



ENCLOSURE B
GEOTECHNICAL LABORATORY TEST RESULTS

Determination of Moisture Content and Atterberg Limits – Summary of Results

Determination of pH and Sulphate content of Soils – Summary of Results

Particle Size Distribution Analyses

Determination of Particle Density – Summary of Results

Summary of Undrained Triaxial Compression Tests

Heavy Compaction Test Results

Dry Density / Moisture Content Relationship

COMPH 1 to COMPH 3

Determination of Consolidated Drained Shear Strength by Direct Shear

Project Name: Havant Thicket					Date received: 14/01/2007		K4 SOILS 	
Client: Soil Mechanics					Date sampled: 17/01/2007			
Project No: D6072					Date tested: 30/01/2007			
Our job/report no: 5029					Date reported: 06/02/2007			

Borehole No:	Sample No:	Depth (m)	Description	Moisture content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425 mm (%)	Remarks
BH101	11	4.00	Brownish grey slightly sandy CLAY	24	48	19	29	100	
BH101	18	6.00	Reddish brown and pale grey CLAY with occasional yellowish brown sand pockets	20	53	20	33	100	
BH101	27	9.00	Red and pale grey CLAY	18	50	16	34	100	
BH101	32	11.00	Red slightly mottled pale grey CLAY	16	47	19	28	100	
BH101	38	13.00	Reddish brown and greyish brown mottled CLAY with occasional sand pockets	17	44	19	25	100	
BH102	11	4.00	Red and pale grey CLAY	21	55	18	37	100	
BH102	16	6.00	Reddish brown and pale grey CLAY with grey staining	16	51	18	33	100	
BH102	21	8.00	Red and pale grey CLAY	21	63	22	41	100	
BH102	26	10.00	Red and pale grey CLAY with grey staining	16	47	19	28	100	
BH102	32	12.00	Red and pale grey CLAY with grey staining	16	39	15	24	100	
BH102	37	14.00	Pale grey slightly reddish brown CLAY with sand pockets	15	40	14	26	100	
BH103	8	3.00	Red and pale grey CLAY with orange brown sand staining	24	63	21	42	100	
BH103	14	5.00	Reddish brown and pale grey CLAY with grey staining	14	48	15	33	100	
BH103	20	7.00	Red and pale grey CLAY	19	59	18	41	100	
BH103	27	9.00	Red slightly pale grey CLAY	21	54	21	33	100	
BH103	33	11.00	Greyish brown, pale grey slightly reddish brown slightly sandy CLAY	14	38	16	22	100	
BH103	40	13.00	Greyish brown, reddish brown slightly pale grey CLAY with occasional sand pockets	16	38	15	23	100	
BH104	8	3.00	Brown, reddish brown slightly pale grey CLAY with occasional selenite crystals	30	71	28	43	100	



Summary of Test Results

BS 1377 Part 2 Clause 4.3 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377 Part 2 Clause 5 1990 Determination of the plastic limit and plasticity index

BS 1377 Part 2 Clause 3.2 1990 Determination of the moisture content by the oven-drying method

Checked and Approved

Initials: kp

Date: 06/02/2007

Test Report by K4 SOILS LABORATORY Unit 5 Olds Close Olds Approach Watford Herts WD18 9RU

Test Results relate only to the sample numbers shown above. Approved Signatories: K4 Phase 1 Test Mgr, K4 Phase 1 Lab Mgr, K4 Phase 1 R Qual Mgr.

All samples collected and the report issued on behalf of K4 SOILS and delivered or according to Customer Policy. Accuracy of results is subject to request.

REF: 11/62

Project Name: Havant Thicket		Date received: 14/01/2007	K4 SOILS 
		Date sampled: 17/01/2007	
Client: Soil Mechanics		Date tested: 30/01/2007	
Project No: D6072	Our job/report no: 5029	Date reported: 06/02/2007	

Borehole No:	Sample No:	Depth (m)	Description	Moisture content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425 mm (%)	Remarks
BH104	14	5.00	Grey and reddish brown CLAY with occasional selenite crystals	30	73	28	45	100	
BH104	20	7.00	Grey CLAY	30	77	25	52	100	
BH104	26	9.00	Grey CLAY	32	79	28	51	100	
BH104	31	11.00	Grey CLAY	27	77	24	53	100	
BH104	37	13.00	Grey CLAY	26	81	25	56	100	

	Summary of Test Results				Checked and Approved
	BS 1377 Part 2 Clause 4.3	1990 Determination of the liquid limit by the cone penetrometer method			Initials: kp
	BS 1377 Part 2 Clause 5	1990 Determination of the plastic limit and plasticity index			Date: 06/02/2007
2519	BS 1377 Part 2 Clause 3.2	1990 Determination of the moisture content by the oven-drying method			

Project Name: Havant Thicket					K4 SOILS LABORATORY
Client: Soil Mechanics		Project No: D6072			
		Reference: 5029			
Borehole No:	Sample No:	Depth m	Description	pH	Sulphate content (g/l)
BH101	16	5.00	Grey slightly sandy CLAY	7.0	0.26
BH102	28	11.00	Reddish brown and mottled blue grey CLAY	7.4	0.43
BH104	16	6.00	Greyish brown CLAY	6.9	0.26
BH104	32	11.00	Dark grey CLAY	6.8	0.08
Summary of Test Results BS 1377 Part 3 Clause 5 1990 Determination of sulphate content of soil and ground water gravimetric method					Checked and Approved Initials kp



PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit No

BH101

Location

Havant Thicket

Sample No

12

Visual Soil Description

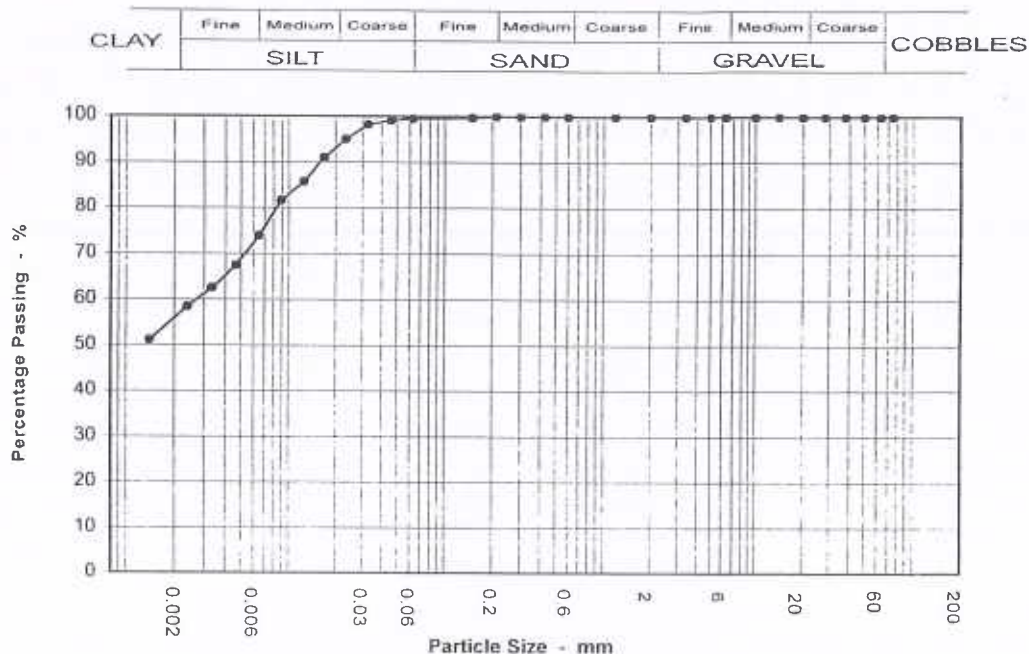
Dark grey slightly sandy silty CLAY

Depth

4.00 m

Sample type

U





PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit No

BH101

Location

Havant Thicket

Sample No

30

Visual Soil Description

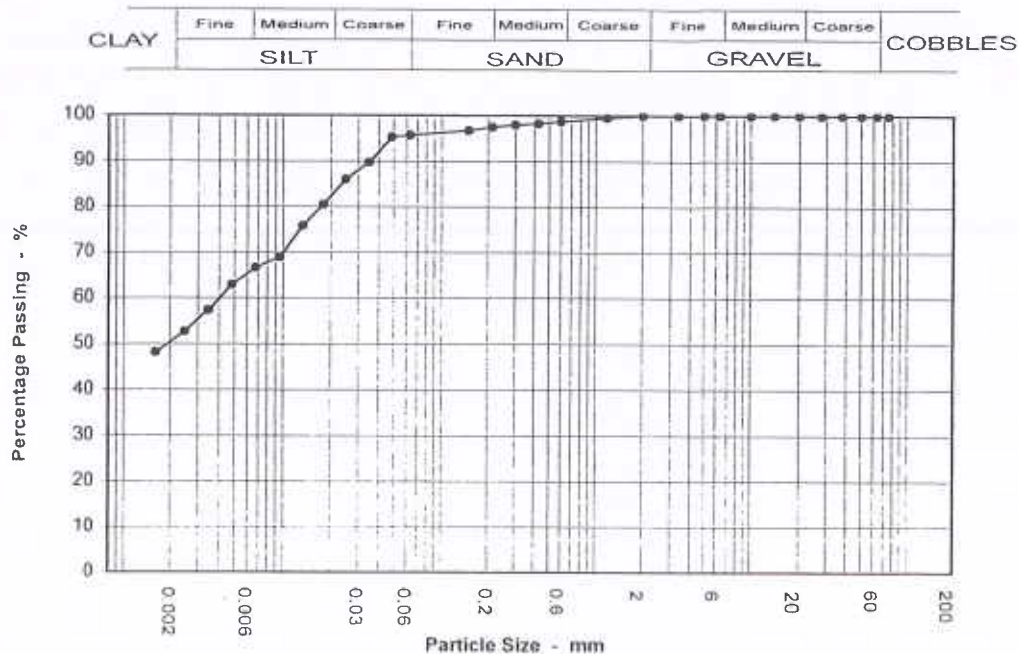
Reddish brown and grey slightly sandy silty CLAY

Depth

10.00 m

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.048	95
63	100	0.035	90
50	100	0.025	86
37.5	100	0.018	80
28	100	0.013	76
20	100	0.009	69
14	100	0.007	67
10	100	0.005	63
6.3	100	0.003	57
5	100	0.002	53
3.35	100	0.002	48
2	100		
1.18	100		
0.6	99		
0.425	98		
0.3	98		
0.212	98		
0.15	97		
0.063	96		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	4.3
Silt	45.4
Clay	50.2

Grading Analysis	
D100	2.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY

Unit 8 Olds Close Olds Approach
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Approved Signatories: K.Phaure(Tech.Mgr)

J.Phaure(Lab Mgr) Bhavika R (Qual Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved

Initials kp

Date 08/02/2007

Sheet 3/3

MSF 11 / R9

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PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit
No

BH101

Location

Havant Thicket

Sample No

39

Visual Soil
Description

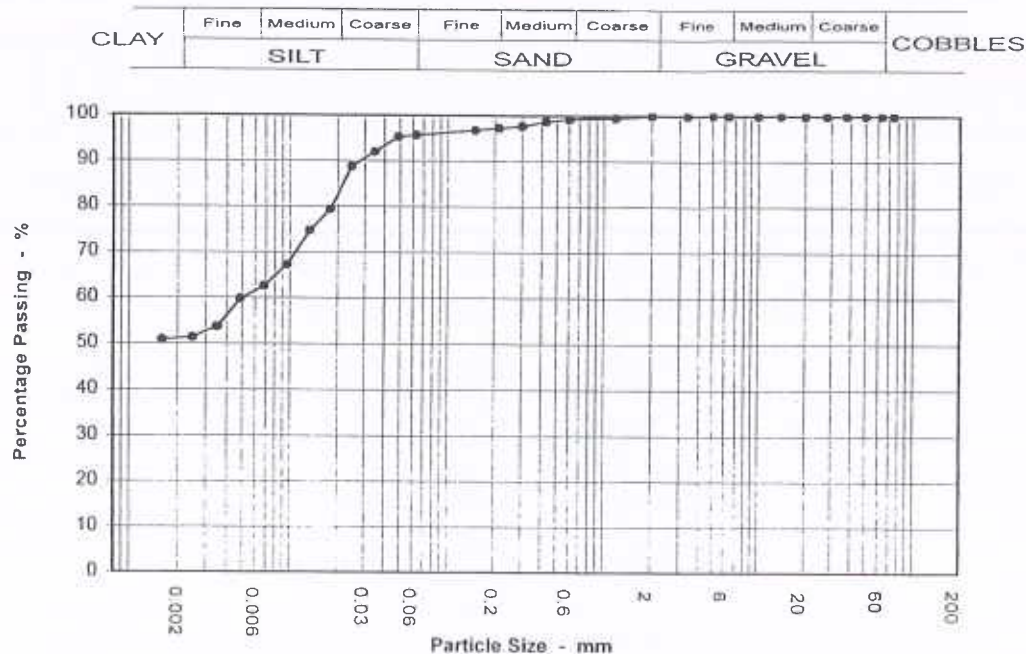
Reddish brown and greyish brown mottled blue grey
slightly sandy silty CLAY

Depth

13.50 m

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.049	95
63	100	0.035	92
50	100	0.025	89
37.5	100	0.018	79
28	100	0.013	75
20	100	0.010	67
14	100	0.007	63
10	100	0.005	60
6.3	100	0.003	54
5	100	0.002	51
3.35	100	0.002	51
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	98		
0.212	97		
0.15	97		
0.063	96		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	4.3
Silt	44.5
Clay	51.1

Grading Analysis	
D100	2.0
D60	
D10	
Uniformity Coefficient	N/A

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M01 2112 R09

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PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit No

BH102

Location

Havant Thicket

Sample No

15

Visual Soil Description

Reddish brown and grey slightly sandy silty CLAY

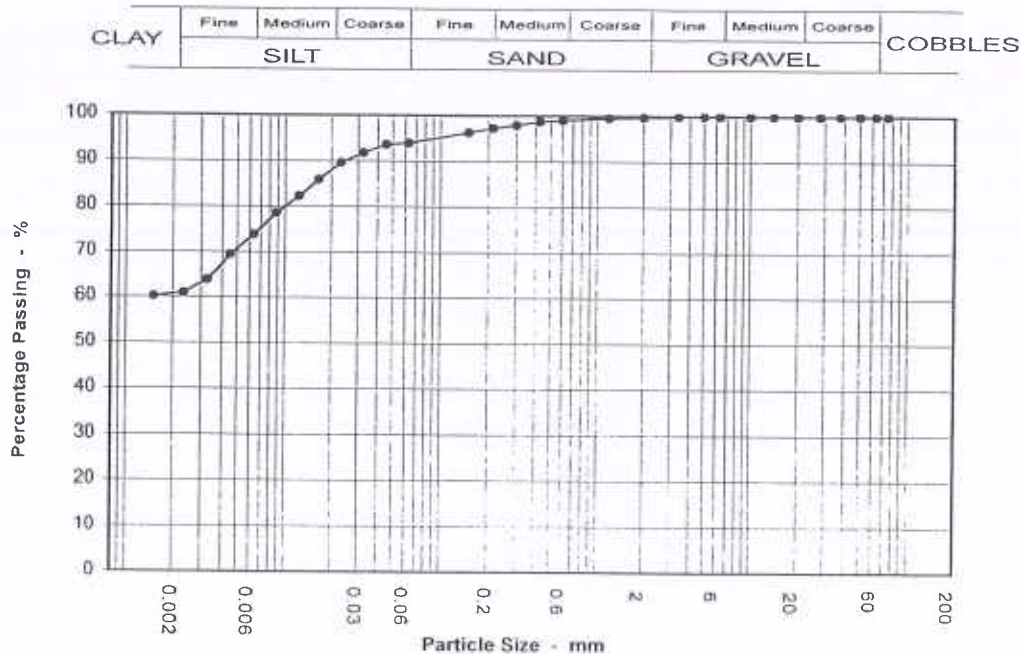
Depth

5.00

m

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.045	94
63	100	0.032	92
50	100	0.023	90
37.5	100	0.016	86
28	100	0.012	82
20	100	0.009	79
14	100	0.006	74
10	100	0.005	69
6.3	100	0.003	64
5	100	0.002	61
3.35	100	0.002	60
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	98		
0.212	97		
0.15	96		
0.063	94		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.3
Sand	5.8
Silt	33.3
Clay	60.7

Grading Analysis	
D100	3.4
D60	
D10	
Uniformity Coefficient	N/A

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Initials kp

Date 08/02/2007

Sheet 0/3

MS-11/199

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PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit
No

BH102

Location

Havant Thicket

Sample No

27

Visual Soil
Description

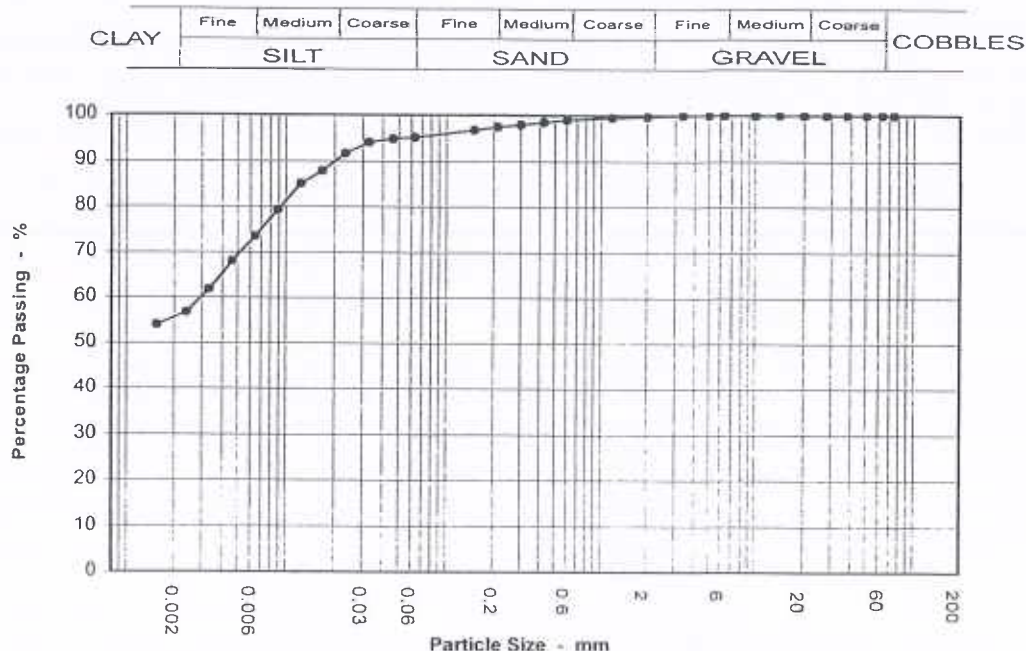
Reddish brown and grey slightly sandy silty CLAY

Depth

10.00 m

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.046	95
63	100	0.033	94
50	100	0.023	92
37.5	100	0.017	88
28	100	0.012	85
20	100	0.009	79
14	100	0.006	73
10	100	0.005	68
6.3	100	0.003	62
5	100	0.002	57
3.35	100	0.002	54
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	98		
0.212	98		
0.15	97		
0.063	95		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.3
Sand	4.6
Silt	39.7
Clay	55.5

Grading Analysis	
D100	3.4
D60	
D10	
Uniformity Coefficient	N/A

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Initials: kp

Date: 08/02/2007

Sheet 03

MSE 11/7/99

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PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit
No

BH102

Location

Havant Thicket

Sample No

38

Visual Soil
Description

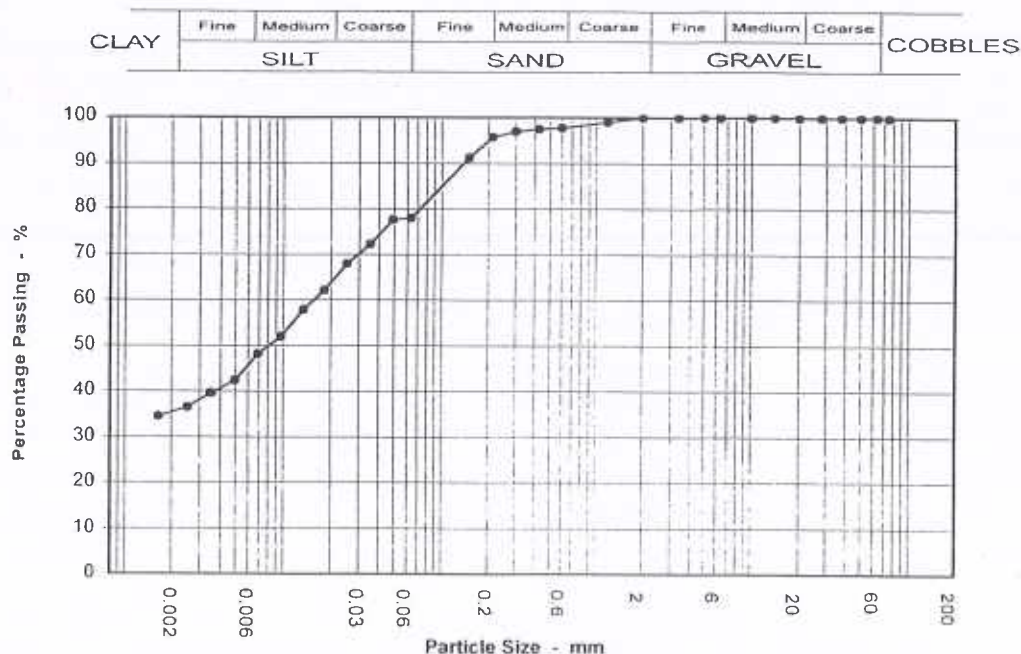
Reddish brown, greyish brown and mottled blue grey
sandy clayey SILT

Depth

14.00 m

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.049	78
63	100	0.035	72
50	100	0.025	68
37.5	100	0.018	62
28	100	0.013	58
20	100	0.010	52
14	100	0.007	48
10	100	0.005	42
6.3	100	0.004	40
5	100	0.003	36
3.35	100	0.002	35
2	100		
1.18	99		
0.6	98		
0.425	98		
0.3	97		
0.212	96		
0.15	91		
0.063	78		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	22.1
Silt	42.6
Clay	35.3

Grading Analysis	
D100	2.0
D60	
D10	
Uniformity Coefficient	N/A

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Checked and Approved

Initials: kp

Date: 08/02/2007

Sheet 3 of 3

MSF:11 R5

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PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit
No

BH103

Location

Havant Thicket

Sample No

15

Visual Soil
Description

Reddish brown and grey slightly sandy silty CLAY

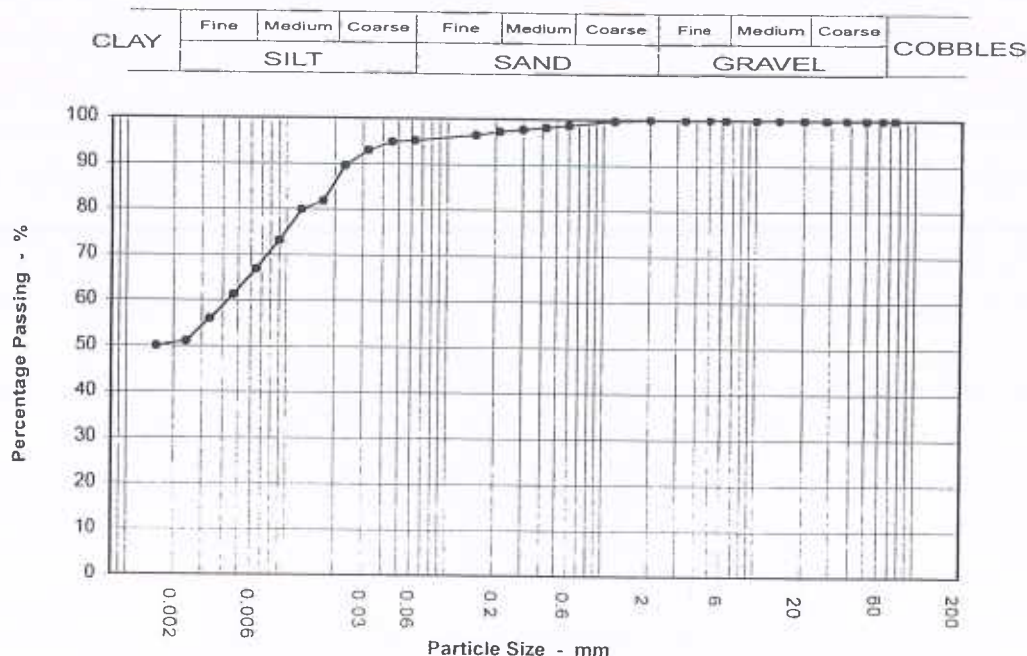
Depth

5.00

m

Sample type

D



Seiving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.045	95
63	100	0.032	93
50	100	0.023	90
37.5	100	0.017	82
28	100	0.012	80
20	100	0.009	73
14	100	0.006	67
10	100	0.005	61
6.3	100	0.003	56
5	100	0.002	51
3.35	100	0.002	50
2	100		
1.18	100		
0.6	99		
0.425	98		
0.3	98		
0.212	97		
0.15	97		
0.063	95		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	4.8
Silt	44.5
Clay	50.6

Grading Analysis	
D100	2.0
D60	
D10	
Uniformity Coefficient	N/A

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Checked and Approved

Initials: kp

Date: 08/02/2007

Sheet 3/3

MSF-11:R9

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PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit
No

BH103

Location

Havant Thicket

Sample No

25

Visual Soil
Description

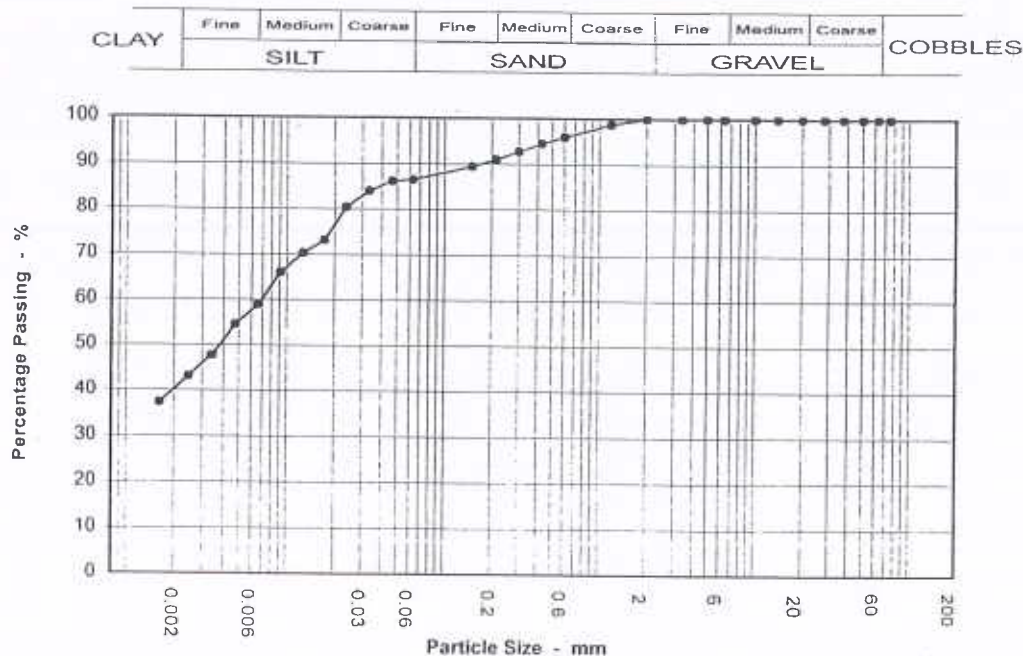
Reddish brown and grey slightly sandy clayey SILT

Depth

8.45 m

Sample type

D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.046	86
63	100	0.033	84
50	100	0.024	80
37.5	100	0.017	73
28	100	0.013	70
20	100	0.009	66
14	100	0.007	59
10	100	0.005	55
6.3	100	0.003	48
5	100	0.002	43
3.35	100	0.002	37
2	100		
1.18	99		
0.6	96		
0.425	95		
0.3	93		
0.212	91		
0.15	90		
0.063	87		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	13.6
Silt	46.4
Clay	40.0

Grading Analysis	
D100	2.0
D60	
D10	
Uniformity Coefficient	N/A

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Checked and Approved

Initials: kp

Date: 08/02/2007

Sheet 3/3

WSF.11/99

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PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit No

BH103

Location

Havant Thicket

Sample No

34

Visual Soil Description

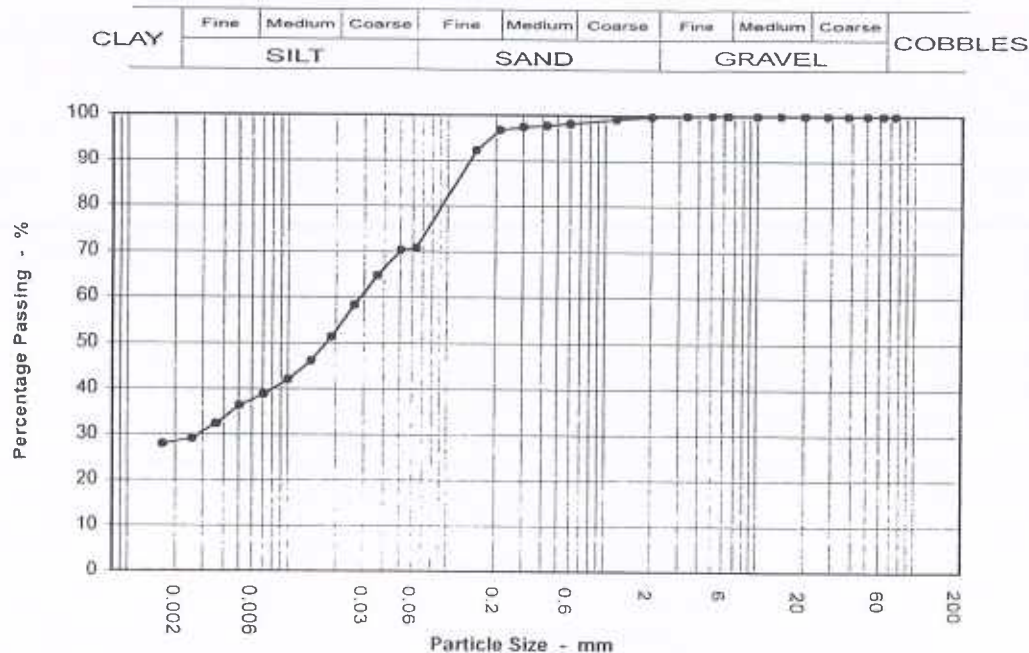
Brown, blue grey and reddish brown mottled clayey sandy SILT

Depth

11.00 m

Sample type

D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.050	70
63	100	0.036	65
50	100	0.026	58
37.5	100	0.019	51
28	100	0.014	46
20	100	0.010	42
14	100	0.007	39
10	100	0.005	36
6.3	100	0.004	32
5	100	0.003	29
3.35	100	0.002	28
2	100		
1.18	99		
0.6	98		
0.425	98		
0.3	98		
0.212	97		
0.15	92		
0.063	71		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.3
Sand	29.1
Silt	42.3
Clay	28.3

Grading Analysis	
D100	34
D60	
D10	
Uniformity Coefficient	N/A

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Initials kp

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MSE 11/1/09

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PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit
No

BH104

Location

Havant Thicket

Sample No

15

Visual Soil
Description

Greyish brown slightly sandy silty CLAY

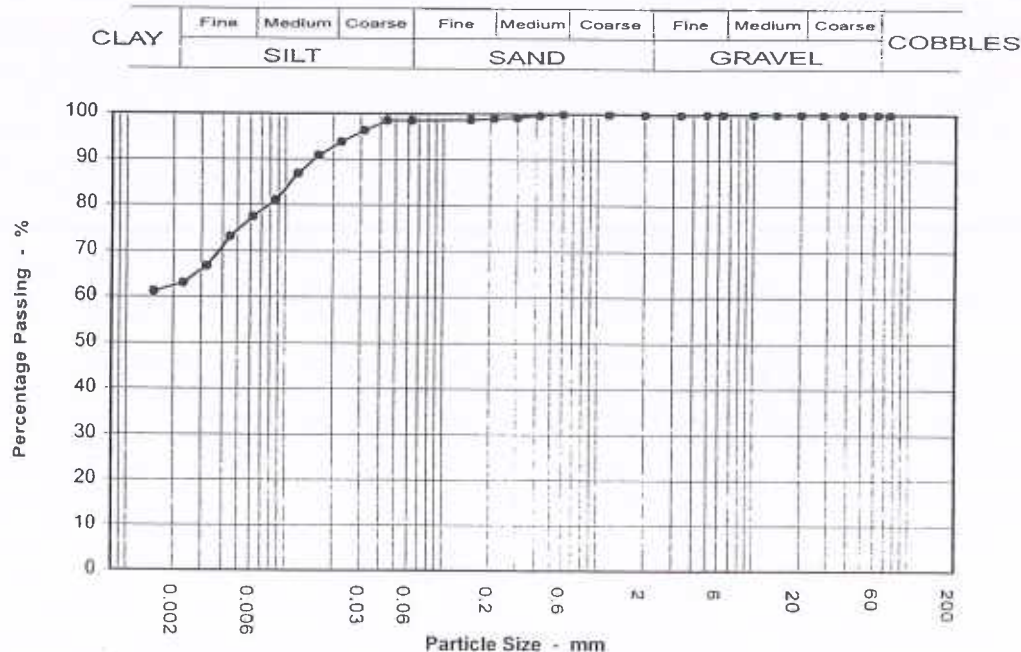
Depth

5.00

m

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.044	99
63	100	0.031	96
50	100	0.023	94
37.5	100	0.016	91
28	100	0.012	87
20	100	0.009	81
14	100	0.006	77
10	100	0.004	73
6.3	100	0.003	67
5	100	0.002	63
3.35	100	0.002	61
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	99		
0.212	99		
0.15	99		
0.063	99		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	1.5
Silt	36.2
Clay	62.3

Grading Analysis	
D100	0.6
D60	
D10	
Uniformity Coefficient	N/A

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MSI-11-R5

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PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit
No

BH104

Location

Havant Thicket

Sample No

29

Visual Soil
Description

Stiff fissured dark grey slightly sandy silty CLAY

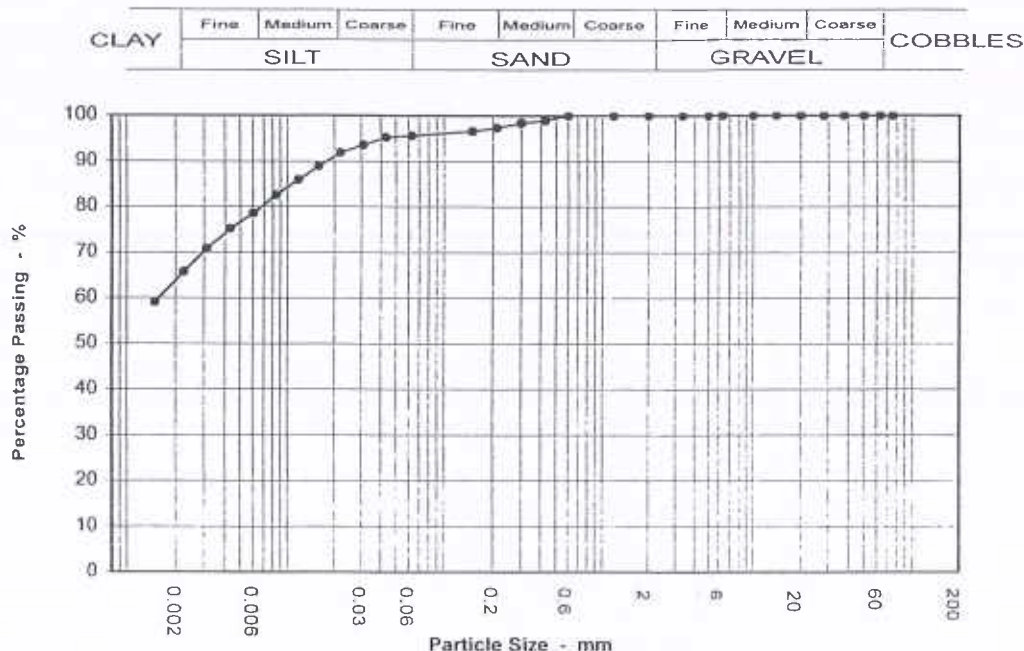
Depth

10.00

m

Sample type

U



Seiving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.043	95
63	100	0.031	94
50	100	0.022	92
37.5	100	0.016	89
28	100	0.012	86
20	100	0.008	83
14	100	0.006	79
10	100	0.004	75
6.3	100	0.003	71
5	100	0.002	66
3.35	100	0.001	59
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	98		
0.212	97		
0.15	97		
0.063	96		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	4.4
Silt	32.0
Clay	63.6

Grading Analysis	
D100	0.6
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY

Unit 8 Olds Close Olds Approach
Wotton Bassett Herts WD18 9RU
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)

J.Phaure(Lab Mgr) Bhavika R (Qual Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved

Initials: kp

Date: 08/02/2007

Sheet 3/3

MSE 1117 R9

All samples connected with this report and any on hold will be disposed off according to Company Policy. Copy of this policy is available on request



PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit
No

BH104

Location

Havant Thicket

Sample No

39

Visual Soil
Description

Dark grey slightly sandy silty CLAY

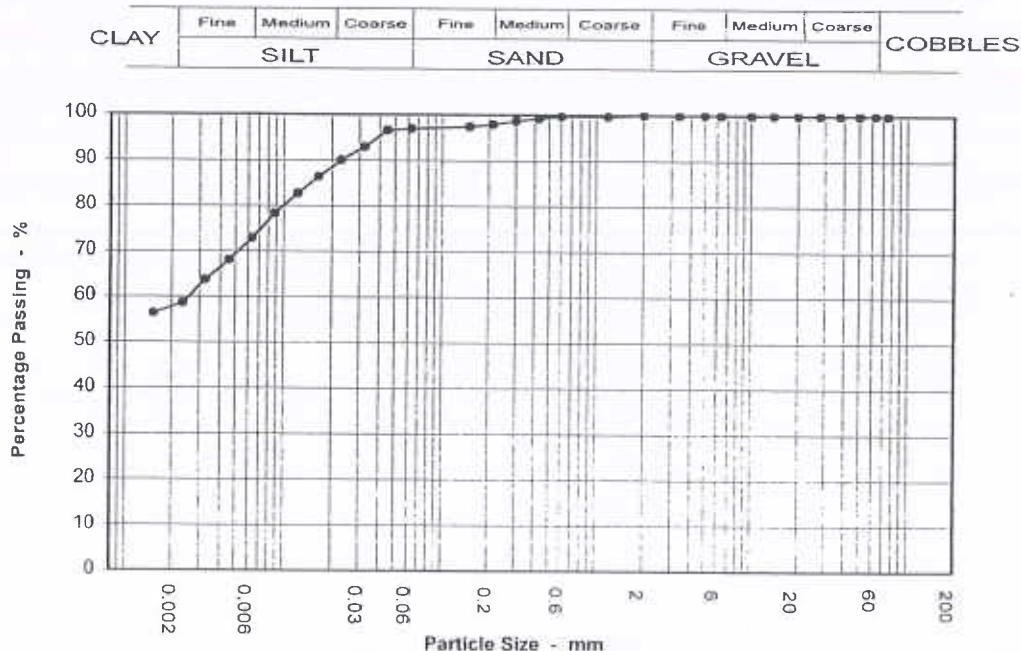
Depth

13.00

m

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.045	97
63	100	0.032	93
50	100	0.023	90
37.5	100	0.016	86
28	100	0.012	83
20	100	0.009	78
14	100	0.006	73
10	100	0.005	68
6.3	100	0.003	64
5	100	0.002	59
3.35	100	0.002	56
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	99		
0.212	98		
0.15	98		
0.063	97		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.0
Sand	3.1
Silt	39.3
Clay	57.6

Grading Analysis	
D100	2.0
D60	
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY

Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)

J.Phaure(Lab Mgr)

Bhavika R (Qual Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved

Initials: kp

Date: 08/02/2007

Sheet 3/3

12/01/11/09

All samples connected with this report and any on 'hold' will be disposed off according to Company Policy. A copy of this policy is available on request.



PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

5029

Borehole / Pit
No

TP101

Location

Havant Thicket

Sample No

2

Visual Soil
Description

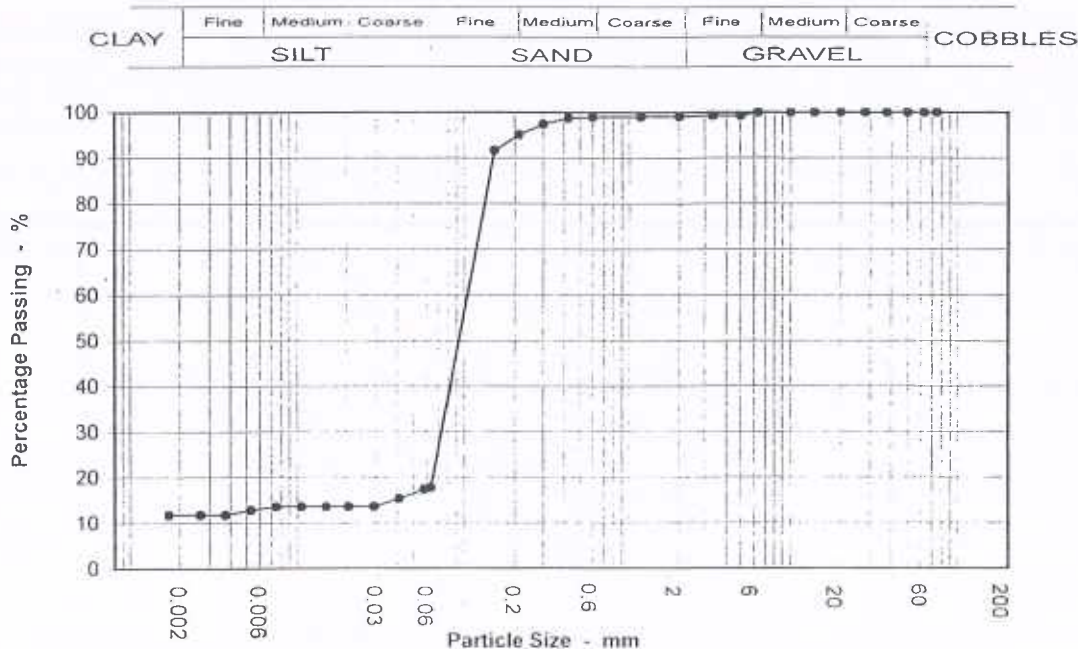
Brown slightly silty clayey SAND

Depth

1.50 m

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.057	17
63	100	0.041	15
50	100	0.029	14
37.5	100	0.020	14
28	100	0.015	14
20	100	0.011	14
14	100	0.007	14
10	100	0.005	13
6.3	100	0.004	12
5	99	0.003	12
3.35	99	0.002	12
2	99		
1.18	99		
0.6	99		
0.425	99		
0.3	97		
0.212	95		
0.15	92		
0.063	18		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	0.9
Sand	81.5
Silt	5.7
Clay	11.8

Grading Analysis	
D100	63
D60	0.1
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY

Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
E-mail: k4soils@aol.com

Approved Signatories: K.Phaure(Tech.Mgr)

J.Phaure(Lab.Mgr) Bhavika R.(Qual.Mgr)

TEST RESULTS TO BE CHECKED BY THE LABORATORY MANAGER

Checked and Approved

Initials: kp

Date: 26/02/2007

SHEK13/3

MSF 11-105

All samples connected with this report and any on hold will be disposed of according to Company Policy. A copy of this policy is available on request.

Project Name: Havant Thicket		Date received:		K4 SOILS 
Client: Soil Mechanics		Date sampled:		
Project No: D6072		Date tested:		
Our Job/report no: 5029		Date reported: 08/02/2007		
BH / TP No	Sample no / ref :	Sample depth (m)	Soil Description	Specific gravity Mg/m3
BH101	30	10	Reddish brown and grey slightly sandy silty CLAY	2.71
BH102	26	10	Red and pale grey CLAY with grey staining	2.68
BH102	37	14	Pale grey slightly reddish brown CLAY with sand pockets	2.77
BH103	30	10	Grey and reddish brown CLAY	2.74
BH104	14	5	Grey and reddish brown CLAY with occasional selenite crystals	2.79
BH104	31	11	Grey CLAY	2.64
Summary of Testing BS 1377 Part 2 Clause 8 : 1990 Determination of the Particle Density				Checked and Approved Initials kp Date 08/02/2007
Test Report by K4 SOILS LABORATORY Unit D Belvue House Belvue Road Northolt Midd UB5 5QJ Test Results relate only to the sample numbers shown above. Approved Signatories: K Phaire (Tech Mgr) J Phaire (Lab Mgr) (Bhavika R (Qum Mgr) Above tests are outside the scope of our UKAS accreditation All samples connected with this report and any on hold will be stored and disposed of according to Company policy. A copy of this policy is available on request.				

Project Name: Havant Thicket		Date received: 14/02/2007	K4 SOILS 	
Client: Soil Mechanics		Date sampled: 18/02/2007		
Project No: D6072		Date tested: 20/02/2007		
Our Job/report no: 5029		Date reported: 26/02/2007		
BH / TP No	Sample no / ref :	Sample depth (m)	Soil Description	Specific gravity Mg/m3
TP101	2	1.5	Brown slightly silty clayey SAND	2.67
Summary of Testing BS 1377 Part 2 : Clause 8 : 1990 Determination of the Particle Density				Checked and Approved Initials: kp Date: 26/02/2007
Test Report by: K4 SOILS LABORATORY Unit D Belvue House Belvue Road Northolt Midd UB5 5QJ Test Results relate only to the sample numbers shown above. Approved Signatories: A. Phaire (Tech. Mgr) J. Phaire (Lab. Mgr) Bhawna R. (Qual. Mgr) Above tests are outside the scope of our UKAS accreditation All samples connected with this report, incl any on hold, will be stored and disposed of according to Company policy. Copy of this policy is available on request.				

Client : Soil Mechanics												
Project name:				Havant Thicket		Our Job/report no: 5029		Date received: 14/01/2007		Date tested: 19/01/2007		
						Project No: D6072		Date sampled: 16/01/2007		Date reported: 08/02/2007		
BH / TP No	Sample no / ref	Sample depth (m)	Description	Moisture content (%)	Bulk Density (Mg/m3)	Dry density (Mg/m3)	Cell Pressure (kPa)	Strain at failure (%)	Max Deviator Stress (kPa)	Mode of failure	Cohesion (kPa)	Phi (deg)
BH103	24	8.00	Very stiff variegated brick red and pale blue grey CLAY	17	2.21	1.90						
BH103	37	12.00	Firm friable variegated greenish brown and pale blue grey very sandy CLAY	17	2.18	1.87						
BH104	29	10.00	Stiff fissured dark grey slightly sandy silty CLAY	30	1.96	1.51						
BH104	35	12.00	Stiff fissured dark grey slightly silty CLAY	25	1.99	1.59						

K4 SOILS



Summary of Undrained Triaxial Compression Testing

Checked and approved

Initials

kp

BS 1377 : Part 7 : Clause 8 : 1990

Test Results relate only to the sample numbers shown above. All samples connected with this report, incl any on 'hold' will be stored and disposed off according to Company policy. A copy of this policy is available on request.

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford WD18 9RU

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Bhavika R.(Qual.Mgr)

Project Name	Havant Thicket					K4 Soils Laboratory
Project Number	D6072	Client	Soil Mechanics	Reference	5029	
Borehole Number	BH101	Sample Number	B19	Depth (m)	6.00-6.45	

Sample description : Reddish brown and grey silty sandy CLAY

Initial preparation : Sample was oven dried

Single sample was remixed for each compaction point.

Proportion passing on 37.5mm sieve % : 100

Proportion passing on 20mm sieve % : 100

Particle density Mg/m^3 : 2.7 (Assumed)

Dry density vs moisture content graph

Maximum Dry Density Mg/m^3	1.96
Optimum Moisture Content %	12.5

	Heavy Compaction Test BS 1377 : Part 4 : Clause 3.5 : 1990 Determination of dry density/moisture content relationship Method using 4.5kg rammer		Approved by Initials kp Date 08/02/2007
	Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU		
	Test Results relate only to the sample numbers shown above. Approved Signatories: K. Frazer Tech Mgr; J. Phares QC Mgr; B. Haines H. Qual. Mgr.		

Sheet 1/2

All samples connected with this report and any on hold will be stored and disposed of according to Company policy. A copy of this policy is available on request.

Project Name	Havant Thicket					K4 Soils Laboratory
Project Number	D6072	Client	Soil Mechanics		Reference	5029
Borehole Number	BH101	Sample Number	B34	Depth (m)	11.50-12.00	

Sample description : Reddish brown and grey mottled CLAY

Initial preparation : Sample was oven dried

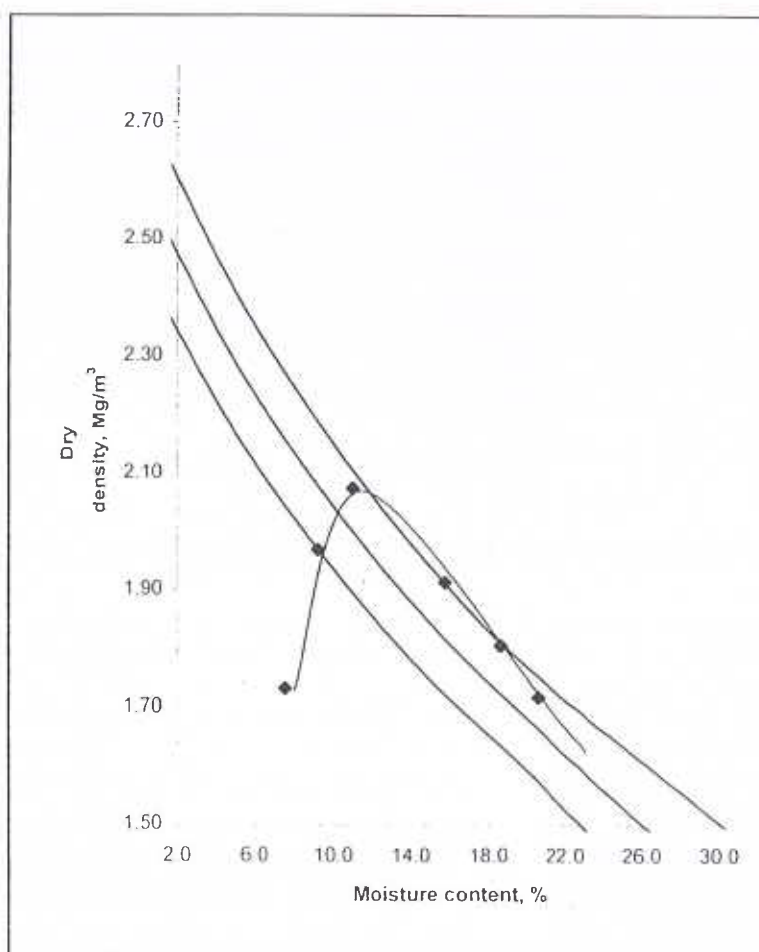
Single sample was remixed for each compaction point.

Proportion passing on 37.5mm sieve % : 100

Proportion passing on 20mm sieve % : 100

Particle density Mg/m^3 : 2.7 (Assumed)

Dry density vs moisture content graph



Maximum Dry Density	Mg/m^3	2.08
Optimum Moisture Content	%	11.0



Heavy Compaction Test

BS 1377 : Part 4 : Clause 3.5 : 1990

Determination of dry density/moisture content relationship Method using 4.5kg rammer

Approved by

Initials kp
Date 08/02/2007

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Sheet 1/2

Test Results relate only to the sample numbers shown above Approved Signatories : K Phaire : Tech Mgr J Phaire : Lab Mgr Brawika R : Qual Mgr

All samples connected with this report and any on 'hold' will be stored and disposed off according to Company policy. Copy of this policy is available on request.

Project Name	Havant Thicket						K4 Soils Laboratory
Project Number	D6072	Client	Soil Mechanics		Reference	5029	
Borehole Number	BH102	Sample Number	B12	Depth (m)	4.00-4.45		

Sample description : Reddish brown and blue grey CLAY

Initial preparation : Sample was oven dried

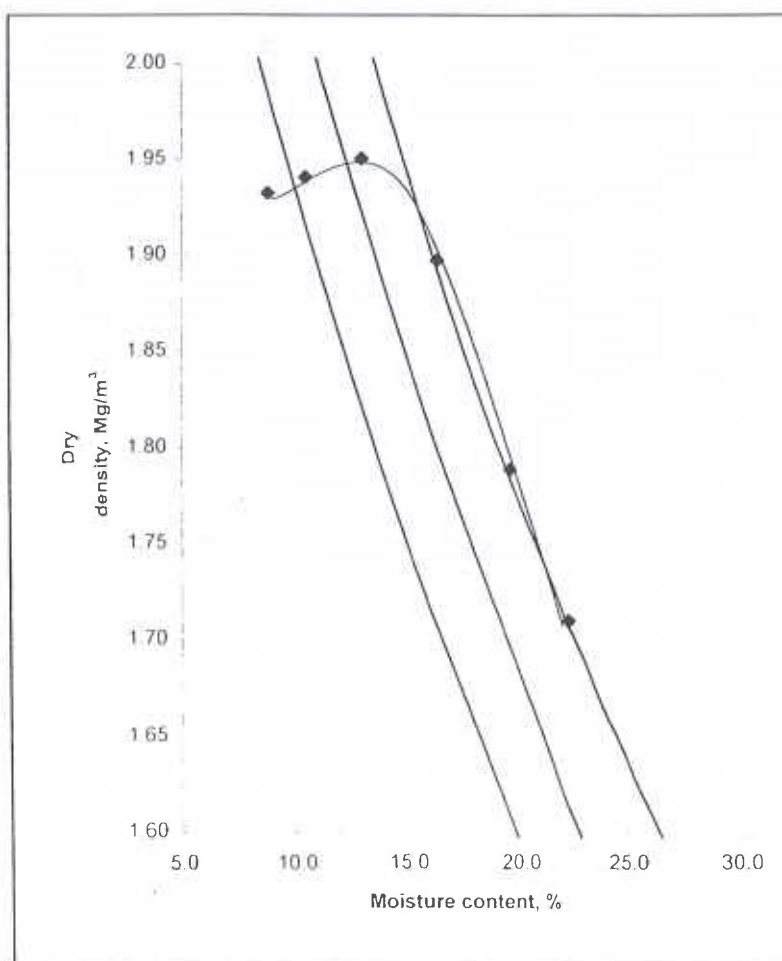
Single sample was remixed for each compaction point.

Proportion passing on 37.5mm sieve % : 100

Proportion passing on 20mm sieve % : 100

Particle density Mg/m^3 : 2.7 (Assumed)

Dry density vs moisture content graph



Maximum Dry Density	Mg/m^3	1.95
Optimum Moisture Content	%	12.9



Heavy Compaction Test

BS 1377 : Part 4 : Clause 3.5 : 1990

Determination of dry density/moisture content relationship Method using 4.5kg rammer

Approved by

Initials kp
Date 08/02/2007

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Sheet 1 of 2

Test Results relate only to the sample numbers shown above. Approved Signatories: K Phaire (Tech Mgr), J Phaire (Lab Mgr), Bhavika R (Qual Mgr)

All samples connected with this report and any on hold will be stored and disposed off according to Company policy. Copy of this policy is available on request.

Project Name	Havant Thicket					K4 Soils Laboratory
Project Number	D6072	Client	Soil Mechanics		Reference	5029
Borehole Number	BH102	Sample Number	B33	Depth (m)	12.00-12.45	

Sample description : Reddish brown and grey slightly sandy CLAY

Initial preparation : Sample was oven dried

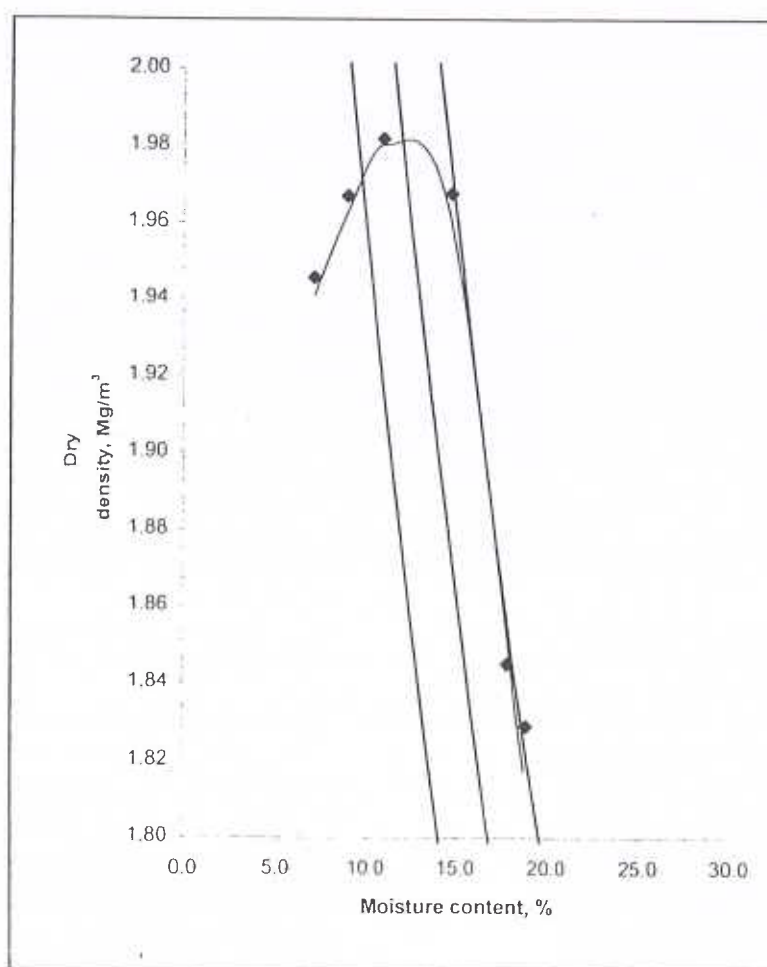
Single sample was remixed for each compaction point.

Proportion passing on 37.5mm sieve % : 100

Proportion passing on 20mm sieve % : 100

Particle density Mg/m^3 : 2.5 (Assumed)

Dry density vs moisture content graph



Maximum Dry Density Mg/m^3	1.98
Optimum Moisture Content %	11.0



Heavy Compaction Test

BS 1377 : Part 4 : Clause 3.5 : 1990

Determination of dry density/moisture content relationship. Method using 4.5kg rammer

Approved by

Initials kp
Date 08/02/2007

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Test Results relate only to the sample numbers shown above. Approved Signatories: K Phaire (Tech Mgr), J Phaire (Lab Mgr)

Bhavika P. Chaudhary

All samples connected with this report (incl any on 'hold') will be stored and disposed of according to Company policy. A copy of this policy is available on request.

SHEET 1/2

Project Name	Havant Thicket					K4
Project Number	D6072	Client	Soil Mechanics		Reference	5029
Borehole Number	BH103	Sample Number	B16	Depth (m)	5.00-5.45	Soils Laboratory

Sample description : Brown, pale grey and dark reddish brown CLAY

Initial preparation : Sample was oven dried

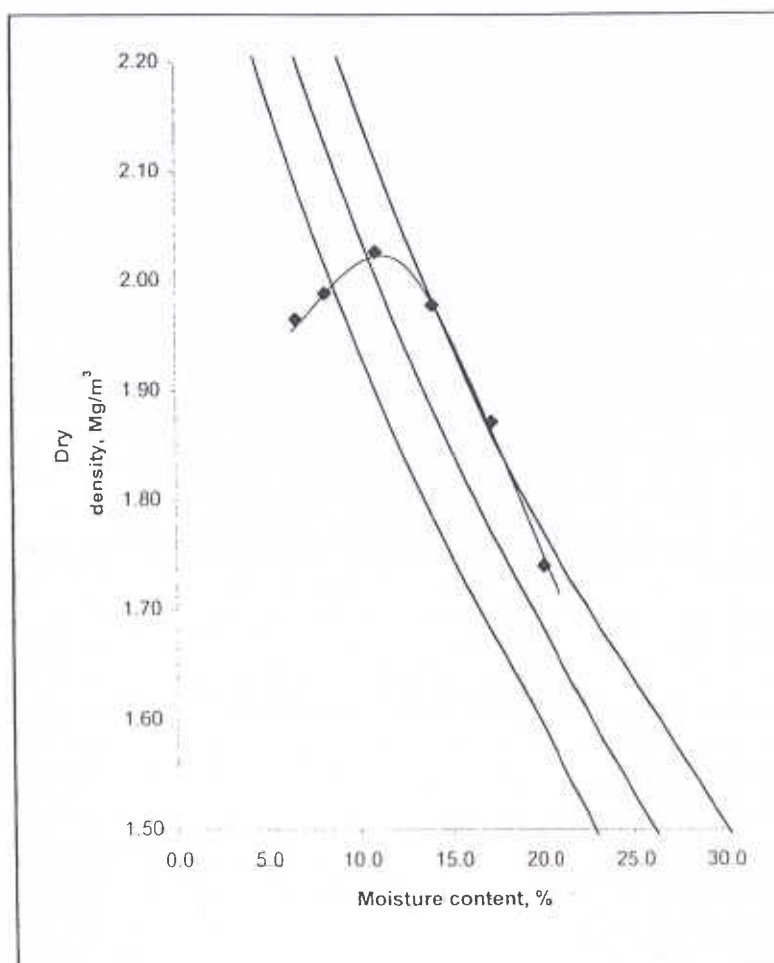
Single sample was remixed for each compaction point.

Proportion passing on 37.5mm sieve % : 100

Proportion passing on 20mm sieve % : 100

Particle density Mg/m^3 : 2.7 (Assumed)

Dry density vs moisture content graph



Maximum Dry Density Mg/m^3	2.03
Optimum Moisture Content %	10.9



Heavy Compaction Test

BS 1377 : Part 4 : Clause 3.5 : 1990

Determination of dry density/moisture content relationship : Method using 4.5kg rammer

Approved by

Initials kp
Date 08/02/2007

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Sheet 1/2

Test Results relate only to the sample numbers shown above. Approved Signatories: K. Phaire (Tech Mgr), J. Phaire (Lab Mgr), Bravka R (Cust Mgr)

All samples connected with this report, incl any on hold, will be stored and disposed of according to Company policy. A copy of this policy is available on request.

Project Name	Havant Thicket					K4 Soils Laboratory
Project Number	D6072	Client	Soil Mechanics		Reference	
Borehole Number	BH103	Sample Number	B35	Depth (m)	11.00-11.50	

Sample description : Pale blue grey and grey slightly sandy CLAY

Initial preparation : Sample was oven dried

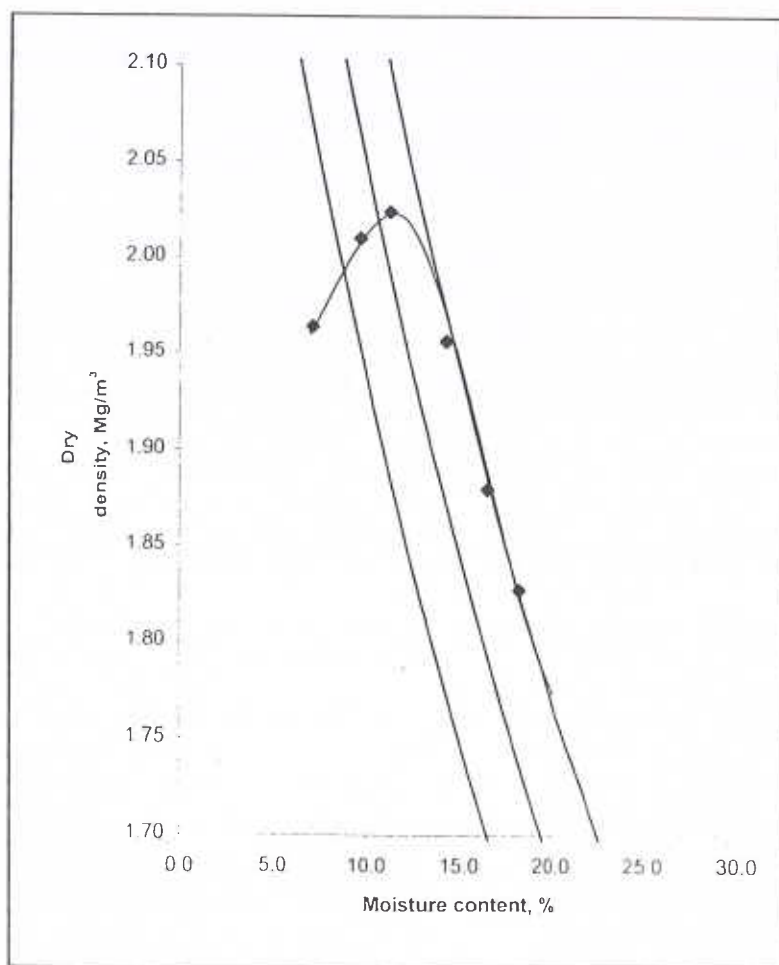
Single sample was remixed for each compaction point

Proportion passing on 37.5mm sieve % : 100

Proportion passing on 20mm sieve % : 100

Particle density Mg/m^3 : 2.74 (Assumed)

Dry density vs moisture content graph



Maximum Dry Density Mg/m^3	2.02
Optimum Moisture Content %	11.2



Heavy Compaction Test

BS 1377 : Part 4 : Clause 3.5 : 1990

Determination of dry density/moisture content relationship : Method using 4.5kg rammer

Approved by

Initials

kp

Date

08/02/2007

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Sheet 1/2

Test Results relate only to the sample numbers shown above. Approved Signatories: K Praire (Tech Mgr), J Praire (Lab Mgr), Bhavika R (Qual Mgr)

All samples connected with this report incl any on file will be stored and disposed off according to Company policy. A copy of this policy is available on request.

Project Name	Havant Thicket						K4 Soils Laboratory
Project Number	D6072	Client	Soil Mechanics		Reference	5029	
Borehole Number	BH104	Sample Number	B33	Depth (m)	11.00-11.45		

Sample description : Dark grey silty CLAY

Initial preparation : Sample was oven dried

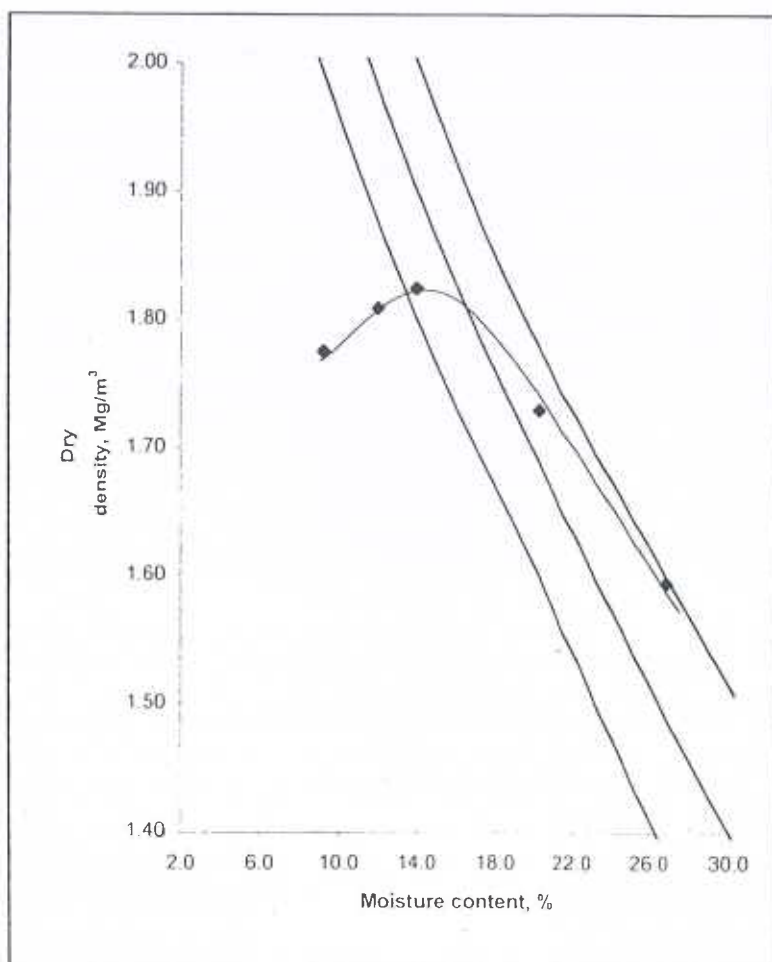
Single sample was remixed for each compaction point.

Proportion passing on 37.5mm sieve % : 100

Proportion passing on 20mm sieve % : 100

Particle density Mg/m^3 : 2.7 (Assumed)

Dry density vs moisture content graph



Maximum Dry Density Mg/m^3	1.82
Optimum Moisture Content %	14.0



Heavy Compaction Test

BS 1377 : Part 4 : Clause 3.5 : 1990

Determination of dry density/moisture content relationship Method using 4.5kg rammer

Approved by

Initials kp

Date 08/02/2007

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

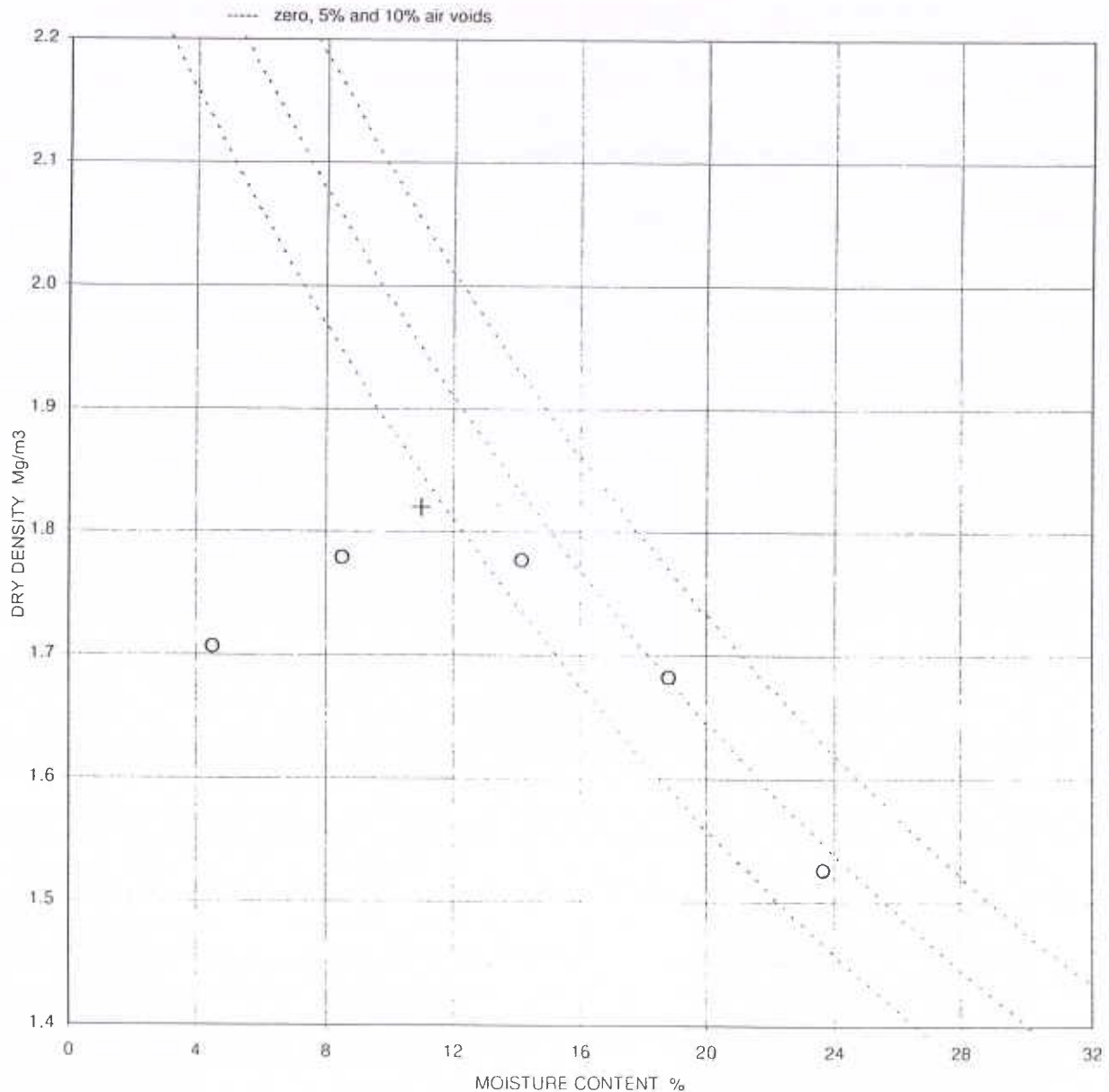
Sheet 1/2

Test Results relate only to the sample numbers shown above Approved Signatories K Phaire (Tech Mgr) J Phaire (Lab Mgr) Bhavika R (Qual Mgr)

All samples connected with this report and any on hold will be stored and disposed off according to Company policy. A copy of this policy is available on request.

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	D6072	Sample Details:	Hole No	BH101
Project Name	Havant Thicket		Depth (m BGL)	9.50
			Samp No	28
			Type	B
			ID	ESGD607220061120470300
			Spec Ref	



Soil description Red brown mottled grey CLAY

Test method BS 1377:part 4:1990; clause 3.5, 4.5 kg rammer in a 1 litre mould
 Preparation Original material was oven dried at 45°C. single sample tested

Material > 37.5mm 0 %
 Material < 37.5mm > 20mm 0 %
 Particle density 2.65 assumed

Remarks

Derived Parameters +

Maximum dry density, Mg/m³ 1.82
 Optimum moisture content, % 11

QA Ref

SLD 4, 3.5/6
 Rev 0
 Nov 04



Soil Mechanics



Approved

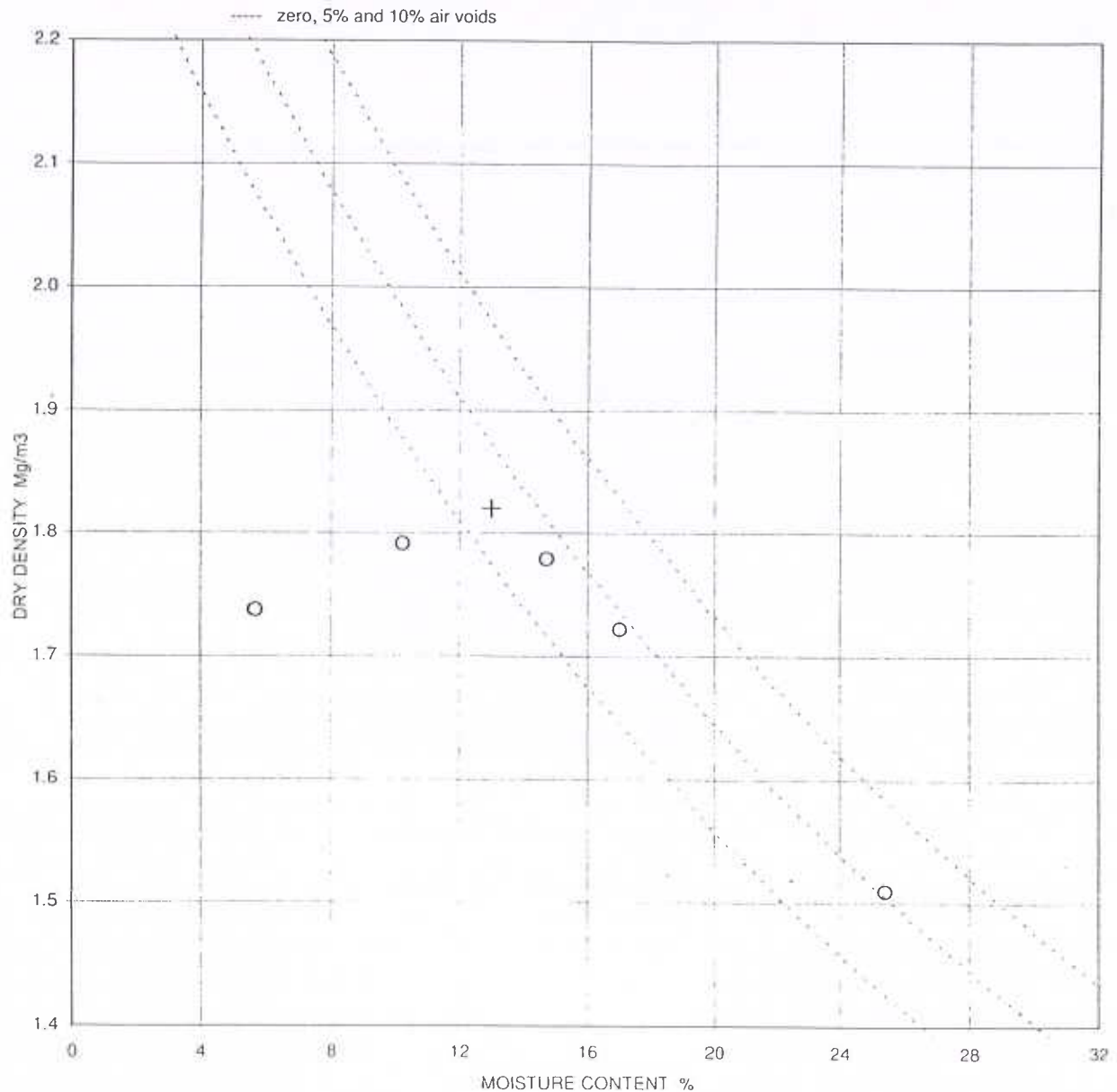
Date

Figure

COMPH 1

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	D6072	Sample Details:	Hole No	BH102
Project Name	Havant Thicket		Depth (m BGL)	8.00
			Samp No	22
			Type	B
			ID	ESGD607220061120028297
			Spec Ref	



Soil description Multi-coloured CLAY

Test method BS 1377 part 4:1990 clause 3.5, 4.5 kg rammer in a 1 litre mould

Preparation Original material was oven dried at 45°C, single sample tested

Material > 37.5mm 0 %

Material < 37.5mm > 20mm 0 %

Particle density 2.65 assumed

Remarks

Derived Parameters +

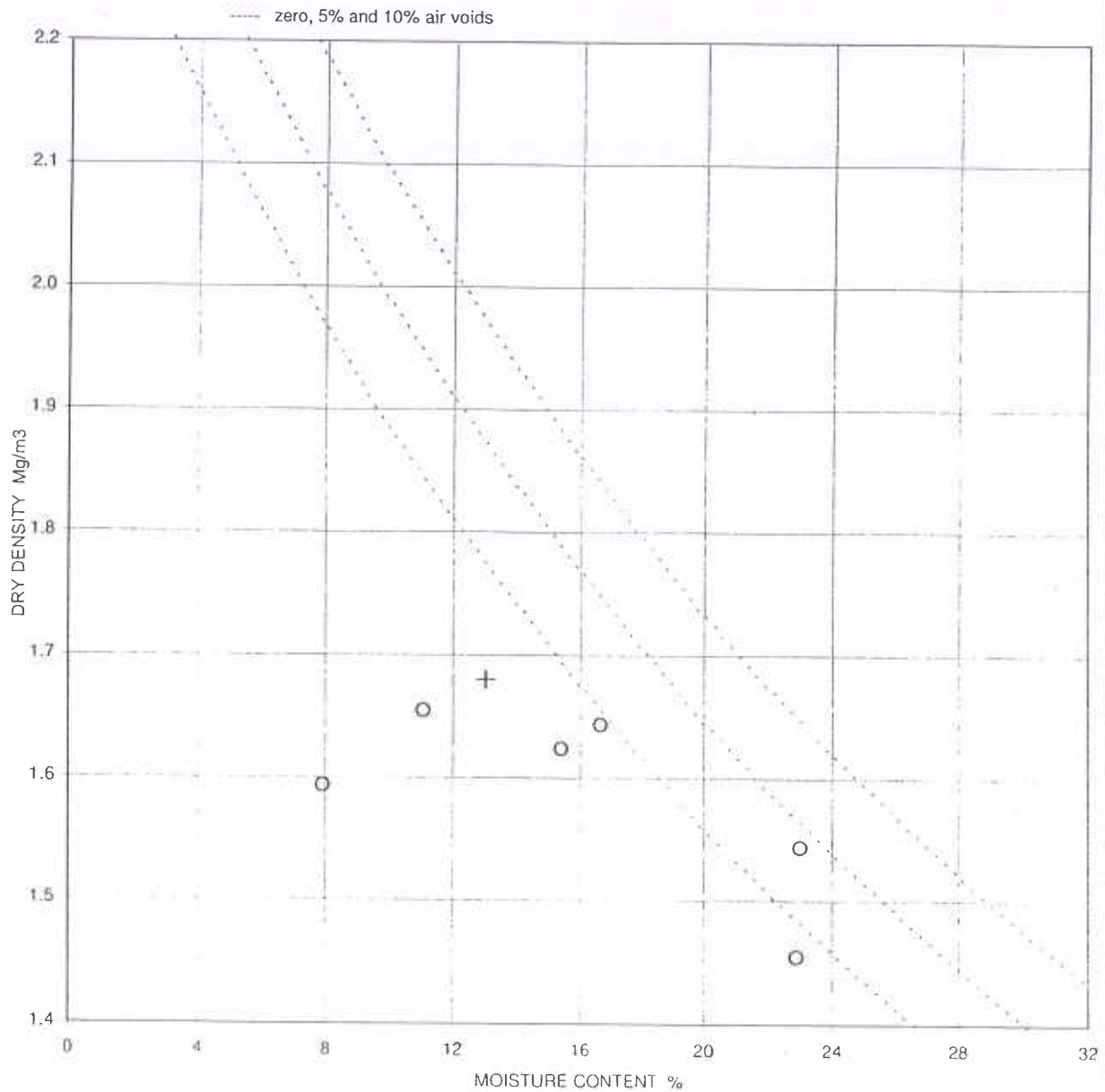
Maximum dry density, Mg/m³ 1.82

Optimum moisture content, % 13

QA Ref	 Soil Mechanics		Approved		Figure COMPH 2
SLD 4, 3.5/6 Rev 0 Nov 04			Date		

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	D6072	Sample Details:	Hole No	BH104
Project Name	Havant Thicket		Depth (m BGL)	9.00
			Samp No	27
			Type	B
			ID	ESGD607220061120942945
			Spec Ref	



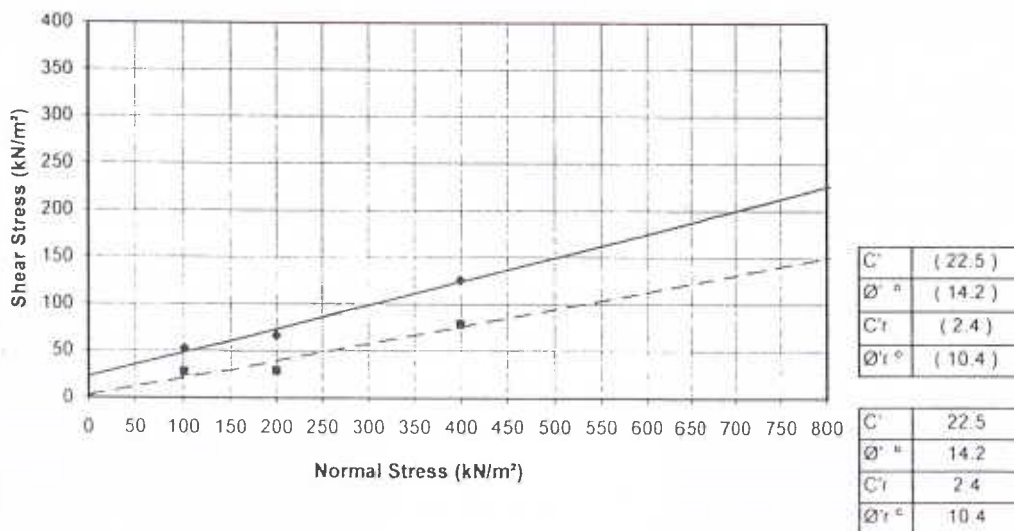
Soil description	Grey CLAY.	Derived Parameters* +
Test method	BS 1377 part 4:1990- clause 3.5, 4.5 kg rammer in a 1 litre mould	Maximum dry density, Mg/m3
Preparation	Original material was oven dried at 45°C, single sample tested	1.68
Material > 37.5mm	0 %	Optimum moisture content, %
Material < 37.5mm > 20mm	0 %	13
Particle density	2.65 assumed	
Remarks		
QA Ref	SLD 4, 3.5/6 Rev 0 Nov 04	Figure
	Soil Mechanics	COMPH 3
	Approved	
	Date	

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH101
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	9.50 - 10.00
			No	28
			Type	Bulk
			ID	

Test Specimen Number		1	2	3	4	5	6
Initial Height of Specimen	mm	23.91	23.91	23.91			
Initial Width of Specimen	mm	59.89	59.89	59.89			
Initial Length of Specimen	mm	59.89	59.89	59.89			
Initial Water Content (Trimming)	%	21.76	21.90	22.34			
Final Water Content (Sample)	%	22.31	20.86	19.57			
Initial Bulk Density	Mg/m ³	2.09	2.09	2.09			
Initial Dry Density	Mg/m ³	1.70	1.73	1.75			
Particle Density	Mg/m ³	2.65	2.65	2.65			
Initial Voids Ratio	e _o	0.5545	0.5340	0.5166			
Voids Ratio after Consolidation	e _c	0.5445	0.5084	0.4902			
Final Voids Ratio	e _f						
Initial Degree of Saturation	%	103.99	108.69	114.60			
Applied Normal Stress	kN/m ²	101.2	199.7	399.3			
Maximum Shear Stress	kN/m ²	52.7	66.1	125.7			
Residual Shear Stress	kN/m ²	27.6	29.0	78.7			
Rate of displacement (Peak)	mm/min	0.00320	0.00320	0.00320			
Rate of displacement (Residual)	mm/min	0.00960	0.00960	0.00960			
Displacement at Failure	mm	1.75	2.50	3.25			
Final Cumulative Displacement	mm	40.00	40.00	40.00			
Number Of Traverses	3						
Method of Reversal	4.5.5.5 B						
Specimen Test Conditions	Submerged						



Values in Parenthesis are based upon linear regression

Soft red brown mottled grey CLAY

Ref	Soil Mechanics	Operator		Date	
		Checked		Date	
		Approved		Date	11/2/7

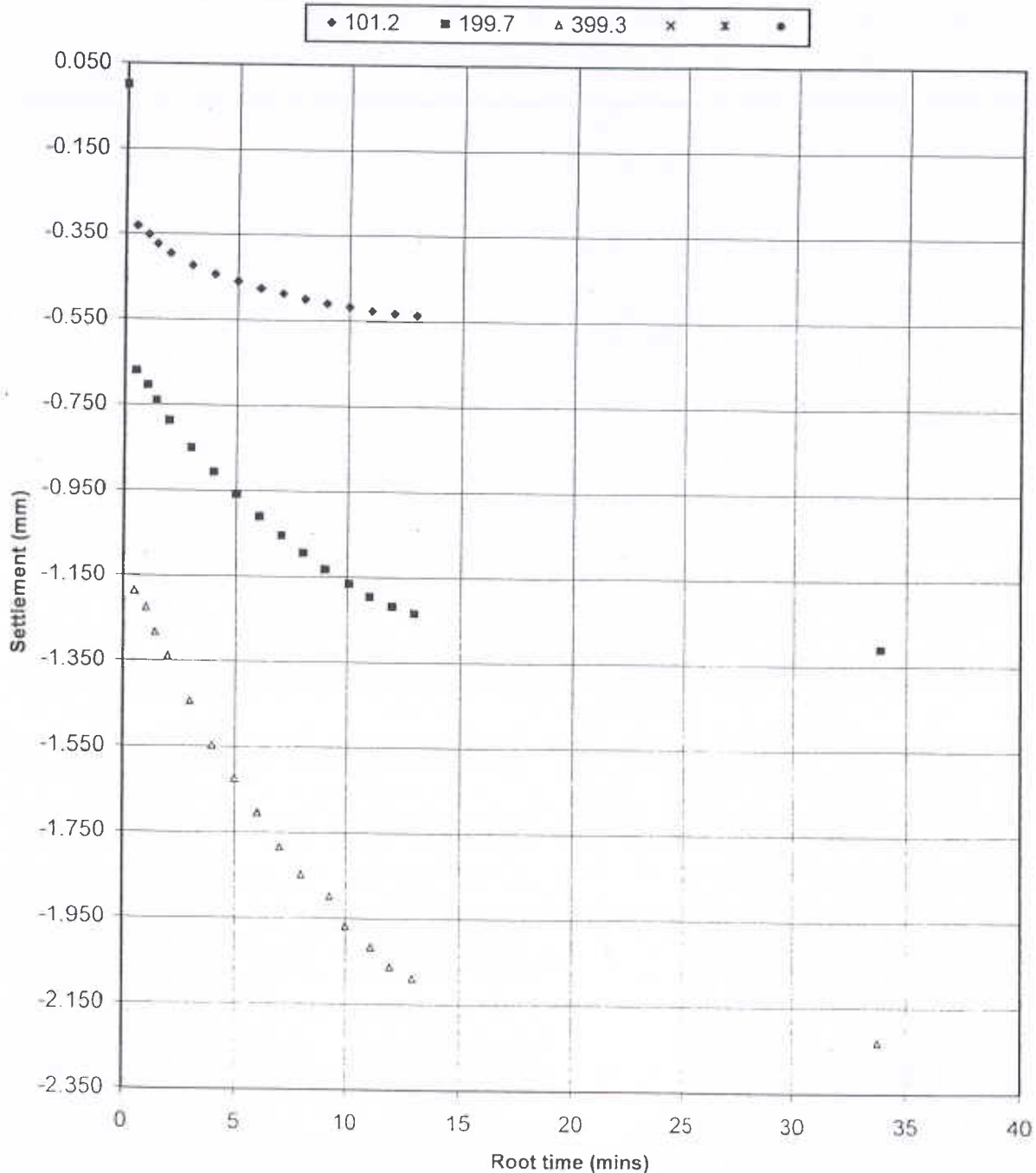
1348

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH101
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	9.50 - 10.00
			No	28
			Type	Bulk
			ID	

Consolidation

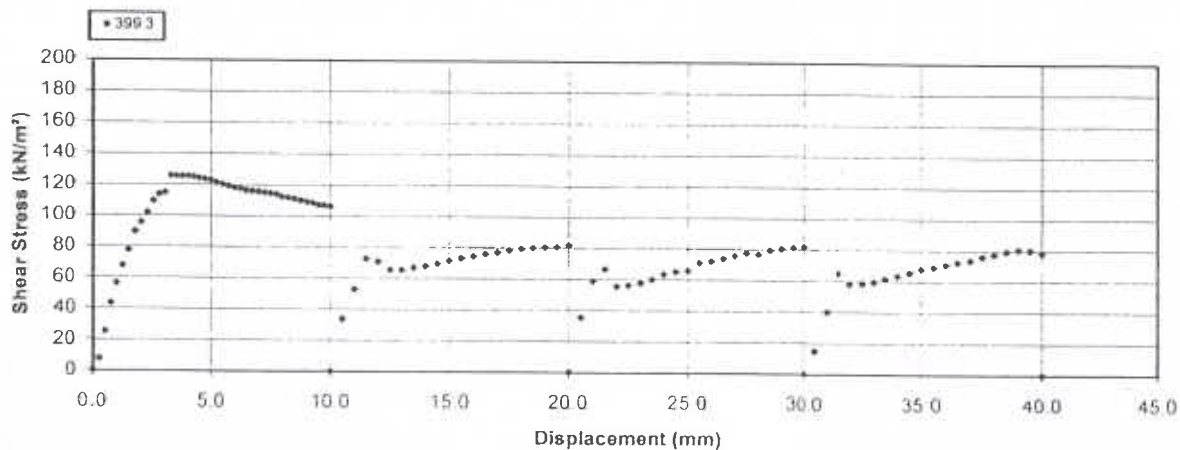
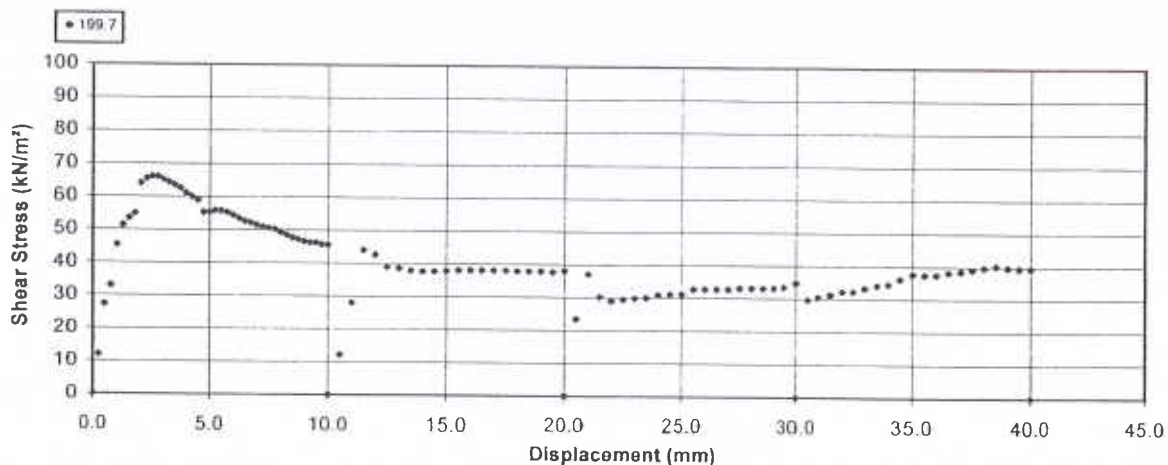
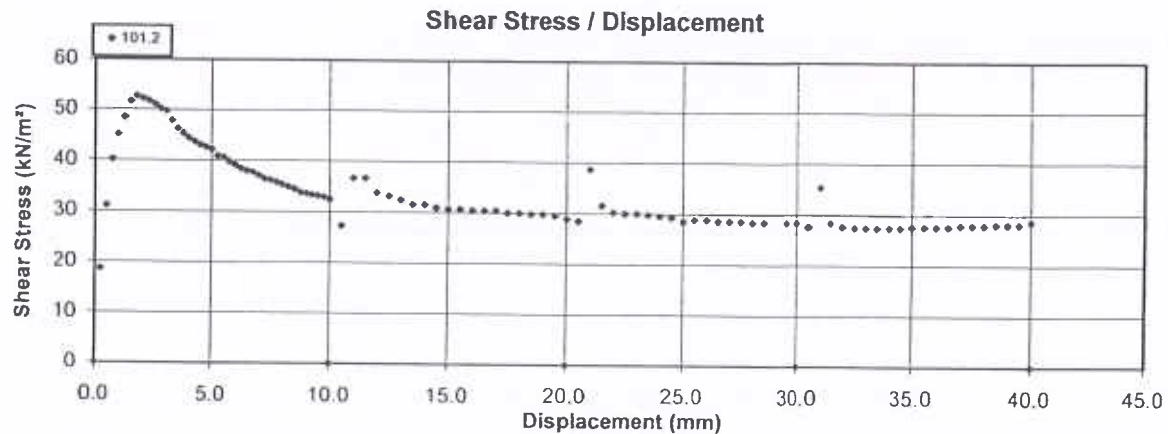


Ref	 Soil Mechanics	 1348	Operator		Date	
			Checked		Date	
			Approved		Date	9/2/7

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH101
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	9.50 - 10.00
			No	28
			Type	Bulk
			ID	



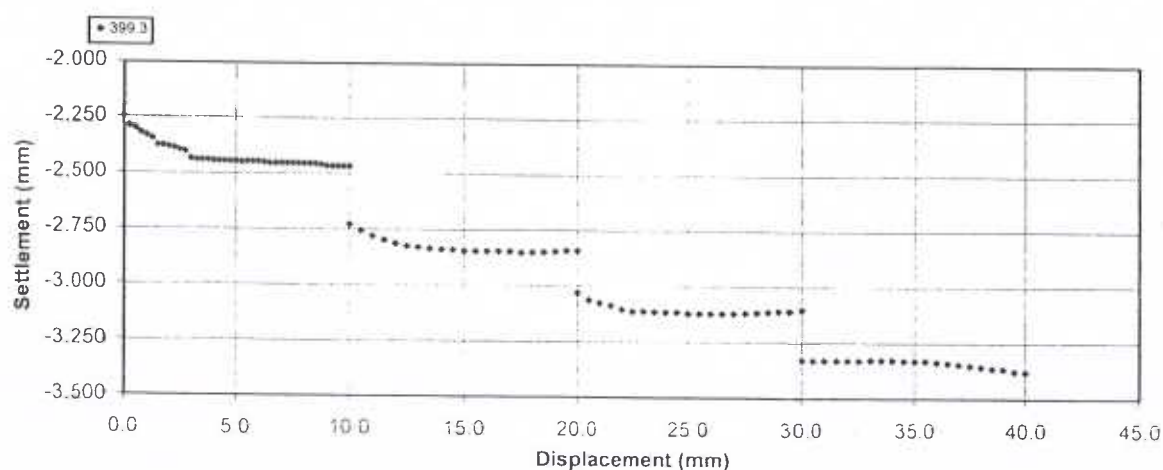
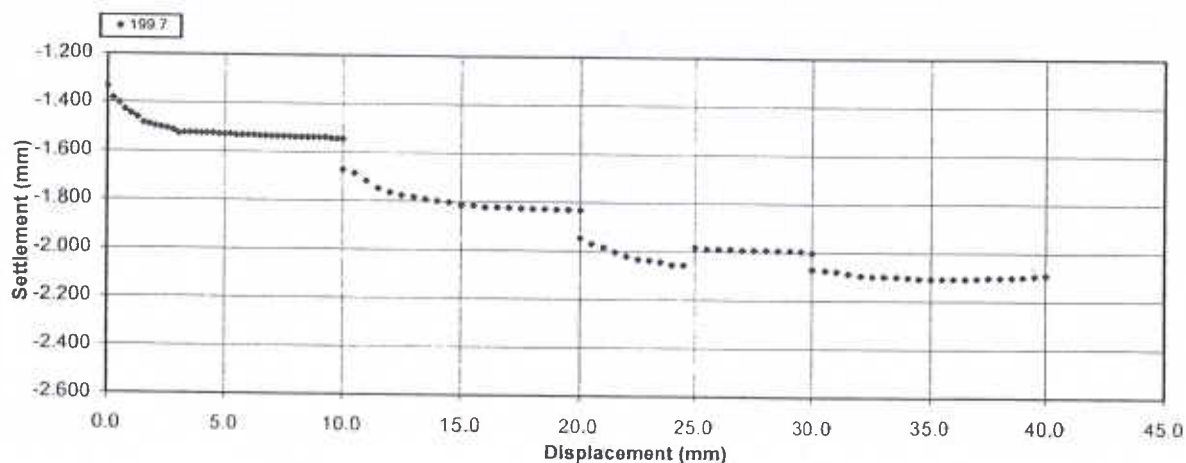
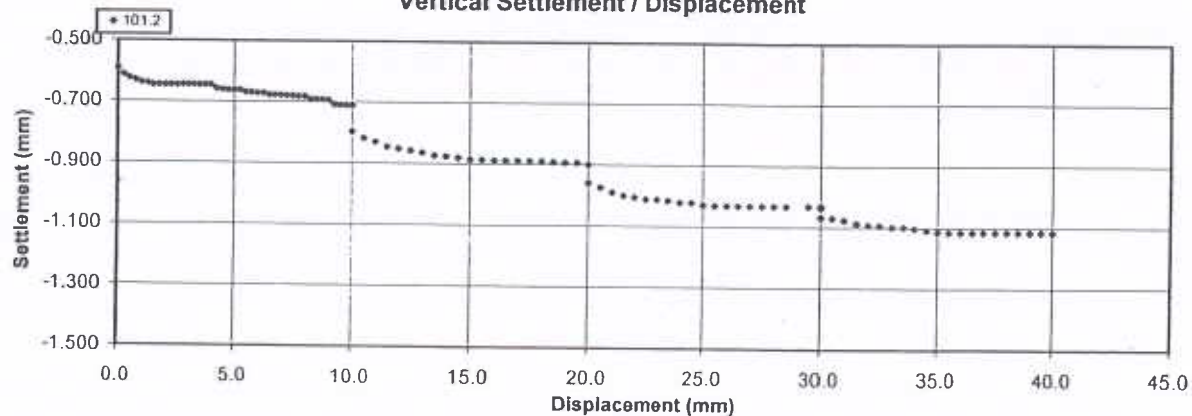
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Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH101
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	9.50 - 10.00
			No	28
			Type	Bulk
			ID	

Vertical Settlement / Displacement



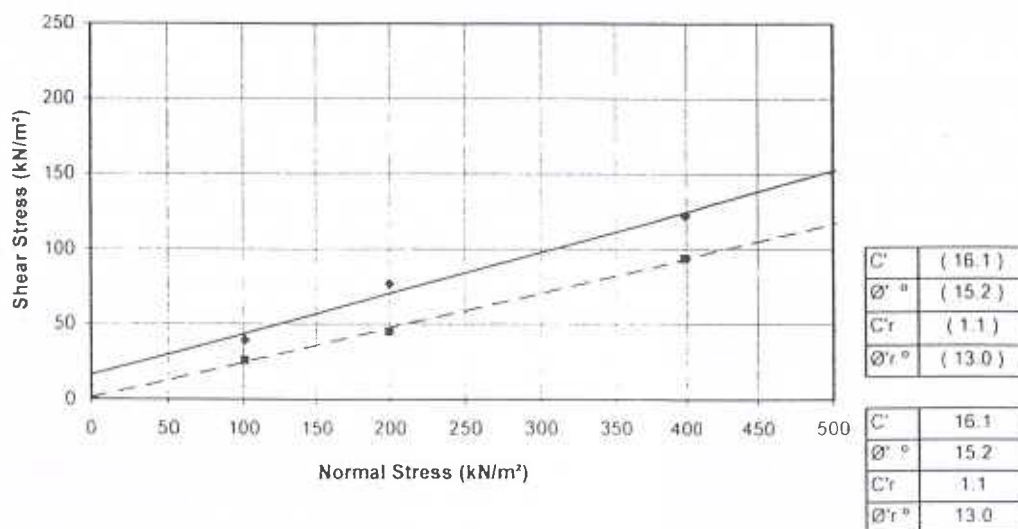
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			Checked		Date	
			Approved		Date	9/2/7

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH102
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	8.00 - 8.50
			No	22
			Type	Bulk
			ID	

Test Specimen Number		1	2	3	4	5	6
Initial Height of Specimen	mm	23.91	23.91	23.91			
Initial Width of Specimen	mm	59.89	59.89	59.89			
Initial Length of Specimen	mm	59.89	59.89	59.89			
Initial Water Content (Trimming)	%	25.78	25.95	25.94			
Final Water Content (Sample)	%	27.56	25.83	23.52			
Initial Bulk Density	Mg/m ³	2.00	2.00	2.01			
Initial Dry Density	Mg/m ³	1.57	1.59	1.62			
Particle Density	Mg/m ³	2.65	2.65	2.65			
Initial Voids Ratio	e _o	0.6879	0.6650	0.6314			
Voids Ratio after Consolidation	e _c	0.6742	0.6527	0.6179			
Final Voids Ratio	e _f						
Initial Degree of Saturation	%	99.30	103.39	108.84			
Applied Normal Stress	kN/m ²	101.2	199.7	399.3			
Maximum Shear Stress	kN/m ²	39.2	76.8	122.3			
Residual Shear Stress	kN/m ²	26.0	44.9	94.0			
Rate of displacement (Peak)	mm/min	0.00320	0.00320	0.00320			
Rate of displacement (Residual)	mm/min	0.00960	0.00960	0.00960			
Displacement at Failure	mm	1.50	2.25	3.75			
Final Cumulative Displacement	mm	40.00	40.00	40.00			
Number Of Traverses	3						
Method of Reversal	4.5.5.5 B						
Specimen Test Conditions	Submerged						



Values in Parenthesis are based upon linear regression

Soft red brown mottled grey slightly sandy CLAY

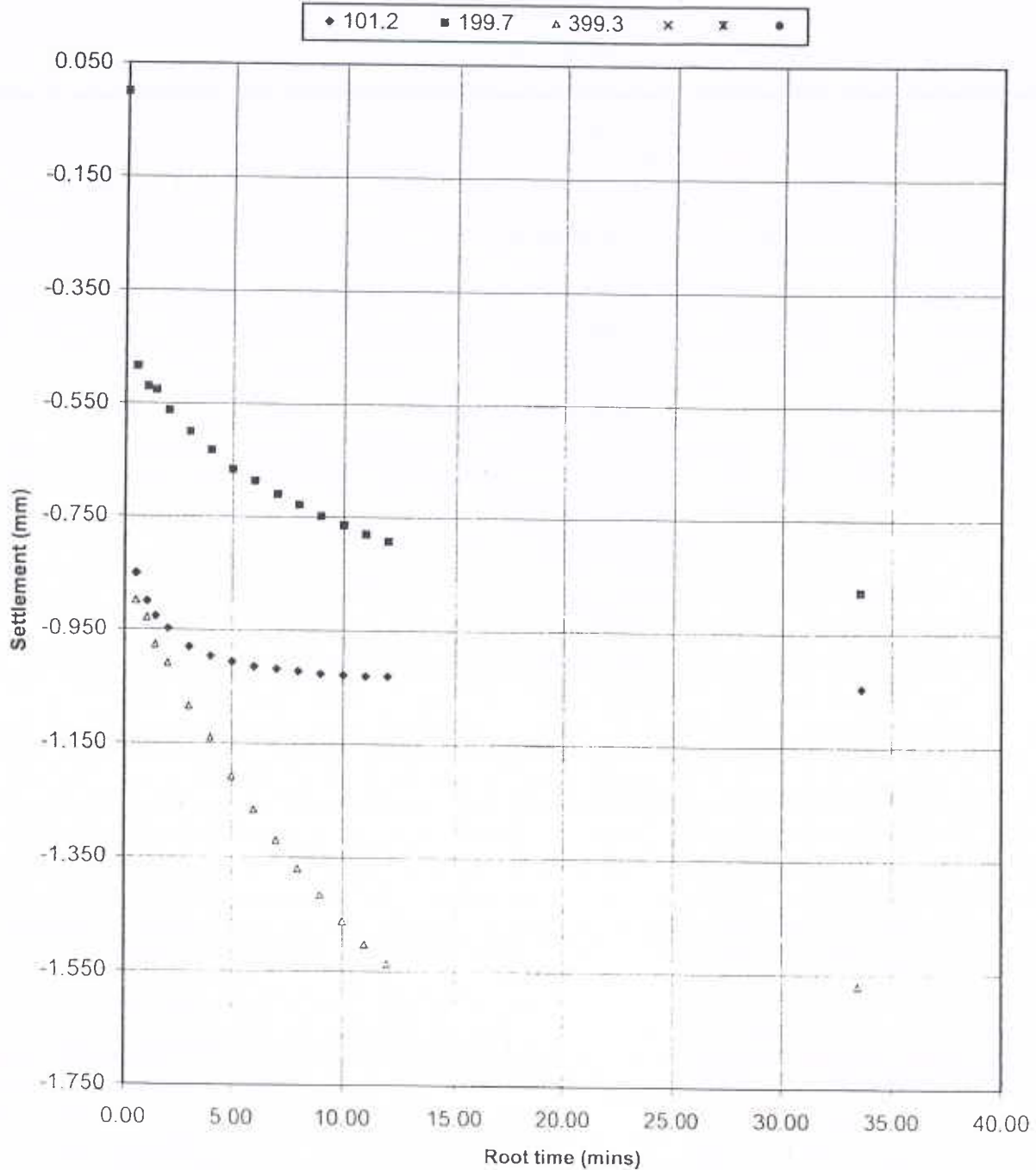
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		Approved		Date	5/2/7

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH102
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	8.00 - 8.50
			No	22
			Type	Bulk
			ID	

Consolidation



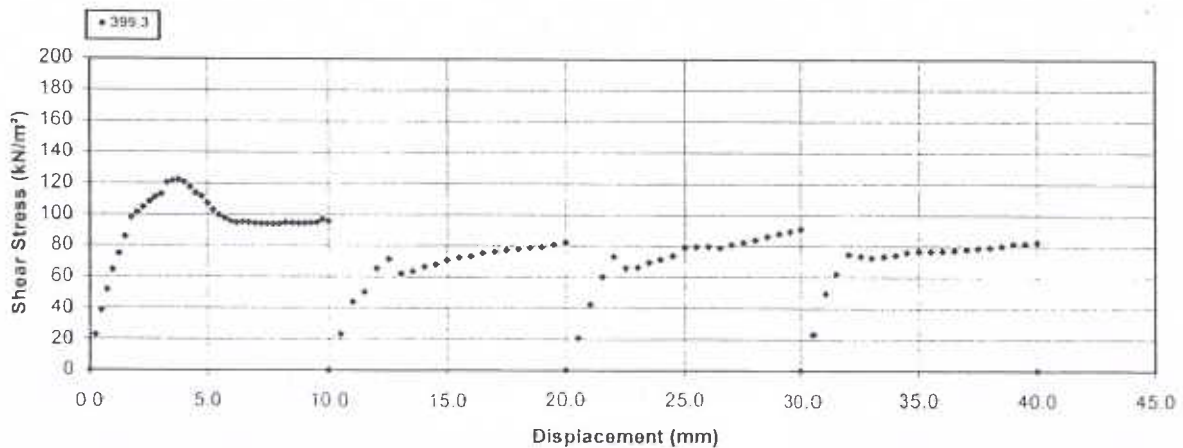
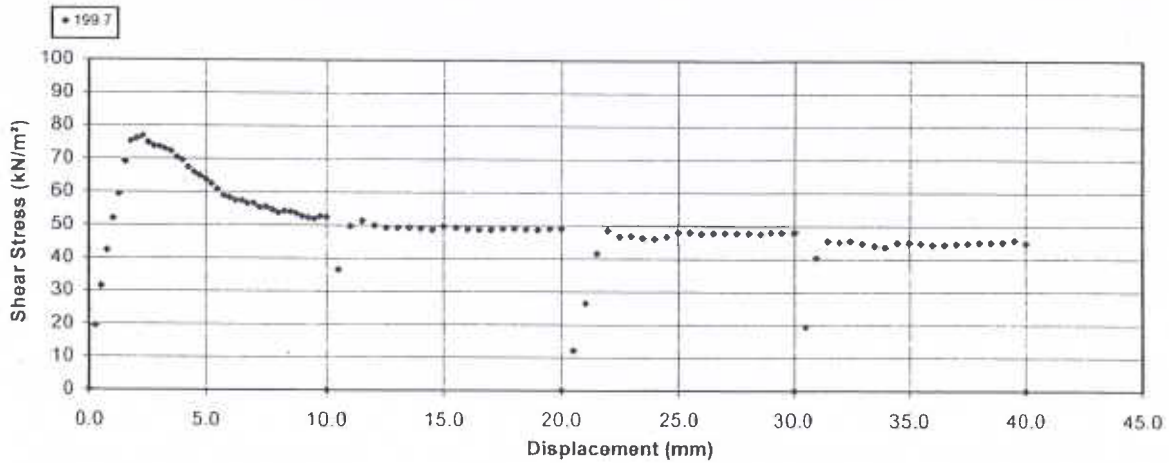
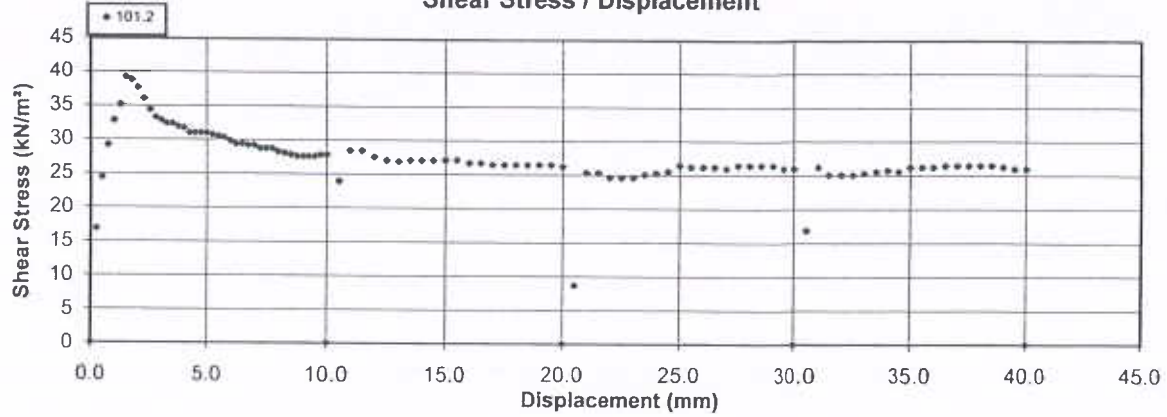
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			Checked		Date	
			Approved		Date	5/2/7

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH102
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	8.00 - 8.50
			No	22
			Type	Bulk
			ID	

Shear Stress / Displacement



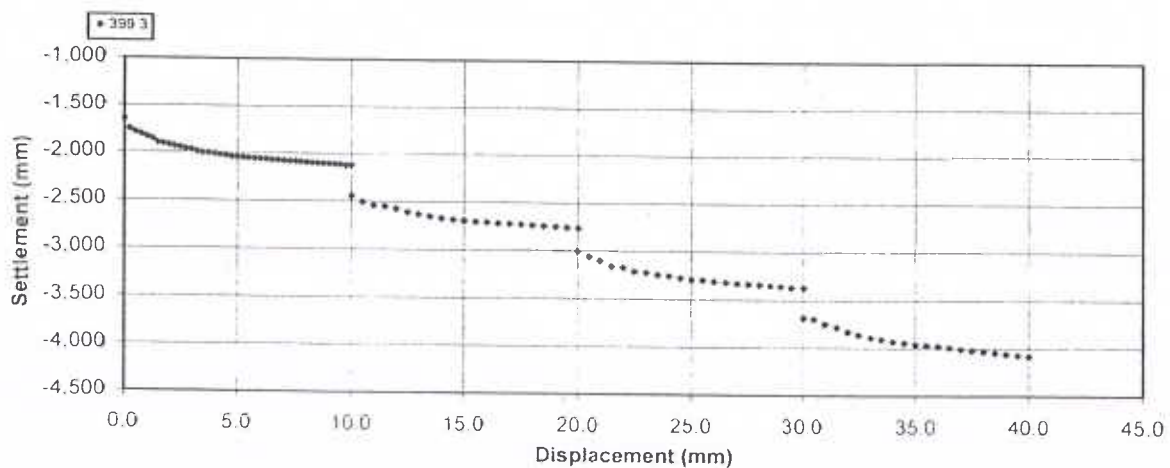
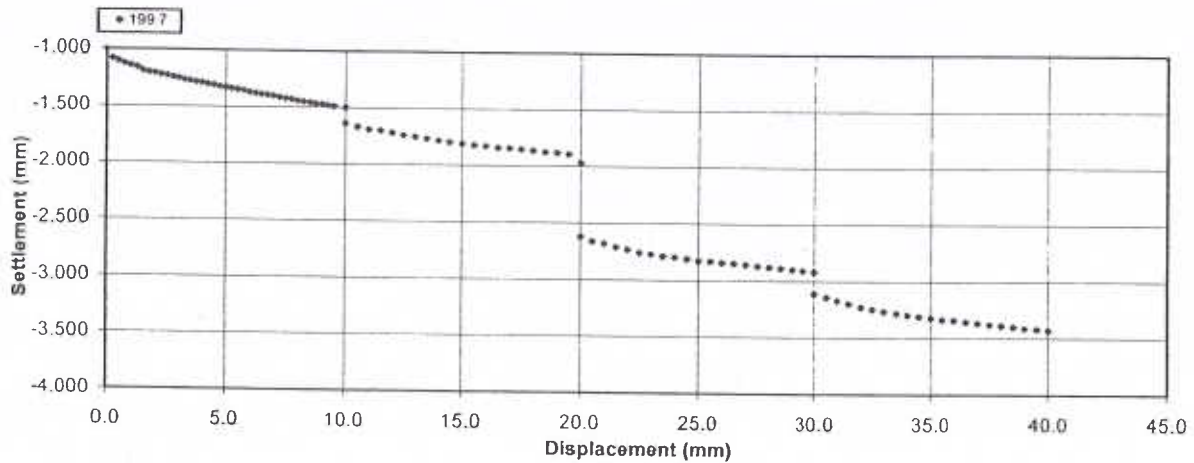
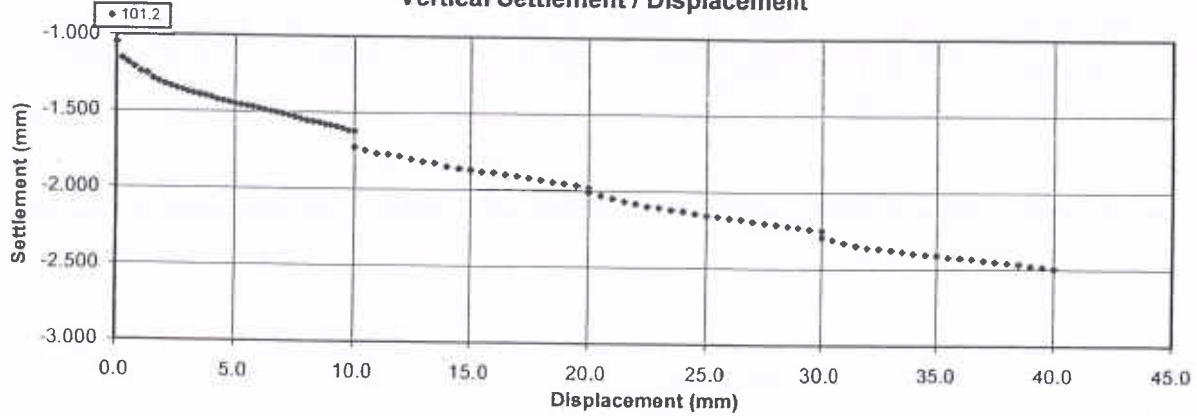
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		Approved		Date	5/2/7

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH102
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	8.00 - 8.50
			No	22
			Type	Bulk
			ID	

Vertical Settlement / Displacement



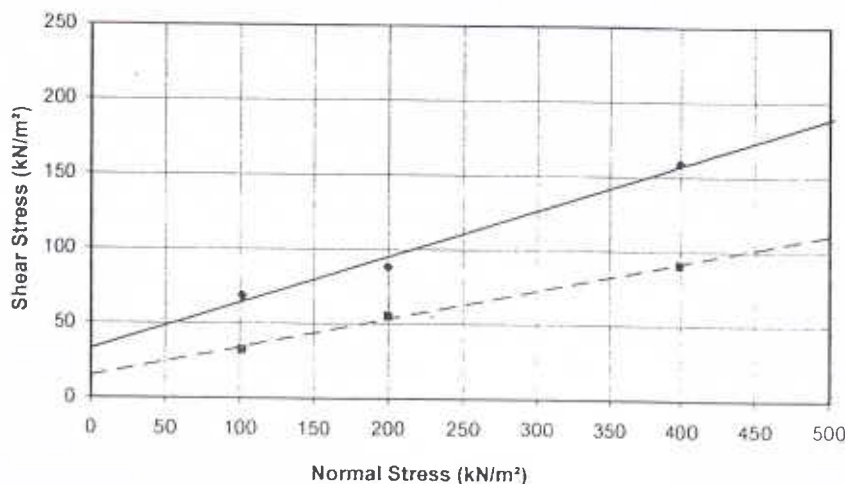
Ref	 Soil Mechanics  1348	Operator		Date	
		Checked		Date	
		Approved		Date	5/2/7

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH104
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	9.00 - 9.50
			No	27
			Type	Bulk
			ID	

Test Specimen Number		1	2	3	4	5	6
Initial Height of Specimen	mm	23.91	23.91	23.91			
Initial Width of Specimen	mm	59.89	59.89	59.89			
Initial Length of Specimen	mm	59.89	59.89	59.89			
Initial Water Content (Trimming)	%	31.69	32.07	32.30			
Final Water Content (Sample)	%	33.45	32.14	29.63			
Initial Bulk Density	Mg/m ³	1.92	1.93	1.92			
Initial Dry Density	Mg/m ³	1.44	1.46	1.48			
Particle Density	Mg/m ³	2.65	2.65	2.65			
Initial Voids Ratio	e _o	0.8409	0.8185	0.7852			
Voids Ratio after Consolidation	e _c	0.8400	0.8158	0.7820			
Final Voids Ratio	e _f						
Initial Degree of Saturation	%	99.88	103.82	109.00			
Applied Normal Stress	kN/m ²	101.2	199.7	399.3			
Maximum Shear Stress	kN/m ²	68.7	88.2	159.0			
Residual Shear Stress	kN/m ²	32.5	55.5	90.7			
Rate of displacement (Peak)	mm/min	0.01200	0.01200	0.01200			
Rate of displacement (Residual)	mm/min	0.02400	0.02400	0.02400			
Displacement at Failure	mm	2.25	2.75	4.25			
Final Cumulative Displacement	mm	40.00	40.00	40.00			
Number Of Traverses	3						
Method of Reversal	4.5.5.5 B	Specimen Test Conditions		Submerged			



C'	(32.8)
Ø' °	(17.3)
C'r	(14.7)
Ø'r °	(10.9)

C'	32.8
Ø' °	17.3
C'r	14.7
Ø'r °	10.9

Values in Parenthesis are based upon linear regression

Firm brown slightly sandy CLAY

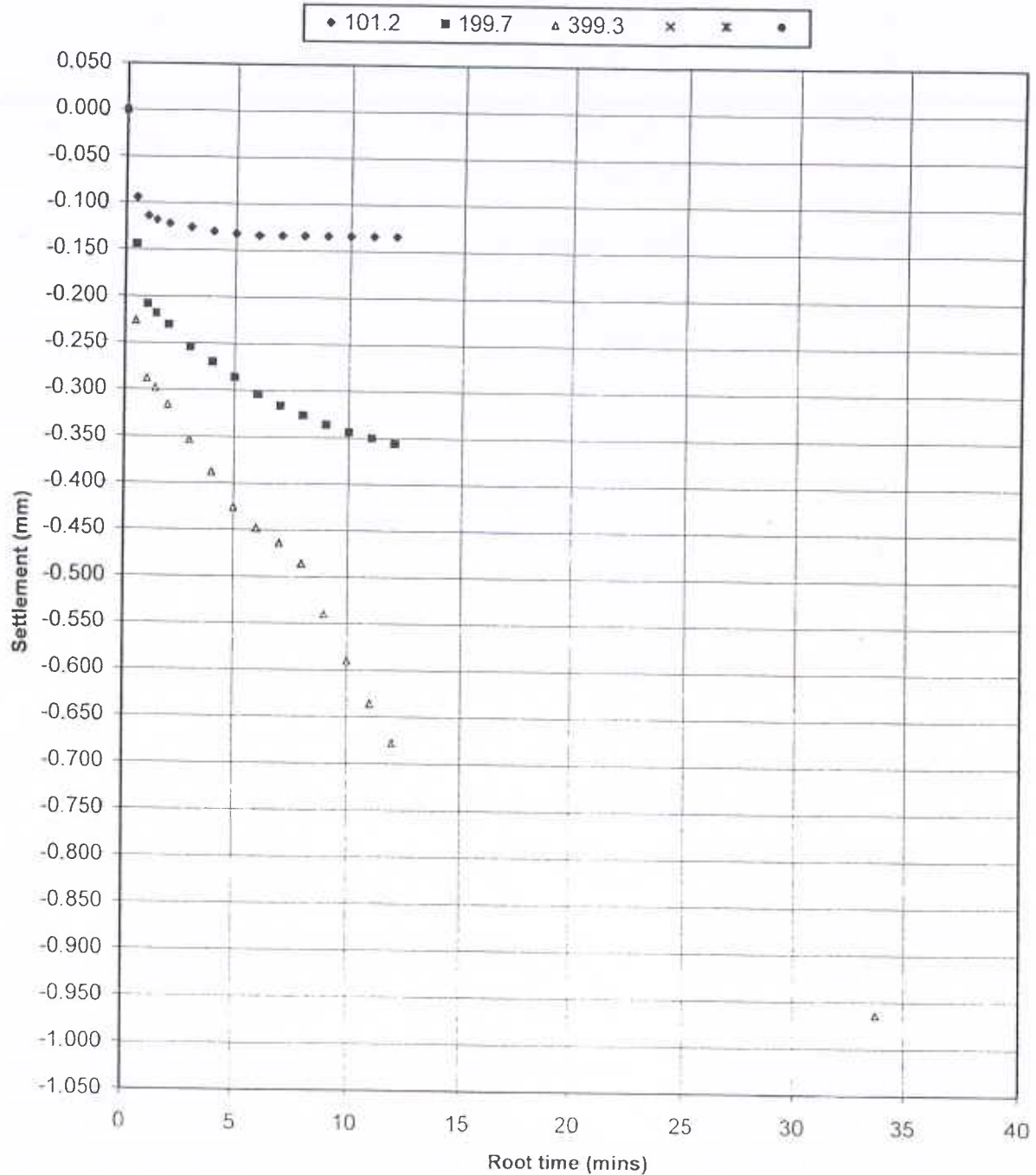
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		Checked		Date	
		Approved		Date	26/01/07

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH104
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	9.00 - 9.50
			No	27
			Type	Bulk
			ID	

Consolidation

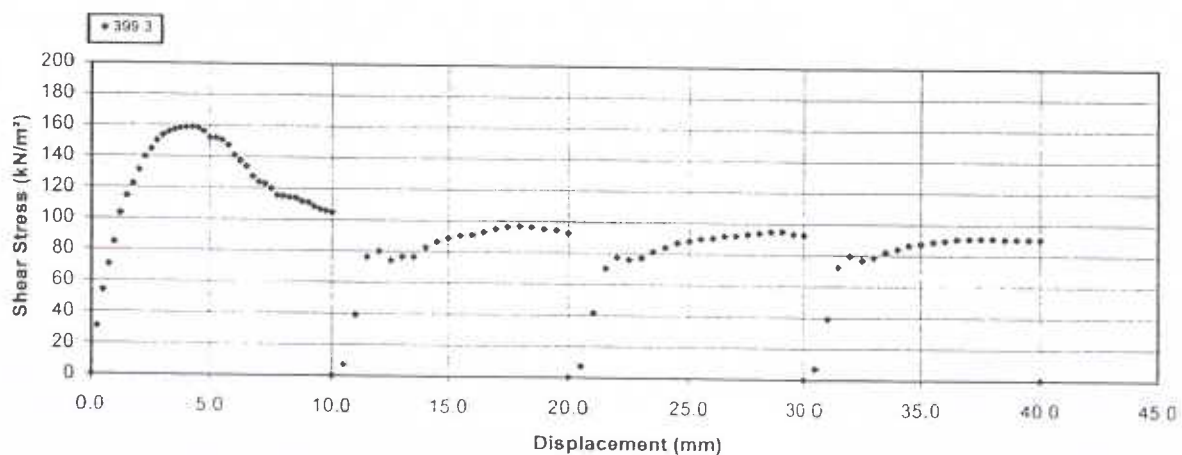
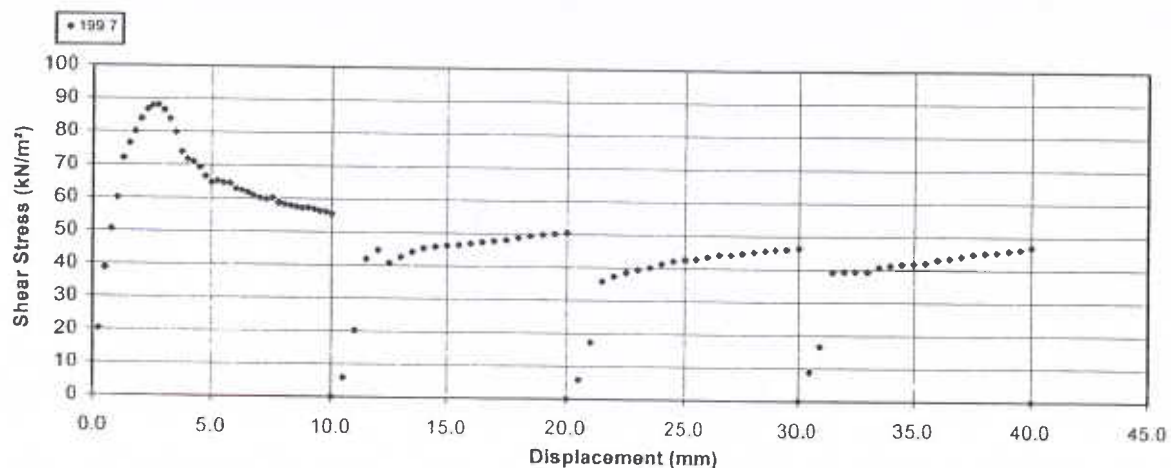
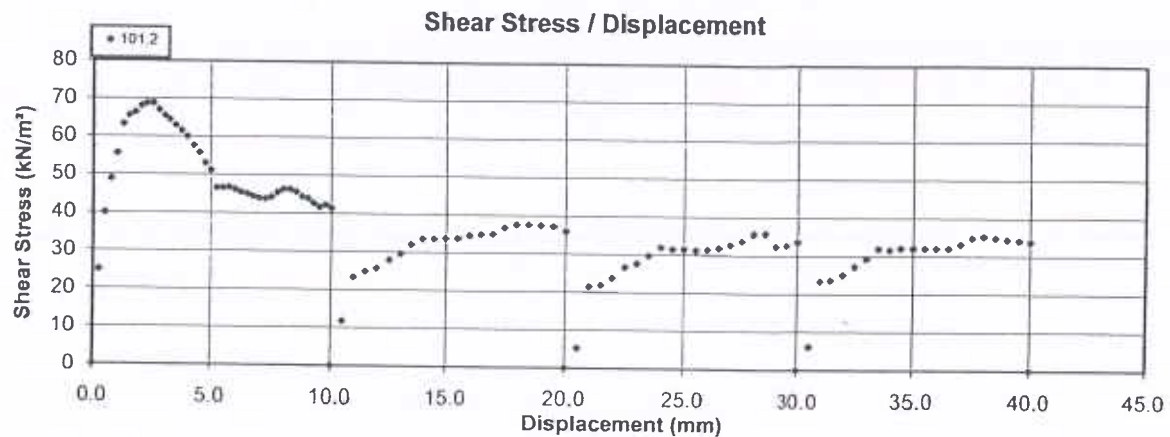


Ref	 Soil Mechanics	 1348	Operator		Date	
			Checked		Date	
			Approved		Date	26/01/07

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH104
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	9.00 - 9.50
			No	27
			Type	Bulk
			ID	



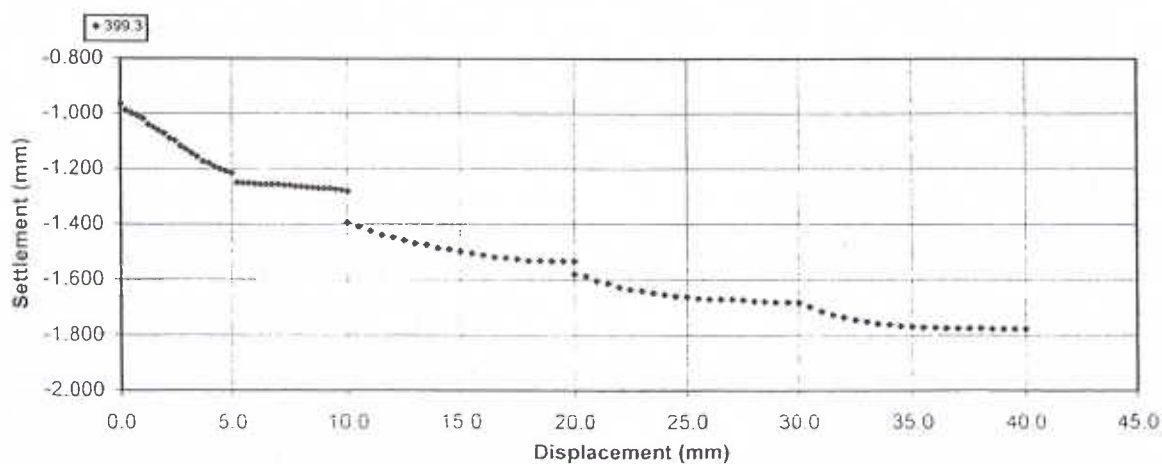
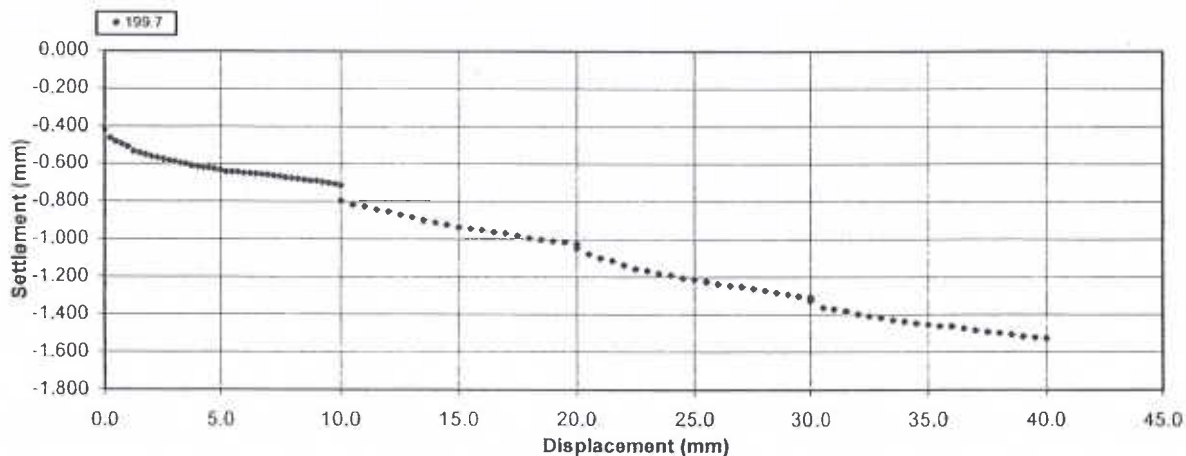
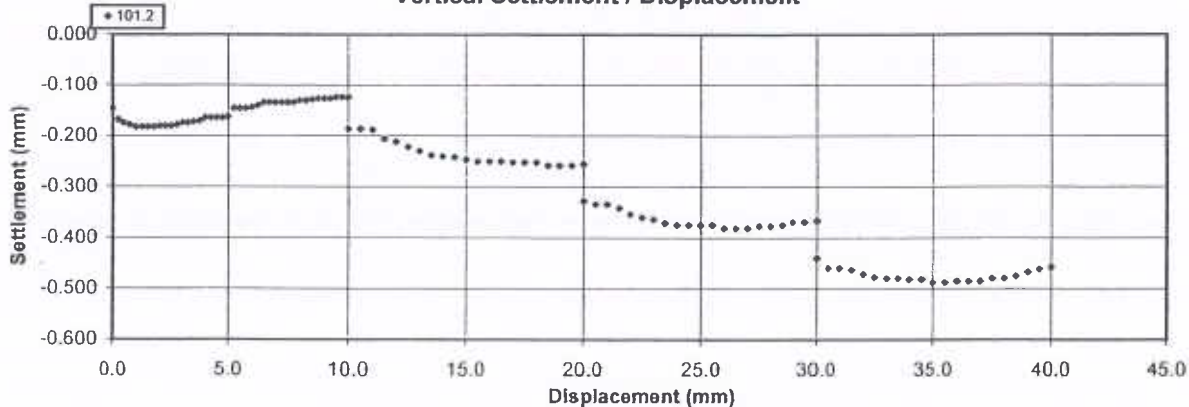
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		Approved		Date	26/01/07

Determination of Consolidated Drained Shear Strength by Direct Shear

(BS1377 : Part 7 : 1990 : Clause 4)

Project Number	D6072	Sample Details	BH	BH104
Project Name	Havant Thicket Portsmouth Water Ltd		Depth	9.00 - 9.50
			No	27
			Type	Bulk
			ID	

Vertical Settlement / Displacement



Ref	 Soil Mechanics	 1348	Operator		Date	
			Checked		Date	
			Approved		Date	26/01/07