APPENDIX C

Appendix C – Laboratory Test Results

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LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL15/3590

Client's Reference: Report Date: 12 August 2015

Client Name: CC Ground Investigations Ltd
Unit A2 Innsworth Technology Park.
Innsworth Lane
Gloucester
GL3 1DL.

For the attention of: Richard Tucker

Contract Title: Southfield Manor, Cheltenham

Date Received: 22/7/2015
Date Commenced: 22/7/2015
Date Completed: 12/8/2015

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 in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
WS06		B	0.50	Brown slightly gravelly slightly sandy very silty CLAY.
WS06		B	1.00	Brown slightly sandy very silty CLAY.
WS06		B	1.75	Brown very gravelly sandy very silty CLAY.
WS06		U	3.00	Grey very silty CLAY.
WS06		U	5.00	Stiff grey very silty CLAY.
WS07		B	1.00	Brown slightly gravelly sandy very silty CLAY.
WS07		U	2.00	Stiff brown very silty CLAY.
WS07		U	4.00	Grey slightly sandy very silty CLAY.
WS08		U	2.00	Stiff grey slightly sandy CLAY.
WS08		D	3.60	Grey slightly sandy very silty CLAY.
WS09		B	0.50	Brown gravelly sandy very silty CLAY.
WS09		B	1.00	Brown slightly gravelly sandy very silty CLAY.
WS09		B	2.70	Brown very sandy silty GRAVEL.
WS09		U	3.00	Stiff brown very silty CLAY.

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DK	04/08/15		12/08/15		12/08/15

SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

Contract No:	PSL15/3590
Client Ref:	C4710

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Dispersive Classification Catergory Clause 6.2	Dry Density Mg/m^3 Clause 7.2	Linear Shrinkage % Clause 6.5	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	% Passing .425mm	Remarks
WS06		B	0.50	19	ND2			50	23	27	93	High plasticity CH.
WS06		B	1.00	21				54	24	30	100	High plasticity CH.
WS06		U	3.00	22				58	26	32	100	High plasticity CH.
WS06		U	5.00	19				56	25	31	100	High plasticity CH.
WS07		B	1.00	24			9	43	22	21	95	Intermediate plasticity Cl.
WS07		U	2.00	27				61	27	34	100	High plasticity CH.
WS07		U	4.00	19				59	26	33	99	High plasticity CH.
WS08		U	2.00	26				57	26	31	99	High plasticity CH.
WS08		D	3.60	18				52	24	28	99	High plasticity CH.
WS09		B	0.50	13			9	36	19	17	81	Intermediate plasticity Cl.
WS09		B	1.00	18				41	21	20	93	Intermediate plasticity Cl.
WS09		B	2.70		U/S							
WS09		U	3.00	26				60	26	34	100	High plasticity CH.

SYMBOLS : NP : Non Plastic * : Liquid Limit and Plastic Limit Wet Sieved. U/S : Unsuitable for Pinhole Test

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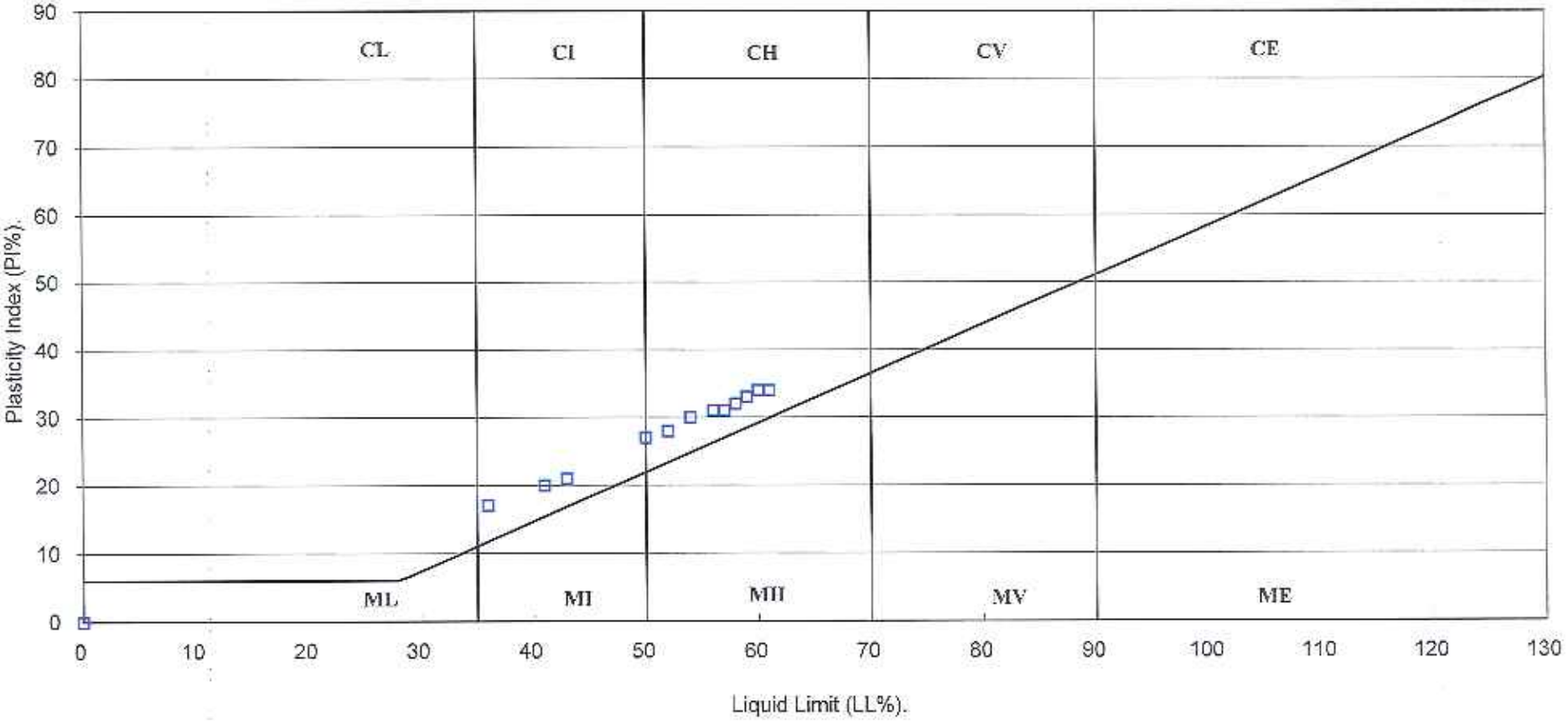
SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

Contract No: PSL15/3590

Client Ref: C4710

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



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	SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.				Contract No:	PSL15/3590
					Client Ref:	C4710

SUMMARY OF LABORATORY HAND VANE TESTS

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content %	Shear Strength kPa	Description
WS06		U	5.00	19	136	See summary of soil descriptions
WS07		U	2.00	27	107	See summary of soil descriptions
WS08		U	2.00	26	124	See summary of soil descriptions

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SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

Contract No: PSL15/3590
Client Ref: C4710

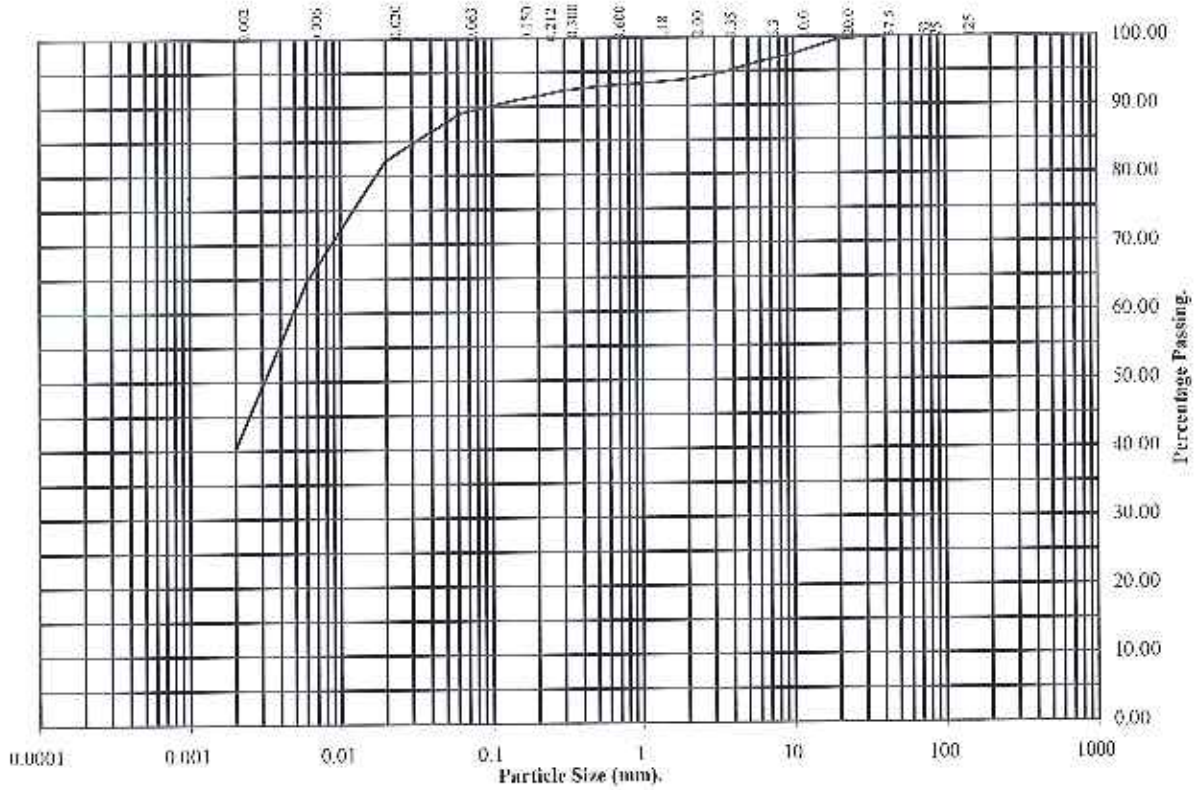
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: WS06 **Depth (m):** 0.50

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	97
6.3	96
3.35	95
2	94
1.18	93
0.6	93
0.3	92
0.212	92
0.15	91
0.063	89

Particle Diameter	Percentage Passing
0.02	82
0.006	65
0.002	40

Soil Fraction	Total Percentage
Cobbles	0
Gravel	6
Sand	5
Silt	49
Clay	40

Remarks:
See summary of soil descriptions.

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PSL Professional Soils Laboratory	SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.	Contract No.: PSL15/3590

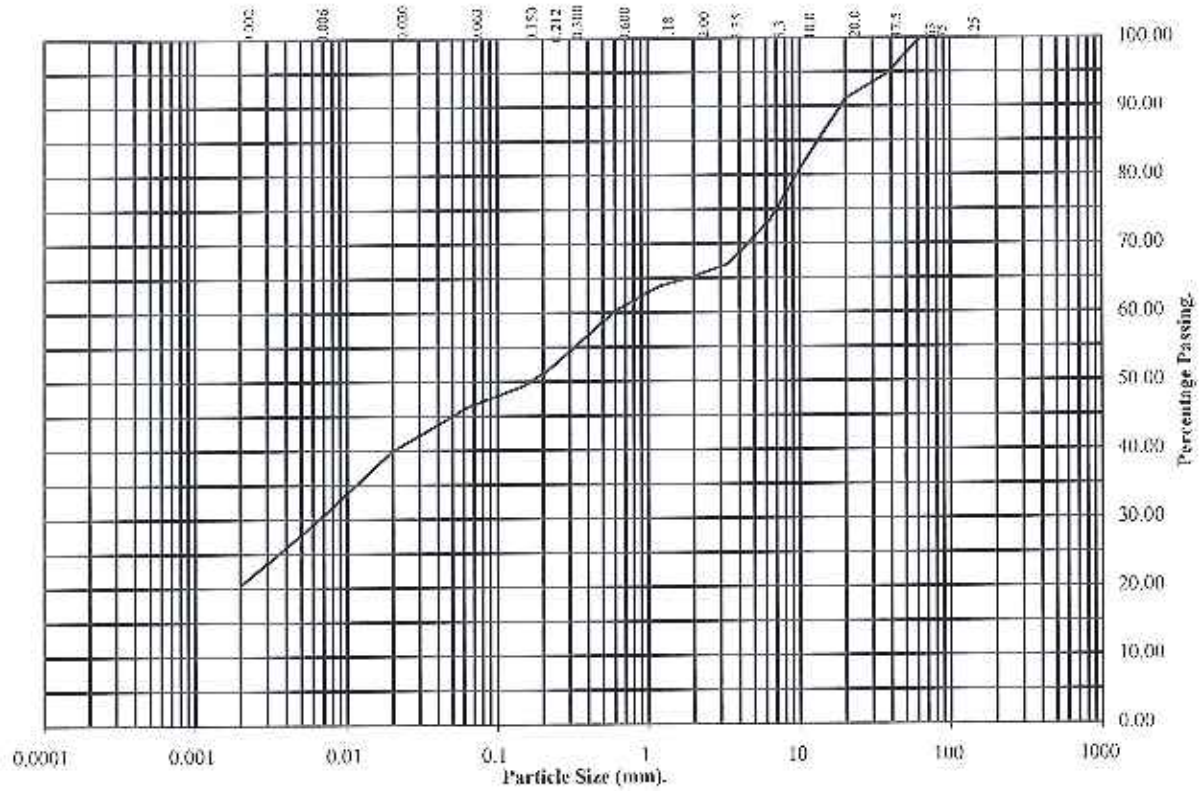
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: WS06 **Depth (m):** 1.75

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	95
20	91
10	81
6.3	73
3.35	67
2	65
1.18	64
0.6	60
0.3	54
0.212	52
0.15	49
0.063	46

Particle Diameter	Percentage Passing
0.02	40
0.006	29
0.002	20

Soil Fraction	Total Percentage
Cobbles	0
Gravel	35
Sand	19
Silt	26
Clay	20

Remarks:
See summary of soil descriptions.

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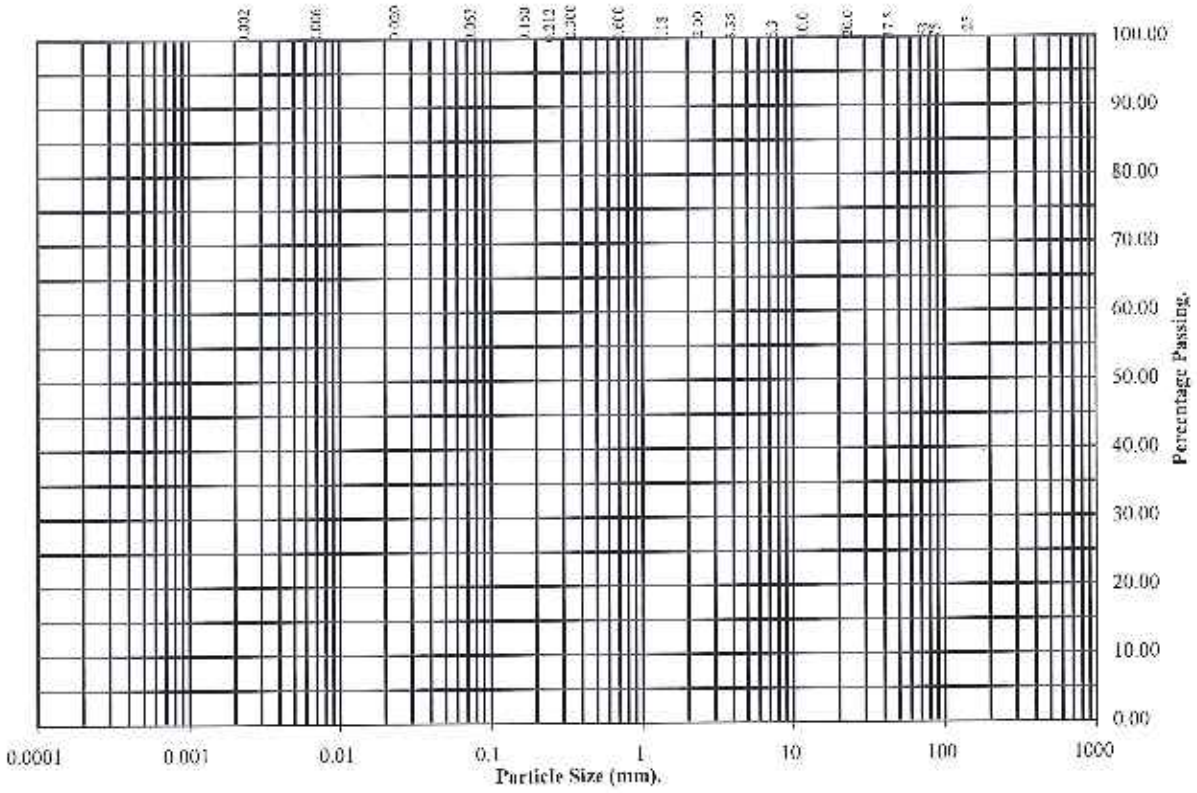
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: WS06 **Depth (m):** 5.00

Sample Number: **Sample Type:** U



BS Test Sieve	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	100
0.063	100

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	0
Silt / Clay	100

Remarks:
See summary of soil descriptions.

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PSL Professional Soils Laboratory	SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.	Contract No.: PSL15/3590

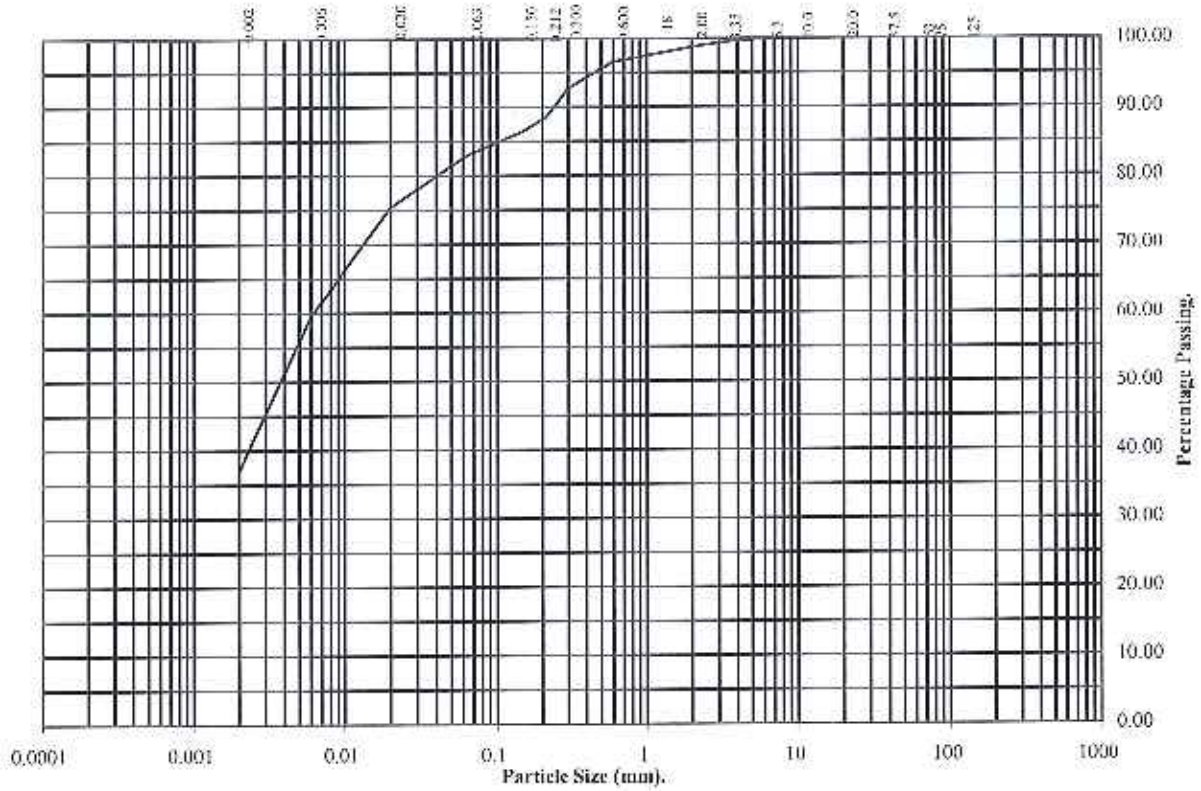
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: WS07 **Depth (m):** 1.00

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	99
1.18	98
0.6	97
0.3	93
0.212	89
0.15	87
0.063	83

Particle Diameter	Percentage Passing
0.02	75
0.006	60
0.002	37

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	16
Silt	46
Clay	37

Remarks:
See summary of soil descriptions.

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SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

Contract No.: PSL15/3590

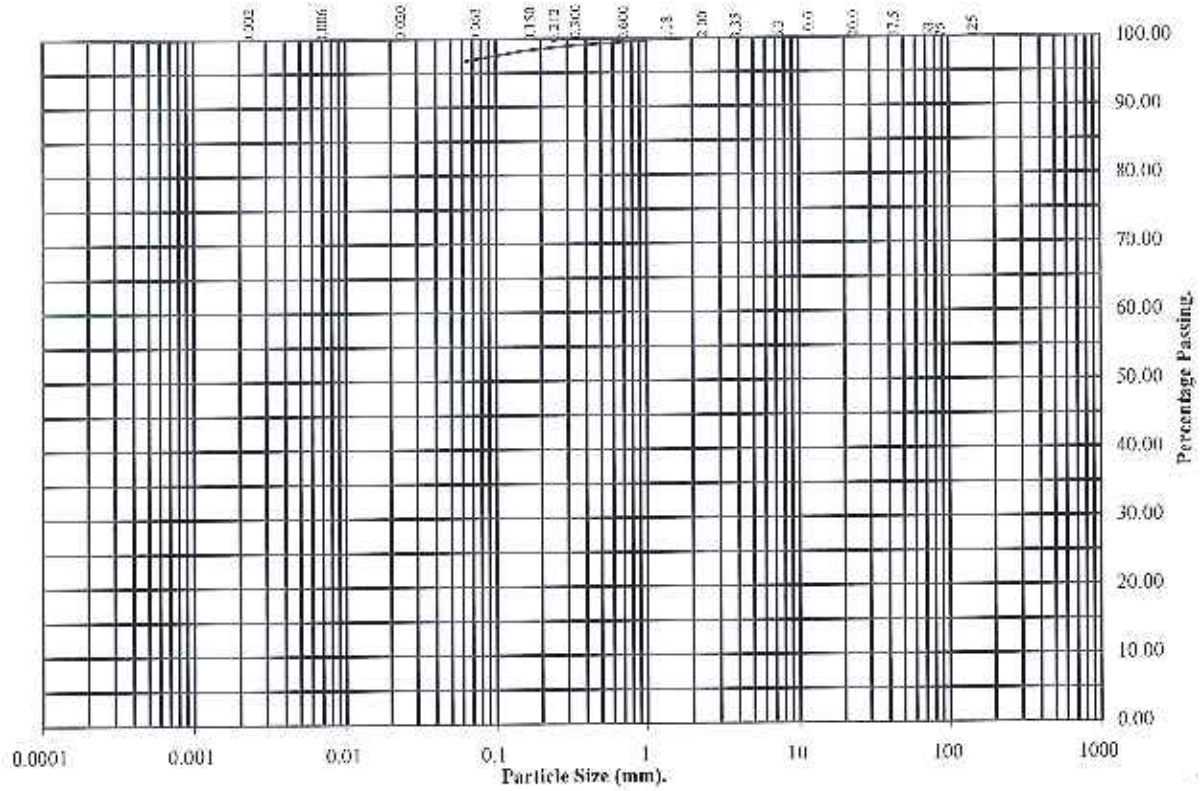
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: WS07 **Depth (m):** 4.00

Sample Number: **Sample Type:** U



BS Test Sieve	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	99
0.15	98
0.063	97

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

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	05/08/15		05/08/15

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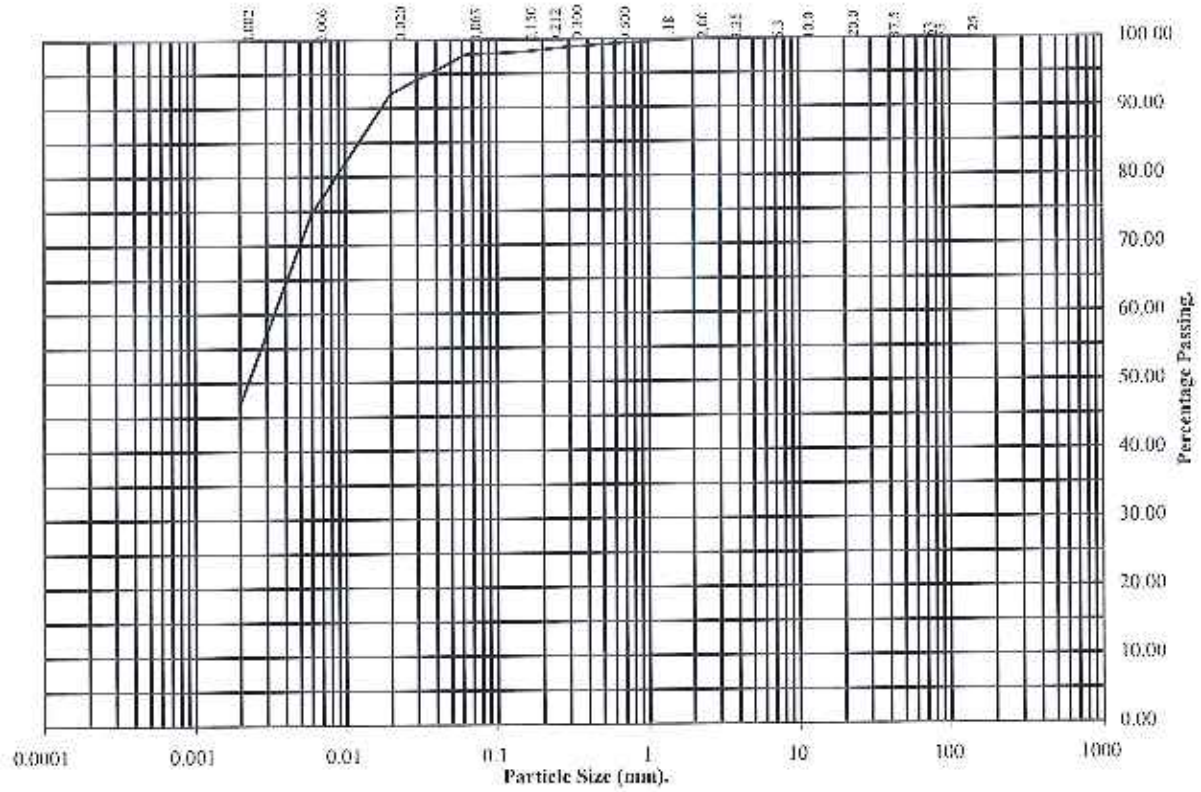
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: WS08 **Depth (m):** 2.00

Sample Number: **Sample Type:** U



BS Test Sieve	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	99
0.15	98
0.063	98

Particle Diameter	Percentage Passing
0.02	92
0.006	75
0.002	47

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	2
Silt	51
Clay	47

Remarks:
See summary of soil descriptions.

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SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

Contract No.: PSL15/3590

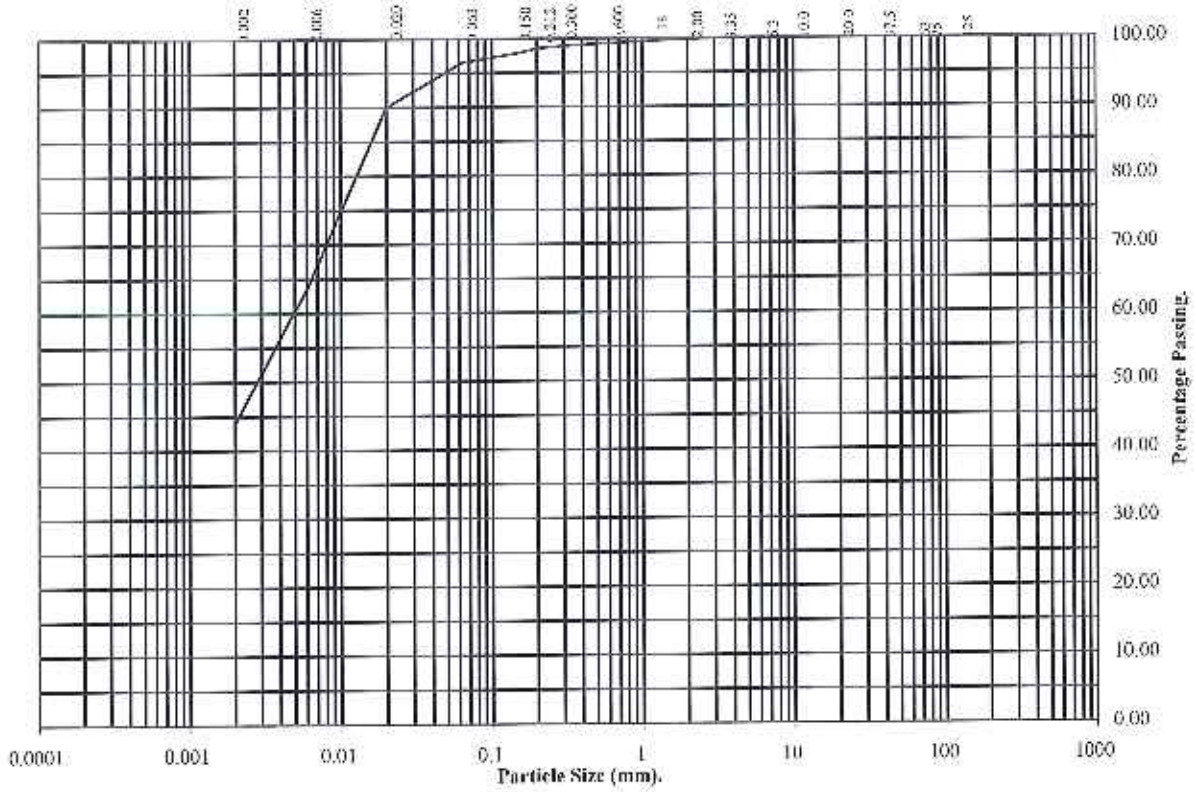
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: WS08 **Depth (m):** 3.60

Sample Number: **Sample Type:** D



BS Test Sieve	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	99
0.15	98
0.063	97

Particle Diameter	Percentage Passing
0.02	90
0.006	63
0.002	44

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	3
Silt	53
Clay	44

Remarks:
See summary of soil descriptions.

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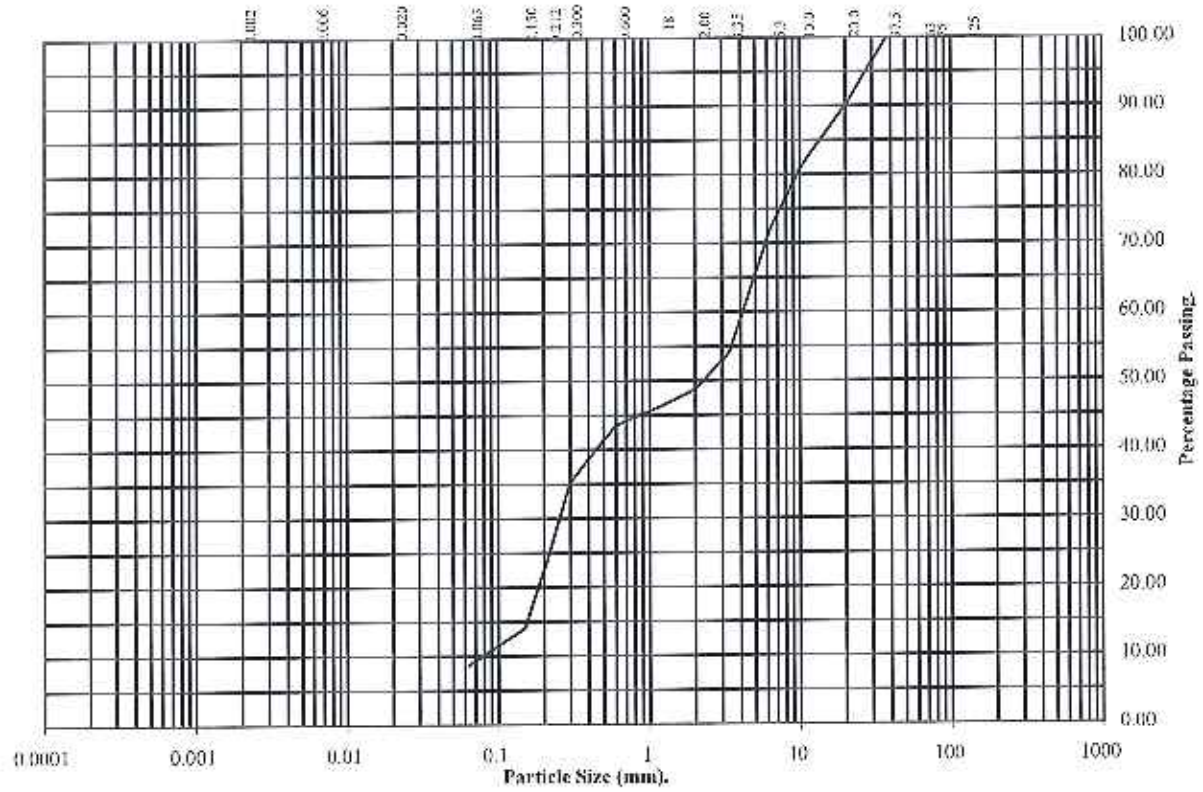
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: WS09 **Depth (m):** 2.70

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	90
10	81
6.3	72
3.35	54
2	49
1.18	46
0.6	44
0.3	35
0.212	24
0.15	14
0.063	9

Soil Fraction	Total Percentage
Cobbles	0
Gravel	51
Sand	40
Silt / Clay	9

Remarks:
See summary of soil descriptions.

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SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

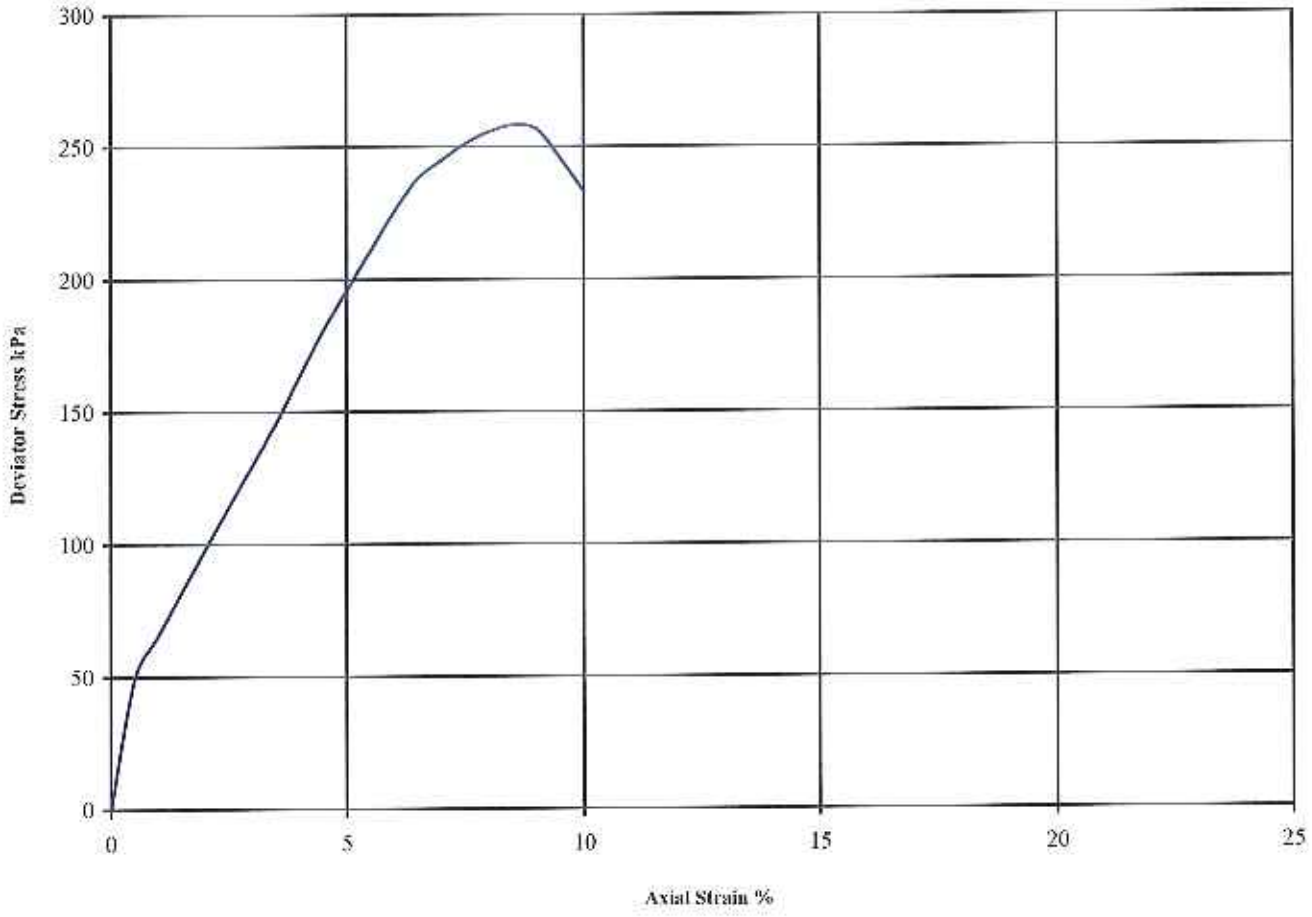
Contract No.: PSL15/3590

Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure
B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: WS06 **Depth (m):** 5.00

Sample Number: **Sample Type:** U



Diameter (mm):		70.0	Height (mm):		152.0	Test:	76 mm Single Stage. Undisturbed		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	Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thickness. Correction applied 0.52 kPa See summary of soil descriptions.
A	19	1.89	1.60	150	258	129	8.5	Brittle	

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SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

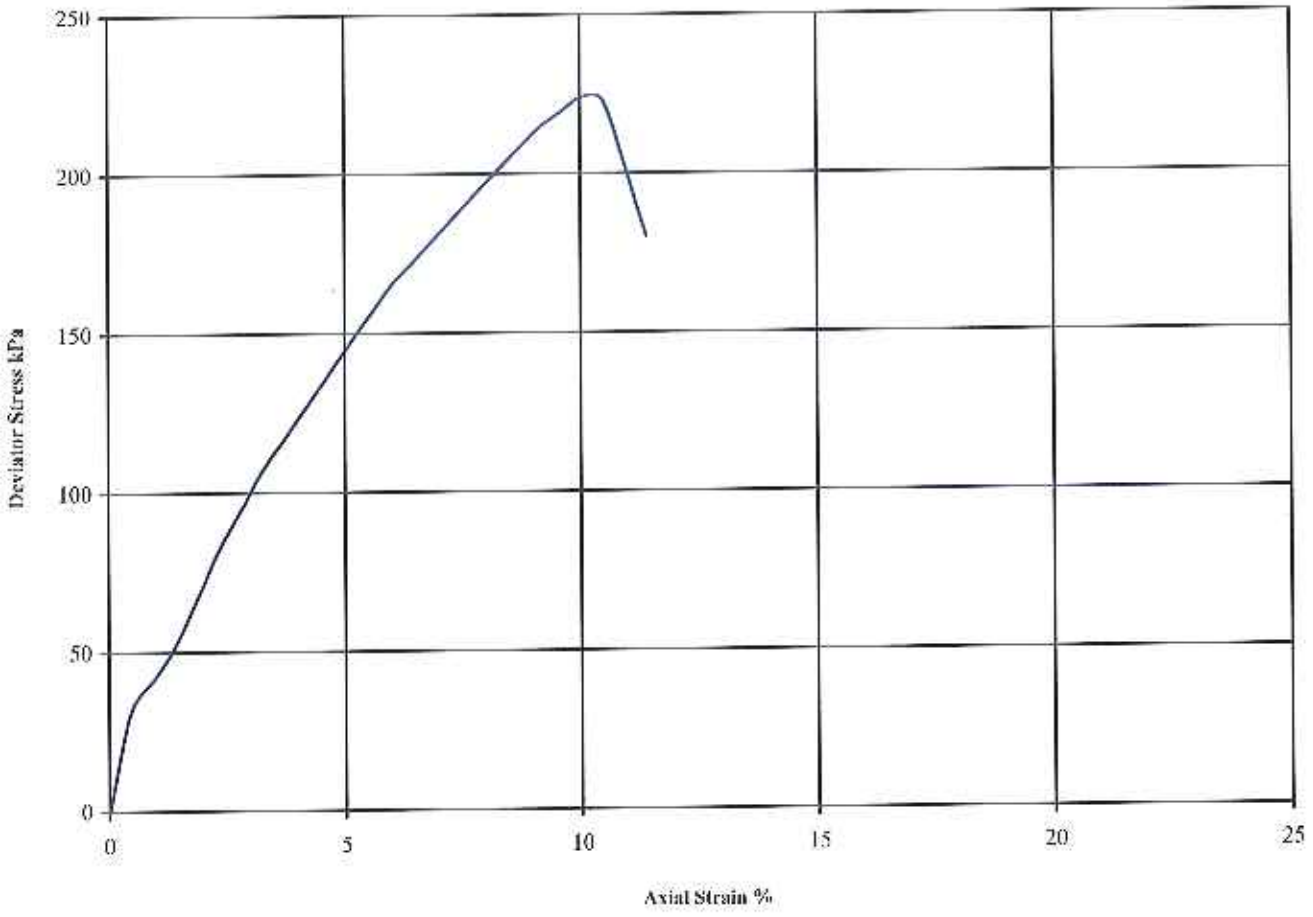
Contract No: PSL15/3590

Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure
B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: WS07 **Depth (m):** 2.00

Sample Number: **Sample Type:** U



Diameter (mm):		69.0	Height (mm):		152.0	Test:	76 mm Single Stage.		Undisturbed
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	Remarks
A	27	2.01	1.59	80	224	112	10.0	Brittle	Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thickness, Correction applied 0.52 kPa See summary of soil descriptions.

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SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

Contract No: PSL15/3590

Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: WS08 **Depth (m):** 2.00

Sample Number: **Sample Type:** U

Diameter (mm):		69.0	Height (mm):		152.0	Test:	76 mm Single Stage. Undisturbed		
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	Remarks
A	26	2.01	1.60	50	221	111	9.6	Plastic	Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thickness, Correction applied 0.52 kPa See summary of soil descriptions.

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SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

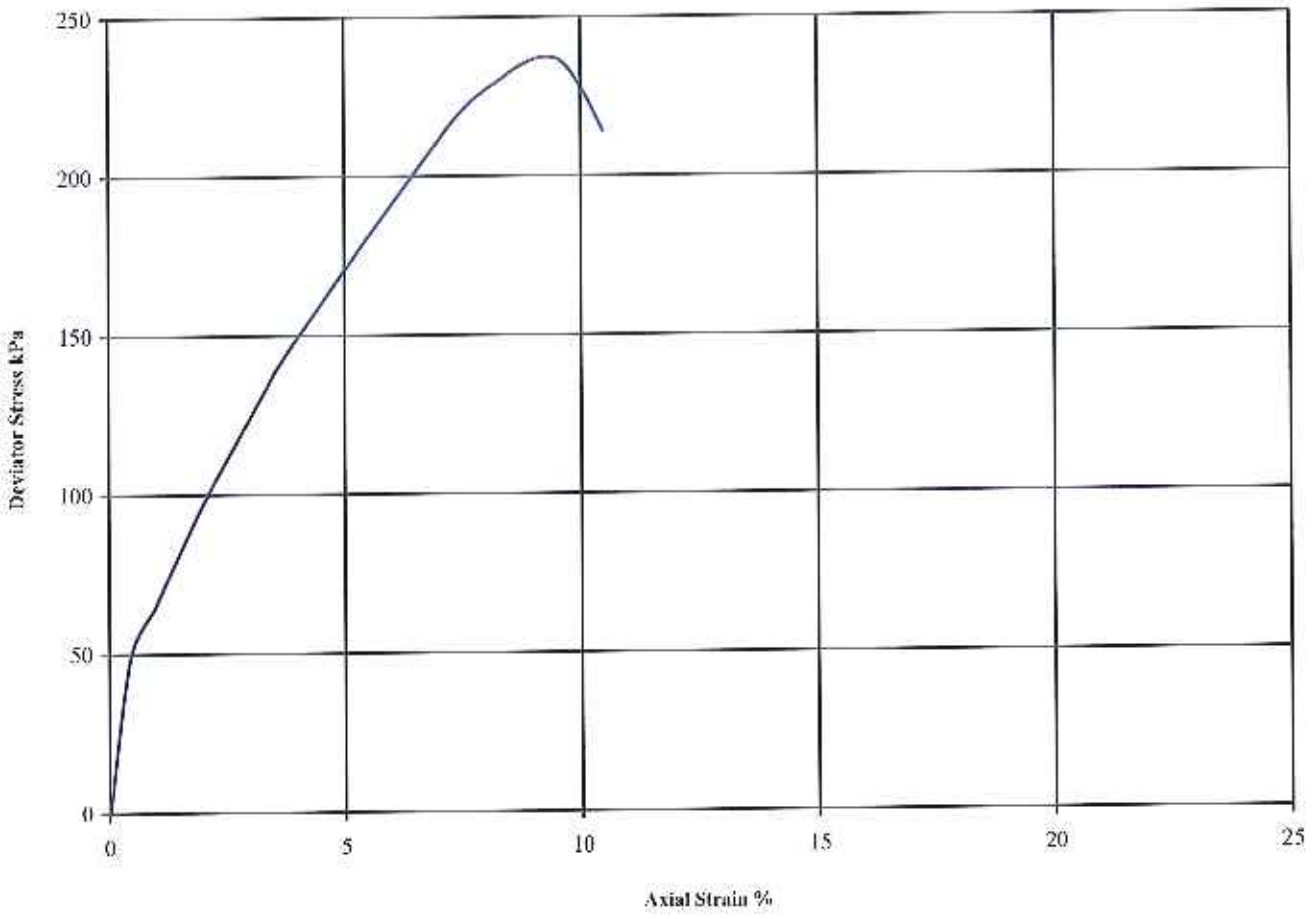
Contract No: PSL15/3590

Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure
B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: WS09 **Depth (m):** 3.00

Sample Number: **Sample Type:** U



Diameter (mm):		69.0	Height (mm):		152.0	Test:	76 mm Single Stage. Undisturbed		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	26	2.07	1.63	70	237	119	9.1	Brittle	Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thickness, Correction applied 0.52 kPa See summary of soil descriptions.

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	05/08/15		05/08/15

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SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

Contract No: PSL15/3590

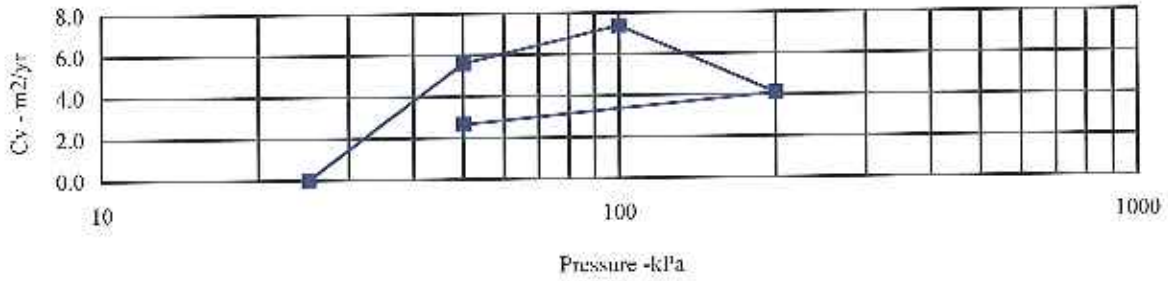
One Dimensional Consolidation Properties

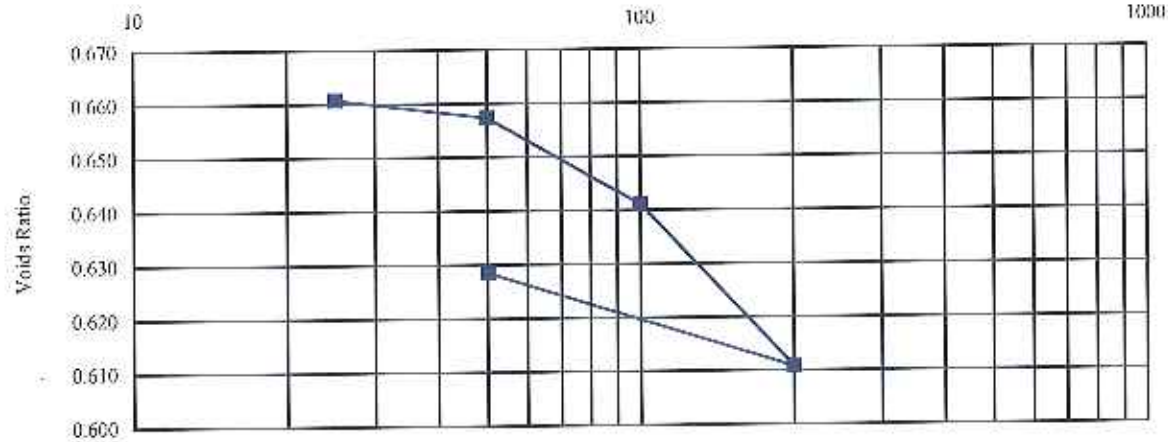
BS 1377: Part 5: 1990

Hole Number: WS06 **Depth (m):** 3.00-3.40

Sample Number: **Sample Type:** U

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	22							
Bulk Density (Mg/m3):	1.95	0	-	25	Swelling	Swelling	Method used to determine CV:	t90
Dry Density (Mg/m3):	1.60	25	-	50	0.085	5.600		
Voids Ratio:	0.652	50	-	100	0.195	7.383	Nominal temperature during test ' C:	20
Degree of saturation:	87.7	100	-	200	0.185	4.094		
Height (mm):	20.2	200	-	50	0.073	2.655	Remarks: See summary of soil descriptions.	
Diameter (mm)	75.02							
Particle Density (Mg/m3): Assumed	2.65							





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	05/08/15		05/08/15

PSL Professional Soils Laboratory	SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.	Contract No. PSL15/3590 Page of

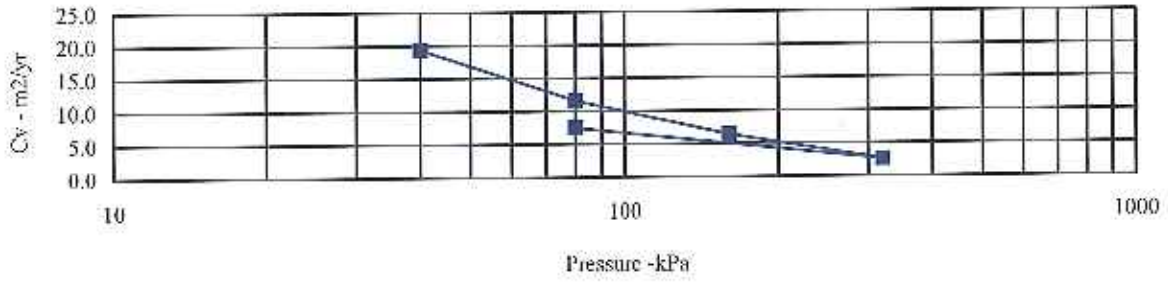
One Dimensional Consolidation Properties

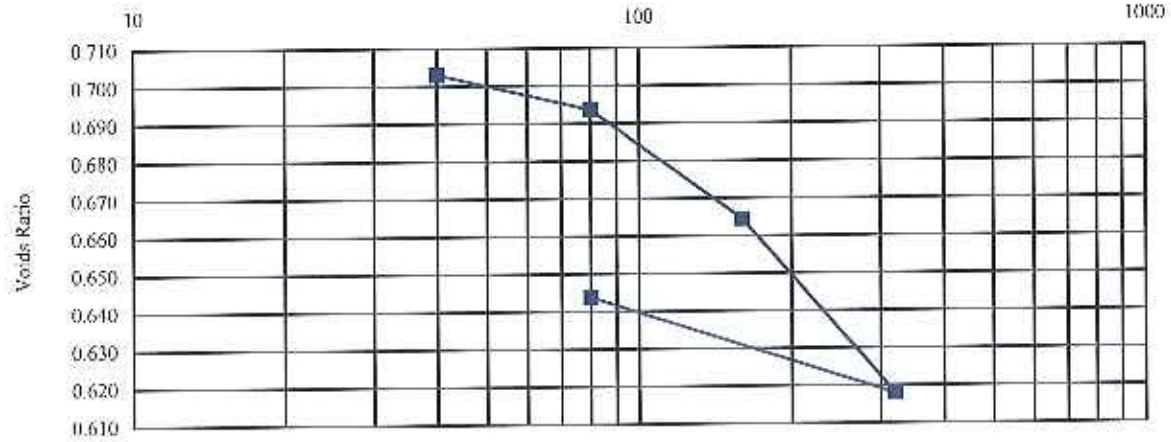
BS 1377: Part 5: 1990

Hole Number: WS07 **Depth (m):** 2.00-2.40

Sample Number: **Sample Type:** U

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	27							
Bulk Density (Mg/m3):	1.95	0	-	40	0.320	19.349	Method used to determine CV:	t90
Dry Density (Mg/m3):	1.54	40	-	80	0.139	11.594		
Voids Ratio:	0.725	80	-	160	0.215	6.454	Nominal temperature during test ' C:	20
Degree of saturation:	99.0	160	-	320	0.175	2.597		
Height (mm):	20.15	320	-	80	0.067	7.494	Remarks: See summary of soil descriptions.	
Diameter (mm)	50.07							
Particle Density (Mg/m3): Assumed	2.65							





Checked by	Date	Approved by	Date
	05/08/15		05/08/15

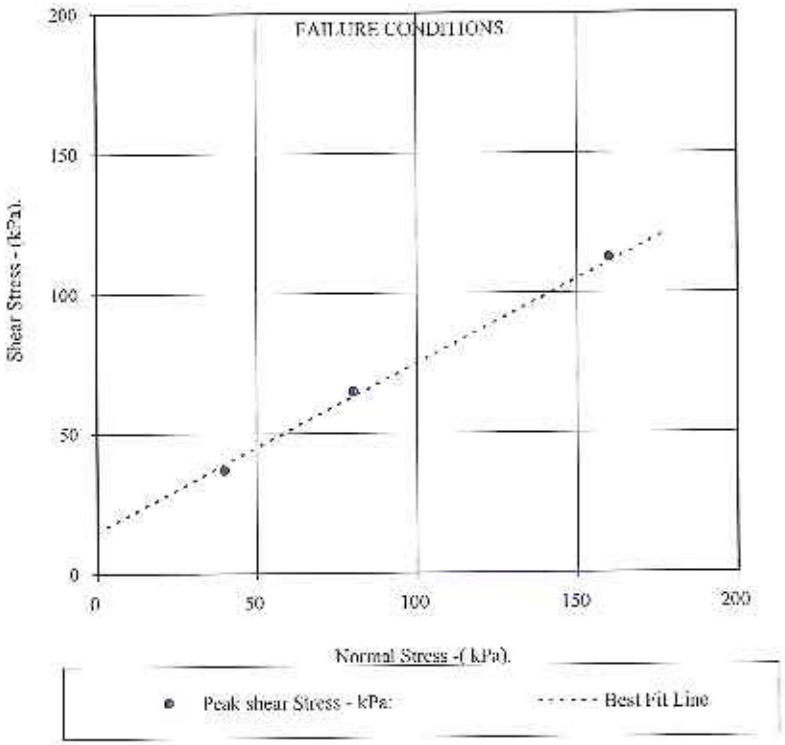
PSL Professional Soils Laboratory	SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.	Contract No. PSL15/3590 Page of

CONSOLIDATED DRAINED SHEARBOX TEST.

BS1377:Part 7:1990 Clause 4.5.4

Hole Number: **WS06** Depth (m): **1.75** Sample Number:

Sample Type:	Recompacted with 2.5kg Effort		
Particle Density - Mg/m3:	2.65 (Assumed)		
Specimen Tested:	Submerged Material tested passing 2mm		
Sample Description:	**See summary of soil descriptions.**		
STAGE	1	2	3
Initial Conditions			
Height - mm:	24.98	24.98	24.98
Length - mm:	60.01	60.01	60.01
Moisture Content - %:	22	22	22
Bulk Density - Mg/m3:	2.02	2.02	2.03
Dry Density - Mg/m3:	1.66	1.65	1.66
Voids Ratio:	0.599	0.602	0.593
Normal Pressure- kPa	40	80	160
Consolidation			
Consolidated Height - mm:	24.85	24.54	24.11
Shear			
Rate of Strain (mm/min)	0.040	0.040	0.040
Strain at peak shear stress (%)	2.50	4.00	5.00
Peak shear Stress - kPa:	37	65	112
Final Consolidated Conditons			
Moisture Content - %:	21	21	19
Bulk Density - Mg/m3:	2.03	2.05	2.10
Dry Density - Mg/m3:	1.68	1.70	1.76
PEAK			
Angle of Shearing Resistance:(Φ)			31.0
Effective Cohesion - kPa:			15



Checked by Date 05/08/2015

Approved by Date 05/08/2015

PSL Professional Soils Laboratory

SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

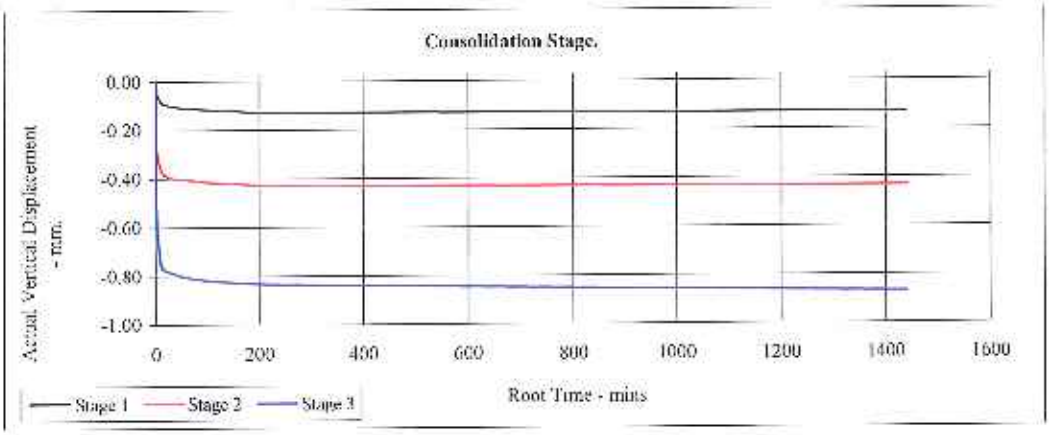
Contract No.: **PSL15/3590**

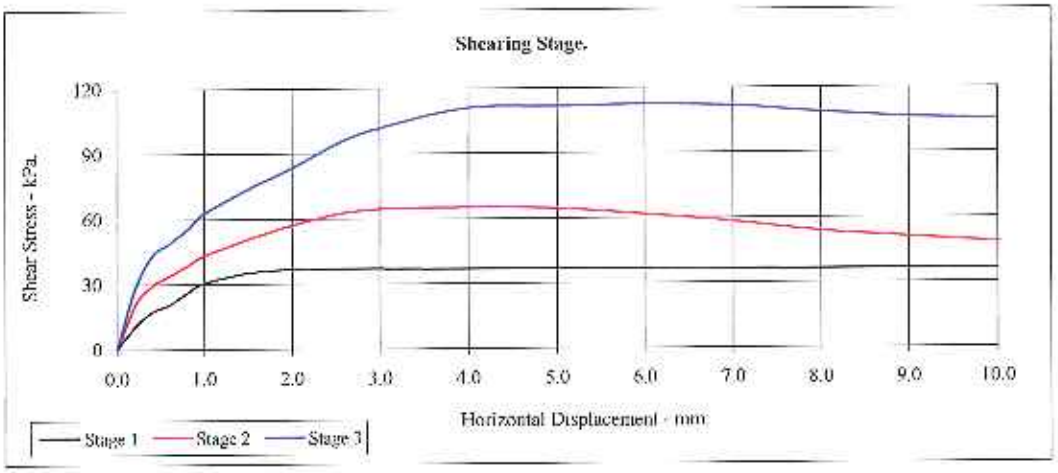
Client Ref Number: **C4710**

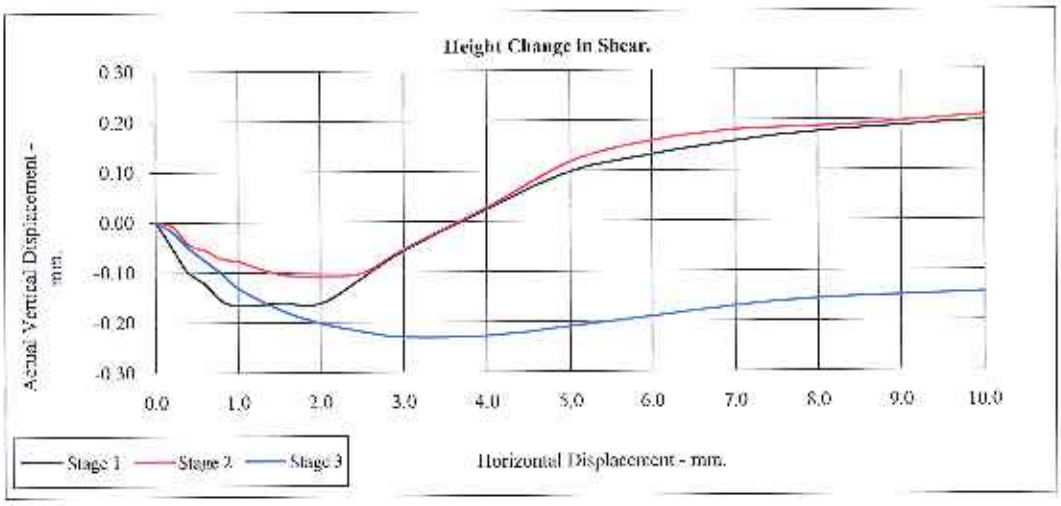
CONSOLIDATED DRAINED SHEARBOX TEST.

BS1377:Part 7:1990 Clause 4.5.4

Hole Number: **WS06** Depth (m): 1.75 Sample Number: -







Contract No.:
PSL15/3590

PSL
Professional Soils Laboratory

SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

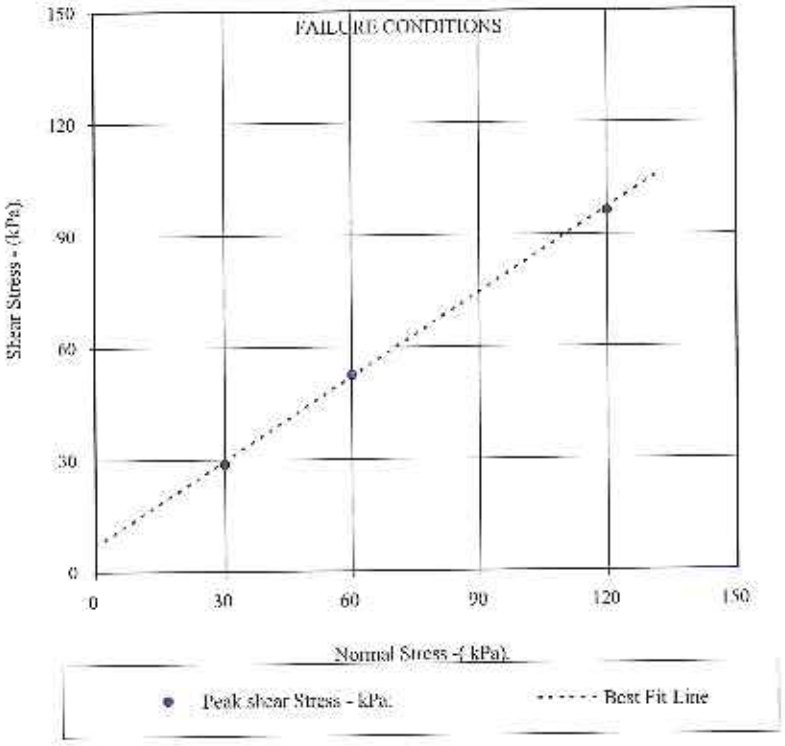
Client Ref Number:
C4710

CONSOLIDATED DRAINED SHEARBOX TEST.

BS1377 Part 7:1990 Clause 4.5.4

Hole Number: WS09 Depth (m): 2.70 Sample Number: -

Sample Type:	Recompacted with hand tamped pressure.		
Particle Density - Mg/m3:	2.65 (Assumed)		
Specimen Tested:	Material tested passing 2mm		
Sample Description	**See summary of soil descriptions.**		
STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	19.78	19.78	19.78
Length - mm:	60.01	60.01	60.01
Moisture Content - %:	13	13	13
Bulk Density - Mg/m3:	1.96	1.96	1.96
Dry Density - Mg/m3:	1.74	1.74	1.74
Voids Ratio:	0.524	0.521	0.524
Normal Pressure- kPa	30	60	120
Consolidation			
Consolidated Height - mm:	19.75	19.59	19.46
Shear			
Rate of Strain (mm/min)	0.600	0.600	0.600
Strain at peak shear stress (%)	3.00	3.00	3.00
Peak shear Stress - kPa:	29	53	96
Final Consolidated Conditions			
Moisture Content - %	11	12	12
Bulk Density - Mg/m3:	1.96	1.98	1.99
Dry Density - Mg/m3:	1.76	1.78	1.78
PEAK			
Angle of Shearing Resistance:(ϕ)			**37.0**
Effective Cohesion - kPa:			**7**



Checked by Date 05/08/2015

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PSL Professional Soils Laboratory

SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

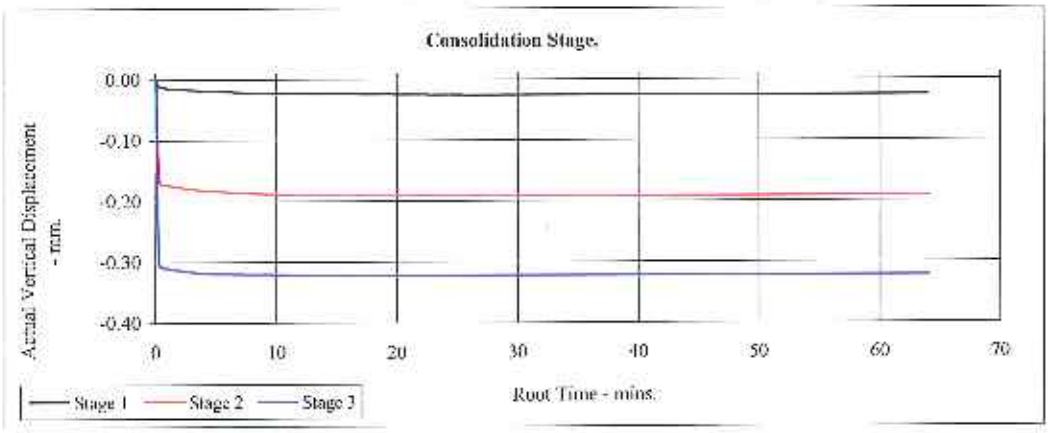
Contract No.: **PSL15/3590**

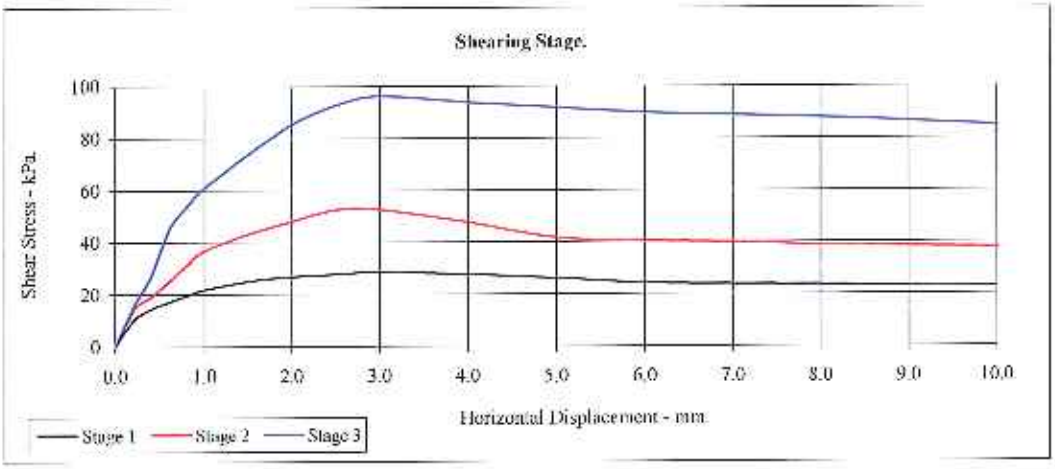
Client Ref Number: **C4710**

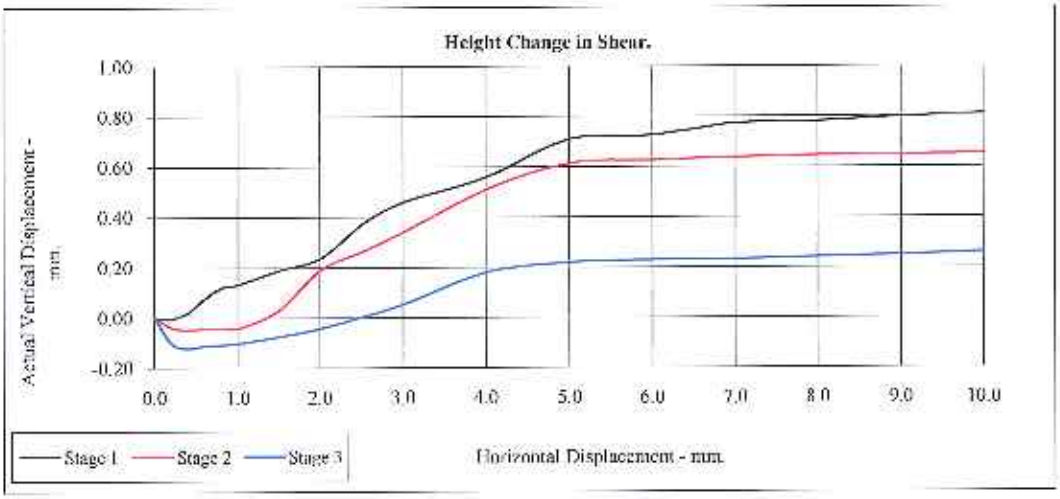
CONSOLIDATED DRAINED SHEARBOX TEST.

BS1377:Part 7:1990 Clause 4.5.4

Hole Number: WS09 Depth (m): 2.70 Sample Number: -







Contract No :
PSL15/3590

PSL
Professional Soils Laboratory

SOUTHFIELD BROOK FLOOD ALLEVIATION SCHEME.

Client Ref Number:
C4710

Effective Stress Triaxial Compression

Consolidated Undrained

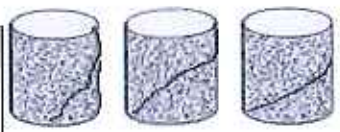
Summary Report

Sample Details						
 *sketch showing specimen location in original sample*	Depth		3.00m			
	Description		Grey very silty CLAY.			
	Type		Undisturbed, vertical orientation.			
				1	2	3
	Initial Length	L_o	(mm)	76.0	76.0	76.0
	Initial Diameter	D_o	(mm)	38.0	38.0	38.0
	Initial Weight	W_o	(gr)	170.1	169.6	169.9
	Initial Bulk Density	ρ_o	(Mg/m3)	1.97	1.97	1.97
	Particle Density	ρ_s	(Mg/m3)	2.65	2.65	2.65

Initial Conditions			1	2	3
Initial Cell Pressure	σ_{3i}	(kPa)	600	650	650
Initial Back Pressure	U_{bi}	(kPa)	550	550	450
Membrane Thickness	m_b	(mm)	0.400	0.400	0.400
Displacement Input	L_{IP}	(mm)	CH 2	CH 2	CH 2
Load Input	N_{IP}	(N)	CH 4	CH 4	CH 4
Pore Water Pressure Input	u_{pwp}	(kPa)	CH 3	CH 3	CH 3
Sample Volume	V	(cm3)	CH 2	CH 2	CH 2
Initial Moisture	ω_i%	(%)	21	21	21
Initial Dry Density	ρ_{di}	(Mg/m3)	1.63	1.63	1.63
Initial Voids Ratio	e_i	-	0.627	0.624	0.630
Initial Degree of Saturation	S_i	(%)	89	88	89
B Value	B	-	0.98	0.96	0.98

Final Conditions			1	2	3
Final Moisture	ω_f%	(%)	25	24	22
Final Dry Density	ρ_{df}	(Mg/m3)	1.65	1.69	1.72
Final Voids Ratio	e_f	-	0.604	0.566	0.543
Final Degree of Saturation	S_f	(%)	100.0	100.0	100.0
Failure Criteria		-	Max. Dev. Stress	Max. Dev. Stress	Max. Dev. Stress
Strain At Failure	ε %	(%)	16.41	5.77	6.67
Stress At Failure	$(\sigma_1 - \sigma_3)$	(kPa)	138.3	169.5	282.3
Minor Stress At Failure	σ_3'	(kPa)	53.0	66.0	112.0
Major Stress At Failure	σ_1'	(kPa)	191.3	235.5	394.3
Principal Stress At Failure	σ_1'/σ_3'	(kPa)	3.610	3.568	3.521

Notes



Test Method	BS1377-8 : 1990 : Clause 7	Test Name	WS06 3.00m U70
Database: .\SQLEXPRESS \ sys1 03FEB2014 final		Test Date	03/08/2015
Site Reference		Borehole	WS06
Jobfile	Southfield Manor, Cheltenham	Sample	3.00m
Client	CC Ground Investigations Ltd	Depth	3.00m
Operator	David Burton	Checked	Sean Royle
		Approved	Anthony Watkins

PSL Professional Soils Laboratory

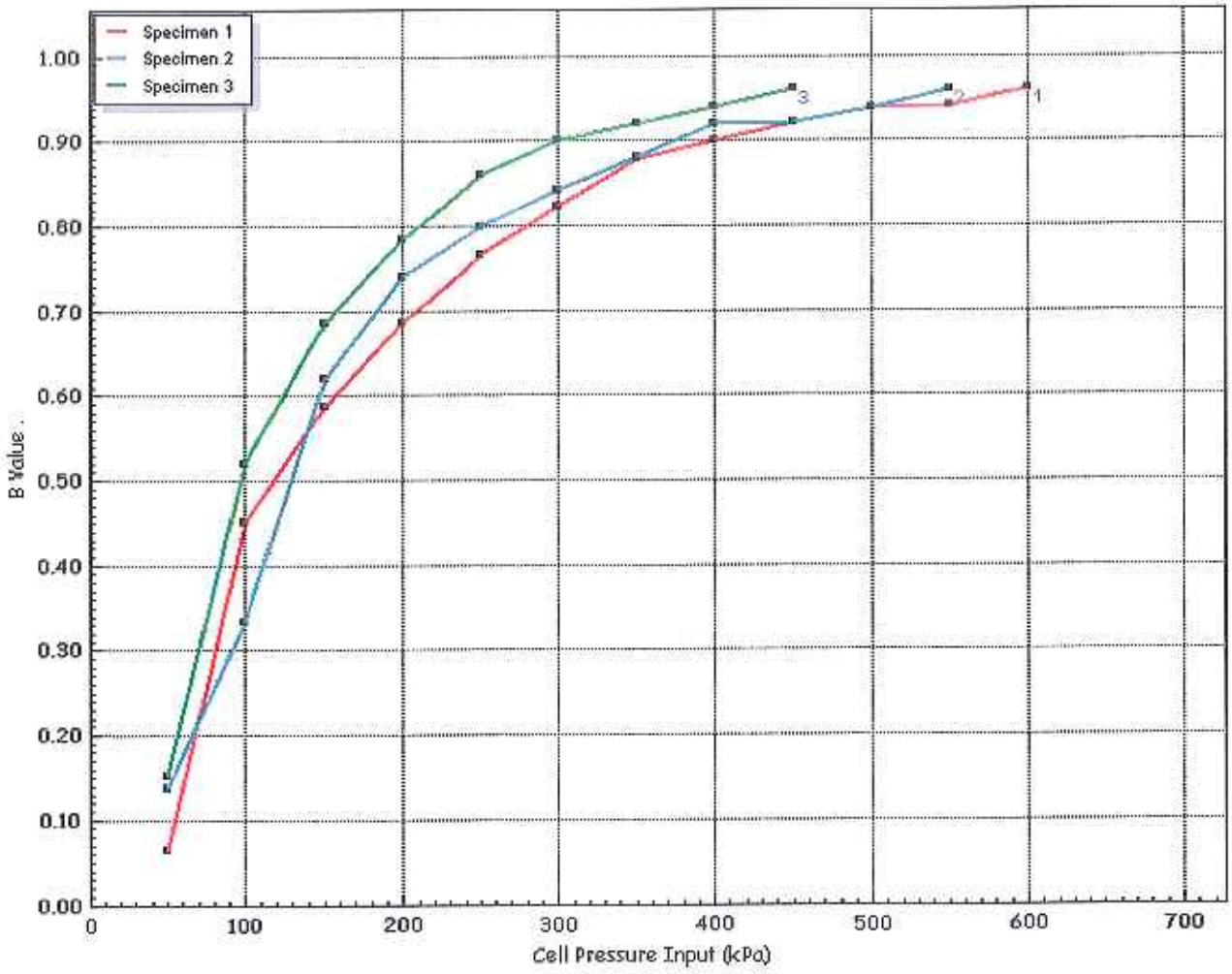
Professional Soils Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Saturation Plots

			1	2	3
Saturation Method			Stepped	Stepped	Stepped
Cell Pressure Input	σ	(kPa)	600	550	450
Pore Water Pressure Input	U pwp	(kPa)	590	539	437
B Value	B		0.96	0.96	0.96



PSL Professional Soils Laboratory	Test Method: BS1377-8 : 1990 : Clause 7	Test Name: WS06 3.00m U70	
	Database: .\SQLEXPRESS \ sys1 03FEB2014 final	Test Date: 03/08/2015	
	Site Reference	Borehole: WS06	
	Jobfile: Southfield Manor, Cheltenham	Sample: 3.00m	
	Client: CC Ground Investigations Ltd	Depth: 3.00m	
	Operator: David Burton	Checked: Sean Royle	Approved: Anthony Watkins

Effective Stress Triaxial Compression

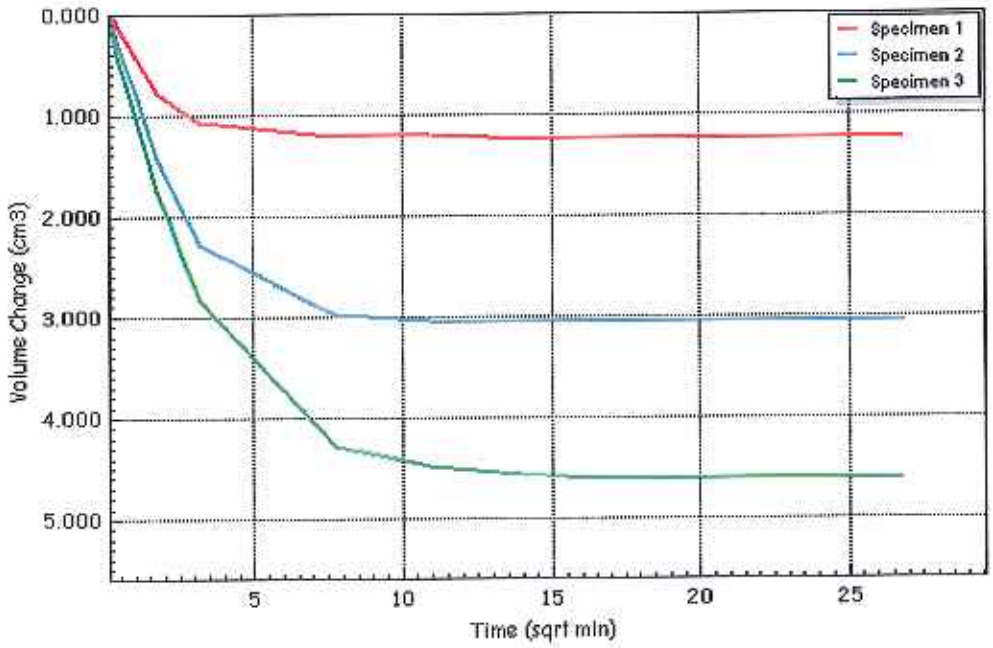
Consolidated Undrained

Consolidation Plots

Initial Conditions			1	2	3
Initial Cell Pressure	σ 3	(kPa)	600	650	650
Initial Back Pressure	u bi	(kPa)	550	550	450
Pore Water Pressure Input	u pwp	(kPa)	589	635	629
Drainage Method			Radial+One End	Radial+One End	Radial+One End

Final Conditions			1	2	3
PWP Dissipation %	U%	(%)	97.44	97.65	98.32
Volumetric Strain	ε v%	(%)	1.44	3.56	5.35
Corrected Length	L c	(mm)	75.6	75.1	74.6
Corrected Area	A c	11.23	11.23	11.07	10.94
Corrected Volume	V c	(cm3)	84.948	83.125	81.590
T100 Time to Failure	t 100	(min)	5.44	13.53	20.75
Consolidation	c v	(m2/year)	5.481	2.204	1.437
Compressibility	m v	(m2/MN)	0.380	0.429	0.304
Test Time	t F	(h:m:s)	02:00:00	02:00:00	02:00:00
Estimated Strain to Failure	ε %	(%)	5.0	5.0	5.0
Shear Machine Speed	d r	(mm/min)	0.03151	0.03129	0.03110

Notes

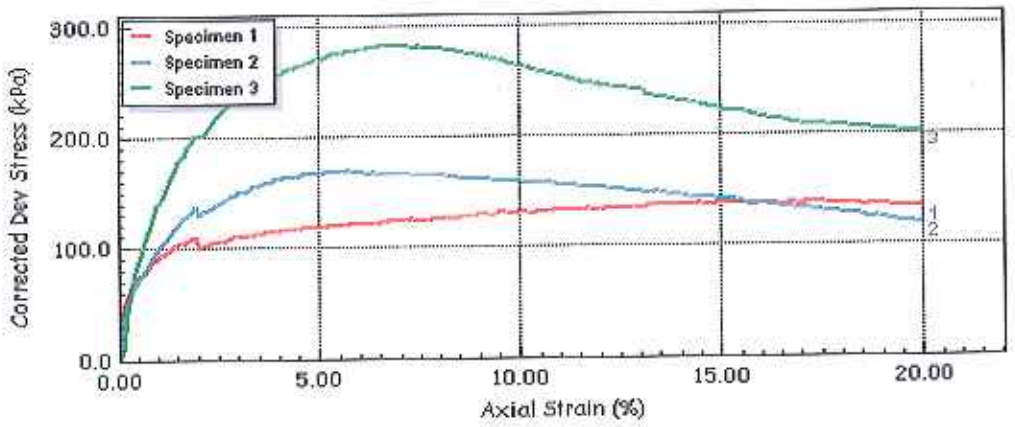


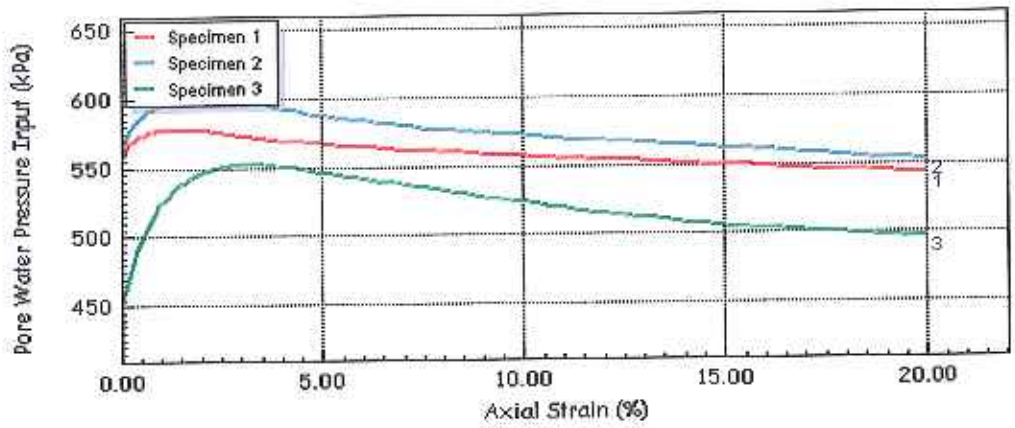
PSL Professional Soils Laboratory	Test Method: BS1377-8 : 1990 : Clause 7	Test Name: WS06 3.00m U70	
	Database: .\SQLEXPRESS \ sys1 03FEB2014 final	Test Date: 03/08/2015	
	Site Reference	Borehole: WS06	
	Jobfile: Southfield Manor, Cheltenham	Sample: 3.00m	
	Client: CC Ground Investigations Ltd	Depth: 3.00m	
	Operator: David Burton	Checked: Sean Royle	Approved: Anthony Watkins

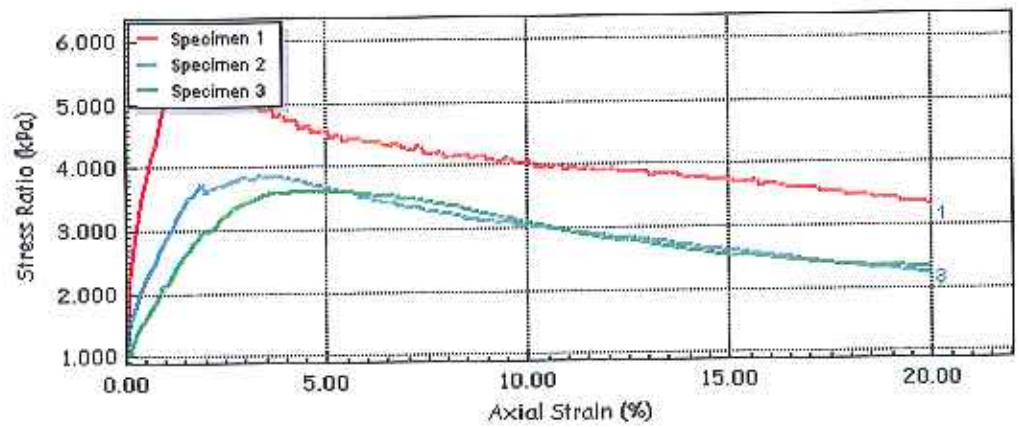
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots







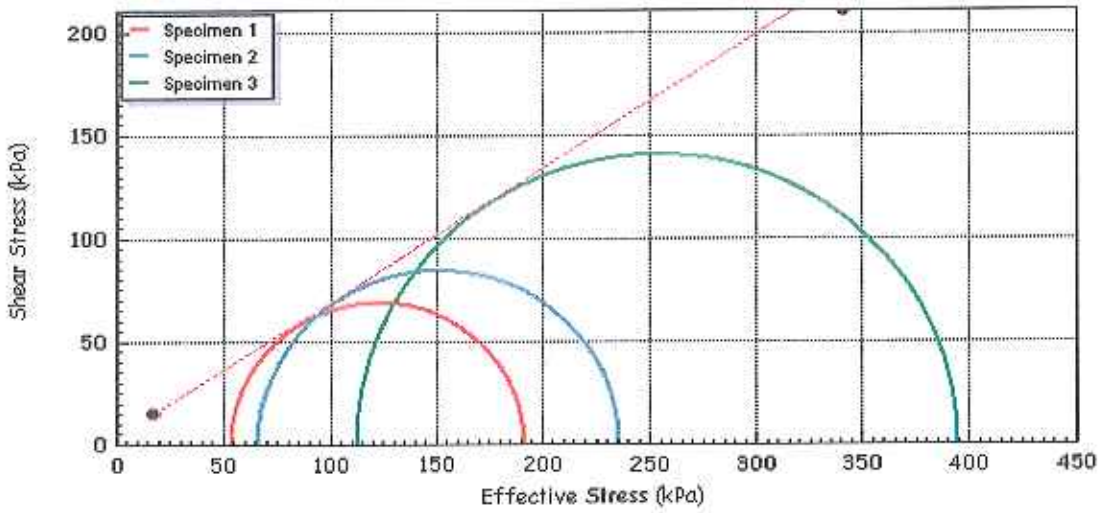
PSL Professional Soils Laboratory	Test Method	BS1377-8 : 1990 : Clause 7		Test Name	WS06 3.00m U70
	Database: .\SQLEXPRESS \ sys1 03FEB2014 final			Test Date	03/08/2015
	Site Reference			Borehole	WS06
	Jobfile	Southfield Manor, Cheltenham		Sample	3.00m
	Client	CC Ground Investigations Ltd		Depth	3.00m
	Operator	David Burton	Checked	Sean Royle	Approved Anthony Watkins

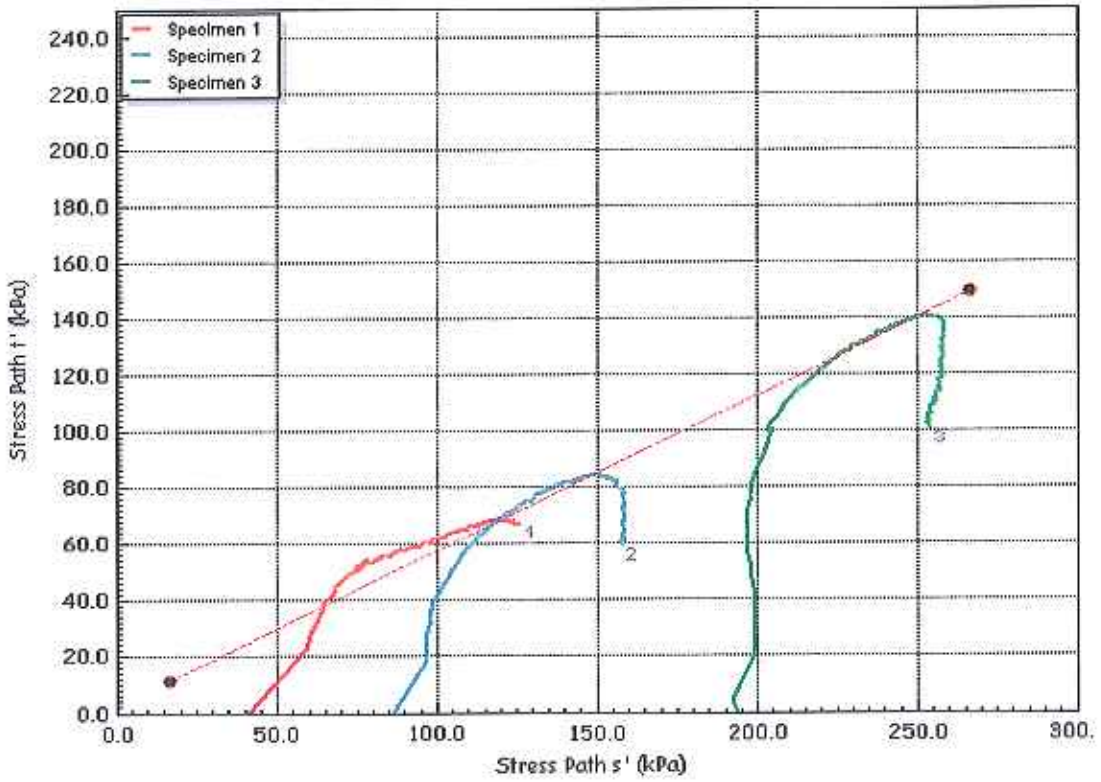
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots

Effective Cohesion	c'	(kPa)	3.10	Effective Cohesion	c'	(kPa)	3.10
Effective Friction	ϕ'	(deg)	33.4	Effective Friction	ϕ'	(deg)	33.4





Test Method	BS1377-8 : 1990 : Clause 7	Test Name	WS06 3.00m U70
Database: .\SQLEXPRESS \ sys1 03FEB2014 final		Test Date	03/08/2015
Site Reference		Borehole	WS06
Jobfile	Southfield Manor, Cheltenham	Sample	3.00m
Client	CC Ground Investigations Ltd	Depth	3.00m
Operator	David Burton	Checked	Sean Royle
		Approved	Anthony Watkins

PSL Professional Soils Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Summary Report

Sample Details

sketch showing specimen location in original sample

Depth	4.00m				
Description	Brown slightly sandy very silty CLAY.				
Type	Undisturbed. Vertical orientation.				
			1	2	3
Initial Length	L o	(mm)	76.0	76.0	76.0
Initial Diameter	D o	(mm)	38.0	38.0	38.0
Initial Weight	W o	(gr)	174.9	172.6	172.9
Initial Bulk Density	ρ o	(Mg/m3)	2.03	2.00	2.01
Particle Density	ρ s	(Mg/m3)	2.65	2.65	2.65

Initial Conditions			1	2	3
Initial Cell Pressure	σ 3i	(kPa)	560	670	790
Initial Back Pressure	U bi	(kPa)	500	550	550
Membrane Thickness	m b	(mm)	0.400	0.400	0.400
Displacement Input	L IP	(mm)	CH 2	CH 2	CH 2
Load Input	N IP	(N)	CH 4	CH 4	CH 4
Pore Water Pressure Input	u pwp	(kPa)	CH 3	CH 3	CH 3
Sample Volume	V	(cm3)	CH 2	CH 2	CH 2
Initial Moisture	ω i%	(%)	18	18	18
Initial Dry Density	ρ di	(Mg/m3)	1.73	1.70	1.69
Initial Voids Ratio	e i	.	0.536	0.560	0.564
Initial Degree of Saturation	S i	(%)	87	85	86
B Value	B	.	1.00	0.96	1.00

Final Conditions			1	2	3
Final Moisture	ω f%	(%)	27	27	24
Final Dry Density	ρ df	(Mg/m3)	1.75	1.84	1.84
Final Voids Ratio	e f	.	0.516	0.440	0.442
Final Degree of Saturation	S f	(%)	100.0	100.0	100.0
Failure Criteria		.	Max. Dev. Stress	Max. Dev. Stress	Max. Dev. Stress
Strain At Failure	ε %	(%)	18.74	19.67	14.40
Stress At Failure	(σ 1 - σ 3)'	(kPa)	124.9	186.7	280.0
Minor Stress At Failure	σ 3'	(kPa)	59.0	101.0	180.0
Major Stress At Failure	σ 1'	(kPa)	183.9	287.7	470.0
Principal Stress At Failure	σ 1' / σ 3'	(kPa)	3.117	2.848	2.611

Notes

Test Method	BS1377-8 : 1990 : Clause 7	Test Name	WS07 4.00m
Database: .\SQLEXPRESS \ System 5		Test Date	06/08/2015
Site Reference		Borehole	WS07
Jobfile	Southfield Manor, Cheltenham	Sample	4.00m
Client	CC Ground Investigations	Depth	4.00m
Operator	David Burton	Checked	Sean Royle
		Approved	Anthony Watkins

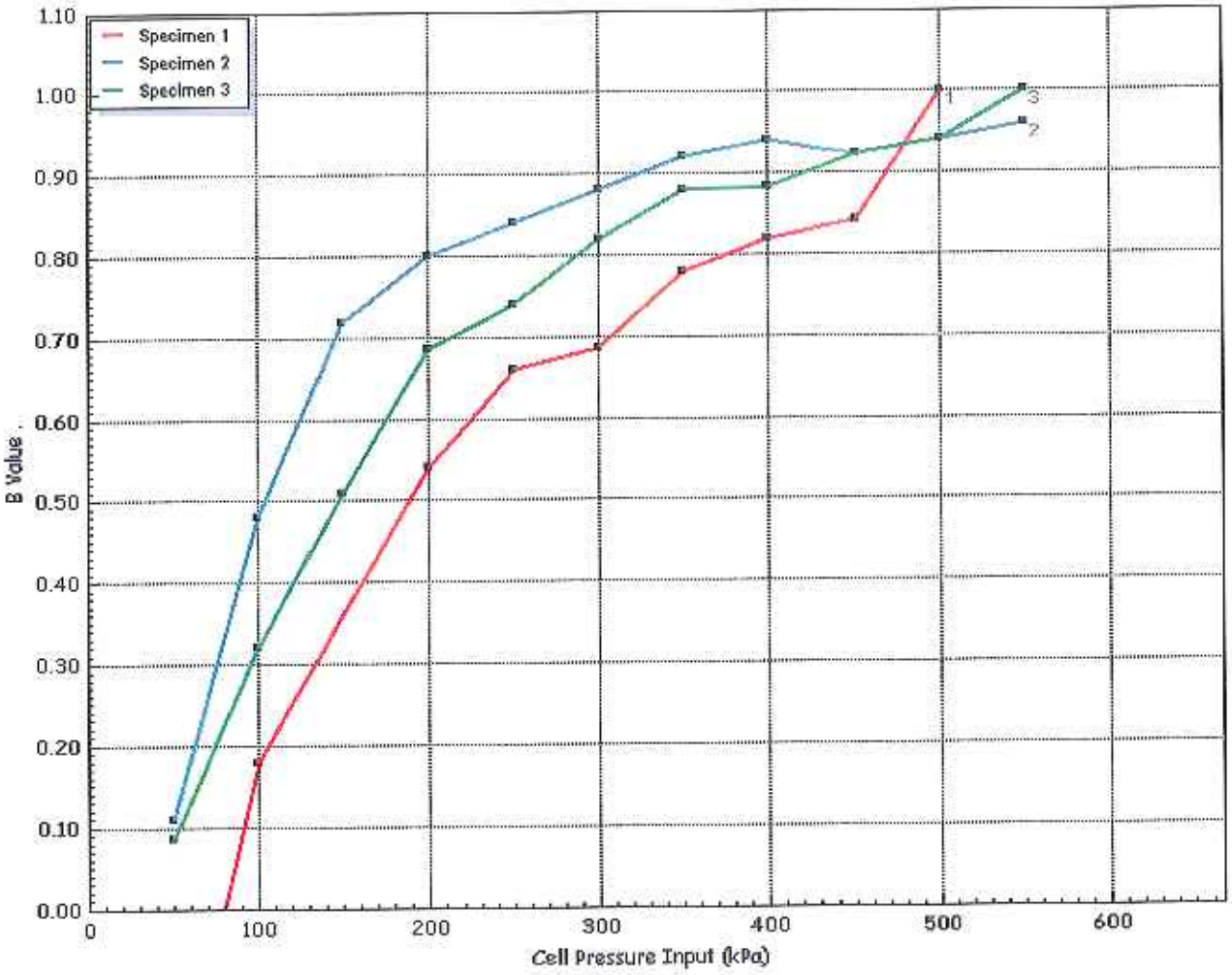
PSL Professional Soils Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Saturation Plots

			1	2	3
Saturation Method			Stepped	Stepped	Stepped
Cell Pressure Input	σ	(kPa)	500	550	550
Pore Water Pressure Input	u pwp	(kPa)	473	535	541
B Value	B		1.00	0.86	1.00



Test Method	BS1377-8 ; 1990 : Clause 7	Test Name	WS07 4.00m
Database: .\SQLEXPRESS \ System 5		Test Date	06/08/2015
Site Reference		Borehole	WS07
Jobfile	Southfield Manor, Cheltenham	Sample	4.00m
Client	CC Ground Investigations	Depth	4.00m
Operator	David Burton	Checked	Sean Royle	Approved	Anthony Watkins

PSL Professional Soils Laboratory

Effective Stress Triaxial Compression

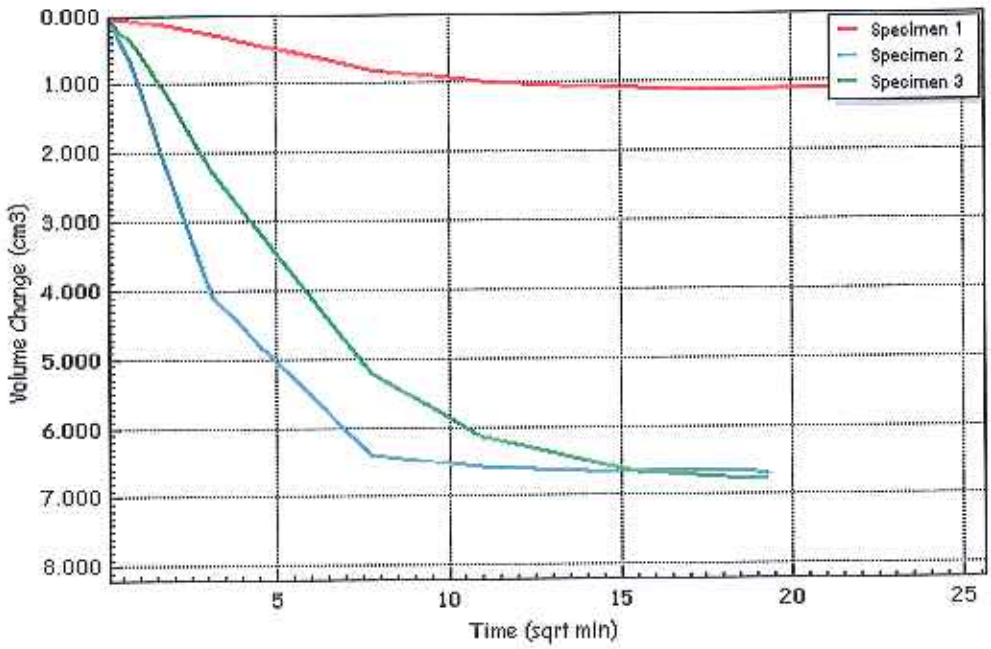
Consolidated Undrained

Consolidation Plots

Initial Conditions			1	2	3
Initial Cell Pressure	σ_3	(kPa)	560	670	790
Initial Back Pressure	u_{bi}	(kPa)	500	550	650
Pore Water Pressure Input	u_{pwp}	(kPa)	529	652	763
Drainage Method			Radial+One End	Radial+One End	Radial+One End

Final Conditions			1	2	3
PWP Dissipation %	U%	(%)	100.00	100.00	96.71
Volumetric Strain	ε_v%	(%)	1.28	7.75	7.86
Corrected Length	L_c	(mm)	75.7	74.0	74.0
Corrected Area	A_c	11.24	11.24	10.76	10.75
Corrected Volume	V_c	(cm3)	85.086	79.515	79.420
T100 Time to Failure	t_{100}	(min)	109.18	22.21	70.12
Consolidation	c_v	(m2/year)	0.273	1.343	0.425
Compressibility	m_v	(m2/MN)	0.428	0.745	0.381
Test Time	t_F	(h:m:s)	03:16:31	02:00:00	02:06:12
Estimated Strain to Failure	ε%	(%)	5.0	5.0	5.0
Shear Machine Speed	d_r	(mm/min)	0.01925	0.03085	0.02932

Notes

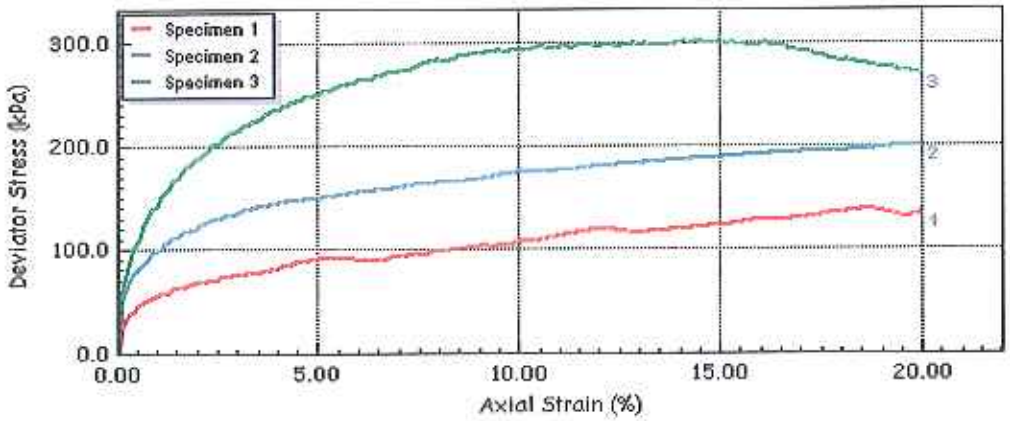


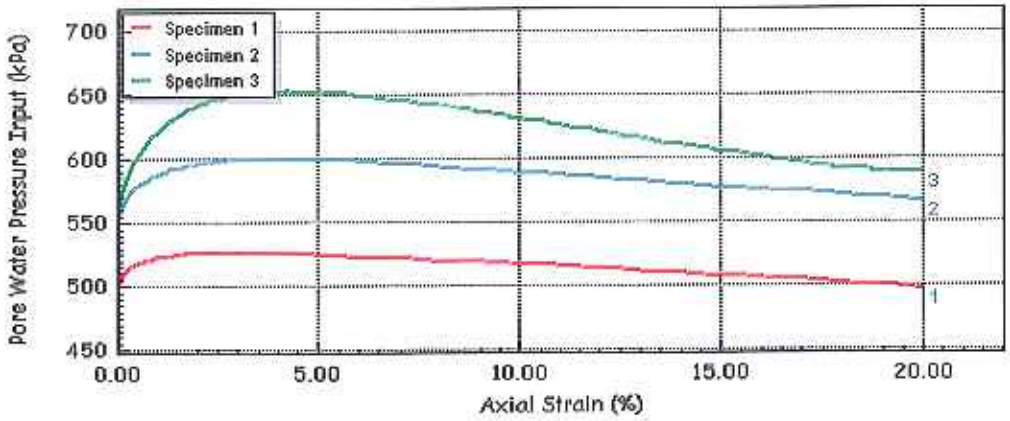
PSL Professional Soils Laboratory	Test Method	BS1377-8 : 1990 : Clause 7		Test Name	WS07 4.00m
	Database: .\SQLEXPRESS \ System 5			Test Date	06/08/2015
	Site Reference			Borehole	WS07
	Jobfile	Southfield Manor, Cheltenham		Sample	4.00m
	Client	CC Ground Investigations		Depth	4.00m
	Operator	David Burton	Checked	Sean Royle	Approved Anthony Watkins

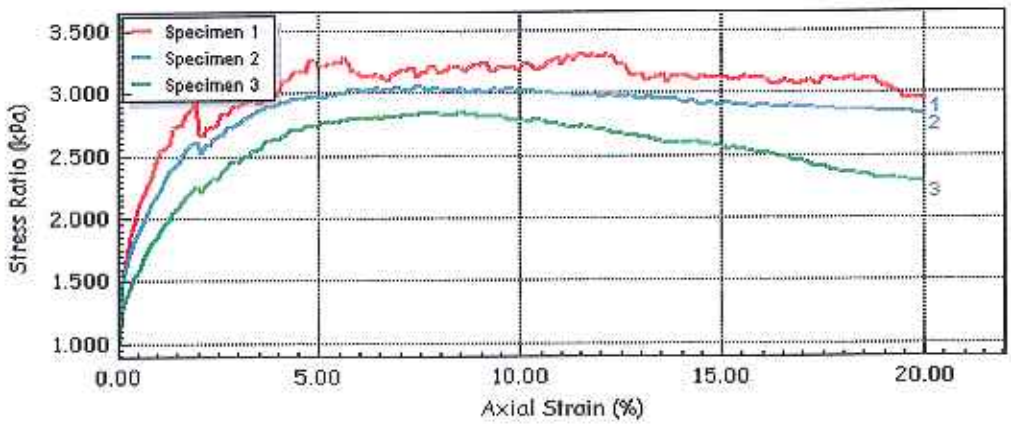
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots







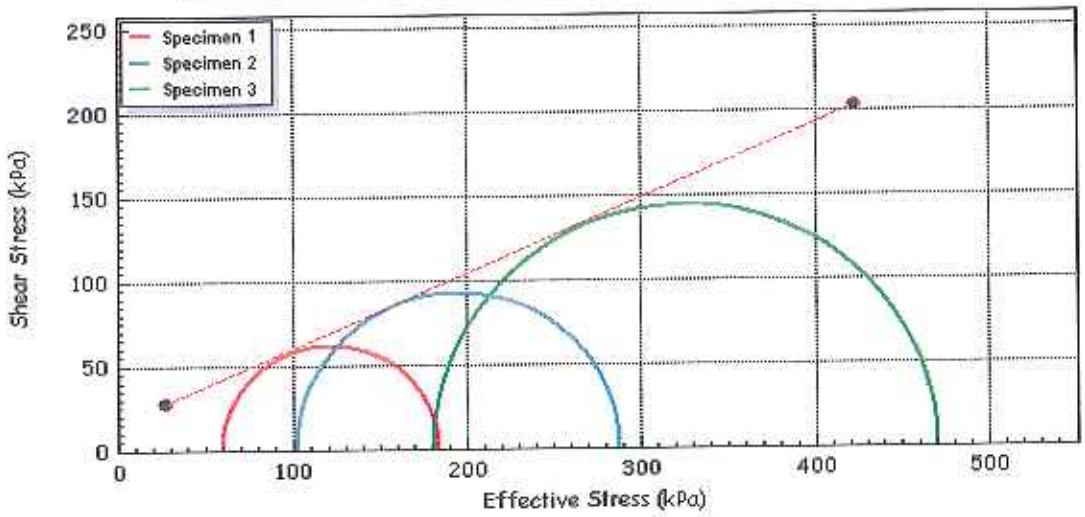
PSL Professional Soils Laboratory	Test Method	BS1377-8 : 1990 : Clause 7		Test Name	WS07 4.00m
	Database: \SQLEXPRESS \ System 5			Test Date	06/08/2015
	Site Reference			Borehole	WS07
	Jobfile	Southfield Manor, Cheltenham		Sample	4.00m
	Client	CC Ground Investigations		Depth	4.00m
	Operator	David Burton	Checked	Sean Royle	Approved Anthony Watkins

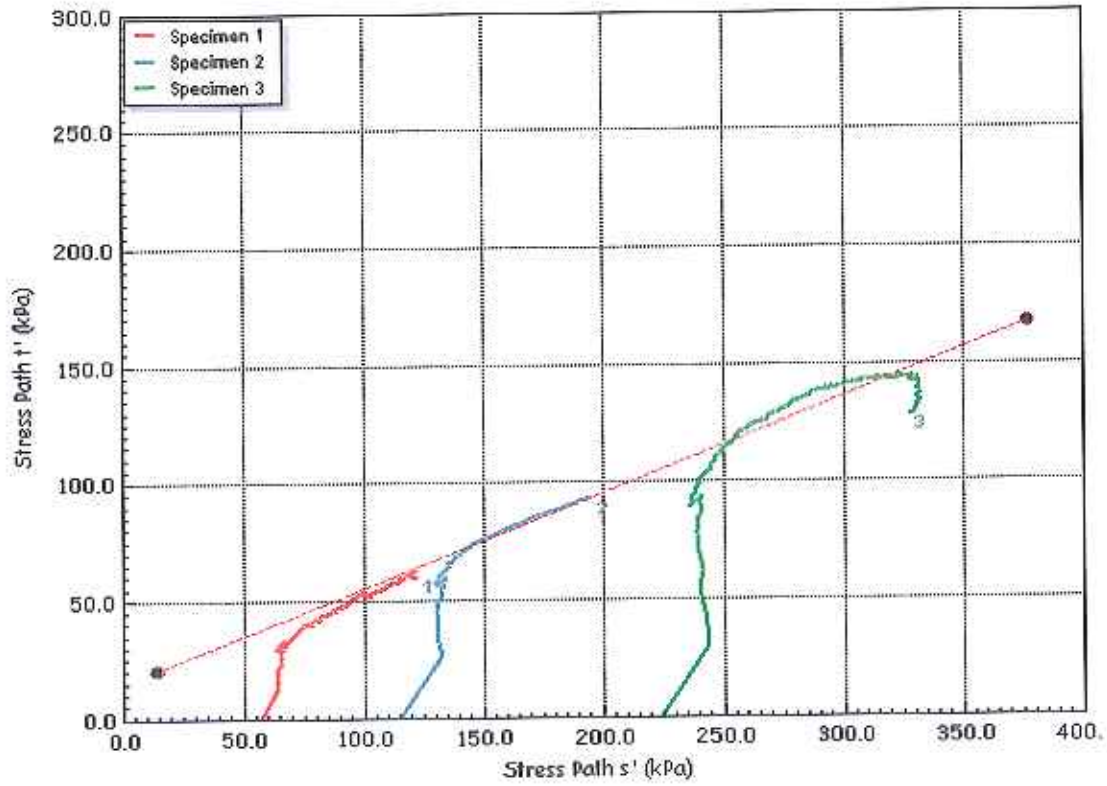
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots

Effective Cohesion	c'	(kPa)	15.48	Effective Cohesion	c'	(kPa)	15.48
Effective Friction	ϕ'	(deg)	23.9	Effective Friction	ϕ'	(deg)	23.9





Test Method	BS1377-8 : 1990 : Clause 7	Test Name	WS07 4.00m
Database: .\SQLEXPRESS \ System 5		Test Date	06/08/2015
Site Reference		Borehole	WS07
Jobfile	Southfield Manor, Cheltenham	Sample	4.00m
Client	CC Ground Investigations	Depth	4.00m
Operator	David Burton	Checked	Sean Royle	Approved	Anthony Watkins

PSL Professional Soils Laboratory

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 15-41130

31-Jul-15

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

Our Reference 15-41130

Client Reference PSL15/3590

Contract Title SOUTHFIELD MANOR, CHELTENHAM

Description 5 Soil samples.

Date Received 25-Jul-15

Date Started 25-Jul-15

Date Completed 31-Jul-15

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the scope of UKAS 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. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Mark Hughes
Operations Manager

UKAS TESTING
2139

Summary of Chemical Analysis

Soil Samples

Our Ref 15-41130
Client Ref PSL15/3590
Contract Title SOUTHFIELD MANOR, CHELTENHAM

			Lab No	844108	844109	844110	844111	844112
			Sample ID	WS06	WS07	WS07	WS08	WS09
			Depth	0.50	0.20	1.00	0.20	0.50
			Other ID					
			Sample Type	B	B	B	B	B
			Sampling Date	22/07/15	22/07/15	22/07/15	22/07/15	22/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
Metals								
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	< 10	< 10		< 10	< 10
Inorganics								
pH	DETSC 2008#			7.3	7.4		7.6	7.1
Organic matter	DETSC 2002#	0.1	%	0.8		1.5		2.8
Chloride Aqueous Extract	DETSC 2055	1	mg/l	2.9	2.9		1.4	6.0
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	1.9	8.2		3.0	11
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	< 10	< 10		< 10	17

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

Information in Support of the Analytical Results

Our Ref 15-41130
Client Ref PSL15/3590
Contract SOUTHFIELD MANOR, CHELTENHAM

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
844108	WS06 0.50 SOIL	22/07/15	PT 500ml		
844109	WS07 0.20 SOIL	22/07/15	PT 500ml		
844110	WS07 1.00 SOIL	22/07/15	PT 500ml		
844111	WS08 0.20 SOIL	22/07/15	PT 500ml		
844112	WS09 0.50 SOIL	22/07/15	PT 500ml		

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 and/or inappropriate containers 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

Richard Tucker
CC Ground Investigation Ltd
Unit A2
Innsworth Tech Park
Innsworth Lane
Gloucester
GL3 1DL

t: 01452 739 165
f: 01452 739 220
e: Richard@ccground.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 15-75700

Project / Site name:	Southfield Manor, Cheltenham	**Samples received on:**	16/07/2015
Your job number:	C4710	**Samples instructed on:**	17/07/2015
Your order number:		**Analysis completed by:**	28/07/2015
Report Issue Number:	1	**Report issued on:**	28/07/2015
Samples Analysed:	5 soil samples		

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Emma Winter
Assistant Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Analytical Report Number: 15-75700

Project / Site name: Southfield Manor, Cheltenham

Lab Sample Number				467353	467354	467355	467356	467357
Sample Reference				WS06	WS07	WS07	WS08	WS09
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.50	1.00	0.20	0.20
Date Sampled				14/07/2015	13/07/2015	13/07/2015	13/07/2015	14/07/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	6.0	9.7	10	4.3	7.6
Total mass of sample received	kg	0.001	NONE	1.1	1.5	1.5	1.2	1.0
Asbestos in Soil	Type	N/A	ISO 17025	Not detected	Not detected	Not detected	Not detected	Not detected
General Inorganics								
pH	pH Units	N/A	MCERTS	8.2	8.1	8.1	7.8	7.6
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.025	0.12	0.067	0.067	0.17
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	25	120	67	67	170
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.012	0.059	0.033	0.033	0.083
Organic Matter	%	0.1	MCERTS	0.9	0.7	0.3	2.8	3.0
Phenols by HPLC								
Catechol	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Resorcinol	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylphenol & Dimethylphenol	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cresols	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	210
Naphthols	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylphenol	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Phenol	µg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	23	910
Trimethylphenol	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols								
Total Phenols (HPLC)	µg/kg	7	NONE	< 7.0	< 7.0	< 7.0	23	1100
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.22	1.2	2.6	1.1	3.9
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	0.40	1.2	0.70	1.6
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.20	0.18	0.47
Fluorene	mg/kg	0.1	MCERTS	< 0.10	0.31	0.82	0.69	1.9
Phenanthrene	mg/kg	0.1	MCERTS	0.98	2.0	5.6	3.4	9.1
Anthracene	mg/kg	0.1	MCERTS	0.17	0.46	1.5	0.82	2.3
Fluoranthene	mg/kg	0.1	MCERTS	0.86	1.9	6.3	3.2	9.4
Pyrene	mg/kg	0.1	MCERTS	0.71	1.6	5.3	2.7	8.0
Benzo(a)anthracene	mg/kg	0.1	MCERTS	0.22	0.73	2.3	0.80	3.2
Chrysene	mg/kg	0.05	MCERTS	0.37	1.2	3.0	1.4	3.7
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	0.33	1.2	0.58	2.2
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	0.36	1.2	0.45	1.9
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	0.29	1.1	0.63	2.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.28	0.19	0.81
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.42	0.29	1.2
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	3.56	10.8	32.8	17.2	52.5

Analytical Report Number: 15-75700

Project / Site name: Southfield Manor, Cheltenham

Lab Sample Number				467353	467354	467355	467356	467357
Sample Reference				WS06	WS07	WS07	WS08	WS09
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.50	1.00	0.20	0.20
Date Sampled				14/07/2015	13/07/2015	13/07/2015	13/07/2015	14/07/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16	15	14	19	27
Boron (water soluble)	mg/kg	0.2	MCERTS	1.0	0.4	< 0.2	1.1	2.0
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	39	35	31	32	33
Copper (aqua regia extractable)	mg/kg	1	MCERTS	9.3	8.7	6.5	10	29
Lead (aqua regia extractable)	mg/kg	1	MCERTS	15	16	16	20	57
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	24	24	23	19	29
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	53	46	43	55	91
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	mg/kg	10	MCERTS	49	37	98	81	260

Iss No 15-75700-1

Analytical Report Number : 15-75700

Project / Site name: Southfield Manor, Cheltenham

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
467353	WS06	None Supplied	0.20	Light brown loam and clay with gravel and vegetation.
467354	WS07	None Supplied	0.50	Light brown clay and loam with gravel.
467355	WS07	None Supplied	1.00	Light brown clay and loam with gravel.
467356	WS08	None Supplied	0.20	Light brown sandy loam with gravel and vegetation.
467357	WS09	None Supplied	0.20	Brown clay and loam with gravel.

Analytical Report Number : 15-75700

Project / Site name: Southfield Manor, Cheltenham

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-S	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Organic matter in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in soil, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L061	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
TPH1 (Soil)	Determination of TPH by GC-MS/GC-FID.	In-house method	L054/076PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

APPENDIX D

Appendix D – SPT Calibration Data

SPT Calibration Report

www.equipegroup.com

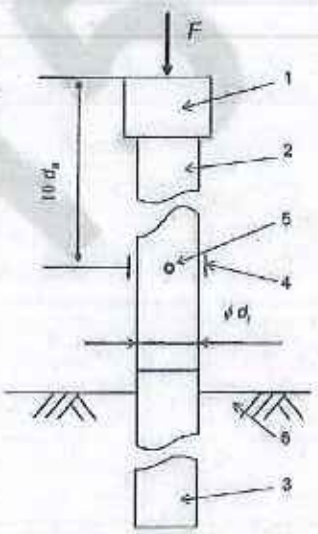
Hammer Energy Measurement Report

Type of Hammer	TERRIER
Client	C C GROUND INVESTIGATIONS
Test No	EQU1287A
Test Depth (m)	10.95
Date of Test	08 May 2015
Valid until	07 May 2016
Hammer ID	TO2

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

Characteristics of the instrumented rod

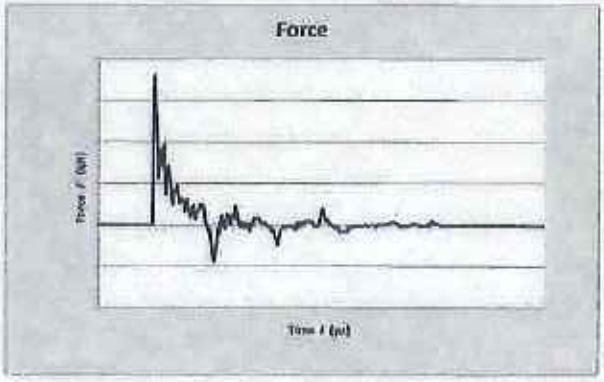
Diameter	d_r =	0.052 m
Length of the instrumented rod		0.558 m
Area	A =	11.61 cm^2
Modulus	E_a =	206843 MPa

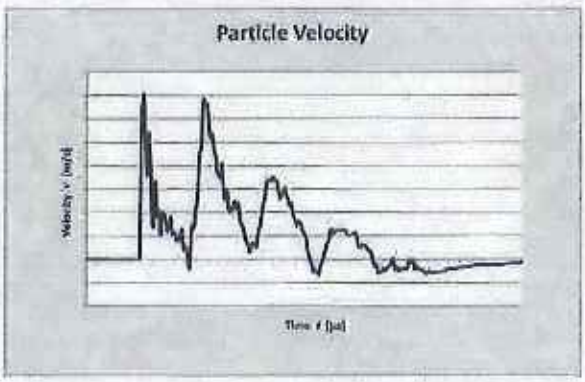


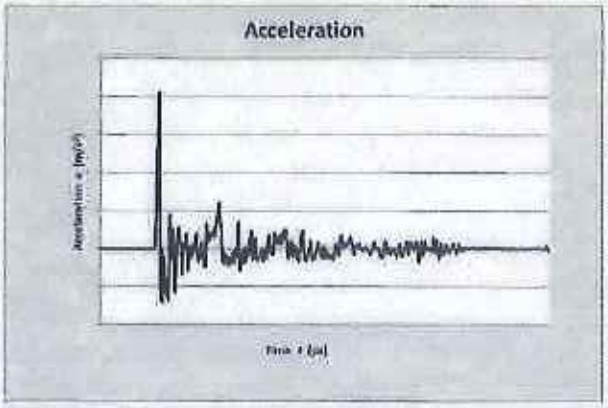
Key
1. Anvil
2. Part of instrumented rod
3. Drive Rod
4. Strain Gauge
5. Accelerometer
6. Ground

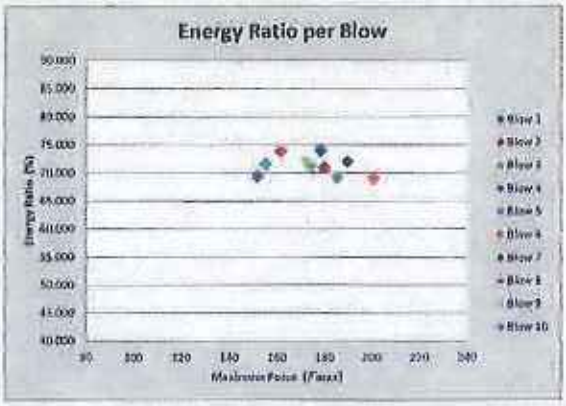
F Force
d_r Diameter of rod

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









Observations:
1.

E_{meas} =	0.336 kN-m	Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$ =	71.10%
E_{theor} =	0.473 kN-m		

Equipe SPT Analyzer Operators: MH

Prepared by:	Spies	Checked by:	Spies	Date	19/05/2015

CC Ground Investigation Limited

STANDARD PENETRATION TEST

Telephone: 01452 739165, Fax: 01452 739220, Email: info@ccground.co.uk

CC Ground Investigations Ltd

CLIENT Cheltenham Borough Council

SITE Southfield Brook Flood Alleviation Scheme

Borehole No.	Borehole Depth (m)	Bottom Depth (m)	Casing Depth (m)	Borehole Diameter (m)	Water Depth (m)	Seating Drive				Test Drive								Test Type	N
						Blows		Pen (mm)		Blows				Pen (mm)					
WS06	1.20	1.65	Nil	Pit	Dry	1	1	75	75	1	3	2	3	75	75	75	75	S	9
WS06	2.00	2.45	Nil	0.101	Dry	3	1	75	75	1	1	2	0	75	75	75	75	S	4
WS06	4.00	4.45	Nil	0.101	Dry	2	3	75	75	4	6	6	8	75	75	75	75	S	24
WS06	6.00	6.36	Nil	0.086	6.18	4	8	75	75	13	19	18		75	75	60		S	71
WS07	1.20	1.65	Nil	Pit	Dry	1	1	75	75	1	2	1	3	75	75	75	75	S	7
WS07	3.00	3.45	Nil	0.101	Dry	2	4	75	75	6	6	7	9	75	75	75	75	S	28
WS07	5.00	5.45	Nil	0.086	Dry	5	8	75	75	10	11	13	15	75	75	75	75	S	49
WS07	6.00	6.43	Nil	0.076	Dry	5	7	75	75	10	13	15	12	75	75	75	55	S	54
WS08	1.20	1.65	Nil	Pit	Dry	1	1	75	75	2	2	2	3	75	75	75	75	S	9
WS08	3.00	3.45	Nil	0.101	Dry	3	5	75	75	5	6	6	6	75	75	75	75	S	23
WS08	5.00	5.45	Nil	0.086	2.80	3	5	75	75	6	7	12	16	75	75	75	75	S	41
WS09	1.20	1.65	Nil	Pit	Dry	2	2	75	75	2	3	3	4	75	75	75	75	S	12
WS09	2.00	2.37	2.00	0.101	Dry	9	15	75	75	17	17	16		75	75	70		S	68
WS09	4.00	4.45	2.00	0.101	Dry	1	3	75	75	4	5	7	10	75	75	75	75	S	26
WS09	5.00	5.45	2.00	0.086	3.8	3	4	75	75	6	6	8	10	75	75	75	75	S	30

Notes:

1 Test carried out in general accordance with BS. 1377: Part 9: 3.3.

2 N values have not been subjected to any correction.

3 Test carried out using split spoon S, solid cone C.

4 Where full test drive not completed, linearly extrapolated N value reported.

5 <1 Denotes hammer self weight penetration (sank under own weight).

6 ** Denotes no effective penetration.

CONTRACT	CHECKED
C4710	RS