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Determination of the shrinking and swelling properties of the Lias Clay: Laboratory Report

Physical Hazards Programme

Internal Report IR/07/035

BRITISH GEOLOGICAL SURVEY

PHYSICAL HAZARDS PROGRAMME

INTERNAL REPORT IR/07/035

Determination of the shrinking and swelling properties of the Lias Clay: Laboratory Report

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Foreword

This report is a published product of a study by the British Geological Survey (BGS) into the shrinking and swelling of Lias Clays. This is a factual laboratory report showing the results of a suite of tests carried out on thirty-four samples from the Lias Group of the UK, under the leadership of Lee Jones. The study of the Lias Clay is the Fourth phase of the BGS project entitled “The shrinkage and swelling behaviour of UK clay soils”, the others having dealt with the Gault (clay) Formation, the mudstones of the Mercia Mudstone group and the Clays of the Lambeth Group.

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Contents

1.1.1 TABLES

1 Introduction

The behaviour of clay rich geological formations in response to a change in moisture content is often exhibited as shrinking or swelling. The material is able to change volume with a change in effective stress causing a geological hazard for engineering construction. These changes vary with clay content and composition and hence geological formation.

The work described in this report comprises the fourth stage of a study of the swelling and shrinkage behaviour of major UK clay formations. It deals with the testing of undisturbed and disturbed samples of the clay in a variety of ways, most of which follow internationally recognised British or American soil mechanics standards. The test methods applied can be broadly grouped into three categories: a) direct swelling tests, b) direct shrinkage tests, c) index tests.

The measured moisture content of the natural state and at certain defined test conditions can provide an extremely useful method of classifying cohesive soils and assessing their engineering behaviour. These tests are *Index Properties* but are also known as the Atterberg Limits. The Atterberg Limits are related to the combined effects of particle size and mineral composition. The liquid limit and plastic limit provide the most useful way of identifying and classifying fine-grained soils. Particle Size provides quantitative data on the range of sizes of particles and the % of clay size particles present. Further information is provided by the particle density test. The purpose of the index tests is to classify the soils and also to investigate correlations between index properties and direct swelling and shrinkage tests.

The report describes the test methodologies for the above geotechnical tests used to determine the characteristics of sampled Lias Group formations. Also presented are the results for the suite of tests carried out on samples taken from thirty sites along the outcrop of the Lias clay, from the south of England to the coastal Durham, North Yorkshire border. The locations of the sample sites are given in table 1 and details on the sites can be found in BGs internal reports (Rowlands and Jones, 2003; Freeborough and Jones, 2004). The tests resulting from the collection of these samples were carried out in the Engineering Geology Group (EGG) laboratories at the British Geological Survey (BGS) on samples obtained by the authors.

Oedometer consolidation tests were also carried out and are reported in an internal report by Nelder and Jones (2004). In addition to the test results reported here, research was also undertaken into the mineralogical and geochemical properties of the samples. Scanning electron microscopy has also been carried out at BGS on the same samples as reported in Bouch 2003. The mineralogical data are complete and are referenced in this report.

Table 1 Location of Sampling Sites

Name	No.	Location	Basin	Sheet	Type	Company	Contact No.	Name	Contacted	Visit Date	Sample
Northamptonshire											
Sita Landfill, Brixworth	1.1	475700 272000	East Midlands Shelf	141	Landfill	SITA	(01933) 680686	Sean Matty	10/07/2001	12/07/2001	**Yes**
Sidegate Lane, Finedon	1.2	491600 270300	East Midlands Shelf	141	Landfill	SITA	(01933) 680686	Sean Matty	10/07/2001	12/07/2001	**Yes**
Warwickshire											
Rugby Cement, Rugby	2.1	448900 275700	East Midlands Shelf	140	Cement Works	Rugby Portland Cement	(07966) 282575	Pete Klewitt	29/11/2001	04/12/2001	No
Southam Cement, Southam	2.2	442200 264000	East Midlands Shelf	151	Cement Works	Rugby Portland Cement	(07966) 282575	Pete Klewitt	29/11/2001	04/12/2001	**Yes**
Edge Hill, Banbury	2.3	437500 247400	East Midlands Shelf	151	Quarry	Hornton Quarries	(01295) 670238	Darren Haywood	30/11/2001	04/12/2001	No
Oxfordshire											
Hornton Grounds, Wroxton	2.4	438200 244900	East Midlands Shelf	151	Quarry	Peter Bennie	(07860) 842855	David Jackson	29/11/2001	05/12/2001	No
Alkerton, Edge Hill	2.5	439500 242900	East Midlands Shelf	151	Quarry	Peter Bennie	(07860) 842855	David Jackson	29/11/2001	05/12/2001	No
Shenington, Edge Hill	2.6	435900 243500	East Midlands Shelf	151	Ex-Quarry	Peter Bennie	(07860) 842855	David Jackson	29/11/2001	05/12/2001	No
Gloucestershire											
Wingmoor, Bishops Cleeve	2.7	394600 227200	Worcester Basin	163	Quarry	S. Grundon (Ewelme)	(01491) 834311	Toni Robinson	04/12/2001	06/12/2001	**Yes**
Robin's Wood Hill	2.8	384000 215000	Worcester Basin	162	Ex-Quarry	Gloucester City Council	(01452) 303206	Tim Jenkins	29/11/2001	06/12/2001	No
Wellacre, Blockley	3.1	418100 237100	Worcester Basin	151	Brick Works	Northcot Bricks	(01386) 700551	Roger Smith	28/11/2001	13/12/2001	**Yes**
Avon											
North Wick, Chew Magna	4.3	358500 165700	Bristol - Radstock Shelf	172	Quarry	Reed Bros. & Bailey	(01225) 477528	Francis Bell	21/01/2002	23/01/2002	No
Stowey, Bishop Sutton	4.4	359800 158700	Bristol - Radstock Shelf	172	Quarry	Stowey Stone Co. Ltd.	(01761) 452356	Site Manager	17/01/2002	23/01/2002	**Yes**
South Glamorgan											
Lliswerry, Rhoose	4.1	303200 167900	Bristol Channel Basin	170	Quarry	Lliswerry Lime Co.	(01446) 749322	Martin Brewer	17/01/2002	22/01/2002	No
Aberthaw, Barry	4.2	303800 167200	Bristol Channel Basin	170	Quarry	Blue Circle	(01446) 752300	Tony Dauncy	17/01/2002	22/01/2002	No
Somerset											
Waste Disposal, Dimmer	3.2	361500 131300	Wessex Basin	183	Landfill	Wyvern Waste	(01823) 324194	Martin Ellis	28/11/2001	14/12/2001	**Yes**
Hamdon Hill, Yeovil	4.5	348200 116200	Wessex Basin	193	Quarry	Montacute Estates	(01962) 850077	Mike Lawrence	17/01/2002	23/01/2002	No
Downslade, Long Sutton	4.6	345500 126900	Wessex Basin	193	Quarry	D. G. Mitchell	(01458) 274062	Mike Mitchell	18/01/2002	24/01/2002	No
Station, Somerton	4.7	353200 129000	Wessex Basin	183	Quarry	Barham Brothers	(01458) 223538	Martin Butt	17/01/2002	24/01/2002	No
Lake View, Street	4.8	354800 130400	Wessex Basin	183	Quarry	C. M. Pearce	(01458) 224033	Site Manager	17/01/2002	24/01/2002	No
North Yorkshire											
Kettleness	5.1	483100 515300	Cleveland Basin	94	Ex-Brick Pit	Scarborough District Council	(01723) 232589	John Woodhead	26/02/2002	04/03/2002	No
Runswick Bay	5.2	481200 515800	Cleveland Basin	94	Cliff-Face	Scarborough District Council	(01723) 232590	John Woodhead	26/02/2002	04/03/2002	No
Robin Hood's Bay	5.3	495300 505500	Cleveland Basin	94	Cliff-Face	Scarborough District Council	(01723) 232591	John Woodhead	26/02/2002	05/03/2002	No
Ravenscar	5.4	498000 501600	Cleveland Basin	94	Ex-Alum Pit	The National Trust	(01723) 870423	Mel Cunningham	26/02/2002	05/03/2002	**Yes**
Stoupe Beck	5.5	495900 503500	Cleveland Basin	94	Cliff-Face	Scarborough District Council	(01723) 232592	John Woodhead	26/02/2002	05/03/2002	No
Dorset											
Stonebarrow Hill	6.1	337000 093000	Wessex Basin	193	Cliff-Face	West Dorset District Council	(01305) 251010	Geoff Davis	26/02/2002	23/04/2002	No
Black Ven	6.2	335500 093200	Wessex Basin	193	Cliff-Face	West Dorset District Council	(01305) 251010	Geoff Davis	26/02/2002	24/04/2002	No
Seatown	6.3	341800 091600	Wessex Basin	193	Cliff-Face	West Dorset District Council	(01305) 251010	Geoff Davis	26/02/2002	22/07/2002	No
Nottinghamshire											
Barnstone	7.1	473500 333600	East Midlands Shelf	142	Ex-Quarry	Blue Circle Cement	(01949) 860541	Daniel Dolman	19/09/2002	01/10/2002	**Yes**
Lincolnshire											
Norton Bottoms, Newark	8.1	486700 336000	East Midlands Shelf	127	Quarry	C & G Concrete Ltd.	(01636) 892220	Martin Blowers	19/09/2002	01/10/2002	**Yes**
Whisby, Lincoln	8.2	489600 366800	East Midlands Shelf	114	Quarry	Lafarge Aggregates Ltd.	(01909) 537800	Ian Pearson	19/09/2002	01/10/2002	**Yes**
Conesby, Scunthorpe	8.3	489500 314500	East Midlands Shelf	157	Ex-Quarry	North Lincs County Council	(01724) 296085	Vick Hodgson	19/09/2002	02/10/2002	**Yes**
Flixborough, Scunthorpe	8.4	487700 314200	East Midlands Shelf	157	Ex-Quarry	North Lincs County Council	(01724) 296086	Vick Hodgson	19/09/2002	02/10/2002	**Yes**

2 Definitions & methodologies

The definitions below are based upon those given by BS 1377: Part 1: 1990 (Anon 1990a). All testing has been carried out using methods provided by BS 1377: Part 2: 1990 (Anon 1990b) with some alterations as appropriate

2.1 MOISTURE CONTENT

The moisture content of a soil is assumed to be the amount of water within the pore space between the soil grains. This pore water is removable by oven drying at 105^{o}, and expressed as a percentage of the mass of dry soil.

The moisture content data from the samples were taken at their natural moisture content from the 'disturbed' bag samples collected from each site, on shavings from 'undisturbed' samples used for other tests, and as part of tests carried out on other 'undisturbed' samples. The procedure followed was identical to that described in Anon 1990b, Test 3.2, the determination of moisture content by the oven drying method.

2.2 LIQUID LIMIT

Determinations of the liquid limit (LL) of a soil are carried out on the fraction passing through a 0.425mm sieve. The LL is the moisture content at which a soil passes from the the plastic state to the liquid state, which then behaves like a viscous liquid This is as determined by the British Standard liquid limit test.

The liquid limit samples were taken at their natural moisture content from the 'disturbed' bag samples collected from each site. The procedure followed was identical to that described in Anon 1990b, Test 4.3, the cone penetrometer (definitive) method of determining the liquid limit.

2.3 PLASTIC LIMIT

The plastic limit is the moisture content at which a soil becomes too dry to be in a plastic condition. Determinations of the plastic limit (PL) of a soil are carried out on the fraction passing through a 0.425mm sieve, by the British Standard plastic limit test.

The plastic limit and thus the plasticity index of the samples were determined at the same time as the liquid limit, using the same samples. The procedure followed was identical to that described in Anon 1990b, Test 5, the determination of the plastic limit, and Test 5.4 the derivation of the plasticity index.

2.4 PLASTICITY INDEX

The plasticity index (PI) is calculated using the formula below:

$$PI = Liquid\ Limit - Plastic\ Limit$$

2.5 LIQUIDITY INDEX

The liquidity index (LI) is calculated using the formula below:

$$LI = \frac{Natural\ Moisture\ content - Plastic\ Limit}{Plasticity\ Index}$$

2.6 LINEAR SHRINKAGE

The measurement of linear (one-dimensional) shrinkage of fine-grained soils is found by determining the change in length of a semi- circular bar sample of soil when it dries out, starting from near the liquid limit. The test gives the percentage linear shrinkage of a soil.

The standard B. S. method was used for analysis. The linear shrinkage of the samples was determined at the same time as the liquid limit, using the same samples. The procedure followed was identical to that described in Anon 1990b, Test 6.5, the determination of shrinkage characteristics by linear shrinkage.

2.7 PARTICLE DENSITY

The average mass per unit of volume of solid particles in a sample of soil, where the volume includes any sealed voids contained within the solid particles.

The standard B. S. method was used for analysis. The particle density samples were taken at their natural moisture content from the 'disturbed' bag samples collected from each site, and then oven dried. The procedure followed was identical to that described in Anon 1990b, Test 8.3, the determination of particle density by the small pyknometer method.

2.8 PARTICLE SIZE DISTRIBUTION

The particle size analysis shows the percentages of the various grain sizes within the soil as determined by sieving and sedimentation. The samples were taken at their natural moisture content from the 'disturbed' bag samples collected from each site. Fine fraction analysis in this project is undertaken using the Micrometrics Sedigraph; therefore there are two main procedures in determining the particle size distribution:

2.8.1 Wet sieving method

The procedure followed was identical to that described in Anon 1990b, Test 9.2, the wet sieving method. After oven drying, the sieve spacing used for analysis of the coarse fraction retained on the 0.063 mm sieve was 0.5Φ to 8.0 mm (-3 Φ) and then as required for larger particles.

2.8.2 Micrometrics Sedigraph analysis of the fine fraction

A 5 g, oven dried, sub-sample was selected from the <0.063 mm washings of the whole sample and mixed with a 0.05% solution of sodium hexametaphosphate to form a suspension. The suspension analysed by the X-ray Sedigraph, the results of which were then integrated with the coarse analysis. The X-ray Sedigraph system was calibrated with a garnet standard prior to testing.

2.9 THREE-DIMENSIONAL SWELLING STRAIN

The three-dimensional swelling strain samples were taken at their natural moisture content from the 'undisturbed' samples collected from each site. The samples were cube-shaped, with all dimensions 50 mm.

The procedure followed was identical to that described in Brown E. T. (ed.) 1981, Part 2, Test 3, the suggested method for determination of the swelling strain developed in an unconfined specimen with one exception. The cell assembly is not the same as the one specified, but was designed in the Engineering Geology and Geophysics Group (EGGG) of the British Geological Survey.

Both cells carry out the same operation but their geometry is different. The EGGG cell is oriented so that the three orthogonal sides of the sample are inclined to the horizontal. This enables all three dial gauges to be above the water level in the cell. This means that the waterproof seals present in the original cell are not required for the dial gauges thus reducing errors in the dial gauge readings, due to sticking.

2.10 ONE-DIMENSIONAL SWELLING STRAIN

The one-dimensional swelling strain samples were taken at their natural moisture content, and also at air-dried moisture content, from the 'undisturbed' samples collected from each site. The samples were cylindrical in shape, with a diameter of 2.5 inches and a length of 16 mm. This length was trimmed so that it was 3 mm less than the original 19 mm long ring, to allow for swelling to occur, within confinement of the ring.

The procedure followed was identical to that described in Anon 1995, Section 4 Construction, Test D 4546, Method A, the standard test method for one-dimensional swell, with one exception. The sample was not loaded after primary swell was complete, but was allowed to finish swelling entirely.

3 Results

3.1 INDEX TESTS

These consist of the moisture content, liquid limit, plastic limit and plasticity index test procedures. The index test results shown in Table 2 were all taken at the samples natural

moisture content, without pre-drying. The results show that the moisture contents of all ten samples are quite varied, with an over all variance of 38.5 %. However, the majority of samples have a moisture content between 10% and 30%.

The results show that the liquid limit results for all samples have a variance of 35 %. No extremes are shown within the LL results and all percentages are fairly evenly spread between Alkerton showing the lowest LL of 34% and Stowey with the highest of 65%

The plastic limit results are fairly similar for all sites, most samples show a PL of between 29 % and 17 %. Only Edgehill and Hornton show a slightly higher value than the remaining sites. Two samples were deemed to be non plastic (NP), Alkerton and Hamdon. These four samples are all taken from the Middle Lias. Plasticity Index results vary by 28%

Table 2 Index Test Results

Sample Site	Natural MC %	LL bs (%)	PL bs (%)	PI bs (%)	LI
Aberthaw Site 1	24.1	39	20	19	0.213
Alkerton Site 1	15.0	34	NP	-	-
Barnstone	9.3	36	22	14	-0.9
Bishops Cleeve	23.5	46	23	23	-0.05
Bishops Cleeve Site 2	22.8	48	20	28	0.096
Black Ven - BM	7.6	36	17	19	-0.47
Black Ven - BVM	21.4	52	24	28	-0.11
Black Ven - SWB	11.1	50	25	25	-0.57
Blockley Site 1	23.9	55	23	32	0.037
Blockley Site 2	21.4	56	22	34	0
Brixworth Site 1	20.5	55	28	27	-0.26
Conesby - S1 (CMF)	18.4	51	24	27	-0.2
Conesby - S2	23.3	61	23	38	0.003
Dimmer Site 1	31.2	57	23	34	0.251
Edgehill Site 1	42.9	55	36	19	0.375
Flixborough	16.2	60	23	37	-0.2
Flixborough (2)	16.7	46	17	29	0
Hamdon Site 1	23.0	35	NP	-	-
Hornton Site 1	29.0	47	31	16	-0.14
Kettleness	10.9	41	23	18	-0.7
Lakeview Site 1	14.1	33	17	16	-0.17
Norton Bottoms	16.7	60	25	35	-0.23
Ravenscar - site 2	12.2	41	25	16	-0.32
Robin Hoods Bay	16.4	34	15	19	0.065
Robins Wood Hill - DF	17.5	46	25	21	-0.09
Robins Wood Hill - MRF	19.9	45	25	20	-0.32
Runswick	4.4	32	18	14	-0.95
Seatown - EC	11.6	54	23	31	-0.37
Seatown - GAB	20.8	58	24	34	-0.1
Sidegate Lane Site1	16.9	61	26	35	-0.28
Southam Site 1	28.2	57	22	35	-0.2
Station Site 1	16.3	30	20	10	-0.41
Stowey Site 1	30.5	65	29	26	-0.03
Whisby	19.7	53	23	31	-0.1

Key:

LL Liquid Limit Test PL Plastic Limit Test PI Plasticity Index
LI Liquidity Index bs British Standard Hand Mix

3.2 PARTICLE DENSITY

These results consist of the determination of the particle density procedure. The results show that all but three of the thirty-four tested samples have similar particle densities, within the range of 2.63 – 2.83 Mg/m^3. The three exceptions of Alkerton, Edgehill and Horton, all have results above 3 Mg/m^3. Again, these three are samples from the Middle Lias formation and appeared to be composed of a greater percentage of ironstone.

Table 3 Particle Density Results

Sample Site	Particle Density (Mg/m^3)	Sample Site	Particle Density (Mg/m^3)
Aberthaw Site 1	2.71	Hamdon Site 1	2.73
Alkerton Site 1	3.17	Hornton Site 1	3.40
Barnstone	2.65	Kettleness	2.63
Bishops Cleeve	2.68	Lakeview Site 1	2.75
Bishops Cleeve Site 2	2.72	Norton Bottoms	2.82
Black Ven - BM	2.76	Ravenscar - site 2	2.69
Black Ven - BVM	2.64	Robin Hoods Bay	2.66
Black Ven - SWB	2.69	Robins Wood Hill - DF	2.70
Blockley Site 1	2.65	Robins Wood Hill - MRF	2.73
Blockley Site 2	2.70	Runswick	2.75
Brixworth Site 1	2.79	Seatown - EC	2.71
Conesby - S1 (CMF)	2.83	Seatown - GAB	2.79
Conesby - S2	2.66	Sidegate Lane Site1	2.83
Dimmer Site 1	2.64	Southam Site 1	2.77
Edgehill Site 1	3.24	Station Site 1	2.65
Flixborough	2.85	Stowey Site 1	2.69
Flixborough (2)	2.70	Whisby	2.64

3.3 PARTICLE SIZE DISTRIBUTION

The particle size distribution results shown in table 4 were all determined from an initial mass. The results from the coarse fraction sieving analysis and the fine fraction Sedigraph analysis have been combined to produce percentages of gravel, sand, silt and clay, and full distribution curves for each of the thirty-four samples. Five samples (Blockley1, Conesby2, Dimmer, Bishops Cleeve1 and Whisby) were analysed as part of a suite of tests carried out by another person, on samples requiring further undisturbed testing. Thus different coarse fraction sieve spacings were used to produce the particle size results.

Samples from Alkerton, Edgehill and Hornton contained the greatest percentages of the gravel-sized fraction (82.3 %, 23.4 % and 26.1 % respectively). All three samples were taken from the Middle Lias and are close geographically. Alkerton shows distribution curve dominated by very fine to medium gravel. Runswick and Station also produced a larger than expected gravel sized fraction, 14.4 % and 18.6 % respectively. The remaining twenty-nine samples show the gravel fraction content to be less that 8%.

The sample from Hamdon comprised 66.1 % sand and displays a very fine sand dominated distribution curve. This again is a Middle Lias sample. Sidegate Lane, with the greatest sand percentage of 73.1 %, shows a very well graded sand dominated distribution curve. Six samples (Barnstone, Black Ven SWB, Edgehill, Hornton, Lakeview, Robin Hoods Bay and Station) display a sand content of between 19.5 % and 37.5 % and have similarities in their distribution curves, the remaining twenty four samples show a sand content of less than 10 %.

Twenty-two of the thirty-four analysed samples have a silt content of greater than 50 %. This is reiterated in the distribution curves, which are very similar and imply a fairly well graded silt for the majority. Of the remaining twelve Samples, five still have a silt content of greater than 40%. The lowest proportions of silt were found in the Kettleness sample where it was just 3.8 % and Alkerton, at 9.9%.

Kettleness contained the largest proportion of clay, showing a value of 96.1 %, followed by Ravenscar2 at 62.4 %. Nine samples display extremely low clay content of less than 10 % (Alkerton, Black Ven BM, Black Ven SWB, Brixworth, Flixborough1, Hamdon, Hornton, Sidegate Lane, Station).

3.4 SHRINKAGE TESTS

This consists of the determination of linear shrinkage and the results are shown in table 5. Linear shrinkage was determined at the point nearest it s liquid limit, without pre-drying.

All but seven of the thirty-four samples show a range of linear shrinkage of between 8 % and 12%. Alkerton, Hamdon and Lakeview all show lower values (4%, 5% and 7 % respectively) whilst Conesby1, Conesby2, Dimmer1 and Stowey all have slightly higher values (4 %, 13 % 13 % and 16 % respectively).

Table 4 Particle Size Distributions

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	< 0.425 mm (%)
Aberthaw Site 1	15.7	68.3	13.2	2.8	92.6
Alkerton Site 1	5.9	9.9	2.0	82.3	16.4
Barnstone	12.0	50.8	37.0	0.3	74.2
Bishops Cleeve	33.2	59.1	5.7	2.0	96.3
Bishops Cleeve Site 2	49.2	49.6	0.1	1.0	98.8
Black Ven - BM	3.7	95.5	0.8	0	99.9
Black Ven - BVM	41.3	56.1	2.6	0	98.9
Black Ven - SWB	5.8	62.9	27.7	3.6	85.7
Blockley Site 1	39.1	55.1	4.4	1.4	95.7
Blockley Site 2	42.3	56.6	1.0	0.1	99.7
Brixworth Site 1	1.7	97.8	0.5	0	99.9
Conesby - S1 (CMF)	46.8	52.5	0.7	0	100
Conesby - S2	35.1	53.6	6.2	5.1	92.7
Dimmer Site 1	53.7	44.3	1.6	0.4	99.0
Edgehill Site 1	15.0	24.2	37.4	23.4	62.8
Flixborough	5.8	90.4	2.5	1.3	97.0
Flixborough (2)	29.1	63.4	7.2	0.3	97.8
Hamdon Site 1	0.0*	26.3	66.1	7.6	86.6
Hornton Site 1	0.0*	54.4	19.5	26.1	69.7
Kettleness	96.1	3.8	0.1	0.0	100
Lakeview Site 1	12.8	49.8	37.5	0	71.4
Norton Bottoms	34.4	63.8	1.7	0.1	99.6
Ravenscar - site 2	62.4	36.3	1.1	0.2	99.3
Robin Hoods Bay	23.9	48.8	27.2	0.1	99.3
Robins Wood Hill - DF	27.3	68.5	1.8	2.4	96.8
Robins Wood Hill - MRF	22.9	75.7	1.2	0.2	99.5
Runswick	31.6	53.8	0.2	14.4	85.4
Seatown - EC	20.6	79	0.3	0	100
Seatown - GAB	38.3	58.1	2.6	1.0	98.0
Sidegate Lane Site1	1.7	25.0	73.1	0.1	40.0
Southam Site 1	53.7	45.0	0.4	0.9	99.0
Station Site 1	2.0	50.9	28.6	18.6	58.0
Stowey Site 1	59.3	38.7	1.3	0.7	98.9
Whisby	35.0	63.0	1.9	0.1	99.3

* Negative Readout produced by Sedigraph after 0.003 mm. Negligible clay content assumed.

Table 5 Shrinkage Test Results

Sample Site	Linear Shrinkage (%)
Aberthaw Site 1	8
Alkerton Site 1	4
Barnstone	8
Bishops Cleeve	9
Bishops Cleeve Site 2	9
Black Ven - BM	8
Black Ven - BVM	12
Black Ven - SWB	11
Blockley Site 1	12
Blockley Site 2	9
Brixworth Site 1	9
Conesby - S1 (CMF)	14
Conesby - S2	13
Dimmer Site 1	13
Edgehill Site 1	10
Flixborough	12
Flixborough (2)	11

Sample Site	Linear Shrinkage (%)
Hamdon Site 1	5
Hornton Site 1	9
Kettleness	10
Lakeview Site 1	7
Norton Bottoms	13
Ravenscar - site 2	9
Robin Hoods Bay	10
Robins Wood Hill - DF	12
Robins Wood Hill - MRF	8
Runswick	8
Seatown - EC	12
Seatown - GAB	12
Sidegate Lane Site1	14
Southam Site 1	10
Station Site 1	6
Stowey Site 1	16
Whisby	12

3.5 SWELLING TESTS

These consist of three-dimensional swelling strain and, one-dimensional swelling strain and were carried out on eleven undisturbed samples. Several samples were unsuccessful in the procedure as a result of the samples being either too friable or too hard upon cutting.

Table 6 3-D and 1-D Strain Results

	1-D Swell Strain (%)	3-D Swell Strain (%)
Bishops Cleeve 1	0.69	2.68
Blockley Site 1	0.36	1.78
Blockley Site 2	-	-
Brixworth Site 1	0.19	6.08
Conesby - S2	-	-
Dimmer Site 1	0.48	2.22

	1-D Swell Strain (%)	3-D Swell Strain (%)
Flixborough (2)	-	-
Ravenscar - site 2	-	-
Sidegate Lane Site1	6.04	12.47
Southam Site 1	0.4	2.76
Stowey Site 1	1.47	0.66

Key: - Unsuccessful due to nature of sample (too hard or too friable)

4 References

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Appendix 1 - Index Test Data

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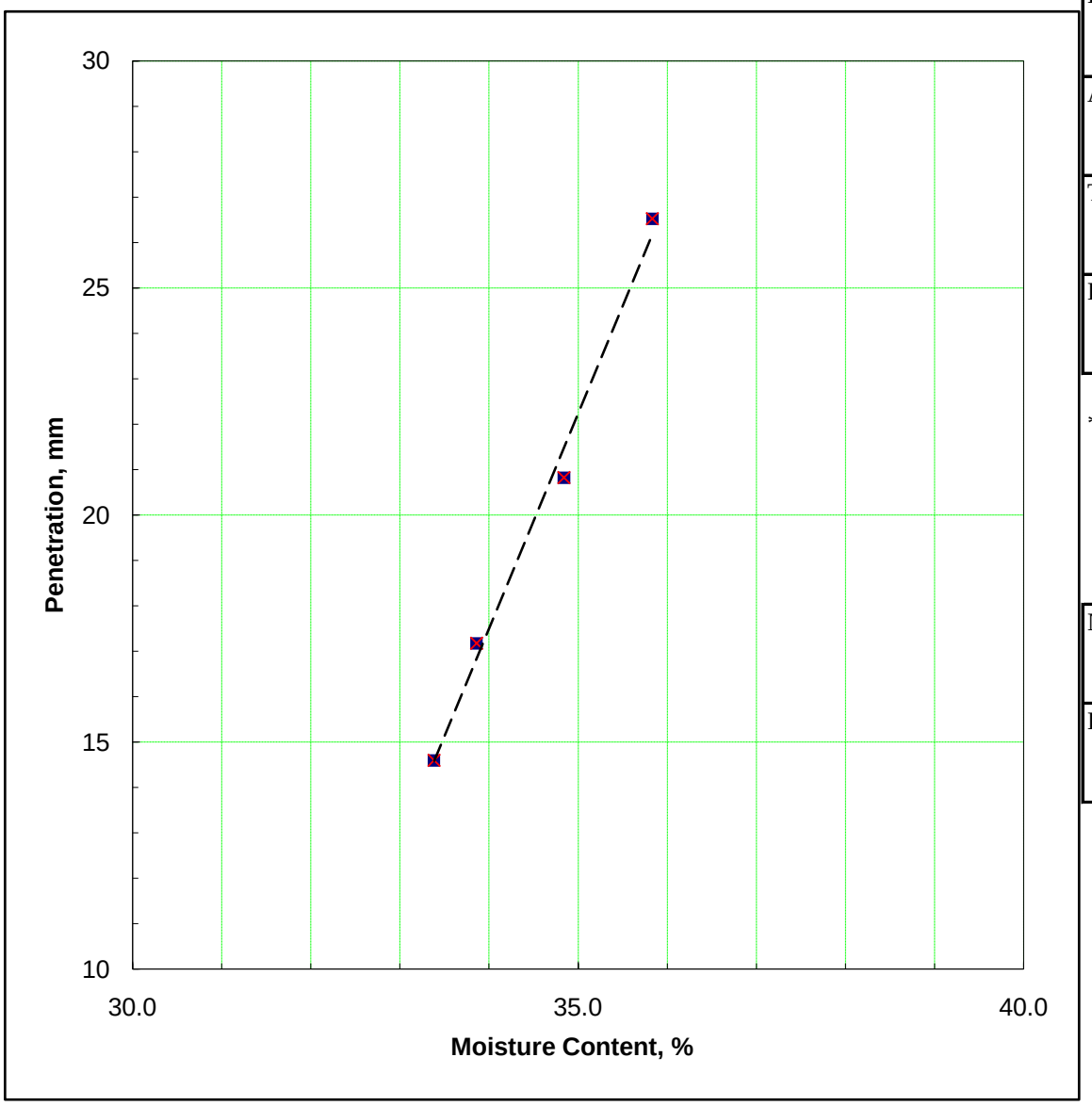
Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**ALKERTON**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	2	3	4	I	II
PENETRATION, mm	14.75	17.25	20.75	26.75		
(or other M.C. test if stated)	14.45	17.10	20.90	26.30		
	14.6	17.18	20.83	26.53		
CONTAINER	9	10	11	12	VI	V
WT. OF WET SOIL + CONTAINER, g	39.09	33.78	39.74	37.42		
WT. OF DRY SOIL + CONTAINER, g	32.47	28.43	32.73	30.92		
WT. OF CONTAINER, g	12.64	12.63	12.61	12.78		
WT. OF MOISTURE, g	6.62	5.35	7.01	6.50	0.00	0.00
WT. OF DRY SOIL, g	19.83	15.80	20.12	18.14	0.00	0.00
MOISTURE CONTENT, %	33.4	33.9	34.8	35.8	#####	######



Liquid Limit, % ;
34

* Plastic Limit, % ;
NP

Plasticity Index, % ;
#VALUE!

Linear Shrinkage, % ;
4

At M.C., % ;
34.8

Trough No. ;
A

Length Dry ;
134.6

* Some Cracks before
3 mm

Nat Moisture Content ;
15

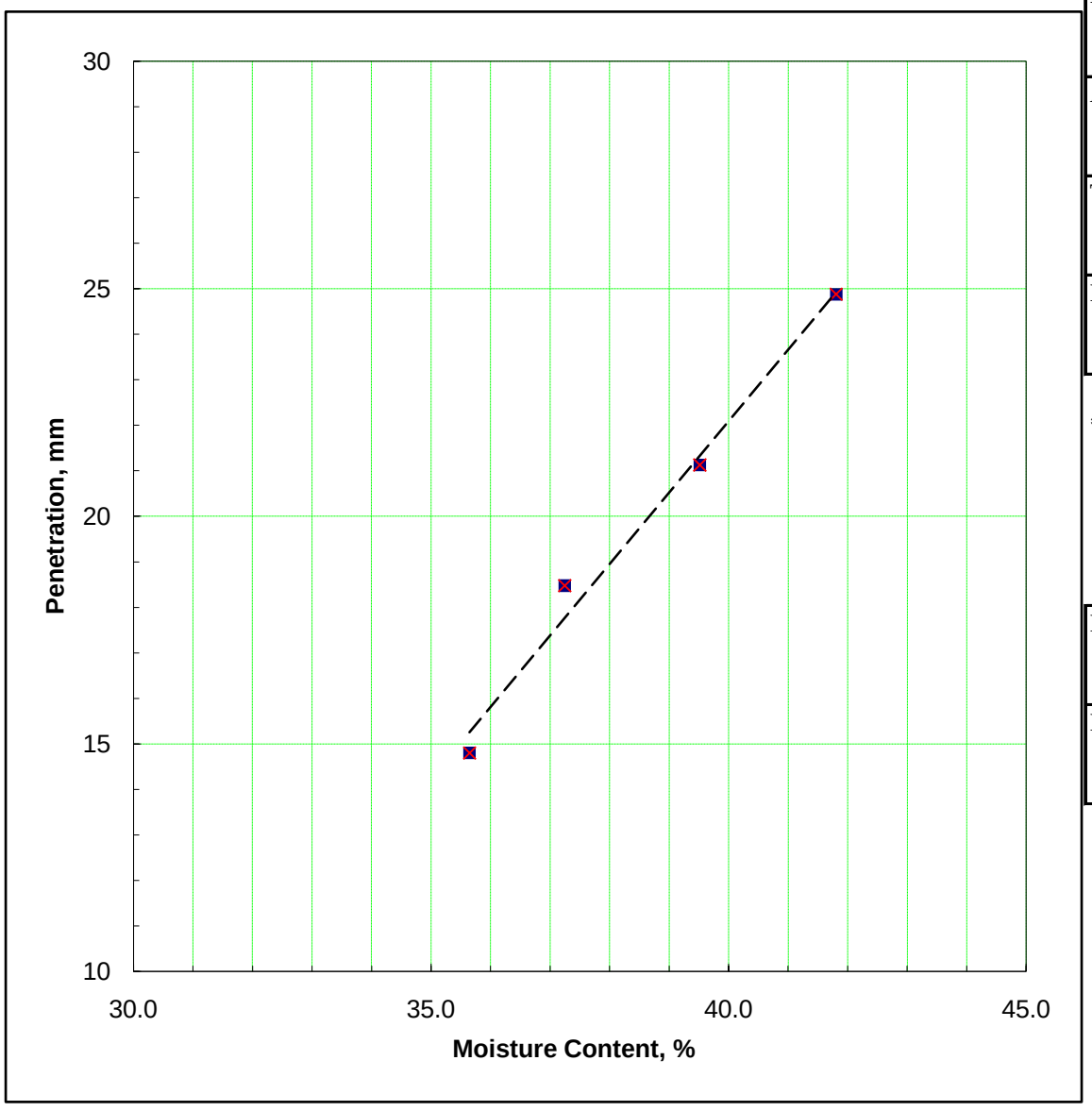
Liquidity Index ;
#VALUE!

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**ABERTHAW**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	2	3	4	I	II
PENETRATION, mm	14.85	18.45	21.05	25.00		
(or other M.C. test if stated)	14.75	18.50	21.20	24.75		
	14.8	18.48	21.13	24.88		
CONTAINER	5	6	7	8	III	IV
WT. OF WET SOIL + CONTAINER, g	34.42	38.16	38.02	34.15	13.41	16.64
WT. OF DRY SOIL + CONTAINER, g	28.72	31.24	30.84	27.90	11.94	14.62
WT. OF CONTAINER, g	12.73	12.66	12.67	12.95	4.53	4.66
WT. OF MOISTURE, g	5.70	6.92	7.18	6.25	1.47	2.02
WT. OF DRY SOIL, g	15.99	18.58	18.17	14.95	7.41	9.96
MOISTURE CONTENT, %	35.6	37.2	39.5	41.8	19.8	20.3



Liquid Limit, % ;
39

* Plastic Limit, % ;
20

Plasticity Index, % ;
19

Linear Shrinkage, % ;
8

At M.C., % ;
39.5

Trough No. ;
B

Length Dry ;
128.5

* Some Cracks before
3 mm

Nat Moisture Content ;
24.1

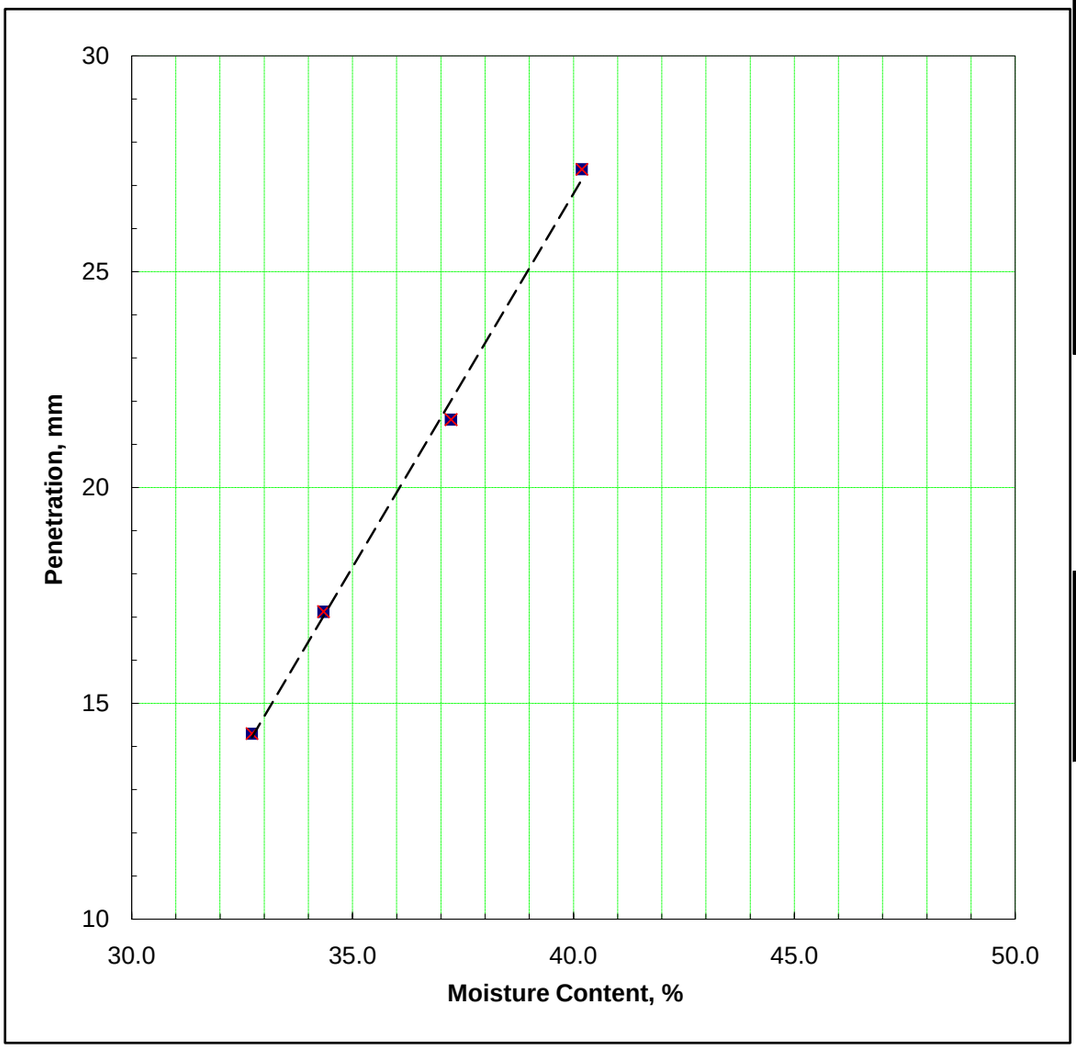
Liquidity Index ;
0.213322179

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**BARNSTONE**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	14.50	17.00	21.35	27.15		
(or other M.C. test if stated)	14.10	17.25	21.80	27.60		
	14.3	**17.13**	**21.58**	**27.38**		
CONTAINER	**1**	**2**	**3**	**4**	**I**	**II**
WT. OF WET SOIL + CONTAINER, g	30.89	30.37	31.92	36.32	26.44	23.66
WT. OF DRY SOIL + CONTAINER, g	26.40	25.83	26.73	29.52	22.61	20.39
WT. OF CONTAINER, g	12.68	12.61	12.79	12.60	5.22	5.46
WT. OF MOISTURE, g	4.49	4.54	5.19	6.80	3.83	3.27
WT. OF DRY SOIL, g	13.72	13.22	13.94	16.92	17.39	14.93
MOISTURE CONTENT, %	**32.7**	**34.3**	**37.2**	**40.2**	22.0	21.9



Liquid Limit, % ;
36

* Plastic Limit, % ;
22

Plasticity Index, % ;
14

Linear Shrinkage, % ;
8

At M.C., % ;
37.2

Trough No. ;
A

Length Dry ;
128.7

* Some Cracks before
3 mm

Nat Moisture Content ;
9.3

Liquidity Index ;
-0.9

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

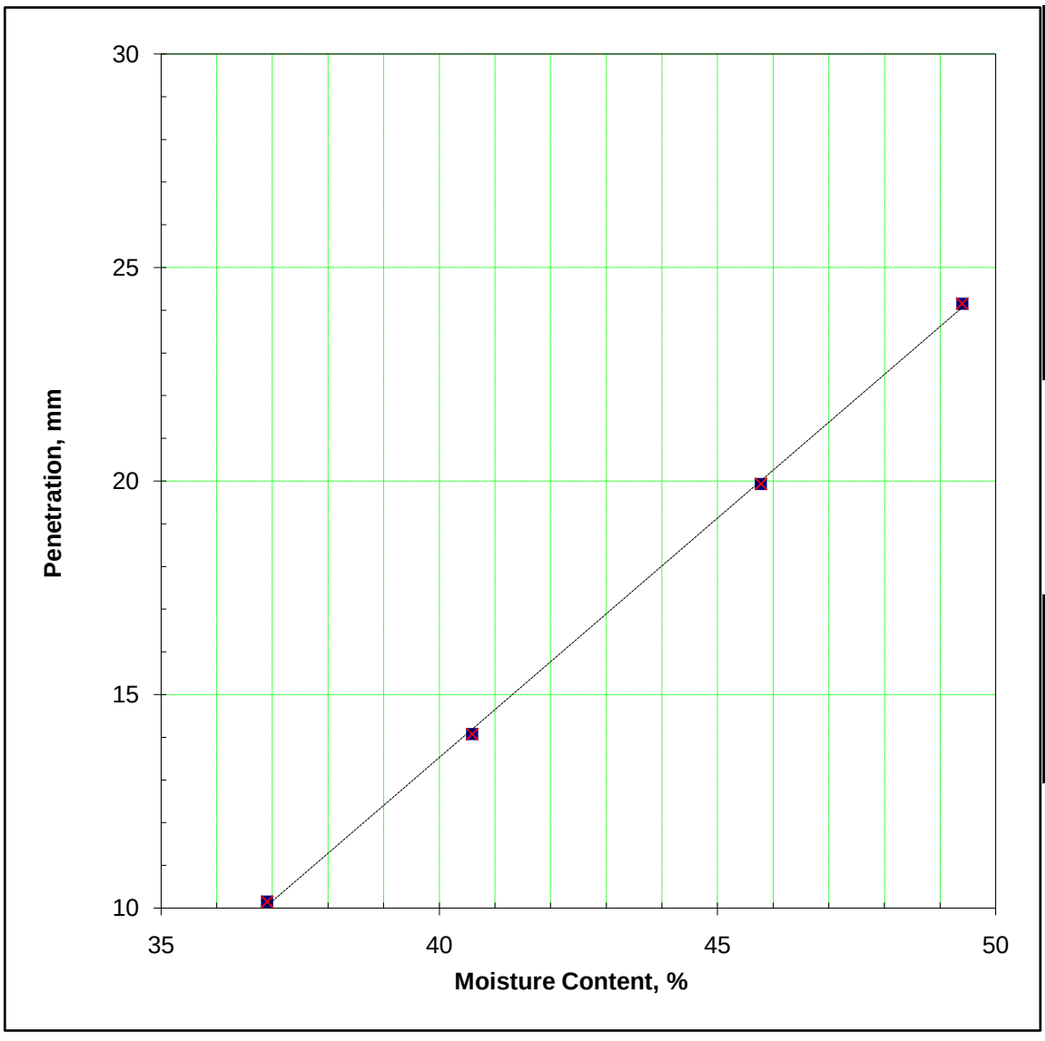
JOB :	E1320S83	OPERATOR :	L.M.Nelder
SAMPLE NO. :		DATE :	
SITE :	**BISHOPS CLEEVE 1**	DESCRIPTION OF SAMPLE :	
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm (or other M.C. test if stated)	10.15	14.07	19.93	24.15		
WT. OF WET SOIL + CONTAINER, g	57.14	55.03	81.58	93.36	28.53	26.42
WT. OF DRY SOIL + CONTAINER, g	45.19	42.80	59.94	66.66	25.57	23.94
WT. OF CONTAINER, g	12.81	12.67	12.67	12.61	12.78	12.80
WT. OF MOISTURE, g	11.95	12.23	21.64	26.70	2.96	2.48
WT. OF DRY SOIL, g	32.38	30.13	47.27	54.05	12.79	11.14
MOISTURE CONTENT, %	**36.9**	**40.6**	**45.8**	**49.4**	23.1	22.3

Liquid Limit, % ;
45.8

* Plastic Limit, % ;
23

Plasticity Index, % ;
23



Linear Shrinkage, % ;
9

At M.C., % ;
45.8

Trough No. ;
D

Length Dry ;
127.6

* Some Cracks before
3 mm

Nat Moisture Content ;
21.6

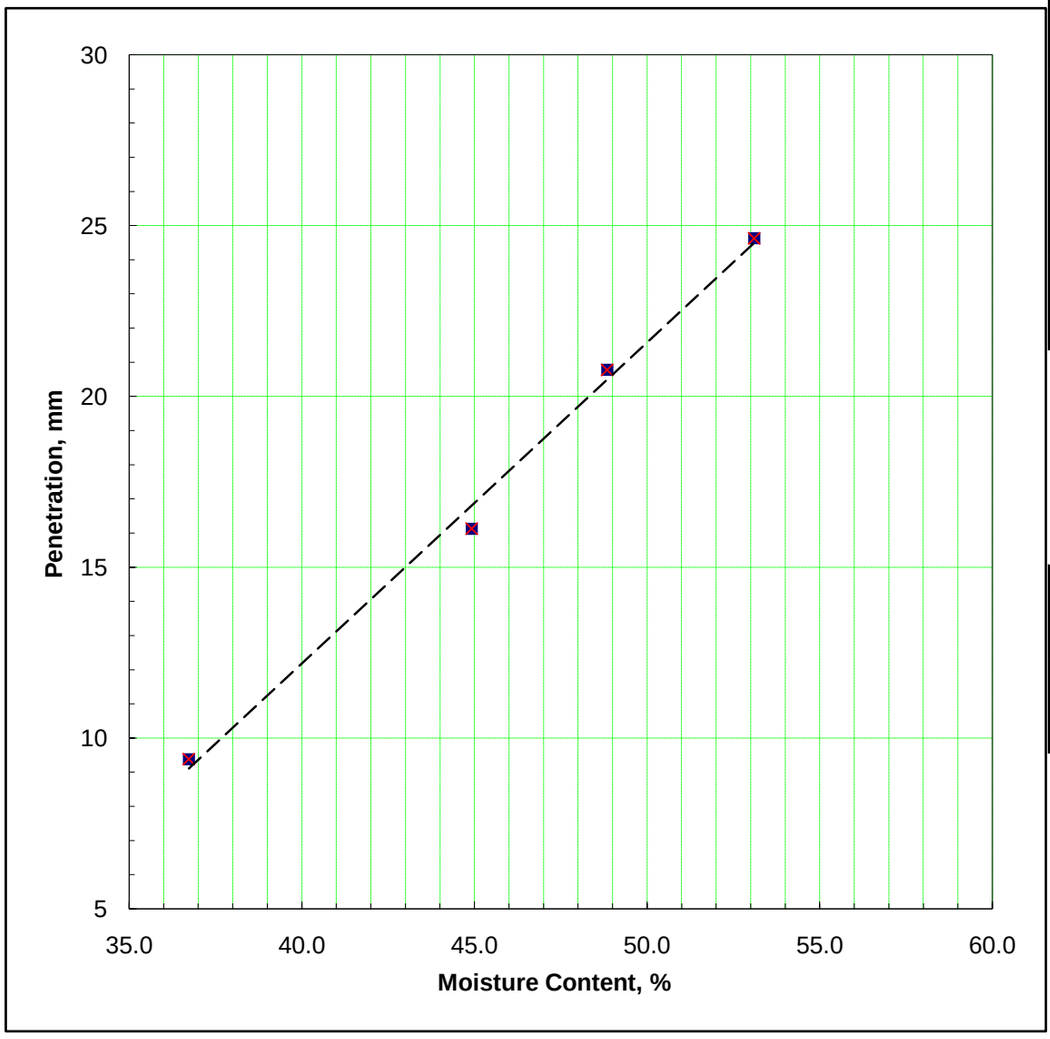
Liquidity Index ;
-0.047737

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**BISHOPS CLEEVE 2**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	9.55	16.00	20.90	24.65		
(or other M.C. test if stated)	9.20	16.25	20.65	24.60		
	9.375	**16.13**	**20.78**	**24.63**		
CONTAINER	1	2	3	4	I	II
WT. OF WET SOIL + CONTAINER, g	33.80	31.86	30.25	37.52	21.27	21.58
WT. OF DRY SOIL + CONTAINER, g	28.13	25.89	24.52	28.88	18.55	18.91
WT. OF CONTAINER, g	12.69	12.60	12.79	12.61	5.22	5.46
WT. OF MOISTURE, g	5.67	5.97	5.73	8.64	2.72	2.67
WT. OF DRY SOIL, g	15.44	13.29	11.73	16.27	13.33	13.45
MOISTURE CONTENT, %	**36.7**	**44.9**	**48.8**	**53.1**	20.4	19.9



Liquid Limit, % ;
48

* Plastic Limit, % ;
20

Plasticity Index, % ;
28

Linear Shrinkage, % ;
9

At M.C., % ;
48.8

Trough No. ;
A

Length Dry ;
127.7

* Some Cracks before
3 mm

Nat Moisture Content ;
22.8

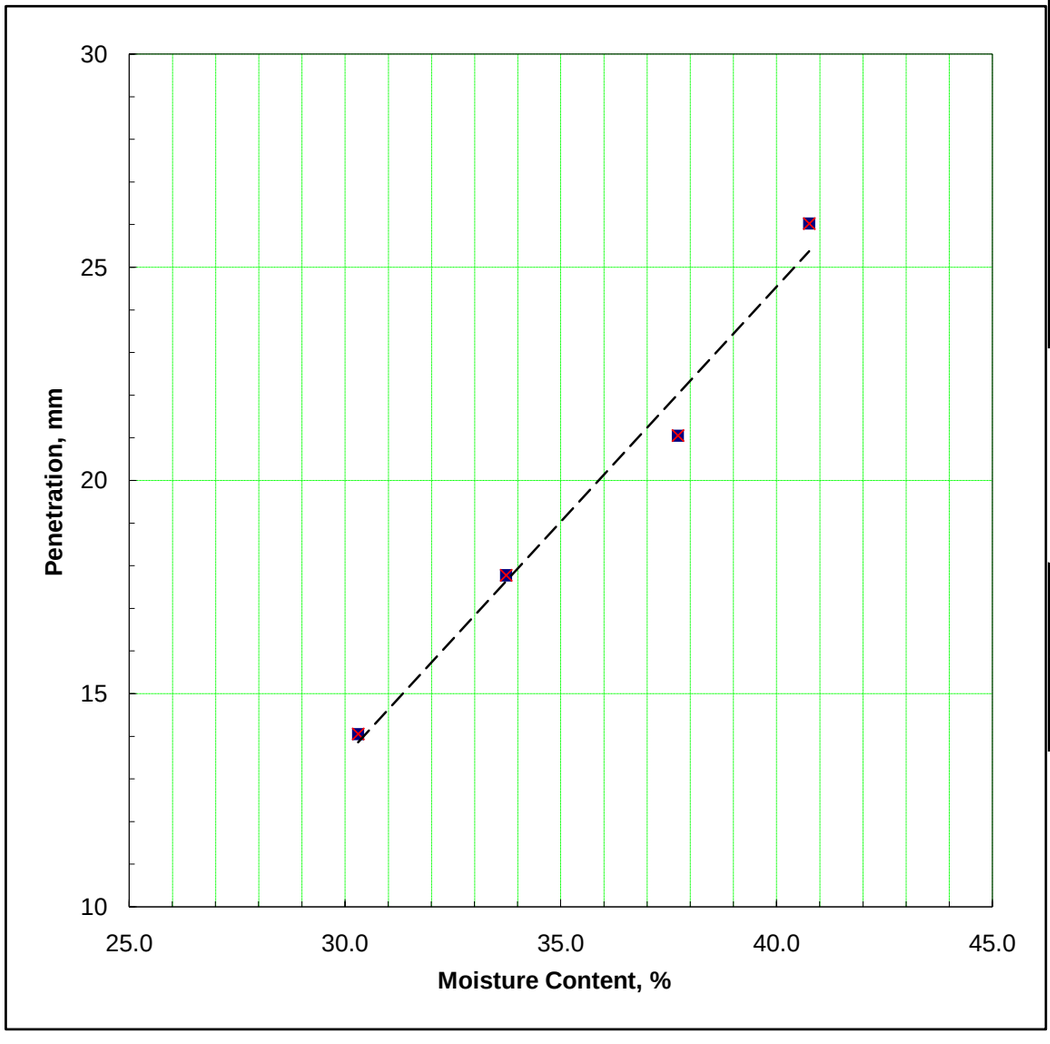
Liquidity Index ;
0.0959

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**BLACK VEN (BM)**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	14.20	17.80	20.90	25.85		
(or other M.C. test if stated)	13.90	17.75	21.20	26.20		
	14.05	**17.78**	**21.05**	**26.03**		
CONTAINER	**21**	**22**	**23**	**24**	**XIII**	**XIV**
WT. OF WET SOIL + CONTAINER, g	24.72	26.41	28.45	30.44	16.07	16.44
WT. OF DRY SOIL + CONTAINER, g	21.92	23.03	24.12	25.39	14.45	14.73
WT. OF CONTAINER, g	12.68	13.01	12.64	13.00	4.62	4.65
WT. OF MOISTURE, g	2.80	3.38	4.33	5.05	1.62	1.71
WT. OF DRY SOIL, g	9.24	10.02	11.48	12.39	9.83	10.08
MOISTURE CONTENT, %	**30.3**	**33.7**	**37.7**	**40.8**	16.5	17.0



Liquid Limit, % ;
36

* Plastic Limit, % ;
17

Plasticity Index, % ;
19

Linear Shrinkage, % ;
8

At M.C., % ;
37.7

Trough No. ;
F

Length Dry ;
128.2

* Some Cracks before
3 mm

Nat Moisture Content ;
7.6

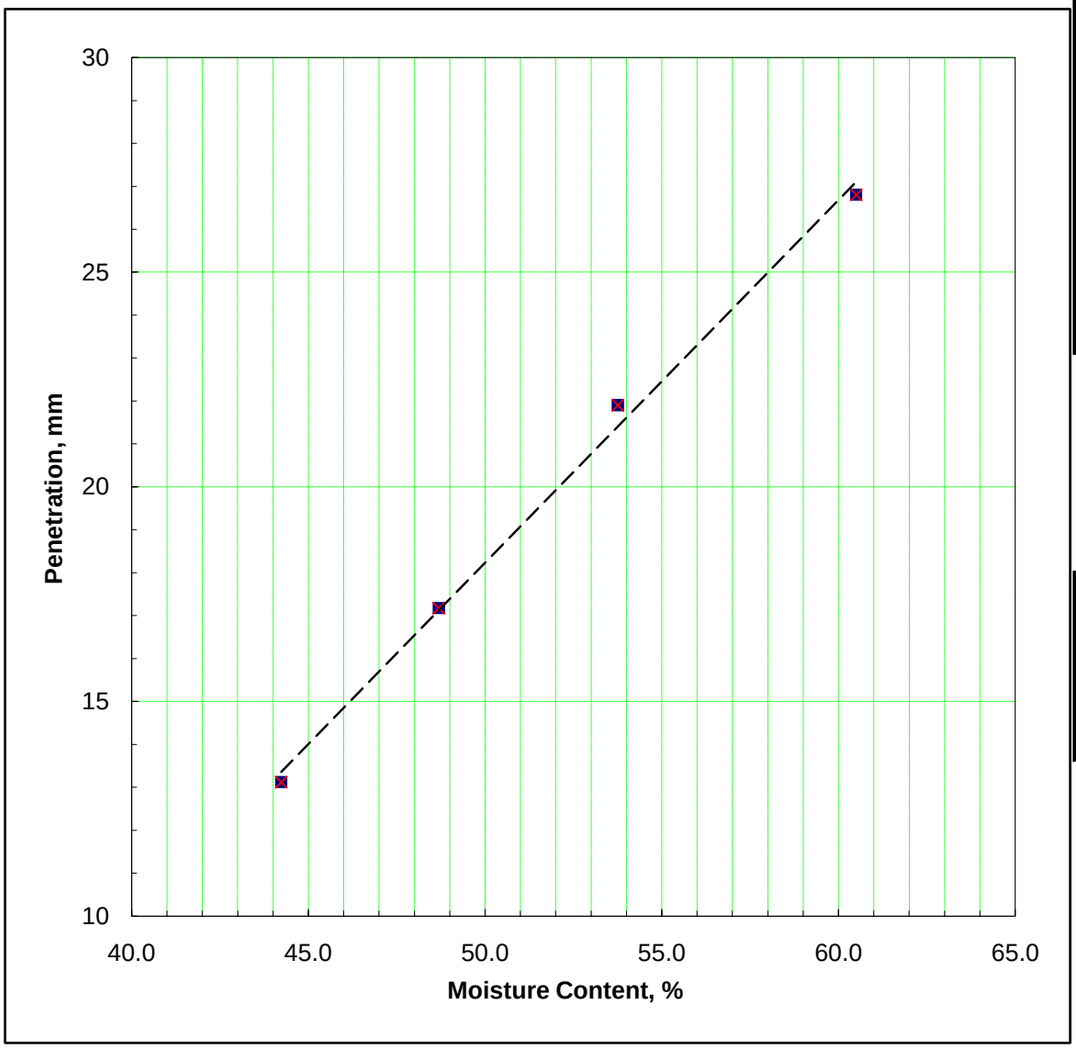
Liquidity Index ;
-0.473199

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**BLACK VEN (BVM)**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	13.05	17.40	21.75	26.60		
(or other M.C. test if stated)	13.20	16.95	22.05	27.00		
	13.13	**17.18**	**21.9**	**26.8**		
CONTAINER	**29**	**30**	**31**	**32**	**XII**	**XIII**
WT. OF WET SOIL + CONTAINER, g	28.89	30.99	30.64	35.20	18.79	17.91
WT. OF DRY SOIL + CONTAINER, g	23.90	25.03	24.42	26.70	16.37	15.35
WT. OF CONTAINER, g	12.62	12.79	12.85	12.65	5.54	5.62
WT. OF MOISTURE, g	4.99	5.96	6.22	8.50	2.42	2.56
WT. OF DRY SOIL, g	11.28	12.24	11.57	14.05	10.83	9.73
MOISTURE CONTENT, %	**44.2**	**48.7**	**53.8**	**60.5**	22.3	26.3



Liquid Limit, % ;
52

* Plastic Limit, % ;
24

Plasticity Index, % ;
28

Linear Shrinkage, % ;
12

At M.C., % ;
53.8

Trough No. ;
G

Length Dry ;
123.2

* Some Cracks before
3 mm

Nat Moisture Content ;
21.4

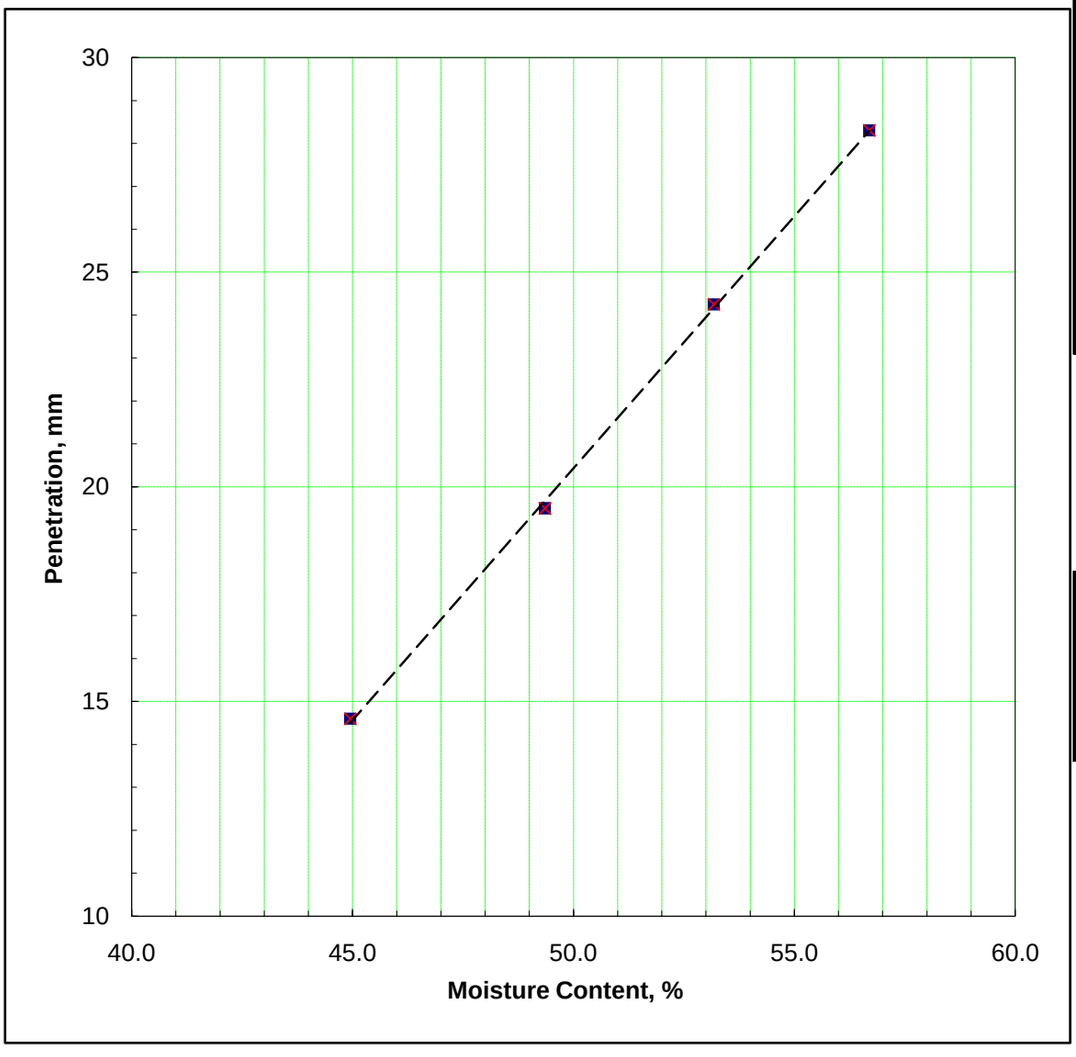
Liquidity Index ;
-0.11

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**BLACK VEN (SWB)**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	14.70	19.60	24.15	28.20		
(or other M.C. test if stated)	14.50	19.40	24.35	28.40		
	14.6	**19.5**	**24.25**	**28.3**		
CONTAINER	**21**	**22**	**23**	**24**	**X**	**XI**
WT. OF WET SOIL + CONTAINER, g	31.35	30.44	31.68	29.86	14.66	20.68
WT. OF DRY SOIL + CONTAINER, g	25.56	24.68	25.07	23.76	12.65	17.58
WT. OF CONTAINER, g	12.68	13.01	12.64	13.00	4.71	5.24
WT. OF MOISTURE, g	5.79	5.76	6.61	6.10	2.01	3.10
WT. OF DRY SOIL, g	12.88	11.67	12.43	10.76	7.94	12.34
MOISTURE CONTENT, %	**45.0**	**49.4**	**53.2**	**56.7**	25.3	25.1



Liquid Limit, % ;
50

* Plastic Limit, % ;
25

Plasticity Index, % ;
25

Linear Shrinkage, % ;
11

At M.C., % ;
49.4

Trough No. ;
C

Length Dry ;
124.4

* Some Cracks before
3 mm

Nat Moisture Content ;
11.1

Liquidity Index ;
-0.57

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

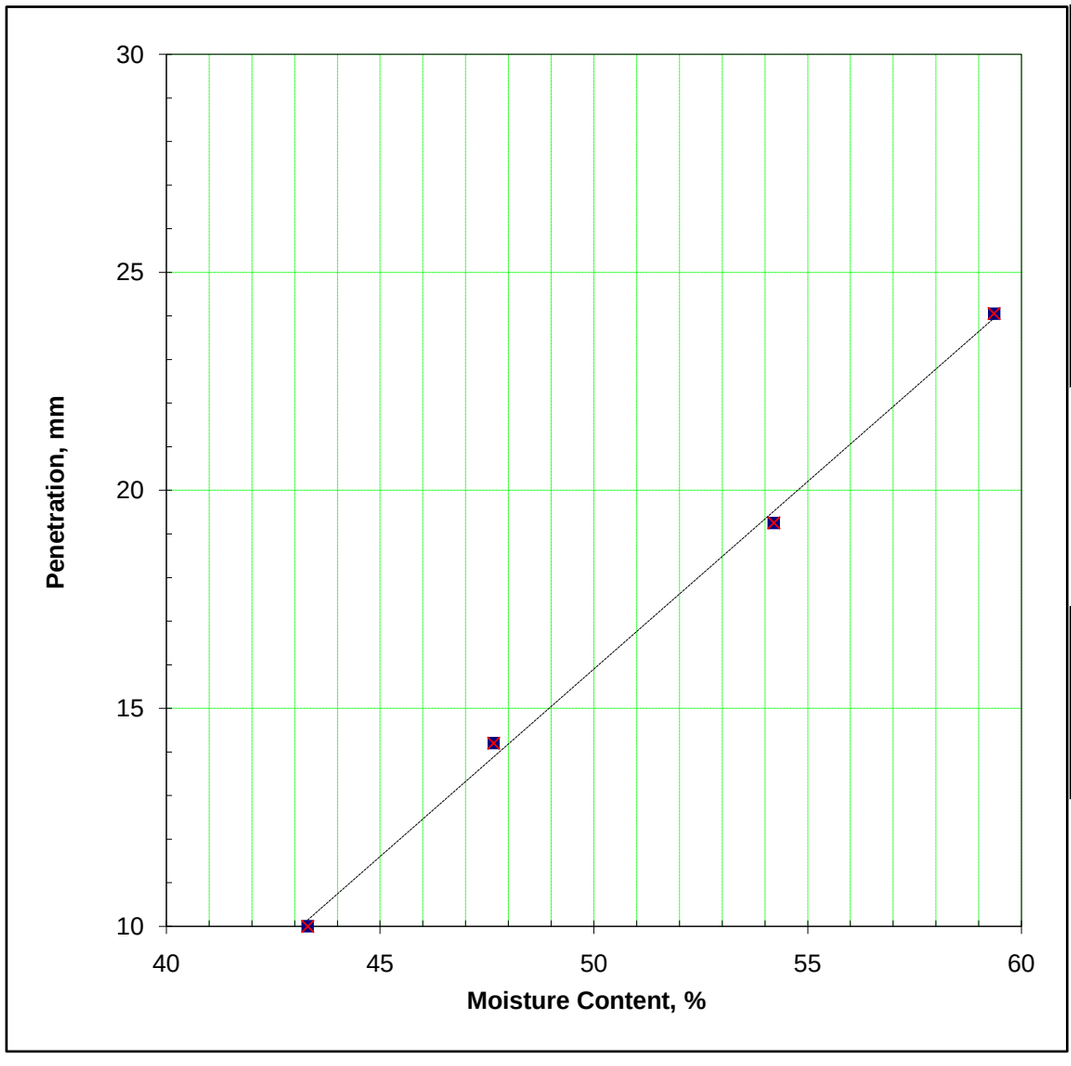
JOB :	E1320S83	OPERATOR :	L.M.Nelder
SAMPLE NO. :		DATE :	
SITE :	**BLOCKLEY 1**	DESCRIPTION OF SAMPLE :	
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm (or other M.C. test if stated)	10.00	14.20	19.25	24.05		
WT. OF WET SOIL + CONTAINER, g	84.36	80.28	40.78	52.91	28.53	26.42
WT. OF DRY SOIL + CONTAINER, g	62.67	58.46	30.92	37.91	25.57	23.94
WT. OF CONTAINER, g	12.58	12.67	12.73	12.64	12.78	12.80
WT. OF MOISTURE, g	21.69	21.82	9.86	15.00	2.96	2.48
WT. OF DRY SOIL, g	50.09	45.79	18.19	25.27	12.79	11.14
MOISTURE CONTENT, %	**43.3**	**47.7**	**54.2**	**59.4**	23.1	22.3

Liquid Limit, % ;
54.7

* Plastic Limit, % ;
23

Plasticity Index, % ;
32



Linear Shrinkage, % ;
12

At M.C., % ;
54.2

Trough No. ;
A

Length Dry ;
123.5

* Some Cracks before
3 mm

Nat Moisture Content ;
23.9

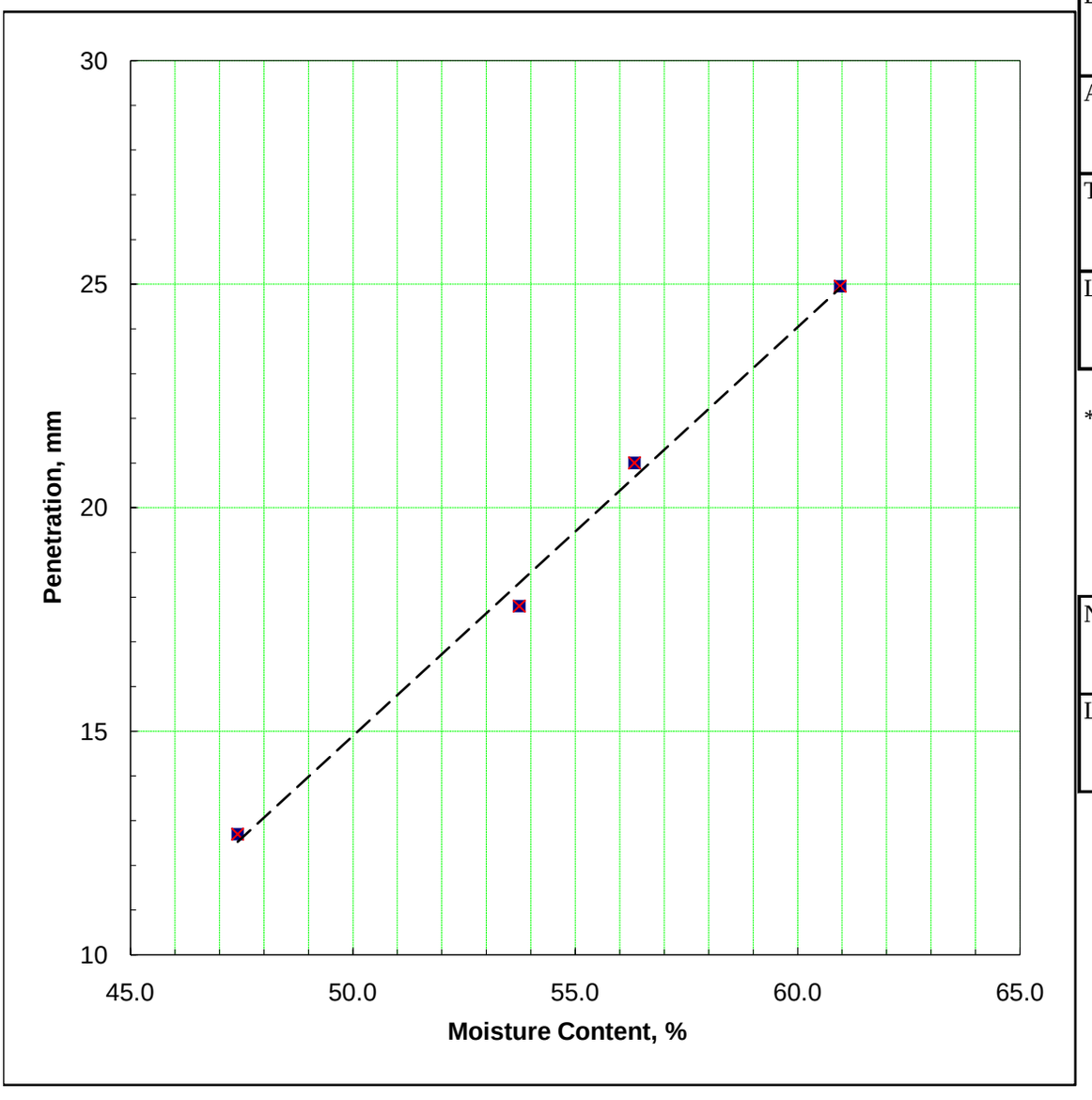
Liquidity Index ;
0.037

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**BLOCKLEY 2**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	2	3	4	I	II
PENETRATION, mm	12.80	17.90	21.20	25.00		
(or other M.C. test if stated)	12.60	17.70	20.80	24.90		
	12.7	17.8	21	24.95		
CONTAINER	25	26	27	28	XI	XII
WT. OF WET SOIL + CONTAINER, g	24.78	27.60	28.69	29.86	21.26	19.80
WT. OF DRY SOIL + CONTAINER, g	20.93	22.43	22.91	23.35	18.33	17.18
WT. OF CONTAINER, g	12.81	12.81	12.65	12.67	5.24	5.54
WT. OF MOISTURE, g	3.85	5.17	5.78	6.51	2.93	2.62
WT. OF DRY SOIL, g	8.12	9.62	10.26	10.68	13.09	11.64
MOISTURE CONTENT, %	47.4	53.7	56.3	61.0	22.4	22.5



Liquid Limit, % ;
56

* Plastic Limit, % ;
22

Plasticity Index, % ;
34

Linear Shrinkage, % ;
9

At M.C., % ;
56.3

Trough No. ;
H

Length Dry ;
127.8

* Some Cracks before
3 mm

Nat Moisture Content ;
21.4

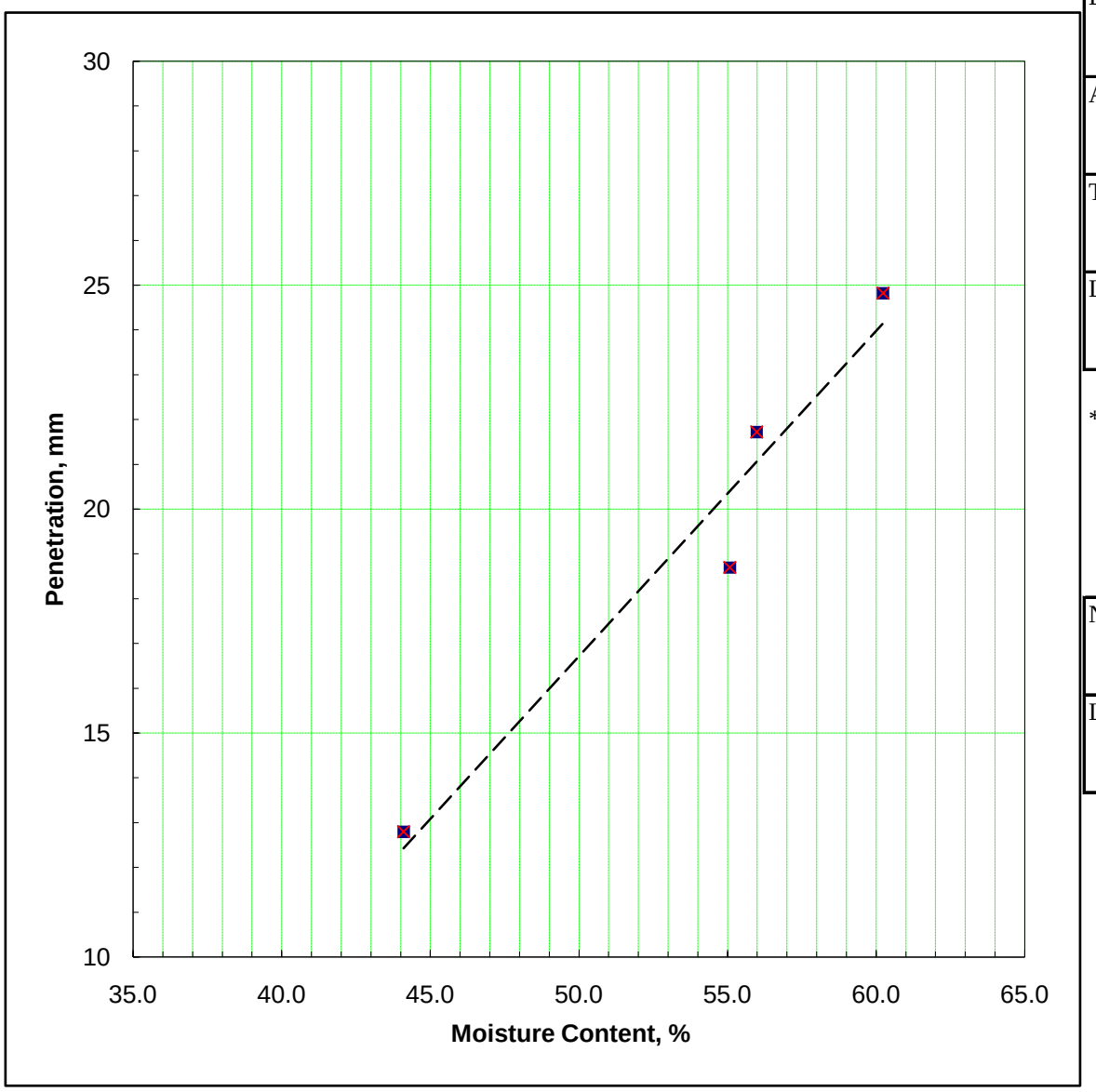
Liquidity Index ;
-0.031

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**BRIXWORTH**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	12.75	18.55	21.90	24.75		
(or other M.C. test if stated)	12.85	18.85	21.55	24.90		
	12.8	**18.7**	**21.73**	**24.83**		
CONTAINER	**13**	**14**	**15**	**16**	**VII**	**VIII**
WT. OF WET SOIL + CONTAINER, g	32.49	33.48	33.50	41.46	24.79	21.30
WT. OF DRY SOIL + CONTAINER, g	26.43	26.05	25.97	30.63	20.63	17.76
WT. OF CONTAINER, g	12.69	12.56	12.52	12.65	5.46	4.97
WT. OF MOISTURE, g	6.06	7.43	7.53	10.83	4.16	3.54
WT. OF DRY SOIL, g	13.74	13.49	13.45	17.98	15.17	12.79
MOISTURE CONTENT, %	**44.1**	**55.1**	**56.0**	**60.2**	27.4	27.7



Liquid Limit, % ;
55

* Plastic Limit, % ;
28

Plasticity Index, % ;
27

Linear Shrinkage, % ;
9

At M.C., % ;
56.0

Trough No. ;
D

Length Dry ;
128.0

* Some Cracks before
3 mm

Nat Moisture Content ;
20.5

Liquidity Index ;
-0.25684

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

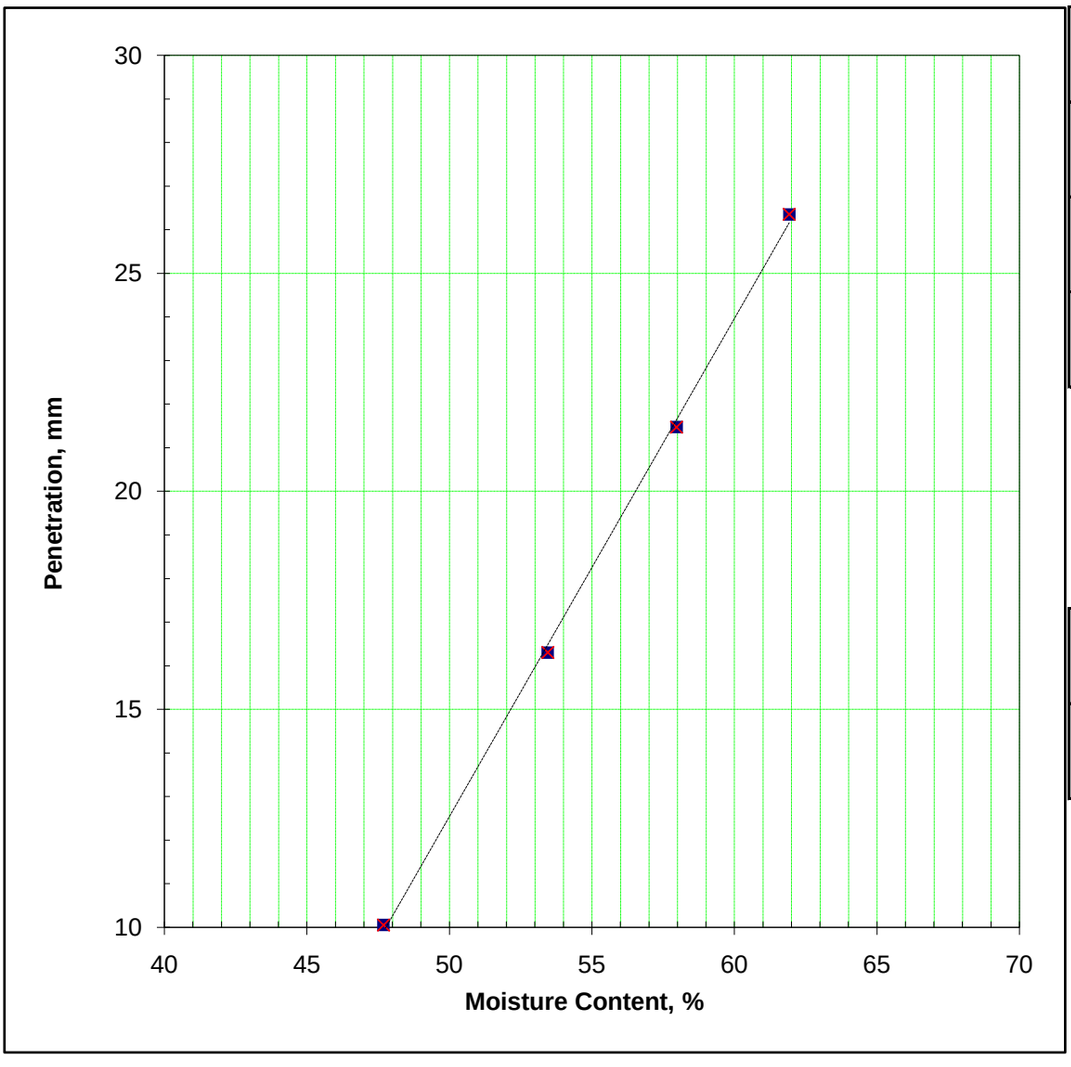
JOB :	E1320S83	OPERATOR :	L.M.Nelder
SAMPLE NO. :		DATE :	
SITE :	**DIMMER 1**	DESCRIPTION OF SAMPLE :	
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm (or other M.C. test if stated)	10.05	16.30	21.47	26.35		
WT. OF WET SOIL + CONTAINER, g	74.15	76.23	75.46	114.90	28.53	26.42
WT. OF DRY SOIL + CONTAINER, g	54.30	54.14	52.44	75.85	25.57	23.94
WT. OF CONTAINER, g	12.67	12.81	12.73	12.79	12.78	12.80
WT. OF MOISTURE, g	19.85	22.09	23.02	39.05	2.96	2.48
WT. OF DRY SOIL, g	41.63	41.33	39.71	63.06	12.79	11.14
MOISTURE CONTENT, %	**47.7**	**53.4**	**58.0**	**61.9**	23.1	22.3

Liquid Limit, % ;
56.5

* Plastic Limit, % ;
23

Plasticity Index, % ;
34



Linear Shrinkage, % ;
13

At M.C., % ;
58.0

Trough No. ;
E

Length Dry ;
121.9

* Some Cracks before
3 mm

Nat Moisture Content ;
31.2

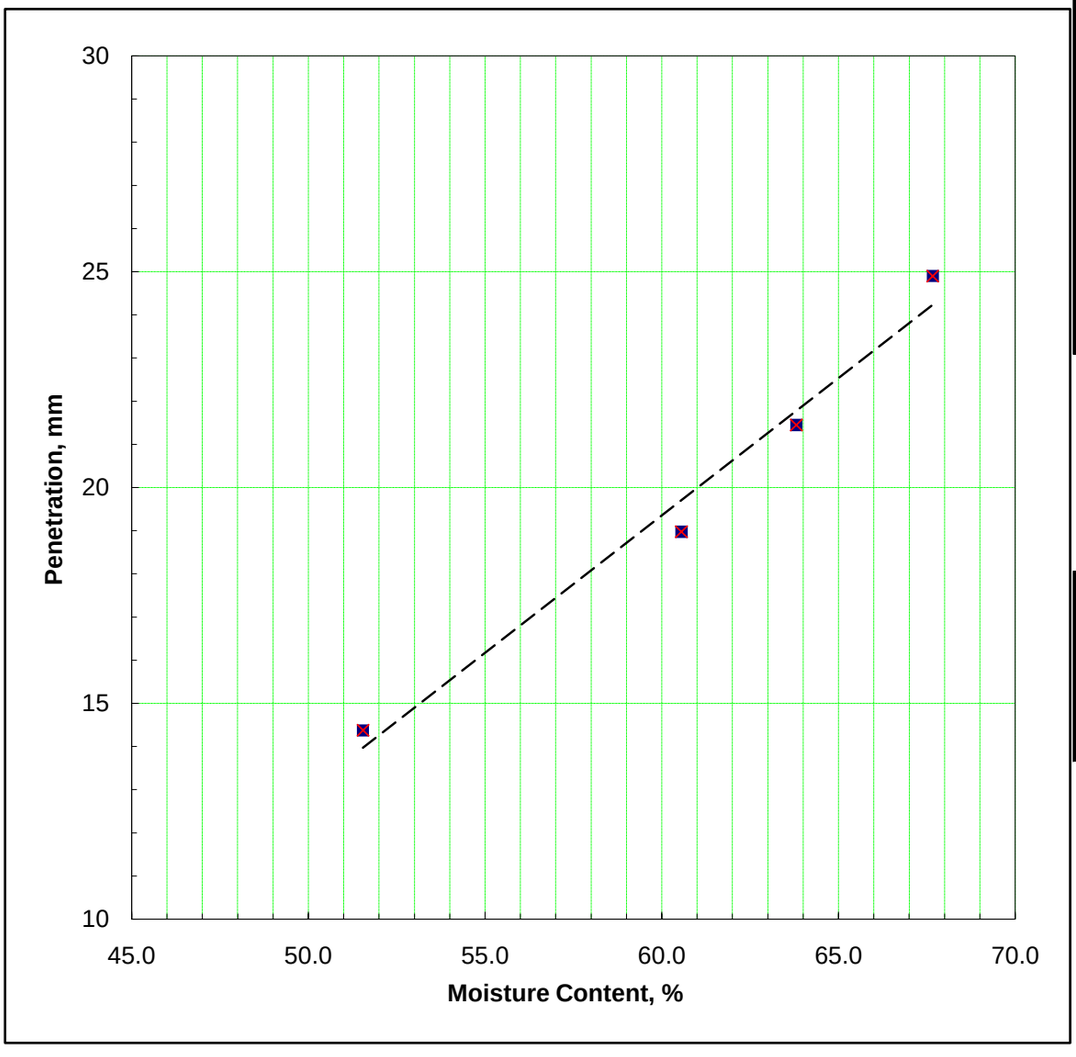
Liquidity Index ;
0.251

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**CONESBY 2**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	14.15	19.10	21.35	24.75		
(or other M.C. test if stated)	14.60	18.85	21.55	25.05		
	14.38	**18.98**	**21.45**	**24.9**		
CONTAINER	**5**	**6**	**7**	**8**	**III**	**IV**
WT. OF WET SOIL + CONTAINER, g	34.76	32.90	34.19	36.24	17.11	17.94
WT. OF DRY SOIL + CONTAINER, g	27.27	25.27	25.94	26.74	14.73	15.46
WT. OF CONTAINER, g	12.74	12.67	13.01	12.70	4.54	4.67
WT. OF MOISTURE, g	7.49	7.63	8.25	9.50	2.38	2.48
WT. OF DRY SOIL, g	14.53	12.60	12.93	14.04	10.19	10.79
MOISTURE CONTENT, %	**51.5**	**60.6**	**63.8**	**67.7**	23.4	23.0



Liquid Limit, % ;
61

* Plastic Limit, % ;
23

Plasticity Index, % ;
38

Linear Shrinkage, % ;
13

At M.C., % ;
63.8

Trough No. ;
C

Length Dry ;
121.5

* Some Cracks before
3 mm

Nat Moisture Content ;
23.3

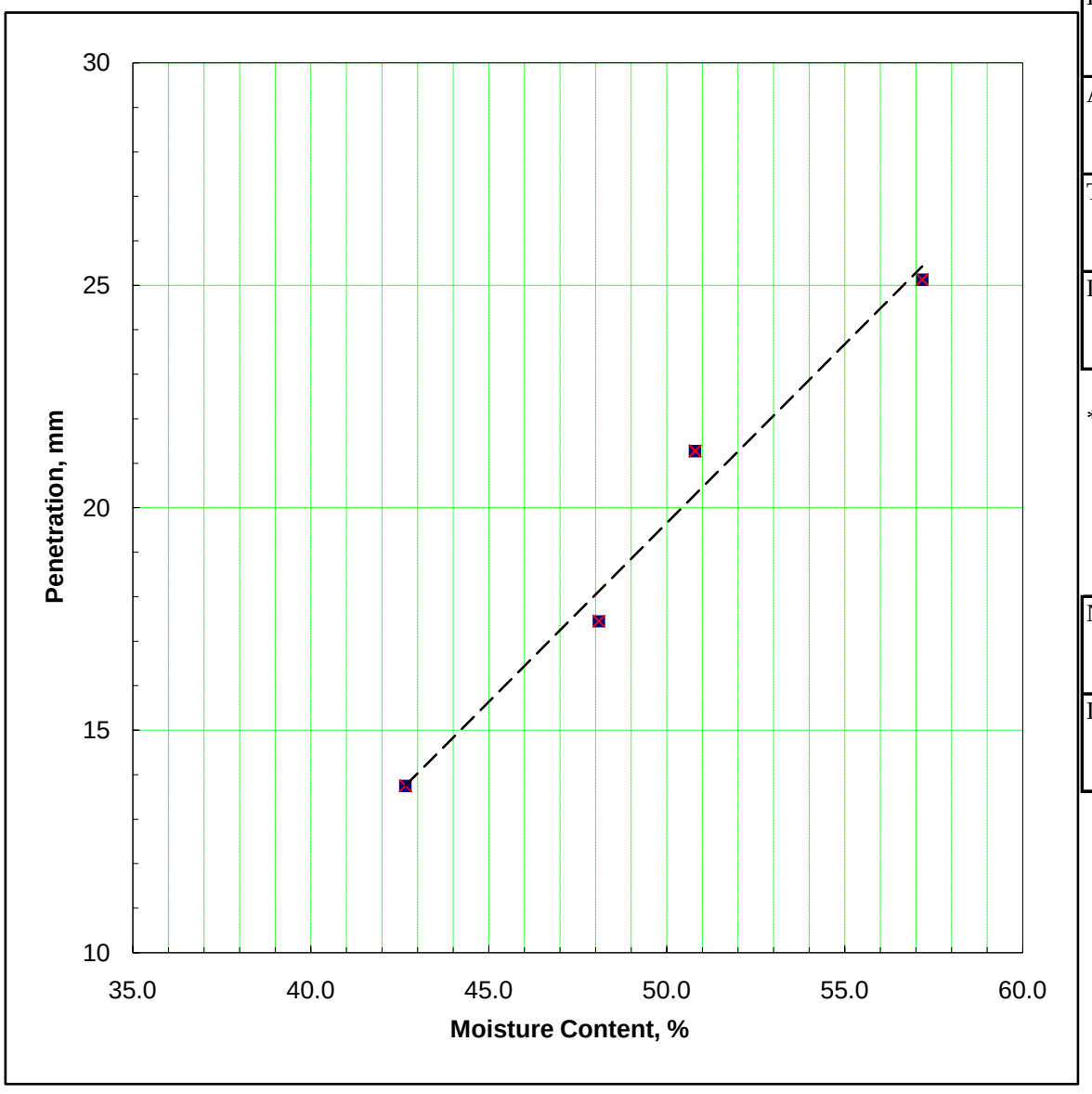
Liquidity Index ;
0.003

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**CONESBY S1 (CMF)**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	13.60	17.60	21.20	25.25		
(or other M.C. test if stated)	13.90	17.30	21.35	25.00		
	13.75	**17.45**	**21.28**	**25.13**		
CONTAINER	**21**	**22**	**23**	**24**	**XI**	**XII**
WT. OF WET SOIL + CONTAINER, g	32.98	35.12	30.69	40.05	18.05	18.68
WT. OF DRY SOIL + CONTAINER, g	26.91	27.94	24.61	30.21	15.64	16.09
WT. OF CONTAINER, g	12.68	13.01	12.64	13.00	5.24	5.54
WT. OF MOISTURE, g	6.07	7.18	6.08	9.84	2.41	2.59
WT. OF DRY SOIL, g	14.23	14.93	11.97	17.21	10.40	10.55
MOISTURE CONTENT, %	**42.7**	**48.1**	**50.8**	**57.2**	23.2	24.5



Liquid Limit, % ;
51

* Plastic Limit, % ;
24

Plasticity Index, % ;
27

Linear Shrinkage, % ;
14

At M.C., % ;
50.8

Trough No. ;
g

Length Dry ;
120.7

* Some Cracks before
3 mm

Nat Moisture Content ;
18.4

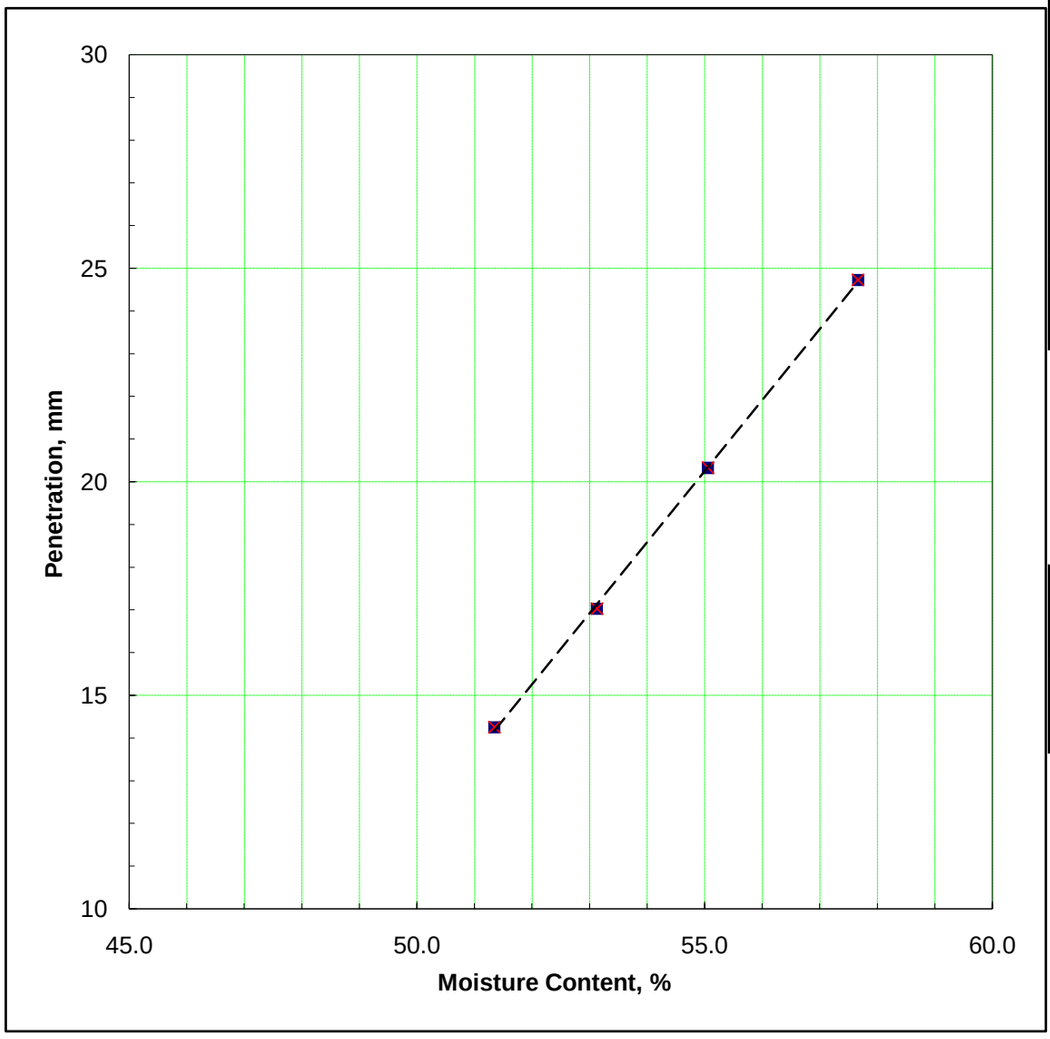
Liquidity Index ;
-0.201242

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**EDGEHILL**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	14.50	17.05	20.20	24.95		
(or other M.C. test if stated)	14.00	17.00	20.45	24.50		
	14.25	**17.03**	**20.33**	**24.73**		
CONTAINER	**13**	**14**	**15**	**16**	**VII**	**VIII**
WT. OF WET SOIL + CONTAINER, g	31.26	37.78	39.19	38.05	20.36	19.61
WT. OF DRY SOIL + CONTAINER, g	24.96	29.03	29.72	28.76	16.41	15.80
WT. OF CONTAINER, g	12.69	12.56	12.52	12.65	5.46	4.97
WT. OF MOISTURE, g	6.30	8.75	9.47	9.29	3.95	3.81
WT. OF DRY SOIL, g	12.27	16.47	17.20	16.11	10.95	10.83
MOISTURE CONTENT, %	**51.3**	**53.1**	**55.1**	**57.7**	36.1	35.2



Liquid Limit, % ;
55

* Plastic Limit, % ;
36

Plasticity Index, % ;
19

Linear Shrinkage, % ;
10

At M.C., % ;
55.1

Trough No. ;
D

Length Dry ;
125.9

* Some Cracks before
3 mm

Nat Moisture Content ;
42.9

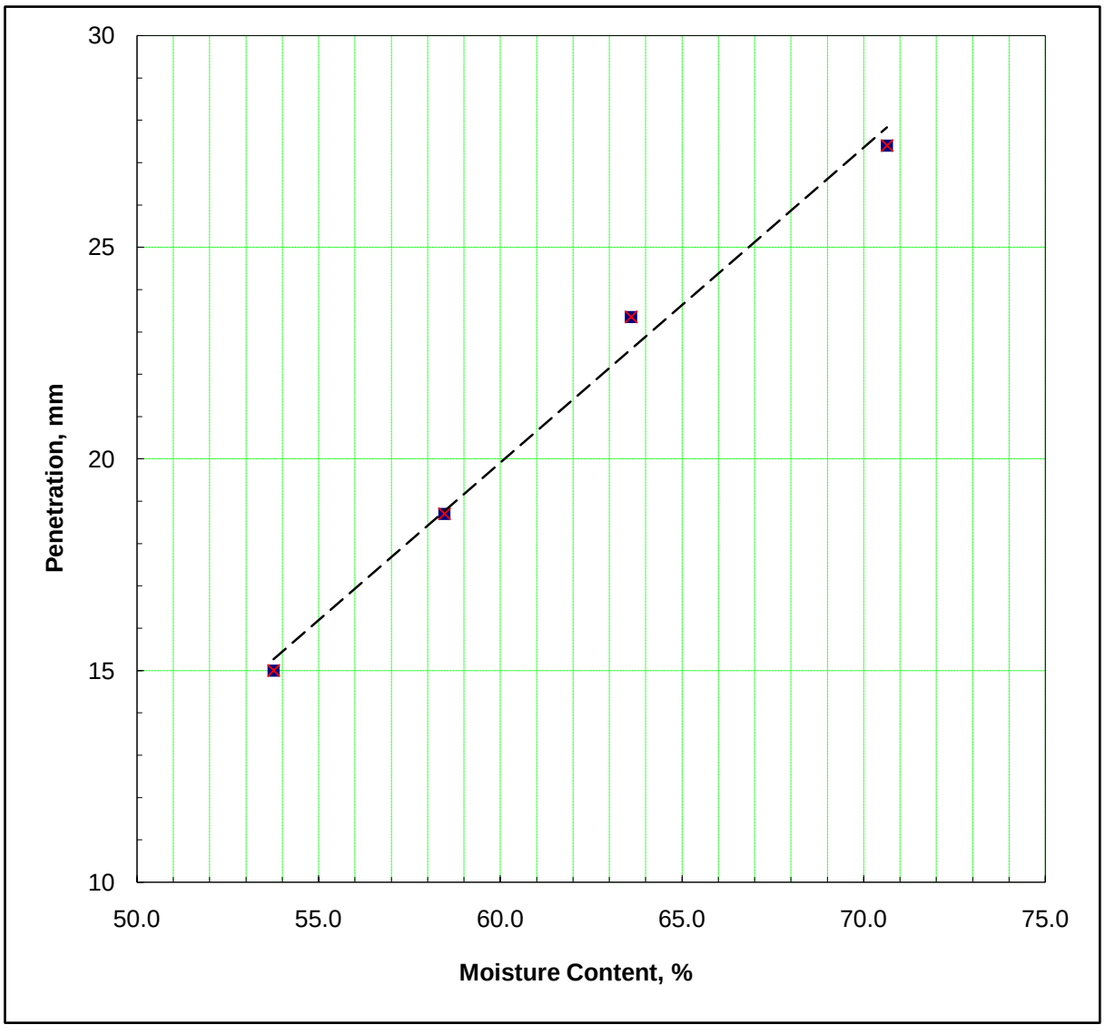
Liquidity Index ;
0.37543

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**FLIXBOROUGH 1**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	15.10	18.80	23.40	27.40		
(or other M.C. test if stated)	14.90	18.60	23.30	27.40		
	15	**18.7**	**23.35**	**27.4**		
CONTAINER	25	26	27	28	XIII	XIV
WT. OF WET SOIL + CONTAINER, g	24.88	24.71	24.02	28.13	25.55	23.92
WT. OF DRY SOIL + CONTAINER, g	20.66	20.32	19.60	21.73	21.69	20.26
WT. OF CONTAINER, g	12.81	12.81	12.65	12.67	4.62	4.65
WT. OF MOISTURE, g	4.22	4.39	4.42	6.40	3.86	3.66
WT. OF DRY SOIL, g	7.85	7.51	6.95	9.06	17.07	15.61
MOISTURE CONTENT, %	**53.8**	**58.5**	**63.6**	**70.6**	22.6	23.4



Liquid Limit, % ;
60

* Plastic Limit, % ;
23

Plasticity Index, % ;
37

Linear Shrinkage, % ;
12

At M.C., % ;
58.5

Trough No. ;
G

Length Dry ;
122.7

* Some Cracks before
3 mm

Nat Moisture Content ;
16.2

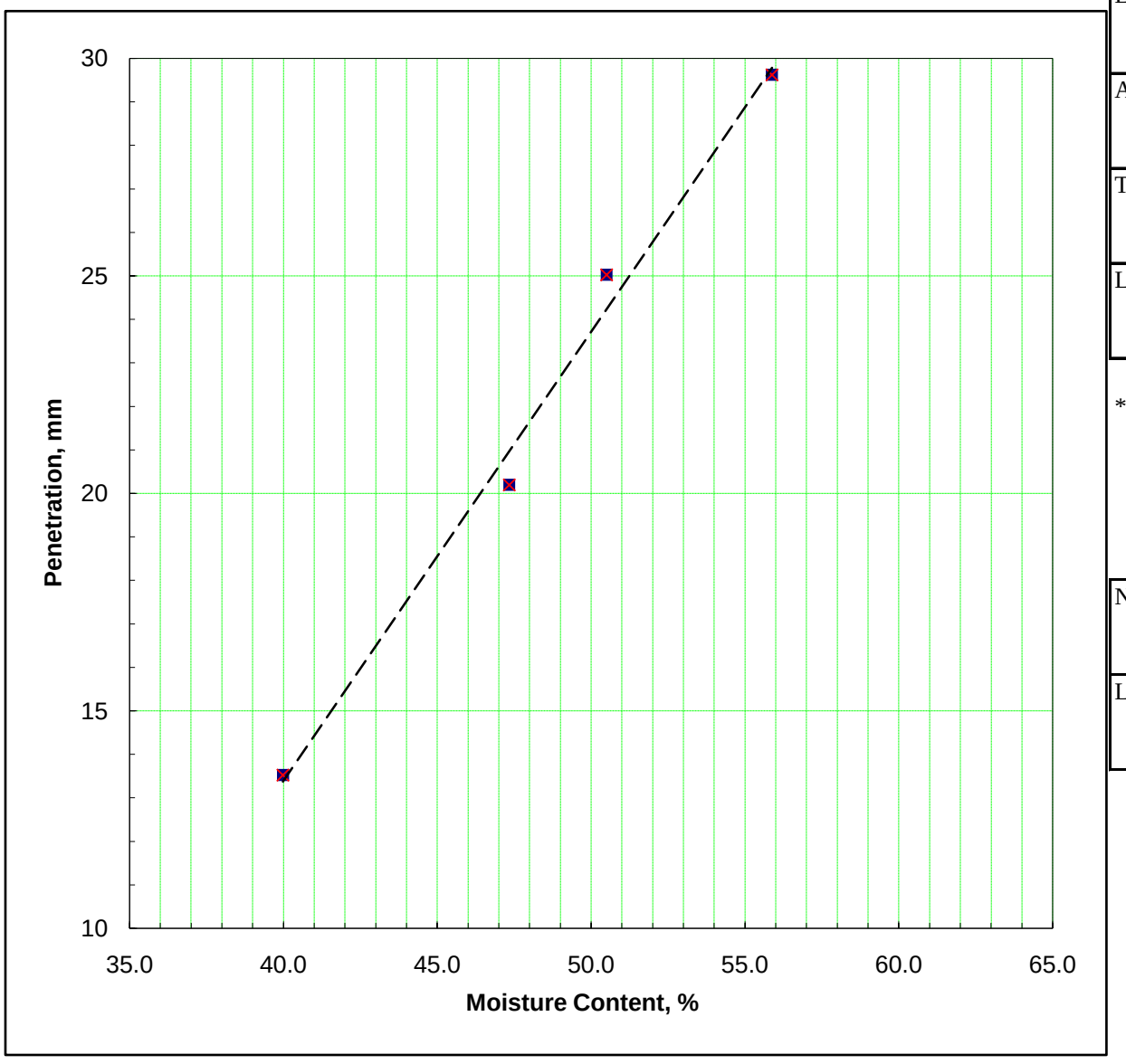
Liquidity Index ;
-0.185

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**FLIXBOROUGH 2**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	2	3	4	I	II
PENETRATION, mm	13.45	20.00	25.15	29.50		
(or other M.C. test if stated)	13.60	20.40	24.90	29.75		
	13.525	**20.2**	**25.025**	**29.625**		
CONTAINER	**21**	**22**	**23**	**24**	**XI**	**XII**
WT. OF WET SOIL + CONTAINER, g	30.01	29.91	21.58	28.51	23.70	23.56
WT. OF DRY SOIL + CONTAINER, g	25.06	24.48	18.58	22.95	21.14	20.89
WT. OF CONTAINER, g	12.68	13.01	12.64	13.00	5.24	5.54
WT. OF MOISTURE, g	4.95	5.43	3.00	5.56	2.56	2.67
WT. OF DRY SOIL, g	12.38	11.47	5.94	9.95	15.90	15.35
MOISTURE CONTENT, %	**40.0**	**47.3**	**50.5**	**55.9**	16.1	17.4



Liquid Limit, % ;
46

* Plastic Limit, % ;
17

Plasticity Index, % ;
29

Linear Shrinkage, % ;
11

At M.C., % ;

Trough No. ;
F

Length Dry ;
125.0

* Some Cracks before
3 mm

Nat Moisture Content ;
16.7

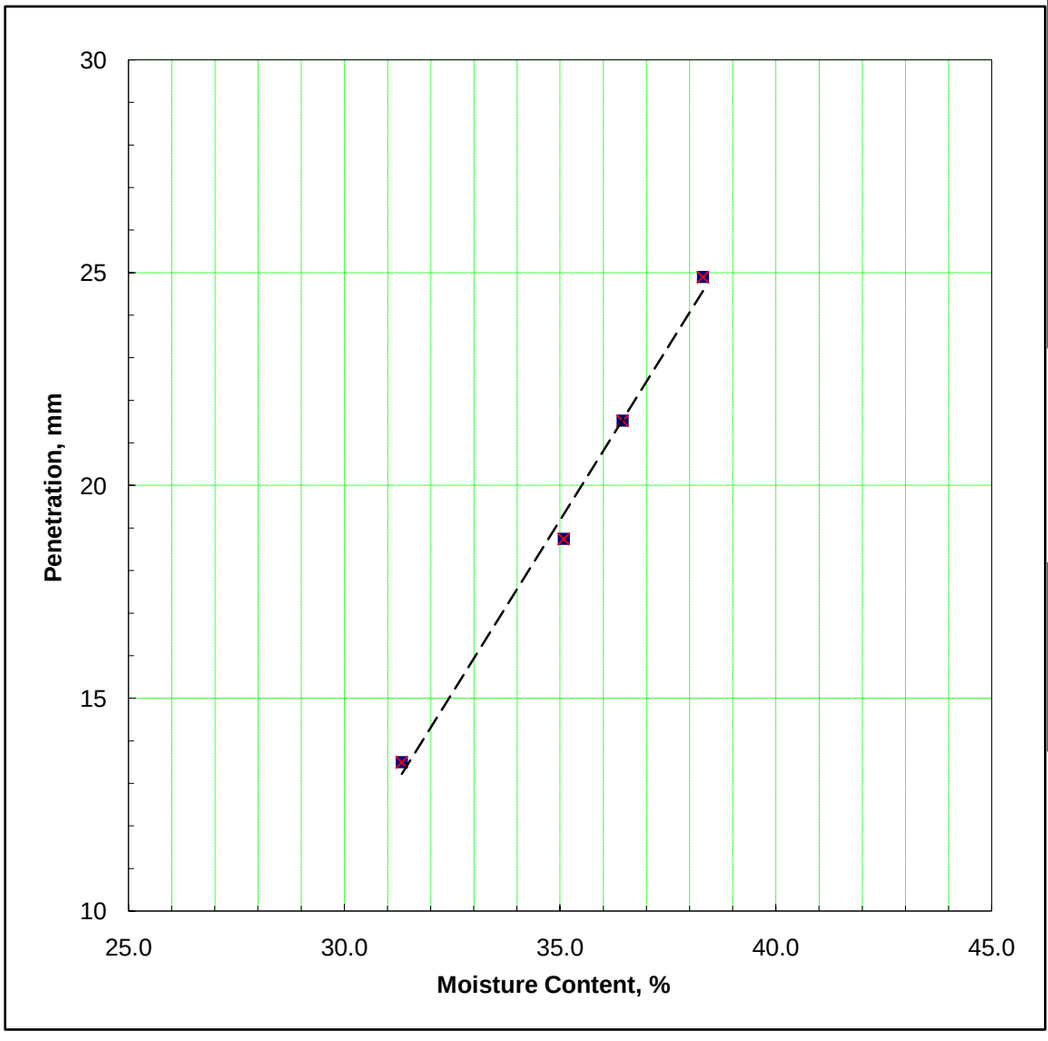
Liquidity Index ;
-0

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**HAMDON**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	13.60	19.00	21.55	24.95		
(or other M.C. test if stated)	13.40	18.50	21.50	24.85		
	13.5	**18.75**	**21.53**	**24.9**		
CONTAINER	4	2	3	1	III	IV
WT. OF WET SOIL + CONTAINER, g	29.02	38.34	35.14	44.38		
WT. OF DRY SOIL + CONTAINER, g	25.11	31.66	29.17	35.60		
WT. OF CONTAINER, g	12.63	12.62	12.79	12.68		
WT. OF MOISTURE, g	3.91	6.68	5.97	8.78	0.00	0.00
WT. OF DRY SOIL, g	12.48	19.04	16.38	22.92	0.00	0.00
MOISTURE CONTENT, %	**31.3**	**35.1**	**36.4**	**38.3**	######	######



Liquid Limit, % ;
35

* Plastic Limit, % ;
NP

Plasticity Index, % ;
######

Linear Shrinkage, % ;
5

At M.C., % ;
36.4

Trough No. ;
B

Length Dry ;
132.5

* Some Cracks before
3 mm

Nat Moisture Content ;
23

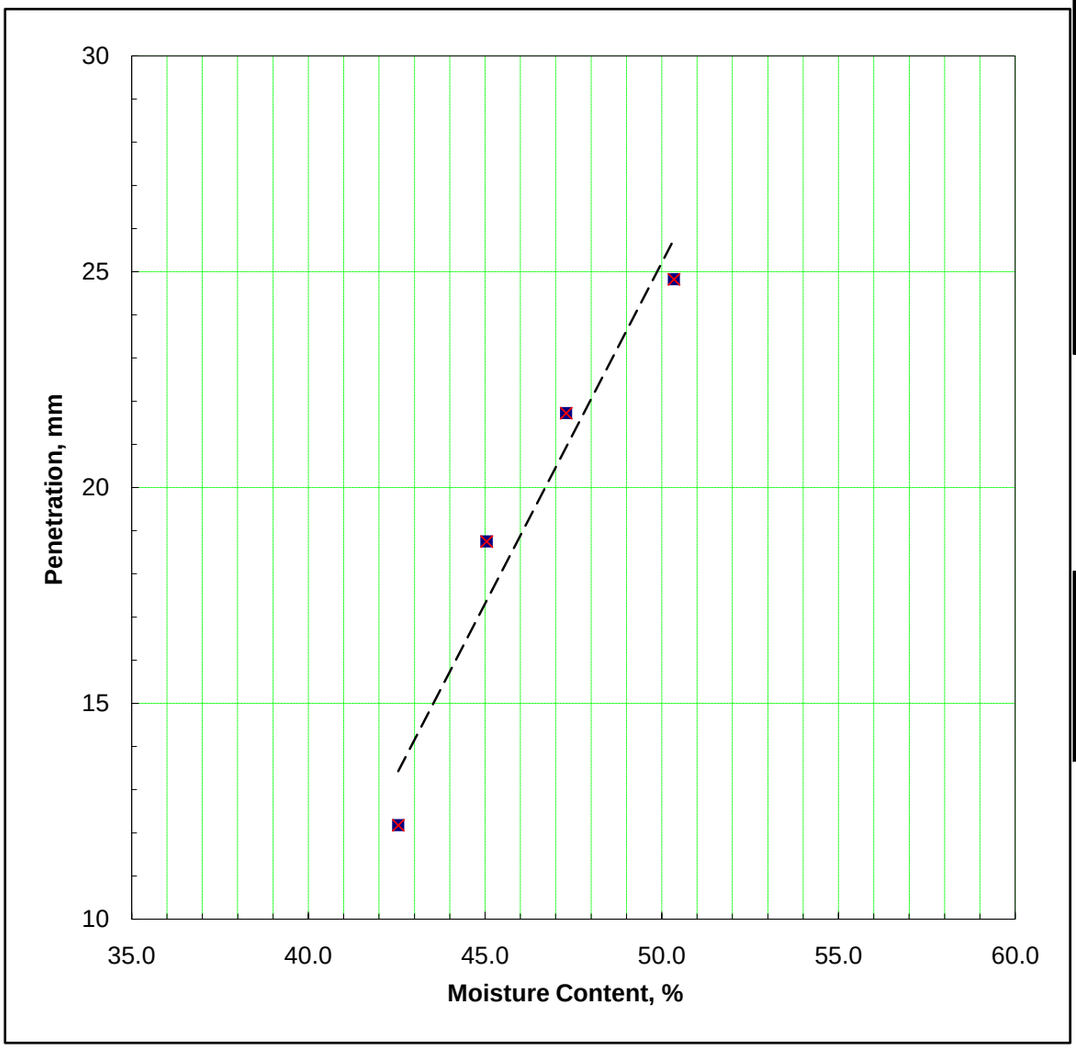
Liquidity Index ;
######

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**HORNTON**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	12.00	18.60	21.75	24.80		
(or other M.C. test if stated)	12.35	18.90	21.70	24.85		
	12.18	**18.75**	**21.73**	**24.83**		
CONTAINER	**5**	**6**	**7**	**8**	**III**	**IV**
WT. OF WET SOIL + CONTAINER, g	34.34	43.67	37.18	43.74	15.60	18.42
WT. OF DRY SOIL + CONTAINER, g	27.89	34.04	29.31	33.43	12.98	15.13
WT. OF CONTAINER, g	12.73	12.66	12.67	12.95	4.53	4.66
WT. OF MOISTURE, g	6.45	9.63	7.87	10.31	2.62	3.29
WT. OF DRY SOIL, g	15.16	21.38	16.64	20.48	8.45	10.47
MOISTURE CONTENT, %	**42.5**	**45.0**	**47.3**	**50.3**	31.0	31.4



Liquid Limit, % ;
47

* Plastic Limit, % ;
31

Plasticity Index, % ;
16

Linear Shrinkage, % ;
9

At M.C., % ;
47.3

Trough No. ;
F

Length Dry ;
127.1

* Some Cracks before
3 mm

Nat Moisture Content ;
29

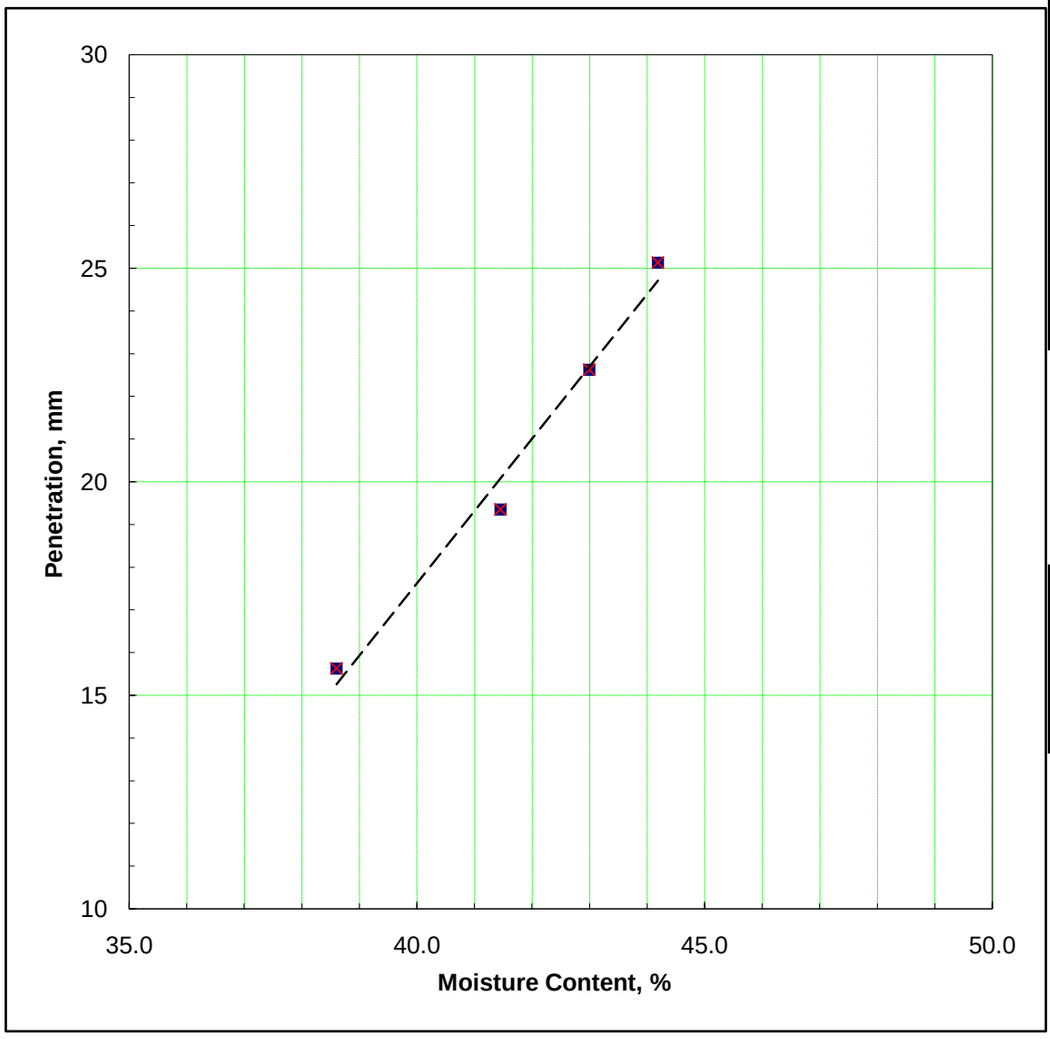
Liquidity Index ;
-0.14

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**KETTLENESS**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	15.60	19.05	22.75	24.96		
(or other M.C. test if stated)	15.65	19.65	22.50	25.30		
	15.63	**19.35**	**22.63**	**25.13**		
CONTAINER	**9**	**10**	**11**	**12**	**V**	**VI**
WT. OF WET SOIL + CONTAINER, g	31.04	34.63	34.56	40.68	23.26	27.03
WT. OF DRY SOIL + CONTAINER, g	25.91	28.18	27.96	32.13	19.74	22.95
WT. OF CONTAINER, g	12.62	12.62	12.61	12.78	4.70	5.39
WT. OF MOISTURE, g	5.13	6.45	6.60	8.55	3.52	4.08
WT. OF DRY SOIL, g	13.29	15.56	15.35	19.35	15.04	17.56
MOISTURE CONTENT, %	**38.6**	**41.5**	**43.0**	**44.2**	23.4	23.2



Liquid Limit, % ;
41

* Plastic Limit, % ;
23

Plasticity Index, % ;
18

Linear Shrinkage, % ;
10

At M.C., % ;
43.0

Trough No. ;
B

Length Dry ;
126.6

* Some Cracks before
3 mm

Nat Moisture Content ;
10.9

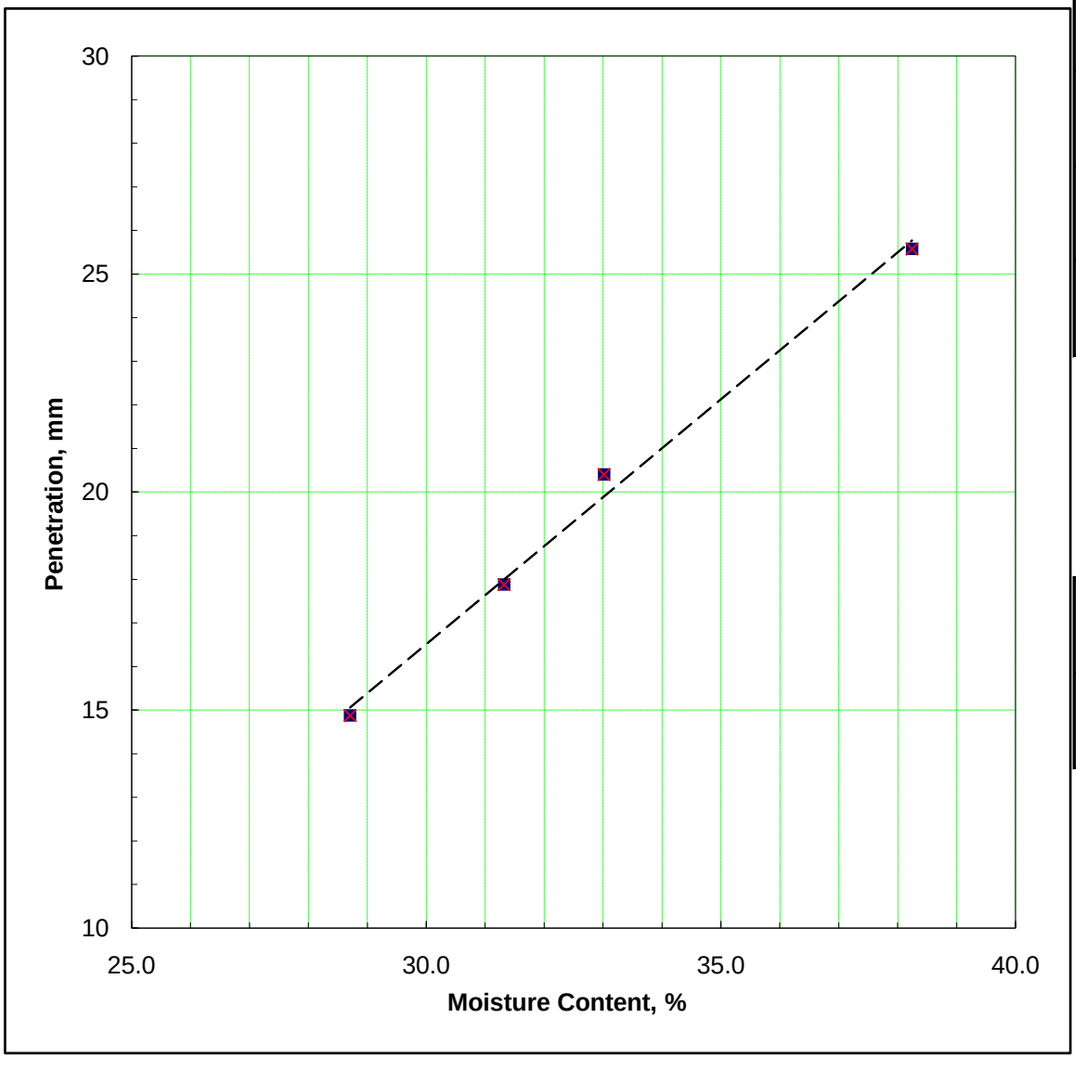
Liquidity Index ;
-0.702

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**LAKE VIEW**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	14.70	17.75	20.65	25.65		
(or other M.C. test if stated)	15.05	18.00	20.15	25.50		
	14.88	**17.88**	**20.4**	**25.58**		
CONTAINER	1	2	3	4	I	II
WT. OF WET SOIL + CONTAINER, g	30.21	33.49	33.85	38.89	20.25	20.35
WT. OF DRY SOIL + CONTAINER, g	26.30	28.51	28.62	31.62	18.06	18.23
WT. OF CONTAINER, g	12.68	12.61	12.78	12.61	5.22	5.49
WT. OF MOISTURE, g	3.91	4.98	5.23	7.27	2.19	2.12
WT. OF DRY SOIL, g	13.62	15.90	15.84	19.01	12.84	12.74
MOISTURE CONTENT, %	**28.7**	**31.3**	**33.0**	**38.2**	17.1	16.6



Liquid Limit, % ;
33

* Plastic Limit, % ;
17

Plasticity Index, % ;
16

Linear Shrinkage, % ;
7

At M.C., % ;
33.0

Trough No. ;
D

Length Dry ;
130.7

* Some Cracks before
3 mm

Nat Moisture Content ;
14.1

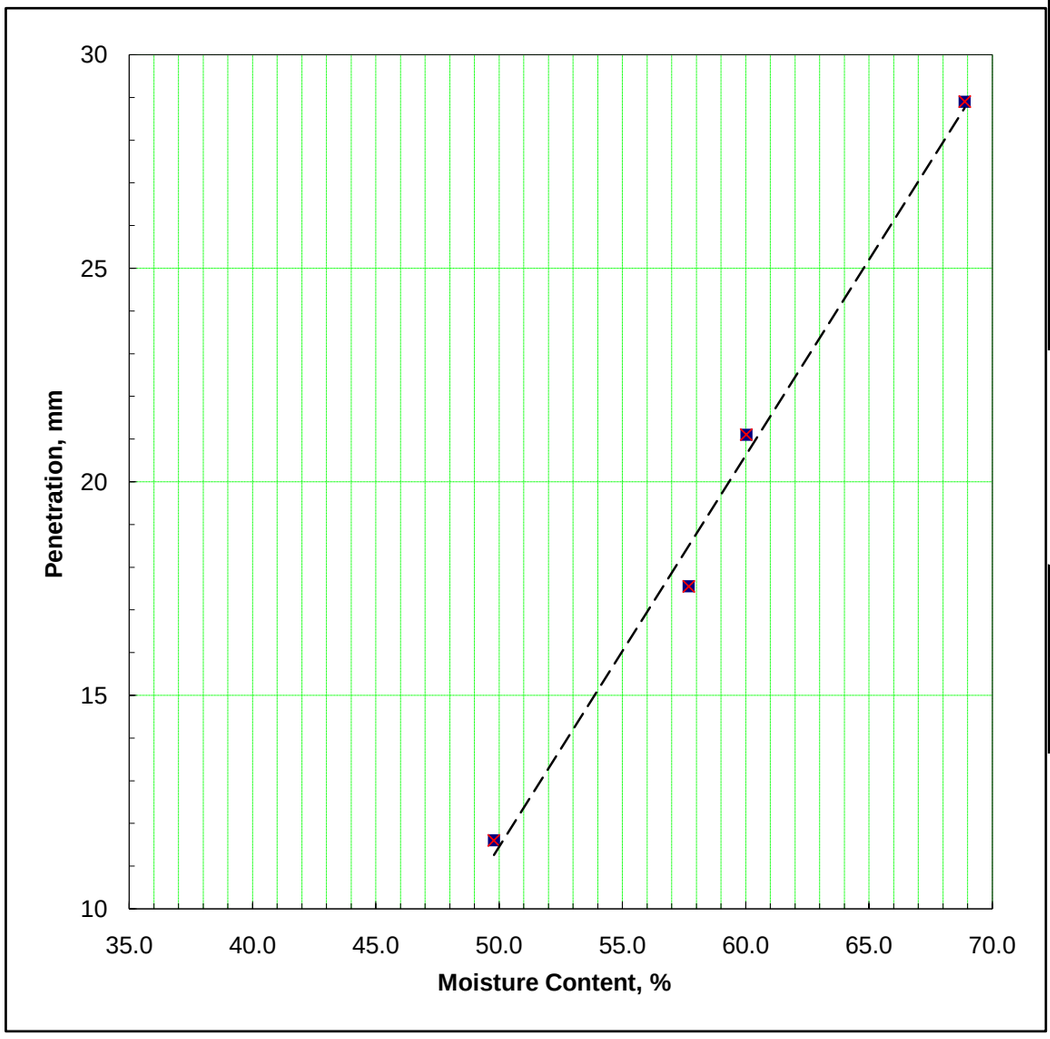
Liquidity Index ;
-0.17

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**NORTON BOTTOMS**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	11.70	17.65	21.05	28.80		
(or other M.C. test if stated)	11.50	17.45	21.15	29.00		
	11.6	**17.55**	**21.1**	**28.9**		
CONTAINER	**9**	**10**	**11**	**12**	**V**	**VI**
WT. OF WET SOIL + CONTAINER, g	29.97	33.76	40.15	42.03	23.35	19.90
WT. OF DRY SOIL + CONTAINER, g	24.21	26.03	29.82	30.10	19.62	17.03
WT. OF CONTAINER, g	12.64	12.63	12.61	12.78	4.73	5.40
WT. OF MOISTURE, g	5.76	7.73	10.33	11.93	3.73	2.87
WT. OF DRY SOIL, g	11.57	13.40	17.21	17.32	14.89	11.63
MOISTURE CONTENT, %	**49.8**	**57.7**	**60.0**	**68.9**	25.1	24.7



Liquid Limit, % ;
60

* Plastic Limit, % ;
25

Plasticity Index, % ;
35

Linear Shrinkage, % ;
13

At M.C., % ;
60.0

Trough No. ;
C

Length Dry ;
122.4

* Some Cracks before
3 mm

Nat Moisture Content ;
16.7

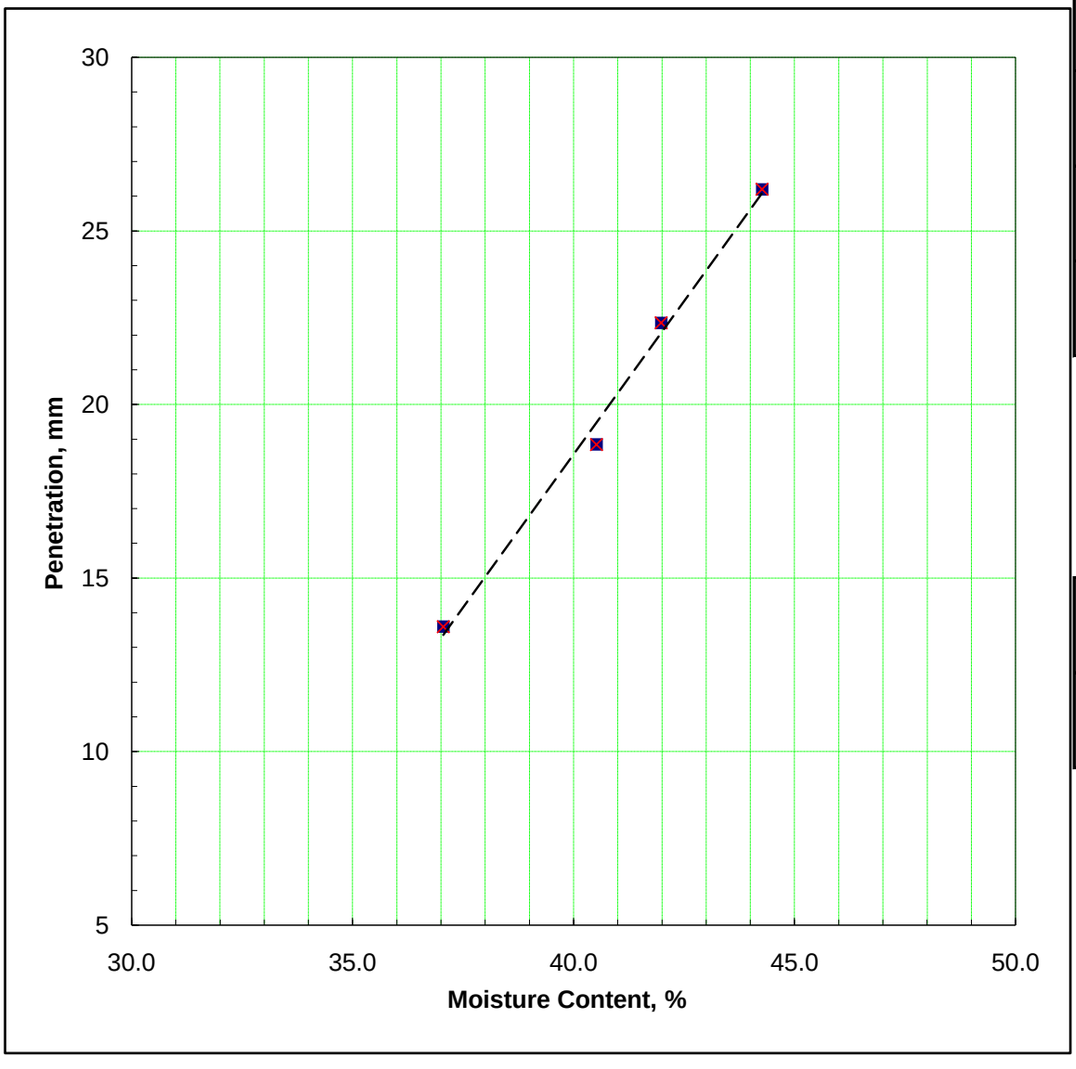
Liquidity Index ;
-0.232

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**RAVENSCAR 2**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	13.60	18.60	22.20	26.40		
(or other M.C. test if stated)	13.60	19.10	22.50	26.00		
	13.6	**18.85**	**22.35**	**26.2**		
CONTAINER	29	30	31	32	XV	XVI
WT. OF WET SOIL + CONTAINER, g	28.34	31.17	31.72	31.65	32.51	27.98
WT. OF DRY SOIL + CONTAINER, g	24.09	25.87	26.14	25.82	26.82	23.55
WT. OF CONTAINER, g	12.62	12.79	12.85	12.65	5.51	4.54
WT. OF MOISTURE, g	4.25	5.30	5.58	5.83	5.69	4.43
WT. OF DRY SOIL, g	11.47	13.08	13.29	13.17	21.31	19.01
MOISTURE CONTENT, %	**37.1**	**40.5**	**42.0**	**44.3**	26.7	23.3



Liquid Limit, % ;
41

* Plastic Limit, % ;
25

Plasticity Index, % ;
16

Linear Shrinkage, % ;
9

At M.C., % ;
40.5

Trough No. ;
H

Length Dry ;
127.7

* Some Cracks before
3 mm

Nat Moisture Content ;
19.9

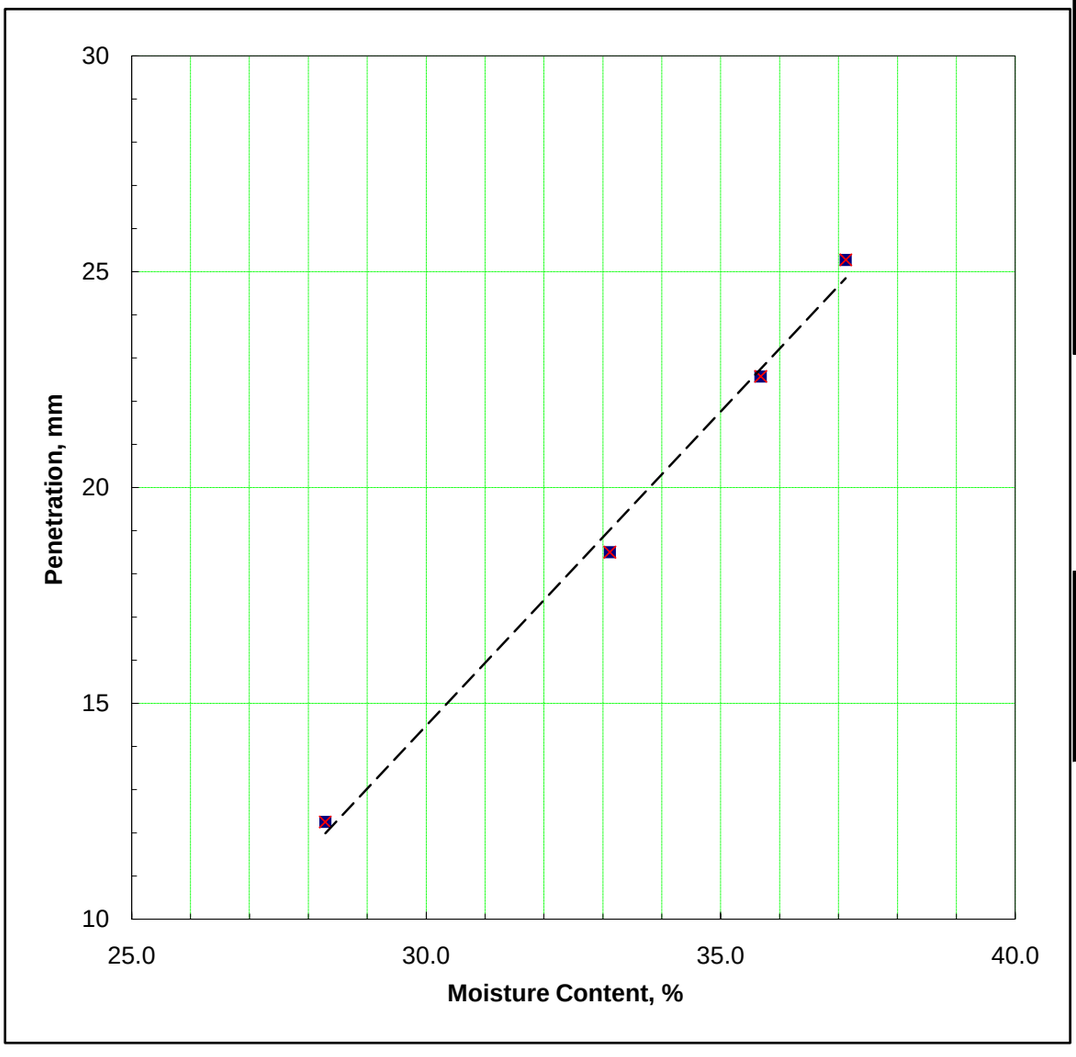
Liquidity Index ;
-0.319

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**ROBIN HOODS BAY**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	12.05	18.45	22.80	25.50		
(or other M.C. test if stated)	12.45	18.55	22.35	25.05		
	12.25	**18.5**	**22.58**	**25.28**		
CONTAINER	**13**	**14**	**15**	**16**	**VII**	**VIII**
WT. OF WET SOIL + CONTAINER, g	35.52	35.23	31.42	37.04	19.53	16.00
WT. OF DRY SOIL + CONTAINER, g	30.49	29.59	26.45	30.44	17.70	14.53
WT. OF CONTAINER, g	12.71	12.56	12.52	12.66	5.46	4.98
WT. OF MOISTURE, g	5.03	5.64	4.97	6.60	1.83	1.47
WT. OF DRY SOIL, g	17.78	17.03	13.93	17.78	12.24	9.55
MOISTURE CONTENT, %	**28.3**	**33.1**	**35.7**	**37.1**	15.0	15.4



Liquid Limit, % ;
34

* Plastic Limit, % ;
15

Plasticity Index, % ;
19

Linear Shrinkage, % ;
10

At M.C., % ;
35.7

Trough No. ;
A

Length Dry ;
126.1

* Some Cracks before
3 mm

Nat Moisture Content ;
16.4

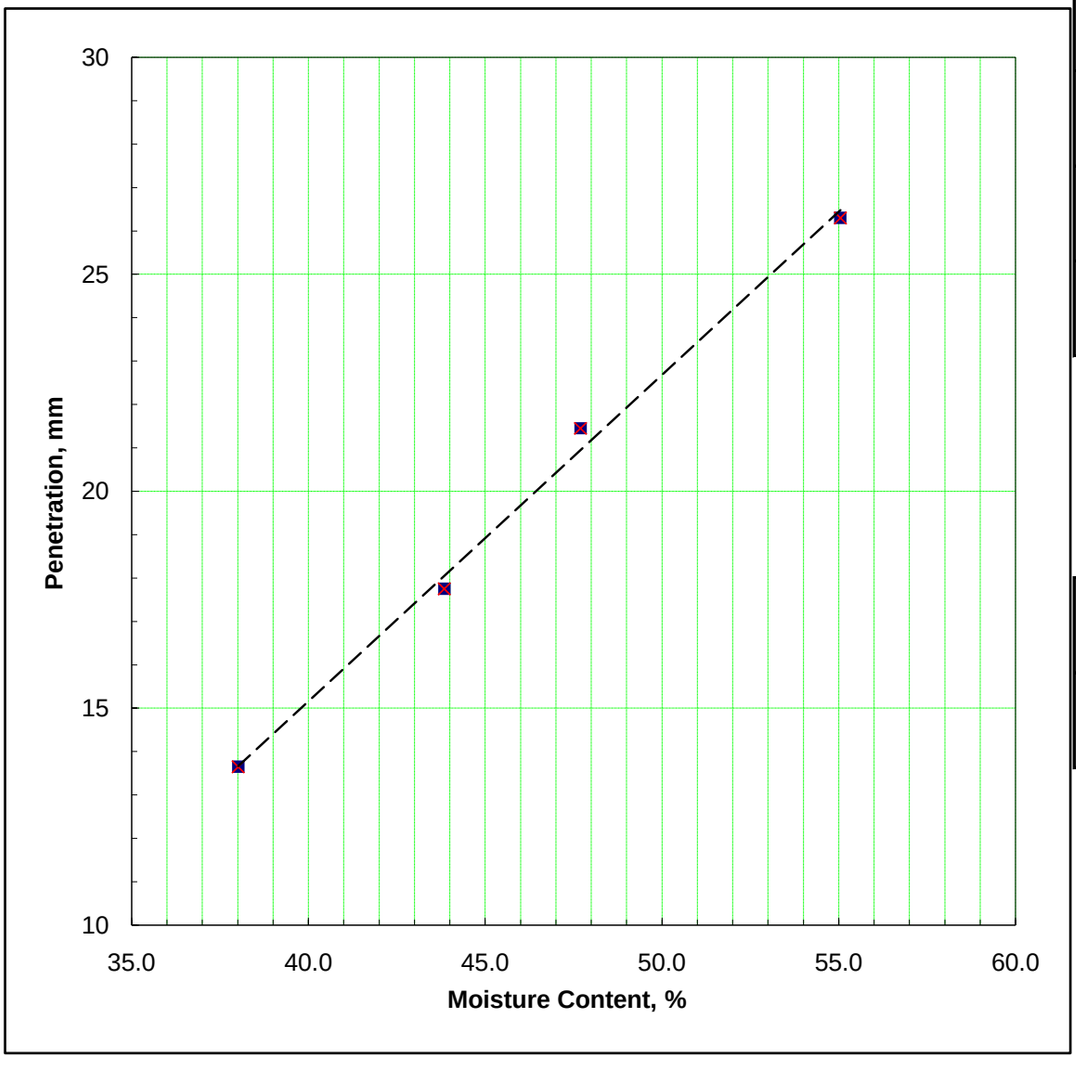
Liquidity Index ;
0.065

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**ROBIN WOOD HILL (DF)**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	13.90	17.85	21.40	26.50		
(or other M.C. test if stated)	13.40	17.65	21.50	26.10		
	13.65	**17.75**	**21.45**	**26.3**		
CONTAINER	17	18	19	20	XII	XIII
WT. OF WET SOIL + CONTAINER, g	25.64	29.54	32.53	31.94	20.55	15.39
WT. OF DRY SOIL + CONTAINER, g	22.04	24.41	26.21	25.07	17.55	13.27
WT. OF CONTAINER, g	12.57	12.71	12.96	12.59	5.54	4.62
WT. OF MOISTURE, g	3.60	5.13	6.32	6.87	3.00	2.12
WT. OF DRY SOIL, g	9.47	11.70	13.25	12.48	12.01	8.65
MOISTURE CONTENT, %	**38.0**	**43.8**	**47.7**	**55.0**	25.0	24.5



Liquid Limit, % ;
46

* Plastic Limit, % ;
25

Plasticity Index, % ;
21

Linear Shrinkage, % ;
12

At M.C., % ;
47.7

Trough No. ;
H

Length Dry ;
122.9

* Some Cracks before
3 mm

Nat Moisture Content ;
22.9

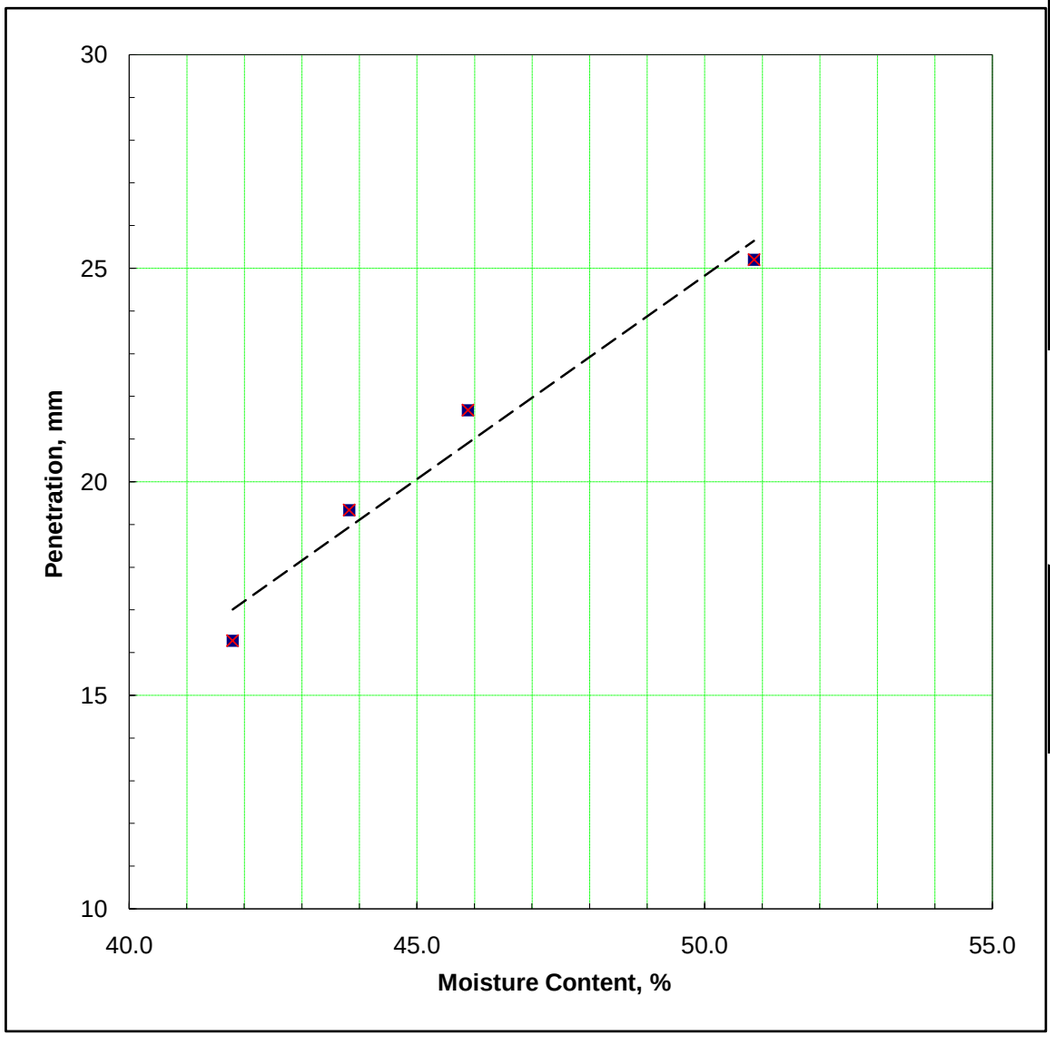
Liquidity Index ;
-0.087

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**ROBIN WOOD HILL - MRF**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	16.35	19.55	21.55	25.35		
(or other M.C. test if stated)	16.20	19.12	21.80	25.05		
	16.28	**19.34**	**21.68**	**25.2**		
CONTAINER	1	2	3	4		
WT. OF WET SOIL + CONTAINER, g	30.83	37.76	32.47	39.86	19.00	20.11
WT. OF DRY SOIL + CONTAINER, g	25.48	30.10	26.28	30.68	16.18	17.16
WT. OF CONTAINER, g	12.68	12.62	12.79	12.63	5.22	5.48
WT. OF MOISTURE, g	5.35	7.66	6.19	9.18	2.82	2.95
WT. OF DRY SOIL, g	12.80	17.48	13.49	18.05	10.96	11.68
MOISTURE CONTENT, %	**41.8**	**43.8**	**45.9**	**50.9**	25.7	25.3



Liquid Limit, % ;
45

* Plastic Limit, % ;
25

Plasticity Index, % ;
20

Linear Shrinkage, % ;
8

At M.C., % ;
45.9

Trough No. ;
C

Length Dry ;
128.5

* Some Cracks before
3 mm

Nat Moisture Content ;
19.3

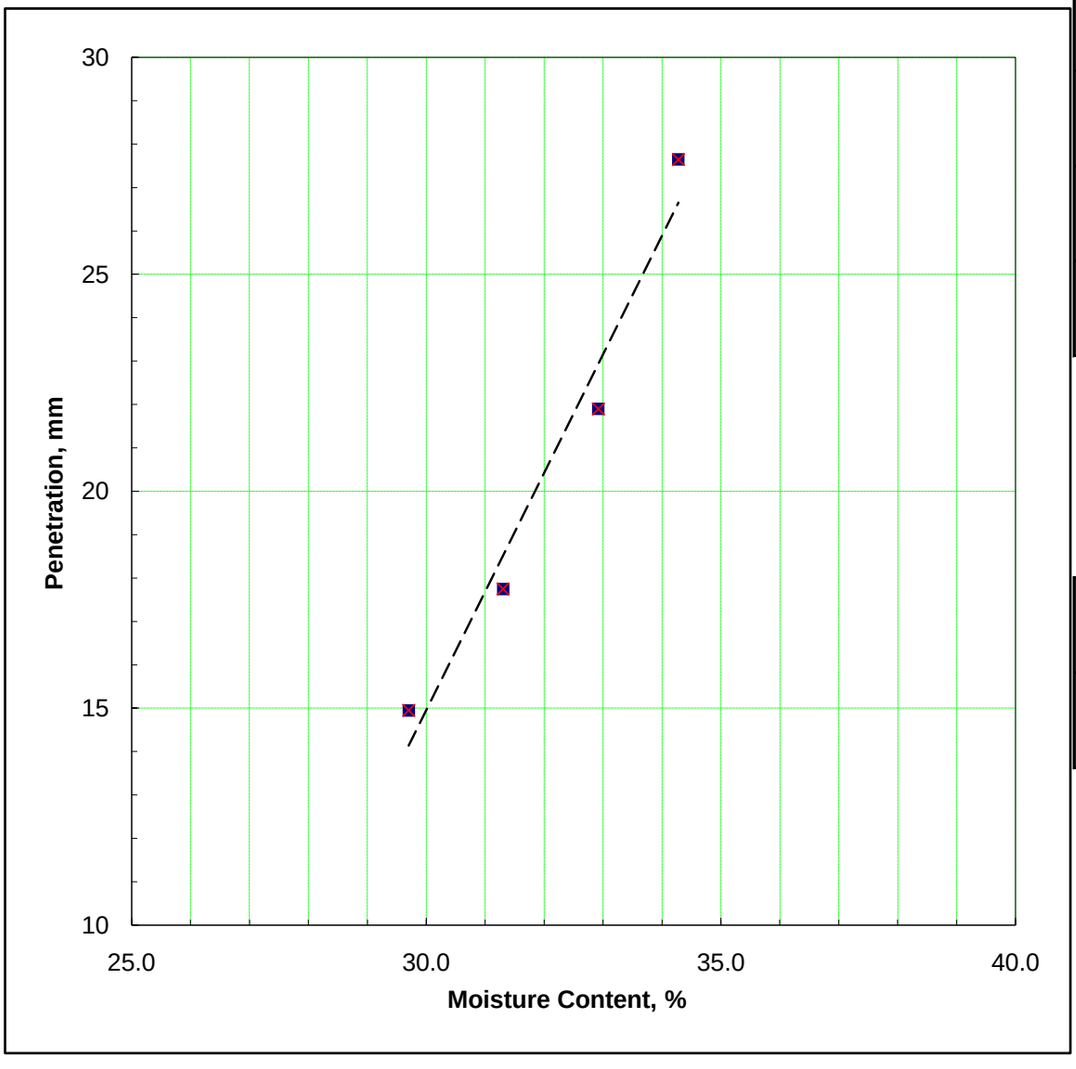
Liquidity Index ;
-0.318

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**RUNSWICK**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	14.90	17.50	21.70	27.60		
(or other M.C. test if stated)	15.00	18.00	22.10	27.70		
	14.95	**17.75**	**21.9**	**27.65**		
CONTAINER	25	26	27	28	XIII	XIV
WT. OF WET SOIL + CONTAINER, g	21.98	29.00	30.90	27.83	26.72	23.01
WT. OF DRY SOIL + CONTAINER, g	19.88	25.14	26.38	23.96	23.33	20.27
WT. OF CONTAINER, g	12.81	12.81	12.65	12.67	4.62	4.65
WT. OF MOISTURE, g	2.10	3.86	4.52	3.87	3.39	2.74
WT. OF DRY SOIL, g	7.07	12.33	13.73	11.29	18.71	15.62
MOISTURE CONTENT, %	**29.7**	**31.3**	**32.9**	**34.3**	18.1	17.5



Liquid Limit, % ;
32

* Plastic Limit, % ;
18

Plasticity Index, % ;
14

Linear Shrinkage, % ;
8

At M.C., % ;
32.9

Trough No. ;
H

Length Dry ;
128.3

* Some Cracks before
3 mm

Nat Moisture Content ;
4.4

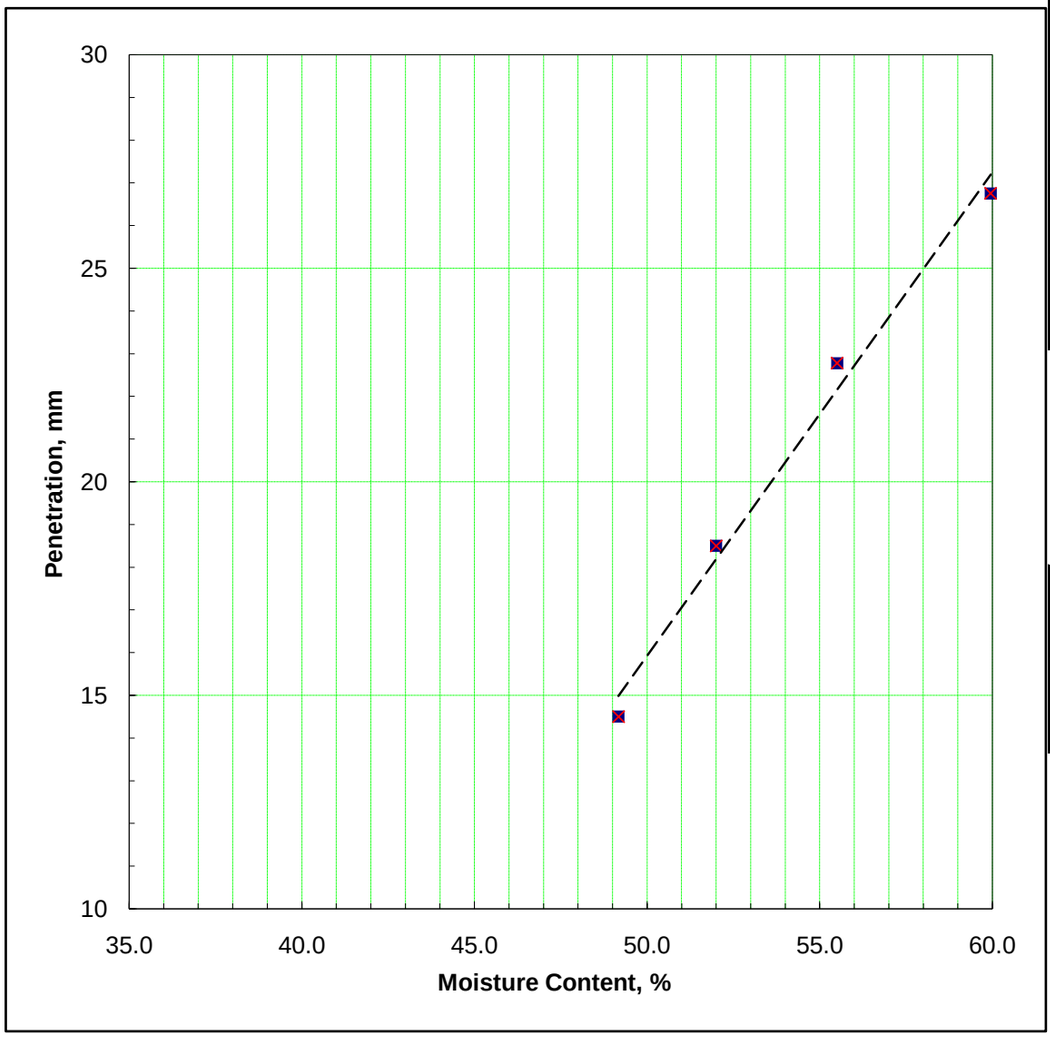
Liquidity Index ;
-0.948

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	K Freeborough
SAMPLE NO. :		DATE :	May-04
SITE :	**SEATOWN (EC)**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	14.45	18.80	22.90	26.55		
(or other M.C. test if stated)	14.55	18.20	22.65	26.95		
	14.5	**18.5**	**22.78**	**26.75**		
CONTAINER	**5**	**6**	**7**	**8**	**III**	**IV**
WT. OF WET SOIL + CONTAINER, g	34.40	32.01	31.49	39.54	23.71	18.62
WT. OF DRY SOIL + CONTAINER, g	27.26	25.39	24.89	29.48	20.17	15.97
WT. OF CONTAINER, g	12.74	12.66	13.00	12.70	4.54	4.66
WT. OF MOISTURE, g	7.14	6.62	6.60	10.06	3.54	2.65
WT. OF DRY SOIL, g	14.52	12.73	11.89	16.78	15.63	11.31
MOISTURE CONTENT, %	**49.2**	**52.0**	**55.5**	**60.0**	22.6	23.4



Liquid Limit, % ;
54

* Plastic Limit, % ;
23

Plasticity Index, % ;
31

Linear Shrinkage, % ;
12

At M.C., % ;
55.5

Trough No. ;
B

Length Dry ;
122.8

* Some Cracks before
3 mm

Nat Moisture Content ;
11.6

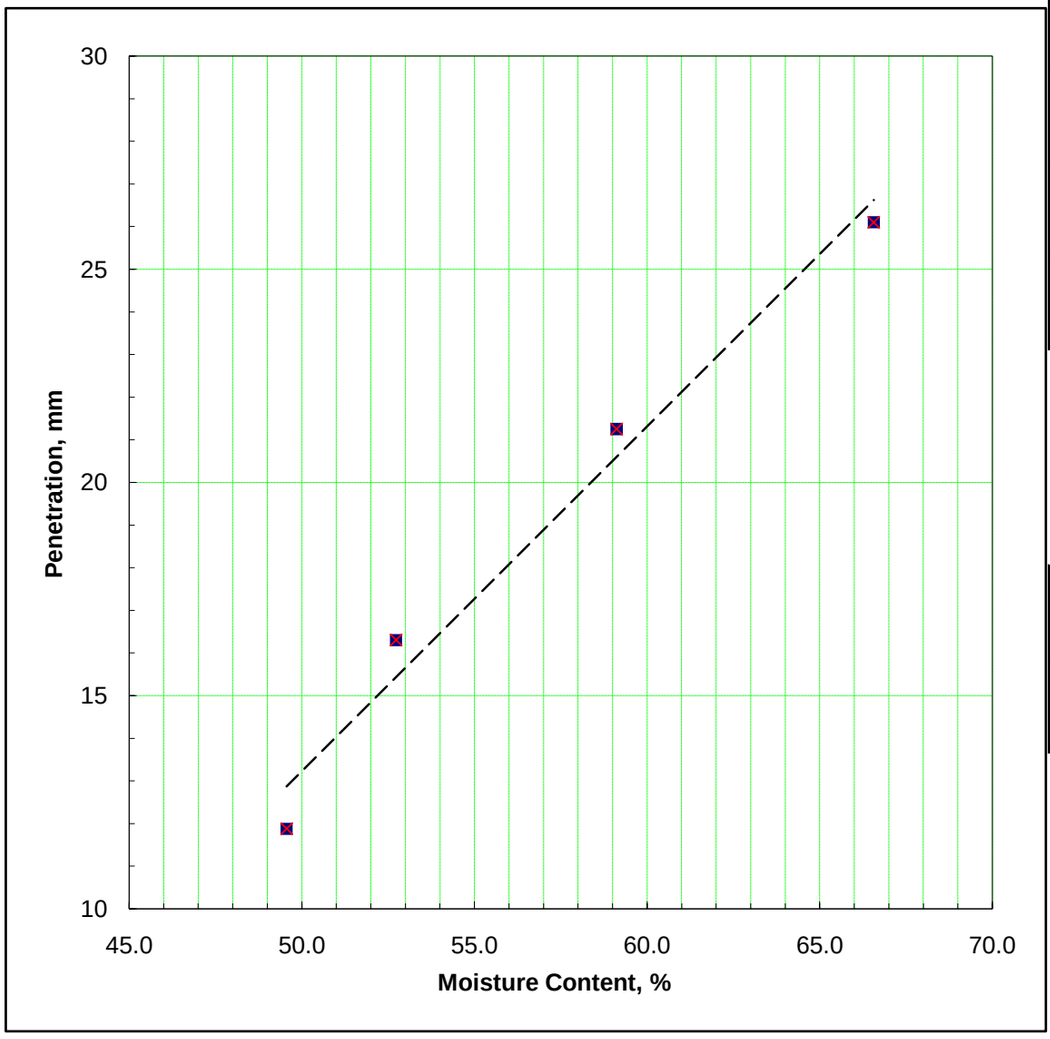
Liquidity Index ;
-0.369

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**SEATOWN (GAB)**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	12.05	16.40	21.50	25.95		
(or other M.C. test if stated)	11.70	16.20	21.00	26.25		
	11.88	**16.3**	**21.25**	**26.1**		
CONTAINER	**20**	**19**	**18**	**17**	**IX**	**X**
WT. OF WET SOIL + CONTAINER, g	27.89	31.44	29.64	34.14	17.49	15.06
WT. OF DRY SOIL + CONTAINER, g	22.82	25.06	23.35	25.52	14.92	13.10
WT. OF CONTAINER, g	12.59	12.96	12.71	12.57	4.76	4.71
WT. OF MOISTURE, g	5.07	6.38	6.29	8.62	2.57	1.96
WT. OF DRY SOIL, g	10.23	12.10	10.64	12.95	10.16	8.39
MOISTURE CONTENT, %	**49.6**	**52.7**	**59.1**	**66.6**	25.3	23.4



Liquid Limit, % ;
58

* Plastic Limit, % ;
24

Plasticity Index, % ;
34

Linear Shrinkage, % ;
12

At M.C., % ;
59.1

Trough No. ;
E

Length Dry ;
122.8

* Some Cracks before
3 mm

Nat Moisture Content ;
20.8

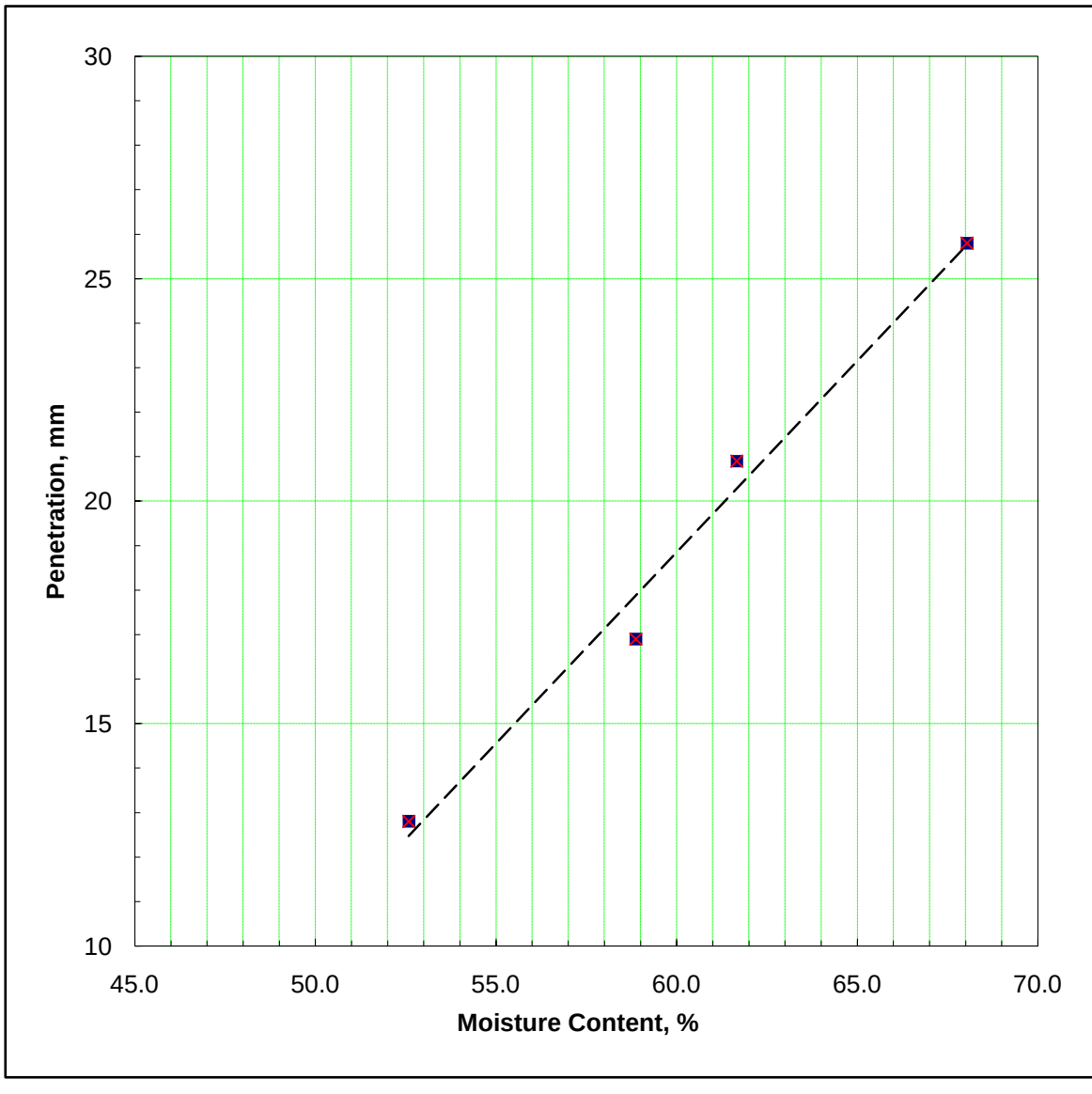
Liquidity Index ;
-0.105

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**SIDEGATE LANE**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	2	3	4	I	II
PENETRATION, mm	12.60	17.00	21.00	25.60		
(or other M.C. test if stated)	13.00	16.80	20.80	26.00		
	12.8	16.9	20.9	25.8		
CONTAINER	17	18	19	20	IX	X
WT. OF WET SOIL + CONTAINER, g	24.96	34.92	32.36	36.67	24.46	21.40
WT. OF DRY SOIL + CONTAINER, g	20.69	26.69	24.96	26.92	20.35	17.89
WT. OF CONTAINER, g	12.57	12.71	12.96	12.59	4.76	4.71
WT. OF MOISTURE, g	4.27	8.23	7.40	9.75	4.11	3.51
WT. OF DRY SOIL, g	8.12	13.98	12.00	14.33	15.59	13.18
MOISTURE CONTENT, %	52.6	58.9	61.7	68.0	26.4	26.6



Liquid Limit, % ;
61

* Plastic Limit, % ;
26

Plasticity Index, % ;
35

Linear Shrinkage, % ;
14

At M.C., % ;
58.9

Trough No. ;
E

Length Dry ;
120.0

* Some Cracks before
3 mm

Nat Moisture Content ;
16.9

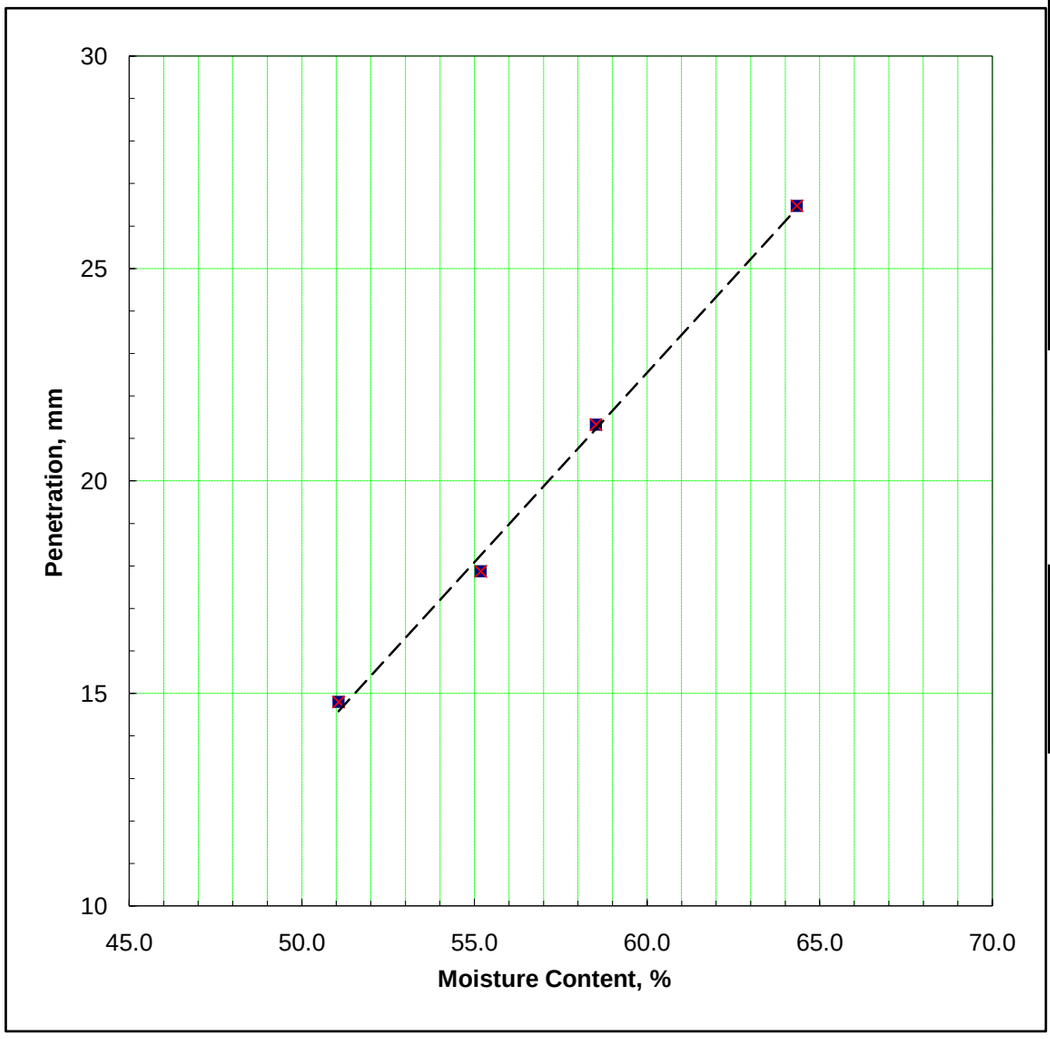
Liquidity Index ;
-0.27816

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**SOUTHAM**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	14.80	17.70	21.40	26.30		
(or other M.C. test if stated)	14.80	18.05	21.25	26.65		
	14.8	**17.88**	**21.33**	**26.48**		
CONTAINER	**17**	**18**	**19**	**20**	**IX**	**X**
WT. OF WET SOIL + CONTAINER, g	23.22	26.04	23.47	26.92	9.68	11.23
WT. OF DRY SOIL + CONTAINER, g	19.62	21.30	19.59	21.31	8.82	10.05
WT. OF CONTAINER, g	12.57	12.71	12.96	12.59	4.76	4.71
WT. OF MOISTURE, g	3.60	4.74	3.88	5.61	0.86	1.18
WT. OF DRY SOIL, g	7.05	8.59	6.63	8.72	4.06	5.34
MOISTURE CONTENT, %	**51.1**	**55.2**	**58.5**	**64.3**	21.2	22.1



Liquid Limit, % ;
57

* Plastic Limit, % ;
22

Plasticity Index, % ;
35

Linear Shrinkage, % ;
10

At M.C., % ;
58.5

Trough No. ;
C

Length Dry ;
126.0

* Some Cracks before
3 mm

Nat Moisture Content ;
14.7

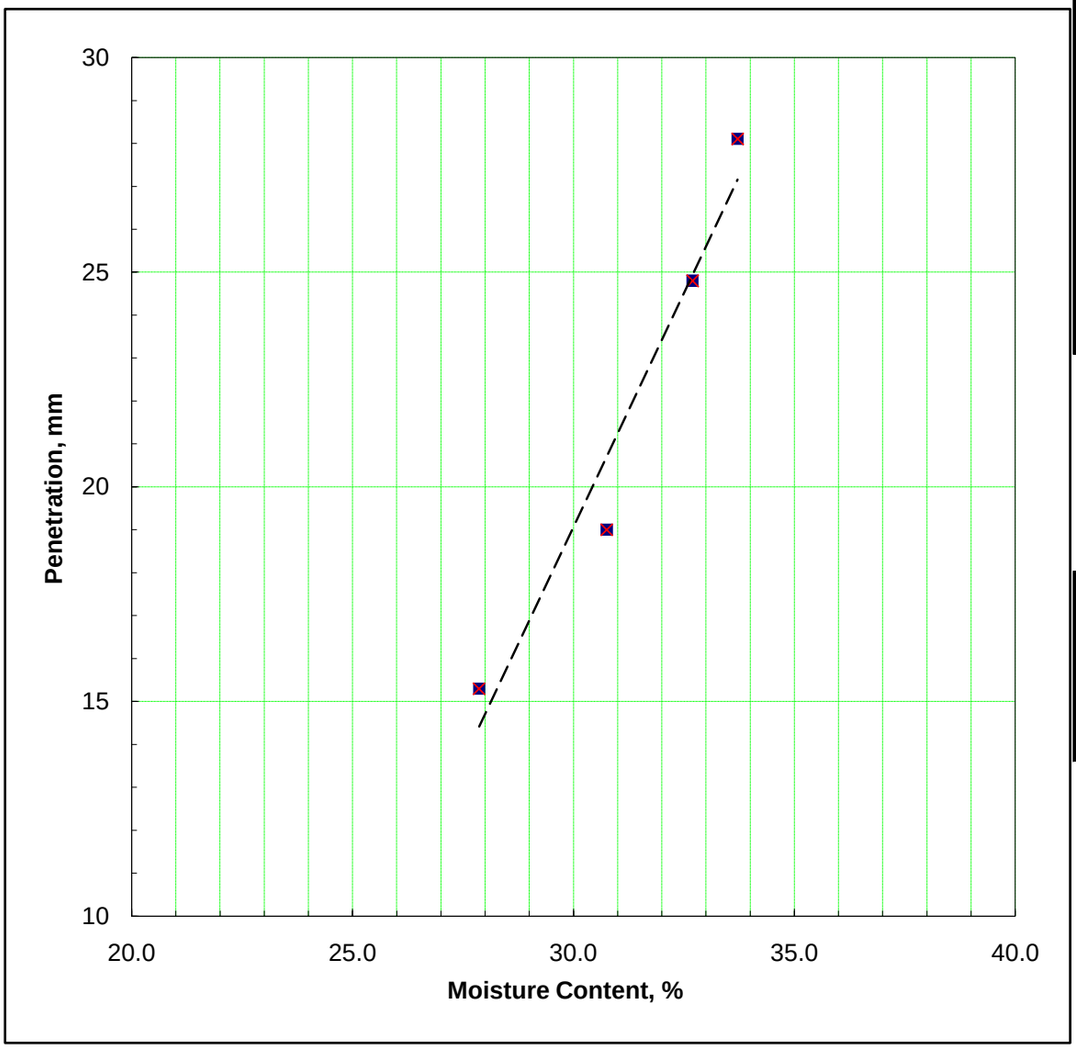
Liquidity Index ;
-0.196

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**STATION**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	15.50	19.00	24.60	28.00		
(or other M.C. test if stated)	15.10	19.00	25.00	28.20		
	15.3	**19**	**24.8**	**28.1**		
CONTAINER	29	30	31	32	XV	XVI
WT. OF WET SOIL + CONTAINER, g	24.55	25.12	26.77	27.80	20.34	16.02
WT. OF DRY SOIL + CONTAINER, g	21.95	22.22	23.34	23.98	17.87	14.06
WT. OF CONTAINER, g	12.62	12.79	12.85	12.65	5.52	4.50
WT. OF MOISTURE, g	2.60	2.90	3.43	3.82	2.47	1.96
WT. OF DRY SOIL, g	9.33	9.43	10.49	11.33	12.35	9.56
MOISTURE CONTENT, %	**27.9**	**30.8**	**32.7**	**33.7**	20.0	20.5



Liquid Limit, % ;
30

* Plastic Limit, % ;
20

Plasticity Index, % ;
10

Linear Shrinkage, % ;
6

At M.C., % ;
30.8

Trough No. ;
E

Length Dry ;
131.4

* Some Cracks before
3 mm

Nat Moisture Content ;
16.3

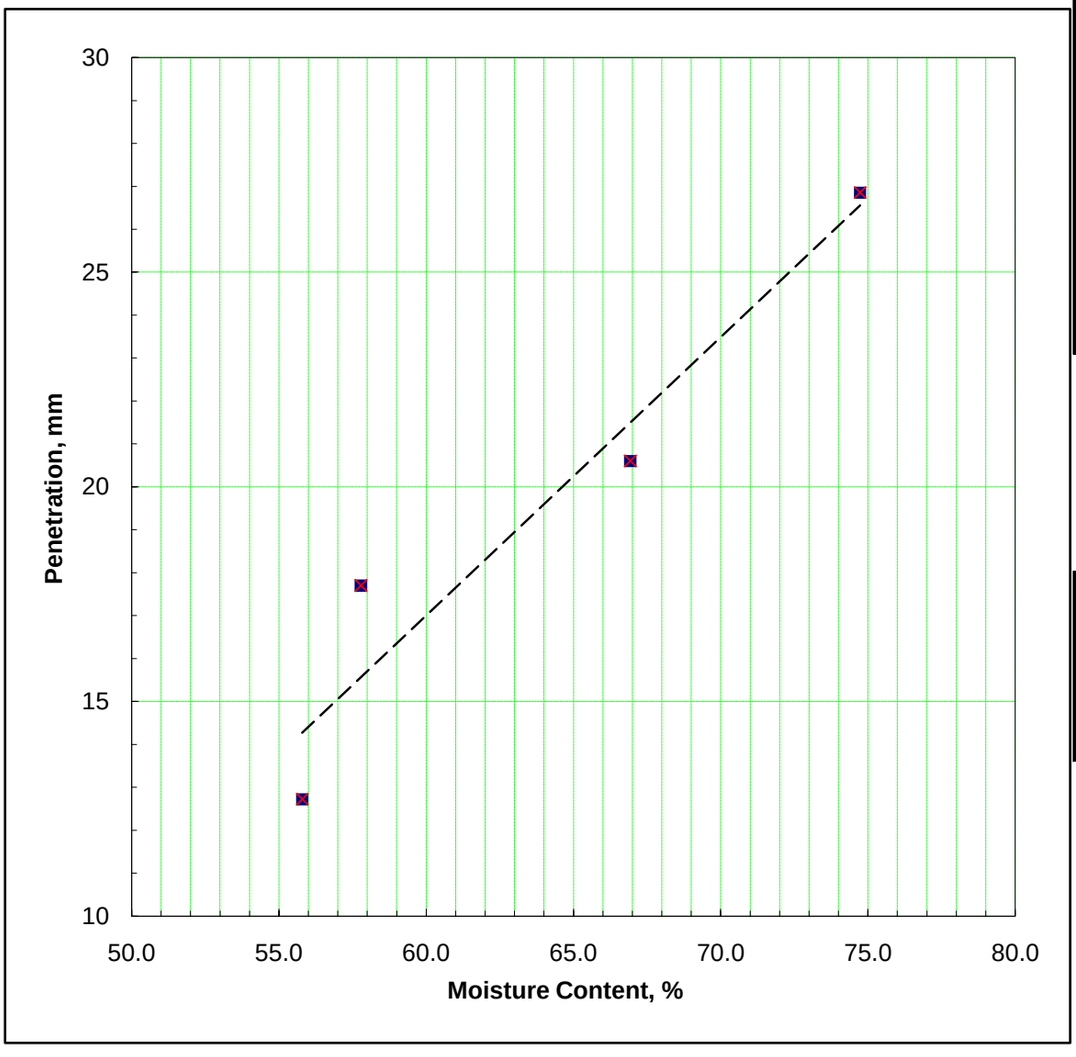
Liquidity Index ;
-0.41

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

JOB :	E1320S83	OPERATOR :	S Doran
SAMPLE NO. :		DATE :	Jun-04
SITE :	**STOWEY**	DESCRIPTION OF SAMPLE :	Lias Formation
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm	12.50	17.50	20.70	26.70		
(or other M.C. test if stated)	12.95	17.90	20.50	27.00		
	12.73	**17.7**	**20.6**	**26.85**		
CONTAINER	**29**	**30**	**31**	**32**	**XV**	**XVI**
WT. OF WET SOIL + CONTAINER, g	27.67	29.31	27.54	30.49	21.68	23.26
WT. OF DRY SOIL + CONTAINER, g	22.28	23.26	21.65	22.86	18.13	19.04
WT. OF CONTAINER, g	12.62	12.79	12.85	12.65	5.52	4.50
WT. OF MOISTURE, g	5.39	6.05	5.89	7.63	3.55	4.22
WT. OF DRY SOIL, g	9.66	10.47	8.80	10.21	12.61	14.54
MOISTURE CONTENT, %	**55.8**	**57.8**	**66.9**	**74.7**	28.2	29.0



Liquid Limit, % ;
65

* Plastic Limit, % ;
29

Plasticity Index, % ;
36

Linear Shrinkage, % ;
16

At M.C., % ;
66.9

Trough No. ;
E

Length Dry ;
117.3

* Some Cracks before
3 mm

Nat Moisture Content ;
27.5

Liquidity Index ;
-0.03

Determination of Liquid Limits, Plastic Limits, and Linear Shrinkage of a Soil.

ENGINEERING GEOLOGY
& GEOPHYSICS GROUP

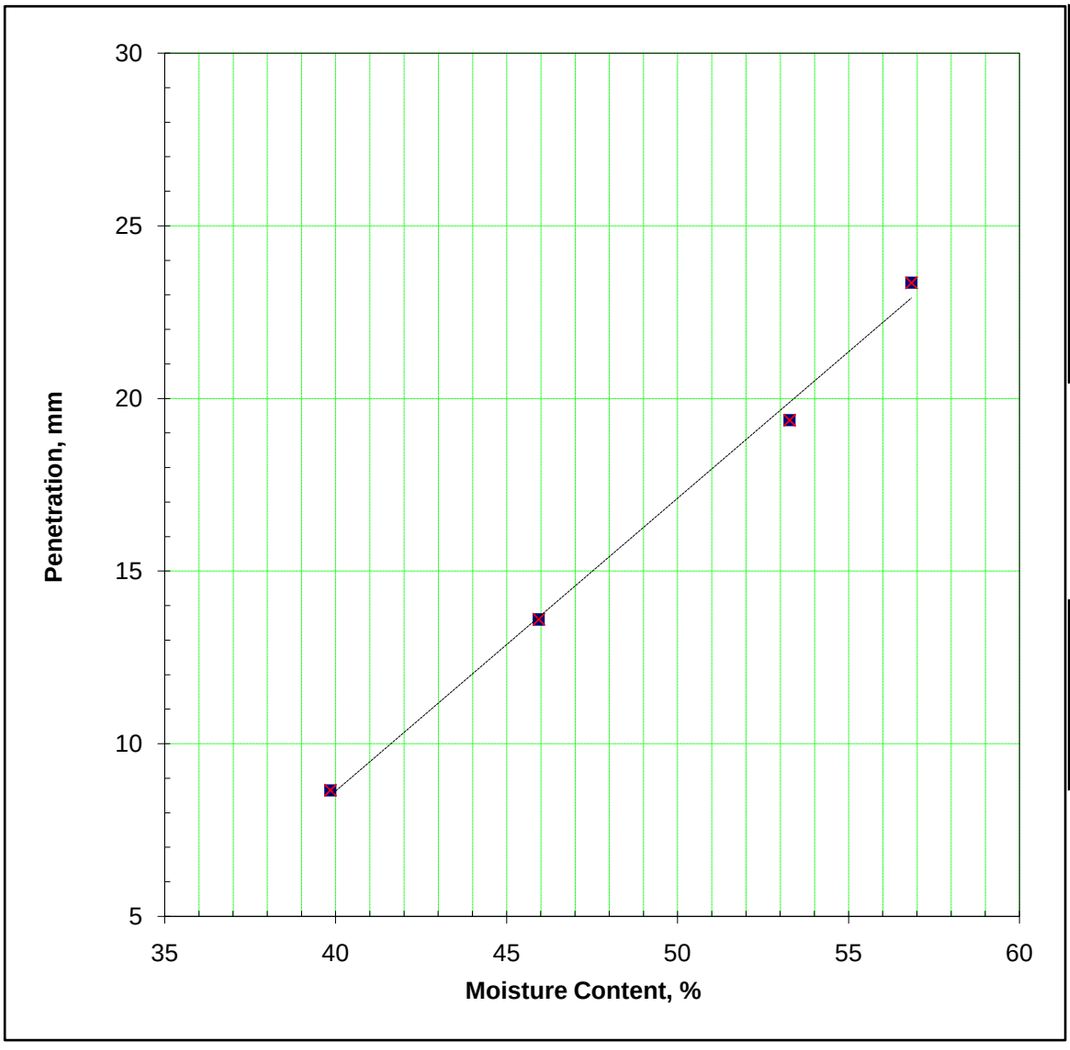
JOB :	E1320S83	OPERATOR :	L.M.Nelder
SAMPLE NO. :		DATE :	
SITE :	**WHISBY**	DESCRIPTION OF SAMPLE :	
TEST DETAILS :	B. S. Test		

	Liquid Limits				Plastic Limits	
	1	**2**	**3**	**4**	**I**	**II**
PENETRATION, mm (or other M.C. test if stated)	8.65	13.60	19.37	23.35		
WT. OF WET SOIL + CONTAINER, g	65.07	52.21	64.37	60.53	28.53	26.42
WT. OF DRY SOIL + CONTAINER, g	50.14	39.83	46.38	43.19	25.57	23.94
WT. OF CONTAINER, g	12.67	12.88	12.61	12.68	12.78	12.80
WT. OF MOISTURE, g	14.93	12.38	17.99	17.34	2.96	2.48
WT. OF DRY SOIL, g	37.47	26.95	33.77	30.51	12.79	11.14
MOISTURE CONTENT, %	**39.8**	**45.9**	**53.3**	**56.8**	23.1	22.3

Liquid Limit, % ;
53.4

* Plastic Limit, % ;
23

Plasticity Index, % ;
31



Linear Shrinkage, % ;
12

At M.C., % ;
53.3

Trough No. ;
I

Length Dry ;
122.9

* Some Cracks before
3 mm

Nat Moisture Content ;
19.7

Liquidity Index ;
-0.098

Appendix 2 - Density Test Data

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Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Blockley 2	
Pyknometer Number			1378	2052
Mass of Bottle+Soil+Water	m3	g	84.876	84.371
Mass of Bottle + Soil	m2	g	38.014	37.335
Mass of Bottle full of Water	m4	g	80.417	79.735
Mass of Bottle	m1	g	30.926	29.979
Mass of Soil	m2-m1	g	7.088	7.356
Mass of Water in full Bottle	m4-m1	g	49.491	49.756
Mass of Water used	m3-m2	g	46.862	47.036
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.629	2.720
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.696	2.704
Average Value, Þs		Mg/m3	2.70	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Black Ven Marls	
Pyknometer Number			483	376
Mass of Bottle+Soil+Water	m3	g	82.360	83.549
Mass of Bottle + Soil	m2	g	35.300	36.444
Mass of Bottle full of Water	m4	g	77.879	79.022
Mass of Bottle	m1	g	28.073	29.177
Mass of Soil	m2-m1	g	7.227	7.267
Mass of Water in full Bottle	m4-m1	g	49.806	49.845
Mass of Water used	m3-m2	g	47.060	47.105
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.746	2.740
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.632	2.652
Average Value, Þs		Mg/m3	2.64	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Southam	
Pyknometer Number			179	122
Mass of Bottle+Soil+Water	m3	g	83.774	89.833
Mass of Bottle + Soil	m2	g	35.637	42.953
Mass of Bottle full of Water	m4	g	79.203	85.180
Mass of Bottle	m1	g	28.474	35.682
Mass of Soil	m2-m1	g	7.163	7.271
Mass of Water in full Bottle	m4-m1	g	50.729	49.498
Mass of Water used	m3-m2	g	48.137	46.880
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.592	2.618
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.764	2.777
Average Value, Þs		Mg/m3	2.77	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Bishops Cleeve -2	
Pyknometer Number			41	478
Mass of Bottle+Soil+Water	m3	g	88.573	82.320
Mass of Bottle + Soil	m2	g	41.177	35.201
Mass of Bottle full of Water	m4	g	84.108	77.690
Mass of Bottle	m1	g	34.137	27.861
Mass of Soil	m2-m1	g	7.040	7.340
Mass of Water in full Bottle	m4-m1	g	49.971	49.829
Mass of Water used	m3-m2	g	47.396	47.119
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.575	2.710
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.734	2.708
Average Value, Þs		Mg/m3	2.72	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Ravenscar -2	
Pyknometer Number			34	160
Mass of Bottle+Soil+Water	m3	g	89.996	87.171
Mass of Bottle + Soil	m2	g	43.055	38.107
Mass of Bottle full of Water	m4	g	85.516	82.605
Mass of Bottle	m1	g	35.934	30.828
Mass of Soil	m2-m1	g	7.121	7.279
Mass of Water in full Bottle	m4-m1	g	49.582	51.777
Mass of Water used	m3-m2	g	46.941	49.064
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.641	2.713
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.696	2.683
Average Value, Þs		Mg/m3	2.69	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Barnstone	
Pyknometer Number			483	41
Mass of Bottle+Soil+Water	m3	g	82.613	88.545
Mass of Bottle + Soil	m2	g	35.689	41.254
Mass of Bottle full of Water	m4	g	77.879	84.108
Mass of Bottle	m1	g	28.073	34.137
Mass of Soil	m2-m1	g	7.616	7.117
Mass of Water in full Bottle	m4-m1	g	49.806	49.971
Mass of Water used	m3-m2	g	46.924	47.291
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.882	2.680
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.643	2.656
Average Value, Þs		Mg/m3	2.65	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Aberthaw	
Pyknometer Number			179	478
Mass of Bottle+Soil+Water	m3	g	83.901	82.129
Mass of Bottle + Soil	m2	g	35.888	34.913
Mass of Bottle full of Water	m4	g	79.203	77.690
Mass of Bottle	m1	g	28.474	27.861
Mass of Soil	m2-m1	g	7.414	7.052
Mass of Water in full Bottle	m4-m1	g	50.729	49.829
Mass of Water used	m3-m2	g	48.013	47.216
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.716	2.613
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.730	2.699
Average Value, Þs		Mg/m3	2.71	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Station	
Pyknometer Number			160	483
Mass of Bottle+Soil+Water	m3	g	87.285	82.289
Mass of Bottle + Soil	m2	g	38.318	35.167
Mass of Bottle full of Water	m4	g	82.605	77.879
Mass of Bottle	m1	g	30.828	28.073
Mass of Soil	m2-m1	g	7.490	7.094
Mass of Water in full Bottle	m4-m1	g	51.777	49.806
Mass of Water used	m3-m2	g	48.967	47.122
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.810	2.684
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.665	2.643
Average Value, Þs		Mg/m3	2.65	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Robins Wood (MRF)	
Pyknometer Number			34	122
Mass of Bottle+Soil+Water	m3	g	90.139	89.687
Mass of Bottle + Soil	m2	g	43.243	42.788
Mass of Bottle full of Water	m4	g	85.516	85.180
Mass of Bottle	m1	g	35.934	35.682
Mass of Soil	m2-m1	g	7.309	7.106
Mass of Water in full Bottle	m4-m1	g	49.582	49.498
Mass of Water used	m3-m2	g	46.896	46.899
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.686	2.599
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.721	2.734
Average Value, Þs		Mg/m3	2.73	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Kettleness	
Pyknometer Number			1378	359
Mass of Bottle+Soil+Water	m3	g	84.829	83.605
Mass of Bottle + Soil	m2	g	38.057	36.497
Mass of Bottle full of Water	m4	g	80.417	79.111
Mass of Bottle	m1	g	30.926	29.271
Mass of Soil	m2-m1	g	7.131	7.226
Mass of Water in full Bottle	m4-m1	g	49.491	49.840
Mass of Water used	m3-m2	g	46.772	47.108
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.719	2.732
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.623	2.645
Average Value, Þs		Mg/m3	2.63	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Robins Wood (DF)	
Pyknometer Number			2129	359
Mass of Bottle+Soil+Water	m3	g	84.722	83.921
Mass of Bottle + Soil	m2	g	37.480	36.914
Mass of Bottle full of Water	m4	g	79.999	79.111
Mass of Bottle	m1	g	29.993	29.271
Mass of Soil	m2-m1	g	7.487	7.643
Mass of Water in full Bottle	m4-m1	g	50.006	49.840
Mass of Water used	m3-m2	g	47.242	47.007
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.764	2.833
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.709	2.698
Average Value, Þs		Mg/m3	2.70	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Robin Hoods Bay	
Pyknometer Number			1378	2052
Mass of Bottle+Soil+Water	m3	g	84.845	84.151
Mass of Bottle + Soil	m2	g	38.025	37.050
Mass of Bottle full of Water	m4	g	80.417	79.735
Mass of Bottle	m1	g	30.926	29.979
Mass of Soil	m2-m1	g	7.099	7.071
Mass of Water in full Bottle	m4-m1	g	49.491	49.756
Mass of Water used	m3-m2	g	46.820	47.101
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.671	2.655
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.658	2.663
Average Value, Þs		Mg/m3	2.66	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Sidegate Lane 1	
Pyknometer Number			34	41
Mass of Bottle+Soil+Water	m3	g	90.650	88.814
Mass of Bottle + Soil	m2	g	43.887	41.406
Mass of Bottle full of Water	m4	g	85.516	84.108
Mass of Bottle	m1	g	35.934	34.137
Mass of Soil	m2-m1	g	7.953	7.269
Mass of Water in full Bottle	m4-m1	g	49.582	49.971
Mass of Water used	m3-m2	g	46.763	47.408
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.819	2.563
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.821	2.836
Average Value, Þs		Mg/m3	2.83	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Runswick Bay	
Pyknometer Number			179	2398
Mass of Bottle+Soil+Water	m3	g	83.758	87.521
Mass of Bottle + Soil	m2	g	35.636	39.71
Mass of Bottle full of Water	m4	g	79.203	82.984
Mass of Bottle	m1	g	28.474	32.591
Mass of Soil	m2-m1	g	7.162	7.119
Mass of Water in full Bottle	m4-m1	g	50.729	50.393
Mass of Water used	m3-m2	g	48.122	47.811
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.607	2.582
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.747	2.757
Average Value, Þs		Mg/m3	2.75	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Lakeview	
Pyknometer Number			168	51
Mass of Bottle+Soil+Water	m3	g	84.498	91.641
Mass of Bottle + Soil	m2	g	38.092	45.654
Mass of Bottle full of Water	m4	g	79.414	86.266
Mass of Bottle	m1	g	30.115	37.206
Mass of Soil	m2-m1	g	7.977	8.448
Mass of Water in full Bottle	m4-m1	g	49.299	49.060
Mass of Water used	m3-m2	g	46.406	45.987
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.893	3.073
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.757	2.749
Average Value, Þs		Mg/m3	2.75	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Edgehill	
Pyknometer Number			2398	376
Mass of Bottle+Soil+Water	m3	g	88.059	84.204
Mass of Bottle + Soil	m2	g	39.921	36.676
Mass of Bottle full of Water	m4	g	82.984	79.022
Mass of Bottle	m1	g	32.591	29.177
Mass of Soil	m2-m1	g	7.330	7.499
Mass of Water in full Bottle	m4-m1	g	50.393	49.845
Mass of Water used	m3-m2	g	48.138	47.528
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.255	2.317
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	3.251	3.237
Average Value, Þs		Mg/m3	3.24	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Hornton	
Pyknometer Number			122	160
Mass of Bottle+Soil+Water	m3	g	90.225	87.648
Mass of Bottle + Soil	m2	g	42.817	37.982
Mass of Bottle full of Water	m4	g	85.180	82.605
Mass of Bottle	m1	g	35.682	30.828
Mass of Soil	m2-m1	g	7.135	7.154
Mass of Water in full Bottle	m4-m1	g	49.498	51.777
Mass of Water used	m3-m2	g	47.408	49.666
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.090	2.111
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	3.414	3.389
Average Value, Þs		Mg/m3	3.40	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Alkerton	
Pyknometer Number			34	179
Mass of Bottle+Soil+Water	m3	g	90.487	84.138
Mass of Bottle + Soil	m2	g	43.186	35.683
Mass of Bottle full of Water	m4	g	85.516	79.203
Mass of Bottle	m1	g	35.934	28.474
Mass of Soil	m2-m1	g	7.252	7.209
Mass of Water in full Bottle	m4-m1	g	49.582	50.729
Mass of Water used	m3-m2	g	47.301	48.455
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.281	2.274
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	3.179	3.170
Average Value, Þs		Mg/m3	3.17	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Flixborough -1	
Pyknometer Number			41	51
Mass of Bottle+Soil+Water	m3	g	88.792	91.070
Mass of Bottle + Soil	m2	g	41.342	44.630
Mass of Bottle full of Water	m4	g	84.108	86.266
Mass of Bottle	m1	g	34.137	37.206
Mass of Soil	m2-m1	g	7.205	7.424
Mass of Water in full Bottle	m4-m1	g	49.971	49.060
Mass of Water used	m3-m2	g	47.450	46.440
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.521	2.620
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.858	2.834
Average Value, Þs		Mg/m3	2.85	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Norton Bottoms	
Pyknometer Number			359	483
Mass of Bottle+Soil+Water	m3	g	83.790	82.497
Mass of Bottle + Soil	m2	g	36.529	35.227
Mass of Bottle full of Water	m4	g	79.111	77.879
Mass of Bottle	m1	g	29.271	28.073
Mass of Soil	m2-m1	g	7.258	7.154
Mass of Water in full Bottle	m4-m1	g	49.840	49.806
Mass of Water used	m3-m2	g	47.261	47.270
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.579	2.536
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.814	2.821
Average Value, Þs		Mg/m3	2.82	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Conesby 1	
Pyknometer Number			1378	376
Mass of Bottle+Soil+Water	m3	g	85.117	83.687
Mass of Bottle + Soil	m2	g	38.195	36.381
Mass of Bottle full of Water	m4	g	80.417	79.022
Mass of Bottle	m1	g	30.926	29.177
Mass of Soil	m2-m1	g	7.269	7.204
Mass of Water in full Bottle	m4-m1	g	49.491	49.845
Mass of Water used	m3-m2	g	46.922	47.306
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.569	2.539
Particle Density, Þs =	$\frac{m2-m1}{(m4-m1)-(m3-m2)}$	Mg/m3	2.830	2.837
Average Value, Þs		Mg/m3	2.83	

	Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Seatown - Green Ammonite Beds	
Pyknometer Number			168	478
Mass of Bottle+Soil+Water	m3	g	84.342	82.342
Mass of Bottle + Soil	m2	g	37.785	35.131
Mass of Bottle full of Water	m4	g	79.414	77.690
Mass of Bottle	m1	g	30.115	27.861
Mass of Soil	m2-m1	g	7.670	7.270
Mass of Water in full Bottle	m4-m1	g	49.299	49.829
Mass of Water used	m3-m2	g	46.557	47.211
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.742	2.618
Particle Density, Þs =	$\frac{m2-m1}{(m4-m1)-(m3-m2)}$	Mg/m3	2.797	2.777
Average Value, Þs		Mg/m3	2.79	

	Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Connesby	
Pyknometer Number			122	1378
Mass of Bottle+Soil+Water	m3	g	89.709	85.028
Mass of Bottle + Soil	m2	g	42.889	38.361
Mass of Bottle full of Water	m4	g	85.180	80.417
Mass of Bottle	m1	g	35.682	30.926
Mass of Soil	m2-m1	g	7.207	7.435
Mass of Water in full Bottle	m4-m1	g	49.498	49.491
Mass of Water used	m3-m2	g	46.820	46.667
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.678	2.824
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.691	2.633
Average Value, Þs		Mg/m3	2.66	
		Operator	Checked	Approved
		LN		

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Stowey	
Pyknometer Number			179	41
Mass of Bottle+Soil+Water	m3	g	83.770	88.638
Mass of Bottle + Soil	m2	g	35.733	41.359
Mass of Bottle full of Water	m4	g	79.203	84.108
Mass of Bottle	m1	g	28.474	34.137
Mass of Soil	m2-m1	g	7.259	7.222
Mass of Water in full Bottle	m4-m1	g	50.729	49.971
Mass of Water used	m3-m2	g	48.037	47.279
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.692	2.692
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.697	2.683
Average Value, Þs		Mg/m3	2.69	
		Operator	Checked	Approved
		LN		

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Whisby	
Pyknometer Number			359	2398
Mass of Bottle+Soil+Water	m3	g	83.612	87.611
Mass of Bottle + Soil	m2	g	36.513	40.027
Mass of Bottle full of Water	m4	g	79.111	82.984
Mass of Bottle	m1	g	29.271	32.591
Mass of Soil	m2-m1	g	7.242	7.436
Mass of Water in full Bottle	m4-m1	g	49.840	50.393
Mass of Water used	m3-m2	g	47.099	47.584
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.741	2.809
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.642	2.647
Average Value, Þs		Mg/m3	2.64	
		Operator	Checked	Approved
		LN		

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Bishops Cleeve - 1	
Pyknometer Number			2227	34
Mass of Bottle+Soil+Water	m3	g	84.235	89.975
Mass of Bottle + Soil	m2	g	37.196	43.008
Mass of Bottle full of Water	m4	g	79.731	85.516
Mass of Bottle	m1	g	29.975	35.934
Mass of Soil	m2-m1	g	7.221	7.074
Mass of Water in full Bottle	m4-m1	g	49.756	49.582
Mass of Water used	m3-m2	g	47.039	46.967
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.717	2.615
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.658	2.705
Average Value, Þs		Mg/m3	2.68	
		Operator	Checked	Approved
		LN		

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Dimmer 1	
Pyknometer Number			2052	2129
Mass of Bottle+Soil+Water	m3	g	84.115	84.425
Mass of Bottle + Soil	m2	g	37.023	37.114
Mass of Bottle full of Water	m4	g	79.735	79.999
Mass of Bottle	m1	g	29.979	29.993
Mass of Soil	m2-m1	g	7.044	7.121
Mass of Water in full Bottle	m4-m1	g	49.756	50.006
Mass of Water used	m3-m2	g	47.092	47.311
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.664	2.695
Particle Density, Þs =	$\frac{m2-m1}{(m4-m1)-(m3-m2)}$	Mg/m3	2.644	2.642
Average Value, Þs		Mg/m3	2.64	

	Operator	Checked	Approved
	LN		

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Blockley 1	
Pyknometer Number			483	51
Mass of Bottle+Soil+Water	m3	g	82.376	90.814
Mass of Bottle + Soil	m2	g	35.317	44.475
Mass of Bottle full of Water	m4	g	77.879	86.266
Mass of Bottle	m1	g	28.073	37.206
Mass of Soil	m2-m1	g	7.244	7.269
Mass of Water in full Bottle	m4-m1	g	49.806	49.060
Mass of Water used	m3-m2	g	47.059	46.339
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.747	2.721
Particle Density, Þs =	$\frac{m2-m1}{(m4-m1)-(m3-m2)}$	Mg/m3	2.637	2.671
Average Value, Þs		Mg/m3	2.65	

	Operator	Checked	Approved
	LN		

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Black Ven - Belemnite Marls	
Pyknometer Number			51	160
Mass of Bottle+Soil+Water	m3	g	91.037	87.202
Mass of Bottle + Soil	m2	g	44.688	38.036
Mass of Bottle full of Water	m4	g	86.266	82.605
Mass of Bottle	m1	g	37.206	30.828
Mass of Soil	m2-m1	g	7.482	7.208
Mass of Water in full Bottle	m4-m1	g	49.060	51.777
Mass of Water used	m3-m2	g	46.349	49.166
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.711	2.611
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.760	2.761
Average Value, Þs		Mg/m3	2.76	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Black Ven - Shales with Beef	
Pyknometer Number			122	168
Mass of Bottle+Soil+Water	m3	g	89.722	83.912
Mass of Bottle + Soil	m2	g	42.897	37.298
Mass of Bottle full of Water	m4	g	85.180	79.414
Mass of Bottle	m1	g	35.682	30.115
Mass of Soil	m2-m1	g	7.215	7.183
Mass of Water in full Bottle	m4-m1	g	49.498	49.299
Mass of Water used	m3-m2	g	46.825	46.614
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.673	2.685
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.699	2.675
Average Value, Þs		Mg/m3	2.69	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Flixborough 2	
Pyknometer Number			359	1378
Mass of Bottle+Soil+Water	m3	g	84.238	85.708
Mass of Bottle + Soil	m2	g	37.436	39.296
Mass of Bottle full of Water	m4	g	79.111	80.417
Mass of Bottle	m1	g	29.271	30.926
Mass of Soil	m2-m1	g	8.165	8.370
Mass of Water in full Bottle	m4-m1	g	49.840	49.491
Mass of Water used	m3-m2	g	46.802	46.412
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	3.038	3.079
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.688	2.718
Average Value, Þs		Mg/m3	2.70	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Hamdon Hill	
Pyknometer Number			34	179
Mass of Bottle+Soil+Water	m3	g	90.485	83.867
Mass of Bottle + Soil	m2	g	43.771	35.834
Mass of Bottle full of Water	m4	g	85.516	79.203
Mass of Bottle	m1	g	35.934	28.474
Mass of Soil	m2-m1	g	7.837	7.360
Mass of Water in full Bottle	m4-m1	g	49.582	50.729
Mass of Water used	m3-m2	g	46.714	48.033
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.868	2.696
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.733	2.730
Average Value, Þs		Mg/m3	2.73	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Seatown - Eype Clay	
Pyknometer Number			483	376
Mass of Bottle+Soil+Water	m3	g	82.535	83.513
Mass of Bottle + Soil	m2	g	35.432	36.307
Mass of Bottle full of Water	m4	g	77.879	79.022
Mass of Bottle	m1	g	28.073	29.177
Mass of Soil	m2-m1	g	7.359	7.130
Mass of Water in full Bottle	m4-m1	g	49.806	49.845
Mass of Water used	m3-m2	g	47.103	47.206
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.703	2.639
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.723	2.702
Average Value, Þs		Mg/m3	2.71	
		Operator	Checked	Approved

Particle Density (Pyknometer). BS 1377: Part 2: 1990, Test 8.4

Specimen Reference			Brixworth	
Pyknometer Number			2398	2052
Mass of Bottle+Soil+Water	m3	g	87.664	84.381
Mass of Bottle + Soil	m2	g	39.878	37.232
Mass of Bottle full of Water	m4	g	82.984	79.735
Mass of Bottle	m1	g	32.591	29.979
Mass of Soil	m2-m1	g	7.287	7.253
Mass of Water in full Bottle	m4-m1	g	50.393	49.756
Mass of Water used	m3-m2	g	47.786	47.149
Volume of Soil Particles	(m4-m1)-(m3-m2)	mL	2.607	2.607
Particle Density, Þs =	$\frac{\text{m2-m1}}{\text{(m4-m1)-(m3-m2)}}$	Mg/m3	2.795	2.782
Average Value, Þs		Mg/m3	2.79	
		Operator	Checked	Approved

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Appendix 3 - Particle Size Data and Plots

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Project: Shrink Swell **Country:** UK

Sample No: Sidegate Lane **Date:**

Coarse fraction analysis

Starting wt/g 75.02 g **<0.063mm** 20.04 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.11	0.1	0.1	99.9
1.41	-0.50	12.33	16.4	16.6	83.4
1.00	0.00	13.53	18.0	34.6	65.4
0.71	0.50	9.58	12.8	47.4	52.6
0.50	1.00	7.05	9.4	56.8	43.2
0.425	1.25	2.38	3.2	60.0	40.0
0.36	1.50	1.89	2.5	62.5	37.5
0.25	2.00	3.43	4.6	67.0	33.0
0.180	2.50	1.92	2.6	69.6	30.4
0.125	3.00	1.42	1.9	71.5	28.5
0.090	3.50	0.81	1.1	72.6	27.4
0.063	4.00	0.53	0.7	73.3	26.7

Fine fraction analysis

Sample Sidegate Lane

Particle size (mm)	Wt/g	Wt %
Start weight (g)	75.02	100.0
+2	0.11	0.1
-2.0 + 0.063	54.87	73.1
- 0.063 (back calc)	20.04	26.7
Total	75.02	100

Particle size	Percentage
Gravel	0.1
Sand	73.1
Silt	25.0
Clay	1.7

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	100.0	26.7
0.050	100.0	26.7
0.040	100.0	26.7
0.030	99.6	26.6
0.025	98.5	26.3
0.020	96.8	25.9
0.015	93.5	25.0
0.010	88.2	23.6
0.0080	84.9	22.7
0.0060	77.6	20.7
0.0050	61.9	16.5
0.0040	25.4	6.8
0.0030	7.3	2.0
0.0020	6.4	1.7
0.0015	6.1	1.6
0.0010	6.7	1.8

% <0.425mm	40.0

Project: Shrink Swell **Country:** UK
Sample No: Aberthaw **Date:**

Coarse fraction analysis
Starting wt/g 73.62 g **<0.063mm** 61.85 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	1.41	1.9	1.9	98.1
2.83	-1.50	0.33	0.4	2.4	97.6
2.00	-1.00	0.30	0.4	2.8	97.2
1.41	-0.50	0.41	0.6	3.3	96.7
1.00	0.00	0.66	0.9	4.2	95.8
0.71	0.50	0.81	1.1	5.3	94.7
0.50	1.00	1.04	1.4	6.7	93.3
0.425	1.25	0.49	0.7	7.4	92.6
0.36	1.50	0.38	0.5	7.9	92.1
0.25	2.00	1.07	1.5	9.4	90.6
0.180	2.50	0.84	1.1	10.5	89.5
0.125	3.00	0.71	1.0	11.5	88.5
0.090	3.50	1.17	1.6	13.1	86.9
0.063	4.00	2.15	2.9	16.0	84.0

Fine fraction analysis
Sample Aberthaw

Particle size (mm)	Wt/g	Wt %
Start weight (g)	73.62	100.0
+2	2.04	2.8
-2.0 + 0.063	9.73	13.2
- 0.063 (back calc)	61.85	84.0
Total	73.62	100

Particle size	Percentage
Gravel	2.8
Sand	13.2
Silt	68.3
Clay	15.7

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	94.9	79.7
0.050	92.9	78.0
0.040	88.4	74.3
0.030	80.4	67.5
0.025	74.9	62.9
0.020	69.0	58.0
0.015	62.1	52.2
0.010	52.2	43.9
0.0080	46.3	38.9
0.0060	38.7	32.5
0.0050	34.4	28.9
0.0040	29.7	25.0
0.0030	24.2	20.3
0.0020	18.7	15.7
0.0015	15.6	13.1
0.0010	12.7	10.7

% <0.425mm	92.6

Project: Shrink Swell **Country:** UK
Sample No: Alkerton **Date:**

Coarse fraction analysis
Starting wt/g 78.08 g **<0.063mm** 12.30 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	31.08	39.8	39.8	60.2
6.73	-2.75	9.49	12.2	52.0	48.0
5.66	-2.5	5.56	7.1	59.1	40.9
4.76	-2.25	4.96	6.4	65.4	34.6
4.00	-2	5.42	6.9	72.4	27.6
2.83	-1.50	6.08	7.8	80.2	19.8
2.00	-1.00	1.66	2.1	82.3	17.7
1.41	-0.50	0.64	0.8	83.1	16.9
1.00	0.00	0.16	0.2	83.3	16.7
0.71	0.50	0.08	0.1	83.4	16.6
0.50	1.00	0.07	0.1	83.5	16.5
0.425	1.25	0.05	0.1	83.6	16.4
0.36	1.50	0.04	0.1	83.6	16.4
0.25	2.00	0.13	0.2	83.8	16.2
0.180	2.50	0.12	0.2	83.9	16.1
0.125	3.00	0.09	0.1	84.1	15.9
0.090	3.50	0.07	0.1	84.1	15.9
0.063	4.00	0.08	0.1	84.2	15.8

Fine fraction analysis
Sample Alkerton

Particle size (mm)	Wt/g	Wt %
Start weight (g)	78.08	100.0
+2	64.25	82.3
-2.0 + 0.063	1.53	2.0
- 0.063 (back calc)	12.30	15.8
Total	78.08	100

Particle size	Percentage
Gravel	82.3
Sand	2.0
Silt	9.9
Clay	5.9

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.6	15.5
0.050	98.7	15.5
0.040	98.3	15.5
0.030	97.6	15.4
0.025	97.5	15.4
0.020	96.8	15.2
0.015	94.0	14.8
0.010	85.8	13.5
0.0080	79.5	12.5
0.0060	70.4	11.1
0.0050	64.1	10.1
0.0040	56.6	8.9
0.0030	47.9	7.5
0.0020	37.3	5.9
0.0015	30.9	4.9
0.0010	24.6	3.9

% <0.425mm	16.4

Project: Shrink Swell **Country:** UK
Sample No: Barnstone **Date:**

Coarse fraction analysis
Starting wt/g 74.15 g **<0.063mm** 46.53 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.12	0.2	0.2	99.8
2.00	-1.00	0.08	0.1	0.3	99.7
1.41	-0.50	3.82	5.2	5.4	94.6
1.00	0.00	5.87	7.9	13.3	86.7
0.71	0.50	4.57	6.2	19.5	80.5
0.50	1.00	4.11	5.5	25.0	75.0
0.425	1.25	0.54	0.7	25.8	74.2
0.36	1.50	0.53	0.7	26.5	73.5
0.25	2.00	1.08	1.5	27.9	72.1
0.180	2.50	1.48	2.0	29.9	70.1
0.125	3.00	2.00	2.7	32.6	67.4
0.090	3.50	1.39	1.9	34.5	65.5
0.063	4.00	2.03	2.7	37.2	62.8

Fine fraction analysis
Sample Barnstone

Particle size (mm)	Wt/g	Wt %
Start weight (g)	74.15	100.0
+2	0.20	0.3
-2.0 + 0.063	27.42	37.0
- 0.063 (back calc)	46.53	62.8
Total	74.15	100

Particle size	Percentage
Gravel	0.3
Sand	37.0
Silt	50.8
Clay	12.0

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	97.2	61.0
0.050	96.3	60.4
0.040	94.1	59.0
0.030	88.6	55.6
0.025	84.0	52.7
0.020	76.6	48.1
0.015	64.5	40.5
0.010	48.4	30.4
0.0080	41.3	25.9
0.0060	34.4	21.6
0.0050	30.9	19.4
0.0040	27.3	17.1
0.0030	23.4	14.7
0.0020	19.1	12.0
0.0015	16.8	10.5
0.0010	14.8	9.3

% <0.425mm	74.2

Project: Shrink Swell **Country:** UK
Sample No: Bishops Cleeve-2 **Date:**

Coarse fraction analysis
Starting wt/g 103.61 g **<0.063mm** 102.41 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	1.07	1.0	1.0	99.0
1.41	-0.50	0.09	0.1	1.1	98.9
1.00	0.00	0.02	0.0	1.1	98.9
0.71	0.50	0.02	0.0	1.2	98.8
0.50	1.00	0.00	0.0	1.2	98.8
0.425	1.25	0.00	0.0	1.2	98.8
0.36	1.50	0.00	0.0	1.2	98.8
0.25	2.00	0.00	0.0	1.2	98.8
0.180	2.50	0.00	0.0	1.2	98.8
0.125	3.00	0.00	0.0	1.2	98.8
0.090	3.50	0.00	0.0	1.2	98.8
0.063	4.00	0.00	0.0	1.2	98.8

Fine fraction analysis
Sample Bishops Cleeve-2

Particle size (mm)	Wt/g	Wt %
Start weight (g)	103.61	100.0
+2	1.07	1.0
-2.0 + 0.063	0.13	0.1
- 0.063 (back calc)	102.41	98.8
Total	103.61	100

Particle size	Percentage
Gravel	1.0
Sand	0.1
Silt	49.6
Clay	49.2

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.7	97.6
0.050	98.4	97.3
0.040	97.1	96.0
0.030	94.1	93.0
0.025	91.9	90.8
0.020	89.4	88.4
0.015	85.2	84.2
0.010	75.1	74.2
0.0080	70.4	69.6
0.0060	65.7	64.9
0.0050	63.0	62.3
0.0040	59.5	58.8
0.0030	54.9	54.3
0.0020	49.8	49.2
0.0015	46.2	45.7
0.0010	42.9	42.4

% <0.425mm	98.8

Project: Shrink Swell **Country:** UK
Sample No: Blockley-2 **Date:**

Coarse fraction analysis
Starting wt/g 100.63 g **<0.063mm** 99.57 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.09	0.1	0.1	99.9
1.41	-0.50	0.03	0.0	0.1	99.9
1.00	0.00	0.02	0.0	0.1	99.9
0.71	0.50	0.05	0.0	0.2	99.8
0.50	1.00	0.08	0.1	0.3	99.7
0.425	1.25	0.05	0.0	0.3	99.7
0.36	1.50	0.03	0.0	0.3	99.7
0.25	2.00	0.12	0.1	0.5	99.5
0.180	2.50	0.11	0.1	0.6	99.4
0.125	3.00	0.16	0.2	0.7	99.3
0.090	3.50	0.16	0.2	0.9	99.1
0.063	4.00	0.16	0.2	1.1	98.9

Fine fraction analysis
Sample Blockley-2

Particle size (mm)	Wt/g	Wt %
Start weight (g)	100.63	100.0
+2	0.09	0.1
-2.0 + 0.063	0.97	1.0
- 0.063 (back calc)	99.57	98.9
Total	100.63	100

Particle size	Percentage
Gravel	0.1
Sand	1.0
Silt	56.6
Clay	42.3

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.5	98.5
0.050	99.4	98.4
0.040	99.0	98.0
0.030	98.5	97.5
0.025	98.0	97.0
0.020	95.8	94.8
0.015	90.2	89.2
0.010	80.8	79.9
0.0080	75.1	74.3
0.0060	67.7	67.0
0.0050	63.0	62.3
0.0040	57.7	57.1
0.0030	51.3	50.8
0.0020	42.8	42.3
0.0015	39.3	38.9
0.0010	34.7	34.3

% <0.425mm	99.7

Project: Shrink Swell **Country:** UK
Sample No: Brixworth **Date:**

Coarse fraction analysis
Starting wt/g 73.7 g **<0.063mm** 73.30 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.00	0.0	0.0	100.0
1.41	-0.50	0.01	0.0	0.0	100.0
1.00	0.00	0.01	0.0	0.0	100.0
0.71	0.50	0.02	0.0	0.1	99.9
0.50	1.00	0.05	0.1	0.1	99.9
0.425	1.25	0.02	0.0	0.1	99.9
0.36	1.50	0.03	0.0	0.2	99.8
0.25	2.00	0.08	0.1	0.3	99.7
0.180	2.50	0.04	0.1	0.4	99.6
0.125	3.00	0.05	0.1	0.4	99.6
0.090	3.50	0.03	0.0	0.5	99.5
0.063	4.00	0.06	0.1	0.5	99.5

Fine fraction analysis
Sample Brixworth

Particle size (mm)	Wt/g	Wt %
Start weight (g)	73.70	100.0
+2	0.00	0.0
-2.0 + 0.063	0.40	0.5
- 0.063 (back calc)	73.30	99.5
Total	73.70	100

Particle size	Percentage
Gravel	0.0
Sand	0.5
Silt	97.8
Clay	1.7

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.2	98.7
0.050	99.0	98.5
0.040	98.4	97.9
0.030	97.1	96.6
0.025	95.6	95.1
0.020	93.0	92.5
0.015	89.6	89.1
0.010	79.5	79.1
0.0080	58.1	57.8
0.0060	12.0	11.9
0.0050	3.4	3.4
0.0040	2.7	2.7
0.0030	2.3	2.3
0.0020	1.7	1.7
0.0015	1.7	1.7
0.0010	1.7	1.7

% <0.425mm	99.9

Project: Shrink Swell **Country:** UK

Sample No: Black Ven - Belemnite Marls **Date:**

Coarse fraction analysis

Starting wt/g 77.4 g **<0.063mm** 76.79 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.01	0.0	0.0	100.0
1.41	-0.50	0.00	0.0	0.0	100.0
1.00	0.00	0.00	0.0	0.0	100.0
0.71	0.50	0.01	0.0	0.0	100.0
0.50	1.00	0.01	0.0	0.0	100.0
0.425	1.25	0.01	0.0	0.1	99.9
0.36	1.50	0.01	0.0	0.1	99.9
0.25	2.00	0.04	0.1	0.1	99.9
0.180	2.50	0.07	0.1	0.2	99.8
0.125	3.00	0.12	0.2	0.4	99.6
0.090	3.50	0.14	0.2	0.5	99.5
0.063	4.00	0.19	0.2	0.8	99.2

Fine fraction analysis

Sample Black Ven - Belemnite Marls

Particle size (mm)	Wt/g	Wt %
Start weight (g)	77.40	100.0
+2	0.01	0.0
-2.0 + 0.063	0.60	0.8
- 0.063 (back calc)	76.79	99.2
Total	77.40	100

Particle size	Percentage
Gravel	0.0
Sand	0.8
Silt	95.5
Clay	3.7

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.1	98.3
0.050	99.0	98.2
0.040	98.9	98.1
0.030	99.4	98.6
0.025	99.5	98.7
0.020	98.8	98.0
0.015	97.8	97.0
0.010	94.7	94.0
0.0080	93.3	92.6
0.0060	87.2	86.5
0.0050	72.9	72.3
0.0040	31.1	30.9
0.0030	4.2	4.2
0.0020	3.7	3.7
0.0015	3.6	3.6
0.0010	4.2	4.2

% <0.425mm	99.9

Project: Shrink Swell **Country:** UK

Sample No: Black Ven - Black Ven Marls **Date:**

Coarse fraction analysis

Starting wt/g 103.61 g **<0.063mm** 100.94 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.00	0.0	0.0	100.0
1.41	-0.50	0.18	0.2	0.2	99.8
1.00	0.00	0.32	0.3	0.5	99.5
0.71	0.50	0.29	0.3	0.8	99.2
0.50	1.00	0.24	0.2	1.0	99.0
0.425	1.25	0.12	0.1	1.1	98.9
0.36	1.50	0.07	0.1	1.2	98.8
0.25	2.00	0.24	0.2	1.4	98.6
0.180	2.50	0.18	0.2	1.6	98.4
0.125	3.00	0.19	0.2	1.8	98.2
0.090	3.50	0.31	0.3	2.1	97.9
0.063	4.00	0.53	0.5	2.6	97.4

Fine fraction analysis

Sample Black Ven - Black Ven Marls

Particle size (mm)	Wt/g	Wt %
Start weight (g)	103.61	100.0
+2	0.00	0.0
-2.0 + 0.063	2.67	2.6
- 0.063 (back calc)	100.94	97.4
Total	103.61	100

Particle size	Percentage
Gravel	0.0
Sand	2.6
Silt	56.1
Clay	41.3

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.9	96.4
0.050	98.6	96.1
0.040	97.8	95.3
0.030	95.8	93.3
0.025	93.4	91.0
0.020	89.9	87.6
0.015	84.1	81.9
0.010	74.1	72.2
0.0080	68.7	66.9
0.0060	61.9	60.3
0.0050	58.1	56.6
0.0040	53.7	52.3
0.0030	48.4	47.2
0.0020	42.4	41.3
0.0015	38.9	37.9
0.0010	34.1	33.2

% <0.425mm	98.9

Project: Shrink Swell **Country:** UK

Sample No: Black Ven - Shales with Beef **Date:**

Coarse fraction analysis

Starting wt/g 74.04 g **<0.063mm** 50.89 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.32	0.4	0.4	99.6
2.83	-1.50	1.01	1.4	1.8	98.2
2.00	-1.00	1.32	1.8	3.6	96.4
1.41	-0.50	1.69	2.3	5.9	94.1
1.00	0.00	1.76	2.4	8.2	91.8
0.71	0.50	1.65	2.2	10.5	89.5
0.50	1.00	1.97	2.7	13.1	86.9
0.425	1.25	0.89	1.2	14.3	85.7
0.36	1.50	0.73	1.0	15.3	84.7
0.25	2.00	1.36	1.8	17.2	82.8
0.180	2.50	2.32	3.1	20.3	79.7
0.125	3.00	2.47	3.3	23.6	76.4
0.090	3.50	2.73	3.7	27.3	72.7
0.063	4.00	2.93	4.0	31.3	68.7

Fine fraction analysis

Sample Black Ven - Shales with Beef

Particle size (mm)	Wt/g	Wt %
Start weight (g)	74.04	100.0
+2	2.65	3.6
-2.0 + 0.063	20.50	27.7
- 0.063 (back calc)	50.89	68.7
Total	74.04	100

Particle size	Percentage
Gravel	3.6
Sand	27.7
Silt	62.9
Clay	5.8

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.0	68.0
0.050	99.0	68.0
0.040	98.7	67.8
0.030	97.6	67.1
0.025	96.7	66.5
0.020	95.4	65.6
0.015	92.0	63.2
0.010	86.0	59.1
0.0080	82.5	56.7
0.0060	76.0	52.2
0.0050	65.1	44.7
0.0040	32.9	22.6
0.0030	9.7	6.7
0.0020	8.5	5.8
0.0015	8.4	5.8
0.0010	8.3	5.7

% <0.425mm	85.7

Project: Shrink Swell **Country:** UK

Sample No: Conesby-1 **Date:**

Coarse fraction analysis

Starting wt/g 85.84 g **<0.063mm** 85.27 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.00	0.0	0.0	100.0
1.41	-0.50	0.00	0.0	0.0	100.0
1.00	0.00	0.00	0.0	0.0	100.0
0.71	0.50	0.00	0.0	0.0	100.0
0.50	1.00	0.00	0.0	0.0	100.0
0.425	1.25	0.00	0.0	0.0	100.0
0.36	1.50	0.02	0.0	0.0	100.0
0.25	2.00	0.12	0.1	0.2	99.8
0.180	2.50	0.09	0.1	0.3	99.7
0.125	3.00	0.09	0.1	0.4	99.6
0.090	3.50	0.07	0.1	0.5	99.5
0.063	4.00	0.18	0.2	0.7	99.3

Fine fraction analysis

Sample Conesby-1

Particle size (mm)	Wt/g	Wt %
Start weight (g)	85.84	100.0
+2	0.00	0.0
-2.0 + 0.063	0.57	0.7
- 0.063 (back calc)	85.27	99.3
Total	85.84	100

Particle size	Percentage
Gravel	0.0
Sand	0.7
Silt	52.5
Clay	46.8

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.1	98.4
0.050	99.3	98.6
0.040	99.4	98.7
0.030	98.5	97.8
0.025	97.1	96.5
0.020	94.3	93.7
0.015	89.3	88.7
0.010	80.6	80.1
0.0080	76.1	75.6
0.0060	70.3	69.8
0.0050	66.7	66.3
0.0040	61.8	61.4
0.0030	55.6	55.2
0.0020	47.1	46.8
0.0015	41.7	41.4
0.0010	35.3	35.1

% <0.425mm	100.0

Project: Shrink Swell **Country:** UK
Sample No: Edgehill **Date:**

Coarse fraction analysis
Starting wt/g 77.6 g **<0.063mm** 30.41 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	1.27	1.6	1.6	98.4
6.73	-2.75	2.20	2.8	4.5	95.5
5.66	-2.5	1.89	2.4	6.9	93.1
4.76	-2.25	1.96	2.5	9.4	90.6
4.00	-2	2.22	2.9	12.3	87.7
2.83	-1.50	4.75	6.1	18.4	81.6
2.00	-1.00	3.85	5.0	23.4	76.6
1.41	-0.50	3.05	3.9	27.3	72.7
1.00	0.00	2.14	2.8	30.1	69.9
0.71	0.50	1.97	2.5	32.6	67.4
0.50	1.00	2.38	3.1	35.7	64.3
0.425	1.25	1.20	1.5	37.2	62.8
0.36	1.50	0.77	1.0	38.2	61.8
0.25	2.00	3.80	4.9	43.1	56.9
0.180	2.50	3.52	4.5	47.6	52.4
0.125	3.00	4.30	5.5	53.2	46.8
0.090	3.50	3.37	4.3	57.5	42.5
0.063	4.00	2.55	3.3	60.8	39.2

Fine fraction analysis
Sample Edgehill

Particle size (mm)	Wt/g	Wt %
Start weight (g)	77.60	100.0
+2	18.14	23.4
-2.0 + 0.063	29.05	37.4
- 0.063 (back calc)	30.41	39.2
Total	77.60	100

Particle size	Percentage
Gravel	23.4
Sand	37.4
Silt	24.2
Clay	15.0

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	93.3	36.6
0.050	92.7	36.3
0.040	91.2	35.7
0.030	87.4	34.3
0.025	84.7	33.2
0.020	81.4	31.9
0.015	76.5	30.0
0.010	69.0	27.0
0.0080	64.8	25.4
0.0060	59.2	23.2
0.0050	55.4	21.7
0.0040	51.0	20.0
0.0030	45.6	17.9
0.0020	38.3	15.0
0.0015	33.7	13.2
0.0010	28.0	11.0

% <0.425mm	62.8

Project: Shrink Swell **Country:** UK
Sample No: Flixborough-1 **Date:**

Coarse fraction analysis
Starting wt/g 76.88 g **<0.063mm** 73.91 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.47	0.6	0.6	99.4
2.83	-1.50	0.31	0.4	1.0	99.0
2.00	-1.00	0.24	0.3	1.3	98.7
1.41	-0.50	0.42	0.5	1.9	98.1
1.00	0.00	0.36	0.5	2.3	97.7
0.71	0.50	0.27	0.4	2.7	97.3
0.50	1.00	0.18	0.2	2.9	97.1
0.425	1.25	0.07	0.1	3.0	97.0
0.36	1.50	0.05	0.1	3.1	96.9
0.25	2.00	0.13	0.2	3.3	96.7
0.180	2.50	0.09	0.1	3.4	96.6
0.125	3.00	0.08	0.1	3.5	96.5
0.090	3.50	0.06	0.1	3.6	96.4
0.063	4.00	0.24	0.3	3.9	96.1

Fine fraction analysis
Sample Flixborough-1

Particle size (mm)	Wt/g	Wt %
Start weight (g)	76.88	100.0
+2	1.02	1.3
-2.0 + 0.063	1.95	2.5
- 0.063 (back calc)	73.91	96.1
Total	76.88	100

Particle size	Percentage
Gravel	1.3
Sand	2.5
Silt	90.4
Clay	5.8

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.3	95.5
0.050	99.4	95.6
0.040	99.5	95.7
0.030	98.6	94.8
0.025	96.8	93.1
0.020	94.0	90.4
0.015	89.3	85.9
0.010	84.4	81.1
0.0080	82.0	78.8
0.0060	78.5	75.5
0.0050	75.8	72.9
0.0040	68.1	65.5
0.0030	43.3	41.6
0.0020	6.0	5.8
0.0015	5.2	5.0
0.0010	5.7	5.5

% <0.425mm	97.0

Project: Shrink Swell **Country:** UK
Sample No: Flixborough - 2 **Date:**

Coarse fraction analysis
Starting wt/g 77.21 g **<0.063mm** 71.44 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.21	0.3	0.3	99.7
1.41	-0.50	0.26	0.3	0.6	99.4
1.00	0.00	0.34	0.4	1.0	99.0
0.71	0.50	0.35	0.5	1.5	98.5
0.50	1.00	0.37	0.5	2.0	98.0
0.425	1.25	0.20	0.3	2.2	97.8
0.36	1.50	0.16	0.2	2.4	97.6
0.25	2.00	0.36	0.5	2.9	97.1
0.180	2.50	0.33	0.4	3.3	96.7
0.125	3.00	0.29	0.4	3.7	96.3
0.090	3.50	0.42	0.5	4.3	95.7
0.063	4.00	2.48	3.2	7.5	92.5

Fine fraction analysis
Sample Flixborough - 2

Particle size (mm)	Wt/g	Wt %
Start weight (g)	77.21	100.0
+2	0.21	0.3
-2.0 + 0.063	5.56	7.2
- 0.063 (back calc)	71.44	92.5
Total	77.21	100

Particle size	Percentage
Gravel	0.3
Sand	7.2
Silt	63.4
Clay	29.1

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	95.2	88.1
0.050	92.8	85.9
0.040	87.0	80.5
0.030	78.7	72.8
0.025	74.3	68.7
0.020	70.4	65.1
0.015	66.5	61.5
0.010	61.1	56.5
0.0080	57.2	52.9
0.0060	52.2	48.3
0.0050	49.0	45.3
0.0040	44.8	41.5
0.0030	39.5	36.5
0.0020	31.5	29.1
0.0015	19.6	18.1
0.0010	9.2	8.5

% <0.425mm	97.8

Project: Shrink Swell **Country:** UK
Sample No: Hamdon Hill **Date:**

Coarse fraction analysis
Starting wt/g 77.14 g **<0.063mm** 20.28 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	2.46	3.2	3.2	96.8
2.83	-1.50	1.41	1.8	5.0	95.0
2.00	-1.00	2.02	2.6	7.6	92.4
1.41	-0.50	2.06	2.7	10.3	89.7
1.00	0.00	0.96	1.2	11.6	88.4
0.71	0.50	0.73	0.9	12.5	87.5
0.50	1.00	0.50	0.6	13.1	86.9
0.425	1.25	0.21	0.3	13.4	86.6
0.36	1.50	0.21	0.3	13.7	86.3
0.25	2.00	0.34	0.4	14.1	85.9
0.180	2.50	0.54	0.7	14.8	85.2
0.125	3.00	1.47	1.9	16.7	83.3
0.090	3.50	21.91	28.4	45.1	54.9
0.063	4.00	22.04	28.6	73.7	26.3

Fine fraction analysis
Sample Hamdon Hill

Particle size (mm)	Wt/g	Wt %
Start weight (g)	77.14	100.0
+2	5.89	7.6
-2.0 + 0.063	50.97	66.1
- 0.063 (back calc)	20.28	26.3
Total	77.14	100

Particle size	Percentage
Gravel	7.6
Sand	66.1
Silt	26.3
Clay	0.0

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	95.1	25.0
0.050	93.0	24.4
0.040	88.7	23.3
0.030	82.7	21.7
0.025	79.7	21.0
0.020	76.7	20.2
0.015	72.9	19.2
0.010	64.1	16.9
0.0080	55.7	14.6
0.0060	40.3	10.6
0.0050	27.3	7.2
0.0040	7.2	1.9
0.0030	-2.2	-0.6
0.0020	-2.2	-0.6
0.0015	-2.2	-0.6
0.0010	-2.2	-0.6

% <0.425mm	86.6

Project: Shrink Swell **Country:** UK
Sample No: Hornton **Date:**

Coarse fraction analysis
Starting wt/g 87.59 g **<0.063mm** 47.63 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	17.90	20.4	20.4	79.6
2.83	-1.50	3.01	3.4	23.9	76.1
2.00	-1.00	1.96	2.2	26.1	73.9
1.41	-0.50	1.51	1.7	27.8	72.2
1.00	0.00	0.95	1.1	28.9	71.1
0.71	0.50	0.59	0.7	29.6	70.4
0.50	1.00	0.47	0.5	30.1	69.9
0.425	1.25	0.17	0.2	30.3	69.7
0.36	1.50	0.13	0.1	30.5	69.5
0.25	2.00	0.43	0.5	31.0	69.0
0.180	2.50	0.69	0.8	31.8	68.2
0.125	3.00	3.23	3.7	35.4	64.6
0.090	3.50	5.33	6.1	41.5	58.5
0.063	4.00	3.59	4.1	45.6	54.4

Fine fraction analysis
Sample Hornton

Particle size (mm)	Wt/g	Wt %
Start weight (g)	87.59	100.0
+2	22.87	26.1
-2.0 + 0.063	17.09	19.5
- 0.063 (back calc)	47.63	54.4
Total	87.59	100

Particle size	Percentage
Gravel	26.1
Sand	19.5
Silt	54.4
Clay	0.0

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	71.9	39.1
0.050	71.0	38.6
0.040	68.8	37.4
0.030	63.7	34.7
0.025	60.3	32.8
0.020	56.4	30.6
0.015	49.3	26.8
0.010	28.3	15.4
0.0080	14.7	8.0
0.0060	7.1	3.9
0.0050	5.8	3.2
0.0040	2.9	1.6
0.0030	-6.4	-3.5
0.0020	-6.4	-3.5
0.0015	-6.4	-3.5
0.0010	-6.4	-3.5

% <0.425mm	69.7

Project: Shrink Swell **Country:** UK
Sample No: Kettleness **Date:**

Coarse fraction analysis
Starting wt/g 74.34 g **<0.063mm** 74.24 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.00	0.0	0.0	100.0
1.41	-0.50	0.00	0.0	0.0	100.0
1.00	0.00	0.00	0.0	0.0	100.0
0.71	0.50	0.00	0.0	0.0	100.0
0.50	1.00	0.00	0.0	0.0	100.0
0.425	1.25	0.00	0.0	0.0	100.0
0.36	1.50	0.00	0.0	0.0	100.0
0.25	2.00	0.01	0.0	0.0	100.0
0.180	2.50	0.02	0.0	0.0	100.0
0.125	3.00	0.02	0.0	0.1	99.9
0.090	3.50	0.02	0.0	0.1	99.9
0.063	4.00	0.03	0.0	0.1	99.9

Fine fraction analysis
Sample Kettleness

Particle size (mm)	Wt/g	Wt %
Start weight (g)	74.34	100.0
+2	0.00	0.0
-2.0 + 0.063	0.10	0.1
- 0.063 (back calc)	74.24	99.9
Total	74.34	100

Particle size	Percentage
Gravel	0.0
Sand	0.1
Silt	3.8
Clay	96.1

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.9	98.8
0.050	99.0	98.9
0.040	99.4	99.3
0.030	99.6	99.5
0.025	99.4	99.3
0.020	99.4	99.3
0.015	99.7	99.6
0.010	99.5	99.4
0.0080	99.4	99.3
0.0060	98.8	98.7
0.0050	98.5	98.4
0.0040	98.6	98.5
0.0030	98.2	98.1
0.0020	96.2	96.1
0.0015	93.3	93.2
0.0010	58.7	58.6

% <0.425mm	100.0

Project: Shrink Swell **Country:** UK
Sample No: Lakeview **Date:**

Coarse fraction analysis
Starting wt/g 76.79 g **<0.063mm** 48.00 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.00	0.0	0.0	100.0
1.41	-0.50	3.20	4.2	4.2	95.8
1.00	0.00	6.03	7.9	12.0	88.0
0.71	0.50	5.90	7.7	19.7	80.3
0.50	1.00	5.09	6.6	26.3	73.7
0.425	1.25	1.78	2.3	28.6	71.4
0.36	1.50	1.33	1.7	30.4	69.6
0.25	2.00	2.50	3.3	33.6	66.4
0.180	2.50	1.29	1.7	35.3	64.7
0.125	3.00	0.84	1.1	36.4	63.6
0.090	3.50	0.48	0.6	37.0	63.0
0.063	4.00	0.35	0.5	37.5	62.5

Fine fraction analysis
Sample Lakeview

Particle size (mm)	Wt/g	Wt %
Start weight (g)	76.79	100.0
+2	0.00	0.0
-2.0 + 0.063	28.79	37.5
- 0.063 (back calc)	48.00	62.5
Total	76.79	100

Particle size	Percentage
Gravel	0.0
Sand	37.5
Silt	49.8
Clay	12.8

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.8	61.8
0.050	98.7	61.7
0.040	98.6	61.6
0.030	99.0	61.9
0.025	99.1	61.9
0.020	98.8	61.8
0.015	97.8	61.1
0.010	90.1	56.3
0.0080	80.9	50.6
0.0060	64.6	40.4
0.0050	53.6	33.5
0.0040	41.9	26.2
0.0030	30.5	19.1
0.0020	20.4	12.8
0.0015	16.3	10.2
0.0010	12.3	7.7

% <0.425mm	71.4

Project: Shrink Swell **Country:** UK

Sample No: Norton Bottoms **Date:**

Coarse fraction analysis

Starting wt/g 76.6 g **<0.063mm** 75.22 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.03	0.0	0.0	100.0
2.83	-1.50	0.06	0.1	0.1	99.9
2.00	-1.00	0.02	0.0	0.1	99.9
1.41	-0.50	0.04	0.1	0.2	99.8
1.00	0.00	0.06	0.1	0.3	99.7
0.71	0.50	0.04	0.1	0.3	99.7
0.50	1.00	0.05	0.1	0.4	99.6
0.425	1.25	0.03	0.0	0.4	99.6
0.36	1.50	0.03	0.0	0.5	99.5
0.25	2.00	0.11	0.1	0.6	99.4
0.180	2.50	0.12	0.2	0.8	99.2
0.125	3.00	0.09	0.1	0.9	99.1
0.090	3.50	0.11	0.1	1.0	99.0
0.063	4.00	0.59	0.8	1.8	98.2

Fine fraction analysis

Sample Norton Bottoms

Particle size (mm)	Wt/g	Wt %
Start weight (g)	76.60	100.0
+2	0.11	0.1
-2.0 + 0.063	1.27	1.7
- 0.063 (back calc)	75.22	98.2
Total	76.60	100

Particle size	Percentage
Gravel	0.1
Sand	1.7
Silt	63.8
Clay	34.4

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.6	96.8
0.050	98.6	96.8
0.040	98.3	96.5
0.030	97.0	95.3
0.025	96.0	94.3
0.020	94.4	92.7
0.015	89.9	88.3
0.010	79.9	78.5
0.0080	72.8	71.5
0.0060	62.8	61.7
0.0050	56.9	55.9
0.0040	50.4	49.5
0.0030	43.1	42.3
0.0020	35.0	34.4
0.0015	30.7	30.1
0.0010	24.8	24.4

% <0.425mm	99.6

Project: Shrink Swell **Country:** UK
Sample No: Ravenscar - 2 **Date:**

Coarse fraction analysis
Starting wt/g 99.5 g **<0.063mm** 98.19 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.18	0.2	0.2	99.8
1.41	-0.50	0.06	0.1	0.2	99.8
1.00	0.00	0.04	0.0	0.3	99.7
0.71	0.50	0.16	0.2	0.4	99.6
0.50	1.00	0.17	0.2	0.6	99.4
0.425	1.25	0.10	0.1	0.7	99.3
0.36	1.50	0.06	0.1	0.8	99.2
0.25	2.00	0.15	0.2	0.9	99.1
0.180	2.50	0.10	0.1	1.0	99.0
0.125	3.00	0.11	0.1	1.1	98.9
0.090	3.50	0.09	0.1	1.2	98.8
0.063	4.00	0.09	0.1	1.3	98.7

Fine fraction analysis
Sample Ravenscar - 2

Particle size (mm)	Wt/g	Wt %
Start weight (g)	99.50	100.0
+2	0.18	0.2
-2.0 + 0.063	1.13	1.1
- 0.063 (back calc)	98.19	98.7
Total	99.50	100

Particle size	Percentage
Gravel	0.2
Sand	1.1
Silt	36.3
Clay	62.4

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.8	98.5
0.050	99.5	98.2
0.040	99.2	97.9
0.030	98.7	97.4
0.025	98.2	96.9
0.020	97.4	96.1
0.015	96.4	95.1
0.010	93.7	92.5
0.0080	91.6	90.4
0.0060	87.5	86.3
0.0050	84.7	83.6
0.0040	79.9	78.8
0.0030	73.1	72.1
0.0020	63.2	62.4
0.0015	56.7	56.0
0.0010	47.6	47.0

% <0.425mm	99.3

Project: Shrink Swell **Country:** UK

Sample No: Robin Hoods Bay **Date:**

Coarse fraction analysis

Starting wt/g 72.92 g **<0.063mm** 53.03 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.07	0.1	0.1	99.9
1.41	-0.50	0.03	0.0	0.1	99.9
1.00	0.00	0.07	0.1	0.2	99.8
0.71	0.50	0.08	0.1	0.3	99.7
0.50	1.00	0.14	0.2	0.5	99.5
0.425	1.25	0.09	0.1	0.7	99.3
0.36	1.50	0.09	0.1	0.8	99.2
0.25	2.00	0.78	1.1	1.9	98.1
0.180	2.50	1.98	2.7	4.6	95.4
0.125	3.00	3.76	5.2	9.7	90.3
0.090	3.50	5.45	7.5	17.2	82.8
0.063	4.00	7.35	10.1	27.3	72.7

Fine fraction analysis

Sample Robin Hoods Bay

Particle size (mm)	Wt/g	Wt %
Start weight (g)	72.92	100.0
+2	0.07	0.1
-2.0 + 0.063	19.82	27.2
- 0.063 (back calc)	53.03	72.7
Total	72.92	100

Particle size	Percentage
Gravel	0.1
Sand	27.2
Silt	48.8
Clay	23.9

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	96.7	70.3
0.050	93.6	68.1
0.040	87.4	63.6
0.030	79.1	57.5
0.025	74.5	54.2
0.020	69.9	50.8
0.015	64.3	46.8
0.010	57.0	41.5
0.0080	53.0	38.5
0.0060	48.6	35.3
0.0050	45.7	33.2
0.0040	42.5	30.9
0.0030	38.5	28.0
0.0020	32.9	23.9
0.0015	30.0	21.8
0.0010	26.5	19.3

% <0.425mm	99.3

Project: Shrink Swell **Country:** UK
Sample No: Runswick **Date:**

Coarse fraction analysis
Starting wt/g 74.69 g **<0.063mm** 63.78 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	2.81	3.8	3.8	96.2
5.66	-2.5	2.75	3.7	7.4	92.6
4.76	-2.25	2.00	2.7	10.1	89.9
4.00	-2	1.23	1.6	11.8	88.2
2.83	-1.50	1.51	2.0	13.8	86.2
2.00	-1.00	0.46	0.6	14.4	85.6
1.41	-0.50	0.12	0.2	14.6	85.4
1.00	0.00	0.03	0.0	14.6	85.4
0.71	0.50	0.00	0.0	14.6	85.4
0.50	1.00	0.00	0.0	14.6	85.4
0.425	1.25	0.00	0.0	14.6	85.4
0.36	1.50	0.00	0.0	14.6	85.4
0.25	2.00	0.00	0.0	14.6	85.4
0.180	2.50	0.00	0.0	14.6	85.4
0.125	3.00	0.00	0.0	14.6	85.4
0.090	3.50	0.00	0.0	14.6	85.4
0.063	4.00	0.00	0.0	14.6	85.4

Fine fraction analysis
Sample Runswick

Particle size (mm)	Wt/g	Wt %
Start weight (g)	74.69	100.0
+2	10.76	14.4
-2.0 + 0.063	0.15	0.2
- 0.063 (back calc)	63.78	85.4
Total	74.69	100

Particle size	Percentage
Gravel	14.4
Sand	0.2
Silt	53.8
Clay	31.6

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.0	84.5
0.050	98.8	84.4
0.040	98.6	84.2
0.030	98.6	84.2
0.025	98.6	84.2
0.020	97.6	83.3
0.015	94.5	80.7
0.010	85.8	73.3
0.0080	79.7	68.1
0.0060	70.6	60.3
0.0050	64.5	55.1
0.0040	57.3	48.9
0.0030	47.7	40.7
0.0020	37.0	31.6
0.0015	32.8	28.0
0.0010	27.4	23.4

% <0.425mm	85.4

Project: Shrink Swell **Country:** UK

Sample No: Robins Wood Hill - DRF **Date:**

Coarse fraction analysis

Starting wt/g 77.05 g **<0.063mm** 73.83 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	1.35	1.8	1.8	98.2
2.83	-1.50	0.42	0.5	2.3	97.7
2.00	-1.00	0.10	0.1	2.4	97.6
1.41	-0.50	0.12	0.2	2.6	97.4
1.00	0.00	0.13	0.2	2.8	97.2
0.71	0.50	0.14	0.2	2.9	97.1
0.50	1.00	0.15	0.2	3.1	96.9
0.425	1.25	0.09	0.1	3.2	96.8
0.36	1.50	0.04	0.1	3.3	96.7
0.25	2.00	0.13	0.2	3.5	96.5
0.180	2.50	0.12	0.2	3.6	96.4
0.125	3.00	0.10	0.1	3.8	96.2
0.090	3.50	0.09	0.1	3.9	96.1
0.063	4.00	0.24	0.3	4.2	95.8

Fine fraction analysis

Sample Robins Wood Hill - DRF

Particle size (mm)	Wt/g	Wt %
Start weight (g)	77.05	100.0
+2	1.87	2.4
-2.0 + 0.063	1.35	1.8
- 0.063 (back calc)	73.83	95.8
Total	77.05	100

Particle size	Percentage
Gravel	2.4
Sand	1.8
Silt	68.5
Clay	27.3

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	97.6	93.5
0.050	97.7	93.6
0.040	97.8	93.7
0.030	96.1	92.1
0.025	93.5	89.6
0.020	88.7	85.0
0.015	80.2	76.8
0.010	65.2	62.5
0.0080	57.7	55.3
0.0060	49.6	47.5
0.0050	45.1	43.2
0.0040	40.2	38.5
0.0030	34.4	33.0
0.0020	28.5	27.3
0.0015	24.4	23.4
0.0010	18.3	17.5

% <0.425mm	96.8

Project: Shrink Swell **Country:** UK

Sample No: Robins Wood Hll - MRF **Date:**

Coarse fraction analysis

Starting wt/g 74.09 g **<0.063mm** 73.05 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.07	0.1	0.1	99.9
2.00	-1.00	0.05	0.1	0.2	99.8
1.41	-0.50	0.05	0.1	0.2	99.8
1.00	0.00	0.07	0.1	0.3	99.7
0.71	0.50	0.06	0.1	0.4	99.6
0.50	1.00	0.06	0.1	0.5	99.5
0.425	1.25	0.02	0.0	0.5	99.5
0.36	1.50	0.03	0.0	0.6	99.4
0.25	2.00	0.06	0.1	0.6	99.4
0.180	2.50	0.06	0.1	0.7	99.3
0.125	3.00	0.09	0.1	0.8	99.2
0.090	3.50	0.18	0.2	1.1	98.9
0.063	4.00	0.24	0.3	1.4	98.6

Fine fraction analysis

Sample Robins Wood Hll - MRF

Particle size (mm)	Wt/g	Wt %
Start weight (g)	74.09	100.0
+2	0.12	0.2
-2.0 + 0.063	0.92	1.2
- 0.063 (back calc)	73.05	98.6
Total	74.09	100

Particle size	Percentage
Gravel	0.2
Sand	1.2
Silt	75.7
Clay	22.9

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.5	97.1
0.050	97.7	96.3
0.040	94.6	93.3
0.030	85.1	83.9
0.025	76.4	75.3
0.020	65.8	64.9
0.015	54.6	53.8
0.010	43.4	42.8
0.0080	38.9	38.4
0.0060	34.4	33.9
0.0050	32.0	31.6
0.0040	29.5	29.1
0.0030	26.6	26.2
0.0020	23.2	22.9
0.0015	21.4	21.1
0.0010	19.1	18.8

% <0.425mm	99.5

Project: Shrink Swell **Country:** UK

Sample No: Seatown_EC **Date:**

Coarse fraction analysis

Starting wt/g 70.99 g **<0.063mm** 70.75 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.00	0.0	0.0	100.0
2.00	-1.00	0.00	0.0	0.0	100.0
1.41	-0.50	0.00	0.0	0.0	100.0
1.00	0.00	0.00	0.0	0.0	100.0
0.71	0.50	0.00	0.0	0.0	100.0
0.50	1.00	0.00	0.0	0.0	100.0
0.425	1.25	0.00	0.0	0.0	100.0
0.36	1.50	0.00	0.0	0.0	100.0
0.25	2.00	0.00	0.0	0.0	100.0
0.180	2.50	0.00	0.0	0.0	100.0
0.125	3.00	0.00	0.0	0.0	100.0
0.090	3.50	0.10	0.1	0.1	99.9
0.063	4.00	0.14	0.2	0.3	99.7

Fine fraction analysis

Sample Seatown_EC

Particle size (mm)	Wt/g	Wt %
Start weight (g)	70.99	100.0
+2	0.00	0.0
-2.0 + 0.063	0.24	0.3
- 0.063 (back calc)	70.75	99.7
Total	70.99	100

Particle size	Percentage
Gravel	0.0
Sand	0.3
Silt	79.0
Clay	20.6

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.2	97.9
0.050	97.9	97.6
0.040	96.7	96.4
0.030	92.1	91.8
0.025	87.2	86.9
0.020	79.0	78.7
0.015	65.7	65.5
0.010	49.1	48.9
0.0080	42.3	42.2
0.0060	35.3	35.2
0.0050	32.2	32.1
0.0040	28.8	28.7
0.0030	25.1	25.0
0.0020	20.7	20.6
0.0015	18.8	18.7
0.0010	17.0	16.9

% <0.425mm	100.0

Project: Shrink Swell **Country:** UK

Sample No: Seatown - Green Ammonites **Date:**

Coarse fraction analysis

Starting wt/g 91.03 g **<0.063mm** 87.76 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.32	0.4	0.4	99.6
2.83	-1.50	0.26	0.3	0.6	99.4
2.00	-1.00	0.33	0.4	1.0	99.0
1.41	-0.50	0.18	0.2	1.2	98.8
1.00	0.00	0.28	0.3	1.5	98.5
0.71	0.50	0.21	0.2	1.7	98.3
0.50	1.00	0.24	0.3	2.0	98.0
0.425	1.25	0.01	0.0	2.0	98.0
0.36	1.50	0.06	0.1	2.1	97.9
0.25	2.00	0.21	0.2	2.3	97.7
0.180	2.50	0.24	0.3	2.6	97.4
0.125	3.00	0.32	0.4	2.9	97.1
0.090	3.50	0.33	0.4	3.3	96.7
0.063	4.00	0.28	0.3	3.6	96.4

Fine fraction analysis

Sample Seatown - Green Ammonites

Particle size (mm)	Wt/g	Wt %
Start weight (g)	91.03	100.0
+2	0.91	1.0
-2.0 + 0.063	2.36	2.6
- 0.063 (back calc)	87.76	96.4
Total	91.03	100

Particle size	Percentage
Gravel	1.0
Sand	2.6
Silt	58.1
Clay	38.3

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.6	95.1
0.050	98.6	95.1
0.040	98.6	95.1
0.030	98.4	94.9
0.025	98.0	94.5
0.020	97.2	93.7
0.015	95.0	91.6
0.010	89.4	86.2
0.0080	84.2	81.2
0.0060	75.4	72.7
0.0050	69.4	66.9
0.0040	61.2	59.0
0.0030	51.1	49.3
0.0020	39.7	38.3
0.0015	33.8	32.6
0.0010	27.6	26.6

% <0.425mm	98.0

Project: Shrink Swell **Country:** UK
Sample No: Southam **Date:**

Coarse fraction analysis
Starting wt/g 101.24 g **<0.063mm** 99.94 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.00	0.0	0.0	100.0
2.83	-1.50	0.82	0.8	0.8	99.2
2.00	-1.00	0.08	0.1	0.9	99.1
1.41	-0.50	0.07	0.1	1.0	99.0
1.00	0.00	0.05	0.0	1.0	99.0
0.71	0.50	0.01	0.0	1.0	99.0
0.50	1.00	0.01	0.0	1.0	99.0
0.425	1.25	0.01	0.0	1.0	99.0
0.36	1.50	0.02	0.0	1.1	98.9
0.25	2.00	0.04	0.0	1.1	98.9
0.180	2.50	0.03	0.0	1.1	98.9
0.125	3.00	0.06	0.1	1.2	98.8
0.090	3.50	0.05	0.0	1.2	98.8
0.063	4.00	0.05	0.0	1.3	98.7

Fine fraction analysis
Sample Southam

Particle size (mm)	Wt/g	Wt %
Start weight (g)	101.24	100.0
+2	0.90	0.9
-2.0 + 0.063	0.40	0.4
- 0.063 (back calc)	99.94	98.7
Total	101.24	100

Particle size	Percentage
Gravel	0.9
Sand	0.4
Silt	45.0
Clay	53.7

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	100.5	99.2
0.050	100.1	98.8
0.040	99.5	98.2
0.030	98.5	97.2
0.025	97.5	96.2
0.020	95.9	94.7
0.015	92.9	91.7
0.010	86.0	84.9
0.0080	81.5	80.5
0.0060	75.3	74.3
0.0050	71.4	70.5
0.0040	66.7	65.8
0.0030	61.3	60.5
0.0020	54.4	53.7
0.0015	50.2	49.6
0.0010	43.8	43.2

% <0.425mm	99.0

Project: Shrink Swell **Country:** UK
Sample No: Station **Date:**

Coarse fraction analysis
Starting wt/g 73.01 g **<0.063mm** 38.57 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	7.04	9.6	9.6	90.4
2.83	-1.50	3.22	4.4	14.1	85.9
2.00	-1.00	3.30	4.5	18.6	81.4
1.41	-0.50	4.14	5.7	24.2	75.8
1.00	0.00	5.17	7.1	31.3	68.7
0.71	0.50	3.78	5.2	36.5	63.5
0.50	1.00	3.18	4.4	40.9	59.1
0.425	1.25	0.85	1.2	42.0	58.0
0.36	1.50	0.58	0.8	42.8	57.2
0.25	2.00	1.04	1.4	44.2	55.8
0.180	2.50	0.92	1.3	45.5	54.5
0.125	3.00	0.64	0.9	46.4	53.6
0.090	3.50	0.24	0.3	46.7	53.3
0.063	4.00	0.34	0.5	47.2	52.8

Fine fraction analysis
Sample Station

Particle size (mm)	Wt/g	Wt %
Start weight (g)	73.01	100.0
+2	13.56	18.6
-2.0 + 0.063	20.88	28.6
- 0.063 (back calc)	38.57	52.8
Total	73.01	100

Particle size	Percentage
Gravel	18.6
Sand	28.6
Silt	50.9
Clay	2.0

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.8	52.2
0.050	99.0	52.3
0.040	98.9	52.2
0.030	98.1	51.8
0.025	97.3	51.4
0.020	94.8	50.1
0.015	90.8	48.0
0.010	83.5	44.1
0.0080	74.3	39.3
0.0060	29.7	15.7
0.0050	7.6	4.0
0.0040	4.0	2.1
0.0030	3.9	2.1
0.0020	3.7	2.0
0.0015	3.7	2.0
0.0010	4.2	2.2

% <0.425mm	58.0

Project: Shrink Swell **Country:** UK
Sample No: Stowey **Date:**

Coarse fraction analysis
Starting wt/g 76.46 g **<0.063mm** 74.94 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
8.00	-3	0.00	0.0	0.0	100.0
6.73	-2.75	0.00	0.0	0.0	100.0
5.66	-2.5	0.00	0.0	0.0	100.0
4.76	-2.25	0.00	0.0	0.0	100.0
4.00	-2	0.19	0.2	0.2	99.8
2.83	-1.50	0.15	0.2	0.4	99.6
2.00	-1.00	0.19	0.2	0.7	99.3
1.41	-0.50	0.14	0.2	0.9	99.1
1.00	0.00	0.07	0.1	1.0	99.0
0.71	0.50	0.05	0.1	1.0	99.0
0.50	1.00	0.04	0.1	1.1	98.9
0.425	1.25	0.02	0.0	1.1	98.9
0.36	1.50	0.02	0.0	1.1	98.9
0.25	2.00	0.04	0.1	1.2	98.8
0.180	2.50	0.05	0.1	1.3	98.7
0.125	3.00	0.08	0.1	1.4	98.6
0.090	3.50	0.09	0.1	1.5	98.5
0.063	4.00	0.39	0.5	2.0	98.0

Fine fraction analysis
Sample Stowey

Particle size (mm)	Wt/g	Wt %
Start weight (g)	76.46	100.0
+2	0.53	0.7
-2.0 + 0.063	0.99	1.3
- 0.063 (back calc)	74.94	98.0
Total	76.46	100

Particle size	Percentage
Gravel	0.7
Sand	1.3
Silt	38.7
Clay	59.3

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.4	97.4
0.050	99.1	97.1
0.040	98.8	96.8
0.030	98.1	96.1
0.025	97.0	95.1
0.020	95.4	93.5
0.015	92.5	90.7
0.010	88.3	86.5
0.0080	85.6	83.9
0.0060	82.6	81.0
0.0050	79.9	78.3
0.0040	75.3	73.8
0.0030	69.2	67.8
0.0020	60.5	59.3
0.0015	50.0	49.0
0.0010	12.6	12.3

% <0.425mm	98.9

Project: Shrink Swell **Country:** UK
Sample No: Blockley - 1 **Date:**

Coarse fraction analysis

Starting wt/g 168.98 g **<0.063mm** 159.17 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
2.00	-1.00	2.42	1.4	1.4	98.6
1.18	-0.25	1.71	1.0	2.4	97.6
0.60	0.75	2.29	1.4	3.8	96.2
0.425	1.25	0.92	0.5	4.3	95.7
0.30	1.75	0.60	0.4	4.7	95.3
0.212	2.25	0.53	0.3	5.0	95.0
0.15	2.75	0.40	0.2	5.2	94.8
0.09	3.25	0.52	0.3	5.6	94.4
0.063	4.00	0.42	0.2	5.8	94.2

Fine fraction analysis

0.425 Blockley - 1

Particle size (mm)	Wt/g	Wt %
Start weight (g)	168.98	100.0
+2	2.42	1.4
-2.0 + 0.063	7.39	4.4
- 0.063 (back calc)	159.17	94.2
Total	168.98	100

Particle size	Percentage
Gravel	1.4
Sand	4.4
Silt	55.1
Clay	39.1

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.5	92.8
0.050	98.7	93.0
0.040	98.8	93.1
0.030	98.4	92.7
0.025	97.4	91.7
0.020	94.9	89.4
0.015	89.7	84.5
0.010	78.9	74.3
0.0080	72.6	68.4
0.0060	64.5	60.8
0.0050	59.7	56.2
0.0040	54.3	51.1
0.0030	48.3	45.5
0.0020	41.5	39.1
0.0015	37.3	35.1
0.0010	31.9	30.0

% <0.425mm	95.7

Project: Shrink Swell **Country:** UK
Sample No: Conesby 2 **Date:**

Coarse fraction analysis
Starting wt/g 170.42 g **<0.063mm** 151.21 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
2.00	-1.00	8.70	5.1	5.1	94.9
1.18	-0.25	1.26	0.7	5.8	94.2
0.60	0.75	1.74	1.0	6.9	93.1
0.425	1.25	0.79	0.5	7.3	92.7
0.30	1.75	0.84	0.5	7.8	92.2
0.212	2.25	0.81	0.5	8.3	91.7
0.15	2.75	0.64	0.4	8.7	91.3
0.09	3.25	1.56	0.9	9.6	90.4
0.063	4.00	2.87	1.7	11.3	88.7

Fine fraction analysis
0.425 Conesby 2

Particle size (mm)	Wt/g	Wt %
Start weight (g)	170.42	100.0
+2	8.70	5.1
-2.0 + 0.063	10.51	6.2
- 0.063 (back calc)	151.21	88.7
Total	170.42	100

Particle size	Percentage
Gravel	5.1
Sand	6.2
Silt	53.6
Clay	35.1

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	98.3	87.2
0.050	98.1	87.0
0.040	97.2	86.2
0.030	94.9	84.2
0.025	92.3	81.9
0.020	88.2	78.3
0.015	82.4	73.1
0.010	72.6	64.4
0.0080	67.8	60.2
0.0060	61.6	54.7
0.0050	57.8	51.3
0.0040	53.2	47.2
0.0030	47.3	42.0
0.0020	39.6	35.1
0.0015	35.1	31.1
0.0010	28.6	25.4

% <0.425mm	92.7

Project: Shrink Swell **Country:** UK
Sample No: Dimmer 1 **Date:**

Coarse fraction analysis
Starting wt/g 128.72 g **<0.063mm** 126.20 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
2.00	-1.00	0.48	0.4	0.4	99.6
1.18	-0.25	0.24	0.2	0.6	99.4
0.60	0.75	0.39	0.3	0.9	99.1
0.425	1.25	0.20	0.2	1.0	99.0
0.30	1.75	0.16	0.1	1.1	98.9
0.212	2.25	0.21	0.2	1.3	98.7
0.15	2.75	0.20	0.2	1.5	98.5
0.09	3.25	0.27	0.2	1.7	98.3
0.063	4.00	0.37	0.3	2.0	98.0

Fine fraction analysis
0.425 Dimmer 1

Particle size (mm)	Wt/g	Wt %
Start weight (g)	128.72	100.0
+2	0.48	0.4
-2.0 + 0.063	2.04	1.6
- 0.063 (back calc)	126.20	98.0
Total	128.72	100

Particle size	Percentage
Gravel	0.4
Sand	1.6
Silt	44.3
Clay	53.7

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.2	97.3
0.050	99.2	97.3
0.040	99.0	97.1
0.030	98.6	96.7
0.025	97.7	95.8
0.020	96.1	94.2
0.015	93.1	91.3
0.010	85.3	83.6
0.0080	80.4	78.8
0.0060	74.8	73.3
0.0050	71.3	69.9
0.0040	66.9	65.6
0.0030	61.4	60.2
0.0020	54.8	53.7
0.0015	51.1	50.1
0.0010	46.7	45.8

% <0.425mm	99.0

Project: Shrink Swell **Country:** UK

Sample No: Bisops Cleeve 1 **Date:**

Coarse fraction analysis

Starting wt/g 166.67 g **<0.063mm** 153.90 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
2.00	-1.00	3.33	2.0	2.0	98.0
1.18	-0.25	1.02	0.6	2.6	97.4
0.60	0.75	1.22	0.7	3.3	96.7
0.425	1.25	0.59	0.4	3.7	96.3
0.30	1.75	0.63	0.4	4.1	95.9
0.212	2.25	0.71	0.4	4.5	95.5
0.15	2.75	0.82	0.5	5.0	95.0
0.09	3.25	2.15	1.3	6.3	93.7
0.063	4.00	2.30	1.4	7.7	92.3

Fine fraction analysis

0.425 Bisops Cleeve 1

Particle size (mm)	Wt/g	Wt %
Start weight (g)	166.67	100.0
+2	3.33	2.0
-2.0 + 0.063	9.44	5.7
- 0.063 (back calc)	153.90	92.3
Total	166.67	100

Particle size	Percentage
Gravel	2.0
Sand	5.7
Silt	59.1
Clay	33.2

Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.4	91.8
0.050	98.9	91.3
0.040	96.9	89.5
0.030	92.4	85.3
0.025	88.4	81.6
0.020	83.0	76.6
0.015	76.6	70.7
0.010	66.4	61.3
0.0080	61.0	56.3
0.0060	55.1	50.9
0.0050	51.6	47.6
0.0040	47.4	43.8
0.0030	42.3	39.1
0.0020	36.0	33.2
0.0015	32.8	30.3
0.0010	28.0	25.9

% <0.425mm	96.3

Project: Shrink Swell **Country:** UK
Sample No: Whisby **Date:**

Coarse fraction analysis
Starting wt/g 166.67 g **<0.063mm** 163.24 g

Sieve Size (mm)	Sieve Size (ø)	Retained Weight (g)	% Retained	Total % Retained	% Passing
2.00	-1.00	0.19	0.1	0.1	99.9
1.18	-0.25	0.31	0.2	0.3	99.7
0.60	0.75	0.60	0.4	0.7	99.3
0.425	1.25	0.31	0.2	0.8	99.2
0.30	1.75	0.26	0.2	1.0	99.0
0.212	2.25	0.30	0.2	1.2	98.8
0.15	2.75	0.34	0.2	1.4	98.6
0.09	3.25	0.61	0.4	1.8	98.2
0.063	4.00	0.51	0.3	2.1	97.9

Fine fraction analysis
0.425 Whisby

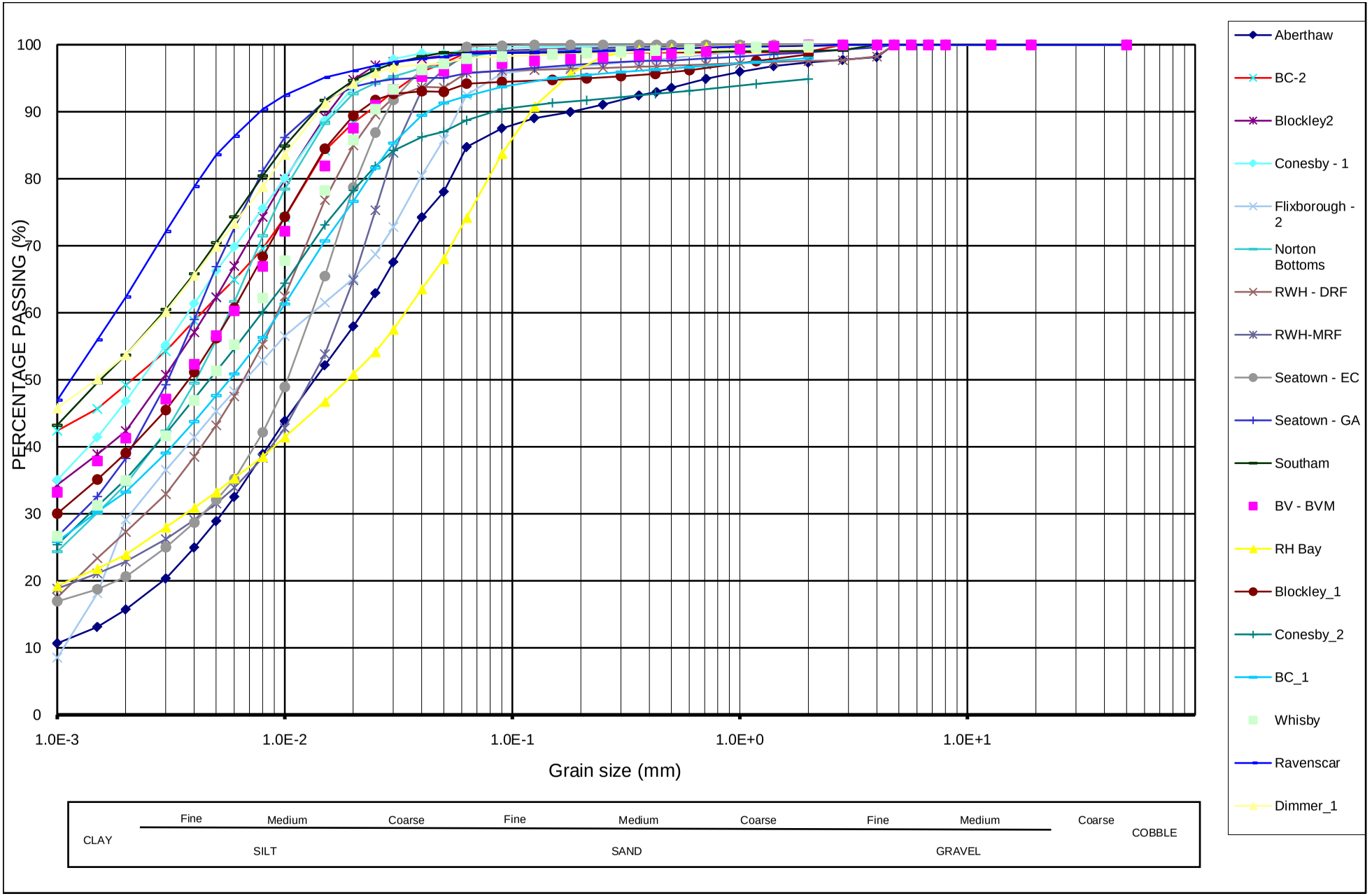
Particle size (mm)	Wt/g	Wt %
Start weight (g)	166.67	100.0
+2	0.19	0.1
-2.0 + 0.063	3.24	1.9
- 0.063 (back calc)	163.24	97.9
Total	166.67	100

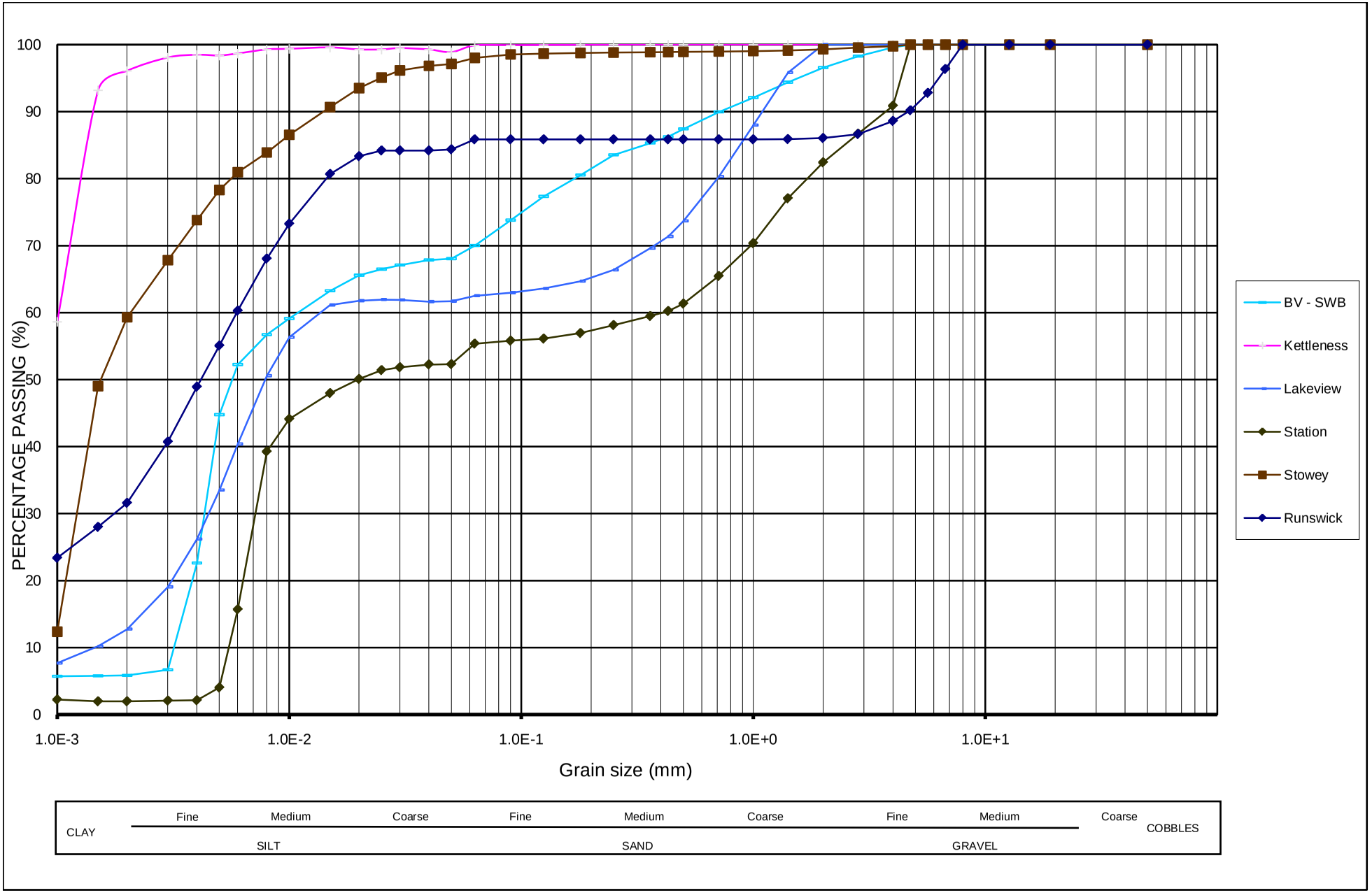
Particle size	Percentage
Gravel	0.1
Sand	1.9
Silt	63.0
Clay	35.0

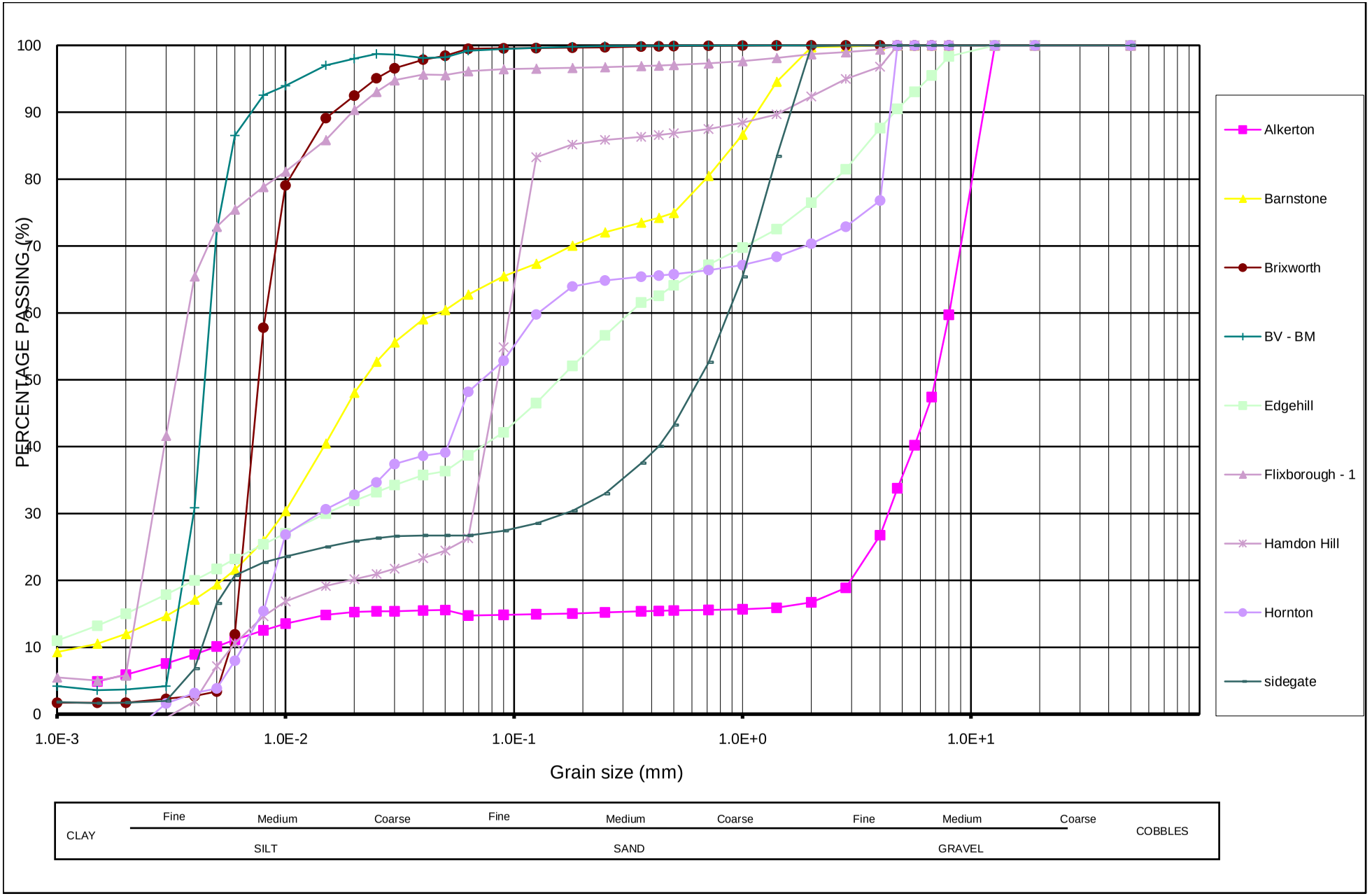
Sedigraph

Particle size (mm)	Cumulative Wt%	Cumulative correct < wt%
0.060	99.5	97.5
0.050	99.2	97.2
0.040	98.3	96.3
0.030	95.3	93.3
0.025	92.3	90.4
0.020	87.6	85.8
0.015	79.9	78.3
0.010	69.2	67.8
0.0080	63.5	62.2
0.0060	56.4	55.2
0.0050	52.4	51.3
0.0040	47.9	46.9
0.0030	42.5	41.6
0.0020	35.7	35.0
0.0015	31.9	31.2
0.0010	27.2	26.6

% <0.425mm	99.2


PERCENTAGE PASSING (%)
100
90
80
70
60
50
40
30
20
10
0
1.0E-3
1.0E-2
1.0E-1
1.0E+0
1.0E+1
Grain size (mm)
CLAY
Fine
Medium
Coarse
Fine
Medium
Coarse
Fine
Medium
Coarse
COBBLE
SILT
SAND
GRAVEL
Aberthaw
BC-2
Blockley2
Conesby - 1
Flixborough - 2
Norton Bottoms
RWH - DRF
RWH-MRF
Seatown - EC
Seatown - GA
Southam
BV - BVM
RH Bay
Blockley_1
Conesby_2
BC_1
Whisby
Ravenscar
Dimmer_1


100
90
80
70
60
50
40
30
20
10
0
PERCENTAGE PASSING (%)
1.0E-3
1.0E-2
1.0E-1
1.0E+0
1.0E+1
Grain size (mm)
BV - SWB
Kettleness
Lakeview
Station
Stowey
Runswick
CLAY
Fine
Medium
Coarse
Fine
Medium
Coarse
Fine
Medium
Coarse
COBBLES
SILT
SAND
GRAVEL


PERCENTAGE PASSING (%)
100
90
80
70
60
50
40
30
20
10
0
1.0E-3
1.0E-2
1.0E-1
1.0E+0
1.0E+1
Grain size (mm)
Alkerton
Barnstone
Brixworth
BV - BM
Edgehill
Flixborough - 1
Hamdon Hill
Hornton
sidegate
CLAY
Fine
Medium
Coarse
Fine
Medium
Coarse
Fine
Medium
Coarse
COBBLES
SILT
SAND
GRAVEL

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Appendix 4 – Swelling Test Data

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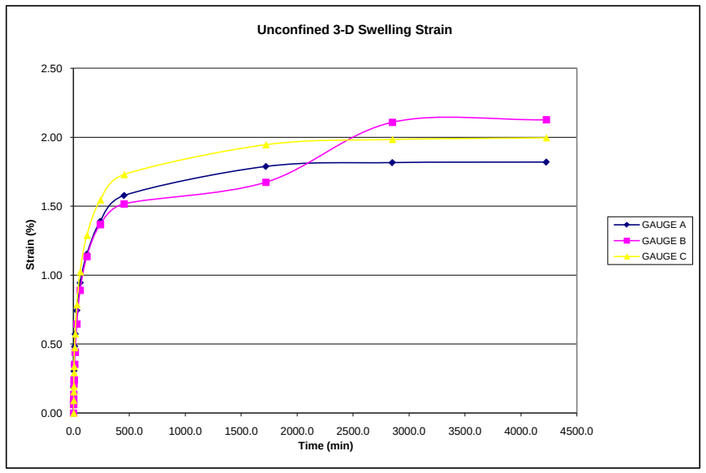
3-D SWELLING TEST

SAMPLE FORMATION Lodge Farm

INITIAL SAMPLE HEIGHT A (mm)	50.35	**INITIAL SAMPLE WEIGHT (g)**	247.74
INITIAL SAMPLE HEIGHT B (mm)	49.02	**SATURATED SAMPLE WEIGHT (g)**	250.1
INITIAL SAMPLE HEIGHT C (mm)	50.07	**DRY SAMPLE WEIGHT (g)**	194.69
		INITIALMOISTURE CONTENT (%)	
		FINAL MOISTURE CONTENT (%)	

TIME	ELAPSED TIME (HOURS)	ELAPSED TIME (MINS)	GAUGE A GAUGE READING 1	GAUGE A GAUGE READING 2	GAUGE A GAUGE READING 3	GAUGE A CORRECTED READING (mm)	GAUGE A DISPLACEMENT (mm)	GAUGE A STRAIN (%)	GAUGE B GAUGE READING 1	GAUGE B GAUGE READING 2	GAUGE B GAUGE READING 3	GAUGE B CORRECTED READING (mm)	GAUGE B DISPLACEMENT (mm)	GAUGE B STRAIN (%)	GAUGE C GAUGE READING 1	GAUGE C GAUGE READING 2	GAUGE C GAUGE READING 3	GAUGE C CORRECTED READING (mm)	GAUGE C DISPLACEMENT (mm)	GAUGE C STRAIN (%)
17/05/2005 10:05:00	0:00:00	0.0	4	0	2	0.8020	0.00	0.00	18	8	6	3.6860	0.00	0.00	20	12	8	4.1280	0.00	0.00
17/05/2005 10:05:30	0:00:30	0.5	4	6	4	0.8640	0.06	0.12	18	11	6	3.7160	0.03	0.06	20	17	4	4.1740	0.05	0.09
17/05/2005 10:06:00	0:01:00	1.0	4	9	6	0.8960	0.09	0.19	18	13	0	3.7300	0.04	0.09	20	19	16	4.2060	0.08	0.15
17/05/2005 10:07:00	0:02:00	2.0	4	10	2	0.9020	0.10	0.20	18	15	2	3.7520	0.07	0.13	21	2	6	4.2260	0.10	0.19
17/05/2005 10:09:00	0:04:00	4.0	4	15	6	0.9560	0.15	0.31	18	18	8	3.7880	0.10	0.21	21	7	6	4.2760	0.15	0.29
17/05/2005 10:10:00	0:05:00	5.0	4	17	8	0.9780	0.18	0.35	19	0	4	3.8040	0.12	0.24	21	9	8	4.2980	0.17	0.34
17/05/2005 10:15:00	0:10:00	10.0	5	4	5	1.0450	0.24	0.48	19	5	9	3.8590	0.17	0.35	21	16	7	4.3670	0.24	0.47
17/05/2005 10:20:00	0:15:00	15.0	5	9	0	1.0900	0.29	0.57	19	10	2	3.9020	0.22	0.44	22	1	7	4.4170	0.29	0.57
17/05/2005 10:35:00	0:30:00	30.0	5	17	6	1.1760	0.37	0.74	20	0	2	4.0020	0.32	0.64	22	12	4	4.5240	0.40	0.79
17/05/2005 11:05:00	1:00:00	60.0	6	7	7	1.2770	0.48	0.94	20	12	2	4.1220	0.44	0.89	23	4	4	4.6440	0.52	1.02
17/05/2005 12:05:00	2:00:00	120.0	6	18	2	1.3820	0.58	1.15	21	4	2	4.2420	0.56	1.13	23	17	7	4.7770	0.65	1.29
17/05/2005 14:05:00	4:00:00	240.0	7	10	2	1.5020	0.70	1.39	21	15	6	4.3560	0.67	1.37	24	10	6	4.9060	0.78	1.55
17/05/2005 17:35:00	7:30:00	452.0	7	19	6	1.5960	0.79	1.58	22	2	9	4.4290	0.74	1.52	24	19	9	4.9990	0.87	1.73
18/05/2005 14:45:00	28:40:00	1720.0	8	10	2	1.7020	0.90	1.79	22	10	6	4.5060	0.82	1.67	25	10	8	5.1080	0.98	1.95
19/05/2005 09:36:00	47:31:00	2850.0	8	11	6	1.7160	0.91	1.82	23	11	9	4.7190	1.03	2.11	25	12	7	5.1270	1.00	1.98
20/05/2005 08:32:00	70:27:00	4227	8	11	8	1.718	0.92	1.82	23	12	8	4.728	1.04	2.13	25	13	3	5.133	1.01	2.00

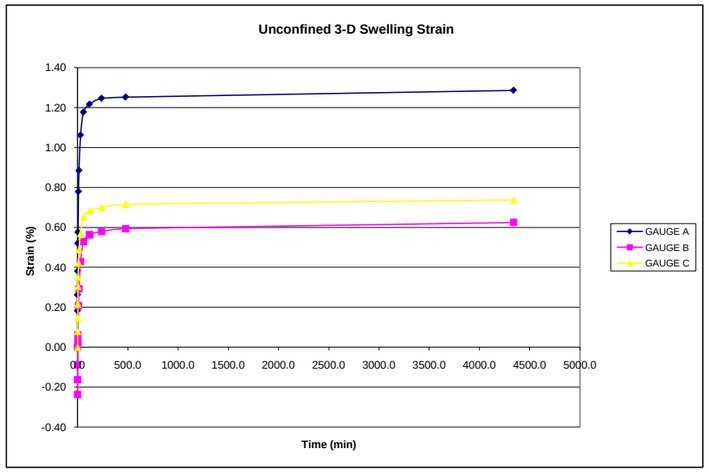


3-D SWELLING TEST

SAMPLE FORMATION **Bishops Cleeve**

INITIAL SAMPLE HEIGHT A (mm)	50.35	**INITIAL SAMPLE WEIGHT (g)**	248.15
INITIAL SAMPLE HEIGHT B (mm)	49.02	**SATURATED SAMPLE WEIGHT (g)**	257.56
INITIAL SAMPLE HEIGHT C (mm)	50.07	**DRY SAMPLE WEIGHT (g)**	204.81
		INITIALMOISTURE CONTENT (%)	
		FINAL MOISTURE CONTENT (%)	

TIME	ELAPSED TIME (HOURS)	ELAPSED TIME (MINS)	GAUGE A GAUGE READING 1	GAUGE A GAUGE READING 2	GAUGE A GAUGE READING 3	GAUGE A CORRECTED READING (mm)	GAUGE A DISPLACEMENT (mm)	GAUGE A STRAIN (%)	GAUGE B GAUGE READING 1	GAUGE B GAUGE READING 2	GAUGE B GAUGE READING 3	GAUGE B CORRECTED READING (mm)	GAUGE B DISPLACEMENT (mm)	GAUGE B STRAIN (%)	GAUGE C GAUGE READING 1	GAUGE C GAUGE READING 2	GAUGE C GAUGE READING 3	GAUGE C CORRECTED READING (mm)	GAUGE C DISPLACEMENT (mm)	GAUGE C STRAIN (%)
20/05/2005 09:35:00	0:00:00	0.0	22	11	0	4.5100	0.00	0.00	14	16	0	2.9600	0.00	0.00	22	0	0	4.4000	0.00	0.00
20/05/2005 09:35:30	0:00:30	0.5	23	0	2	4.6020	0.09	0.18	14	4	4	2.8440	-0.12	-0.24	22	4	0	4.4400	0.04	0.08
20/05/2005 09:36:00	0:01:00	1.0	23	4	2	4.6420	0.13	0.26	14	8	0	2.8800	-0.08	-0.16	22	7	4	4.4740	0.07	0.15
20/05/2005 09:37:00	0:02:00	2.0	23	10	2	4.7020	0.19	0.38	14	11	7	2.9170	-0.04	-0.09	22	10	9	4.5090	0.11	0.22
20/05/2005 09:39:00	0:04:00	4.0	23	17	2	4.7720	0.26	0.52	14	17	2	2.9720	0.01	0.02	22	15	3	4.5530	0.15	0.30
20/05/2005 09:40:00	0:05:00	5.0	24	0	0	4.8000	0.29	0.58	14	19	0	2.9900	0.03	0.06	22	17	7	4.5770	0.18	0.35
20/05/2005 09:45:00	0:10:00	10.0	24	10	2	4.9020	0.39	0.78	15	6	2	3.0620	0.10	0.21	23	1	2	4.6120	0.21	0.42
20/05/2005 09:50:00	0:15:00	15.0	24	15	5	4.9550	0.45	0.88	15	10	3	3.1030	0.14	0.29	23	4	6	4.6460	0.25	0.49
20/05/2005 10:05:00	0:30:00	30.0	25	4	4	5.0440	0.53	1.06	15	17	0	3.1700	0.21	0.43	23	8	7	4.6870	0.29	0.57
20/05/2005 10:35:00	1:00:00	60.0	25	10	2	5.1020	0.59	1.18	16	1	9	3.2190	0.26	0.53	23	12	8	4.7280	0.33	0.65
20/05/2005 11:35:00	2:00:00	120.0	25	12	2	5.1220	0.61	1.22	16	3	6	3.2360	0.28	0.56	23	14	4	4.7440	0.34	0.68
20/05/2005 13:35:00	4:00:00	240.0	25	13	7	5.1370	0.63	1.25	16	4	4	3.2440	0.28	0.58	23	15	2	4.7520	0.35	0.70
20/05/2005 17:35:00	8:00:00	480.0	25	14	0	5.1400	0.63	1.25	16	5	1	3.2510	0.29	0.59	23	16	0	4.7600	0.36	0.71
23/05/2005 09:56:00	72:21:00	4341.0	25	15	7	5.1570	0.65	1.29	16	6	6	3.2660	0.31	0.62	23	17	1	4.7710	0.37	0.74

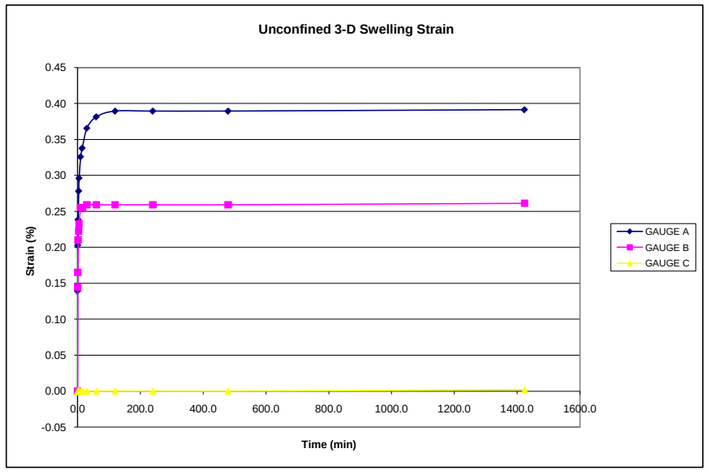


3-D SWELLING TEST

SAMPLE FORMATION	**Stowey**	Very friable sample

INITIAL SAMPLE HEIGHT A (mm)	50.35	**INITIAL SAMPLE WEIGHT (g)**	209.45
INITIAL SAMPLE HEIGHT B (mm)	49.02	**SATURATED SAMPLE WEIGHT (g)**	229.16
INITIAL SAMPLE HEIGHT C (mm)	50.07	**DRY SAMPLE WEIGHT (g)**	164.66
		INITIALMOISTURE CONTENT (%)	
		FINAL MOISTURE CONTENT (%)	

TIME	ELAPSED TIME (HOURS)	ELAPSED TIME (MINS)	GAUGE A GAUGE READING 1	GAUGE A GAUGE READING 2	GAUGE A GAUGE READING 3	GAUGE A CORRECTED READING (mm)	GAUGE A DISPLACEMENT (mm)	GAUGE A STRAIN (%)	GAUGE B GAUGE READING 1	GAUGE B GAUGE READING 2	GAUGE B GAUGE READING 3	GAUGE B CORRECTED READING (mm)	GAUGE B DISPLACEMENT (mm)	GAUGE B STRAIN (%)	GAUGE C GAUGE READING 1	GAUGE C GAUGE READING 2	GAUGE C GAUGE READING 3	GAUGE C CORRECTED READING (mm)	GAUGE C DISPLACEMENT (mm)	GAUGE C STRAIN (%)
24/05/2005 09:44:00	0:00:00	0.0	21	4	0	4.2400	0.00	0.00	20	18	1	4.1810	0.00	0.00	24	0	1	4.8010	0.00	0.00
24/05/2005 09:44:30	0:00:30	0.5	21	11	0	4.3100	0.07	0.14	21	5	2	4.2520	0.07	0.14	24	0	1	4.8010	0.00	0.00
24/05/2005 09:45:00	0:01:00	1.0	21	14	2	4.3420	0.10	0.20	21	6	2	4.2620	0.08	0.17	24	0	1	4.8010	0.00	0.00
24/05/2005 09:46:00	0:02:00	2.0	21	16	0	4.3600	0.12	0.24	21	8	4	4.2840	0.10	0.21	24	0	1	4.8010	0.00	0.00
24/05/2005 09:48:00	0:04:00	4.0	21	18	0	4.3800	0.14	0.28	21	9	0	4.2900	0.11	0.22	24	0	1	4.8010	0.00	0.00
24/05/2005 09:49:00	0:05:00	5.0	21	18	9	4.3890	0.15	0.30	21	9	5	4.2950	0.11	0.23	24	0	1	4.8010	0.00	0.00
24/05/2005 09:54:00	0:10:00	10.0	22	0	4	4.4040	0.16	0.33	21	10	6	4.3060	0.13	0.25	24	0	1	4.8010	0.00	0.00
24/05/2005 09:59:00	0:15:00	15.0	22	1	0	4.4100	0.17	0.34	21	10	6	4.3060	0.13	0.25	24	0	1	4.8010	0.00	0.00
24/05/2005 10:14:00	0:30:00	30.0	22	2	4	4.4240	0.18	0.37	21	10	8	4.3080	0.13	0.26	24	0	1	4.8010	0.00	0.00
24/05/2005 10:44:00	1:00:00	60.0	22	3	2	4.4320	0.19	0.38	21	10	8	4.3080	0.13	0.26	24	0	1	4.8010	0.00	0.00
24/05/2005 11:44:00	2:00:00	120.0	22	3	6	4.4360	0.20	0.39	21	10	8	4.3080	0.13	0.26	24	0	1	4.8010	0.00	0.00
24/05/2005 13:44:00	4:00:00	240.0	22	3	6	4.4360	0.20	0.39	21	10	8	4.3080	0.13	0.26	24	0	1	4.8010	0.00	0.00
24/05/2005 17:44:00	8:00:00	480.0	22	3	6	4.4360	0.20	0.39	21	10	8	4.3080	0.13	0.26	24	0	1	4.8010	0.00	0.00
25/05/2005 09:28:00	23:44:00	1424.0	22	3	7	4.4370	0.20	0.39	21	10	9	4.3090	0.13	0.26	24	0	2	4.8020	0.00	0.00

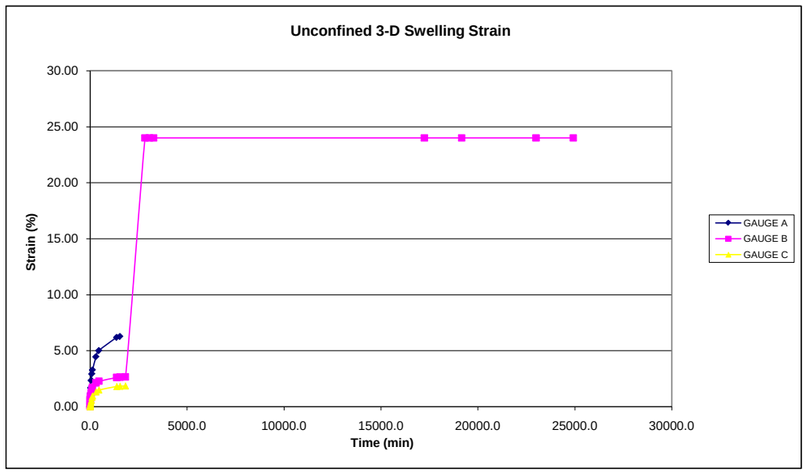


3-D SWELLING TEST

SAMPLE FORMATION Sidegate Lane

INITIAL SAMPLE HEIGHT A (mm)	50.35	**INITIAL SAMPLE WEIGHT (g)**	209.45
INITIAL SAMPLE HEIGHT B (mm)	49.02	**SATURATED SAMPLE WEIGHT (g)**	229.16
INITIAL SAMPLE HEIGHT C (mm)	50.07	**DRY SAMPLE WEIGHT (g)**	164.66
		INITIALMOISTURE CONTENT (%)	
		FINAL MOISTURE CONTENT (%)	

TIME	ELAPSED TIME (HOURS)	ELAPSED TIME (MINS)	GAUGE A GAUGE READING 1	GAUGE A GAUGE READING 2	GAUGE A GAUGE READING 3	GAUGE A CORRECTED READING (mm)	DISPLACEMENT (mm)	STRAIN (%)	GAUGE B GAUGE READING 1	GAUGE B GAUGE READING 2	GAUGE B GAUGE READING 3	GAUGE B CORRECTED READING (mm)	DISPLACEMENT (mm)	STRAIN (%)	GAUGE C GAUGE READING 1	GAUGE C GAUGE READING 2	GAUGE C GAUGE READING 3	GAUGE C CORRECTED READING (mm)	DISPLACEMENT (mm)	STRAIN (%)
25/05/2005 10:07:00	0:00:00	0.0	22	7	7	4.4770	0.00	0.00	17	0	0	3.4000	0.00	0.00	19	14	0	3.9400	0.00	0.00
25/05/2005 10:07:30	0:00:30	0.5	22	14	0	4.5400	0.06	0.13	17	4	0	3.4400	0.04	0.08	19	14	5	3.9450	0.00	0.01
25/05/2005 10:08:00	0:01:00	1.0	22	18	2	4.5820	0.11	0.21	17	5	3	3.4530	0.05	0.11	19	15	1	3.9510	0.01	0.02
25/05/2005 10:09:00	0:02:00	2.0	23	7	9	4.6790	0.20	0.40	18	5	4	3.6540	0.25	0.52	19	16	3	3.9630	0.02	0.05
25/05/2005 10:11:00	0:04:00	4.0	23	14	8	4.7480	0.27	0.54	18	11	8	3.7180	0.32	0.65	19	19	0	3.9900	0.05	0.10
25/05/2005 10:12:00	0:05:00	5.0	23	18	4	4.7840	0.31	0.61	18	13	0	3.7300	0.33	0.67	20	0	1	4.0010	0.06	0.12
25/05/2005 10:17:00	0:10:00	10.0	24	14	0	4.9400	0.46	0.92	18	17	3	3.7730	0.37	0.76	20	4	6	4.0460	0.11	0.21
25/05/2005 10:22:00	0:15:00	15.0	25	5	8	5.0580	0.58	1.15	19	0	7	3.8070	0.41	0.83	20	7	7	4.0770	0.14	0.27
25/05/2005 10:37:00	0:30:00	30.0	26	12	1	5.3210	0.84	1.68	19	8	3	3.8830	0.48	0.99	20	13	7	4.1370	0.20	0.39
25/05/2005 11:04:00	0:57:00	57.0	28	5	4	5.6540	1.18	2.34	20	0	8	4.0080	0.61	1.24	21	3	0	4.2300	0.29	0.58
25/05/2005 11:37:00	1:30:00	90.0	29	14	6	5.9460	1.47	2.92	20	17	4	4.1740	0.77	1.58	21	16	1	4.3610	0.42	0.84
25/05/2005 12:07:00	2:00:00	120.0	30	12	3	6.1230	1.65	3.27	21	4	8	4.2480	0.85	1.73	22	2	4	4.4240	0.48	0.96
25/05/2005 15:07:00	5:00:00	300.0	33	11	9	6.7190	2.24	4.45	22	3	8	4.4380	1.04	2.12	23	0	6	4.6060	0.67	1.32
25/05/2005 17:37:00	7:30:00	450.0	34	19	6	6.9960	2.52	5.00	22	11	3	4.5130	1.11	2.27	23	9	2	4.6920	0.75	1.49
26/05/2005 09:00:00	22:53:00	1373	37	19	4	7.5940	3.12	6.19	23	7	8	4.6780	1.28	2.61	24	5	4	4.8540	0.91	1.82
26/05/2005 11:48:00	25:41:00	1541	38	3	4	7.6340	3.16	6.27	23	8	7	4.6870	1.29	2.63	24	6	3	4.8630	0.92	1.83
26/05/2005 16:30:00	30:23:00	1823							23	10	1	4.7010	1.30	2.65	24	7	6	4.8760	0.94	1.86
27/05/2005 09:15:00	47:08:00	2828						23	13	0	4.7300	1.33	2.71	24	10	4	4.9040	0.96	1.91	
27/05/2005 13:04:00	50:57:00	3057						23	13	0	4.7300	1.33	2.71	24	10	7	4.9070	0.97	1.92	
27/05/2005 16:43:00	54:36:00	3276						23	13	4	4.7340	1.33	2.72	24	11	0	4.9100	0.97	1.93	
06/06/2005 09:30:00	287:23:00	17243						24	0	0	4.8000	1.40	2.86	24	14	9	4.9490	1.01	2.00	
07/06/2005 17:30:00	319:23:00	19163						24	0	6	4.8060	1.41	2.87	24	15	0	4.9500	1.01	2.01	
10/06/2005 09:30:00	383:23:00	23003						24	1	4	4.8140	1.41	2.88	24	15	2	4.9520	1.01	2.01	
11/06/2005 17:30:00	415:23:00	24923						24	2	3	4.8230	1.42	2.90	24	15	6	4.9560	1.02	2.02	

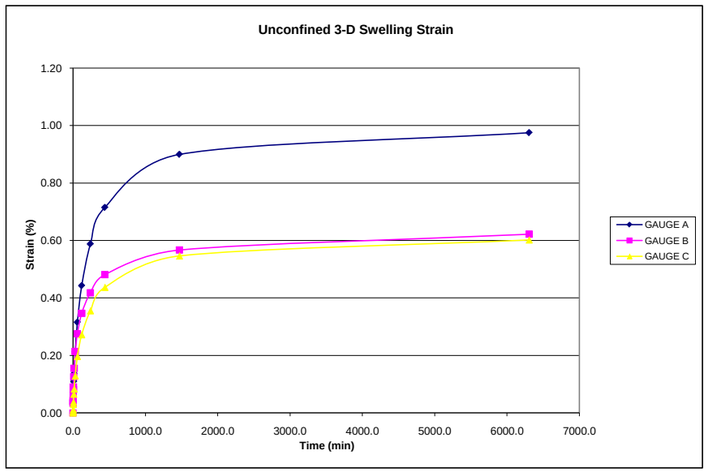


3-D SWELLING TEST

SAMPLE FORMATION **Dimmer 1**

INITIAL SAMPLE HEIGHT A (mm)	50.35	**INITIAL SAMPLE WEIGHT (g)**	230.34
INITIAL SAMPLE HEIGHT B (mm)	49.02	**SATURATED SAMPLE WEIGHT (g)**	234.95
INITIAL SAMPLE HEIGHT C (mm)	50.07	**DRY SAMPLE WEIGHT (g)**	179
		INITIALMOISTURE CONTENT (%)	
		FINAL MOISTURE CONTENT (%)	

TIME	ELAPSED TIME (HOURS)	ELAPSED TIME (MINS)	GAUGE A READING 1	GAUGE A READING 2	GAUGE A READING 3	GAUGE A CORRECTED READING (mm)	DISPLACEMENT (mm)	STRAIN (%)	GAUGE B READING 1	GAUGE B READING 2	GAUGE B READING 3	GAUGE B CORRECTED READING (mm)	DISPLACEMENT (mm)	STRAIN (%)	GAUGE C READING 1	GAUGE C READING 2	GAUGE C READING 3	GAUGE C CORRECTED READING (mm)	DISPLACEMENT (mm)	STRAIN (%)
16/06/2005 10:13:00	0:00:00	0.0	18	6	3	3.6630	0.00	0.00	20	10	9	4.1090	0.00	0.00	18	16	9	3.7690	0.00	0.00
16/06/2005 10:13:30	0:00:30	0.5	18	7	8	3.6780	0.01	0.03	20	12	6	4.1260	0.02	0.03	18	17	1	3.7710	0.00	0.00
16/06/2005 10:14:00	0:01:00	1.0	18	8	0	3.6800	0.02	0.03	20	12	9	4.1290	0.02	0.04	18	17	2	3.7720	0.00	0.01
16/06/2005 10:15:00	0:02:00	2.0	18	8	5	3.6850	0.02	0.04	20	13	7	4.1370	0.03	0.06	18	17	5	3.7750	0.01	0.01
16/06/2005 10:17:00	0:04:00	4.0	18	9	6	3.6960	0.03	0.07	20	14	9	4.1490	0.04	0.08	18	18	4	3.7840	0.02	0.03
16/06/2005 10:18:00	0:05:00	5.0	18	9	9	3.6990	0.04	0.07	20	15	3	4.1530	0.04	0.09	18	18	8	3.7880	0.02	0.04
16/06/2005 10:23:00	0:10:00	10.0	18	11	8	3.7180	0.05	0.11	20	17	1	4.1710	0.06	0.13	19	0	2	3.8020	0.03	0.07
16/06/2005 10:28:00	0:15:00	15.0	18	13	2	3.7320	0.07	0.14	20	18	5	4.1850	0.08	0.16	19	1	1	3.8110	0.04	0.08
16/06/2005 10:43:00	0:30:00	30.0	18	17	0	3.7700	0.11	0.21	21	1	4	4.2140	0.11	0.21	19	3	4	3.8340	0.06	0.13
16/06/2005 11:13:00	1:00:00	60.0	19	2	2	3.8220	0.16	0.32	21	4	4	4.2440	0.14	0.28	19	6	8	3.8680	0.10	0.20
16/06/2005 12:13:00	2:00:00	120.0	19	8	6	3.8860	0.22	0.44	21	7	9	4.2790	0.17	0.35	19	10	6	3.9060	0.14	0.27
16/06/2005 14:13:00	4:00:00	240.0	19	15	9	3.9590	0.30	0.59	21	11	4	4.3140	0.21	0.42	19	14	8	3.9480	0.18	0.36
16/06/2005 17:33:00	7:20:00	440.0	20	2	3	4.0230	0.36	0.71	21	14	5	4.3450	0.24	0.48	19	18	9	3.9890	0.22	0.44
17/06/2005 10:43:00	24:30:00	1470.0	20	11	6	4.1160	0.45	0.90	21	18	7	4.3870	0.28	0.57	20	4	4	4.0440	0.27	0.55
20/06/2005 19:15:00	105:02:00	6302.0	20	15	4	4.1540	0.49	0.98	22	1	4	4.4140	0.31	0.62	20	7	2	4.0720	0.30	0.60

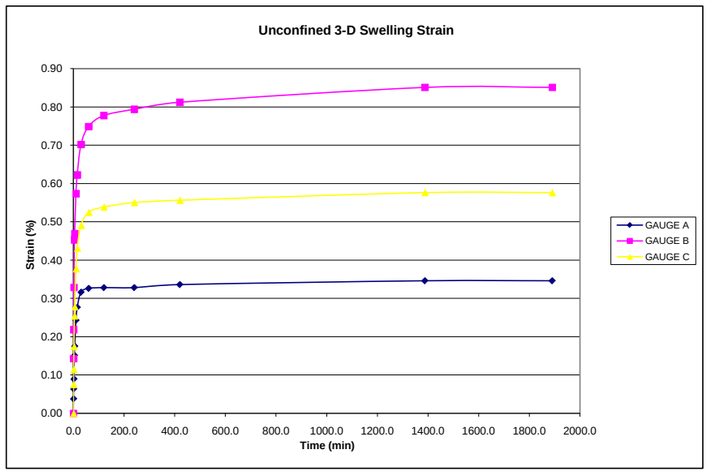


3-D SWELLING TEST

SAMPLE FORMATION	**Blockley**

INITIAL SAMPLE HEIGHT A (mm)	50.35	**INITIAL SAMPLE WEIGHT (g)**	231.96
INITIAL SAMPLE HEIGHT B (mm)	49.02	**SATURATED SAMPLE WEIGHT (g)**	241.8
INITIAL SAMPLE HEIGHT C (mm)	50.07	**DRY SAMPLE WEIGHT (g)**	209.26
		INITIALMOISTURE CONTENT (%)	
		FINAL MOISTURE CONTENT (%)	

TIME	ELAPSED TIME (HOURS)	ELAPSED TIME (MINS)	GAUGE A GAUGE READING 1	GAUGE A GAUGE READING 2	GAUGE A GAUGE READING 3	GAUGE A CORRECTED READING (mm)	GAUGE A DISPLACEMENT (mm)	GAUGE A STRAIN (%)	GAUGE B GAUGE READING 1	GAUGE B GAUGE READING 2	GAUGE B GAUGE READING 3	GAUGE B CORRECTED READING (mm)	GAUGE B DISPLACEMENT (mm)	GAUGE B STRAIN (%)	GAUGE C GAUGE READING 1	GAUGE C GAUGE READING 2	GAUGE C GAUGE READING 3	GAUGE C CORRECTED READING (mm)	GAUGE C DISPLACEMENT (mm)	GAUGE C STRAIN (%)
20/06/2005 10:02:00	0:00:00	0.0	21	10	2	4.3020	0.00	0.00	19	8	6	3.8860	0.00	0.00	20	6	8	4.0680	0.00	0.00
20/06/2005 10:02:30	0:00:30	0.5	21	12	1	4.3210	0.02	0.04	19	15	6	3.9560	0.07	0.14	20	10	6	4.1060	0.04	0.08
20/06/2005 10:03:00	0:01:00	1.0	21	13	4	4.3340	0.03	0.06	19	19	3	3.9930	0.11	0.22	20	12	6	4.1260	0.06	0.12
20/06/2005 10:04:00	0:02:00	2.0	21	14	7	4.3470	0.04	0.09	20	4	7	4.0470	0.16	0.33	20	15	6	4.1560	0.09	0.17
20/06/2005 10:06:00	0:04:00	4.0	21	17	8	4.3780	0.08	0.15	20	10	8	4.1080	0.22	0.45	20	19	6	4.1960	0.13	0.25
20/06/2005 10:07:00	0:05:00	5.0	21	19	0	4.3900	0.09	0.17	20	11	6	4.1160	0.23	0.47	21	0	8	4.2080	0.14	0.28
20/06/2005 10:12:00	0:10:00	10.0	22	2	4	4.4240	0.12	0.24	20	16	7	4.1670	0.28	0.57	21	5	8	4.2580	0.19	0.38
20/06/2005 10:17:00	0:15:00	15.0	22	4	1	4.4410	0.14	0.28	20	19	1	4.1910	0.31	0.62	21	8	5	4.2850	0.22	0.43
20/06/2005 10:32:00	0:30:00	30.0	22	6	1	4.4610	0.16	0.32	21	3	0	4.2300	0.34	0.70	21	11	5	4.3150	0.25	0.49
20/06/2005 11:02:00	1:00:00	60.0	22	6	6	4.4660	0.16	0.33	21	5	3	4.2530	0.37	0.75	21	13	2	4.3320	0.26	0.52
20/06/2005 12:02:00	2:00:00	120.0	22	6	7	4.4670	0.17	0.33	21	6	7	4.2670	0.38	0.78	21	13	9	4.3390	0.27	0.54
20/06/2005 14:02:00	4:00:00	240.0	22	6	7	4.4670	0.17	0.33	21	7	5	4.2750	0.39	0.79	21	14	5	4.3450	0.28	0.55
20/06/2005 17:02:00	7:00:00	420.0	22	7	1	4.4710	0.17	0.34	21	8	4	4.2840	0.40	0.81	21	14	8	4.3480	0.28	0.56
21/06/2005 09:10:00	23:08:00	1388.0	22	7	6	4.4760	0.17	0.35	21	10	3	4.3030	0.42	0.85	21	15	8	4.3580	0.29	0.58
21/06/2005 17:33:00	31:31:00	1891.0	22	7	6	4.4760	0.17	0.35	21	10	3	4.3030	0.42	0.85	21	15	8	4.3580	0.29	0.58



3-D SWELLING TEST

SAMPLE FORMATION Southam

INITIAL SAMPLE HEIGHT A (mm)	50.35	**INITIAL SAMPLE WEIGHT (g)**	263.45
INITIAL SAMPLE HEIGHT B (mm)	49.02	**SATURATED SAMPLE WEIGHT (g)**	268.09
INITIAL SAMPLE HEIGHT C (mm)	50.07	**DRY SAMPLE WEIGHT (g)**	242.51
		INITIALMOISTURE CONTENT (%)	
		FINAL MOISTURE CONTENT (%)	

TIME	ELAPSED TIME (HOURS)	ELAPSED TIME (MINS)	GAUGE A GAUGE READING 1	GAUGE A GAUGE READING 2	GAUGE A GAUGE READING 3	GAUGE A CORRECTED READING (mm)	GAUGE A DISPLACEMENT (mm)	GAUGE A STRAIN (%)	GAUGE B GAUGE READING 1	GAUGE B GAUGE READING 2	GAUGE B GAUGE READING 3	GAUGE B CORRECTED READING (mm)	GAUGE B DISPLACEMENT (mm)	GAUGE B STRAIN (%)	GAUGE C GAUGE READING 1	GAUGE C GAUGE READING 2	GAUGE C GAUGE READING 3	GAUGE C CORRECTED READING (mm)	GAUGE C DISPLACEMENT (mm)	GAUGE C STRAIN (%)
24/06/2005 10:17:00	0:00:00	0.0	3	4	0	0.6400	0.00	0.00	21	8	4	4.2840	0.00	0.00	19	19	4	3.9940	0.00	0.00
24/06/2005 10:17:30	0:00:30	0.5	3	5	4	0.6540	0.01	0.03	21	8	5	4.2850	0.00	0.00	20	1	2	4.0120	0.02	0.04
24/06/2005 10:18:00	0:01:00	1.0	3	6	2	0.6620	0.02	0.04	21	8	6	4.2860	0.00	0.00	20	1	8	4.0180	0.02	0.05
24/06/2005 10:19:00	0:02:00	2.0	3	9	4	0.6940	0.05	0.11	21	9	0	4.2900	0.01	0.01	20	3	2	4.0320	0.04	0.08
24/06/2005 10:21:00	0:04:00	4.0	3	14	0	0.7400	0.10	0.20	21	9	5	4.2950	0.01	0.02	20	4	5	4.0450	0.05	0.10
24/06/2005 10:22:00	0:05:00	5.0	3	16	0	0.7600	0.12	0.24	21	9	7	4.2970	0.01	0.03	20	5	0	4.0500	0.06	0.11
24/06/2005 10:27:00	0:10:00	10.0	4	6	0	0.8600	0.22	0.44	21	10	8	4.3080	0.02	0.05	20	6	2	4.0620	0.07	0.14
24/06/2005 10:32:00	0:15:00	15.0	4	11	8	0.9180	0.28	0.55	21	11	8	4.3180	0.03	0.07	20	7	0	4.0700	0.08	0.15
24/06/2005 10:47:00	0:30:00	30.0	5	4	5	1.0450	0.41	0.80	21	13	7	4.3370	0.05	0.11	20	8	1	4.0810	0.09	0.17
24/06/2005 11:17:00	1:00:00	60.0	6	3	4	1.2340	0.59	1.18	21	15	2	4.3520	0.07	0.14	20	9	0	4.0900	0.10	0.19
24/06/2005 12:17:00	2:00:00	120.0	6	17	6	1.3760	0.74	1.46	21	16	4	4.3640	0.08	0.16	20	9	8	4.0980	0.10	0.21
24/06/2005 14:17:00	4:00:00	240.0	7	17	3	1.5730	0.93	1.85	21	17	8	4.3780	0.09	0.19	20	10	3	4.1030	0.11	0.22
24/06/2005 17:17:00	7:00:00	420.0	8	11	7	1.7170	1.08	2.14	21	18	8	4.3880	0.10	0.21	20	11	6	4.1160	0.12	0.24
25/06/2005 09:45:00	23:28:00	1408.0	8	17	0	1.7700	1.13	2.24	22	0	5	4.4050	0.12	0.25	20	12	1	4.1210	0.13	0.25