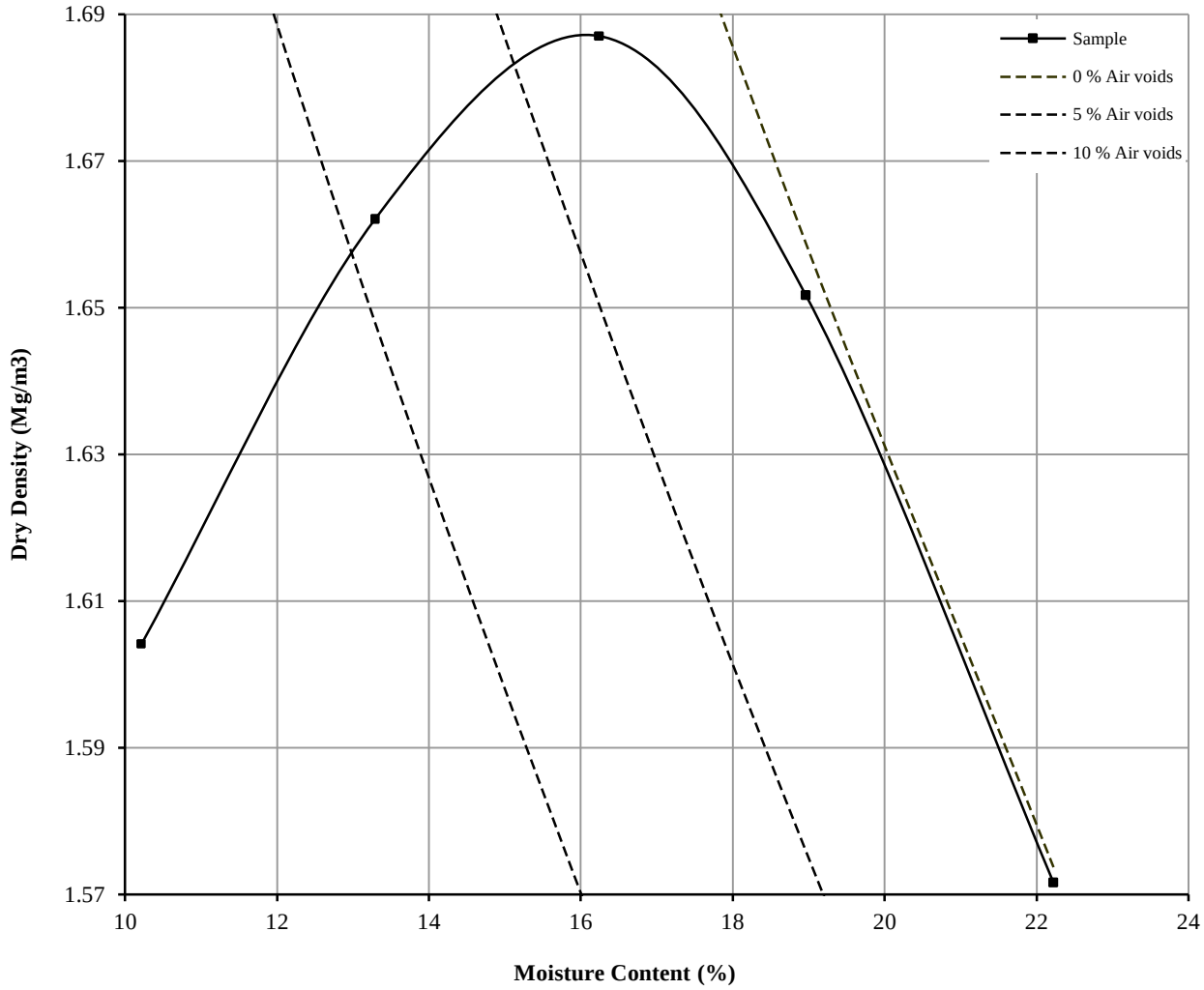
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: WBH109 **Top Depth (m) :** 0.40

Sample Number: **Base Depth (m) :**

Sample Type: B



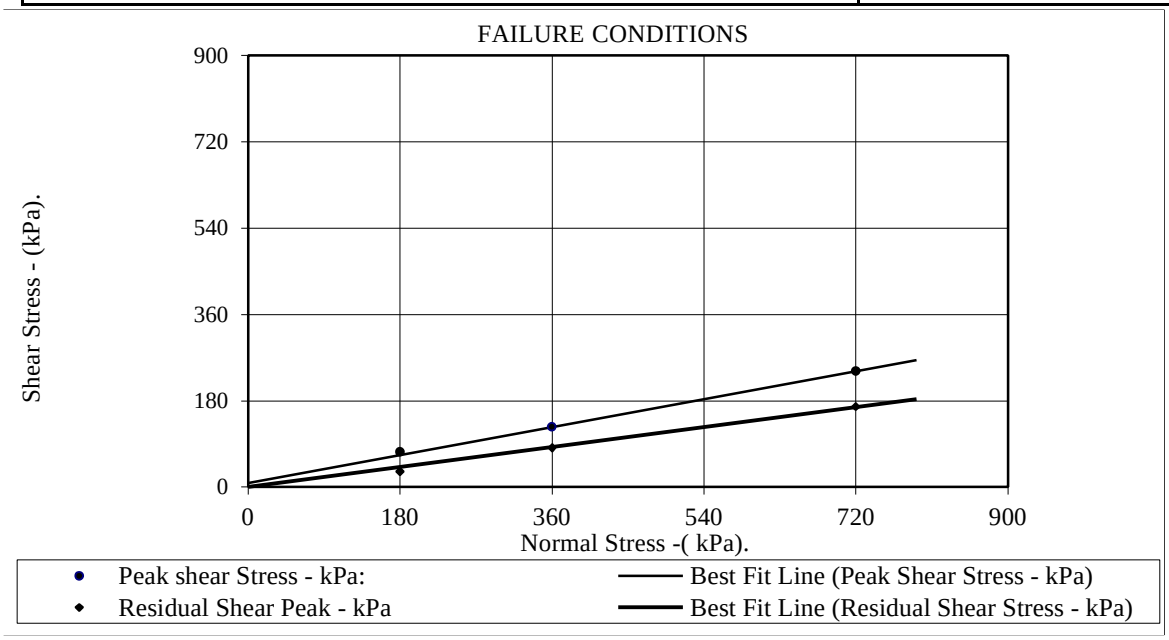
Initial Moisture Content:		19	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.42	Assumed	Material Retained on 37.5 mm Test Sieve (%):		22
Maximum Dry Density (Mg/m3):		1.69	Material Retained on 20.0 mm Test Sieve (%):		13
Optimum Moisture Content (%):		16			
Remarks See summary of soil descriptions					

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377 : 1990 Part 7 Clause 4

Hole Number:	**WBH109**		Top Depth	**18.00**
Sample Number:			Base Depth	
Sample Conditions:	Submerged		Sample Type	**U**
Particle Density - Mg/m3:	2.65	Assumed	**Remarks:**	
Specimen Preparation	Cut and trimmed Undisturbed			
Sample Description:	**See summary of soil descriptions**			

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	19.99	19.99	19.99
Length - mm:	60.05	60.05	60.05
Moisture Content - %:	28	28	28
Bulk Density - Mg/m3:	1.74	1.74	1.74
Dry Density - Mg/m3:	1.36	1.36	1.36
Voids Ratio:	0.945	0.945	0.945
Normal Pressure- kPa	180	360	720
Consolidation Stage			
Consolidated Height - mm:	18.79	18.30	16.67
Peak Shear			
Rate of Strain - mm/min	0.039	0.039	0.039
Displacement at peak shear stress - mm	3.90	3.90	3.00
Peak shear Stress - kPa:	73	125	242
Residual Shear			
Rate of Strain - mm/min	0.078	0.078	0.078
Displacement at residual shear stress - mm	20.00	30.00	20.00
Residual shear Stress - kPa:	32	82	167
Final Consolidation Conditions			
Moisture Content - %:	34	33	30
Bulk Density - Mg/m3:	1.86	1.90	2.09
Dry Density - Mg/m3:	1.38	1.43	1.61
Peak Shear			
Angle of Shearing Resistance:(0)	18		
Effective Cohesion - kPa:	8		
Residual Shear			
Angle of Shearing Resistance:(0)	13		
Effective Cohesion - kPa:	1		



UKAS TESTING 4043

PSL Professional Soils Laboratory

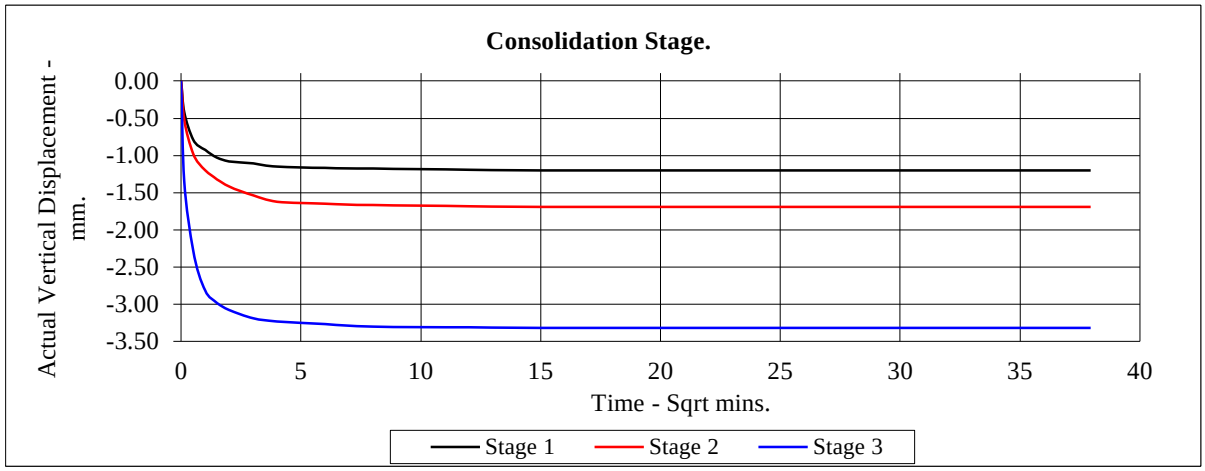
Project Otter

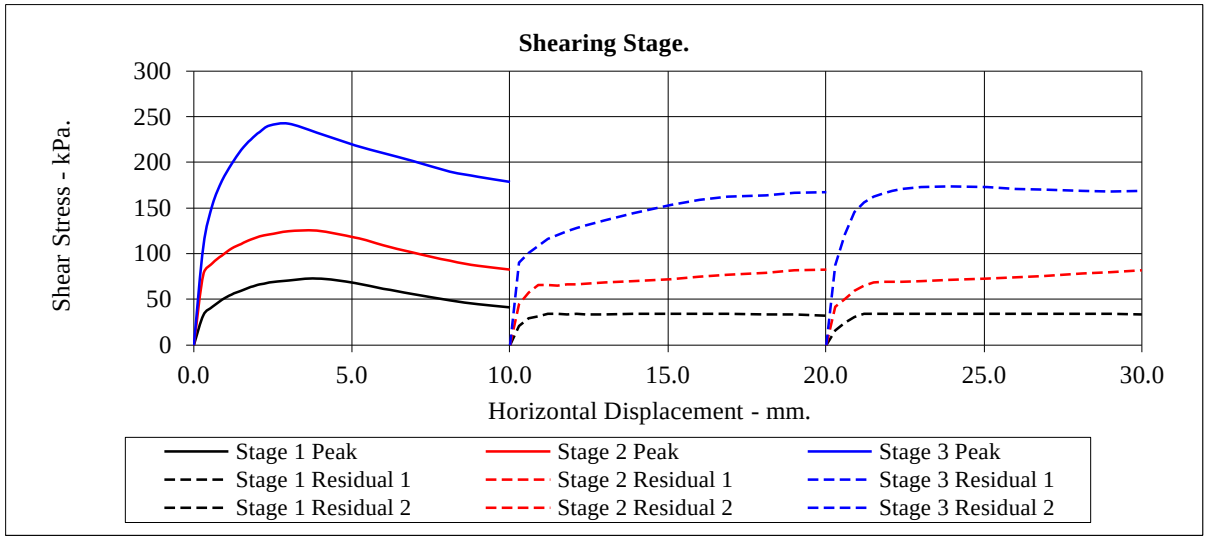
Contract No:
PSL22/7852
Client Ref:
WIE17469

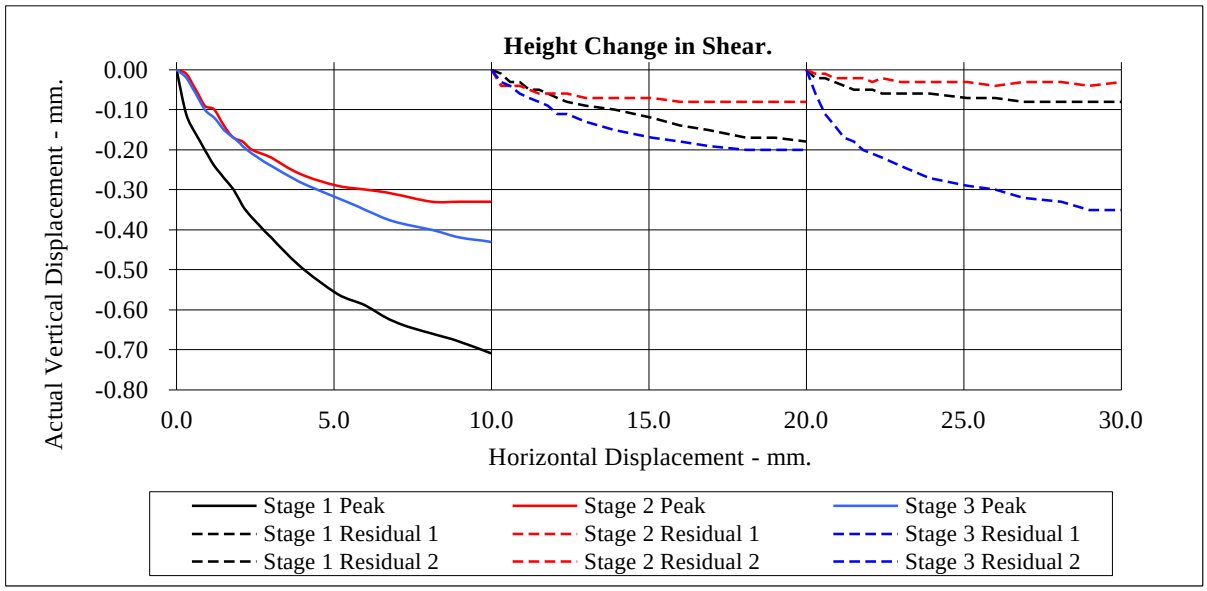
CONSOLIDATED DRAINED SHEARBOX TEST

BS1377 : 1990 Part 7 Clause 4

Hole Number:	**WBH109**	Top Depth:	**18.00**
Sample Number:		Base Depth:	







UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7852
Client Ref:
WIE17469

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
WBH109	6.00		A	Perp	100	47	4700	5984.23	77.36	-	0.34	0.06	1.217	0.07	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7852
Client Ref:
WIE17469

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
WBH109	6.00		D	Par	-	100	10000	100.00	-	0.14	0.014	1.366	0.02	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043 / PSL Professional Soils Laboratory	**Project Otter**	**Contract No:** PSL22/7852 **Client Ref:** WIE17469

UKAS TESTING
2531

CHEMTECH environmental part of Cawood

ANALYTICAL TEST REPORT

Contract no: 117336

Contract name: WIE17469: Project Otter

Client reference: PSL22/7852

Clients name: Professional Soils Laboratory

Clients address: 5/7 Hexthorpe Road
Doncaster
DN4 0AR

Samples received: 05 January 2023

Analysis started: 05 January 2023

Analysis completed: 12 January 2023

Report issued: 12 January 2023

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing

Approved by: [redacted]
Abbie Neasham-Bourn
Senior Reporting Administrator

Chemtech Environmental Limited

SOILS

Lab number			117336-1	117336-2
Sample id			WBH109	WBH109
Depth (m)			2.00	4.50
Sample Type			B	B
Date sampled			-	-
Test	Method	Units		
pH	CE004 U	units	8.0	6.9
Magnesium (2:1 water soluble)	CE061	mg/l Mg	1.2	5.2
Chloride (2:1 water soluble)	CE049 U	mg/l Cl	17	37
Nitrate (2:1 water soluble)	CE049 U	mg/l NO_3	5.9	1.5
Sulphate (2:1 water soluble)	CE061 U	mg/l SO_4	256	201
Sulphate (acid extractable)	CE062 U	mg/kg SO_4	1244	765
Sulphate (acid extractable)	CE062 U	% w/w SO_4	0.12	0.08
Sulphur (total)	CE119	mg/kg S	845	439
Sulphur (total)	CE119	% w/w S	0.08	0.04

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	As received	U	-	units
CE061	Magnesium (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry		1	mg/l Mg
CE049	Chloride (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	1	mg/l Cl
CE049	Nitrate (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	1	mg/l NO_3
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	10	mg/l SO_4
CE062	Sulphate (acid extractable)	HCl extract, analysed by ICP-OES	Dry	U	100	mg/kg SO4
CE062	Sulphate (acid extractable)	HCl extract, analysed by ICP-OES	Dry	U	0.01	% w/w SO4
CE119	Sulphur (total)	Aqua regia digest, analysed by ICP-OES	Dry		100	mg/kg S
CE119	Sulphur (total)	Aqua regia digest, analysed by ICP-OES	Dry		0.01	% w/w S

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
117336-1	WBH109	2.00	Y	All (NSD)
117336-2	WBH109	4.50	Y	All (NSD)

Chemtech Environmental Limited

ADDITIONAL INFORMATION

Notes

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

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

This report shall not be reproduced except in full, without prior written approval.

Samples will be disposed of 4 weeks from initial receipt unless otherwise instructed.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones, where applicable.

LABORATORY REPORT

4043

Contract Number: PSL22/7853

Report Date: 10 January 2023

Client's Reference: WIE17469-WBH110

Client Name: Groundtech Consulting
First Floor
Lloyd House
Orford Court
Greenfold Way
WN7 3XJ

For the attention of: Michael Berry

Contract Title: Project Otter

Date Received: 9/12/2022
Date Commenced: 9/12/2022
Date Completed: 10/1/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Director)
R Berriman (Quality Manager)
S Royle (Laboratory Manager)
[redacted]
L Knight (Assistant Laboratory Manager)
S Eyre (Senior Technician)
T Watkins (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WBH110		AMAL	0.20	0.80	MADE GROUND brown very sandy clayey gravel.
WBH110		D	1.50		Brown slightly gravelly very sandy CLAY.
WBH110		U	2.50		Brown slightly gravelly sandy CLAY.
WBH110		U	4.50		Brown CLAY.
WBH110		U	7.50		Stiff brown mottled grey CLAY.
WBH110		D	8.00		Brown mottled grey CLAY.
WBH110		U	16.50		Very stiff brown mottled grey CLAY.
WBH110		D	17.00		Grey CLAY.
WBH110		B	17.50		Grey slightly sandy CLAY.
WBH110		U	22.50		Grey CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WBH110		D	1.50		18							
WBH110		D	8.00		29			82	31	51	100	Very High Plasticity CV
WBH110		D	17.00		27			80	31	49	100	Very High Plasticity CV

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

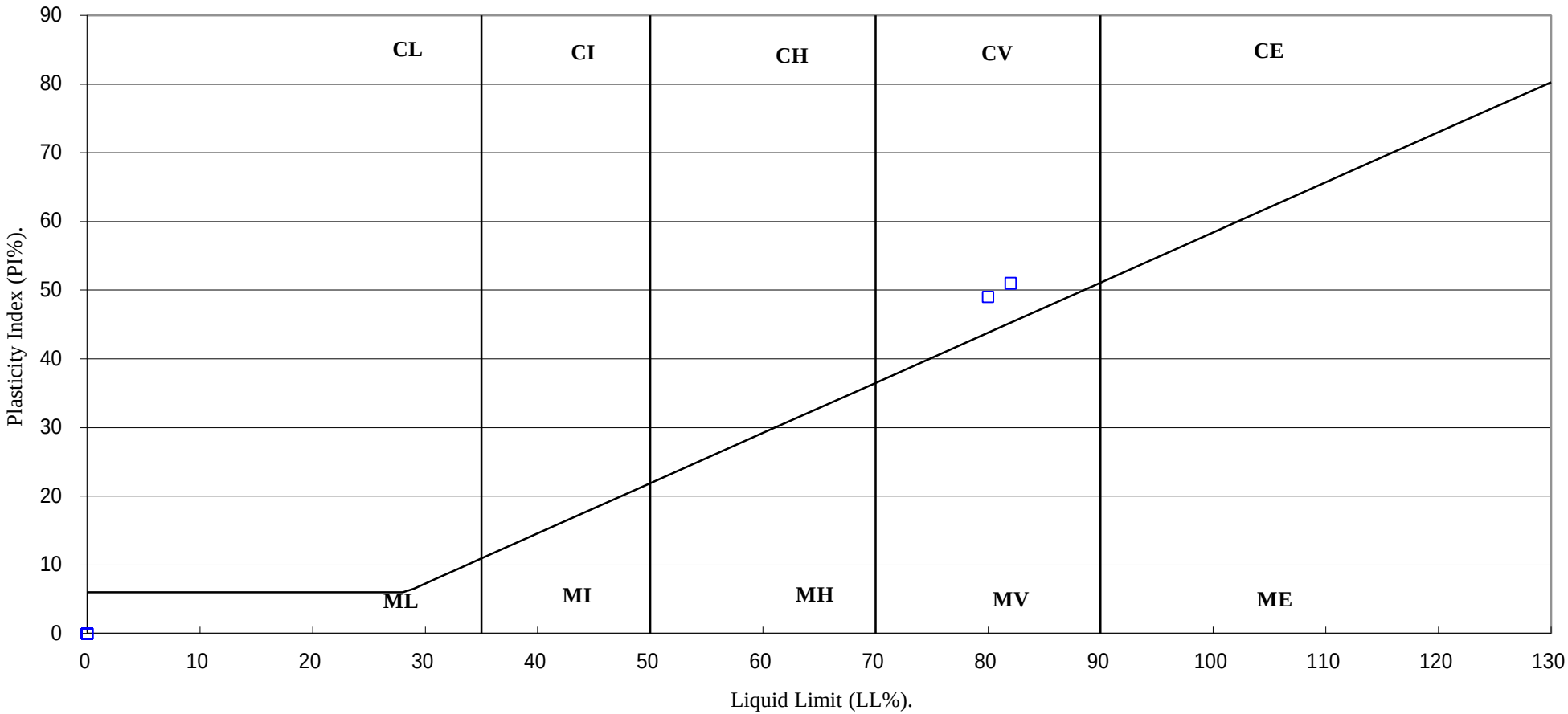
Contract No:

PSL22/7853

Client Ref:

WIE17469

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Project Otter**	**Contract No:**
			PSL22/7853
			Client Ref:
			WIE17469

PARTICLE SIZE DISTRIBUTION TEST

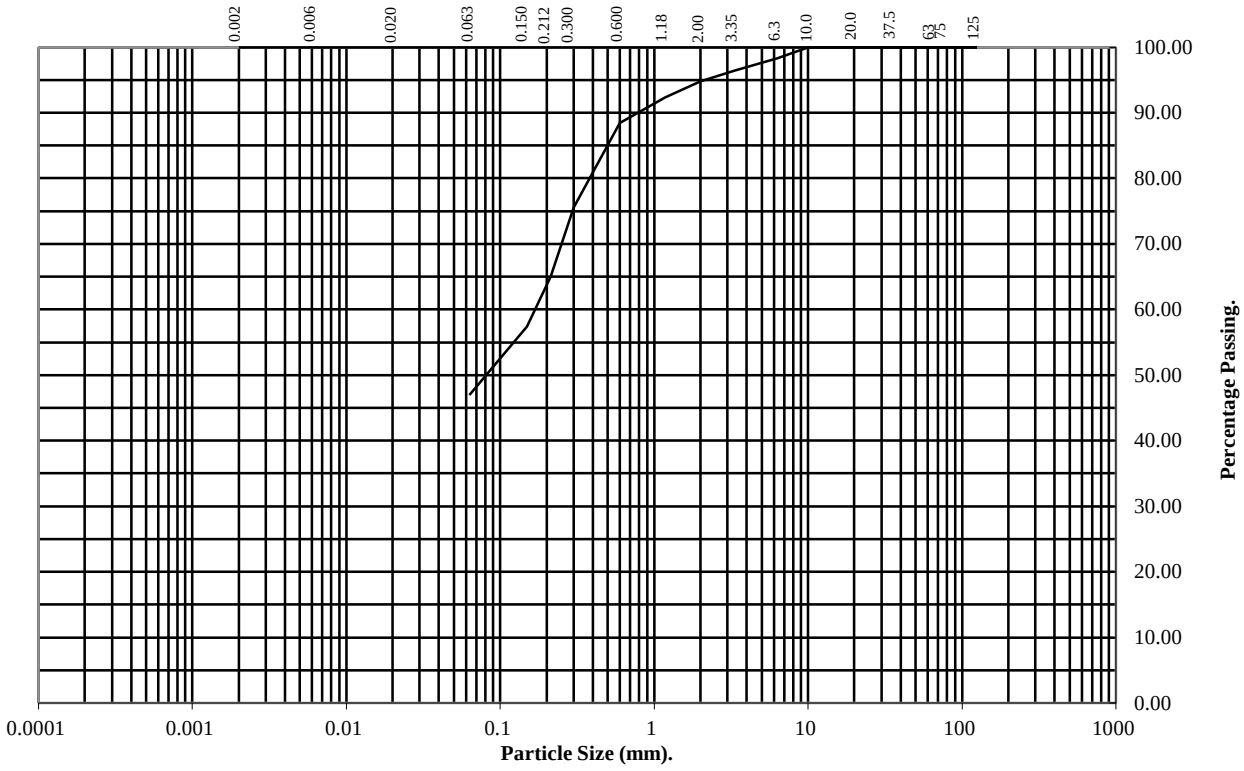
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WBH110** **Top Depth (m):** **1.50**

Sample Number: **Base Depth(m):**

Sample Type: **D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	98
3.35	96
2	95
1.18	92
0.6	88
0.3	76
0.212	65
0.15	57
0.063	47

Soil Fraction	Total Percentage
Cobbles	0
Gravel	5
Sand	48
Silt/Clay	47

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

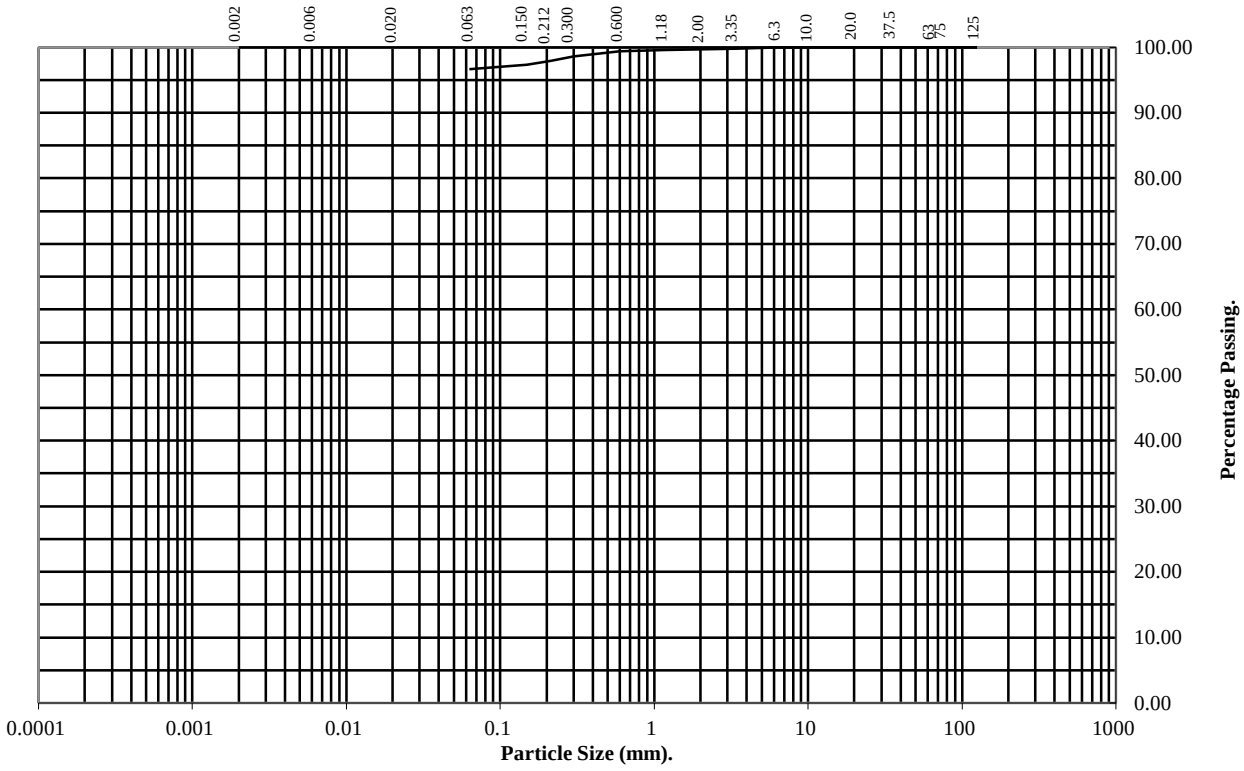
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WBH110** **Top Depth (m):** **17.50**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	99
0.3	99
0.212	98
0.15	97
0.063	97

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	3
Silt/Clay	97

Remarks:

See Summary of Soil Descriptions

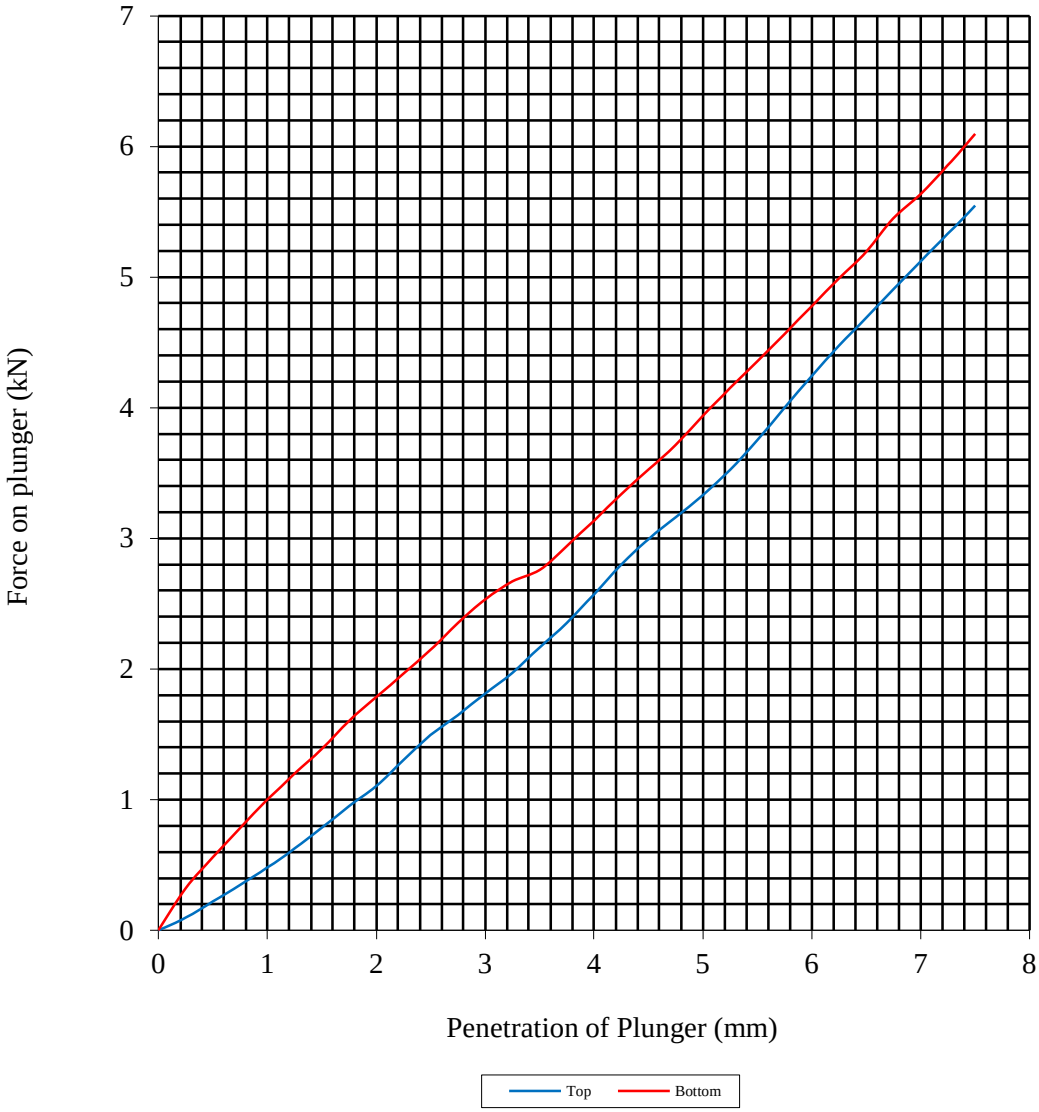
CALIFORNIA BEARING RATIO TEST

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: WBH110 **Top Depth (m):** 0.20

Sample Number: **Base Depth (m):** 0.80

Sample Type: AMAL



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	9.5	Surcharge Kg:	4.20	Sample Top	14	Sample Top	16.7
Bulk Density Mg/m3:	2.03	Soaking Time hrs	96	Sample Bottom	12	Sample Bottom	19.7
Dry Density Mg/m3:	1.85	Swelling mm:	2.88	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			27				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

Contract No: PSL22/7853

Client Ref: WIE17469

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

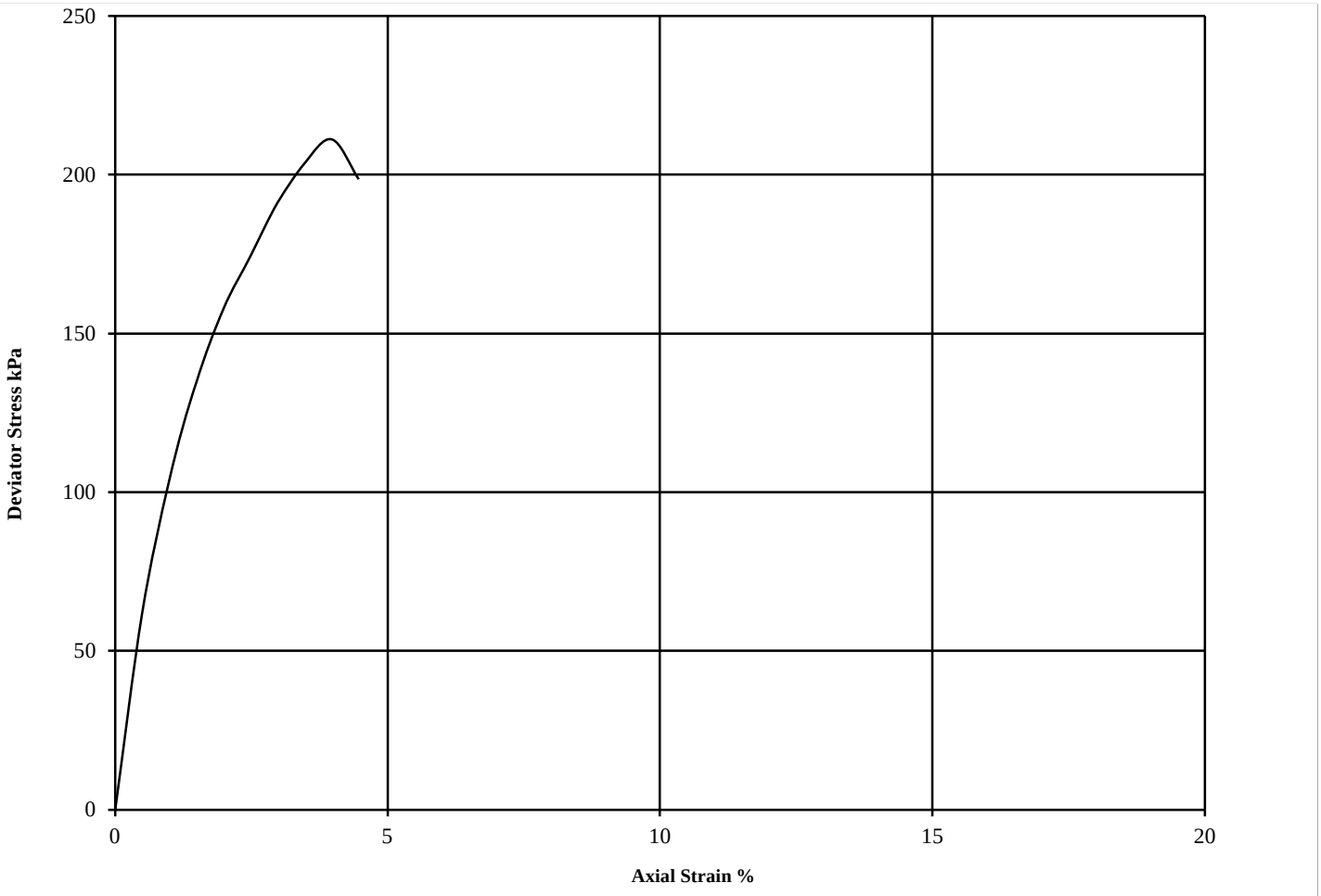
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **WBH110** **Top Depth (m):** **7.50**

Sample Number: **Base Depth (m):**

Sample Type **U**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) $_3$	Corr. Max. Deviator Stress (kPa) $(_1 \ _3)_f$	Shear Strength Cu (kPa) $^1/_2(_1 \ _3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	29	1.91	1.48	150	211	106	4.0	Brittle	See summary of soil descriptions

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

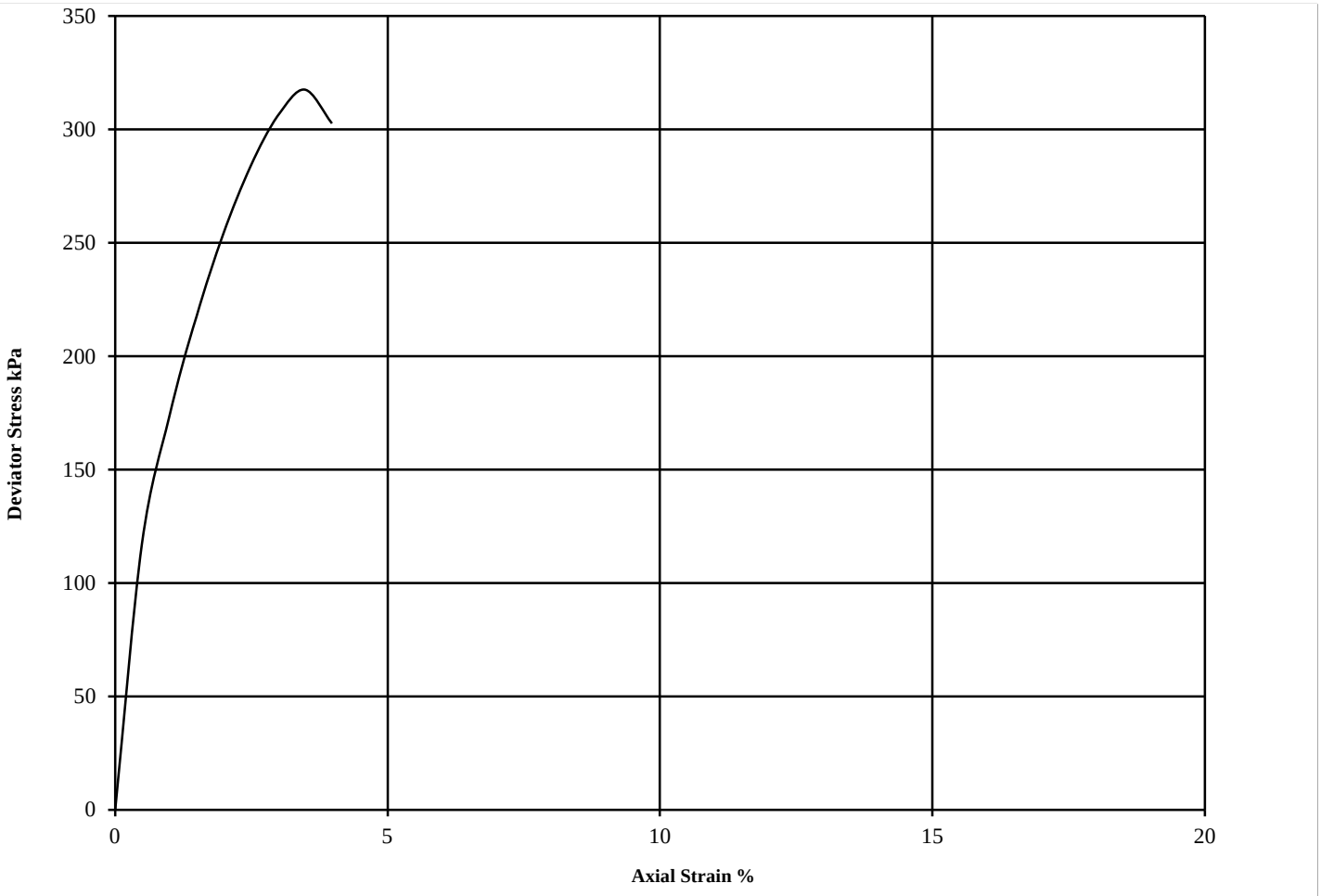
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **WBH110** **Top Depth (m):** **16.50**

Sample Number: **Base Depth (m):**

Sample Type **U**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) $_3$	Corr. Max. Deviator Stress (kPa) $(_1 \ _3)_f$	Shear Strength Cu (kPa) $^1/_2(_1 \ _3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	27	1.90	1.49	330	318	159	3.5	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7853
Client Ref:
WIE17469

ONE DIMENSIONAL CONSOLIDATION TEST

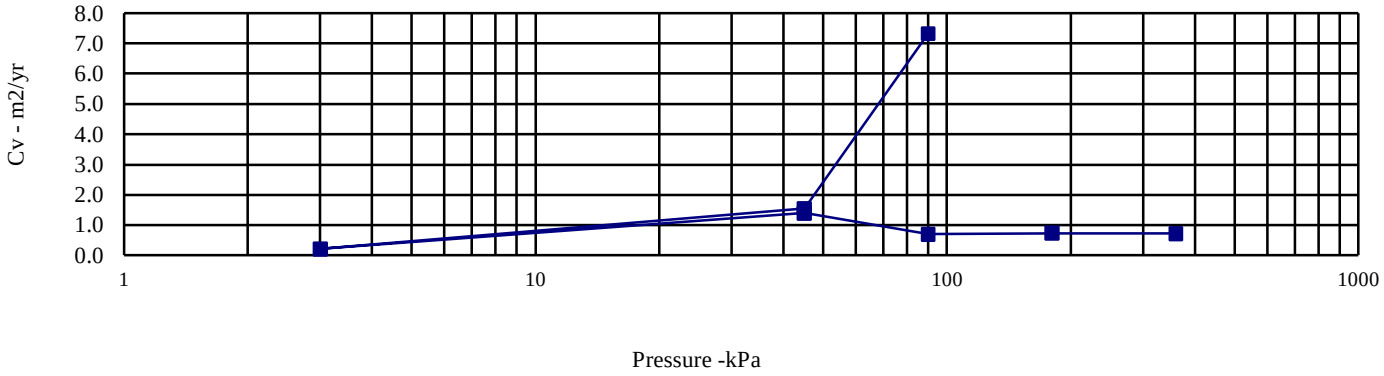
BS 1377: Part 5: 1990: Clause 3

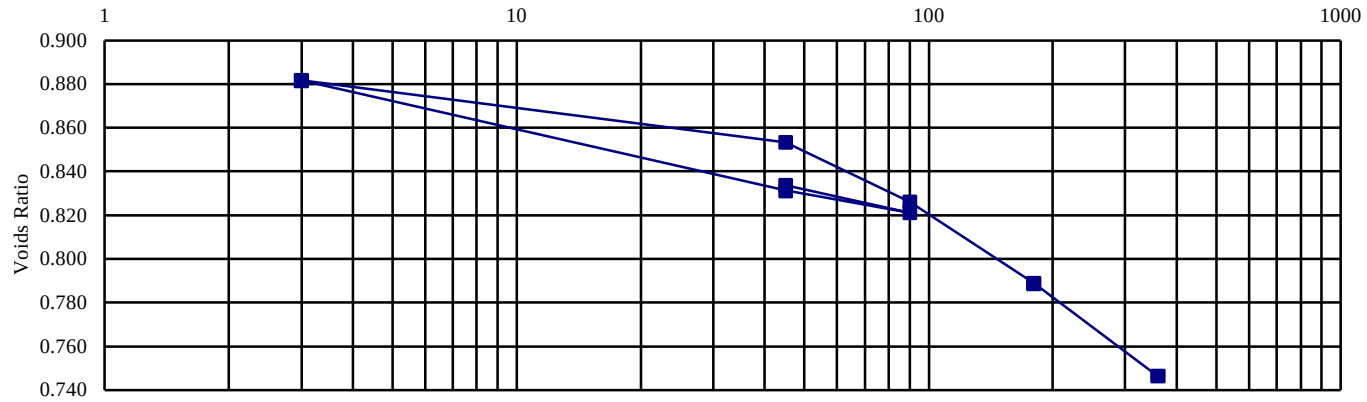
Hole Number: **WBH110** **Top Depth (m):** **4.50**

Sample Number: **Base Depth (m) :**

Sample Type: **U**

Initial Conditions		Pressure Range kPa		Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	31						
Bulk Density (Mg/m3):	1.89	0	45	Swelling	Swelling	Method used to	
Dry Density (Mg/m3):	1.44	45	90	0.152	7.324	determine CV:	T90
Voids Ratio:	0.843	90	45	0.122	1.539	Nominal temperature	
Degree of saturation:	97.8	45	3	0.655	0.210	during test ' C:	20
Height (mm):	20.022	3	45	0.358	1.387	Remarks:	
Diameter (mm)	75.013	45	90	0.327	0.694	See summary of soil descriptions	
Particle Density (Mg/m3):	2.65	90	180	0.227	0.729		
Assumed		180	360	0.131	0.711		





4043

Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7853
Client Ref:
WIE17469

Certificate of Analysis

Certificate Number	22-26375	*Issued:*	23-Dec-22

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference	22-26375
Client Reference	PSL22/7853
Order No	(not supplied)
Contract Title	WIE17469: Project Otter
Description	2 Soil samples.
Date Received	19-Dec-22
Date Started	19-Dec-22
Date Completed	23-Dec-22
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 22-26375
Client Ref PSL22/7853
Contract Title WIE17469: Project Otter

			Lab No	2101342	2101343
			.Sample ID	WBH110	WBH110
			Depth	11.50	21.00
			Other ID		
			Sample Type	B	D
			Sampling Date	n/s	n/s
			Sampling Time	n/s	n/s
Test	Method	LOD	Units		
Metals					
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	< 10	< 10
Inorganics					
pH	DETSC 2008#		pH	8.0	8.3
Chloride Aqueous Extract	DETSC 2055	1	mg/l	20	10
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	< 1.0	< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	150	21
Sulphur as S, Total	DETSC 2320	0.01	%	0.29	0.29
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.25	0.22

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 22-26375
Client Ref PSL22/7853
Contract WIE17469: Project Otter

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2101342	WBH110 11.50 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Metals ICP Prep (182 days), pH + Conductivity (7 days)	
2101343	WBH110 21.00 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Metals ICP Prep (182 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

LABORATORY REPORT

4043

Contract Number: PSL22/7317

Report Date:	19 December 2022
Client's Reference:	WIE17469-WBH111
Client Name:	Groundtech Consulting First Floor Lloyd House Orford Court Greenfold Way WN7 3XJ
For the attention of:	**Michael Berry**
Contract Title:	Project Otter
Date Received:	14/11/2022
Date Commenced:	14/11/2022
Date Completed:	14/12/2022
Notes:	**Opinions and Interpretations are outside the UKAS Accreditation**

Checked and Approved Signatories:

A Watkins (Director)

[redacted]

R Berriman (Quality Manager)

S Royle (Laboratory Manager)

L Knight (Assistant Laboratory Manager)

S Eyre (Senior Technician)

T Watkins (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WBH111		B	0.50		Grey slightly gravelly sandy CLAY.
WBH111		D	1.20		Grey sandy CLAY.
WBH111		U	2.50		Stiff brown mottled grey slightly sandy CLAY.
WBH111		U	16.50		Brown slightly sandy CLAY.
WBH111		U	19.50		Stiff brown slightly sandy CLAY.
WBH111		D	20.00		Brown mottled grey slightly sandy CLAY.
WBH111		U	25.50		Brown slightly sandy CLAY.
WBH111		U	34.50		Very stiff brown slightly sandy CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WBH111		D	1.20		22			45	23	22	100	Intermediate Plasticity CI
WBH111		D	20.00		28			77	32	45	100	Very High Plasticity CV

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

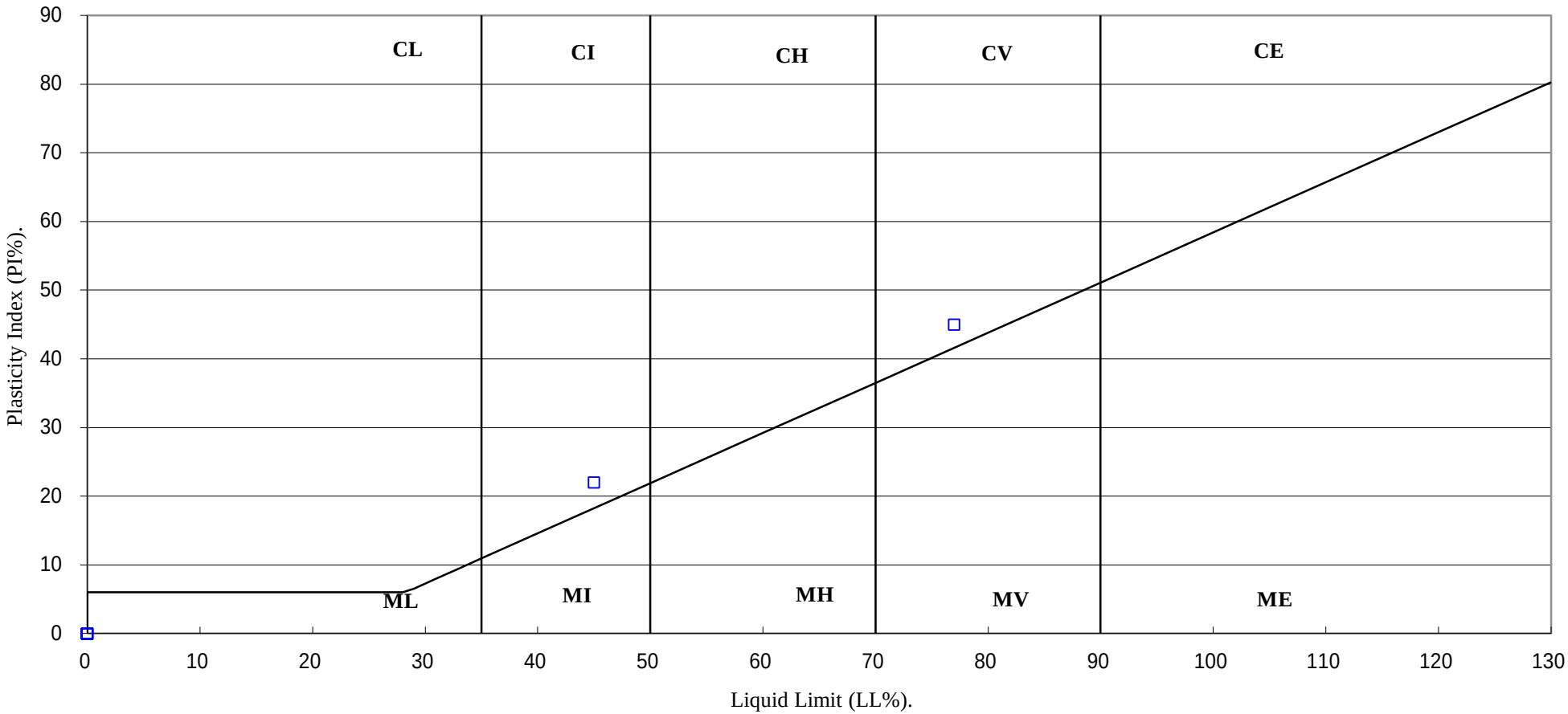
Contract No:

PSL22/7317

Client Ref:

WIE7469

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Project Otter**	**Contract No:**
			PSL22/7317
			Client Ref:
			WIE7469

PARTICLE SIZE DISTRIBUTION TEST

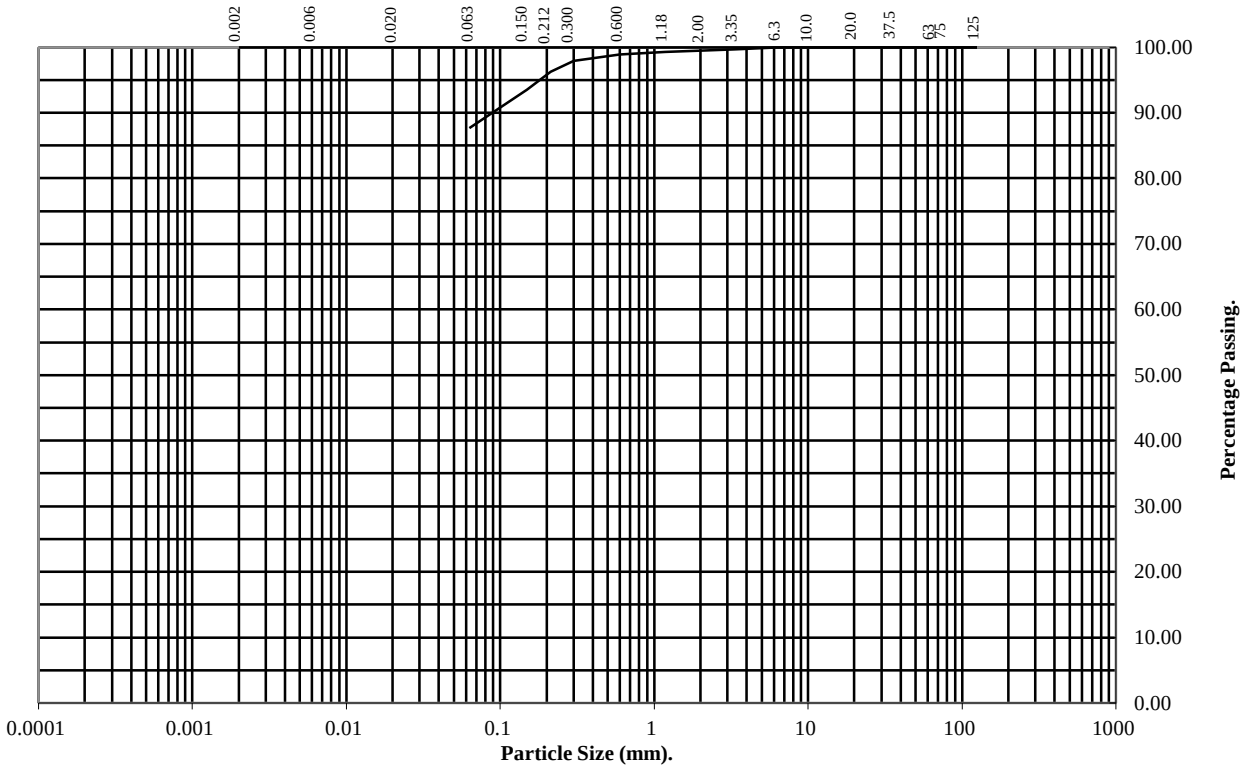
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WBH111** **Top Depth (m):** **1.20**

Sample Number: **Base Depth(m):**

Sample Type: **D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	99
0.6	99
0.3	98
0.212	96
0.15	93
0.063	88

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	12
Silt/Clay	88

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

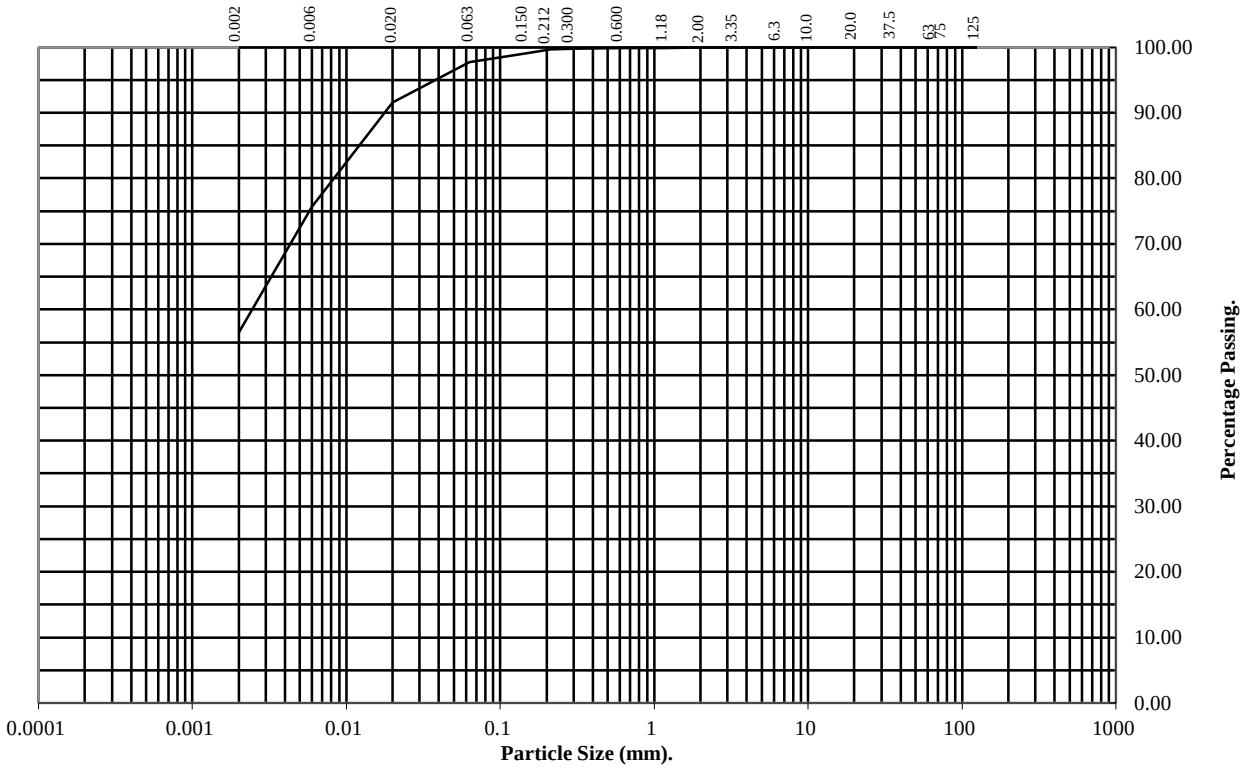
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **WBH111** **Top Depth (m):** **20.00**

Sample Number: **Base Depth(m):**

Sample Type: **D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	100
0.3	100
0.212	100
0.15	99
0.063	98

Particle Diameter	Percentage Passing
0.02	92
0.006	76
0.002	57

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	2
Silt	41
Clay	57

Remarks:
See Summary of Soil Descriptions

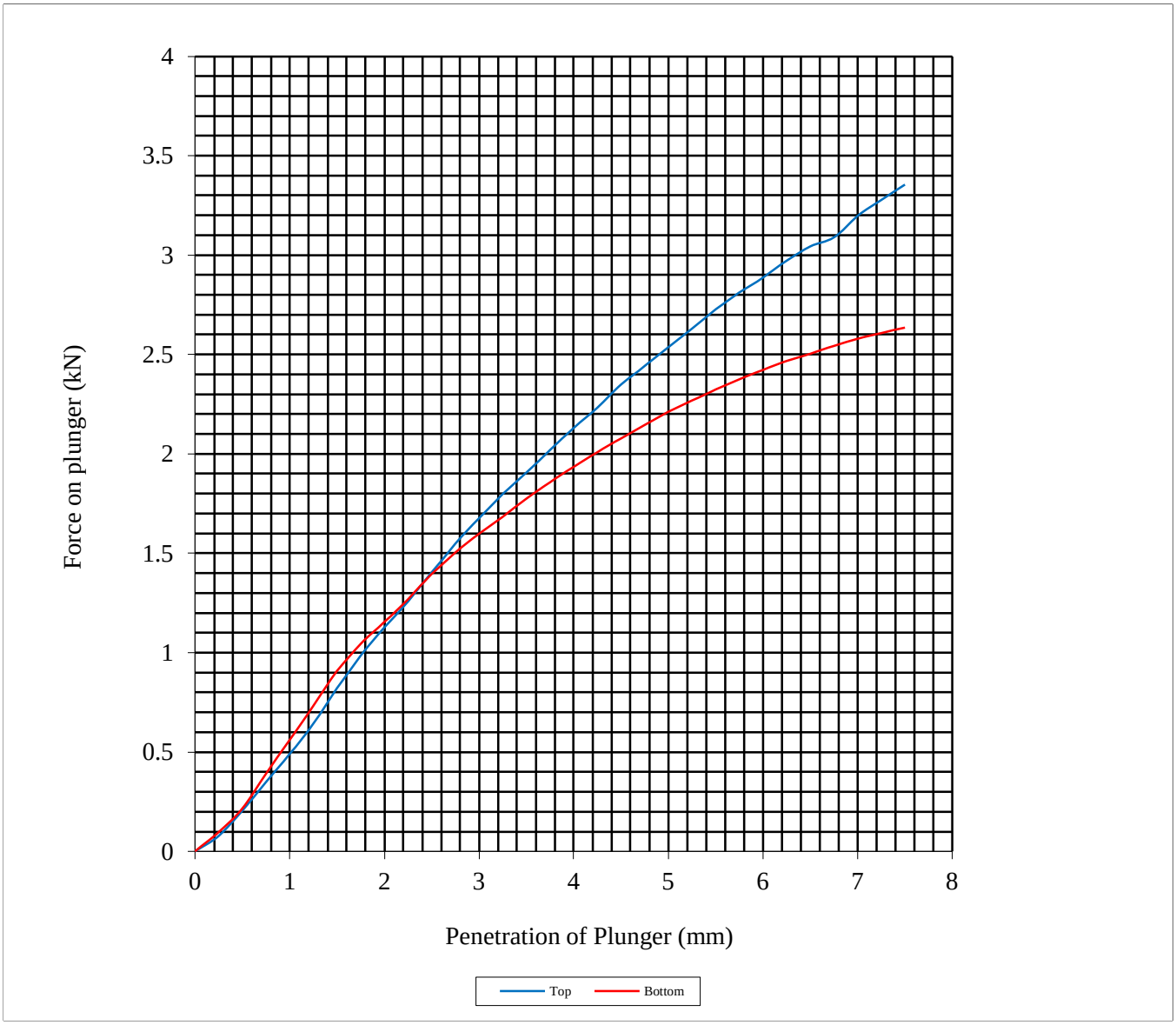
CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number: WBH111 **Top Depth (m):** 0.50

Sample Number: **Base Depth (m):**

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	21	Surcharge Kg:	4.00	Sample Top	21	Sample Top	12.7
Bulk Density Mg/m3:	2.00	Soaking Time hrs	0	Sample Bottom	21	Sample Bottom	11.1
Dry Density Mg/m3:	1.66	Swelling mm:	0	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			0				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

Contract No: PSL22/7317

Client Ref: WIE17469

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

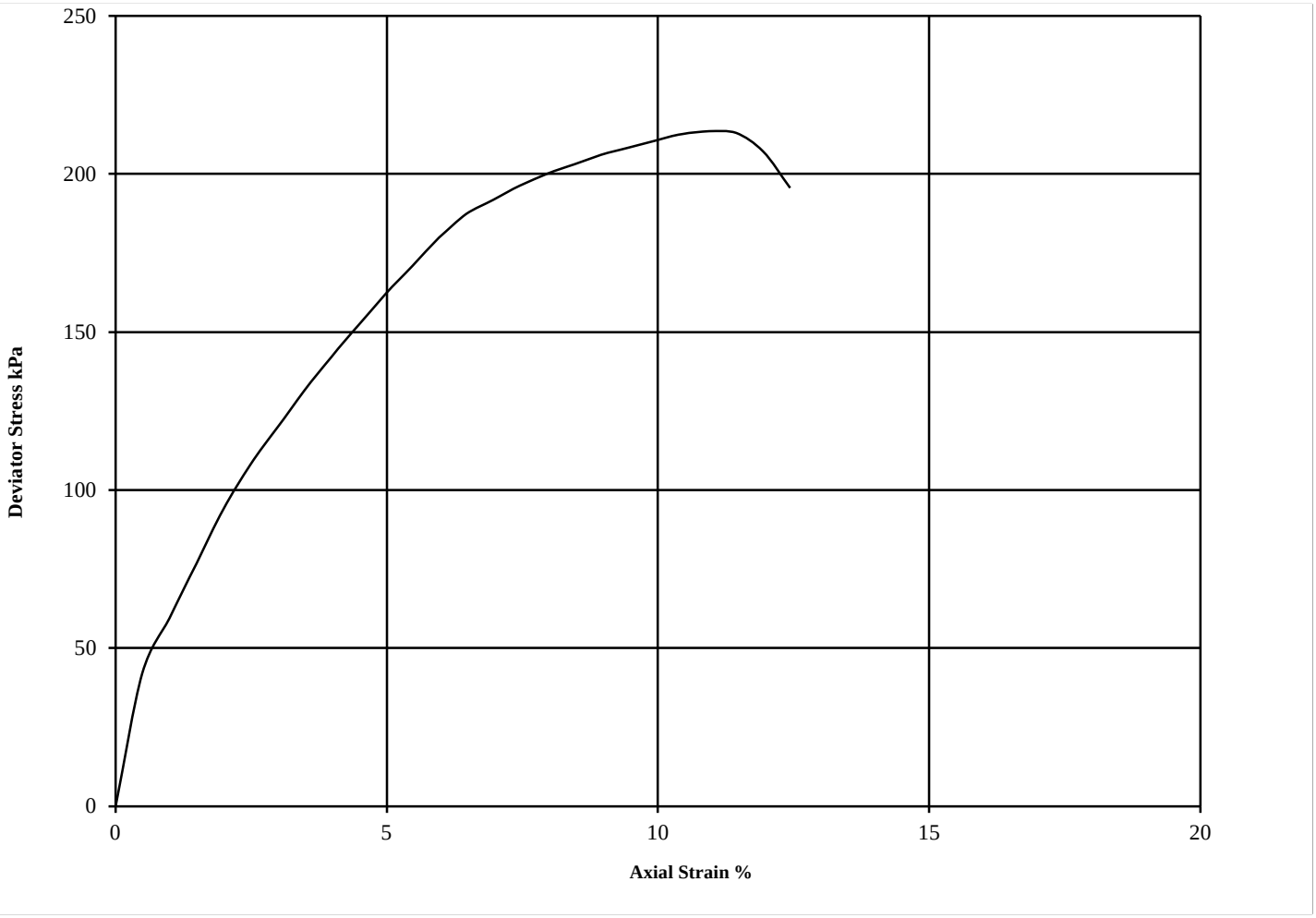
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **WBH111** **Top Depth (m):** **2.50**

Sample Number: **Base Depth (m):**

Sample Type **U**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) $_3$	Corr. Max. Deviator Stress (kPa) $(_1 \ _3)_f$	Shear Strength Cu (kPa) $^1/_2(_1 \ _3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.35
1	27	1.97	1.56	50	214	107	10.9	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7317
Client Ref:
WIE17469

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

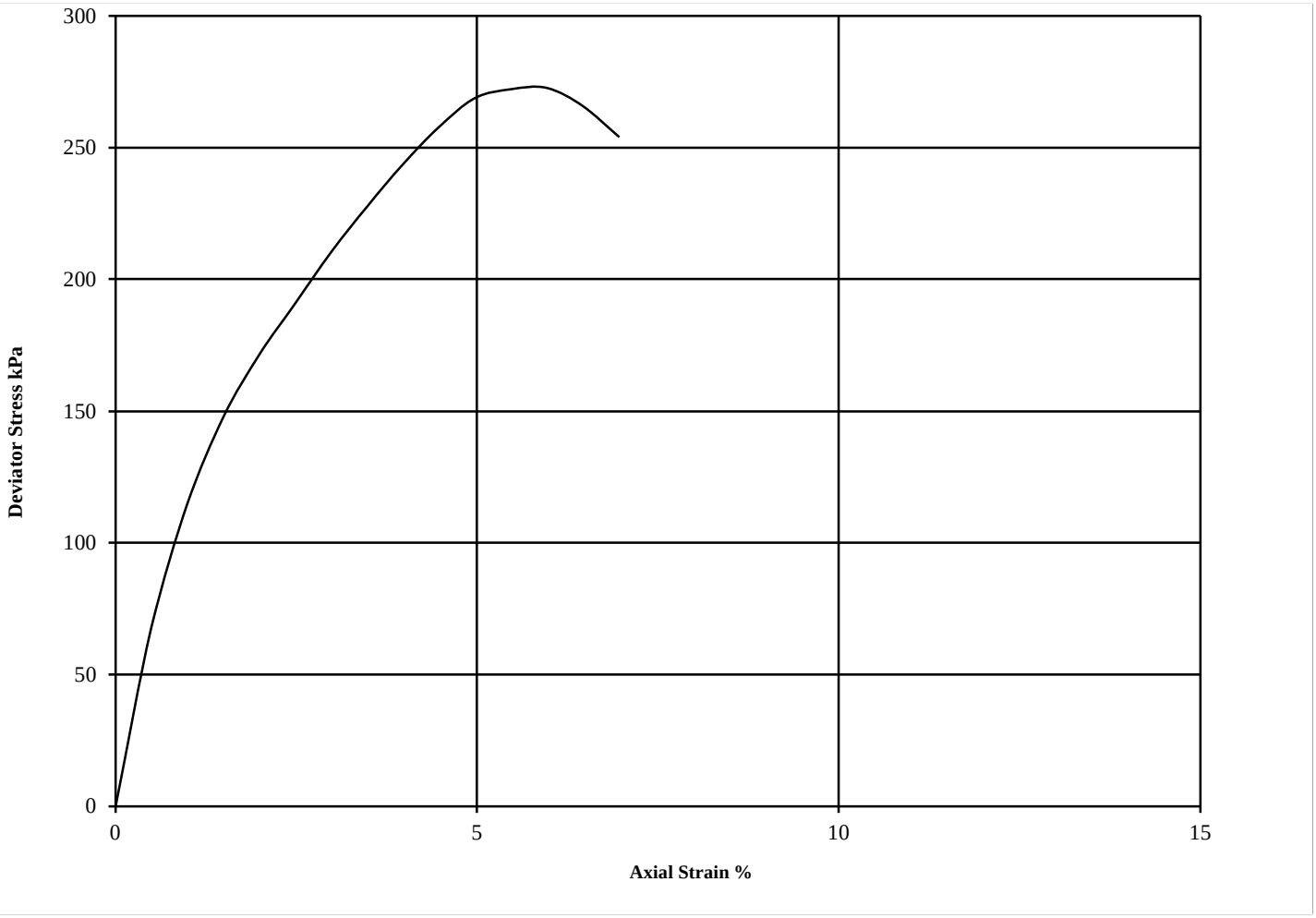
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **WBH111** **Top Depth (m):** **19.50**

Sample Number: **Base Depth (m):**

Sample Type **U**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) σ_3	Corr. Max. Deviator Stress (kPa) $(\sigma_1 - \sigma_3)_f$	Shear Strength Cu (kPa) $^1/_2(\sigma_1 - \sigma_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	28	1.94	1.51	390	273	136	6.0	Brittle	See summary of soil descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Project Otter**	**Contract No:** PSL22/7317 **Client Ref:** WIE17469

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

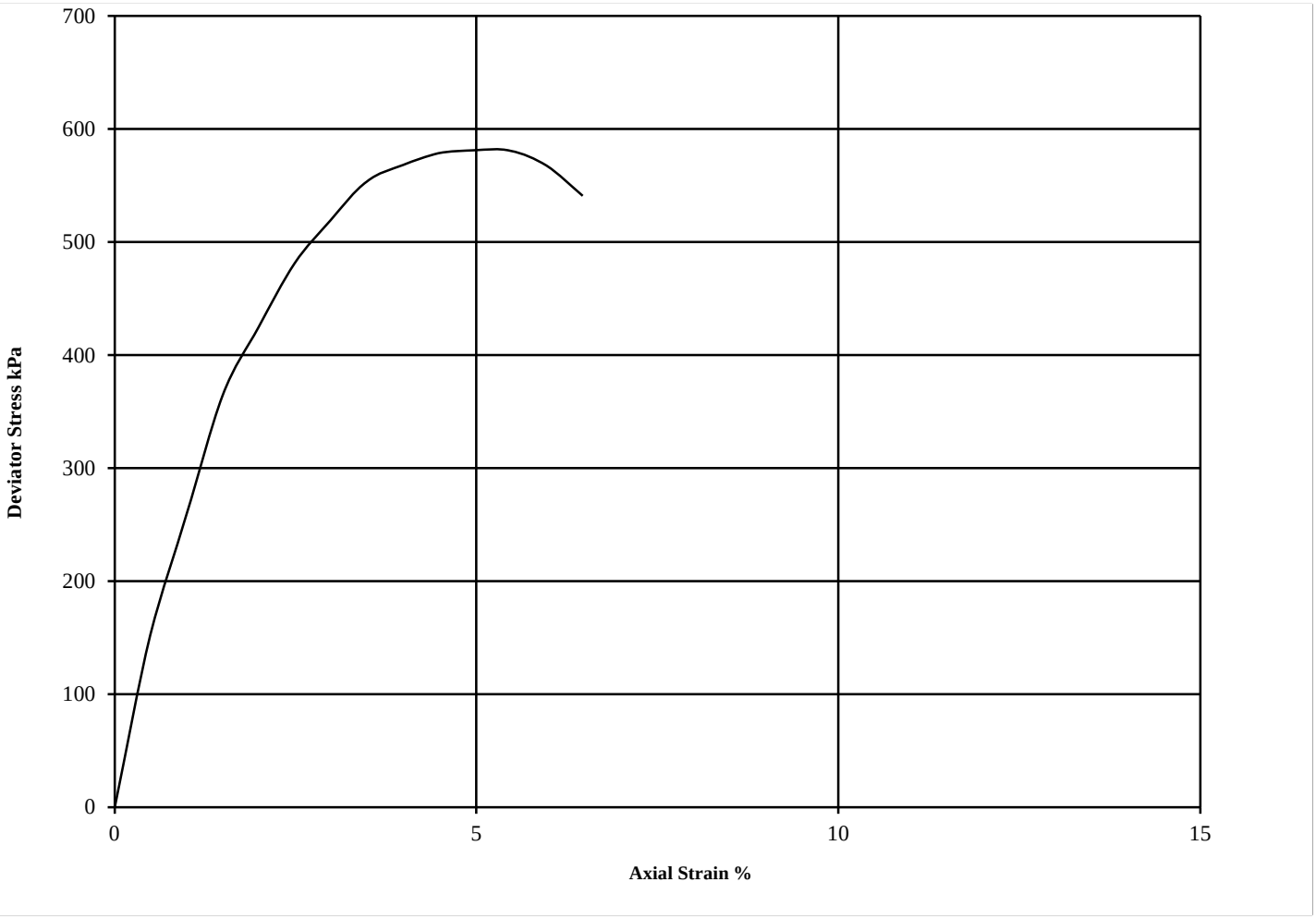
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **WBH111** **Top Depth (m):** **34.50**

Sample Number: **Base Depth (m):**

Sample Type **U**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) σ_3	Corr. Max. Deviator Stress (kPa) $(\sigma_1 - \sigma_3)_f$	Shear Strength Cu (kPa) $\frac{1}{2}(\sigma_1 - \sigma_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	27	1.93	1.53	690	581	291	5.0	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7317
Client Ref:
WIE17469

ONE DIMENSIONAL CONSOLIDATION TEST

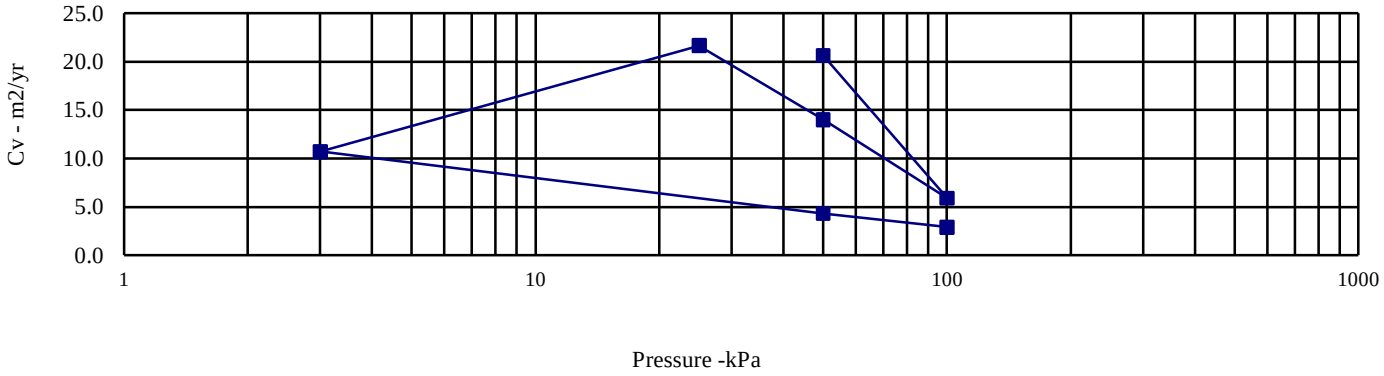
BS 1377: Part 5: 1990: Clause 3

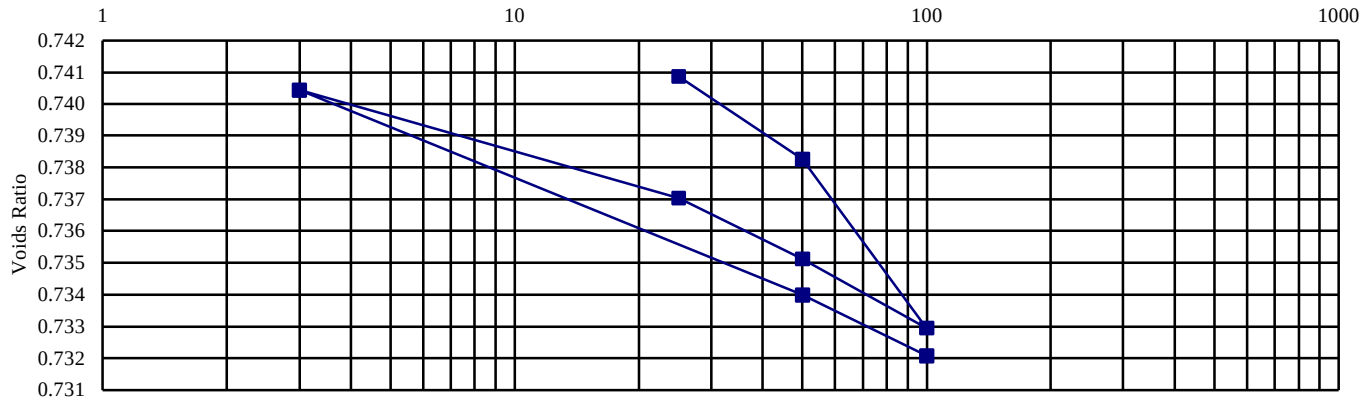
Hole Number: **WBH111** **Top Depth (m):** **2.50**

Sample Number: **Base Depth (m) :**

Sample Type: **U**

Initial Conditions		Pressure Range kPa		Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	28						
Bulk Density (Mg/m3):	1.95	0	25	Swelling	Swelling	Method used to	
Dry Density (Mg/m3):	1.52	25	50	0.060	20.641	determine CV:	T90
Voids Ratio:	0.742	50	100	0.061	5.882	Nominal temperature	
Degree of saturation:	101.1	100	50	0.025	13.999	during test ' C:	20
Height (mm):	20.018	50	25	0.044	21.667	Remarks:	
Diameter (mm)	75.018	25	3	0.089	10.683	See summary of soil descriptions	
Particle Density (Mg/m3):	2.65	3	50	0.079	4.322		
Assumed		50	100	0.022	2.883		





UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7317
Client Ref:
WIE17469

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
WBH111	37.50		A	Perp	100	45	4500	5729.58	75.69	-	1.08	0.19	1.205	0.23	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7317
Client Ref:
WIE17469

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
WBH111	37.50		D	Par	-	100	10000	100.00	-	0.78	0.078	1.366	0.11	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043 / PSL Professional Soils Laboratory	**Project Otter**	**Contract No:** PSL22/7317 **Client Ref:** WIE17469

Certificate of Analysis

Certificate Number	22-25495	*Issued:*	16-Dec-22

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference	22-25495
Client Reference	PSL22/7317
Order No	(not supplied)
Contract Title	WIE17469:PROJECT Otter
Description	2 Soil samples.
Date Received	09-Dec-22
Date Started	09-Dec-22
Date Completed	16-Dec-22
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 22-25495
Client Ref PSL22/7317
Contract Title WIE17469:PROJECT Otter

			Lab No	2096411	2096412
			.Sample ID	WBH111	WBH111
			Depth	2.00	21.50
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	11/11/2022	23/11/2022
			Sampling Time	n/s	n/s
Test	Method	LOD	Units		
Metals					
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	< 10	11
Inorganics					
pH	DETSC 2008#		pH	8.1	8.2
Chloride Aqueous Extract	DETSC 2055	1	mg/l	29	8.0
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	2.6	< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	45	220
Sulphur as S, Total	DETSC 2320	0.01	%	0.02	0.33
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.07	0.26

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 22-25495
Client Ref PSL22/7317
Contract WIE17469:PROJECT Otter

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2096411	WBH111 2.00 SOIL	11/11/22	PT 500ml	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2096412	WBH111 21.50 SOIL	23/11/22	PT 500ml	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

LABORATORY REPORT

4043

Contract Number: PSL22/7303

Report Date: 07 December 2022

Client's Reference: WIE17469-WBH112

Client Name: Groundtech Consulting
First Floor
Lloyd House
Orford Court
Greenfold Way
WN7 3XJ

For the attention of: Jamie Parr

Contract Title: Project Otter

Date Received: 14/11/2022
Date Commenced: 14/11/2022
Date Completed: 7/12/2022

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

A Watkins (Director)

R Berriman (Quality Manager)

S Royle (Laboratory Manager)

L Knight (Assistant Laboratory Manager)

S Eyre (Senior Technician)

T Watkins (Senior Technician)

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Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WBH112		B	0.40		Brown very sandy silty GRAVEL.
WBH112		U	3.50		Soft white structureless CHALK.
WBH112		D	4.50		Brown mottled grey slightly gravelly slightly sandy CLAY.
WBH112		U	10.50		Stiff brown mottled grey slightly sandy CLAY.
WBH112		D	11.00		Brown mottled grey slightly sandy CLAY.
WBH112		U	22.50		Very stiff grey slightly sandy CLAY.
WBH112		D	23.00		Grey slightly sandy CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WBH112		D	4.50		26							
WBH112		D	11.00		27			72	30	42	100	Very High Plasticity CV
WBH112		D	23.00		28			77	32	45	100	Very High Plasticity CV

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

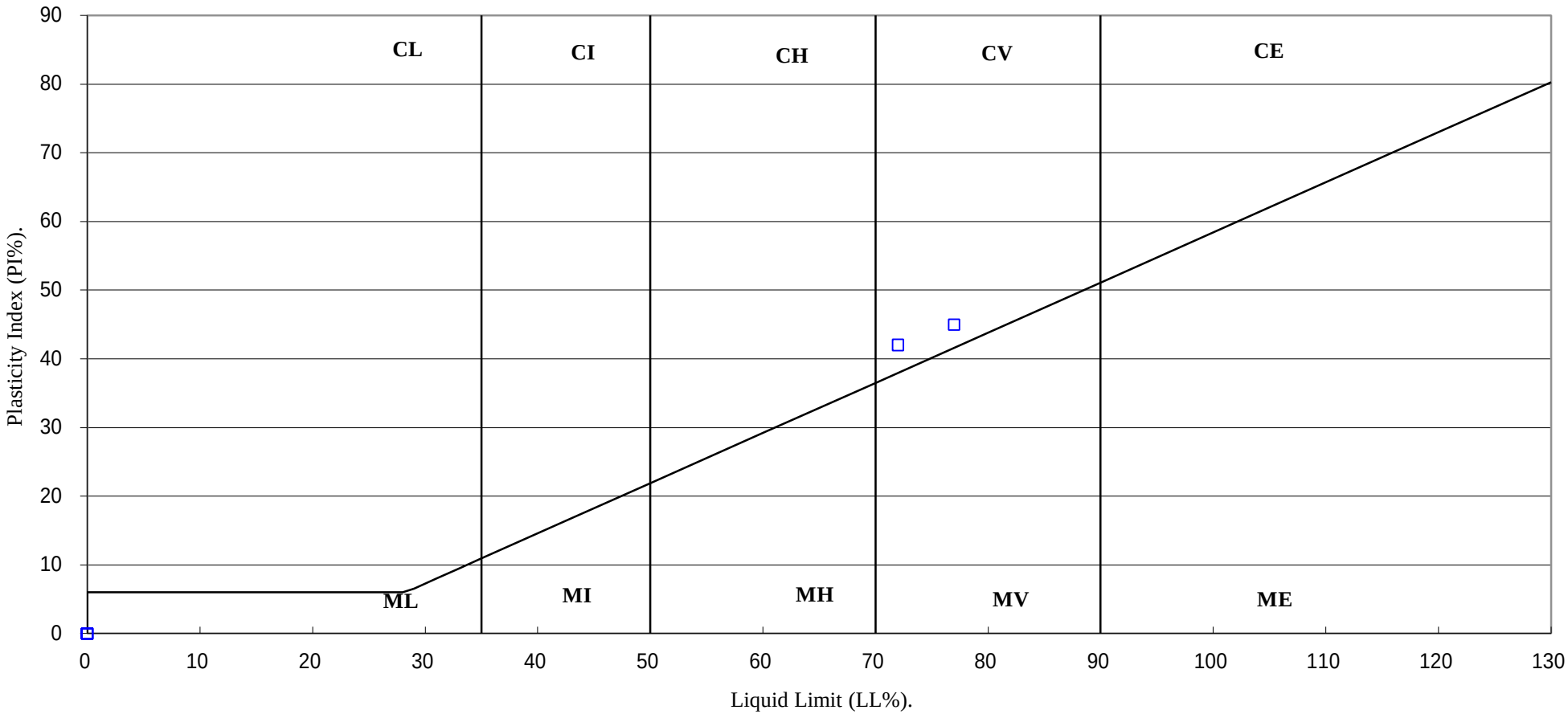
Contract No:

PSL22/7303

Client Ref:

WIE17469

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Project Otter**	**Contract No:**
			PSL22/7303
			Client Ref:
			WIE17469

PARTICLE SIZE DISTRIBUTION TEST

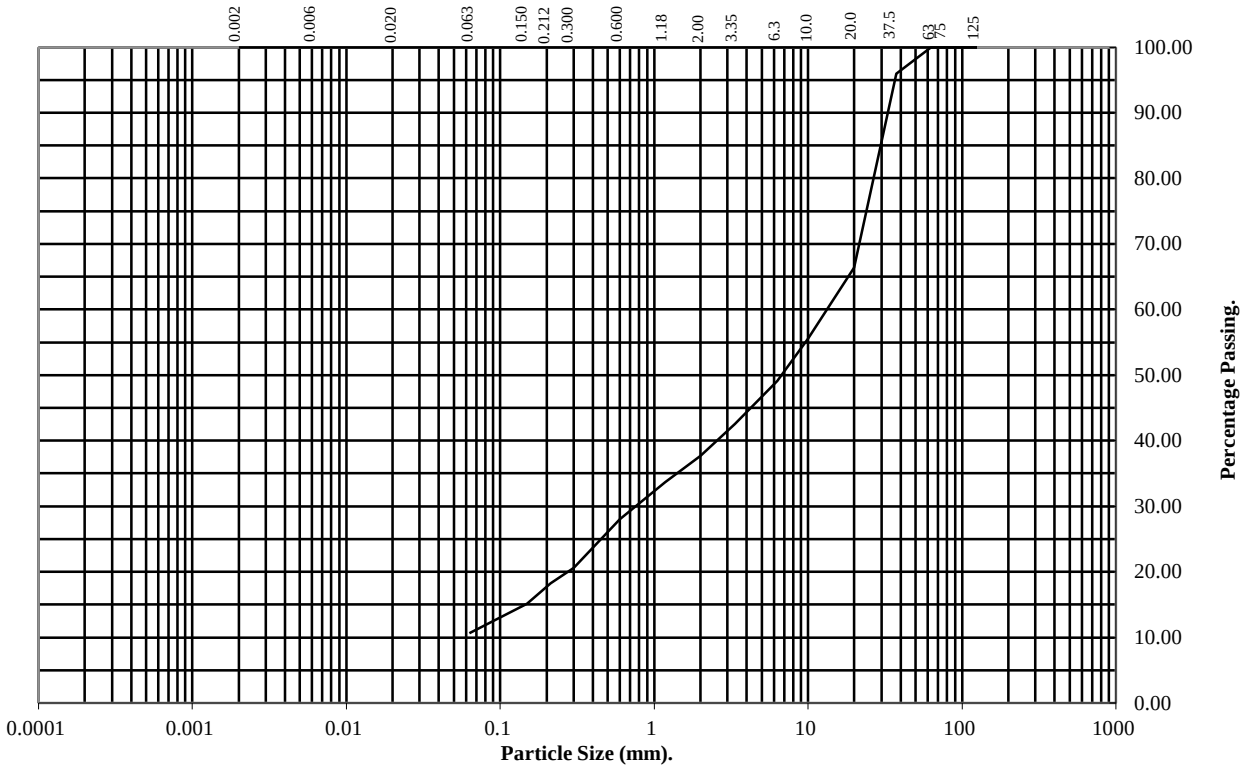
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WBH112** **Top Depth (m):** **0.40**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	96
20	66
10	56
6.3	49
3.35	43
2	38
1.18	34
0.6	28
0.3	21
0.212	18
0.15	15
0.063	11

Soil Fraction	Total Percentage
Cobbles	0
Gravel	62
Sand	27
Silt/Clay	11

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

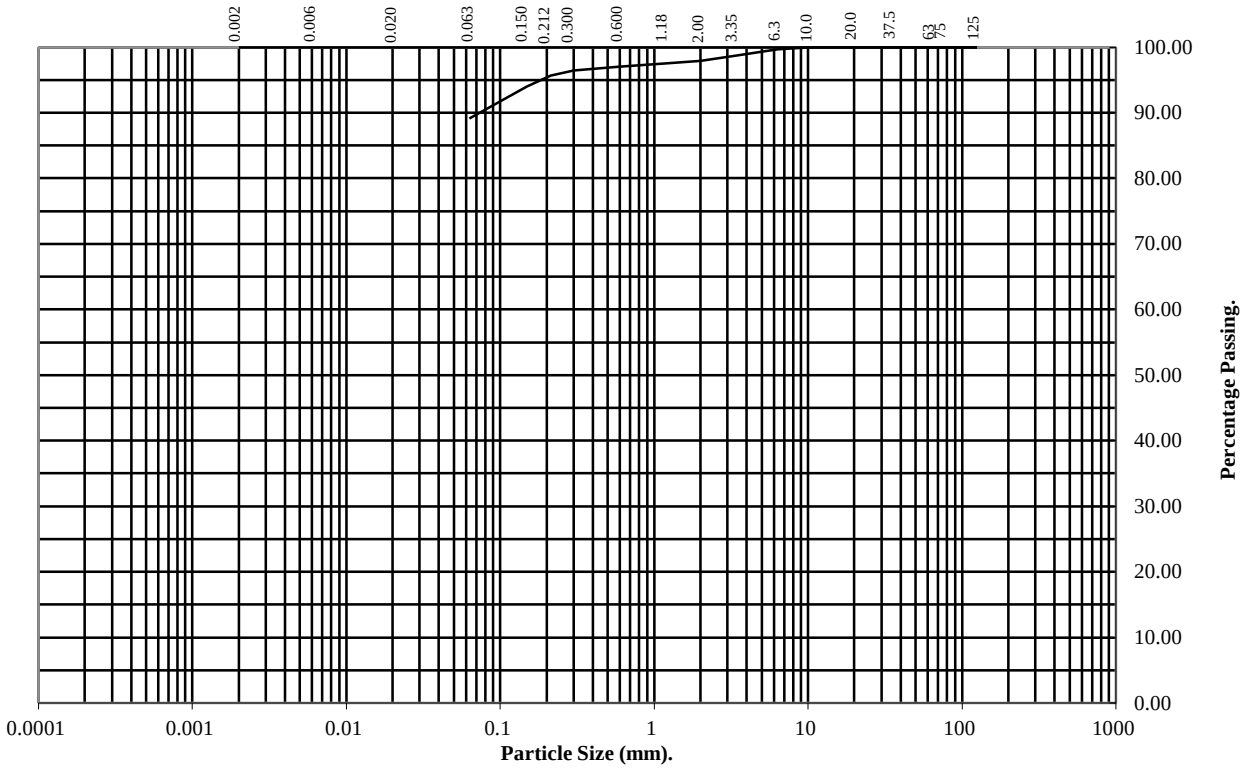
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WBH112** **Top Depth (m):** **4.50**

Sample Number: **Base Depth(m):**

Sample Type: **D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2	98
1.18	97
0.6	97
0.3	96
0.212	96
0.15	94
0.063	89

Soil Fraction	Total Percentage
Cobbles	0
Gravel	2
Sand	9
Silt/Clay	89

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

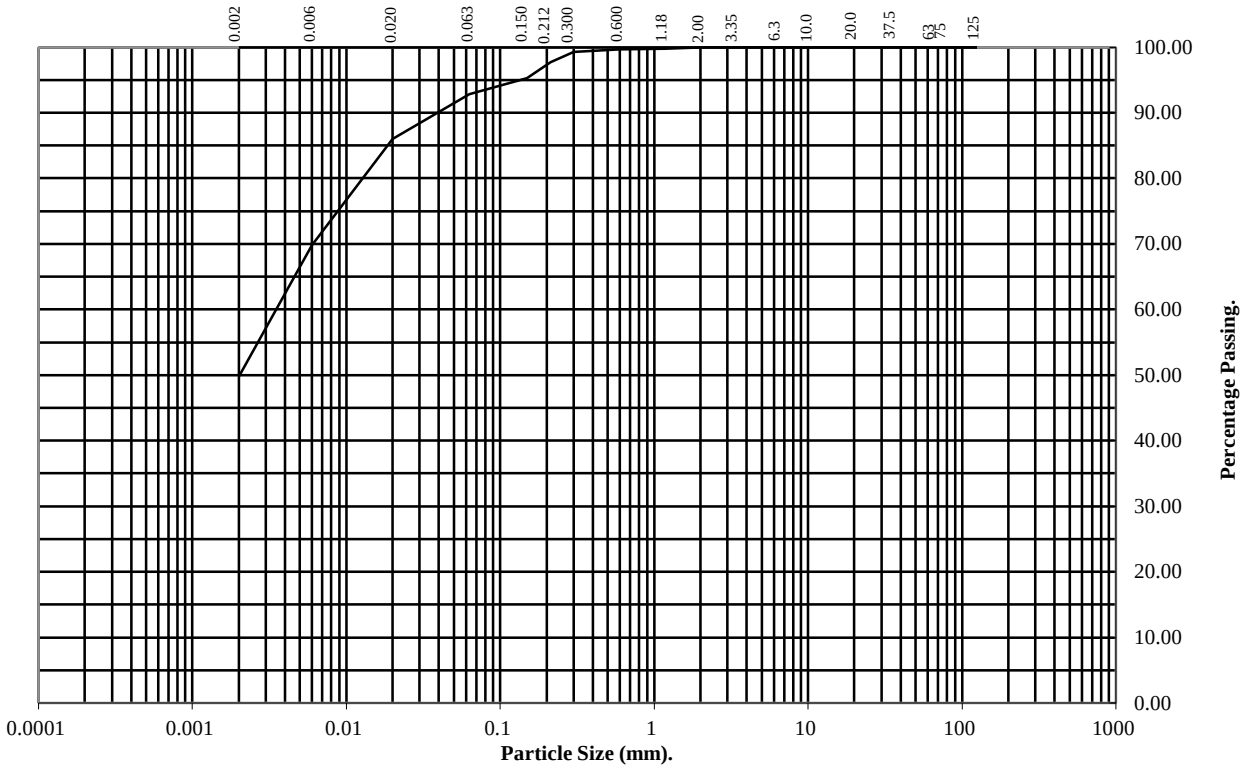
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **WBH112** **Top Depth (m):** **11.00**

Sample Number: **Base Depth(m):**

Sample Type: **D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	100
0.3	99
0.212	98
0.15	95
0.063	93

Particle Diameter	Percentage Passing
0.02	86
0.006	70
0.002	50

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	7
Silt	43
Clay	50

Remarks:
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

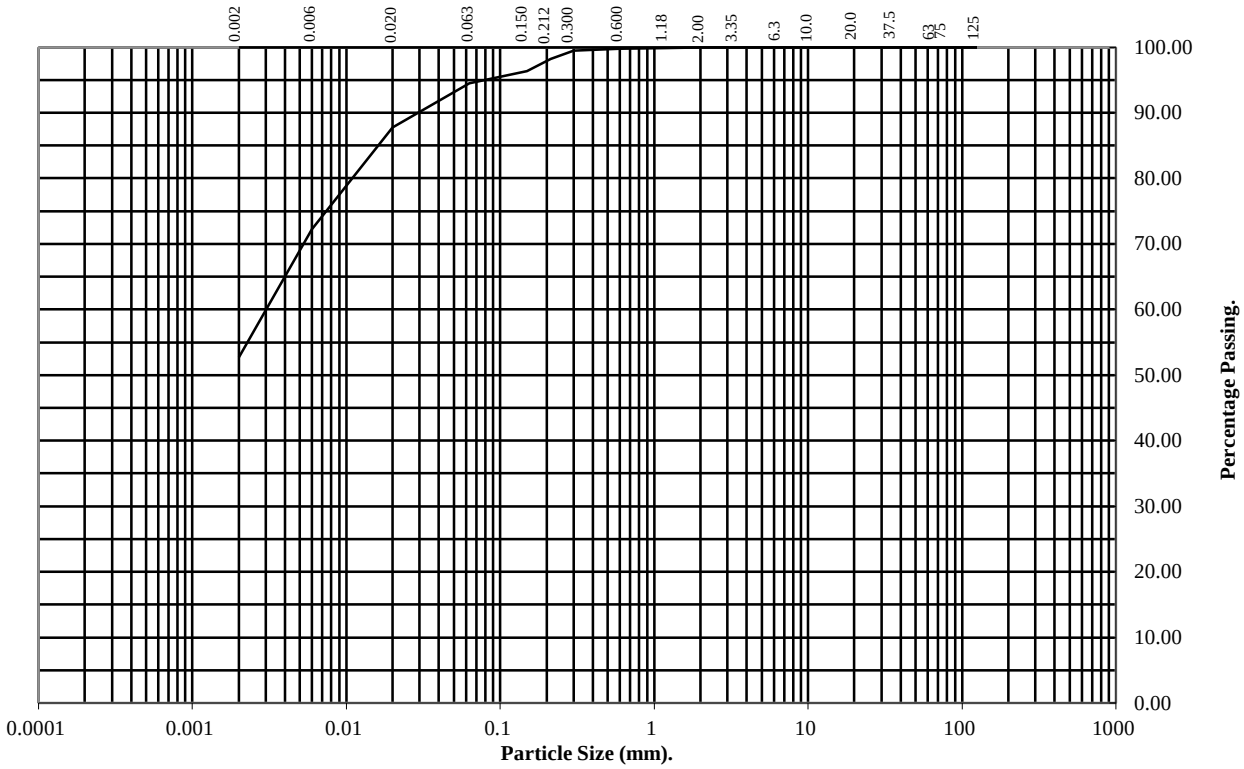
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **WBH112** **Top Depth (m):** **23.00**

Sample Number: **Base Depth(m):**

Sample Type: **D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	100
0.3	99
0.212	98
0.15	96
0.063	94

Particle Diameter	Percentage Passing
0.02	88
0.006	72
0.002	53

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	6
Silt	41
Clay	53

Remarks:
See Summary of Soil Descriptions

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

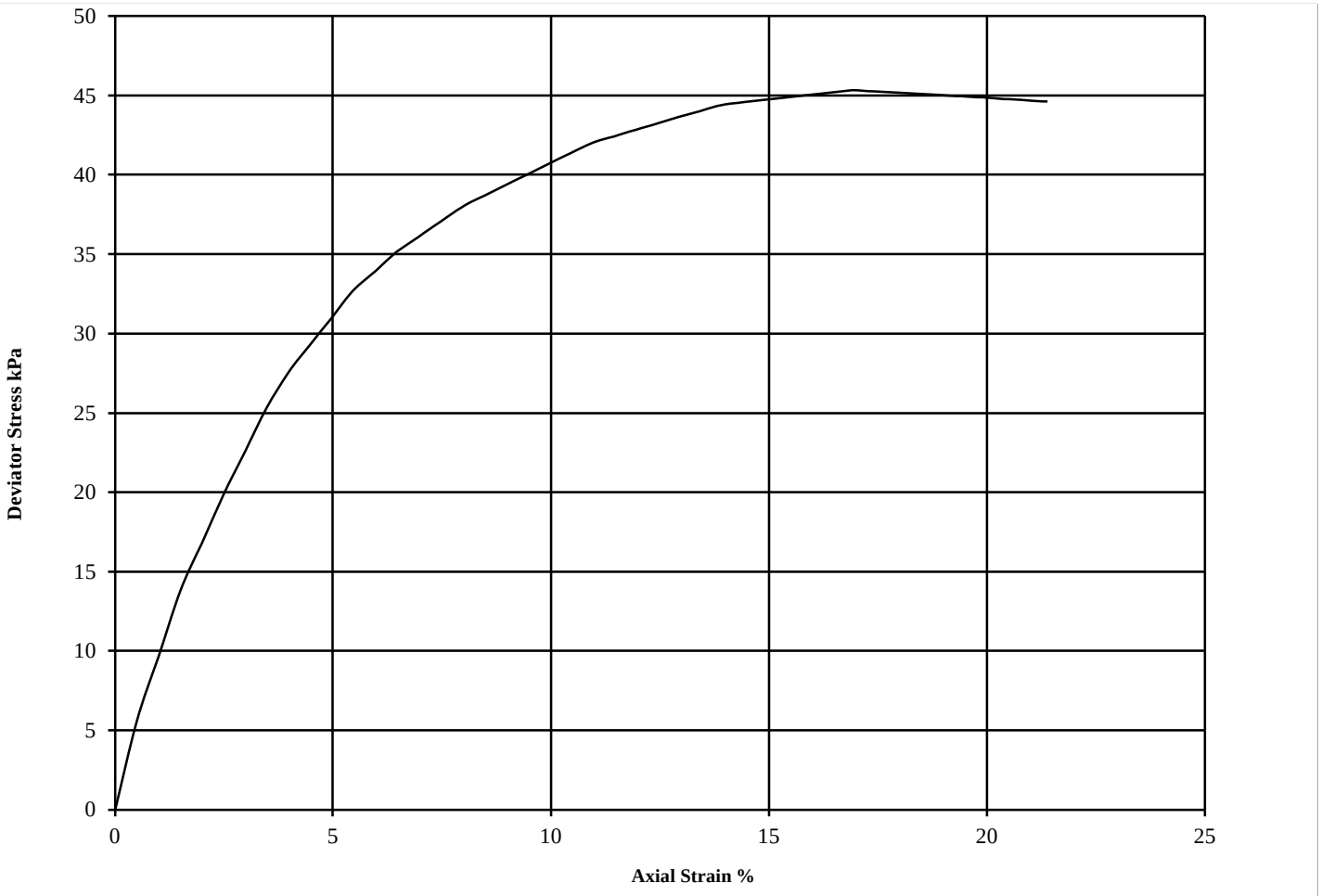
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **WBH112** **Top Depth (m):** **3.50**

Sample Number: **Base Depth (m):**

Sample Type **U**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) $_3$	Corr. Max. Deviator Stress (kPa) $(_1 \ _3)_f$	Shear Strength Cu (kPa) $^1/_2(_1 \ _3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.34
1	23	2.02	1.64	70	45	23	16.9	Plastic	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7303
Client Ref:
WIE17469

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

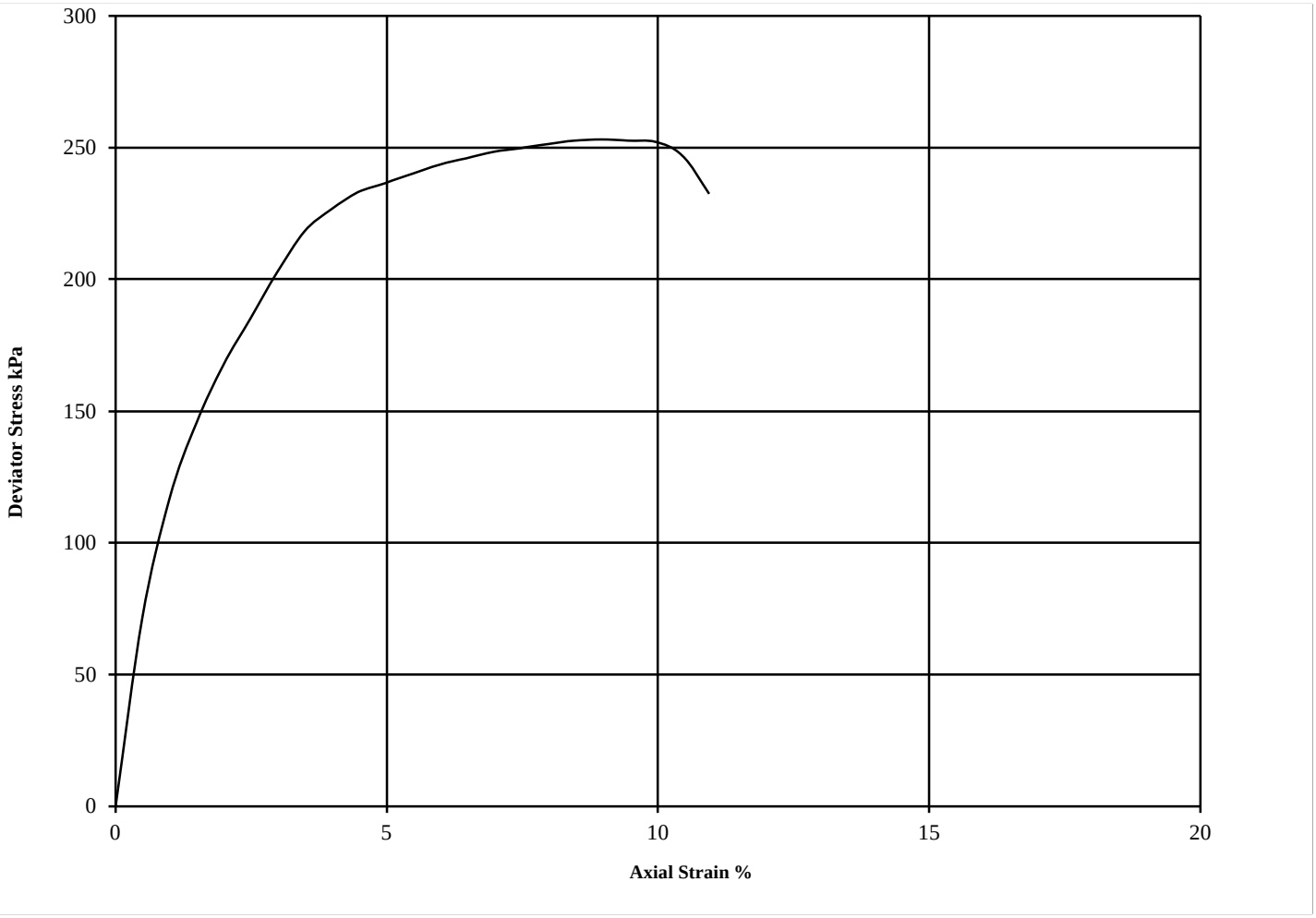
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **WBH112** **Top Depth (m):** **10.50**

Sample Number: **Base Depth (m):**

Sample Type **U**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) $_3$	Corr. Max. Deviator Stress (kPa) $(_1 \ _3)_f$	Shear Strength Cu (kPa) $^1/_2(_1 \ _3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.35
1	31	1.91	1.46	210	253	127	9.0	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Project Otter

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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

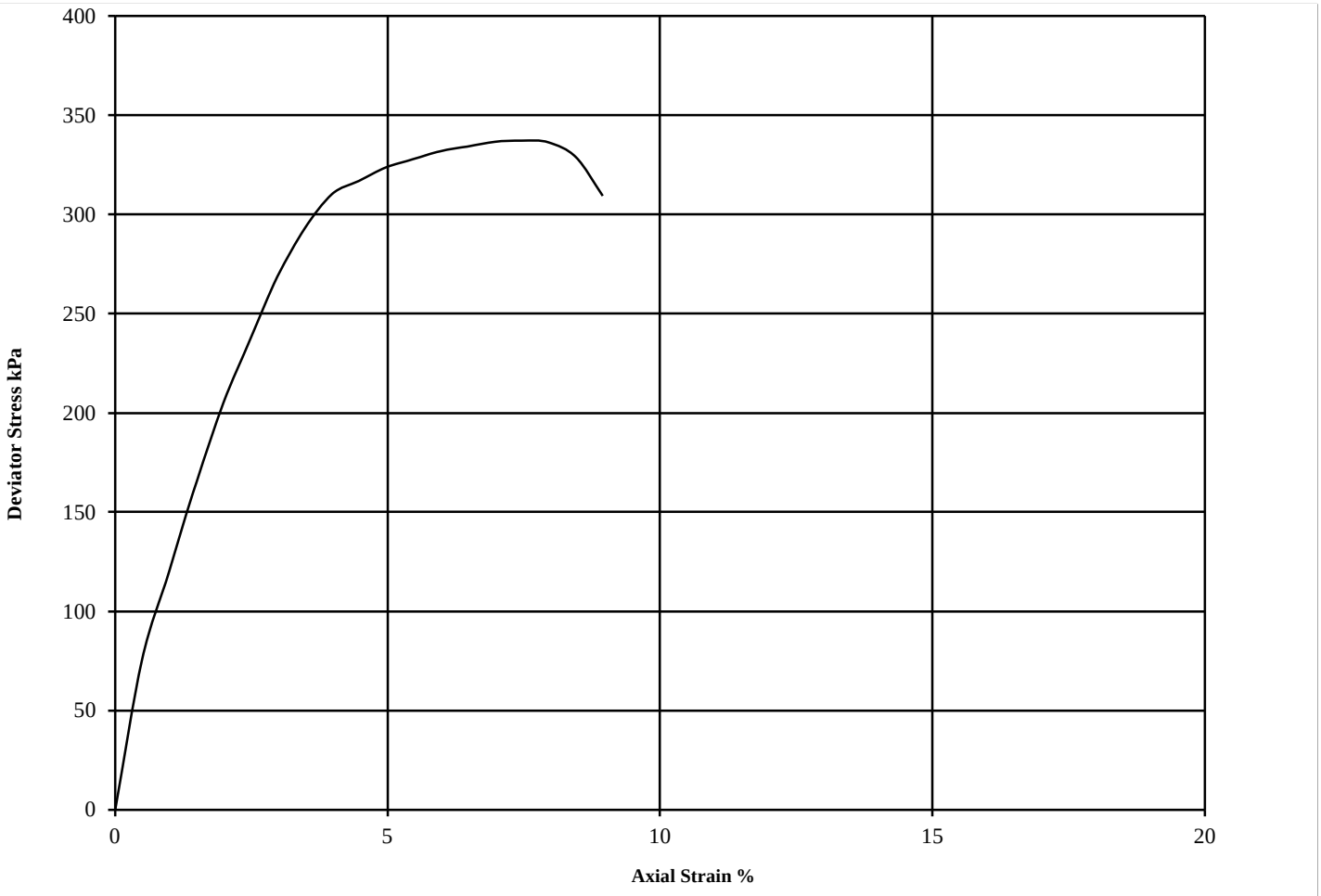
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **WBH112** **Top Depth (m):** **22.50**

Sample Number: **Base Depth (m):**

Sample Type **U**



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) $_3$	Corr. Max. Deviator Stress (kPa) $(\ _1\ \ _3)_f$	Shear Strength Cu (kPa) $^1/_2(\ _1\ \ _3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	26	1.93	1.53	450	337	169	7.5	Brittle	See summary of soil descriptions