	4	Type	B
			ID	ESGA1077-11201110100000000004		
			Spec Ref			



Soil description	Dark brown slightly gravelly sandy CLAY with occasional rootlets.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, separate specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

1.81

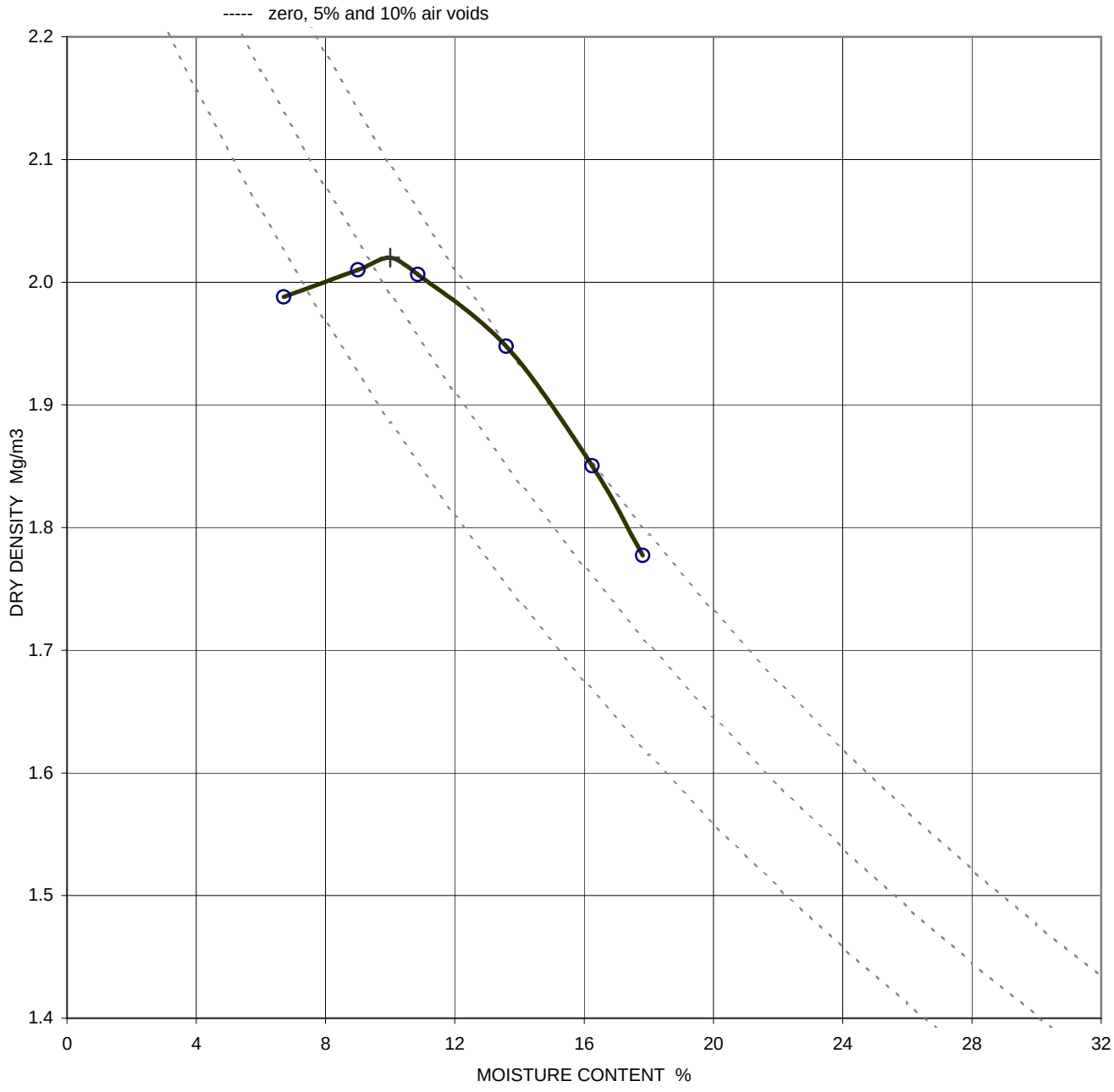
Optimum moisture content, %

15

QA Ref SLD 4, 3.5/6 Rev 66 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:33	**Figure** **COMPH 1**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	8	Type	B
			ID	ESGA1077-11201110100000000009		
			Spec Ref			



Soil description	Brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, composite specimens tested		
Material > 37.5mm	2	%	
Material < 37.5mm > 20mm	2	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

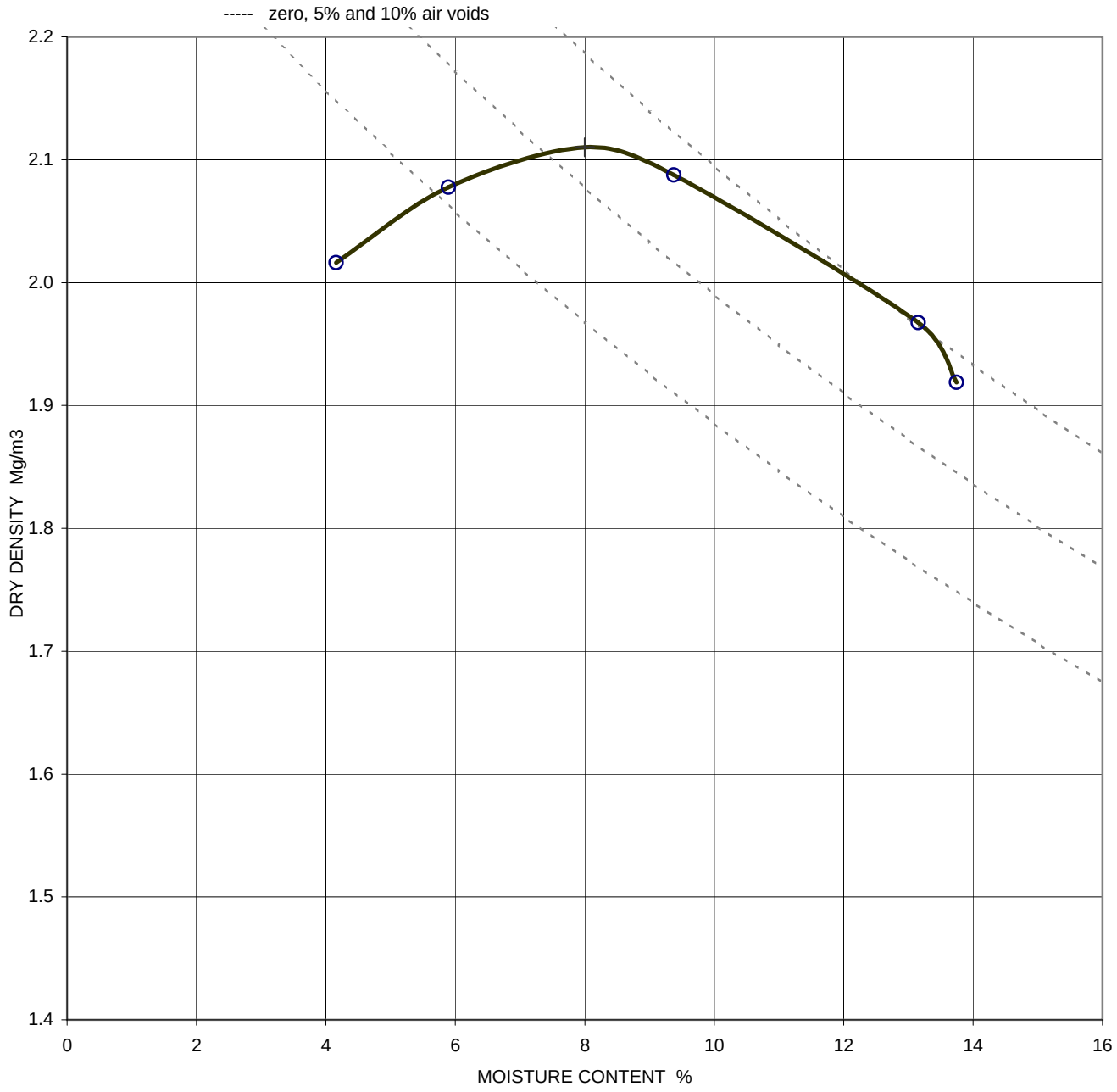
2.02

Optimum moisture content, %

10

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	12	Type	B
			ID	ESGA1077-11201110100000000013		
			Spec Ref			



Soil description	Brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.6, 4.5 kg rammer in a CBR mould		
Preparation	Original material was natural, composite specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	3	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

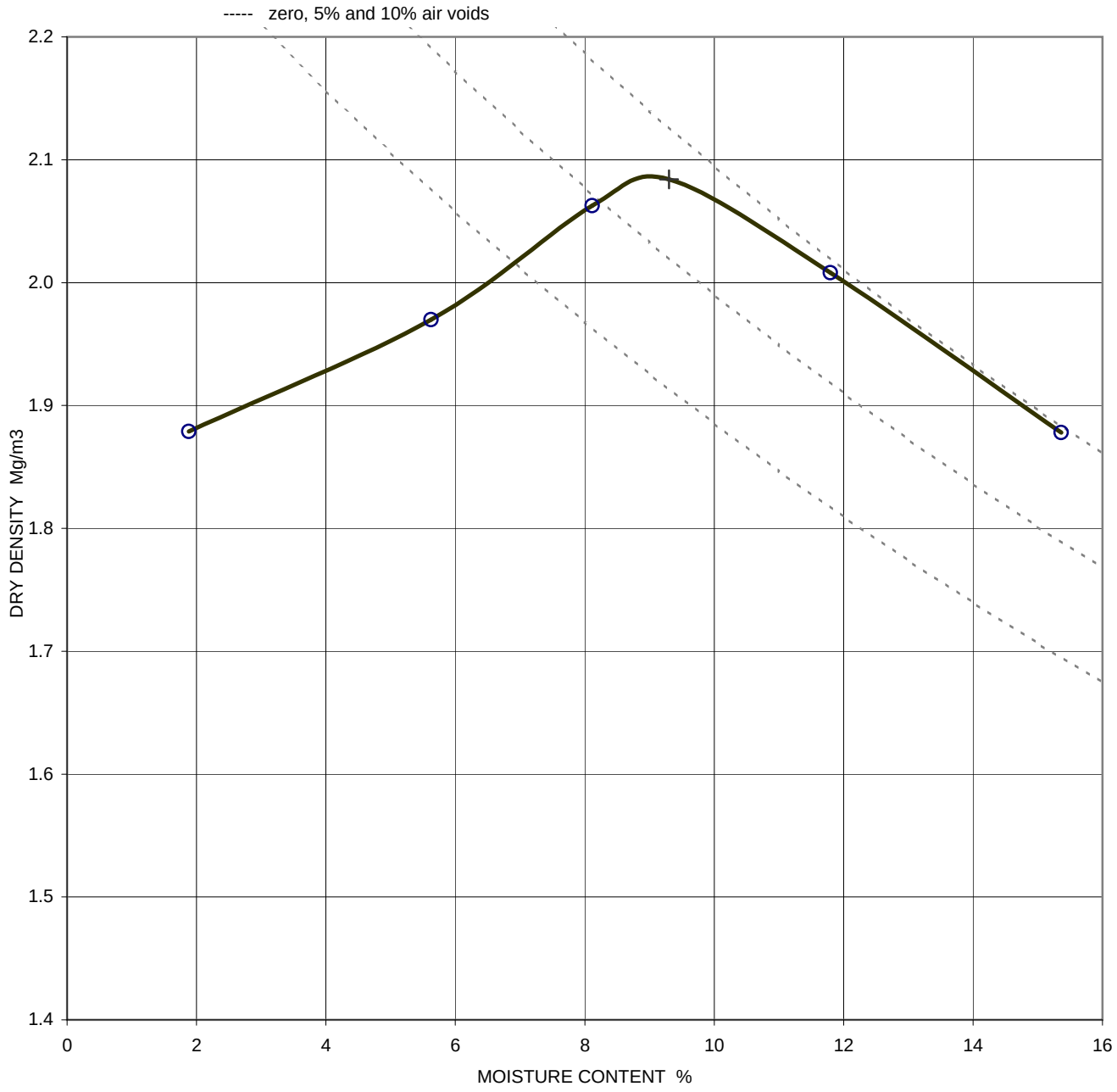
2.11

Optimum moisture content, %

8.0

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	5.65		
			Samp No	16	Type	B
			ID	ESGA1077-11201110100000000017		
			Spec Ref			



Soil description	Brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, separate specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	4	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

2.08

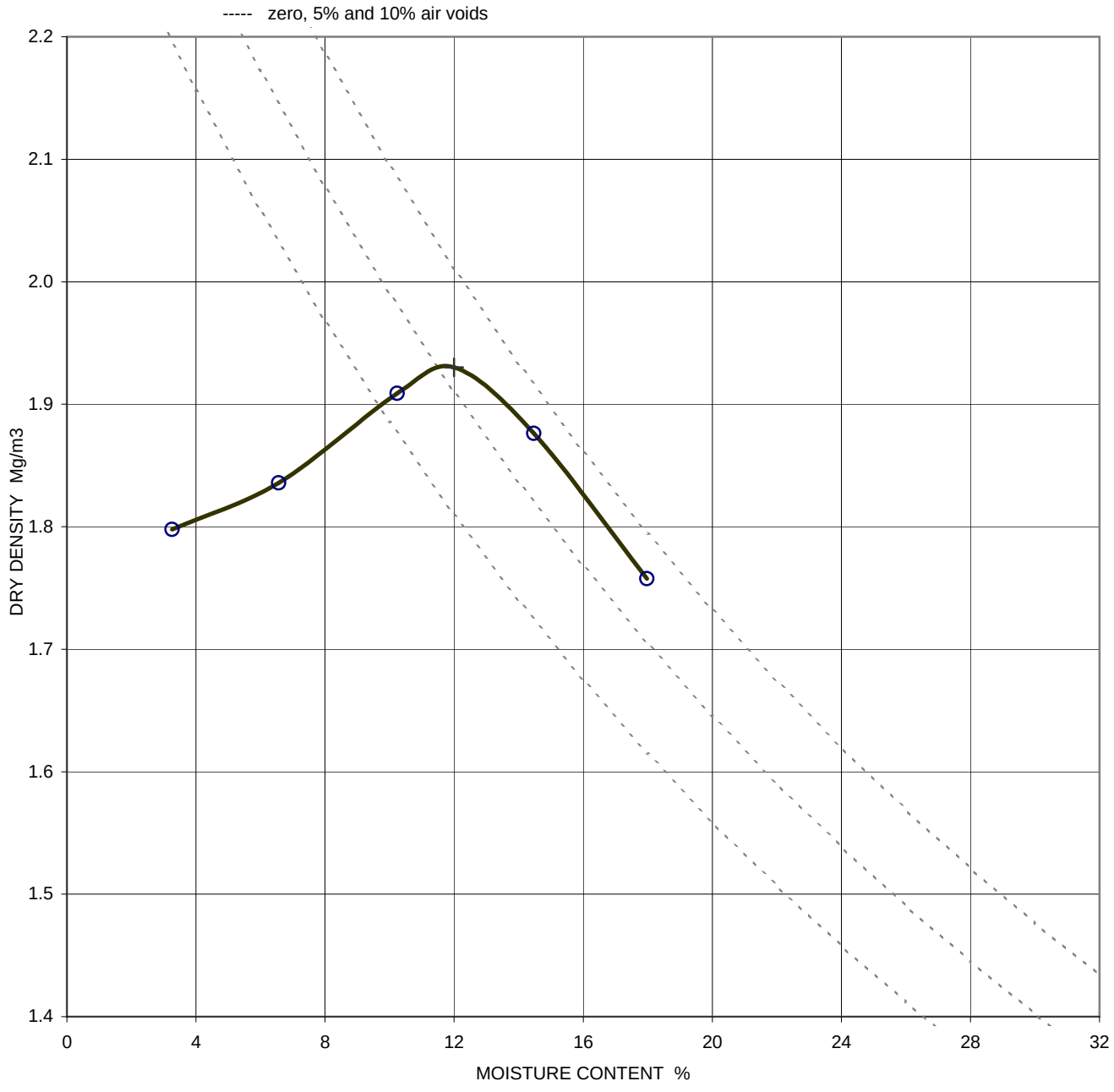
Optimum moisture content, %

9.3

QA Ref SLD 4, 3.5/6 Rev 66 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:33	**Figure** **COMPH 4**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	3	Type	B
			ID	ESGA1077-11201110100000000069		
			Spec Ref			



Soil description	Brown slightly gravelly sandy silty CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, separate specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

1.93

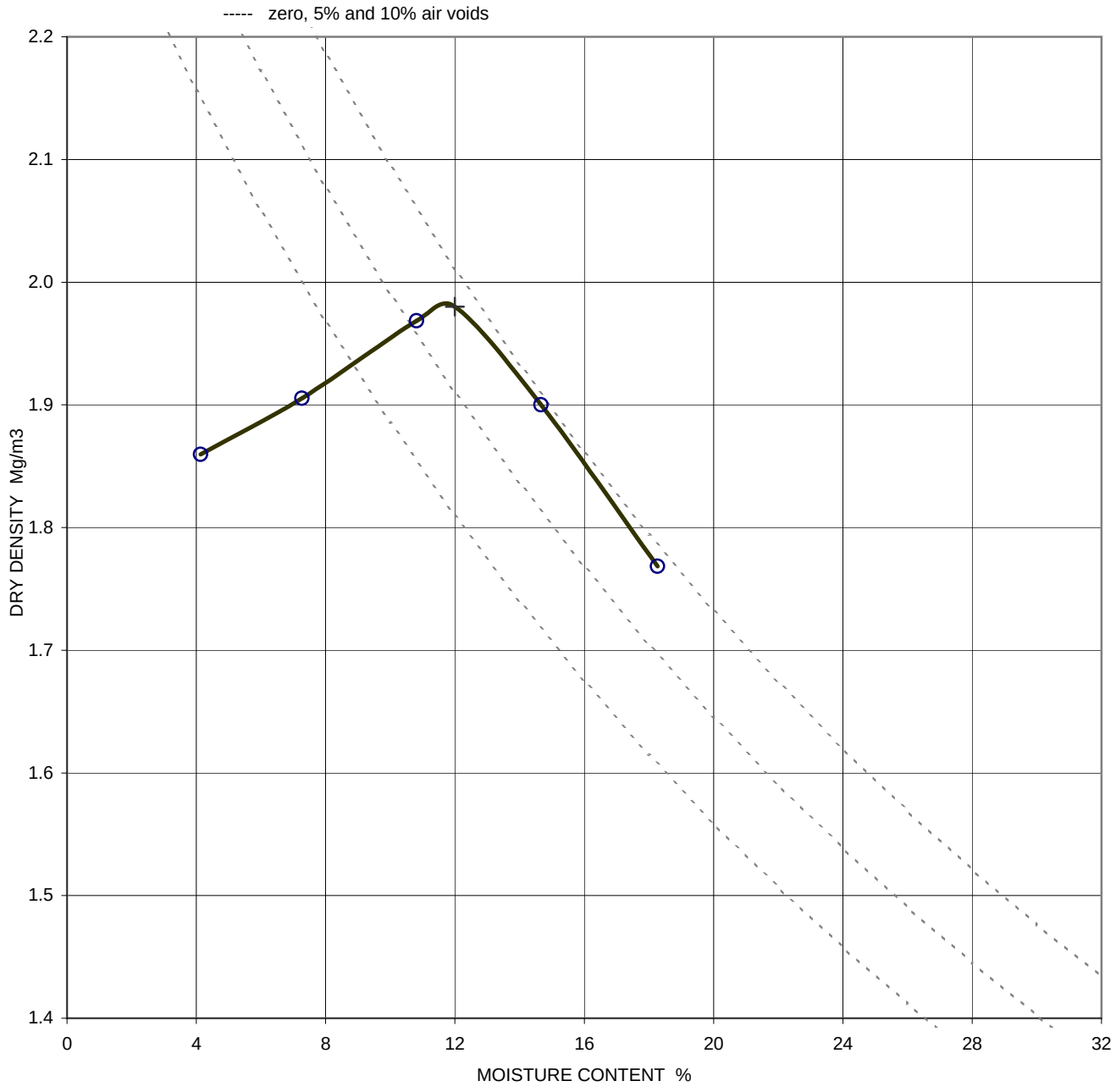
Optimum moisture content, %

12

QA Ref SLD 4, 3.5/6 Rev 66 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:33	**Figure** **COMPH 5**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	7	Type	B
			ID	ESGA1077-11201110100000000073		
			Spec Ref			



Soil description	Brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, separate specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	2	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

1.98

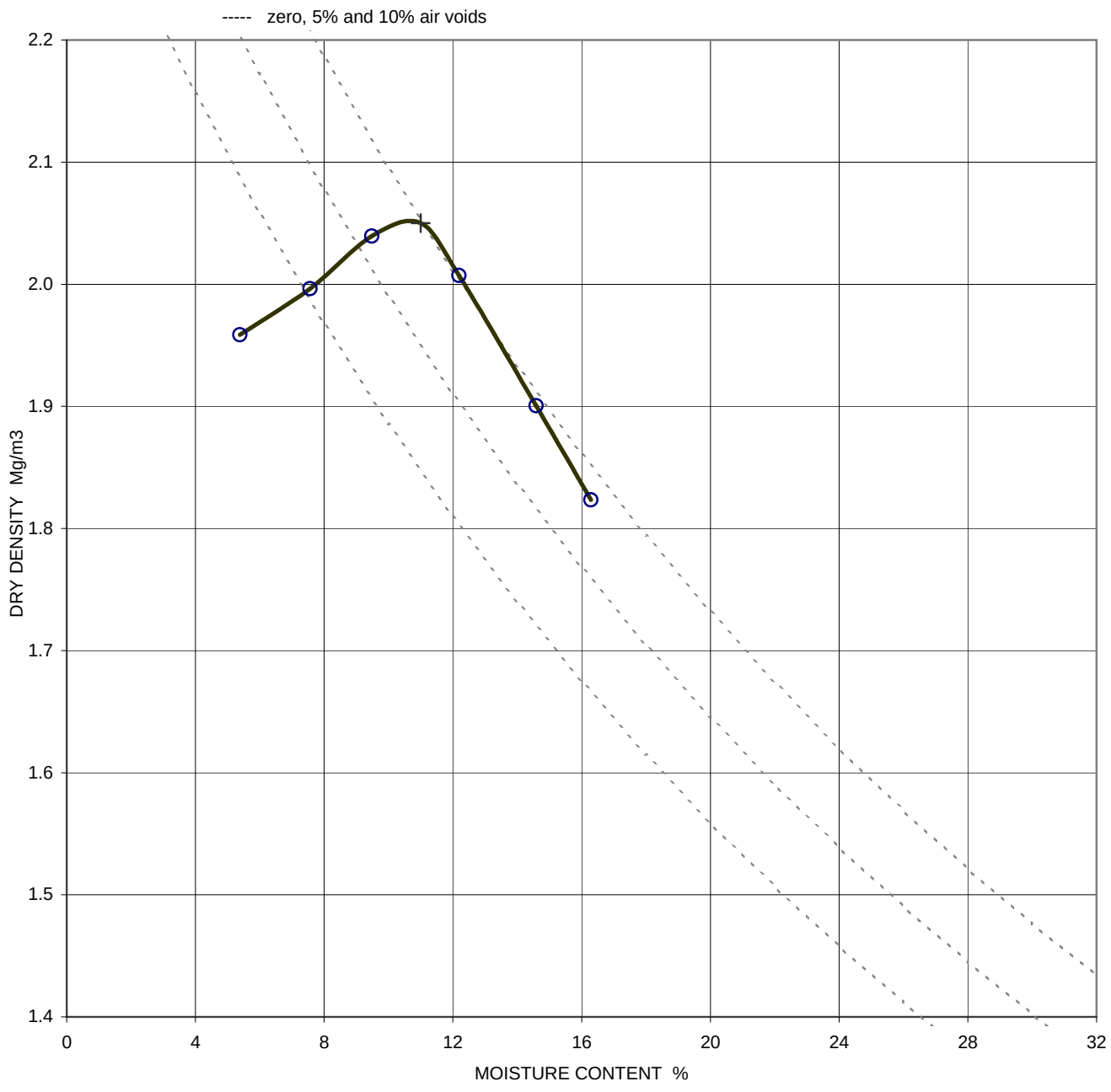
Optimum moisture content, %

12

QA Ref SLD 4, 3.5/6 Rev 66 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:33	**Figure** **COMPH 6**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	11	Type	B
			ID	ESGA1077-11201110100000000077		
			Spec Ref			



Soil description	Gryeish brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, composite specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	2	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

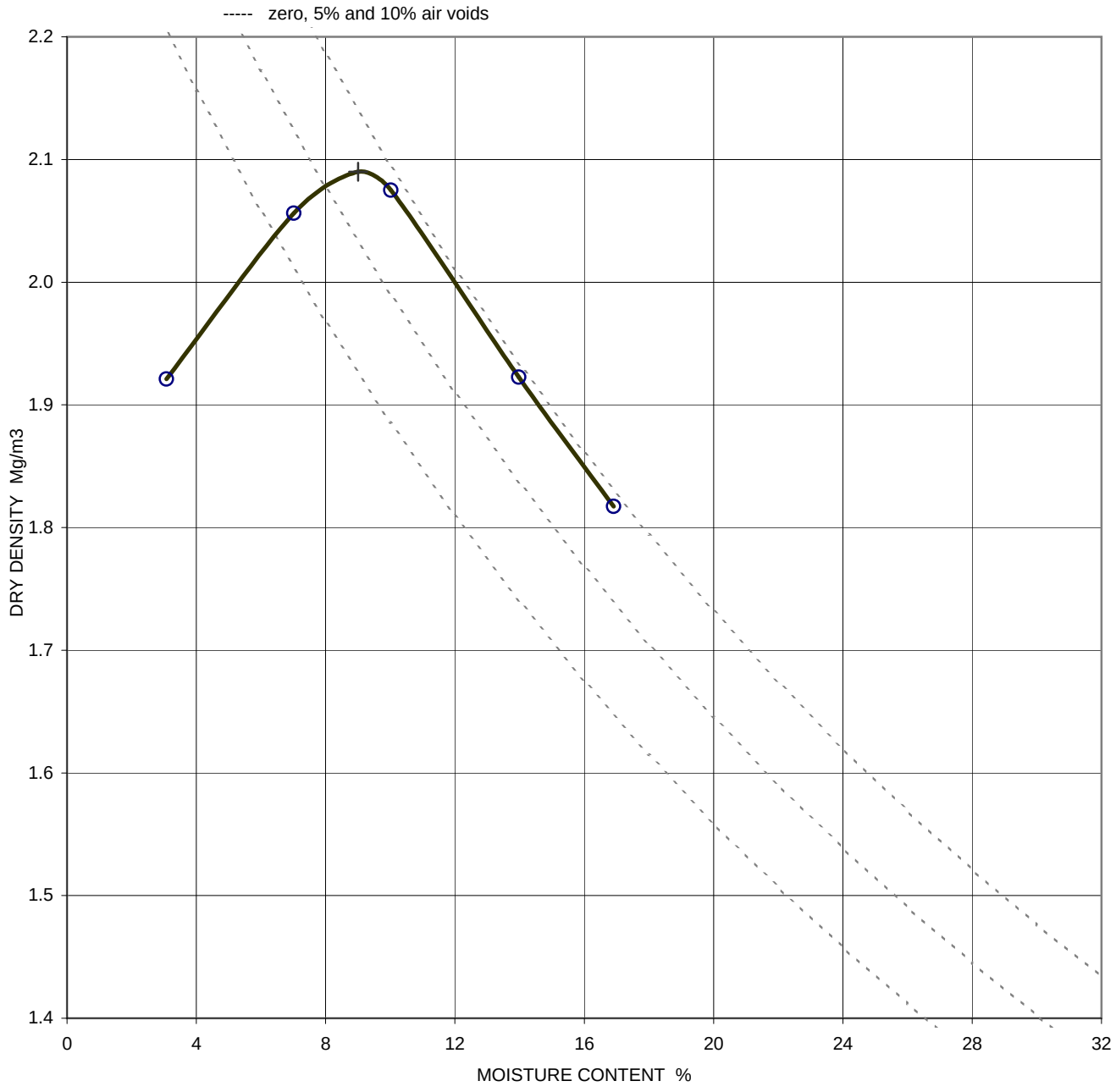
2.05

Optimum moisture content, %

11

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	6.00		
			Samp No	15	Type	B
			ID	ESGA1077-11201110100000000081		
			Spec Ref			



Soil description	Brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, separate specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	1	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

2.09

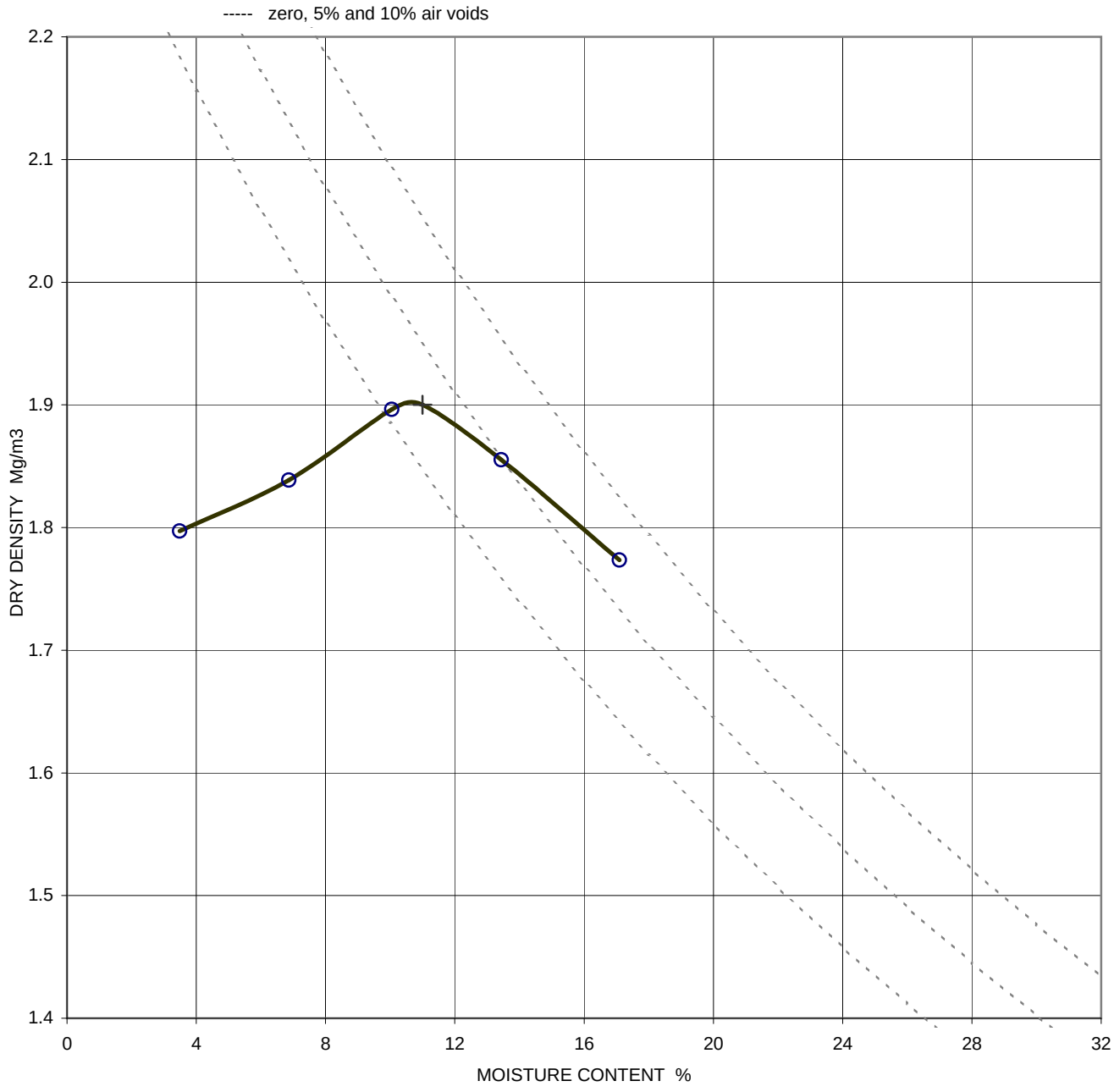
Optimum moisture content, %

9.0

QA Ref SLD 4, 3.5/6 Rev 66 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:33	**Figure** **COMPH 8**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	3	Type	B
			ID	ESGA1077-11201110110000000128		
			Spec Ref			



Soil description	Brown slightly gravelly sandy CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, separate specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

1.90

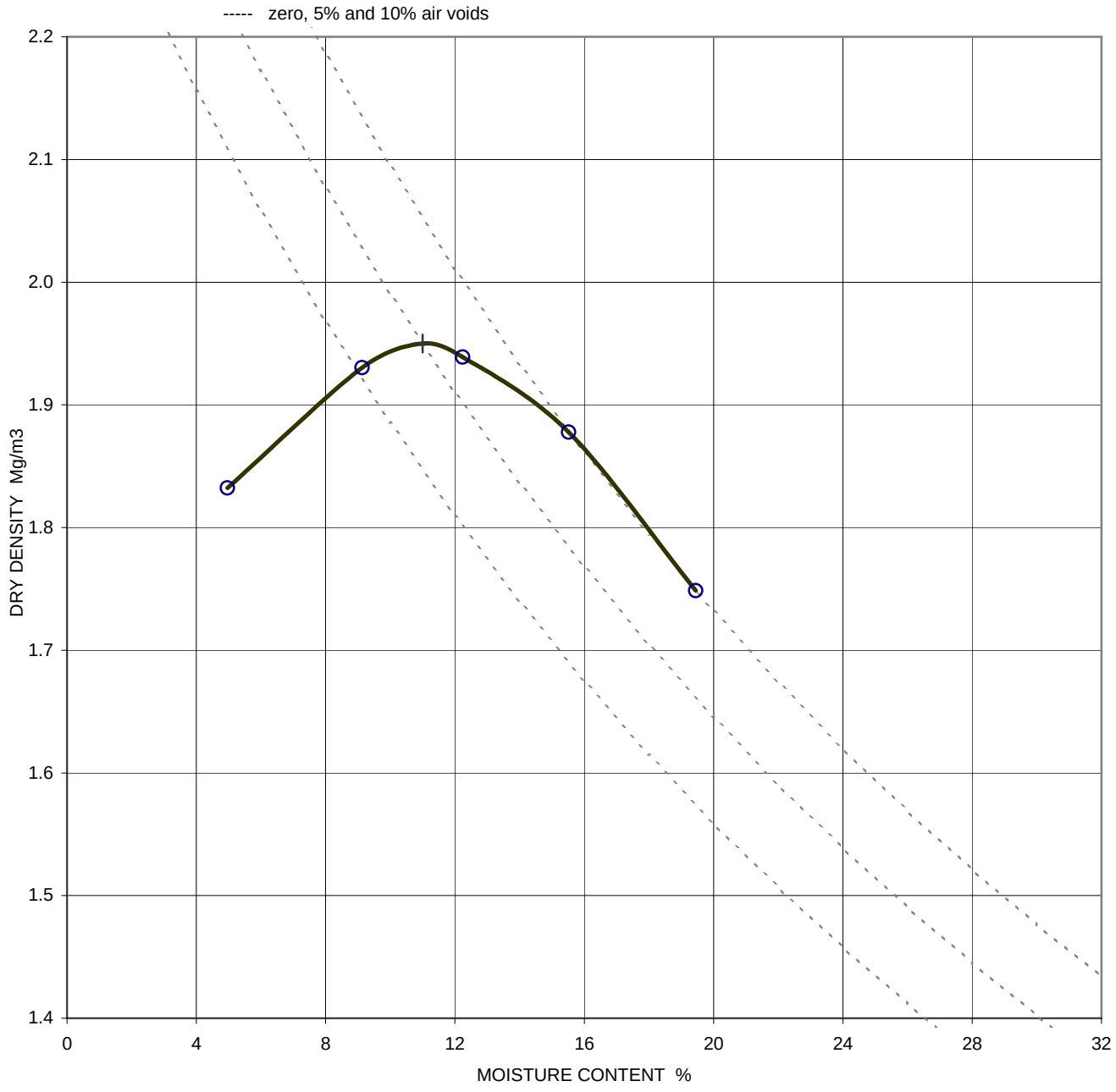
Optimum moisture content, %

11

QA Ref SLD 4, 3.5/6 Rev 66 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:33	**Figure** **COMPH 9**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.85		
			Samp No	7	Type	B
			ID	ESGA1077-11201110110000000132		
			Spec Ref			



Soil description	Brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, separate specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	1	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

1.95

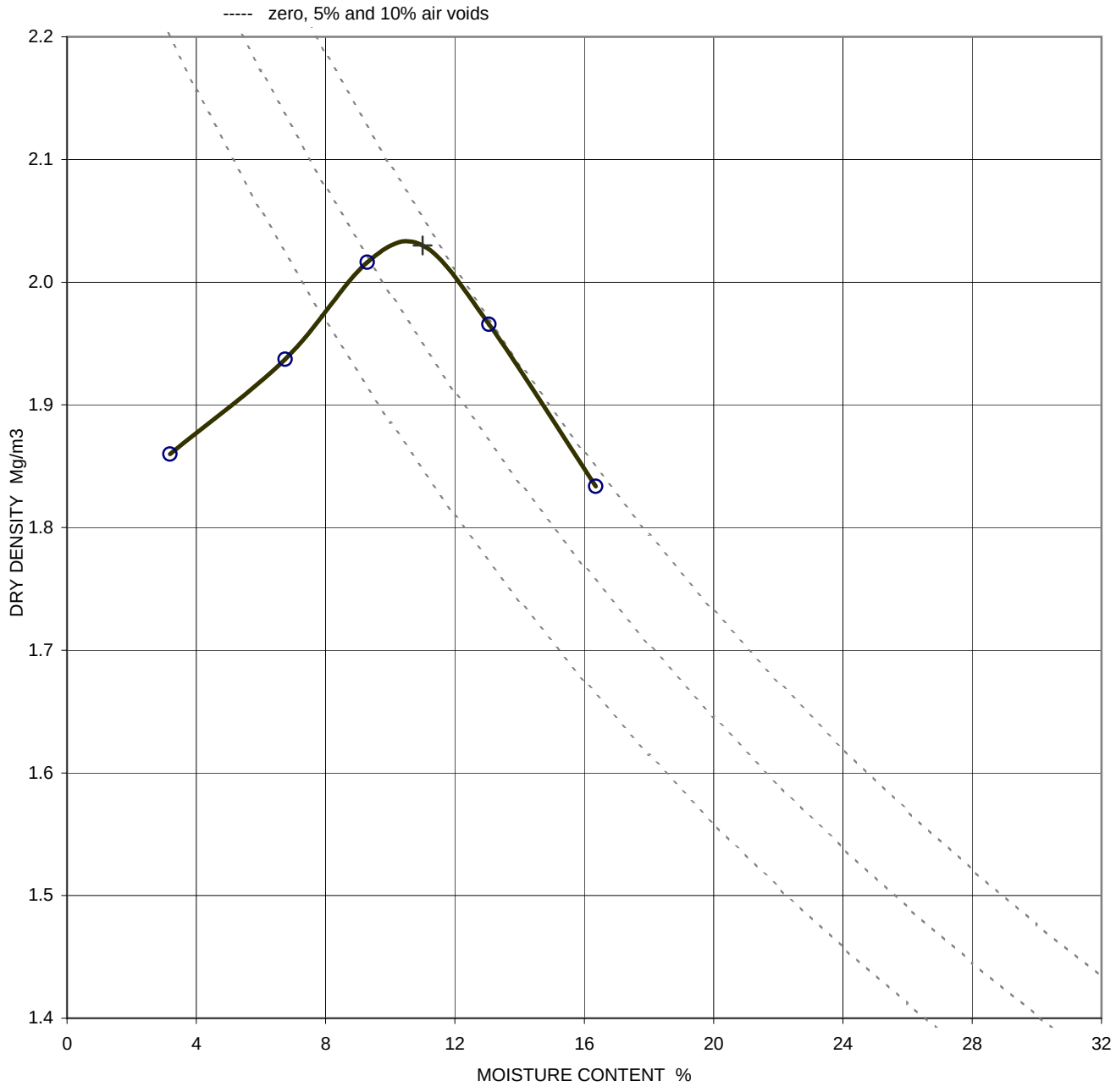
Optimum moisture content, %

11

QA Ref SLD 4, 3.5/6 Rev 66 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:33	**Figure** **COMPH 10**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.15		
			Samp No	11	Type	B
			ID	ESGA1077-11201110110000000136		
			Spec Ref			



Soil description	Reddish brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, separate specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

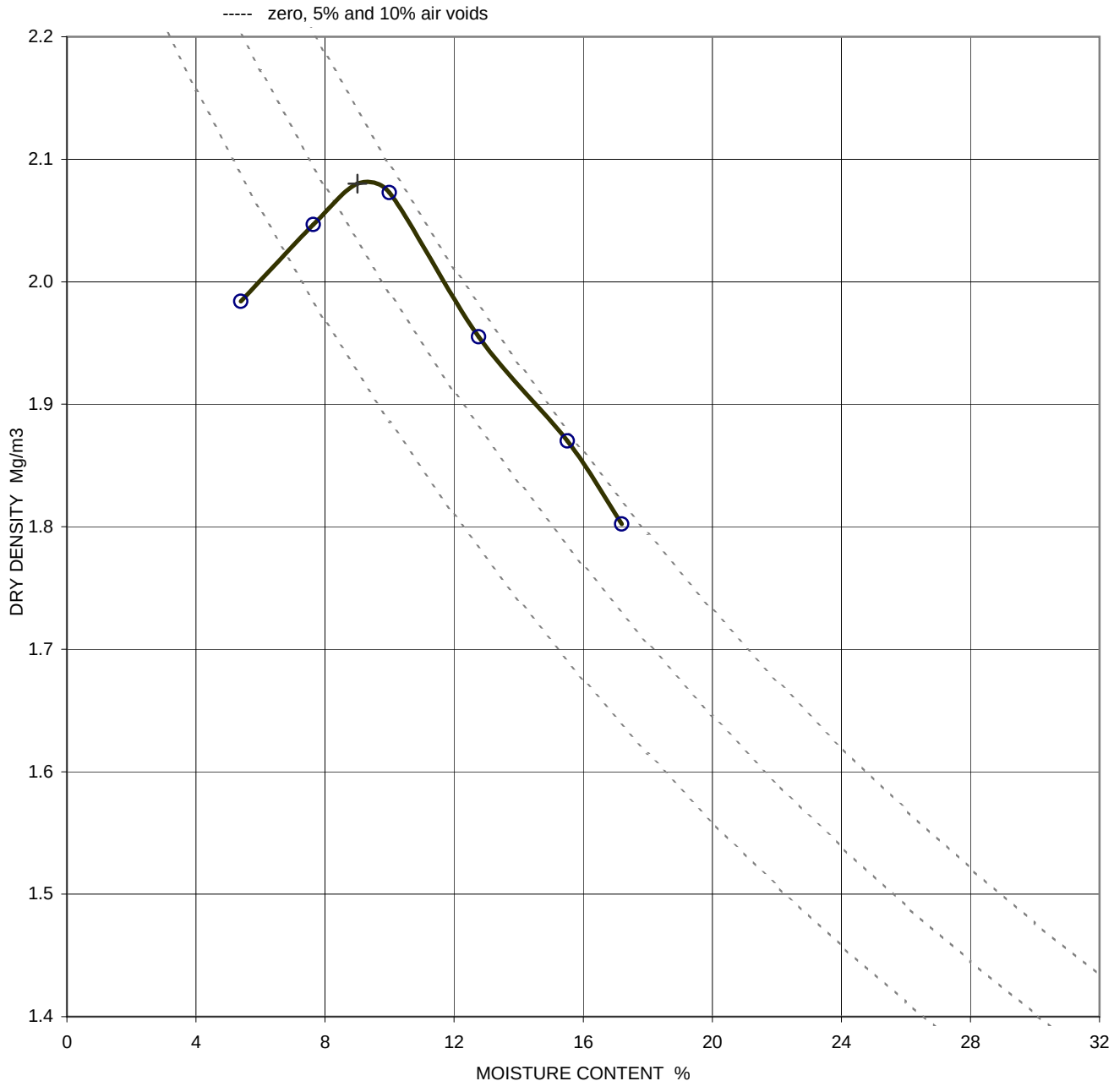
2.03

Optimum moisture content, %

11

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.65		
			Samp No	15	Type	B
			ID	ESGA1077-11201110110000000140		
			Spec Ref			



Soil description	Brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, composite specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	1	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

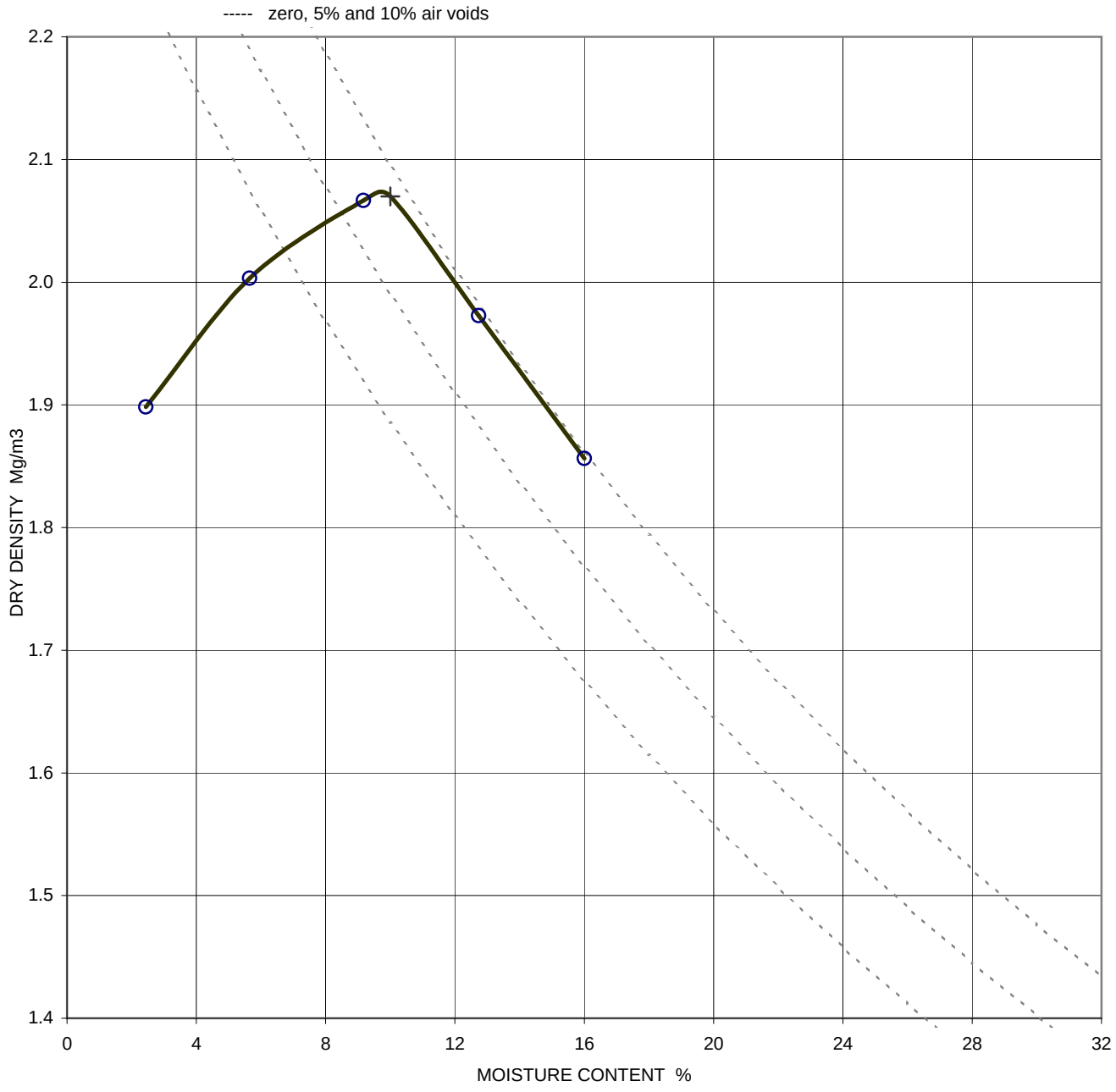
2.08

Optimum moisture content, %

9.0

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	6.15		
			Samp No	19	Type	B
			ID	ESGA1077-11201110110000000144		
			Spec Ref			



Soil description	Brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, separate specimens tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	1	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

2.07

Optimum moisture content, %

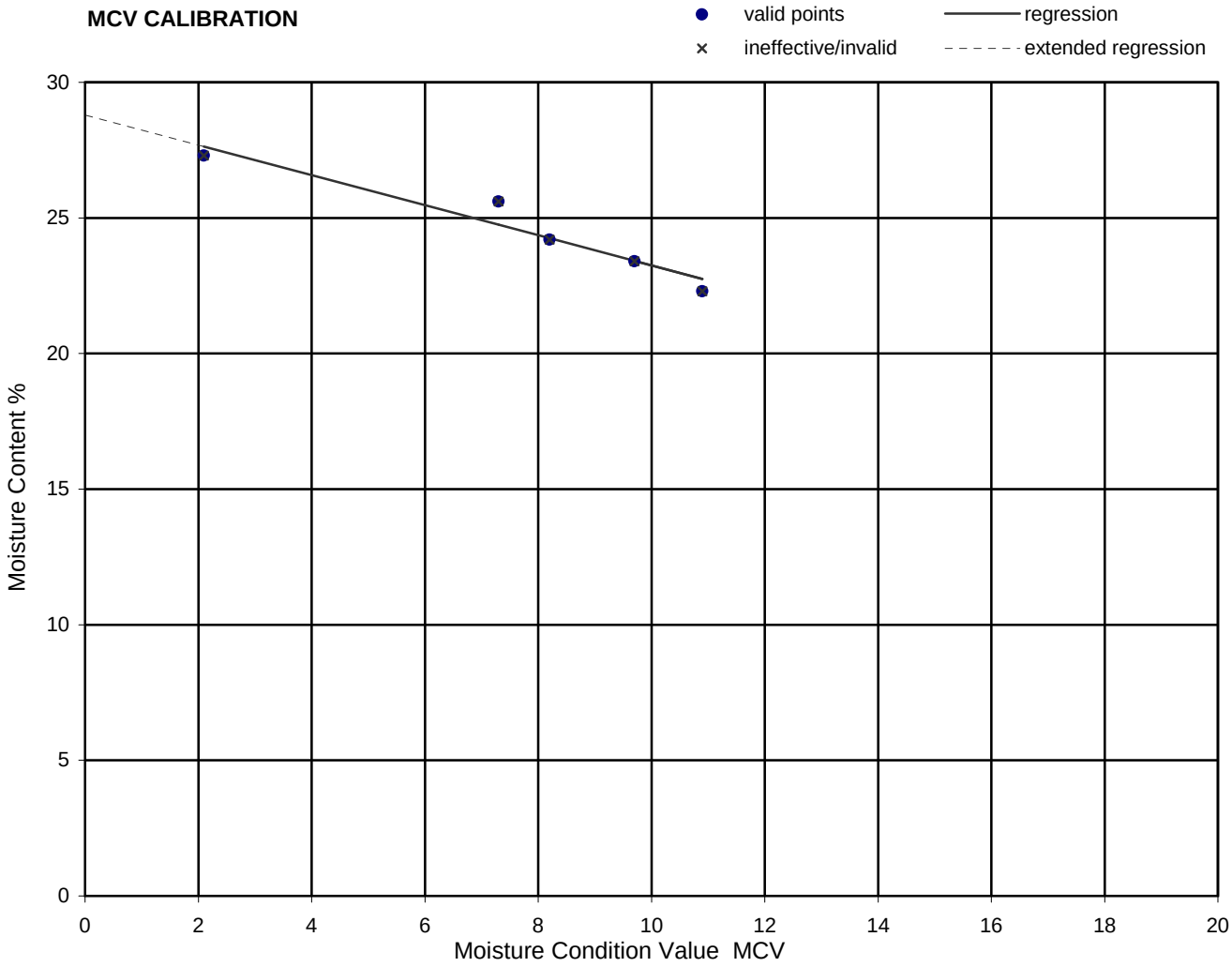
10

QA Ref SLD 4, 3.5/6 Rev 66 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:18/11/2011 17:33	**Figure** **COMPH 13**

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	4	Type	B
			ID	ESGA1077-11201110100000000004		
			Spec Ref			

MCV CALIBRATION

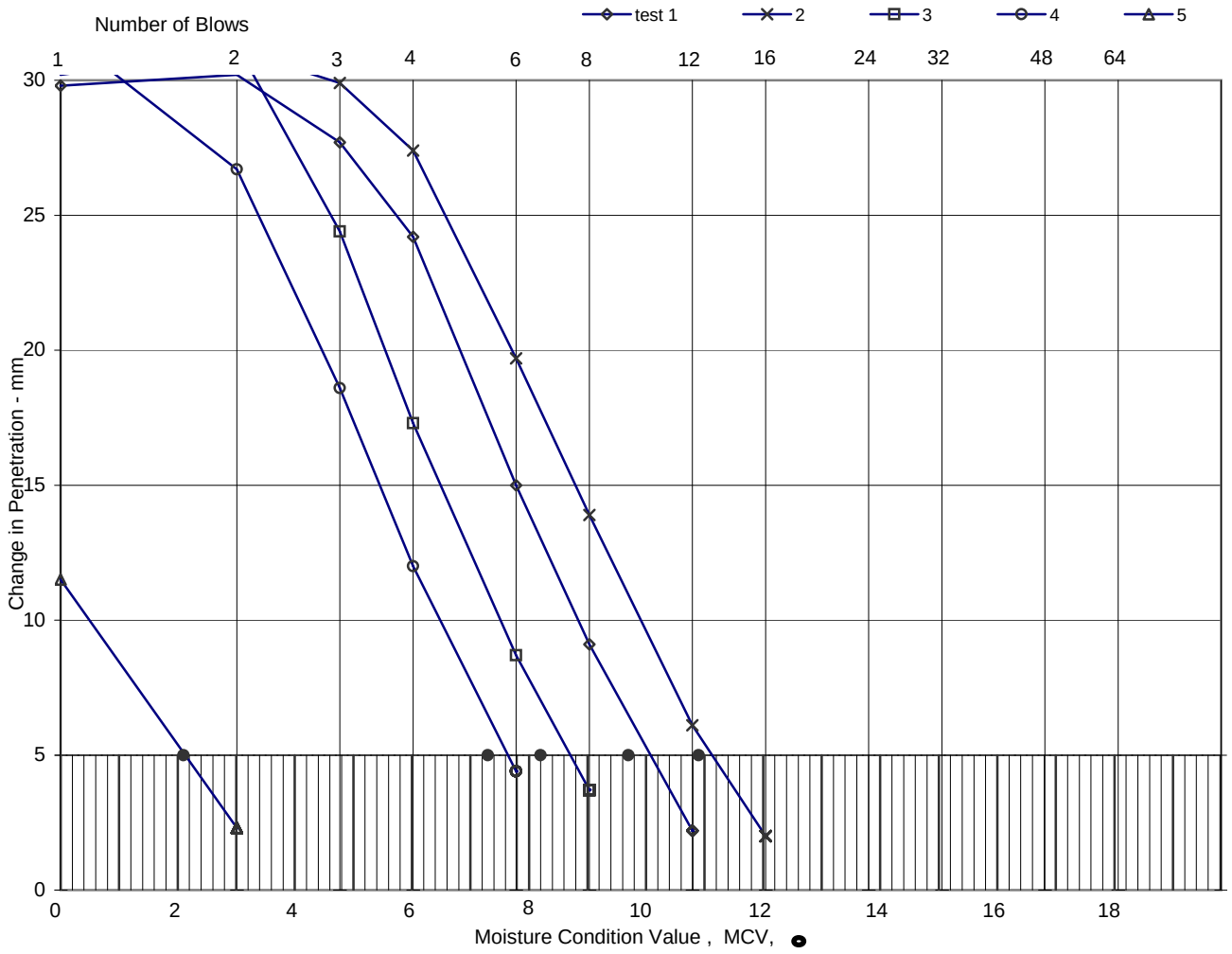


Characteristics of calibration line (determined using linear regression)	
Intercept	28.8
Slope	-0.55
Sensitivity (Change in MCV per 1% moisture content)	1.80
Correlation (proximity of test points to regression line)	-0.97
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	4	Type	B
			ID	ESGA1077-11201110100000000004		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	5
Moisture Condition Value		9.7	10.9	8.2	7.3	2.1
Moisture Content	%	23.4	22.3	24.2	25.6	27.3
Bulk density after test	Mg/m³	2.00	2.04	2.00	1.98	1.91
Dry density after test	Mg/m³	1.62	1.67	1.61	1.58	1.50

Soil description	Dark brown slightly gravelly sandy CLAY with occasional rootlets.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

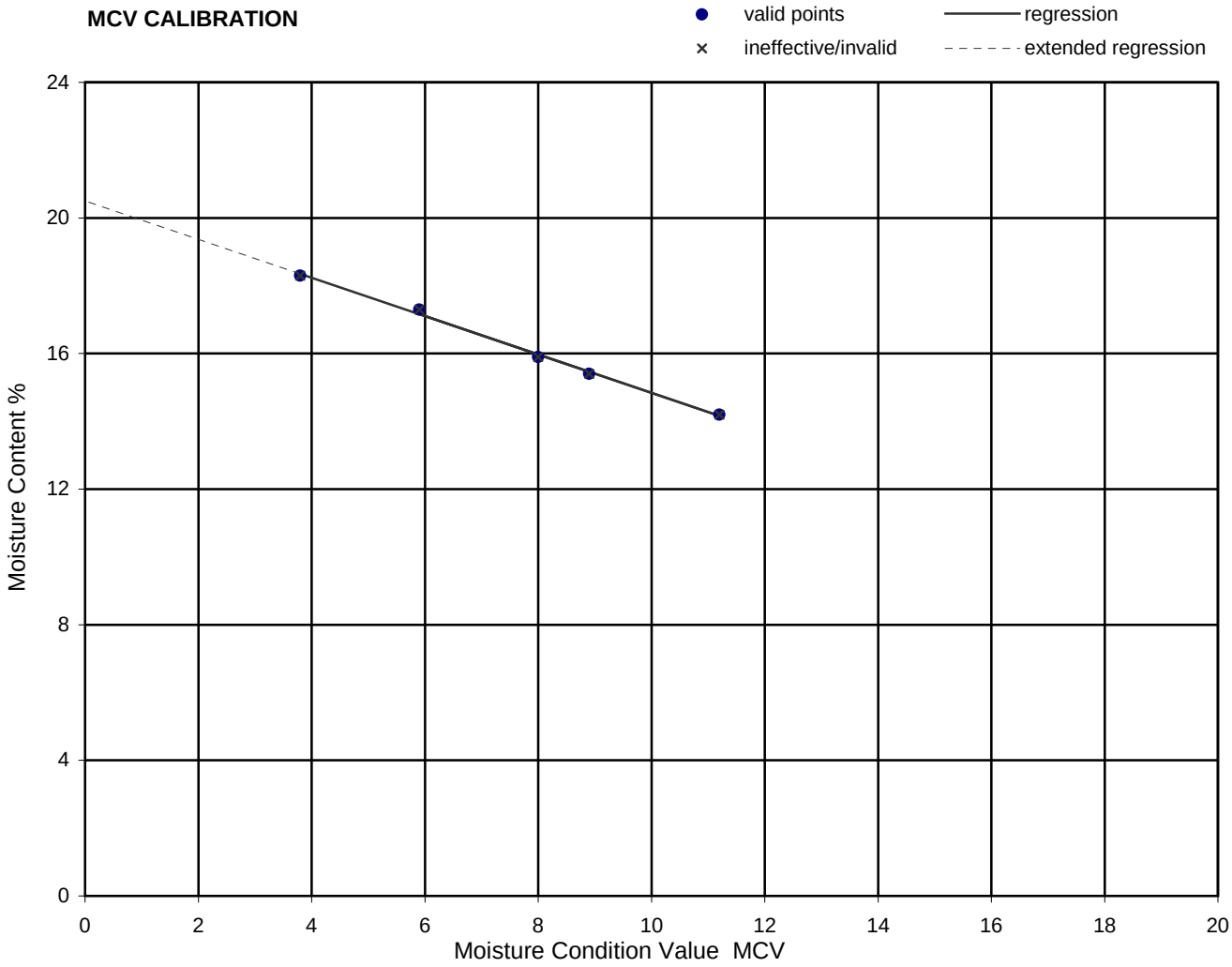
Initial moisture content <20mm	%	23.4
Material retained on 20mm sieve	%	0

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	8	Type	B
			ID	ESGA1077-11201110100000000009		
			Spec Ref			

MCV CALIBRATION

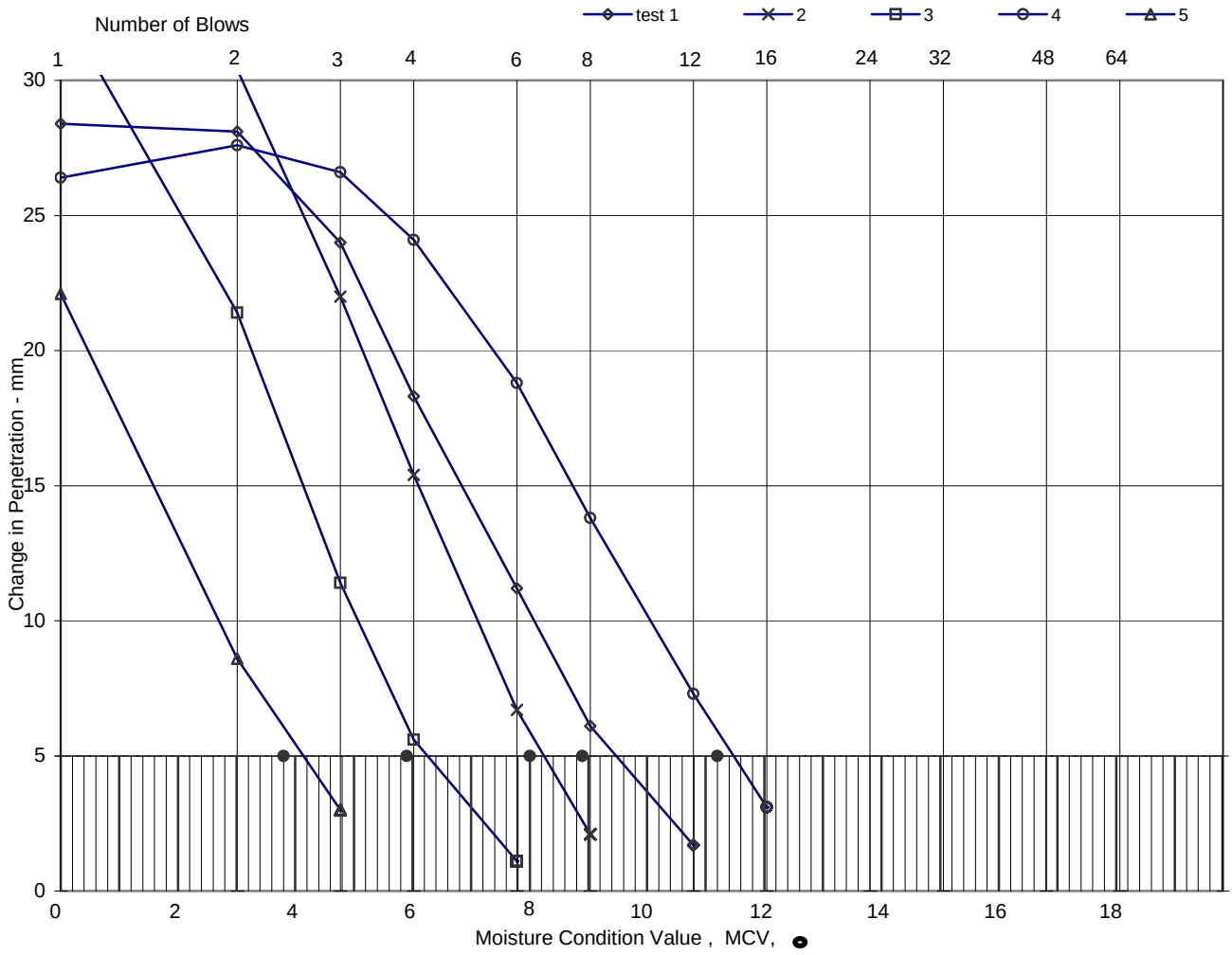


Characteristics of calibration line (determined using linear regression)	
Intercept	20.5
Slope	-0.57
Sensitivity (Change in MCV per 1% moisture content)	1.76
Correlation (proximity of test points to regression line)	-1.00
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	8	Type	B
			ID	ESGA1077-11201110100000000009		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	5
Moisture Condition Value		8.9	8.0	5.9	11.2	3.8
Moisture Content	%	15.4	15.9	17.3	14.2	18.3
Bulk density after test	Mg/m³	2.19	2.16	2.11	2.21	2.09
Dry density after test	Mg/m³	1.90	1.86	1.80	1.94	1.77

Soil description	Brown slightly sandy slightly gravelly CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

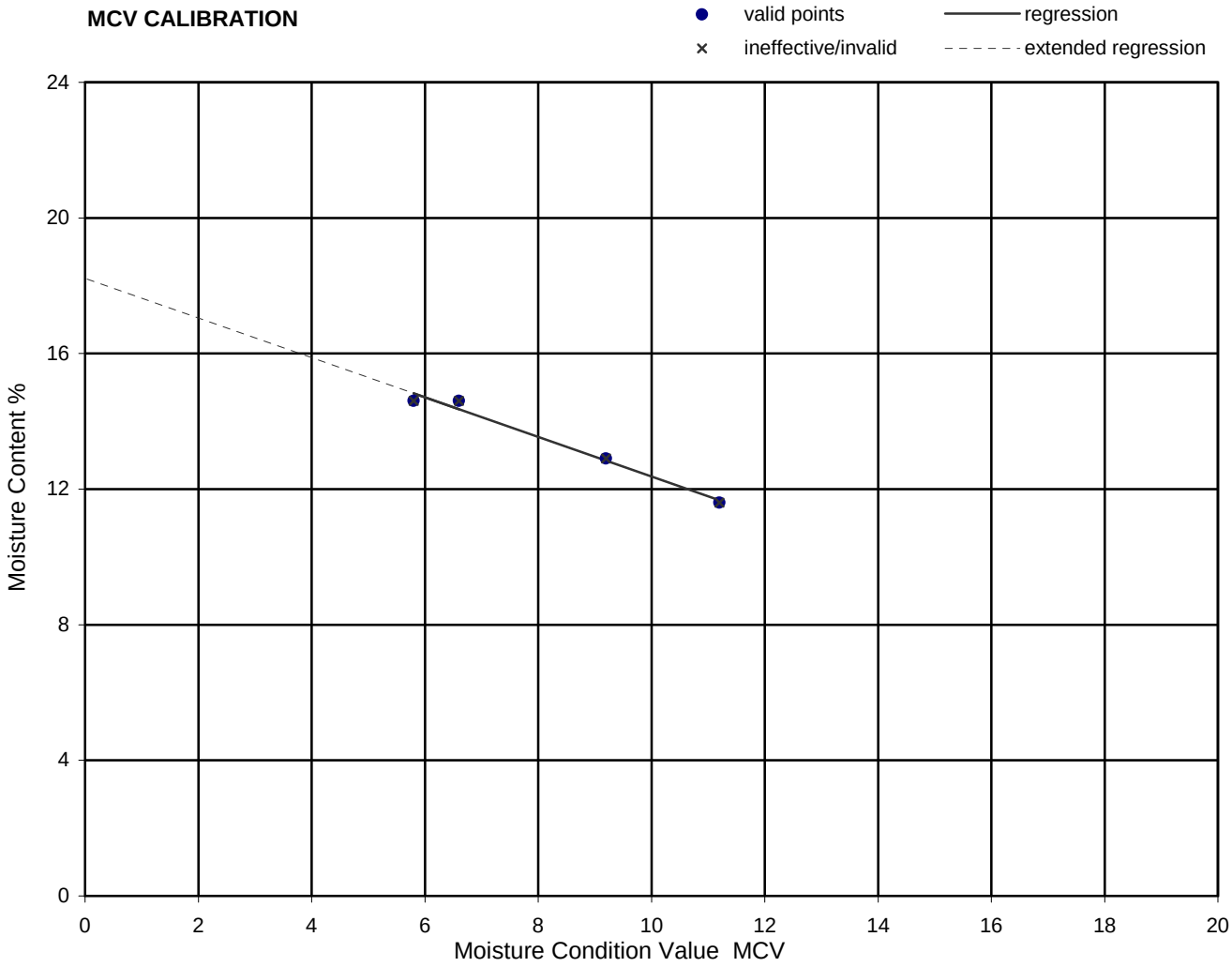
Initial moisture content <20mm	%	15.4
Material retained on 20mm sieve	%	4

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	12	Type	B
			ID	ESGA1077-11201110100000000013		
			Spec Ref			

MCV CALIBRATION

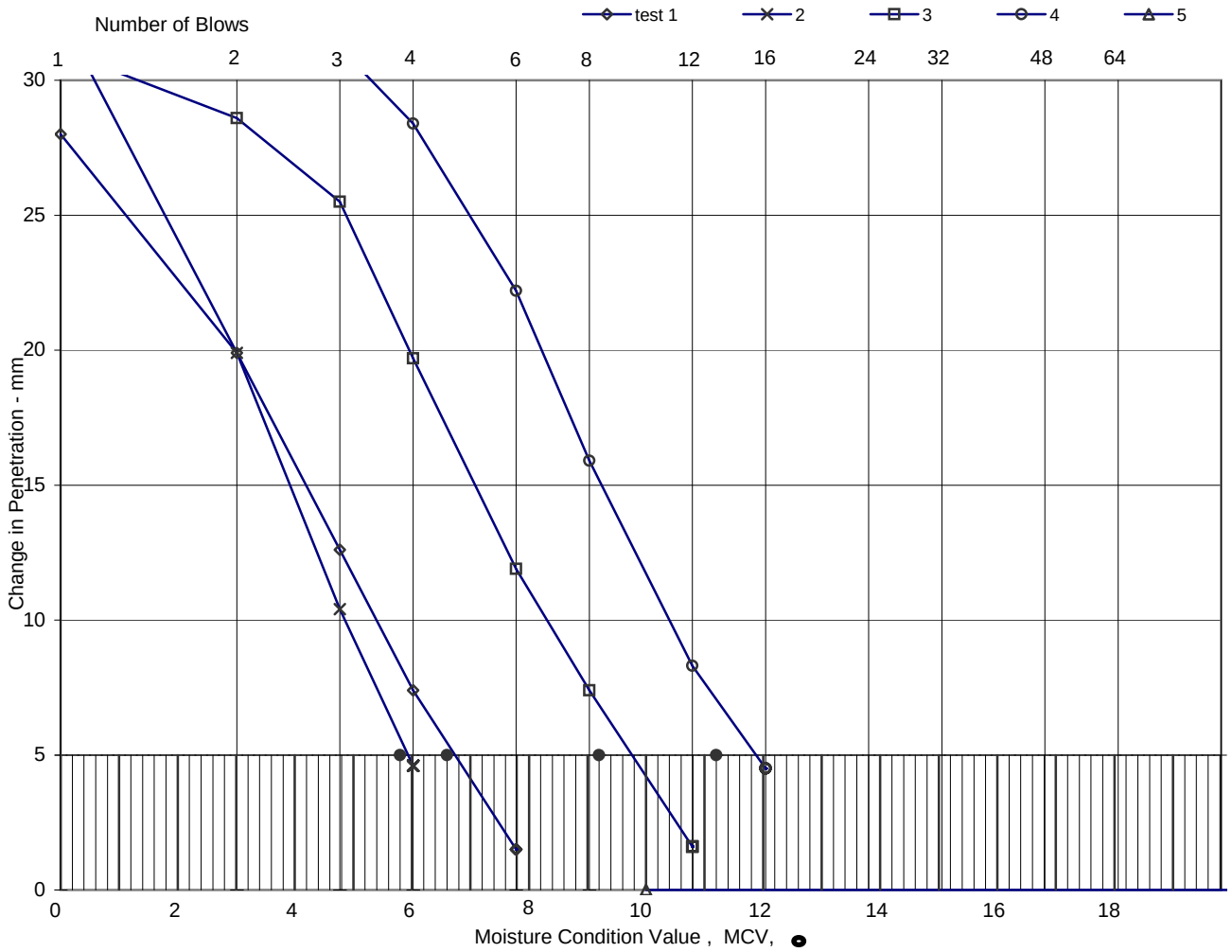


Characteristics of calibration line (determined using linear regression)	
Intercept	18.2
Slope	-0.58
Sensitivity (Change in MCV per 1% moisture content)	1.71
Correlation (proximity of test points to regression line)	-0.99
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	12	Type	B
			ID	ESGA1077-11201110100000000013		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	
Moisture Condition Value		6.6	5.8	9.2	11.2	
Moisture Content	%	14.6	14.6	12.9	11.6	
Bulk density after test	Mg/m³	2.20	2.19	2.25	2.29	
Dry density after test	Mg/m³	1.92	1.91	1.99	2.05	

Soil description	Brown slightly sandy slightly gravelly CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

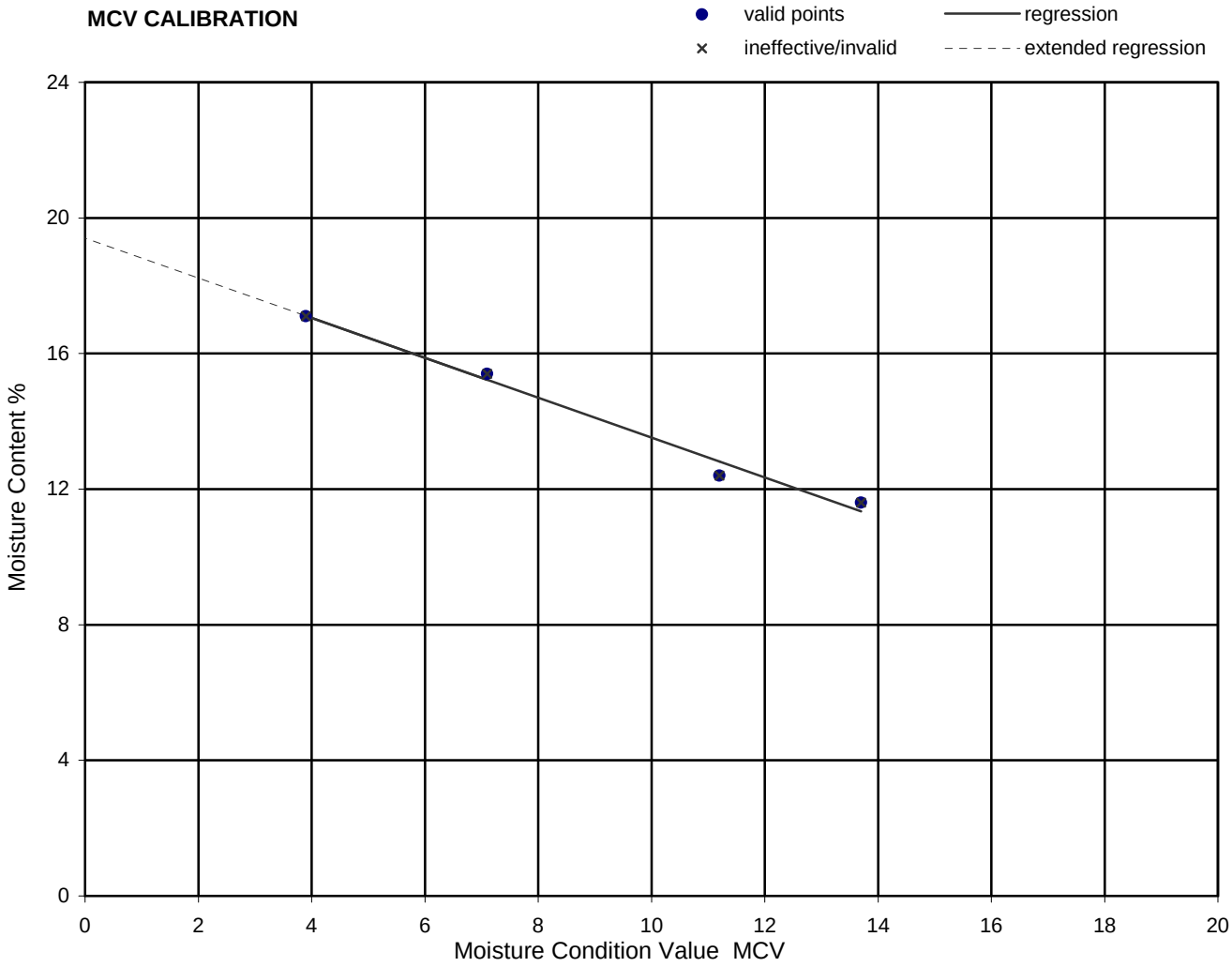
Initial moisture content <20mm	%	14.6
Material retained on 20mm sieve	%	5

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	5.65		
			Samp No	16	Type	B
			ID	ESGA1077-11201110100000000017		
			Spec Ref			

MCV CALIBRATION

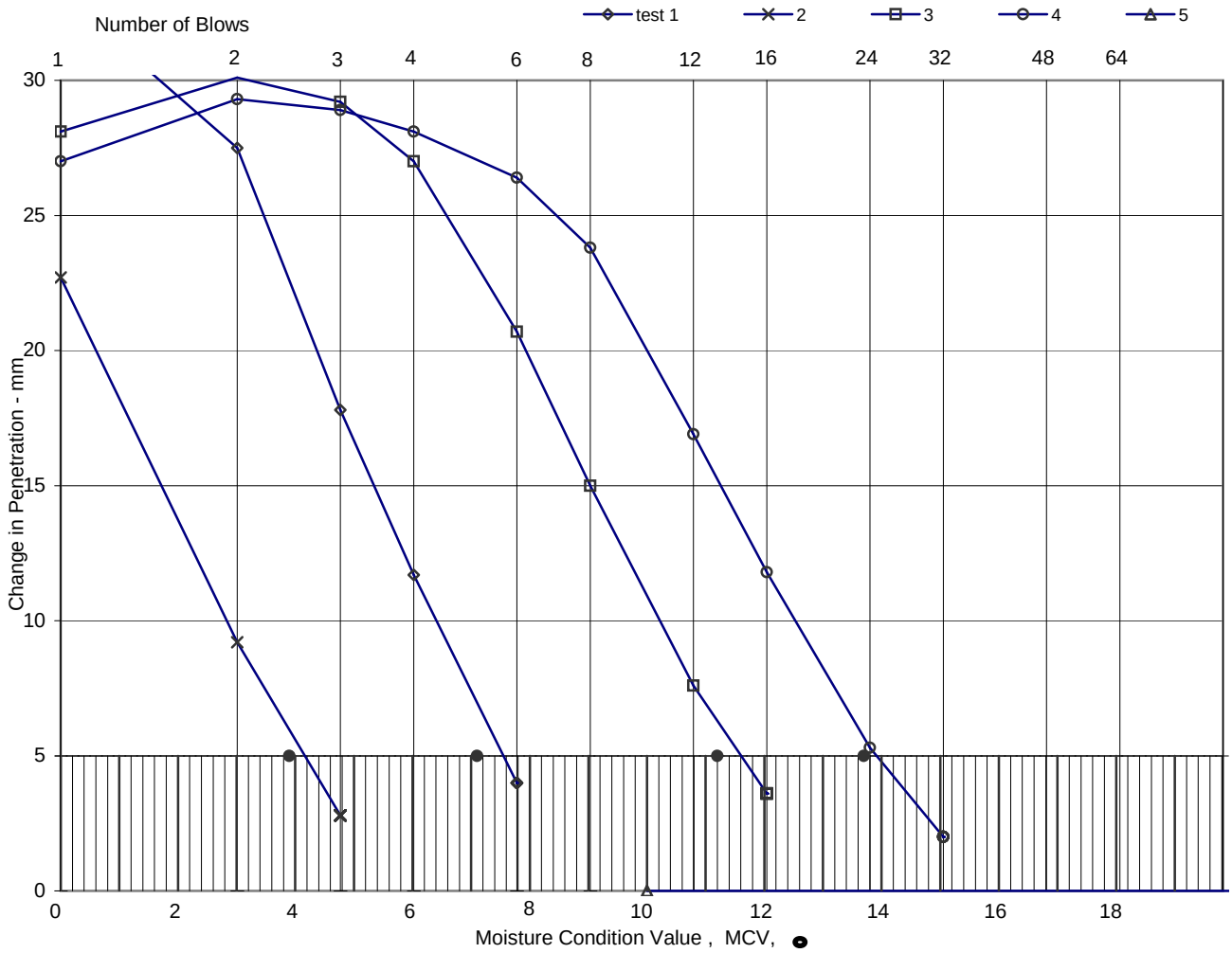


Characteristics of calibration line (determined using linear regression)	
Intercept	19.4
Slope	-0.59
Sensitivity (Change in MCV per 1% moisture content)	1.70
Correlation (proximity of test points to regression line)	-0.99
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH1		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	5.65		
			Samp No	16	Type	B
			ID	ESGA1077-11201110100000000017		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	
Moisture Condition Value		7.1	3.9	11.2	13.7	
Moisture Content	%	15.4	17.1	12.4	11.6	
Bulk density after test	Mg/m³	2.21	2.13	2.28	2.30	
Dry density after test	Mg/m³	1.92	1.82	2.03	2.06	

Soil description	Brown slightly sandy slightly gravelly CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

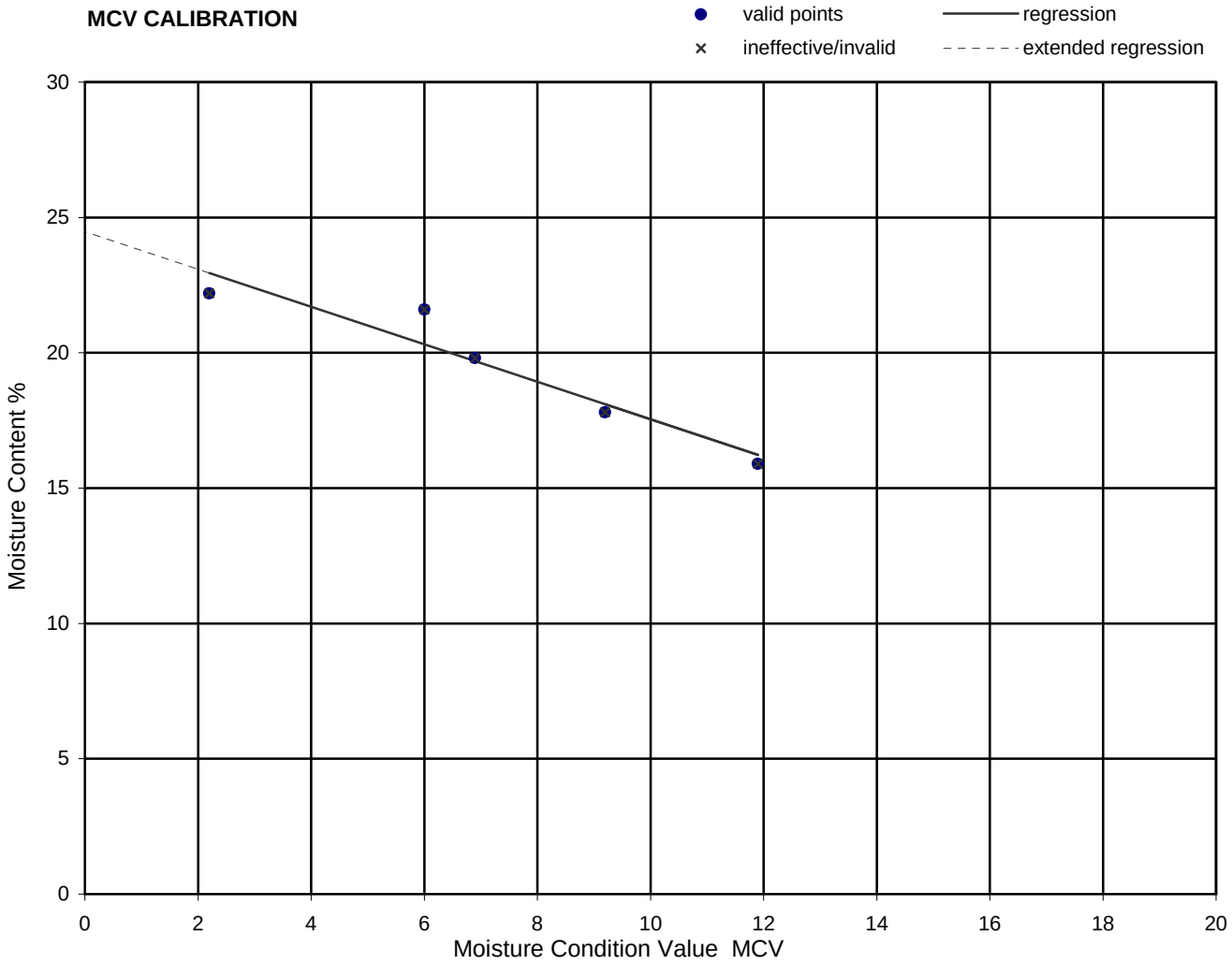
Initial moisture content <20mm	%	15.4
Material retained on 20mm sieve	%	3.7

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	3	Type	B
			ID	ESGA1077-11201110100000000069		
			Spec Ref			

MCV CALIBRATION

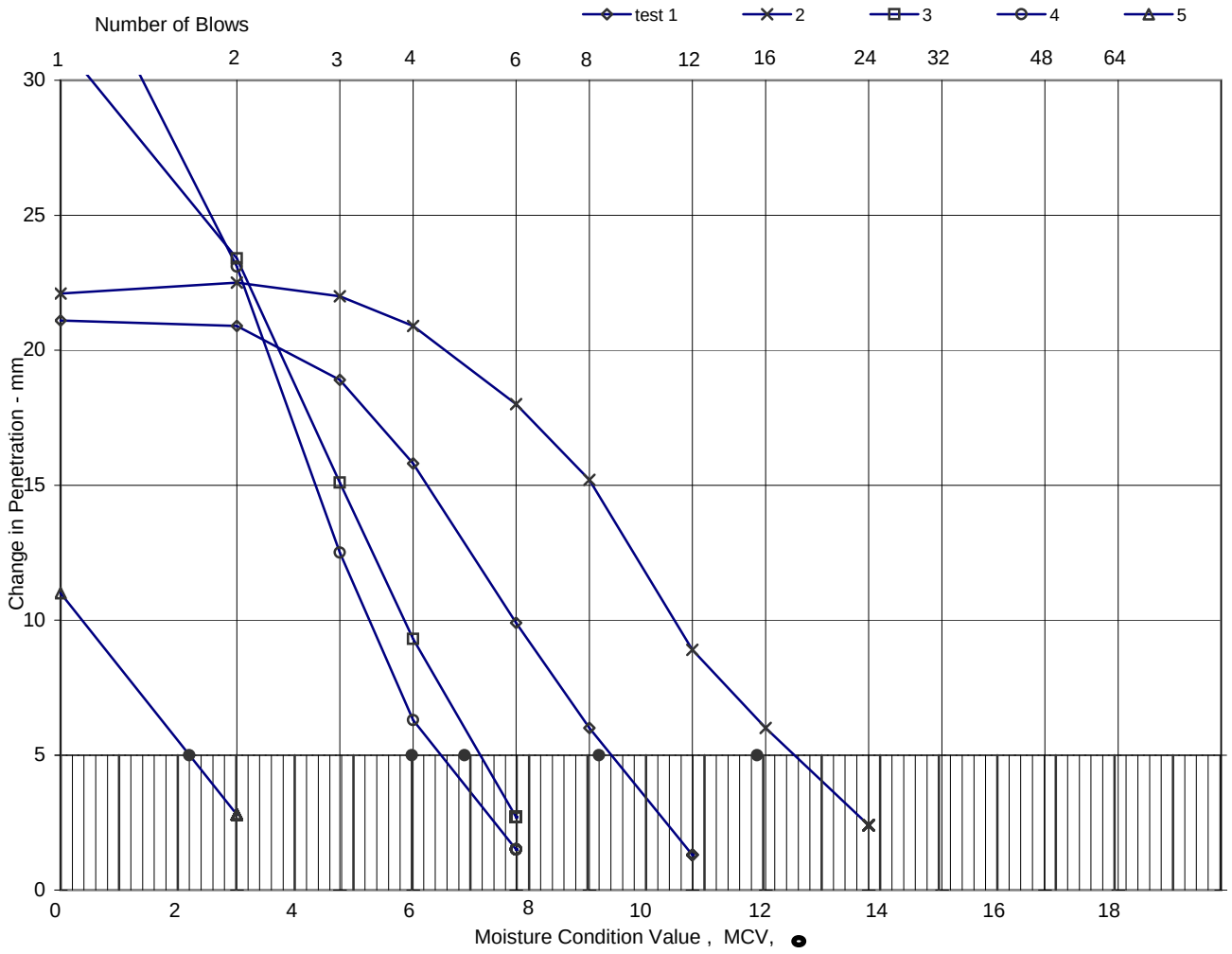


Characteristics of calibration line (determined using linear regression)	
Intercept	24.5
Slope	-0.69
Sensitivity (Change in MCV per 1% moisture content)	1.44
Correlation (proximity of test points to regression line)	-0.96
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	3	Type	B
			ID	ESGA1077-11201110100000000069		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	5
Moisture Condition Value		9.2	11.9	6.9	6.0	2.2
Moisture Content	%	17.8	15.9	19.8	21.6	22.2
Bulk density after test	Mg/m³	2.09	2.16	2.05	2.02	1.95
Dry density after test	Mg/m³	1.77	1.86	1.71	1.66	1.60

Soil description	Brown slightly gravelly sandy silty CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

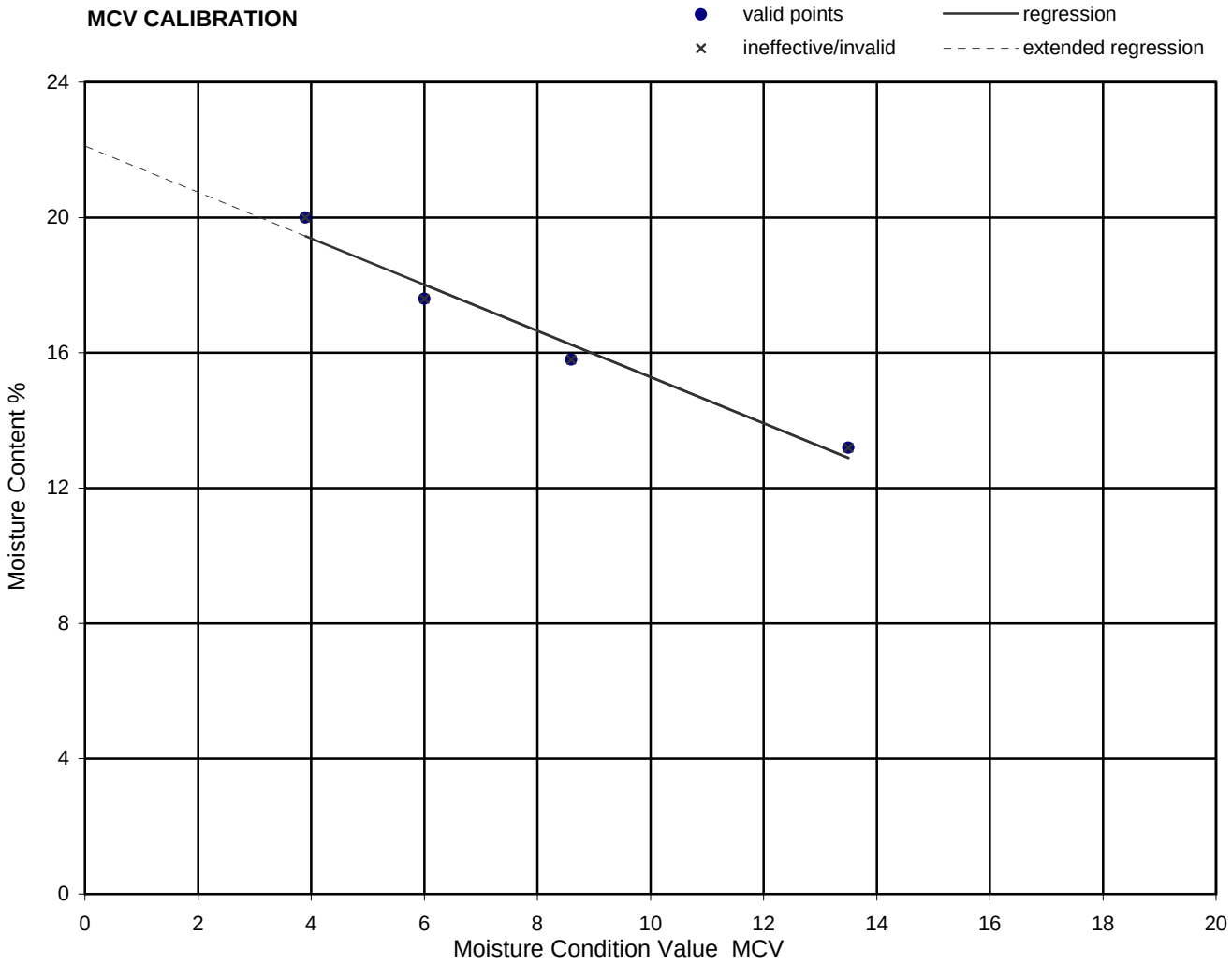
Initial moisture content <20mm	%	17.8
Material retained on 20mm sieve	%	0

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	7	Type	B
			ID	ESGA1077-11201110100000000073		
			Spec Ref			

MCV CALIBRATION

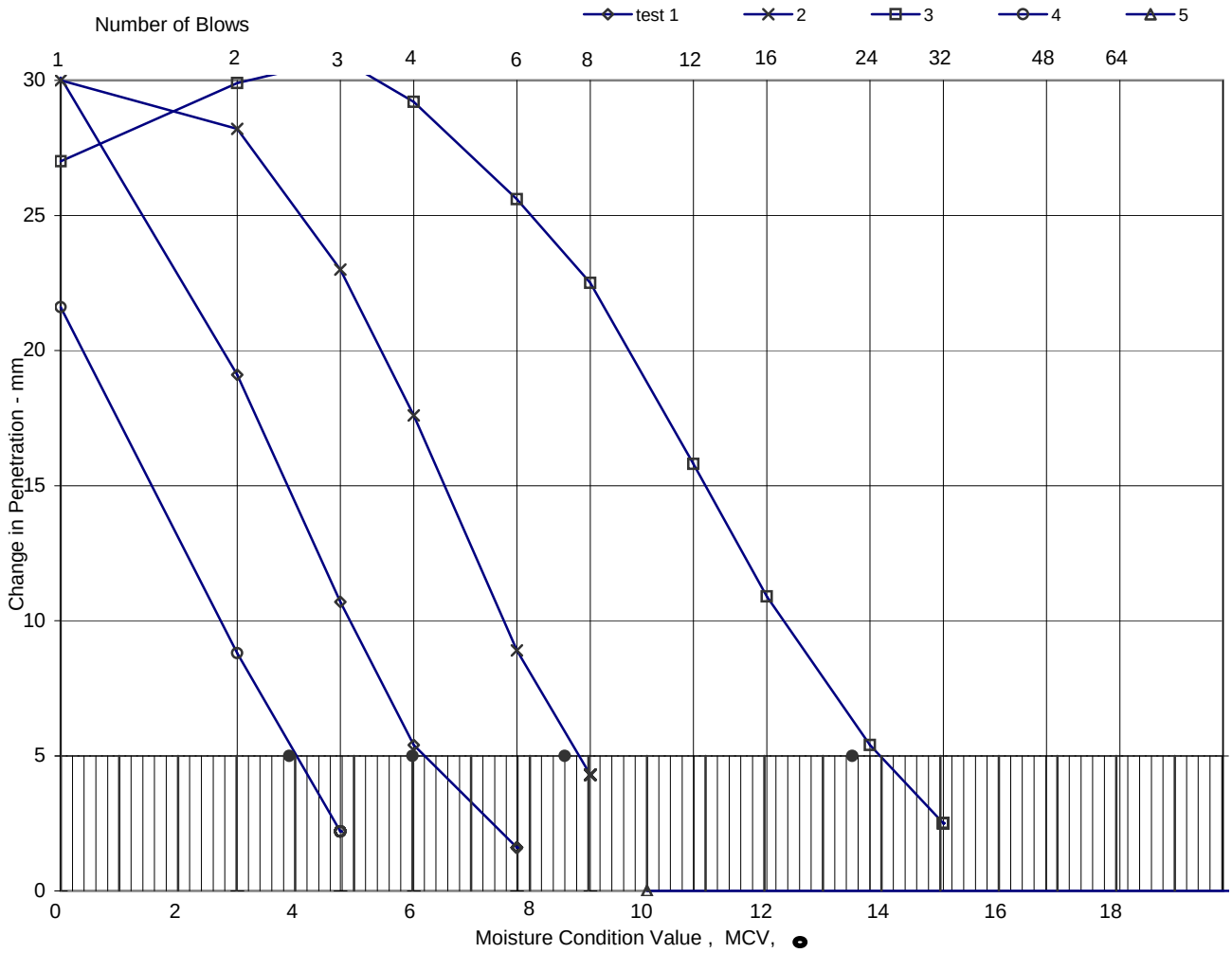


Characteristics of calibration line (determined using linear regression)	
Intercept	22.1
Slope	-0.68
Sensitivity (Change in MCV per 1% moisture content)	1.46
Correlation (proximity of test points to regression line)	-0.98
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	2.00		
			Samp No	7	Type	B
			ID	ESGA1077-11201110100000000073		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	
Moisture Condition Value		6.0	8.6	13.5	3.9	
Moisture Content	%	17.6	15.8	13.2	20.0	
Bulk density after test	Mg/m³	2.09	2.15	2.23	2.04	
Dry density after test	Mg/m³	1.78	1.86	1.97	1.70	

Soil description	Brown slightly sandy slightly gravelly CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

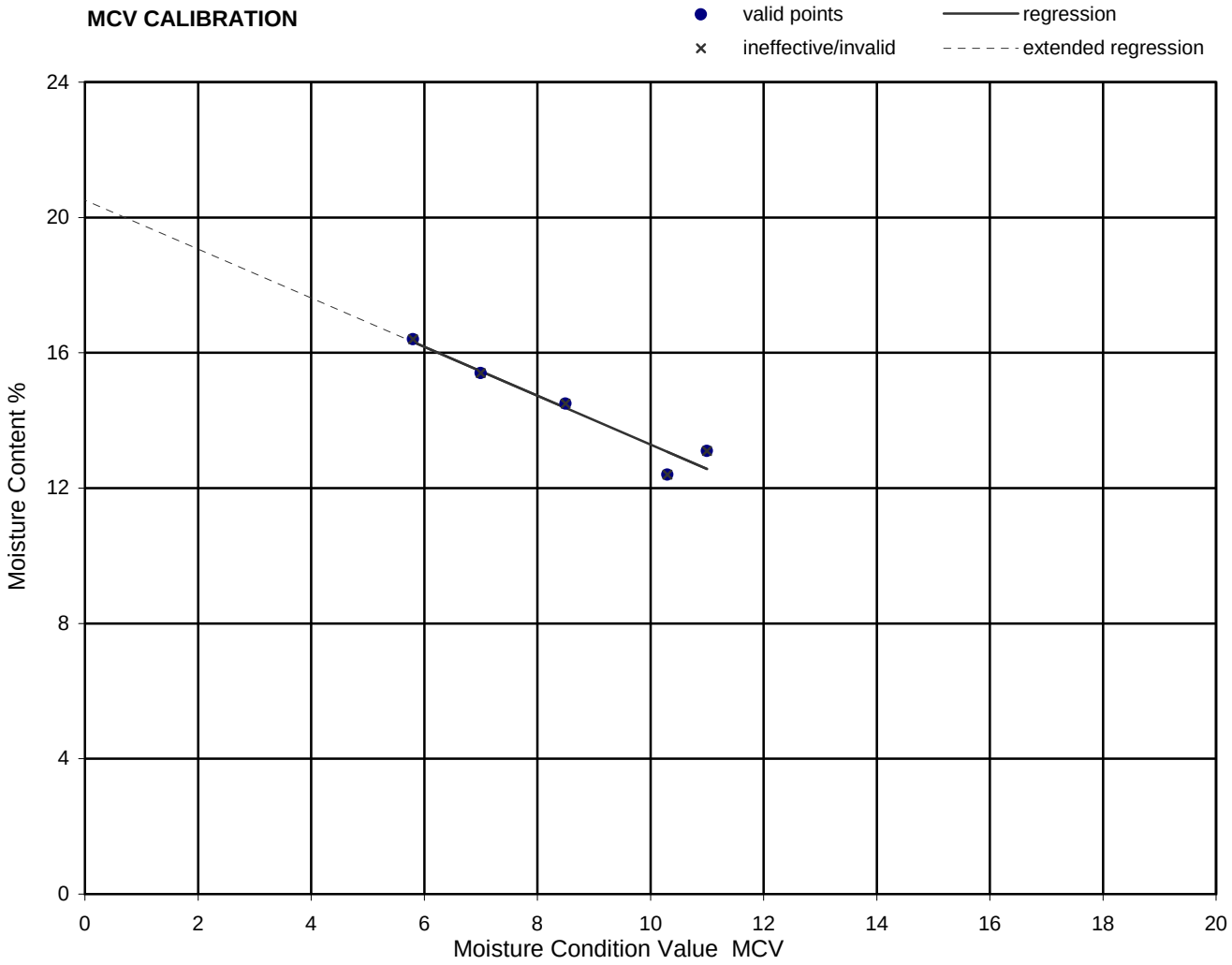
Initial moisture content <20mm	%	17.6
Material retained on 20mm sieve	%	2

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	11	Type	B
			ID	ESGA1077-11201110100000000077		
			Spec Ref			

MCV CALIBRATION

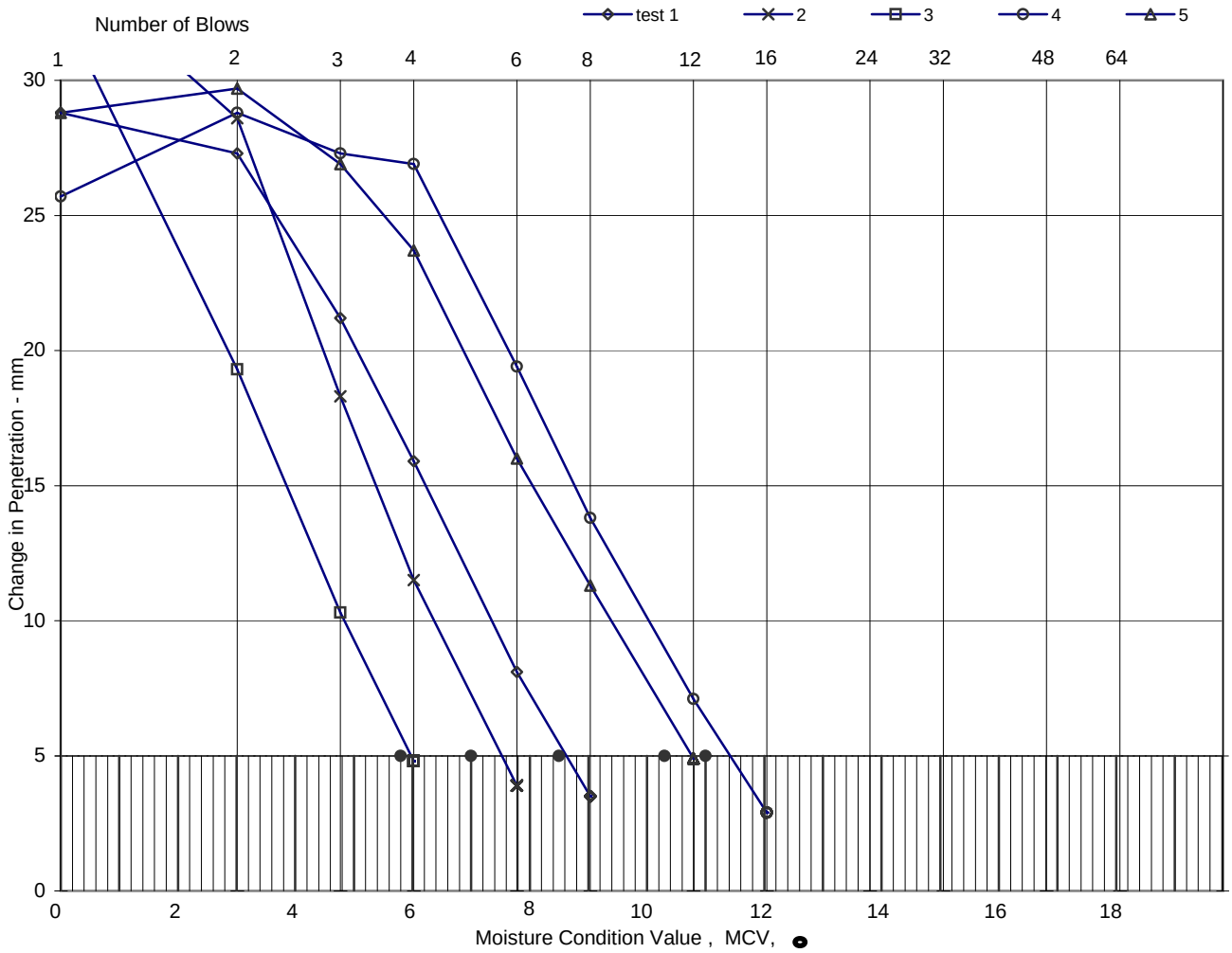


Characteristics of calibration line (determined using linear regression)	
Intercept	20.5
Slope	-0.72
Sensitivity (Change in MCV per 1% moisture content)	1.38
Correlation (proximity of test points to regression line)	-0.96
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.00		
			Samp No	11	Type	B
			ID	ESGA1077-11201110100000000077		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	5
Moisture Condition Value		8.5	7.0	5.8	11.0	10.3
Moisture Content	%	14.5	15.4	16.4	13.1	12.4
Bulk density after test	Mg/m³	2.21	2.17	2.15	2.24	2.23
Dry density after test	Mg/m³	1.93	1.88	1.85	1.98	1.98

Soil description	Gryeish brown slightly sandy slightly gravelly CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

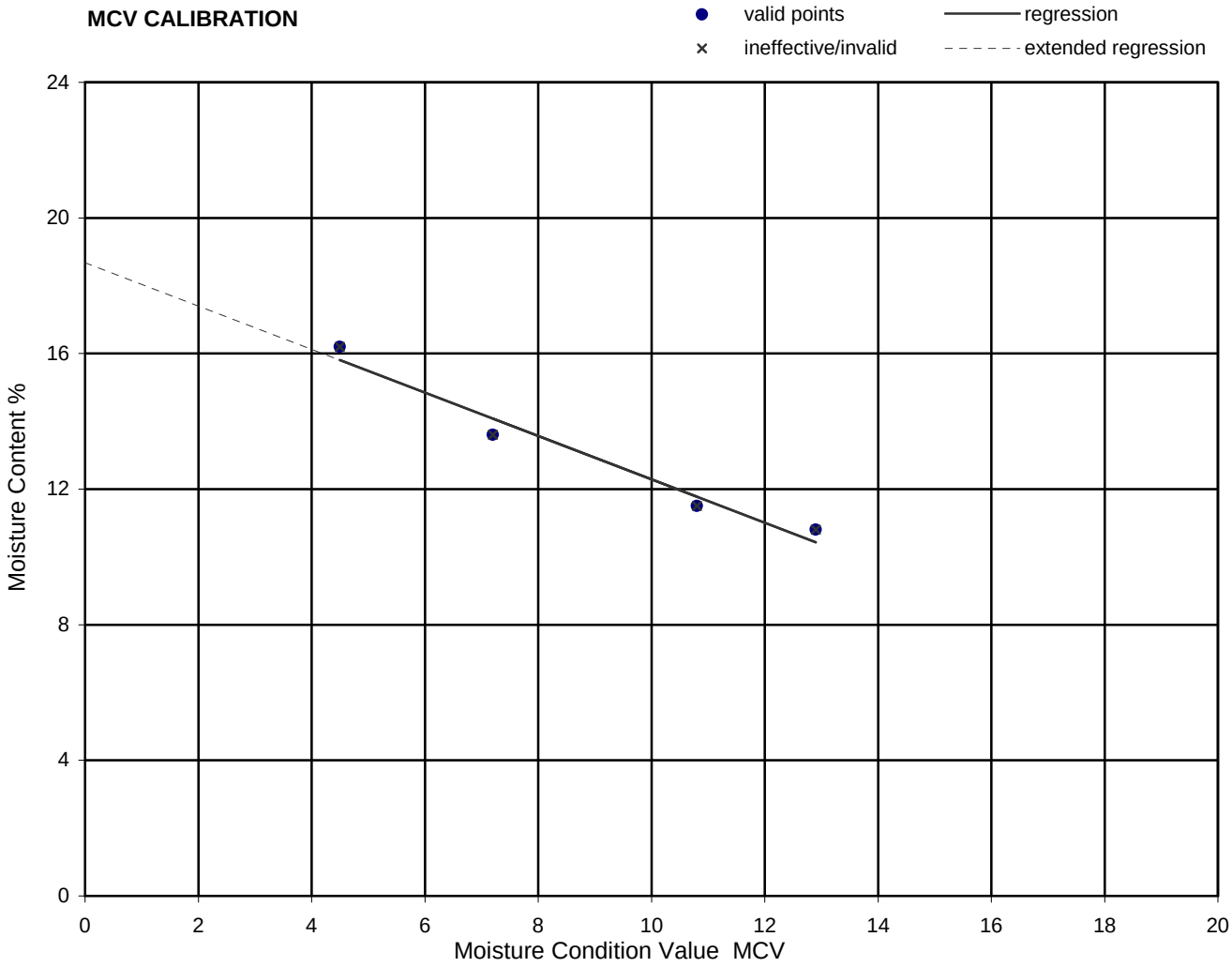
Initial moisture content <20mm	%	14.5
Material retained on 20mm sieve	%	1.7

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	6.00		
			Samp No	15	Type	B
			ID	ESGA1077-11201110100000000081		
			Spec Ref			

MCV CALIBRATION

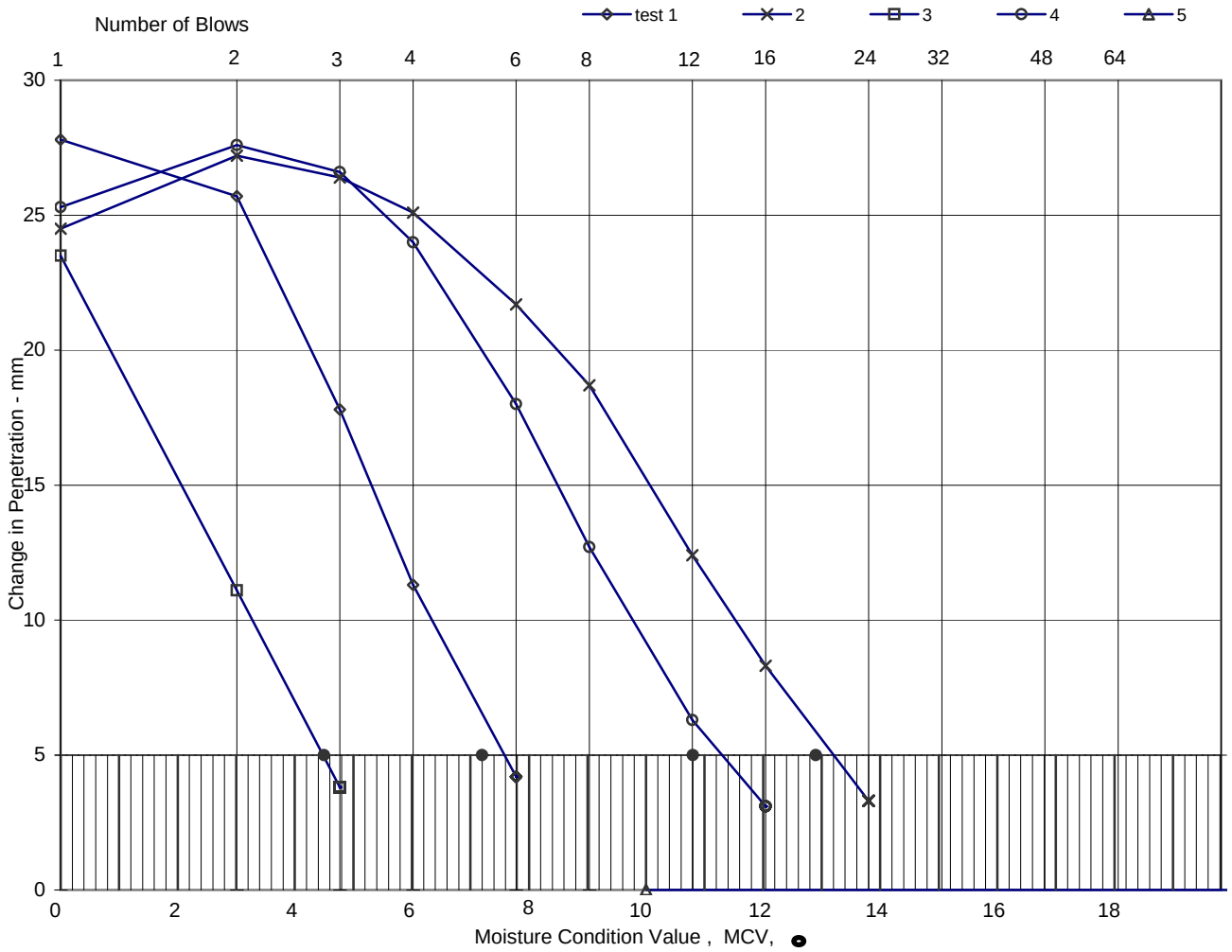


Characteristics of calibration line (determined using linear regression)	
Intercept	18.7
Slope	-0.64
Sensitivity (Change in MCV per 1% moisture content)	1.56
Correlation (proximity of test points to regression line)	-0.98
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH2		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	6.00		
			Samp No	15	Type	B
			ID	ESGA1077-11201110100000000081		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	
Moisture Condition Value		7.2	12.9	4.5	10.8	
Moisture Content	%	13.6	10.8	16.2	11.5	
Bulk density after test	Mg/m³	2.20	2.30	2.14	2.27	
Dry density after test	Mg/m³	1.94	2.08	1.84	2.04	

Soil description	Brown slightly sandy slightly gravelly CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

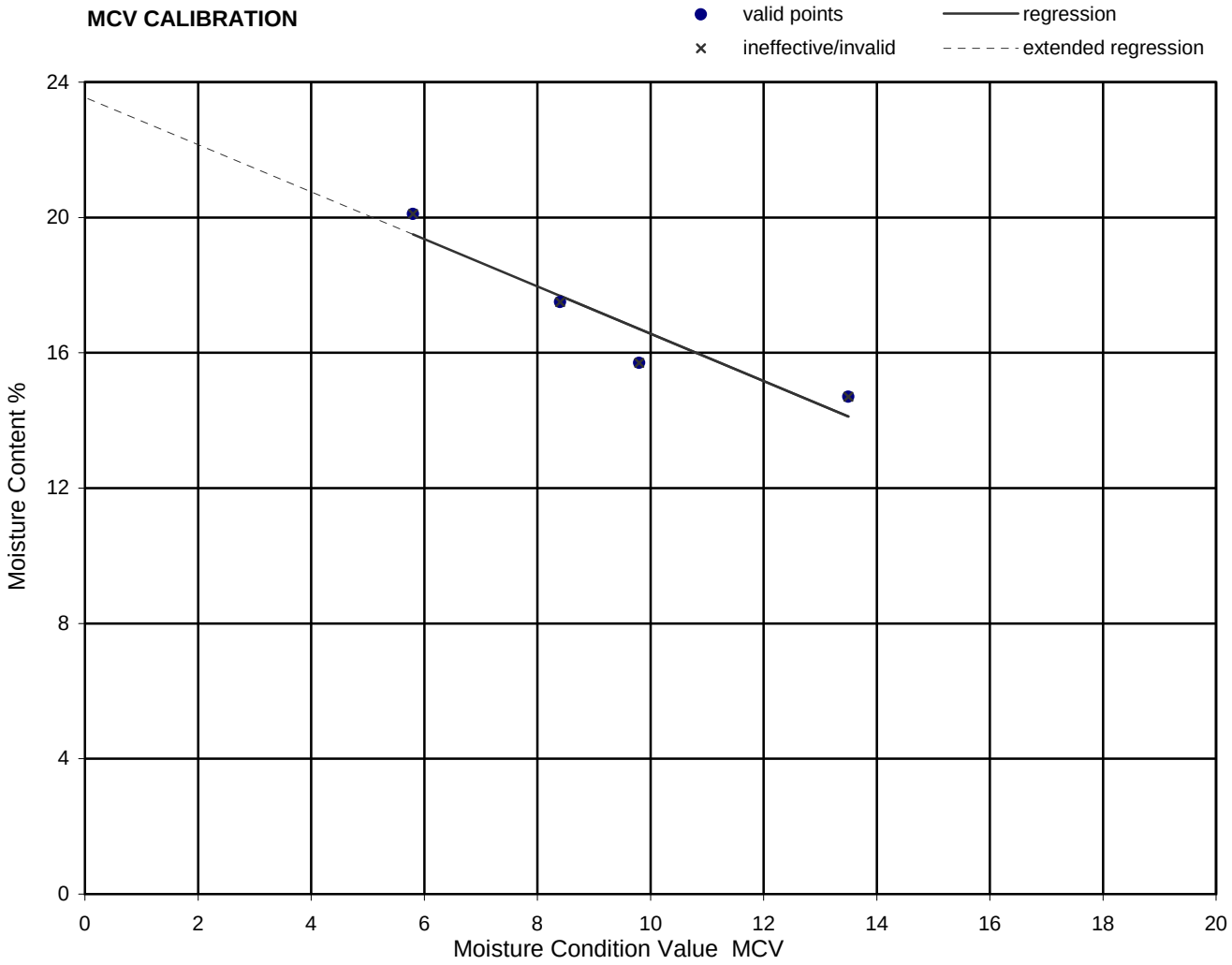
Initial moisture content <20mm	%	13.6
Material retained on 20mm sieve	%	1.2

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	3	Type	B
			ID	ESGA1077-11201110110000000128		
			Spec Ref			

MCV CALIBRATION

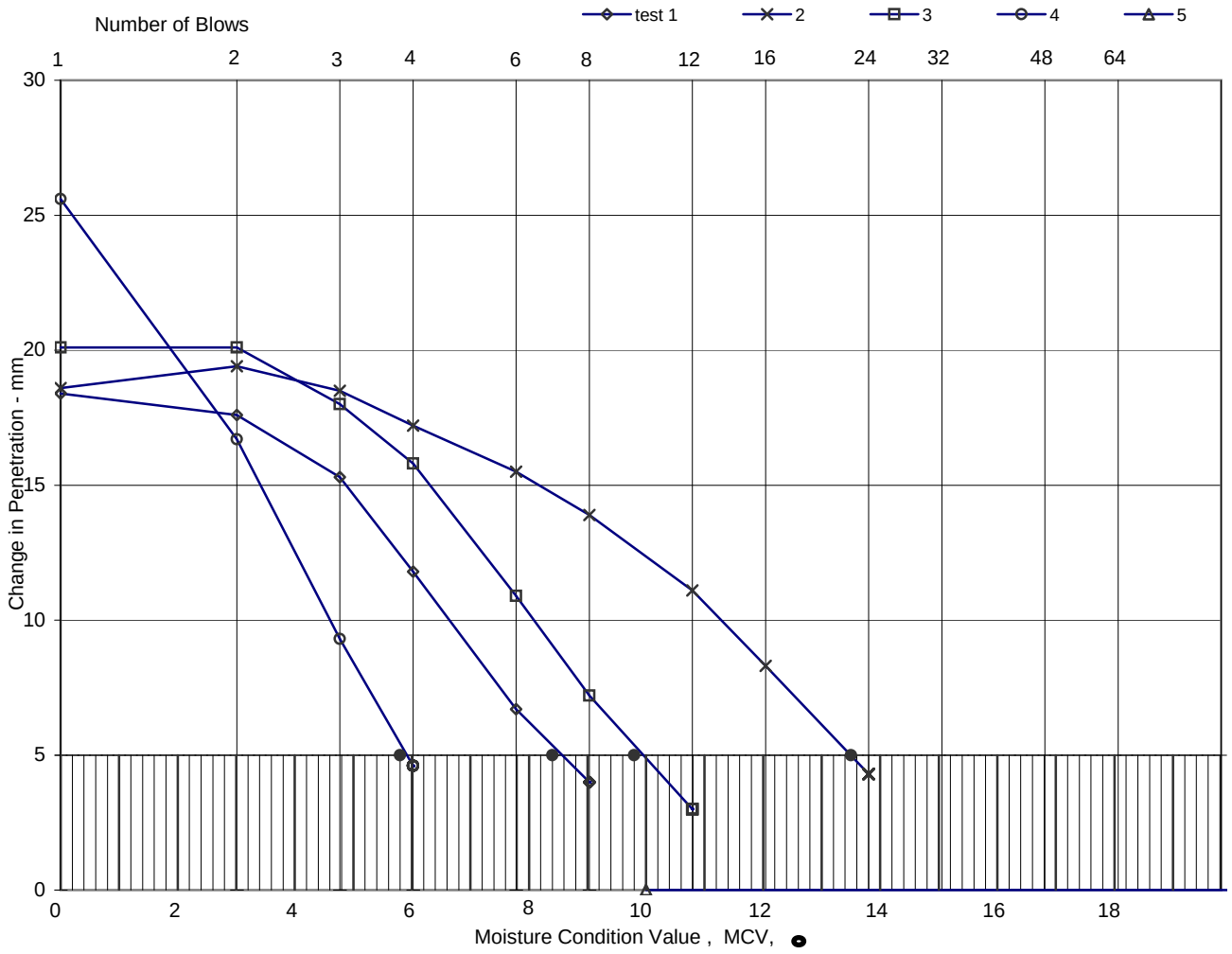


Characteristics of calibration line (determined using linear regression)	
Intercept	23.6
Slope	-0.70
Sensitivity (Change in MCV per 1% moisture content)	1.43
Correlation (proximity of test points to regression line)	-0.95
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	0.50		
			Samp No	3	Type	B
			ID	ESGA1077-11201110110000000128		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	
Moisture Condition Value		8.4	13.5	9.8	5.8	
Moisture Content	%	17.5	14.7	15.7	20.1	
Bulk density after test	Mg/m³	2.05	2.16	2.10	2.02	
Dry density after test	Mg/m³	1.74	1.88	1.82	1.68	

Soil description	Brown slightly gravelly sandy CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

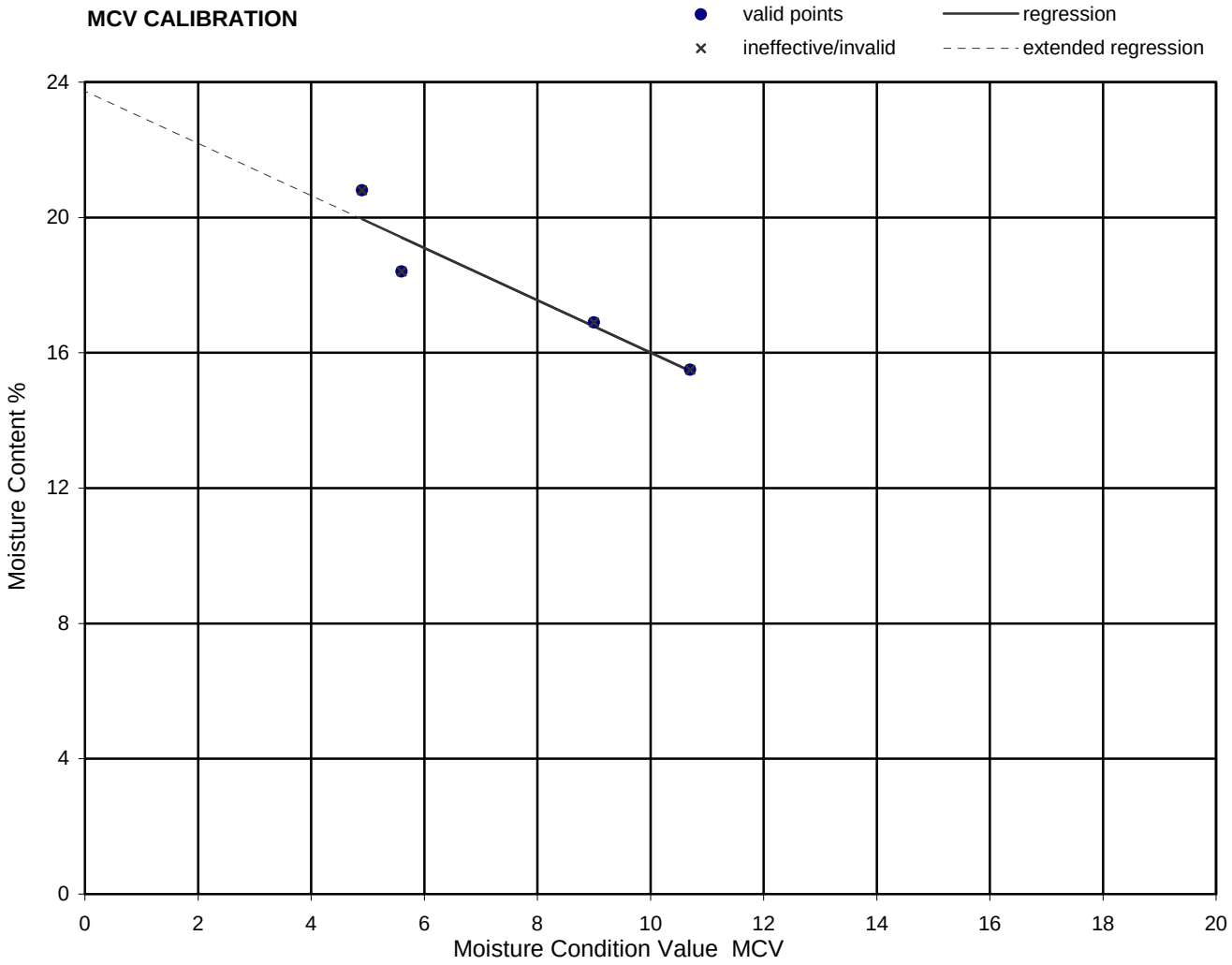
Initial moisture content <20mm	%	17.5
Material retained on 20mm sieve	%	0

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.85		
			Samp No	7	Type	B
			ID	ESGA1077-11201110110000000132		
			Spec Ref			

MCV CALIBRATION

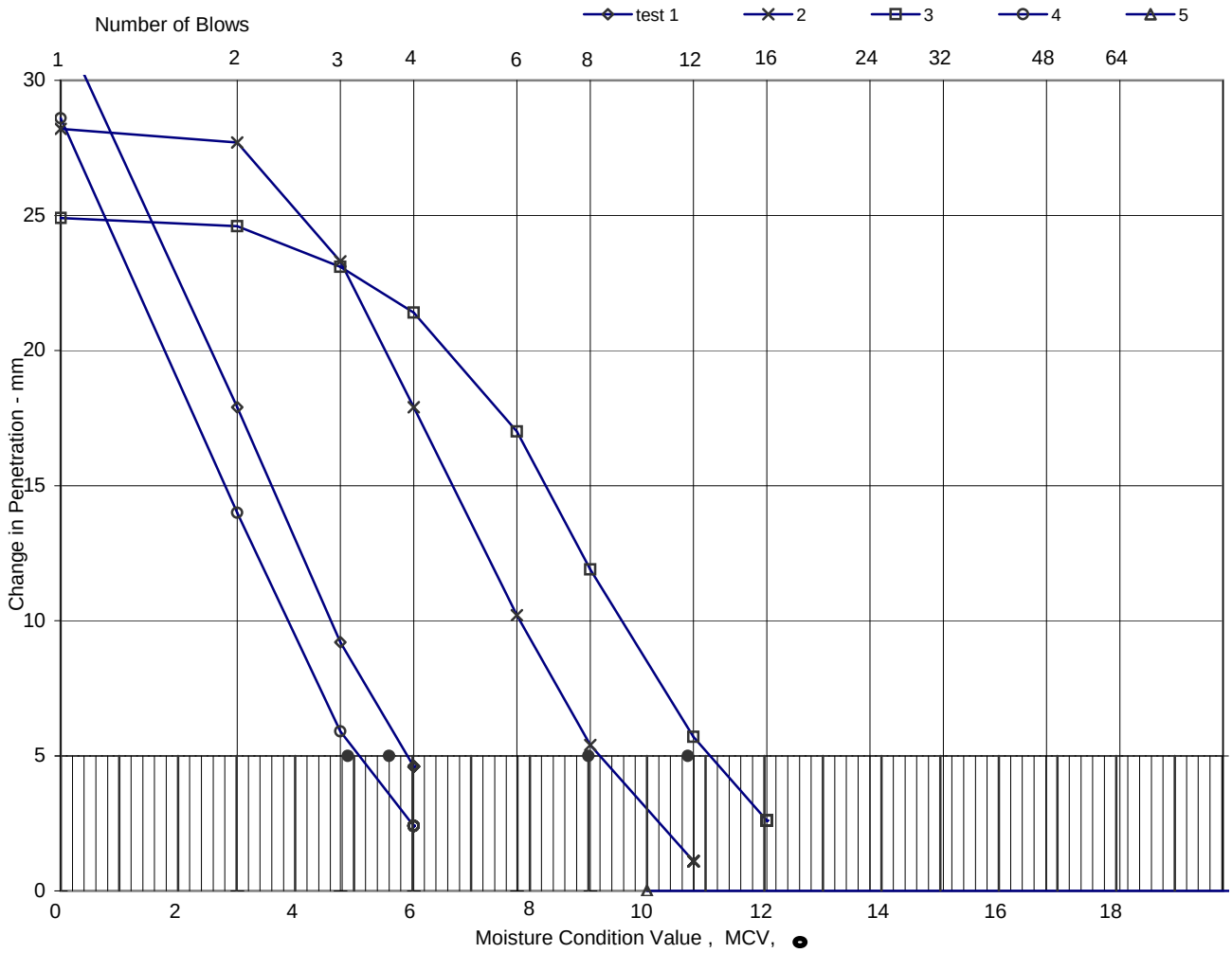


Characteristics of calibration line (determined using linear regression)	
Intercept	23.7
Slope	-0.77
Sensitivity (Change in MCV per 1% moisture content)	1.29
Correlation (proximity of test points to regression line)	-0.94
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	1.85		
			Samp No	7	Type	B
			ID	ESGA1077-11201110110000000132		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	*
Moisture Condition Value		5.6	9.0	10.7	4.9	
Moisture Content	%	18.4	16.9	15.5	20.8	
Bulk density after test	Mg/m³	2.07	2.13	2.16	2.04	
Dry density after test	Mg/m³	1.75	1.82	1.87	1.69	

Soil description	Brown slightly sandy slightly gravelly CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

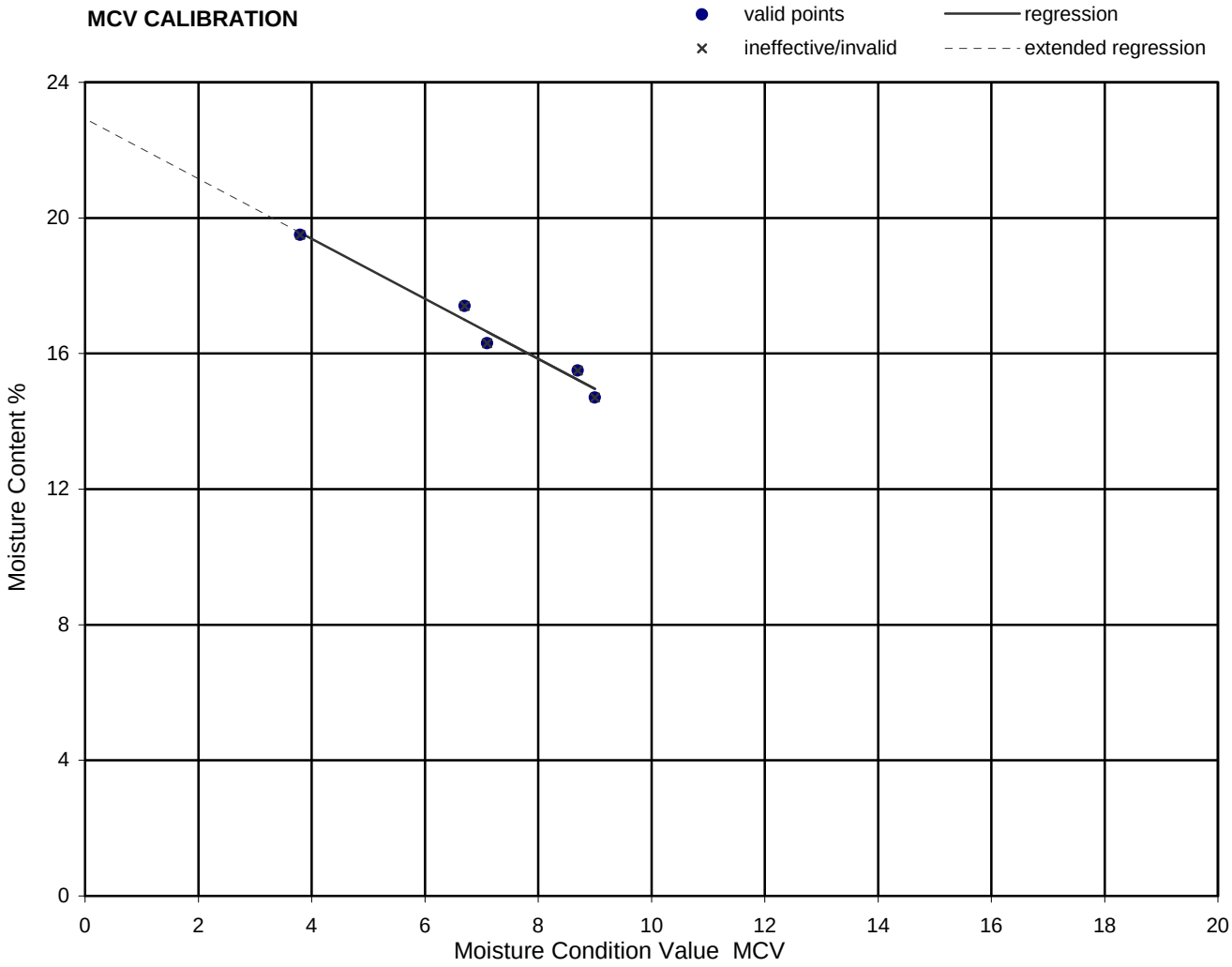
Initial moisture content <20mm	%	18.4
Material retained on 20mm sieve	%	1

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.15		
			Samp No	11	Type	B
			ID	ESGA1077-11201110110000000136		
			Spec Ref			

MCV CALIBRATION

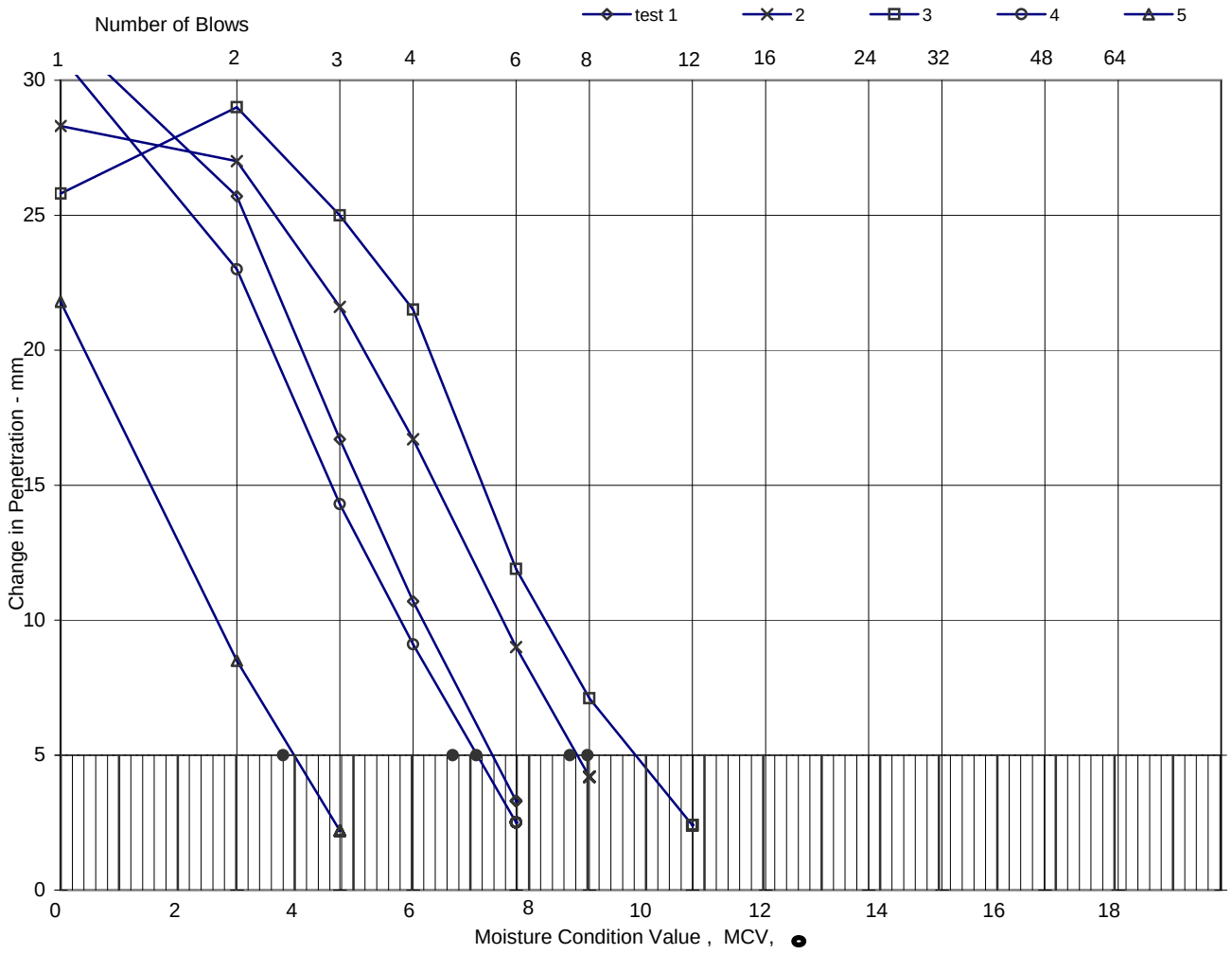


Characteristics of calibration line (determined using linear regression)	
Intercept	22.9
Slope	-0.89
Sensitivity (Change in MCV per 1% moisture content)	1.13
Correlation (proximity of test points to regression line)	-0.98
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	3.15		
			Samp No	11	Type	B
			ID	ESGA1077-11201110110000000136		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	5
Moisture Condition Value		7.1	8.7	9.0	6.7	3.8
Moisture Content	%	16.3	15.5	14.7	17.4	19.5
Bulk density after test	Mg/m³	2.14	2.17	2.19	2.12	2.05
Dry density after test	Mg/m³	1.84	1.88	1.91	1.81	1.72

Soil description	Reddish brown slightly sandy slightly gravelly CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

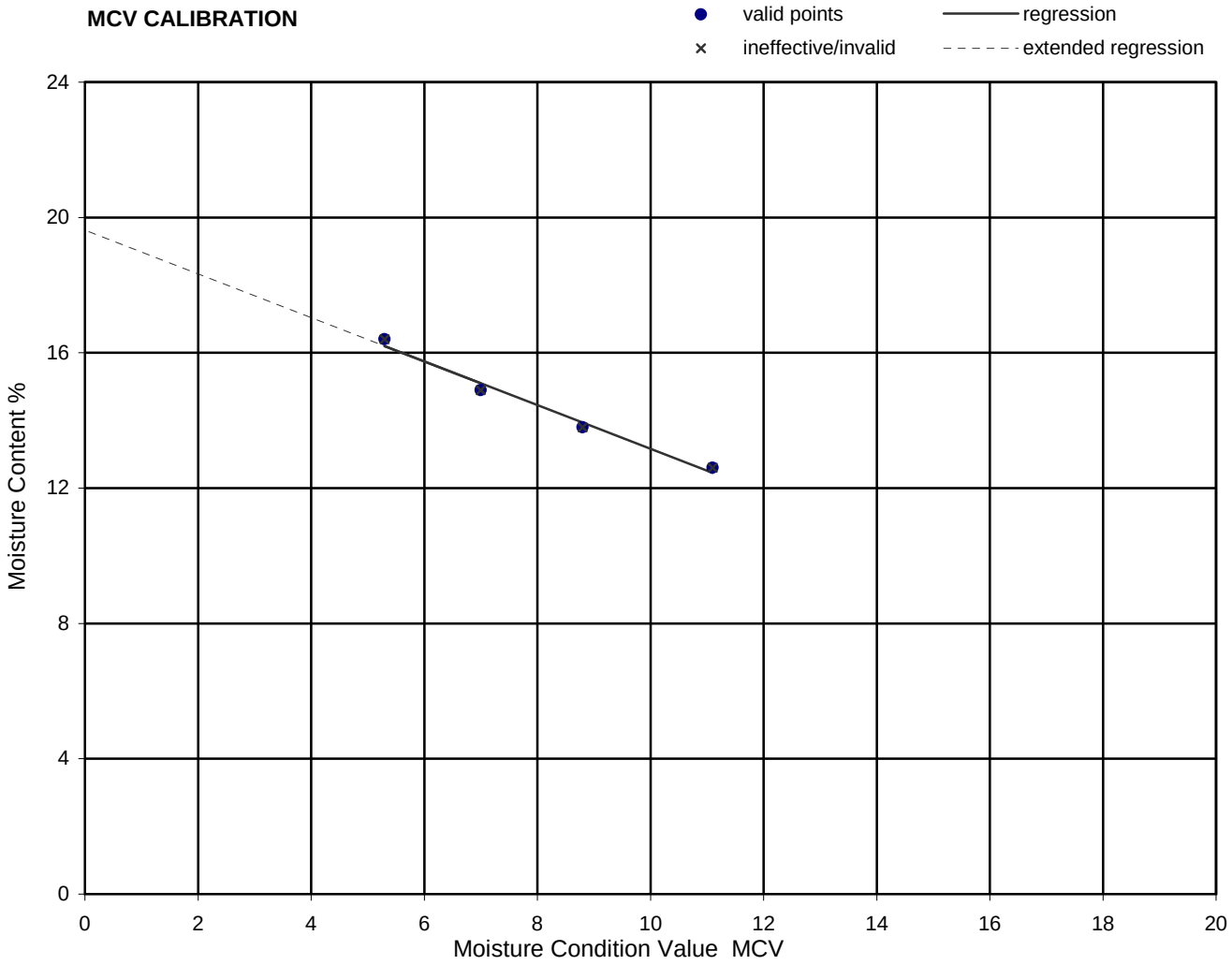
Initial moisture content <20mm	%	16.3
Material retained on 20mm sieve	%	0

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.65		
			Samp No	15	Type	B
			ID	ESGA1077-11201110110000000140		
			Spec Ref			

MCV CALIBRATION

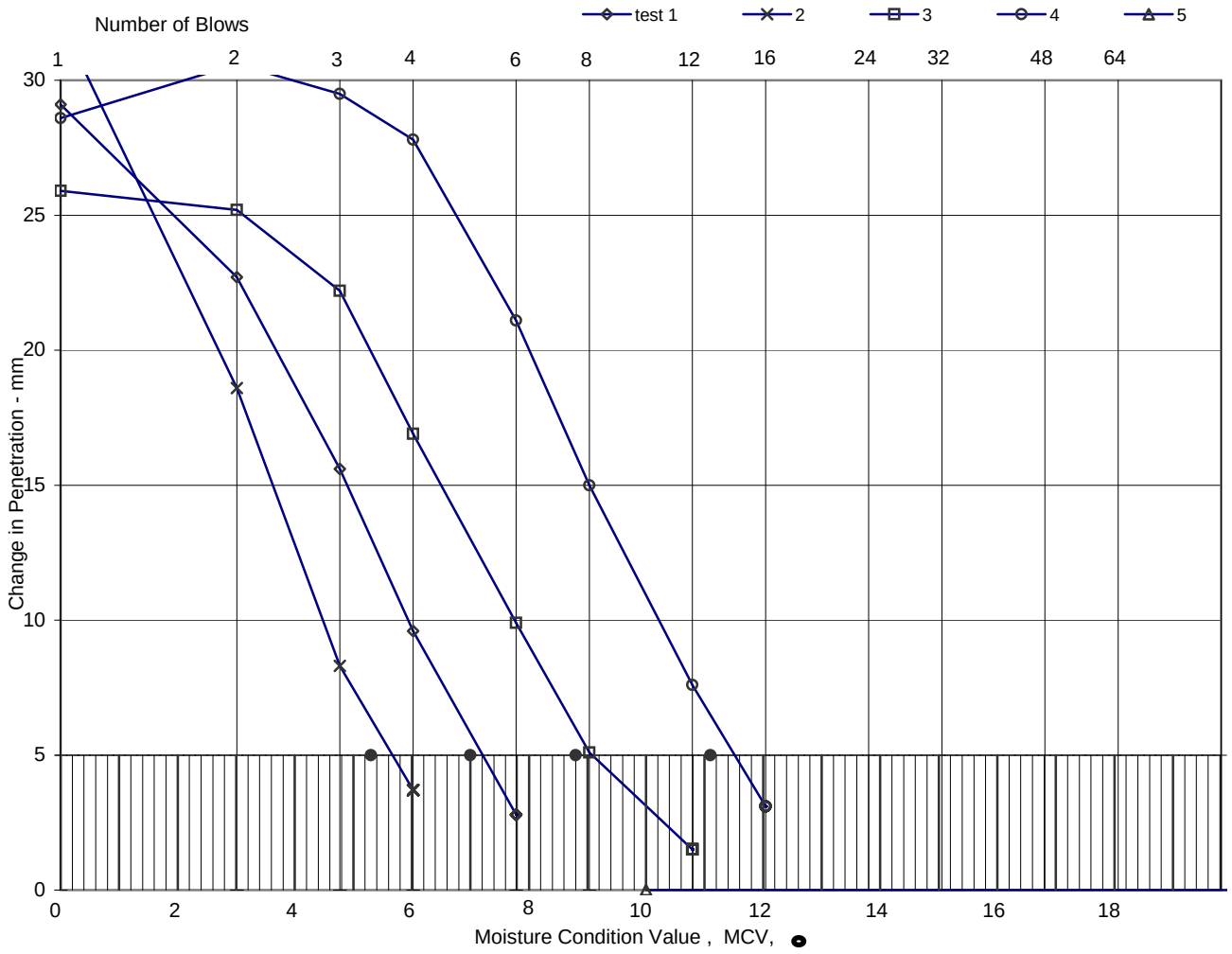


Characteristics of calibration line (determined using linear regression)	
Intercept	19.6
Slope	-0.65
Sensitivity (Change in MCV per 1% moisture content)	1.55
Correlation (proximity of test points to regression line)	-0.99
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	4.65		
			Samp No	15	Type	B
			ID	ESGA1077-11201110110000000140		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	
Moisture Condition Value		7.0	5.3	8.8	11.1	
Moisture Content	%	14.9	16.4	13.8	12.6	
Bulk density after test	Mg/m³	2.20	2.15	2.24	2.26	
Dry density after test	Mg/m³	1.91	1.85	1.97	2.01	

Soil description	Brown slightly sandy slightly gravelly CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

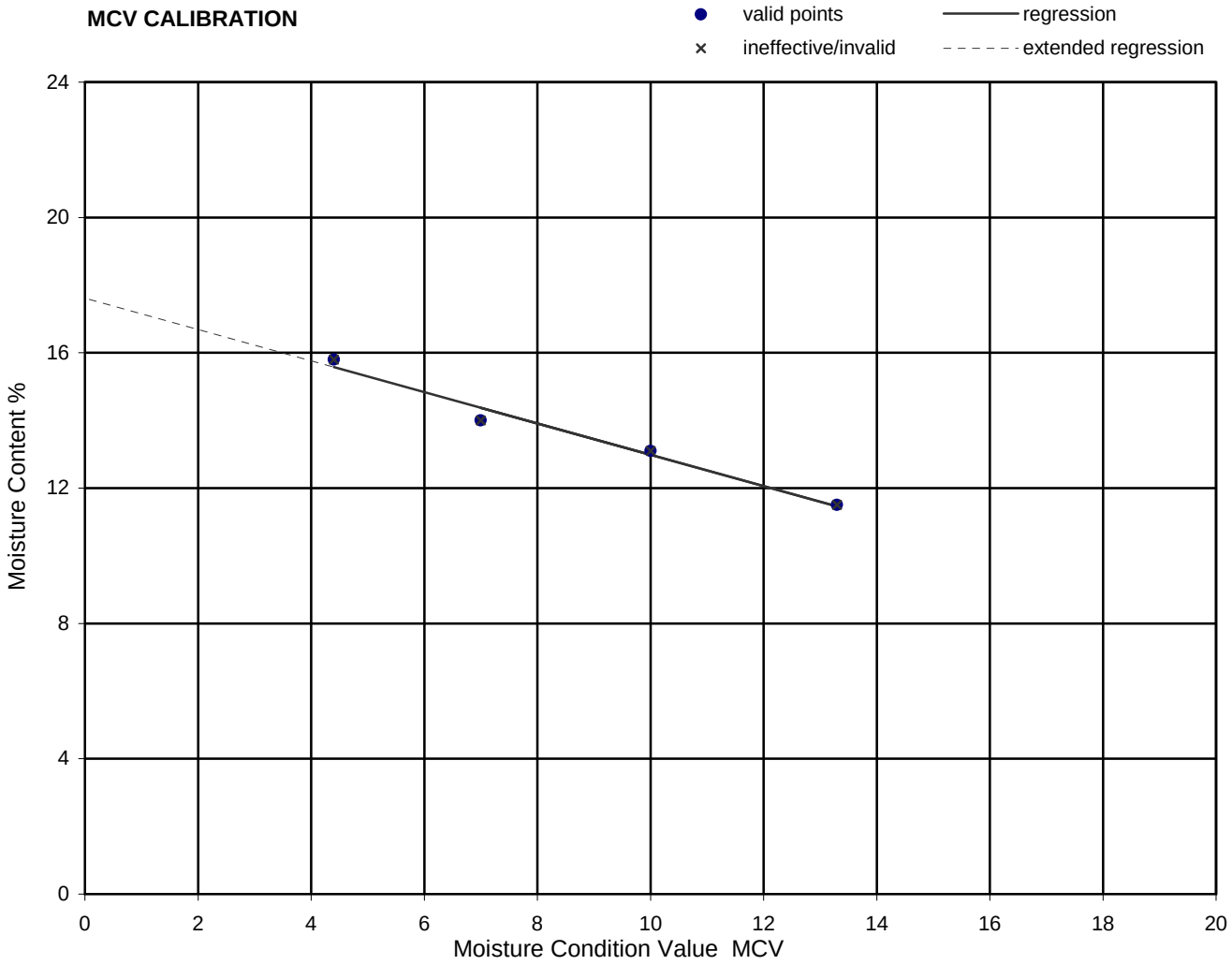
Initial moisture content <20mm	%	14.9
Material retained on 20mm sieve	%	1

Method of determining MCV
Steepest straight line

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	6.15		
			Samp No	19	Type	B
			ID	ESGA1077-11201110110000000144		
			Spec Ref			

MCV CALIBRATION

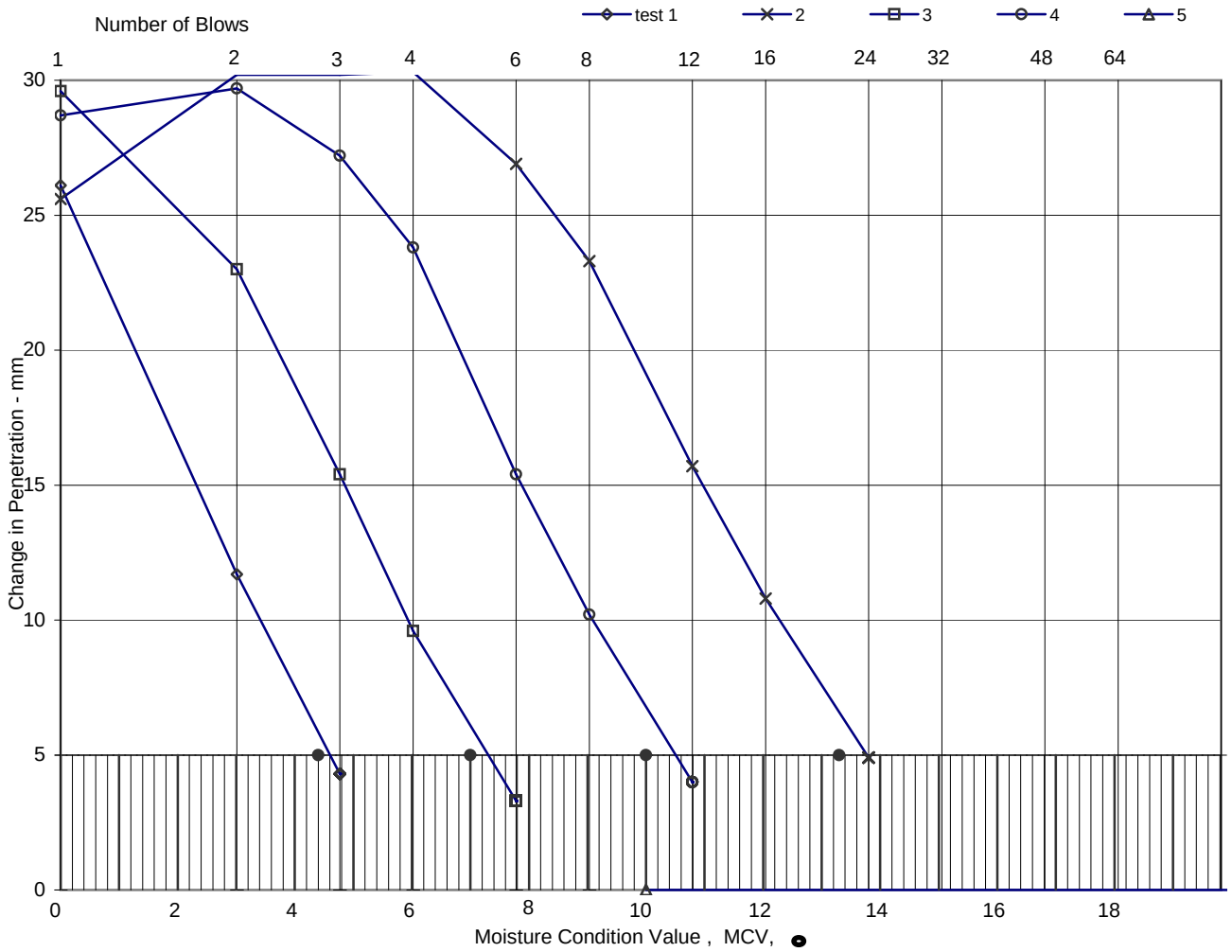


Characteristics of calibration line (determined using linear regression)	
Intercept	17.6
Slope	-0.46
Sensitivity (Change in MCV per 1% moisture content)	2.16
Correlation (proximity of test points to regression line)	-0.99
Method of interpretation of MCV	Steepest straight line

The above characteristics are NOT covered by UKAS accreditation to BS1377

MOISTURE CONDITION VALUE (MCV) / MOISTURE CONTENT RELATIONSHIP
BS1377:PART 4 : 1990 : CLAUSE 5.5

Project No	A1077-11	Sample Details:	Hole No	BH3		
Project Name	SANDSEND BOREHOLES, NORTH YORKSHIRE		Depth (m BGL)	6.15		
			Samp No	19	Type	B
			ID	ESGA1077-11201110110000000144		
			Spec Ref			



Test No * ineffective / invalid point		1	2	3	4	
Moisture Condition Value		4.4	13.3	7.0	10.0	
Moisture Content	%	15.8	11.5	14.0	13.1	
Bulk density after test	Mg/m³	2.12	2.31	2.19	2.26	
Dry density after test	Mg/m³	1.83	2.07	1.92	2.00	

Soil description	Brown slightly sandy slightly gravelly CLAY.
Procedure / Preparation	BS1377:Part 1 and Part 4, clause 5.5
Remarks	

Initial moisture content <20mm	%	15.8
Material retained on 20mm sieve	%	1.3

Method of determining MCV
Steepest straight line

CHEMICAL TESTS - SUMMARY OF RESULTS

Project No	Project Name
A1077-11	SANDSEND BOREHOLES, NORTH YORKSHIRE

Hole No.	Sample				Soil Description	Org	LOI	pH	Sulphate as SO_4				SD1 options		CO_2	Chloride, Cl		<2 mm	Remarks
	No.	Depth (m)		type					Preparation/test *	2:1 water sol.	ground water	acid sol.	TS	Mg mg/L NO_3 mg/L NH_4		water sol.	acid sol.		
		from	to			%	%			g/L	g/L	%	%		%	%	%	%	
BH1	6	1.65	1.85	D	Brown slightly sandy slightly gravelly CLAY.			7.9	1+3	0.20								93	
BH1	22	8.45	8.65	D	Brown slightly gravelly CLAY.			7.9	1+3	0.20								88	
BH1	42	15.95	16.15	D	Brown slightly sandy gravelly CLAY.			7.5	1+3	0.25								57	
BH1	60	22.50	23.95	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.			7.9	1+3	0.26								91	
BH2	8	3.00	3.45	U	Stiff greyish brown slightly sandy slightly gravelly CLAY.			8.0	1+3	0.14								89	
BH2	25	11.45	11.65	D	Brown slightly sandy slightly gravelly CLAY.			7.8	1+3	0.33								91	
BH2	36	15.90		W				7.7	2+3		0.86								
BH2	38	17.45	17.65	D	Brown slightly sandy slightly gravelly CLAY.			7.6	1+3	0.22								98	
BH2	39	17.90		W				7.7	2+3		0.68								
BH2	54	24.45	24.65	D	Brown slightly sandy slightly gravelly CLAY.			7.6	1+3	0.19								93	
BH3	1	0.10		D	Brown slightly gravelly SILT with occasional rootlets.			5.7	1+3	0.12								96	
BH3	9	2.95	3.95	D	Brown slightly sandy slightly gravelly CLAY.			7.9	1+3	0.16								97	
BH3	22	7.65	8.10	D	Brown slightly sandy slightly gravelly CLAY.			7.8	1+3	0.35								91	
BH3	35	12.50	12.95	D	Greyish brown slightly sandy CLAY.			7.9	1+3	0.06								100	
BH3	48	17.95	18.15	D	Greyish brown slightly sandy slightly gravelly CLAY.			7.7	1+3	0.21								94	
BH4	4	0.20	0.30	B	Light grey sandy gravelly SILT.			8.7	1+3	0.98								56	
BH4	8	0.80	1.10	B	Brown slightly gravelly sandy CLAY.			7.6	1+3	0.33								69	
BH4	21	4.50		D	Dark grey slightly gravelly CLAY. Gravel is mainly weak mudstone.			8.1	1+3	1.19								100	
BH5	8	1.20	1.65	D	Grey very gravelly slightly clayey SAND.			7.1	1+3	0.41								63	

BS 1377 : definitive method unless stated :

Org Organic matter content (s-sulphides, c-chlorides identified)

LOI Mass loss on ignition at 440°C

CO_2 Carbonate content (rapid titration)

Cl Chloride content

* Sulphate tests preparation / test methods :

1. BS 1377:Part 3:1990:clause 5.3
2. BS 1377:Part 3:1990:clause 5.4
3. BS 1377:Part 3:1990:clause 5.5
4. TRL447 - 1 water soluble sulphate
5. TRL447 - 2 acid soluble sulphate
6. BR279 - groundwater sulphate

< 2mm material passing 2mm sieve

BRE Special Digest SD1, dependent options :

TS Total Sulphur to BR279 / EN ISO15178

Mg Soluble Magnesium to BR279, colorimetric

NO3 Soluble Nitrate to BR279, colorimetric

NH_4 qualitative

CHEMICAL TESTS - SUMMARY OF RESULTS

Project No	Project Name
A1077-11	SANDSEND BOREHOLES, NORTH YORKSHIRE

Hole No.	Sample No.	Depth (m) from	Depth (m) to	type	Soil Description	Org %	LOI %	pH	Sulphate as SO_4 Preparation/test *	Sulphate as SO_4 2:1 water sol. g/L	Sulphate as SO_4 ground water g/L	Sulphate as SO_4 acid sol. %	SD1 options TS %	SD1 options Mg mg/L NO_3 mg/L NH_4	CO_2 %	Chloride, Cl water sol. %	Chloride, Cl acid sol. %	<2 mm %	Remarks
WS1	2	0.30	1.00	B	Brown SAND.			8.0	1+3	0.22								100	
WS2	2	0.30	1.00	B	Brownish grey gravelly SAND.			8.1	1+3	0.20								92	
WS2	7	2.80		D	Grey sandy clayey SILT.			7.3	1+3	0.26								100	
WS3	2	0.30	1.00	B	Brown gravelly SAND.			7.2	1+3	0.14								87	
WS4	2	0.40	0.90	B	Grey and brown very gravelly SAND.			7.6	1+3	0.15								68	
WS5	4	1.70		D	Brown slightly sandy slightly gravelly CLAY.			7.6	1+3	0.19								93	

BS 1377 : definitive method unless stated :

Org Organic matter content (s-sulphides, c-chlorides identified)

LOI Mass loss on ignition at 440°C

CO_2 Carbonate content (rapid titration)

Cl Chloride content

* Sulphate tests preparation / test methods :

1. BS 1377:Part 3:1990:clause 5.3
2. BS 1377:Part 3:1990:clause 5.4
3. BS 1377:Part 3:1990:clause 5.5
4. TRL447 - 1 water soluble sulphate
5. TRL447 - 2 acid soluble sulphate
6. BR279 - groundwater sulphate

< 2mm material passing 2mm sieve

BRE Special Digest SD1, dependent options :

TS Total Sulphur to BR279 / EN ISO15178

Mg Soluble Magnesium to BR279, colorimetric

NO3 Soluble Nitrate to BR279, colorimetric

NH_4 qualitative

ENCLOSURE D

GEOENVIRONMENTAL LABORATORY TEST RESULTS

ESG Scientifics Reports Nos EFS/119196
EXR/127351

TEST REPORT
SOIL SAMPLE ANALYSIS

1252

Report No. EFS/119196 (Ver. 1)

Soil Mechanics
Askern Road
Carcroft
Doncaster
South Yorkshire
DN6 8DG

Site: Sandsend Boreholes, North Yorkshire

The 4 samples described in this report were registered for analysis by ESG on 01-Nov-2011. This report supersedes any versions previously issued by the laboratory.
The analysis was completed by: 14-Nov-2011

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by ESG.

The following tables are contained in this report:

On behalf of
ESG :
Andrew Timms Operations Manager

Date of Issue: 14-Nov-2011

Tests marked '^' have been subcontracted to another laboratory.

ESG accepts no responsibility for any sampling not carried out by our personnel.

Units :		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Method Codes :		GROHSA	ICPBOR	ICPMSS	ICPMSS	ICPMSS	ICPMSS	ICPMSS	ICPMSS	ICPMSS	ICPMSS	ICPMSS	ICPMSS	ICPMSS	ICPMSS	ICPSOIL	ICPSOIL
Method Reporting Limits :		0.2	0.5	0.3	0.1	0.5	0.1	0.5	0.5	1	0.1	0.5	0.5	0.6	3	10	1
UKAS Accredited :		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LAB ID Number CL/	**Client Sample Description**	**GRO**	**Boron (H20 Soluble)**	**Arsenic (MS)**	**Cadmium (MS)**	**Chromium (MS)**	**Cobalt (MS)**	**Copper (MS)**	**Lead (MS)**	**Manganese (MS)**	**Mercury (MS)**	**Nickel (MS)**	**Selenium (MS)**	**Vanadium (MS)**	**Zinc (MS)**	**Aluminium**	**Barium.**
1142187	BH1 D 1 0.10		1	5.8	0.39	21.2	5.7	14.4	26.2	216.7	<0.1	14	0.6	29	57.6	13400	92.7
1142188	BH1 ES 4A 1.00	<0.2	0.8	6.8	0.18	23.8	15.9	6.2	19.8	830.6	<0.1	25.6	<0.5	32.3	98.9	18200	148
1142189	BH3 ES 2A 0.30	<0.2	1.1	5.6	0.14	21.7	7.8	10.6	23.7	703.9	<0.1	15.3	0.6	33.4	47.8	13500	108
1142190	BH3 ES 7A 2.00	<0.2	0.6	4.8	0.13	25.7	9.7	13.8	14.9	451.9	<0.1	29	<0.5	28.2	47.2	16500	238

ESG Environmental Scientifics Group
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel +44 (0) 1283 554400
Fax +44 (0) 1283 554422

Client Name Soil Mechanics

Contact Mr B Swallow

Sandsend Boreholes, North Yorkshire

Soil Sample Analysis

Date Printed	**14-Nov-2011**
Report Number	**EFS/119196**
Table Number	**1**

Where individual results are flagged see report notes for status.

Units :		mg/kg	mg/kg	mg/l	pH Units	mg/kg		%	mg/kg	mg/kg	mg/kg	% M/M	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
Method Codes :		ICPSOIL	ICPSOIL	ICPWSS	PHSOIL	SFAPI	Sub002a	TMSS	TPHFIDUS	TPHFIDUS	PCBUSECDAR	WSLM59	BTEXHSA	BTEXHSA	BTEXHSA	BTEXHSA	BTEXHSA
Method Reporting Limits :		15	10	10		0.5		0.2	10	10		0.01	10	10	10	20	20
UKAS Accredited :		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
LAB ID Number CL/	**Client Sample Description**	**Iron**	**Magnesium.**	**SO4-- (H2O sol) mg/l**	**pH units (AR)**	**Cyanide(Total) (AR)**	**^Asbestos Screen**	**Tot.Moisture @ 105C**	**TPH by GCFID (AR)**	**TPH Carbon Banding.**	**PCB-7 Congeners Analysis**	**Total Organic Carbon**	**Benzene**	**Toluene**	**Ethyl Benzene**	**MTBE**	**Xylenes**
1142187	BH1 D 1 0.10	24900	2280	50	7.1		NAIIS	16.0				1.09					
1142188	BH1 ES 4A 1.00	41600	3360	50	7.8	<0.5	NAIIS	20.1	16	Req	Req	0.66	<10	<10	<10	<20	<20
1142189	BH3 ES 2A 0.30	24400	3100	49	5.5	1	NAIIS		134	Req	Req	3.59	<10	<10	<10	<20	<20
1142190	BH3 ES 7A 2.00	31200	10400	110	7.6	<0.5	NAIIS		21	Req	Req	0.70	<10	<10	<10	<20	<20

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Client Name Soil Mechanics

Contact Mr B Swallow

Sandsend Boreholes, North Yorkshire

Soil Sample Analysis

Date Printed	**14-Nov-2011**
Report Number	**EFS/119196**
Table Number	**1**

Where individual results are flagged see report notes for status.

Units :		µg/kg	µg/kg	mg/kg														
Method Codes :		BTEXHSA	BTEXHSA	PAHMSUS														
Method Reporting Limits :		10	10															
UKAS Accredited :		Yes	Yes	Yes														
LAB ID Number CL/	**Client Sample Description**	**m/p Xylenes**	**o Xylene**	**PAH (16) by GCMS**														
1142187	BH1 D 1 0.10																	
1142188	BH1 ES 4A 1.00	<10	<10	Req														
1142189	BH3 ES 2A 0.30	<10	<10	Req														
1142190	BH3 ES 7A 2.00	<10	<10	Req														

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Client Name	**Soil Mechanics**
Contact	Mr B Swallow

Sandsend Boreholes, North Yorkshire

Soil Sample Analysis

Date Printed	**14-Nov-2011**
Report Number	**EFS/119196**
Table Number	**1**

Where individual results are flagged see report notes for status.

Polycyclic Aromatic Hydrocarbons
GC/MS (SIM)

Customer and Site Details:	Soil Mechanics: Sandsend Boreholes, North Yorkshire		
Sample Details:	BH1 ES 4A 1.00	**Job Number:**	S11_9196
LIMS ID Number:	CL1142188	**Date Booked in:**	01-Nov-11
QC Batch Number:	112027	**Date Extracted:**	11-Nov-11
Quantitation File:	Initial Calibration	**Date Analysed:**	14-Nov-11
Directory:	1411PAH.MS5\	**Matrix:**	Soil
Dilution:	1.0	**Ext Method:**	Ultrasonic

UKAS accredited?: Yes

Target Compounds	CAS #	R.T. (min)	Concentration mg/kg	% Fit
Naphthalene	91-20-3	-	< 0.08	-
Acenaphthylene	208-96-8	-	< 0.08	-
Acenaphthene	83-32-9	-	< 0.08	-
Fluorene	86-73-7	-	< 0.08	-
Phenanthrene	85-01-8	-	< 0.08	-
Anthracene	120-12-7	-	< 0.08	-
Fluoranthene	206-44-0	-	< 0.08	-
Pyrene	129-00-0	-	< 0.08	-
Benzo[a]anthracene	56-55-3	-	< 0.08	-
Chrysene	218-01-9	-	< 0.08	-
Benzo[b]fluoranthene	205-99-2	-	< 0.08	-
Benzo[k]fluoranthene	207-08-9	-	< 0.08	-
Benzo[a]pyrene	50-32-8	-	< 0.08	-
Indeno[1,2,3-cd]pyrene	193-39-5	-	< 0.08	-
Dibenzo[a,h]anthracene	53-70-3	-	< 0.08	-
Benzo[g,h,i]perylene	191-24-2	-	< 0.08	-
Total (USEPA16) PAHs	-	-	< 1.28	-

"M" denotes that % fit has been manually interpreted

Internal Standards	% Area
1,4-Dichlorobenzene-d4	NA
Naphthalene-d8	122
Acenaphthene-d10	122
Phenanthrene-d10	139
Chrysene-d12	148
Perylene-d12	150

Surrogates	% Rec
Nitrobenzene-d5	NA
2-Fluorobiphenyl	96
Terphenyl-d14	104

Concentrations are reported on a wet weight basis.

The Total PAH result is the sum of non-rounded individual PAH results and therefore may differ to the sum of the rounded individual PAH results printed above. By convention, where any one or more result is a "less than", the total is expressed as a "less than" and includes the "less than" concentration within the total.

Polycyclic Aromatic Hydrocarbons
GC/MS (SIM)

Customer and Site Details:	Soil Mechanics: Sandsend Boreholes, North Yorkshire		
Sample Details:	BH3 ES 2A 0.30	**Job Number:**	S11_9196
LIMS ID Number:	CL1142189	**Date Booked in:**	01-Nov-11
QC Batch Number:	112027	**Date Extracted:**	11-Nov-11
Quantitation File:	Initial Calibration	**Date Analysed:**	14-Nov-11
Directory:	1411PAH.MS5\	**Matrix:**	Soil
Dilution:	1.0	**Ext Method:**	Ultrasonic

UKAS accredited?: Yes

Target Compounds	CAS #	R.T. (min)	Concentration mg/kg	% Fit
Naphthalene	91-20-3	-	< 0.08	-
Acenaphthylene	208-96-8	-	< 0.08	-
Acenaphthene	83-32-9	-	< 0.08	-
Fluorene	86-73-7	-	< 0.08	-
Phenanthrene	85-01-8	6.03	0.13	100
Anthracene	120-12-7	-	< 0.08	-
Fluoranthene	206-44-0	7.43	0.33	93
Pyrene	129-00-0	7.73	0.35	M
Benzo[a]anthracene	56-55-3	9.45	0.22	91
Chrysene	218-01-9	9.50	0.18	97
Benzo[b]fluoranthene	205-99-2	11.00	0.30	69
Benzo[k]fluoranthene	207-08-9	11.03	0.10	69
Benzo[a]pyrene	50-32-8	11.44	0.25	98
Indeno[1,2,3-cd]pyrene	193-39-5	12.85	0.16	97
Dibenzo[a,h]anthracene	53-70-3	-	< 0.08	-
Benzo[g,h,i]perylene	191-24-2	13.20	0.12	90
Total (USEPA16) PAHs	-	-	< 2.62	-

"M" denotes that % fit has been manually interpreted

Internal Standards	% Area
1,4-Dichlorobenzene-d4	NA
Naphthalene-d8	119
Acenaphthene-d10	119
Phenanthrene-d10	131
Chrysene-d12	137
Perylene-d12	140

Surrogates	% Rec
Nitrobenzene-d5	NA
2-Fluorobiphenyl	93
Terphenyl-d14	100

Concentrations are reported on a wet weight basis.

The Total PAH result is the sum of non-rounded individual PAH results and therefore may differ to the sum of the rounded individual PAH results printed above. By convention, where any one or more result is a "less than", the total is expressed as a "less than" and includes the "less than" concentration within the total.

Polycyclic Aromatic Hydrocarbons
GC/MS (SIM)

Customer and Site Details:	Soil Mechanics: Sandsend Boreholes, North Yorkshire		
Sample Details:	BH3 ES 7A 2.00	**Job Number:**	S11_9196
LIMS ID Number:	CL1142190	**Date Booked in:**	01-Nov-11
QC Batch Number:	112027	**Date Extracted:**	11-Nov-11
Quantitation File:	Initial Calibration	**Date Analysed:**	14-Nov-11
Directory:	1411PAH.MS5\	**Matrix:**	Soil
Dilution:	1.0	**Ext Method:**	Ultrasonic

UKAS accredited?: Yes

Target Compounds	CAS #	R.T. (min)	Concentration mg/kg	% Fit
Naphthalene	91-20-3	-	< 0.08	-
Acenaphthylene	208-96-8	-	< 0.08	-
Acenaphthene	83-32-9	-	< 0.08	-
Fluorene	86-73-7	-	< 0.08	-
Phenanthrene	85-01-8	-	< 0.08	-
Anthracene	120-12-7	-	< 0.08	-
Fluoranthene	206-44-0	-	< 0.08	-
Pyrene	129-00-0	-	< 0.08	-
Benzo[a]anthracene	56-55-3	-	< 0.08	-
Chrysene	218-01-9	-	< 0.08	-
Benzo[b]fluoranthene	205-99-2	-	< 0.08	-
Benzo[k]fluoranthene	207-08-9	-	< 0.08	-
Benzo[a]pyrene	50-32-8	-	< 0.08	-
Indeno[1,2,3-cd]pyrene	193-39-5	-	< 0.08	-
Dibenzo[a,h]anthracene	53-70-3	-	< 0.08	-
Benzo[g,h,i]perylene	191-24-2	-	< 0.08	-
Total (USEPA16) PAHs	-	-	< 1.28	-

"M" denotes that % fit has been manually interpreted

Internal Standards	% Area
1,4-Dichlorobenzene-d4	NA
Naphthalene-d8	119
Acenaphthene-d10	120
Phenanthrene-d10	133
Chrysene-d12	139
Perylene-d12	140

Surrogates	% Rec
Nitrobenzene-d5	NA
2-Fluorobiphenyl	95
Terphenyl-d14	103

Concentrations are reported on a wet weight basis.

The Total PAH result is the sum of non-rounded individual PAH results and therefore may differ to the sum of the rounded individual PAH results printed above. By convention, where any one or more result is a "less than", the total is expressed as a "less than" and includes the "less than" concentration within the total.

Polychlorinated Biphenyls (congeners)

Customer and Site Details:	Soil Mechanics: Sandsend Boreholes, North Yorkshire	**Matrix:**	SOIL
Job Number:	S11_9196	**Date Booked in:**	01-Nov-11
QC Batch Number:	111732	**Date Extracted:**	12-Nov-11
Directory:	1114PCB.GC8	**Date Analysed:**	14-Nov-11
Method:	Ultrasonic		

*** This sample data is not UKAS accredited.**

			Concentration, (µg/kg)						
	Sample ID	**Customer ID**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB153**	**PCB138**	**PCB180**
*	CL1142188	BH1 ES 4A 1.00	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
*	CL1142189	BH3 ES 2A 0.30	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
*	CL1142190	BH3 ES 7A 2.00	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Where individual results are flagged see report notes for status.

Total Petroleum Hydrocarbons (TPH) Carbon Ranges

Customer and Site Details: Soil Mechanics : Sandsend Boreholes, North Yorkshire
Job Number: s11_9196
QC Batch Number: 2027
Directory: D:\TES\DATA\Y2011\NOVEMBER2011\1111TPH_GC3\019F2001.D
Method: Ultra Sonic

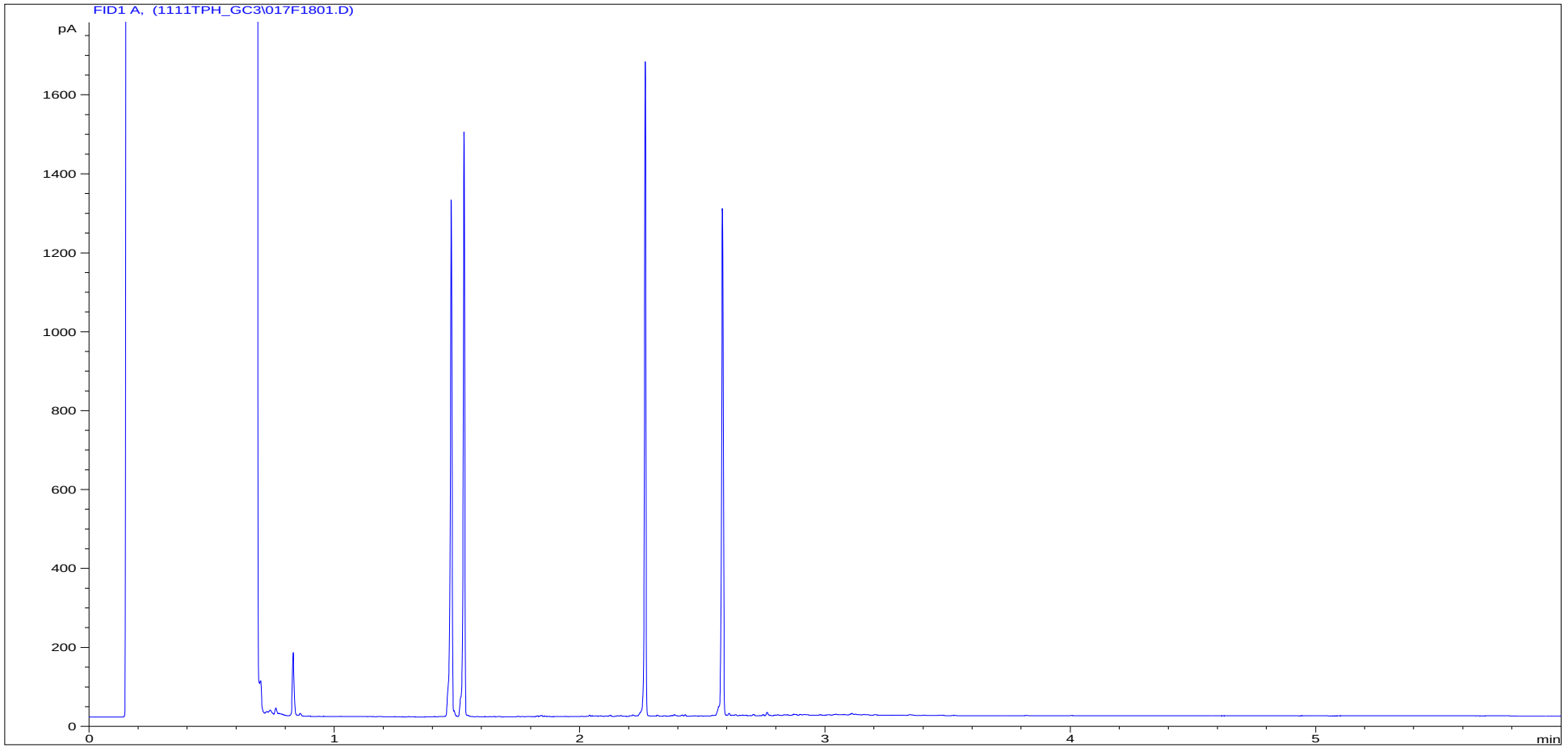
Matrix: Soil
Date Booked in: 01-Nov-11
Date Extracted: 11-Nov-11
Date Analysed: 11-Nov-11

*** Sample data with an asterisk are not UKAS accredited.**

		Concentration, (mg/kg) - as wet weight				
Sample ID	**Client ID**	**>C8 - C10**	**>C10 - C12**	**>C12 - C16**	**>C16 - C21**	**>C21 - C35**
CL1142188	BH1 ES 4A 1.00	<2	<2	<2	2.15	9.8
CL1142189	BH3 ES 2A 0.30	<2	<2	<2	6.9	111
CL1142190	BH3 ES 7A 2.00	<2	<2	<2	2.61	14.1

Where individual results are flagged see report notes for status.

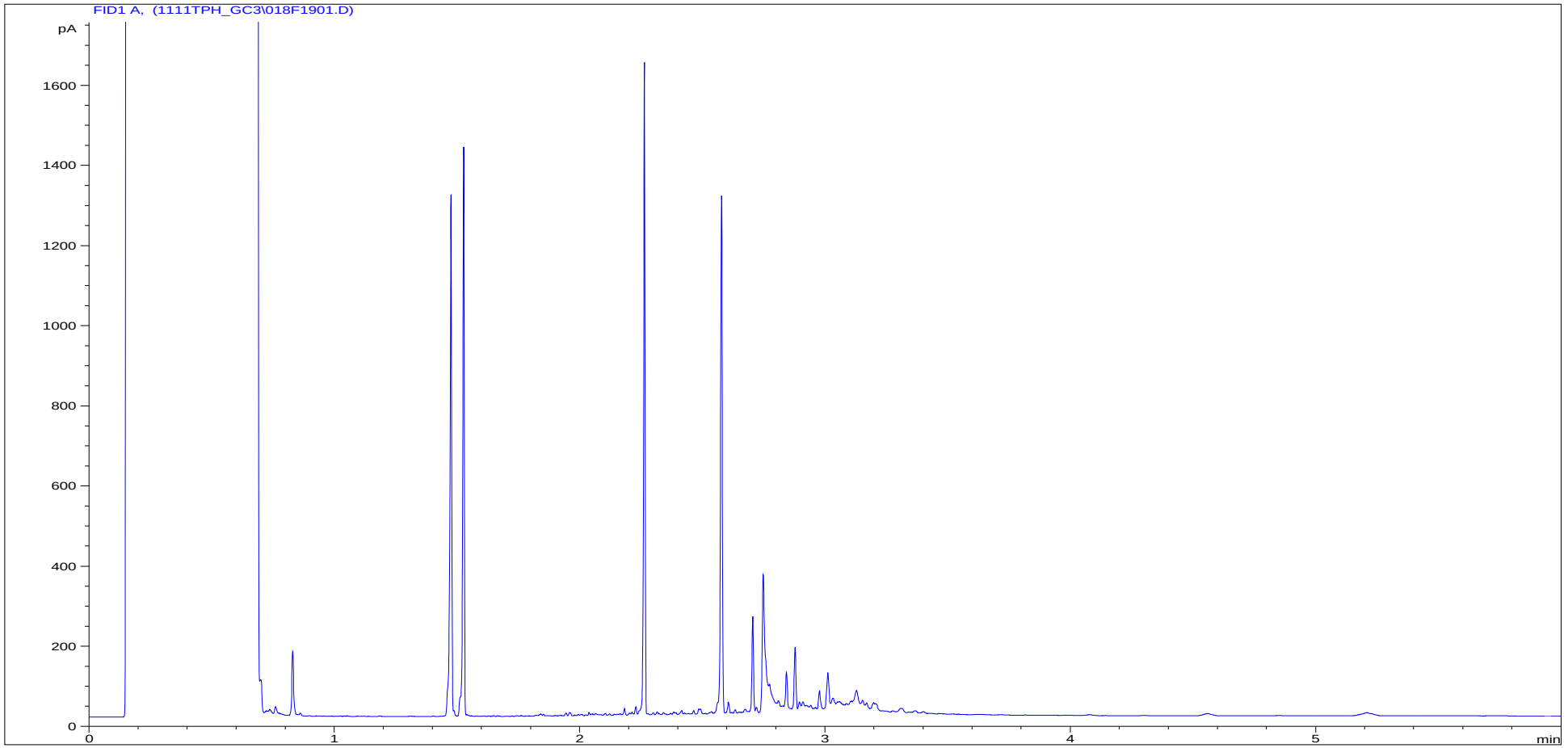
Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	CL1142188	**Job Number:**	s11_9196
Multiplier:	8	**Client:**	Soil Mechanics
Dilution:	1	**Site:**	Sandsend Boreholes, North Yorkshire
Acquisition Method:	5UL_RUNF.M	**Client Sample Ref:**	BH1 ES 4A 1.00
Acquisition Date/Time:	11-Nov-11		
Datafile:	D:\TES\DATA\Y2011\NOVEMBER2011\1111TPH_GC3\017F1801.D		

Where individual results are flagged see report notes for status.

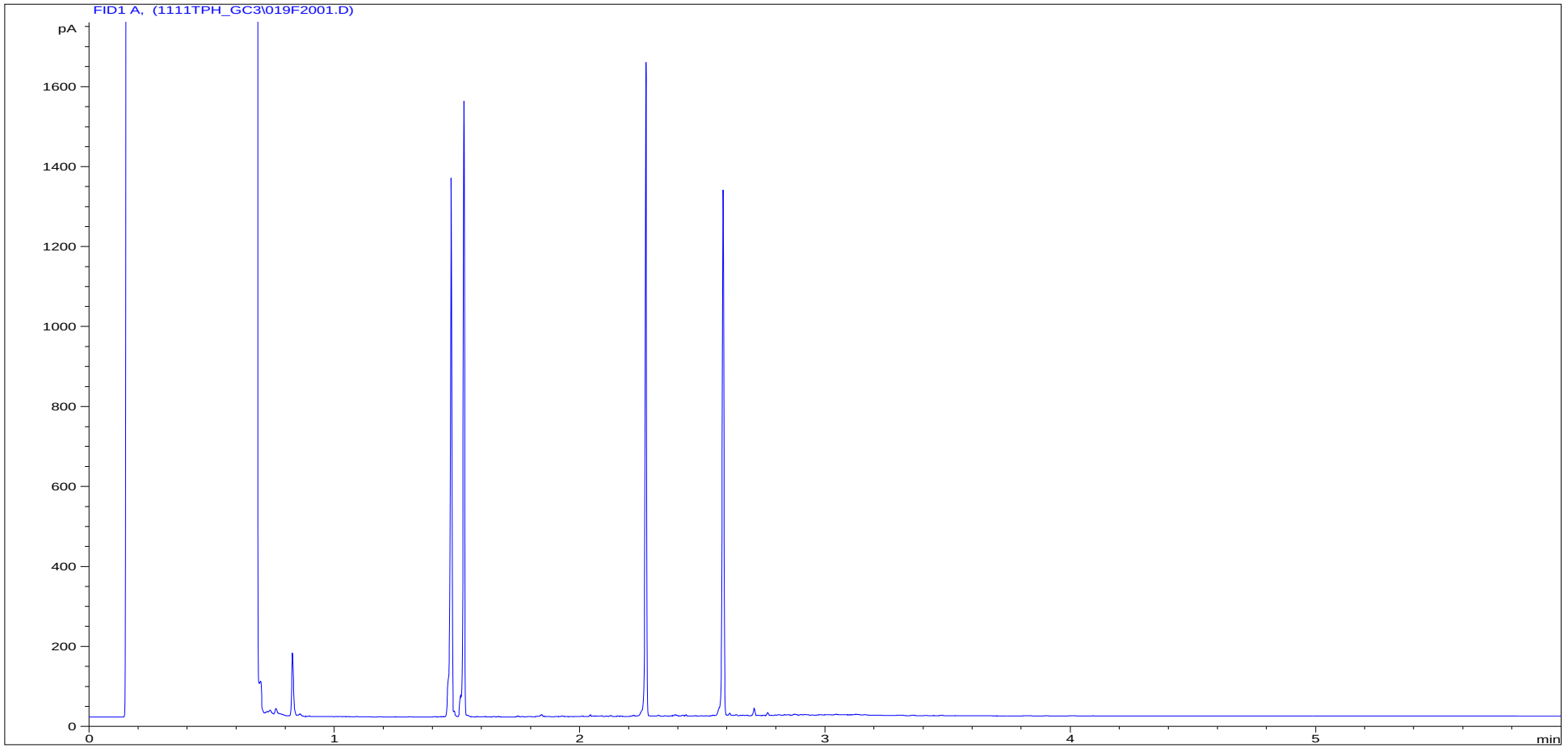
Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	CL1142189	**Job Number:**	s11_9196
Multiplier:	8	**Client:**	Soil Mechanics
Dilution:	1	**Site:**	Sandsend Boreholes, North Yorkshire
Acquisition Method:	5UL_RUNF.M	**Client Sample Ref:**	BH3 ES 2A 0.30
Acquisition Date/Time:	11-Nov-11		
Datafile:	D:\TES\DATA\Y2011\NOVEMBER2011\1111TPH_GC3\018F1901.D		

Where individual results are flagged see report notes for status.

Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	CL1142190	**Job Number:**	s11_9196
Multiplier:	8	**Client:**	Soil Mechanics
Dilution:	1	**Site:**	Sandsend Boreholes, North Yorkshire
Acquisition Method:	5UL_RUNF.M	**Client Sample Ref:**	BH3 ES 7A 2.00
Acquisition Date/Time:	11-Nov-11		
Datafile:	D:\TES\DATA\Y2011\NOVEMBER2011\1111TPH_GC3\019F2001.D		

Where individual results are flagged see report notes for status.

ASBESTOS ANALYSIS RESULTS - SOIL ANALYSIS

ESG Asbestos limited Certificate of Analysis for Asbestos in Soils

UKAS TESTING 1089

Detection limit of Method SCI-ASB-020 is 0.001%

Sampling has been carried out by client

Client:	ESG Environmental Chemistry	**Page 1 of 1**	
Address:	Etwall House, Bretby Business Park, Ashby Road, Burton upon Trent	**Report No:**	**ANO-0488-2324**
For the attention of:	Soil Mechanics	**Report Date:**	**14/11/2011**
Site Address:	Sandsend Boreholes, North Yorkshire	**Project Number:**	**S119196**

Sample Number	Sample Date	Sample Location	Test Date	Total Sample Dry Weight (g)	Weight of <2mm Fraction (g)	(g) Asbestos in >8mm+>2mm	(g) Asbestos in <2mm	% Asbestos by Weight of Total Dried Sample	Asbestos Fibre Types Identified
CL/1142187		BH1 0.10	14/11/2011					Screen Only	No Asbestos Identified in Sample
CL/1142188		BH1 1.00	14/11/2011					Screen Only	No Asbestos Identified in Sample
CL/1142189		BH3 0.30	14/11/2011					Screen Only	No Asbestos Identified in Sample
CL/1142190		BH3 2.00	14/11/2011					Screen Only	No Asbestos Identified in Sample

Keys

NAACR = Not Analysed at Clients Request

NAIIS = No Asbestos Identified in Sample (Screens Only)

NADIS = No Asbestos Detected in Sample (ID & Quant Only)

Name: Andrew Elsby

Position: Regional Manager

Authorised Signatory:

The sample analysis for the above results was carried out using the procedures detailed in ESG Asbestos Limited in house method (SCI-ASB-020) based on HSE document MDHS 90 - Asbestos Contaminated Land - Draft 5 - November 1997 (withdrawn). Fibre identification was carried out using ESG Asbestos Limited in house method of transmitted/polarised light microscopy and centre stop dispersion staining (SCI-ASB-007), based on HSE's HSG 248. The analysis of fine fraction for asbestos content only includes fibres and does not discriminate non-asbestos fibres. All fibres are assumed, unless specified, to be amphiboles. All tests were carried out at ESG Asbestos Laboratory, Ashbourne House, Bretby Business Park, Ashby Road, Burton-upon-Trent, Staffordshire. DE15 0XD, UKAS Laboratory Number 1089.

Analytical and Deviating Sample Overview

Customer Soil Mechanics
Site Sandsend Boreholes, North Yorkshire
Report No S119196

Consignment No S24253
Date Logged 01-Nov-2011
Report Due 14-Nov-2011

ID Number	Description	MethodID	BTEXHSA		CEN Leach	CustServ	GROHSA	ICPBOR	ICPMSS											ICPSOIL				ICPWSS	PAHMSUS	PCBUSEDAR
		Sampled	BTEX-HSA + MTBE analysis	MTBE (µg/kg)	CEN Leac(P)1	Report B	GRO	Boron (H20 Soluble)	Arsenic (MS)	Cadmium (MS)	Chromium (MS)	Cobalt (MS)	Copper (MS)	Lead (MS)	Manganese (MS)	Mercury (MS)	Nickel (MS)	Selenium (MS)	Vanadium (MS)	Zinc (MS)	Aluminium	Barium.	Iron	Magnesium.	SO4-- (H2O sol) mg/l	PAH (16) by GCMS	PCB-7 Congeners Analysis
Accredited to ISO17025			✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CL/1142187	BH1 0.10	D																								
CL/1142188	BH1 1.00	D																								
CL/1142189	BH3 0.30	D																								
CL/1142190	BH3 2.00	D																								

Note: For analysis where the Report Due date is greater than 7 days (PAH, Pesticides, PCB, Phenols, Herbicides) or 2 days (BOD) after the sampling date, although we will do our utmost to prioritise your samples, they may become deviant whilst being processed in the Laboratory.

In this instance, please contact the Laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key

A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time

Requested Analysis Key

	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted

Where individual results are flagged see report notes for status.
The integrity of data for samples/analysis that have been categorised as Deviating may be compromised. Data may not be representative of the sample at the time of sampling.

Analytical and Deviating Sample Overview

Customer Soil Mechanics
Site Sandsend Boreholes, North Yorkshire
Report No S119196

Consignment No S24253
Date Logged 01-Nov-2011
Report Due 14-Nov-2011

ID Number	Description	MethodID	PHSOIL	SFAPI	Sub002a	TMSS	TPHFIDUS		WSLM59
		Sampled	pH units (AR)	Cyanide(Total) (AR)	^Asbestos Screen	Tot.Moisture @ 105C	TPH by GCFID (AR)	TPH Carbon Banding.	Total Organic Carbon
	Accredited to ISO17025		✓	✓	✓	✓	✓	✓	
CL/1142187	BH1 0.10	D							
CL/1142188	BH1 1.00	D							
CL/1142189	BH3 0.30	D							
CL/1142190	BH3 2.00	D							

Note: For analysis where the Report Due date is greater than 7 days (PAH, Pesticides, PCB, Phenols, Herbicides) or 2 days (BOD) after the sampling date, although we will do our utmost to prioritise your samples, they may become deviant whilst being processed in the Laboratory.

In this instance, please contact the Laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time

Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted

Where individual results are flagged see report notes for status.
The integrity of data for samples/analysis that have been categorised as Deviating may be compromised. Data may not be representative of the sample at the time of sampling.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	BTEXHSA	As Received	Determination of Benzene, Toluene, Ethyl benzene and Xylenes (BTEX) by Headspace GCFID
Soil	GROHSA	As Received	Determination of Total Gasoline Range Organics Hydrocarbons (GRO) by Headspace GCFID
Soil	ICPBOR	Air Dried	Determination of Boron in soil samples by hot water extraction followed by ICPOES detection
Soil	ICPMSS	Air Dried	Determination of Metals in soil samples by aqua regia digestion followed by ICPMS
Soil	ICPSOIL	Air Dried	Determination of Metals in soil samples by aqua regia digestion followed by ICPOES detection
Soil	ICPWSS	Air Dried	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	PAHMSUS	As Received	Determination of Polycyclic Aromatic Hydrocarbons (PAH) by hexane/acetone extraction followed by GCMS detection
Soil	PCBUSECDAR	As Received	Determination of Polychlorinated Biphenyl (PCB) congeners/aroclors by hexane/acetone extraction followed by GCECD detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.
Soil	SFAPI	As Received	Segmented flow analysis with colorimetric detection
Soil	SubCon*	*	Contact Laboratory for details of the methodology used by the sub-contractor.
Soil	TMSS	As Received	Determination of the Total Moisture content at 105ºC by loss on oven drying gravimetric analysis
Soil	TPHFIDUS	As Received	Determination of hexane/acetone extractable Hydrocarbons in soil with GCFID detection.
Soil	WSLM59	Air Dried	Determination of Organic Carbon in soil using sulphurous Acid digestion followed by high temperature combustion and IR detection

Where individual results are flagged see report notes for status.

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on an air dried basis
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile
CR Denotes Crocidolite
AM Denotes Amosite
NAIIS No Asbestos Identified in Sample

Symbol Reference

^ Sub-contracted analysis. Note: The accreditation status is that assigned by the subcontract laboratory.
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined
N.Det Not detected
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

END OF REPORT

Where individual results are flagged see report notes for status.

TEST REPORT
CEN LEACHATE 2:1

1252

Report No. EXR/127351 (Ver. 1)

Soil Mechanics
Askern Road
Carcroft
Doncaster
South Yorkshire
DN6 8DG

Site: Sandsend Boreholes, North Yorkshire

The 2 samples described in this report were registered for analysis by ESG on 01-Nov-2011. This report supersedes any versions previously issued by the laboratory.
The analysis was completed by: 16-Nov-2011

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by ESG.

The following tables are contained in this report:

On behalf of
ESG :
Andrew Timms Operations Manager

Date of Issue: 16-Nov-2011

Tests marked '^' have been subcontracted to another laboratory.

ESG accepts no responsibility for any sampling not carried out by our personnel.

Units :		pH units	mg/l	mg/l	mg/l	mg/l	mg/l	µg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Method Codes :		WSLM3	ICPWATVAR	ICPWATVAR	ICPMSW	ICPMSW	ICPMSW	PAHMSW	ICPMSW	ICPMSW	ICPMSW	ICPMSW	ICPWATVAR	ICPWATVAR	ICPMSW	ICPWATVAR	ICPMSW
Method Reporting Limits :			3	1	0.001	0.001	0.0001		0.001	0.001	0.002	0.002	0.01	0.01	0.001	0.01	0.0001
UKAS Accredited :		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LAB ID Number EXR	**Client Sample Description**	**pH units w**	**Total Sulphur as SO4 (Dissolved) a**	**Magnesium as Mg (Dissolved) a**	**Nickel as Ni (Dissolved)**	**Chromium as Cr (Dissolved)**	**Cadmium as Cd (Dissolved)**	**PAH GC-MS (16) o**	**Copper as Cu (Dissolved)**	**Lead as Pb (Dissolved)**	**Zinc as Zn (Dissolved)**	**Manganese as Mn (Dissolved)**	**Iron as Fe (Dissolved) a**	**Aluminium as Al (Dissolved) a**	**Arsenic as As (Dissolved)**	**Boron as B (Dissolved) a**	**Mercury as Hg (Dissolved)**
1147750	BH1 0.10	7.7	5	1	0.065	0.035	0.001		0.148	0.014	0.252	0.016	1.13	1.07	0.002	0.37	<0.0001
1147751	BH1 1.00	7.7	5	2	0.001	0.003	<0.0001	Req	0.006	0.015	0.083	0.02	1.27	1.68	0.001	0.28	<0.0001

ESG Environmental Scientifics Group
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel +44 (0) 1283 554400
Fax +44 (0) 1283 554422

Client Name Soil Mechanics

Contact Mr B Swallow

Sandsend Boreholes, North Yorkshire

CEN Leachate 2:1

Date Printed	**16-Nov-2011**
Report Number	**EXR/127351**
Table Number	**1**

Where individual results are flagged see report notes for status.

Units :		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Method Codes :		ICPMSW	ICPMSW	ICPMSW	SFAPI	WSLM13	GROHSA	TPHFID	TPHFID	ICPWATVAR	PCBCONEC	BTEXHSA	BTEXHSA	BTEXHSA	BTEXHSA	BTEXHSA	BTEXHSA
Method Reporting Limits :		0.001	0.001	0.001	0.02	0.1	0.1	0.01	0.01	0.01	0.05	5	5	5	10	10	5
UKAS Accredited :		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
LAB ID Number EXR	**Client Sample Description**	**Selenium as Se (Dissolved)**	**Vanadium as V (Dissolved)**	**Cobalt as Co (Dissolved)**	**Cyanide (Total) as CN**	**Total Organic Carbon w**	**GRO-HSA o**	**Carbon Banding**	**TPH GC (0.01)**	**Barium as Ba (Dissolved) a**	**PCB - 7 Congeners Analysis**	**Ethyl Benzene**	**Benzene**	**Toluene**	**MTBE**	**Xylenes**	**m/p Xylenes**
1147750	BH1 0.10	<0.001	0.003	0.003		12				0.18							
1147751	BH1 1.00	<0.001	0.004	<0.001	<0.02	4.9	<0.1	Req	0.06	0.14	Req	<5	<5	<5	<10	<10	<5

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Client Name Soil Mechanics

Contact Mr B Swallow

Sandsend Boreholes, North Yorkshire

CEN Leachate 2:1

Date Printed	**16-Nov-2011**
Report Number	**EXR/127351**
Table Number	**1**

Units :		µg/l																
Method Codes :		BTEXHSA																
Method Reporting Limits :		5																
UKAS Accredited :		No																
LAB ID Number EXR	**Client Sample Description**	**o Xylene**																
1147750	BH1 0.10																	
1147751	BH1 1.00	<5																

ESG Environmental Scientifics Group

Bretby Business Park, Ashby Road

Burton-on-Trent, Staffordshire, DE15 0YZ

Tel +44 (0) 1283 554400

Fax +44 (0) 1283 554422

Client Name	**Soil Mechanics**
Contact	Mr B Swallow

Sandsend Boreholes, North Yorkshire

CEN Leachate 2:1

Date Printed	**16-Nov-2011**
Report Number	**EXR/127351**
Table Number	**1**

Where individual results are flagged see report notes for status.

Polycyclic Aromatic Hydrocarbons
GC/MS (SIM)

Customer and Site Details:	Soil Mechanics: Sandsend Boreholes, North Yorkshire		
Sample Details:	BH1 1.00	**Job Number:**	W12_7351
LIMS ID Number:	EX1147751	**Date Booked in:**	01-Nov-11
QC Batch Number:	110983	**Date Extracted:**	15-Nov-11
Quantitation File:	Initial Calibration	**Date Analysed:**	15-Nov-11
Directory:	115PAH.MS17\	**Matrix:**	Leachate
Dilution:	1.0	**Ext Method:**	Bottle

UKAS accredited?: Yes

Target Compounds	CAS #	R.T. (min)	Concentration ug/l	% Fit
Naphthalene	91-20-3	3.36	0.012	94
Acenaphthylene	208-96-8	4.41	0.035	95
Acenaphthene	83-32-9	4.53	0.204	98
Fluorene	86-73-7	4.92	0.138	98
Phenanthrene	85-01-8	-	< 0.010	-
Anthracene	120-12-7	-	< 0.010	-
Fluoranthene	206-44-0	7.13	0.063	89
Pyrene	129-00-0	7.42	0.119	87
Benzo[a]anthracene	56-55-3	9.10	0.024	82
Chrysene	218-01-9	9.15	0.019	83
Benzo[b]fluoranthene	205-99-2	10.63	0.010	91
Benzo[k]fluoranthene	207-08-9	-	< 0.010	-
Benzo[a]pyrene	50-32-8	-	< 0.010	-
Indeno[1,2,3-cd]pyrene	193-39-5	-	< 0.010	-
Dibenzo[a,h]anthracene	53-70-3	-	< 0.010	-
Benzo[g,h,i]perylene	191-24-2	-	< 0.010	-
Total (USEPA16) PAHs	-	-	< 0.694	-

"M" denotes that % fit has been manually interpreted

Internal Standards	% Area
1,4-Dichlorobenzene-d4	NA
Naphthalene-d8	96
Acenaphthene-d10	95
Phenanthrene-d10	95
Chrysene-d12	99
Perylene-d12	97

Surrogates	% Rec
Nitrobenzene-d5	NA
2-Fluorobiphenyl	94
Terphenyl-d14	116

The Total PAH result is the sum of non-rounded individual PAH results and therefore may differ to the sum of the rounded individual PAH results printed above. By convention, where any one or more result is a "less than", the total is expressed as a "less than" and includes the "less than" concentration within the total.

Polychlorinated Biphenyls (congeners)

Customer and Site Details: Soil Mechanics: Sandsend Boreholes, North Yorkshire
Job Number: W12_7351
QC Batch Number: 110080
Directory: 1109PCB.GC8
Method: Separating Funnel

Matrix: Leachate
Date Booked in: 01-Nov-11
Date Extracted: 09-Nov-11
Date Analysed: 10-Nov-11

*** This sample data is not UKAS accredited.**

			Concentration, (µg/l)						
	Sample ID	**Customer ID**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB153**	**PCB138**	**PCB180**
*	EX1147751	BH1 1.00	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Where individual results are flagged see report notes for status.

Total Petroleum Hydrocarbons (TPH) Carbon Ranges

Customer and Site Details: Soil Mechanics : Sandsend Boreholes, North Yorkshire
Job Number: W12_7351
QC Batch Number: 110967
Directory: D:\TES\DATA\Y2011\110811TPH_GC16\110811 2011-11-08 09-00-42\086B5301.D
Method: Bottle

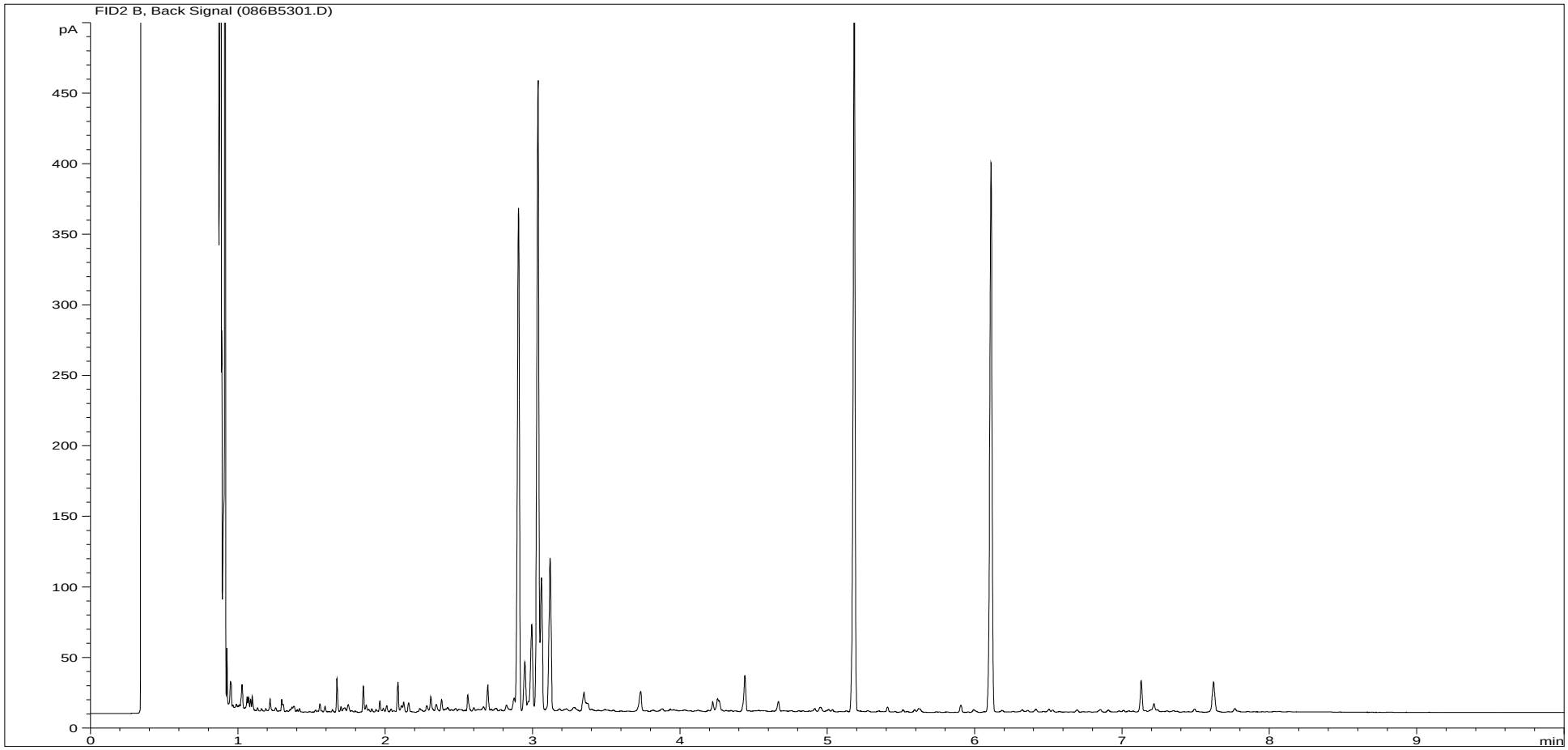
Matrix: Leachate
Date Booked in: 01-Nov-11
Date Extracted: 08-Nov-11
Date Analysed: 09-Nov-11, 01:50:04

*** Sample data with an asterisk are not UKAS accredited.**

		Concentration, (mg/l)				
Sample ID	**Client ID**	**>C8 - C10**	**>C10 - C12**	**>C12 - C16**	**>C16 - C21**	**>C21 - C35**
EX1147751	BH1 1.00	<0.01	<0.01	0.025	<0.01	0.01

Where individual results are flagged see report notes for status.

Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID:	EX1147751	**Job Number:**	W12_7351
Multiplier:	0.005	**Client:**	Soil Mechanics
Dilution:	1	**Site:**	Sandsend Boreholes, North Yorkshire
Acquisition Method:	TPH_RUNF.M	**Client Sample Ref:**	BH1 1.00
Acquisition Date/Time:	09-Nov-11, 01:50:04		
Datafile:	D:\TES\DATA\Y2011\110811TPH_GC16\110811 2011-11-08 09-00-42\086B5301.D		

Where individual results are flagged see report notes for status.

WATER Analysis

ESG Environmental Chemistry
Analytical and Deviating Sample Overview

W127351

Customer Soil Mechanics
Site Sandsend Boreholes, North Yorkshire
Report No W127351

Consignment No S24253
Date Logged 01-Nov-2011

Report Due 14-Nov-2011

ID Number	Description	MethodID	BTEXHSA	CUSTSERV	GROHSA	ICPMSW											ICPWATVAR						LeachPrep	PAHMSW	PCBONEC	SFAPI
		Sampled	BTEX-HSA + MTBE analysis	Report B (CEN1)	GRO-HSA	Nickel as Ni MS (Dissolved)	Chromium as Cr MS (Dissolved)	Cadmium as Cd MS (Dissolved)	Copper as Cu MS (Dissolved)	Lead as Pb MS (Dissolved)	Zinc as Zn MS (Dissolved)	Manganese as Mn MS (Dissolved)	Arsenic as As MS (Dissolved)	Mercury as Hg MS (Dissolved)	Selenium as Se MS (Dissolved)	Vanadium as V MS (Dissolved)	Cobalt as Co MS (Dissolved)	Total Sulphur as SO4 (Diss) VAR	Magnesium as Mg (Dissolved) VAR	Barium as Ba (Dissolved) VAR	Iron as Fe (Dissolved) VAR	Aluminium as Al (Dissolved) VAR	Boron as B (Dissolved) VAR	Leachate Prep	PAH GC-MS (16)	PCB - 7 Congeners Analysis	Cyanide (Total) as CN SFA
Accredited to ISO17025			✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EX/1147750	BH1 0.10																										
EX/1147751	BH1 1.00																										

Note: For analysis where the Report Due date is greater than 7 days (PAH, Pesticides, PCB, Phenols, Herbicides) or 2 days (BOD) after the sampling date, although we will do our utmost to prioritise your samples, they may become deviant whilst being processed in the Laboratory.

In this instance, please contact the Laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time

Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted

Where individual results are flagged see report notes for status.

The integrity of data for samples/analysis that have been categorised as Deviating may be compromised. Data may not be representative of the sample at the time of sampling.

Analytical and Deviating Sample Overview

Customer Soil Mechanics
Site Sandsend Boreholes, North Yorkshire
Report No W127351

Consignment No S24253
Date Logged 01-Nov-2011
Report Due 14-Nov-2011

ID Number	Description	MethodID	TPHFID		WSLM13	WSLM3
		Sampled	TPH Carbon Banding	TPH GC (0.01)	Total Organic Carbon	pH units
	Accredited to ISO17025		✓	✓	✓	✓
EX/1147750	BH1 0.10					
EX/1147751	BH1 1.00					

Note: For analysis where the Report Due date is greater than 7 days (PAH, Pesticides, PCB, Phenols, Herbicides) or 2 days (BOD) after the sampling date, although we will do our utmost to prioritise your samples, they may become deviant whilst being processed in the Laboratory.

In this instance, please contact the Laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time

Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted

Where individual results are flagged see report notes for status.
The integrity of data for samples/analysis that have been categorised as Deviating may be compromised. Data may not be representative of the sample at the time of sampling.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	BTEXHSA	As Received	Benzene, Toluene, Ethylbenzene, & Xylenes by headspace extraction GCFID quantitation
Water	GROHSA	As Received	Determination of Total Gasoline Range Organics Hydrocarbons (GRO) by Headspace FID
Water	ICPMSW	As Received	Direct quantitative determination of Metals in water samples using ICPMS
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	PAHMSW	As Received	Determination of PolyAromatic Hydrocarbons in water by pentane extraction GCMS quantitation
Water	PCBCONEC	As Received	Determination of Polychlorinated Biphenyl (PCB) congeners by pentane extraction followed by GCECD detection
Water	SFAPI	As Received	Segmented flow analysis with colorimetric detection
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM13	As Received	Instrumental analysis using acid/persulphate digestion and dispersive IR detection
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on an air dried basis
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile
CR Denotes Crocidolite
AM Denotes Amosite
NAIIS No Asbestos Identified in Sample

Symbol Reference

^ Sub-contracted analysis. Note: The accreditation status is that assigned by the subcontract laboratory.
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined
N.Det Not detected
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

END OF REPORT

Where individual results are flagged see report notes for status.

ENCLOSURE E
PHOTOGRAPHS

Rotary Cores Plates 1 to 8

ENCLOSURE F

DRAWINGS

Site Location Plan

Soil Mechanics

Notes: Scale 1:50 000	**Project** SANDSEND SLOPE STABILISATION, WHITBY, NORTH YORKSHIRE **Project No.** A1077-11 **Carried out for** Balfour Beatty Living Places	**Figure** **F1**

GENERAL NOTES

1. Reproduced from Ordnance Survey Data with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright. Supplied by ******** ********. Licence No. nnnnnnnnn.
2. Reproduced from CLIENT NAME's Drawing No. ******** Rev No. ***.
3. Hole Locations to OSGB36 Co-ordinate Reference System.
4. All dimensions are in metres unless indicated otherwise.
5. All levels are in metres and related to OS Orthometric level datum.

Survey Control Co-ordinates

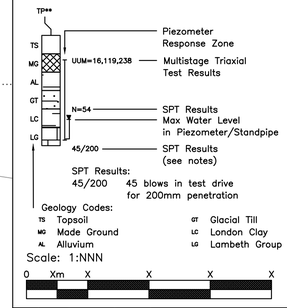
Reference	East	North	Elevation	Description
SANDS-REF	487211.203	512092.729	30.61	GPS Ref Stn

GI Investgation Co-ordinates (OSGB36 + OS Orthometric Hts)

Reference	East	North	Elevation	Description
BH01	486765.856	512240.035	44.48	Borehole
BH02	486709.848	512274.241	45.56	Borehole
BH03	486620.134	512293.055	45.95	Borehole
BH04	486819.851	512318.462	14.59	Borehole
BH05	486705.875	512374.439	12.66	Borehole
BH06	486739.825	512358.088	13.02	Borehole
W501	487176.623	512177.532	4.43	Window Sample
W502	487089.805	512215.234	3.86	Window Sample
W503	486809.973	512351.996	3.98	Window Sample
W504	486449.562	512432.748	2.69	Window Sample
W505	486380.618	512549.270	3.72	Window Sample

LEGEND TO SYMBOLS

- Borehole Location
- Window Sample Location
- Trial Pit Location
- Dynamic Probe Location
- Inspection Pit Location
- Water Sample Location



Rev	Drawn	Date	Approv.	Date	Modification Details

AMENDMENTS

Title

Ground Investigation Survey

Project

Sandsend
Whitby
Nth Yorkshire

Client

CLIENT NAME
OR LOGO

Soil Mechanics

Date	Drawn By	Approv. By
12.10.11	HSL	DEF

Sheet Size	Scale	Project No
A1—1	1:1000	123456

Drawing No	Rev
123456/001	

PRELIMINARY / DRAFT

GENERAL NOTES

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2. Reproduced from CLIENT NAME's Drawing No. ******** Rev No. ***.
3. Hole Locations to OSGB36 Co–ordinate Reference System.
4. All dimensions are in metres unless indicated otherwise.
5. All levels are in metres and related to OS Orthometric level datum.

Survey Control Co-ordinates

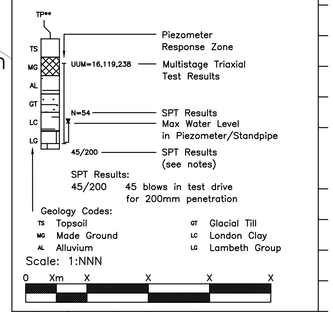
Reference	East	North	Elevation	Description
SANDS-REF	487211.203	512092.729	30.61	GPS Ref Stn

GI Investgation Co-ordinates (OSGB36 + OS Orthometric Hts)

Reference	East	North	Elevation	Description
BH01	486765.856	512240.035	44.48	Borehole
BH02	486709.848	512274.241	45.56	Borehole
BH03	486620.134	512295.055	45.95	Borehole
BH04	486819.851	512318.462	14.59	Borehole
BH05	486705.875	512374.439	12.66	Borehole
BH06	486739.825	512358.088	13.02	Borehole
W501	487176.623	512177.532	4.43	Window Sample
W502	487089.805	512215.234	3.86	Window Sample
W503	486809.973	512351.996	3.98	Window Sample
W504	486649.562	512432.748	2.49	Window Sample
W505	486380.618	512549.270	3.72	Window Sample

LEGEND TO SYMBOLS

- Borehole Location
- Window Sample Location
- Trial Pit Location
- Dynamic Probe Location
- Inspection Pit Location
- Water Sample Location



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Sheet Size	Scale	Project No
A1–2	1:1000	123456

Drawing No	Rev
123456/001	