Norwest Holst

Ground Investigation Report

NR/SR/F10895 APRIL 1998

GROUND INVESTIGATION

M4 RELIEF ROAD

FOR

THE WELSH OFFICE

Consulting Engineer
Ove Arup and Partners

VOLUME 1

Norwest Holst Soil Engineering Ltd

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VOLUME 1

AGS ASSOCIATION OF GEOTECHNICAL SPECIALISTS
FPS FEDERATION OF PILING SPECIALISTS
BRITISH DRILLING ASSOCIATION LTD
NAMAS TESTING No. 1265 SI
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M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

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NOTES ON GROUND INVESTIGATION PROCEDURE

The following notes should be read in conjunction with the report. Any modifications to the procedures outlined below are indicated in the main text.

GENERAL

The recommendations made and opinions expressed in the Report are based on the Exploratory Hole Records, an examination of samples and the results of insitu and laboratory testing. Whilst the report may express an opinion on a possible configuration of strata, both between exploratory hole positions and below the maximum depth of the investigation, this is for guidance only and being an estimate its accuracy cannot be guaranteed.

BORING TECHNIQUE

Unless otherwise stated, the light cable percussion technique of soft ground boring has been employed. Whilst this particular drilling technique allows the maximum data to be obtained on strata conditions, a degree of mixing of some layered soils (e.g. thin layers of coarse and fine granular material) is inevitable. Specific attention is drawn to this factor where evidence of such a condition is available.

GROUNDWATER

The groundwater conditions entered on the exploratory hole records are those encountered at the time of the investigation. These however, may not represent the actual conditions or those which may apply in large excavations. The normal rate of boring does not always permit the recording of an equilibrium water level for any one water strike, particularly because the entry of water into a borehole may be reduced or even eliminated due to casing off a water bearing layer or due to a skin being formed on the borehole wall by the drilling tools. It is also pointed out that groundwater conditions may vary seasonally and/or tidally and that the water levels as shown at

the time of investigation should not necessarily be taken as being constant because they may be subject to fluctuations.

ROUTINE SAMPLING

'Undisturbed' samples of predominantly cohesive soils are obtained in a 102mm diameter open drive sampler, complying with the requirements of the British Standard Code of Practice B.S. 5930, although it should be appreciated that no sample can be truly undisturbed. Unless otherwise stated in the main text, disturbed soils samples may not be at their natural water content.

INSITU DYNAMIC PENETRATION TESTS

These tests are generally employed where undisturbed samples cannot be obtained, e.g. in granular soils, fill, rock etc., in order to gain an indication of the insitu density, compaction or hardness. Inherent difficulties are present in obtaining true "N" values in water bearing granular deposits, and in lieu of other more expensive forms of testing, these must be regarded as useful guides and not as absolute values.

ROTARY DRILLING

Examination of rock cores obtained by rotary drilling generally enables bedding planes, fissuring, consistency etc. to be observed but does not necessarily reveal the presence of vertical fissures or joints.

TOPSOIL

The term "TOPSOIL" is used to describe the upper, usually organic layer, including turf, subsoil, organic filling weathered material with roots etc., and should not be taken to imply agricultural soils suitable for re-use.

MADE GROUND

The term "MADE GROUND" is used to describe all artificially deposited superficial materials. Unless specifically stated to the contrary, tests are limited to determining the acidity and sulphate content in so far as these may be considered deleterious to buried concrete. There are many other substances, of either a chemical or a biological nature, which can be found in artificial deposits and which may pose an environmental risk, but it is emphasised that consideration or identification of such material is beyond the scope of this report.

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GROUND INVESTIGATION

M4 RELIEF ROAD

1.0 INTRODUCTION

1.1 General

It is proposed to construct a relief road to the existing M4 Motorway. The proposed route is approximately 23kms long from Junction 23 (Magor) to Junction 29 (Castleton) off the existing M4 around the south of Newport. The scheme is expected to comprise a three lane dual carriageway.

In order to determine the subsurface conditions a ground investigation was undertaken comprising the formation of 87 cable percussive boreholes, of these 30 were extended by rotary coring techniques, 50 boreholes formed by rotary coring techniques only, 15 rotary open holes to facilitate groundwater monitoring installations and 11 machine dug trial pits. Geophysical surveying was also undertaken at specific locations along the route.

The investigation was commenced in mid October 1997 by Norwest Holst Soil Engineering Limited and carried out to the instructions of Ove Arup and Partners (The Engineer), acting for the Welsh Office (the Client).

1.2 Scope of the Investigation

This report is presented as a factual record of the fieldworks undertaken, the ground conditions encountered and the results of laboratory testing.

We understand our brief to comprise the following items related to the factual report:-

- Carry out exploratory holes on site
- Supervise site works
- Install groundwater monitoring points
- Monitor on-site installations
- Determine subsurface ground conditions
- Undertake and design certain elements of the geophysical surveying
- Carry out laboratory testing

2.0 SITE LOCATION AND DESCRIPTION

The site is approximately 23kms long running from Magor in the east to Castleton in the west. The majority of the route traverses the River Severn estuarine alluvial levels on both sides of the River Usk where it passes through the Newport Docks and where it will also cross the River Ebbw.

The route is mostly comprised of low lying level fields generally left for grazing, these fields were generally soft and poorly drained. The extremities were higher in relief, around Magor the fields were also generally for grazing and afforded reasonable access as the fields were well drained. In the Castleton area the terrain was notably undulating and the fields utilised for a mix of arable and grazing purposes. Centrally where it crossed the River Usk, south of Newport, the land is industrialised.

3.0 DESK STUDY

3.1 General

No formal desk study was requested for this investigation and therefore only published geological maps and books have been consulted.

3.2 Published Geological Maps

From the available information on the one inch to one mile Geological Survey maps of the area (Sheets 249, Newport and 250, Chepstow, Solid and Drift Editions) the eastern end of the site around Magor is shown to be underlain by the second and third River Severn river terrace deposits overlying the Tintern Sandstone Group of Devonian Age and in parts over the Dolomitic Conglomerate of Triassic Age and Linestones of the Carboniferous Period.

Across the levels on both sides of the River Usk the site is shown to be underlain by Estuarine Alluvium overlying Mercia Mudstone of Triassic Age. Around Castleton, in the west, Moranic Drift is shown to overlie the St Maughans Group of Devonian Age.

4.0 FIELDWORKS

4.1 General

The scope and siting of the fieldworks was specified by the Engineer. Norwest Holst had responsibility for the setting out and carrying out of all exploratory holes and for undertaking and partially determining the geophysical investigation. The fieldworks were essentially undertaken between the 13th October and 19th December 1997.

4.2 Inspection Pits

In order to prove the absence of buried services or to identify the precise location of buried services a hand dug inspection pit was excavated to a depth of 1.20m at a number of the borehole positions.

4.3 Cable Percussive Boring

A total of 87 boreholes were formed to depths of between 1.1m and 18.20m below ground level using conventional cable percussive boring techniques. The boreholes were formed to provide geotechnical information, obtain samples for laboratory testing and in a number boreholes for the installation of groundwater monitoring points.

A total of 30 of the cable percussive boreholes were subsequently extended into rock using rotary coring techniques.

The boreholes were arranged and located so as to provide a good spread of information with regard subsurface conditions and outline proposals.

102mm diameter undisturbed samples were obtained at regular intervals throughout the boring operations where suitable cohesive materials were encountered. These were sealed with wax to prevent moisture loss and were transported to the laboratory.

In granular materials or where the presence of coarse material prevented the taking of undisturbed samples or where instructed to Standard Penetration Tests were carried out using either a split spoon sampler or a solid 60 degree cone. The results of these tests are given as a Standard Penetration "N" value or as a blow count for given penetration at the appropriate position on the borehole logs.

Representative disturbed samples of all materials encountered were obtained and these were placed in sealed jars or large polythene containers for transport to the laboratory.

A detailed geotechnical description of all strata encountered, groundwater conditions and positions and types of samples taken are included on the borehole logs appended to this report.

4.4 Rotary Drilling

A total of 80 boreholes were formed using rotary coring techniques. Of these 30 were formed as extensions to previously drilled cable percussive boreholes to a maximum depth of 55.65m below ground level. The other 50 boreholes were formed using rotary openhole and coring techniques from ground level.

Standard double swivel tube core barrels of 'S', 'P' and '412' sizes were utilised with an additional semi rigid plastic liner to ensure optimal core recovery and presentations, to produce cores of nominal 112mm, 92mm and 76mm diameter respectively. Compressed air or air mist were used as drilling flush.

Attempts were made in several of the boreholes in the Castleton and Magor areas to orientate each vertical core run with respect to "North". However the nature of the strata often caused this to be unsuccessful. The strata were sometimes; impractical to score/scribe and/or they caused the inner core barrel to rotate during coring prohibiting any referencing of the core to a compass direction. Where successfully orientated and discernable discontinuity features exist these are recorded on the appended borehole record sheets.

Details of the strata encountered are given on the borehole log along with the geologist's assessment of Total Core Recovery (TCR), Solid Core Recovery (SCR) and Rock Quality Designation (RQD) each expressed as a percentage of the individual core runs.

The symbols and abbreviations used on the rotary borehole logs are explained in the key at the bottom of the tabular information supplementary sheet (Header Sheet). It is considered however that the meaning of the abbreviations NI and NA (not shown in the key) needs further clarification. NI denotes material recovered Non Intact and applies to material that has numerous fractures or incipient fractures and which is either naturally broken up or which becomes broken up by drilling activities. The result in both cases is that the core is recovered in a highly fragmented state, generally as a gravel. This should not be confused with a fracture index of >25, as this indicates core dissected by many natural fractures (greater than 25 per metre) but still with coherent core between each fracture. The term NA is the abbreviation for Not Applicable and refers to any materials to which determination of a fracture index would be inappropriate, i.e for clay bands.

Engineers' and drillers' descriptions of all the strata encountered in each borehole are given on the borehole logs appended to this report (Appendix One). The cores were also photographed and sub sampled for laboratory rock testing.

4.5 Trial Pits

A total of eleven trial pits were excavated using a backhoe mechanical digger to depths of between 1.0m and 3.0m. These trial pits were located on the site to obtain samples from areas of proposed cuttings for laboratory testing and to observe the ground conditions.

The trial pits were not shored and were logged by a engineering geologist from samples recovered from the JCB bucket. The engineering geologist provided a detailed

description of the ground conditions encountered in each pit and also obtained soil samples at regular intervals for laboratory testing as reported on the Trial Pit Logs included in Appendix One..

4.6 Geophysical Survey

Geophysical surveying was undertaken by specialist geophysicists "Terradat (UK) Ltd" comprising a Microgravity Survey (at Magor), a trial Seismic Reflection Survey (at Castleton), Vertical Down Hole Seismic Profiling (at Castleton and Magor), Resistivity and Conductivity Surveys (at Castleton). The results and full details of the work undertaken are given in the factual and interpretative report by the specialist sub-contractors and are included as an addendum to this report, Appendix Two.

4.7 In-situ Testing

4.7.1 In-Situ Vane

In boreholes D2, E3, E6, H4, J1, J2, K3, L3 and M3 the Engineer required that in-situ vane testing was undertaken. These tests were performed in accordance with BS 1377, Part 9, 4.4. The results of these tests are included in a summary and individually in Appendix Two of this report.

4.7.2 Variable Head Permeability Tests

The engineer requested that both falling and rising head permeability tests be undertaken in boreholes B3, B4, B7A, B9A, B10A and B14. These tests were carried out in accordance with the method described in BS 5930 (1981) pages 34-38.

The results of these tests are included in Appendix Two of this report.

4.8 Installations

4.8.1 Plastic Casing

Into a number of the boreholes in Castleton and Magor, a 110mm diameter HDPE tube was installed. This tubing was grouted into the boreholes using cement bentonite grout. These tubes were installed to facilitate the undertaking of the Vertical Seismic Profiling, as reported within the geophysics report as given in Appendix Two.

4.8.2 Standpipe Piezometers

Into a number of the boreholes 19mm diameter UPVC tube was installed. This tube was either slotted or had a porous element attached at its base within a sand filter pack. The sand filter pack was isolated within a discrete horizon by bentonite seals. Protective metal covers either upstanding or flush stopcock type were cemented into place on each of the installations.

Full details of the installations constructed within individual boreholes are given on the appropriate borehole logs.

4.9 Monitoring

The Engineer required the installations to be monitored weekly after commissioning for the duration of the siteworks. The monitoring records are included in appendix Two of this report.

5.0 LABORATORY TESTING

5.1 General

All laboratory testing both geotechnical and chemical (contamination) was scheduled by the Engineer.

5.2 Soils Testing

A programme of laboratory testing was carried out in accordance with B.S. 1377 (1990) "Methods of Test for Soils for Civil Engineering Purposes". All testing was carried out at the Leeds Laboratory of Norwest Holst Soil Engineering Ltd which is registered as a NAMAS TESTING laboratory No 1265.

The results of these tests are given in the attached summary sheets and individual test plots presented in Appendix Three:-

B.S. TEST NO.	DESCRIPTION
Part 2:3	Moisture Content
Part 2:4,5	Atterberg Limits
Part 2:8	Particle Density
Part 2:9	Particle Size Distribution
Part 3:5 & 9	Sulphate Content & pH values
Part 4:3	Dry Density/Moisture Content Relationship
Part 4:5	Moisture Condition Value
Part 4:7	California Bearing Ratio
Part 5:3	One Dimensional Consolidation Properties
Part 7:3	Laboratory Vane
Part 7:4	Shearbox (small)

B.S. TEST NO.	DESCRIPTION
Part 7:7	Unconfined Compressive Strength
Part 7:8	Undrained Triaxial Compression
Part 7:9	Triaxial Compression Undrained Multistage
Part 8:7	Consolidated - Undrained Triaxial Compression Test with Measurement of Pore Pressure

and also Point Load Tests, 10% fines, slake durability and aggregate impact value testing was carried out as per "Rock Characteristics Testing and Monitoring ", editor E T Brown, Part 2, International Society for Rock Mechanics, 1981.

5.3 Contamination Testing

A programme of contamination testing was scheduled by the Engineer. A total of twenty five soil samples were sent to our specialist chemical laboratories at ECoS Environmental Control Systems Ltd of Halifax.

See references and methods, the following determinants being tested for:-

DETERMINANT	REFERENCES
Arsenic (Total)	1, 2, 11, 12
Boron (Available)	3, 4
Cadmium (Total)	2, 5, 13
Chromium (Total)	2, 5
Copper (Total)	2, 5, 14
Total Cyanide	1
Ferro/Ferricyanide	1

DETERMINANT	REFERENCES
Free Cyanide	1
Thiocyanate	1
Lead (Total)	2, 5, 15
Mercury	6
Mineral Oils	1
Nickel (Total)	2, 5
pH	7, 17
Phenols	19
Phenol Monohydric	20
Polycromatic Hydro Carbons	21
Selenium	1
Total Sulphate	A
Sulphate (2:1 soil/water extract)	A
Sulphide	22
Free Sulphur	8, 24
Toluene Extractable Matter	23
Zinc (Total)	2, 5, 18
Pentachlorophenol (PCP)	9
Polychlorinate Biphenyls (PCBS)	9
Organic Compounds Scan (VOC)	9

(Specification references follow this text)

The results of the contamination testing are presented in Appendix Three of this report.

6.0 RESULTS OF THE INVESTIGATION

6.1 General

The results of this investigation appear to broadly concur with the published geology.

The following sections provide a brief summary of the ground conditions encountered during this investigation, whilst the logs appended to the report give a detailed account of all the strata observed.

The names of geological units referred to have been derived from an assessment of the strata descriptions and regional geology. At some locations, the geological formation is complex and descriptions of different geological units are similar. No responsibility is accepted for the geological units being inaccurate.

6.2 Castleton Area

In this area a variable thickness from 0.2m to 7.9m of stiff boulder clay (Morganic drift deposits) overlying highly weathered reddish brown mudstone and sandstones (St Maughans Group) were found. Groundwater levels were locally variable, some horizons having deep standing water levels and others very shallow or occasionally artesian.

6.3 The Levels

This extensive section of the route generally had a sequence of very soft clays, organic clays and peats (Estuarine Alluvium) overlying sands and gravels (Fluvial Alluvium) which in turn overlie reddish brown mudstones (Mercia Mudstone).

An accurate assessment of the individual weathering zones for the Mercia Mudstone Group could not be successfully undertaken since much of the data used to categorise

individual zones conflicted with other data available. Consequently, the exploratory hole logs do not show separate weathering zones for the Mercia Mudstone Group.

Around the docks areas (Rivers Usk and Ebbw) relatively greater thicknessess of gravel were encountered within the sequence and it should be noted that in Borehole F2 a large pocket of methane was encountered forcing drilling work to be suspended for a few hours whilst it vented from the borehole to see if concentration and/or flow decreased and to implement safe drilling procedures.

Within the Solutia plant the operatives reported irritation to their exposed skin but the cause of this was not identified by Solutia, no long term effects have been noted by our operatives.

Groundwater levels were generally at shallow depth along much of this section of the route.

6.4 Magor Area

In this area around Magor the boreholes generally encountered bed rock at shallow depth. The general sequence comprises clay (Head deposits) overlying Limestones and Dolomites of the Carboniferous Limestone Group and Marginal Facies of the Mercia Mudstone Group. To the south west of Magor Head deposits were seen to overlie Sandstone and Conglomerates of the Tintern Sandstone Group.

N Raw
Geotechnical Engineer

M.J. Baldwin
Assistant Technical Manager

REFERENCES

A) BS 1377 (1990) Part 3, Clause 5.2.

1) 'Standard Methods of the Examination of Water and Waste Water' 16th Edition (APHA, AWWA, WPLF, 1985).

2) 'Emission Spectrophotometry Multi-Element Methods for Waters, Sediments and Other Materials of Interest to the Water Industry' (HMSO 1980).

3) 'Boron in Waters,, Effluents, Sewage and some Solids' (HMSO 1980).

4) 'Extractable Metals in Soils, Sewage, Sludge-Treated Soil, Sand Related Materials' (HMSO 1982).

5) 'Cadmium, Chromium, Copper, Lead, Nickel and Zinc in Sewage Sludges by Nitric Acid, Atomic Absorption Spectrophotometry' (HMSO 1981).

6) 'Mercury in Waters, Effluents, Soils and Sediments etc. Additional Methods' (HMSO 1985).

7) 'Determination of pH Value of Sludge, Soil, Mud and Sediment, and Lime Requirements of Soil' (HMSO 1977).

8) 'Sulphate in Waters, Effluent and Solids' (HMSO 1979)

9) 'Liquid - Liquid Extraction Gas Chromatographic Method' - Standard Methods for the Examination of Waters and Waste Waters 18th Edition.

10) 'General Principals of Sampling and Accuracy of Results' (HMSO 1980).

11) 'Arsenic in Potable and Sea Waters by Spectrophotometry (arsenomelybdenum blue procedure)' (HMSO 1978).

12) 'Arsenic in Potable Water by Atomic Absorption Spectrophotometry (semi Automatic Method) (HMSO 1982).

13) 'Cadmium in Potable Waters by Atomic Absorption Spectrophotometry' (HMSO 1976).

14) 'Copper in Potable Waters Atomic Absorption Spectrophotometry' (HMSO 1980).

15) 'Lead in Potable Waters Atomic Absorption Spectrophotometry' (HMSO 1976).

16) 'Nickel in Potable Waters' (HMSO 1981).

17) 'The Measurement of Electrical Conductivity and the Laboratory Determination of the pH Value of Natural, Treated and Waste Waters' (HMSO 1978).

18) 'Zinc in Potable Waters by Atomic Absorption Spectrophotometry' (HMSO 1980).

19) Analysis by HPLC-UV as per the British Gas Methodology.

20) Analysis by Colorimetry following reaction with 4-aminoantipyrene (MEWAM 1981).

21) Analysis by GC-FID.

22) Colorimetric determination following steam distillation.

23) Gravimetric determination.

24) Free sulphur (water) analysis by GC-ECD.

APPENDIX ONE
EXPLORATION HOLE LOGS

APPENDIX 1.2:
TERMINOLOGY USED IN SOIL DESCRIPTIONS

1.0 GENERAL PROCEDURES

Soil descriptions contained in this report have been produced in accordance with the procedure and principles given in B.S. 5930 (1981) Section 8 (ref 01). However in some instances a modified or extended approach has been adopted based on the work of Norbury, Child and Spink (ref 02) and this is indicated at appropriate points in the following text.

For a soil description the main soil characteristics should be given in a standard word order although the word order can be adjusted to enhance and clarify if appropriate. The main soil characteristics can be divided as follows:-

(1)	Mass Characteristics	(2)	Material Characteristics
1a)	Field Strength or density	2a)	Colour
1b)	Discontinuities	2b)	Particle shape, grading & composition
1c)	Bedding	2c)	Soil name in capital eg (CLAY)

(3) Geological Formations, age and type of deposit
(4) Classification Soil Group (optional)

For descriptions used in this report the soil colour is placed after the field strength or density ie stiff grey CLAY. Other word order is as described previously.

The basic soil categories covered by the following notes may be broadly summarised as:

(i) Very coarse soils: greater than 60mm in diameter, ie cobbles and boulders.

(ii) Coarse soils: 0.06m to 60mm in diameter, ie sands and gravels.

(iii) Fine soils: less than 0.06mm in diameter, ie clays and silts.

(iv) Organic soils.

(v) Man made "soils".

2.0 MASS CHARACTERISTICS OF SOILS

2.1 Cohesive Soils

For cohesive material the following strength scale is used.

Term	Field Identification	Undrained Shear Strength kN/m²
Very Soft	Can be squeezed through fingers	20
Soft	Easily remoulded by hand	20-40
Firm	Hard to remould by hand	40-75
Stiff	Indented slightly by thumb	75-150
Very Stiff	Indented by thumb nail	150-300
Hard	Can be scratched	>300
N.B Clays with undrained strengths greater than 300 kN/m² can be described as hard clays or as very weak mudstones as suggested by Spink and Norbury.		

2.2 Granular Soils

For granular deposits relative density may only be determined by the standard penetration test (S.P.T). The following table provides a scale of terms related to S.P.T 'N' values (see B.S. 1377:1990).

Term	Field Identification	S.P.T 'N' Values (blows for 300mm penetration)
Very loose	Can be excavated with a spade	0-4
Loose	and 50mm wooden peg can be easily driven	4-10
Medium dense	-	10-30
Dense	Requires pick for excavation	30-50
Very dense	and 50mm wooden peg is hard to drive	over 50
N.B. The field identification terms for very loose/loose material and dense/very dense material are very general and should only be used with caution.		

2.3 Discontinuities

The type of discontinuity should be described eg fissures, faults and shear planes together with their spacing as given in the following table. Discontinuity openness, and surface texture eg rough, smooth, polished, striated should be recorded although this need not always be added to the borehole log if the required level of detail is low.

2.4 Bedding

Bedding spacing is assessed using the thickness terms given in Table One.

TABLE ONE: DESCRIPTIONS FOR DISCONTINUITIES AND BEDDING

DISCONTINUITIES		BEDDING	
Scale of Spacing Term	**Mean Spacing mm**	**Scale of Bedding Term**	**Mean Thickness mm**
Very widely	>2000	Very thickly bedded	>2000
Widely	2000-600	Thickly bedded	2000-600
Medium	600-200	Medium bedded	600-200
Closely	200-60	Thinly bedded	200-60
Very closely	60-20	Very thinly bedded	60-20
Extremely closely	<20	Thickly laminated	20-6
		Thinly laminated	<6
Note: Spacing terms are also used for describing the distance between partings, isolated beds, laminae or roots etc.		Note: Interbedded/interlaminated: alternating layers of different material type. These terms must be given a thickness if material is present in equal proportions. Otherwise the thickness of and spacing between subordinate layers must be defined.	

3.0 MATERIAL CHARACTERISTICS OF SOIL

An examination of insitu soil deposits, disturbed or undisturbed samples allows the material characteristics to be recorded. These characteristics included colour, particle shape, particle grading and particle composition.

3.1 Colour

The recorded colour should be based on the logger's general impression of the overall colour. For material with more than one colour the terms mottled or multicoloured should be used.

White, cream, grey, black, yellow, orange, red, brown, green and blue etc may be used but supplemented as necessary with: light, dark, mottled and reddish brownish etc. All coloration associated with chemical changes should be noted ie grey gleying on fissures.

3.2 Particle Shape

For coarser granular deposits (gravel and cobbles) the particle shape should be described as follows:-

Angularity	Form	Surface Texture
Angular Subangular Subrounded Rounded	Flat Elongated	Rough Smooth
Notes: Form and surface textural descriptors are optional.		

3.3 Principle Soil Type and Secondary Constituents

The main ambiguities in BS 5930 (1981) Section 8 relate to the description of composite soil types. In order to overcome these ambiguities the modifications to BS 5930 proposed by Norbury, Child and Spink (1986) have been adopted as follows:-

3.3.1 Predominantly Coarse Soils

BS 5930 Section 8 recommends that the secondary constituents of coarse soil should in the soil description, precede the main soil type, eg (slightly/-/very) sandy gravel. This can become ambiguous if qualifying adjectives also form part of the description. Norbury et al overcome this by proposing that the secondary constituent may be placed after the main soil type, eg GRAVEL (with a little/some/much) sand as shown in Table Two.

3.3.2 Mixtures of Coarse and Fine Soils

Section 41.3.2.1 of BS 5930 states that mixtures of coarse and fine soils with more than 35% of fine soil (Silt and Clay) shall be described as a clay or silt (fine soil) or they should be described as sand or gravel (coarse soil) ! This could lead to misleading descriptions if strictly adhered to since a material that in engineering terms behaves as a clay may have a clay content as low as 10%. The above approach is therefore not adopted where it would lead to a description which would not reflect the engineering behaviour of the material. For such cases the 35% limit is relaxed.

TABLE TWO: DESCRIPTORS FOR SECONDARY CONSTITUENTS IN COARSE SOILS

Term Before	Principal Term	Term After	Secondary Constituent (Approx %)
Slightly (sandy*)		with a little (sand*) or occasional (cobbles*)	<5
(Sandy*)	SAND, GRAVEL COBBLES OR BOULDERS	with some (sand*) or some (cobbles*)	5-20
Very (Sandy*)		with much (sand) or many (cobbles+) and (sand*) or and (cobbles+)	20-40 50
Notes: Terms may be placed before or after the principal constituents as appropriate. * Fine or coarse soil type as appropriate + Very coarse soil type as appropriate x or described as fine soil depending on mass behaviour			

3.3.3 **Predominantly Fine Soils**

Mixtures of clay and silt are fine soils and BS 5930 suggests that they are classified as either clay or silt based on plasticity. When fine soils present as a secondary constituent have an appreciable influence on mass behaviour the terms 'very silty' and 'very clayey' are exclusively used. As for predominantly coarse soils, secondary constituents may be included after the main soil type in accordance with following table:

TABLE THREE: DESCRIPTORS FOR SECONDARY CONSTITUENTS IN FINE SOILS

Term Before	Principal Term	Term After	Secondary Constituent (Approx %)
Slightly (sandy*)		with a little (sand*)	<35
(Sandy*)	CLAY OR SILT	with some (sand*)	35-65
Very (Sandy*)		with much (sand*)	65+
Notes: Terms may be placed before or after the principal constituents as appropriate. * Coarse soil type as appropriate + or described as coarse soil depending on mass behaviour			

APPENDIX 1.3:
TERMINOLOGY USED IN THE DESCRIPTION AND CLASSIFICATION OF ROCKS

1.0 GENERAL PROCEDURES

Rock descriptions contained in this report have been produced in accordance with the procedure and principles given in BS 5930 (1981) Section 8 (ref 01), with the exception of the description of the weathered state for which the scheme outlined in QJEG (1972) (ref 03) and recommended by Norbury et al (1984) (ref 02) is used.

For rock descriptions the main rock characteristics should be given in a standard word order. The descriptions and classification is therefore based on the following:-

(1) Material Characteristics
1a) Colour
1b) Grain size
1c) Texture
1d) Structure
1e) State of weathering
1f) Rock name (in capitals eg SANDSTONE)
1g) Strength
1h) Other characteristics
(2) Geological Formation
(3) Mass Characteristics
3a) State of weathering
3b) Fracture state
3c) Discontinuities

2.0 MATERIAL CHARACTERISTICS OF ROCK

2.1 Colour

Colour is described according to the scheme for soils (see Appendix 2 and also BS 5930 Section 41.3.2.2).

2.2 Grain Size

The descriptive scheme given in Table 9 of BS 5930 is used together with the accompanying notes in section 44.2.2.

2.3 Texture

A description of rock texture is not normally required but when used refers to the arrangement of individual grains in the rock. Terms which may be used include: porphyritic, crystalline, amorphous and glass. For further guidance refer to BS 5930 section 44.2.3.

2.4 Structure

The descriptive terms for structure cove the inter-relationship of lithology and textural features in the rock. Terms include: bedding, laminated, foliated and banded. The thicknesses of these structures are described by the following terms which also apply to the spacing of Discontinuities (see 4.3).

TABLE ONE: DESCRIPTIVE TERMS FOR STRUCTURE AND DISCONTINUITY SPACING

Structure (eg Bedding, Cleavage)	Discontinuity (eg Joint, Fissure)	Spacing
Very thickly	Very widely (jointed)	> 2m
Thickly (bedded)	Widely (jointed)	0.6m-2m
Medium (bedded)	Medium (jointed)	0.2m-0.6m
Thinly (bedded)	Closely (jointed)	60mm-200mm
Very thinly (bedded)	Very closely (jointed)	200mm-60mm
Laminated	Extremely closely (jointed)	6mm-20mm
Thinly laminated	-	< 6mm

2.5 State of Weathering

The descriptors given in the following table which are based on the scheme given in QJEG (1972) are used for weathering in rock.

TABLE TWO: DESCRIPTORS FOR WEATHERING IN ROCK CORES

Term	Description
Fresh	Parent rock showing no discolouration, loss of strength or any other weathering effect
Slightly weathered	Rock may be slightly discoloured, particularly adjacent to discontinuities, which may be open and will have slightly discoloured surfaces; the intact rock is not noticeably weaker than the fresh rock
Moderately weathered	Rock is discoloured; discontinuities may be open and will have discoloured surfaces with alteration starting to penetrate inwards; intact rock is noticeably weaker, as determined in the field, than the fresh rock. (The ratio of original rock to weathered rock is estimated where possible)
Highly weathered	Rock is discoloured: discontinuities may be open and will have discoloured surfaces and the original fabric of the rock may be altered. Alteration penetrates deeply inwards, but corestones are still present. (The ratio of original rock to weathered rock is estimated where possible)
Completely weathered	Rock is discoloured and changed to a soil but original fabric is mainly preserved. There may be occasional small corestones. The property of the soil depends in part on the nature of the parent rock.
Residual soil	Rock is discoloured and completely changed to a soil in which the original rock fabric is completely destroyed.

2.6 Rock Name

An aid to the identification of rock type is given in Table 9 of BS 5930.

2.7 Strength

The descriptors given in the following table are used to assess rock strength.

TABLE THREE: DESCRIPTORS AND FIELD IDENTIFICATION FOR ROCK STRENGTH

Term	Field Identification	Uniaxial Compressive Strength Range (MN/m^2)
Very weak	Gravel size lumps crushed between finger and thumb	1.25
Weak	Gravel size lumps broken in half by heavy hand pressure	1.25-5
Moderately weak	Thin slabs/corner broken off with heavy hand pressure	5-12.5
Moderately strong	Rock broken by hammer blow when held in hand	12.5-50
Strong	Rock broken by hammer blow when resting on solid surface	50-100
Very strong	Rock chipped by heavy hammer blows	100-200
Extremely strong	Rock rings on hammer blow. Only broken by sledge hammer	200

2.8 Other Characteristics

In formation can include minor constituents as for soils (see Appendix 2) and can included abnormal mineralogy, presence of vugs etc.

3.0 GEOLOGICAL FORMATION

The geological formation, age and type of deposit are only given where this can be done with confidence and where no conjecture is involved.

The names of geological units referred to have been derived from an assessment of the strata descriptions and regional geology. At some locations the geological formation is complex and description of different geological units are similar. No responsibility is accepted for the geological units being inaccurate.

4.0 MASS CHARACTERISTICS

4.1 Weathering Classification for Rock Mass

A draft revision of BS 5930 (1992), Section 8 recognises the original 1981 BS mass weathering classification is unworkable and should be changed as for rock material description. Although the distribution of weathering grades of rock material may be recorded for borehole cores, the distribution of weathering grades of the rock mass from which the cores were obtained has to be inferred. For further guidance see the Draft BS 5930 (1992) Section 44.3.2.

4.2 Fracture State

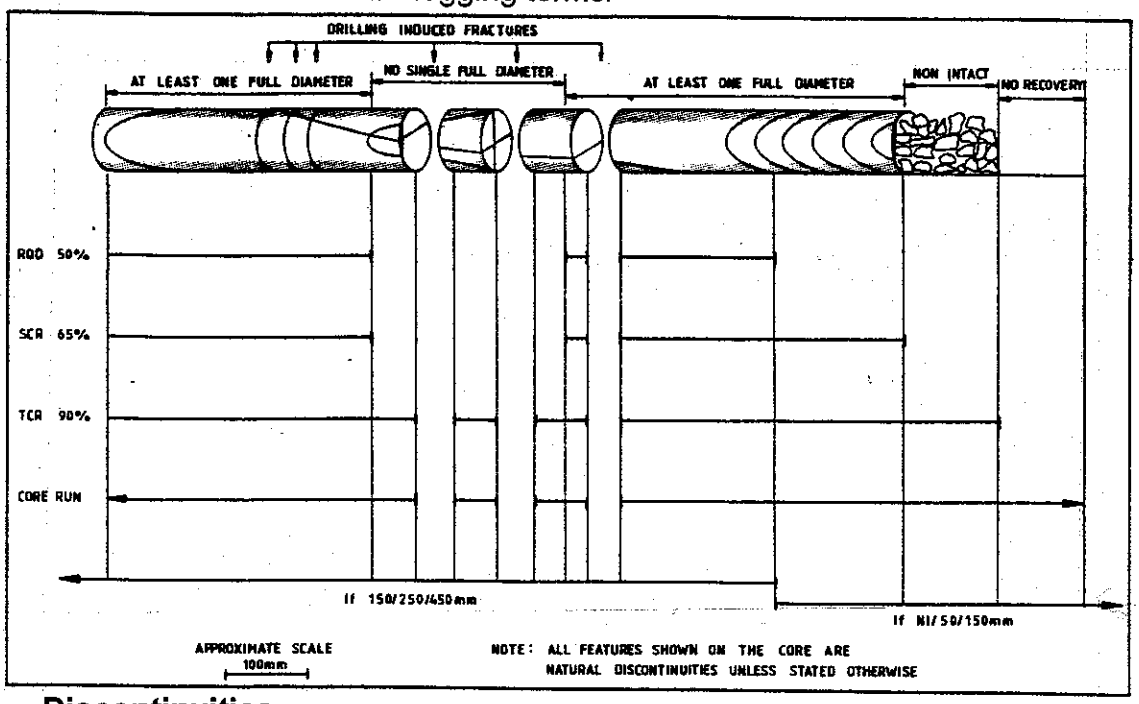
Fracture state is recorded in accordance with the terms detailed in BS 5930 (1981) and is further clarified using the definition of solid core given by Norbury et al (1984) as follows:

Solid core - Core with at least one full diameter (but not necessarily a full circumference) between two natural fractures. By this definition core that has a single set of inclined fractures would have a core recovery of 100%. Where there are two or more sets of non parallel fractures only sections of the core in which the fractures actually intersect are excluded from the solid core.

Based on these definitions the following terms are defined:

Term	Abbreviation	Definition
Total Core Recovery	TCR (%)	The percentage ratio of core recovered (both solid and non-intact) to the total length of core run
Solid Core Recovery	SCR (%)	The percentage of solid core recovered to total length of core run
Rock Quality Designation	RQD(%)	The total length of solid core pieces greater than 100mm between natural fractures expressed as a percentage of total length of core run
Fracture Index	F.I	The number of natural fractures contained within a metre of core of reasonably uniform characteristics. This need not correspond to core runs. (NI) is used to denote non intact fragmented core.

The terms on the previous page may be related to the definitions given in the following schematic illustration of fracture logging terms:



4.3 Discontinuities

Discontinuities are described in terms of type, i.e joint, fissure, fault, vein etc and the spacing detailed in Table One is recorded. The presence or absence of infill material is recorded together with joint roughness as detailed in the following table:

TABLE FOUR: DESCRIPTORS FOR DISCONTINUITY INFILL AND ROUGHNESS

Infill Description	Definition
Clean	No fracture infill material
Stained	Colouration on rock only. No recognisable infill material
Filled or partially filled	Fracture filled with recognisable infill material (which should be described, eg clay, gypsum etc)
Roughness Description	**Definition**
Smooth	Appears smooth and is essentially smooth to the touch. May be slickensided
Slightly rough	Asperities on the fracture surfaces are visible and may be distinctly felt
Medium rough	Asperities on the fracture surfaces are visible and fracture surface abrasive
Rough	Large angular asperities can be seen. Some ridge and high side angle steps evident
Very rough	Near vertical steps can occur on the fracture surfaces

5.0 Geological Formational Weathering Zones

An accurate assessment of the individual stratum's weathering zones within the Mercia Mudstone Group could be not be successfully ascertained since much of the data used to categorise individual zones conflicted with other data available. Consequently, the exploratory hole logs do not show separate weathering zones for the Mercia Mudstone Group.

References:

(01) Code of Practice for Site Investigation, BS 5930. British Standards Institution (Revision Section 8; 1992).

(02) Norbury, D.R, Child, G.H and Spink, T.W 'A Critical Review of Section 8 (BS 5930) - Soil and Rock Description'. Geological Society, Engineering Geology Special Publication No 2, 1986.

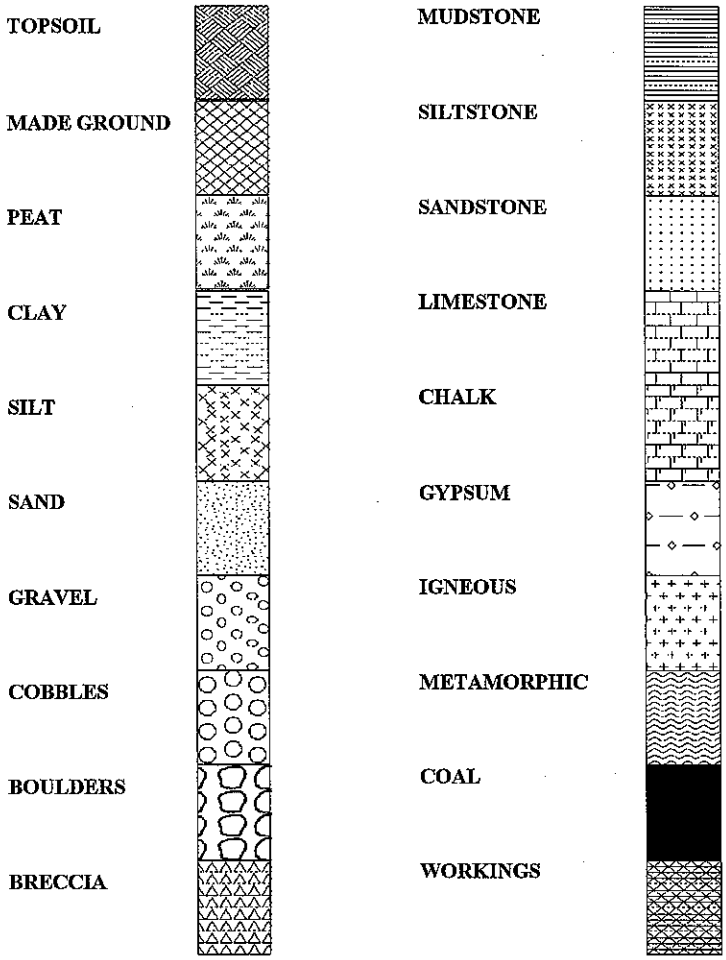
(03) Anon (1970): The logging of cores for engineering purposes. Q. Journ. Engng. Geol. 3, pp 1-24.

BOREHOLE RECORDS

Norwest Holst Soil Engineering Ltd.

EXPLORATION HOLE LOG LEGEND AND NOTATION SHEET

SOIL AND ROCK LEGEND CODES



Where a strata consists of material of more than one soil or rock type the legends are appropriately combined.

LOG NOTATION

U -- Undisturbed U100 Sample
P - Piston Sample
BL - Block Sample
M - Mazier Sample
D -- Disturbed Sample
B -- Bulk Disturbed Sample
W -- Water Sample
V - Vane Test
K - Permeability Test
Pr - Pressuremeter Test
S -- Standard Penetration Test
C -- Cone Penetration Test

NR -- No Recovery
NP -- No Penetration
TCR -- Total Core Recovery
SCR -- Solid Core Recovery
RQD -- Rock Quality Designation
F.I. - Fracture Index
N.A. - Not Applicable
N.I. - Not Intact

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHA1** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	324942.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184060.0 N
		Drilling Rig	Pilcon	Ground Level	58.60m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	14/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
14/10/1997	1800	8.35	6.80	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
5.10	5.43	0.50	
5.80	6.00	0.50	
7.15	7.80	0.50	
7.80	8.10	0.50	
8.10	8.35	0.50	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	8.35	150	6.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=13 (2,3,3,3,4,3)
4.00	S	N=20 (1,3,3,4,6,7)
7.80	S	71/150mm (7,16,21,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHA1** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	324942.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184060.0 N
		Driller	I.D	Ground Level	58.60m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	14/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.40	58.20	B 0.50 - 0.90			
Firm reddish brown sandy CLAY with some fine to medium subangular to subrounded mudstone and sandstone gravel and occasional coarse gravel and cobbles. (Morainic Drift)				D 0.90 U 1.00 - 1.45	(21)		
				D 1.45			
---at 2.00m with occasional fine gravel sized angular coal fragments				D 2.00	S13	S 2.00 - 2.45	
				B 2.45 - 3.00			
				D 3.00 - 3.50 U 3.05	(32)		
				D 3.50			
---at 4.00m firm to stiff				D 4.00	S20	S 4.00 - 4.45	
				B 4.45 - 4.80			
				B 4.80 - 6.00			
				U 5.00	(99)		
				D 6.05 - 6.55 U 6.10	(37)		
				D 6.55			
		6.75	51.85				
Reddish brown mottled greyish green highly weathered silty MUDSTONE weak to very weak. (St. Maughans Group)				U 7.00 - 7.45	(40)		
				B 7.80 - 8.10 D 7.80	S71/150mm	S 7.80 - 8.10	
		8.35	50.25	D 8.35			
Cable Percussion boring complete at 8.35 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHA2** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	325079.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				183745.0 N
		Drilling Rig	Pilcon	Ground Level	41.10m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	02/11/1997
Consultant	Ove Arup and Partners			Date Completed	02/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
02/11/1997	1600	5.78	5.60	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
3.20	3.30	0.25	
5.30	5.50	0.25	
5.60	5.78	2.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	5.78	150	5.60

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole drilled on steep slope.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.95	C	N=41 (3,6,9,12,10,10)
3.30	C	N=97 (4,7,9,15,23,50)
4.10	C	N=63 (2,5,9,15,18,21)
5.00	S	76/150mm (2,8,26,50)
5.60	C	50/75mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHA2** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	325079.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183745.0 N
		Driller	A.M	Ground Level	41.10m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	02/11/1997
Consultant	Ove Arup and Partners			Date Completed	02/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.30	40.80	B 0.30 - 0.90			
Firm to stiff reddish brown occasionally thinly laminated very silty sandy CLAY with occasional to some sub-angular and sub-rounded gravel and cobbles of sandstone and mudstone. (Morainic Drift)				D 0.95 - 1.30 U 1.00 D 1.30	(50)		
				D 1.80 B 1.95 - 3.00 D 1.95	C41	C 1.95 - 2.40	
—from 2.00m very stiff							
—from 3.00m hard				D 3.05 - 3.20 U 3.10 B 3.30 - 4.00 D 3.30	NR C97	C 3.30 - 3.75	
Hard reddish brown very silty sandy CLAY with some to much sub-angular and sub-rounded gravel and cobbles of sandstone and mudstone. (Morainic Drift)		4.00	37.10	B 4.10 - 5.00 D 4.10	C63	C 4.10 - 4.55	
				D 5.00	S76/150mm	S 5.00 - 5.30	
		5.60	35.50	D 5.60	C50/75mm*	C 5.60 - 5.68	
Light reddish brown fine to medium grained moderately to highly weathered SANDSTONE, moderately strong. (St Maughans Group)		5.78	35.32				
Cable Percussion boring complete at 5.78 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHA3
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	325308.6 E 184122.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	62.70m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	17/10/1997
		Core bit	DS		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
14/10/1997	1700	4.90	3.20	Dry	
16/10/1997	1700	12.30	3.20	10.30	
17/10/1997	0800	12.30	3.20	10.30	
17/10/1997	1800	15.00	3.20	Dry	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
4.20	4.90	2.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	4.90	150	3.20
110	15.00	150	3.20

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
4.90	12.30	mist	good	110
12.30	15.00	mist	good	110

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=14 (2,3,3,4,5,2)
2.00	S	N=12 (2,1,2,3,4,3)
4.30	S	50/75mm*

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHA3**
Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	325308.6 E 184122.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	62.70 m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners	Core Barrel	S	Date Completed	17/10/1997
		Core Bit	DS		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring		Blow count to drive U100	SPT N & depth	Install-ation
TOPSOIL		0.25	62.45					
Medium dense reddish light brown clayey silty medium SAND with much subangular to subrounded medium and coarse gravel and occasional cobbles of sandstone. (Morainic Drift)				B	0.50 - 1.00			
				D	1.00		S14 1.00 1.45	
				B	1.50 - 2.00			
				D	2.00		S12 2.00 2.45	
---at 2.50m becoming reddish brown				B	2.50 - 2.90			
---at 3.00m dark reddish brown very clayey fine to medium SAND				D	3.00			
				U	3.20 - 3.65	(42)		
		3.30	59.40					
Dark reddish brown mottled greenish grey thinly laminated highly to completely weathered silty MUDSTONE. (St Maughans Group)				D	3.65			
---at 4.00m highly weathered				D	4.00			
		4.20	58.50					
Dark reddish brown fine to medium thinly laminated highly weathered slightly micaceous SANDSTONE, weak with occasional greenish grey lenses (<2cm). (St. Maughans Group)				D	4.30		S50/75mm* 4.30 4.38	
		4.90	57.80		4.90 - 5.05	TCR SCR RQD FL		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHA3** Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	325308.6 E 184122.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	62.70 m AOD
Client	Welsh Office	Driller	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	17/10/1997
		Core bit	DS		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Light greyish pink fine to coarse grained closely to medium thickly spaced sub-horizontally bedded occasionally thinly to thickly laminated slightly to moderately weathered SANDSTONE moderately strong to strong with very closely to closely spaced sub-horizontal to inclined (45°) fractures planar rough. (St. Maughans Group)				5.05 - 5.35	100	80	33	4		
				5.35 - 5.45	100	100	100	0		
				5.45 - 5.55	83	83	83	0		
				5.55 - 5.95	100	95	46	3		
								3		
Purple brown mottled greyish green medium spaced sub- horizontally bedded highly weathered slightly sandy silty MUDSTONE, very weak completely fractured. (St Maughans Group)		6.19	56.51							
				5.95 - 7.20	125	29	104	NI		
---from 6.75m reddish brown mottled greyish green										
Reddish brown mottled greyish green fine grained closely to medium bedded slightly weathered argillaceous SANDSTONE moderately strong to strong completely fractured. (St. Maughans Group)		7.20	55.50					NI		
---from 7.55 to 7.72m with extremely closely spaced horizontal and vertical fractures planar rough								7		
Reddish brown mottled greyish green medium to thickly horizontal to sub-horizontally bedded highly weathered slightly micaceous MUDSTONE, very weak to weak completely fractured. (St. Maughans Group)		7.72	54.98	7.20 - 8.45	104	35	0	NI		
---from 8.20 to 8.45m moderately weatherd weak with extremely closely spaced subhorizontal and subvertical fractures irregular rough								8		
---from 8.45 to 8.75m moderately weathered								NI		
				8.45 - 9.90	93	38	0			
---from 9.35 to 9.90m moderatley weathered weak with extremely closely spaced sub-horizontal and sub-vertical fractures irregular rough								10		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHA3** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	325308.6 E 184122.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	62.70 m AOD
Client	Welsh Office	Driller	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	17/10/1997
		Core bit	DS		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green medium to thickly horizontal to sub-horizontally bedded highly weathered slightly micaceous MUDSTONE, very weak to weak completely fractured. (St. Maughans Group)								NI		
---from 10.36 to 10.80m moderately weatherd weak with extremely closely spaced sub-horizontal and sub-vertical fractures irregular rough				9.90 - 11.30	100	58	0	12		
		10.80	51.90							
Reddish brown mottled light greyish green medium to thickly sub-horizontal bedded (15°) slightly to moderately weathered sandy MUDSTONE moderately strong to strong with closely to medium spaced sub-horizontal to sub-vertical fractures planar rough tight with vertical thick veins of calcite. (St. Maughans Group)								4		
---from 11.30m fresh to slightly weathered very sandy strong to very strong								NI		
				11.30 - 12.30	103	40	40	0		
		11.83	50.87							
Reddish brown mottled greyish green medium to thickly bedded highly weathered silty MUDSTONE weak completely fractured. (St. Maughans Group)								NI		
---from 12.46 to 12.70m moderately weathered with extremely closely spaced horizontal and vertical fractures irregular rough tight								NI		
								12		
---from 13.00 to 13.50m slightly to moderately weathered weak to moderately weak with closely spaced horizontal fractures planar rough tight				12.30 - 13.50	100	46	26	NI		
								3		
---from 13.88 to 14.05m moderately to highly weathered weak with extremely closely spaced subhorizontal to inclined (50°) fractures irregular rough tight								NI		
								5		
				13.50 - 15.00	63	13	0	NI		
								NI		
Borehole complete at 15.00 m.		15.00	47.70							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB1
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	325393.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hans England		184147.8 N
		Driller	D.D	Ground Level	55.70m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	19/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
18/10/1997	1600	8.10	8.10	Dry	
19/10/1997	0800	10.40	8.30	6.90	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
6.40	10.40	mist	good	110

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	10.40	150	8.10

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
18/10/1997	0000	2.50	0.00	0	seepage	0.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB1** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	325393.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184147.8 N
		Driller	D.D	Ground Level	55.70m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	19/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL, sand and gravel (Drillers description)										
		3.00	52.70							
Sand and GRAVEL (drillers description) (Morainic Drift)										
		6.00	49.70							
Boulder CLAY (drillers description) (Morainic Drift)										
		6.40	49.30							
Firm reddish brown sandy CLAY with some fine to coarse angular to sub-rounded mudstone gravel and cobbles with medium spaced very thin beds of reddish brown highly weathered sandy mudstone completely fractured. (Morainic Drift)				6.40 6.75	94	0	0			
				6.75 7.35	148	0	0	NI		
				7.35 8.10	37	0	0			
---from 8.00 to 8.30m very closely spaced very thin beds of mudstone		8.33	47.37	8.10 8.70	103	33	0	8 3 NI		
Reddish brown fine to medium grained thinly sub-horizontally bedded (08°) slightly weathered slightly argillaceous micaceous SANDSTONE, moderately strong to strong locally very strong with very closely spaced horizontal to sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				8.70 9.40	103	64	0	12 NI		
				9.40 9.65	100	100	0	8		
		9.81	45.89							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB1** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	325393.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184147.8 N
		Driller	D.D	Ground Level	55.70m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	19/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green medium bedded highly to completely weathered slightly sandy MUDSTONE very weak completely fractured. (St. Maughans Group)		10.40	45.30	9.65 10.40	100	37	0	NI		
---from 8.41 to 8.47m highly weathered very weak completely fractured										
---from 9.07 to 9.17m mottled grey green highly weathered very weak completely fractured										
Rotary drilling complete at 10.40 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHB1A
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	325391.6 E
Project	M4 Relief Road Magor to Castleton Stage 2				184147.0 N
		Drilling Rig	Pilcon	Ground Level	55.80m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	01/11/1997
Consultant	Ove Arup and Partners			Date Completed	01/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
01/11/1997	1800	9.15	7.90	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
7.20	7.40	0.50	
8.75	9.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	9.15	150	7.90

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
01/11/1997	0000	5.30	4.90	15.0	fast	5.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.05	C	N=16 (1,2,3,3,4,6)
2.10	C	N=31 (2,3,6,8,8,9)
3.15	C	N=29 (1,3,5,8,7,9)
4.15	C	N=29 (2,4,6,6,8,9)
5.10	S	N=34 (3,3,3,5,12,14)
7.00	S	68/150mm*
9.00	S	87/145mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHB1A** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	325391.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184147.0 N
		Driller	A.M	Ground Level	55.80m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	01/11/1997
Consultant	Ove Arup and Partners			Date Completed	01/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
TOPSOIL	0.50	55.30	B 0.50 - 1.00			
Medium dense brown clayey silty GRAVEL with some subangular to subrounded cobbles. (Morainic Drift)			B 1.05 - 2.00 D 1.05	C16	C 1.05 1.50	
	1.93	53.87				
Dense brown clayey SAND with occasional to many sub-rounded cobbles. (Morainic Drift)			D 2.05 - 3.05 B 2.10 D 2.10	C31	C 2.10 2.55	
---at 3.15m becoming medium dense			D 3.10 - 4.00 B 3.15 D 3.15	C29	C 3.15 3.60	
			D 4.10 - 5.00 B 4.15 D 4.15	C29	C 4.15 4.60	
---at 5.10m becoming dense			D 5.05 - 5.60 B 5.10 D 5.10 W 5.30	S34	S 5.10 5.55	
	5.80	50.00				
Firm to stiff reddish brown very sandy CLAY with occasional fine to medium sub-rounded sandstone and mudstone gravel. (Morainic Drift)			D 5.95 - 6.45 U 6.00	(45)		
			D 6.45			
			D 6.90 D 7.00	S68/150mm*	S 7.00 7.15	
			D 7.40 U 7.50 - 7.90	(43)		
	7.90	47.90	D 7.90			
Reddish brown mottled greyish green completely to highly weathered slightly sandy MUDSTONE, very weak to weak. (St. Maughans Group)						
	8.75	47.05				
Reddish brown highly to moderately weathered sandy MUDSTONE, moderately weak to moderately strong. (St. Maughans Group)	9.15	46.65	D 9.00	S87/145mm*	S 9.00 9.15	
Cable Percussion boring complete at 9.15 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB2** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	325348.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184009.0 N
		Drilling Rig	Pilcon/Knebel 77	Ground Level	52.10m AOD
Client	Welsh Office	Drillers	A.M/E.D	Orientation	Vertical
		Logged by	C.D/ T.R	Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	13/11/1997
		Core bit	Geocube		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
02/11/1997	1600	3.60	3.60	Dry	
03/11/1997	0800	3.60	3.60	Dry	
03/11/1997	1200	4.72	4.30	Dry	
13/11/1997	1800	25.35	4.50	11.30	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
4.35	4.61	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	4.72	150	4.30

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
13/11/1997	0000	10.30	NR	NR		4.50	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
4.50	25.35	mist	100%	112

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=24 (3,4,5,6,6,7)
2.05	C	N=11 (1,3,2,2,3,4)
2.80	S	N=13 (1,2,2,3,4,4)
4.60	S	84/125mm

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB2** Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion	Coordinates	325348.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184009.0 N
		Drilling Rig	Pilcon/Knebel 77	Ground Level	52.10 m AOD
Client	Welsh Office	Drillers	A.M/E.D	Orientation	Vertical
		Logged by	C.D/ T.R	Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core Barrel	S	Date Completed	13/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL	0.40	51.70	B 0.40 - 0.95						
Medium dense reddish brown clayey SAND with much to some fine to medium sub-angular to sub-rounded gravel. (Morainic Drift)			B 1.00 - 2.00 D 1.00 D 1.00					S24 1.00 1.45	
			D 2.05					C11 2.05 2.50	
	2.56	49.54	D 2.50						
Reddish brown mottled greyish green completely to highly weathered MUDSTONE, very weak to weak. (St. Maughans Group) ---from 3.60m highly weathered weak			B 2.80 - 3.60					S13 2.80 3.25	
	4.72	47.38	D 4.60					S84/125mm 4.60 4.73	
Reddish brown medium bedded slightly to moderately weathered slightly sandy silty MUDSTONE, moderately strong with very closely spaced inclined fractures planar rough tight. (St. Maughans Group) ---from 5.50 to 5.70m completely fractured	5.70	46.40	4.50 - 5.70	98	83	0	12 NI		
Purplish brown fine to medium grained thinly to medium inclined bedding slightly to moderately weathered silty MUDSTONE, moderately strong to strong with very closely spaced inclined fractures planar smooth tight. (St. Maughans Group) ---from 5.70 to 5.90m completely fractured	6.18	45.92	5.70 - 6.80	100	54	0	NI 6 12 NI		
Purplish brown thinly to medium inclined bedding slightly to moderately weathered very sandy silty MUDSTONE, moderately strong with very closely spaced inclined fractures planar rough tight. (St. Maughans Group)	7.31	44.79	6.80 - 7.60 7.60 - 8.10	100 100	44 90	0 46	8 5 NI 5		
Purplish brown fine to medium grained thinly inclined bedding fresh to slightly weathered slightly silty SANDSTONE, moderately strong to strong with extremely to very closely spaced sub-horizontal to inclined undulating laminations of calcite and closely spaced inclined fractures planar rough tight. (St. Maughans Group)	9.60	42.50	8.10 - 8.70 8.70 - 10.30	100 84	63 69	27 8	NI 11 6		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB2** Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion	Coordinates	325348.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184009.0 N
		Drilling Rig	Pilcon/Knebel 77	Ground Level	52.10 m AOD
Client	Welsh Office	Driller	A.M/E.D	Orientation	Vertical
		Logged by	C.D/ T.R	Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	13/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish to reddish brown mottled green thinly to medium inclined bedding slightly to moderately weathered very sandy MUDSTONE, moderately weak to moderately strong with closely spaced inclined fractures planar rough tight. (St. Maughans Group)		10.30	41.80					NA		
				10.30 - 11.80	88	87	40	7		
Reddish brown mottled green medium horizontal to inclined bedded slightly weathered very sandy MUDSTONE, (very weak to) moderately weak with medium spaced inclined fractures planar rough tight. (St Maughans Group)								NA		
				11.80 - 13.30	100	100	80	8		
---from 12.80m purplish to reddish brown										
				13.30 - 14.80	99	97	64	5		
---from 14.70 to 14.80m with extremely to very closely spaced gravel size pockets of calcite		14.80	37.30					0		
				14.80 - 16.30	100	85	30	7		
Reddish brown thinly inclined bedding slightly to moderately weathered sandy MUDSTONE, moderately strong with very closely to closely spaced inclined fractures planar rough tight. (St. Maughans Group)								3		
---from 14.80 to 15.05m with extremely closely spaced gravel size pockets of calcite										
---from 15.05 to 15.65m moderately weathered weak				16.30 - 17.80	100	85	33	12		
---from 15.65 to 15.85m very sandy very weak										
---from 15.85 to 16.30m moderately weathered moderately weak to moderately strong				17.80 - 19.30	95	91	0	8		
---from 16.30 to 17.80m very sandy moderately strong										
---from 17.80m purplish brown										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB2** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion	Coordinates	325348.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184009.0 N
		Drilling Rig	Pilcon/Knebel 77	Ground Level	52.10 m AOD
Client	Welsh Office	Driller	A.M/E.D	Orientation	Vertical
		Logged by	C.D/ T.R	Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	13/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly inclined bedding slightly to moderately weathered sandy MUDSTONE, moderately strong with very closely to closely spaced inclined fractures planar rough tight. (St. Maughans Group)				19.30 - 20.85	100	87	55	9		
---from 20.85 to 21.45m with extremely closely to very closely spaced gravel size pockets of calcite								2		
				20.85 - 22.35	100	97	41	9		
---from 21.10 to 21.85m very closely spaced inclined fractures planar rough tight		22.05	30.05					3		
Purplish brown mottled green thinly to medium sub-horizontally to inclined bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (St. Maughans Group)				22.35 - 23.85	100	93	22	14		
		23.85	28.25							
Reddish brown mottled green medium sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (St. Maughans Group)				23.85 - 25.35	93	90	57	7		
---from 24.35 to 25.35m extremely closely to closely spaced inclined undulating thin laminations of calcite		25.35	26.75							
Borehole complete at 25.35 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB3** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	325458.8 E 184111.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	54.70m AOD
Client	Welsh Office	Drillers	I.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	17/10/1997
		Core bit	Geocube		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
14/10/1997	1800	4.00	1.70	Dry	
16/10/1997	0800	4.00	1.70	3.80	
17/10/1997	1800	15.15	4.00	3.80	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
3.65	4.00	1.00	
4.00	4.00	0.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	4.00	150	1.70
110	15.15	150	4.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
16/10/1997	0800	3.80	0.00	0		0.00	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
4.00	10.00	air	good	110
10.00	15.15	air	good	110

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=36 (2,6,7,8,10,11)
3.80	S	50/50mm*

* Seating blows only.

GENERAL NOTES

1. Borehole complete at 15.15m.
2. Standpipe piezometer installed Tip at 10.00m, sand filter from 5.00 to 10.50m.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB3** Sheet 1 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	325458.8 E 184111.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	54.70 m AOD
Client	Welsh Office	Drillers	I.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners	Core Barrel	S	Date Completed	17/10/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
TOPSOIL			D 0.00			
	0.20	54.50				
Soft to firm reddish brown fine sandy CLAY with a little subangular fine to medium sandstone and mudstone gravel. (Morainic Drift)			B 0.50 - 0.90			
	0.90	53.80				
Reddish brown mottled black brown completely weathered MUDSTONE, very weak. (St. Maughans Group)			U 1.00 - 1.45	(40)		
			D 1.45			
			D 1.70			
			D 2.00		S36 2.00	
---at 2.00m completely weathered, weak					2.45	
---at 2.50m mottled greenish grey, highly weathered , weak			B 2.50 - 3.00			
			U 3.00 - 3.45	(44)		
			D 3.45			
	3.65	51.05				
Reddish brown moderately weathered fine sandy MUDSTONE, moderately weak. (St. Maughans Group)			D 3.80		S50/50mm* 3.80	
					3.85	
	4.00	50.70				
Reddish brown mottled greyish green thinly horizontally bedded highly weathered silty MUDSTONE, very weak completely fractured. (St. Maughans Group)	4.06	50.64	4.00 - 4.10	TCR 80 SCR 80 RQD NI		
Reddish brown fine to medium grained thinly horizontally bedded slightly to moderately weathered SANDSTONE, moderately weak to moderately strong with extremely closely spaced horizontal and vertical fractures irregular rough tight. (St. Maughans Group)	4.12	50.58		EI 3 NI 10		
Reddish brown mottled greyish green medium horizontally bedded completely to highly weathered silty MUDSTONE, very weak completely fractured. (St. Maughans Group)			4.10 - 5.20	97 46 0		
---from 4.41 to 4.61m moderately to highly weathered weak with				NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB3** Sheet 2 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	325458.8 E 184111.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	54.70 m AOD
Client	Welsh Office	Driller	I.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	17/10/1997
		Core bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green medium horizontally bedded completely to highly weathered silty MUDSTONE, very weak completely fractured. (St. Maughans Group)	5.20	49.50					6		
	5.27	49.43					2		
Reddish brown very thinly horizontally bedded slightly to moderately weathered silty very sandy MUDSTONE, moderately weak to moderately strong with very closely spaced horizontal fractures planar rough tight. (St. Maughans Group)							NI		
							3		
Reddish brown fine to medium grained thin to medium horizontally bedded slightly to moderately weathered SANDSTONE, moderately strong with closely to medium spaced thin horizontal beds of reddish brown greyish green moderately weathered silty mudstone weak. (St. Maughans Group)			5.20 - 6.40	110	98	28	10		
---from 5.45 to 5.60m extremely to closely spaced horizontal to subhorizontal (15°) fractures planar rough tight									
---from 6.03m slightly weathered to fresh sandstone							2		
---from 6.03 to 6.40m thinly to cross laminated									
---from 6.40 to 6.55m extremely closely to very closely spaced horizontal and vertical fractures planar rough tight							6		
							3		
	6.88	47.82							
Pink to greyish green fine to coarse grained medium to thickly horizontally bedded fresh to slighlty weathered SANDSTONE strong with closely spaced horizontal to subhorizontal fractures planar rough tight. (St. Maughans Group)			6.40 - 7.70	94	79	36	8		
---from 7.07 to 7.69m subvertical (80°) fracture planar rough open									
---from 7.77 to 7.88m subvertical (60°) fracture planar smooth to rough tight									
---from 8.28m medium spaced horizontal fractures planar rough tight			7.90 - 9.20	103	100	97	6		
---from 8.83 to 9.00m thinly and cross laminated									
---from 9.40 to 9.60m moderately to highly weathered weak	9.30	45.40	9.20 - 9.40	140	140	0	5		
Purple brown medium sub-horizontally bedded moderately weathered sandy micaceous MUDSTONE, moderately weak with extremely closely to very closely spaced sub-horizontal fractures irregular rough tight (10°). (St.Maughans Group)							4		
	9.70	45.00	9.40 - 10.00	87	87	30	2		
SANDSTONE As Sheet 3									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB3** Sheet 3 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	325458.8 E 184111.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	54.70 m AOD
Client	Welsh Office	Driller	I.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	17/10/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled dark greyish green fine to medium grained fresh to slightly weathered medium subhorizontally bedded thinly and thickly laminated micaceous SANDSTONE moderately strong to strong with medium spaced subhorizontal fractures planar rough tight (10°). (St. Maughans Group)								10		
		10.33	44.37							
Reddish brown mottled greyish green medium sub-horizontally bedded slightly to moderately weathered very sandy micaceous MUDSTONE, moderately weak to strong with very closely spaced sub-horizontal fractures planar rough tight (170°/05°). (St. Maughans Group)								4		
		10.71	43.99	10.00 - 11.30	100	98	65			
Pink light greyish green fine to coarse grained medium to thickly sub-horizontally bedded thinly thickly and cross laminated SANDSTONE strong with medium spaced sub-horizontal fractures planar rough tight (15°). (St. Maughans Group) ---from 11.06 to 11.26m sub-vertical fracture planar rough slightly open green discolouration (75°) ---from 11.30 to 11.52m medium spaced undulating thin to thick laminations of calcite ---at 11.52m calcite								3		
								2		
		12.08	42.62	11.30 - 12.80	93	57	51			
Reddish brown medium to thickly sub-horizontally bedded moderately to highly weathered silty MUDSTONE weak to moderatley weak completely fractured. (St.Maughans Group) ---from 12.31 to 13.55m extremely closely to very closely spaced sub-horizontal to sub-vertical fractures irregular rough tight ---from 12.80 to 13.55m moderately weathered								NI		
								8		
								NI		
								8		
		13.55	41.15	12.80 - 14.10	96	94	40			
Reddish brown mottled green thickly bedded fresh to slightly weathered calcitic micaceous sandy MUDSTONE strong with medium to widely spaced sub-horizontal fractures planar rough tight (10°). (St. Maughans Group)								0		
				14.10 - 15.15	102	100	95	2		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB3** Sheet 4 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	325458.8 E
Project	M4 Relief Road Magor to Castleton Stage 2				184111.0 N
		Drilling Rig	Pilcon/Dando	Ground Level	54.70 m AOD
Client	Welsh Office	Driller	I.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	17/10/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled green thickly bedded fresh to slightly weathered calcitic micaceous sandy MUDSTONE strong with medium to widely spaced sub-horizontal fractures planar rough tight (10°). (St. Maughans Group)		15.15	39.55							
Borehole complete at 15.15 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB4** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	325553.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184267.0 N
		Driller	H.J	Ground Level	82.00m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth/ PCD	Date Completed	24/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
21/10/1997	1800	4.50	2.50	Dry	
22/10/1997	1800	8.20	4.00	Dry	
23/10/1997	1800	14.70	4.00	Dry	
24/10/1997	1800	20.50	4.20	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	2.90	air	good	112
2.90	8.20	air	good	112
8.20	20.50	air	none	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
145	20.50	150	4.20

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. 100mm plastic casing grouted in to base of borehole.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
3.70	C	N=60 (9,10,14,13,15,18)
5.60	C	58/150mm*

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB4** Sheet 1 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	325553.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184267.0 N
		Driller	H.J	Ground Level	82.00m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth/ PCD	Date Completed	24/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Boulder CLAY (drillers description). (Morainic Drift)									
	2.50	79.50							
Soft MUDSTONE (drillers description). (St. Maughans Group)									
	2.90	79.10							
Reddish brown occasionally mottled greyish green thinly bedded (08°)? highly weathered slightly sandy MUDSTONE, very weak completely fractured. (St. Maughans Group)			2.90 3.70	66	0	0	NI	60 3.70	
								4.15	
			3.70 4.80	100	19	0	NI		
---from 4.50 to 4.70m moderately weathered calcareous							2		
							NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB4** Sheet 2 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	325553.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184267.0 N
		Driller	H.J	Ground Level	82.00m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth/ PCD	Date Completed	24/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green thinly bedded (08°)? highly weathered slightly sandy MUDSTONE, very weak completely fractured. (St. Maughans Group)				4.80 5.60	100	9	0	NI		
								1	C58/150mm* 5.60	
								5	5.75	
---from 5.80m thinly to medium horizontally to sub-horizontally bedded slightly to moderately weathered with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight				5.60 7.20	93	93	41	7		
---from 7.20 to 7.80m medium spaced undulating thin laminations of calcite				7.20 7.80	100	83	0	12		
		7.80	74.20							
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded thickly laminated and cross laminated slightly weathered micaceous SANDSTONE, strong to very strong with closely to medium spaced sub-horizontal discontinuities. (St. Maughans Group)				7.80 8.20	100	25	0	7		
---from 7.80 to 8.20m slightly argillaceous										
---from 8.20 to 9.30m vertical to sub-vertical fracture planar rough slightly open				8.20 9.30	84	28	25	7		
				9.30 10.10	100	90	60	2		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB4** Sheet 3 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	325553.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184267.0 N
		Driller	H.J	Ground Level	82.00m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth/ PCD	Date Completed	24/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded thickly laminated and cross laminated slightly weathered micaceous SANDSTONE, strong to very strong with closely to medium spaced sub-horizontal discontinuities. (St. Maughans Group)				10.10 11.25	100	90	60	9		
---from 10.90m calcitic (calcareous alteration)										
---from 11.10 to 11.20m vertical fracture planar open (infilled with calcite)		11.25	70.75							
---from 11.10 to 11.25m greyish green very argillaceous slightly calcitic										
Reddish brown thinly to medium sub-horizontally bedded thinly laminated and thickly laminated slightly weathered very sandy micaceous MUDSTONE, moderately strong with closely spaced thick laminations to very thin beds of pink grey fine to medium grained sandstone sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				11.25 12.70	94	90	47	8		
---from 11.25 to 11.40m moderately to highly weathered and weak										
---from 12.20 to 12.70m vertical fractured planar rough tight										
		12.85	69.15					1		
Light grey to pink fine to medium grained medium sub-horizontally bedded (11°) thinly, thickly and cross laminated fresh to slightly weathered micaceous SANDSTONE, strong to very strong with medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				12.70 13.20	92	92	80	0		
---from 13.20m occasionally mottled greyish green				13.20 14.70	60	60	56	2		
		14.60	67.40							
Purple and white fine to coarse grained medium sub-horizontally bedded slightly weathered slightly sandy calcitic CONGLOMERATE, strong. (St. Maughans Group)				14.70 15.10	100	80	80	0		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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BOREHOLE LOG - ROTARY

Borehole No. **BHB4** Sheet 4 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	325553.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184267.0 N
		Driller	H.J	Ground Level	82.00m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth/ PCD	Date Completed	24/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purple and white fine to coarse grained medium sub-horizontally bedded slightly weathered slightly sandy calcitic CONGLOMERATE, strong. (St. Maughans Group)		15.10	66.90					5		
Reddish brown occasionally mottled greyish green thinly to medium sub-horizontally bedded slightly weathered slightly sandy MUDSTONE, strong with medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)								6		
---from 15.10 to 15.60m thinly bedded moderately to highly weathered weak				15.10 16.60	93	89	69	5		
---from 16.45 to 17.00m with very closely spaced gravel size pockets of calcite										
		17.00	65.00							
Reddish brown to pink fine to medium grained thinly sub-horizontally bedded slightly weathered micaceous SANDSTONE, strong with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				16.60 18.00	98	82	82	3		
								5		
		18.20	63.80					3		
Light greyish pink fine to coarse grained thinly sub-horizontally bedded occasionally thinly laminated slightly weathered micaceous SANDSTONE, very strong with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)		18.50	63.50					1		
Purplish brown mottled greyish green medium sub-horizontally bedded slightly weathered slightly sandy MUDSTONE, moderately strong with very closely to closely spaced sub-horizontal to inclined discontinuities irregular rough tight. (St. Maughans Group)				18.00 19.50	95	93	42	11		
---from 19.50m reddish brown										
---from 19.70 to 20.50m with occasional thin laminations and gravel size pockets of calcite				19.50 20.50	100	90	31	11		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB4** Sheet 5 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	325553.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184267.0 N
		Driller	H.J	Ground Level	82.00m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth/ PCD	Date Completed	24/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish brown mottled greyish green medium sub-horizontally bedded slightly weathered slightly sandy MUDSTONE, moderately strong with very closely to closely spaced sub-horizontal to inclined discontinuities irregular rough tight. (St. Maughans Group)				19.50 20.50	100	90	31	11		
		20.50	61.50							
Rotary drilling complete at 20.50 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB4A
Header

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325553.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184260.0 N
		Driller	H.J	Ground Level	81.80m AOD
Client	Welsh Office	Logged by		Orientation	Vertical
		Core barrel		Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
28/10/1997	1800	16.00	0.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	16.00	air	good	76

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB4A
Sheet 1 of 2

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325553.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184260.0 N
		Driller	H.J	Ground Level	81.80m AOD
Client	Welsh Office	Logged by		Orientation	Vertical
		Core barrel		Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Refer to BH4 for descriptions to 16.00m.		2.50	79.30							
		7.70	74.10							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB4A** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325553.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184260.0 N
		Driller	H.J	Ground Level	81.80m AOD
Client	Welsh Office	Logged by		Orientation	Vertical
		Core barrel		Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
		14.70	67.10							
		16.00	65.80							
Rotary drilling complete at 16.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB5
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	325574.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184173.6 N
		Driller	H.J	Ground Level	72.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	20/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
18/10/1997	1600	8.20	2.30	Dry	
19/10/1997	1600	14.50	2.30	Dry	
20/10/1997	1800	20.10	2.30	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	8.20	air	full	112
8.20	14.50	air	full	112
14.50	20.10	air	full	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	20.10	150	2.30

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. 100mm diameter plastic pipe grouted into base of borehole on completion.
2. Bedding dips and dip directions on separate sheet.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB5** Sheet 1 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	325574.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184173.6 N
		Driller	H.J	Ground Level	72.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	20/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
CLAY (drillers description). (Moraine Drift)										
		2.30	70.10							
Reddish brown thinly to medium bedded (03°) thickly and cross laminated slightly to moderately weathered very sandy micaceous MUDSTONE, moderately strong with very closely to closely spaced sub-horizontal discontinuities planar rough to smooth tight. (St. Maughans Group) ---from 2.30 to 2.40m completely fractured								NI 10		
				2.30 3.80	92	81	8			
		3.57	68.83					0		
Pink light green fine to coarse grained thinly to medium sub-horizontally bedded thinly and cross laminated slightly weathered micaceous argillaceous SANDSTONE, strong with closely spaced horizontal discontinuities planar rough tight. (St. Maughans Group) ---from 3.88 to 4.16m sub-vertical (75°) fracture irregular rough slightly open								7		
		4.35	68.05							
Pinkish green very thinly to thinly sub-horizontally bedded slightly to moderately weathered sandy micaceous MUDSTONE, moderately weak to moderately strong with very closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				3.80 5.25	100	97	57	10		
		4.69	67.71							
SANDSTONE As Sheet 2										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB5** Sheet 2 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	325574.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184173.6 N
		Driller	H.J	Ground Level	72.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	20/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Light grey to pink medium sub-horizontal bedded (03°) thinly and thickly laminated slightly weathered micaceous SANDSTONE, strong to very strong with medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)								0		
---from 5.05m very closely spaced very thin beds of well cemented sandstone conglomerate		5.45	66.95					0		
Reddish brown mottled greyish green thinly to medium bedded (27°) slightly sandy micaceous MUDSTONE, moderately weak with close to medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)										
---from 5.90m with occasional undulating thin laminations of calcite				5.25 6.80	101	85	65			
---from 6.10m thin and cross laminated sandy to very sandy with closely spaced thick laminations of micaceous sandstone								9		
		6.80	65.60							
Reddish brown fine to medium grained thinly to medium sub-horizontal bedding (09°) thinly and thickly laminated fresh to slightly weathered micaceous SANDSTONE, strong with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)										
---from 7.40 to 7.50m occasional undulating thin laminations of calcite				6.80 8.20	63	59	36	7		
---from 7.40m with closely spaced very thin beds of very sandy micaceous mudstone		7.70	64.70							
---at 7.46m bedding 080°/14° **										
Light greyish pink fine to medium grained medium to thickly sub-horizontally bedded fresh to slightly weathered micaceous SANDSTONE, strong to very strong with medium spaced sub-horizontal discontinuities, planar smooth to rough tight. (St. Maughans Group)										
---from 8.53 to 8.68m occasionally mottled greyish green								5		
---from 8.70 to 9.20m vertical fracture planar rough slightly open				8.20 9.70	97	93	85			
		9.20	63.20							
Reddish brown thickly bedded slightly weathered sandy slightly micaceous MUDSTONE, moderately weak to strong with very closely to closely spaced sub-horizontal to inclined discontinuities, irregular smooth rough tight. (St. Maughans Group)										
---from 9.20 to 9.30m mottled greyish green, calcite, sandy								7		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB5** Sheet 3 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	325574.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184173.6 N
		Driller	H.J	Ground Level	72.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	20/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thickly bedded slightly weathered sandy slightly micaceous MUDSTONE, moderately weak to strong with very closely to closely spaced sub-horizontal to inclined discontinuities, irregular smooth rough tight. (St. Maughans Group)			9.70 11.00	97	92	78			
	10.52	61.88							
Reddish brown mottled greyish green thinly to medium sub-horizontally bedded slightly to moderately weathered sandy micaceous MUDSTONE, strong to very strong with extremely closely to very closely spaced thin laminations and coarse gravel sized pockets of calcite with closely spaced sub-horizontal to inclined discontinuities, irregular rough tight. (St. Maughans Group)							1		
---from 11.09 to 11.19m highly weathered, very weak completely fractured							NI		
---from 11.95m extremely closely to very closely spaced thin laminations to very thin beds of fine to medium grained sandstone			11.0012.50	96	90	65	7		
	12.50	59.90							
Reddish brown occasional mottled greyish green thinly and medium sub-horizontally bedded slightly weathered very sandy micaceous MUDSTONE, moderately weak to moderately strong with closely spaced horizontal to inclined discontinuities, planar rough tight. (St. Maughans Group)			12.5013.10	95	92	55	7		
	13.10	59.30							
Reddish brown occasionally mottled greenish grey medium to thickly sub-horizontal to inclined bedding (36°) slightly weathered silty MUDSTONE, moderately weak with very closely to closely spaced sub-horizontal to sub-vertical discontinuities, planar smooth tight. (St. Maughans Group)							1		
							NI		
---from 13.10 to 13.18m with faint slickenside									
---from 13.37 to 13.42m completely fractured									
---from 13.58 to 14.45m sub-vertical fracture (80°)			13.1014.50	107	114	16			
---at 14.10m fracture with full dip slickensides							7		
---at 14.70m fracture with slickensides							8		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB5** Sheet 4 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	325574.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184173.6 N
		Driller	H.J	Ground Level	72.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	20/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greenish grey medium to thickly sub-horizontal to inclined bedding (36°) slightly weathered silty MUDSTONE, moderately weak with very closely to closely spaced sub-horizontal to sub-vertical discontinuities, planar smooth tight. (St. Maughans Group)		15.18	57.22	14.5016.00	100	97	65			
Reddish brown mottled greyish green closely to medium sub-horizontally bedded (14°) fresh to slightly weathered very sandy MUDSTONE, strong to very strong with extremely closely to very closely spaced undulating thin to thick laminations of calcite with medium spaced sub-horizontal discontinuities, planar, smooth, tight. (St. Maughans Group)								4		
---from 15.42 to 15.92m with extremely closely to very closely sub-horizontal thin laminations of fine to medium grained sandstone										
		16.25	56.15					3		
Reddish brown occasionally mottled greyish green medium to thickly sub-horizontally bedded (10°) fresh to slightly weathered silty MUDSTONE, moderately strong to strong with closely to medium spaced sub-horizontal to inclined discontinuities, planar, smooth, tight. (St. Maughans Group)				16.0017.40	104	89	26	14		
				17.4018.80	96	91	46	7		
---from 18.80m purplish brown sandy to very sandy slightly micaceous, strong to very strong								5		
		19.27	53.13					4		
Reddish brown mottled greyish green thinly to medium horizontal to sub-horizontally bedded (16°) fresh to slightly weathered very sandy MUDSTONE, strong to very strong with extremely closely to very closely spaced undulating thin to thick laminations of calcite with medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				18.8020.10	96	85	45			
---from 19.50 to 20.00m with extremely closely to very closely spaced thin, thick and cross laminations of fine to medium grained sandstone								4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB5** Sheet 5 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	325574.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184173.6 N
		Driller	H.J	Ground Level	72.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	20/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green thinly to medium horizontal to sub-horizontally bedded (16°) fresh to slightly weathered very sandy MUDSTONE, strong to very strong with extremely closely to very closely spaced undulating thin to thick laminations of calcite with medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)		20.10	52.30							
Rotary drilling complete at 20.10 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB6
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	325709.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184437.0 N
		Driller	H.J	Ground Level	104.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	02/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
31/10/1997	1800	2.50	2.50	Dry	
01/11/1997	0800	2.50	2.50	Dry	
01/11/1997	1800	14.30	2.60	Dry	
02/11/1997	0800	14.30	2.60	8.20	
02/11/1997	1800	15.10	2.60	8.20	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	2.50	air	100%	0*
2.50	15.10	air	100%	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
146	15.10	150	2.60

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. 100mm diameter plastic pipe grouted into base of borehole on completion.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	50/67mm (,25,50)
4.00	S	N=64 (3,8,11,12,15,26)
5.10	S	63/150mm (3,20,22,41)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB6** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	325709.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184437.0 N
		Driller	H.J	Ground Level	104.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	02/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
Boulder CLAY (drillers description). (Morainic Drift)								S50/67mm 2.00 2.14	
	2.50	101.70							
MUDSTONE (drillers description). (St. Maughans Group)			2.50 4.00	0	0	0	NI		
	4.00	100.20						64 4.00	
Reddish brown mottled greyish green thinly to medium bedded (20°) moderately to highly weathered MUDSTONE, moderately strong to strong with very closely to closely spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)			4.00 5.10	35	18	0	NI 4 NI	S63/150mm 5.10	4.45
---from 4.00 to 6.50m purplish brown highly weathered moderately weak to moderately strong			5.10 6.20	100	36	0	NI 6 NI		5.40
---from 4.00 to 4.20m completely weathered completely fractured			6.20 6.70	100	21	11	NI 5		
---from 5.10 to 5.60m completely fractured			6.70 8.30	94	78	31	17		
---from 5.85 to 6.20m mottled greyish green completely fractured									
---from 6.20 to 6.50m completely fractured									
---from 8.80m sandy moderately weathered strong			8.30 9.80	100	87	33	9 9		
---from 8.80 to 9.56m sub-vertical fracture planar rough tight									
	9.80	94.40							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB6** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	325709.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184437.0 N
		Driller	H.J	Ground Level	104.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	02/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish grey brown fine to medium grained thinly to medium bedded (26°) thinly laminated fresh to slightly weathered micaceous SANDSTONE strong to very strong with closely to medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				9.80 11.30	100	97	95	4		
---from 11.79 to 11.82m inclined fracture planar rough tight				11.3012.80	100	83	55	8		
---from 12.30 to 12.80m silty slightly to moderately weathered moderately strong to strong								9		
				12.8014.30	100	97	97	5		
---from 14.60 to 15.00m medium to coarse grained mottled greyish green with a sub-vertical fracture planar rough very tight				14.3015.10	100	94	88	2 5 2		
		15.10	89.10							
---from 15.00 to 15.10m mottled greyish green silty slightly to moderately weathered moderately strong to strong										
Rotary drilling complete at 15.10 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB6A
Header

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325711.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184442.0 N
		Driller	H.J	Ground Level	104.60m AOD
Client	Welsh Office	Logged by	HJ	Orientation	Vertical
		Core barrel		Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	02/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
02/11/1997	0000	14.50	0.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	14.50	air	100%	0"

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
106	14.50	0	0.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Piezometer installed into open holed borehole beside B6.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB6A
Sheet 1 of 2

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325711.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184442.0 N
		Driller	H.J	Ground Level	104.60m AOD
Client	Welsh Office	Logged by	HJ	Orientation	Vertical
		Core barrel		Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	02/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Refer to borehole B6 for descriptions to 14.50m.		2.50	102.10							
		9.80	94.80							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB6A** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325711.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184442.0 N
		Driller	H.J	Ground Level	104.60m AOD
Client	Welsh Office	Logged by	HJ	Orientation	Vertical
		Core barrel		Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	02/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
		14.50	90.10							
Rotary drilling complete at 14.50 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB7** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	325729.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184364.8 N
		Driller	H.J	Ground Level	96.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
03/11/1997	1800	18.20	4.30	Dry	
04/11/1997	0800	18.20	4.30	12.40	
04/11/1997	1800	35.90	7.50	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	4.50	air	100%	0*
4.50	35.90	air	100%	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
146	35.90	150	7.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. See borehole B7A for SPT results and piezometer installation.
2. 100mm diameter plastic casing grouted into base of borehole on completion.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB7** Sheet 1 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	325729.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184364.8 N
		Driller	H.J	Ground Level	96.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Boulder CLAY (drillers description). (Morainic Drift)										
		4.50	92.10							
Reddish brown mottled greyish green thinly to medium bedded (08°) highly to moderately weathered MUDSTONE, moderately weak to weak with very closely to closely spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)								NI		
---from 4.50 to 4.71m highly weathered completely fractured								3		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB7** Sheet 2 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	325729.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184364.8 N
		Driller	H.J	Ground Level	96.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green thinly to medium bedded (08°) highly to moderately weathered MUDSTONE, moderately weak to weak with very closely to closely spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)				4.50 5.70	50	33	12	NI		
---from 5.70 to 5.90m highly weathered completely fractured								NI		
				5.70 6.80	82	45	15	7		
---from 6.45 to 6.98m completely fractured								NI		
								NI		
								NI		
				6.80 7.90	100	76	0	8		
---from 7.40 to 7.60m sandy moderately strong										
		7.90	88.70							
Purplish grey mottled greyish green fine to medium grained thinly to medium bedded (24°) slightly weathered to moderately weathered micaceous SANDSTONE, strong to very strong with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)										
---from 8.30m inclined fracture (52°) planar rough tight										
---from 8.48 to 9.10m sub-vertical fracture planar rough tight (70°)				7.90 9.30	99	84	31	9		
---from 9.15m sub-vertical fracture planar rough tight (280°/60°)										
		9.50	87.10					2		
Purplish grey mottled pale greyish green thinly to medium bedded (29°) thinly and cross laminated slightly weathered calcitic sandy CONGLOMERATE with thinly to medium spaced thin to medium interbedding of fine to medium grained sandstone strong to very strong with sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB7** Sheet 3 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	325729.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184364.8 N
		Driller	H.J	Ground Level	96.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish grey mottled pale greyish green thinly to medium bedded (29°) thinly and cross laminated slightly weathered calcitic sandy CONGLOMERATE with thinly to medium spaced thin to medium interbedding of fine to medium grained sandstone strong to very strong with sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				~~9.30 10.80~~	~~97~~	~~81~~	~~70~~	3		
								3		
								2		
				10.80 12.30	97	94	67	6		
								3		
---from 12.90 to 12.97m sub-vertical fracture irregular rough open (calcite infill) ---from 13.03 to 13.27m moderately to strong completely fractured				12.30 13.70	97	94	66	5		
								0		
		13.60	83.00					0		
Pale greyish green fine to medium grained medium to thickly sub-horizontally bedded thinly laminated and cross laminated fresh to slightly weathered micaceous SANDSTONE, very strong with medium to widely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)										
								2		
				13.70 15.20	100	98	91			
		14.97	81.63							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB7** Sheet 4 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	325729.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184364.8 N
		Driller	H.J	Ground Level	96.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Pinkish grey mottled greyish green thinly to medium sub-horizontally bedded thinly and cross laminated slightly weathered calcitic sandy CONGLOMERATE, with thinly to medium spaced thin to medium interbedding of fine to medium grained sandstone, strong to very strong with thin to medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)								1		
								0		
		15.50	81.10					0		
Reddish brown thinly to medium sub-horizontal to inclined bedding slightly to moderately weathered micaceous sandy MUDSTONE, moderately strong to strong with medium to closely spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)								NI		
---from 15.50 to 15.74m moderately weathered moderately strong completely fractured				15.20 16.70	97	89	41			
---from 15.74 to 15.90m sub-vertical fracture irregular rough tight								8		
---from 16.00 to 16.48m sub-vertical fracture irregular rough tight (70°)		16.48	80.12							
Pinkish grey fine to medium grained medium to thinly sub-horizontally bedded thinly and cross laminated fresh to slightly weathered micaceous SANDSTONE, strong to very strong with medium to closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)								0		
---from 16.50 to 16.68m inclined fracture planar rough open (calcite infill)								0		
								5		
		17.38	79.22	16.70 18.20	100	82	41	5		
Reddish brown mottled greyish green thinly to medium sub-horizontal bedded slightly to moderately weathered slightly sandy MUDSTONE, moderately strong to moderately weak with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)		17.70	78.90							
---from 17.38 to 17.70m sub-vertical fracture irregular rough tight								4		
Reddish brown occasionally mottled greyish green medium bedded (25°) slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)										
				18.20 19.60	100	96	61	9		
---from 19.60m purplish brown										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB7** Sheet 5 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	325729.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184364.8 N
		Driller	H.J	Ground Level	96.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
Reddish brown occasionally mottled greyish green medium bedded (25°) slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				19.60 21.10	100	97	63	8		
---from 20.40m thickly sub-horizontally to inclined bedded										
---from 21.10m moderately weathered				21.10 22.60	100	83	57	5		
---from 23.00m slightly to moderately weathered				22.60 24.10	100	90	67	8		
---from 24.10m thinly to medium sub-horizontally bedded				24.10 25.40	100	81	68	7		
---from 24.70m reddish brown occasionally mottled greyish green										
---from 24.70 to 25.00m with extremely to very closely spaced										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB7** Sheet 6 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	325729.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184364.8 N
		Driller	H.J	Ground Level	96.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green medium bedded (25°) slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)										
---from 25.90m medium to thickly sub-horizontally bedded				25.40 26.80	100	96	39	9		
---from 26.80 to 28.10m very closely to closely spaced undulating thin to thick laminations of calcite								3		
---from 27.30m moderately to highly weathered weak to moderately weak				26.80 28.10	100	97	45	8		
---from 28.10 to 28.27m very sandy moderately strong to strong								0		
		28.27	68.33							
Greyish pink fine to coarse grained medium to thickly bedded (22°) occasionally cross laminated fresh to slightly weathered micaceous SANDSTONE, strong to very strong with medium to widely spaced inclined discontinuities planar rough tight. (St. Maughans Group)				28.10 29.60	100	95	95	3		
								0		
		29.82	66.78							
SANDSTONE As Sheet 7										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB7** Sheet 7 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	325729.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184364.8 N
		Driller	H.J	Ground Level	96.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Light grey to dark grey fine to medium grained thinly to medium bedded (26°) thinly, thickly and cross laminated fresh to slightly weathered micaceous SANDSTONE, strong with medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				29.60 31.10	100	97	87	4		
				31.10 32.60	90	77	51	6		
								0		
		32.60	64.00							
Greenish grey fine to medium grained thinly to medium sub-horizontally to inclined bedding cross laminated slightly weathered micaceous SANDSTONE, strong with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group) ---from 32.60 to 32.90m silty				32.60 32.90	100	73	0	4		
				32.90 34.40	99	97	80	2		
---from 33.80 to 33.95m very closely spaced thin laminations of calcite		33.95	62.65							
Greyish pink fine to coarse grained medium to thickly bedding (31°) thinly laminated fresh to slightly weathered micaceous SANDSTONE, strong with medium sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group) ---from 33.95 to 34.80m very closely to closely spaced sub-vertical thin laminations of calcite								0		
								2		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB7** Sheet 8 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	325729.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184364.8 N
		Driller	H.J	Ground Level	96.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Greyish pink fine to coarse grained medium to thickly bedding (31°) thinly laminated fresh to slightly weathered micaceous SANDSTONE, strong with medium sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)		35.08	61.52	34.40 35.90	97	77	73			
Purplish grey to brown thinly sub-horizontally bedded slightly to moderately weathered very silty slightly sandy MUDSTONE, moderately strong with closely spaced sub horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)								5		
		35.90	60.70							
Rotary drilling complete at 35.90 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB7A
Header

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325727.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184372.2 N
		Driller	H.J	Ground Level	97.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	05/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	05/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
05/11/1997	0000	30.00	0.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	30.00	air	good	0"

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
105	30.00	0	0.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Piezometer installed into open holed borehole beside B7.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.20	S	N=25 (3,3,4,5,7,9)
2.50	S	50/75mm (,25,50)
3.60	S	50/75mm (,25,50)
5.00	S	76/225mm (7,9,11,15,50)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB7A** Sheet 1 of 3

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325727.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184372.2 N
		Driller	H.J	Ground Level	97.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	05/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	05/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Refer to borehole B7 for descriptions to 30.00m.									25 1.20 1.65	
									S50/75mm 2.50 2.65	
									S50/75mm 3.60 3.75	
		4.50	92.90							
									S76/225mm 5.00 5.38	
		7.90	89.50							
		9.50	87.90							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB7A** Sheet 2 of 3

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325727.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184372.2 N
		Driller	H.J	Ground Level	97.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	05/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	05/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
		13.60	83.80							
		14.97	82.43							
		15.50	81.90							
		16.48	80.92							
		17.38	80.02							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB7A** Sheet 3 of 3

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325727.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184372.2 N
		Driller	H.J	Ground Level	97.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	05/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	05/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
		28.27	69.13							
Rotary drilling complete at 30.00 m.		30.00	67.40							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB7B
Header

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325729.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184372.5 N
		Driller	J.M	Ground Level	97.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	412	Date Started	28/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
28/11/1997	1800	20.00	0.00	3.30	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	20.00	air	good	0*

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
102	20.00	0	0.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
28/11/1997	0000	7.00	0.00	0		0.00	0.00

GENERAL NOTES

1. Borehole open-holed for piezometer installation adjacent to boreholes B7 and B7A.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB7B** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325729.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184372.5 N
		Driller	J.M	Ground Level	97.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	412	Date Started	28/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Boulder CLAY (drillers description). (Morainic Drift)										
		4.00	93.40							
Reddish brown marly SANDSTONE and sandy MARL (drillers description). (St. Maughans Group)										
		10.00	87.40							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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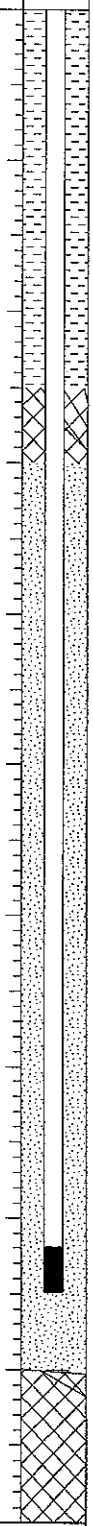
BOREHOLE LOG - ROTARY

Borehole No. **BHB7B** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325729.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184372.5 N
		Driller	J.M	Ground Level	97.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	412	Date Started	28/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown marly SANDSTONE and sandy MARL (drillers description). (St. Maughans Group)		10.00	87.40							
Reddish brown sandy MARL and SANDSTONE (drillers description). (St. Maughans Group)										
Rotary drilling complete at 20.00 m.		20.00	77.40							



NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB8** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	325758.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184246.1 N
		Driller	H.J	Ground Level	82.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	30/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
28/10/1997	1800	2.20	1.60	Dry	
29/10/1997	1800	23.30	1.60	Dry	
30/10/1997	1200	30.10	1.60	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	2.20	mist	good	112
2.20	23.30	mist	good	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	23.30	140	1.60

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole collapsing at 18.10m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=13 (3,2,3,4,3,3)
2.20	S	N=23 (3,3,4,5,5,9)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB8** Sheet 1 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	325758.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184246.1 N
		Driller	H.J	Ground Level	82.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	30/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Clayey weathered MUDSTONE (drillers description). (St. Maughans Group)									13 1.00 1.45	
		1.60	80.50							
Reddish brown medium sub-horizontally bedded moderately to highly weathered slightly sandy MUDSTONE, moderately weak completely fractured. (St. Maughans Group)				1.60 2.20	60	0	0	NI		
		2.20	79.90						23 2.20 2.65	
Reddish brown fine to medium grained thinly bedded 15-20° slightly to moderately weathered silty micaceous SANDSTONE, moderately strong very closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)								NI		
---from 2.20 to 2.62m completely fractured				2.20 3.60	57	14	0	6		
								NI		
---from 3.60 to 4.50m extremely closely to very closely spaced sub-horizontal to sub-vertical discontinuities planar rough tight								NI		
---from 4.00 to 4.50m very silty				3.60 4.50	94	56	0	15		
								NI		
---from 4.50m slightly weathered								10		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB8** Sheet 2 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	325758.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184246.1 N
		Driller	H.J	Ground Level	82.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	30/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to medium grained thinly bedded 15-20° slightly to moderately weathered silty micaceous SANDSTONE, moderately strong very closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				4.50 5.90	100	81	0			
		5.36	76.74							
Reddish brown occasional mottled greyish green thinly to medium bedded 21° moderately weathered sandy MUDSTONE, weak to moderately weak with extremely to very closely spaced sub-horizontal to inclined discontinuities irregular rough tight. (St. Maughans Group)								15		
---at 5.40m discontinuite with slickensiding										
---from 5.90 to 6.20m completely fractured								NI		
				5.90 7.30	96	71	0	16		
---from 7.30 to 7.47m moderately weathered moderately weak completely fractured								NI		
---from 7.47m slightly to moderately weathered closely spaced sub-horizontal discontinuities planar rough tight				7.30 8.00	90	34	14	2		
								NI		
---from 8.00 to 8.12m highly weathered very weak completely fractured								NI		
				8.00 9.20	100	98	17	14		
---from 9.10m very sandy										
---from 9.20m very thinly sub-horizontally bedded with extremely closely to very closely spaced discontinuities planar rough tight								NI		
---from 9.20 to 9.35m moderately weathered weak completely fractured								2		
---from 9.55 to 9.68m moderately weathered completely fractured								NI		
		9.98	72.12	9.20 10.70	100	75	27	7		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB8** Sheet 3 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	325758.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184246.1 N
		Driller	H.J	Ground Level	82.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	30/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded silty SANDSTONE, moderately strong to strong with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group) ---from 10.30 to 10.70m closely spaced very thin beds of moderately weathered very sandy mudstone		10.70	71.40					13		
Greenish grey to pink fine to coarse grained closely to medium sub-horizontally bedded thickly cross laminated slightly weathered micaceous SANDSTONE, strong locally very strong with closely to medium spaced discontinuities planar rough tight. (St. Maughans Group) ---from 11.30 to 11.70m vertical fracture planar rough tight ---from 11.90 to 12.00m moderately weathered very silty moderately weak				10.70 12.20	100	93	41	7 10		
---from 12.94 to 13.00m horizontal discontinuities planar rough open (completely fractured sandstone, infilled) ---from 13.05 to 13.60m vertical fracture planar rough tight		13.60	68.50	12.20 13.70	100	87	57	8 NI		
Reddish brown occasionally mottled greyish green thinly sub-horizontally bedded sandy MUDSTONE, weak to moderately weak with very closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group) ---from 13.60 to 13.70m highly weathered very weak completely fractured ---from 13.70 to 14.50m closely spaced gravel size pockets of calcite ---from 14.50 to 14.80m very closely spaced thin to thick horizontal to sub-horizontal laminations of calcite				13.70 15.20	100	79	62	6 8		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB8** Sheet 4 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	325758.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184246.1 N
		Driller	H.J	Ground Level	82.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	30/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
Reddish brown occasionally mottled greyish green thinly sub-horizontally bedded sandy MUDSTONE, weak to moderately weak with very closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)		15.02	67.08					3		
Pinkish grey coarse to fine grained medium sub-horizontally bedded cross laminated slightly weathered micaceous SANDSTONE strong locally very strong closely to medium spaced discontinuities planar rough tight. (St. Maughans Group)										
---from 15.02 to 15.20m very silty				15.20 16.20	100	94	74	7		
---from 15.20 to 16.30m very closely to medium spaced inclined thin to thick laminations of calcite										
---from 15.41 to 15.50m very silty										
---from 15.79 to 15.90m very silty										
---from 16.40 to 17.35m medium spaced very thin to thin beds of reddish brown highly weathered very sandy mudstone								0		
								NI		
---from 16.80m very closely to closely spaced sub-horizontal discontinuities planar rough tight								9		
---from 17.37 to 17.45m calcitic mudstone				16.20 17.80	61	56	39			
								5		
---from 17.80m reddish brown								10		
				17.80 18.80	51	38	10			
								NI		
								8		
		19.20	62.90							
Reddish brown occasionally mottled greyish green medium bedded 50° bedding/fracture? slightly weathered sandy MUDSTONE, moderately strong to strong medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				18.80 20.30	90	73	55	4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB8** Sheet 5 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	325758.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184246.1 N
		Driller	H.J	Ground Level	82.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	30/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green medium bedded 50° bedding/fracture? slightly weathered sandy MUDSTONE, moderately strong to strong medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)										
---at 20.00m discontinuities with slickensiding										
---from 20.50 to 20.65m irregular, rough tight 50-80°										
---from 20.72 to 20.92m fracture planar, rough, tight 70° with some striations										
---at 21.00m bedding fracture (30°) with striation				20.30 21.80	100	90	41	NI		
---at 21.40m fracture with some polishing										
		21.80	60.30							
Purplish brown occasionally mottled green medium sub-horizontal to inclined bedding slightly to moderately weathered sandy MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)										
---at 22.20m fracture with striations								8		
---at 22.55m fracture with striations				21.80 23.30	100	80	40			
---at 22.65m fracture with striations								7		
---at 23.40m fracture with striations										
---at 23.45m fracture with striations										
---at 23.60m reddish brown mottled green				23.30 24.50	100	89	48	8		
---from 24.00 to 24.25m slightly weathered very closely spaced gravel size pockets of calcite										
---at 24.00m fracture with striations										
---from 24.50m very sandy										
---from 24.60 to 25.10m very closely spaced gravel size pockets of calcite										
—at 24.86m fracture with striations								7		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB8** Sheet 6 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	325758.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184246.1 N
		Driller	H.J	Ground Level	82.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	30/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish brown occasionally mottled green medium sub-horizontal to inclined bedding slightly to moderately weathered sandy MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				24.50 25.70	93	1	0			
---at 25.30m fracture with striations								7		
---from 25.40m medium to thickly sub-horizontally bedded										
---at 25.52m fracture with striations										
---at 25.60m fracture with striations										
---at 25.70m fracture with striations										
---at 26.00m fracture with striations				25.70 27.00	92	98	47	11		
---at 26.80m fracture with striations										
				27.00 28.40	100	93	73	8		
Light grey to pink fine to medium grained medium inclined bedded slightly weathered silty SANDSTONE, strong. (St. Maughans Group)		28.20	53.90					0		
		28.50	53.60	28.40 28.70	100	100	87	0 1		
Reddish brown occasionally mottled greyish green medium sub-horizontal to inclined bedded slightly to moderately weathered sandy MUDSTONE, moderately strong with medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)		28.75	53.35							
---from 28.70 to 28.80m extremely to very closely spaced thin to thick undulating laminations of calcite										
Greyish to reddish brown fine to medium grained medium sub-horizontal to inclined bedded slightly weathered silty SANDSTONE, strong with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				28.70 30.10	100	89	62	6		
								3		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB8** Sheet 7 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	325758.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184246.1 N
		Driller	H.J	Ground Level	82.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	30/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Greyish to reddish brown fine to medium grained medium sub-horizontal to inclined bedded slightly weathered silty SANDSTONE, strong with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)		30.10	52.00							
Rotary drilling complete at 30.10 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB8A
Header

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325753.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184245.0 N
		Driller	H.J	Ground Level	82.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	412	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	Rock Bit	Date Completed	31/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
31/10/1997	1800	22.00	0.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	22.00	air	100%	0*

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB8A** Sheet 1 of 3

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325753.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184245.0 N
		Driller	H.J	Ground Level	82.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	412	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	Rock Bit	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Refer to BHB8 for descriptions to 30.10m.		1.60	80.60							
		2.20	80.00							
		5.36	76.84							
		9.98	72.22							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB8A
Sheet 2 of 3

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325753.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184245.0 N
		Driller	H.J	Ground Level	82.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	412	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	Rock Bit	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
		13.60	68.60							
		15.02	67.18							
		19.20	63.00							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB8A** Sheet 3 of 3

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325753.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Dando		184245.0 N
		Driller	H.J	Ground Level	82.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	412	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	Rock Bit	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
		22.00	60.20							
Rotary drilling complete at 22.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB9
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	325915.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco T30		184457.8 N
		Driller	J.M	Ground Level	101.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	21/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
21/10/1997	1800	5.60	3.00	Dry	
22/10/1997	0800	5.60	3.00	1.75	
22/10/1997	1800	15.20	3.50	1.75	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	5.60	mist	good	150
5.60	15.20	mist	good	150

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.20	150	3.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB9** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	325915.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco T30		184457.8 N
		Driller	J.M	Ground Level	101.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	21/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Stiff reddish brown silty marly CLAY (drillers description). (Morainic Drift)									
	1.00	100.60							
Reddish brown medium to thickly horizontally bedded highly weathered silty MUDSTONE, very weak to moderately weak with closely spaced horizontal discontinuities, planar, rough. (St. Maughans Group)			1.00 2.00	46	43	30	2 NI		
---from 2.00 to 2.45m weak to very weak, completely fractured			2.00 2.75	60	60	0	NI NI		
---from 2.45 to 2.75m no return									
---from 2.75 to 3.03m completely fractured			2.75 3.40	100	48	26	NI 2		
---from 3.40 to 3.82m moderately weathered, planar, rough, tight	3.82	97.78	3.40 4.20	95	28	28	NI 6 NI		
Reddish brown occasionally mottled greyish green thinly to medium bedded (18°) slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined discontinuities, planar, rough, tight. (St. Maughans Group)			4.20 5.60	106	75	8	NI 4		
---from 4.08 to 4.62m completely fractured									
---from 5.40 to 5.60m moderately weathered									
---from 5.95 to 6.30m gravel sized pockets of white calcite			5.60 6.30	96	63	14	7 NI		
---from 6.13 to 6.72m moderately weathered, weak, completely fractured			6.30 7.40	100	64	14	NI 9		
	7.40	94.20							
Light greyish pink fine to medium grained thinly to medium bedded (14°) thinly and cross laminated slightly weathered argillaceous micaceous SANDSTONE, strong with closely to medium spaced sub-horizontal discontinuities, planar, rough tight. (St. Maughans Group)	7.90	93.70	7.40 8.80	111	73	44	NI 2 12		
---from 7.40 to 7.60m completely fractured									
Purplish brown mottled greyish green thinly to medium bedded (16°) slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)			8.80 9.70	101	27	0	NI 4		
							NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB9** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	325915.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco T30		184457.8 N
		Driller	J.M	Ground Level	101.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	21/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish brown mottled greyish green thinly to medium bedded (16°) slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				9.70 11.15	99	68	20	11		
---from 10.77 to 10.97m greenish grey highly weathered, weak completely fractured								NI 0		
---from 11.15m thinly to medium sub-horizontally bedded (30°) slightly weathered, slightly sandy, moderately strong to strong				11.15 12.60	100	88	42	11		
---from 12.22 to 12.60m moderately weathered moderately weak								1		
---from 13.06 to 13.20m moderately weathered				12.60 14.10	100	93	33	5 5		
---from 13.20 to 13.60m sandy with extremely closely to closely spaced undulating thin fractures infilled with calcite		13.90	87.70					1		
---from 13.60 to 13.90m thinly interbedded with very thin beds of moderately to highly weathered mudstone		14.10	87.50							
Light greyish pink fine to medium grained thinly to medium bedded (14°) thinly laminated and cross laminated slightly weathered argillaceous SANDSTONE, strong with closely to medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				14.10 15.20	100	82	12	17		
		15.20	86.40							
Reddish brown very thinly to thinly bedded (13°) moderately weathered silty MUDSTONE, moderately weak with very closely to medium spaced thin interbedding of light grey to pink fine to medium grained slightly weathered micaceous argillaceous sandstone, strong with very closely to closely spaced sub-horizontal discontinuities planar smooth tight. (St. Maughans Group)										
Rotary drilling complete at 15.20 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB9A
Header

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325914.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hans England		184459.3 N
		Driller	J.M	Ground Level	101.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	22/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	22/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole drilled to install piezometer.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	C	N=17 (2,3,3,4,5,5)
2.00	C	N=22 (4,4,6,3,6,7)
3.00	S	N=24 (1,5,8,5,3,8)
4.00	S	50/80mm*

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB9A** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325914.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hans England		184459.3 N
		Driller	J.M	Ground Level	101.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	22/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	22/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL		0.30	101.40							
Soft to firm marly CLAY (drillers description). (Morainic Drift)		1.00	100.70						17 1.00 1.45	
Marly CLAY (drillers description). (Morainic Drift)		2.00	99.70						22 2.00 2.45	
Marly CLAY (drillers description). (Morainic Drift)		3.00	98.70						24 3.00 3.45	
Soft bands SILTSTONE (drillers description). (St. Maughans Group)		4.00	97.70						S50/80mm* 4.00 4.08	
Strong MUDSTONE (drillers description). (St. Maughans Group)		5.00	96.70							
Rotary drilling complete at 5.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB9B** Header

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325914.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184460.5 N
		Driller	J.M	Ground Level	101.80m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	27/11/1997
Consultant	Ove Arup and Partners	Core bit	412	Date Completed	28/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
27/11/1997	1800	17.00	0.70	Dry	
28/11/1997	0800	17.00	0.70	0.80	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	17.00	air	water	0*

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	17.00	140	0.70

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
27/11/1997	0000	7.00	0.00	0	moderate	0.70	0.00
27/11/1997	0000	12.00	0.00	0	heavy	0.70	0.00

GENERAL NOTES

1. Borehole open-holed for piezometer installation adjacent to boreholes B9 and B9A.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB9B** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325914.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184460.5 N
		Driller	J.M	Ground Level	101.80m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	27/11/1997
Consultant	Ove Arup and Partners	Core bit	412	Date Completed	28/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Clayey marl (MUDSTONE) (drillers description). (St. Maughans Group)										
		7.00	94.80							
MARL banded SANDSTONE (drillers description). (St. Maughans Group)										
		10.00	91.80							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB9B** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325914.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184460.5 N
		Driller	J.M	Ground Level	101.80m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	27/11/1997
Consultant	Ove Arup and Partners	Core bit	412	Date Completed	28/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
MARL banded SANDSTONE (drillers description). (St. Maughans Group)		10.00	91.80							
MARL banded SANDSTONE (drillers description). (St. Maughans Group)										
		17.00	84.80							
Rotary drilling complete at 17.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB10
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	325926.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184351.9 N
		Driller	J.H	Ground Level	85.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Geocube	Date Completed	31/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
28/10/1997	1800	5.35	3.00	Dry	
30/10/1997	0800	5.35	3.00	Dry	
30/10/1997	1800	17.20	3.00	9.10	
31/10/1997	0800	17.20	3.00	8.55	
31/10/1997	1800	29.95	3.00	9.20	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	2.45	air & water	good	NR
2.45	29.95	air & water	good	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
146	29.95	150	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=18 (3,4,4,4,5,5)
2.00	S	N=22 (2,3,3,4,5,10)
3.00	S	N=15 (6,5,3,4,4,4)
4.00	S	75/220mm (7,7,13,30,32)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB10** Sheet 1 of 6

Contract No.	F10895	Method	Rotary Coring	Coordinates	325926.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184351.9 N
		Driller	J.H	Ground Level	85.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Geocube	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Firm to stiff red marly boulder CLAY (drillers description). (Morainic Drift)									18 1.00 1.45 22 2.00 2.45	
		2.45	83.25							
Reddish brown highly weathered MUDSTONE, very weak. (St Maughans Group)									15 3.00 3.45	
		4.00	81.70						S75/220mm 4.00	
Reddish brown occasionally mottled greyish green thinly bedded (14°) moderately weathered silty MUDSTONE, very weak to moderately weak with very closely to closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group) ---from 4.00 to 4.46m extremely to very closely spaced fracture irregular rough tight ---from 4.46 to 4.71m moderately to highly weathered weak to moderately weak				4.00 5.35	100	58	0	12 NI	4.37	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB10** Sheet 2 of 6

Contract No.	F10895	Method	Rotary Coring	Coordinates	325926.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184351.9 N
		Driller	J.H	Ground Level	85.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Geocube	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling		TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green thinly bedded (14°) moderately weathered silty MUDSTONE, very weak to moderately weak with very closely to closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)									4		
---from 5.30m slightly weathered									6		
---from 5.98m mottled greyish green slightly to moderately weathered				5.35	6.80	100	93	35			
---from 6.10 to 6.60m vertical fracture planar rough tight									10		
									5		
				6.80	8.25	96	75	21	10		
---from 7.78m thinly to medium sub-horizontally bedded slightly weathered											
---from 7.78 to 8.65m sandy									6		
---from 8.80m purplish brown				8.25	9.65	100	86	49	9		
---from 9.50m moderately weathered moderately weak completely fractured									NI		
									7		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB10** Sheet 3 of 6

Contract No.	F10895	Method	Rotary Coring	Coordinates	325926.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184351.9 N
		Driller	J.H	Ground Level	85.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Geocube	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green thinly bedded (14°) moderately weathered silty MUDSTONE, very weak to moderately weak with very closely to closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				9.65 10.40	80	56	41	NI		
---from 10.50m slightly to moderately weathered				10.40 11.20	84	68	31	4		
---from 11.90 to 12.95m closely to medium spaced sub-horizontal discontinuities planar rough tight				11.20 12.65	97	82	62	9		
---from 12.35 to 12.65m with closely spaced gravel size pockets of calcite										
---from 13.18 to 13.38m sub-vertical fracture (70°) planar rough open (25mm calcite infill)				12.65 13.70	100	70	52	6		
---from 13.58 to 13.70m highly weathered very weak completely fractured								NI		
---from 13.70m thinly and cross laminated very sandy				13.70 15.00	100	98	38	16		
Greyish green to pink fine to coarse grained medium bedded (06°) thinly, thickly and cross laminated fresh to slightly weathered micaceous SANDSTONE, strong with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)		14.55	71.15					4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB10** Sheet 4 of 6

Contract No.	F10895	Method	Rotary Coring	Coordinates	325926.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184351.9 N
		Driller	J.H	Ground Level	85.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Geocube	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Greyish green to pink fine to coarse grained medium bedded (06°) thinly, thickly and cross laminated fresh to slightly weathered micaceous SANDSTONE, strong with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				15.00 16.10	100	95	78	6		
---from 16.10m silty with thin interbedding of very thin beds of reddish brown very sandy mudstone				16.10 17.20	100	76	18	7		
		16.79	68.91							
Greyish green thinly sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, weak to moderately weak with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)								6		
---from 17.06 to 17.20m moderately weathered weak completely fractured								NI		
								3		
---from 17.56 to 17.81m moderately weathered weak completely fractured								NI		
---from 17.81m medium sub-horizontally bedded fresh to slightly weathered moderately strong with medium spaced sub-horizontal discontinuities planar rough tight				17.20 18.65	97	85	77	2		
---from 19.05m mottled reddish brown										
---from 19.30m slightly to moderately weathered				18.65 20.05	100	99	70	7		
---from 19.85 to 20.05m with extremely closely spaced gravel size										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB10** Sheet 5 of 6

Contract No.	F10895	Method	Rotary Coring	Coordinates	325926.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184351.9 N
		Driller	J.H	Ground Level	85.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Geocube	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Greyish green thinly sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, weak to moderately weak with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)		20.10	65.60							
Reddish brown occasionally mottled greyish green medium sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				20.05 21.45	99	93	49	6		
		21.05	64.65							
Purplish brown mottled greyish green medium bedded (22°) silty MUDSTONE, moderately strong with closely spaced undulating thin laminations of calcite with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)								1		
---from 22.05m slightly weathered ---from 22.05 to 22.90m with medium to widely spaced very thin beds of very sandy mudstone				21.45 22.90	100	97	68	7		
								7		
---from 23.70 to 24.20m with extremely closely spaced sub-horizontal and inclined fractures planar rough tight				22.90 24.35	99	69	56	3		
								15		
---from 24.20 to 24.35m green calcitic								0		
---from 24.35 to 24.85m with very closely spaced gravel size pockets of calcite								2		
---from 24.85m medium to thickly sub-horizontally bedded fresh										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB10** Sheet 6 of 6

Contract No.	F10895	Method	Rotary Coring	Coordinates	325926.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184351.9 N
		Driller	J.H	Ground Level	85.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Geocube	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish brown mottled greyish green medium bedded (22°) silty MUDSTONE, moderately strong with closely spaced undulating thin laminations of calcite with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				24.35 25.80	97	86	82	4		
---from 25.90 to 26.00m highly weathered very weak completely fractured								NI		
				25.80 27.15	100	90	60	2		
---from 26.75 to 27.15m extremely closely spaced sub-horizontal to inclined discontinuities planar rough tight								15		
				27.15 28.50	94	89	72	2		
								8		
---from 29.00 to 29.95m very closely spaced gravel size pockets of calcite				28.50 29.95	100	98	75	7		
		29.95	55.75							
Rotary drilling complete at 29.95 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB10A** Header

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325919.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184356.0 N
		Driller	J.H	Ground Level	85.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	02/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
02/11/1997	0000	27.00	0.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	27.00	air	good	0"

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
106	27.00	0	0.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
02/11/1997	0000	11.80	0.00	0	moderate	0.00	0.00

GENERAL NOTES

1. Piezometer installed into open holed borehole beside B10.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB10A
Sheet 1 of 3

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325919.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184356.0 N
		Driller	J.H	Ground Level	85.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	02/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Refer to borehole B10 for descriptions to 27.00m.		2.50	83.40							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB10A** Sheet 2 of 3

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325919.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184356.0 N
		Driller	J.H	Ground Level	85.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	02/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
		17.50	68.40							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB10A
Sheet 3 of 3

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325919.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184356.0 N
		Driller	J.H	Ground Level	85.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	02/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Rotary drilling complete at 27.00 m.		27.00	58.90							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB10B** Header

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325920.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184355.5 N
		Driller	J.H	Ground Level	85.90m AOD
Client	Welsh Office	Logged by	J.H	Orientation	Vertical
		Core barrel		Date Started	28/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
28/11/1997	1400	19.00	0.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	19.00	air	good	0"

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
102	19.00	0	0.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
28/11/1997	0000	4.55	0.00	0	moderate	0.00	0.00

GENERAL NOTES

1. Borehole open-holed for piezometer installation adjacent to boreholes B10 and B10A.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB10B
Sheet 1 of 2

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325920.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184355.5 N
		Driller	J.H	Ground Level	85.90m AOD
Client	Welsh Office	Logged by	J.H	Orientation	Vertical
		Core barrel		Date Started	28/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Red marly boulder CLAY (drillers description). (Morainic Drift)										
		2.60	83.30							
Red SANDSTONE with mudstone bands (drillers description). (St. Maughans Group)										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB10B** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	325920.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184355.5 N
		Driller	J.H	Ground Level	85.90m AOD
Client	Welsh Office	Logged by	J.H	Orientation	Vertical
		Core barrel		Date Started	28/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Red SANDSTONE with mudstone bands (drillers description). (St. Maughans Group)										
		17.50	68.40							
Red MUDSTONE (drillers description). (St. Maughans Group)										
		19.00	66.90							
Rotary drilling complete at 19.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB11
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	325942.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184256.9 N
		Driller	J.H	Ground Level	64.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
03/11/1997	1800	4.80	2.50	3.85	
04/11/1997	0800	4.80	2.50	3.90	
04/11/1997	1800	15.05	2.50	5.25	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	1.00	air	good	0*
1.00	15.05	air & water	good	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
146	15.05	150	2.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=12 (2,2,4,4,2,2)
2.00	S	N=23 (3,4,5,5,6,7)
2.70	S	N=32 (5,7,6,7,7,12)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB11** Sheet 1 of 4

Contract No.	F10895	Method	Rotary Coring	Coordinates	325942.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184256.9 N
		Driller	J.H	Ground Level	64.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling		TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Boulder CLAY (drillers description). (Morainic Drift)										12 1.00 1.45	
		1.35	63.15								
Red weathered silty SANDSTONE (drillers description). (St. Maughans Group)										23 2.00 2.45	
		2.70	61.80							32 2.70	
Reddish brown fine to medium grained thinly sub-horizontally bedded slightly weathered silty SANDSTONE strong with closely spaced interbedding of reddish brown highly weathered sandy mudstone very weak and very closely spaced sub-horizontal to sub-vertical discontinuities planar rough tight. (St. Maughans Group)				2.70	2.90	40	25	0	0		3.15
---from 3.05 to 3.17m highly weathered very weak completely fractured				2.90	3.55	97	40	0	3 NI 5		
		3.44	61.06						2		
Reddish brown fine to medium grained thinly bedded (13°) occasionally thinly laminated fresh to slightly weathered slightly micaceous SANDSTONE, very weak to very strong with very closely to closely spaced sub-horizontal discontinuities planar rough to smooth tight. (St. Maughans Group)				3.55	3.90	66	44	0	1		
				3.90	4.15	100	100	72	1		
				4.15	4.40	84	84	40	2		
---from 4.56 to 4.71m sub-vertical fracture (60°) planar rough tight (green staining)				4.40	4.80	100	100	25	7		
---from 4.80 to 5.25m inclined fracture planar rough tight (green staining) (70°)				4.80	5.00	100	75	0	2		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB11** Sheet 2 of 4

Contract No.	F10895	Method	Rotary Coring	Coordinates	325942.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184256.9 N
		Driller	J.H	Ground Level	64.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to medium grained thinly bedded (13°) occasionally thinly laminated fresh to slightly weathered slightly micaceous SANDSTONE, very weak to very strong with very closely to closely spaced sub-horizontal discontinuities planar rough to smooth tight. (St. Maughans Group)				5.00 5.20	100	25	0	3		
				5.20 6.55	100	93	77	10		
---from 5.95 to 6.20m sub-vertical fracture irregular rough tight (green staining) and occasional calcite infill										
---from 6.77m silty slightly to moderately weathered strong				6.55 7.90	100	84	56	10		
		7.75	56.75							
Reddish brown mottled greyish green thinly to medium sub-horizontally bedded moderately to highly weathered MUDSTONE, weak to moderately strong with closely to moderately spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)								NI		
								NI		
---from 7.75 to 8.12m completely fractured				7.90 8.75	99	19	0	10		
				8.75 10.20	99	85	10	12		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB11** Sheet 3 of 4

Contract No.	F10895	Method	Rotary Coring	Coordinates	325942.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184256.9 N
		Driller	J.H	Ground Level	64.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green thinly to medium sub-horizontally bedded moderately to highly weathered MUDSTONE, weak to moderately strong with closely to moderately spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)								NI		
---from 10.10 to 10.20m highly weathered completely fractured								5		
---from 10.30 to 10.35m sub-horizontal fracture planar rough open (calcite infill) (15°)										
---from 10.70 to 10.75m inclined fracture planar rough tight (50°)				10.20 11.30	100	50	30			
---from 10.75 to 11.30m highly weathered completely fractured								NI		
---from 11.30m sandy strong										
---from 11.30 to 11.74m highly weathered completely fractured								NI		
				11.30 12.40	100	48	26	2		
---from 12.05 to 12.40m completely fractured								NI		
		12.40	52.10							
Reddish brown mottled greyish green fine to medium grained medium to thickly bedded (14°) occasionally thinly laminated slightly weathered to fresh silty SANDSTONE, strong to very strong with closely spaced undulating thin laminations of calcite and medium to widely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)								NI		
---from 12.40 to 12.73m completely fractured								6		
				12.40 13.75	100	75	57			
---from 13.35m moderately strong								2		
				13.75 15.05	100	96	60	4		
---from 14.60 to 14.85m sub-vertical fracture planar rough tight to open (calcite infill, green staining) (75°)										
		14.85	49.65					5		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB11
Sheet 4 of 4

Contract No.	F10895	Method	Rotary Coring	Coordinates	325942.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184256.9 N
		Driller	J.H	Ground Level	64.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	03/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly to medium bedded (10°) slightly to moderately weathered MUDSTONE, strong with closely to moderately spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)		15.05	49.45							
Rotary drilling complete at 15.05 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB11A
Header

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325930.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184258.0 N
		Driller	J.H	Ground Level	64.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	05/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	05/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
05/11/1997	0000	10.00	0.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	10.00	air	good	0*

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
106	10.00	0	0.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Piezometer installed into open holed borehole beside B11.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB11A
Sheet 1 of 1

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	325930.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184258.0 N
		Driller	J.H	Ground Level	64.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel		Date Started	05/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	05/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Refer to BHB11 for descriptions to 10.00m.		2.00	62.20							
Rotary drilling complete at 10.00 m.		10.00	54.20							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB12
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	326144.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184436.0 N
		Driller	J.M	Ground Level	94.30m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	06/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
04/11/1997	1800	7.00	1.50	6.30	
05/11/1997	0800	7.00	1.50	4.90	
05/11/1997	1800	12.50	4.60	9.00	
06/11/1997	0800	12.50	4.60	4.20	
06/11/1997	1800	15.50	4.60	5.10	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	1.00	air & water	good	0*
1.00	15.50	air & water	good	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
146	15.50	150	4.60

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. 100mm diameter pipe grouted to 15.50m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB12** Sheet 1 of 4

Contract No.	F10895	Method	Rotary Coring	Coordinates	326144.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184436.0 N
		Driller	J.M	Ground Level	94.30m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	06/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL and clay. (drillers description).		1.00	93.30							
Reddish to greyish brown fine to medium grained very thinly to thinly bedded (16°), thinly and cross laminated slightly weathered silty slightly micaceous SANDSTONE, moderately strong with very closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)		1.40	92.90					9		
Reddish brown thinly to medium bedded moderately weathered silty MUDSTONE, very weak to moderately strong with extremely to very closely spaced sub-horizontal to inclined discontinuities planar irregular rough tight. (St. Maughans Group)				1.00 2.40	93	57	0	NI		
---from 1.40 to 1.80m highly weathered very weak completely fractured								6		
---from 2.00 to 2.68m highly weathered very weak completely fractured								NI		
								NI		
---from 3.10m mottled greyish green				2.40 3.95	100	56	0	10		
								20		
---from 3.95 to 4.20m highly weathered very weak completely fractured								NI		
---from 4.00m slightly to moderately weathered				3.95 5.45	100	51	0	20		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB12** Sheet 2 of 4

Contract No.	F10895	Method	Rotary Coring	Coordinates	326144.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184436.0 N
		Driller	J.M	Ground Level	94.30m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	06/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly to medium bedded moderately weathered silty MUDSTONE, very weak to moderately strong with extremely to very closely spaced sub-horizontal to inclined discontinuities planar irregular rough tight. (St. Maughans Group)								7		
---at 5.37m with striation parallel to bedding										
---from 5.45 to 5.65m weak completely fractured								NI		
								7		
---from 5.80 to 6.00m weak completely fractured								NI		
				5.45 7.00	100	48	0	10		
---from 6.40 to 7.00m with very closely spaced fine to medium gravel size pockets of calcite								9		
								NI		
				7.00 8.40	100	89	11	15		
		8.00	86.30							
Reddish brown thinly to medium bedded (10°) slightly weathered silty MUDSTONE, weak to moderately weak locally moderately strong with closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)								4		
---from 8.90m slightly to moderately weathered with medium spaced thin beds of green moderately weathered silty mudstone										
---at 9.60m possible striations parallel to bedding										
---from 9.80 to 10.06m completely fractured				8.40 9.80	100	86	26	15		
								NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB12** Sheet 3 of 4

Contract No.	F10895	Method	Rotary Coring	Coordinates	326144.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184436.0 N
		Driller	J.M	Ground Level	94.30m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	06/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly to medium bedded (10°) slightly weathered silty MUDSTONE, weak to moderately weak locally moderately strong with closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				9.80 11.00	100	58	25	7		
---from 11.00m very sandy		11.17	83.13					5		
Reddish brown mottled greyish green fine to medium grained medium bedded slightly weathered micaceous silty SANDSTONE, moderately strong to strong with closely spaced undulating thin laminations of calcite and closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)								6		
		11.75	82.55	11.00 12.50	100	80	23			
Reddish brown occasionally mottled green thinly inclined bedding slightly weathered silty MUDSTONE, very weak to moderately strong with very closely to closely spaced inclined discontinuities planar rough tight. (St. Maughans Group)								10		
				12.50 13.90	93	89	26	10		
---at 14.50m striation parallel to bedding				13.90 15.50	100	94	23	16		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB12** Sheet 4 of 4

Contract No.	F10895	Method	Rotary Coring	Coordinates	326144.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184436.0 N
		Driller	J.M	Ground Level	94.30m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	P.C.D	Date Completed	06/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green thinly inclined bedding slightly weathered silty MUDSTONE, very weak to moderately strong with very closely to closely spaced inclined discontinuities planar rough tight. (St. Maughans Group)										
---at 15.25m striations parallel to bedding										
		15.50	78.80							
Rotary drilling complete at 15.50 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB12A** Header

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326144.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184437.0 N
		Driller	J.M	Ground Level	94.30m AOD
Client	Welsh Office	Logged by	J.M	Orientation	Vertical
		Core barrel		Date Started	07/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	07/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

Borehole openholed to facilitate piezometer installation adjacent to BH12.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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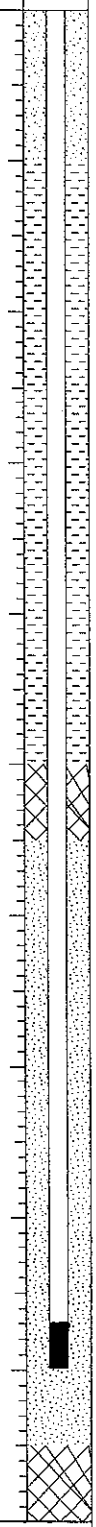
BOREHOLE LOG - ROTARY

Borehole No.
BHB12A
Sheet 1 of 2

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326144.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184437.0 N
		Driller	J.M	Ground Level	94.30m AOD
Client	Welsh Office	Logged by	J.M	Orientation	Vertical
		Core barrel		Date Started	07/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	07/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation



NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB12A** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326144.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco		184437.0 N
		Driller	J.M	Ground Level	94.30m AOD
Client	Welsh Office	Logged by	J.M	Orientation	Vertical
		Core barrel		Date Started	07/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	07/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Rotary drilling complete at 10.50 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB13
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	326147.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184356.7 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	P.D.C	Date Completed	31/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
29/10/1997	1800	5.90	3.50	5.30	
30/10/1997	0800	5.90	3.50	4.50	
30/10/1997	1700	23.80	5.00	10.70	
31/10/1997	0800	23.80	5.00	9.00	
31/10/1997	1500	35.60	5.00	10.70	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	3.00	mist	good	0*
3.00	5.90	mist	good	112
5.90	23.80	mist	good	112
23.80	35.60	mist	good	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
146	35.60	150	5.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
29/10/1997	1600	4.80	0.00	0	slight	0.00	0.00
30/10/1997	1500	14.60	0.00	0	seepage	0.00	0.00
30/10/1997	0000	17.00	0.00	0	moderate	0.00	0.00

GENERAL NOTES

1. Core orientated where practical.
2. 100mm diameter uPVC pipe grouted into base of borehole on completion.
3. Bedding dips and dip direction on separate sheet.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=27 (3,5,7,7,7,6)
2.00	S	N=77 (3,7,11,14,21,31)
3.00	S	50/140mm (7,13,23,27)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB13** Sheet 1 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	326147.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184356.7 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	P.D.C	Date Completed	31/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL	0.30	89.10							
Stiff becoming hard CLAY (drillers description). (St. Maughans Group)								27 1.00 1.45 77 2.00 2.45	
Firm to stiff reddish brown MARL (drillers description). (St. Maughans Group)	2.75	86.65							
	3.00	86.40					NI	S50/140mm 3.00 3.29	
Reddish brown medium to thickly sub-horizontally bedded (16°) moderately weathered sandy MUDSTONE, moderately weak to moderately strong with medium spaced sub-horizontal discontinuities, irregular rough tight. (St. Maughans Group)			3.00 4.50	99	85	85	3		
---from 4.50m occasional greyish green thinly to medium sub-horizontally bedded slightly weathered moderately strong ---from 4.70m moderately weathered							NI 5		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB13** Sheet 2 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	326147.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184356.7 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	P.D.C	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown medium to thickly sub-horizontally bedded (16°) moderately weathered sandy MUDSTONE, moderately weak to moderately strong with medium spaced sub-horizontal discontinuities, irregular rough tight. (St. Maughans Group)				4.50 5.90	100	62	7	NI 7		
---from 5.60m thinly to thickly laminated very sandy								6		
		5.90	83.50							
Greenish grey to pink fine to coarse grained medium sub-horizontally bedded (09°) thickly laminated and cross laminated fresh to slightly weathered micaceous SANDSTONE, moderately strong to very strong with medium to widely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				5.90 7.40	97	81	57	8		
---from 7.30 to 7.40m reddish brown thinly sub-horizontally to inclined bedded moderately weathered sandy mudstone moderately strong with very closely spaced sub-horizontally to inclined discontinuities planar rough tight								2 2		
---from 7.40 to 8.15m closely to medium spaced sub-vertical discontinuities planar rough tight (70°)								4		
---from 8.15m greyish green with medium spaced thin beds of very silty sandstone and widely spaced thin interbedding of highly weathered sandy mudstone				7.40 8.60	100	62	24	NI 0		
---from 9.04 to 9.17m calcite								2		
		9.17	80.23							
Reddish brown occasionally mottled greyish green thinly to medium sub-horizontally bedded moderately weathered slightly sandy MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)				8.60 10.10	97	76	45	8		
---from 9.75m very sandy										
		9.87	79.53					0		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB13** Sheet 3 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	326147.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184356.7 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	P.D.C	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded slightly weathered very silty SANDSTONE, weak to moderately strong with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group) ---from 10.28 to 10.70m sub-vertical fracture (65) planar rough slightly open (calcite fill)				10.10 11.60	100	93	75	8		
		10.95	78.45							
Light grey to pink fine to medium grained thickly bedded (330°/10°) thinly and cross laminated fresh SANDSTONE, strong to very strong with closely spaced sub-horizontal discontinuities planar smooth tight. (St. Maughans Group)								1		
				11.60 13.05	100	81	14	2		
								NI		
---from 13.05m with reddish brown medium spaced thin sub-horizontal interbedding of moderately to highly weathered very sandy mudstone very weak								NI		
								0		
		13.57	75.83							
Reddish brown thinly to medium bedded (11°) moderately weathered sandy MUDSTONE, weak to moderately strong with closely spaced sub-horizontal to inclined discontinuities irregular rough tight. (St. Maughans Group)				13.05 14.60	100	61	40	8		
								3		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB13** Sheet 4 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	326147.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184356.7 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	P.D.C	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly to medium bedded (11°) moderately weathered sandy MUDSTONE, weak to moderately strong with closely spaced sub-horizontal to inclined discontinuities irregular rough tight. (St. Maughans Group)								NI		
				14.60 16.20	100	81	44	6		
				16.20 17.75	100	100	36	12		
---from 17.20 to 17.75m with very closely spaced gravel size pockets of calcite										
		17.75	71.65							
Reddish brown thinly sub-horizontally bedded (12°) slightly to moderately weathered slightly sandy MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)										
				17.75 19.30	100	94	48	16		
---from 19.30m with pinkish grey medium spaced sub-horizontal thin interbedding of fine to medium grained slightly weathered sandstone, strong										
		19.80	69.60							
MUDSTONE As Sheet 5										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB13** Sheet 5 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	326147.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184356.7 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	P.D.C	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish brown occasionally mottled greyish green thinly to medium bedded (23°) slightly weathered very silty MUDSTONE, moderately strong with medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				19.30 20.80	100	94	51	9		
				20.80 22.30	100	85	76	6		
---from 21.65m medium to widely spaced sub-horizontal to inclined discontinuities planar rough tight										
---from 21.65 to 22.60m very closely spaced gravel size pockets of calcite										
---from 22.25m with light grey to pink medium to widely spaced thin to medium spaced fine to medium grained slightly weathered sandstone strong								NI		
---from 22.30 to 22.40m moderately weathered weak completely fractured								3		
				22.30 23.80	100	89	64			
		23.30	66.10							
Reddish brown occasionally mottled greyish green thinly to medium bedded (17°) slightly weathered slightly sandy MUDSTONE weak to moderately weak with closely spaced sub-horizontal to inclined discontinuities irregular smooth tight. (St. Maughans Group)								4		
---from 24.00 to 25.30m very closely spaced gravel size pockets of calcite										
				23.80 25.30	100	100	61	9		
---from 24.80m medium to widely spaced sub-horizontal to inclined discontinuities planar rough tight										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB13** Sheet 6 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	326147.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184356.7 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	P.D.C	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green thinly to medium bedded (17°) slightly weathered slightly sandy MUDSTONE weak to moderately weak with closely spaced sub-horizontal to inclined discontinuities irregular smooth tight. (St. Maughans Group)										
				25.30 26.80	100	95	81	5		
---from 26.55 to 27.23m closely spaced gravel size pockets of calcite										
				26.80 28.30	100	95	87	4		
---from 28.20 to 28.30m moderately weathered weak completely fractured								NI		
---from 28.30m slightly to moderately weathered										
				28.30 29.80	100	93	73	3		
		29.33	60.07							
Greyish pink occasionally mottled greyish green fine to medium grained medium bedded (14°) thinly and cross laminated silty micaceous SANDSTONE, moderately weak to strong with medium to widely spaced very thin to thin beds of reddish brown moderately weathered sandy mudstone and extremely to very closely spaced gravel size pockets of calcite with medium sub-horizontally to inclined discontinuities planar rough tight. (St. Maughans Group)								2		
---from 29.70 to 28.95m very closely spaced gravel size pockets of										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHB13** Sheet 7 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	326147.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184356.7 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	P.D.C	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Greyish pink occasionally mottled greyish green fine to medium grained medium bedded (14°) thinly and cross laminated silty micaceous SANDSTONE, moderately weak to strong with medium to widely spaced very thin to thin beds of reddish brown moderately weathered sandy mudstone and extremely to very closely spaced gravel size pockets of calcite with medium sub-horizontally to inclined discontinuities planar rough tight. (St. Maughans Group)				29.80 31.25	100	97	76	9		
		31.20	58.20					NI		
Reddish brown to purplish brown mottled greyish green medium sub-horizontally bedded slightly to moderately weathered sandy MUDSTONE, weak to moderately strong with very closely to closely spaced gravel size pockets of calcite with medium spaced sub-horizontal discontinuities irregular rough tight. (St. Maughans Group)										
---from 31.20 to 31.25m completely fractured				31.25 32.75	100	89	67	9		
---from 32.75 to 34.10m very closely spaced vertical to sub-vertical thin laminations of calcite								4		
		33.08	56.32							
Reddish brown occasionally mottled greyish green medium sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				32.75 34.25	100	87	65	3		
---from 34.10 to 34.25m completely fractured								NI		
---from 34.25m closely to medium spaced sub-horizontal discontinuities								2		
---at 34.25m discontinuities with slicken siding								NI		
---from 34.42 to 34.60m moderately weathered very weak completely fractured				34.25 35.60	100	69	37	3		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB13
Sheet 8 of 8

Contract No.	F10895	Method	Rotary Coring	Coordinates	326147.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184356.7 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	P.D.C	Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green medium sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)								NI		
---from 35.25 to 35.80m moderately weathered very weak completely fractured								0		
		35.60	53.80							
Rotary drilling complete at 35.60 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB13A
Header

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326147.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184357.0 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	J.M	Orientation	Vertical
		Core barrel		Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	01/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB13A
Sheet 1 of 3

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326147.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184357.0 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	J.M	Orientation	Vertical
		Core barrel		Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	01/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No.
BHB13A
Sheet 2 of 3

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326147.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184357.0 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	J.M	Orientation	Vertical
		Core barrel		Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	01/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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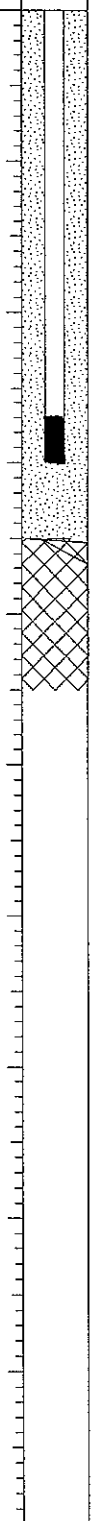
BOREHOLE LOG - ROTARY

Borehole No.
BHB13A
Sheet 3 of 3

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326147.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184357.0 N
		Driller	J.M	Ground Level	89.40m AOD
Client	Welsh Office	Logged by	J.M	Orientation	Vertical
		Core barrel		Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	01/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Rotary drilling complete at 24.50 m.										



NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB14
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	326154.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184258.5 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Sawtooth	Date Completed	22/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
20/10/1997	1800	10.20	1.35	8.70	
21/10/1997	0800	10.20	1.35	5.00	
21/10/1997	1800	20.25	1.35	19.50	
22/10/1997	0800	20.25	1.35	13.35	
22/10/1997	1800	30.20	1.35	28.20	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	30.20	mist	100%	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB14** Sheet 1 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	326154.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184258.5 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Sawtooth	Date Completed	22/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Boulder CLAY (drillers description). (Morainic Drift)		1.35	75.15							
Light grey reddish brown fine to medium grained thinly to medium sub-horizontally bedded (13°), (06°) slightly weathered argillaceous SANDSTONE, moderately strong to strong, completely fractured. (St. Maughans Group)				1.35 1.85	88	10	0	NI		
				1.85 2.15	100	17	0	NI		
---from 2.15m occasionally thinly, thickly and cross laminated closely spaced sub-horizontal discontinuities planar smooth tight				2.15 2.45	100	53	33	2		
								NI		
				2.45 2.85	100	65	30	6		
				2.85 3.00	100	100	0	1		
---from 3.26 to 3.52m very closely spaced discontinuities planar rough tight								8		
---from 3.32 to 3.63m vertical fracture irregular rough tight		3.52	72.98							
Reddish brown mottled greyish green thinly to medium sub-horizontally bedded, (14°) slightly to moderately weathered sandy MUDSTONE, very weak to moderately weak with closely to medium spaced sub-horizontal discontinuities irregular, rough tight. (St. Maughans Group)				3.00 4.50	100	53	8	3		
---from 3.85 to 4.20m highly weathered weak completely fractured								NI		
---from 4.20 to 4.50m moderately to highly weathered weak								3		
								4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB14** Sheet 2 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	326154.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184258.5 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Sawtooth	Date Completed	22/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green thinly to medium sub-horizontally bedded, (14°) slightly to moderately weathered sandy MUDSTONE, very weak to moderately weak with closely to medium spaced sub-horizontal discontinuities irregular, rough tight. (St. Maughans Group)				4.50 5.70	98	73	59	4		
---from 5.35 to 5.70m sub-vertical fractures (70°) planar rough slightly open (greyish green discolouration)								NI		
---from 5.50 to 5.70m moderately weathered to highly weathered weak completely fractured								NI		
---from 5.70 to 5.90m purplish brown slightly sandy highly weathered very weak completely fractured								2		
---from 6.28 to 6.40m highly weathered weak completely fractured								NI		
				5.70 7.30	100	61	23	5		
---from 6.90m with closely spaced inclined discontinuities planar rough tight										
---from 7.20 to 7.30m highly weathered weak completely fractured								NI		
				7.30 8.70	107	93	7	20		
---from 8.70 to 10.20m moderately weathered										
				8.70 10.20	107	97	25	12		
								2		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB14** Sheet 3 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	326154.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184258.5 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Sawtooth	Date Completed	22/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green thinly to medium sub-horizontally bedded, (14°) slightly to moderately weathered sandy MUDSTONE, very weak to moderately weak with closely to medium spaced sub-horizontal discontinuities irregular, rough tight. (St. Maughans Group)										
---from 10.20m slightly weathered				10.20 11.55	104	100	64	9		
---from 11.80m reddish brown				11.55 13.05	107	103	55	10		
---from 12.55m with occasional gravel size pockets of calcite gravel								3		
		13.35	63.15							
Pinkish grey fine to medium grained thinly to medium sub-horizontal bedded thinly to thickly laminated and cross laminated slightly weathered argillaceous slightly micaceous SANDSTONE, moderately strong to very strong with closely to medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)										
---from 13.56 to 13.80m sub-vertical fracture (75°) planar rough tight				13.05 14.55	104	89	56	9		
		14.72	61.78					0		
MUDSTONE As Sheet 4										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB14** Sheet 4 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	326154.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184258.5 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Sawtooth	Date Completed	22/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown medium to thickly sub-horizontally bedded, (10°) fresh to slightly weathered very sandy slightly micaceous MUDSTONE, very strong with occasional to some gravel size pockets of calcite and with widely spaced sub-horizontal discontinuities. (St. Maughans Group)				14.55 16.05	96	93	47	3		
---from 15.47 to 16.05m sub-vertical to vertical fracture planar rough tight										
		15.70	60.80							
Light greyish pink fine to medium grained medium to thickly sub-horizontally bedded (13°) thinly and thickly laminated fresh to slightly weathered micaceous SANDSTONE, very strong with medium to widely spaced sub-horizontal discontinuities, planar rough tight. (St. Maughans Group)								1		
---from 15.93 to 16.28m mottled greyish green				16.05 17.40	99	96	72	4		
---from 17.50 to 17.85m very calcitic								1		
		17.75	58.75							
Reddish brown thinly to medium sub-horizontally bedded slightly weathered very sandy slightly micaceous MUDSTONE, strong to very strong with many gravel size pockets of calcite and with medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)				17.40 18.85	100	97	87	3		
		18.30	58.20							
Light greyish pink occasionally mottled greyish green fine to medium grained thickly sub-horizontally bedded, (09°) fresh micaceous SANDSTONE, strong to very strong with widely spaced sub-horizontal planar discontinuities, planar, smooth tight. (St Maughans Group)								0		
---from 18.30 to 19.62m argillaceous with some gravel size pockets of calcite				18.85 20.25	106	106	106	1		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB14** Sheet 5 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	326154.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184258.5 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Sawtooth	Date Completed	22/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Light greyish pink occasionally mottled greyish green fine to medium grained thickly sub-horizontally bedded, (09°) fresh micaceous SANDSTONE, strong to very strong with widely spaced sub-horizontal planar discontinuities, planar, smooth tight. (St Maughans Group) ---from 20.10m fine to coarse grained thinly and thickly laminated				20.25 21.70	101	97	90	4		
		21.30	55.20							
Reddish brown occasional mottled greyish green medium sub-horizontally bedded (05°) slightly weathered sandy MUDSTONE, moderately strong to strong with extremely closely to very closely spaced thin to thick laminations of light greyish pink fine to medium grained sandstone, with closely to medium spaced sub-horizontal discontinuities, planar, rough tight. (St. Maughans Group) ---from 21.30 to 21.70m some to many gravel size pockets of calcite ---from 22.10 to 22.30m occasional gravel size pockets of calcite								0		
				21.70 23.25	97	94	67	7		
---from 23.10 to 23.25m many gravel size pockets of calcite ---from 23.55 to 23.68m sub-vertical fracture (70°) planar rough slightly open (calcite infill)								4		
		23.95	52.55	23.25 24.65	100	99	81			
Purplish brown fine to medium grained medium to very thickly sub-horizontally bedded (03°) thinly and cross laminated fresh argillaceous micaceous SANDSTONE, very strong with widely to very widely spaced sub-horizontal discontinuities, planar smooth tight. (St. Maughans Group) ---from 24.30 to 24.32m sub-vertical thick laminations of calcite ---from 24.35 to 24.38m inclined fracture irregular rough open (greenish grey highly weathered mudstone infill)								3		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB14** Sheet 6 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	326154.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184258.5 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Sawtooth	Date Completed	22/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish brown fine to medium grained medium to very thickly sub-horizontally bedded (03°) thinly and cross laminated fresh argillaceous micaceous SANDSTONE, very strong with widely to very widely spaced sub-horizontal discontinuities, planar smooth tight. (St. Maughans Group)				24.65 25.90	101	101	101	1		
---from 25.90m mottled greyish green				25.90 27.45	100	100	100	1		
		27.45	49.05							
Reddish brown occasionally mottled greyish green thinly to medium sub-horizontally bedded, (05°) slightly weathered sandy MUDSTONE, strong with sub-horizontal to inclined closely to medium spaced discontinuities, planar rough tight. (St. Maughans Group)				27.45 28.65	105	102	89	4		
---from 28.65m with some thin laminations to gravel size pockets of calcite				28.65 30.20	103	103	97	7		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB14** Sheet 7 of 7

Contract No.	F10895	Method	Rotary Coring	Coordinates	326154.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184258.5 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Sawtooth	Date Completed	22/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green thinly to medium sub-horizontally bedded, (05°) slightly weathered sandy MUDSTONE, strong with sub-horizontal to inclined closely to medium spaced discontinuities, planar rough tight. (St. Maughans Group)		30.20	46.30							
Rotary drilling complete at 30.20 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB14A
Header

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326154.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184259.0 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	D.D	Orientation	Vertical
		Core barrel		Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	23/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB14A
Sheet 1 of 3

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326154.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184259.0 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	D.D	Orientation	Vertical
		Core barrel		Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	23/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB14A
Sheet 2 of 3

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326154.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184259.0 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	D.D	Orientation	Vertical
		Core barrel		Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	23/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB14A
Sheet 3 of 3

Contract No.	F10895	Method	Rotary Openhole	Coordinates	326154.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184259.0 N
		Driller	D.D	Ground Level	76.50m AOD
Client	Welsh Office	Logged by	D.D	Orientation	Vertical
		Core barrel		Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	23/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Rotary drilling complete at 22.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB15** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	326323.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184367.1 N
		Driller	J.M	Ground Level	79.60m AOD
Client	Welsh Office	Logged by	T.R/C.D/M.B	Orientation	Vertical
		Core barrel	S	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	28/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
23/10/1997	1800	5.80	4.80	Dry	
24/10/1997	0800	5.80	4.80	2.50	
24/10/1997	1800	10.30	4.80	6.00	
27/10/1997	0800	10.30	4.80	1.75	
27/10/1997	1800	16.30	4.80	6.30	
28/10/1997	0800	16.30	4.80	1.55	
28/10/1997	1230	20.60	4.80	7.00	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	1.80	air & mist	good	0*
1.80	20.60	air & mist	good	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
146	20.60	150	4.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
23/10/1997	1800	5.80	2.50	840	seepage	4.80	0.00

GENERAL NOTES

1. 100mm plastic casing grouted in to base of borehole.
2. Core orientated with scribe during drilling.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	C	N=25 (4,5,5,5,7,8)
1.80	C	50/85mm*

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB15** Sheet 1 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	326323.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184367.1 N
		Driller	J.M	Ground Level	79.60m AOD
Client	Welsh Office	Logged by	T.R/C.D/M.B	Orientation	Vertical
		Core barrel	S	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	28/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Sandy CLAY (drillers description). (Morainic Drift)										
		1.00	78.60						25 1.00	
Marly CLAY (drillers description). (Morainic Drift)									1.45	
		1.80	77.80						C50/85mm* 1.80	
Reddish brown occasionally mottled greyish green fine to medium grained thinly to medium bedded slightly weathered slightly micaceous SANDSTONE, strong to very strong with closely spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)								NI	1.89	
---from 1.80 to 1.92m moderately to highly weathered completely fractured moderately strong to strong				1.80 2.75	100	66	11	9		
---from 2.75 to 3.23m sub-vertical fracture (80°) planar smooth tight to open (clay infill)								NI		
		3.23	76.37					5		
Reddish brown mottled greyish green thinly bedded occasionally thinly laminated moderately to highly weathered slightly sandy MUDSTONE, weak to very weak with closely to medium spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)				2.75 4.10	100	86	17			
---from 3.23 to 3.45m greyish green mottled reddish brown								NI		
---from 3.23 to 4.10m highly weathered completely fractured										
---from 4.10 to 4.85m completely fractured				4.10 4.60	100	0	64	NI		
								NI		
---from 4.85 to 5.25m sandy										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB15** Sheet 2 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	326323.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184367.1 N
		Driller	J.M	Ground Level	79.60m AOD
Client	Welsh Office	Logged by	T.R/C.D/M.B	Orientation	Vertical
		Core barrel	S	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	28/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green thinly bedded occasionally thinly laminated moderately to highly weathered slightly sandy MUDSTONE, weak to very weak with closely to medium spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)				4.60 5.80	95	79	21	12		
		5.70	73.90					NI		
Reddish brown medium to thickly bedded moderately weathered slightly sandy silty MUDSTONE, weak to moderately weak with very closely to closely spaced discontinuities planar rough tight. (St Maughans Group)				5.80 6.00	85	0	0	NI		
---from 5.70 to 6.10m highly weathered completely fractured								NI		
---from 6.00 to 6.35m highly weathered completely fractured								0		
---from 6.55 to 6.95m highly weathered completely fractured				6.00 7.30	89	59	27	NI		
								0		
---from 7.30 to 7.60m highly weathered completely fractured								NI		
				7.30 8.80	100	73	33	10		
		8.80	70.80							
Reddish brown occasionally mottled greyish green fine to medium grained medium to thickly bedded (21°) fresh to slightly weathered silty micaceous SANDSTONE, strong with very closely spaced fine to medium gravel size pockets of calcite with medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)								0		
		9.50	70.10	8.80 10.30	96	90	77			
Reddish brown occasionally mottled greyish green medium to thickly bedded (14°) moderately weathered silty slightly sandy MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)								4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB15** Sheet 3 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	326323.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184367.1 N
		Driller	J.M	Ground Level	79.60m AOD
Client	Welsh Office	Logged by	T.R/C.D/M.B	Orientation	Vertical
		Core barrel	S	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	28/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green medium to thickly bedded (14°) moderately weathered silty slightly sandy MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group) ---from 10.30m slightly to moderately weathered				10.30 11.80	100	90	43	9		
---from 11.80 to 12.00m highly weathered weak completely fractured				11.80 13.35	100	68	47	NI 11		
		13.00	66.60							
Reddish brown fine to medium grained thinly bedded (12°), cross laminated slightly weathered silty SANDSTONE, strong with thinly sub-horizontal discontinuities planar rough tight. (St. Maughans Group)										
		13.35	66.25							
Reddish brown thinly to medium sub-horizontally bedded slightly to moderately weathered sandy MUDSTONE, moderately strong to strong with closely to medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group) ---from 13.35 to 13.60m highly weathered weak completely fractured ---from 13.95 to 14.50m mottled greyish green with very closely spaced gravel size pockets of calcite				13.35 14.85	98	50	33	NI 6		
		14.50	65.10							
Reddish brown fine to medium grained thinly bedded (10°) thinly and cross laminated slightly weathered silty SANDSTONE, strong with closely to medium spaced very thin to thin interbedding of reddish brown sandy mudstone and thinly laminated to thickly laminated sub-horizontal fractures planar rough tight. (St. Maughans Group)								2 1		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB15** Sheet 4 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	326323.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184367.1 N
		Driller	J.M	Ground Level	79.60m AOD
Client	Welsh Office	Logged by	T.R/C.D/M.B	Orientation	Vertical
		Core barrel	S	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	28/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to medium grained thinly bedded (10°) thinly and cross laminated slightly weathered silty SANDSTONE, strong with closely to medium spaced very thin to thin interbedding of reddish brown sandy mudstone and thinly laminated to thickly laminated sub-horizontal fractures planar rough tight. (St. Maughans Group)		15.33	64.27					NI 5		
Reddish brown occasionally mottled greyish green thinly to medium bedded (10°) slightly weathered sandy MUDSTONE, weak to moderately strong with closely spaced sub-horizontal to inclined discontinuities irregular rough tight. (St. Maughans Group)				14.85 16.30	38	26	14	NI 10		
---from 15.33 to 15.60m moderately weathered moderately weak										
---from 16.30 to 16.95m moderately to highly weathered weak completely fractured				16.30 17.65	100	54	17	NI 6 6		
---from 17.30m moderately weathered										
---from 17.65 to 18.15m moderately weathered weak				17.65 19.15	100	97	45	6 9		
---from 19.15 to 19.60m highly weathered very weak completely fractured				19.15 20.60	100	70	49	NI 2		
---from 19.63m very sandy		19.95	59.65							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB15** Sheet 5 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	326323.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hands England		184367.1 N
		Driller	J.M	Ground Level	79.60m AOD
Client	Welsh Office	Logged by	T.R/C.D/M.B	Orientation	Vertical
		Core barrel	S	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	28/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to medium grained medium to thickly bedded slightly weathered silty micaceous SANDSTONE strong with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)								4		
		20.60	59.00							
Rotary drilling complete at 20.60 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB15A
Header

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	326325.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hans England		184369.0 N
		Driller	J.M	Ground Level	79.70m AOD
Client	Welsh Office	Logged by		Orientation	Vertical
		Core barrel		Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	29/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
29/10/1997	1800	11.50	0.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	11.50	air	good	76

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB15A** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	326325.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hans England		184369.0 N
		Driller	J.M	Ground Level	79.70m AOD
Client	Welsh Office	Logged by		Orientation	Vertical
		Core barrel		Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	29/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Refer to borehole B15 for descriptions to 11.50m.		1.00	78.70							
		1.80	77.90							
		3.23	76.47							
		5.70	74.00							
		8.80	70.90							
		9.50	70.20							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB15A** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Open Holing	Coordinates	326325.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Hans England		184369.0 N
		Driller	J.M	Ground Level	79.70m AOD
Client	Welsh Office	Logged by		Orientation	Vertical
		Core barrel		Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	29/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
		11.50	68.20							
Rotary drilling complete at 11.50 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHB16** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	326320.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184284.9 N
		Drilling Rig	Pilcon	Ground Level	71.50m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	T.R	Date Started	15/10/1997
Consultant	Ove Arup and Partners			Date Completed	15/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
15/10/1997	1400	1.10	0.80	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
0.80	1.10	0.75	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	1.10	150	0.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole abandoned at 1.10m due to obstruction.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHB16** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	326320.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184284.9 N
		Driller	A.M	Ground Level	71.50m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	15/10/1997
Consultant	Ove Arup and Partners			Date Completed	15/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.20	71.30	B 0.20 - 0.60			
Soft to firm reddish brown sandy CLAY with occasional to some angular to subrounded mudstone gravel and rootlets. (Morainic Drift)		0.80	70.70				
BOULDERS with a sandy clayey matrix (drillers description). (Morianic Drift)		1.10	70.40				
Cable Percussion boring complete at 1.10 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHB16A
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	326323.0 E 184285.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	71.40m AOD
Client	Welsh Office	Drillers	A.M/J.H	Orientation	Vertical
		Logged by	T.R/C.D/M.B	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	24/10/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
15/10/1997	1800	4.40	1.80	Dry	
21/10/1997	1800	7.55	7.25	Dry	
22/10/1997	0800	7.55	7.25	Dry	
22/10/1997	1800	18.80	7.25	18.35	
23/10/1997	0800	18.80	7.25	Dry	
23/10/1997	1800	26.20	7.25	25.50	
24/10/1997	0800	26.20	7.25	25.95	
24/10/1997	1800	29.60	7.25	25.95	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
3.90	4.25	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	29.60	150	7.20

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
4.40	29.60	air & water	good	112

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.10	C	50/60mm (18,21,50)
4.25	S	90/105mm*

* Seating blows only.

GENERAL NOTES

1. Borehole moved due to obstruction.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB16A** Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	326323.0 E 184285.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	71.40 m AOD
Client	Welsh Office	Drillers	A.M/J.H	Orientation	Vertical
		Logged by	T.R/C.D/M.B	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core Barrel	S	Date Completed	24/10/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
TOPSOIL	0.20	71.20				
Soft to firm reddish brown sandy CLAY with some angular to subrounded mudstone and sandstone gravel and occasional cobbles and boulders. Locally silty sandy gravel. (Morainic Drift)			U 1.00 - 1.09		C50/60mm 1.10 1.31	
			B 1.90 - 2.80			
Reddish brown mottled greyish green highly to completely weathered silty MUDSTONE, weak. (St. Maughans Group)	2.90	68.50	D 3.00 U 3.30 - 3.75 D 3.75	(48)		
---at 4.25m moderately weathered	4.40	67.00	D 4.25 4.40 - 4.65	TCR 0 SCR 2 RQD 0 FI NI	S90/105mm* 4.25 4.36	
Reddish brown to light grey fine to medium grained thinly to medium sub-horizontally bedded (06°) cross laminated slightly to moderately weathered argillaceous micaceous SANDSTONE,moderately strong with medium spaced thin to very thin beds of sandy mudstone very closely to closely spaced horizontal discontinuities planar rough tight. (St. Maughans Group)	5.85	65.55	4.65 - 5.85	96 88 0 18		
---from 4.40 to 4.65m completely fractured			5.85 - 7.25	95 89 0 20		
Green very thinly to thinly horizontally bedded moderately weathered sandy MUDSTONE, moderately weak to moderately strong with very closely spaced sub-horizontal to sub-vertical discontinuities planar rough tight. (St. Maughans Group)	6.63	64.77			4	
---from 5.85 to 5.95m cross laminated slightly weathered very sandy			7.25 - 7.55	87 67 0 7	NI	
					2	
Grey occasionally mottled green fine to coarse grained medium sub-horizontally bedded occasionally thinly laminated slightly weathered micaceous SANDSTONE, moderately weak to strong with closely to medium spaced sub-horizontal discontinuities planar rough tight. (St. Maughans Group)			7.55 - 8.95	89 68 44	NI 5	
---from 6.63 to 7.25m vertical fracture planar rough slightly open	9.55	61.85	8.95 - 10.40	100 77 15	NI 7 NI	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB16A** Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	326323.0 E 184285.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	71.40 m AOD
Client	Welsh Office	Driller	A.M/J.H	Orientation	Vertical
		Logged by	T.R/C.D/M.B	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	24/10/1997
		Core bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth
Reddish brown thinly to medium horizontally bedded (25°) slightly weathered slightly sandy MUDSTONE, moderately strong to strong with closely to medium spaced horizontal discontinuities planar rough tight. (St. Maughans Group)							8	
---from 10.40 to 11.20m sandy			10.40 - 11.89	96	96	0	21	
			11.89 - 13.20	98	68	22	15	
---from 12.90 to 14.00m with medium spaced thin beds of fine to medium grained argillaceous sandstone							NI	
			13.20 - 14.65	95	89	46	11	
	15.45	55.95	14.65 - 16.05	96	95	61	7	
Pinkish grey fine to medium grained medium sub-horizontally bedded (18°) slightly weathered argillaceous micaceous SANDSTONE moderately weak to moderately strong with medium spaced thin beds of reddish brown sandy mudstone closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)							2	
---from 15.45 to 17.05m very closely to closely spaced thin laminations to gravel sized pockets of calcite			16.05 - 17.50	93	79	44	2 6 3	
	17.50	53.90						
Reddish brown occasionally mottled greyish green medium sub-horizontally bedded (39°) slightly to moderately weathered sandy MUDSTONE, very weak to moderately strong with moderately spaced very thinly to thinly spaced interbedding of greyish pink fine to medium grained argillaceous sandstone with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)			17.50 - 18.80	100	100	93	4	
---from 17.50 to 17.58m very closely spaced fine to medium gravel sized pockets of calcite			18.80 - 20.25	97	83	41	8	

Installation

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB16A** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	326323.0 E 184285.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	71.40 m AOD
Client	Welsh Office	Driller	A.M/J.H	Orientation	Vertical
		Logged by	T.R/C.D/M.B	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	24/10/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green medium sub-horizontally bedded (39°) slightly to moderately weathered sandy MUDSTONE, very weak to moderately strong with moderately spaced very thinly to thinly spaced interbedding of greyish pink fine to medium grained argillaceous sandstone with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)								2		
								0		
								NI		
				20.25 - 21.70	103	79	34	6		
								7		
---from 20.40 to 20.55m moderately to highly weathered moderately weak to moderately strong completely fractured								3		
								NI		
---from 20.40 to 20.90m closely to very closely spaced fine to medium gravel sized pockets of calcite				21.70 - 23.15	97	83	52	6		
---from 21.00 to 21.40m greyish green mottled reddish brown slightly weathered calcitic silty mudstone very strong		23.30	48.10					NI		
								3		
---from 21.50 to 21.57m greyish green mottled reddish brown slightly weathered calcitic silty mudstone very strong				23.15 - 24.50	109	100	30	8		
---from 22.00 to 22.10m completely fractured										
---from 23.00 to 23.15m moderately to highly weathered moderately weak to moderately strong completely fractured				24.50 - 25.75	100	84	42	6		
								NI		
Dark reddish brown occasionally mottled greyish green fine to moderately grained moderately sub-horizontally bedded (20°) occasionally thinly and cross laminated fresh to slightly weathered micaceous argillaceous SANDSTONE, strong to very strong moderately to closely spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)				25.75 - 26.20	107	49	0	NI		
		26.45	44.95					0		
								12		
---from 23.40 to 26.45m sub-vertical to vertical fracture irregular rough tight to open (calcite infill)				26.20 - 27.65	99	90	43	8		
---from 25.52 to 25.75m slightly weathered completely fractured										
---from 25.75 to 26.20m greyish green mottled brown slightly weathered strong to very strong completely fractured				27.65 - 29.10	98	90	52	10		
Reddish brown mottled greyish green thinly sub-horizontally bedded (12°) slightly weathered sandy MUDSTONE, moderately strong to strong with closely to medium spaced sub-horizontal and inclined discontinuities planar rough tight. (St. Maughans Group)				29.10 - 29.60	80	64	64	2		
		29.60	41.80					NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Borehole complete at 29.60m

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB16B
Header

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	326321.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184286.0 N
		Driller	J.H	Ground Level	71.50m AOD
Client	Welsh Office	Logged by	J.H	Orientation	Vertical
		Core barrel		Date Started	28/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
28/11/1997	1800	21.00	0.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	21.00	air	good	0*

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
102	21.00	0	0.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole open-holed for piezometer installation adjacent to borehole B16A.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB16B** Sheet 1 of 3

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	326321.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184286.0 N
		Driller	J.H	Ground Level	71.50m AOD
Client	Welsh Office	Logged by	J.H	Orientation	Vertical
		Core barrel		Date Started	28/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
MADE GROUND: Overburden (drillers description).		4.20	67.30							
Red SANDSTONE with mudstone bands (drillers description). (St. Maughans Group)										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB16B
Sheet 2 of 3

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	326321.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184286.0 N
		Driller	J.H	Ground Level	71.50m AOD
Client	Welsh Office	Logged by	J.H	Orientation	Vertical
		Core barrel		Date Started	28/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Red SANDSTONE with mudstone bands (drillers description). (St. Maughans Group)										
		14.50	57.00							
Red MUDSTONE with occasional sandstone bands (drillers description). (St. Maughans Group)										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB16B
Sheet 3 of 3

Contract No.	F10895	Method	Rotary Open Holed	Coordinates	326321.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184286.0 N
		Driller	J.H	Ground Level	71.50m AOD
Client	Welsh Office	Logged by	J.H	Orientation	Vertical
		Core barrel		Date Started	28/11/1997
Consultant	Ove Arup and Partners	Core bit		Date Completed	28/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Red MUDSTONE with occasional sandstone bands (drillers description). (St. Maughans Group)		21.00	50.50							
Rotary drilling complete at 21.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB17** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	326443.0 E 184310.3 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco	Ground Level	65.30m AOD
Client	Welsh Office	Drillers	J.M	Orientation	Vertical
		Logged by	T.R/M.B/C.D	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	20/10/1997
		Core bit	ST		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
15/10/1997	1800	3.00	1.70	Dry	
17/10/1997	1430	3.00	3.00	Dry	
17/10/1997	1600	5.75	3.00	Dry	
18/10/1997	1600	9.35	4.20	Dry	
19/10/1997	1600	17.50	4.20	Dry	
20/10/1997	1800	20.40	4.20	Dry	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
2.30	3.00	1.50	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	20.40	150	4.20

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
3.00	5.75	air/mist	good	112
5.75	9.35	air/mist	good	112
9.35	17.50	air/mist	good	112
17.50	20.40	air/mist	good	112

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	50/75mm (2,11,50)
2.80	S	50/60mm*

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB17** Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	326443.0 E 184310.3 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco	Ground Level	65.30 m AOD
Client	Welsh Office	Drillers	J.M	Orientation	Vertical
		Logged by	T.R/M.B/C.D	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core Barrel	S	Date Completed	20/10/1997
		Core Bit	ST		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	TCR	SCR	RQD	SPT N & depth	Installation
TOPSOIL	0.30	65.00							
Soft reddish brown sandy CLAY with some angular to subrounded mudstone gravel. (Morainic Drift)	0.60	64.70	D 0.50 B 0.60 - 1.00						
Reddish brown mottled greyish green highly to completely weathered silty MUDSTONE, very weak. (St. Maughans Group)			U 1.00 - 1.45	(39)					
			D 1.45						
			D 1.80						
---at 2.00m becoming moderately weathered			D 2.00					S50/75mm 2.00 2.23	
			D 2.80					S50/60mm* 2.80 2.86	
	3.00	62.30							
Reddish brown mottled greyish green medium to thickly horizontally bedded moderately weathered silty MUDSTONE, moderately weak with medium spaced sub-horizontal to sub-vertical fractures irregular, rough, tight. (St. Maughans Group)			3.00 - 4.50		97	90	90	0 NI 1	
---from 3.00 to 3.28m highly weathered very weak completely fractured								1 NI	
	4.50	60.80						0	
---from 4.35 to 4.50m highly weathered very weak completely fractured								NI 2	
	4.95	60.35	4.50 - 5.40		107	68	40	NI	
	5.02	60.28						8	
Reddish brown mottled greyish green medium horizontally bedded slightly weathered sandy micaceous MUDSTONE, strong with closely spaced horizontal fractures planar rough tight. (St. Maughans Group)								NI	
			5.40 - 5.75		103	63	0	NI	
---from 4.58 to 4.65m completely fractured								NI	
			5.75 - 7.10		101	81	58	8	
Reddish brown mottled greyish green thinly bedded highly weathered silty MUDSTONE ,weak, completely fractured. (St. Maughans Group)								3	
	7.10	58.20							
Reddish brown thinly to medium sub-horizontally bedded (23°) slightly to moderately weathered sandy MUDSTONE, moderately weak and moderately strong closely spaced sub-horizontal discontinuities, planar, rough, tight. (St. Maughans Group)			7.10 - 8.25		89	83	77	3	
---at 5.35m highly weathered weak to very weak completely fractured									
---from 6.70m occasionally mottled greyish green very closely spaced thick laminations of fine to medium grained sandstone			8.25 - 9.35		95	94	35	9	
SANDSTONE As Sheet 2									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB17** Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	326443.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184310.3 N
		Drilling Rig	Edeco	Ground Level	65.30 m AOD
Client	Welsh Office	Driller	J.M	Orientation	Vertical
		Logged by	T.R/M.B/C.D	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	20/10/1997
		Core bit	ST		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Light greyish pink fine to coarse grained medium to thickly sub-horizontally bedded (26°) thinly and thickly cross laminated micaceous SANDSTONE, very strong medium to widely spaced sub-horizontal discontinuities planar smooth tight. (St. Maughans Group)				9.35 - 10.80	96	96	90	2		
				10.80 - 12.22	99	99	97	2		
		11.65	53.65							
White to light grey fine to coarse grained thickly sub-horizontally bedded (26°) fresh siliceous CONGLOMERATE, very strong with widely spaced sub-horizontal discontinuities planar smooth tight. (St. Maughans Group)								0		
		12.36	52.94					0		
		12.77	52.53					2		
Dark greenish grey fine to coarse grained medium sub-horizontally bedded (48°) thinly and thickly laminated fresh to slightly weathered micaceous SANDSTONE, very strong with closely spaced and medium spaced sub-horizontal discontinuities planar rough tight occasionally infilled with calcite (<6mm). (St. Maughans Group)				12.22 - 13.55	101	74	42	NI		
								6		
		13.87	51.43					1		
Green thinly to medium sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely to medium spaced horizontal to inclined discontinuities, undulating smooth tight. (St. Maughans Group) ---at 12.69m fracture with striations ---from 12.77 to 12.96m highly weathered, very weak, completely fractured				13.55 - 15.00	106	97	53	6		
		14.87	50.43					3		
				15.00 - 16.00	98	83	75	6		
Purplish brown thinly to medium sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely to medium spaced horizontal to inclined discontinuities undulating smooth tight. (St. Maughans Group)								6		
				16.00 - 17.50	97	77	25	NI		
								6		
Reddish brown occasionally mottled greyish green fine to medium grained thinly to medium sub-horizontally bedded (24°) slightly weathered slightly micaceous SANDSTONE, moderately strong to strong with closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group) ---from 14.87 to 15.00m argillaceous ---from 15.00 to 15.37m vertical to sub-vertical fracture (70-90°) ---from 16.60 to 18.50m with vertical to sub-vertical undulating fracture rough, tight to open (quartz infill) ---from 16.60 to 18.50m planes of				17.50 - 18.95	98	93	13	6		
								NI		
								3		
				18.95 - 20.40	101	94	52	4		
								7		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHB17** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	326443.0 E 184310.3 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Edeco	Ground Level	65.30 m AOD
Client	Welsh Office	Driller	J.M	Orientation	Vertical
		Logged by	T.R/M.B/C.D	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core barrel	S	Date Completed	20/10/1997
		Core bit	ST		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green fine to medium grained thinly to medium sub-horizontally bedded (24°) slightly weathered slightly micaceous SANDSTONE, moderately strong to strong with closely spaced sub-horizontal to inclined discontinuities planar rough tight. (St. Maughans Group)		20.40	44.90							
---at 19.55m bedding planar with slight polishing										
Borehole complete at 20.40 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB18** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	326501.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		184229.9 N
		Driller	E.D	Ground Level	48.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	17/11/1997
Consultant	Ove Arup and Partners	Core bit	Geocube	Date Completed	18/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
17/11/1997	1800	12.00	2.00	Dry	
18/11/1997	0800	12.00	2.00	Dry	
18/11/1997	1800	15.10	2.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	2.00	mist	100%	0*
2.00	15.10	mist	100%	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
112	15.10	146	2.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Bedding dips and dip direction on separate sheet.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=26 (6,6,6,6,7,7)
2.00	S	50/70mm (12,13,50)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB18** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	326501.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		184229.9 N
		Driller	E.D	Ground Level	48.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	17/11/1997
Consultant	Ove Arup and Partners	Core bit	Geocube	Date Completed	18/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
TOPSOIL	0.10	48.10							
Reddish brown sandy CLAY (drillers description). (Morainic Drift)								26 1.00 1.45	
Greenish pink to pinkish brown fine to coarse very thinly bedded slightly weathered micaceous SANDSTONE, very weak to weak with very closely to closely spaced inclined fractures planar rough tight. (St. Maughans Group)	2.00	46.20						S50/70mm 2.00 2.22	
	2.38	45.82	2.00 3.00	100	52	0	NI 5 3		
Reddish brown mottled green medium bedded moderately to highly weathered silty MUDSTONE, weak to moderately weak. (St. Maughans Group)	2.90	45.30					NI		
			3.00 4.50	100	87	7	13		
Purplish brown mottled green fine to coarse grained very thinly to thinly inclined bedding slightly weathered micaceous SANDSTONE, strong with closely to medium spaced inclined fractures planar rough tight. (St. Maughans Group) ---from 3.00 to 3.15m completely fractured	4.20	44.00							
			4.50 6.00	97	43	30	5 NI		
Reddish brown mottled green medium bedded moderately weathered silty MUDSTONE, very weak to moderately strong with medium to widely spaced sub-horizontal to inclined fractures planar rough tight. (St. Maughans Group) ---from 5.50m moderately to highly weathered weak to moderately weak completely fractured ---from 6.20 to 6.50m slightly to moderately weathered moderately weak to moderately strong completely fractured ---from 6.50 to 6.80m slightly calcitic ---from 6.50m slightly to moderately weathered moderately strong with medium spaced sub-horizontal fractures planar rough tight							2 NI		
			6.00 7.50	87	52	43	3 NA		
			7.50 8.80	100	94	45	8		
Reddish brown occasionally mottled green fine to medium grained medium bedded occasionally thinly and cross laminated fresh to slightly weathered silty micaceous SANDSTONE, moderately strong to strong. (St. Maughans Group)	8.65	39.55							
	9.25	38.95	8.80 10.40	85	78	37	0 10		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB18** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	326501.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		184229.9 N
		Driller	E.D	Ground Level	48.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	17/11/1997
Consultant	Ove Arup and Partners	Core bit	Geocube	Date Completed	18/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown very thinly to thinly inclined bedded moderately weathered silty MUDSTONE, very weak to moderately weak with very closely to closely spaced inclined fractures planar rough tight. (St. Maughans Group)								NA		
---from 10.40m mottled green thinly to medium sub-horizontally bedded moderately weak to moderately strong				10.40 12.00	94	86	29	9		
---from 11.00m slightly to moderately weathered										
		11.90	36.30							
---from 11.60 to 11.90m very closely spaced gravel size pockets of calcite										
Purplish brown occasionally mottled green medium to thickly sub-horizontally bedded fresh to slightly weathered silty MUDSTONE, moderately strong with widely spaced inclined fractures planar irregular rough tight. (St. Maughans Group)				12.00 13.55	100	100	97	4		
---from 13.95m thinly to medium sub-horizontally bedded moderately weathered				13.55 15.10	97	84	13	11		
		15.10	33.10							
Rotary drilling complete at 15.10 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHB19** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	326752.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				184240.9 N
		Drilling Rig	Pilcon	Ground Level	27.40m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	C.D	Date Started	13/11/1997
Consultant	Ove Arup and Partners			Date Completed	14/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
13/11/1997	1800	1.00	0.00	Dry	
14/11/1997	0800	1.00	0.00	Dry	
14/11/1997	1800	4.30	1.50	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
2.70	3.00	1.00	
3.05	3.20	0.50	
3.20	3.40	0.50	
3.70	4.10	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	4.30	150	1.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.50	S	N=23 (4,5,5,6,6,6)
2.50	S	50/70mm (14,20,50)
3.00	S	50/60mm*
3.20	S	48/75mm*
4.10	S	50/70mm (,36,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHB19** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	326752.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184240.9 N
		Driller	I.D	Ground Level	27.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	13/11/1997
Consultant	Ove Arup and Partners			Date Completed	14/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.20	27.20				
Firm to stiff reddish brown micaceous sandy CLAY with occasional to some sub-angular gravels of micaceous sandstone. (Morainic Drift)		0.80	26.60	B 0.50 - 1.00			
				D 1.20			
Reddish brown fine to medium grained thinly to thickly laminated highly to completely weathered micaceous silty SANDSTONE, very weak to weak. (St. Maughans Group)				B 1.50 - 2.00	S23	S 1.50 1.95	
---from 1.50 to 1.95m mottled greyish green very silty highly weathered weak to moderately weak				D 2.20			
				B 2.50 - 2.80	S50/70mm	S 2.50 2.72	
---from 2.50m moderately to highly weathered moderately weak				D 2.90			
				D 3.10	S50/60mm*	S 3.00	
---from 3.00 to 3.30m moderately weathered moderately weak to moderately strong				B 3.20 - 3.30	S48/75mm*	S 3.20 3.06 3.28	
				D 3.90			
					S50/70mm	S 4.10 4.25	
		4.30	23.10				
Cable Percussion boring complete at 4.30 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHB19A
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	326742.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184253.1 N
		Driller	H.J	Ground Level	31.93m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	27/11/1997
Consultant	Ove Arup and Partners	Core bit	PCD	Date Completed	27/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
27/11/1997	1800	20.70	4.40	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
1.20	4.50	air	100%	NR
4.50	20.70	air	100%	112

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	20.70	140	4.40

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
27/11/1997	0000	14.00	0.00	0	moderate	4.40	0.00

GENERAL NOTES

1. Bedding dips and dip direction on separate sheet.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB19A** Sheet 1 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	326742.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184253.1 N
		Driller	H.J	Ground Level	31.93m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	27/11/1997
Consultant	Ove Arup and Partners	Core bit	PCD	Date Completed	27/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
MADE GROUND: Marl fill (drillers description).										
		3.00	28.93							
SANDSTONE (drillers description). (St. Maughans Group)										
		4.50	27.43							
Pinkish grey fine to coarse grained very thinly to thinly sub-horizontally bedded slightly weathered micaceous SANDSTONE, moderately strong to strong with very closely spaced sub-horizontal to inclined fractures planar rough tight. (St. Maughans Group)				4.50 4.90	88	38	25	6		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB19A** Sheet 2 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	326742.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184253.1 N
		Driller	H.J	Ground Level	31.93m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	27/11/1997
Consultant	Ove Arup and Partners	Core bit	PCD	Date Completed	27/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Pinkish grey fine to coarse grained very thinly to thinly sub-horizontally bedded slightly weathered micaceous SANDSTONE, moderately strong to strong with very closely spaced sub-horizontal to inclined fractures planar rough tight. (St. Maughans Group)		5.15	26.78					2		
---from 5.10m silty				4.90 6.00	91	36	11	NI		
Purplish brown occasionally mottled green very thinly to thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with very closely spaced sub-horizontal to sub-vertical fractures planar rough tight. (St. Maughans Group)								7		
---from 5.15 to 5.45m moderately to highly weathered completely fractured weak								NI		
---from 5.75 to 6.00m highly weathered very weak completely fractured								9		
---from 6.70 to 6.90m highly weathered very weak completely fractured				6.00 7.50	83	35	7	NI		
---from 7.12 to 7.25m highly weathered very weak completely fractured								1		
---from 7.25 to 7.50m no recovery								NI		
		7.50	24.43					NA		
Reddish brown occasionally mottled green thinly sub-horizontally bedded slightly sandy MUDSTONE, moderately strong with closely spaced sub-horizontal fractures planar smooth tight. (St. Maughans Group)				7.50 8.00	100	46	26	5		
---from 8.00 to 8.40m slightly weathered sub-vertical to vertical fracture planar rough tight 135° to 315° strike				8.00 8.60	100	88	0	4		
---from 8.60 to 8.85m slightly weathered								2		
---from 8.85 to 8.95m moderately weathered weak completely fractured								NI		
---from 9.10m with very closely spaced sub-horizontal to sub-vertical fractures planar irregular rough tight				8.60 9.90	100	50	8	10		
---from 9.50 to 9.60m moderately to highly weathered weak completely fractured								NI		
		9.90	22.03					4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB19A** Sheet 3 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	326742.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184253.1 N
		Driller	H.J	Ground Level	31.93m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	27/11/1997
Consultant	Ove Arup and Partners	Core bit	PCD	Date Completed	27/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish brown mottled green thinly to medium sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with very closely to closely spaced sub-horizontal to inclined fractures planar irregular rough tight. (St. Maughans Group)							2		
---from 10.30 to 10.45m weak completely fractured							NI		
			9.90 11.20	100	50	9	5		
---from 10.75 to 10.90m moderately to highly weathered weak completely fractured							NI		
							4		
							7		
---from 11.70 to 12.70m very closely spaced sub-horizontal to inclined fractures planar rough tight			11.20 12.70	100	60	7	10		
			12.70 14.00	100	77	8	14		
---from 13.50 to 13.70m moderately to highly weathered weak									
---from 14.00 to 14.25m weak completely fractured							NI		
---from 14.25m slightly sandy									
---at 14.70m discontinuity planes with striations			14.00 15.50	100	70	13	14		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB19A** Sheet 4 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	326742.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184253.1 N
		Driller	H.J	Ground Level	31.93m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	27/11/1997
Consultant	Ove Arup and Partners	Core bit	PCD	Date Completed	27/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish brown mottled green thinly to medium sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with very closely to closely spaced sub-horizontal to inclined fractures planar irregular rough tight. (St. Maughans Group)	15.35	16.58							
Reddish brown occasionally mottled green thinly to medium sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal to inclined fractures planar rough tight. (St. Maughans Group)							4		
---from 15.50 to 15.75m moderately to highly weathered very weak completely fractured			15.50 16.30	100	81	13	NI		
---from 16.10 to 16.20m moderately to highly weathered very weak completely fractured	16.30	15.63					7		
Purplish brown mottled green thinly sub-horizontally bedded moderately weathered silty MUDSTONE, very weak to moderately weak with closely spaced sub-horizontal to inclined fractures planar rough tight. (St. Maughans Group)									
---from 16.55 to 16.65m highly weathered very weak completely fractured							9		
---from 16.95 to 17.15m highly weathered very weak completely fractured			16.30 17.70	100	93	44	NI		
	17.40	14.53					1		
Reddish brown mottled green thinly to medium sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with closely spaced sub-horizontal to inclined fractures planar rough tight. (St. Maughans Group)							1		
---from 17.40 to 17.65m calcitic strong							6		
---from 17.65 to 18.50m very closely spaced horizontal to inclined thin to thick laminations of calcite									
---from 18.70m slightly to moderately weathered moderately weak to moderately strong			17.70 19.20	97	93	57	3		
---from 18.70 to 19.20m very closely spaced sub-horizontal to sub-vertical fractures planar rough tight									
---at 19.70m fracture planes striated			19.20 20.70	100	97	43	9		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHB19A** Sheet 5 of 5

Contract No.	F10895	Method	Rotary Coring	Coordinates	326742.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	T30		184253.1 N
		Driller	H.J	Ground Level	31.93m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	S	Date Started	27/11/1997
Consultant	Ove Arup and Partners	Core bit	PCD	Date Completed	27/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled green thinly to medium sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with closely spaced sub-horizontal to inclined fractures planar rough tight. (St. Maughans Group)		20.70	11.23							
Rotary drilling complete at 20.70 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHC1
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	326789.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184144.1 N
		Drilling Rig	Pilcon	Ground Level	14.70m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners			Date Completed	15/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
14/11/1997	1800	4.50	1.50	4.40	
15/11/1997	0800	4.50	1.50	2.40	
15/11/1997	1800	4.90	1.50	3.80	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
4.30	4.50	0.50	
4.50	4.80	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	4.90	150	1.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.50	S	N=4 (1,1,1,1,1,1)
4.50	S	56/75mm*
4.80	S	50/60mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC1** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	326789.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184144.1 N
		Driller	I.D	Ground Level	14.70m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	14/11/1997
Consultant	Ove Arup and Partners			Date Completed	15/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.30	14.40				
Firm dark reddish brown sandy CLAY with occasional sub-angular to sub-rounded sandstone and mudstone gravel. (Morainic Drift)				D 0.50			
				D 1.20			
---at 1.20m with occasional fine to medium gravel size pockets of brittle black coal				U 1.50 - 2.00	(12)		
		1.70	13.00				
Firm reddish brown slightly sandy CLAY. (Morainic Drift)				D 2.20			
		2.40	12.30	W 2.40			
Very soft to soft reddish brown occasionally thinly laminated slightly sandy CLAY. (St Maughans Group)				B 2.50 - 3.00	S4	S 2.50 2.95	
		3.10	11.60				
Soft reddish brown very silty CLAY. (St Maughans Group)				D 3.20			
				U 3.50 - 4.00	(36)		
		3.90	10.80				
Reddish brown fine to medium grained moderately to highly weathered very silty SANDSTONE, moderately weak to moderately strong. (St. Maughans Group)				D 4.20			
				B 4.50 - 4.60	S56/75mm*	S 4.50 4.58	
---from 4.50 to 4.57m micaceous				D 4.70	S50/60mm*	S 4.80 4.86	
		4.90	9.80				
---from 4.70m moderately to slightly weathered moderately strong							
---from 4.80m micaceous							
Cable Percussion boring complete at 4.90 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHC2
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	327011.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184164.0 N
		Drilling Rig	Pilcon	Ground Level	14.20m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	C.D	Date Started	15/11/1997
Consultant	Ove Arup and Partners			Date Completed	15/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
15/11/1997	1800	5.20	4.50	4.10	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
4.70	5.10	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	5.20	150	4.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
15/11/1997	0000	2.40	3.90	20.0	moderate	4.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.50	S	N=5 (1,2,1,1,2,1)
4.50	S	50/60mm (10,24,50)
5.10	S	50/50mm (,25,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	CP HEADBR
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC2** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	327011.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184164.0 N
		Driller	I.D	Ground Level	14.20m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	15/11/1997
Consultant	Ove Arup and Partners			Date Completed	15/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.10	14.10				
Firm to stiff orangish brown very silty slightly sandy CLAY with occasional sub-angular to sub-rounded sandstone and mudstone gravel. (River Terrace)			D 0.50			
			D 1.20			
---from 0.60m no gravel			U 1.50 - 2.00	(25)		
	1.80	12.40				
Soft orangish brown very silty sandy CLAY with occasional thin laminations and gravel size pockets of clayey silty micaceous sand. (River Terrace)			D 2.20			
			B 2.50 - 3.00	S5	S 2.50 - 2.95	
---from 2.50m soft to firm			D 3.20			
			U 3.50 - 4.00	(12)		
	3.80	10.40				
Firm dark brown slightly sandy slightly micaceous CLAY. (River Terrace)			D 4.20			
	4.40	9.80	B 4.50 - 4.70	S50/60mm	S 4.50 - 4.71	
Purplish brown occasionally mottled greyish green highly to moderately weathered silty sandy micaceous MUDSTONE, weak. (St. Maughans Group)				S50/50mm	S 5.10 - 5.18	
	5.20	9.00				
---from 5.10m weak to moderately weak						
Cable Percussion boring complete at 5.20 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHC3
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	327116.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184034.0 N
		Drilling Rig	Pilcon	Ground Level	10.40m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	C.D	Date Started	16/11/1997
Consultant	Ove Arup and Partners			Date Completed	16/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
16/11/1997	1800	5.30	4.50	4.50	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
4.70	5.20	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	5.30	150	4.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
16/11/1997	0000	1.70	1.00	20.0	moderate	1.50	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.50	S	N=13 (2,3,3,3,3,4)
2.50	S	N=13 (2,3,3,3,4,3)
3.50	S	N=38 (5,6,8,9,9,12)
4.50	S	50/70mm (15,27,50)
5.20	S	50/70mm (,25,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC3** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	327116.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184034.0 N
		Driller	I.D	Ground Level	10.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	16/11/1997
Consultant	Ove Arup and Partners			Date Completed	16/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.20	10.20				
Firm to stiff orangish brown CLAY with occasional sub-angular to sub-rounded gravel of sandstone and mudstone. (River Terrace)				D 0.50			
		1.20	9.20	D 1.20			
Medium dense orangish brown mottled greyish green and reddish brown slightly clayey sandy subrounded to subangular siliceous GRAVEL with occasional gravel size pockets of clayey silty sand. (River Terrace)				D 1.40 B 1.50 - 2.00	S13	S 1.50 1.95	
---from 2.20m with occasional to some gravel				D 2.20			
---from 2.50 to 3.20m silty				B 2.50 - 3.00	S13	S 2.50 2.95	
		2.90	7.50				
Reddish brown occasionally mottled greyish green highly to moderately weathered silty MUDSTONE, weak. (St. Maughans Group)				D 3.20			
				B 3.50 - 4.00	S38	S 3.50 3.95	
				D 4.20			
---from 4.50m moderately weak				B 4.50 - 4.70	S50/70mm	S 4.50 4.72	
---from 5.00m moderately weathered moderately weak to moderately strong				D 5.00			
		5.30	5.10		S50/70mm	S 5.20 5.35	
Cable Percussion boring complete at 5.30 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC4** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	327338.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				183987.0 N
		Drilling Rig	Pilcon	Ground Level	10.60m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	20/11/1997
Consultant	Ove Arup and Partners			Date Completed	20/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
20/11/1997	1800	4.25	3.00	2.70	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
3.85	4.10	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	4.25	150	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
20/11/1997	0000	3.85	2.70	15.0	fast	0.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.90	S	N=13 (1,2,3,3,3,4)
2.90	S	N=44 (3,5,8,12,12,12)
4.10	S	50/40mm (25,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC4** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	327338.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183987.0 N
		Driller	A.M	Ground Level	10.60m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	20/11/1997
Consultant	Ove Arup and Partners			Date Completed	20/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
TOPSOIL	0.30	10.30	B 0.30 - 0.80			
Soft to firm reddish brown mottled greyish brown very silty CLAY with occasional sub-rounded siliceous gravel and rootlets. (River Terrace)	0.85	9.75	D 0.85 - 1.35 U 0.90	(18)		
Firm dark reddish brown occasionally mottled greyish green sandy organic CLAY with occasional sub-angular to sub-rounded fine siliceous gravel. (River Terrace)			D 1.35			
			B 1.90 - 2.64 D 1.90	S13	S 1.90 2.35	
Reddish brown mottled greyish green completely weathered MUDSTONE, very weak. (St. Maughans Group)	2.64	7.96	B 2.64 - 2.85			
			B 2.90 - 3.80 D 2.90	S44	S 2.90 3.35	
---from 2.90m highly to completely weathered weak to moderately weak	3.85	6.75	W 3.85			
Purplish brown mottled greyish green occasionally thinly laminated slightly sandy moderately to highly weathered MUDSTONE, moderately weak. (St. Maughans Group)	4.25	6.35	D 4.10	S50/40mm	S 4.10 4.22	
Cable Percussion boring complete at 4.25 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHC5
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	327434.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		183864.6 N
		Driller	E.D	Ground Level	11.10m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	17/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
16/11/1997	1800	15.30	4.50	12.31	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	4.50	mist	100%	0*
4.50	15.30	mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	15.30	140	4.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
16/11/1997	0000	1.20	0.00	0	fast	0.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHC5** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	327434.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		183864.6 N
		Driller	E.D	Ground Level	11.10m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	17/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL		0.60	10.50							
Light brown sandy CLAY (drillers description). (River Terrace)		0.75	10.35							
Dense clayey GRAVEL (drillers description). (River Terrace)		1.20	9.90							
Greyish brown weathered MUDSTONE (marl) (drillers description). (St. Maughans Group)		4.50	6.60							
Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, very weak to moderately strong with medium to widely spaced horizontal to inclined fractures planar rough tight. (St. Maughans Group)				4.50 5.80	77	52	38	NI 5 NA		
---from 4.50 to 4.75m highly weathered very weak completely fractured										
---from 5.65 to 6.10m moderately to highly weathered weak				5.80 7.30	100	97	57	4 NI		
---from 7.10 to 7.80m moderately to highly weathered weak										
---from 7.20 to 7.50m completely fractured				7.30 8.80	100	57	27	4 NI		
---from 8.30 to 8.80m moderately to highly weathered weak										
---from 8.80 to 9.05m highly weathered very weak completely fractured				8.80 10.00	83	34	17	NI 4 NI		
---from 8.80 to 10.00m with medium spaced undulating thin to thick laminations of calcite										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHC5** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	327434.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		183864.6 N
		Driller	E.D	Ground Level	11.10m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	17/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, very weak to moderately strong with medium to widely spaced horizontal to inclined fractures planar rough tight. (St. Maughans Group)				10.00 10.60	58	0	0	NI NA		
---from 11.00 to 12.00m with closely to medium spaced thin to thick undulating laminations of calcite				10.60 11.30	96	96	96	1		
				11.30 12.80	100	58	43	9		
				12.80 14.30	100	73	60	3 NI		
---from 14.00 to 14.30m moderately to highly weathered weak completely fractured ---from 14.40m slightly to moderately weathered				14.30 15.30	100	95	78	7		
		15.30	-4.20							
Rotary drilling complete at 15.30 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHC5A
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	327434.6 E
Project	M4 Relief Road Magor to Castleton Stage 2				183866.4 N
		Drilling Rig	Pilcon	Ground Level	11.10m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	20/11/1997
Consultant	Ove Arup and Partners			Date Completed	20/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
20/11/1997	1800	4.50	3.00	0.70	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
4.00	4.36	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	4.50	150	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
20/11/1997	0000	1.00	0.70	5.00	moderate	0.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.05	C	N=14 (2,3,3,4,3,4)
2.15	C	N=21 (1,3,4,5,5,7)
3.00	S	N=51 (7,9,10,12,13,16)
4.35	S	50/70mm (,25,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC5A** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	327434.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183866.4 N
		Driller	A.M	Ground Level	11.10m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	20/11/1997
Consultant	Ove Arup and Partners			Date Completed	20/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.30	10.80	B 0.30 - 0.90			
Medium dense brown clayey silty SAND with some sub-angular gravel of sandstone and mudstone. (River Terrace)				D 1.00 - 1.50 W 1.00 B 1.05	C14	C 1.05 1.50	
---from 2.15m stiff				D 2.10 - 2.83 B 2.15	C21	C 2.15 2.60	
Reddish brown occasionally mottled greyish green thinly laminated completely to highly weathered MUDSTONE, very weak. (St. Maughans Group)		2.83	8.27	B 3.00 - 3.97 D 3.00	S51	S 3.00 3.45	
---from 4.00m moderately weathered, moderately weak		4.50	6.60	D 4.35	S50/70mm	S 4.35 4.50	
Cable Percussion boring complete at 4.50 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHC6
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	327626.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				183774.0 N
		Drilling Rig	Pilcon	Ground Level	10.70m AOD
Client	Welsh Office	Driller	T.R	Orientation	Vertical
		Logged by	C.D	Date Started	24/11/1997
Consultant	Ove Arup and Partners			Date Completed	25/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
24/11/1997	1800	5.50	3.00	Dry	
25/11/1997	0800	5.50	3.00	Dry	
25/11/1997	1000	5.80	3.00	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
2.00	2.30	0.50	
4.80	5.30	1.00	
5.50	5.80	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	5.80	150	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.60	C	115/290mm (4,10,14,21,30,50)
2.60	C	N=81 (3,7,17,18,20,26)
3.50	S	N=68 (3,8,10,15,19,24)
4.50	S	75/145mm (9,18,25,50)
5.30	S	88/145mm (9,21,38,50)
5.80	S	90/140mm (14,28,40,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC6** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	327626.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183774.0 N
		Driller	T.R	Ground Level	10.70m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	24/11/1997
Consultant	Ove Arup and Partners			Date Completed	25/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Soft to firm orangish brown very silty CLAY with occasional rootlets. (River Terrace)				D 0.50 B 1.00 - 1.45			
		1.20	9.50				
Very dense orangish brown slightly clayey silty SAND with some sub-rounded siliceous gravel. (River Terrace)				D 1.50 B 1.60 - 2.00	C115/290mm	C 1.60 2.04	
		2.50	8.20	D 2.40 D 2.50 B 2.60 - 3.05	C81	C 2.60 3.05	
Very stiff reddish brown thinly laminated CLAY with occasional sub-rounded fine to medium siliceous gravel. (River Terrace)							
		3.20	7.50	D 3.20			
Reddish brown mottled greyish green occasionally thinly laminated highly to completely weathered calcareous MUDSTONE, very weak. (St. Maughans Group)				B 3.50 - 3.95	S68	S 3.50 3.95	
---from 4.50 to 5.50m reddish brown highly weathered weak				B 4.50 - 4.80	S75/145mm	S 4.50 4.80	
				B 5.30 - 5.50	S88/145mm	S 5.30 5.60	
---at 5.80m reddish brown mottled greyish green highly to moderately weathered moderately weak		5.80	4.90		S90/140mm	S 5.80 6.09	
Cable Percussion boring complete at 5.80 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC7** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	327852.3 E
Project	M4 Relief Road Magor to Castleton Stage 2				183561.4 N
		Drilling Rig	Pilcon	Ground Level	5.40m AOD
Client	Welsh Office	Driller	T.R	Orientation	Vertical
		Logged by	C.D	Date Started	25/11/1997
Consultant	Ove Arup and Partners			Date Completed	25/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
25/11/1997	1800	6.70	4.50	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
3.00	3.30	0.50	
6.20	6.70	2.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	6.70	150	4.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
25/11/1997	0000	6.50	0.00	0.00	seepage	4.50	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	C	N=28 (2,3,5,6,9,8)
3.40	S	N=28 (3,4,6,6,7,9)
4.50	S	N=66 (4,7,9,15,21,21)
5.50	S	118/220mm (8,17,30,38,50)
6.50	S	129/215mm (10,16,36,43,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC7** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	327852.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183561.4 N
		Driller	T.R	Ground Level	5.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	25/11/1997
Consultant	Ove Arup and Partners			Date Completed	25/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.20	5.20				
			D 0.40			
Soft to firm orangish brown mottled grey thinly laminated sandy CLAY with occasional sub-rounded siliceous gravel and occasional rootlets. (Fluvial Alluvium)			U 1.00 - 1.45	(7)		
	1.40	4.00	D 1.50			
Very soft dark greyish brown organic very silty CLAY with occasional to some gravel size pockets of blackish brown firm fibrous and occasionally woody peat. (Fluvial Alluvium)	1.70	3.70	D 1.80			
			B 2.00 - 2.45	C28	C 2.00 2.45	
Medium dense brown very clayey silty SAND with some to much sub-rounded siliceous gravel. (Fluvial Alluvium)	2.80	2.60	D 2.80			
Stiff reddish brown occasionally thinly laminated CLAY with occasional sub-rounded siliceous gravel and cobbles. (Fluvial Alluvium)	3.30	2.10	D 3.30			
			B 3.40 - 3.85	S28	S 3.40 3.85	
Reddish brown mottled greyish green highly to completely weathered MUDSTONE, very weak with occasional sub-rounded siliceous fine to medium gravel. (Probably Mercia Mudstone group)			D 4.00			
			B 4.50 - 4.95	S66	S 4.50 4.95	
			D 5.00			
---from 5.50m highly weathered very weak to weak			B 5.50 - 5.80	S118/220mm	S 5.50 5.87	
				S129/215mm	S 6.50 6.87	
	6.70	-1.30				
Cable Percussion boring complete at 6.70 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHC8
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	327965.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				183559.1 N
		Drilling Rig	Pilcon	Ground Level	5.60m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	18/11/1997
Consultant	Ove Arup and Partners			Date Completed	19/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
18/11/1997	1800	6.30	6.30	Dry	
19/11/1997	0800	6.30	6.30	Dry	
19/11/1997	1800	10.47	10.05	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
10.05	10.25	2.50	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	10.47	150	10.05

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
19/11/1997	0000	9.00	3.50	15.0	fast	0.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.80	S	N=1 (0,0,0,0,1,0)
4.00	S	N=2 (1,0,1,0,1,0)
7.60	C	N=12 (2,2,3,3,3,3)
9.00	C	N=23 (1,2,4,6,6,7)
10.10	S	50/0mm*
10.25	S	50/120mm (10,14,30,20)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC8** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	327965.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183559.1 N
		Driller	A.M	Ground Level	5.60m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	18/11/1997
Consultant	Ove Arup and Partners			Date Completed	19/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.40	5.20	B 0.40 - 0.90			
Soft to firm brown mottled grey thinly laminated slightly organic CLAY locally very silty. (Estuarine Alluvium)			D 0.95 - 1.45 U 1.00	(8)		
			D 1.45			
Soft greyish brown organic CLAY with some to many fine to medium gravel size pockets of brownish black spongy and fibrous peat. (Estuarine Alluvium)	1.60	4.00	B 1.80 - 2.90			
	2.90	2.70	D 2.80 - 3.25	S1	S 2.80 - 3.25	
Very soft grey CLAY with occasional gravel size pockets of brownish black firm fibrous clayey peat. (Estuarine Alluvium)			D 3.00 U 3.10 - 3.55	(4)		
			D 3.55			
---at 3.00m greyish brown			B 4.00 - 5.00 D 4.00	S2	S 4.00 - 4.45	
			D 5.10 - 5.60 U 5.15	(4)		
---at 5.60m with some gravel size pockets of clayey peat			D 5.60			
			D 6.00			
---from 6.00m grey mottled dark grey organic			D 6.40 U 6.50 - 6.95	(6)		
	6.95	-1.35	D 6.95 - 7.50 B 7.00			
Very soft to soft reddish brown silty CLAY. (Estuarine Alluvium)						
---from 7.00m with occasional sub-rounded to sub-angular siliceous gravel	7.60	-2.00	B 7.60 - 8.80 D 7.60	C12	C 7.60 - 8.05	
Medium dense reddish brown clayey silty sandy sub-rounded and occasional sub-angular siliceous GRAVEL and occasional cobbles. (Fluvial Alluvium)						
---from 7.60 to 8.05m very clayey			B 9.00 - 10.00 D 9.00 W 9.00	C23	C 9.00 - 9.45	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHC8** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	327965.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183559.1 N
		Driller	A.M	Ground Level	5.60m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	18/11/1997
Consultant	Ove Arup and Partners			Date Completed	19/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Medium dense reddish brown clayey silty sandy sub-rounded and occasional sub-angular siliceous GRAVEL and occasional cobbles. (Fluvial Alluvium)		10.05	-4.45	D 10.25	S50/0mm*	S 10.10	
					S50/120mm	S 10.25	0.10
		10.47	-4.87				10.52
Reddish brown mottled greyish brown moderately to highly weathered sandy MUDSTONE, with thin to thick laminations of silty sandstone. (Mercia Mudstone Group)							
Cable Percussion boring complete at 10.47 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHD1
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	328312.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				183442.0 N
		Drilling Rig	Pilcon	Ground Level	7.42m AOD
Client	Welsh Office	Driller	T.R	Orientation	Vertical
		Logged by	C.D	Date Started	22/11/1997
Consultant	Ove Arup and Partners			Date Completed	24/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
22/11/1997	1800	12.50	12.50	6.20	
23/11/1997	0800	12.50	12.50	5.81	
23/11/1997	1800	14.70	13.50	6.02	
24/11/1997	0800	14.70	13.50	2.41	
24/11/1997	1000	15.00	13.50	2.41	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
10.30	10.80	2.00	
14.20	14.70	2.50	
14.70	15.00	1.50	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.00	150	13.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
22/11/1997	0000	8.30	6.49	20.0	fast	8.00	0.00

GENERAL NOTES

SPT's at 4.20m, 4.30m, 6.40m and 7.50m one blow recorded, but sank under self weight.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.20	S	N=1 (1,0,0,0,1,0)
4.20	S	N=1 (0,0,1,0,0,0)
5.30	S	N=1 (0,0,1,0,0,0)
6.40	S	N=1 (0,0,1,0,0,0)
7.50	S	N=1 (0,0,1,0,0,0)
8.50	C	N=60 (3,9,10,10,19,21)
10.00	C	78/135mm (4,12,28,50)
11.60	C	N=38 (2,3,5,8,11,14)
13.00	C	89/145mm (10,26,39,50)
14.50	C	50/65mm (,25/50,50/65)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHD1** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	328312.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183442.0 N
		Driller	T.R	Ground Level	7.42m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	22/11/1997
Consultant	Ove Arup and Partners			Date Completed	24/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
MADE GROUND: Compact grey stone base (drillers description).							
		0.60	6.82	D 0.60			
Soft to firm brown mottled grey thinly laminated CLAY. (Estuarine Alluvium)				U 1.20 - 1.65	(6)		
		1.70	5.72	D 1.70			
Very soft grey CLAY. (Estuarine Alluvium)				D 1.90			
				B 2.20 - 2.65	SI	S 2.20 - 2.65	
---from 2.20m dark grey							
				D 3.00			
---from 3.00 to 4.65m with occaisonal to some gravel size pockets of blackish brown firm fibrous peat				B 3.50 - 3.95 U 3.50 - 3.95	NR		
				B 4.20 - 4.65	SI	S 4.20 - 4.65	
				D 5.00			
				B 5.30 - 5.75	SI	S 5.30 - 5.75	
				D 6.00			
---at 6.00m very silty							
				B 6.40 - 6.85	SI	S 6.40 - 6.85	
				W 6.94 D 7.00			
---from 7.00m with some gravel size pockets of blackish brown firm fibrous peat							
				B 7.50 - 7.95	SI	S 7.50 - 7.95	
		8.30	-0.88	D 8.30			
Very dense greyish brown sandy sub-rounded siliceous GRAVEL with some cobbles. (Fluvial Alluvium)				B 8.50 - 8.95	C60	C 8.50 - 8.95	
				D 9.50			
				B 10.00 - 10.30	C78/135mm	C 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHD1** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	328312.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183442.0 N
		Driller	T.R	Ground Level	7.42m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	22/11/1997
Consultant	Ove Arup and Partners			Date Completed	24/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very dense greyish brown sandy sub-rounded siliceous GRAVEL with some cobbles. (Fluvial Alluvium)				B 10.00 - 10.30	C78/135mm	C 10.00 0.29	
				D 11.00			
---from 11.00m very sandy		11.40	-3.98	D 11.50			
Very stiff reddish brown CLAY with occasional locally some sub-rounded fine to medium grained siliceous gravel. (Fluvial Alluvium)				B 11.60 - 12.05	C38	C 11.60 12.05	
---from 12.50m with some gravel and occasional cobbles				D 12.50			
				B 13.00 - 13.30	C89/145mm	C 13.00 13.30	
				D 14.00			
		14.20	-6.78				
Very dense reddish brown fine to medium grained SAND with occasional sub-rounded fine to medium grained siliceous and mudstone gravel. (Fluvial Alluvium)				D 14.50	C50/65mm	C 14.50 14.62	
		14.70	-7.28				
Reddish brown very silty CLAY. (Probably Completely Weathered Mudstone) (Probably Mercia Mudstone Group)		15.00	-7.58	B 14.90 - 15.00			
Cable Percussion boring complete at 15.00 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHD2** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	328435.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				183406.1 N
		Drilling Rig	Pilcon	Ground Level	5.40m AOD
Client	Welsh Office	Driller	T.R	Orientation	Vertical
		Logged by	C.D	Date Started	20/11/1997
Consultant	Ove Arup and Partners			Date Completed	21/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
20/11/1997	1800	5.00	4.50	Dry	
21/11/1997	0800	5.00	4.50	Dry	
21/11/1997	1800	10.00	9.70	8.60	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
8.90	9.40	1.50	
9.70	10.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	10.00	150	9.70

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
21/11/1997	0000	8.60	0.00	0.00	seepage	8.50	9.50

GENERAL NOTES

1. Inspection pit hand dug to 1.20m.
2. SPT at 7.20m sank under own weight.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
4.00	S	N=1 (0,0,1,0,0,0)
7.20	S	N=1 (0,0,1,0,0,0)
8.80	C	50/60mm (14,11/20,50/60)
9.70	C	90/115mm (,28,40,50)
10.00	C	50/50mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHD2** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	328435.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183406.1 N
		Driller	T.R	Ground Level	5.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	20/11/1997
Consultant	Ove Arup and Partners			Date Completed	21/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.40	5.00	D 0.50			
Firm brown mottled grey thinly laminated CLAY. (Estuarine Alluvium)	1.50	3.90	D 1.50			
Very soft grey to greyish blue CLAY. (Estuarine Alluvium)			U 1.70 - 2.15	(3)		
			D 2.20			
			D 2.50			
			D 3.20			
			V 3.20			
			D 3.60			
---from 3.60 to 5.00m with occasional gravel size pockets of blackish brown firm fibrous peat			B 4.00 - 4.45	S1	S 4.00 4.45	
			D 5.00			
---from 5.00 to 7.65m organic			V 5.00			
			D 5.50			
			U 6.00 - 6.45	(2)		
			D 6.50			
			D 6.80			
			B 7.20 - 7.65	S1	S 7.20 7.65	
			D 7.80			
			B 8.30 - 8.75			
	8.60	-3.20				
Very dense grey sub-rounded slightly silty sandy siliceous GRAVEL with many cobbles. (Fluvial Alluvium)	8.90	-3.50	B 8.80 - 8.96	C50/60mm	C 8.80 8.96	
			B 9.40 - 9.70			
MUDSTONE As Sheet 2				C90/115mm	C 9.70 9.89	
Cable Percussion boring complete at 10.00 m.	10.00	-4.60	D 10.00	C50/50mm*	C 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHD2
Extra Sheet

Contract No.	F10895	Method	Cable Percussion	Coordinates	328435.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183406.1 N
		Driller	T.R	Ground Level	5.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	20/11/1997
Consultant	Ove Arup and Partners			Date Completed	21/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Reddish brown to purplish brown moderately to slightly weathered slightly sandy MUDSTONE, moderately weak to moderately strong with occasional gravel size pockets of highly weathered weak mudstone. (Mercia Mudstone Group)		10.00	-4.60	D 10.00	C50/50mm*	C 10.00 0.05	
Cable Percussion boring complete at 10.00 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHD3** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	328762.9 E
Project	M4 Relief Road Magor to Castleton Stage 2				183406.0 N
		Drilling Rig	Pilcon	Ground Level	5.90m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	15/11/1997
Consultant	Ove Arup and Partners			Date Completed	16/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
15/11/1997	1800	13.15	12.80	Dry	
16/11/1997	0800	13.15	12.80	2.70	
16/11/1997	1800	13.60	12.80	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
7.80	8.10	0.50	
9.65	9.82	1.00	
11.80	12.16	0.50	
13.25	13.45	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	13.60	150	12.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
15/11/1997	0000	5.55	5.30	15.0	slow	5.00	0.00
15/11/1997	0000	7.80	3.60	20.0	fast	7.80	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.95	S	N=6 (1,1,1,2,2,1)
4.00	S	N=1 (1,1)
5.60	S	N=2 (1,0,1,0,1,0)
7.10	S	1/450mm
8.10	C	N=53 (5,8,10,12,14,17)
9.50	C	58/150mm*
11.30	C	N=41 (7,7,9,12,10,10)
12.70	S	N=43 (5,7,9,10,12,12)
13.45	S	76/150mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHD3** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	328762.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183406.0 N
		Driller	A.M	Ground Level	5.90m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	15/11/1997
Consultant	Ove Arup and Partners			Date Completed	16/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.30	5.60	B 0.30 - 0.90			
Soft to firm greyish brown mottled brown occasionally thinly laminated CLAY. (Estuarine Alluvium)				D 0.95 - 1.45 U 1.00	(12)		
				D 1.45			
---from 1.95m soft				B 1.95 - 2.55 D 1.95	S6	S 1.95 - 2.40	
Soft grey very silty CLAY. (Estuarine Alluvium)		2.55	3.35	D 2.80 U 2.90 - 3.35	(5)		
				D 3.35			
Blackish brown spongy to firm fibrous PEAT with occasional gravel size pockets and thin to thick laminations of soft grey clay. (Peat)		3.50	2.40	B 3.50 - 3.90			
		3.90	2.00	B 4.00 - 5.00 D 4.00	S1	S 4.00 - 4.45	
Very soft dark grey sandy slightly organic CLAY, locally very silty. (Estuarine Alluvium)				B 5.10 - 5.60 U 5.10 - 5.55	(5)		
---from 5.60 to 6.05m with very occasional fine to medium gravel size pockets of brownish black spongy fibrous peat				W 5.55 - 6.10 B 5.60 D 5.60	S2	S 5.60 - 6.05	
---from 6.15 to 6.65m sandy				D 6.15 - 6.65 U 6.20	(4)		
				D 6.65			
				B 7.10 - 7.80 D 7.10	S1/450mm	S 7.10 - 7.55	
		7.80	-1.90	W 7.80			
Dense to very dense grey silty sandy sub-rounded to rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)				D 8.00 B 8.10 - 8.60	C53	C 8.10 - 8.55	
---from 9.00m greyish brown very sandy				D 9.00			
				B 9.50 - 10.20	C58/150mm*	C 9.50 - 9.65	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHD3** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	328762.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183406.0 N
		Driller	A.M	Ground Level	5.90m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	15/11/1997
Consultant	Ove Arup and Partners			Date Completed	16/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		SPT N & (U blows)	SPT type & depth	Install-ation
Dense to very dense grey silty sandy sub-rounded to rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)				D	11.00			
				B	11.30 - 12.65	C41	C 11.30 11.75	
		12.65	-6.75	B	12.70 - 13.15	S43	S 12.70	
Reddish brown mottled greyish green highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)				D	12.70		13.15	
---from 13.25m highly weathered weak				D	13.45	S76/150mm*	S 13.45	
		13.60	-7.70				13.60	
Cable Percussion boring complete at 13.60 m.								

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHD4
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	328865.0 E 183363.9 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	5.90m AOD
Client	Welsh Office	Drillers	A.M/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	13/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	15/11/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
13/11/1997	1800	11.00	11.00	Dry	
14/11/1997	0800	11.00	11.00	1.50	
14/11/1997	1800	15.35	13.80	Dry	
15/11/1997	1800	34.80	15.00	4.26	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
8.95	9.23	0.75	
10.65	11.00	0.50	
11.25	11.41	0.75	
12.06	12.30	0.50	
12.90	13.15	0.67	
14.95	15.20	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.35	150	13.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
13/11/1997	0000	8.30	2.70	15	seepage	8.30	0.00
15/11/1997	0000	24.50	0.00	0	fast	15.00	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
15.35	34.80	mist	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.95	S	N=9 (1,2,2,3,2,2)
4.00	S	N=2 (1,0,1,0,1,0)
6.10	S	N=1 (0,0,0,0,1,0)
7.80	C	N=6 (1,0,1,2,1,2)
8.50	C	61/285mm (6,10,11,18,18,14)
10.50	C	60/270mm (7,12,12,16,18,14)
12.50	C	50/145mm (7,14,19,31)
13.70	S	N=37 (6,7,7,8,10,12)
15.20	S	76/137mm*

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD4** Sheet 1 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	328865.0 E 183363.9 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	5.90 m AOD
Client	Welsh Office	Drillers	A.M/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	13/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	15/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
TOPSOIL	0.50	5.40	B 0.50 - 0.90			
Firm brown mottled grey thinly to thickly laminated CLAY. (Estuarine Alluvium)			D 0.95 U 1.05 - 1.50	(11)		
			D 1.50			
			B 1.95 - 2.56 D 1.95		S9 1.95 2.40	
	2.56	3.34				
Very soft to soft grey occasionally thinly laminated very silty CLAY. (Estuarine Alluvium)			D 2.80 U 2.90 - 3.35	(6)		
			D 3.35			
	3.58	2.32	B 3.58 - 3.93			
Blackish brown spongy to firm fibrous PEAT. (Peat)	3.93	1.97	B 4.00 - 5.00 D 4.00		S2 4.00 4.45	
Very soft grey very silty CLAY with occasional gravel size pockets of brownish black firm fibrous peat. (Estuarine Alluvium)			D 5.10 U 5.20 - 5.65	(5)		
---from 5.65m slightly sandy			D 5.65			
			B 6.10 - 7.00 D 6.10		S1 6.10 6.55	
---from 7.00m sandy soft			D 7.00 - 7.45 U 7.00	(6)		
			D 7.45			
	7.80	-1.90	B 7.80 - 8.30		C6 7.80 8.25	
Soft brownish red sandy CLAY with occasional sub-angular to sub-rounded siliceous gravel. (Estuarine Alluvium)	8.30	-2.40	W 8.30			
Very dense greyish brown silty sandy sub-rounded and occasionally sub-angular siliceous GRAVEL with many cobbles. (Fluvial Alluvium)			B 8.50 - 8.90 D 8.50		C61/285mm 8.50 8.94	
			D 10.00			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD4** Sheet 2 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	328865.0 E 183363.9 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	5.90 m AOD
Client	Welsh Office	Drillers	A.M/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	13/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	15/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI100	SPT N & depth	Install-ation
Very dense greyish brown silty sandy sub-rounded and occasionally sub-angular siliceous GRAVEL with many cobbles. (Fluvial Alluvium)				D 10.00 B 10.50 - 11.00		C60/270mm 10.50 10.92	
		11.00	-5.10				
Very dense brown slightly clayey fine to medium grained SAND with some sub-rounded and sub-angular gravel and occasional cobbles. (Fluvial Alluvium)				D 11.50 B 12.50 - 13.70		C50/145mm 12.50 12.80	
		13.62	-7.72	B 13.70 - 14.80 D 13.70		S37 13.70 14.15	
Reddish brown mottled greyish green moderately to highly weathered sandy MUDSTONE, very weak to moderately weak. (Mercia Mudstone Group)				D 15.20		S76/137mm*15.20 15.34	
		15.35	-9.45				
Reddish brown occasionally mottled green medium to thickly horizontally to sub-horizontally bedded moderately weathered silty MUDSTONE, weak with medium spaced inclined fractures planar rough tight. (Mercia Mudstone Group)				15.35 - 16.80	TCR 100 SCR 95 RQD 55 FI 5		
---from 16.80 to 17.00m moderately to highly weathered weak to moderately weak completely fractured				16.80 - 18.30	97 87 20 NI 6		
				18.30 - 19.90	100 63 19 13		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD4** Sheet 3 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	328865.0 E 183363.9 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	5.90 m AOD
Client	Welsh Office	Driller	A.M/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	13/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	15/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green medium to thickly horizontally to sub-horizontally bedded moderately weathered silty MUDSTONE, weak with medium spaced inclined fractures planar rough tight. (Mercia Mudstone Group)				19.90 - 21.50	100	19	13	NI 5 NI 4		
---from 20.40 to 20.55m moderately to highly weathered weak										
---from 20.85 to 21.15m moderately to highly weathered weak completely fractured				21.50 - 23.00	100	67	37	NI 6		
---from 21.50 to 21.75m highly weathered very weak completely fractured										
				23.00 - 24.50	100	93	30	4 7		
---from 24.20m weak		24.50	-18.60							
Reddish brown occasionally mottled green medium to thickly bedded highly weathered silty sandy MUDSTONE, very weak to weak completely fractured. (Mercia Mudstone Group)				24.50 - 24.90	100	0	0	NI		
				24.90 - 25.50	100	17	0	NI		
				25.50 - 26.50	100	30	10	1 5		
		26.10	-20.20							
Reddish brown very thinly to thinly sub-horizontally bedded slightly to moderately weathered very sandy MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)				26.50 - 28.00	90	55	23	5 NI 7		
---from 26.70 to 27.15m moderately to highly weathered weak completely fractured										
---from 27.60m fresh to slightly weathered moderately strong										
		28.40	-22.50	28.00 - 28.90	100	44	0	6 NI		
Reddish brown occasionally mottled green medium sub-horizontally bedded highly weathered silty sandy MUDSTONE, weak completely fractured. (Mercia Mudstone Group)								NI 0		
---from 29.05 to 29.17m moderately weathered, moderately weak closely spaced horizontal fractures planar, rough tight				28.90 - 30.00	100	11	11	NI		
		30.00	-24.10							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD4** Sheet 4 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	328865.0 E 183363.9 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	5.90 m AOD
Client	Welsh Office	Driller	A.M/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	13/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	15/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green medium sub-horizontally bedded highly weathered silty sandy MUDSTONE, weak completely fractured. (Mercia Mudstone Group)		30.00	-24.10							
				30.00 - 31.60	99	97	54	12		
Reddish brown occasionally mottled green medium to thickly horizontally to sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, very weak to moderately weak with medium to widely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)				31.60 - 33.20	100	97	56	10		
---from 33.20 to 33.70m moderately weathered weak to moderately weak								7		
				33.20 - 34.80	100	63	26	8		
		34.50	-28.60							
Borehole complete at 34.80 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHD5
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	328954.1 E 183375.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.00m AOD
Client	Welsh Office	Drillers	A.M/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	15/11/1997
		Core bit	Geocube		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
11/11/1997	1800	10.50	10.50	Dry	
12/11/1997	0800	10.50	10.50	1.80	
12/11/1997	1800	14.03	13.50	Dry	
14/11/1997	0800	14.03	14.00	1.00	
14/11/1997	1800	19.70	16.00	5.40	
15/11/1997	0800	0.00	0.00	Dry	
15/11/1997		19.70	16.00	1.50	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
8.55	8.80	0.50	
9.35	9.57	0.50	
10.28	10.50	0.50	
10.85	11.00	0.50	
11.83	12.00	0.50	
12.90	13.18	0.50	
13.35	13.80	1.25	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	14.03	150	13.50
150	30.00	150	16.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
11/11/1997	0000	1.80	1.60	15	moderate	1.60	0.00
11/11/1997	0000	8.53	2.15	15	fast	8.50	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
14.05	30.00	foam	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.90	S	N=4 (1,0,1,1,1,1)
4.00	S	N=1 (0,0,0,0,1,0)
6.00	S	N=4 (1,1,1,1,1,1)
8.00	S	N=2 (1,0,1,0,1,0)
8.80	S	N=44 (5,7,7,9,12,16)
10.55	S	N=68 (7,11,18,50)
12.50	S	81/225mm (6,12,13,18,50)
13.50	S	50/75mm (12,17,50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD5** Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	328954.1 E 183375.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.00 m AOD
Client	Welsh Office	Drillers	A.M/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	15/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
TOPSOIL	0.25	5.75	B 0.25 - 0.80			
Firm becoming soft brown mottled grey occasionally laminated CLAY. (Estuarine Alluvium)			D 0.90 U 1.00 - 1.45	(9)		
			D 1.45			
			W 1.80 B 1.90 - 2.85 D 1.90		S4 1.90 2.35	
Very soft grey CLAY. (Esturaine Alluvium)	2.85	3.15	D 3.00 U 3.10 - 3.55	(5)		
			D 3.55			
Black brown firm fibrous PEAT. (Peat)	3.63 3.90	2.37 2.10	B 3.63 - 3.90 D 3.63			
Very soft to soft grey very silty CLAY with occasional fine to medium gravel size pockets of blackish brown spongy to firm fibrous peat. (Estuarine Alluvium)			B 4.00 - 5.00 D 4.00		S1 4.00 4.45	
			D 5.10 U 5.15 - 5.60	(4)		
			D 5.60			
			B 6.00 - 7.00 D 6.00		S4 6.00 6.45	
			D 7.05 U 7.05 - 7.45	(4)		
			D 7.45			
			B 8.00 - 8.53 D 8.00 - 8.45		S2 8.00 8.45	
Dense greyish brown very sandy sub-rounded and occasionally sub-angular siliceous GRAVEL, with occasional cobbles. (Fluvial Alluvium)	8.53	-2.53	B 8.53 - 9.30 W 8.53 D 8.80 - 9.25		S44 8.80 9.25	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD5** Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	328954.1 E 183375.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.00 m AOD
Client	Welsh Office	Drillers	A.M/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	15/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI100	SPT N & depth	Install-ation
Dense greyish brown very sandy sub-rounded and occasionally sub-angular siliceous GRAVEL, with occasional cobbles. (Fluvial Alluvium)			B 10.50 - 11.00 D 10.55		S68 10.55 11.00	
---from 10.55m very dense			B 11.50 - 12.50 D 11.50			
			B 12.50 - 13.00 D 12.50		S81/225mm 12.50 12.88	
	13.35	-7.35	B 13.35 - 14.03 D 13.50		S50/75mm 13.50 13.73	
Reddish brown mottled greyish green occasionally thinly laminated highly to completely weathered slightly calcareous MUDSTONE, weak. (Mercia Mudstone Group)	14.03	-8.03				

Description of Strata	Sampling & coring	TCR	SCR	RQD	FI
Reddish brown occasionally mottled green medium to thickly horizontally bedded moderately weathered silty MUDSTONE, very weak to moderately strong with medium to widely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)	14.05 - 15.30	25	0	0	NI
---from 15.30 to 15.50m highly weathered very weak completely fractured	15.30 - 16.30	41	21	10	NI 2 NA
---from 16.30 to 16.54m highly weathered very weak completely fractured	16.30 - 17.30	92	56	56	NI 0
---from 17.00 to 17.24m highly weathered very weak completely fractured					NI
---from 17.30 to 17.42m highly weathered very weak completely fractured	17.30 - 18.70	21	10	0	NI 6 NA
---from 17.42 to 17.62m very closely to closely spaced sub-horizontal to inclined fractures planar rough tight	18.70 - 19.70	93	78	70	4
	19.90	-13.90			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD5** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	328954.1 E 183375.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.00 m AOD
Client	Welsh Office	Driller	A.M/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	15/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled green thinly to medium sub-horizontally bedded slightly to moderately weathered sandy silty MUDSTONE, moderately strong with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)		20.40	-14.40	19.70 - 21.10	93	64	26	93		
Reddish brown mottled green thinly to medium horizontal to sub-horizontally bedded moderately weathered silty MUDSTONE, very weak to moderately weak with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)				21.10 - 22.60	97	85	28	NR		
---from 21.10 to 21.30m moderately to highly weathered weak completely fractured										
---from 22.60m moderately to highly weathered weak				22.60 - 24.10	100	80	28	12		
---from 24.10 to 24.25m weak completely fractured								NI		
---from 24.30m moderately weathered weak to moderately weak with closely to medium spaced sub-horizontal to inclined fractures planar rough tight				24.10 - 25.60	97	90	41	9		
---from 25.60 to 24.72m moderately to highly weathered very weak completely fractured								NI		
				25.60 - 27.10	100	70	33	9		
				27.10 - 28.60	100	85	59	8		
---from 28.30 to 28.80m highly weathered weak completely fractured								NI		
---from 28.80m medium to thickly bedded moderately weathered silty mudstone moderately weak to moderately strong with medium to widely spaced sub-horizontal to inclined fractures planar rough tight				28.60 - 30.00	96	82	74	NI 5		
Borehole complete at 30.00 m.		30.00	-24.00							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD6** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	329011.0 E 183468.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.90m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	15/11/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
11/11/1997	1800	11.00	11.00	1.70	
12/11/1997	0800	11.00	11.00	1.70	
12/11/1997	1800	15.50	15.10	2.90	
13/11/1997	1800	17.90	17.00	Dry	
14/11/1997	0800	17.90	17.00	1.40	
14/11/1997	1800	23.00	17.00	1.20	
15/11/1997	0800	23.00	17.00	1.40	
15/11/1997	1800	30.00	17.00	1.40	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
7.90	8.10	0.75	
10.80	11.00	1.00	
12.24	12.60	1.00	
15.10	15.35	1.00	
15.35	15.45	0.50	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.50	150	15.10
120	30.00	140	17.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
11/11/1997	0000	7.60	6.70	20	fast	7.50	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
15.40	30.00	foam	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.05	S	N=5 (1,2,2,1,1,1)
4.00	S	N=3 (1,2,1,0,1,1)
6.00	S	N=2 (0,0,1,1,1,0)
7.80	C	50/75mm (8,12,50)
9.00	C	N=35 (5,7,8,8,9,10)
10.50	C	79/170mm (4,8,10,19,50)
12.00	C	61/105mm (6,7,11,50)
13.30	S	N=44 (7,7,10,11,11,12)
15.35	S	75/150mm*
16.90	C	N=113 (8,12,18,25,33,37)
17.90	C	N=136 (8,15,20,28,39,49)
20.15	C	50/180mm (7,13,18,21,11)
21.15	C	50/150mm (7,15,20,30)
22.15	C	50/165mm (8,12,19,24,7)
23.00	C	50/95mm (5,20,32,18)
25.50	C	50/75mm (4,21,50)
26.50	C	50/225mm (6,6,9,13,28)
29.00	C	50/75mm (5,11,50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD6** Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	329011.0 E 183468.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.90 m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	15/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI00	SPT N & depth	Install-ation
TOPSOIL	0.20	5.70	D 0.25 B 0.40 - 1.00			
Firm becoming soft greyish brown mottled orange slightly sandy CLAY with occasional thin laminations. (Estuarine Alluvium)			U 1.00 - 1.45	(12)		
			D 1.45 D 1.70			
---from 2.05m very silty			D 2.05		S5 2.05 2.50	
	2.50	3.40	B 2.50 - 3.00			
Very soft grey thinly laminated slightly organic CLAY. (Estuarine Alluvium)			U 3.00 - 3.45	(6)		
---at 3.45m very silty			D 3.45 D 3.80 D 4.00		S3 4.00 4.45	
			B 4.45 - 5.00			
---at 5.45m occasionally medium to coarse gravel sized pockets of firm black fibrous peat			U 5.00 - 5.45 D 5.45 D 5.85 D 6.00	(1)	S2 6.00 6.45	
---at 6.49m becoming slightly sandy			B 6.45 - 6.90 W 6.70			
	6.90	-1.00	D 7.00			
Very soft greyish brown very sandy CLAY. (Estuarine Allvium)			U 7.10 - 7.55	(1)		
	7.60	-1.70	D 7.55 D 7.70 D 7.80		C50/75mm 7.80 8.03	
Dense greyish brown slightly clayey sandy sub-rounded to sub-angular siliceous GRAVEL with occasional cobbles. (Fluvial Alluvium)			B 8.50 - 9.00			
			D 9.00		C35 9.00 9.45	
			B 10.00 - 10.50			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD6** Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	329011.0 E 183468.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.90 m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	15/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
Dense greyish brown slightly clayey sandy sub-rounded to sub-angular siliceous GRAVEL with occasional cobbles. (Fluvial Alluvium)			B 10.00 - 10.50			
			D 10.50		C79/170mm 10.50	
						10.82
—at 10.50m becoming very dense very sandy gravel with occasional cobbles			B 11.00 - 11.50			
			D 12.00		C61/105mm 12.00	
						12.26
			B 12.60 - 13.00			
	13.20	-7.30	D 13.20			
Reddish brown mottled greyish green thinly laminated highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)			D 13.30		S44 13.30	
						13.75
			B 13.80 - 14.80			
—from 15.10m highly weathered weak			D 15.35		S75/150mm 15.35	
	15.50	-9.60		TCR SCR RQD FI		15.50
Reddish brown medium bedded moderately to highly weathered silty MUDSTONE, weak to moderately weak completely fractured. (Mercia Mudstone Group)			15.40 - 16.90	21 0 0 NI		
					C113	16.90
			16.90 - 17.90	0 0 0 NA		17.35
					C136	17.90
			17.90 - 18.90	81 0 0 81		18.35
			18.90 - 20.15	25 0 0 >25		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD6** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	329011.0 E 183468.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.90 m AOD
Client	Welsh Office	Driller	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	15/11/1997
		Core bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown medium bedded moderately to highly weathered silty MUDSTONE, weak to moderately weak completely fractured. (Mercia Mudstone Group)								C50/180mm 20.15	
			20.15 - 21.15	0	0	0	0	20.48	
								C50/150mm 21.15	
			21.15 - 22.15	0	0	0	0	21.45	
								C50/165mm 22.15	
			22.15 - 23.00	0	0	0	0	22.47	
	23.00	-17.10						C50/95mm 23.00	
Reddish brown thinly to medium bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			23.00 - 24.00	85	53	10	8	23.25	
							NI		
---from 23.60 to 23.85m highly weathered very weak completely fractured									
---from 24.00m slightly to moderately weathered moderately weak completely fractured			24.00 - 25.50	37	0	0	NI		
								C50/75mm 25.50	
			25.50 - 26.50	0	0	0	NA	25.73	
	26.50	-20.60						C50/225mm 26.50	
Reddish brown thinly to medium sub-horizontally bedded moderately weathered very sandy MUDSTONE, moderately weak to moderately strong with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			26.50 - 27.50	97	50	10	NI	26.88	
	27.15	-21.25					10		
---from 26.50 to 26.85m moderately to highly weathered weak completely fractured									
			27.50 - 29.00	57	30	7	NI		
							10		
Reddish brown thinly sub-horizontally bedded slightly to moderately weathered sandy MUDSTONE, moderately strong with closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)							NA		
	29.00	-23.10						C50/75mm 29.00	
---from 27.50 to 27.75m completely fractured			29.00 - 30.00	100	30	0	NI	29.23	
							4		
							NI		
Borehole complete at 30.00 m.	30.00	-24.10							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHD6
Extra Sheet

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	329011.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				183468.1 N
		Drilling Rig	Pilcon/Hands England	Ground Level	5.90 m AOD
Client	Welsh Office	Driller	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	15/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown medium bedded moderately to highly weathered silty MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)		30.00	-24.10							
Borehole complete at 30.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD7** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	329095.0 E 183408.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	7.90m AOD
Client	Welsh Office	Drillers	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	14/11/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
11/11/1997	1800	1.00	0.00	Dry	
12/11/1997	0800	1.00	0.00	Dry	
12/11/1997	1800	10.50	10.50	9.30	
13/11/1997	0800	10.50	10.50	4.10	
13/11/1997	1800	16.30	16.00	Dry	
14/11/1997	1130	16.30	16.00	1.44	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
0.30	0.50	0.75	
11.60	11.85	0.75	
15.80	16.00	0.75	
16.00	16.20	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	16.30	150	15.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
12/11/1900	0000	9.10	8.80	20	moderate	0.00	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
16.00	35.00	mist	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	C	N=11 (3,2,3,4,2,2)
2.00	C	N=1 (1,0,0,1,0,0)
4.00	S	N=3 (1,0,1,1,0,1)
6.00	S	1/450mm
8.00	S	1/450mm
10.00	C	N=60 (7,8,12,15,15,18)
11.50	C	50/50mm (8,19,50)
13.00	C	50/168mm (9,15,18,21,11)
14.50	C	N=56 (18,10,10,12,15,19)
15.50	S	50/165mm (8,14,20,25,5)
16.20	S	50/70mm (17,20,50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD7** Sheet 1 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	329095.0 E 183408.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	7.90 m AOD
Client	Welsh Office	Drillers	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	14/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
MADE GROUND: Soft brown silty sandy clay with occasional to some sub-angular gravel size fragments of concrete and rubble with occasional rootlets to 1.00m.			D 0.20 B 0.50 - 1.00 B 1.00 - 1.45 D 1.25 B 2.00 - 2.45 D 2.75 U 3.00 - 3.45	(10)	C11 1.00 1.45 C1 2.00 2.45	
	3.10	4.80				
Very soft grey occasionally thinly laminated very silty CLAY with very occasional gravel size pockets of plant remains. (Estuarine Alluvium)			D 3.50 D 3.75 B 4.00 - 4.45 D 4.00		S3 4.00 4.45	
---from 4.75m slightly sandy			D 4.75 U 5.00 - 5.45 D 5.50 D 5.75	(4)		
---from 5.75m organic	5.90	2.00	D 5.90 B 6.00 - 6.45 D 6.00		S1/450mm 6.00 6.45	
Very soft greyish blue thinly laminated CLAY with some to many extremely closely spaced thin laminations of blackish brown spongy and firm fibrous peat. (Estuarine Alluvium)			D 6.75 U 7.00 - 7.45 D 7.50 D 7.75	(4)		
---from 7.75m sandy with occasionally fine to medium gravel size pockets of blackish brown firm fibrous peat			B 8.00 - 8.45 D 8.00		S1/450mm 8.00 8.45	
	9.10	-1.20	D 9.00 D 9.10			
Very soft to soft reddish brown very silty sandy CLAY. (Estuarine Alluvium)	9.30	-1.40	U 9.20 - 9.65 D 9.70 B 10.00 - 10.45	(90)	C60 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD7** Sheet 2 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	329095.0 E 183408.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	7.90 m AOD
Client	Welsh Office	Drillers	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	14/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
Soft greyish brown very silty slightly sandy CLAY with occasional to some sub-rounded siliceous gravel and occasional cobbles. (Estuarine Alluvium)	10.10	-2.20	B 10.00 - 10.45		C60 10.00 - 10.45	
Very dense greyish brown sandy sub-rounded siliceous GRAVEL with occaisonal cobbles. (Fluvial Alluvium)			D 11.00			
			B 11.50 - 11.95		C50/50mm 11.50 - 11.70	
			D 12.50			
			B 13.00 - 13.45		C50/168mm 13.00 - 13.32	
			D 14.00			
			B 14.50 - 14.95		C56 14.50 - 14.95	
Reddish brown mottled greyish green occasionally thinly laminated highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)	14.70	-6.80	D 15.00			
			B 15.50 - 15.95 D 15.50		S50/165mm 15.50 - 15.82	
---from 16.20m highly weathered weak to moderately weak	16.30	-8.40	D 16.20	TCR SCR RQD FI	S50/70mm 16.20 - 16.42	
Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong locally very weak with medium to widely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			16.00 - 17.60	97 66 49 4 NI		
---from 17.10 to 17.80m moderately weathered weak completely fractured ---from 17.80 to 19.10m moderately to highly weathered weak ---from 18.55 to 20.00m with medium spaced undulating thin laminations of calcite			17.60 - 19.00	100 46 0 NI 12		
			19.00 - 20.50	97 59 59 5		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD7** Sheet 3 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	329095.0 E 183408.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	7.90 m AOD
Client	Welsh Office	Driller	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	14/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
								NI		
Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong locally very weak with medium to widely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)								NI		
				20.50 - 22.00	100	70	60	2		
---from 22.00 to 22.25m moderately to highly weathered weak completely fractured								NI		
				22.00 - 23.50	100	97	80	3		
		23.50	-15.60							
Reddish brown thinly to medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)				23.50 - 25.00	100	27	0	NI		
		25.00	-17.10							
Reddish brown occasionally mottled green medium bedded moderately weathered silty MUDSTONE, very weak with medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)				25.00 - 26.50	100	73	63	7		
---from 26.00m very sandy		26.20	-18.30					NI		
Reddish brown mottled green thinly to medium bedded highly weathered silty sandy MUDSTONE, very weak to weak completely fractured. (Mercia Mudstone Group)				26.50 - 28.00	100	7	0	NI		
				28.00 - 29.00	100	0	0	NI		
---from 29.00 to 29.65m moderately weathered weak with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight				29.00 - 29.80	100	25	0	8		
								NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHD7** Sheet 4 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	329095.0 E 183408.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	7.90 m AOD
Client	Welsh Office	Driller	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	14/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled green thinly to medium bedded highly weathered silty sandy MUDSTONE, very weak to weak completely fractured. (Mercia Mudstone Group)				29.80 - 30.90	100	0	0	NI		
		30.90	-23.00							
Reddish brown thinly to medium bedded moderately weathered silty MUDSTONE, weak to moderately strong with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)				30.90 - 31.90	100	50	15	NI 6		
---from 30.90 to 31.30m moderately to highly weathered weak completely fractured										
---from 31.90 to 32.40m moderately to highly weathered weak completely fractured				31.90 - 33.40	100	17	0	NI 10		
---from 32.90 to 33.20m moderately to highly weathered weak completely fractured								NI 10		
---from 33.40m with closely spaced sub-horizontal to inclined fractures planar rough tight				33.40 - 35.00	100	76	38	12		
---from 34.80m weak		35.00	-27.10							
Borehole complete at 35.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHD8
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	329208.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				183520.0 N
		Drilling Rig	Pilcon	Ground Level	5.87m AOD
Client	Welsh Office	Driller	C.A	Orientation	Vertical
		Logged by	C.D	Date Started	14/11/1997
Consultant	Ove Arup and Partners			Date Completed	15/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
14/11/1997	1800	10.00	7.70	5.70	
15/11/1997	0800	10.00	0.00	1.90	
15/11/1997	1800	14.30	13.50	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
8.20	8.40	0.75	
9.70	9.80	0.50	
13.90	14.25	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	14.30	150	13.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
14/11/1997	0000	7.90	5.70	20.0	fast	7.70	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	C	N=1 (1,0,0,1,0,0)
4.50	S	1/450mm
6.50	S	1/450mm
7.80	C	N=57 (5,7,8,12,16,21)
9.30	C	50/165mm (7,18,21,25,4)
10.80	C	N=85 (8,17,18,21,22,24)
12.20	C	N=58 (7,8,12,14,15,17)
13.80	S	N=67 (8,8,14,14,18,21)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHD8** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	329208.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183520.0 N
		Driller	C.A	Ground Level	5.87m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	14/11/1997
Consultant	Ove Arup and Partners			Date Completed	15/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
TOPSOIL	0.10	5.77	U 0.20			
Soft to firm brown mottled very silty CLAY. (Estuarine Alluvium)			B 0.50 - 1.00			
---at 0.20m with occasional rootlets			U 1.00 - 1.45	(6)		
			D 1.50			
			D 1.75			
	2.00	3.87	B 2.00 - 2.45	C1	C 2.00	
Very soft dark grey CLAY. (Estuarine Alluvium)			D 2.00		2.45	
			D 2.75			
---at 2.75m soft			B 3.00 - 3.45	(4)		
			U 3.00 - 3.45			
			U 3.50 - 3.95	(4)		
			D 4.00			
			D 4.25			
			B 4.50 - 4.95	S1/450mm	S 4.50	
			D 4.50		4.95	
			D 5.25			
---at 5.50m very silty			U 5.50 - 5.95	(3)		
			D 6.00			
			D 6.25			
			B 6.50 - 6.95	S1/450mm	S 6.50	
			D 6.50		6.95	
	7.10	-1.23	D 7.10			
Very dense greyish brown sandy sub-rounded and occasional sub-angular siliceous GRAVEL with some cobbles. (Fluvial Alluvium)			U 7.20 - 7.65	(150)		
			D 7.70			
			B 7.80 - 8.25	C57	C 7.80	
			W 7.90		8.25	
			D 8.50			
			B 9.30 - 9.75	C50/165mm	C 9.30	
					9.62	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHD8** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	329208.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183520.0 N
		Driller	C.A	Ground Level	5.87m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	14/11/1997
Consultant	Ove Arup and Partners			Date Completed	15/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very dense greyish brown sandy sub-rounded and occasional sub-angular siliceous GRAVEL with some cobbles. (Fluvial Alluvium)				D 10.50 B 10.80 - 11.25	C85	C 10.80 11.25	
				D 11.80 B 12.20 - 12.75	C58	C 12.20 12.65	
		12.50	-6.63				
Reddish brown occasionally mottled greyish green highly to moderately weathered MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)				D 13.30			
---from 13.80m moderately weathered moderately weak				B 13.80 - 14.25 D 13.80	S67	S 13.80 14.25	
		14.30	-8.43				
Cable Percussion boring complete at 14.30 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHE1
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	329645.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				183719.0 N
		Drilling Rig	Pilcon	Ground Level	6.20m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	05/11/1997
Consultant	Ove Arup and Partners			Date Completed	06/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
05/11/1997	1800	8.00	7.90	Dry	
06/11/1997	0800	8.00	7.90	1.25	
06/11/1997	1200	8.60	8.40	8.40	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
8.30	8.60	2.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	8.60	150	8.40

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.05	S	N=4 (1,1,0,2,1,1)
4.10	S	0/450mm
6.40	S	0/450mm
8.20	C	50/75mm (8,17,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE1** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	329645.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183719.0 N
		Driller	I.M	Ground Level	6.20m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	05/11/1997
Consultant	Ove Arup and Partners			Date Completed	06/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.20	6.00	B 0.20 - 0.75			
Soft brown mottled grey slightly sandy CLAY with occaisonal thin laminations of bluish grey silt and occasional rootlets. (Estuarine Alluvium)				D 0.85 U 1.00 - 1.45 W 1.25 D 1.45 D 1.90 D 2.05 B 2.50 - 2.85	(10) S4	S 2.05 - 2.50	
		2.85	3.35				
Very soft dark greyish blue very silty CLAY. (Estuarine Alluvium) ---at 4.10m becoming slightly organic				D 3.00 U 3.10 - 3.55 D 3.55 D 3.90 D 4.10 - 4.55 B 4.55 - 5.00 U 5.00 - 5.45 D 5.45 D 6.00 D 6.40 B 7.00 - 7.90	(2) S1 (1) S1	S 4.10 - 4.55 S 6.40 - 6.85	
		7.90	-1.70				
Very dense grey slightly sandy sub-angular to sub-rounded GRAVEL with many cobbles. (Fluvial Alluvium)				D 8.10 D 8.20	C50/75mm	C 8.20 - 8.43	
		8.60	-2.40				
Cable Percussion boring complete at 8.60 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE1A** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	329645.3 E
Project	M4 Relief Road Magor to Castleton Stage 2				183717.0 N
		Drilling Rig	Pilcon	Ground Level	6.20m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	10/11/1997
Consultant	Ove Arup and Partners			Date Completed	10/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
10/11/1997	1800	13.34	12.80	1.15	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
9.10	9.20	0.25	
9.90	10.10	0.75	
12.85	13.10	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	13.34	150	12.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
10/11/1997	0000	8.20	4.00	15.0	fast	7.90	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
8.00	C	N=45 (6,8,7,10,11,17)
9.40	C	N=35 (4,7,8,8,9,10)
11.40	S	N=40 (4,6,8,10,11,11)
13.10	C	79/150mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE1A** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	329645.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183717.0 N
		Driller	I.M	Ground Level	6.20m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	10/11/1997
Consultant	Ove Arup and Partners			Date Completed	10/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.05	6.15				
Soft brown mottled grey slightly sandy CLAY with occasional thin laminations of bluish grey silt and rootlets. (Estuarine Alluvium)				B 1.00 - 1.50 B 2.00 - 2.50			
		2.85	3.35				
Very soft to soft dark grey blue CLAY. (Estuarine Alluvium)				B 3.00 - 3.50 B 4.00 - 4.50 W 4.00 B 5.00 - 5.50 B 6.00 - 6.50 B 7.00 - 7.50			
		7.90	-1.70	D 8.00	C45	C 8.00 8.45	
Dense to very dense grey sandy sub-angular to sub-rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)				B 8.50 - 9.00			
---from 9.40m very sandy				D 9.40	C35	C 9.40 9.85	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE1A** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	329645.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183717.0 N
		Driller	I.M	Ground Level	6.20m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	10/11/1997
Consultant	Ove Arup and Partners			Date Completed	10/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Dense to very dense grey sandy sub-angular to sub-rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)				B 10.10 - 10.60			
		11.20	-5.00	D 11.20			
Reddish brown mottled greyish green occasionally thinly laminated highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)				D 11.40	S40	S 11.40 11.85	
				B 11.90 - 12.50			
---from 13.10m highly weathered weak to moderately weak				D 13.10	C79/150mm*	C 13.10 13.25	
		13.34	-7.14				
Cable Percussion boring complete at 13.34 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHE2
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	329834.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				183905.0 N
		Drilling Rig	Pilcon	Ground Level	6.40m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	04/11/1997
Consultant	Ove Arup and Partners			Date Completed	05/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
04/11/1997	1800	12.00	12.00	8.90	
05/11/1997	0800	12.00	12.00	4.90	
05/11/1997	1800	13.81	12.50	2.80	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
10.60	10.85	0.75	
13.40	13.80	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	13.81	150	12.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
04/11/1997	0000	9.20	5.40	5.00	fast	9.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=7 (1,1,2,1,3,1)
4.00	S	N=2 (0,0,0,0,1,1)
6.50	S	N=1 (0,0,0,0,0,1)
9.40	C	N=34 (4,7,8,8,9,9)
11.60	S	N=44 (5,9,10,10,11,13)
13.60	S	50/75mm (14,27,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE2** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	329834.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183905.0 N
		Driller	I.M	Ground Level	6.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	04/11/1997
Consultant	Ove Arup and Partners			Date Completed	05/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.20	6.20	B 0.20 - 0.70			
Soft to firm brown mottled greyish brown thinly laminated CLAY. (Estuarine Alluvium)			D 0.85 U 1.00 - 1.45	(12)		
			D 1.45			
			D 1.80			
			D 2.00	S7	S 2.00 - 2.45	
			B 2.45 - 2.80			
	2.80	3.60	D 2.90			
Very soft to soft grey mottled greyish brown CLAY. (Estuarine Alluvium)			U 3.10 - 3.55	(10)		
			D 3.55			
			D 3.75			
			D 4.00	S2	S 4.00 - 4.45	
---from 4.00m grey soft			B 4.45 - 5.00			
			U 5.00 - 5.45	(2)		
			D 5.45			
			D 6.00			
---from 6.00m dark grey			D 6.50	S1	S 6.50 - 6.95	
---from 6.50m with occasional fine to medium gravel size pockets of firm black brown firm fibrous peat			B 7.00 - 7.50			
	7.90	-1.50	D 7.90			
Firm blackish brown fibrous woody PEAT with occasional gravel size pockets of soft grey clay. (Peat)			U 8.10 - 8.55	(12)		
			D 8.55			
			D 9.00			
	9.20	-2.80	D 9.20			
Dense grey medium to coarse sub-rounded sandy siliceous GRAVEL with occasional cobbles. (Fluvial Alluvium)			D 9.40	C34	C 9.40 - 9.85	
	10.00	-3.60	B 10.00 - 10.50			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE2** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	329834.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183905.0 N
		Driller	I.M	Ground Level	6.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	04/11/1997
Consultant	Ove Arup and Partners			Date Completed	05/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Dense grey medium to coarse sub-rounded sandy siliceous GRAVEL with occasional cobbles. (Fluvial Alluvium)	10.00	-3.60	B 10.00 - 10.50			
Dense greyish brown medium to coarse sub-angular to sub-rounded very sandy siliceous GRAVEL with occasional cobbles. (Fluvial Alluvium)	11.40	-5.00	D 11.00 D 11.50 D 11.60	S44	S 11.60 – 12.05	
Reddish brown mottled greyish green occasionally thinly laminated highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)			B 12.00 - 12.50 D 13.00 D 13.60	S50/75mm	S 13.60 – 13.83	
Cable Percussion boring complete at 13.81 m.	13.81	-7.41				

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE3** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	330037.8 E
Project	M4 Relief Road Magor to Castleton Stage 2				183960.7 N
		Drilling Rig	Pilcon	Ground Level	6.40m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	04/11/1997
Consultant	Ove Arup and Partners			Date Completed	05/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
04/11/1997	1800	5.00	5.00	Dry	
05/11/1997	0800	5.00	5.00	Dry	
05/11/1997	1200	10.70	10.70	3.70	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
8.75	9.00	0.50	
9.40	9.68	0.75	
9.80	10.15	0.50	
10.50	10.70	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	10.70	150	10.70

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
05/11/1997	0000	8.60	3.70	15.0	fast	0.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.90	S	N=10 (2,2,2,3,3,2)
4.00	S	N=3 (1,0,1,1,1,0)
7.50	S	N=1 (0,0,0,0,0,1)
8.10	S	N=10 (1,1,1,1,1,7)
9.00	C	94/225mm (6,11,18,26,50)
10.50	C	50/75mm (7,32,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE3** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	330037.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183960.7 N
		Driller	A.M	Ground Level	6.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	04/11/1997
Consultant	Ove Arup and Partners			Date Completed	05/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
TOPSOIL	0.30	6.10	B 0.30 - 0.80			
Firm becoming soft to firm greyish brown slightly sandy CLAY with occaisonal thin laminations and rootlets. (Estuarine Alluvium)			D 0.85 - 1.25 U 0.85 D 1.25	(13)		
---at 1.90m becoming mottled bluish grey			B 1.90 - 2.80 D 1.90	S10	S 1.90 - 2.35	
	2.80	3.60	D 2.90			
Very soft dark greyish brown CLAY. (Estuarine Alluvium)			U 3.00 - 3.45 D 3.45	(8)		
---at 4.00m becoming slightly sandy			D 4.00	S3	S 4.00 - 4.45	
	4.70	1.70				
Very soft to soft dark grey very silty CLAY with occasional gravel size pockets of very silty fine sandy CLAY. (Estuarine Alluvium)			D 5.50 V 5.50 D 6.00			
			U 6.50 - 6.95 D 6.95	(4)		
			B 7.50 - 8.05 D 7.50	S1	S 7.50 - 7.95	
---from 8.05m slightly organic with occasional sub-rounded coarse gravel and cobbles of sandstone and mudstone			B 8.10 - 8.60 D 8.10	S10	S 8.10 - 8.55	
	8.60	-2.20	W 8.60			
Dense to very dense grey sub-rounded slightly clayey silty sandy GRAVEL and COBBLES. (Fluvial Alluvium)			B 8.90 - 9.50 D 9.00	C94/225mm	C 9.00 - 9.38	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE3** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	330037.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		183960.7 N
		Driller	A.M	Ground Level	6.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	04/11/1997
Consultant	Ove Arup and Partners			Date Completed	05/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
Dense to very dense grey sub-rounded slightly clayey silty sandy GRAVEL and COBBLES. (Fluvial Alluvium)		10.70	-4.30	B D	10.50 - 10.70 10.50	C50/75mm	C	10.50 10.73	
Cable Percussion boring complete at 10.70 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHE3A
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330039.9 E
Project	M4 Relief Road Magor to Castleton Stage 2				183956.5 N
		Drilling Rig	Pilcon/Dando	Ground Level	6.40m AOD
Client	Welsh Office	Drillers	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	06/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	16/11/1997
		Core bit	Geocube		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
06/11/1997	1800	11.00	11.00	Dry	
10/11/1997	0800	11.00	11.00	3.50	
10/11/1997	1800	15.45	13.40	0.00	
15/11/1997	0800	15.45	15.40	2.20	
15/11/1997	1800	27.10	15.40	0.00	
16/11/1997	0800	27.10	15.40	0.00	
16/11/1997	1800	30.60	15.40	0.00	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
8.10	8.28	0.75	
9.05	9.30	0.50	
10.80	11.00	1.00	
11.55	11.75	0.67	
11.93	12.20	1.00	
12.30	12.42	0.75	
15.00	15.30	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.45	150	13.40

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
15.45	30.60	air	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
9.80	S	N=13 (2,3,3,3,4,3)
11.55	S	79/150mm*
13.50	S	N=32 (3,4,6,9,8,9)
15.30	S	78/150mm*

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHE3A** Sheet 1 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330039.9 E 183956.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	6.40 m AOD
Client	Welsh Office	Drillers	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	06/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	16/11/1997
		Core Bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI00	SPT N & depth	Install-ation
TOPSOIL		0.05	6.35				
Firm laminated CLAY (drillers description). (Estuarine Alluvium)							
		2.86	3.54				
Dark firm silty CLAY (drillers description). (Estuarine Alluvium)							
		4.60	1.80				
Soft grey CLAY (drillers description). (Estuarine Alluvium)							
		8.10	-1.70				
Dark coarse SAND and GRAVEL with large cobbles (drillers description). (Fluvial Alluvium)							
		9.70	-3.30	B 9.80 - 10.80 D 9.80 - 10.30		S13 9.80 10.25	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHE3A** Sheet 2 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330039.9 E 183956.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	6.40 m AOD
Client	Welsh Office	Drillers	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	06/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	16/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI 00	SPT N & depth	Install-ation
Soft to firm dark grey CLAY with occasional sub-angular fine and medium gravel of sandstone and mudstone. (Fluival Alluvium)						
	10.80	-4.40				
Dense greyish brown sandy sub-angular to sub-rounded siliceous GRAVEL occasional cobbles. (Fluvial Alluvium)			B 11.00 - 12.00			
			D 11.55		S79/150mm*11.55 11.70	
	13.20	-6.80				
Reddish brown mottled greyish green thinly laminated highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)			D 13.50		S32 13.50 13.95	
---from 15.00m weak to moderately weak			D 15.30		S78/150mm*15.30 15.45	
	15.45	-9.05				
Reddish brown occasionally mottled greyish green medium to thickly sub-horizontally bedded thinly laminated highly to completely weathered MUDSTONE, very weak to weak with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			15.45 - 16.50	TCR 67 SCR 62 RQD 0 FI NI NA		
---from 15.45 to 16.15m completely fractured			16.50 - 17.80	TCR 100 SCR 100 RQD 31 FI NI 7 NI		
---from 16.15 to 16.50m no recovery						
---from 17.00 to 17.25m steep inclined fracture (70°) planar rough tight			17.80 - 19.30	TCR 80 SCR 44 RQD 15 FI 3 NI 2 NA		
---from 17.35 to 17.60m steep inclined fracture (70°) planar rough tight						
---from 17.60 to 17.70m inclined fracture (55°) planar rough tight to open (soft weathered calcite infill)						
---from 17.75 to 17.80m completely fractured				NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHE3A** Sheet 3 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330039.9 E 183956.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	6.40 m AOD
Client	Welsh Office	Driller	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	06/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	16/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Installation
Reddish brown occasionally mottled greyish green medium to thickly sub-horizontally bedded thinly laminated highly to completely weathered MUDSTONE, very weak to weak with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)				19.30 - 20.80	100	80	55	6		
---from 21.30 to 22.00m completely fractured				20.80 - 22.40	100	56	28	7 NI		
---from 22.00m weak								3		
---from 22.80 to 23.00m sub-vertical fracture (70°) planar rough tight to open occasionally weathered calcite infill				22.40 - 24.00	100	91	33	7		
---from 23.45 to 23.60m completely fractured								NI 3		
---from 23.90m occasionally calcareous										
---from 24.00 to 24.60m completely fractured								NI		
---from 24.70 to 25.50m occasionally calcitic				24.00 - 25.50	100	90	20	5		
---from 25.50 to 26.46m completely fractured								NI		
---from 26.00 to 26.10m occasionally calcitic				25.50 - 27.10	100	38	19	3		
---from 27.00 to 27.10m completely fractured								NI 3		
---at 27.05m occasionally calcareous								NI		
---from 27.10 to 27.50m sub-vertical fracture irregular rough tight to open (calcite infill)				27.10 - 28.60	100	87	20	7		
---from 28.25 to 28.60m completely fractured								7		
---from 28.60 to 29.80m completely fractured				28.60 - 30.10	100	43	0	NI		
---from 29.35m occasionally calcareous		29.80	-23.40					NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHE3A
Sheet 4 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330039.9 E
Project	M4 Relief Road Magor to Castleton Stage 2				183956.5 N
		Drilling Rig	Pilcon/Dando	Ground Level	6.40 m AOD
Client	Welsh Office	Driller	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	06/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	16/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green thinly to medium bedded slightly to moderately weathered slightly sandy MUDSTONE, moderately strong to strong completely fractured. (Mercia Mudstone Group)		30.60	-24.20							
Borehole complete at 30.60 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHE4
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	330084.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				184116.1 N
		Drilling Rig	Pilcon	Ground Level	6.50m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	03/11/1997
Consultant	Ove Arup and Partners			Date Completed	04/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
03/11/1997	1800	10.80	10.80	5.20	
04/11/1997	0800	10.80	10.80	3.10	
04/11/1997	1800	13.75	12.75	4.00	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
9.80	10.15	1.00	
10.60	10.80	0.50	
10.80	11.10	0.75	
11.60	11.80	0.50	
12.45	12.60	0.25	
13.32	13.60	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	13.75	150	12.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
03/11/1997	0000	2.67	2.50	15.0	slow	NR	0.00
03/11/1997	0000	8.10	6.35	15.0	fast□□	NR	0.00

GENERAL NOTES

1. Piezometer installed on completion.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=9 (1,2,2,2,3,2)
4.00	S	N=2 (1,0,1,0,1,0)
6.10	S	N=1 (0,0,0,0,1,0)
8.15	C	N=46 (2,5,7,12,13,14)
9.50	S	78/150mm (5,12,28,50)
11.20	C	100/225mm (7,14,21,29,50)
12.30	C	88/150mm*
12.70	C	N=32 (5,7,8,8,7,9)
13.60	C	78/125mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE4** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	330084.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184116.1 N
		Driller	A.M	Ground Level	6.50m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	03/11/1997
Consultant	Ove Arup and Partners			Date Completed	04/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.30	6.20	B 0.30 - 1.00			
Soft to firm brown mottled greyish brown occasionally thinly laminated very silty CLAY. (Estuarine Alluvium)			D 1.05 - 1.55 U 1.10	(12)		
			D 1.55			
			B 2.00 - 2.67 D 2.00	S9	S 2.00 2.45	
	2.67	3.83	W 2.67			
Soft to very soft dark grey CLAY. (Estuarine Alluvium)			D 2.90 - 3.40 U 2.95	(6)		
			D 3.40			
			B 4.00 - 5.00 D 4.00	S2	S 4.00 4.45	
---from 5.00m becomes organic			D 5.10 - 5.60 U 5.15	(5)		
			D 5.60			
			B 6.10 - 7.00 D 6.10	S1	S 6.10 6.55	
			D 7.10 - 7.60 U 7.15	(4)		
			D 7.60			
	8.10	-1.60	W 8.10 - 9.00 B 8.15 D 8.15	C46	C 8.15 8.60	
Dense grey sub-angular to sub-rounded sandy siliceous GRAVEL and occasional to some cobbles. (Fluvial Alluvium)						
---from 9.50m becomes very dense with many cobbles			B 9.50 - 10.30 D 9.50	S78/150mm	S 9.50 9.80	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE4** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	330084.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184116.1 N
		Driller	A.M	Ground Level	6.50m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	03/11/1997
Consultant	Ove Arup and Partners			Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Dense grey sub-angular to sub-rounded sandy siliceous GRAVEL and occasional to some cobbles. (Fluvial Alluvium)				B 11.20 - 12.10 D 11.20	C100/225mm	C 11.20 11.58	
				B 12.30 - 12.60 D 12.30	C88/150mm*	C 12.30 12.45	
		12.60	-6.10		C32	C 12.70 13.15	
Reddish brown mottled greyish green thinly laminated highly weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)					C78/125mm*	C 13.60 13.73	
		13.75	-7.25				
Cable Percussion boring complete at 13.75 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE5** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	330399.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				184245.0 N
		Drilling Rig	Pilcon	Ground Level	6.60m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	03/11/1997
Consultant	Ove Arup and Partners			Date Completed	03/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
03/11/1997	1800	15.15	14.80	10.70	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
9.10	9.35	0.75	
14.80	15.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.15	150	14.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
03/11/1997	0000	2.40	2.40	0.00	seepage	0.00	0.00
03/11/1997	0000	8.60	7.20	15.0		8.40	0.00

GENERAL NOTES

1. Borehole grouted up on completion.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=5 (1,2,1,2,1,1)
4.00	S	N=10 (1,2,3,3,2,2)
8.10	C	N=44 (4,4,8,11,11,14)
9.50	C	N=45 (6,9,10,10,12,13)
11.00	C	70/150mm (8,11,20,50)
12.50	C	N=33 (4,5,5,6,8,14)
13.80	S	N=53 (5,8,11,12,13,17)
15.00	S	50/75mm (,39,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE5** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	330399.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184245.0 N
		Driller	I.M	Ground Level	6.60m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	03/11/1997
Consultant	Ove Arup and Partners			Date Completed	03/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.10	6.50	B 0.10 - 0.80			
Firm becoming soft brown mottled grey slightly sandy CLAY with occasional thin laminations of greyish blue silt. (Estuarine Alluvium)			D 0.90 U 1.00 - 1.45	(7)		
			D 1.45			
			D 1.70			
			D 2.00	S5	S 2.00 - 2.45	
			B 2.45 - 2.80			
Very soft becoming soft to firm greyish blue slightly sandy CLAY. (Estuarine Alluvium)	2.80	3.80	D 2.90 U 3.10 - 3.55	(3)		
			D 3.55			
---at 3.90m becoming slightly organic			D 3.90 D 4.00	S10	S 4.00 - 4.45	
---from 4.00m becomes soft to firm			B 4.45 - 5.00			
Soft to firm grey mottled black organic CLAY with some medium to coarse gravel size pockets of black firm fibrous peat. (Estuarine Alluvium)	5.05	1.55	D 5.05 U 5.15 - 5.60	(11)		
			D 5.60			
			D 6.50			
			U 7.00 - 7.45	(10)		
Soft grey sandy slightly organic CLAY. (Estuarine Alluvium)	7.20	-0.60	W 7.20 D 7.45			
Dense grey medium to coarse grained SAND with some gravel and occasional cobbles. (Fluvial Alluvium)	8.10	-1.50	D 8.10	C44	C 8.10 - 8.55	
			B 8.55 - 9.10			
---at 9.50m becoming greyish brown			D 9.50	C45	C 9.50 - 9.95	
			B 10.00 - 10.50			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE5** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	330399.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184245.0 N
		Driller	I.M	Ground Level	6.60m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	03/11/1997
Consultant	Ove Arup and Partners			Date Completed	03/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Dense grey medium to coarse grained SAND with some gravel and occasional cobbles. (Fluvial Alluvium)				B 10.00 - 10.50			
				D 11.00	C70/150mm	C 11.00 - 11.30	
---at 11.28m becoming very dense				B 11.50 - 12.00			
		12.00	-5.40	D 12.10			
Dense reddish brown slightly clayey gravelly medium to coarse SAND. (Fluvial Alluvium)				D 12.50	C33	C 12.50 - 12.95	
---at 12.50m becoming mottled greyish green				B 13.00 - 13.50			
		13.50	-6.90	D 13.60			
Reddish brown mottled greyish blue highly to completely weathered sandy MUDSTONE, weak to very weak. (Mercia Mudstone Group)				D 13.80	S53	S 13.80 - 14.25	
---at 13.80m becoming highly weathered to moderately weathered		14.80	-8.20				
Reddish brown mottled greyish brown highly to moderately weathered slightly sandy MUDSTONE, moderately weak to weak. (Mercia Mudstone Group)		15.15	-8.55	D 15.00	S50/75mm	S 15.00 - 15.15	
Cable Percussion boring complete at 15.15 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHE6
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	330617.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				184486.0 N
		Drilling Rig	Pilcon	Ground Level	6.50m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	01/11/1997
Consultant	Ove Arup and Partners			Date Completed	02/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
01/11/1997	1600	9.00	9.00	7.20	
02/11/1997	0800	9.00	9.00	4.70	
02/11/1997	1600	15.50	14.90	5.90	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
8.60	9.00	2.00	
9.00	9.20	0.75	
11.30	11.50	1.00	
15.05	15.30	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.50	150	14.90

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
01/11/1997	0000	5.00	2.70	15.0	fast	4.70	0.00

GENERAL NOTES

1. Borehole grouted up on completion.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=6 (1,2,1,2,2,1)
7.80	C	N=100 (6,6,12,18,20,50)
9.50	C	N=43 (4,8,10,10,11,12)
11.00	C	76/135mm (10,18,26,50)
12.50	C	N=52 (6,8,11,12,12,17)
14.00	S	N=52 (6,8,8,14,15,15)
15.30	S	50/60mm (26,38,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE6** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	330617.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184486.0 N
		Driller	I.M	Ground Level	6.50m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	01/11/1997
Consultant	Ove Arup and Partners			Date Completed	02/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
TOPSOIL	0.20	6.30	B 0.25 - 1.00 D 0.25			
Soft greyish brown slightly sandy CLAY with occasional thin laminations of bluish grey silt. (Estuarine Alluvium)			U 1.00 - 1.45	(10)		
			D 1.45			
			D 1.80			
---from 1.80 to 2.00m very silty with occasional rootlets			D 2.00	S6	S 2.00 - 2.45	
---at 2.00m becoming slightly organic			B 2.45 - 3.00 W 2.70			
			U 3.00 - 3.45	(14)		
			D 3.45			
			D 3.70			
---at 3.70m becoming greyish brown mottled black organic	3.90	2.60	D 3.90 U 4.00 - 4.45	(6)		
Very soft grey mottled black CLAY with medium to coarse gravel size pockets of black fibrous peat. (Estuarine Alluvium)			D 4.45 D 4.60			
---from 4.60m grey mottled black slightly organic clay			D 5.50 V 5.50			
			U 6.00 - 6.45	(6)		
			D 6.45			
---at 6.80m occasional medium to coarse gravel sized pockets of black fibrous peat			D 6.80			
	7.70	-1.20	D 7.80	C100	C 7.80 - 8.25	
Very dense dark grey SAND with some sub-rounded gravel and occasional cobbles. (Fluvial Alluvium)			B 8.25 - 8.60			
---from 7.80 to 9.50m clayey						
---from 8.20 to 8.60m slightly sandy gravel with some cobbles						
			D 9.50	C43	C 9.50 - 9.95	
---at 9.50m becoming gravelly			B 10.00 - 10.50			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHE6** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	330617.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		184486.0 N
		Driller	I.M	Ground Level	6.50m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	01/11/1997
Consultant	Ove Arup and Partners			Date Completed	02/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Very dense dark grey SAND with some sub-rounded gravel and occasional cobbles. (Fluvial Alluvium)			B 10.00 - 10.50 D 11.00 - 11.25 B 11.50 - 12.00 D 12.50 B 13.00 - 13.50	C76/135mm C52	C 11.00 - 11.29 C 12.50 - 12.95	
	13.80	-7.30	D 13.90			
Reddish brown mottled greyish green completely to highly weathered slightly sandy MUDSTONE, very weak to weak. (Mercia Mudstone Group) ---at 14.00m becoming sandy			D 14.00 B 14.50 - 15.10	S52	S 14.00 - 14.45	
	15.05	-8.55				
Reddish brown highly to moderately weathered highly to moderately weathered sandy MUDSTONE, moderately weak to moderately strong. (Mercia Mudstone Group)	15.50	-9.00	D 15.30	S50/60mm	S 15.30 - 15.51	
Cable Percussion boring complete at 15.50 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHF1
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330831.0 E 184656.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	5.30m AOD
Client	Welsh Office	Drillers	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	21/11/1997
		Core bit	Geocube		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
16/11/1997	1800	8.70	8.70	NR	
17/11/1997	0800	8.70	8.70	5.00	
17/11/1997	1800	12.75	12.75	NR	
18/11/1997	0800	12.75	12.75	5.00	
18/11/1997	1330	14.45	13.70	NR	
18/11/1997	1430	14.45	14.40	4.20	
18/11/1997	1800	16.50	14.40	NR	
19/11/1997	0800	16.50	14.40	4.20	
19/11/1997	1800	24.90	14.40	NR	
20/11/1997	0800	24.90	14.40	4.20	
20/11/1997	1800	34.40	14.40	NR	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
8.30	8.50	0.50	
8.50	8.70	1.00	
8.70	8.95	1.15	
9.25	9.53	1.15	
10.35	10.48	0.75	
11.50	11.73	1.20	
12.50	12.75	0.67	
12.75	13.10	0.50	
13.35	13.63	0.25	
13.90	14.10	0.67	
14.10	14.20	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	14.45	150	13.70
120	40.80	140	14.40

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
16/11/1997	0000	5.45	4.75	15	fast	5.30	6.00
16/11/1997	0000	8.30	7.00	15	fast	8.30	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
14.45	40.80	air	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
0.40	C	N=13 (2,4,5,3,3,2)
3.00	S	N=5 (1,2,1,1,2,1)
5.00	S	N=2 (1,0,1,0,1,0)
6.80	S	N=1 (0,1,0,0,1,0)
8.50	C	53/75mm*
10.00	C	86/200mm (9,14,18,18,50)
11.50	C	50/75mm*
12.50	C	50/75mm (8,21,50)
13.80	S	24/225mm*
14.30	S	74/115mm*

* Seating blows only.

GENERAL NOTES

1. First water strike partially sealed off with casing to around 6.00m.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF1** Sheet 1 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330831.0 E 184656.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	5.30 m AOD
Client	Welsh Office	Drillers	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	21/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
MADE GROUND: Ash and slag clay and brick fill (drillers description).			B 0.40 - 1.40		C13 0.40	
					0.85	
	1.55	3.75				
Soft greyish brown slightly sandy CLAY. (Estuarine Alluvium)			D 1.70 U 1.80 - 2.25	(9)		
	2.35	2.95	D 2.25			
Very soft to soft slightly sandy CLAY. (Estuarine Alluvium)			B 3.00 - 4.00 D 3.00		S5 3.00	
					3.45	
---from 4.00m becoming very soft			D 4.05 - 4.55 U 4.10	(6)		
---from 4.05m occasional medium to coarse gravel sized pockets of black fibrous peat			D 4.55			
			B 5.00 - 6.00 D 5.00		S2 5.00	
					5.45	
			W 5.45			
---from 6.05m becoming sandy			D 6.05 - 6.55 U 6.10	(6)		
			D 6.55			
			B 6.80 - 7.50 D 6.80		S1 6.80	
					7.25	
---from 7.70m becoming very sandy			D 7.70 U 7.80 - 8.25	(4)		
	8.30	-3.00	D 8.25 W 8.30			
Very dense dark grey sandy sub-rounded and occasional sub-angular siliceous GRAVEL with many cobbles. (Fluvial Alluvium)			B 8.50 - 8.70		C53/75mm* 8.50	
					8.58	
			D 9.00			
			B 10.00 - 11.00		C86/200mm 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF1** Sheet 2 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330831.0 E 184656.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	5.30 m AOD
Client	Welsh Office	Drillers	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	21/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI00	SPT N & depth	Installation
Very dense dark grey sandy sub-rounded and occasional sub-angular siliceous GRAVEL with many cobbles. (Fluvial Alluvium)			B 10.00 - 11.00		C35/200mm 10.00 10.35	
			B 11.50 - 12.50 B 11.50 - 12.50 D 11.50		C50/75mm* 11.50 11.58	
			B 12.50 - 12.70		C50/75mm 12.50 12.73	
			B 12.80 - 13.63			
Reddish brown mottled greyish green highly to completely weathered MUDSTONE, weak. (Mercia Mudstone Group)	13.63	-8.33	B 13.63 - 14.10 D 13.80		S24/225mm*13.80 14.03	
---from 13.90m with occasional gravel size pockets of reddish brown silty sand	14.10	-8.80	D 14.30		S74/115mm*14.30 14.42	
Reddish brown highly weathered slightly sandy MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)	14.45	-9.15	14.45 - 16.00	TCR 65, SCR 6, RQD 0, FI 2, NI		
Reddish brown mottled green thinly to medium sub-horizontally bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)			16.00 - 16.50	TCR 70, SCR 10, RQD 0, NI		
---from 14.75 to 14.90m slightly to moderately weathered with very closely spaced sub-horizontal fractures planar rough tight	16.80	-11.50	16.50 - 17.90	TCR 86, SCR 7, RQD 0, NI, 1, NI		
Reddish brown thinly sub-horizontally bedded moderately to highly weathered slightly sandy MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)						
---from 16.90 to 17.00m moderately to highly weathered weak with very closely spaced sub-horizontal fractures planar rough tight	18.60	-13.30	17.90 - 19.20	TCR 92, SCR 12, RQD 0, NI, 4		
---from 17.90 to 18.15m green slightly weathered moderately strong completely fractured						
MUDSTONE As Sheet 3			19.20 - 20.40	TCR 100, SCR 65, RQD 8, 17		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF1** Sheet 3 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330831.0 E 184656.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	5.30 m AOD
Client	Welsh Office	Driller	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	21/11/1997
		Core bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green very thinly to thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)							1		
							NI		
							1		
	21.00	-15.70					NI		
---from 20.40 to 20.50m green slightly to moderately weathered moderately strong			20.40 - 21.90	93	59	27	6		
---from 20.50 to 20.65m moderately to highly weathered weak completely fractured									
---from 20.80 to 21.00m moderately to highly weathered weak to moderately weak completely fractured			21.90 - 23.30	100	13	7	NA		
Reddish brown medium bedded moderately weathered silty MUDSTONE, moderately weak with very closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			23.30 - 23.50	0	0	0			
---from 21.90 to 24.30m moderately to highly weathered weak completely fractured							NI		
---from 23.70 to 23.80m inclined (50°) thick laminations of powdery calcite (10mm)			23.50 - 24.90	93	61	29	4		
	24.90	-19.60							
Reddish brown mottled greyish green very thinly to thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			24.90 - 26.50	94	63	50	4		
---from 24.90 to 25.90m highly weathered very weak to weak							NI		
---from 25.90 to 26.20m completely fractured							6		
---from 26.20 to 26.50m weak							4		
---from 27.00 to 27.15m completely fractured			26.50 - 28.00	87	64	33	NI		
---from 27.80 to 28.00m no recovery							7		
							NA		
---from 28.45 to 29.30m highly weathered very weak to weak completely fractured							9		
			28.00 - 29.30	100	34	0	NI		
			29.30 - 29.60	0	0	0	NA		
							6		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF1** Sheet 4 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330831.0 E 184656.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	5.30 m AOD
Client	Welsh Office	Driller	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	21/11/1997
		Core bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Installation
Reddish brown mottled greyish green very thinly to thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			29.60 - 31.00	36	23	7	NA		
---from 30.10 to 31.70m no recovery			31.00 - 31.70	0	0	0	NA		
---from 31.70 to 32.60m moderately to highly weathered completely fractured			31.70 - 33.00	69	35	0	NI NA		
---from 33.00 to 33.20m green slightly to moderately weathered completely fractured							NI		
	33.70	-28.40	33.00 - 34.40	100	64	7	4 NI		
Reddish brown thinly sub-horizontally bedded moderately to highly weathered silty MUDSTONE, weak with very closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)									
---from 34.20 to 35.20m highly weathered very weak to weak completely fractured			34.40 - 36.00	96	33	6	NI 12		
			36.00 - 36.50	56	0	0	NI		
	36.50	-31.20							
Reddish brown thinly sub-horizontally bedded moderately weathered silty MUDSTONE, very weak to moderately weak with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			36.50 - 37.90	100	77	30	4 NI 15		
---from 36.71 to 36.85m moderately weathered weak completely fractured									
---at 37.10m weak							3 NI		
---from 38.05 to 38.35m moderately to highly weathered weak to very weak completely fractured			37.90 - 39.20	97	35	27	5		
---from 38.50 to 38.65m with very closely spaced undulating thin laminations of powdery calcite							NI		
---from 39.20m occasionally mottled green							3 NI		
			39.20 - 40.80	85	31	9			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF1** Sheet 5 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	330831.0 E 184656.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	5.30 m AOD
Client	Welsh Office	Driller	A.M/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	21/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly sub-horizontally bedded moderately weathered silty MUDSTONE, very weak to moderately weak with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)		40.80	-35.50	39.20 - 40.80	85	31	9	7		
Borehole complete at 40.80 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF2** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331008.1 E 184732.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	8.80m AOD
Client	Welsh Office	Drillers	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	13/11/1997
		Core bit	Geocube		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
04/11/1997	1800	1.00	0.00	NR	
05/11/1997	0800	1.00	0.00	0.50	
05/11/1997	1800	9.50	9.50	NR	
06/11/1997	0800	9.50	9.50	NR	
06/11/1997	1800	17.00	17.00	NR	
10/11/1997	0800	17.00	17.00	7.50	
10/11/1997	1800	18.30	18.00	NR	
11/11/1997	0800	18.30	18.00	7.50	
11/11/1997	1800	19.10	18.50	NR	
12/11/1997	1800	30.90	18.00	Dry	
13/11/1997	0800	30.90	18.00	7.20	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
0.00	1.00	3.00	
1.00	1.20	1.50	
15.10	15.40	1.00	
15.50	15.80	1.50	
16.70	17.00	0.75	
17.20	17.40	0.75	
18.10	18.30	1.00	
18.30	18.70	1.50	
18.70	18.90	0.50	
18.90	19.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	19.10	150	18.50
120	40.30	140	18.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
04/11/1997	1400	0.50	0.50	0	fast	NR	0.00
06/11/1997	0000	10.90	9.00	20	moderate	10.50	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
19.00	40.30	air	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	C	N=7 (35,23,2,2,1,2)
2.50	C	N=9 (1,2,2,2,2,3)
4.50	S	N=1 (1,0,0,1,0,0)
6.50	S	1/450mm
9.00	S	N=1 (1,0,0,0,1,0)
12.10	C	N=29 (2,2,4,7,10,8)
13.50	C	N=61 (6,8,9,12,18,22)
15.00	C	50/60mm (18,28,50)
16.50	C	N=132 (4,8,18,29,36,49)
18.70	S	85/100mm (8,14,35,50)
19.00	S	50/90mm (4,14,42,8)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF2** Sheet 1 of 9

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331008.1 E 184732.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	8.80 m AOD
Client	Welsh Office	Drillers	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	13/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
MADE GROUND: Brown gravelly sandy clay, concrete and brick fill.			B 0.20 - 1.00			
			D 0.50			
			W 0.50			
			B 1.00 - 1.45		C7 1.00	
---at 1.00m becoming very clayey					1.45	
	1.20	7.60				
Soft to firm grey sandy CLAY with much sub-angular to sub-rounded gravel. (Esturarine Alluvium)			D 1.75			
			U 2.00 - 2.50	(150)		
			B 2.50 - 2.95		C9 2.50	
	2.60	6.20			2.95	
Soft brown mottled grey slightly sandy CLAY with occasional thin laminations of bluish grey silt. (Estuarine Alluvium)			D 3.25			
			U 3.50 - 3.95	(8)		
	3.70	5.10				
Very soft dark greyish brown CLAY. (Estuarine Alluvium)			D 4.00			
---from 4.00 to 9.45m slightly sandy			D 4.25			
			B 4.50 - 4.95		S1 4.50	
---from 4.50 to 9.45m occasional sub-angular gravel					4.95	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF2** Sheet 2 of 9

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331008.1 E 184732.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	8.80 m AOD
Client	Welsh Office	Drillers	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	13/11/1997
		Core Bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring			Blow count to drive U100	SPT N & depth		Install-ation
Very soft dark greyish brown CLAY. (Estuarine Alluvium)				D	5.25					
				U	5.50	- 5.95	(4)			
				D	6.00					
				D	6.25					
---at 6.25 to 8.00m becoming slightly organic				B	6.50	- 6.95		S1/450mm	6.50	
				D	6.50				6.95	
				D	7.25					
				U	7.50	- 7.95	(4)			
				D	8.00					
				D	8.50					
				B	9.00	- 9.95		S1	9.00	
				D	9.00				9.45	
				D	10.00					

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF2** Sheet 3 of 9

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331008.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				184732.7 N
		Drilling Rig	Pilcon/Dando	Ground Level	8.80 m AOD
Client	Welsh Office	Drillers	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	13/11/1997
		Core Bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Very soft dark greyish brown CLAY. (Estuarine Alluvium)				D 10.00			
				U 10.50 - 10.95	(5)		
				D 11.00			
		12.00	-3.20	D 12.00			
Dense dark grey organic very clayey slightly silty sandy sub-rounded siliceous GRAVEL and occasional cobbles. (Fluvial Alluvium)				W 12.00 - 12.55 B 12.10		C29 12.10 12.55	
				D 13.00			
---from 13.50m very dense				B 13.50 - 13.95		C61 13.50 13.95	
				D 14.50			
				B 15.00 - 15.43		C50/60mm 15.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF2**
Sheet 4 of 9

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331008.1 E 184732.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	8.80 m AOD
Client	Welsh Office	Drillers	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	13/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth
Dense dark grey organic very clayey slightly silty sandy sub-rounded siliceous GRAVEL and occasional cobbles. (Fluvial Alluvium)	15.20	-6.40	B 15.00 - 15.43		C50/60mm 15.00 15.21
Very dense greyish brown sandy sub-rounded siliceous GRAVEL and occasional cobbles. (Fluival Alluvium)			D 16.00		
			B 16.50 - 16.95		C132 16.50 16.95
	17.50	-8.70	D 17.50		
Reddish brown mottled greyish green thinly laminated highly weathered MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)			U 17.60 - 17.95	(170)	
			D 18.00		
---from 18.50m moderately to highly weathered moderately weak			B 18.50		
			B 18.70 - 18.90		S85/100mm 18.70
			D 18.70		18.95
			D 19.00		S50/90mm 19.00
---from 19.00 to 19.15m highly weathered very weak completely fractured	19.10	-10.30	19.00 - 19.25	TCR 50, SCR 20, RQD 0, NI 2	19.24
Reddish brown thinly sub-horizontally bedded moderately weathered very sandy MUDSTONE, moderately weak with very closely spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)	19.35	-10.55	19.25 - 19.50	64, 20, 0, NI 2 NA	
MUDSTONE As Sheet 5				15	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF2** Sheet 5 of 9

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331008.1 E 184732.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	8.80 m AOD
Client	Welsh Office	Driller	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	13/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish brown very thinly to thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with medium to widely spaced thin beds of green fine to medium cross laminated silty sandstone slightly weathered strong and extremely closely to very closely spaced horizontal to sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)		20.10	-11.30	19.50 - 20.80	100	35	8	6		
Green very thinly to thinly sub-horizontally bedded slightly weathered silty SANDSTONE, strong with very closely spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)		20.45	-11.65					3		
Purplish brown very thinly to thinly sub-horizontally bedded moderately to highly weathered silty MUDSTONE, moderately weak with widely spaced very thin to thin beds of green fine to medium grained slightly weathered silty sandstone with extremely closely to very closely spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)								15		
---from 21.10 to 22.00m highly weathered very weak completely fractured				20.80 - 21.90	100	14	0	NI		
								NI		
								NI		
				21.90 - 23.20	100	52	24	NI		
								NI		
Reddish brown thinly to medium sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with widely spaced thin beds of green fine to medium grained cross laminated slightly weathered very silty with very closely to closely spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)		22.85	-14.05					5		
---from 23.20 to 23.40m completely fractured								NI		
								3		
								NI		
				23.20 - 24.50	100	48	23	5		
---from 24.00 to 24.40m moderately to highly weathered weak completely fractured								NI		
								0		
Reddish brown thinly to medium horizontally bedded moderately to highly weathered silty MUDSTONE, weak completely fractured. (Mercia Mudstone Group)		24.54	-15.74					NI		
								NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF2**
Sheet 6 of 9

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331008.1 E 184732.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	8.80 m AOD
Client	Welsh Office	Driller	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	13/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly to medium horizontally bedded moderately to highly weathered silty MUDSTONE, weak completely fractured. (Mercia Mudstone Group)		25.14	-16.34					1		
				24.50 - 26.10	91	25	0			
Reddish brown very thinly to thinly sub-horizontally bedded moderately to highly weathered silty MUDSTONE, weak completely fractured. (Mercia Mudstone Group)										
---from 25.14m with closely spaced undulating fractures								20		
---from 25.14 to 26.10m extremely to very closely spaced sub-horizontal discontinuities planar rough tight										
								NI		
---from 26.80 to 27.10m extremely to very closely spaced sub-horizontal discontinuities planar rough tight				26.10 - 27.70	94	13	0	10		
								NI		
				27.70 - 29.30	90	13	0	NI		
								NI		
Reddish brown very thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with extremely to very closely spaced sub-horizontal to inclined discontinuities planar rough tight. (Mercia Mudstone Group)		29.64	-20.84							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF2** Sheet 7 of 9

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331008.1 E 184732.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	8.80 m AOD
Client	Welsh Office	Driller	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	13/11/1997
		Core bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown very thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with extremely to very closely spaced sub-horizontal to inclined discontinuities planar rough tight. (Mercia Mudstone Group)			29.30 - 30.90	93	9	0	>25		
	30.80	-22.00							
Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, moderately weak with medium to widely spaced discontinuities planar rough tight. (Mercia Mudstone Group)							NI		
---from 30.90 to 31.10m completely fractured			30.90 - 32.50	98	78	56	2		
---from 32.40 to 32.50m completely fractured							NI		
---from 32.50 to 32.80m completely fractured							NI		
---from 32.80m closely spaced horizontal to sub-horizontal discontinuities			32.50 - 34.00	100	37	16	5		
---from 33.40 to 33.65m moderately to highly weathered weak completely fractured							NI		
							5		
---from 34.00m extremely to very closely sub-horizontal to inclined discontinuities planar rough tight							5		
---from 34.00 to 34.20m slightly weathered			34.00 - 34.40	50	45	0	NA		
---from 34.40 to 34.65m completely fractured							NI		
							5		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF2** Sheet 8 of 9

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331008.1 E 184732.7 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	8.80 m AOD
Client	Welsh Office	Driller	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	13/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, moderately weak with medium to widely spaced discontinuities planar rough tight. (Mercia Mudstone Group)				34.40 - 35.90	100	47	15	5		
---from 35.35 to 35.80m completely fractured								NI		
---from 35.90 to 36.15m slightly weathered moderately strong completely fractured								1		
---from 36.15m moderately to highly weathered weak								NI		
				35.90 - 37.30	88	58	29	10		
---from 37.30 to 37.55m highly weathered weak completely fractured								NI		
				37.30 - 38.80	88	80	47	6		
				38.80 - 40.30	100	81	17	18		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHF2
Sheet 9 of 9

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331008.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				184732.7 N
		Drilling Rig	Pilcon/Dando	Ground Level	8.80 m AOD
Client	Welsh Office	Driller	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	13/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, moderately weak with medium to widely spaced discontinuities planar rough tight. (Mercia Mudstone Group)		40.30	-31.50							
Borehole complete at 40.30 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHF3
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331173.4 E
Project	M4 Relief Road Magor to Castleton Stage 2				184948.9 N
		Drilling Rig	Pilcon/Dando	Ground Level	10.20m AOD
Client	Welsh Office	Drillers	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	11/11/1997
		Core bit	Geocube		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
01/11/1997	1800	8.50	8.50	Dry	
02/11/1997	0800	8.50	8.90	Dry	
02/11/1997	1600	15.80	15.50	9.70	
03/11/1997	0800	15.80	15.50	8.90	
03/11/1997	1800	20.30	19.80	8.90	
04/11/1997	0800	20.30	19.80	8.50	
04/11/1997	1100	21.00	20.80	8.50	
07/11/1997	0800	21.00	21.00	7.60	
07/11/1997	1800	23.40	21.00	NR	
10/11/1997	0800	23.40	21.00	7.80	
10/11/1997	1800	29.70	21.00	NR	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
0.00	0.40	2.75	
12.70	13.00	0.75	
13.20	13.30	1.00	
15.40	15.80	1.25	
16.10	16.40	1.00	
16.40	16.70	0.75	
17.30	17.50	1.25	
17.80	18.00	1.50	
18.90	19.30	1.00	
19.95	20.25	1.00	
20.30	21.00	2.50	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	21.00	150	20.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
02/11/1997	0000	12.00	9.70	20	fast	11.90	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
21.00	35.20	air	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
0.50	C	N=19 (3,3,4,7,5,3)
2.50	S	N=4 (2,2,1,1,1,1)
4.50	S	N=11 (2,1,2,3,3,3)
6.50	S	N=2 (1,0,1,0,1,0)
9.00	S	N=1 (0,0,1,0,0,0)
12.00	C	N=40 (3,2,6,10,12,12)
13.50	C	N=40 (8,10,10,12,8,10)
15.00	C	80/180mm (4,8,12,18,50)
16.50	C	N=114 (2,3,10,25,32,47)
18.00	C	50/75mm (4,22,50)
19.00	C	79/150mm (2,12,37,42)
19.80	S	N=114 (5,12,15,24,34,41)
20.80	S	85/115mm*
24.50	S	65/150mm*
26.80	S	50/22mm (13,34,50)

* Seating blows only.

GENERAL NOTES

Methane gas encountered with water strike at 12.00m. Strong flow greater than 5% (CH4) continued after one hour. Gas cased off with casing to 12.50m.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF3** Sheet 1 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331173.4 E 184948.9 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	10.20 m AOD
Client	Welsh Office	Drillers	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	11/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
MADE GROUND: Tarmac (drillers description).	0.10	10.10	B 0.20 - 0.50 D 0.20			
MADE GROUND: Dark greyish green sandy clayey brick cement fill.	0.50	9.70	B 0.50 - 0.95 D 0.50		CI9 0.50 0.95	
MADE GROUND: Greyish brown clayey sandy gravelly brick and cement fill.			D 1.25 U 1.50 - 1.95	(20)		
Firm to stiff grey mottled black sandy organic CLAY with occasional fine to medium gravel. (Estuarine Alluvium) --at 2.50m becoming soft greyish brown slightly sandy slightly organic	1.80	8.40	D 2.00 D 2.25 B 2.50 - 2.95 D 2.50 D 3.25 U 3.50 - 3.95 D 4.00 D 4.25	(10)	S4 2.50 2.95	
Soft brown mottled grey sandy CLAY. (Estuarine Alluvium)	4.50	5.70	B 4.50 - 4.95 D 4.50 D 5.25 U 5.50 - 5.95	(18)	S11 4.50 4.95	
Soft grey mottled brown slightly sandy CLAY. (Estuarine Alluvium)	5.60	4.60	D 6.00 D 6.25 B 6.50 - 6.95 D 6.50 D 7.25 U 7.50 - 7.95 D 8.00	(5)	S2 6.50 6.95	
Soft grey blue CLAY. (Estuarine Alluvium)	8.50	1.70	D 8.50 B 9.00 - 9.45 D 9.45 W 9.70 D 10.00		S1 9.00 9.45	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF3** Sheet 2 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331173.4 E 184948.9 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	10.20 m AOD
Client	Welsh Office	Drillers	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	11/11/1997
		Core Bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100 (d)	SPT N & depth	Install-ation
Soft grey blue CLAY. (Estuarine Alluvium)				D 10.00 - 10.95 U 10.05			
				D 11.00			
---at 11.50m becoming mottled black slightly organic				D 11.50			
		12.00	-1.80	B 12.00 - 12.45 D 12.00 W 12.00 W 12.00		C40 12.00 12.45	
Dense dark grey very sandy sub-rounded siliceous GRAVEL. (Fluvial Alluvium)				D 13.00			
				B 13.50 - 13.95		C40 13.50 13.95	
---at 14.00m becoming clayey				D 14.00			
---at 15.00m becoming very dense				B 15.00 - 15.45		C80/180mm 15.00 15.33	
				D 16.00			
				B 16.50 - 16.95		C114 16.50 16.95	
				D 17.50			
				B 18.00 - 18.45		C50/75mm 18.00 18.23	
				D 18.90 B 19.00 - 19.45		C79/150mm 19.00 19.30	
		19.70	-9.50	D 19.70 B 19.80 - 20.25		S114 19.80 20.25	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF3** Sheet 3 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331173.4 E 184948.9 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	10.20 m AOD
Client	Welsh Office	Drillers	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	11/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100 (TCR / SCR / RQD / FI)	SPT N & depth	Installation
Reddish brown mottled greyish green occasionally thinly laminated highly to moderately weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)			B 20.80 - 21.00		S85/115mm*20.80 20.92	
	21.00	-10.80				
Reddish brown medium bedded moderately weathered slightly sandy MUDSTONE, moderately weak completely fractured. (Mercia Mudstone Group)			21.00 - 22.35	74 / 19 / 7 / NI		
	21.55	-11.35				
---from 21.20 to 21.40m highly weathered				5		
Reddish brown medium bedded moderately weathered very sandy MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined discontinuities planar rough tight. (Mercia Mudstone Group)			22.35 - 23.40	90 / 53 / 13 / NI		
---from 22.55 to 23.10m highly weathered completely fractured				3 / 5		
			23.40 - 23.90	90 / 80 / 0		
---from 23.50m mottled greyish green moderately to highly weathered	23.90	-13.70				
Purplish brown medium sub-horizontal to inclined bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced inclined discontinuities planar rough tight. (Mercia Mudstone Group)			23.90 - 25.40	93 / 33 / 18 / NI	S65/150mm*24.50 24.65	
---from 23.90 to 24.40m highly weathered very weak completely fractured						
---from 24.40 to 24.65m moderately to highly weathered weak completely fractured			25.40 - 26.80	75 / 41 / 7 / 9		
---from 25.40m with closely to medium spaced very thin beds of greyish green mudstone	26.40	-16.20				
	26.80	-16.60			S50/22mm 26.80 26.97	
---from 25.40 to 25.60m moderately weathered weak completely fractured	27.10	-16.90		5 / NI		
---from 26.00m moderately to highly weathered very weak completely fractured			26.80 - 28.30	100 / 67 / 0 / 7 / 12		
Reddish brown thinly bedded moderately weathered silty MUDSTONE, moderately weak completely fractured. (Mercia Mudstone Group)						
Greyish green medium sub-horizontally bedded moderately weathered very silty MUDSTONE, moderately weak with very closely spaced horizontal to sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)			28.30 - 29.70	96 / 44 / 0 / 8		
	29.70	-19.50				

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF3** Sheet 4 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331173.4 E 184948.9 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Dando	Ground Level	10.20 m AOD
Client	Welsh Office	Driller	C.A/H.J	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	11/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown medium to thickly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)				29.70 - 30.90	98	53	0	NI		
(29.70-35.20) Reddish brown occasionally mottled greyish green medium to thickly bedded moderately to highly weathered silty MUDSTONE, moderately weak to moderately strong with medium to widely spaced horizontal to sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group) Detail:---from 30.90 to 31.20m slightly weathered Detail:completely fractured Detail:---from 32.00 to 32.25m slightly weathered Detail:completely fractured Detail:---from 32.95 to 33.25m with gravel size Detail:pockets of calcite ---from 30.90 to 31.20m slightly weathered completely fractured ---from 32.00 to 32.25m slightly weathered completely fractured ---from 32.95 to 33.25m with gravel size pockets of calcite				30.90 - 32.30	100	37	0	NI 8 NI		
				32.30 - 33.80	98	87	0	NI		
				33.80 - 35.20	100	93	0	NI		
		35.20	-25.00							
Borehole complete at 35.20 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHF4
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331437.7 E 185087.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Edeco	Ground Level	9.30m AOD
Client	Welsh Office	Drillers	C.A/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	19/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	27/11/1997
		Core bit	Chunk		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
19/11/1997	1800	13.50	13.50	NR	
20/11/1997	0800	13.50	13.50	8.80	
20/11/1997	1800	19.00	19.00	NR	
21/11/1997	0800	19.00	19.00	6.80	
21/11/1997	1800	20.60	20.10	7.50	
24/11/1997	0800	20.60	20.60	6.30	
24/11/1997	1800	23.00	22.50	NR	
25/11/1997	0800	23.00	22.50	5.10	
25/11/1997	1800	32.55	24.00	4.80	
26/11/1997	0800	32.50	24.00	6.50	
26/11/1997	1800	40.20	24.50	7.40	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
13.00	13.50	2.00	
14.40	14.70	1.50	
15.20	15.30	0.75	
15.70	16.10	1.25	
17.00	17.30	0.75	
18.70	19.00	1.50	
20.10	20.60	2.50	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
200	20.60	200	20.10
120	40.20	140	24.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
19/11/1997	0000	12.30	9.80	20	fast	12.30	0.00
25/11/1997	0000	23.50	0.00	0	moderate	22.50	0.00
25/11/1997	0000	31.50	0.00	0	heavy	24.00	0.00
26/11/1997	0000	37.00	0.00	0	heavy	24.50	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
20.60	31.00	foam	good	92
31.00	40.20	mist	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	C	N=20 (1,3,5,4,6,5)
2.00	C	N=11 (1,2,3,3,3,2)
3.00	C	N=4 (1,2,1,1,1,1)
5.00	S	N=1 (0,0,1,0,0,0)
7.50	S	N=1 (0,0,1,0,0,0)
10.00	S	N=1 (0,0,1,0,0,0)
12.50	C	N=66 (6,8,10,14,17,25)
15.00	C	50/30mm (18,25,50/30)
15.50	C	96/225mm (10,16,25,30,41)
17.00	C	88/225mm (8,10,20,26,42)
18.50	C	50/50mm (11,23,50/50)
20.00	S	80/125mm (14,11/15,30,50)
20.60	S	50/60mm (,25/30,50/60)
24.00	C	50/105mm (10,13,26,24)
25.00	C	36/110mm
32.50	S	50/30mm (10,14,50)
33.50	S	50/40mm*

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF4** Sheet 1 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331437.7 E 185087.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Edeco	Ground Level	9.30 m AOD
Client	Welsh Office	Drillers	C.A/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	19/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	27/11/1997
		Core Bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
CONCRETE		0.20	9.10	D 0.30			
MADE GROUND: Blackish grey slightly silty sandy sub-angular gravel of brick ash and stone rubble.				B 0.50 - 1.00			
				B 1.00 - 1.45		C20 1.00 1.45	
				D 1.75			
				B 2.00 - 2.45		C11 2.00 2.45	
				D 2.85			
				B 3.00 - 3.45		C4 3.00 3.45	
		3.30	6.00				
Very soft to soft greyish brown very silty CLAY with a moderate hydrocarbon odour. (Estuarine Alluvium)				D 3.75			
---at 3.75m mottled blackish brown				U 4.00 - 4.45	(18)		
				D 4.50			
		4.70	4.60	D 4.75			
Very soft grey very silty CLAY. (Estuarine Alluvium)				B 5.00 - 5.45		S1 5.00 5.45	
---from 4.70 to 8.25m mild hydrocarbon odour				D 5.75			
				B 6.00 - 6.45	(5)		
				U 6.00 - 6.45			
				U 6.50 - 6.95	(4)		
				D 7.00			
				D 7.25			
				B 7.50 - 7.95		S1 7.50 7.95	
				D 7.50			
				D 8.25			
				U 8.50 - 8.95	(5)		
				D 9.00			
				D 9.50			
				B 10.00 - 10.45		S1 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF4** Sheet 2 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331437.7 E 185087.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Edeco	Ground Level	9.30 m AOD
Client	Welsh Office	Drillers	C.A/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	19/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	27/11/1997
		Core Bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Very soft grey very silty CLAY. (Estuarine Alluvium)				B 10.00 - 10.45 D 10.00		S1 10.00 10.45	
				D 11.00			
---from 11.50 to 11.95m slightly organic				U 11.50 - 11.95	(8)		
---from 11.50m dark grey				D 12.10 D 12.20 D 12.30			
		12.30	-3.00				
Very dense grey slightly sandy sub-rounded siliceous GRAVEL with some cobbles. (Fluvial Alluvium)				B 12.50 - 12.95		C66 12.50 12.95	
				D 13.50			
				B 14.00 - 14.50			
				D 15.00		C50/30mm 15.00 15.18	
				B 15.50 - 15.95		C96/225mm 15.50 15.88	
				D 16.50			
				B 17.00 - 17.45		C88/225mm 17.00 17.38	
				D 18.00			
				B 18.50 - 18.95		C50/50mm 18.50 18.70	
---from 19.50m very sandy				D 19.50			
		19.90	-10.60	D 19.90 - 20.50		S80/125mm 20.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF4** Sheet 3 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331437.7 E 185087.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Edeco	Ground Level	9.30 m AOD
Client	Welsh Office	Drillers	C.A/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	19/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	27/11/1997
		Core Bit	Chunk		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100 TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally thinly laminated highly weathered MUDSTONE, weak. (Mercia Mudstone Group)			B 20.00 - 20.50 D 20.00					S80/125mm 20.00 20.22	
	20.60	-11.30	D 20.60					S50/60mm 20.60 20.69	
Reddish brown mottled green thinly to medium sub-horizontally bedded moderately to highly weathered silty MUDSTONE, weak with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			20.80 - 22.10	92	28	0	NI 6		
---at 20.60m weak									
	22.10	-12.80							
---from 21.25 to 21.60m weak to very weak completely fractured			22.10 - 23.00	83	0	0	NI		
---from 21.60 to 22.10m moderately weathered weak to moderately weak									
Reddish brown mottled green medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)			23.00 - 24.00	0	0	0	NA		
---from 22.82m reddish brown			24.00 - 25.00	0	0	0	NA	C50/105mm 24.00 24.26 C36/110mm 25.00	
			25.00 - 26.00	100	0	0	NI	25.11	
			26.00 - 27.00	100	28	10	NI 2		
	26.75	-17.45							
Reddish brown thinly sub-horizontally bedded moderately to highly weathered silty MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)			27.00 - 28.40	100	36	14	NI 2 0 0 NI 2		
---from 26.95m occasionally mottled green									
---from 27.00 to 27.55m highly weathered completely fractured									
---from 27.90 to 28.00m highly weathered very weak completely fractured			28.40 - 29.90	97	63	31	4 NI 3 NI 2		
---from 28.10 to 28.20m highly weathered very weak completely fractured									
---from 28.55m thinly sub-horizontally to inclined bedding									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF4** Sheet 4 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331437.7 E 185087.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Edeco	Ground Level	9.30 m AOD
Client	Welsh Office	Driller	C.A/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	19/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	27/11/1997
		Core bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly sub-horizontally bedded moderately to highly weathered silty MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)				29.90 - 31.35	97	14	0	NI		
---from 30.35 to 30.55m highly weathered very weak completely fractured								8		
---from 30.55 to 30.67m moderately to highly weathered very weak completely fractured		31.55	-22.25	31.35 - 31.55	100	0	0	NI		
		31.76	-22.46							
Purplish to reddish brown thinly bedded highly weathered very sandy silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)		32.23	-22.93	31.55 - 32.50	79	0	0	NI		
				32.50 - 33.00	100	0	0	NI	S50/30mm 32.50 32.68	
Green thinly bedded moderately to highly weathered silty sandy MUDSTONE, weak to very weak completely fractured. (Mercia Mudstone Group)				33.00 - 33.50	0	0	0	NI	S50/40mm* 33.50 33.54	
Reddish brown thinly sub-horizontally bedded moderately weathered silty MUDSTONE, very weak to moderately weak with very closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)		34.50	-25.20	33.50 - 34.50	100	70	28	8		
---from 32.50 to 33.15m slightly sandy highly weathered very weak completely fractured				34.50 - 36.00	93	7	0	NI		
---from 33.50 to 33.65m highly weathered very weak completely fractured								2		
---from 33.65m very weak								NI		
Reddish brown occasionally mottled green thinly to medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)				36.00 - 37.50	100	0	0	NI		
---from 35.60 to 35.75m moderately weathered moderately weak with closely spaced inclined fractures planar rough tight				37.50 - 38.70	100	33	25	NI		
		38.23	-28.93					3		
Reddish brown occasionally mottled green very thinly to thinly sub-horizontally bedded to moderately weathered silty MUDSTONE, moderately weak with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)								NI		
---from 38.70 to 39.00m highly weathered very weak completely fractured				38.70 - 40.20	100	79	50	4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHF4
Sheet 5 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331437.7 E
Project	M4 Relief Road Magor to Castleton Stage 2				185087.5 N
		Drilling Rig	Pilcon/Edeco	Ground Level	9.30 m AOD
Client	Welsh Office	Driller	C.A/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	19/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	27/11/1997
		Core bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green very thinly to thinly sub-horizontally bedded to moderately weathered silty MUDSTONE, moderately weak with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)		40.20	-30.90							
Borehole complete at 40.20 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF5** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331692.1 E 185263.3 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	9.80m AOD
Client	Welsh Office	Drillers	C.A/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	21/11/1997
		Core bit	Geocube		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
16/11/1997	1800	15.50	15.50	NR	
17/11/1997	0800	15.50	15.50	7.90	
17/11/1997	1800	18.50	18.50	8.20	
18/11/1997	0800	18.50	18.50	9.00	
18/11/1997	1800	21.10	20.90	NR	
19/11/1997	0800	21.10	21.10	4.40	
19/11/1997	1800	35.70	21.10	7.50	
20/11/1997	0800	35.70	21.10	7.45	
20/11/1997	1800	45.75	21.10	NR	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
16.60	16.90	3.50	
17.20	18.30	4.00	
19.80	20.00	1.25	
20.80	21.00	1.50	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	21.10	150	20.90

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
16/11/1997	0000	1.10	0.50	20	fast	0.00	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
21.10	45.75	foam	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	C	N=3 (1,0,1,1,0)
2.50	S	N=1 (1,0,0,1,0,0)
4.50	S	N=9 (1,1,2,2,2,3)
6.50	S	N=1 (1,0,0,1,0,0)
9.00	S	1/450mm
12.00	S	N=1 (1,0,0,1,0,0)
15.00	C	N=54 (7,8,10,12,15,17)
16.50	C	56/65mm (10,21,56)
18.00	C	80/150mm (8,17,38,42)
19.50	C	86/220mm (2,8,12,18,56)
21.00	S	50/30mm (14,25,50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF5** Sheet 1 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331692.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				185263.3 N
		Drilling Rig	Pilcon/T30	Ground Level	9.80 m AOD
Client	Welsh Office	Drillers	C.A/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	21/11/1997
		Core Bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
MADE GROUND: Black sandy sub-angular gravel fill of stone brick and rubble.				D 0.20 B 0.50 - 1.00			
				B 1.00 - 1.45		C3 1.00	
		1.10	8.70	W 1.10		1.45	
Very soft bluish grey mottled brown occasionally organic CLAY. (Estuarine Alluvium)				D 1.25			
				B 2.00 - 2.45 U 2.00 - 2.45	(70)		
		2.40	7.40				
Very soft blackish brown mottled grey slightly silty sandy organic CLAY with occasional sub-angular fine to medium siliceous gravel and occasional gravel size pockets of very soft grey silty clay. (Estuarine Alluvium)				B 2.50 - 2.95 D 2.50		S1 2.50 2.95	
		3.25	6.55	D 3.25			
				U 3.50 - 3.95	(19)		
Soft to firm grey mottled brown occasionally thinly laminated CLAY. (Estuarine Alluvium)				D 4.00 D 4.25			
				B 4.50 - 4.95 D 4.50		S9 4.50 4.95	
				D 5.25			
				U 5.50 - 5.95	(17)		
				D 6.00			
		6.20	3.60	D 6.25			
Very soft grey CLAY. (Estuarine Alluvium)				B 6.50 - 6.95 D 6.50		S1 6.50 6.95	
				D 7.25			
				U 7.50 - 7.95	(3)		
---at 7.75m slightly sandy				D 8.00			
				D 8.50			
				B 9.00 - 9.50 D 9.00		S1/450mm 9.00 9.45	
				D 10.00			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF5** Sheet 2 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331692.1 E 185263.3 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	9.80 m AOD
Client	Welsh Office	Drillers	C.A/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	21/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
Very soft grey CLAY. (Estuarine Alluvium)			D 10.00			
			U 10.50 - 10.95	(5)		
---from 11.00m sandy			D 11.00			
			D 11.50			
			B 12.00 - 12.45		S1 12.00	
			D 12.00		12.45	
			D 13.00			
			U 13.50 - 13.95	(15)		
			D 14.00			
	14.80	-5.00	D 14.80			
Very dense grey slightly sandy sub-rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)			B 15.00 - 15.45		C54 15.00 15.45	
			D 16.00			
			B 16.50 - 16.95		C56/65mm 16.50 16.72	
			D 17.50			
			B 18.00 - 18.45		C80/150mm 18.00 18.30	
			D 19.00			
			B 19.50 - 19.95		C86/220mm 19.50 19.87	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF5** Sheet 3 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331692.1 E 185263.3 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	9.80 m AOD
Client	Welsh Office	Drillers	C.A/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	21/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI100	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Very dense grey slightly sandy sub-rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)			D 20.50							
---from 20.50m very sandy	20.80	-11.00	D 20.80							
	21.10	-11.30	B 21.00 D 21.00						S50/30mm 21.00	
Reddish brown mottled greyish green highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)									21.18	
	21.70	-11.90	21.10 - 22.40		98	65	38	NI 3		
Reddish brown medium bedded highly weathered silty MUDSTONE, very weak to weak completely fractured. (Mercia Mudstone Group)										
Reddish brown occasionally mottled green medium sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			22.40 - 23.90		98	53	25	NI 6		
---from 22.40 to 22.90m moderately to highly weathered weak completely fractured										
---from 23.07 to 23.90m moderately weathered moderately weak			23.90 - 25.40		100	93	60	NI 5		
---from 23.90 to 24.05m moderately to highly weathered weak completely fractured										
---at 24.30m very weak										
---from 25.25 to 25.75m moderately weathered moderately weak			25.40 - 26.90		100	41	14	4 NI 5		
---from 25.75 to 26.35m moderately to highly weathered weak completely fractured										
	26.71	-16.91								
Green very thinly to thinly sub-horizontally bedded moderately weathered silty slightly sandy MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)	27.24	-17.44	26.90 - 28.00		75	29	0	7 NI NA		
---from 27.23 to 27.45m sub-vertical (70-75°) planar rough tight										
	28.32	-18.52	28.00 - 28.90		98	44	0	NI 0 4 NI 5		
Purplish brown thinly sub-horizontally bedded moderately to highly weathered silty MUDSTONE, moderately weak with very closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)										
---from 27.40 to 27.72m highly weathered very weak completely fractured	29.43	-19.63	28.90 - 29.90		95	52	0	4 5 NI NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF5** Sheet 4 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331692.1 E 185263.3 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	9.80 m AOD
Client	Welsh Office	Driller	C.A/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	21/11/1997
		Core bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Green thinly sub-horizontally bedded slightly to moderately weathered silty slightly sandy MUDSTONE, moderately weak to moderately strong with widely spaced thin beds of purplish brown moderately to highly weathered mudstone and very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			29.90 - 31.40	95	85	21	9 6		
(29.43-32.65) Reddish brown occasionally mottled green thinly to medium bedded moderately weathered silty MUDSTONE, moderately weak with widely spaced thin beds of green slightly sandy mudstone moderately strong and very closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) Detail:---from 29.70 to 30.05m moderately to Detail:highly weathered weak completely fractured Detail:---from 31.40 to 31.60m moderately to Detail:highly weathered weak completely fractured Detail:---from 32.50 to 32.65m moderately to Detail:highly weathered weak completely fractured			31.40 - 32.65	100	74	18	NI NI NI		
---from 31.40 to 31.60m moderately to highly weathered weak completely fractured ---from 32.50 to 32.65m moderately to highly weathered weak completely fractured	32.65	-22.85	32.65 - 34.20	100	90	66	3 NI		
Reddish brown occasionally mottled green medium to thinly sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately weak with medium spaced inclined fractures planar rough tight. (Mercia Mudstone Group)	34.20	-24.40	34.20 - 35.70	100	46	33	NI 7		
Reddish brown occasionally mottled green medium sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) ---from 34.10 to 34.44m highly weathered weak completely fractured ---from 34.84 to 35.60m slightly to moderately weathered ---from 35.70 to 35.90m completely fractured ---from 35.90m medium to thickly sub-horizontally bedded	37.20	-27.40	35.70 - 37.20	97	85	41	NI 9		
			37.20 - 38.70	98	85	72	7 5		
Reddish brown occasionally mottled green thickly sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, very weak to moderately weak with medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			38.70 - 40.20	100	97	60	9		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF5** Sheet 5 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	331692.1 E 185263.3 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	9.80 m AOD
Client	Welsh Office	Driller	C.A/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	16/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	21/11/1997
		Core bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green thickly sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, very weak to moderately weak with medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)				40.20 - 41.70	100	97	61	12		
				41.70 - 43.20	99	93	59	5 7		
				43.20 - 44.35	100	100	94	3		
---from 44.05 to 44.35m with very closely spaced gravel size pockets of silt sized fragments of calcite										
---from 44.95 to 45.25m moderately to highly weathered weak to moderately weak				44.35 - 45.75	98	46	29	6		
---from 45.25 to 45.51m moderately to highly weathered very weak completely fractured								NI 3		
		45.75	-35.95							
Borehole complete at 45.75 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHF6
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332114.9 E
Project	M4 Relief Road Magor to Castleton Stage 2				185399.0 N
		Drilling Rig	Pilcon/T30	Ground Level	8.80m AOD
Client	Welsh Office	Drillers	T.R/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	27/11/1997
		Core bit	Geocube		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
18/11/1997	1800	14.00	14.00	6.65	
19/11/1997	0800	14.00	14.00	6.21	
19/11/1997	1800	21.70	21.50	8.40	
21/11/1997	0800	21.70	21.70	4.00	
21/11/1997	1800	28.80	21.70	7.70	
24/11/1997	0800	28.80	21.70	8.50	
24/11/1997	1800	34.70	21.70	7.10	
25/11/1997	0800	34.70	21.70	8.40	
25/11/1997	1800	45.20	21.70	3.15	
26/11/1997	0800	45.20	21.70	7.90	
26/11/1997	1800	54.15	21.70	5.70	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
18.80	19.10	1.25	
19.70	19.90	0.75	
20.80	21.00	0.50	
21.40	21.70	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	21.70	150	21.50
120	21.70	140	55.65

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
18/11/1997	0000	2.00	0.00	0	seepage□□	1.50	3.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
21.70	55.65	foam	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.50	S	N=3 (1,0,1,1,0,1)
2.50	S	N=4 (1,0,1,1,1,1
5.00	S	N=3 (1,1,1,1,0,1)
7.00	S	N=2 (1,0,0,1,0,1)
9.50	S	N=1 (1,0,0,1,0,0)
13.20	S	N=2 (1,0,0,1,0,1)
16.00	S	N=12 (1,2,3,3,3,3)
17.00	C	N=37 (2,4,7,11,10,9)
18.50	C	79/125mm (7,14,29,50)
20.20	C	N=98 (3,6,10,28,29,31)
21.40	C	50/60mm*
21.70	C	50/50mm*
28.80	S	60/75mm (,25,60)
45.20	S	54/190mm
48.75	S	70/156mm

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF6** Sheet 1 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332114.9 E 185399.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	8.80 m AOD
Client	Welsh Office	Drillers	T.R/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	27/11/1997
		Core Bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring				Blow count to drive U100	SPT N & depth		Install-ation
MADE GROUND: Dark grey slightly clayey silty sandy sub-angular gravel of ash, brick, shale, and rubble fill.				D	0.50						
				B	1.50	-	1.95		S3	1.50 1.95	
---at 2.10m slight hydrocarbon odour				D	2.10						
				B	2.50	-	2.95		S4	2.50 2.95	
		2.80	6.00								
Soft greyish brown slightly organic CLAY. (Estuarine Alluvium)				D	3.00						
				U	3.20	-	3.65	(4)			
				U	4.00	-	4.45	(8)			
		4.20	4.60								
Very soft to soft grey occasionally mottled orangish brown CLAY. (Estuarine Alluvium)				D	4.50						
				D	4.80						
---from 4.80 to 5.70m occasionally thinly laminated organic				B	5.00	-	5.45		S3	5.00 5.45	
---from 5.00m very soft				D	5.70						
				U	6.00	-	6.45	(9)			
				D	6.50						
		6.80	2.00	D	6.80						
Very soft brownish grey very silty CLAY. (Estuarine Alluvium)				B	7.00	-	7.45		S2	7.00 7.45	
---at 6.80m bluish grey organic				D	7.80						
				U	8.00	-	8.45	(6)			
				D	8.50						
				D	9.00						
---at 9.00m slightly organic				B	9.50	-	9.95		S1	9.50 9.95	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF6** Sheet 2 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332114.9 E 185399.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	8.80 m AOD
Client	Welsh Office	Drillers	T.R/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	27/11/1997
		Core Bit	Geocube		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Very soft brownish grey very silty CLAY. (Estuarine Alluvium)				D 10.50			
				B 11.00 - 11.45			
				U 11.80 - 12.25	(4)		
				D 12.30			
---at 12.70m slightly organic				D 12.70			
---from 13.20 to 15.10m with occasional gravel size pockets of brownish black firm fibrous woody peat				B 13.20 - 13.65		S2 13.20 13.65	
---from 14.00m soft				D 14.00			
				U 14.60 - 15.00	(15)		
				D 15.10			
---at 15.50m with very occasional sub-rounded siliceous fine to medium gravel				D 15.50			
---from 16.00m firm with occasional gravel size pockets of brownish black firm fibrous and woody peat				B 16.00 - 16.45		S12 16.00 16.45	
		16.80	-8.00				
Dense grey slightly silty sandy sub-rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)				B 17.00 - 17.45		C37 17.00 17.45	
				D 18.00			
---from 18.50m very dense				B 18.50 - 18.80		C79/125mm 18.50 18.78	
				D 19.50			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF6** Sheet 3 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332114.9 E 185399.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	8.80 m AOD
Client	Welsh Office	Drillers	T.R/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	27/11/1997
		Core Bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100 (TCR / SCR / RQD)	SPT N & depth	Installation
Dense grey slightly silty sandy sub-rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)			B 20.20 - 20.65		C98 20.20 20.65	
Greyish green highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudston Group)	21.20	-12.40	B 21.20 - 21.40 D 21.20 D 21.40		C50/60mm* 21.40 21.46	
---from 21.40m highly weathered weak to moderately weak	21.70	-12.90	D 21.70		C50/50mm* 21.70 21.75	
	21.95	-13.15	21.70 - 21.95	0 / 0 / 0 — NI		
Green thinly bedded moderately to highly weathered silty MUDSTONE, weak with very closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)	22.50	-13.70	21.95 - 22.50	96 / 0 / 0 — NI		
---at 21.70m slightly to moderately weathered moderately strong to strong			22.50 - 24.00	97 / 53 / 15 — 0, NI, 10		
---from 21.70 to 21.75m completely fractured			24.00 - 25.50	100 / 40 / 20 — 12, NI		
---from 21.80 to 21.95m completely fractured						
---from 21.90 to 21.95m mottled purple						
Reddish brown thinly bedded highly weathered silty MUDSTONE, weak to very weak completely fractured. (Mercia Mudstone Group)	25.25	-16.45	25.50 - 27.00	93 / 7 / 0 — NI		
---from 22.42 to 23.05m highly weathered very weak completely fractured			27.00 - 27.60	97 / 25 / 0 — NI, 3, NI		
Reddish brown thinly to medium sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak to weak with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)	27.60	-18.80	27.60 - 28.10	70 / 56 / 0 — 5		
---from 22.50 to 22.62m highly weathered very weak completely fractured			28.10 - 28.80	71 / 7 / 0 — NI, 1, NA	S60/75mm 28.80 28.93	
---from 23.05 to 25.25m with closely to medium spaced inclined thin to thick laminations of calcite			28.80 - 29.55	89 / 27 / 0 — 10		
---from 24.00 to 24.30m light green moderately to highly weathered						
Reddish brown thinly to medium bedded highly weathered silty MUDSTONE, weak to very weak completely fractured. (Mercia Mudstone Group)				NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF6** Sheet 4 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332114.9 E 185399.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	8.80 m AOD
Client	Welsh Office	Driller	T.R/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	27/11/1997
		Core bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly sub-horizontally bedded moderately to highly weathered silty MUDSTONE, very weak to weak with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			29.55 - 30.55	90	18	0	4		
							NI		
	30.55	-21.75					2		
							2		
							NI		
---at 28.00m very weak			30.55 - 31.85	100	46	12	6		
---from 30.20 to 30.45m highly weathered weak completely fractured							NI		
							9		
							NI		
Reddish brown thinly to medium sub-horizontally bedded moderately weathered silty MUDSTONE, weak with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)							9		
			31.85 - 33.85	74	48	15			
---from 30.65 to 30.95m highly weathered very weak completely fractured	33.05	-24.25							
---from 31.35 to 31.43m highly weathered very weak completely fractured							NI		
---from 31.70 to 31.85m highly weathered very weak completely fractured	34.10	-25.30					NI		
---from 32.15 to 32.25m highly weathered very weak completely fractured			33.85 - 34.70	94	71	12	6		
							NI		
Reddish brown occasionally mottled green very thinly to thinly bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)							NI		
			34.70 - 36.20	100	80	15	10		
Reddish brown occasionally mottled greyish green thinly to medium sub-horizontally bedded highly to moderately weathered silty MUDSTONE, weak to moderately weak with closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)	36.40	-27.60					NI		
			36.20 - 37.70	100	93	23	13		
---from 34.45 to 34.70m highly weathered completely fractured									
---from 34.70 to 36.40m highly weathered completely fractured	37.70	-28.90							
---from 35.60 to 35.70m inclined fracture (60°) planar rough tight (calcite infill)							NI		
---at 35.85m slightly calcareous	38.60	-29.80	37.70 - 39.20	100	60	7			
---from 36.20 to 36.40m completely fractured							10		
MUDSTONE As Sheet 5									
							NI		
			39.20 - 40.70	100	87	23			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF6** Sheet 5 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332114.9 E 185399.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	8.80 m AOD
Client	Welsh Office	Driller	T.R/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	27/11/1997
		Core bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Installation
Reddish brown occasionally mottled greyish green thinly sub-horizontally bedded moderately weathered silty MUDSTONE, very weak with closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)							7		
	40.60	-31.80					NI		
(37.70-38.60) Reddish brown occasionally mottled greyish green very thinly to thinly sub-horizontally bedded highly weathered silty MUDSTONE, very weak to weak completely fractured. (Mercia Mudstone Group)			40.70 - 42.20	100	83	12	NI		
(38.60-40.60) Reddish brown occasionally mottled greyish green thinly sub-horizontally bedded moderately to highly weathered silty MUDSTONE, weak to moderately weak with closely to medium spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group) Detail:---from 38.60 to 39.20m reddish brown Detail:mottled greyish green calcitic Detail:---from 39.20 to 40.00m highly weathered Detail:very weak completely fractured							1		
	42.20	-33.40					NI		
			42.20 - 43.70	100	87	7	34		
	43.70	-34.90					2		
Reddish brown mottled greyish green very thinly to thinly sub-horizontally bedded highly to moderately weathered silty MUDSTONE, very weak to moderately weak with closely to medium spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group) ---from 40.60 to 41.90m completely fractured ---at 41.80m very weak ---from 41.90 to 42.00m inclined fracture (50°) planar rough tight (stained green calcite infill) ---from 42.00 to 42.20m completely fractured			43.70 - 45.20	61	0	0	NI	S54/190mm 45.20 45.39	
			45.20 - 46.20	76	0	0	NI		
			46.20 - 46.70	70	0	0	NA NI		
	46.92	-38.12					NI		
Reddish brown thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			46.70 - 47.60	100	62	42	3		
							NI		
Reddish brown thinly bedded highly weathered silty MUDSTONE very weak completely fractured. (Mercia Mudstone Group) ---from 46.22 to 47.50m medium spaced sub-horizontal fractures planar rough tight ---from 46.72 to 48.00m closely spaced thin to thick laminations of white calcite			47.60 - 48.75	46	4	0	NI	S70/156mm 48.75 48.91	
			48.75 - 49.75	93	45	10	NI 2 NI 3		
MUDSTONE As Sheet 6									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHF6** Sheet 6 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332114.9 E 185399.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	8.80 m AOD
Client	Welsh Office	Driller	T.R/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	27/11/1997
		Core bit	Geocube		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green thinly sub-horizontally bedded moderately weathered silty MUDSTONE, very weak to weak with very closely to closely spaced sub-horizontal fractures planar rough tight. ---from 50.15 to 51.85m closely spaced thin sub-horizontal laminations of white calcite			49.75 - 51.25	91	59	29	8 6 NA 2		
	51.35	-42.55							
Reddish brown occasionally mottled green thinly to medium sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely to medium spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group) ---from 52.55 to 52.65m thin beds of white calcite ---from 52.65 to 54.70m with very closely to closely spaced inclined undulating thin to thick laminations of calcite			51.25 - 52.65	100	93	65	9		
	52.90	-44.10					0 NI 0 NI		
			52.65 - 54.15	100	62	43	4 NI 1		
Reddish brown mottled green thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with closely to medium spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group) ---from 52.90 to 53.05m highly weathered very weak completely fractured ---from 53.15 to 53.22m highly weathered very weak completely fractured ---from 53.65 to 53.90m highly weathered very weak completely fractured	53.90	-45.10							
			54.15 - 55.65	99	90	60	6 4		
Reddish brown mottled green thinly to medium sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) ---from 54.70 to 55.33m sub-vertical to vertical very thin (20mm-60mm) 1 vein of white calcite									
	55.65	-46.85							
Borehole complete at 55.65 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				185472.0 N
		Drilling Rig	Pilcon/T30	Ground Level	6.20m AOD
Client	Welsh Office	Drillers	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Chunk		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
11/11/1997	1800	11.00	9.00	Dry	
12/11/1997	0800	11.00	9.00	Dry	
12/11/1997	1800	19.50	19.20	7.60	
16/11/1997	1800	27.35	20.00	10.50	
17/11/1997	0800	27.35	20.00	4.10	
17/11/1997	1800	35.65	20.00	6.80	
18/11/1997	0800	35.65	20.00	6.80	
18/11/1997	1800	47.50	20.00	12.00	
19/11/1997	0800	47.50	20.00	6.50	
19/11/1997	1800	55.00	20.00	12.30	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
16.50	16.90	1.00	
18.30	18.50	0.50	
19.00	19.50	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	19.50	150	19.20
120	55.00	140	20.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
12/11/1997	0000	12.90	6.30	20	fast	12.90	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
19.50	20.00	foam	moderate	92
20.00	55.00	air & water	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.50	S	N=2 (1,0,1,0,0,1)
3.50	S	1/450mm
5.50	S	1/450mm
7.50	S	1/450mm
10.50	S	1/450mm
13.50	S	N=8 (2,2,2,2,2,2)
16.50	S	30/0mm*
18.00	S	49/150mm
19.00	S	81/150mm
19.50	S	42/75mm*

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 1 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Drillers	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	19/11/1997
		Core Bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Soft to firm becoming very soft greyish brown thinly laminated slightly micaceous organic CLAY, with occasional rootlets. (Estuarine Alluvium)				U 0.50 - 1.00	(9)		
				D 1.20			
				B 1.50 - 2.00		S2 1.50 1.95	
				D 2.20			
		2.40	3.80				
Very soft dark grey slightly organic CLAY. (Estuarine Alluvium)				D 3.20			
				B 3.50 - 4.00	(2)	S1/450mm 3.50 3.95	
				D 4.20			
				U 4.50 - 5.00	(2)		
				D 5.20			
---from 5.50 to 5.95m slightly micaceous				B 5.50 - 6.00		S1/450mm 5.50 5.95	
				D 6.20			
				U 6.50 - 7.00	(2)		
				D 7.20			
---from 7.50m soft slightly micaceous slightly sandy				B 7.50 - 8.00		S1/450mm 7.50 7.95	
				D 8.20			
				B 9.00 - 9.50 U 9.00 - 9.50	(3)		
				D 9.70			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 2 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Drillers	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	19/11/1997
		Core Bit	Chunk		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI 00	SPT N & depth	Install-ation
Very soft dark grey slightly organic CLAY. (Estuarine Alluvium)			B 10.50 - 11.00		S1/450mm 10.50 10.95	
---at 10.50m occasionally mottled brown						
			D 11.50			
---at 11.50m sandy			U 12.00 - 12.50	(5)		
			D 12.70			
---from 12.70m very dark grey	12.90	-6.70				
Soft grey sandy CLAY with occasional sub-rounded siliceous gravel. (Estuarine Alluvium)			B 13.50 - 14.00		S8 13.50 13.95	
	13.80	-7.60				
Firm greyish brown sandy very silty CLAY with occasional fine to medium gravel size pockets of brownish yellow and black, brown woody fibrous peat. (Estuarine Alluvium)			D 14.50			
			U 15.00 - 15.50	(11)		
			D 15.70			
	16.20	-10.00				
Very dense greyish brown slightly sandy sub-angular to sub-rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)			B 16.50 - 17.00		S30/0mm* 16.50 16.50	
			B 17.20 - 17.70			
					S49/150mm 18.00 18.30	
	18.20	-12.00				
Reddish brown mottled greyish green thinly laminated moderately to highly weathered slightly calcitic MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)			D 18.80		S81/150mm 19.00 19.15	
---at 19.30m moderately weak to moderately strong	19.50	-13.30	D 19.50		S42/75mm* 19.50 19.58	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 3 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Drillers	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	19/11/1997
		Core Bit	Chunk		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled green medium bedded moderately to highly weathered silty MUDSTONE, weak to moderately weak with closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			20.00 - 21.50	99	61	55	NI		
---from 20.40 to 20.50m calcitic							2		
---from 21.50 to 21.60m highly weathered weak completely fractured			21.50 - 23.00	100	20	0	NI		
							3		
---from 21.90 to 22.30m highly weathered very weak completely fractured							NI		
---from 22.65 to 23.00m highly weathered weak							NI		
---from 23.00 to 23.40m completely fractured weak			23.00 - 24.25	92	38	26	8		
---from 24.25 to 26.00m highly weathered very weak completely fractured			24.25 - 25.80	100	0	0	NI		
	26.00	-19.80					NI		
Reddish brown occasionally mottled green medium bedded moderately weathered slightly sandy silty MUDSTONE, moderately weak to moderately strong with medium to widely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			25.80 - 27.35	100	71	35	6		
---from 27.35 to 27.50m highly weathered very weak completely fractured							NI		
---from 27.95m moderately to highly weathered weak to moderately weak			27.35 - 28.90	98	68	19	10		
---from 28.50 to 28.55m inclined fracture (45°) planar slightly open (15mm calcite infill)							NI		
---from 28.55 to 28.90m highly weathered very weak completely fractured									
---from 28.90m very closely to closely spaced			28.90 - 30.40	100	79	0	15		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 4 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Driller	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Chunk		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green medium bedded moderately weathered slightly sandy silty MUDSTONE, moderately weak to moderately strong with medium to widely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			30.40 - 31.75	100	74	59	3		
---from 30.40 to 31.40m closely to medium spaced sub-horizontal fractures							NI		
---from 31.40 to 31.75m highly weathered weak completely fractured									
---from 31.70 to 32.55m moderately to highly weathered weak to moderately weak			31.75 - 32.95	100	83	30	10		
							2		
---from 32.95 to 33.70m highly weathered very weak completely fractured			32.95 - 34.45	100	40	13	NI		
---from 33.70 to 34.45m moderately to highly weathered weak to moderately weak							7		
	34.45	-28.25							
Reddish brown occasionally mottled green thinly to medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)			34.45 - 35.65	100	0	0	NI		
---from 35.65 to 35.95m moderately weathered moderately weak with very closely spaced inclined fractures planar rough tight			35.65 - 35.95	100	50	0	4		
			35.95 - 37.45	97	13	0	NI		
---from 37.05 to 37.25m moderately weathered moderately weak with very closely spaced inclined fractures planar rough tight							4		
							NI		
			37.45 - 38.90	88	0	0	NI		
			38.90 - 40.30	100	0	0	NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 5 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Driller	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green thinly to medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)										
		41.00	-34.80	40.30 - 41.80	100	17	7	NI 3 NI 8		
Reddish brown thinly bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures. (Mercia Mudstone Group)		41.80	-35.60							
Reddish brown thinly to medium bedded highly weathered silty MUDSTONE, weak completely fractured. (Mercia Mudstone Group)		42.60	-36.40	41.80 - 43.30	100	30	0	NI 10		
Reddish brown thinly bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)		43.30	-37.10							
Reddish brown occasionally mottled green thinly to medium bedded slightly weathered silty MUDSTONE, moderately strong with closely to medium spaced sub-horizontal to inclined thick laminations to very thin beds of calcite and closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) ---from 43.75 to 43.85m slightly to moderately weathered moderately weak completely fractured ---from 43.85m moderately weathered moderately weak ---from 44.75 to 44.95m completely fractured ---from 45.20m fresh to slightly weathered ---from 46.65 to 47.15m slightly to moderately weathered ---from 47.40 to 47.80m moderately to highly weathered weak completely fractured				43.30 - 44.75	100	72	30	4 NI 9		
				44.75 - 46.20	100	77	36	NI 11		
				46.20 - 47.50	100	69	39	9 NI		
				47.50 - 48.90	100	69	44	NI 4		
				48.90 - 50.30	100	75	39	8		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 6 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Driller	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green thinly to medium bedded slightly weathered silty MUDSTONE, moderately strong with closely to medium spaced sub-horizontal to inclined thick laminations to very thin beds of calcite and closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) ---from 50.10 to 50.65m highly weathered very weak completely fractured ---from 50.85 to 51.05m highly weathered very weak completely fractured ----from 51.15 to 51.70m sub-vertical (075°) thick laminations of calcite (15mm) ---from 52.40 to 52.85m vertical to sub-vertical (90-75°) thick laminations of calcite (15-20mm)				50.30 - 51.70	93	44	29	NI NI 1 NI 2		
				51.70 - 52.40	86	60	37	3		
				52.40 - 53.35	86	84	53	6		
				53.35 - 54.25	83	78	37	9		
				54.25 - 55.00	89	89	83	6		
		55.00	-48.80							
Borehole complete at 55.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHG2
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00m AOD
Client	Welsh Office	Drillers	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	20/11/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
18/11/1997	1800	14.80	14.50	Dry	
19/11/1997	0800	14.80	14.50	8.40	
19/11/1997	1800	16.60	15.00	Dry	
19/11/1997	1800	31.50	16.25	10.68	
20/11/1997	0800	31.50	16.25	6.31	
20/11/1997	1530	45.00	16.25	10.32	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
13.30	13.40	0.75	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	16.60	150	15.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
18/11/1997	0000	13.20	8.90	20	fast	0.00	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
16.50	45.00	mist	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	C	N=16 (6,7,4,3,4,5)
7.00	S	N=2 (1,0,1,0,1,0)
13.50	C	N=37 (7,8,11,10,7,9)
14.80	S	N=55 (5,6,10,16,14,15)
16.30	S	56/225mm (7,8,16,16,24)
25.60	S	50/75mm (5,20,50)
39.00	S	99/225mm (6,6,21,28,50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Sheet 1 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00 m AOD
Client	Welsh Office	Drillers	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	20/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring				Blow count to drive UI00	SPT N & depth		Install-ation
MADE GROUND: Blackish brown slightly clayey silty sandy sub-angular gravel of brick, clinker, slag and rubble with occasional cobbles.				B	1.00	-	1.50		C16	1.00 1.45	
		1.30	6.70								
Stiff brown mottled grey occasionally thinly laminated CLAY. (Estuarine Alluvium)				D	1.80						
				U	2.00	-	2.50	(30)			
				D	2.50						
		2.70	5.30								
Soft becoming very soft grey CLAY. (Estuarine Alluvium)				U	3.00	-	3.50	(11)			
				D	3.50						
---at 3.50m organic											
				U	4.00	-	4.50	(9)			
				D	4.50						
				U	5.00	-	5.50	(8)			
				D	5.50						
---from 5.50m dark grey											
				U	6.00	-	6.50	(9)			
				D	6.50						
---at 7.00m very soft									S2	7.00 7.45	
				D	7.50						
---from 7.50 to 10.00m very silty											
				U	8.00	-	8.50	(9)			
				D	8.50						
				D	9.50	-	10.00	(13)			
				U	9.50						
				D	10.00						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Sheet 2 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00 m AOD
Client	Welsh Office	Drillers	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	20/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Soft becoming very soft grey CLAY. (Estuarine Alluvium)			D 10.00			
			D 10.70			
			U 11.00 - 11.50	(14)		
			D 11.50			
			D 12.20			
			U 12.50 - 13.00			
			D 13.00			
---from 13.00m dark grey mottled black organic very silty	13.20	-5.20				
			B 13.50 - 14.00		C37 13.50	
Dense grey slightly silty sandy sub-rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)	14.00	-6.00			13.95	
Greyish green mottled reddish brown highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)			B 14.50 - 15.00 U 14.50 - 14.75	(100)	S55 14.80 15.25	
			B 15.50 - 16.00			
---from 16.30m reddish brown mottled greyish green slightly to moderately weathered moderately strong to strong	16.60	-8.60			S56/225mm 16.30 16.68	
---from 16.50 to 16.65m moderately to highly weathered weak			16.50 - 18.00	TCR 93 SCR 57 RQD 8 FI		
Reddish brown thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)						
---from 16.90 to 17.15m with very closely spaced thick laminations to very thin beds of calcite			18.00 - 19.50	TCR 98 SCR 69 RQD 42 FI		
---from 17.35 to 17.50m moderately to highly weathered moderately weak						
---from 17.60 to 18.00m green highly						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Sheet 3 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	20/11/1997
		Core bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			19.50 - 21.00	100	73	35			
---from 21.00m moderately to highly weathered weak completely fractured	21.33	-13.33							
Reddish to purplish brown occasionally mottled green medium bedded moderately to highly weathered silty slightly sandy MUDSTONE, weak to moderately weak with extremely to very closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			21.00 - 22.60	90	13	0			
---from 21.33 to 21.50m completely fractured									
---from 21.70 to 21.90m completely fractured									
---from 22.20 to 22.30m completely fractured									
---from 22.60 to 22.80m completely fractured			22.60 - 24.00	96	54	30			
---from 23.05 to 23.78m slightly to moderately weathered moderately weak with medium spaced sub-horizontal to inclined fractures planar rough tight	24.60	-16.60					5		
---from 23.78 to 24.30m weak completely fractured			24.00 - 25.60	94	51	30	7	S50/75mm 25.60 25.83	
Reddish brown occasionally mottled green medium to thickly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with medium spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			25.60 - 27.10	100	73	45	7		
---from 27.10 to 27.40m moderately to highly weathered weak to moderately weak	27.40	-19.40					5		
Reddish brown occasionally mottled green medium to thickly sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, very weak to weak locally moderately strong with medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			27.10 - 28.40	100	96	58	5		
---from 28.40 to 28.62m moderately to highly weathered very weak completely fractured							NI		
			28.40 - 30.00	95	83	65	5		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Sheet 4 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	20/11/1997
		Core bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green medium to thickly sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, very weak to weak locally moderately strong with medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)							NI		
			30.00 - 31.50	100	83	49	6		
---from 31.00 to 33.10m with closely to medium spaced thin to thick laminations and gravel size pockets of calcite							NI		
---from 31.50 to 31.75m moderately to highly weathered weak completely fractured			31.50 - 33.10	94	55	43	4		
---from 32.80 to 33.10m highly weathered very weak completely fractured	33.10	-25.10					NI		
Reddish brown mottled greyish green very thinly to thinly sub-horizontally bedded moderately weathered MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			33.10 - 34.60	100	97	90	9		
			34.60 - 36.00	100	96	57	4		
---from 35.50 to 35.70m moderately to highly weathered completely fractured							NI		
---from 36.00 to 36.30m completely fractured weak							4		
---at 36.30m sub-horizontal fracture with calcite infill			36.00 - 37.60	100	88	25	NI		
---from 36.50 to 37.10m completely fractured weak							1		
---from 37.30m sub-horizontal fracture with calcite infill							NI		
---from 37.60 to 37.80m completely fractured weak							2		
			37.60 - 39.00	93	79	54	NI		
							3	S99/225mm 39.00	
---from 39.00 to 39.30m moderately to highly weathered completely fractured							NI	39.38	
---from 39.30 to 39.90m no recovery			39.00 - 39.90	33	0	0	NA		
							NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Sheet 5 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	20/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green very thinly to thinly sub-horizontally bedded moderately weathered MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)				39.90 - 40.50	100	83	50	NI 2		
---from 40.50 to 41.60m moderately to highly weathered weak				40.50 - 42.00	80	67	20	10 NI NA		
---from 41.60 to 41.70m moderately to highly weathered weak completely fractured										
---from 42.00 to 42.40m completely fractured				42.00 - 43.50	100	73	47	NI 6 NI		
---from 43.20 to 43.50m completely fractured										
---at 43.40m calcitic				43.50 - 45.00	90	73	0	NI 6 NA		
---from 43.50 to 44.20m completely fractured										
---from 44.40 to 44.65m inclined fracture (50°) planar rough tight (calcite infill)										
---from 44.85 to 45.00m no recovery		45.00	-37.00							
Borehole complete at 45.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHG3
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners			Date Completed	11/11/1997

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.80	150	15.50
120	40.05	140	30.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=4 (1,2,1,1,1,1)
4.00	S	N=1 (0,0,1,0,0,0)
6.50	S	N=1 (1,0,1,0,0,0)
9.00	S	N=2 (1,0,1,0,1,0)
12.00	S	N=1 (0,0,1,0,0,0)
15.00	S	N=2 (1,0,0,0,1,1)
15.76	S	95/95mm*
16.95	C	50/70mm (16,9,50)
18.35	C	127/200mm (7,13,35,42,50)
19.35	C	116/200mm (13,12,28,38,50)
20.35	C	50/65mm (9,16,50)
22.90	C	75/115mm*
25.50	C	50/60mm (20,5,50)
26.50	C	97/220mm (4,4,8,39,50)
27.50	C	20/223mm*
27.72	C	50/60mm (17,8,50)
30.80	C	75/150mm (9,16,25,50)
33.30	C	78/145mm (6,14,28,50)
34.30	C	50/75mm (19,6,50)
35.55	C	78/145mm (8,15,28,50)
36.55	C	N=89 (,9,17,27,36)
39.05	C	50/50mm (19,6,50)
40.05	C	50/60mm (7,9,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	COMBINED HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG3** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners			Date Completed	11/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
30/10/1997	1800	8.00	7.50	Dry	
31/10/1997	0800	8.00	7.50	7.80	
31/10/1997	1800	15.80	15.50	10.10	
04/11/1997	1300	18.35	18.55	4.45	
04/11/1997	1800	18.35	15.50	Dry	
05/11/1997	0800	18.35	17.55	4.50	
05/11/1997	1800	21.90	19.35	6.20	
06/11/1997	0800	21.90	19.35	5.00	
06/11/1997	1800	30.00	19.35	8.10	
10/11/1997	0800	30.00	19.35	5.10	
10/11/1997	1800	35.55	30.00	6.80	
11/11/1997	0800	35.55	30.00	5.15	
11/11/1997	1800	40.05	30.00	5.80	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
15.80	40.05	foam	100%	92.0

CABLE PERCUSSION DETAILS

Hard Strata from depth	Hard Strata to depth	Hours	Remarks
0.00	0.40	1.00	
0.40	0.60	0.75	
15.60	15.80	1.00	

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	COMBINED HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG3** Sheet 1 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00 m AOD
Client	Welsh Office	Drillers	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	11/11/1997
		Core Bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
MADE GROUND: Black sandy clayey slag and brick fill.			D 0.20 B 0.30 - 0.70			
	0.70	7.30				
Soft becoming very soft grey mottled brown sandy very silty CLAY with occasional thin laminations of greyish blue silt. (Estuarine Alluvium)			D 0.80 U 1.00 - 1.45	(10)		
			D 1.50 D 1.75			
			B 2.00 - 2.45 D 2.00		S4 2.00 2.45	
			D 2.75			
---from 2.75 to 3.75m becoming slightly organic			U 3.00 - 3.45	(7)		
			D 3.50 D 3.75			
			B 4.00 - 4.45 D 4.00		S1 4.00 4.45	
---at 4.00m becoming very soft and slightly sandy						
			D 4.75			
---at 4.75m becoming slightly organic			B 5.00 - 5.40 U 5.00 - 5.40	(5)		
			U 5.50 - 5.95	(4)		
			D 6.00			
---at 6.00m becoming grey mottled black			D 6.25			
			B 6.50 - 6.95 D 6.50		S1 6.50 6.95	
			D 7.25			
			U 7.50 - 7.95	(5)		
	8.00	0.00	D 8.00			
Very soft grey mottled black organic CLAY. (Estuarine Alluvium)			D 8.50			
			B 9.00 - 9.45 D 9.00		S2 9.00 9.45	
---at 9.00m becoming slightly sandy			D 10.00			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG3** Sheet 2 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00 m AOD
Client	Welsh Office	Drillers	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	11/11/1997
		Core Bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI00	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Very soft grey mottled black organic CLAY. (Estuarine Alluvium)			D 10.00							
			U 10.50 - 10.95	(4)						
			D 11.00							
			D 11.50							
			B 12.00 - 12.45						S1 12.00 12.45	
Soft dark grey slightly sandy very silty CLAY. (Estuarine Alluvium)	13.00	-5.00	D 13.00							
			U 13.50 - 13.95	(5)						
			D 14.00							
---at 14.50m becoming mottled black			D 14.50							
			B 15.00 - 15.45						S2 15.00 15.45	
	15.60	-7.60								
Brown mottled greyish green highly to moderately weathered sandy MUDSTONE, very weak to weak. (Mercia Mudstone Group)	15.80	-7.80	B 15.76						S95/95mm* 15.76	15.86
Greyish green mottled reddish brown thinly to medium sub-horizontally bedded highly weathered MUDSTONE, moderately weak to moderately strong with extremely closely to very closely spaced horizontal to vertical fractures irregular rough tight to open. (Mercia Mudstone Group)			15.80 - 16.95		32	10	0	NA	C50/70mm 16.95	17.17
---from 15.80 to 16.03m completely fractured			16.95 - 17.95		0	0	0	NA		
	17.95	-9.95								
---from 16.17 to 16.95m no recovery			17.95 - 18.35		100	88	0	NI 7	C127/200mm 8.35	
---from 16.95 to 17.95m no recovery	18.35	-10.35						NI		18.70
Greyish green mottled reddish brown sub-horizontally bedded completely weathered MUDSTONE, weak to moderately weak with extremely closely spaced sub-horizontal to vertical fractures irregular rough tight to open. (Mercia Mudstone Group)			18.35 - 19.35		15	5	0	NA	C116/200mm 9.35	
			19.35 - 20.35		0	0	0	NA		19.70

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG3** Sheet 3 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	11/11/1997
		Core bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green thinly to medium sub-horizontally bedded moderately to highly weathered MUDSTONE, very to moderately weak with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (Mercia Mudstone Group)								C50/65mm 20.35 20.57	
			20.35 - 21.35	25	5	0	NI NA		
---from 20.35 to 20.60m completely fractured									
			21.35 - 21.90	0	0	0	NA		
---from 20.60 to 21.35m no recovery									
---from 21.35 to 21.90m no recovery									
			21.90 - 22.90	0	0	0	NA		
---from 21.90 to 22.90m no recovery									
								C75/115mm 22.90	
---from 22.90 to 23.10m highly weathered								23.02	
			22.90 - 23.90	100	87	79	5		
			23.90 - 24.60	100	79	31	0		
---from 24.60 to 24.80m completely fractured							NI		
			24.60 - 25.50	22	0	0	NA		
---from 24.80 to 25.50m no recovery								C50/60mm 25.50	
---from 25.50 to 26.50m no recovery								25.71	
			25.50 - 26.50	0	0	0	NA		
								C97/220mm 26.50	
---from 26.50 to 26.77m completely fractured							NI	26.87	
			26.50 - 27.50	27	0	0	0		
---from 26.77 to 27.50m no recovery									
								C20/223mm 27.50	
---from 27.50 to 27.70m highly weathered completely fractured							NI	27.72	
								C50/60mm 27.72	
	27.90	-19.90	27.50 - 28.50	63	25	0	4 NI	27.93	
Reddish brown thinly to medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)									
			28.50 - 30.00	22	0	0	NI		
	30.00	-22.00							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG3** Sheet 4 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	11/11/1997
		Core bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Installation
Reddish brown thinly to medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)	30.00	-22.00	30.00 - 30.80	0	0	0	NA	C75/150mm 30.80	
Reddish brown medium bedded completely weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)			30.80 - 31.80	90	15	0	NI	31.10	
---from 31.25m moderately to highly weathered							7		
---from 31.65m occasionally mottled greyish green slightly to moderately weathered			31.80 - 33.30	40	20	0	0	C78/145mm 33.30	
---from 31.75m very closely spaced sub-horizontal discontinuities planar rough tight								33.60	
			33.30 - 34.30	0	0	0	NA	C50/75mm 34.30	
			34.30 - 34.55	100	60	0	NI	34.53	
			34.55 - 35.55	0	0	0	NA	C78/145mm 35.55	
			35.55 - 36.55	0	0	0	NI	35.85	
	36.55	-28.55						C89 36.55	
Reddish brown occasionally mottled greyish green medium bedded moderately weathered silty MUDSTONE, moderately weak with closely spaced horizontal to sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)			36.55 - 37.55	97	56	17	4	37.00	
	37.55	-29.55					NI		
---from 37.15 to 37.55m moderately to highly weathered weak completely fractured							1 NI		
---from 37.25 to 37.45m slightly calcitic			37.55 - 39.05	65	39	11	8	C50/50mm 39.05	
Reddish brown thinly sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with very closely to closely spaced horizontal to sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)								39.25	
---from 37.67 to 37.79m completely fractured			39.05 - 40.05	0	0	0	NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHG3
Sheet 5 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	11/11/1997
		Core bit	P.C.D		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with very closely to closely spaced horizontal to sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)		40.05	-32.05						C50/60mm 40.05 40.26	
Borehole complete at 40.05 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - HEADER SHEET

Borehole No. **BHG4** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333362.4 E 185244.4 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.92m AOD
Client	Welsh Office	Drillers	I.M/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	12/11/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
30/10/1997	1800	10.00	9.20	Dry	
31/10/1997	0800	10.00	9.20	6.90	
31/10/1997	1800	14.10	13.80	7.90	
07/11/1997	0800	12.10	13.80	0.50	
07/11/1997	1800	16.60	14.10	4.30	
10/11/1997	0800	16.60	14.10	4.15	
10/11/1997	1800	19.45	16.90	Dry	
11/11/1997	0800	19.45	16.90	4.40	
11/11/1997	1800	29.75	19.80	4.55	
12/11/1997	0800	29.75	19.80	4.45	
12/11/1997	1800	40.10	19.80	14.00	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Water added from depth	Water added to depth
13.80	14.00	1.00		

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	14.10	150	13.80
120	40.10	140	19.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter	
14.10	40.10	air & foam	100%	92	

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.05	S	N=2 (1,0,1,0,1,0)
4.00	S	N=1 (0,0,1,0,0,0)
6.00	S	N=2 (0,0,1,1,0,0)
8.00	S	N=5 (1,1,2,1,1,1)
11.00	S	N=1 (0,0,1,0,0,0)
12.50	S	N=22 (2,3,3,4,6,9)
14.00	S	50/30mm
15.20	S	75/203mm (9,16,27,27,21)
17.60	S	N=85 (7,9,13,20,22,30)
18.45	S	75/121mm
19.45	S	75/70mm (25/72mm,75/70mm)
20.25	S	75/50mm (25/31mm,75/50mm)
29.75	S	69/182mm (20,49,26/32mm)
33.60	S	59/145mm (16,25,28,31)

* Seating blows only.

GENERAL NOTES

1. Inspection pit dug 6m to south-west to prove location of gas main.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG4** Sheet 1 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333362.4 E 185244.4 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.92 m AOD
Client	Welsh Office	Drillers	I.M/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	12/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
MADE GROUND: Soil clay fill (drillers description).		0.30	6.62	B 0.40 - 1.00 D 0.40			
Soft to firm becoming soft brown mottled greyish black slightly organic slightly sandy CLAY with occasional thin laminations of greyish green silt. (Estuarine Alluvium)				U 1.00 - 1.45 D 1.45	(11)		
Very soft grey mottled reddish brown slightly sandy CLAY. (Estuarine Alluvium)		1.85	5.07	D 1.85 D 2.05 B 2.50 - 3.00		S2 2.05 - 2.50	
---from 4.00 to 5.70m becoming grey mottled black slightly organic				U 3.00 - 3.45 D 3.45 D 3.80 D 4.00 B 4.45 - 5.00	(3)	S1 4.00 - 4.45	
Soft grey mottled brown slightly sandy CLAY with occasional thin laminations of grey silt. (Estuarine Alluvium)		6.70	0.22	U 5.00 - 5.45 D 5.45 D 5.70 D 6.00 B 6.45 - 6.70 D 6.80 - 7.35 U 6.80 W 6.90 D 7.35	(1) (11)	S2 6.00 - 6.45	
Soft grey slightly sandy slightly organic CLAY. (Estuarine Alluvium)		7.75	-0.83	D 7.75 D 8.00 B 8.45 - 9.00		S5 8.00 - 8.45	
Very soft grey mottled black slightly sandy CLAY with medium to coarse gravel size pockets of black peat. (Estuarine Alluvium)		9.10	-2.18	D 9.30 - 9.75 U 9.30 D 9.75	(9)		
		10.00	-3.08				

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG4** Sheet 2 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333362.4 E 185244.4 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.92 m AOD
Client	Welsh Office	Drillers	I.M/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	12/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
Very soft grey mottled black slightly sandy CLAY with medium to coarse gravel size pockets of black peat. (Estuarine Alluvium)	10.00	-3.08	D 10.50			
Very soft grey very sandy slightly organic CLAY with organic odour. (Estuarine Alluvium)			D 11.00		S1 11.00 / 11.45	
---at 11.00m becoming sandy			B 11.45 - 12.00			
	12.20	-5.28	D 12.20			
Reddish brown completely to highly weathered sandy MUDSTONE, very weak. (Mercia Mudstone Group)			B 12.50 - 13.00 D 12.50		S22 12.50 / 12.95	
	13.60	-6.68	D 13.60			
Reddish brown mottled greyish green highly to moderately weathered sandy MUDSTONE, weak to very weak. (Mercia Mudstone Group)	13.80	-6.88	D 14.00		S50/30mm 14.00 / 14.11	
	14.10	-7.18	14.10 - 14.85	TCR 87, SCR 51, RQD 27, NI/FI 2		
Greyish green mottled brown highly to moderately weathered very sandy MUDSTONE, weak. (Mercia Mudstone Group)			14.85 - 15.20	57, 37, 0, 3	S75/203mm 15.20 / 15.55	
Greyish green thinly to medium bedded moderately weathered silty MUDSTONE, very weak to moderately weak with medium spaced very thin to thin beds of reddish brown mudstone and very closely spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)			15.20 - 15.60	100, 90, 40, 3		
			15.60 - 16.20	56, 25, 0, 3 NI 7 NA		
	16.20	-9.28	16.20 - 16.60	95, 33, 0, 8		
---from 14.10 to 14.25m highly weathered weak completely fractured			16.60 - 16.70	100, 0, 0, NI 3		
---at 14.70m very weak			16.70 - 17.00	33, 0, 0, NA		
---from 15.25 to 15.80m purplish brown			17.00 - 17.66	0, 0, 0, 4	S85 17.60 / 18.05	
---from 15.80 to 15.95m highly weathered weak completely fractured			17.66 - 18.45	35, 12, 0, NI 5	S75/121mm 18.45 / 18.68	
Reddish brown medium sub-horizontally bedded moderately weathered silty MUDSTONE, weak with very closely spaced sub-horizontal to inclined discontinuities irregular planar rough tight. (Mercia Mudstone Group)			18.45 - 19.45	0, 0, 0, 5 NA		
---from 16.20 to 16.35m highly weathered very weak completely fractured	19.45	-12.53			S75/70mm 19.45 / 19.59	
---from 16.60 to 16.70m highly weathered very weak completely fractured			19.45 - 20.25	56, 31, 0, 5 NI 1		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG4** Sheet 3 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333362.4 E 185244.4 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.92 m AOD
Client	Welsh Office	Driller	I.M/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	12/11/1997
		Core bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Installation
Reddish brown thinly sub-horizontally bedded slightly to moderately weathered slightly sandy MUDSTONE, moderately weak to moderately strong with closely spaced thick laminations to very thin beds of very sandy mudstone with very closely to closely spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)	20.85	-13.93	20.25 - 21.25	95	55	15	NA 9 NI	S75/50mm 20.25 20.33	
Reddish brown occasionally mottled green thinly to medium horizontal to sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with closely to medium spaced horizontal to sub-horizontally discontinuities planar rough tight. (Mercia Mudstone Group) ---from 21.10 to 21.25m completely fractured			21.25 - 22.75	94	83	46	12		
			22.75 - 24.25	100	93	39	13 0		
---from 24.30 to 24.45m completely fractured			24.25 - 25.75	100	89	49	NI 7 5		
---from 26.55 to 26.65m completely fractured			25.75 - 27.25	98	91	41	5 NI 4		
Reddish brown occasionally mottled greyish green medium sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately strong with medium spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group) ---from 28.10 to 28.28m moderately to highly weathered weak completely fractured ---from 28.80 to 29.00m completely fractured	27.55	-20.63	27.25 - 28.75	92	74	59	4 2 NI 2 1		
			28.75 - 29.75	33	10	0	NI 1 NA	S69/182mm 29.75 29.93	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG4** Sheet 4 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333362.4 E 185244.4 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.92 m AOD
Client	Welsh Office	Driller	I.M/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	12/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green medium sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately strong with medium spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)				29.75 - 30.75	72	46	32			
				30.75 - 31.70	100	96	61	8		
---from 31.70 to 31.77m highly weathered weak to moderately weak completely fractured		32.15	-25.23	31.70 - 32.70	100	88	15			
---from 31.97 to 32.09m highly weathered weak completely fractured								NI NI		
Reddish brown occasionally mottled greyish green thinly to medium sub-horizontally bedded moderately weathered to highly weathered silty MUDSTONE, moderately weak with medium spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)				32.70 - 33.60	70	11	0		S59/145mm 33.60 33.90	
---from 32.59 to 33.90m moderately to highly weathered weak completely fractured				33.60 - 34.60	98	60	15			
from 34.60 to 36.75m moderately to highly weathered weak to moderately weak completely fractured				34.60 - 36.10	100	11	0			
				36.10 - 37.60	100	63	30			
---from 37.50 to 37.90m moderately to highly weathered weak completely fractured				37.60 - 39.10	100	73	27			
---from 38.48 to 39.00m moderately to highly weathered weak completely fractured										
---from 39.00 to 39.50m highly weathered weak completely fractured				39.10 - 40.10	100	30	0			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG4** Sheet 5 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333362.4 E 185244.4 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.92 m AOD
Client	Welsh Office	Driller	I.M/J.H	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	12/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled greyish green thinly to medium sub-horizontally bedded moderately weathered to highly weathered silty MUDSTONE, moderately weak with medium spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)		40.10	-33.18							
Borehole complete at 40.10 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHG5** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	333430.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				185316.9 N
		Drilling Rig	Pilcon	Ground Level	7.40m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	16/11/1997
Consultant	Ove Arup and Partners			Date Completed	17/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
16/11/1997	1800	8.00	7.70	Dry	
17/11/1997	0800	8.00	7.70	Dry	
17/11/1997	1800	17.47	17.00	6.30	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
14.00	14.20	0.75	
16.95	17.40	2.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	17.47	150	17.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
17/11/1997	0000	12.80	9.70	20.0	fast	12.70	0.00

GENERAL NOTES

1. Rotary follow on cancelled, borehole grouted to ground level on completion.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=6 (2,1,2,2,1,1)
4.00	S	N=3 (1,0,0,1,1,1)
6.00	S	1/450mm
8.00	S	N=1 (0,0,0,1,0,0)
11.00	S	N=6 (1,2,1,1,2,2)
12.70	C	N=19 (3,4,4,4,5,6)
14.20	C	N=35 (4,5,8,8,9,10)
15.50	C	N=32 (6,6,7,6,8,11)
17.20	C	50/30mm (25,50)
17.40	S	55/20mm (25,55)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHG5** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	333430.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185316.9 N
		Driller	I.M	Ground Level	7.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	16/11/1997
Consultant	Ove Arup and Partners			Date Completed	17/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.20	7.20	D 0.40 B 0.50 - 1.00			
Soft becoming brown mottled greyish brown occasional thinly laminated CLAY. (Estuarine Alluvium)			U 1.00 - 1.45	(8)		
---from 0.20 to 1.45m with occasional rootlets			D 1.45 D 1.70 D 2.00 B 2.45 - 2.70	S6	S 2.00 - 2.45	
	2.85	4.55	D 2.85			
Very soft to soft grey occasionally mottled dark grey CLAY. (Estuarine Alluvium)			U 3.00 - 3.45 D 3.45 D 3.80 D 4.00 B 4.45 - 5.00	(6) S3	S 4.00 - 4.45	
	5.00	2.40	D 5.10			
Very soft dark grey CLAY. (Estuarine Alluvium)			U 5.20 - 5.65 D 5.65 D 5.80 D 6.00 B 6.45 - 7.00	(1) S1/450mm	S 6.00 - 6.45	
---from 7.45m very silty			U 7.00 - 7.45 D 7.45 D 7.70 D 8.00 B 8.45 - 9.00	(1) S1	S 8.00 - 8.45	
	9.00	-1.60				
Very soft becoming soft firm dark grey occasionally organic very silty CLAY. (Estuarine Alluvium)			U 9.50 - 9.95 W 9.70 D 9.95	(4)		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHG5** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	333430.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185316.9 N
		Driller	I.M	Ground Level	7.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	16/11/1997
Consultant	Ove Arup and Partners			Date Completed	17/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very soft becoming soft firm dark grey occasionally organic very silty CLAY. (Estuarine Alluvium)				D 10.50			
				D 11.00	S6	S 11.00	
---from 11.00m with occasional to some gravel size pockets of blackish brown firm fibrous peat				B 11.45 - 12.00		11.45	
				D 12.10			
				U 12.30 - 12.55	NR		
		12.55	-5.15				
Medium dense greyish brown silty sandy sub-rounded and occasionally sub-angular siliceous GRAVEL with some cobbles. (Fluvial Alluvium)				D 12.70	C19	C 12.70	
				B 13.15 - 14.00		13.15	
---from 14.20m dense				D 14.20	C35	C 14.20	
				B 14.65 - 15.10		14.65	
				D 15.50	C32	C 15.50	
						15.95	
		16.95	-9.55				
Greyish green slightly to moderately weathered sandy MUDSTONE, moderately strong. (Mercia Mudstone Group)				D 17.10			
				D 17.20	C50/30mm	C 17.20	
		17.47	-10.07	D 17.40	S55/20mm	S 17.40 17.31	
						17.47	
Cable Percussion boring complete at 17.47 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG6** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333509.1 E 185250.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	7.00m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
14/11/1997	1800	8.00	7.70	Dry	
15/11/1997	0800	8.00	7.70	6.60	
15/11/1997	1800	18.00	17.55	5.40	
16/11/1997	0800	18.00	17.55	4.80	
16/11/1997	1800	18.00	17.85	4.25	
17/11/1997	1800	20.25	18.06	15.60	
18/11/1997	0800	20.25	18.06	Dry	
18/11/1997	1800	31.15	18.06	4.40	
19/11/1997	0800	30.15	18.06	4.00	
19/11/1997	1800	40.00	18.06	0.00	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
16.10	16.35	1.00	
16.60	16.70	0.50	
17.55	17.85	1.00	
17.85	18.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	18.06	150	17.85

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
18.06	40.00	foam	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=4 (1,0,0,1,1,2)
4.00	S	N=1 (1,0,0,1,0,0)
6.00	S	N=1 (1,0,1,0,0,0)
8.00	S	N=1 (1,0,1,0,0,0)
12.50	C	N=19 (2,4,3,4,5,7)
14.00	C	N=36 (2,3,3,8,9,16)
15.45	C	N=38 (5,7,8,10,10,10)
17.10	S	N=43 (4,6,7,7,14,15)
17.95	S	75/105mm*
20.25	C	50/70mm (25/60,50/70)
21.25	C	50/75mm (25/135,50/75)
22.25	C	50/50mm (25/120,50/50)
23.25	C	50/75mm (25/110,50/75)
24.25	C	50/60mm (25/90,50/60)
25.25	C	50/50mm (25/80,50/50)
27.75	C	50/50mm (25/75,50/50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG6** Sheet 1 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333509.1 E 185250.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	7.00 m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	19/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI100	SPT N & depth	Install-ation
MADE GROUND: Dark grey sandy gravelly brick and concrete fill.			D 0.30			
	0.60	6.40	D 0.60 B 0.70 - 0.90			
Firm becoming very soft to soft dark brown slightly sandy CLAY. (Estuarine Alluvium)			D 0.95 U 1.00 - 1.45	(17)		
---at 0.95m becoming mottled grey sandy with occasional thin laminations of bluish grey silt			D 1.45			
			D 1.70			
---at 1.70m becoming slightly sandy			D 2.00		S4 2.00 2.45	
			B 2.45 - 2.70			
			D 2.80			
---from 2.80 to 4.00m slightly sandy			U 3.00 - 3.45	(7)		
			D 3.45			
			D 3.80			
			D 4.00		S1 4.00 4.45	
			B 4.45 - 5.00			
			U 5.00 - 5.45			
			D 5.45			
			D 5.85			
			D 6.00		S1 6.00 6.45	
---at 6.00m becoming slightly organic			B 6.45 - 7.00 W 6.60			
			U 7.00 - 7.45	(2)		
			D 7.45			
			D 7.70			
			D 8.00		S1 8.00 8.45	
---at 8.00m becoming pale grey			B 8.60 - 8.90			
	9.60	-2.60	U 9.50 - 9.95	(3)		
CLAY - SD As Sheet 2			D 9.95			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG6** Sheet 2 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333509.1 E 185250.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	7.00 m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	19/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Very soft grey mottled black very sandy CLAY. (Estuarine Alluvium)	10.40	-3.40	D 10.20 D 10.60			
Very soft to soft dark grey mottled black slightly sandy CLAY with occasionally medium to coarse gravel sized pockets of black fibrous peat. (Estuarine Alluvium)			U 11.50 - 11.95 D 11.95			
Medium dense becoming dense brownish grey sandy sub-rounded to sub-angular GRAVEL with some cobbles. (Fluvial Alluvium)	12.45	-5.45	D 12.50 B 13.00 - 13.50		C19 12.50 12.95	
---at 14.00m becoming dense very sandy			D 14.00 B 14.50 - 15.00 D 15.40 B 16.35 - 16.60		C36 14.00 14.45 C38 15.45 15.90	
Reddish brown mottled greyish green highly to completely weathered sandy MUDSTONE, weak to weak. (Mercia Mudstone Group)	16.90	-9.90	D 17.00 D 17.10		S43 17.10 17.55	
---at 17.10m becoming highly weathered moderately weak	17.55	-10.55	D 17.85 D 18.00		S75/105mm*17.95 18.06	
Reddish brown mottled greyish green moderately weathered sandy MUDSTONE (marl), moderately weak to moderately strong. (Mercia Mudstone Group)	18.06	-11.06	18.06 - 19.10	TCR 96 SCR 56 RQD 0 FI 5 NI 3 NI		
MUDSTONE As Sheet 3			19.10 - 20.25	30 17 9 NI 0 NA		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG6** Sheet 3 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333509.1 E 185250.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	7.00 m AOD
Client	Welsh Office	Driller	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Installation
Greyish green occasionally mottled reddish brown thinly to medium sub-horizontally bedded highly to completely weathered MUDSTONE, very weak to weak with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)	20.25	-13.25						C50/70mm 20.25 20.38	
			20.25 - 21.25	25	0	0	NI NA		
Reddish brown occasionally mottled greyish green very thinly to thinly sub-horizontally bedded moderately to highly weathered MUDSTONE, moderately strong completely fractured. (Mercia Mudstone Group) ---from 20.50 to 21.25m no recovery	21.50	-14.50						C50/75mm 21.25 21.46	
			21.25 - 22.25	65	30	0	NI NI 3 NA		
Purplish brown mottled greyish green thinly to medium sub-horizontally bedded highly weathered sandy MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) ---from 21.50 to 21.75m completely fractured ---from 21.90 to 22.25m no recovery ---from 22.25 to 22.30m greyish green calcareous slightly weathered strong ---from 22.25 to 22.45m completely fractured ---from 22.45 to 23.25m no recovery	22.55	-15.55						C50/50mm 22.25 22.42	
			22.25 - 23.25	20	0	0	NI NA		
			23.25 - 24.24	35	20	0	NI 5 NA	C50/75mm 23.25 23.44	
			24.24 - 25.25	60	25	0	NI 6 NA	C50/60mm 24.25 24.40	
			25.25 - 26.25	100	75	40	NI 8	C50/50mm 25.25 25.38	
Reddish brown mottled greyish green medium to thinly sub-horizontally to inclined bedding moderately to highly weathered MUDSTONE, very weak to weak locally moderately strong with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) ---from 23.25 to 23.40m completely fractured ---from 23.40m moderately weathered ---from 23.60 to 24.25m no recovery ---from 24.25 to 24.60m completely fractured ---from 24.85 to 25.25m no recovery ---from 25.25 to 25.45m completely fractured ---from 27.35 to 27.75m no recovery			26.25 - 27.75	73	67	28	14 NA	C50/50mm 27.75 27.88	
			27.75 - 28.75	95	70	0	18		
			28.75 - 30.15	93	50	34	NI 4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG6** Sheet 4 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333509.1 E 185250.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	7.00 m AOD
Client	Welsh Office	Driller	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green medium to thinly sub-horizontally to inclined bedding moderately to highly weathered MUDSTONE, very weak to weak locally moderately strong with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)		30.15	-23.15	30.15 - 30.75	97	92	53	5		
Reddish brown occasionally mottled green thinly to medium sub-horizontally bedded moderately weathered silty MUDSTONE, very weak to moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)				30.75 - 32.25	99	79	29	5 NI 9		
---from 30.15 to 31.15m slightly to moderately weathered										
---from 31.20 to 31.32m highly weathered very weak completely fractured				32.25 - 33.80	100	66	16	5 NI 6		
---from 32.95 to 33.10m highly weathered weak completely fractured										
---from 34.00 to 34.20m highly weathered weak completely fractured								3 NI		
from 34.20m medium bedded with medium to widely spaced sub-horizontal to inclined fractures planar rough tight				33.80 - 35.35	100	75	40	8		
Reddish brown medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)		35.35	-28.35	35.35 - 35.80	100	0	0	NI		
				35.80 - 36.90	100	42	15	NI		
Reddish brown thinly to medium sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely to medium spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)		36.55	-29.55					4		
---from 37.35 to 37.90m moderately to highly weathered weak				36.90 - 38.40	97	50	21	1 3 NI		
---from 37.90 to 38.95m very weak completely fractured				38.40 - 39.50	91	55	18	NI 6 NI		
---from 39.40 to 39.80m very weak completely fractured				39.50 - 40.00	96	52	22	NI 7		
Borehole complete at 40.00 m.		40.00	-33.00							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH1** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	333676.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				185237.1 N
		Drilling Rig	Pilcon	Ground Level	7.70m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	13/11/1997
Consultant	Ove Arup and Partners			Date Completed	14/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
13/11/1997	1800	15.00	15.00	8.50	
14/11/1997	0800	15.00	15.00	6.30	
14/11/1997	1800	18.20	17.85	7.90	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
0.55	0.90	1.00	
16.20	16.40	0.50	
17.85	18.10	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	18.20	150	17.82

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
13/11/1997	0000	1.40	1.00	20.0	slow	0.00	4.50
13/11/1997	0000	13.45	8.75	20.0	fast	13.30	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=30 (2,16,19,4,3,4)
2.00	S	N=14 (3,4,6,3,2,3)
4.00	S	N=2 (2,1,1,0,0,1)
6.00	S	N=1 (0,0,0,1,0,0)
8.50	S	N=1 (0,0,1,0,0,0)
11.50	S	N=1 (0,0,0,0,0,1)
13.70	C	N=37 (4,7,9,9,10,9)
15.00	C	N=38 (4,7,8,8,10,12)
16.50	C	N=40 (3,5,8,10,11,11)
17.20	S	N=30 (4,5,6,7,8,9)
18.10	S	25/50mm, 50/50mm

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH1** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	333676.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185237.1 N
		Driller	I.M	Ground Level	7.70m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	13/11/1997
Consultant	Ove Arup and Partners			Date Completed	14/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
MADE GROUND: Brownish grey sandy clay with some sub-angular gravel size fragments of brick, concrete and rubble, with occasional fragments of wood, strong hydrocarbon odour.				D 0.20 B 0.30 - 0.55			
---at 0.90m moderate petroleum odour				D 0.90 D 1.00 W 1.00 B 1.45 - 1.70	S30	S 1.00 1.45	
				D 1.85 D 2.00	S14	S 2.00 2.45	
Firm brown mottled grey thinly laminated CLAY. (Estuarine Alluvium)		2.15	5.55	B 2.45 - 3.00 U 3.00 - 3.45	(7)		
Very soft to soft grey organic CLAY. (Estuarine Alluvium)		3.30	4.40	D 3.45			
---from 3.45 to 4.00m with occasional vegetation				D 3.80 D 4.00	S1	S 4.00 4.45	
---from 4.00m becomes dark grey				B 4.45 - 5.00 B 5.00 - 6.00 U 5.00 U 5.50	NR NR		
				D 6.00	S1	S 6.00 6.53	
Blackish brown firm fibrous PEAT with occasionally thin and thick laminations of very soft grey silty organic clay. (Peat)		6.70	1.00	D 6.70 U 6.90 - 7.35 D 7.35 D 8.00	(4)		
Very soft grey very silty sandy CLAY. (Estuarine Alluvium)		8.35	-0.65	D 8.35 D 8.50 W 8.90 - 9.50 B 8.95	S1	S 8.50 8.95	
---from 9.00m with occasional gravel size pockets of blackish brown firm fibrous peat				U 10.00 - 10.45	(2)		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH1** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	333676.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185237.1 N
		Driller	I.M	Ground Level	7.70m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	13/11/1997
Consultant	Ove Arup and Partners			Date Completed	14/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very soft grey very silty sandy CLAY. (Estuarine Alluvium)			U 10.00 - 10.45	(2)		
			D 10.45			
			D 11.00			
			D 11.50	S1	S 11.50 - 11.95	
			B 12.00 - 12.50			
	12.85	-5.15	D 12.85			
Firm reddish brown occasionally mottled greyish brown sandy CLAY with occasional sub-angular and sub-rounded sandstone and mudstone gravel. (Estuarine Alluvium)			U 13.00 - 13.43	(20)		
	13.45	-5.75				
---from 13.00m stiff to very stiff			D 13.70 - 14.15	C37	C 13.70 - 14.15	
Dense reddish brown clayey sandy sub-rounded siliceous GRAVEL, with many cobbles. (Fluvial Alluvium)			B 14.15 - 14.75			
			D 15.00	C38	C 15.00 - 15.45	
			B 15.45 - 16.00			
			B 16.50 - 17.05	C40	C 16.50 - 16.95	
			D 16.50			
	17.05	-9.35	D 17.05			
Reddish brown mottled greyish green highly weathered sandy MUDSTONE , weak to moderately weak. (Mercia Mudstone Group)			D 17.20	S30	S 17.20 - 17.65	
	17.85	-10.15				
	18.00	-10.30				
Reddish brown moderately weathered sandy MUDSTONE, moderately weak. (Mercia Mudstone Group)			D 18.10	S25/50mm, 50/50mm	S 18.10 - 18.23	
Cable Percussion boring complete at 18.20 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH2** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	333880.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				185160.0 N
		Drilling Rig	Pilcon	Ground Level	6.60m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	18/11/1997
Consultant	Ove Arup and Partners			Date Completed	19/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
18/11/1997	1800	13.00	13.00	7.50	
19/11/1997	0800	13.00	13.00	4.30	
19/11/1997	1800	18.04	17.70	4.00	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
12.80	13.00	1.00	
16.15	16.40	0.75	
17.70	17.90	1.00	
17.90	18.04	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	18.04	150	17.70

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
18/11/1997	0000	11.10	8.75	20.0	fast	10.70	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.05	S	N=4 (2,1,0,1,2,1)
4.00	S	N=2 (0,0,1,0,0,1)
6.50	S	1/450mm
9.50	S	N=9 (2,1,3,2,1,3)
11.10	S	N=11 (2,3,3,3,2,3)
12.30	C	N=25 (2,5,4,5,8,8)
13.50	C	N=34 (4,5,5,7,9,13)
15.00	C	N=33 (6,5,7,7,8,11)
16.50	C	N=32 (7,10,8,7,7,10)
17.20	S	N=46 (6,7,9,10,12,15)
17.90	S	50/75mm (25,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH2** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	333880.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185160.0 N
		Driller	I.M	Ground Level	6.60m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	18/11/1997
Consultant	Ove Arup and Partners			Date Completed	19/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.20	6.40	D 0.30			
Soft to firm brown mottled grey thinly laminated CLAY. (Estuarine Alluvium)			B 0.50 - 1.00			
			U 1.00 - 1.45	(9)		
---at 1.00m very silty						
			D 1.45			
---from 0.20 to 1.45m with occasional rootlets			D 1.70			
			D 2.05	S4	S 2.05 - 2.50	
---from 2.05m soft						
	2.50	4.10	B 2.50 - 3.00			
Very soft dark grey very silty CLAY. (Estuarine Alluvium)			U 3.00 - 3.45	(6)		
			D 3.45			
			D 3.80			
			D 4.00	S2	S 4.00 - 4.45	
			B 4.45 - 5.00			
			U 5.00 - 5.45	(2)		
			D 5.45			
			D 6.00			
			D 6.50	S1/450mm	S 6.50 - 6.95	
			B 7.00 - 8.00			
	8.20	-1.60				
Soft grey slightly sandy very silty CLAY. (Estuarine Alluvium)			D 8.45			
			W 8.75			
			D 9.35			
			D 9.50	S9	S 9.50 - 9.95	
	9.70	-3.10				
			B 9.95 - 10.50			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH2** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	333880.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185160.0 N
		Driller	I.M	Ground Level	6.60m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	18/11/1997
Consultant	Ove Arup and Partners			Date Completed	19/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Firm dark grey silty CLAY with occasional gravel size pockets of brownish black firm fibrous and woody peat. (Estuarine Alluvium)						
	10.80	-4.20	D 10.80			
Medium dense grey silty fine SAND. (Fluival Alluvium)			D 11.10	S11	S 11.10 - 11.55	
---at 10.80m very sandy			B 11.55 - 12.00			
	12.00	-5.40	D 12.00			
Medium dense becoming dense grey slightly silty SAND with much sub-rounded siliceous gravel and occasional cobbles. (Fluvial Alluvium)			D 12.30	C25	C 12.30 - 12.75	
---from 13.00m reddish brown to grey becoming dense			B 13.00 - 13.50			
			D 13.50	C34	C 13.50 - 13.95	
			B 14.50 - 15.00			
			D 15.00	C33	C 15.00 - 15.45	
			B 15.45 - 16.00			
			D 16.50	C32	C 16.50 - 16.95	
	17.15	-10.55	D 17.15	S46	S 17.20 - 17.65	
Reddish brown highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)			D 17.20			
			D 17.90	S50/75mm	S 17.90 - 18.05	
---from 17.90m mottled greyish green highly weathered weak to moderately weak	18.04	-11.44				
Cable Percussion boring complete at 18.04 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH3** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	334140.0 E 185211.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon	Ground Level	6.10m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	30/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
29/10/1997	1800	6.30	6.30	5.10	
30/10/1997	0800	6.30	6.30	Dry	
30/10/1997	1800	15.65	15.60	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
12.30	12.50	0.50	
14.70	14.95	0.50	
15.60	15.65	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.65	150	15.60

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
30/10/1997	0000	13.00	5.70	15.0	fast	13.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.95	S	N=5 (1,2,2,1,1,1)
4.10	S	N=2 (1,0,1,0,1,0)
6.50	S	N=1 (0,0,0,0,0,1)
9.00	S	N=7 (1,1,2,2,2,1)
11.30	S	N=14 (1,2,3,4,4,3)
12.50	S	N=39 (2,4,6,9,11,13)
14.10	C	N=48 (3,7,9,14,13,12)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH3** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	334140.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185211.0 N
		Driller	A.M	Ground Level	6.10m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	30/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.30	5.80	B 0.30 - 0.80			
Soft to firm becoming soft brown mottled grey occasional thinly laminated CLAY. (Estuarine Alluvium)			D 0.85 - 1.35 U 0.90	(11)		
			D 1.35			
---from 1.95m becoming soft grey mottled brown			B 1.90 - 2.68 D 1.95	S5	S 1.95 2.40	
	2.68	3.42				
Very soft grey occasionally thinly laminated slightly organic CLAY with occasionally fine to medium gravel size pockets of blackish brown firm to spongy fibrous peat. (Estuarine Alluvium)			D 2.90 U 3.00 - 3.45	(7)		
			D 3.45			
			B 4.10 - 5.00 D 4.10	S2	S 4.10 4.55	
			D 5.05 - 5.55 U 5.10	(6)		
			D 5.55			
			D 6.30			
			B 6.50 - 7.20 D 6.50	S1	S 6.50 6.95	
			D 8.05 - 8.55 U 8.10	(5)		
	8.55	-2.45	D 8.55			
Soft grey mottled black slightly sandy slightly organic CLAY. (Estuarine Alluvium)			B 9.00 - 9.60 D 9.00	S7	S 9.00 9.45	
	9.60	-3.50				
CLAY - SD As Sheet 2			D 10.00			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH3** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	334140.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185211.0 N
		Driller	A.M	Ground Level	6.10m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	30/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Soft grey slightly sandy CLAY. (Estuarine Alluvium)			D 10.00 U 10.50 - 10.95 D 10.95	(6)		
Firm grey mottled brown very sandy CLAY with occasional fine to medium sub-rounded gravel. (Estuarine Alluvium) ---at 11.30m much fine to medium sub-angular to sub-rounded gravel	11.10	-5.00	D 11.15 B 11.30 - 12.00 D 11.30	S14	S 11.30 11.75	
Dense brown slightly clayey very sandy sub-rounded GRAVEL with some cobbles. (Fluvial Alluvium) ---at 12.50m becoming clayey	12.30	-6.20	D 12.40 B 12.50 - 14.00 D 12.50 - 12.95 W 13.00	S39	S 12.50 12.95	
Dense brown grey sandy sub-angular to sub-rounded GRAVEL with occasional cobbles. (Fluvial Alluvium)	14.05	-7.95	B 14.10 - 15.40 D 14.45	C48	C 14.10 14.55	
Greyish pink fine to coarse grained slightly weathered very sandy CONGLOMERATE, strong. (Mercia Mudstone Group)	15.60 15.65	-9.50 -9.55	D 15.65			
Cable Percussion boring complete at 15.65 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH4** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	334433.5 E
Project	M4 Relief Road Magor to Castleton Stage 2				185205.0 N
		Drilling Rig	Pilcon	Ground Level	6.00m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	29/10/1997
Consultant	Ove Arup and Partners			Date Completed	30/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
29/10/1997	1800	15.00	13.00	7.30	
30/10/1997	0800	15.00	15.00	4.10	
30/10/1997	1800	17.20	16.90	6.05	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
11.80	12.00	1.00	
13.90	14.00	0.50	
16.85	17.10	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	17.20	150	16.90

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
29/10/1997	0000	4.85	2.70	15.0	fast	4.50	5.90
29/10/1997	0000	12.20	8.70	15.0	fast	12.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=2 (1,2,1,1,0,0)
5.00	S	N=1 (0,0,0,1,0,0)
10.00	S	N=3 (1,2,1,0,1,1)
11.70	C	50/75mm (13,15,50)
13.00	C	N=41 (4,7,8,10,11,12)
14.50	C	N=30 (3,4,5,7,8,10)
15.30	S	N=36 (4,5,7,7,9,13)
17.10	S	79/105mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH4** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	334433.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185205.0 N
		Driller	I.M	Ground Level	6.00m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	29/10/1997
Consultant	Ove Arup and Partners			Date Completed	30/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
TOPSOIL	0.25	5.75	D 0.35 - 1.00 B 0.40			
Soft to firm brownish grey mottled grey thinly laminated CLAY. (Estuarine Alluvium)			U 1.00 - 1.45	(7)		
			D 1.45			
	1.90	4.10	D 1.90 D 2.00	S2	S 2.00 2.45	
Very soft grey to dark grey occasional thinly laminated CLAY with occasional fine and medium gravel size pockets of blackish brown firm fibrous peat. (Estuarine Alluvium)			B 2.45 - 3.00			
---from 2.00 to 2.45m with occasional to some fine and medium gravel size pockets of blackish brown peat			W 2.70 V 3.00			
			B 3.40 - 4.00 D 3.50			
			U 4.00 - 4.45	(4)		
			D 4.45			
			D 4.80 D 5.00	S1	S 5.00 5.45	
			B 5.45 - 5.70			
	5.70	0.30	D 5.80			
Soft grey mottled blackish brown occasionally thinly laminated organic CLAY with many gravel size pockets and lenses of blackish brown spongy fibrous peat. (Estuarine Alluvium)			U 6.00 - 6.45	(10)		
			D 6.45			
			D 7.00			
	7.60	-1.60	D 7.60			
Very soft grey occasionally thinly laminated slightly organic CLAY. (Estuarine Alluvium)			V 8.00			
---from 7.60 to 8.80m with occasionally fine to medium gravel size pockets of blackish brown spongy and firm fibrous peat			W 8.70 D 8.80			
---at 9.50m with occasionally fine to medium gravel size pockets of brownish black firm fibrous peat			U 9.00 - 9.45	(4)		
			D 9.45			
			D 9.80 D 10.00	S3	S 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH4** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	334433.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185205.0 N
		Driller	I.M	Ground Level	6.00m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	29/10/1997
Consultant	Ove Arup and Partners			Date Completed	30/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very soft grey occasionally thinly laminated slightly organic CLAY. (Estuarine Alluvium)			D 10.00 B 10.45 - 11.00	S3	S 10.00 10.45	
	11.55	-5.55				
Dense reddish brown to greyish brown clayey silty and sandy sub-angular to sub-rounded sandstone and mudstone GRAVEL and COBBLES. (Fluvial Alluvium)			D 11.70 B 12.00 - 12.50	C50/75mm	C 11.70 11.93	
			D 13.00 B 13.45 - 13.90	C41	C 13.00 13.45	
	13.90	-7.90				
Reddish brown highly to completely weathered sandy MUDSTONE, weak to very weak. (Mercia Mudstone Group)			B 14.50 - 15.00	C30	C 14.50 14.95	
			D 15.20 D 15.30 B 15.75 - 16.85	S36	S 15.30 15.75	
---at 17.10m becoming highly to moderately weathered moderately weak to moderately strong	17.20	-11.20	B 17.10	S79/105mm*	S 17.10 17.21	
Cable Percussion boring complete at 17.20 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH5** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	334757.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				185127.1 N
		Drilling Rig	Pilcon	Ground Level	5.90m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	30/10/1997
Consultant	Ove Arup and Partners			Date Completed	31/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
30/10/1997	1800	4.50	4.30	Dry	
31/10/1997	0800	4.50	4.30	Dry	
31/10/1997	1800	14.20	13.00	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
11.80	12.05	0.50	
13.79	14.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	14.20	150	13.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
31/10/1997	0000	13.79	8.70	15.0	fast	13.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=10 (1,1,2,3,2,3)
4.00	S	N=7 (1,1,1,2,2,2)
6.40	S	N=4 (1,1,1,1,1,1)
11.05	S	N=8 (1,1,2,2,2,2)
12.50	S	N=63 (5,7,10,14,18,21)
14.00	S	50/50mm (26,27,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH5** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	334757.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185127.1 N
		Driller	A.M	Ground Level	5.90m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	30/10/1997
Consultant	Ove Arup and Partners			Date Completed	31/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
TOPSOIL	0.35	5.55	B 0.35 - 0.90			
Soft to firm brown mottled grey sandy CLAY. (Estuarine Alluvium)			D 0.95 - 1.45 U 1.00	(12)		
			D 1.45			
---at 1.45m occasional thin laminations of greyish green silt	1.80	4.10				
Soft to firm grey mottled brown slightly sandy CLAY. (Estuarine Alluvium)			D 2.00 D 2.00	S10	S 2.00 - 2.45	
---at 3.05m becoming grey mottled black slightly organic and slightly sandy			D 3.05 - 3.55 U 3.10 D 3.55	(11)		
			B 4.00 - 4.80 D 4.00	S7	S 4.00 - 4.45	
	4.50	1.40				
Firm black slightly sandy fibrous PEAT. (Peat)	4.80	1.10				
Soft grey mottled black slightly sandy CLAY with medium to coarse gravel size pockets of black fibrous peat. (Estuarine Alluvium)			D 4.90 U 5.00 - 5.45	(4)		
			D 5.45			
			D 6.00			
			B 6.40 - 7.00 D 6.40 - 6.85	S4	S 6.40 - 6.85	
	7.00	-1.10	D 7.00			
Firm black slightly sandy fibrous PEAT. (Peat)	7.40	-1.50				
Very soft to Soft grey mottled black slightly sandy CLAY with occasional gravel sized pockets of peat. (Estuarine Alluvium)			D 8.00 U 8.10 - 8.55	(7)		
			D 8.55			
			D 9.00			
			U 9.55 - 10.00	(6)		
			D 10.00			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH5** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	334757.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185127.1 N
		Driller	A.M	Ground Level	5.90m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	30/10/1997
Consultant	Ove Arup and Partners			Date Completed	31/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very soft to Soft grey mottled black slightly sandy CLAY with occasional gravel sized pockets of peat. (Estuarine Alluvium)				D 10.00 D 10.80 B 11.05 - 11.60 D 11.05	S8	S 11.05 11.50	
		11.60	-5.70	B 11.60 - 12.30			
Soft brown mottled grey slightly sandy CLAY with some gravel some cobbles and occasional medium to coarse gravel sized pockets of peat. (Estuarine Alluvium)		12.30	-6.40				
Reddish brown mottled grey highly to moderately weathered sandy MUDSTONE, very weak to weak. (Mercia Mudstone Group)				D 12.50	S63	S 12.50 12.95	
		13.75	-7.85	W 13.79			
Reddish brown mottled greyish blue moderately weathered sandy MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)		14.20	-8.30	D 14.00	S50/50mm	S 14.00 14.20	
Cable Percussion boring complete at 14.20 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH6** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	334670.8 E
Project	M4 Relief Road Magor to Castleton Stage 2				185488.1 N
		Drilling Rig	Pilcon	Ground Level	7.30m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	28/10/1997
Consultant	Ove Arup and Partners			Date Completed	28/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
28/10/1997	1800	14.55	14.00	6.25	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
0.60	0.70	0.25	
13.80	14.55	2.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	14.55	150	14.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
28/10/1997	0000	12.45	7.90	15.0	fast	12.00	0.00

GENERAL NOTES

1. Borehole grouted to ground level.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=7 (1,2,1,1,2,3)
4.00	S	N=14 (1,2,4,3,3,4)
5.50	S	N=5 (1,1,0,2,1,2)
8.10	S	N=3 (1,0,1,0,1,1)
12.40	S	N=43 (7,8,10,10,11,12)
13.80	S	50/75mm (17,31,50)
14.40	S	76/150mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH6** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	334670.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185488.1 N
		Driller	I.M	Ground Level	7.30m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	28/10/1997
Consultant	Ove Arup and Partners			Date Completed	28/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
MADE GROUND: Black to brown clayey very sandy angular to sub-angular gravel size brick, clinker and ash fragments.			B 0.00 - 0.80			
	0.80	6.50	D 0.90			
Firm greyish brown mottled brown thinly laminated CLAY. (Estuarine Alluvium)			U 1.10 - 1.55	(10)		
			D 1.55			
---at 0.90m with occasional rootlets and occasional subangular gravel of sandstone and coal	1.85	5.45	D 1.85			
			D 2.00 - 2.45	S7	S 2.00	
					2.45	
Soft to firm grey occasional thinly laminated CLAY. (Estuarine Alluvium)			B 2.45 - 3.00			
			U 3.00 - 3.45	(6)		
			D 3.45			
---at 3.45m grey mottled greyish brown			D 3.70			
			B 4.00 - 4.60	S14	S 4.00	
---at 4.00m firm			D 4.00		4.45	
	4.60	2.70				
			D 4.70			
Soft blackish brown fibrous PEAT. (Peat)			U 4.80 - 5.25	(5)		
---at 4.70m with some gravel size pockets of soft grey clay	5.35	1.95	D 5.40			
			B 5.50 - 6.20	S5	S 5.50	
			D 5.50		5.95	
Soft grey organic CLAY with occasional to some fine to medium gravel size pockets of brownish black spongy and firm fibrous peat. (Estuarine Alluvium)	6.20	1.10	D 6.25			
			D 6.30			
			U 6.60 - 7.05	(7)		
Soft blackish brown fibrous occasionally slightly clayey PEAT. (Peat)	6.90	0.40	D 7.05			
			D 7.50			
Soft dark grey thinly laminated organic CLAY with occasional fine to medium gravel size pockets of brownish black firm fibrous peat. (Estuarine Alluvium)			W 7.90			
			W 7.90			
			D 8.10	S3	S 8.10	
---from 8.10m soft occasionally thinly laminated silty					8.55	
			B 8.55 - 9.00			
	9.20	-1.90	D 9.20			
CLAY - ST As Sheet 2			U 9.50 - 9.95	(2)		
			D 9.95			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH6** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	334670.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185488.1 N
		Driller	I.M	Ground Level	7.30m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	28/10/1997
Consultant	Ove Arup and Partners			Date Completed	28/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Soft grey very silty CLAY with very occasionally fine to medium gravel size pockets of brownish black firm fibrous peat. (Estuarine Alluvium)			D 10.50			
---from 10.50m very silty and fine sandy	11.00	-3.70	D 11.00			
			U 11.20 - 11.65	(40)		
Reddish brown mottled greyish green occasionally thinly laminated moderately to highly weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)			D 11.65			
			D 12.00			
			D 12.40	S43	S 12.40 12.85	
			B 12.85 - 13.70			
---from 13.80m highly weathered moderately weak to moderately strong			D 13.80	S50/75mm	S 13.80 14.03	
---from 14.40m sandy	14.55	-7.25	D 14.40	S76/150mm*	S 14.40 14.55	
Cable Percussion boring complete at 14.55 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHH7
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	334780.0 E 185334.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Edeco	Ground Level	7.02m AOD
Client	Welsh Office	Drillers	A.M/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	13/11/1997
		Core bit	P.C.D		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
28/10/1997	1800	8.10	8.00	Dry	
29/10/1997	0800	8.10	8.00	Dry	
29/10/1997	1800	14.35	13.60	8.40	
10/11/1997	1800	15.75	15.00	4.30	
11/11/1997	0800	15.75	15.00	3.80	
11/11/1997	1800	19.30	18.00	5.60	
12/11/1997	0800	19.30	18.00	4.10	
12/11/1997	1800	25.70	21.50	12.00	
13/11/1997	0800	25.70	21.50	4.10	
13/11/1997	1800	35.50	21.50	4.20	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
0.90	1.25	0.50	
13.85	14.10	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	14.35	150	13.60
120	35.50	140	21.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
29/10/1997	0000	13.85	8.40	15	fast	0.00	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
14.35	15.75	mist	good	92
15.75	19.30	foam	moderate	92
19.30	35.50	foam	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
0.80	S	69/150mm (2,7,19,50)
2.60	S	N=10 (1,2,3,2,2,3)
5.55	S	N=6 (1,1,2,1,1,2)
7.50	S	N=4 (1,1,1,1,1,1)
10.50	S	N=3 (0,1,1,0,1,1)
13.00	S	N=56 (5,7,10,12,16,18)
14.10	S	50/75mm (27,33,50)
15.75	S	112/235mm (4,6,14,19,29,50)
17.50	S	N=99 (8,8,12,16,29,42)
18.80	S	N=86 (6,8,12,20,23,31)
24.50	S	50/30mm (8,26,50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHH7** Sheet 1 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	334780.0 E 185334.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Edeco	Ground Level	7.02 m AOD
Client	Welsh Office	Drillers	A.M/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	13/11/1997
		Core Bit	P.C.D		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI100	SPT N & depth	Install-ation
MADE GROUND: Dark greyish brown fine sandy clay with much sub-angular gravel of brick, concrete and coal rubble.				B 0.00 - 0.80 D 0.80 - 1.00		S69/150mm 0.80 1.10	
		1.35	5.67	D 1.40			
Soft to firm grey occasionally thinly laminated CLAY. (Estuarine Alluvium)				U 1.50 - 1.95	(12)		
---at 1.40m dark grey to greenish brown				D 1.95			
---from 1.95 to 3.05m grey mottled greyish brown				B 2.60 - 3.50 D 2.60		S10 2.60 3.05	
---at 3.60m occasionally organic				D 3.60 - 4.10 U 3.65	(11)		
---from 4.10m greyish brown with occasional fine to medium gravel size pockets of blackish brown spongy to firm fibrous peat		4.40	2.62	D 4.10 U 4.50 - 4.95	(5)		
Spongy to firm blackish brown fibrous PEAT. (Estuarine Alluvium)		4.95	2.07	D 4.95			
Soft dark grey occasionally thinly laminated organic CLAY with occasional fine to medium gravel size pockets of brownish black spongy to firm fibrous peat. (Estuarine Alluvium)				B 5.55 - 6.20 D 5.55		S6 5.55 6.00	
---at 6.40m with much blackish brown firm fibrous peat				D 6.40 U 6.50 - 6.95	(7)		
---from 7.50m very silty				D 6.95 B 7.50 - 8.10 D 7.50		S4 7.50 7.95	
---at 9.00m stiff				D 8.80 U 9.00 - 9.45	(6)		
				D 9.45			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHH7** Sheet 2 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	334780.0 E 185334.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Edeco	Ground Level	7.02 m AOD
Client	Welsh Office	Drillers	A.M/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	13/11/1997
		Core Bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Soft dark grey occasionally thinly laminated organic CLAY with occasional fine to medium gravel size pockets of brownish black spongy to firm fibrous peat. (Estuarine Alluvium)			D 10.30							
			B 10.50 - 11.10						S3 10.50	
			D 10.50						10.95	
---from 10.50m very soft										
			U 11.70 - 12.15	(10)						
---from 11.80m fine sandy			D 11.80							
	12.20	-5.18	B 12.15 - 12.60							
Grey slightly sandy clayey sub-angular and sub-rounded GRAVEL and COBBLES of sandstone and mudstone. (Fluvial Alluvium)	12.60	-5.58								
			D 13.00						S56 13.00	
Reddish brown mottled greyish green occasionally thinly laminated completely weathered silty MUDSTONE, very weak to weak. (Mercia Mudstone Group)									13.45	
			W 13.85							
			D 14.10						S50/75mm 14.10	
									14.33	
---from 14.35 to 15.75m no recovery			14.35 - 15.75		0	0	0	NA		
	15.75	-8.73							S112/235mm 15.75	
Reddish brown thinly bedded highly weathered silty MUDSTONE, weak completely fractured. (Mercia Mudstone Group)			15.75 - 16.30		82	18	0	NI 1 NA		16.14
			16.30 - 16.50		45	0	0	NI NA		
---from 16.10 to 16.20m with very closely horizontal discontinuities planar rough tight			16.50 - 17.50		0	0	0	NA		
									S99 17.50	
			17.50 - 17.80		0	0	0	NA	17.95	
---from 17.75m occasionally mottled green										
---from 18.15 to 18.27m with very closely spaced horizontal discontinuities planar rough tight			17.80 - 18.80		60	13	0	NI 1 NI NA		
									S86 18.80	
			18.80 - 19.30		0	0	0	NA	19.25	
---from 19.30m sandy										
	19.65	-12.63								
			19.30 - 20.30		100	34	14	NI 1		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHH7** Sheet 3 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	334780.0 E 185334.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Edeco	Ground Level	7.02 m AOD
Client	Welsh Office	Driller	A.M/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	13/11/1997
		Core bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Installation
							NI		
							1		
Reddish brown thinly bedded moderately weathered silty MUDSTONE, moderately weak with medium spaced very thin beds of green slightly to moderately weathered very silty mudstone moderately weak to moderately strong with closely spaced horizontal discontinuities planar rough tight. (Mercia Mudstone Group)							NI		
			20.30 - 21.60	98	41	25			
							7		
---from 20.30 to 20.90m highly weathered weak completely fractured	21.60	-14.58							
Reddish brown thinly to medium sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with very closely to closely spaced sub-horizontal discontinuities planar, rough, tight. (Mercia Mudstone Group)			21.60 - 23.00	91	79	36	10		
	23.00	-15.98							
Reddish brown medium horizontally bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)							NI		
			23.00 - 24.50	45	0	0			
							NA		
								S50/30mm 24.50 24.68	
	25.10	-18.08	24.50 - 25.70	40	4	0	NI		
Reddish brown medium bedded moderately to highly weathered silty MUDSTONE, weak to moderately weak completely fractured. (Mercia Mudstone Group)	25.60	-18.58							
Reddish brown very thinly to thinly horizontal to sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with widely spaced very thin to thin beds of green very silty mudstone and closely to medium spaced horizontal to sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			25.70 - 26.70	90	80	37	8		
							14		
---from 27.30 to 27.45m moderately to highly weathered moderately weak completely fractured			26.70 - 28.10	96	54	27			
							NI		
---from 27.90 to 27.10m completely fractured									
---from 28.10 to 28.40m sub-vertical fracture (075°) planar rough tight			28.10 - 29.50	96	82	41	9		
---from 29.50 to 29.75m sub-vertical fracture (065°) planar rough tight							2		
							NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHH7** Sheet 4 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	334780.0 E 185334.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Edeco	Ground Level	7.02 m AOD
Client	Welsh Office	Driller	A.M/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	13/11/1997
		Core bit	P.C.D		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown very thinly to thinly horizontal to sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with widely spaced very thin to thin beds of green very silty mudstone and closely to medium spaced horizontal to sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)				29.50 - 31.00	91	60	23	2 NI 0 NI 2		
		31.55	-24.53							
Reddish brown thinly to medium bedded highly weathered silty MUDSTONE, weak completely fractured. (Mercia Mudstone Group) ---from 31.95 to 32.50m with very closely spaced very thin to thin beds of green moderately to highly weathered silty mudstone				31.00 - 32.50	93	75	27	5 NI 5 2 NI		
				32.50 - 34.00	100	21	15	NI 0 0		
		33.80	-26.78							
Light green medium to thickly horizontal to sub-horizontal bedding fresh to slightly weathered slightly silty dolomitic SANDSTONE, strong with medium spaced thick laminations to very thin beds of reddish brown and green sandy mudstone and medium to widely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group) ---from 35.00m thinly bedded slightly dolomitic silty				34.00 - 35.50	100	97	78	6		
		35.50	-28.48							
Borehole complete at 35.50 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BH1** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	335181.5 E
Project	M4 Relief Road Magor to Castleton Stage 2				185331.3 N
		Drilling Rig	Pilcon	Ground Level	6.10m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	M.B/C.D	Date Started	27/10/1997
Consultant	Ove Arup and Partners			Date Completed	28/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
27/10/1997	1800	16.30	16.30	4.70	
28/10/1997	0830	16.30	16.30	4.10	
28/10/1997	1100	17.55	16.30	4.10	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
14.40	14.65	0.50	
15.75	16.00	0.50	
16.30	16.42	0.50	
17.15	17.42	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	17.55	150	16.30

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
27/10/1997	0000	11.83	4.70	15.0	fast	11.80	0.00

GENERAL NOTES

1. Borehole grouted on completion.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.95	S	N=9 (1,2,2,2,3,2)
4.00	S	N=4 (1,1,1,1,1,1)
6.50	S	N=2 (1,0,1,0,1,0)
9.60	S	N=1 (0,0,1,0,0,0)
11.00	S	N=2 (0,0,0,1,0,1)
12.20	C	N=16 (1,3,3,4,4,5)
14.00	C	N=75 (3,5,7,14,26,28)
15.50	C	N=67 (2,7,12,14,18,23)
16.50	S	N=68 (7,8,12,14,18,24)
17.42	S	80/135mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BH11** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	335181.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185331.3 N
		Driller	I.M	Ground Level	6.10m AOD
Client	Welsh Office	Logged by	M.B/C.D	Orientation	Vertical
				Date Started	27/10/1997
Consultant	Ove Arup and Partners			Date Completed	28/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.25	5.85	B 0.30 - 0.80			
Soft to firm grey mottled brown slightly sandy CLAY. (Estuarine Alluvium) ---from 0.30 to 1.35m occasional rootlets and thin laminations of grey silt.			D 0.85 - 1.35 U 0.90 D 1.35	(12)		
			B 1.95 - 2.62 D 1.95	S9	S 1.95 - 2.40	
Soft to firm occasionally thinly laminated dark grey mottled brown slightly sandy slightly organic CLAY. (Estuarine Alluvium)	2.62	3.48	D 2.80 U 2.95 - 3.40	(8)		
Firm black clayey fibrous PEAT. (Peat) ---at 4.00m becoming plastic dark brown black	3.40	2.70	D 3.40 B 4.00 - 4.85 D 4.00	S4	S 4.00 - 4.45	
Soft dark grey mottled black slightly organic CLAY. (Estuarine Alluvium)	4.85	1.25	D 4.90 U 5.00 - 5.45 D 5.45	(7)		
Soft grey slightly sandy locally very silty CLAY. (Estuarine Alluvium) ---at 8.60m becoming very sandy	6.40	-0.30	B 6.50 - 6.95 D 6.50 D 8.10 - 8.60 U 8.15 B 8.60 - 9.50 D 8.60	S2 (5)	S 6.50 - 6.95	
			B 9.60 - 10.80 D 9.60	S1	S 9.60 - 10.05	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHI1** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	335181.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185331.3 N
		Driller	I.M	Ground Level	6.10m AOD
Client	Welsh Office	Logged by	M.B/C.D	Orientation	Vertical
				Date Started	27/10/1997
Consultant	Ove Arup and Partners			Date Completed	28/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		SPT N & (U blows)	SPT type & depth		Installation
Soft grey slightly sandy locally very silty CLAY. (Estuarine Alluvium)				D	11.00	S2	S	11.00 11.45	
		11.83	-5.73	W	11.83				
Medium dense becoming very dense greyish brown clayey very sandy sub-angular GRAVEL with occasional cobbles. (Fluvial Alluvium)				B	12.00 - 13.50	C16	C	12.20 12.65	
---at 14.00m becoming very dense slightly clayey with many cobbles				B	14.00 - 15.00	C75	C	14.00 14.45	
				B	15.50 - 16.30	C67	C	15.50 15.95	
		16.42	-10.32	D	16.50	S68	S	16.50 16.95	
Reddish brown mottled greyish green completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)									
---from 17.15m highly weathered moderately weak				D	17.42	S80/135mm*	S	17.42 17.56	
		17.55	-11.45						
Cable Percussion boring complete at 17.55 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BH12** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	335493.3 E
Project	M4 Relief Road Magor to Castleton Stage 2				185449.4 N
		Drilling Rig	Pilcon	Ground Level	5.70m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	M.B	Date Started	22/10/1997
Consultant	Ove Arup and Partners			Date Completed	23/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
22/10/1997	1800	13.30	13.30	Dry	
23/10/1997	0800	13.30	13.30	9.30	
23/10/1997	1000	15.40	14.00	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
14.80	15.10	1.00	
15.10	15.28	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.40	150	14.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
22/10/1997	0000	9.30	8.50	15.0	fast	9.30	0.00
23/10/1997	0730	13.60	5.60	15.0	fast	13.30	13.50

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.05	S	N=9 (1,2,2,2,3,2)
5.00	S	N=1 (0,0,0,1,0,0)
8.00	S	N=4 (0,1,1,1,1,1)
9.50	S	N=2 (1,0,1,0,1,0)
11.00	S	1/450mm*
12.50	S	N=34 (3,4,6,8,9,11)
14.50	S	83/150mm (18,27,33,50)
15.28	S	88/125mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BH12** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	335493.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185449.4 N
		Driller	A.M	Ground Level	5.70m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	22/10/1997
Consultant	Ove Arup and Partners			Date Completed	23/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.20	5.50				
Firm becoming soft brown mottled grey sandy locally very silty CLAY. (Estuarine Alluvium)				B 0.50 - 0.90			
---from 0.50 to 1.00m occasional rootlets				D 1.00 - 1.50 U 1.05	(9)		
				D 1.50			
---from 2.00m becomes soft				B 2.05 - 2.60 D 2.05 - 2.45	S9	S 2.05 2.50	
		2.60	3.10				
Spongy black slightly sandy clayey fibrous PEAT. (Peat)				D 2.70 U 2.80 - 3.25	(5)		
				D 3.25			
		3.70	2.00				
Very soft dark grey mottled black slightly sandy CLAY. (Estuarine Alluvium)				D 3.80 U 4.00 - 4.45	(4)		
---from 3.80 to 6.10m occasional coarse gravel sized pockets of black fibrous peat				D 4.45			
				D 4.90 B 5.00 - 6.00 D 5.00	S1	S 5.00 5.45	
---at 6.10m becoming sandy				D 6.10			
				U 6.50 - 6.95	(4)		
				D 6.95			
				B 7.50			
				B 8.00 - 9.20 D 8.00 - 8.45	S4	S 8.00 8.45	
		9.30	-3.60	W 9.30			
Very soft grey very sandy CLAY locally slightly clayey silt. (Estuarine Alluvium)				B 9.50 - 11.00 D 9.50 - 9.95	S0	S 9.50 9.95	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BH12** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	335493.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185449.4 N
		Driller	A.M	Ground Level	5.70m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	22/10/1997
Consultant	Ove Arup and Partners			Date Completed	23/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very soft grey very sandy CLAY locally slightly clayey silt. (Estuarine Alluvium)				B 11.00 - 12.00 D 11.00 - 11.45	S1/450mm*	S 11.00 11.45	
		12.10	-6.40				
Reddish brown mottled grey completely to highly weathered sandy MUDSTONE, very weak to weak. (Mercia Mudstone Group)				B 12.50 - 13.00 D 12.50	S34	S 12.50 12.95	
				D 14.50 - 15.10	S83/150mm	S 14.50 14.80	
		14.80	-9.10				
Reddish brown highly to moderately weathered slightly sandy MUDSTONE , weak to moderately weak. (Mercia Mudstone Group)				D 15.28	S88/125mm*	S 15.28 15.41	
		15.41	-9.71				
Cable Percussion boring complete at 15.41 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHI3** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	335873.7 E
Project	M4 Relief Road Magor to Castleton Stage 2				185423.0 N
		Drilling Rig	Pilcon	Ground Level	5.66m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	M.B	Date Started	23/10/1997
Consultant	Ove Arup and Partners			Date Completed	27/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
23/10/1997	1800	5.00	4.70	Dry	
27/10/1997	0800	5.00	4.70	Dry	
27/10/1997	1800	14.21	13.80	5.70	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
11.00	11.20	0.50	
13.80	14.00	0.75	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	14.21	150	13.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
27/10/1997	0000	11.60	8.35	15.0	fast	13.80	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.90	S	N=7 (1,2,2,2,1,2)
7.00	S	N=5 (1,2,1,1,1,2)
9.35	S	N=4 (0,0,1,1,1,1)
11.80	C	N=17 (2,3,4,4,5,4)
12.70	S	N=32 (8,6,7,7,8,10)
14.00	S	50/75mm (10,20,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BH13** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	335873.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185423.0 N
		Driller	I.M	Ground Level	5.66m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	23/10/1997
Consultant	Ove Arup and Partners			Date Completed	27/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
TOPSOIL	0.25	5.41	D 0.30 B 0.50 - 1.00			
Soft to firm occasionally laminated dark grey mottled brown slightly sandy CLAY. (Estuarine Alluvium)			U 1.00 - 1.45 D 1.45	(7)		
	1.70	3.96	D 1.70			
Soft dark grey slightly sandy CLAY. (Estuarine Alluvium)			D 1.90 B 2.50 - 3.00	S7	S 1.90 2.35	
	3.05	2.61	D 3.05			
Spongy black clayey fibrous PEAT. (Peat)			U 3.30 - 3.75 D 3.75 D 4.00 U 4.20 - 4.65 D 4.65	(8) (3)		
---at 4.65m occasional fine to medium gravel size pockets of soft grey clay	5.10	0.56	D 5.10			
Soft dark grey mottled black slightly organic CLAY. (Estuarine Alluvium)			U 5.50 - 5.95 D 5.95 D 6.50	(4)		
---at 7.00m very silty			D 7.00 B 7.45 - 8.00	S5	S 7.00 7.45	
			W 8.35 W 8.35 - 8.95 U 8.50	(3)		
	8.80	-3.14				
Soft grey slightly sandy CLAY. (Estuarine Alluvium)			D 8.95 D 9.20 D 9.35	S4	S 9.35 9.80	
---at 9.35m becoming sandy			B 9.80 - 10.50			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHI3** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	335873.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185423.0 N
		Driller	I.M	Ground Level	5.66m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	23/10/1997
Consultant	Ove Arup and Partners			Date Completed	27/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Soft grey slightly sandy CLAY. (Estuarine Alluvium)	10.70	-5.04				
Soft to firm grey mottled red very sandy CLAY with fine to medium sub-rounded gravel. (Estuarine Alluvium)			D 10.90 U 11.20	NR		
	11.60	-5.94				
Firm to stiff reddish brown mottled greyish green very sandy CLAY with occasional sub-angular to sub-rounded gravel. (Mercia Mudstone Group)			D 11.80 B 12.00 - 12.40	C17	C 11.80 12.25	
	12.40	-6.74				
Reddish brown mottled greyish green highly weathered sandy MUDSTONE , very weak to weak. (Mercia Mudstone Group)			D 12.60 D 12.70 B 13.00 - 13.50	S32	S 12.70 13.15	
	13.80	-8.14				
Reddish brown mottled greyish green highly weathered slightly sandy MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)	14.23	-8.57	D 14.00	S50/75mm	S 14.00 14.23	
Cable Percussion boring complete at 14.23 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHI4** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	336155.8 E
Project	M4 Relief Road Magor to Castleton Stage 2				185480.5 N
		Drilling Rig	Pilcon	Ground Level	5.20m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	T.R	Date Started	20/10/1997
Consultant	Ove Arup and Partners			Date Completed	20/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
20/10/1997	1800	13.40	12.30	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
13.15	13.40	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	13.40	150	12.30

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
20/10/1997	0900	1.00	0.80	10.0	slow	0.00	2.00
20/10/1997	1700	13.15	4.65	15.0	fast	12.30	0.00

GENERAL NOTES

1. SPT at 9.60m rods sank under own weight.
2. Borehole grouted to ground level.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.05	S	N=3 (1,0,1,0,1,1)
4.10	S	N=7 (1,1,2,2,1,2)
6.15	S	N=2 (0,1,0,1,0,1)
9.60	S	0/450mm*
11.70	S	N=88 (10,10,17,21,24,26)
13.25	S	86/135mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHI4** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	336155.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185480.5 N
		Driller	A.M	Ground Level	5.20m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	20/10/1997
Consultant	Ove Arup and Partners			Date Completed	20/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
TOPSOIL	0.30	4.90	B 0.30 - 0.90			
Soft to firm brown mottled grey occasionally thinly laminated slightly organic CLAY. (Estuarine Alluvium)			D 1.00 - 1.50 W 1.00 W 1.00 U 1.05 D 1.50	(10)		
	1.70	3.50				
Very soft light greyish blue very silty CLAY. (Estuarine Alluvium)			B 2.05 - 3.05 D 2.05	S3	S 2.05 - 2.50	
			D 3.10 - 3.60 U 3.15	(5)		
---at 3.60m soft			D 3.60			
---at 4.10 soft to firm			D 4.10	S7	S 4.10 - 4.55	
	4.70	0.50	B 4.70 - 5.00			
Firm dark brown fibrous PEAT. (Peat)			U 5.00 - 5.45	(5)		
			D 5.45			
	6.10	-0.90	B 6.15 - 7.20 D 6.15	S0	S 6.15 - 6.45	
Very soft greyish blue very silty slightly sandy organic CLAY with occasional gravel size pocket of brown clayey fibrous peat. (Estuarine Alluvium)			D 7.70 U 7.80 - 8.25	(5)		
			D 8.25			
			D 9.30			
---from 9.30 to 9.50m with occasional gravel size pockets of brown grey very organic clay	9.50	-4.30	B 9.60 - 10.10 D 9.60	S0/450mm*	S 9.60 - 10.05	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHI4** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	336155.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185480.5 N
		Driller	A.M	Ground Level	5.20m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	20/10/1997
Consultant	Ove Arup and Partners			Date Completed	20/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
Very soft bluish grey very silty organic CLAY with occasional gravelsize pockets of brown clayey peat. (Estuarine Alluvium)				D	10.40				
		10.80	-5.60						
Very soft brown grey very sandy organic CLAY with occasional angular to sub-rounded silicious mudstone gravel. (Estuarine Alluvium)				U	11.00 - 11.45	(15)			
				D	11.45				
				B	11.70 - 12.25	S88	S	11.70	
		11.80	-6.60	D	11.70			12.15	
Reddish brown moderately weathered silty MUDSTONE, moderately weak. (Mercia Mudstone Group)									
				W	13.15				
				W	13.15	S86/135mm*	S	13.25	
		13.40	-8.20	D	13.25			13.39	
Cable Percussion boring complete at 13.40 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ1** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	336485.9 E
Project	M4 Relief Road Magor to Castleton Stage 2				185406.0 N
		Drilling Rig	Pilcon	Ground Level	5.80m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	C.D	Date Started	19/10/1997
Consultant	Ove Arup and Partners			Date Completed	19/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
19/10/1997	1600	13.53	12.30	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
13.20	13.40	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	13.53	150	12.30

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
19/10/1997	0000	1.00	0.90	15.0	fast	NR	NR
19/10/1997	0000	13.20	10.80	15.0	fast	12.30	NR

GENERAL NOTES

1. Borehole complete at 13.53m.
2. Vane tests at 3.50m and 7.50m.
3. Borehole backfilled with grout.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=6 (1,2,2,2,1,1)
8.40	S	0/450mm*
13.40	S	82/150mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ1** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	336485.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185406.0 N
		Driller	A.M	Ground Level	5.80m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	19/10/1997
Consultant	Ove Arup and Partners			Date Completed	19/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.40	5.40	B 0.40 - 1.00			
Soft to firm becoming soft brown mottled greyish brown occasionally thinly laminated CLAY. (Estuarine Alluvium)			W 1.00			
---from 0.40 to 1.00m with occasional rootlets			W 1.00 - 1.55	(10)		
			D 1.05			
			U 1.10			
			D 1.55			
			B 2.00 - 3.00	S6	S 2.00 - 2.45	
			D 2.00			
	2.85	2.95				
Soft becoming very soft grey occasional thinly laminated CLAY. (Estuarine Alluvium)			V 3.50			
			D 4.10			
			U 4.40 - 4.85	(8)		
	4.93	0.87	D 4.85			
Firm blackish brown fibrous PEAT, occasionally woody. (Peat)			D 5.10 - 5.60	(11)		
			U 5.15			
			D 5.60			
			D 6.30			
			U 6.50 - 6.95	(7)		
---from 6.95m with much soft grey clay	7.05	-1.25	D 6.95			
Very soft grey very silty occasionally fine sandy CLAY occasionally organic. (Estuarine Alluvium)			V 7.50			
---from 7.05 to 7.50m with some fine to medium gravel sized pockets of blackish brown spongy and firm peat			B 8.40 - 9.20	S0/450mm*	S 8.40 - 8.85	
			D 8.40			
			D 9.90 - 10.45	(8)		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ1** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	336485.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185406.0 N
		Driller	A.M	Ground Level	5.80m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	19/10/1997
Consultant	Ove Arup and Partners			Date Completed	19/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very soft grey very silty occasionally fine sandy CLAY occasionally organic. (Estuarine Alluvium)				U 10.00 - 10.45 D 10.45	(8)		
		11.89	-6.09				
Firm locally stiff dark brown occasional fissured CLAY. (Estuarine Alluvium)				D 12.00 U 12.10 - 12.55 D 12.50	(51)		
		13.20	-7.40	W 13.20			
Reddish brown moderately to highly weathered MUDSTONE, moderately weak to moderately strong. (Mercia Mudstone Group)		13.53	-7.73	W 13.20 D 13.40	S82/150mm*	S 13.40 13.55	
Cable Percussion boring complete at 13.53 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHJ2** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	336833.0 E 185417.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.10m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	T.R/C.D	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	03/11/1997
		Core bit	P.C.D		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
20/10/1997	1600	12.67	12.20	8.05	
01/11/1997	1600	14.20	14.10	1.30	
02/11/1997	0800	14.20	14.10	1.10	
02/11/1997	1600	22.90	14.10	2.40	
03/11/1997	0800	22.90	14.10	0.50	
03/11/1997	1600	30.00	14.10	1.70	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
12.35	12.60	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	12.67	150	12.20
120	22.90	140	14.10

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
20/10/1997	0000	9.20	8.05	15	fast	9.00	12.20

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
12.67	30.00	mist	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=1 (0,0,0,0,0,1)
5.80	S	N=2 (0,0,1,0,0,1)
7.50	S	N=3 (1,0,0,1,1,1)
12.60	S	50/75mm*
14.20	C	93/105mm (9,16,43,50)
15.20	C	50/50mm (10,15,50)
19.40	C	N=95 (4,11,13,17,26,39)
20.40	C	50/65mm (8,17,50)
24.40	C	N=114 (4,10,17,21,31,45)
25.95	C	77/145mm (6,14,27,50)
28.50	C	50/73mm (16,9,50)
30.00	C	50/60mm (18,7,50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHJ2** Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	336833.0 E 185417.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.10 m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	T.R/C.D	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	03/11/1997
		Core Bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI 00	SPT N & depth	Install-ation
TOPSOIL	0.25	4.85	D 0.30			
Soft brown mottled grey slightly sandy CLAY. (Estuarine Alluvium)			B 0.50 - 1.00			
---from 0.30 to 1.00m occasional fine gravel and rootlets			U 1.00 - 1.45	(5)		
			D 1.45			
	1.80	3.30	D 1.80			
Very soft grey slightly sandy CLAY. (Estuarine Alluvium)			B 2.00 - 2.60		S1 2.00	
			D 2.00		2.45	
	2.60	2.50				
Firm black slightly sandy clayey fibrous PEAT. (Peat)			D 2.80			
			U 2.90 - 3.25	(7)		
			B 3.30 - 4.00			
			D 3.35			
			U 4.00 - 4.45	(4)		
			D 4.45			
			D 4.80			
			U 5.00 - 5.45	(4)		
	5.50	-0.40	D 5.45			
---at 5.45m becoming spongy			D 5.50			
			D 5.80		S2 5.80	
Very soft dark grey mottled black slightly sandy CLAY with occasional gravel sized pockets of spongy black slightly sandy fibrous peat. (Estuarine Alluvium)					6.25	
			B 6.25 - 6.30			
			U 6.50 - 6.95	(2)		
			D 6.95			
---at 6.95m becoming very sandy			D 7.20			
			D 7.50		S3 7.50	
					7.95	
			B 8.00 - 9.00			
			W 8.05			
			W 8.05			
			U 9.00 - 9.45	(1)		
			D 9.45			
			D 10.00			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHJ2** Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	336833.0 E 185417.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.10 m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	T.R/C.D	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	03/11/1997
		Core Bit	P.C.D		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Very soft dark grey mottled black slightly sandy CLAY with occasional gravel sized pockets of spongy black slightly sandy fibrous peat. (Estuarine Alluvium)				D 10.00 B 10.40 - 11.10 D 10.40							
		11.10	-6.00	D 11.20							
Reddish brown mottled grey completely to highly weathered slightly clayey sandy MUDSTONE, very weak. (Mercia Mudstone Group) ---at 11.65m becoming reddish brown very sandy				U 11.40 - 11.85 D 11.65 D 12.00	(55)						
		12.35	-7.25	D 12.35							
Reddish brown occasional mottled grey moderately to slightly weathered slightly sandy MUDSTONE, moderately strong. (Mercia Mudstone Group)		12.67	-7.57	D 12.60						S50/75mm* 12.60 12.68	
Reddish brown thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with very closely to closely spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group) ---from 12.67 to 14.20m highly weathered very weak completely fractured				12.67 - 14.20		36	16	0	NI NI		
---from 14.43 to 14.64m highly weathered very weak completely fractured				14.20 - 15.20		44	23	23	2 NI NI	C93/105mm 14.20 14.46 C50/50mm 15.20	
---at 15.40m moderately strong				15.20 - 16.65		99	34	7	NI 0 NI 6	15.40	
---from 16.20 to 16.65m moderately to highly weathered extremely closely to very closely spaced sub-horizontal to inclined discontinuities planar rough tight ---from 16.20 to 16.65m vertical fracture irregular rough tight				16.65 - 18.05		91	51	15	NI 2 NI 7 NI		
---from 16.65 to 16.85m completely fractured ---from 16.95 to 17.15m highly weathered very weak completely fractured ---from 18.05 to 18.20m sandy moderately strong ---from 18.05 to 18.45m completely fractured				18.05 - 19.40		59	25	0	NI 8 NI	C95 19.40 19.85	
---from 18.45 to 18.78m very closely spaced sub-horizontal discontinuities planar rough				19.40 - 20.40		0	0	0	NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHJ2** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	336833.0 E 185417.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.10 m AOD
Client	Welsh Office	Driller	I.M/D.D	Orientation	Vertical
		Logged by	T.R/C.D	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	03/11/1997
		Core bit	P.C.D		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with very closely to closely spaced sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)									C50/65mm 20.40	
									20.62	
				20.40 - 21.40	53	10	0	NI		
								4		
---at 19.20m weak								NI		
----from 20.40 to 20.81m highly weathered very weak completely fractured				21.40 - 22.30	57	9	0	NI		
---from 21.40 to 22.05m sandy moderately strong completely fractured								3		
				22.30 - 22.90	87	6	0	NI		
								4		
				22.90 - 24.40	77	23	6	NI		
								1		
								NI		
									C114 24.40	
								NI	24.85	
				24.40 - 25.40	60	31	0	10		
								NA		
				25.40 - 25.95	0	0	0	NA		
									C77/145mm 25.95	
									26.25	
---at 26.20m very weak				25.95 - 27.00	64	52	24	6		
				27.00 - 28.50	24	0	0	NI		
								0	C50/73mm 28.50	
								NI	28.72	
								1		
								NI		
								2		
				28.50 - 30.00	40	15	6			
Borehole complete at 30.00 m.		30.00	-24.90						C50/60mm 30.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHJ3
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	337119.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				185325.0 N
		Drilling Rig	Pilcon	Ground Level	5.60m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	M.B	Date Started	19/10/1997
Consultant	Ove Arup and Partners			Date Completed	19/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
19/10/1997	1630	12.55	12.20	2.80	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
12.30	12.55	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	12.55	150	12.20

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
19/10/1997	0000	12.40	5.20	15.0	very fast	11.00	11.80

GENERAL NOTES

1. Borehole complete at 12.55m.
2. Borehole backfilled with grout from 12.55m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=5 (1,1,2,1,1,1)
4.00	S	N=6 (1,0,1,1,2,2)
6.50	S	N=3 (2,3,2,1,0,0)
9.00	S	N=1 (0,0,1,0,0,0,)
12.40	S	70/150mm* (20,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ3** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	337119.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185325.0 N
		Driller	I.M	Ground Level	5.60m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	19/10/1997
Consultant	Ove Arup and Partners			Date Completed	19/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.30	5.30				
Soft to firm becoming soft dark grey mottled brown sandy CLAY. (Estuarine Alluvium)			B 0.50 - 1.00 D 0.50			
---at 0.50 to 1.00m slightly organic sandy clay with occasional fine gravel			U 1.00 - 1.45	(8)		
			D 1.45 D 1.60			
---at 1.60m becoming sandy clay with occasional fine gravel and rootlets	1.90	3.70				
			D 2.00	S5	S 2.00 - 2.45	
Soft dark grey slightly sandy CLAY locally very silty. (Estuarine Alluvium)			B 2.45 - 3.00			
			U 3.00 - 3.45	(5)		
			D 3.45 D 3.70			
			B 4.00 - 4.30 D 4.00	S6	S 4.00 - 4.45	
---at 4.00m becoming soft grey mottled slightly sandy organic clay	4.30	1.30				
Firm black slightly sandy fibrous PEAT. (Peat)			D 4.60 U 4.80 - 5.25	(11)		
			W 5.20 W 5.20 D 5.25 - 6.00 B 5.50			
---at 6.30m becoming slightly sandy clayey fibrous			D 6.30 B 6.50 - 7.00 D 6.50	S3	S 6.50 - 6.95	
	6.70	-1.10				
Very soft grey mottled black slightly sandy slightly organic CLAY. (Estuarine Alluvium)			D 7.50			
			U 7.90 - 8.35	(7)		
---at 8.35m becoming slightly sandy organic clay			D 8.35 D 8.70			
---at 8.70m becoming slightly organic sandy clay with occasional fine gravel			D 9.00	S1	S 9.00 - 9.45	
			B 9.50 - 10.00			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ3** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	337119.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185325.0 N
		Driller	I.M	Ground Level	5.60m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	19/10/1997
Consultant	Ove Arup and Partners			Date Completed	19/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very soft grey mottled black slightly sandy slightly organic CLAY. (Estuarine Alluvium)				D 10.50			
		11.10	-5.50	D 11.10			
Reddish brown mottled grey highly weathered sandy MUDSTONE, weak to very weak. (Mercia Mudstone Group)				U 11.30 - 11.75	(40)		
				D 11.75			
		12.30	-6.70				
Reddish brown moderately to highly weathered very sandy MUDSTONE, weak to very weak. (Mercia Mudstone Group)		12.55	-6.95	D 12.40	S70/150mm*	S 12.40	
						12.55	
Cable Percussion boring complete at 12.55 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ4** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	337417.6 E
Project	M4 Relief Road Magor to Castleton Stage 2				185385.3 N
		Drilling Rig	Pilcon	Ground Level	5.20m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	T.R	Date Started	21/10/1997
Consultant	Ove Arup and Partners			Date Completed	21/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
21/10/1997	0800	0.00	0.00	Dry	
21/10/1997	1800	12.70	12.00	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	12.70	150	12.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
21/10/1997	1105	8.90	6.50	15.0	fast	11.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=2 (1,0,1,0,1,0)
4.00	S	N=6 (2,1,2,2,1,1)
6.60	S	N=1 (0,0,0,0,1,0)
9.55	S	N=3 (0,1,1,1,0,1)
11.60	S	N=46 (4,5,10,10,12,14)
12.25	S	N=124 (16,26,26,32,36,30)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ4** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	337417.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185385.3 N
		Driller	A.M	Ground Level	5.20m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	21/10/1997
Consultant	Ove Arup and Partners			Date Completed	21/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.25	4.95				
Firm becoming soft greyish brown mottled brown occasionally thinly laminated slightly fissured CLAY. (Estuarine Alluvium)				B 0.50 - 0.90 D 0.95 - 1.45 U 1.00	(10)		
		1.58	3.62	D 1.45			
Soft grey occasionally thinly laminated CLAY. (Estuarine Alluvium)				B 2.00 - 2.95 D 2.00	S2	S 2.00 - 2.45	
---from 2.95m organic clay				D 3.00 - 3.50 U 3.05 D 3.50	(7)		
		4.20	1.00	B 4.00 - 5.00 D 4.00	S6	S 4.00 - 4.45	
Firm blackish brown occasionally mottled brown fibrous PEAT, occasionally woody. (Peat)				D 5.05 - 5.55 U 5.10 D 5.55	(5)		
		5.78	-0.58				
Very soft grey occasionally fine sandy very silty CLAY with occasional fine and medium gravel sized pockets of firm blackish brown fibrous peat. (Estuarine Alluvium)				B 6.60 - 7.80 D 6.60 - 7.05	S1	S 6.60 - 7.05	
				D 7.90 U 8.00 - 8.45 D 8.45	(6)		
				B 9.55 - 10.00 D 9.55	S3	S 9.55 - 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ4** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	337417.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185385.3 N
		Driller	A.M	Ground Level	5.20m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	21/10/1997
Consultant	Ove Arup and Partners			Date Completed	21/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
Very soft grey occasionally fine sandy very silty CLAY with occasional fine and medium gravel sized pockets of firm blackish brown fibrous peat. (Estuarine Alluvium)		10.30	-5.10	D U	10.30 10.40 - 10.85	(11)			
Soft brown mottled greyish brown very silty CLAY with much medium sand. (Estuarine Alluvium)		11.05	-5.85	D W W D	10.85 11.05 11.05 11.15				
Reddish brown occasionally mottled greyish green occasionally thinly laminated highly to completely weathered MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)				D	11.60	S46	S	11.60 12.05	
Greyish green occasionally mottled reddish brown thinly laminated MUDSTONE, moderately weathered moderately strong. (Mercia Mudstone Group)		12.25	-7.05	D	12.25	S124	S	12.25 12.70	
Cable Percussion boring complete at 12.70 m.		12.70	-7.50						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ5** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	337710.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				185335.0 N
		Drilling Rig	Pilcon	Ground Level	5.30m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	21/10/1997
Consultant	Ove Arup and Partners			Date Completed	21/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
21/10/1997	1800	11.95	11.50	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	11.95	150	11.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
21/10/1997	0000	11.20	6.90	20.0	fast	10.70	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.10	S	N=4 (0,0,1,1,1,1)
3.90	S	N=8 (1,2,2,1,3,2)
8.00	S	N=1 (0,0,0,1,0,0)
11.50	S	N=85 (5,10,10,12,13,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ5** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	337710.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185335.0 N
		Driller	I.M	Ground Level	5.30m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	21/10/1997
Consultant	Ove Arup and Partners			Date Completed	21/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.25	5.05	B 0.40 - 1.00 D 0.40			
Soft to firm brownish grey occasionally thinly laminated slightly organic CLAY. (Estuarine Alluvium)			U 1.00 - 1.45	(7)		
			D 1.45 D 1.70			
	1.90	3.40				
Very soft to soft brownish grey very silty slightly organic CLAY. (Estuarine Alluvium)			D 2.10	S4	S 2.10 2.55	
			B 2.55 - 3.00			
			U 3.00 - 3.45	(2)		
---from 3.45m bluish grey			D 3.45 D 3.75			
---from 3.90m soft			D 3.90	S8	S 3.90 4.35	
			B 4.35 - 4.90			
	4.90	0.40				
Firm dark brownish black fibrous PEAT. (Peat)			D 5.00 U 5.10 - 5.55	(10)		
			D 5.55			
			D 6.00			
			U 6.40 - 6.55	(4)		
	6.60	-1.30				
Very soft dark grey very silty organic CLAY with occasional gravel size pockets of fine sandy clay. (Estuarine Alluvium)			D 6.85 W 6.90 W 6.90			
---from 6.60 to 7.50m very organic with occasional gravel size pockets of black fibrous peat			D 7.50			
			D 8.00	S1	S 8.00 8.45	
			B 8.45 - 9.00			
			U 9.50 - 9.95	(15)		
	9.90	-4.60	D 9.95 - 10.45	(15)		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHJ5** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	337710.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185335.0 N
		Driller	I.M	Ground Level	5.30m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	21/10/1997
Consultant	Ove Arup and Partners			Date Completed	21/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Soft to firm reddish brown very sandy CLAY with occasional angular to sub-rounded silicious and mudstone gravel. (Mercia Mudstone Group)			U 10.00 - 10.45	(15)		
			D 10.45			
	10.70	-5.40	D 10.70			
Reddish brown moderately to highly weathered slightly sandy MUDSTONE, weak. (Mercia Mudstone Group)			B 11.00 - 11.30	NR		
			U 11.00 - 11.30			
			D 11.50	S85	S 11.50	
					11.95	
	11.80	-6.50				
Light greyish green moderately weathered very silty MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)	11.95	-6.65				
Cable Percussion boring complete at 11.95 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK1** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	338030.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				185388.1 N
		Drilling Rig	Pilcon	Ground Level	5.30m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	M.B	Date Started	22/10/1997
Consultant	Ove Arup and Partners			Date Completed	22/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
22/10/1997	1800	12.00	10.70	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
11.60	11.80	0.75	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	12.00	150	10.70

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
22/10/1997	0000	10.90	10.70	15.0	fast	10.70	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.80	S	N=4 (1,2,1,1,1,1)
3.90	S	N=2 (0,0,1,0,1,0)
7.90	S	N=3 (0,0,1,1,1,0)
11.80	S	50/60mm (15,19,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK1** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	338030.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185388.1 N
		Driller	I.M	Ground Level	5.30m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	22/10/1997
Consultant	Ove Arup and Partners			Date Completed	22/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.20	5.10				
Soft to firm grey mottled brown slightly sandy CLAY with some rootlets. (Estuarine Alluvium)			D 0.40 B 0.50 - 0.90 U 1.00 - 1.45 D 1.45	(8)		
Soft becoming very soft grey slightly sandy very silty CLAY. (Estuarine Alluvium) ---from 2.25 to 3.90m occasional fine sub-rounded gravel and rootlets	1.70	3.60	D 1.70 D 1.80 B 2.25 - 2.80 U 2.80 - 3.25 D 3.25 D 3.60 D 3.90 B 4.35 - 5.00 U 5.00 - 5.45 D 5.45 D 6.00	S4 (4) S2 (1)	S 1.80 2.25 S 3.90 4.35	
Firm black sandy fibrous PEAT. (Peat) ---from 6.85m becoming black mottled brown very sandy	6.20	-0.90	D 6.20 U 6.40 - 6.85 D 6.85 W 7.40	(15)		
Very soft grey mottled black slightly sandy CLAY with occasional coarse gravel sized pockets of black fibrous peat.(Estuarione Alluvium)	7.70	-2.40	D 7.70 D 7.90 B 8.35 - 9.00	S3	S 7.90 8.35	
Reddish brown mottled grey completely to highly weathered sandy MUDSTONE, very weak to weak. (Mercia Mudstone Group)	9.20	-3.90	D 9.20 B 9.40 - 10.00 U 9.40 U 10.00 - 10.45			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK1** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	338030.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185388.1 N
		Driller	I.M	Ground Level	5.30m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	22/10/1997
Consultant	Ove Arup and Partners			Date Completed	22/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
Reddish brown mottled grey completely to highly weathered sandy MUDSTONE, very weak to weak. (Mercia Mudstone Group)				U	10.00 - 10.45				
				D	10.45				
---at 10.45m becoming reddish brown slightly sandy									
				D	11.50				
		11.60	-6.30						
Reddish brown mottled grey highly weathered sandy MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)				D	11.80	S50/60mm	S	11.80	
		12.00	-6.70					12.01	
Cable Percussion boring complete at 12.00 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK2** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	338344.8 E
Project	M4 Relief Road Magor to Castleton Stage 2				185347.3 N
		Drilling Rig	Pilcon	Ground Level	7.30m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	T.R	Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	16/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
16/10/1997	1800	11.25	8.60	6.80	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
10.80	11.25	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	11.25	150	8.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
16/10/1997	1500	6.80	6.80	20.0	seepage	5.85	5.85
16/10/1997	1700	10.75	9.50	15.0	fast	8.00	0.00

GENERAL NOTES

1. Borehole complete at 11.25m, grouted to ground level.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=7 (1,1,1,2,2,2)
4.00	S	N=3 (0,1,1,0,1,1)
8.15	S	N=20 (3,4,5,4,5,6)
9.15	S	N=42 (4,7,8,10,10,14)
10.55	S	37/150mm
11.10	S	80/150mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK2** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	338344.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185347.3 N
		Driller	A.M	Ground Level	7.30m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	16/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.30	7.00	B 0.30 - 0.90			
Soft brown mottled grey CLAY with occasional partings of light brown fine sand and rootlets. (Estuarine Alluvium)			D 0.95 - 1.45 U 1.00	(7)		
			D 1.45			
			D 2.00	S7	S 2.00 - 2.45	
			B 2.45 - 3.00			
Very soft blue grey slightly organic CLAY. (Estuarine Alluvium)	3.00	4.30	D 3.05 - 3.55 U 3.10	(6)		
			D 3.55			
			D 4.00	S0	S 4.00 - 4.23	
			B 4.45 - 5.00			
			D 5.10 - 5.60 U 5.15	(6)		
			D 5.60			
Firm dark brownish black fibrous PEAT. (Peat)	5.90	1.40	B 5.90 - 6.00 U 6.00 - 6.45	(7)		
Very soft to soft dark grey sandy organic CLAY with occasional gravel size pockets of dark brown sandy clayey peat. (Estuarine Alluvium)	6.45	0.85	D 6.45			
			D 7.20			
			U 7.50 - 7.95	(10)		
			D 7.95			
Bluish green grey completely weathered MUDSTONE, very weak.(Mercia Mudstone Group)	8.10	-0.80	D 8.15	S20	S 8.15 - 8.60	
			B 8.60 - 9.10			
---at 9.05m reddish brown mottled greyish green highly weathered very weak to weak			D 9.15 - 9.60	S42	S 9.15 - 9.60	
			B 9.60 - 10.75			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK2** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	338344.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185347.3 N
		Driller	A.M	Ground Level	7.30m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	16/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Bluish green grey completely weathered MUDSTONE, very weak.(Mercia Mudstone Group)				D 10.55	S37/150mm	S 10.55 10.85	
---at 10.80m reddish brown moderately to highly weathered weak					S80/150mm*	S 11.10 11.25	
		11.25	-3.95				
Cable Percussion boring complete at 11.25 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHK3
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	338602.4 E
Project	M4 Relief Road Magor to Castleton Stage 2				185393.9 N
		Drilling Rig	Pilcon	Ground Level	6.00m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	M.B	Date Started	17/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
17/10/1997	1800	11.20	9.50	7.10	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
0.70	0.95	0.25	
1.45	1.75	0.25	
10.85	11.20	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	11.20	150	9.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
17/10/1997	0000	10.80	7.10	15.0	fast	9.50	0.00

GENERAL NOTES

1. Borehole complete at 11.20m.
2. Backfilled with grout from 11.20m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	C	N=43 (4,5,7,10,10,16)
1.80	S	N=6 (2,2,1,2,2,1)
4.00	S	N=2 (1,0,1,0,1,0)
6.80	S	N=13 (1,1,3,3,4,3)
10.20	S	N=81 (8,8,12,16,22,31)
11.05	S	80/150mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK3** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	338602.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185393.9 N
		Driller	A.M	Ground Level	6.00m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	17/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
MADE GROUND: Reddish brown sandy gravelly clay with some gravel sized black clayey ash sand and occasional cobbles and boulders.			B 0.00 - 0.95			
	0.95	5.05	B 1.00 - 1.80	C43	C 1.00 - 1.45	
MADE GROUND: Reddish brown very sandy clay with much angular to sub-angular siliceous clinker and occasional cobbles and boulders.						
	1.80	4.20	D 1.80 - 2.25	S6	S 1.80 - 2.25	
Soft becoming very soft brown mottled grey slightly sandy CLAY locally very silty. (Estuarine Alluvium)						
---at 1.80m very silty						
			D 4.00	S2	S 4.00 - 4.45	
			B 4.50 - 5.00			
			D 5.30			
			B 5.40 - 5.90	(4)		
			U 5.40 - 5.85			
			D 5.95 - 6.45	(11)		
---at 5.95m becoming grey mottled black slightly organic clay			U 6.00			
	6.45	-0.45	D 6.45			
---at 6.00m very silty						
			D 6.80	S13	S 6.80 - 7.25	
Spongy dark brown slightly sandy clayey fibrous PEAT. (Peat)						
	7.40	-1.40				
Soft dark grey slightly sandy CLAY. (Estuarine Alluvium)						
			D 7.80			
			U 8.10 - 8.55	(11)		
			D 8.55			
			D 8.70 - 9.20			
---at 8.70m becoming grey mottled black slightly organic clay			U 8.75			
	9.25	-3.25	D 9.20			
			U 9.40 - 9.80	(48)		
Light grey mottled blue completely weathered slightly sandy MUDSTONE, very weak. (Mercia Mudstone Group)						
			D 9.80			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK3** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	338602.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185393.9 N
		Driller	A.M	Ground Level	6.00m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	17/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Light grey mottled blue completely weathered slightly sandy MUDSTONE, very weak. (Mercia Mudstone Group)				B 10.20 - 10.80 D 10.20 - 10.65	S81	S 10.20 10.65	
		10.80	-4.80	W 10.80			
Reddish brown highly weathered silty MUDSTONE, weak to very weak. (Mercia Mudstone Group)				D 11.05	S80/150mm*	S 11.05 11.20	
		11.20	-5.20				
Cable Percussion boring complete at 11.20 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK4** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	338949.9 E
Project	M4 Relief Road Magor to Castleton Stage 2				185441.6 N
		Drilling Rig	Pilcon	Ground Level	5.50m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	T.R	Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
16/10/1997	1800	10.00	10.00	Dry	
17/10/1997	0800	10.00	10.00	8.20	
17/10/1997	1000	11.05	10.80	8.20	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
1.25	1.50	1.00	
10.80	11.05	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	11.05	150	10.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
16/10/1997	0000	1.10	1.00	15.0	slight	1.00	3.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	C	67/115mm (10,11,17,50)
2.00	C	N=18 (6,7,7,8,2,1)
3.50	S	N=3 (1,0,1,0,1,1)
6.00	S	N=7 (1,2,2,1,3,1)
9.40	S	N=30 (4,6,7,7,8,8)
10.50	S	80/150mm (14,19,30,50)
11.05	S	50/20mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK4** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	338949.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185441.6 N
		Driller	I.M	Ground Level	5.50m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
MADE GROUND: Dark brown black sandy fine to coarse angular to subangualr ash, clinker and silicious gravel.				B 0.00 - 0.50 D 1.00 W 1.00 D 2.00	C67/115mm C18	C 1.00 1.27 C 2.00 2.45	
		2.30	3.20				
MADE GROUND: Very soft to soft greyish blue silty slightly organic clay with occasional gravel size pockets of black fine to coarse ash sand and fine to coarse subangular to subrounded clinker and silicious gravel.				D 2.50 U 2.60 - 3.05 D 3.05	(6)		
		3.20	2.30	D 3.30			
Very soft light greyish blue slightly organic CLAY. (Estuarine Alluvium)				D 3.50 B 4.00 - 4.50 U 4.50 - 4.95	S3 (8)	S 3.50 3.95	
		4.60	0.90				
Spongy dark brownish black fibrous PEAT. (Peat) ---from 5.50m with occasional gravel to cobble size pockets of light grey very organic clay ---from 6.00m becoming spongy to firm				D 4.95 D 5.50 D 6.00 B 6.50 - 7.00	S7	S 6.00 6.45	
		7.40	-1.90	D 7.40 U 7.50 - 7.95	(3)		
Very soft to soft light greyish blue organic CLAY. (Estuarine Alluvium) ---from 7.95 to 8.50m very organic				D 7.95 D 8.50			
		9.10	-3.60	D 9.10			
Blue greenish grey completely weathered silty MUDSTONE, very weak. (Mercia Mudstone)				D 9.40	S30	S 9.40 9.85	
		10.00	-4.50	B 10.00 - 10.50			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK4** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	338949.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185441.6 N
		Driller	I.M	Ground Level	5.50m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Blue greenish grey completely weathered silty MUDSTONE, very weak. (Mercia Mudstone)		10.00	-4.50	B 10.00 - 10.50			
				D 10.50	S80/150mm	S 10.50 - 10.80	
Red brown mottled grey green highly to completely weathered silty MUDSTONE very weak to weak. (Mercia Mudstone Group)		10.80	-5.30				
		11.05	-5.55	D 11.05	S50/20mm*	S 11.05 - 11.07	
Brown highly weathered silty MUDSTONE, weak. (Mercia Mudstone Group)							
Cable Percussion boring complete at 11.05 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
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Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK5** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	339228.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				185536.9 N
		Drilling Rig	Pilcon	Ground Level	5.20m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	T.R	Date Started	17/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
17/10/1997	1800	11.55	11.30	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
11.30	11.55	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	11.55	150	11.30

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
17/10/1997	1600	9.20	5.40	15.0	fast	9.00	11.30

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=7 (2,1,3,1,2,1)
4.00	S	1/450mm*
11.50	S	50/50mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK5** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	339228.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185536.9 N
		Driller	I.M	Ground Level	5.20m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	17/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.30	4.90	B 0.30 - 1.00			
Firm greyish brown occasionally thinly laminated CLAY. (Estuarine Alluvium)				U 1.00 - 1.45	(10)		
				D 1.45			
				D 1.80			
				D 2.00	S7	S 2.00 - 2.45	
---at 2.00m becoming soft		2.40	2.80				
Very soft grey very silty CLAY. (Estuarine Alluvium)				B 2.50 - 3.00			
				U 3.00 - 3.45	(4)		
				D 3.45			
				D 3.80			
				D 4.00 - 4.60	S1/450mm*	S 4.00 - 4.45	
				B 4.60 - 5.00			
		5.30	-0.10				
Firm dark brownish black fibrous PEAT with gravel to cobble size pockets of grey organic clay. (Peat)				D 5.40 W 5.40 W 5.40 - 6.05 U 5.60	(7)		
				D 6.05			
				B 6.50 - 7.10			
		7.10	-1.90				
Very soft grey organic CLAY with gravel to cobble size pockets of dark brown slightly clayey peat. (Estuarine Alluvium)				D 7.20			
				U 7.40 - 7.85	(8)		
				D 7.85			
				D 8.50			
		8.90	-3.70	D 8.90			
Soft to firm reddish brown sandy very clayey SILT with gravel size pockets of sandy clay and occasional fine to medium angular to subrounded gravel. (Mercia Mudstone Group)				U 9.20 - 9.65	(20)		
				D 9.65			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHK5** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	339228.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185536.9 N
		Driller	I.M	Ground Level	5.20m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	17/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
Soft to firm reddish brown sandy very clayey SILT with gravel size pockets of sandy clay and occasional fine to medium angular to subrounded gravel. (Mercia Mudstone Group)		10.30	-5.10	D	10.30				
				B	10.50 - 11.30				
				D	10.50				
Blue greenish grey completely weathered silty MUDSTONE, very weak. (Mercia Mudstone Group)									
---from 11.30m becoming moderately to highly weathered		11.55	-6.35	D	11.50	S50/50mm*	S	11.50 11.55	
Cable Percussion boring complete at 11.55 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL1** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	339545.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				185562.1 N
		Drilling Rig	Pilcon	Ground Level	5.00m AOD
Client	Welsh Office	Driller	A.M	Orientation	Vertical
		Logged by	M.B	Date Started	18/10/1997
Consultant	Ove Arup and Partners			Date Completed	18/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
18/10/1997	1600	10.91	9.30	8.80	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
10.40	10.70	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	10.91	150	9.30

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
18/10/1997	0000	1.68	1.68	0.00	slight	1.50	NR
18/10/1997	0000	6.10	5.80	15.0	slow	6.00	NR
18/10/1997	0000	10.40	8.80	15.0	fast	8.85	NR

GENERAL NOTES

1. Borehole complete at 10.93m.
2. Backfilled with bentonite/grout from 10.93m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.95	S	0/450mm*
4.00	S	0/450mm*
6.20	S	N=7 (1,1,2,2,1,2)
9.00	S	N=22 (3,4,4,6,5,7)
10.70	S	50/75mm (17,34,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL1** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	339545.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185562.1 N
		Driller	A.M	Ground Level	5.00m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	18/10/1997
Consultant	Ove Arup and Partners			Date Completed	18/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm to stiff grey mottled brown slightly sandy CLAY with occasional rootlets. (Estuarine Alluvium)			B 0.50 - 0.90 D 0.95 U 1.05 - 1.50	(12)		
			D 1.50			
	1.68	3.32				
Very soft grey slightly sandy CLAY. (Estuarine Alluvium) ---from 1.95 to 3.00m slightly organic			D 1.95 B 2.60 - 3.00 D 3.05 D 3.10 D 3.55 D 4.00 B 4.55 - 5.00 D 5.05 - 5.55 U 5.10 D 5.55	S0/450mm* S0/450mm* (5)	S 1.95 2.40 S 4.00 4.45	
	5.63	-0.63	B 5.70 - 6.10 U 5.70 - 6.10	NR		
Firm black slightly sandy fibrous PEAT. (Peat)	6.10	-1.10	B 6.20 - 7.15 D 6.20	S7	S 6.20 6.65	
Soft dark grey mottled black slightly organic very sandy CLAY. (Estuarine Alluvium)						
	7.15	-2.15	D 7.20 U 7.30 - 7.75	(9)		
Very soft dark grey mottled black sandy CLAY with occasional thin beds of firm black fibrous peat. (Estuarine Alluvium)	7.75	-2.75	D 7.75			
Soft dark grey slightly organic sandy CLAY with occasional sub-angular gravel and cobbles. (Estuarine Alluvium)			U 8.10 - 8.55 B 8.55 - 8.80	NR		
	8.80	-3.80				
Grey mottled pale blue highly weathered sandy MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)			D 9.00 B 9.45 - 10.00	S22	S 9.00 9.45	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL1** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	339545.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185562.1 N
		Driller	A.M	Ground Level	5.00m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	18/10/1997
Consultant	Ove Arup and Partners			Date Completed	18/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
Grey mottled pale blue highly weathered sandy MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)		10.40	-5.40	W	10.40				
				W	10.40				
				D	10.70	S50/75mm	S	10.70	
Brown mottled grey highly weathered sandy MUDSTONE, moderately weak to moderately strong. (Mercia Mudstone Group)		10.93	-5.93					10.93	
Cable Percussion boring complete at 10.93 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL2** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	339715.5 E
Project	M4 Relief Road Magor to Castleton Stage 2				185640.1 N
		Drilling Rig	Pilcon	Ground Level	6.10m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	T.R	Date Started	18/10/1997
Consultant	Ove Arup and Partners			Date Completed	18/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
18/10/1997	1800	11.00	9.20	8.60	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
10.50	10.80	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	11.00	150	9.20

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
18/10/1997	1600	10.40	9.05	20.0	slow	9.20	NR

GENERAL NOTES

1. Borehole complete at 11.00m.
2. Borehole backfilled with bentonite/cement grout.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.10	S	N=3 (1,0,0,1,1,1)
4.00	S	N=1 (1,0,1,0,0,0)
7.20	S	N=3(1,0,1,1,1,0)
9.20	S	N=25 (2,4,5,6,7,7)
10.80	S	50/60mm (19,36,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL2** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	339715.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185640.1 N
		Driller	I.M	Ground Level	6.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	18/10/1997
Consultant	Ove Arup and Partners			Date Completed	18/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.20	5.90				
Soft to firm becoming soft brownish grey occasionally thinly laminated CLAY with occasional rootlets. (Estuarine Alluvium)			B 0.50 - 1.00 D 0.50			
---at 1.00m becoming soft very silty			U 1.00 - 1.45	(10)		
			D 1.45			
			D 1.70			
	2.10	4.00	D 2.10	S3	S 2.10 - 2.55	
Very soft bluish grey very silty CLAY. (Estuarine Alluvium)			B 2.55 - 3.00			
			U 3.00 - 3.45	(2)		
			D 3.45			
			D 3.70			
			D 4.00	S1	S 4.00 - 4.45	
			B 4.50 - 5.00			
			U 5.00 - 5.45	(3)		
			D 5.45			
	5.60	0.50	D 5.60			
Firm dark brownish black slightly sandy fibrous PEAT. (Peat)			U 5.70 - 6.15	(20)		
			D 6.15 - 6.80			
---from 5.70m with gravel to cobble size pockets of brownish green slightly sandy clayey very organic silt			B 6.20			
	6.80	-0.70				
Very soft grey sandy CLAY. (Estuarine Alluvium)			D 7.00			
			D 7.20	S3	S 7.20 - 7.65	
			B 7.65 - 8.00			
---from 8.30m with occasional firm black slightly sandy fibrous peat			U 8.30 - 8.75	(7)		
			D 8.95			
			W 9.05			
	9.20	-3.10	W 9.05	S25	S 9.20 - 9.65	
Greenish blue completely weathered silty MUDSTONE, very weak. (Mercia Mudstone Group)			D 9.20			
			B 9.70 - 10.50			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL2** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	339715.5 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185640.1 N
		Driller	I.M	Ground Level	6.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	18/10/1997
Consultant	Ove Arup and Partners			Date Completed	18/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
Greenish blue completely weathered silty MUDSTONE, very weak. (Mercia Mudstone Group)		10.50	-4.40	D	10.50				
Light greyish green moderately weathered slightly sandy SILTSTONE moderately weak. (Mercia Mudstone Group)		11.00	-4.90			S50/60mm	S	10.80 11.01	
Cable Percussion boring complete at 11.00 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHL3
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	339888.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				185686.1 N
		Drilling Rig	Pilcon/Hands England	Ground Level	5.20m AOD
Client	Welsh Office	Drillers	C.A/D.D	Orientation	Vertical
		Logged by	C.D/TR	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	31/10/1997
		Core bit	P.C.D		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
17/10/1997	1800	7.45	6.80	Dry	
18/10/1997	0800	7.45	6.80	4.30	
18/10/1997	1300	11.00	10.50	Dry	
31/10/1997	0800	11.00	10.50	2.80	
31/10/1997	1800	25.00	11.00	2.70	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
10.70	11.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	11.00	150	10.50
120	25.00	140	11.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
17/10/1997	0000	0.80	0.80	0	seepage	0.00	NR

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
11.00	25.00	mist	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.50	S	1/450mm*
5.00	S	N=3 (1,0,1,0,1,1)
7.00	S	N=1 (1,0,0,0,0,1)
8.50	S	N=8 (1,1,1,2,2,3)
10.70	S	81/145mm (8,15,31,50)

* Seating blows only.

GENERAL NOTES

1. Vane tests at 1.50m, 4.50m and 8.00m.
2. Cable Percussion boring complete at 11.00m, rotary casing installed.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHL3** Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	339888.1 E 185686.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.20 m AOD
Client	Welsh Office	Drillers	C.A/D.D	Orientation	Vertical
		Logged by	C.D/TR	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	31/10/1997
		Core Bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
TOPSOIL	0.40	4.80	D 0.40 U 0.50 - 0.90	(7)		
Soft becoming very soft grey mottled brown CLAY. (Estuarine Alluvium) ---at 0.40m firm ---from 0.40 to 1.50m with occasional rootlets			D 1.00 D 1.50 V 1.50 D 2.00			
---from 2.40m very soft	2.90	2.30	B 2.50 - 2.95 D 2.50		S1/450mm* 2.50 2.95	
Very soft grey CLAY occasionally very silty. (Estuarine Alluvium) ---from 4.90m with occasional fine and medium gravel sized pockets of blackish brown firm slightly fibrous peat	5.10	0.10	U 3.25 - 3.95 D 4.00 D 4.00 D 4.25 V 4.50 D 4.90 B 5.00 - 5.45 D 5.00	(3)	S3 5.00 5.45	
Firm black brown mottled brown slightly fibrous PEAT. (Peat) ---from 5.10 to 5.45m with occasional medium gravel sized pockets of soft grey clay	6.00	-0.80	D 5.75 B 6.00 - 6.45 U 6.00 - 6.45 U 6.50 - 7.00	(7) (8)		
Soft grey CLAY with occasional fine and medium gravel sized pockets of blackish brown firm slightly fibrous and occasionally woody PEAT. (Estuarine Alluvium)	7.00	-1.80	D 7.00 - 7.45		S1 7.00 7.45	
Soft grey very silty CLAY occasionally fine sandy and with medium gravel sized pockets of brownish black spongy fibrous woody peat. (Estuarine Alluvium)	8.25	-3.05	D 8.00 V 8.00 D 8.25			
Soft becoming firm greyish green mottled yellow brown CLAY occasionally organic. (Estuarine Alluvium)	9.70	-4.50	B 8.50 - 8.95 D 8.50 D 9.20 U 9.50 - 9.95 D 10.00	(120)	S8 8.50 8.95	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHL3** Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	339888.1 E 185686.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.20 m AOD
Client	Welsh Office	Drillers	C.A/D.D	Orientation	Vertical
		Logged by	C.D/TR	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	31/10/1997
		Core Bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	Fl.	SPT N & depth	Install-ation
Reddish brown occasionally thinly laminated moderately to highly weathered MUDSTONE, weak. (Mercia Mudstone Group)			D 10.00 D 10.25						
---from 10.70m moderately weak			B 10.75 - 11.00 D 10.75					S81/145mm 10.70 11.00	
	11.00	-5.80							
Reddish brown thinly to medium sub-horizontally bedded completely to highly weathered MUDSTONE, very weak to weak with very closely to closely spaced sub-horizontal and inclined discontinuities planar rough tight to open (in places completely fractured). (Mercia Mudstone Group)			11.00 - 12.50	100	53	0	NI 5 NI 10 NI		
	12.50	-7.30							
Reddish brown thinly to medium sub-horizontally bedded moderately to slightly weathered MUDSTONE, moderately strong to strong with very closely spaced sub-horizontal and inclined discontinuities planar rough tight to open. (Mercia Mudstone Group) ---from 12.50 to 12.72m sub-vertical fracture planar smooth tight ---from 12.72 to 12.95m completely fractured ---from 12.95 to 13.45m mottled greyish green ---from 13.65 to 13.80m sub-vertical fracture planar rough tight ---from 13.80 to 13.90m completely fractured ---at 13.90m moderately weak ---from 15.30 to 15.66m greyish green mottled reddish brown ---from 15.80 to 16.80m sub-vertical fracture planar smooth tight ---from 16.50 to 16.80m mottled greyish green ---from 17.00 to 17.27m greyish green mottled reddish brown ---from 17.14 to 18.20m sub-vertical fracture planar rough tight ---from 18.00m slightly sandy strong			12.50 - 13.90	100	59	0	4 NI 17 NI		
			13.90 - 15.30	93	57	46	12		
			15.30 - 16.80	97	77	7	17		
			16.80 - 18.35	100	84	8	14		
			18.35 - 18.70	86	71	0	4		
			18.70 - 18.95	100	100	0	3		
			18.95 - 19.80	74	65	46	6		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHL3** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	339888.1 E 185686.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	5.20 m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/TR	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	31/10/1997
		Core bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly to medium sub-horizontally bedded moderately to slightly weathered MUDSTONE, moderately strong to strong with very closely spaced sub-horizontal and inclined discontinuities planar rough tight to open. (Mercia Mudstone Group)			19.80 - 21.20	91	79	36	4 NI 6		
---from 20.37 to 20.50m completely fractured			21.20 - 22.50	91	59	27	8 NI		
---from 20.47 to 21.20m sub-vertical fracture planar smooth tight									
---from 21.20 to 21.40m sub-vertical fracture planar smooth tight									
---22.40 to 22.50m completely fractured			22.50 - 23.90	98	64	24	NI 12		
---from 22.36 to 22.40m sub-vertical fracture planar rough open (calcite infill)									
---from 22.50 to 22.86m completely fractured									
---from 23.25 to 23.40m inclined to sub-vertical fracture planar rough tight			23.90 - 25.00	100	35	0	NI 5		
---from 23.90 to 24.70m completely fractured									
---from 24.90 to 25.00m sub-horizontal to inclined fracture planar rough tight to open	25.00	-19.80							
Borehole complete at 25.00 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHL4
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	340179.8 E
Project	M4 Relief Road Magor to Castleton Stage 2				185852.9 N
		Drilling Rig	Pilcon	Ground Level	5.10m AOD
Client	Welsh Office	Driller	C.A	Orientation	Vertical
		Logged by	C.D	Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
16/10/1997	1800	6.05	5.50	Dry	
17/10/1997	0800	6.05	5.50	3.60	
17/10/1997	1200	10.50	9.50	3.60	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
9.60	10.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	10.50	150	9.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
16/10/1997	0000	4.20	4.20	20.0	seepage	0.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	1/450mm*
4.00	S	1/450mm*
5.60	S	1/450mm*
6.50	S	N=2 (1,0,0,1,0,1)
9.00	S	N=32 (2,5,6,7,7,12)
10.00	S	92/225mm (9,11,15,37,40)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL4** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	340179.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185852.9 N
		Driller	C.A	Ground Level	5.10m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
TOPSOIL	0.30	4.80	D 0.30			
Soft grey mottled grey brown very silty CLAY with occasional rootlets. (Estuarine Alluvium)			B 0.50 - 1.00			
---at 0.30m with very occasional subangular fine siliceous gravel			U 1.00 - 1.45	(5)		
			D 1.50			
			D 1.75			
---at 1.75m occasional fine sand	1.90	3.20	D 1.75			
	2.10	3.00	B 2.00 - 2.45	S1/450mm*	S 2.00 - 2.45	
Soft blackish brown spongy fibrous slightly clayey PEAT with some coarse gravel sized pockets of soft dark grey organic clay. (Peat)			D 2.00			
			D 2.75			
	2.90	2.20	D 2.90			
Soft dark grey organic CLAY. (Estuarine Alluvium)			U 3.00 - 3.45	(5)		
Firm black brown slightly clayey PEAT occasionally woody. (Peat)			D 3.50			
			W 3.60			
			W 3.60			
			D 3.75			
---at 3.75m with occasional coarse gravel sized pockets of soft dark grey organic clay			B 4.00 - 4.45	S1/450mm*	S 4.00 - 4.08	
			D 4.00			
			D 4.30			
	4.50	0.60				
Soft grey very silty fine sandy CLAY occasionally organic. (Estuarine Alluvium)			U 4.60 - 5.05	(3)		
			D 5.10			
			B 5.60 - 6.05	S1/450mm*	S 5.60 - 6.05	
			D 5.60			
	6.30	-1.20	D 6.30			
Soft reddish brown fine sandy CLAY with occasional subangular medium to coarse grained sandstone and mudstone gravel. (Mercia Mudstone Group)	6.60	-1.50	B 6.50 - 6.95	S2	S 6.50 - 6.95	
			D 7.25			
Firm reddish brown CLAY. (Mercia Mudstone Group)	7.50	-2.40	U 7.50 - 7.95	(100)		
Dark reddish brown mottled greyish green completely weathered MUDSTONE, very weak. (Mercia Mudstone Group)			D 8.00			
			B 9.00 - 9.45	S32	S 9.00 - 9.45	
			D 9.00			
			D 9.75			
			B 10.00 - 10.45	S92/225mm	S 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL4** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	340179.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185852.9 N
		Driller	C.A	Ground Level	5.10m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Dark reddish brown mottled greyish green completely weathered MUDSTONE, very weak. (Mercia Mudstone Group)		10.50	-5.40	B 10.00 - 10.45 D 10.00	S92/225mm	S 10.00-10.38	
Cable Percussion boring complete at 10.50 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL5** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	340509.4 E
Project	M4 Relief Road Magor to Castleton Stage 2				185977.3 N
		Drilling Rig	Pilcon	Ground Level	5.80m AOD
Client	Welsh Office	Driller	C.A	Orientation	Vertical
		Logged by	M.B	Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	15/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
14/10/1997	1200	8.45	7.90	7.80	
15/10/1997	0800	8.45	7.90	5.90	
15/10/1997	1600	12.00	10.00	2.50	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
11.70	12.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	12.00	150	10.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
14/10/1997	0000	1.20	1.20	20.0	seepage	0.00	0.00
14/10/1997	0000	8.00	7.80	10.0	slow	6.00	7.90
15/10/1997	0000	9.60	2.50	0.00		0.00	0.00

GENERAL NOTES

1. Borehole complete at 12.00m.
2. Backfilled with grout to 1.00m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
0.50	S	1/450mm*
1.70	S	1/450mm*
3.50	S	N=2 (1,0,0,1,0,1)
5.50	S	N=1 (1,0,0,1,0,0)
8.00	S	N=29 (3,3,6,7,8,8)
9.50	C	N=23 (2,3,3,5,7,8)
11.50	S	92/225mm (8,17,26,31,35)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL5** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	340509.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185977.3 N
		Driller	C.A	Ground Level	5.80m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	15/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL			B 0.00 - 0.50			
	0.60	5.20	D 0.60	S1/450mm*	S 0.50	
Very soft dark brown sandy CLAY with occasional rootlets from 0.60 to 1.50m. (Estuarine Alluvium)			U 0.70 - 1.15	(28)	0.95	
			D 1.20			
			D 1.50			
			B 1.70 - 2.15	S1/450mm*	S 1.70	
			D 1.70		2.15	
	2.40	3.40	D 2.40			
Very soft dark grey mottled grey brown sandy CLAY. (Estuarine Alluivium)			U 2.50 - 2.95	(10)		
			D 3.00			
			D 3.25			
			B 3.50 - 3.90	S2	S 3.50	
			D 3.50		3.95	
			D 4.25			
	4.40	1.40	D 4.40			
Spongy dark brown to black slightly sandy clayey fibrous PEAT. (Peat)			U 4.50 - 4.95	(10)		
			D 5.00			
			D 5.25			
			B 5.50 - 5.95	S1	S 5.50	
			D 5.50		5.95	
			W 5.90			
			W 5.90			
			D 6.40			
---at 6.40m becoming grey mottled brown very clayey peat	6.60	-0.80	U 6.50 - 6.95	(8)		
Very soft dark grey mottled brown sandy CLAY. (Estuarine Alluvium)			D 7.00			
			D 7.50			
	8.00	-2.20	B 8.00 - 8.45	S29	S 8.00	
			D 8.00		8.45	
Medium dense dark brown mottled grey clayey medium to coarse subangular to subrounded very sandy GRAVEL. (Fluvial Alluvium)	8.45	-2.65				
Stiff dark brown very sandy CLAY with some medium to coarse subrounded gravel. (Fluvial Alluvium)			D 9.00			
	9.60	-3.80	B 9.50 - 10.00	C23	C 9.50	
MUDSTONE As Sheet 2					9.95	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHL5** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	340509.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185977.3 N
		Driller	C.A	Ground Level	5.80m AOD
Client	Welsh Office	Logged by	M.B	Orientation	Vertical
				Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	15/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Reddish brown highly weathered silty MUDSTONE, weak to very weak. (Mercia Mudstone Group)				D 10.25 D 10.50 - 10.95 U 10.50	(140)		
				D 11.00			
---at 11.00m becoming clayey							
---at 11.30m moderately to highly weathered mudstone				B 11.50 - 12.00	S92/225mm	S 11.50 11.88	
		12.00	-6.20				
Cable Percussion boring complete at 12.00 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHL6
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	340751.3 E
Project	M4 Relief Road Magor to Castleton Stage 2				186149.6 N
		Drilling Rig	Pilcon	Ground Level	5.30m AOD
Client	Welsh Office	Driller	C.A	Orientation	Vertical
		Logged by	T.R/C.D	Date Started	15/10/1997
Consultant	Ove Arup and Partners			Date Completed	16/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
15/10/1997	1800	7.70	7.10	Dry	.
16/10/1997	0700	7.70	7.10	3.20	Overnight inflow
16/10/1997	1200	12.00	7.10	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
11.70	12.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	7.70	150	7.10

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
0.50	S	1/450mm*
2.50	S	1/450mm*
4.10	S	N=1 (1,0,0,1,0,0)
5.70	S	1/450mm*
10.10	S	N=38 (2,6,7,8,11,12)
11.50	S	N=65 (7,8,12,14,17,22)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHL6** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	340751.3 E
Project	M4 Relief Road Magor to Castleton Stage 2				186149.6 N
		Drilling Rig	Pilcon	Ground Level	5.30 m AOD
Client	Welsh Office	Drillers	C.A	Orientation	Vertical
		Logged by	T.R/C.D	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core Barrel		Date Completed	16/10/1997
		Core Bit			

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
TOPSOIL	0.40	4.90	D 0.40			
Very soft to soft greyish brown slightly organic CLAY. (Estuarine Alluvium)			B 0.50 - 1.00 D 0.50		S1/450mm* 0.50 0.95	
			D 1.25			
			U 1.50 - 1.95	(5)		
			D 2.00			
			D 2.25			
			B 2.50 - 2.95 D 2.50		S1/450mm* 2.50 2.95	
---at 3.25m very soft grey			W 3.20 W 3.20 D 3.25 - 3.95 U 3.50	(5)		
	4.00	1.30	D 4.00			
Spongy dark brownish black fibrous PEAT. (Peat)			B 4.10 - 4.55 D 4.10		S1 4.10 4.55	
			D 4.75			
			U 5.10 - 5.55	(6)		
	5.70	-0.40	D 5.60 B 5.70 - 6.15		S1/450mm* 5.70	
Very soft grey organic CLAY with occasional gravel size pockets of dark brown very clayey peat. (Estuarine Alluvium)			D 5.70 D 5.70		6.15	
			D 6.70			
			U 7.20 - 7.65	(15)		
	7.70	-2.40	D 7.70			
Soft to firm light brown to grey sandy CLAY with some to much subangular to rounded silicious gravel. (Estuarine Alluvium)			D 8.20			
	8.30	-3.00	D 8.30 U 8.40 - 8.85	(65)		
---at 8.20m silicious gravel and cobbles						
Light reddish brown completely weathered MUDSTONE, weak. (Mercia Mudstone Group)			D 8.90			
---from 8.30m to 8.90m highly to completely weathered very weak with occasional subangular fine and medium,gravel.			D 9.50			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHL6** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	340751.3 E
Project	M4 Relief Road Magor to Castleton Stage 2				186149.6 N
		Drilling Rig	Pilcon	Ground Level	5.30 m AOD
Client	Welsh Office	Drillers	C.A	Orientation	Vertical
		Logged by	T.R/C.D	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core Barrel		Date Completed	16/10/1997
		Core Bit			

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI00	SPT N & depth	Install-ation
Light reddish brown completely weathered MUDSTONE, weak. (Mercia Mudstone Group)				B 10.10 - 10.55		S38 10.10 10.55	
---from 11.00m occasional thinly laminated				D 11.00			
---at 11.50m weak to moderately weak				B 11.50 - 11.95		S65 11.50 11.95	
		12.00	-6.70				
Borehole complete at 12.00 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst

Ground Investigation Report

NR/SR/F10895 APRIL 1998

GROUND INVESTIGATION

M4 RELIEF ROAD

FOR

THE WELSH OFFICE

Consulting Engineer
Ove Arup and Partners

VOLUME 3

Norwest Holst Soil Engineering Ltd

SGE GROUPE

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NR/SR/F10895 **APRIL 1998**

GROUND INVESTIGATION

M4 RELIEF ROAD

FOR

THE WELSH OFFICE

Consulting Engineer
Ove Arup and Partners

VOLUME 3

AGS ASSOCIATION OF GEOTECHNICAL SPECIALISTS
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M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

VOLUME 1	TEXT APPENDIX ONE : EXPLORATORY HOLE LOGS Borehole Records 'A' to 'L' Holes
VOLUME 2	APPENDIX ONE : EXPLORATORY HOLE LOGS Borehole Records 'M' to 'P' Holes Trial Pit Records APPENDIX TWO : INSITU TEST RESULTS Borehole Vane Results Permeability Test Results Groundwater Monitoring Records Geophysics report
VOLUME 3	APPENDIX THREE : LABORATARY TEST RESULTS SOIL SUMMARIES Laboratory Vane Results Shear Strength Plots- undrained triaxials effective triaxials ring shear Particle Size Distribution Graphs Compaction Graphs
VOLUME 4	APPENDIX THREE : LABORATORY TEST RESULTS MCV Plots CBR Plots Oedometer Plots ROCK SUMMARIES Point Load Test Results CHEMICAL CONTAMINATION RESULTS
VOLUME 5	APPENDIX FOUR : DRAWINGS Plans Sections

APPENDIX THREE
LABORATORY

SOILS GEOTECHNICAL

KEY TO SYMBOLS AND LETTERS

Hole ID	■	Indicates results on rock and soil summary sheets

Type	U	Undisturbed sample
	P	Piston sample
	D	Small disturbed sample
	B	Bulk disturbed sample
	C	Rock core

Triaxial /ShearBox	UU	Unconsolidated quick undrained	*(Single)
	UUM	" " "	(Multi)
	UU3	" " "	(Set of 3)
	UUR	" " "	*(Remoulded single)
	UUMR	" " "	(Remoulded multi)
	CD	Consolidated drained	*(Single)
	CDM	" "	(Multi)
	CDR	" "	*(Remoulded single)
	CDRM	" "	(Remoulded multi)
	CU	Consolidated undrained	*(Single)
	CUM	" "	(Multi)
	CUR	" "	*(Remoulded single)
	CURM	" "	(Remoulded multi)
	OTHR	Other	* *NB Single stage tests reported assuming*
	Sh p	Shearbox Peak	*Ø=zero for total stress and c'=zero for*
	Sh r	Shearbox Residual	*effective stress tests.*
	RS r	Ring Shear	

The effective stress parameters are dashed (') on the summary sheets as opposed to the shear strength symbols (c'/=Ø') which are common column headings to total stress results as well.

Consol/Oedometer		Oedometer consolidation Mv quoted for 'p0 to p0+100kPa'

PSD	Frc	Combined Clay/Silt fraction

SO3	t	Total soil sulphate content
	a	Sulphate aqueous extract 2:1 soil/water
	w	Water sulphate content
	d	Total soil sulphur content
Cl	a	Acid soluble chloride ions
	w	Water soluble chloride ions
	d	Dissolved chloride ions
Other	c	Carbonate content (as CO2)
	l	Loss on ignition
	+	Organic content

Compaction	2.5kg	2.5kg Rammer effort
	4.5kg	4.5kg Rammer effort
	Vibro	Vibrating hammer

CBR	t	Top result
	b	Bottom result
	m	Multi point CBR test - highest value

	U/S	Unsuitable sample
	═══	Test scheduled but not complete
	=TX= <TX>	Triaxial test scheduled /Unsuitable
	=ES= <ES>	Effective stress test scheduled/Unsuitable
	=SB= <SB>	Shearbox scheduled/Unsuitable

Project ID : F10895
Project Name : M4

Consolidated Classification/Chemical Summary Sheet

Norwest Holst Soil Engineering

Sample Identification	Sulphate (SO_3) Content %	Sulphate (SO_3) Aq. Extract g/l	Water Sulphate (SO_3) Content g/l	Method of Organic Test	Organic Matter Content %	% passing 2mm Sieve	Particle Density	Bulk Density Mg/m3	Sample Description
BHA1__002.40B							2.71		
BHA1__006.10U							2.71		Reddish brown sandy clay with gravel and cobbles
BHA3__001.50B							2.69		Reddish brown sandy clay with gravel and cobbles
BHA3__002.00D							2.69		Brown clayey sand and gravel
BHA3__004.00D							2.72		Brown clayey sand and gravel
BHB10_002.00D							2.69		Reddish brown clay
BHB16A_003.75D							2.78		Red brown clay
BHB17_002.80D							2.74		Reddish brown silty mudstone
BHB19A_005.30C	0.02								Reddish brown mudstone
BHB1A_006.45D							2.75		Reddish brown very silty clay
BHC1__001.50U							2.70		Reddish brown sandy clay with gravel
BHC3__003.50B	0.02								Reddish brown mudstone
BHC5__006.80C	0.02								Reddish brown mudstone
BHC5A_001.00W			0.185						Brown very sandy clay with gravel
BHC8_001.00U				Dichromate		90		1.8	Brown organic clay with gravel
BHD3__005.55W	0.083								Water
BHD4__003.50B	0.76	0.19		Dichromate	35	85			Grey very silty clay
BHD4__008.30W			0.055						Water
BHD4__016.70C	0.04								Reddish brown mudstone

Organic Content to BS1377:Part3 1990 Clause 3
Sulphate Content to BS1377:Part3 1990 Clause 5

Particle Density to BS1377:Part2 1990Clause 8
Bulk Density to BS1377:Part2 1990Clause 7

Project ID : F10895
Project Name : M4

Consolidated Classification/Chemical Summary Sheet

Norwest Holst Soil Engineering

Sample Identification	Sulphate (SO_3) Content %	Sulphate (SO_3) Aq. Extract g/l	Water Sulphate (SO_3) Content g/l	Method of Organic Test	Organic Matter Content %	% passing 2mm Sieve	Particle Density	Bulk Density Mg/m3	Sample Description
BHD5__001.80W			0.072						Water
BHD5__003.60D				Dichromate	31	85			Brown peat
BHD5__008.80D	.029								Brown very sandy gravel
BHD5__015.30C	0.03								Reddish brown mudstone
BHD6__000.25D	0.050								Brown slightly sandy clay
BHD6__006.70W			.312						Water
BHD6__017.90C	.036								Reddish brown mudstone
BHD7__001.00B	0.06								MADE GROUND: Clay with gravel
BHD7__019.00C	0.06								Reddish brown mudstone
BHE1__001.25W			0.188						Water
BHE3__000.30B	0.05								Brown sandy clay
BHE3__001.90D					0.75				Brown sandy clay
BHE3__008.60W			.165						Water
BHE3A_015.30D	0.07								Reddish brown mudstone
BHE4__002.67W			0.082						Water
BHE4__008.10W			0.041						Water
BHE5__001.70D							2.73		Brown slightly sandy clay
BHE5__004.00D					1.59				Grey slightly sandy clay
BHE6__000.25D	0.03								Brown slightly sandy clay

Organic Content to BS1377:Part3 1990 Clause 3
Sulphate Content to BS1377:Part3 1990 Clause 5

Particle Density to BS1377:Part2 1990Clause 8
Bulk Density to BS1377:Part2 1990Clause 7

Project ID : F10895
Project Name : M4

Consolidated Classification/Chemical Summary Sheet

Norwest Holst Soil Engineering

Sample Identification	Sulphate (SO_3) Content %	Sulphate (SO_3) Aq. Extract g/l	Water Sulphate (SO_3) Content g/l	Method of Organic Test	Organic Matter Content %	% passing 2mm Sieve	Particle Density	Bulk Density Mg/m3	Sample Description
BHE6__006.80D				Dichromate	3.79	100			Grey organic clay
BHE6__014.50B							2.71		Reddish brown mudstone
BHF1__005.40W			.14						Water
BHF1__028.60C	0.05								Reddish brown mudstone
BHF2__012.00W			2.32						Water
BHF2__031.30C	.111								Reddish brown mudstone
BHF3__009.70W			.27						Water
BHF3__012.00W			.332						Water
BHF3__029.40C	0.04								Reddish brown mudstone
BHF4__002.85D	0.13								MADE GROUND: Sandy gravel
BHF4__020.00D	0.06								Reddish brown mudstone
BHF5__019.50B	0.01								Grey sandy gravel
BHF5__025.40C	0.05								Reddish brown mudstone
BHF6__005.70D	0.15								Grey clay
BHF6__021.20B	0.08								Greyish green mudstone
BHF6__025.50C	0.09								Reddish brown mudstone
BHG2__035.50C	0.08								Reddish brown mudstone
BHG4__012.50D							2.71		Reddish brown mudstone
BHG6__013.00B	0.07								Grey sandy gravel

Organic Content to BS1377:Part3 1990 Clause 3
Sulphate Content to BS1377:Part3 1990 Clause 5

Particle Density to BS1377:Part2 1990Clause 8
Bulk Density to BS1377:Part2 1990Clause 7

Project ID : F10895
Project Name : M4

Consolidated Classification/Chemical Summary Sheet

Norwest Holst Soil Engineering

Sample Identification	Sulphate (SO_3) Content %	Sulphate (SO_3) Aq. Extract g/l	Water Sulphate (SO_3) Content g/l	Method of Organic Test	Organic Matter Content %	% passing 2mm Sieve	Particle Density	Bulk Density Mg/m3	Sample Description
BHH1__006.90U				Dichromate		93		1.55	Peat
BHH3__008.10C								1.68	Grey slightly organic clay
BHH4__002.00D							2.67		Dark grey clay
BHH4__004.00U								1.75	Grey clay with pockets of peat
BHH5__002.00D	0.6								Grey slightly sandy clay
BHH5__006.00D	0.365			Dichromate		56			Grey mottled black clay with gravel
BHH5__007.00D					28				Black peat
BHH5__009.55U								1.69	Grey slightly sandy clay
BHH5__012.50D							2.77		Reddish brown mudstone
BHH5__013.90W	0.147								Water
BHH6__004.80U								.8	Peat
BHH6__005.50D				Dichromate	4.0	96			Grey organic clay
BHH6__006.60U				Dichromate	8.7	81			Peat
BHH6__007.90W			0.140						Water
BHH7__001.40D	0.041								Grey clay
BHH7__004.50U								1.32	Black peat
BHH7__008.80D	0.263	0.397							Grey organic clay
BHH7__012.10B	0.27								Grey organic clay
BHH7__013.80W			.14						Water

Organic Content to BS1377:Part3 1990 Clause 3
Sulphate Content to BS1377:Part3 1990 Clause 5

Particle Density to BS1377:Part2 1990Clause 8
Bulk Density to BS1377:Part2 1990Clause 7

Project ID : F10895
Project Name : M4

Consolidated Classification/Chemical Summary Sheet

Norwest Holst Soil Engineering

Sample Identification	Sulphate (SO_3) Content %	Sulphate (SO_3) Aq. Extract g/l	Water Sulphate (SO_3) Content g/l	Method of Organic Test	Organic Matter Content %	% passing 2mm Sieve	Particle Density	Bulk Density Mg/m3	Sample Description
BHI1__001.35D							2.71		
BHI1__004.00D				Dichromate	36	83			
BHI2__002.70D				Dichromate	34	90			Peat
BHI2__002.80U								.93	Peat
BHI2__004.00U								1.71	Dark grey slightly sandy clay
BHI3__004.00D				Dichromate	25	93			Peat
BHI3__004.20U								0.95	Peat
BHI3__008.50U								1.68	Dark grey slightly organic very silty clay
BHI4__001.00D	0.025								Brown slightly organic clay
BHI4__005.00U								1.05	Peat
BHI4__006.10D				Dichromate	3.94	100			Grey very silty organic clay
BHJ1__001.00W			0.068						Brown clay
BHJ1__005.10U								1.03	Peat
BHJ1__005.60D				Dichromate	33	67			
BHJ2__000.50B	0.05								Brown slightly sandy clay
BHJ2__001.00U								1.84	Grey slightly sandy clay
BHJ2__002.90U				Dichromate	34	64			Peat
BHJ2__004.80D	0.56	0.03							Peat
BHJ2__008.05W			0.078						Water

Organic Content to BS1377:Part3 1990 Clause 3
Sulphate Content to BS1377:Part3 1990 Clause 5

Particle Density to BS1377:Part2 1990Clause 8
Bulk Density to BS1377:Part2 1990Clause 7

Project ID : F10895
Project Name : M4

Consolidated Classification/Chemical Summary Sheet

Norwest Holst Soil Engineering

Sample Identification	Sulphate (SO_3) Content %	Sulphate (SO_3) Aq. Extract g/l	Water Sulphate (SO_3) Content g/l	Method of Organic Test	Organic Matter Content %	% passing 2mm Sieve	Particle Density	Bulk Density Mg/m3	Sample Description
BHJ2__012.00D							2.78		Reddish brown mudstone
BHJ3__002.00D				Dichromate		75	2.72		Dark grey slightly sandy clay
BHJ4__000.50B	0.02								Brown clay
BHJ4__002.00D				Dichromate	1.76	59			Grey clay
BHJ5__003.90D							2.66		Grey very silty slightly organic clay
BHJ5__005.10U				Dichromate	24	75			Peat
BHJ5__006.00D				Dichromate	18	18			Peat
BHK1__006.40U				Dichromate		80		1.08	Peat
BHK1__010.00U								2.17	Reddish brown mudstone
BHK4__000.00B							2.70		Sandy gravel
BHK4__004.50U				Dichromate	9.2	96			Blue slightly organic clay
BHK4__005.50D				Dichromate	3.10	63			Peat
BHK4__006.00D				Dichromate	27	95			Peat
BHK4__006.50D							2.15		Peat
BHL1__003.55D							2.69		Grey slightly sandy clay
BHL3__005.00D	0.189								Grey clay
BHL3__007.00D				Dichromate	3.52	82			Grey very silty clay with gravel
BHL3__011.50C	0.05								Reddish brown mudstone
BHL4__002.00D				Dichromate	4.65	100			Peat

Organic Content to BS1377:Part3 1990 Clause 3
Sulphate Content to BS1377:Part3 1990 Clause 5

Particle Density to BS1377:Part2 1990Clause 8
Bulk Density to BS1377:Part2 1990Clause 7

Project ID : F10895
Project Name : M4

Consolidated Classification/Chemical Summary Sheet

Norwest Holst Soil Engineering

Sample Identification	Sulphate (SO_3) Content %	Sulphate (SO_3) Aq. Extract g/l	Water Sulphate (SO_3) Content g/l	Method of Organic Test	Organic Matter Content %	% passing 2mm Sieve	Particle Density	Bulk Density Mg/m3	Sample Description
BHM2__004.50D					1.30				Grey sandy clay
BHM2__017.00C	.05								
BHM3__003.00U				Dichromate		38		1.04	Peat
BHM3__006.50U				Dichromate		97		2.17	Black clayey peat
BHM3__008.00B	0.07								
BHM4__001.00W			0.157						Water
BHM4__003.00B							1.97		Peat
BHM4__003.75D				Dichromate	34	35			Peat
BHM4__004.00D	0.30	0.13							Peat
BHM4__007.00D					7.68				Reddish brown mudstone
BHM5__002.50B							2.03		Peat
BHM5__007.00D	0.031								Reddish brown mudstone
BHN10B000.50D	0.01								
BHN10B004.30W			.041						Water
BHN2__000.50D							2.76		Brown sandy clay with gravel
BHN8__003.00D	0.05								Brown sand
BHN9__004.00W			0.047						Water
BHN9__004.75D							2.78		
BHP12_009.90C	0.06								

Organic Content to BS1377:Part3 1990 Clause 3
Sulphate Content to BS1377:Part3 1990 Clause 5

Particle Density to BS1377:Part2 1990Clause 8
Bulk Density to BS1377:Part2 1990Clause 7

Project ID : F10895
Project Name : M4

Consolidated Classification/Chemical Summary Sheet

Norwest Holst Soil Engineering

Sample Identification	Sulphate (SO_3) Content %	Sulphate (SO_3) Aq. Extract g/l	Water Sulphate (SO_3) Content g/l	Method of Organic Test	Organic Matter Content %	% passing 2mm Sieve	Particle Density	Bulk Density Mg/m3	Sample Description
BHP5__002.20C	0.03								Brown sandy clay
BHP6__002.00D	0.04								
BHP8__001.10C	0.035								Yellowish brown conglomerate

Organic Content to BS1377:Part3 1990 Clause 3
Sulphate Content to BS1377:Part3 1990 Clause 5

Particle Density to BS1377:Part2 1990Clause 8
Bulk Density to BS1377:Part2 1990Clause 7

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHB1A	5.95	D	11	31	14	17	84																					Reddish brown very silty clay
BHB1A	6.00	U	11	31	16	15	77			CUM	11'	33'	22	42	14	22	0											Reddish brown very silty clay σ = 61, τ = 100 σ = 121,τ = 220 σ = 375,τ = 420
BHB1A	6.45	D							2.75 Meas																			Reddish brown very silty clay
BHB1A	7.40	D	12	31	17	14	79																					Reddish brown very silty clay
BHB1A	7.50	U								UU	118																	Reddish brown very silty clay σ = 150, τ = 238
BHB1A	7.90	D	12	31	16	15	72																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHB2	1.00	B											4	9	20	35	32											Brown clayey sand with gravel
BHB2	1.00	D	7.2															0.03t	6.9									Brown clayey sand with gravel
BHB2	2.80	B											9	32	29	30	0											Brown clayey sand with gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		*po' to po'+100kPa interval
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHB3	0.50	B											10	27	21	28	14											Reddish brown sandy clay with gravel and cobbles
BHB3	1.00	U								UU	65																	Reddish brown mudstone σ = 20, τ = 131
BHB3	1.70	D	22	45	22	23	100																					Reddish brown mudstone
BHB3	3.00	U																								0.150	6.800	Reddish brown mudstone
BHB3	3.45	D	52	36	19	17	100																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHB4	4.15	C	10	33	18	15	89			RS r	0	21																Reddish brown mudstone σ = 40, τ = 18.4 σ = 80, τ = 30 σ = 120, τ=422

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHB6	6.90	C																										Reddish brown mudstone
BHB6	9.00	C	1.2	NP						RS r	0	26																Reddish brown mudstone σ = 100, τ = 49 σ = 200, τ = 99 σ = 300, τ = 146

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHB7	7.80	C	8.9	36	19	17	59			RS r	0	16																Red brown mudstone σ = 100, τ = 31 σ = 150, τ = 38 σ = 200, τ = 57
BHB7	13.00	C																										Purplish grey conglomerate

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHB8	16.60	C	1.6	NP						RS r	0	29																Grey sandstone σ = 150, τ = 82 σ = 300, τ = 164 σ = 450, τ = 235

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHB9	3.70	C	4.9	U/S						RS r	0	23																Red brown mudstone σ = 50, τ = 23 σ = 100, τ = 42 σ = 150, τ = 63
BHB9▪	9.30	C	17	48	25	23	81			RS r	0	12																Purplish brown mudstone σ = 150, τ = 36 σ = 200, τ = 42 σ = 250, τ = 53

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHC1	1.50	U							2.70 Meas	SB																0.314	1.600	Reddish brown sandy clay with gravel
BHC1	3.50	U	19	27	15	12	69			UU	24															0.136	25.500	Reddish brown very silty clay σ = 70, τ = 49

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHC2	1.50	U	22	36	19	17	100			UUM	60		24	74	2	0	0	0.02t	6.8							0.273	5.700	Orangish brown very silty clay σ = 30, τ = 150
BHC2	3.50	U	25	28	17	11	98			UU	28		11	66	23	0	0									0.217	5.200	Orangish brown very silty clay σ = 70, τ = 58

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHC3	1.40	D	20	39	17	22	91											0.03t	6.7									Orangish brown very silty clay
BHC3	1.50	B											3	6	19	72	0											Orangish brown very silty clay
BHC3	3.50	B											31	59	10	0	0	0.02t	8.8									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHC4	0.90	U	17	27	17	10	93			UUM	33		19	46	34	1	0									0.251	3.100	Reddish brown sandy clay with gravel σ = 20, τ = 79
BHC4	1.90	B											21	45	30	4	0											Reddish brown sandy clay with gravel
BHC4	2.90	D	19	41	20	21	94																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHC5A	1.00	D	18	29	19	10	66											0.01t	6.7									Brown very sandy clay with gravel
BHC5A	1.00	W																0.18w	7.8									Water
BHC5A	1.05	B											11	17	47	25	0											Brown very sandy clay with gravel
BHC5A	2.10	D	25	I/M																								Brown very sandy clay with gravel
BHC5A	2.15	B											9	8	50	19	14											Brown very sandy clay with gravel
BHC5A	3.00	B											58	17	17	8	0											Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHC5	6.80	C																0.02t	8.6									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHC6	0.50	D	28	35	28	7	89														1.50+							Orangish brown clay
BHC6	1.50	D	15																									Brown silty sand
BHC6	1.60	B											9	12	32	47	0											Brown silty sand
BHC6	3.20	D	37	74	46	28	99																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		*po' to po'+100kPa interval
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHC7	1.00	U	44	65	31	34	100			UU	39		41	34	25	0	0										0.411	1.800	Orangish brown sandy clay σ = 20, τ = 78
BHC7	1.50	D	85	102	57	45	100														9.90+								Brown organic clay
BHC7	1.80	D	15																										Brown clayey silty sand with gravel
BHC7	2.00	B											10	17	52	21	0												Brown clayey silty sand with gravel
BHC7	3.30	D	88	63	35	28	97																						Reddish brown mudstone
BHC7	3.40	B											41	45	14	0	0												Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/Shr8x			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHC8	1.00	U	40	63	37	26	100	1.80 1.37													2.30+					0.275	0.880	Brown organic clay with gravel
BHC8	3.10	U	132	85	52	33	97			UU	8	0																Grey organic clay σ = 60, τ = 18
BHC8	6.50	U	45	30	19	11	98			UU	7	0																Grey organic clay σ = 100, τ = 16
BHC8	7.60	B											14	12	23	51	0											Reddish brown clayey silty sandy gravel
BHC8	7.60	D	11																									Reddish brown clayey silty sandy gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD1	1.20	U	36	60	28	32	97																					Grey clay
BHD1	5.30	B											36	53	10	1	0											Grey organic clay
BHD1	10.00	B											Frc	2	5	45	48											Greyish brown sandy gravel
BHD1	11.50	D	26	I/M																								Reddish brown clay with gravel
BHD1	11.60	B											13	21	25	41	0											Reddish brown clay with gravel
BHD1	14.50	D	22		NP																							Reddish brown sand

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD1	14.90	B											24	67	7	2	0											Reddish brown sand

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD2	1.70	U	58	72	31	41	100			UU	6	0														1.050	0.680	Grey clay σ = 30, τ = 13
BHD2	6.00	U	64	66	25	41	100			UU	2	0									3.66+					1.300	0.540	Grey organic clay σ = 100, τ = 6
BHD2	9.40	B																										Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD3	0.95	D																										Grey clay
BHD3	1.00	U	31	63	28	35	100											0.01t	7.5		5.10+					0.276	0.590	Grey clay
BHD3	2.80	D	38	53	22	31	100			UU	21	0																Grey very silty clay σ = 60, τ = 42
BHD3	5.10	B											19	29	52	0	0											Grey very silty clay
BHD3	5.55	W																0.08t	7.3									Water
BHD3	6.15	D	52	56	27	29	100																					Grey very silty organic clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD3	8.00	D	7.6																									Sandy gravel
BHD3	8.10	B											Frc	3	16	55	26											Sandy gravel
BHD3	12.70	B											31	50	12	7	0											Reddish brown mudstone
BHD3	12.70	D	30	58	26	32	100																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD4	1.05	U	35	48	24	24	100											0.07t	8.4		0.97+					0.253	0.750	Grey clay
BHD4	2.80	D	30	44	21	23	100																					Grey very silty clay
BHD4	2.90	U								UU	18	0																Grey very silty clay σ = 60, τ = 37
BHD4	3.58	B																0.76t 0.19a	6.8		35.0+							Grey very silty clay
BHD4	8.30	W																0.05w	8.0									Water
BHD4	12.50	B											Frc	1	25	74	0											Brown clayey sand with gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD4	13.70	B											25	53	15	7	0											Reddish brown mudstone
BHD4	13.70	D	31	66	31	35	96																					Reddish brown mudstone
BHD4	16.70	C																0.04t	8.6									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD5	0.90	D	27	56	23	33	100																					Grey clay
BHD5	1.00	U								UU	43																	Grey clay σ = 20, τ = 86
BHD5	1.80	W																0.07w	8.0									Water
BHD5	3.55	D																			31.0+							Brown peat
BHD5	6.00	B											42	57	1	0	0											Grey very silty clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD5	7.05	U	56	56	31	25	100			UU	5																Grey very silty clay σ = 100, τ = 12
BHD5	8.00	D	45	60	24	36	100																				Grey very silty clay
BHD5	8.80	D																0.02t	5.9								Brown very sandy gravel
BHD5	11.50	B											Frc	0	24	44	32										Brown very sandy gravel
BHD5	13.50	D	30	63	30	33	89																				Reddish brown mudstone
BHD5	15.30	C																0.03t	8.7								Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD6	0.25	D																0.05t	7.4									Brown slightly sandy clay
BHD6	2.05	D	30	41	21	20	100																					Brown very silty clay
BHD6	3.00	U								UU	9																	Grey slightly organic clay σ = 25, τ = 20
BHD6	3.45	D	47	54	26	28	100																					Grey very silty organic clay
BHD6	5.00	U	84	93	33	60	100			UU	4																	Grey slightly organic clay σ = 75, τ = 9
BHD6	6.70	W																0.31w 7.60s										Water

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD6	7.80	D	12																									Brown sandy gravel
BHD6	8.50	B											Frc	2	16	82	0											Brown sandy gravel
BHD6	13.20	D	33	60	30	30	83																					Reddish brown mudstone
BHD6	13.80	B											2	1	29	54	14											Reddish brown mudstone
BHD6	15.30	D																U/S										Reddish brown mudstone
BHD6	17.90	C																0.03t	8.7									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD7	1.00	B											14	13	31	42	0	0.06t	8.2									MADE GROUND: Clay with gravel
BHD7	5.00	U	36	40	26	14	100			UU	18	0																Grey slightly silty clay σ = 70, τ = 38
BHD7	7.00	U	52	60	25	35	100																					Grey slightly silty clay
BHD7	11.00	D	4.9															0.03t	8.0									Brown sandy gravel
BHD7	11.50	B											Frc	6	7	65	22											Brown sandy gravel
BHD7	15.00	D	31	I/M														0.03t	8.5									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD7	19.00	C																0.06t	8.8									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHD8	0.50	B											48	43	7	2	0											Soft brown clay
BHD8	1.00	U	26	55	25	30	100			UUM	68	2									0.90+					0.186	0.620	Brown very silty clay σ = 20, τ = 141
BHD8	5.50	U	65	71	30	41	100																			0.625	0.820	Brown very silty clay
BHD8	7.20	U								<TX>	U/S																	Brown sandy gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE1A	8.50	B											Frc	2	15	83	0											Grey sandy gravel
BHE1A	11.40	D	39	53	33	20	100																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE1	1.00	U								UU	12																	Brown sandy clay σ = 20, τ = 26
BHE1	1.25	W																0.18w	7.9									Water
BHE1	1.45	D	26	54	26	28	100																					Brown sandy clay
BHE1	3.10	U	72	68	27	41	100																			13.830	0.730	Grey very silty clay
BHE1	5.00	U								UU	4																	Grey very silty clay σ = 80, τ = 9
BHE1	8.10	D	15																									Brown sandy gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE2	0.20	B											52	46	2	0	0											Brown very silty clay
BHE2	1.00	U	28	55	23	32	97																			0.299	0.530	Brown very silty clay
BHE2	2.90	D																										Grey clay
BHE2	3.10	U								UU	26																	Grey clay σ = 50, τ = 53
BHE2	5.00	U	73																									Grey clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE2	8.10	U	93	84	40	44	100																			1.452	0.480	Black peat Mv Cv pressure increment 50-100kpa
BHE2	9.40	D	7.8																									Grey sandy gravel
BHE2	10.00	B											Frc	2	36	62	0											Grey sandy gravel
BHE2	11.50	D	36	56	28	28	100																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE3A	11.55	D	5.8																									Grey sandy gravel
BHE3A	13.50	D	28	58	31	27	70																					Reddish brown mudstone
BHE3A	15.30	D																0.07t	9.1									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/Shr8x			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE3	0.30	B																0.05t	7.2									Brown sandy clay
BHE3	0.85	U								UU	64																	Brown sandy clay σ = 15, τ = 128
BHE3	1.90	D																			0.75+							Brown sandy clay
BHE3	3.00	U	24																									Brown clay
BHE3	6.50	U								UU	5																	Dark grey very silty clay σ = 100, τ = 12
BHE3	8.60	W																0.16w	7.8									Water

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE3	8.90	B											4	8	1	7	80											Grey sandy gravel
BHE3	9.95	D	55	56	23	33	100																					Dark grey very silty clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size						Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE4	1.10	U	29	50	24	26	100																				0.209	0.700	Brown very silty clay
BHE4	2.67	W																0.08w	7.8										Water
BHE4	2.95	U								UU	7																		Dark grey slightly silty clay σ = 50, τ = 16
BHE4	5.15	U	67					1.67 1.00																					Dark grey organic clay
BHE4	7.10	D	72	74	29	45	100																						Dark grey organic clay
BHE4	7.15	U								UU	6	0																	Dark grey organic clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE4	8.10	W																0.04w	8.0									Water
BHE4	9.50	B											Frc	3	2	55	40											Gravel with many cobbles
BHE4	9.50	D	13																									Gravel with many cobbles

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size						Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE5	0.90	D	27	64	20	44	100																						Brown slightly sandy clay
BHE5	1.00	U	30																										Brown slightly sandy clay
BHE5	1.70	D							2.73 Meas																				Brown slightly sandy clay
BHE5	3.10	U								UU	11																		Grey slightly sandy clay σ = 50, τ = 23
BHE5	3.55	D	38	51	20	31	100																						Grey slightly sandy clay
BHE5	4.00	D																			1.59+								Grey slightly sandy clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE5	5.15	U	95	186	84	102	100																			0.679	0.850	Grey mottled blue organic clay
BHE5	8.10	D	5.0																									Grey sand with gravel and cobbles
BHE5	11.50	B											Frc	3	26	71	0											Grey sand with gravel and cobbles
BHE5	13.80	D	22	49	27	22	90																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE6	0.25	D																0.03t	8.4									Brown slightly sandy clay
BHE6	1.00	U	23	51	21	30	79			UU	49																	Brown slightly sandy clay σ = 20, τ = 99
BHE6	1.80	D	28	42	22	20	100																					Brown very silty clay
BHE6	2.45	B											43	50	0	7	0											Brown very silty clay
BHE6	3.00	U	31	49	25	24	100																					Brown very silty clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE6	4.00	U								UU	14																	Black clay σ = 60, τ = 28
BHE6	6.00	U																								1.013	0.560	Grey organic clay
BHE6	6.80	D																			3.79+							Grey organic clay
BHE6	7.00	U	41																									
BHE6	8.25	B											Frc	0	9	77	14											Grey slightly sandy gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHE6	12.50	D	4.4																									Grey slightly sandy gravel with some cobbles
BHE6	13.00	B											Frc	1	14	52	33											Grey slightly sandy gravel with cobbles
BHE6	14.00	D	31	61	33	28	100																					Reddish brown mudstone
BHE6	14.50	B							2.71 Meas																			Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHF1	0.40	B																										MADE GROUND: Ash and clay
BHF1	5.45	W																0.14w	8.4									Water
BHF1	8.50	B											Frc	0	1	52	47											Grey sandy gravel with cobbles
BHF1	9.00	D	9.3																									Grey sandy gravel with cobbles
BHF1	13.80	D	18	I/M																								Reddish brown mudstone
BHF1	28.60	C																0.05t	9.6									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHF2	0.50	D																										MADE GROUND: Brown clay and gravel
BHF2	0.50	W																										Water
BHF2	3.50	U	38	61	24	37	100						44	54	2	0	0									0.411	1.350	Brown sandy clay with silt laminations
BHF2	7.25	D	64	76	36	40	100											0.18t	8.3									Brown clay
BHF2	7.50	U								UU	5																	Brown clay σ = 150, τ = 11
BHF2	12.00	D	20																									

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHF2	12.00	W																2.32w	7.7									Water
BHF2	12.10	B											14	14	25	31	0											Brown sandy gravel
BHF2	17.50	D	21	38	20	18	76											0.05t	8.7									Reddish brown mudstone
BHF2	17.60	U	12																									Reddish brown mudstone
BHF2	31.30	C																0.11t	9.2									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHF3	9.70	W																0.27w	7.6									Water
BHF3	12.00	W																0.33w	8.3									Water
BHF3	16.50	B											1	1	26	67	5											Grey sandy gravel
BHF3	19.70	D	19	40	17	23	99											0.02t	8.1									Reddish brown mudstone
BHF3	19.80	B											20	38	32	10	0											Reddish brown mudstone
BHF3	29.40	C																0.04t	8.7									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHF4	2.00	B											8	14	35	43	0											MADE GROUND: Sandy gravel
BHF4	2.85	D																0.13t	8.0									MADE GROUND: Sandy gravel
BHF4	4.00	U	44	74	29	45	100			UU	38	0														0.226	1.800	Brown very silty gravel σ = 60, τ = 77
BHF4	12.30	D	7.8																									Grey sandy gravel
BHF4	12.50	B											7	8	4	75	6											Grey sandy gravel
BHF4	17.00	B											Frc	2	24	65	9											Grey sandy gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHF4	20.00	D																0.06t	8.9									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHF5	15.00	B											3	6	7	42	42											Grey sandy gravel
BHF5	19.50	B											Frc	3	42	55	0	0.01t	9.1									Grey sandy gravel
BHF5	20.80	D	19	29	18	11	82																					Reddish brown mudstone
BHF5	25.40	C																0.05t	9.1									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHF6	1.50	B											6	6	24	64	0											MADE GROUND: Clayey gravel
BHF6	5.70	D																0.15t	6.9									Grey clay
BHF6	18.50	B											Frc	1	1	57	41											Grey sandy gravel
BHF6	21.20	B																0.08t	9.0									Greyish green mudstone
BHF6	21.20	D																										Greyish green mudstone
BHF6	25.50	C																0.09t	8.9									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHG1	16.50	B											Frc	8	5	44	43											Grey sandy gravel
BHG1	18.80	D	21	31	18	13	86											0.08t	8.6									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHG2	1.00	B																										MADE GROUND: Sandy gravel
BHG2	13.50	B											3	2	14	65	16											Grey sandy gravel
BHG2	14.80	D	21	38	21	17	76																					Green mudstone
BHG2	35.50	C																										Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHG3	0.20	D																										MADE GROUND: Sandy slag and gravel
BHG3	3.00	U	49	52	32	20	100			UU	174	0						0.01t	9.1									Brown very silty clay σ = 50, τ = 348
BHG3	13.50	U	32	31	23	8	96						19	55	26	0	0											Grey sandy clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHG4	9.30	U	62	68	36	32	100			UU	12	0						0.61t 1.37a	6.8		8.20+							Black sandy clay σ = 140, τ = 24
BHG4	12.50	B											14	17	16	33	20											Reddish brown mudstone
BHG4	12.50	D	39	32	16	16	64		2.71 Meas									0.08t	8.7									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHG5	3.00	U	42	57	22	35	100			UU	25							0.04t	8.3									Grey very silty clay σ = 50, τ = 51
BHG5	9.50	U	61	85	39	46	100														1.90+							Grey very silty clay
BHG5	13.15	B											5	10	9	67	9											Grey sandy gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHG6	1.00	U								UU	81																	Dark grey slightly sandy clay σ = 20, τ = 163
BHG6	7.00	U	51	60	22	38	100														3.90+							Grey slightly sandy clay
BHG6	13.00	B											2	2	15	81	0	0.07t	8.5									Grey sandy gravel
BHG6	17.00	D	14	32	19	13	69																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH1	1.45	B											10	14	26	50	0											MADE GROUND: Brown clay with gravel
BHH1	3.00	U	35	49	22	27	97														0.81+					0.443	0.730	Grey slightly silty clay
BHH1	6.90	U	64					1.55													8.30+					0.700	0.710	Peat Mv Cv pressure increment 50-100kpa
BHH1	10.00	U	35	36	27	9	100			UU	11																	Grey very silty clay σ = 150, τ = 24
BHH1	14.15	B											Frc	3	28	69	0											
BHH1	17.05	D	17	27	18	9	81																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH1	17.20	D		I/M																								Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH2	1.00	U	30	51	23	28	99						47	50	3	0	0									0.415	0.700	Grey very silty clay
BHH2	3.00	U		63	29	34	100			UU	24																	Dark grey very silty clay σ = 50, τ = 50
BHH2	5.00	U	71	76	39	37	100																					Dark grey very silty clay
BHH2	13.00	B											6	4	24	66	0											Grey sand with gravel
BHH2	13.50	D	5.4																									Grey sand with gravel
BHH2	17.20	D	16	IM																								Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH3	0.90	U	25	47	22	25	100																					Brown clay
BHH3	1.35	D	28	55	22	33	100																					Brown clay
BHH3	3.00	U								UU	7																	Grey slightly organic clay σ = 50, τ = 14
BHH3	3.45	D	47	61	23	38	100																					Grey slightly organic clay
BHH3	5.10	U	47																									Grey slightly organic clay
BHH3	8.10	U	41	46	21	25	100	1.68																				Grey slightly organic clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH3	10.50	U	39																									Grey slightly sandy clay
BHH3	11.30	D	20	31	13	18	72																					Grey very sandy clay
BHH3	12.50	B											Frc	4	5	82	9											Brown gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size						Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH4	1.00	U	25	62	27	35	100																				0.327	0.610	Grey clay
BHH4	2.00	D							2.67 Meas																				Dark grey clay
BHH4	4.00	U	45					1.75 1.21																					Grey clay with pockets of peat
BHH4	4.80	D	50	55	25	30	100																						Grey organic clay
BHH4	6.45	D	160	218	111	107	100																						Brown organic clay
BHH4	9.00	U	43																										Grey slightly organic clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH4	13.00	D	7.4																									Reddish brown gravel
BHH4	13.45	B											Frc	9	24	67	0											Reddish brown mudstone
BHH4	15.20	D	19	34	18	16	84																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH5	1.00	U	28																									Brown sandy clay
BHH5	2.00	D																0.60t	8.2									Grey slightly sandy clay
BHH5	3.05	D	45	66	28	38	100																					Grey slightly sandy clay
BHH5	3.10	U																								0.336	0.970	Grey slightly sandy clay σ = 75, τ = 34
BHH5	4.00	B											40	59	1	0	0											Grey slightly sandy clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry	Part	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425	Dens	Dens	Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH5	5.00	U	350	543	344	199	100			UU	17	0																Grey mottled black clay with gravel
BHH5	6.00	D																0.36t	6.9									Grey mottled black clay with gravel
BHH5	7.00	D																			28.0+							Black peat
BHH5	8.10	U	33																									Grey slightly sandy clay
BHH5	9.55	U	57					1.69 1.08																				Grey slightly sandy clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH5	11.60	B											10	15	19	56	0											Brown slightly sandy clay with some gravel
BHH5	12.50	D							2.77 Meas																			Reddish brown mudstone
BHH5	13.79	W																0.14t	7.5									Water

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry	Part	Triaxial/ShrBx			Particle Size						Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425	Dens	Dens	Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH6	1.10	U								UU	55																	Brown clay σ = 20, τ = 112
BHH6	2.00	D	32	IM																								Grey clay
BHH6	3.00	U	30																									Grey clay
BHH6	4.80	U	411					0.80 0.54																				Peat
BHH6	5.50	D																			4.00+							Grey organic clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH6	6.60	U																			8.70+					1.159	0.640	Peat Mv Cv pressure increment 50-100kpa
BHH6	7.50	D	75	88	38	50	100																					Dark grey organic clay
BHH6	7.90	W																0.14w	7.5									Water
BHH6	9.50	U	53																									
BHH6	11.20	U								UU	41																	Reddish brown mudstone σ = 180, τ = 83
BHH6	11.65	D	21	46	24	22	100																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH6	12.00	D	20	43	20	23	94																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH7	1.40	D																0.04t	6.9									Grey clay
BHH7	1.50	U	29																									Grey clay
BHH7	3.65	U	41	69	29	40	97																			0.426	0.680	Grey clay Mv Cv pressure increment 50-100kpa
BHH7	4.50	U	129					1.32 1.17																				Black peat
BHH7	5.55	B											42	56	2	0	0											Grey clay
BHH7	6.50	U	36																									Grey organic clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH7	7.50	D	87	104	37	67	100																					Grey organic clay
BHH7	8.80	D																0.26t 0.39a	8.1									Grey organic clay
BHH7	9.00	U								UU	79	0																Grey organic clay σ = 140, τ = 159
BHH7	9.45	D	66	72	36	36	100																					Grey organic clay
BHH7	11.70	U	61																									Grey organic clay
BHH7	12.15	B																0.27t	7.6									Grey organic clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHH7	13.85	W																0.14w	8.0									Water

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHI1	0.90	U	34	69	28	41	100																					Grey very silty sandy clay.
BHI1	1.35	D							2.71 Meas																			
BHI1	2.95	U								UU	18	0																Grey slightly organic clay. σ = 50, τ = 36
BHI1	4.00	D																			36.0+							
BHI1	5.00	U	36	53	24	29	100																			0.867	0.520	Dark grey slightly organic clay. Mv Cv pressure increment 50-100kpa

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BH11	6.50	D	41	40	25	15	100																					Grey slightly sandy, very silty clay.
BH11	8.15	U	30																									Grey slightly sandy, very silty clay.
BH11	12.00	B											7	12	21	46	14											Grey sandy gravel.
BH11	15.50	B											Frc	5	8	87	0											Grey slightly sandy gravel
BH11	16.50	D	20	41	26	15	71																					Reddish brown mudstone.

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHI2	1.05	U								UU	52																	Grey sandy clay. σ = 20, τ = 105
BHI2	1.50	D	33	62	31	31	100																					Grey sandy very silty clay.
BHI2	2.70	D																			34.0+							Peat.
BHI2	2.80	U	432					0.93 0.65		<TX>	U/S																	Peat.
BHI2	4.00	U	52					1.71 1.12																				Dark grey slightly sandy clay.

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BH12	4.90	D	40	43	20	23	100																					Dark grey slightly sandy clay.
BH12	6.50	U	34																									Dark grey slightly sandy clay.
BH12	9.50	B											15	31	54	0	0											Grey very sandy clay.
BH12	12.50	B											23	62	7	8	0											Reddish brown weathered mudstone.
BH12	12.50	D	22	36	20	16	86																					Reddish brown weathered mudstone.

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BH13	1.00	U	32																									Dark grey slightly sandy clay.
BH13	1.70	D	35	54	22	32	100																					Dark grey slightly sandy clay.
BH13	3.30	U	487																		34.0+					7.735	1.000	Peat.
BH13	4.00	D																			25.0+							Peat.
BH13	4.20	U	411					0.95																				Peat

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BH13	5.50	U								UU	9	0																Dark grey organic clay3 σ = 100, τ = 20
BH13	7.00	D	53	59	29	30	100																					Dark grey slightly organic very silty clay
BH13	8.50	U						1.68 0.96																				Dark grey slightly organic very silty clay
BH13	12.60	D	22	31	17	14	94																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHI4	1.00	D																0.02t	7.5									Brown slightly organic clay
BHI4	1.05	U																								0.326	0.700	Brown slightly organic clay
BHI4	2.05	D	46	60	25	35	100																					Greyish blue very silty clay
BHI4	3.15	U	59	69	32	37	100			UU	8																	Greyish blue very silty clay σ = 50, τ = 16
BHI4	5.00	U	364					1.05													33.0+							Peat
BHI4	5.45	D	54																									Peat

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHI4	6.15	D																			3.94+							Grey very silty organic clay
BHI4	7.80	U	51																									Grey very silty organic clay
BHI4	11.00	U								UU	4	0																Grey very sandy organic clay σ = 170, τ = 10

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHJ1	1.00	W																0.06w	8.1									Water
BHJ1	1.10	U	32																									Brown clay
BHJ1	4.40	U								UU	9	0																Grey clay σ = 70, τ = 19
BHJ1	4.85	D	49	73	29	44	100																					Grey clay
BHJ1	5.15	U	876					1.03 0.71																				Peat
BHJ1	5.60	D																			33.0+							Peat

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHJ1	6.50	U																								0.682	0.260	Peat
BHJ1	8.40	D	38	39	21	18	100																					Grey very silty clay
BHJ1	10.00	U	36																									Grey very silty clay
BHJ1	12.10	U								UU	92																	Dark brown clay σ = 180, τ = 185

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHJ2	0.50	B																0.05t	8.3									Brown slightly sandy clay
BHJ2	1.00	U	38					1.84 1.33																				Grey slightly sandy clay
BHJ2	2.00	D	53	75	27	48	100																					Grey slightly sandy clay
BHJ2	2.90	U																			34.0+							Peat
BHJ2	4.00	U	556																									Peat
BHJ2	4.80	D																0.56t 0.03a	6.4									Peat

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHJ2	6.50	U								UU	2																	Dark grey slightly sandy clay σ = 90, τ = 6
BHJ2	6.95	D	52	72	24	48	100																					Dark grey slightly sandy clay
BHJ2	8.05	W																0.07w	7.6									Water
BHJ2	9.00	U	60																									
BHJ2	10.00	D	57	67	29	38	100																					Dark grey sandy clay
BHJ2	11.40	U	20	28	16	12	90			<TX>	U/S																	Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHJ2	11.65	D	14	27	17	10	99																				Reddish brown mudstone
BHJ2	12.00	D							2.78 Meas																		Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size						Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHJ3	1.00	U								UU	20	0																Dark grey sandy clay σ = 20, τ = 42
BHJ3	1.60	D	46	50	23	27	100																					
BHJ3	2.00	D							2.72 Meas																			Dark grey slightly sandy clay
BHJ3	3.00	U	54	66	32	34	100																			2.271	1.100	Dark grey slightly sandy clay
BHJ3	5.25	D	374																									Peat
BHJ3	7.90	U	33																									Grey slightly organic clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHJ3	11.30	U	16	26	17	9	100			UU	64																	Reddish brown mudstone σ = 160, τ = 130
BHJ3	11.75	D	28	35	20	15	100																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHJ4	0.50	B																0.02t	7.6									Brown clay
BHJ4	0.95	D	43	41	23	18	100																					Brown clay
BHJ4	1.00	U								UU	30																	Brown clay σ = 20, τ = 60
BHJ4	2.00	D																			1.76+							Grey clay
BHJ4	3.05	U	45																									Grey clay
BHJ4	5.10	U																								1.801	1.280	Peat

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHJ4	5.55	D																			35.0+							Peat
BHJ4	7.90	D	38	67	26	41	100																					Grey sandy clay
BHJ4	8.00	U								UU	7	0																Grey sandy clay σ = 140 τ = 14
BHJ4	9.55	B											21	55	24	0	0											Grey very silty slightly sandy clay
BHJ4	10.40	U	18																									Brown very silty sandy clay
BHJ4	11.60	D	18	30	18	12	99																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHJ5	0.40	D	27	48	20	28	100																					Brown grey organic clay
BHJ5	1.00	U	50	71	29	42	100																			0.566	1.000	Brown grey organic clay
BHJ5	3.00	U								UU	8	0																Grey very silty slightly organic clay σ = 50, τ = 77
BHJ5	3.90	D							2.66 Meas																			Grey very silty slightly organic clay
BHJ5	5.10	U																			24.0+					1.413	1.840	Peat
BHJ5	6.00	D																			18.0+							Peat

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry	Part	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425	Dens	Dens	Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHK1	1.00	U	32	60	23	37	100			UU	40	0																Brown slightly sandy clay σ = 20, τ = 80
BHK1	2.80	U	43	62	36	26	100			UU	23	0	41	58	1	0	0									0.384	1.700	Grey slightly sandy very silty clay σ = 60, τ =48
BHK1	5.00	U	69	71	28	43	100			UU	4	0																Grey slightly sandy very silty clay σ = 100, τ = 90
BHK1	6.40	U	195					1.08													41.0+					1.841	0.750	Peat
BHK1	10.00	U	17					2.17																		0.084	5.600	Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHK2	1.00	U	24	34	19	15	99																			0.810	5.100	Grey clay
BHK2	3.05	D	55	63	26	37	100																					Blue grey slightly organic clay
BHK2	5.15	U	61																									Blue grey slightly organic clay
BHK2	7.50	U	78	73	39	34	97			UU	12																	Dark grey organic clay σ = 100, τ = 25
BHK2	8.60	B											41	52	6	1	0											Reddish brown mudstone
BHK2	10.55	D	13	30	18	12	100																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHK3	1.80	D	49	47	24	23	100																					Brown slightly sandy clay
BHK3	6.00	U	73	87	48	39	100																			0.970	3.140	Grey slightly organic clay Mv Cv pressure increment 50-100kpa
BHK3	6.80	D	209																									Peat
BHK3	8.10	U	39																									Dark grey slightly sandy clay
BHK3	9.40	U								UU	94																	Grey mudstone σ = 140, τ = 189

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHK4	0.00	B							2.70 Meas				Frc	2	15	83	0											Sandy gravel
BHK4	4.50	U																			9.20+					1.114	1.040	Blue slightly organic clay Mv Cv pressure increment 50-100kpa
BHK4	4.90	D																										Peat
BHK4	5.50	D																			3.10+							Peat
BHK4	6.00	D																			27.0+							Peat
BHK4	6.50	D							2.15 Meas																			Peat

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHK4	8.50	D	75	71	27	44	100																					Greyish blue organic clay
BHK4	9.40	D	26	36	18	18	100																					Blue greenish grey mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHK5	1.00	U	50	73	28	45	100			UU	38	0																Brown clay σ = 20, τ = 77
BHK5	2.00	D	32	59	26	33	100																					Brown clay
BHK5	3.00	U	56																									Grey very silty clay
BHK5	5.40	D	99																									Peat
BHK5	7.40	U	42	41	26	15	100																			0.661	4.280	Grey organic clay Mv Cv pressure increment 50-100kpa

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHK5	9.20	U								UU	62																	Reddish brown sandy clayey silt σ = 140, τ = 125

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL1	1.05	U	36	47	27	20	100																			0.512	1.560	Grey slightly sandy clay
BHL1	3.10	D	59	68	28	40	100																					Grey slightly sandy clay
BHL1	3.55	D							2.69 Meas																			Grey slightly sandy clay
BHL1	4.55	B											45	55	0	0	0											Grey slightly sandy clay
BHL1	5.10	U	76																									Grey slightly sandy clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL1	7.30	U								UU	14																	Grey sandy clay σ = 100, τ = 25
BHL1	9.00	D	23	36	19	17	100																					Grey mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL2	0.50	D	29	64	23	41	100																					Grey clay
BHL2	1.00	U	40	62	27	35	100																					Grey clay
BHL2	3.00	U	69	78	38	40	100																			5.526	0.930	Grey very silty clay
BHL2	5.00	U								UU	26	0																Grey very silty clay σ = 80, τ = 52
BHL2	6.15	D	89																									Peat
BHL2	7.65	B											15	59	26	0	0											Grey sandy clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL2	8.30	U	55																									Grey sandy clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL3	0.50	U																										Grey clay
BHL3	3.25	U	60																									Grey clay
BHL3	5.00	D																0.18t	7.1									Grey clay
BHL3	7.00	D																			3.52+							Grey very silty clay with gravel
BHL3	9.50	U	13																									Greyish green brown clay
BHL3	10.00	D	12	26	15	11	100																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL3	11.50	C																0.05t	9.5									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL4	1.00	U								UU	35																	Grey clay σ = 20, τ = 70
BHL4	1.50	D	65	71	35	36	97																					Grey clay
BHL4	2.00	D																			4.65+							Peat
BHL4	3.75	D	242																									Peat
BHL4	4.60	U	35	36	35	1	100																			3.417	12.210	Grey very silty clay
BHL4	5.60	B											10	76	14	0	0											Grey very silty clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL4	7.25	D	29	40	19	21	100																					Reddish brown mudstone
BHL4	7.50	U	20	33	16	17	100			UU	97																	Reddish brown mudstone σ = 120, τ = 195

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL5	0.60	D	23	41	20	21	99																					Brown sandy clay
BHL5	0.70	U	23																									Dark brown sandy clay
BHL5	2.50	U	45	69	31	38	100			UU	17																	Dark grey sandy clay σ = 40, τ = 34
BHL5	4.40	D	370																									Peat
BHL5	6.50	D																								3.089	0.000	Peat Mv Cv pressure increment 50-100kpa

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL5	10.50	U								UU	45																	Reddish brown mudstone σ = 150, τ = 91

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHL6	1.50	U	35																									Brown slightly organic clay
BHL6	3.50	U	48	55	36	19	100																			4.344	1.230	Grey
BHL6	7.20	U	25																									Grey organic clay
BHL6	8.30	D	17	28	16	12	82																					Reddish brown mudstone
BHL6	8.40	U	21																									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM1	1.50	U	51	43	22	21	100																			1.410	2.070	
BHM1	3.20	D																			33.0+							Peat
BHM1	6.00	U	49	57	28	29	100			UU	4																	Grey sandy clay σ = 90, τ = 10
BHM1	6.70	D	61	41	20	21	99																					Grey sandy clay
BHM1	9.20	D	23	32	19	13	90																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM1	9.50	U								UU	87																	Reddish brown mudstone σ = 140, τ = 174

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM2	1.20	D	83	86	50	36	79																					Black clayey peat
BHM2	1.50	U																								3.036	14.000	Black clayey peat
BHM2	4.50	D																			1.30+							Grey sandy clay
BHM2	6.00	U	461																									Peat
BHM2	7.00	U								UU	56																	Brown sandy clay σ = 140, τ = 113

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM2	7.80	B											7	13	76	4	0											Brown slightly clayey sand with gravel
BHM2	10.00	D	24	70	35	35	100																					Reddish brown mudstone
BHM2	17.00	C																0.05t	8.6									

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM3A	11.40	D	26	40	20	20	57											0.04t	8.5									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM3	3.00	U	719					1.04 0.61		<TX>	U/S										42.0+							Peat
BHM3	6.50	U	30					2.17 1.67													0.90+							Black clayey peat
BHM3	8.00	B											8	10	82	0	0	0.07t	8.6									Brown clayey silty sand
BHM3	10.50	B											10	12	78	0	0											Brown clayey silty sand

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM4	1.00	W																0.15w	7.0									Water
BHM4	1.75	D	166																									Peat
BHM4	3.00	B							1.97 Meas																			Peat
BHM4	3.75	D																			34.0+							Peat
BHM4	4.00	D																0.30t 0.13a	7.2									Peat
BHM4	4.60	U	25																									Brown very silty clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM4	6.50	U								UU	112																	Reddish brown mudstone σ = 100, τ = 225
BHM4	7.00	D																			7.68+							Reddish brown mudstone
BHM4	10.50	C																0.03t	9.1									Grey sandstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM5	0.50	D	64																									Top soil
BHM5	1.50	U																								4.786	2.000	Peat
BHM5	2.20	D																										Peat
BHM5	2.50	B							2.03 Meas																			Peat
BHM5	3.50	U	29																									Brown very sandy clay
BHM5	4.50	D	47	70	30	40	92																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM5	6.00	D	33	78	34	44	50																					Reddish brown mudstone
BHM5	7.00	D																0.03t	8.5									Reddish brown mudstone
BHM5	10.50	D	28	60	26	34	98																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM6	1.00	D	13	39	22	17	36											0.01t	7.7									

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHM7	0.50	U											12	11	76	1	0											Brown clayey silty sand with gravel
BHM7	1.20	D	13																									Brown clayey sand
BHM7	1.50	B											9	15	76	0	0											
BHM7	2.20	D	15																									Brown sandstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHN10B	0.50	D																0.01t	6.8									
BHN10B	1.20	D	22	34	19	15	100																					Reddish brown mudstone
BHN10B	1.50	U								UU	42																	Brown very sandy clay σ = 30, τ = 85
BHN10B	3.50	U	21	31	16	15	100																			2.285	1.190	Grey sandy clay
BHN10B	4.20	D	14	NP																								Grey very sandy clay
BHN10B	4.30	W																0.04w	8.1									Water

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHN10B	6.20	B											3	7	10	80	0											Brown sandy gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHN1	0.50	B											16	26	30	28	0											Reddish brown sandy clay with some gravel
BHN1	1.20	D	14	33	21	12	70																					Reddish brown sandy clay with some gravel
BHN1	1.50	U								UU	47																	Reddish brown sandy clay with some gravel σ = 30, τ = 96
BHN1	2.20	D																										Reddish brown mudstone
BHN1	3.20	D	20	48	24	24	96																					Reddish brown mudstone σ = 60, τ = 252
BHN1	3.50	U								UU	126																	Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		*po' to po'+100kPa interval
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHN2	0.50	D							2.76 Meas																			Brown sandy clay with gravel
BHN2	1.00	U								UU	33																	Reddish brown sandy clay σ = 20, τ = 67
BHN2	1.50	D	14	39	19	20	58																					Reddish brown sandy clay
BHN2	2.00	D	19	44	23	21	91																					Brown sandy clay
BHN2	2.70	U								UU	121																	Purplish grey clay σ = 50, τ = 243
BHN2	3.10	D	15	44	18	26	99																					Purplish grey clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHN5	1.00	D	13	I/M																								

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHN6	1.00	U	6.9	I/M																								Dark brown clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHN7	1.00	D	19	29	16	13	100																					Reddish brown mudstone
BHN7	2.00	D	32	49	15	34	83																					Reddish brown clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHN8	2.00	D	12	NP																								Reddish brown sand
BHN8	3.00	D																0.05t	8.3									Brown sand

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

			Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
Hole ID	Depth	TYPE	MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHN9	0.50	D	34	67	28	39	100																					Brown clay
BHN9	1.00	U	39	58	26	32	100																			0.319	1.300	Brown clay
BHN9	2.00	B											23	36	40	1	0											Brown sandy clay
BHN9	3.75	D	15	25	16	9	88																					
BHN9	4.00	W																0.04w	7.8									Water
BHN9	4.75	D							2.78 Meas																			

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHP10	1.00	D	22	37	18	19	98																					Brown clay
BHP10	2.00	D	31	64	28	36	100																					

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHP12	9.90	C																0.06t	8.4									

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size						Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHP4	1.00	D	21	35	17	18	89																						Brown clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHP5	1.00	D	15	38	16	22	90																					Brown sandy clay
BHP5	2.20	C																0.03t	8.5									Brown sandy clay

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHP6	1.00	D	24	53	22	31	97																					Brown sandy clay
BHP6	2.00	D																0.04t	7.3								

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
BHP8	1.10	C																0.03t	9.0									Yellowish brown conglomerate

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPB100	0.50	B											6	12	45	37	0					8.5	2.09 4.5kg	9.1 6.4 1.6 12.1 13.8	5.6 m 153 m 127 m 114 m 92 m 30 m			Brown very sandy clay with gravel
TPB100	2.50	B											20	40	22	18	0					8.0	2.10 4.5kg	9.9 12.8 7.8 6.4 3.7	21 m 103 m 65 m 103 m 112 m			Grey sandstone
TPB100	2.50	D	13	32	21	11	43																					

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPB101	0.50	B											15	19	27	39	0											Brown sandy clay
TPB101	1.00	B											11	33	22	31	3					8.4	2.11 4.5kg	6.3 3.1 3.0 13.8 9.6 6.4	1.9 m 169 m 133 m 107 m 22 m 4.0 m			Brown sandy clay
TPB101	1.00	D	18	27	20	7	63																					
TPB101	2.00	B											U/S									U/S		U/S	U/S			Reddish brown mudstone
TPB101	2.00	D		U/S																								

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPB102	0.50	B											14	26	30	30	0					11	2.00 4.5kg	7.8 12.4 3.2 6.2 14.1	4.2 m 92 m 84 m 57 m 8.1 m			Reddish brown sandy clay with some gravel
TPB102	0.50	D	22	37	23	14	74																					Reddish brown sandy clay with some gravel
TPB102	1.00	B											26	43	21	10	0					10	2.09 4.5kg	10.2 14.7 8.0 6.3 6.6	8.5 m 138 m 92 m 54 m 17 m			Reddish brown mudstone
TPB102	1.00	D	16	40	19	21	73																					Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPB103	0.50	B											6	15	10	53	16							2.8 8.8 10.3 8.3 10.4				Reddish brown sandy clay with gravel
TPB103	0.50	D	12	32	20	12	52																					Reddish brown sandy clay with gravel
TPB103	1.00	B											5	10	9	76	0					6.7	2.09 4.5kg	10.0 15.1 14.6 8.2 6.1	17 m 106 m 110 m 48 m 71 m 17 m			Reddish brown mudstone
TPB103	1.00	D	14	33	20	13	62											0.05t	3.7									Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPB105	0.50	B											59	39	2	0	0					15	1.88 4.5kg	12.5 11.5 9.8 7.7 7.2	9.7 t 13 b			Reddish brown sandy clay
TPB105	0.50	D	11	31	17	14	68											0.01t	7.9									Reddish brown sandy clay
TPB105	1.00	B											29	40	18	13	0					11	2.06 4.5kg	10.0 5.8 8.0 14.4 16.3	6.4 m 130 m 90 m 59 m 18 m 44 m			Reddish brown mudstone
TPB105	1.00	D																										Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPN100	0.50	B											10	13	41	36	0					8.7	2.15 4.5	6.0 14.7 12.2 7.6 4.9	8.9 m 39 m 110 m 134 m 2.8 m			Brown very sandy clay with some gravel
TPN100	0.50	D	12	I/M														0.01t	8.1									Brown very sandy clay with some gravel
TPN100	2.00	B											42	43	14	1	0					14	1.92 4.5kg	12.8 10.1 9.7 6.2 3.5	3.2 m 132 m 106 m 70 m 31 m			Brown very sandy clay with some gravel
TPN100	2.00	D	16	39	19	20	87																					Brown very sandy clay with some gravel

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPN101	0.50	B											14	19	40	27	0					8.0	2.10 4.5kg	6.2 14.0 11.6 10.9 4.8	3.3 m 76 m 25 m 124 m 137 m			Brown very sandy clay with some gravel
TPN101	0.50	D	11	41	21	20	53																					Brown very sandy clay with some gravel
TPN101	2.00	D	16	I/M														0.01t	7.6									
TPN101	2.20	B											12	15	40	33	0					8.7	2.11 4.5kg	4.6 10.0 7.9 16.2 12.9	49 m 5.7 m 23 m 96 m 120 m 1.7 m			
TPN101	3.00	D	24																									

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPN102	0.50	B											27	26	36	11	0							10.2 6.6 3.7 1.7 15.8				Brown very sandy clay with gravel
TPN102	0.50	D	24	41	23	18	26											0.03t	7.0									Brown very sandy clay with gravel
TPN102	1.00	D																										Brown limestone
TPN102	1.20	B																										

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPN103	0.50	B											29	16	33	22	0					13	2.02 4.5kg	8.3 6.3 10.8 13.2 12.6	5.0 m 92 m 37 m 6.3 m 53 m 74 m			Reddish brown very sandy clay
TPN103	0.50	D	15	34	24	10	54											0.01t	7.8									Reddish brown very sandy clay
TPN103	1.40	B											Frc	32	38	30	0					10	2.11 4.5kg	3.8 16.2 12.5 9.7 7.9	1.3 m 97 m 75 m 52 m 15 m			Yellow limestone
TPN103	1.40	D	24	55	22	33	67																					

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPP100	0.50	D	34	54	29	25	94											0.03t	7.8									Reddish brown sandy clay with occasions.

CONSOLIDATED SUMMARY OF ALL LABORATORY SOIL TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Classification					Bulk Dry Dens	Part Dens	Triaxial/ShrBx			Particle Size					Chemical Testing				Compaction		MCV	CBR	Consolidation		
			MC	LL	PL	PI	425			Type	c	ϕ	Cly	Slt	Snd	Grl	Cbs	SO_3	pH	Cl	Other	MC	Dry Dn			m_v*	c_v*	*po' to po'+100kPa interval
	m		%	%	%	%	%	Mg/m³			kPa	deg	%	%	%	%	%	%		%	%	%	Mg/m³		%	m²/MN	m²/Yr	Sample description
TPP101	0.50	B											25	30	39	6	0					15	1.91	9.8	1.6 m			
																							4.5kg	9.7	88 m			
																								5.6	86 m			
																								4.7	57 m			
																								10.2	22 m			
																								11.9	88 m			
TPP101	0.50	D	14	44	23	21	54											0.03t	7.0									
TPP101	1.00	B											24	53	23	0	0					8.5	2.09	11.5	11 m			Yellow mudstone
																							4.5KG	9.1	11 m			
																								3.7	91 m			
																								2.6	85 m			
																								17.2	4.6 m			
																								12.0	119 m			
TPP101	2.00	B																										
TPP101	2.00	D	13	24	14	10	94											0.04t	8.5									

F10895

M4 RELIEF ROAD, NEWPORT

LABORATORY VANE TEST

(BS 1377: PART 7:3(1990))

BH	DEPTH M	TYPE	MC%	SHEAR STRENGTH kPa	REMOLDED SHEAR STRENGTH kPa	DESCRIPTION
C8	3.10	U100	63	13	5.30	Grey Clay
D1	1.20	U100	41	40	2.60	Brown Clay
D3	6.20	U100	58	7.1	1.10	Dark Grey Sandy Organic Clay
D5	3.10	U100	48	17	4.60	Grey Clay
D6	1.00	U100	31	65	5.90	Grey Slightly Organic Clay
D6	7.20	U100	23	3.6	1.70	Greyish Brown Very Sandy Clay
D7	7.00	U100	47	6.3	4.10	Greyish Blue Clay
E2	5.00	U100	73	5.8	1.50	Grey Clay
E3	3.00	U100	24	18	6.90	Greyish Brown Clay
E5	1.00	U100	30	54	6.50	Brown Mottled Grey Slightly Sandy Clay
E6	7.00	U100	41	5.7	1.50	Grey Clay
E6	3.00	U100	36	>67	*	Brown Slightly Sandy Clay
G5	9.50	U100	64	14	0.82	Dark Grey Clay
G6	7.00	U100	53	17	1.10	Dark Brown Sandy Clay
H2	5.00	U100	69	6	2.60	Dark Grey Very Silty Clay
H3	5.10	U100	47	13	5.30	Grey Slightly Organic Clay
H3	10.50	U100	39	9.9	3.10	Grey Slightly Sandy Clay
H4	9.00	U100	43	6.8	1.90	Grey Organic Clay
H5	1.00	U100	28	66	6.30	Brown Sandy Clay
H5	8.10	U100	33	17	4.50	Grey Slightly Sandy Clay
H6	3.00	U100	30	29	5.60	Grey Clay
H6	9.50	U100	53	6	1.60	Grey Very Silty Clay
H7	1.50	U100	29	48	13.00	Grey Clay
H7	6.50	U100	36	15	3.30	Grey Organic Clay
H7	11.70	U100	61	7.1	3.50	Grey Organic Clay
I1	0.90	U100	33	>67	*	Grey Slightly Sandy Clay
I1	8.10	U100	30	40	0.12	Grey Slightly Sandy Clay
I2	6.50	U100	34	7.2	0.34	Grey Slightly Sandy Clay
I3	1.00	U100	32	44	9.50	Dark Grey Slightly Sandy Clay
I4	7.80	U100	51	11	3.60	Bluish Grey Slightly Sandy Organic Clay
J1	1.00	U100	32	49	1.50	Grey Clay
J1	10.00	U100	36	49	1.10	Grey Very Silty Clay

* Test aborted - above range of springs

Dimensions of vane used - Diameter 12.85mm and Length 12.73mm

F10895

M4 RELIEF ROAD, NEWPORT

LABORATORY VANE TEST

(BS 1377: PART 7:3(1990))

BH	DEPTH M	TYPE	MC%	SHEAR STRENGTH kPa	REMOLDED SHEAR STRENGTH kPa	DESCRIPTION
J2	9.00	U100	60	6.6	0.72	Dark Grey Slightly Sandy Clay
J3	7.90	U100	33	9.8	3.00	Grey Slightly Organic Clay
J4	3.00	U100	45	57	1.40	Grey Clay
J4	10.40	U100	18	22	11.00	Grey Slightly Organic Clay
K1	1.00	U100	37	52	11.00	Grey Slightly Organic Clay
K1	5.00	U100	72	3.6	0.65	Grey Slightly Sandy Very Silty Clay
K2	5.15	U100	61	11	1.10	Grey Slightly Organic Clay
K3	8.10	U100	39	6.2	2.00	Grey Slightly Sandy Clay
K5	3.00	U100	56	21	1.80	Grey Very Silty Clay
L1	5.10	U100	76	4.8	0.39	Grey Slightly Sandy Clay
L2	1.00	U100	49	22	1.70	Brownish Grey Clay
L2	8.30	U100	55	7.8	0.50	Grey Sandy Clay
L3	3.20	U100	60	5.6	1.70	Grey Clay
L3	9.50	U100	13	50	0.89	Green Clay
L5	0.70	U100	23	>71	*	Brown Sandy Clay
L6	1.50	U100	35	13	1.90	Brown Slightly Organic Clay
L6	7.20	U100	25	8.5	2.80	Grey Organic Clay
L6	8.40	U100	21	31	2.10	Brown Mudstone
M2	6.00	U100	461	27	1.70	Black Peat
M4	4.60	U100	25	23	1.80	Greyish Brown Very Sandy Clay
M5	3.50	U100	29	27	5.00	Brown Very Sandy Clay

* Test aborted - above range of springs

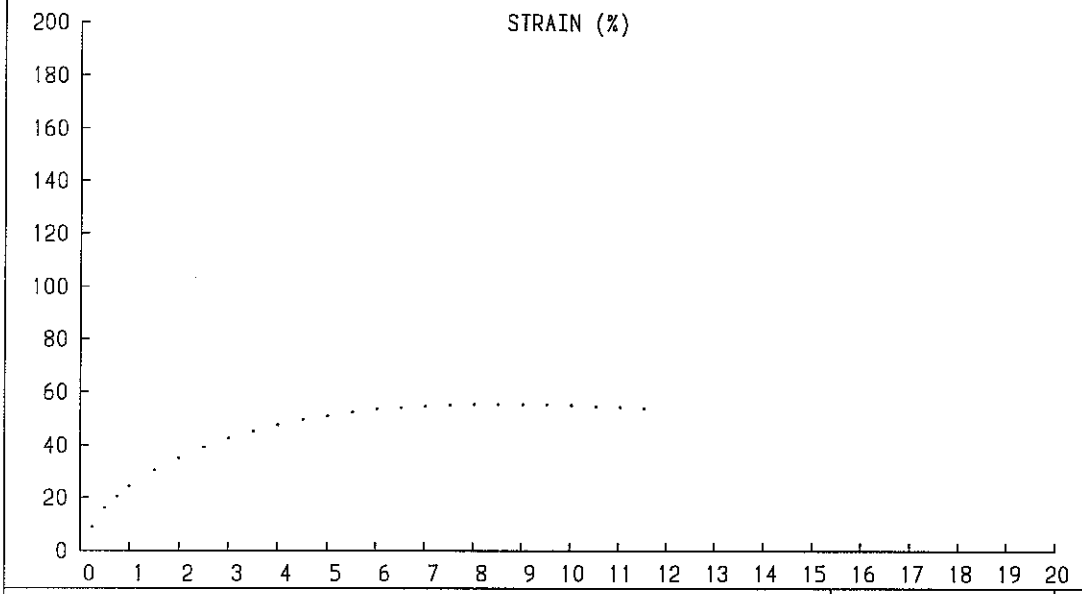
Dimensions of vane used - Diameter 12.85mm and Length 12.73mm

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

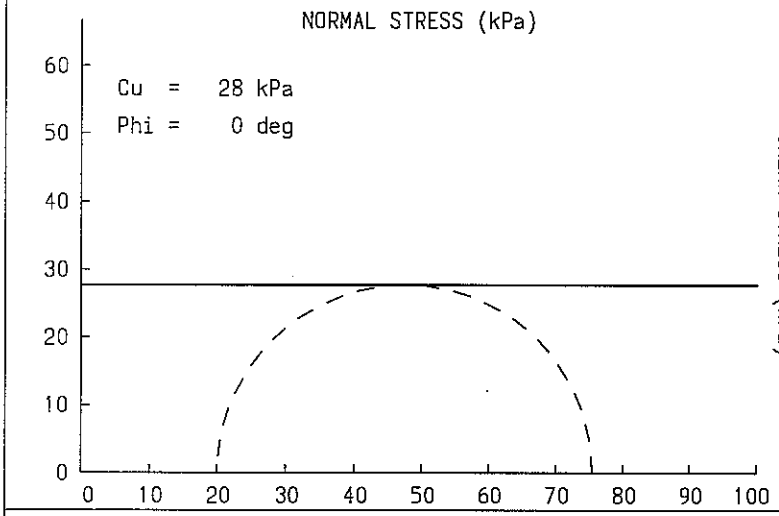
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm reddish brown sandy CLAY with some fine to medium subangular to subrounded mudstone and sandstone gravel and occasional coarse gravel	Hole ID	BHA1
		Sample No	
		Depth	1.00 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	56			kPa
...Corrected	55			kPa
Membrane Corr.	1			kPa
Moisture Content	16			%
Bulk Density	1.98			Mg/m3
Dry Density	1.71			Mg/m3
Diameter	102.4			mm
Length	199.2			mm
Failure Strain	8.5			%
Cu	28			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

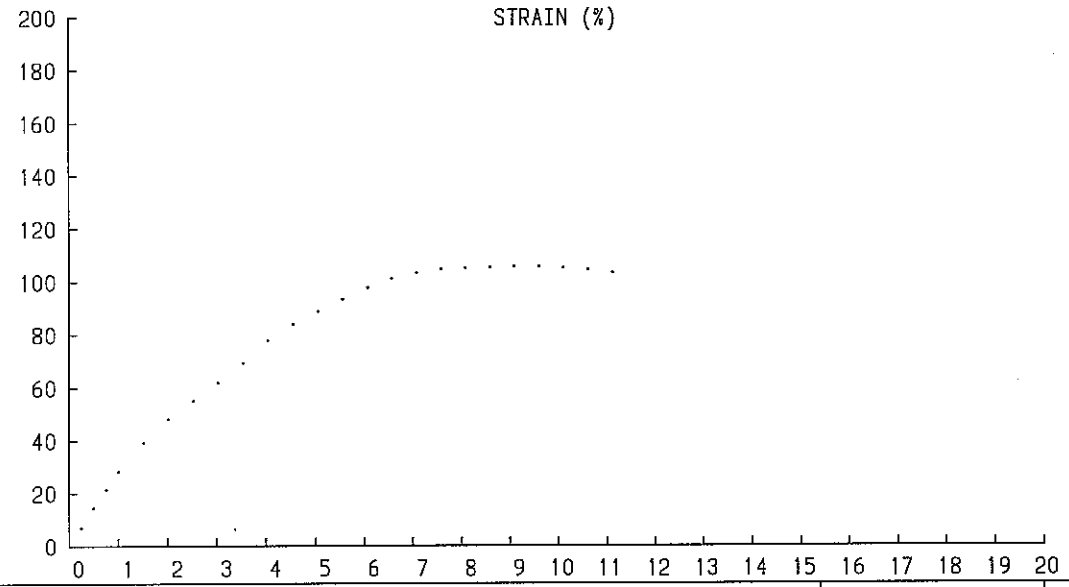
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

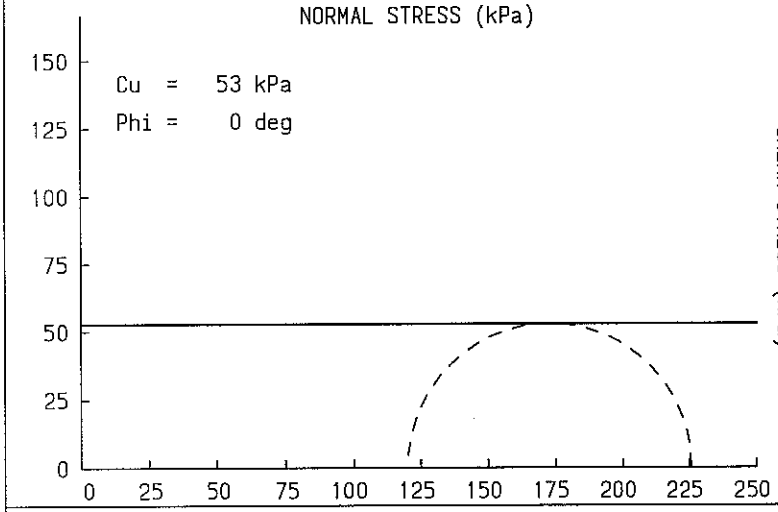
NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Firm to stiff reddish sandy CLAY with some fine to coarse gravel	Hole ID	BHA1
		Sample No	
		Depth	6.10 m





	1	2	3	
Cell Pressure	120			kPa
Deviator Stress	106			kPa
...Corrected	106			kPa
Membrane Corr.	1			kPa
Moisture Content	11			%
Bulk Density	2.34			Mg/m3
Dry Density	2.11			Mg/m3
Diameter	102.2			mm
Length	197.9			mm
Failure Strain	9.1			%
Cu	53			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

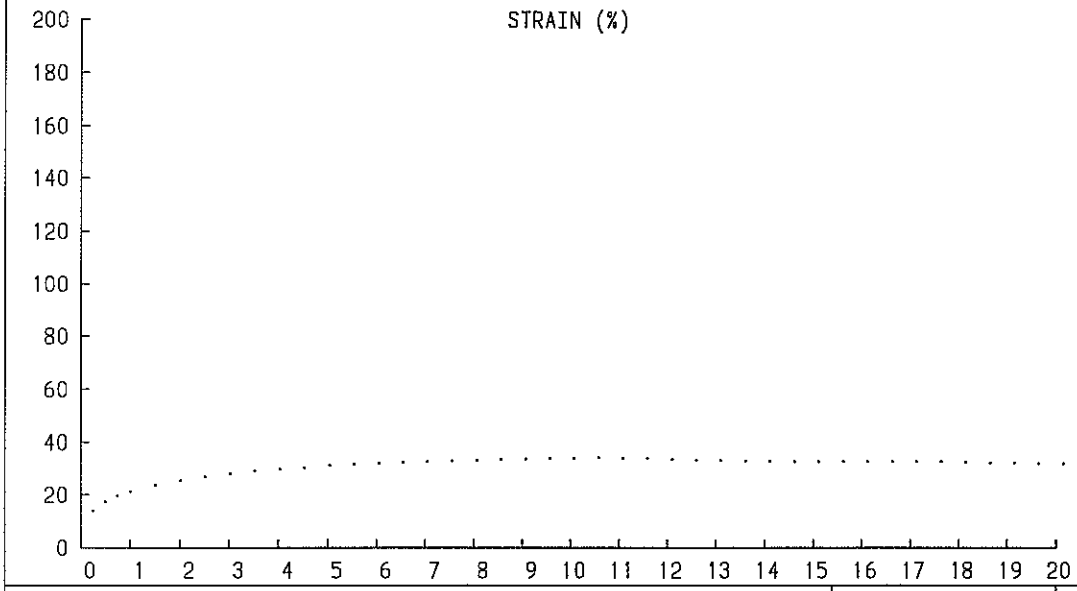
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

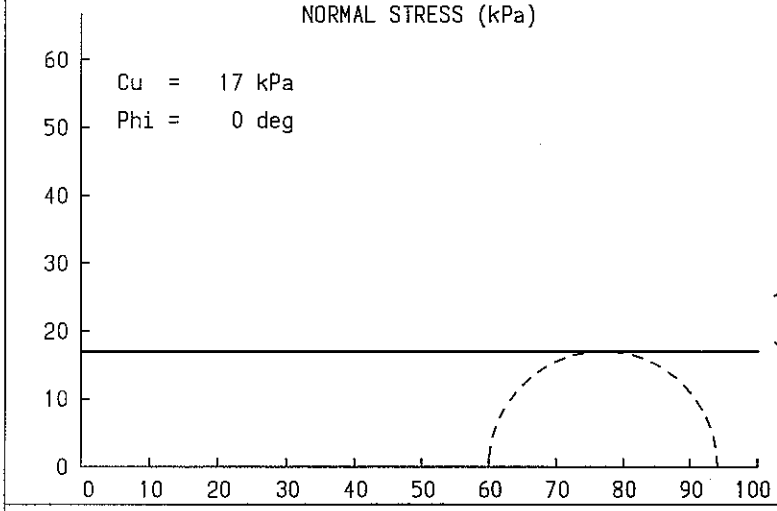
NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Soft dark reddish brown CLAY with much fine to coarse angular weak mudstone lithorelics (highly weathered mudstone)	Hole ID	BHA3
		Sample No	
		Depth	3.20 m





	1	2	3	
Cell Pressure	60			kPa
Deviator Stress	35			kPa
...Corrected	34			kPa
Membrane Corr.	1			kPa
Moisture Content	30			%
Bulk Density	1.93			Mg/m3
Dry Density	1.48			Mg/m3
Diameter	100.3			mm
Length	198.4			mm
Failure Strain	10.6			%
Cu	17			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

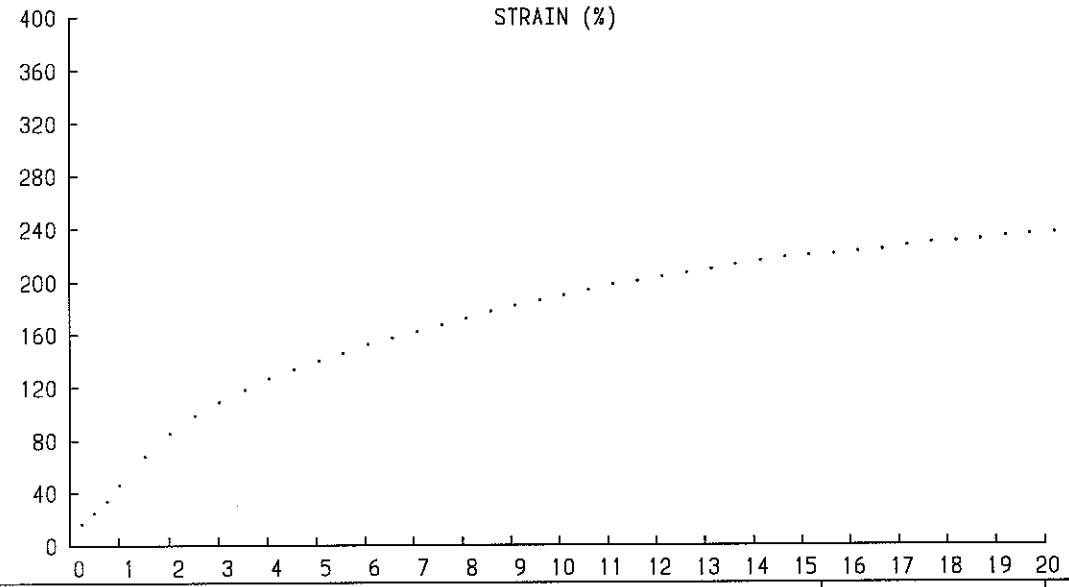
Q.A. Ref: /117-24/M4BHA332.QTX 2.05

NORWEST HOLST SOIL ENGINEERING LIMITED

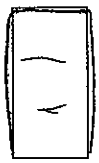
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

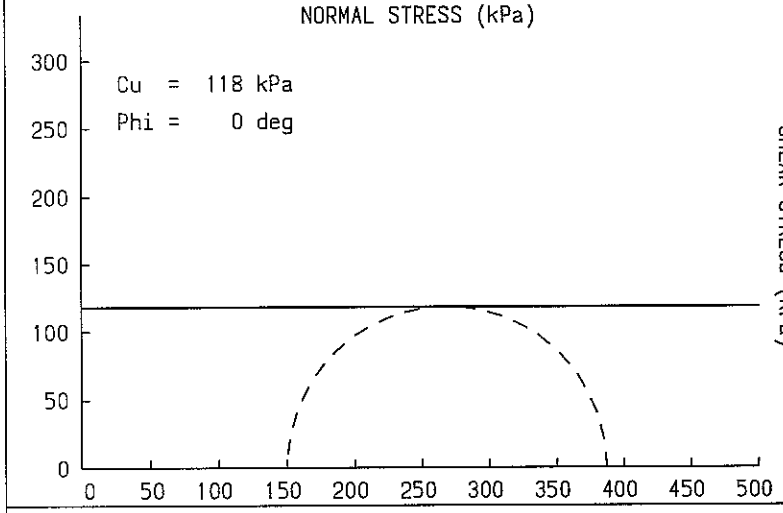
Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Stiff reddish brown very sandy CLAY with occasional fine to medium subrounded sandstone and mudstone gravel	Hole ID	BHB1A
		Sample No	
		Depth	7.50 m



FAILURE MODE DIAGRAM



Plastic



	1	2	3	
Cell Pressure	150			kPa
Deviator Stress	238			kPa
...Corrected	237			kPa
Membrane Corr.	1			kPa
Moisture Content	12			%
Bulk Density	2.27			Mg/m3
Dry Density	2.02			Mg/m3
Diameter	103.7			mm
Length	197.9			mm
Failure Strain	20.0			%
Cu	118			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

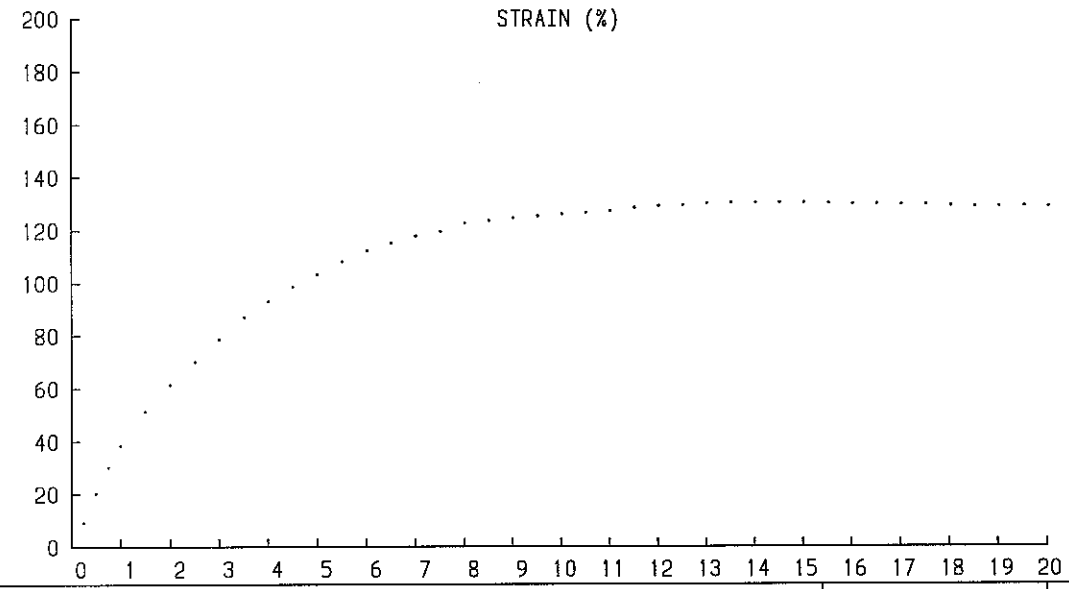
Q.A. Ref: /117-24/M4BHB1A7.QTX 2.05

NORWEST HOLST SOIL ENGINEERING LIMITED

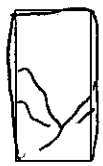
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

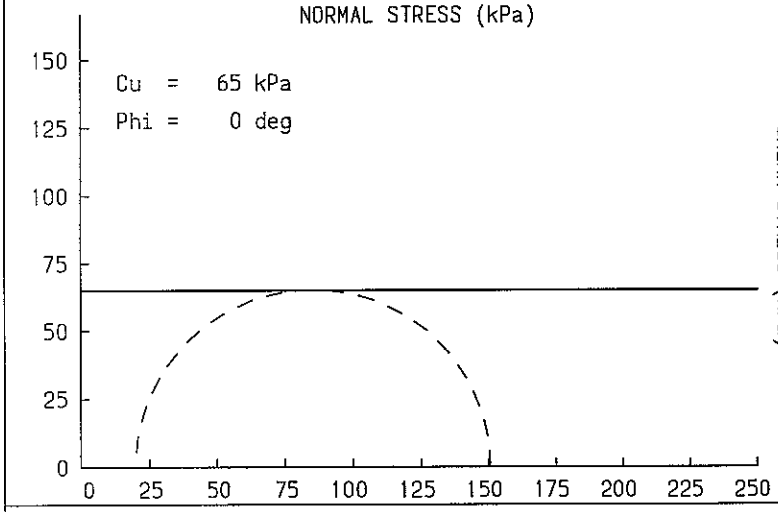
Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm to stiff reddish brown mottled black brown completly weathered residual MUDSTONE (MARL) very weak	Hole ID	BHB3
		Sample No	
		Depth	1.00 m



FAILURE MODE DIAGRAM



Brittle



	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	131			kPa
...Corrected	130			kPa
Membrane Corr.	1			kPa
Moisture Content	10			%
Bulk Density	2.11			Mg/m3
Dry Density	1.91			Mg/m3
Diameter	101.9			mm
Length	199.6			mm
Failure Strain	13.5			%
Cu	65			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

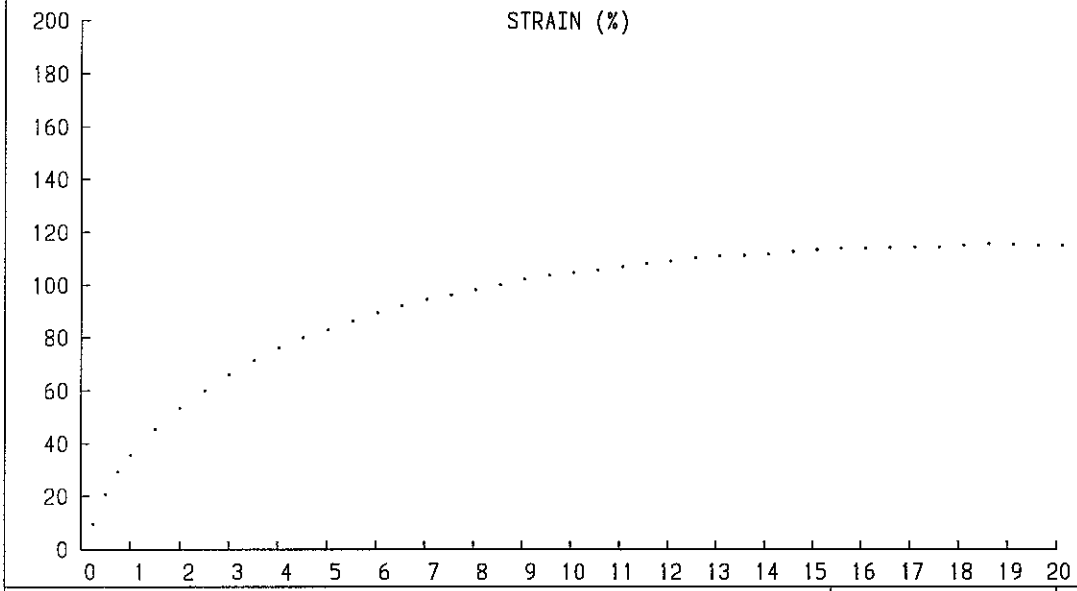
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

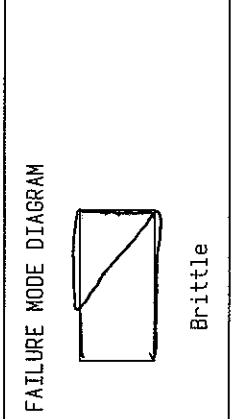
NORWEST HOLST SOIL ENGINEERING LIMITED

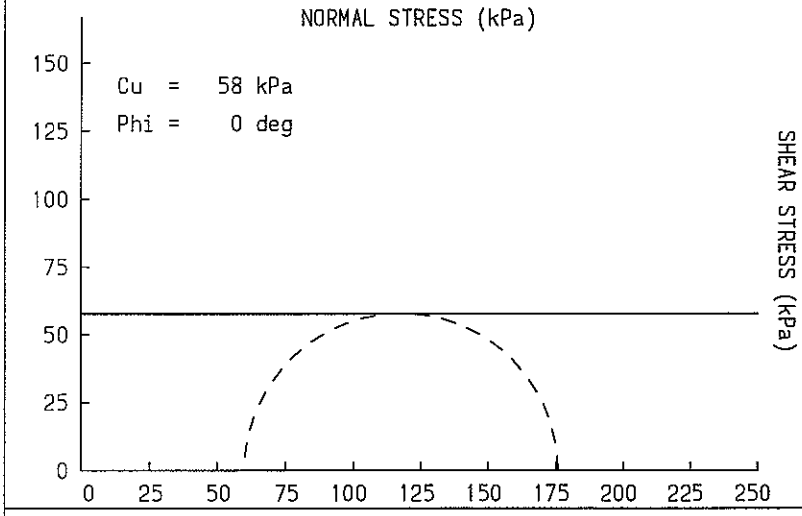
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm reddish brown mottled greenish brown highly weathered silty MUDSTONE	Hole ID	BHB16A
		Sample No	
		Depth	3.30 m







	1	2	3	
Cell Pressure	60			kPa
Deviator Stress	117			kPa
...Corrected	116			kPa
Membrane Corr.	1			kPa
Moisture Content	13			%
Bulk Density	2.23			Mg/m3
Dry Density	1.97			Mg/m3
Diameter	103.1			mm
Length	198.8			mm
Failure Strain	18.6			%
Cu	58			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

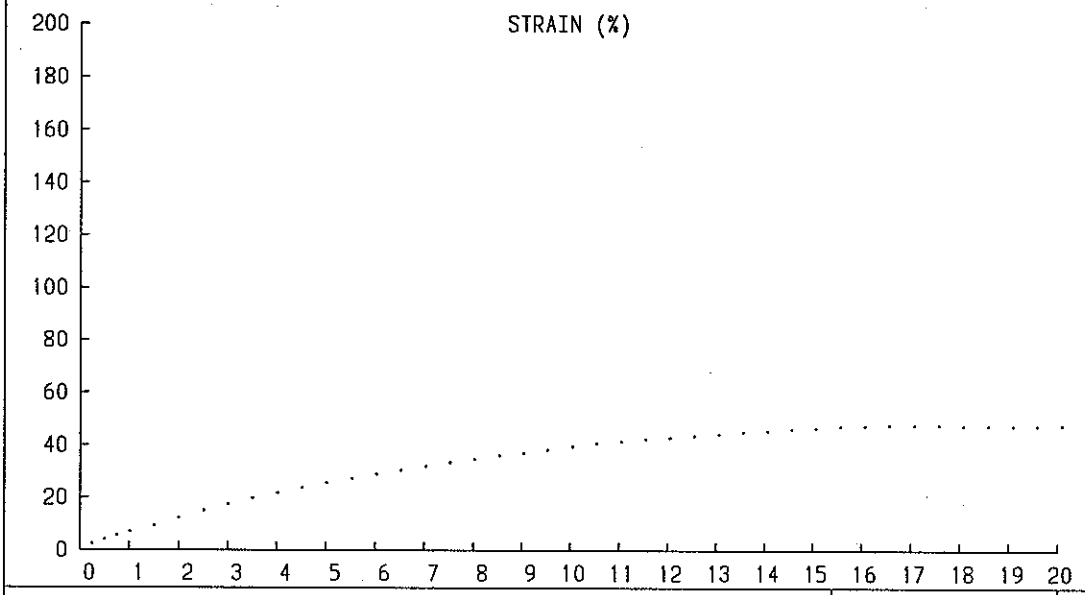
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

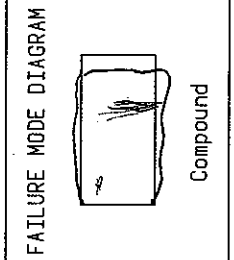
NORWEST HOLST SOIL ENGINEERING LIMITED

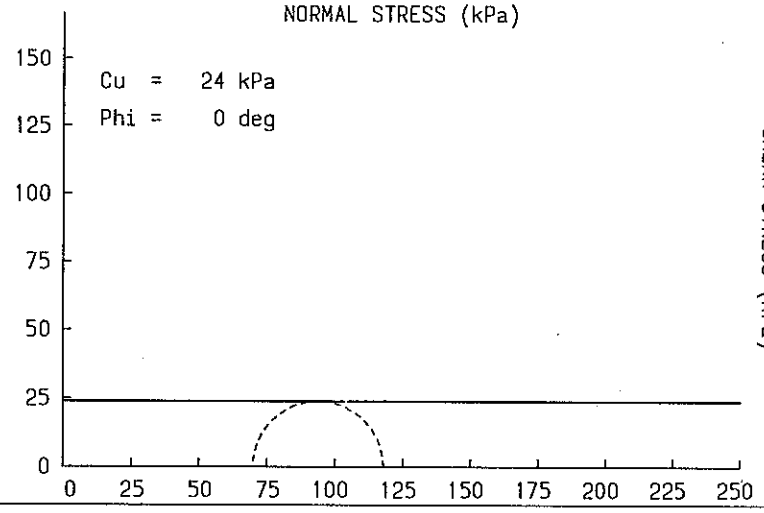
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft to firm reddish brown very silty CLAY. (Completely weathered mudstone.)	Hole ID	BHC1
		Sample No	
		Depth	3.50 m







	1	2	3	
Cell Pressure	70			kPa
Deviator Stress	49			kPa
...Corrected	48			kPa
Membrane Corr.	1			kPa
Moisture Content	23			%
Bulk Density	2.07			Mg/m3
Dry Density	1.68			Mg/m3
Diameter	104.3			mm
Length	199.1			mm
Failure Strain	20.0			%
Cu	24			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.
No apparent failure observed, hence first stage run to termination.

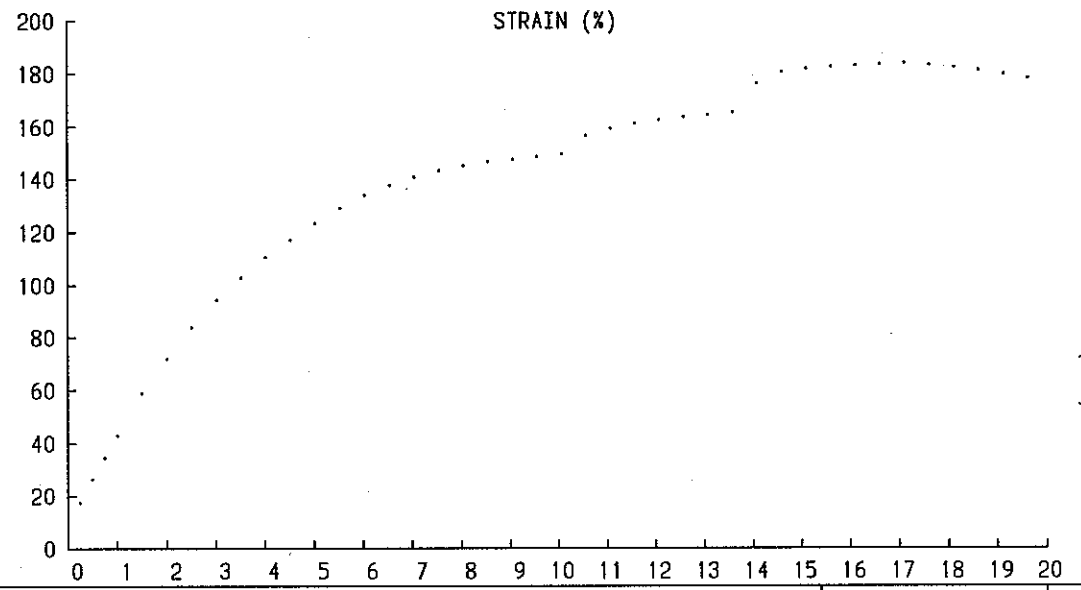
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

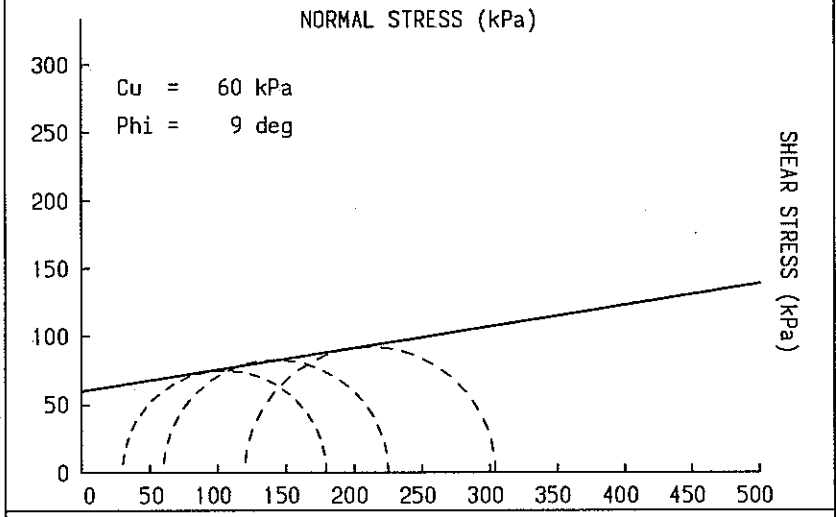
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Firm to stiff very clayey completely weathered MUDSTONE.	Hole ID	BHC2
		Sample No	
		Depth	1.50 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	30	60	120	kPa
Deviator Stress	150	166	185	kPa
...Corrected	149	165	184	kPa
Membrane Corr.	1	1	1	kPa
Moisture Content	24			%
Bulk Density	2.07			Mg/m3
Dry Density	1.67			Mg/m3
Diameter	102.8			mm
Length	198.6			mm
Failure Strain	10.1	13.6	17.1	%
Cu	75	83	92	kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Multi Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

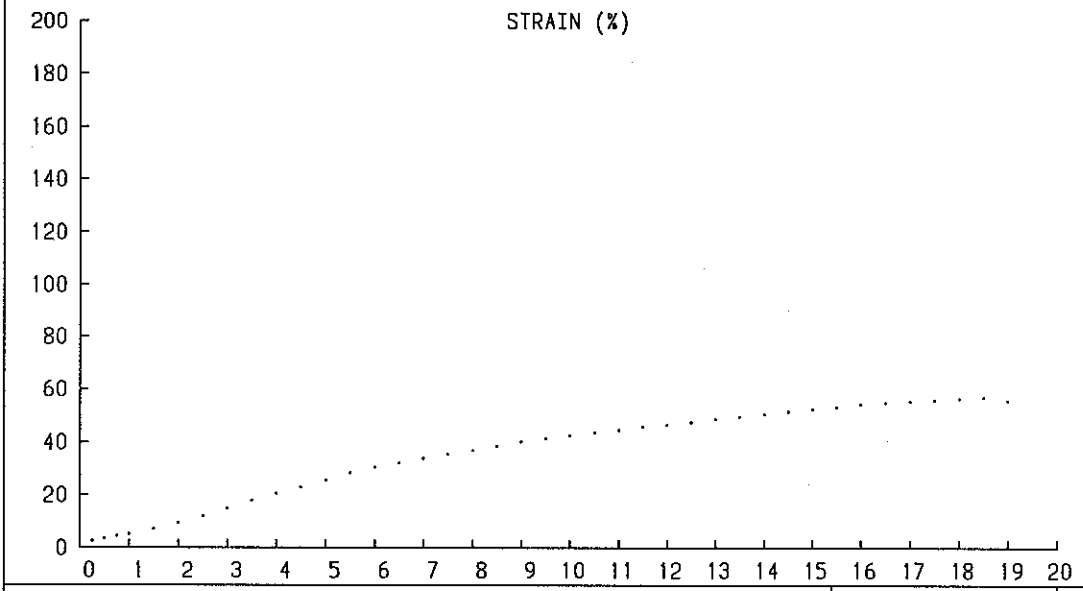
Q.A. Ref: /127-12/m4bc235.QTX 2.05

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

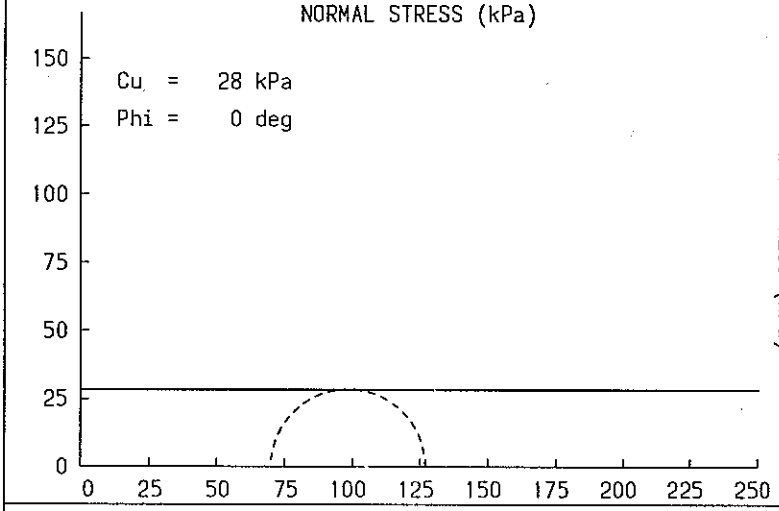
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NE	Contract	F10895
Soil description	Soft brown very clayey SILT.	Hole ID	BHC2
		Sample No	
		Depth	3.50 m



FAILURE MODE DIAGRAM

Brittle



	1	2	3	
Cell Pressure	70			kPa
Deviator Stress	58			kPa
...Corrected	57			kPa
Membrane Corr.	1			kPa
Moisture Content	25			%
Bulk Density	2.13			Mg/m3
Dry Density	1.71			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	18.5			%
Cu	28			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.
No apparent failure observed, hence first stage run to termination.

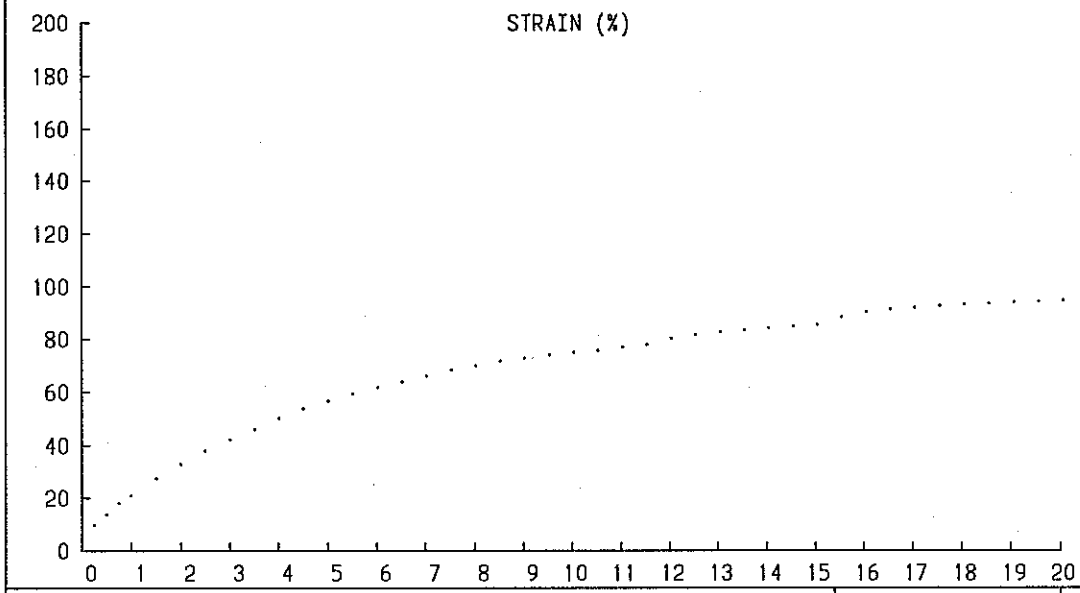
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

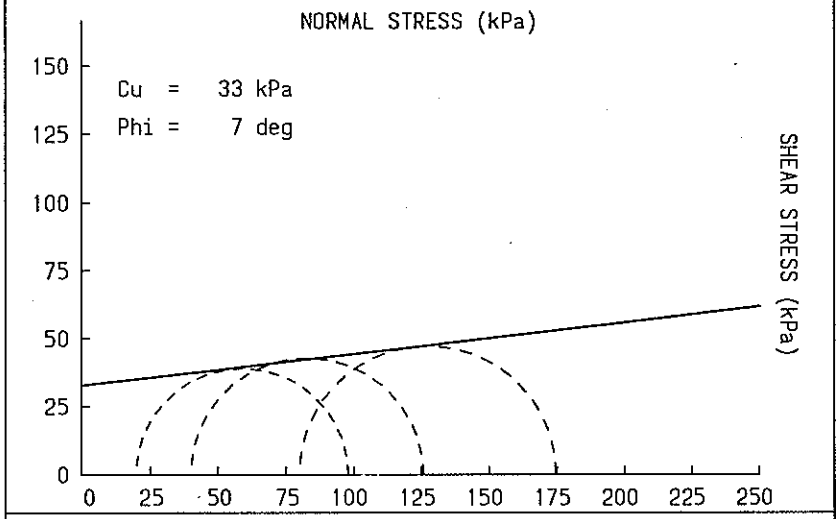
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft reddish brown very sandy CLAY with some fine to coarse gravel.	Hole ID	BHC4
		Sample No	
		Depth	0.90 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	20	40	80	kPa
Deviator Stress	79	86	96	kPa
...Corrected	78	86	95	kPa
Membrane Corr.	1	1	1	kPa
Moisture Content	19			%
Bulk Density	2.14			Mg/m3
Dry Density	1.80			Mg/m3
Diameter	102.7			mm
Length	199.3			mm
Failure Strain	11.5	15.1	20.0	%
Cu	39	43	47	kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
All specimens prepared from top of undisturbed sample tube suitable material.

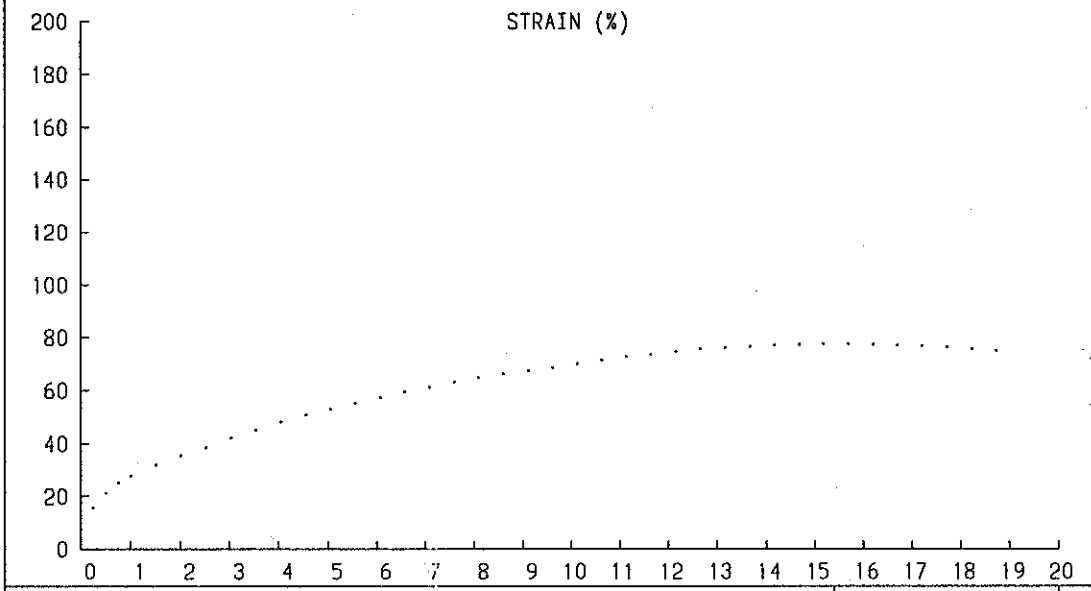
Test Type : Multi Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

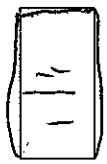
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

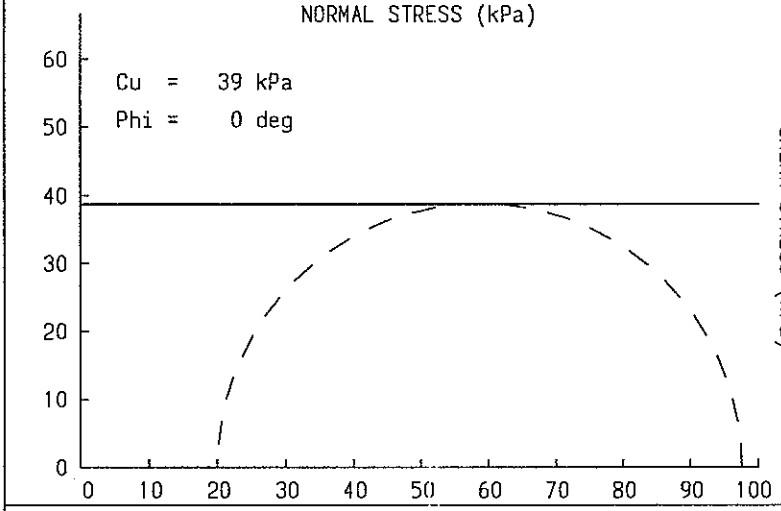
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Firm light brown and grey mottled CLAY.	Hole ID	BHC7
		Sample No	
		Depth	1.00 m



FAILURE MODE DIAGRAM





	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	78			kPa
...Corrected	78			kPa
Membrane Corr.	1			kPa
Moisture Content	37			%
Bulk Density	1.85			Mg/m3
Dry Density	1.35			Mg/m3
Diameter	103.1			mm
Length	197.5			mm
Failure Strain	15.2			%
Cu	39			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
All specimens prepared from top of undisturbed sample tube suitable material.

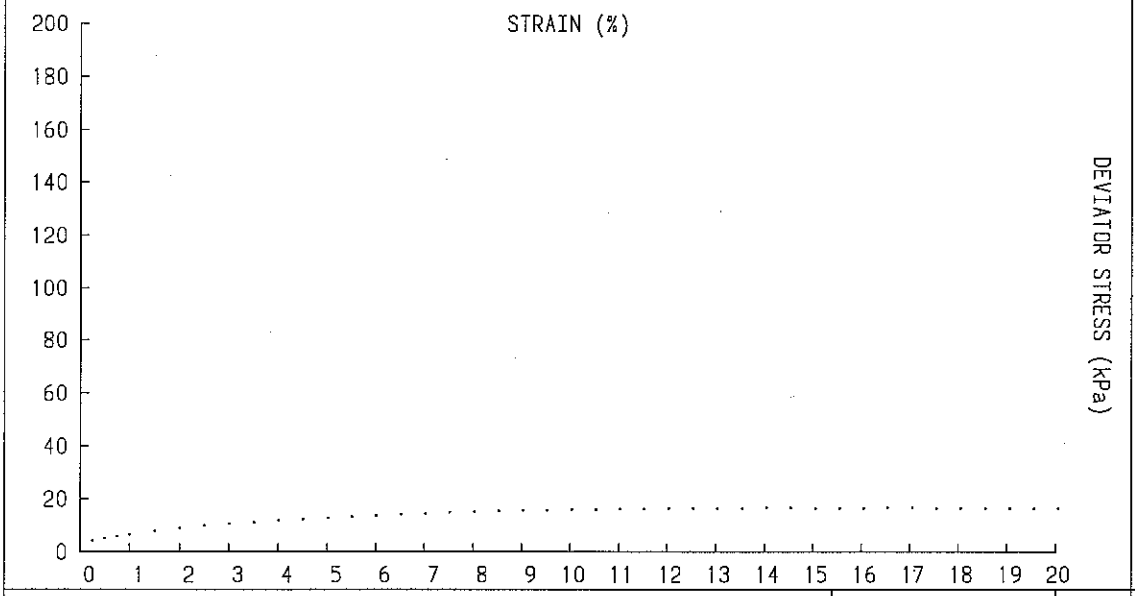
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

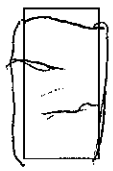
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

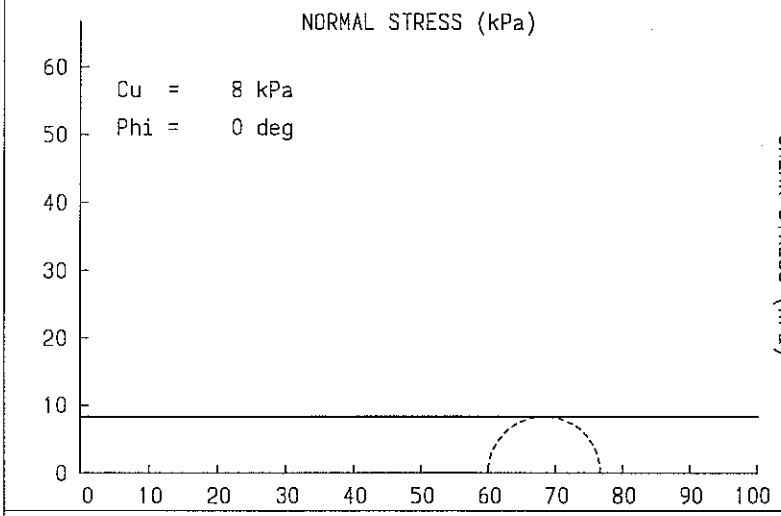
Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft brown and grey mottled CLAY with a little plant matter.	Hole ID	BHC8
		Sample No	
		Depth	3.10 m



FAILURE MODE DIAGRAM



Compound



	1	2	3	
Cell Pressure	60			kPa
Deviator Stress	18			kPa
...Corrected	17			kPa
Membrane Corr.	1			kPa
Moisture Content	136			%
Bulk Density	1.30			Mg/m3
Dry Density	0.55			Mg/m3
Diameter	102.4			mm
Length	199.4			mm
Failure Strain	17.1			%
Cu	8			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

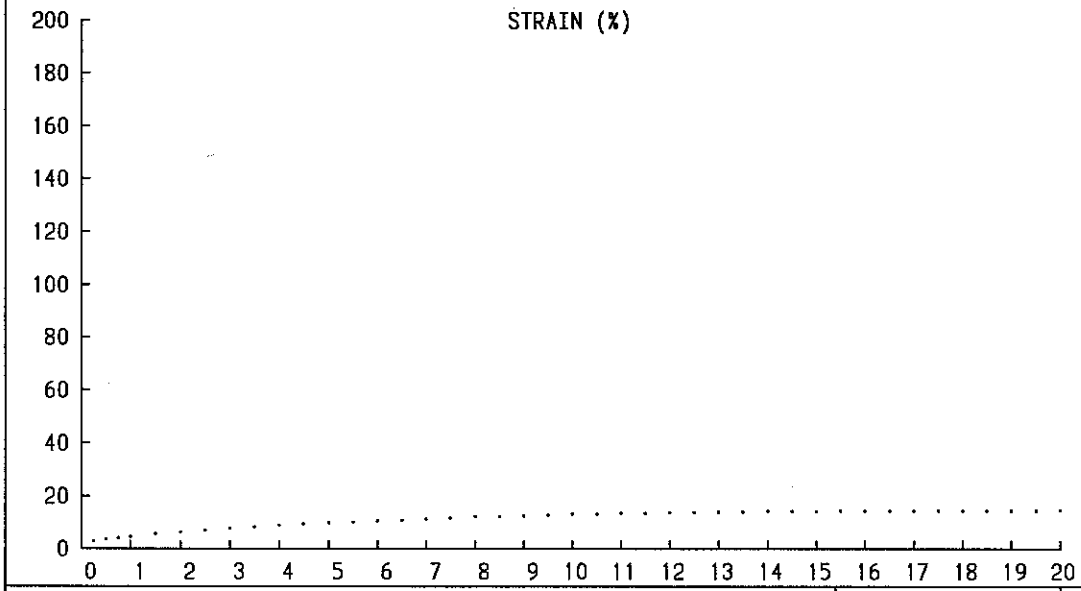
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

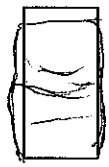
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

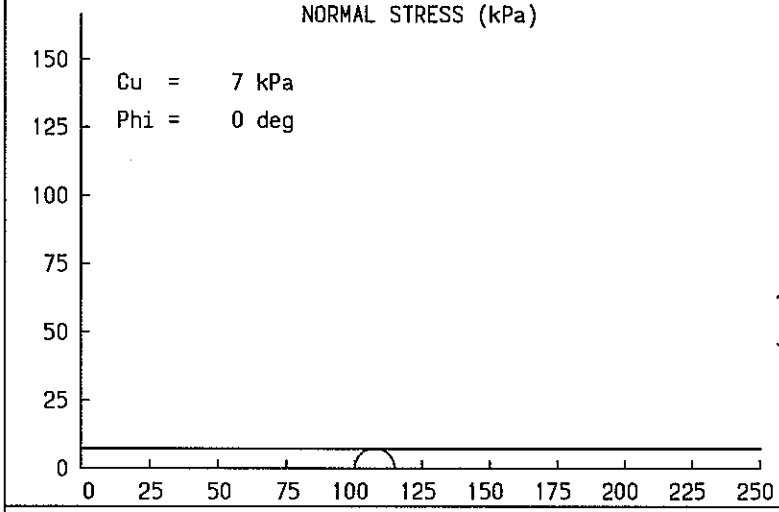
Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft dark brown and reddish brown mottled slightly organic CLAY	Hole ID	BHC8
		Sample No	
		Depth	6.50 m



FAILURE MODE DIAGRAM



Compound



	1	2	3	
Cell Pressure	100			kPa
Deviator Stress	16			kPa
...Corrected	15			kPa
Membrane Corr.	1			kPa
Moisture Content	61			%
Bulk Density	1.67			Mg/m3
Dry Density	1.04			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	20.0			%
Cu	7			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

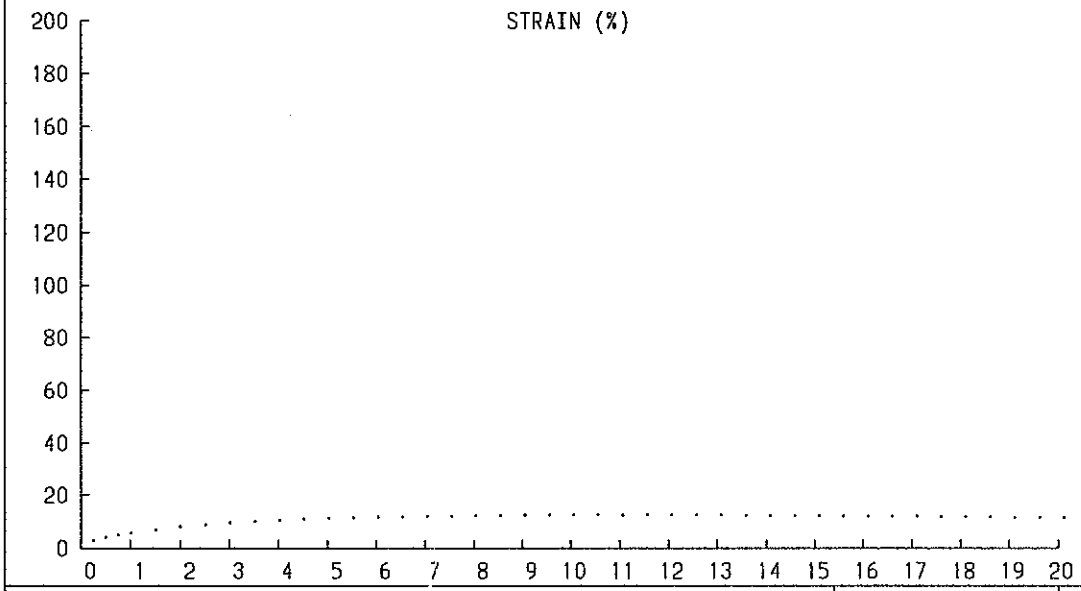
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

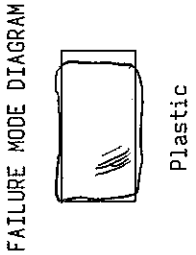
NORWEST HOLST SOIL ENGINEERING LIMITED

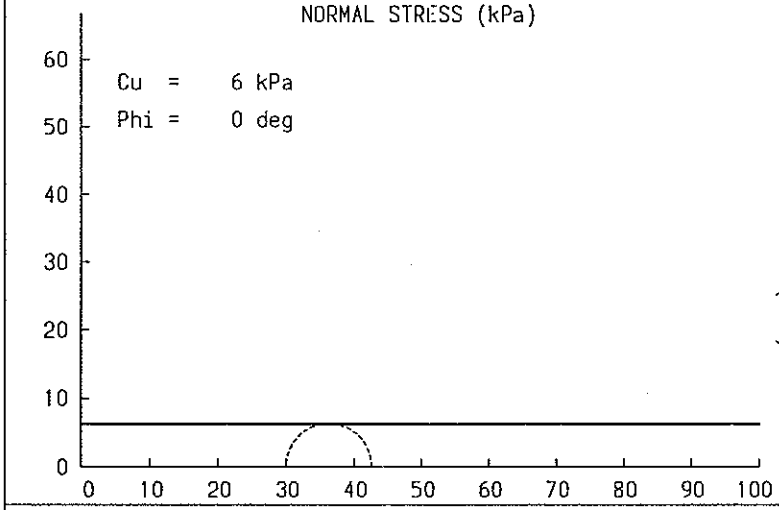
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft grey very silty CLAY.	Hole ID	BH D2
		Sample No	
		Depth	1.70 m







	1	2	3	
Cell Pressure	30			kPa
Deviator Stress	13			kPa
...Corrected	13			kPa
Membrane Corr.	1			kPa
Moisture Content	55			%
Bulk Density	1.65			Mg/m3
Dry Density	1.06			Mg/m3
Diameter	102.9			mm
Length	198.8			mm
Failure Strain	11.1			%
Cu	6			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

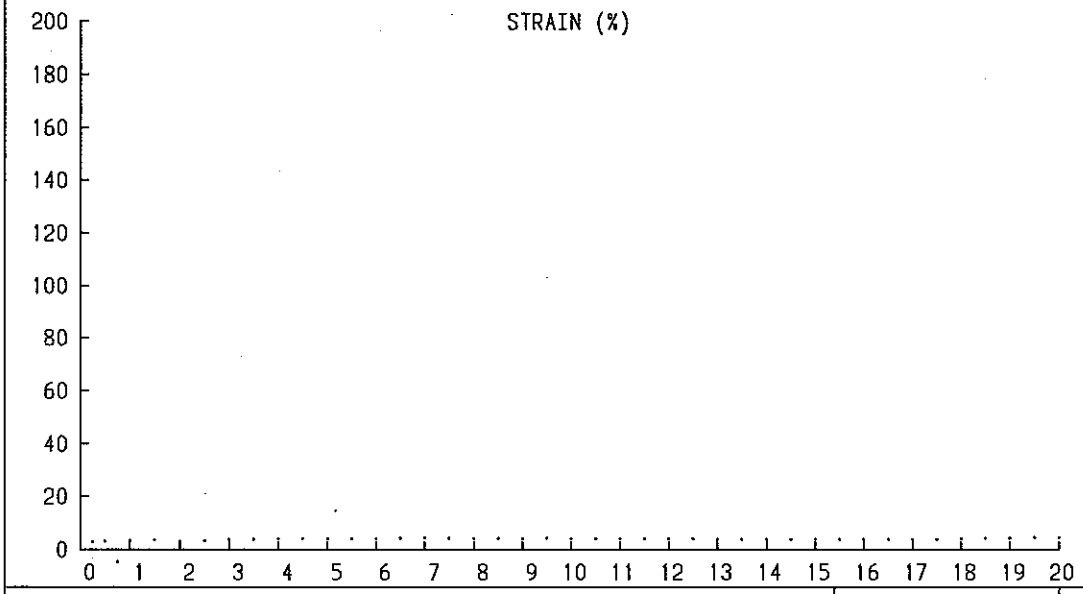
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

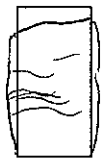
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

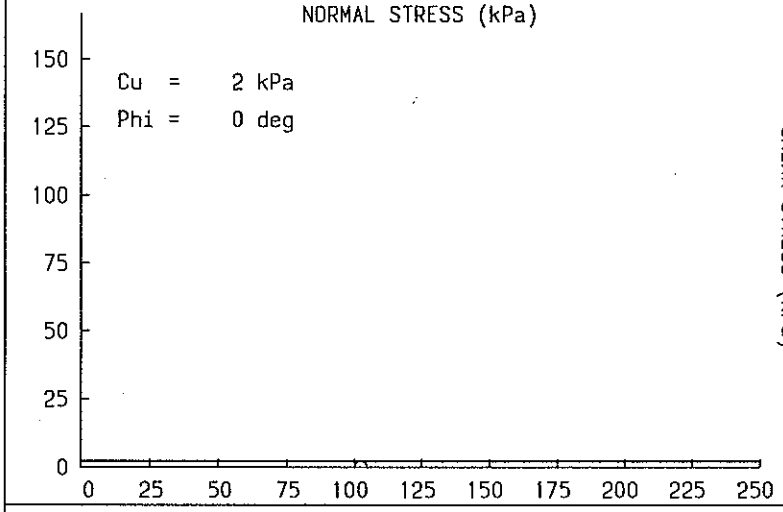
Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft blueish grey slightly organic CLAY.	Hole ID	BH D2
		Sample No	
		Depth	6.00 m



FAILURE MODE DIAGRAM



Compound



	1	2	3	
Cell Pressure	100			kPa
Deviator Stress	6			kPa
...Corrected	5			kPa
Membrane Corr.	1			kPa
Moisture Content	66			%
Bulk Density	1.67			Mg/m3
Dry Density	1.01			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	20.0			%
Cu	2			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

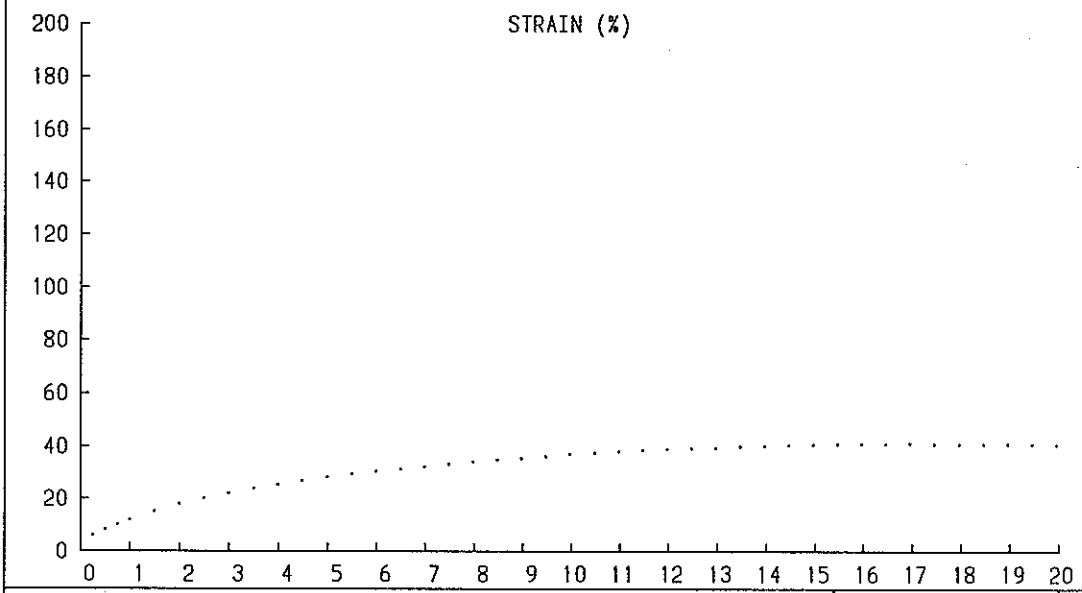
Q.A. Ref: /018-09/m4nbd26.QTX 2.05

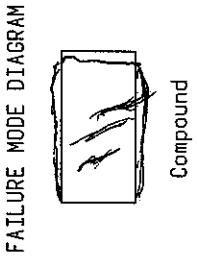
NORWEST HOLST SOIL ENGINEERING LIMITED

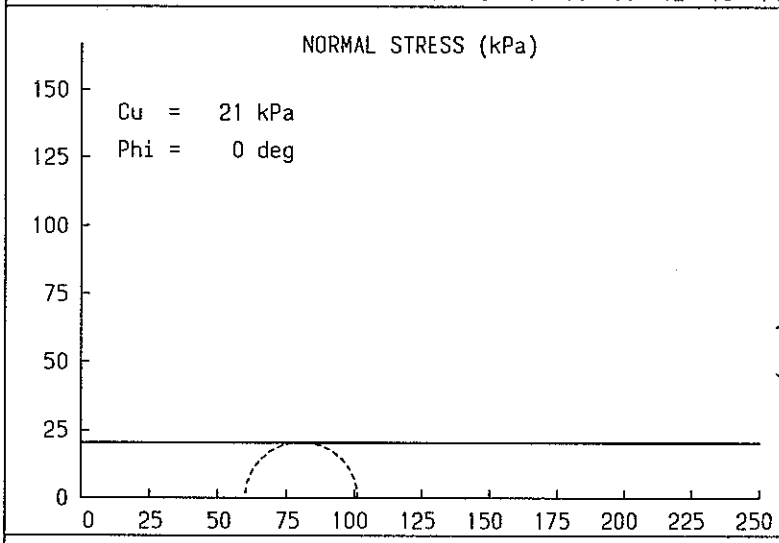
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft grey very silty CLAY.	Hole ID	BH D3
		Sample No	
		Depth	2.80 m







	1	2	3	
Cell Pressure	60			kPa
Deviator Stress	42			kPa
...Corrected	41			kPa
Membrane Corr.	1			kPa
Moisture Content	39			%
Bulk Density	1.83			Mg/m3
Dry Density	1.31			Mg/m3
Diameter	102.7			mm
Length	200.5			mm
Failure Strain	17.0			%
Cu	21			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

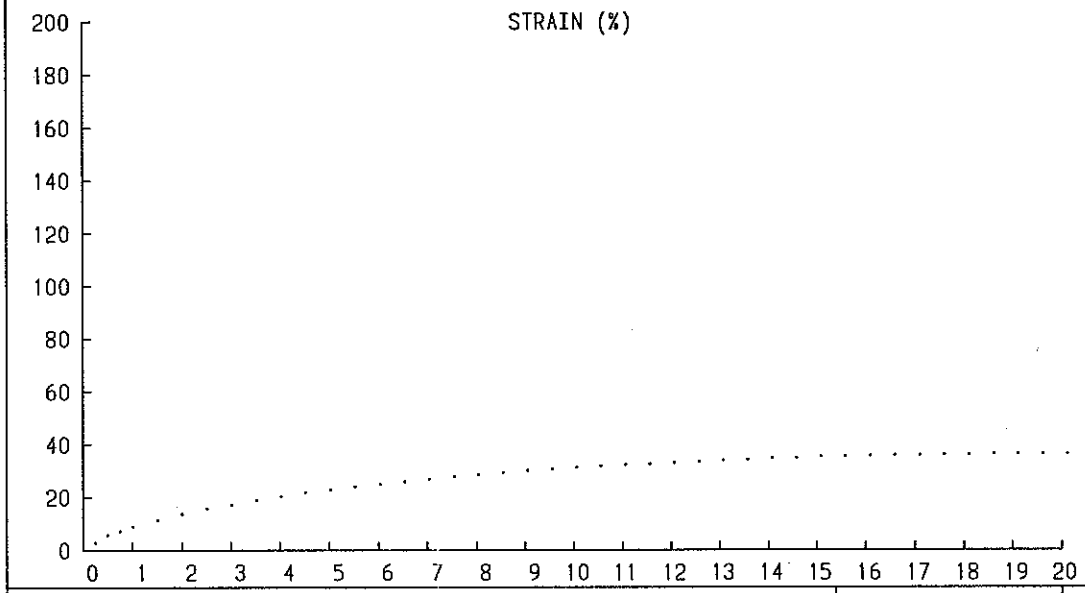
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

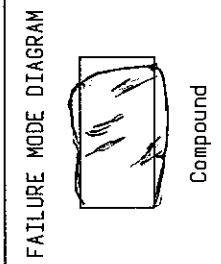
NORWEST HOLST SOIL ENGINEERING LIMITED

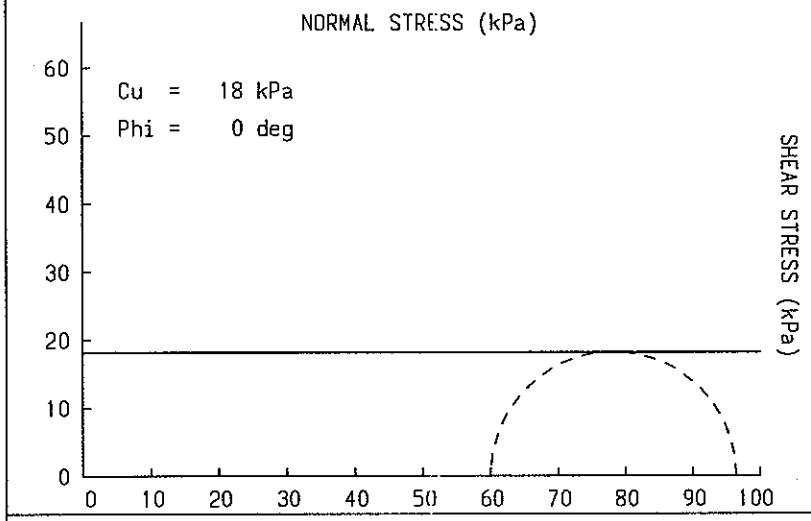
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft to firm grey with occasional thinly laminated very silty CLAY.	Hole ID	BH D4
		Sample No	
		Depth	2.90 m







	1	2	3	
Cell Pressure	60			kPa
Deviator Stress	37			kPa
...Corrected	36			kPa
Membrane Corr.	1			kPa
Moisture Content	32			%
Bulk Density	1.94			Mg/m3
Dry Density	1.47			Mg/m3
Diameter	102.1			mm
Length	198.8			mm
Failure Strain	19.6			%
Cu	18			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

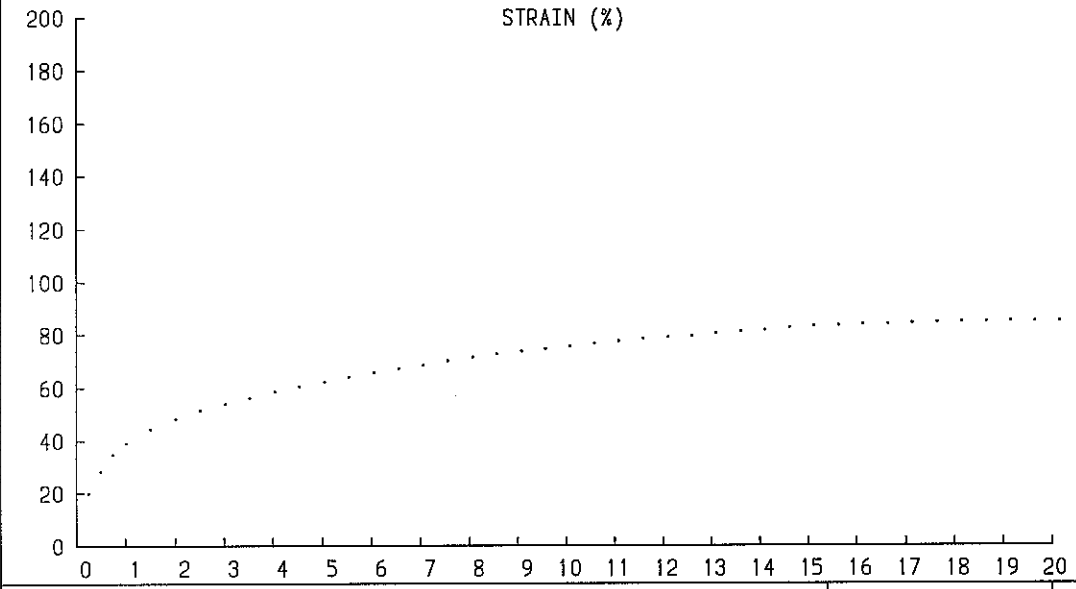
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

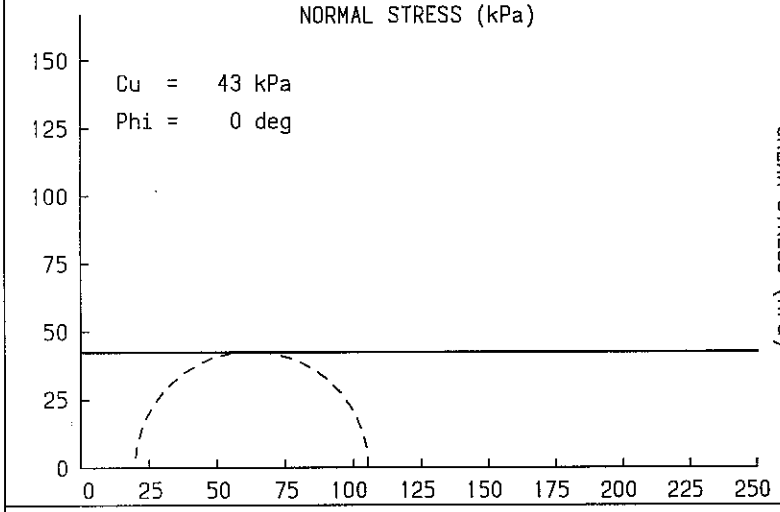
NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm brown and grey mottled CLAY with rootlets and rootlet traces	Hole ID	BHD5
		Sample No	
		Depth	1.00 m





	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	86			kPa
...Corrected	85			kPa
Membrane Corr.	1			kPa
Moisture Content	29			%
Bulk Density	1.95			Mg/m3
Dry Density	1.51			Mg/m3
Diameter	103.0			mm
Length	198.4			mm
Failure Strain	19.7			%
Cu	43			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

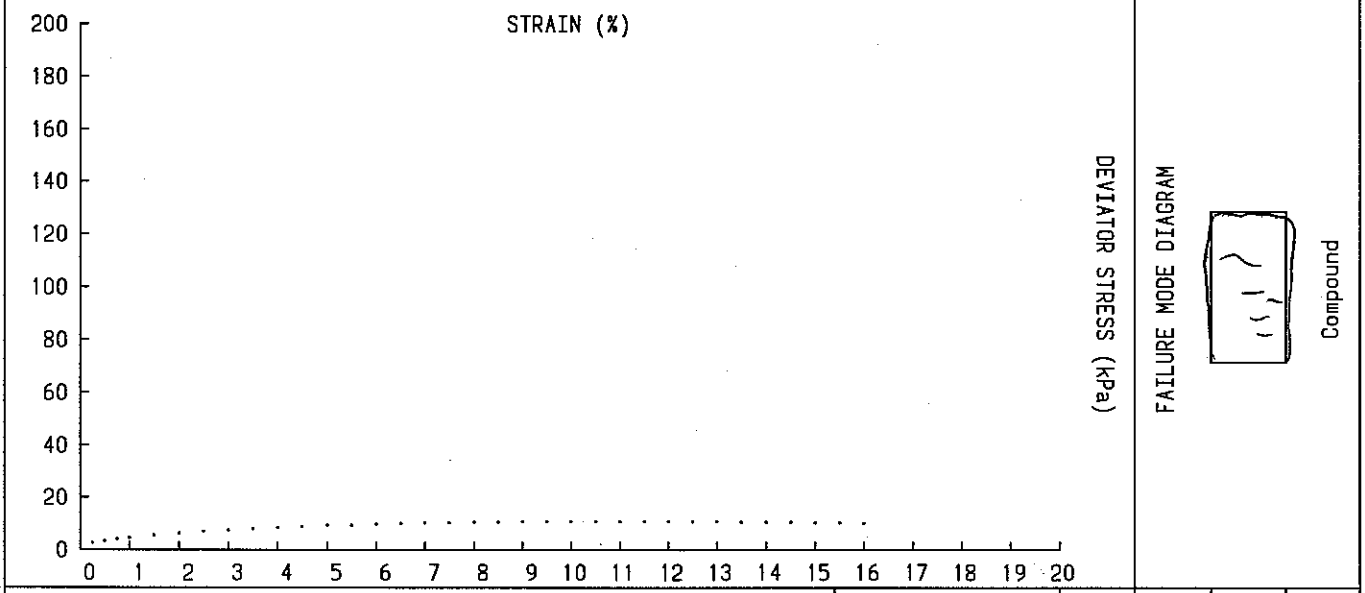
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

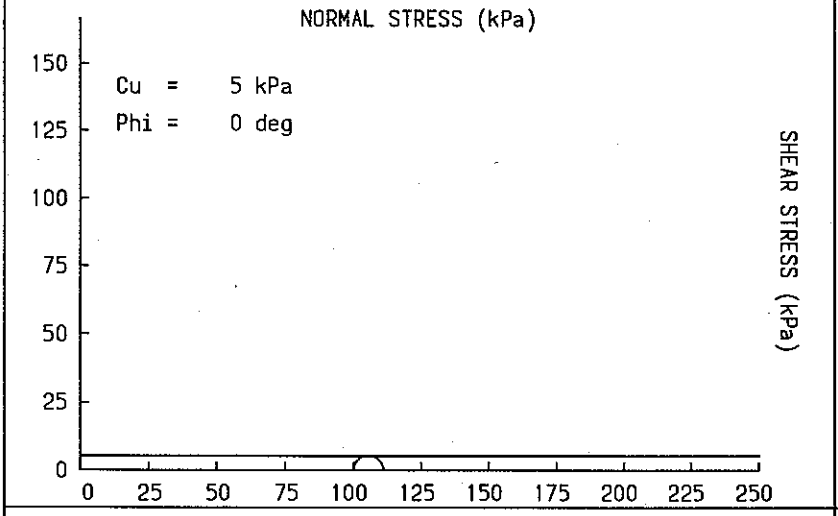
NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Soft dark grey slightly organic CLAY with some decaying material	Hole ID	BHD5
		Sample No	
		Depth	7.00 m





	1	2	3	
Cell Pressure	100			kPa
Deviator Stress	12			kPa
...Corrected	11			kPa
Membrane Corr.	1			kPa
Moisture Content	57			%
Bulk Density	1.75			Mg/m3
Dry Density	1.11			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	11.5			%
Cu	5			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

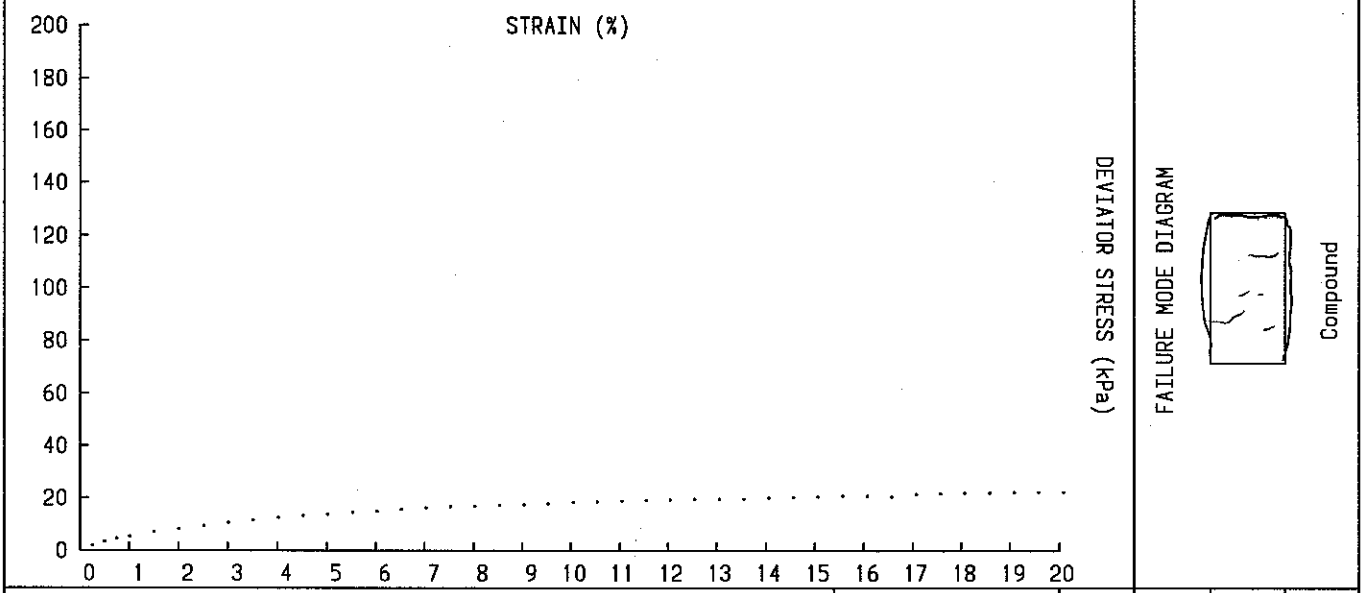
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

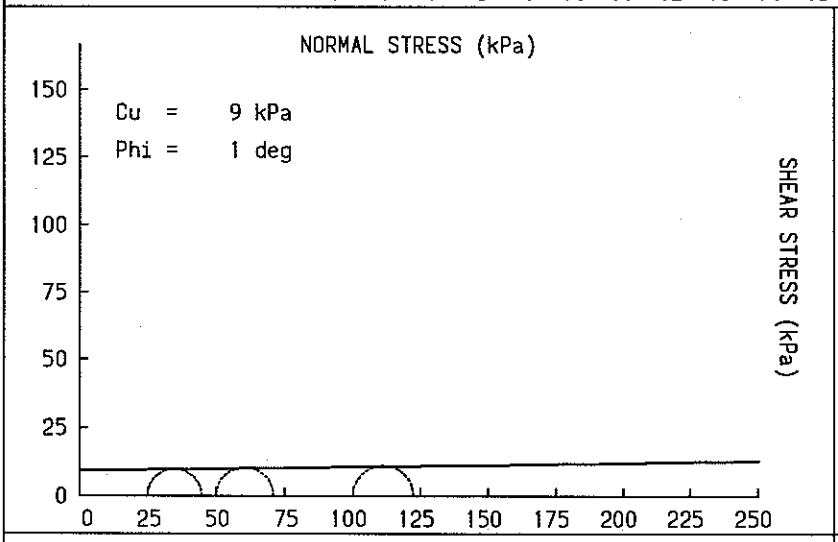
NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Soft to firm light grey slightly organic CLAY	Hole ID	BHD6
		Sample No	
		Depth	3.00 m





	1	2	3	
Cell Pressure	25	50	100	kPa
Deviator Stress	20	22	23	kPa
...Corrected	20	21	22	kPa
Membrane Corr.	1	1	1	kPa
Moisture Content	44			%
Bulk Density	1.80			Mg/m3
Dry Density	1.25			Mg/m3
Diameter	101.6			mm
Length	199.1			mm
Failure Strain	13.1	16.1	20.0	%
Cu	10	10	11	kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

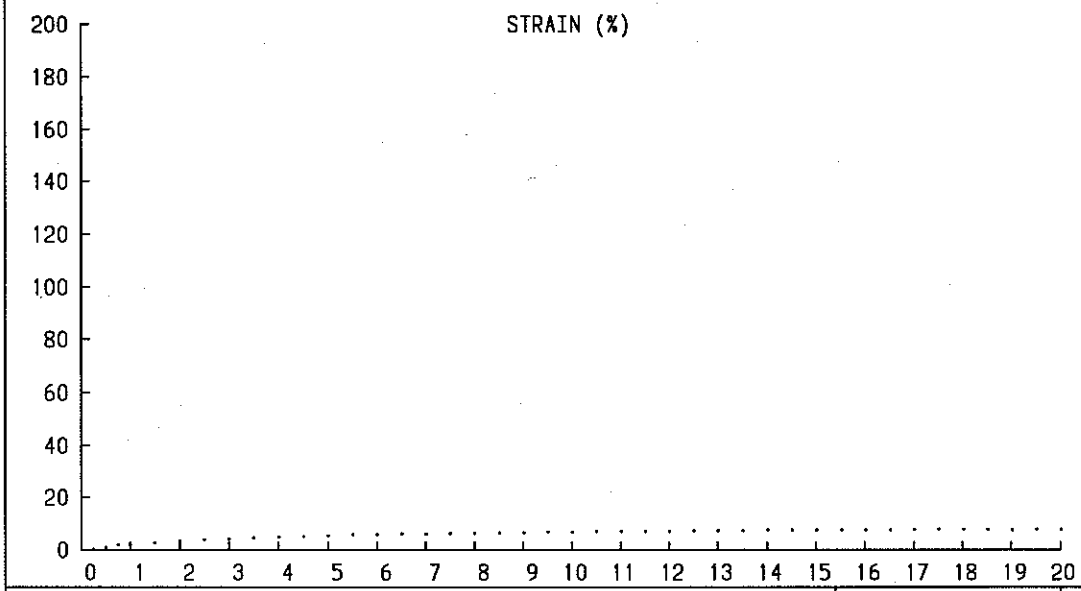
Test Type : Multi Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

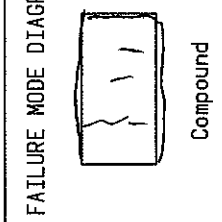
NORWEST HOLST SOIL ENGINEERING LIMITED

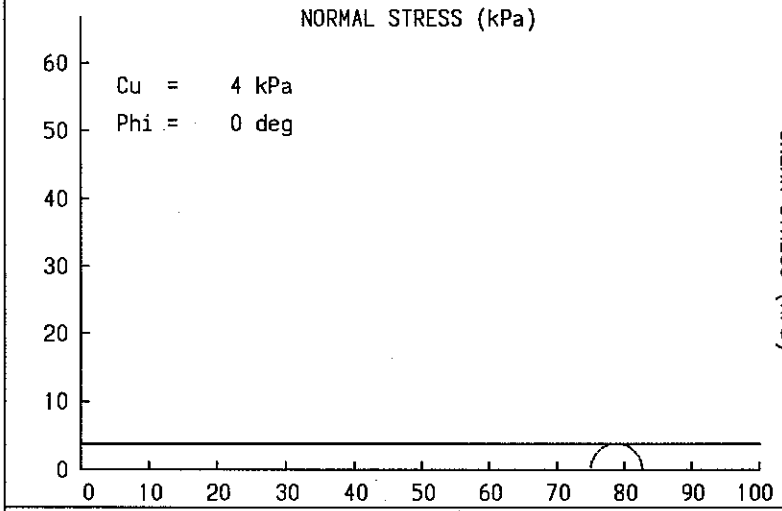
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Very soft dark grey slightly organic CLAY with occasional decaying plant material	Hole ID	BHD6
		Sample No	
		Depth	5.00 m







	1	2	3	
Cell Pressure	75			kPa
Deviator Stress	9			kPa
...Corrected	8			kPa
Membrane Corr.	1			kPa
Moisture Content	80			%
Bulk Density	1.54			Mg/m3
Dry Density	0.86			Mg/m3
Diameter	100.3			mm
Length	199.8			mm
Failure Strain	17.5			%
Cu	4			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

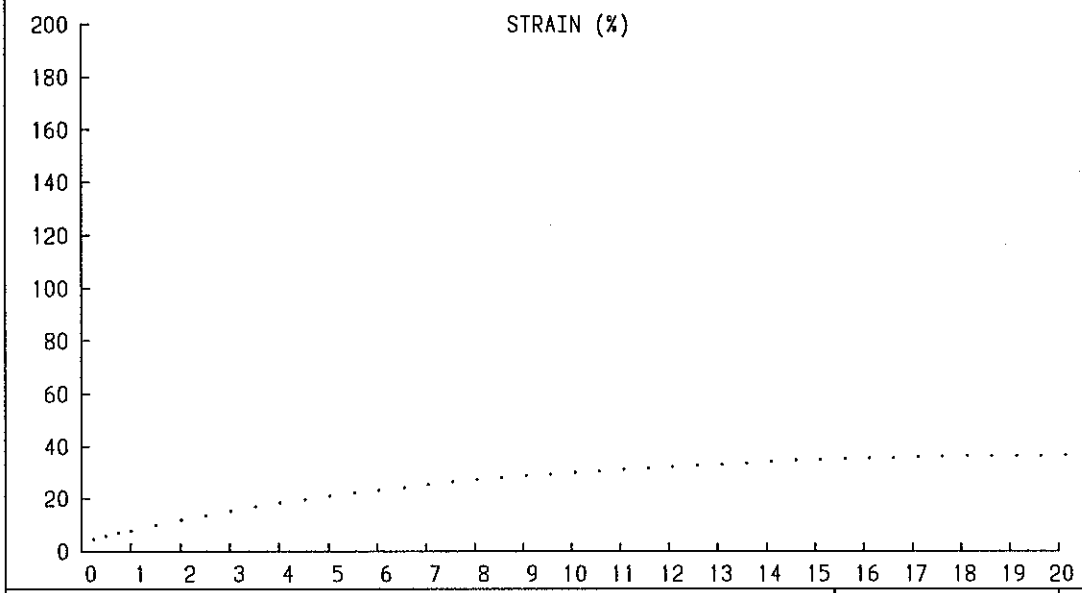
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

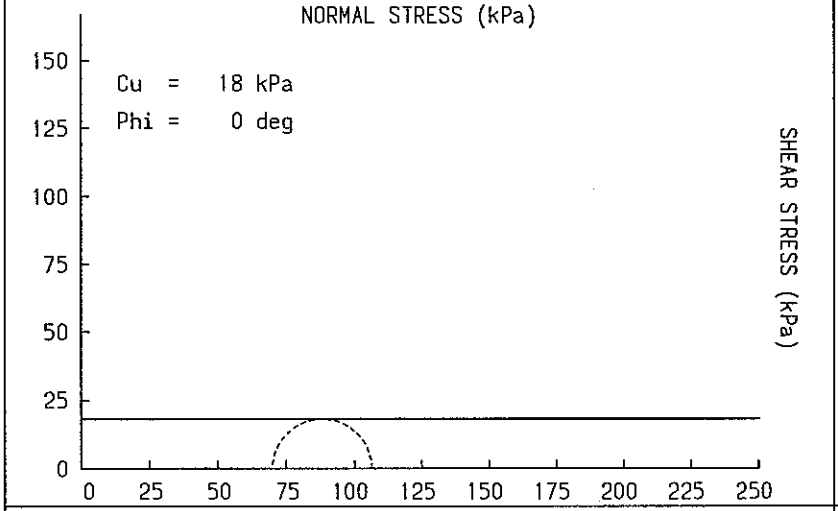
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft grey thinly laminated CLAY with a little fine to coarse sand and occasional rootlets.	Hole ID	BH D7
		Sample No	
		Depth	5.00 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	70			kPa
Deviator Stress	38			kPa
...Corrected	36			kPa
Membrane Corr.	1			kPa
Moisture Content	33			%
Bulk Density	1.89			Mg/m3
Dry Density	1.43			Mg/m3
Diameter	102.9			mm
Length	198.6			mm
Failure Strain	20.0			%
Cu	18			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.
Test run at slow speed.

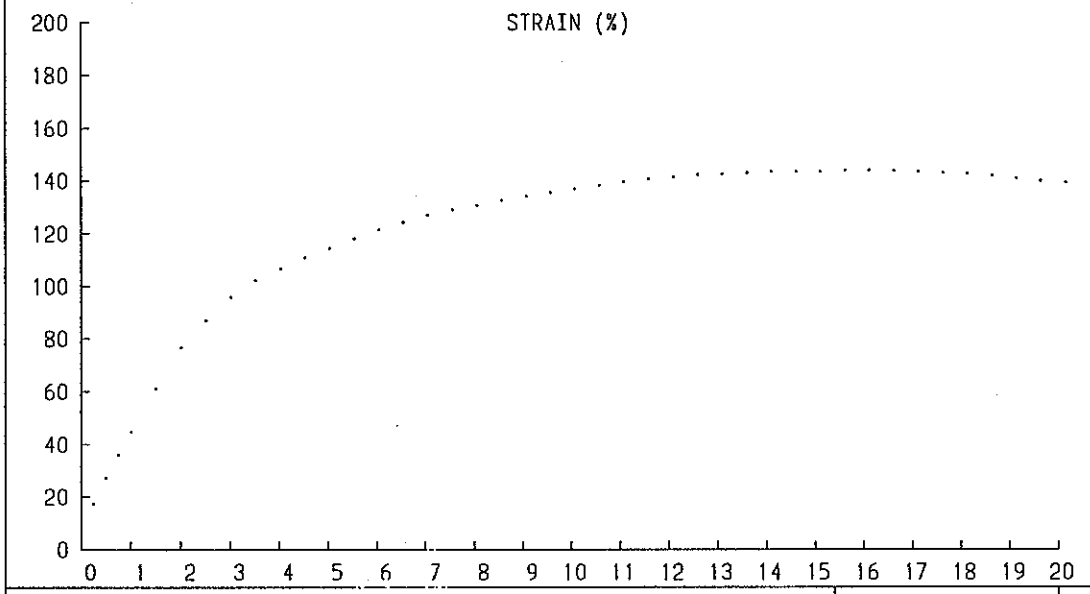
Test Type : Single Stage
Undisturbed
Rate : 1% per minute
Orientated and loaded with vertical axis

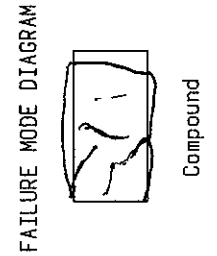
NORWEST HOLST SOIL ENGINEERING LIMITED

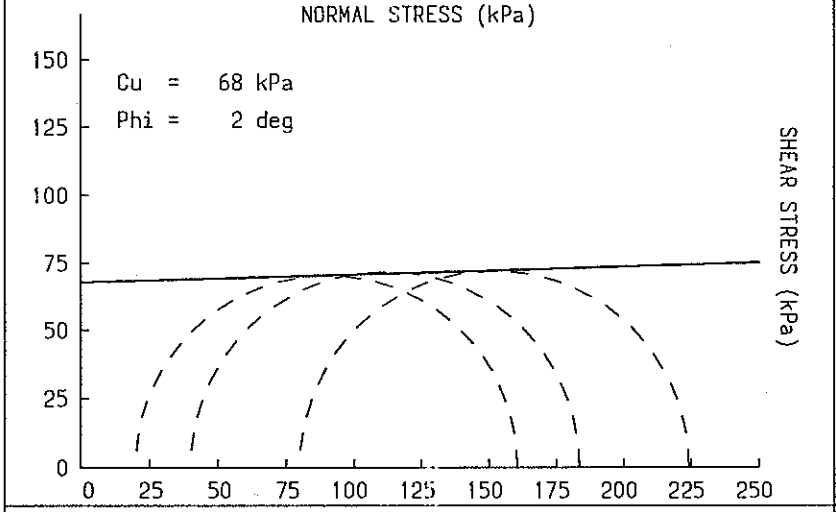
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft to firm brown mottled grey CLAY with some fine rootlets and much gleying.	Hole ID	BH D8
		Sample No	
		Depth	1.00 m







	1	2	3	
Cell Pressure	20	40	80	kPa
Deviator Stress	141	144	145	kPa
...Corrected	140	144	144	kPa
Membrane Corr.	1	1	1	kPa
Moisture Content	25			%
Bulk Density	2.01			Mg/m3
Dry Density	1.61			Mg/m3
Diameter	102.6			mm
Length	198.4			mm
Failure Strain	11.6	14.6	16.1	%
Cu	70	72	72	kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

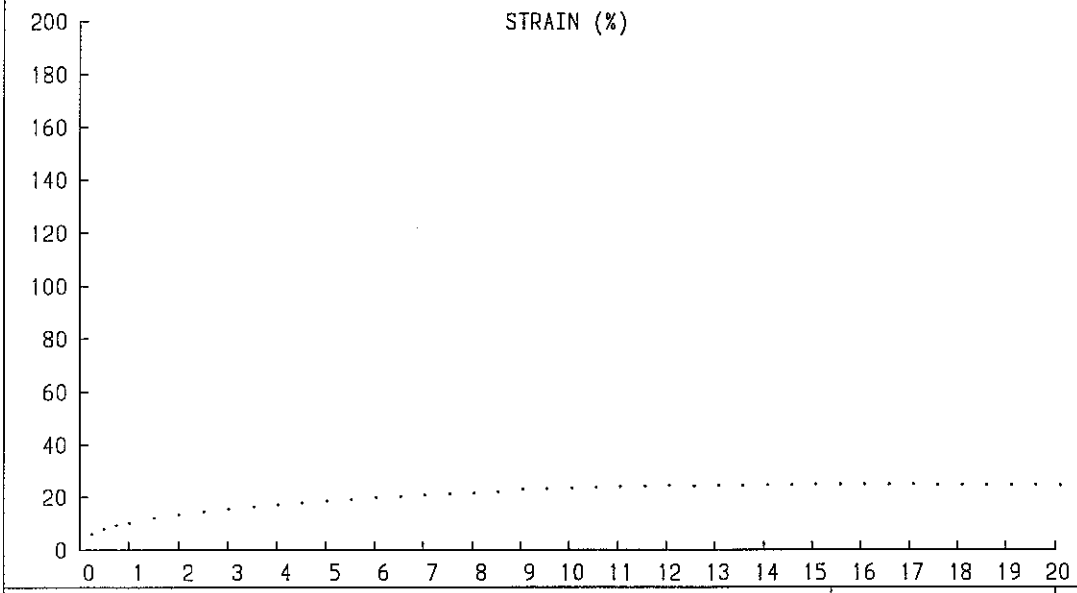
Test Type : Multi Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

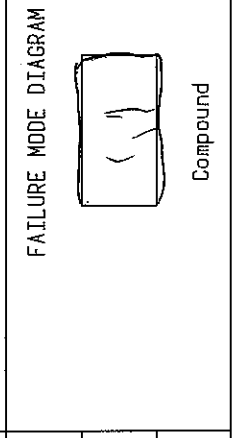
NORWEST HOLST SOIL ENGINEERING LIMITED

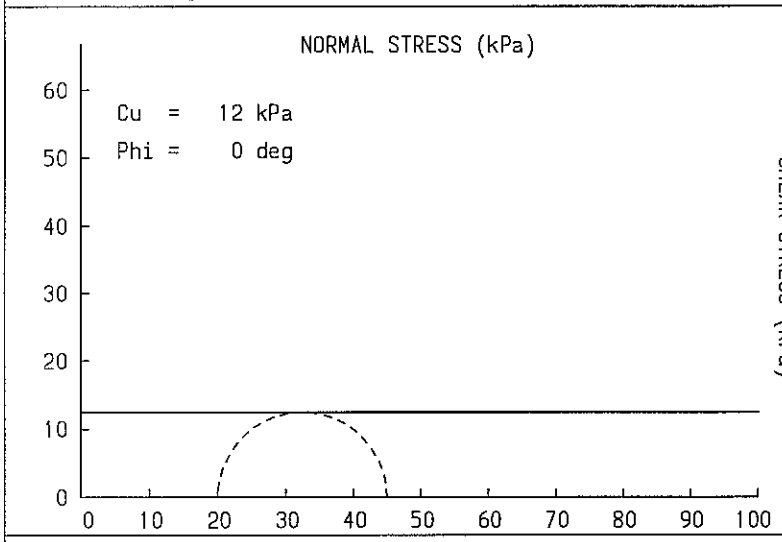
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Soft brown mottled grey slightly sandy CLAY with occasional thin laminations of blueish grey silt and rootlets	Hole ID	BHE1
		Sample No	
		Depth	1.00 m







	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	26			kPa
...,Corrected	25			kPa
Membrane Corr.	1			kPa
Moisture Content	39			%
Bulk Density	1.83			Mg/m3
Dry Density	1.32			Mg/m3
Diameter	103.0			mm
Length	198.9			mm
Failure Strain	16.1			%
Cu	12			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

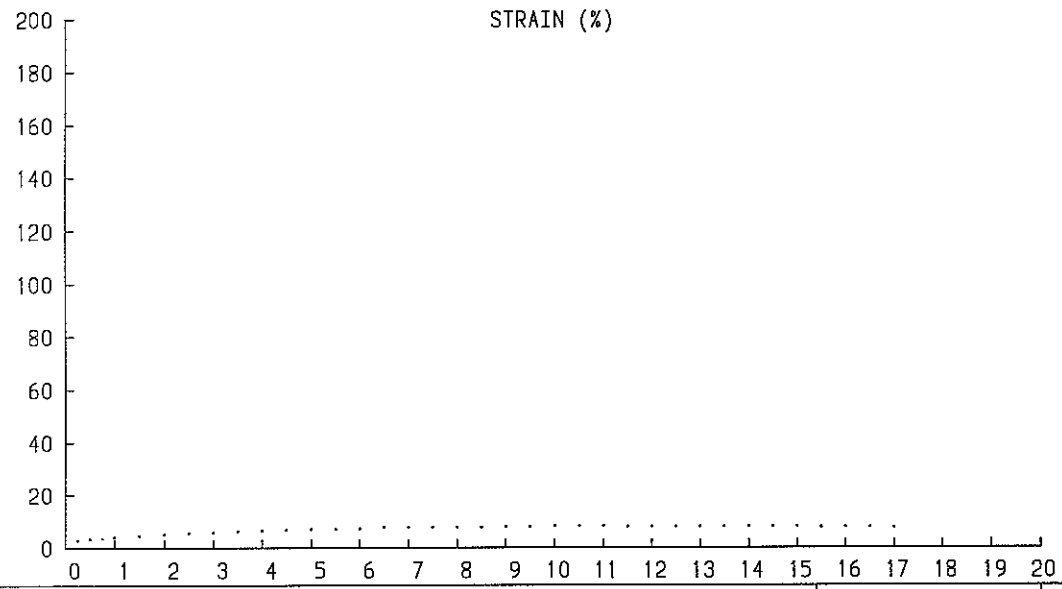
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

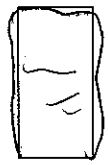
NORWEST HOLST SOIL ENGINEERING LIMITED

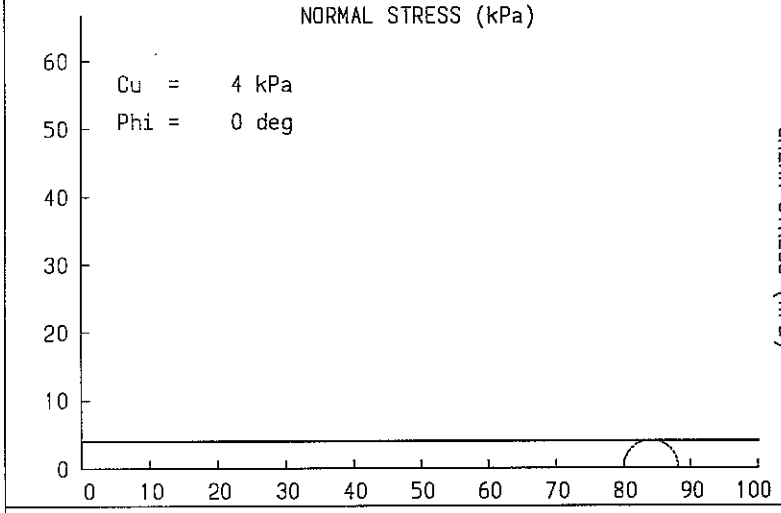
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Very soft dark grey organic CLAY	Hole ID	BHE1
		Sample No	
		Depth	5.00 m







	1	2	3	
Cell Pressure	80			kPa
Deviator Stress	9			kPa
...Corrected	8			kPa
Membrane Corr.	1			kPa
Moisture Content	75			%
Bulk Density	1.68			Mg/m3
Dry Density	0.97			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	10.5			%
Cu	4			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

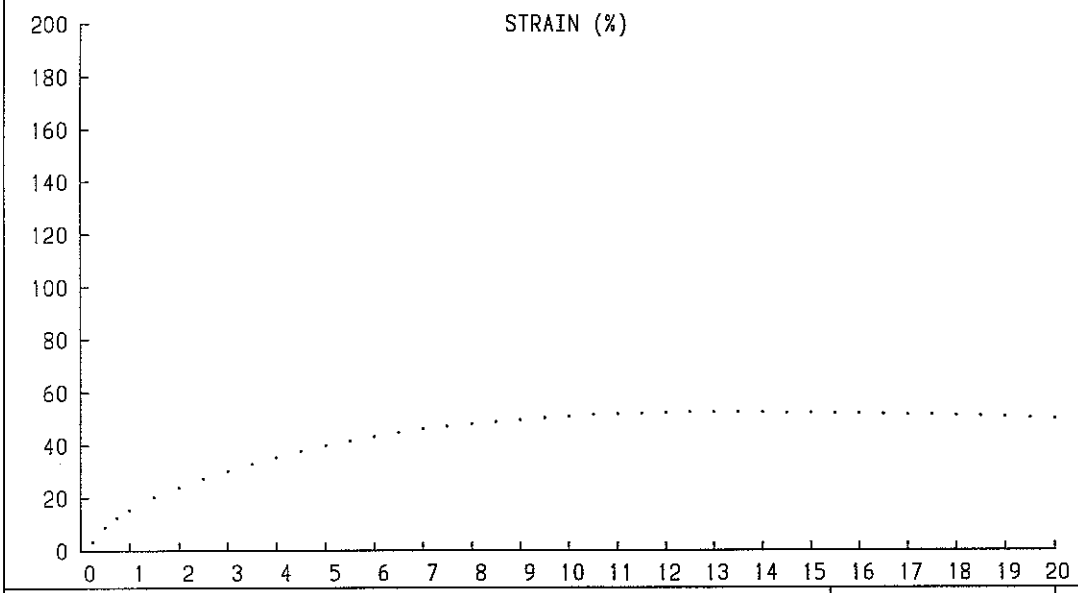
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

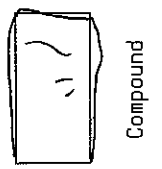
NORWEST HOLST SOIL ENGINEERING LIMITED

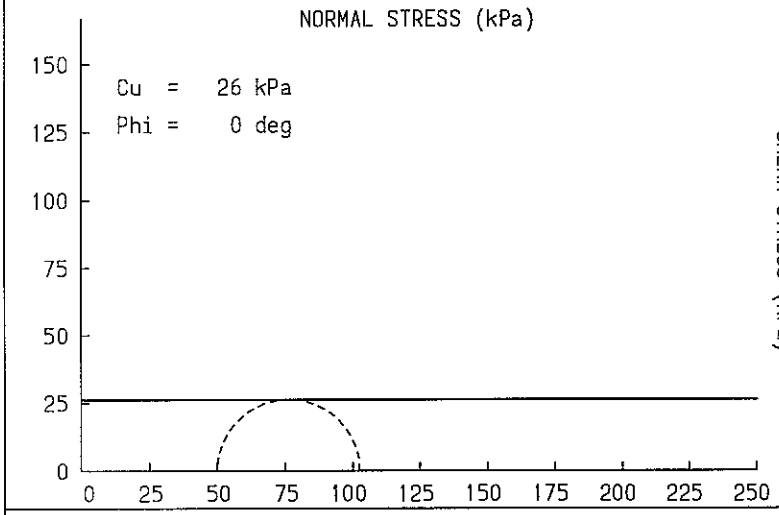
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Soft to firm mottled grey brown very silty CLAY	Hole ID	BHE2
		Sample No	
		Depth	3.10 m







	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	53			kPa
...Corrected	53			kPa
Membrane Corr.	1			kPa
Moisture Content	40			%
Bulk Density	1.80			Mg/m3
Dry Density	1.29			Mg/m3
Diameter	103.6			mm
Length	200.0			mm
Failure Strain	14.0			%
Cu	26			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

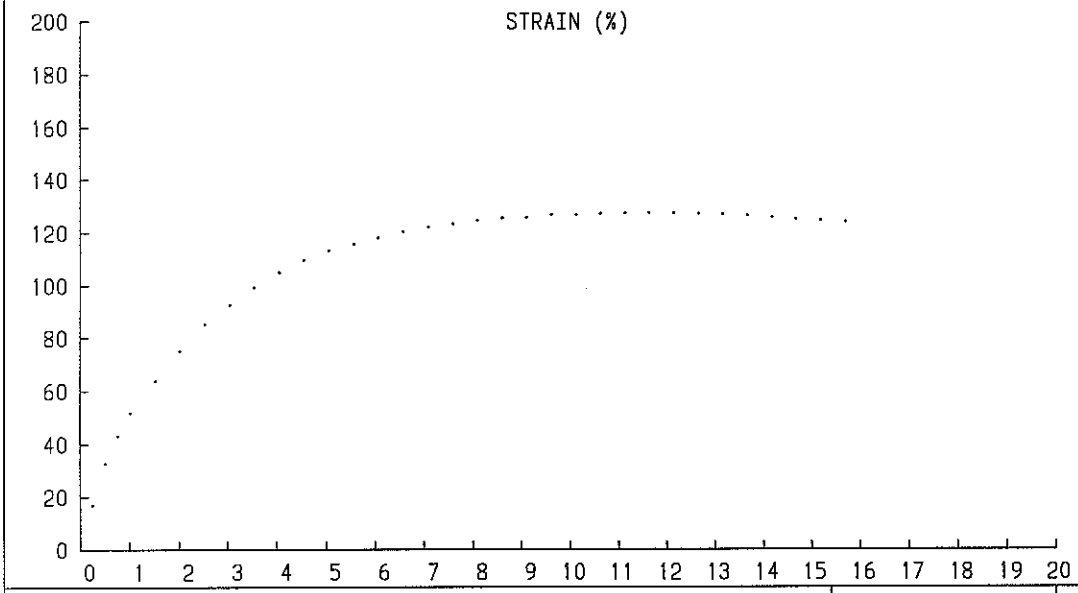
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

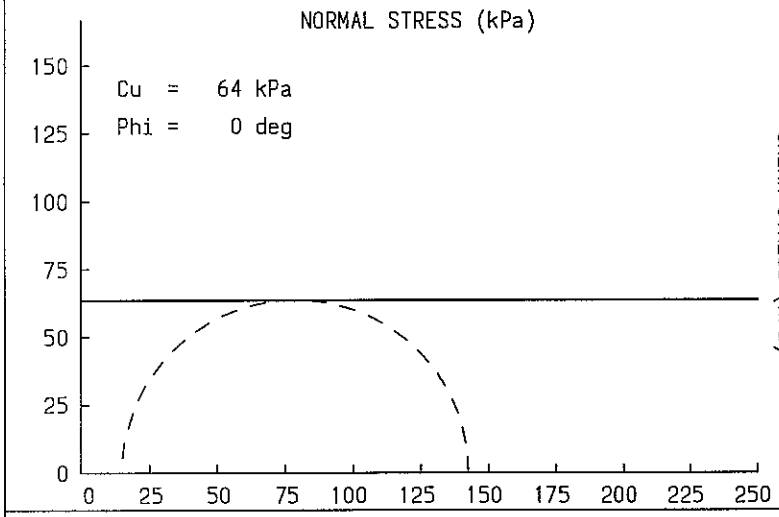
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm greyish brown mottled indistinctly thinly laminated very silty CLAY with occasional very fine gravel and gleyed rootlet traces	Hole ID	BHE3
		Sample No	
		Depth	0.85 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	15			kPa
Deviator Stress	128			kPa
...Corrected	127			kPa
Membrane Corr.	1			kPa
Moisture Content	29			%
Bulk Density	1.95			Mg/m3
Dry Density	1.51			Mg/m3
Diameter	102.4			mm
Length	197.6			mm
Failure Strain	12.1			%
Cu	64			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

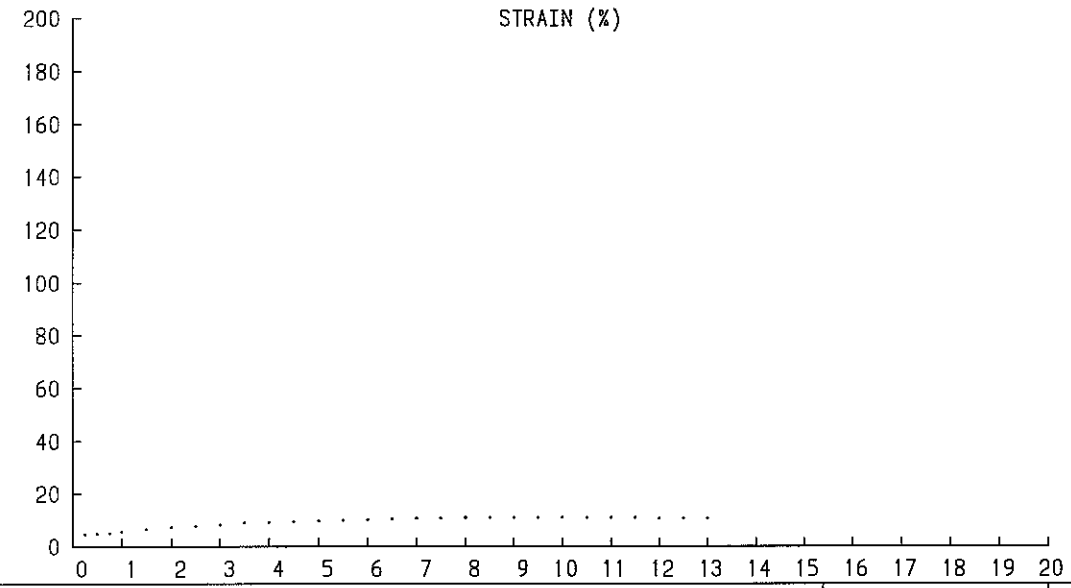
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

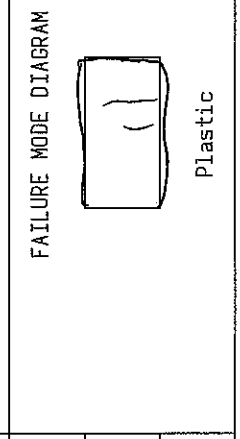
NORWEST HOLST SOIL ENGINEERING LIMITED

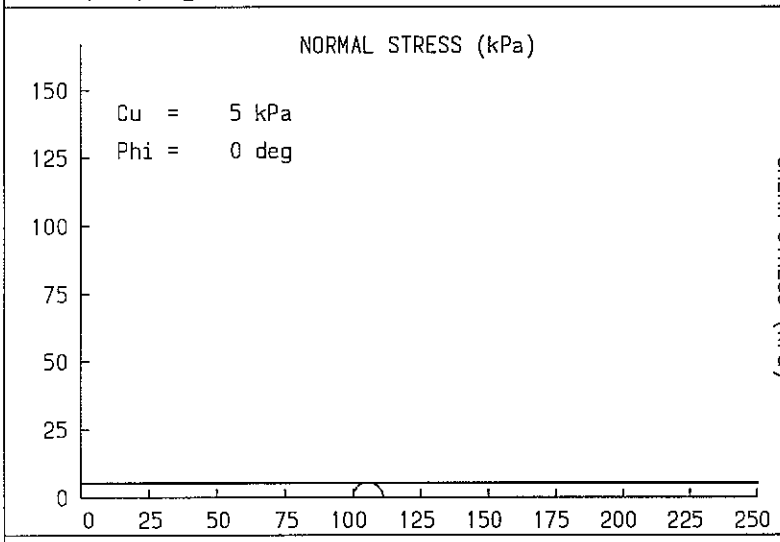
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Very soft grey very silty organic CLAY	Hole ID	BHE3
		Sample No	
		Depth	6.50 m







	1	2	3	
Cell Pressure	100			kPa
Deviator Stress	12			kPa
...Corrected	11			kPa
Membrane Corr.	1			kPa
Moisture Content	66			%
Bulk Density	1.67			Mg/m3
Dry Density	1.01			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	10.0			%
Cu	5			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

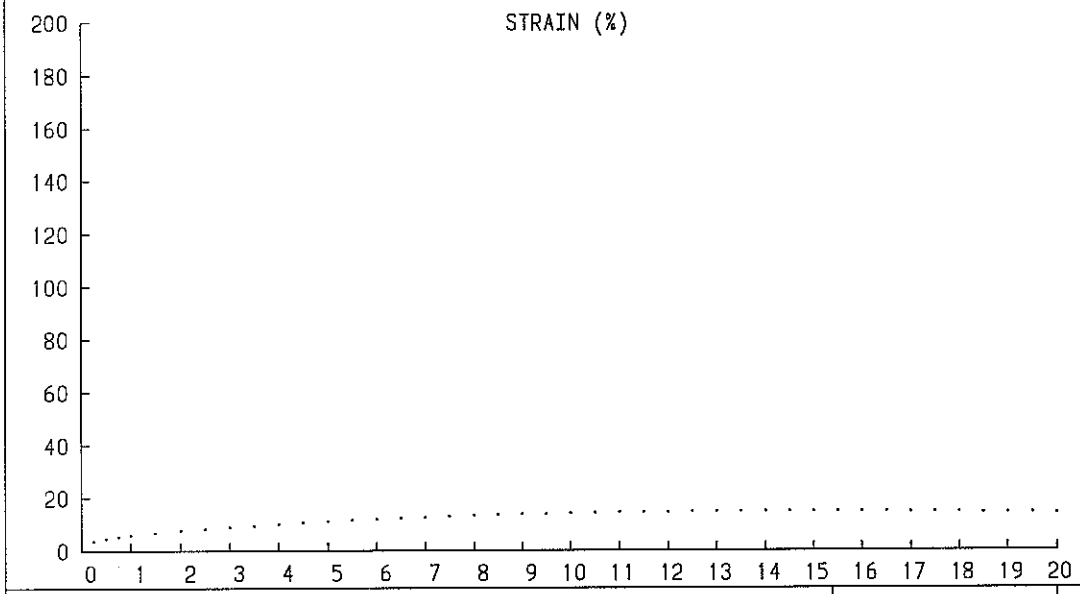
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

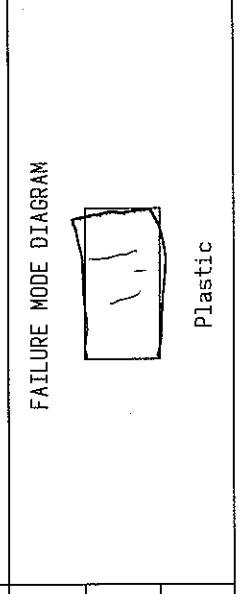
NORWEST HOLST SOIL ENGINEERING LIMITED

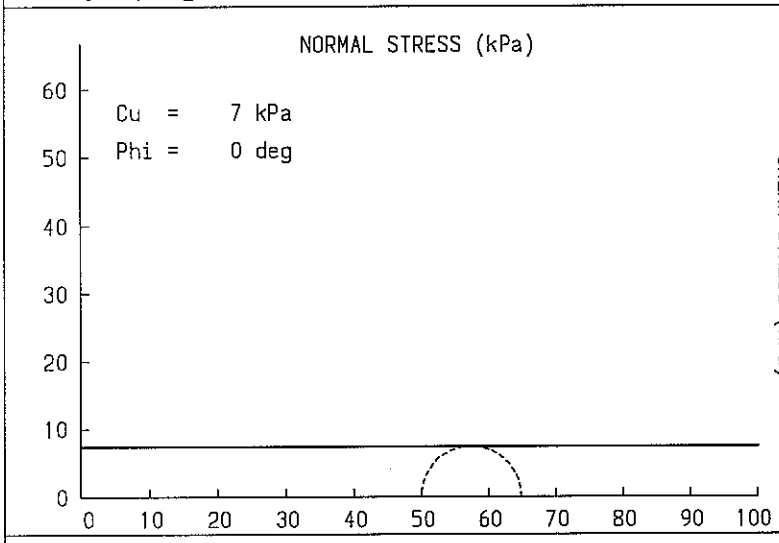
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Very soft dark grey organic CLAY	Hole ID	BHE4
		Sample No	
		Depth	2.95 m







	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	16			kPa
...Corrected	15			kPa
Membrane Corr.	1			kPa
Moisture Content	55			%
Bulk Density	1.68			Mg/m3
Dry Density	1.08			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	14.5			%
Cu	7			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

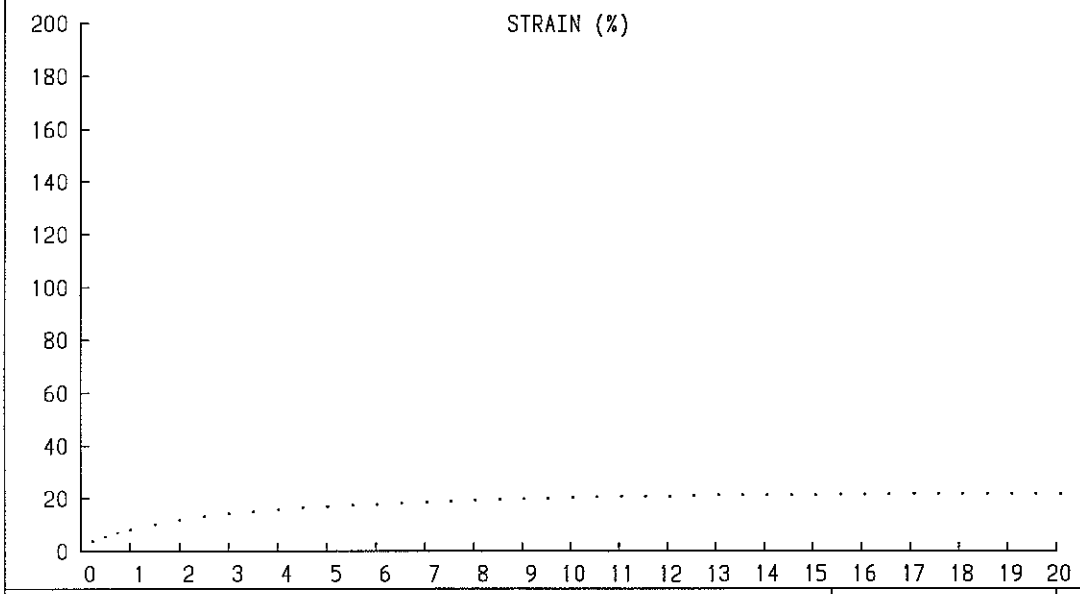
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

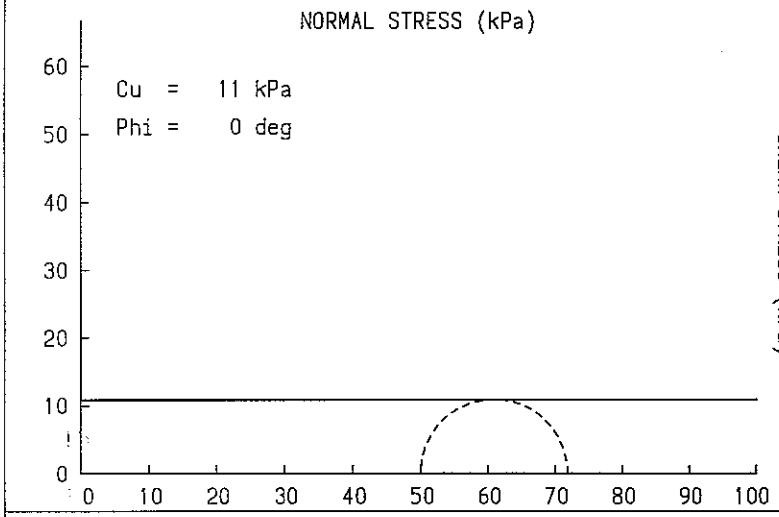
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Soft grey mottled brown slightly organic very silty CLAY with a little strongly decomposed plant fragments	Hole ID	BHE5
		Sample No	
		Depth	3.10 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	23			kPa
...Corrected	22			kPa
Membrane Corr.	1			kPa
Moisture Content	37			%
Bulk Density	1.83			Mg/m3
Dry Density	1.33			Mg/m3
Diameter	102.6			mm
Length	199.1			mm
Failure Strain	19.1			%
Cu	11			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

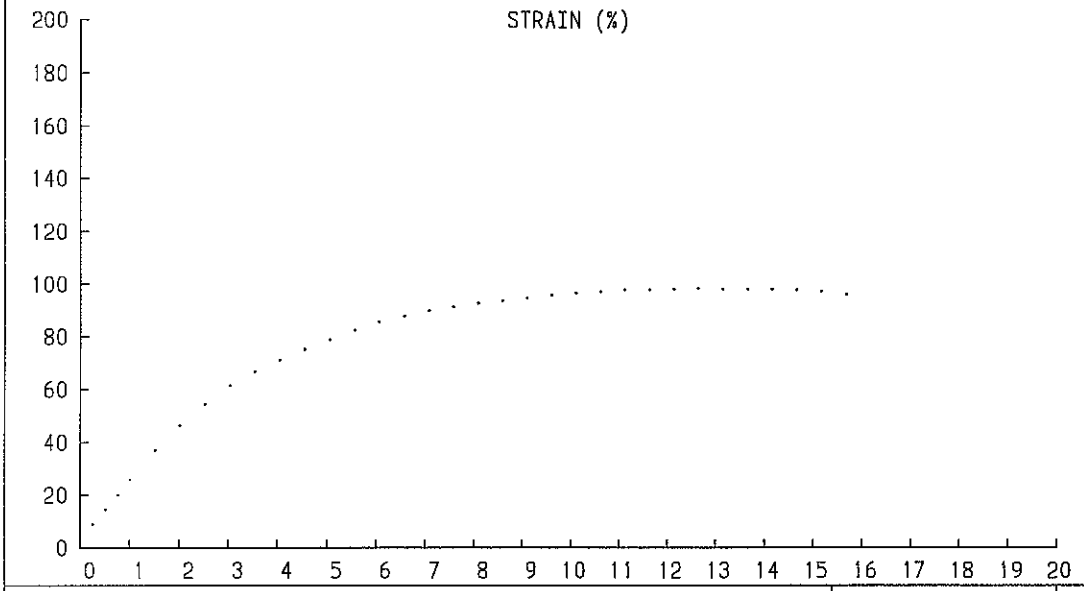
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

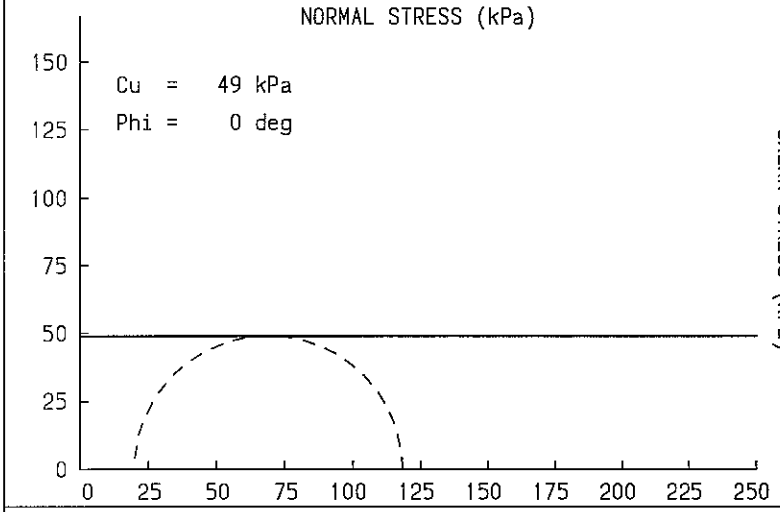
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Soft greyish brown slightly sandy CLAY with occasional thin laminations of blueish grey silt	Hole ID	BHE6
		Sample No	
		Depth	1.00 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	99			kPa
...Corrected	98			kPa
Membrane Corr.	1			kPa
Moisture Content	31			%
Bulk Density	1.94			Mg/m3
Dry Density	1.48			Mg/m3
Diameter	102.8			mm
Length	197.7			mm
Failure Strain	12.6			%
Cu	49			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

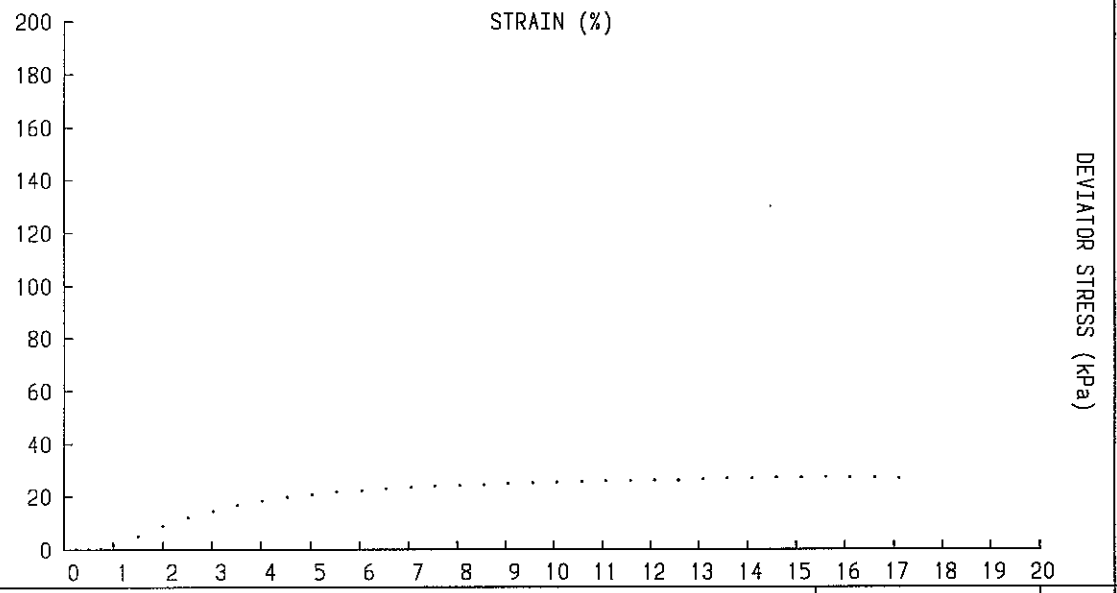
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

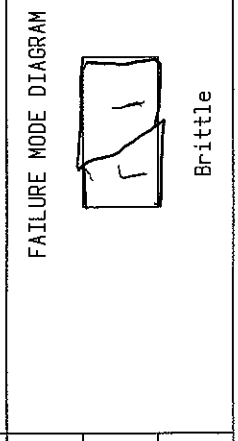
NORWEST HOLST SOIL ENGINEERING LIMITED

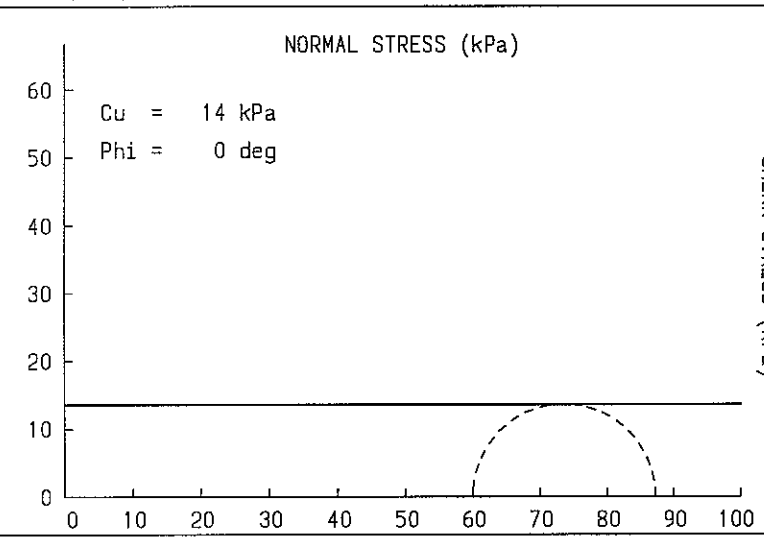
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Firm grey mottled black CLAY with medium to coarse gravel sized pockets of black fibrous peat	Hole ID	BHE6
		Sample No	
		Depth	4.00 m







	1	2	3	
Cell Pressure	60			kPa
Deviator Stress	28			kPa
...Corrected	27			kPa
Membrane Corr.	1			kPa
Moisture Content	176			%
Bulk Density	1.09			Mg/m3
Dry Density	0.40			Mg/m3
Diameter	104.2			mm
Length	198.7			mm
Failure Strain	15.6			%
Cu	14			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

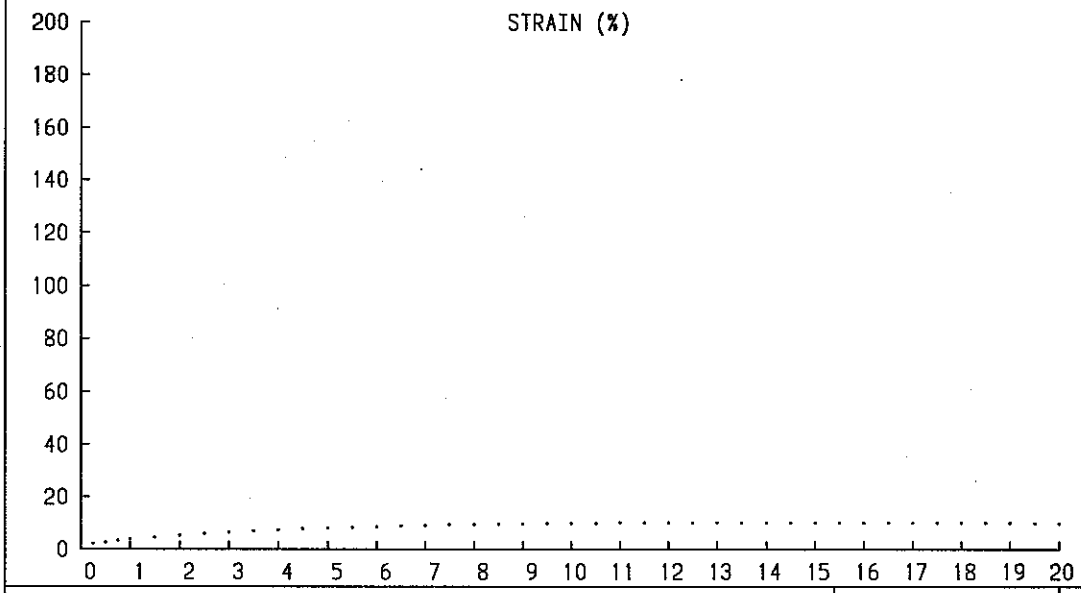
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

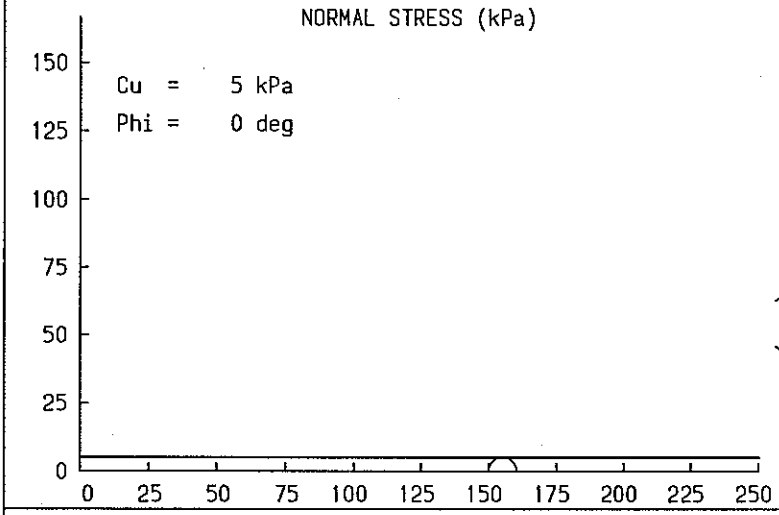
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft dark grey brown slightly organic CLAY.	Hole ID	BHF2
		Sample No	
		Depth	7.50 m



FAILURE MODE DIAGRAM



	1	2	3	
Cell Pressure	150			kPa
Deviator Stress	11			kPa
...Corrected	10			kPa
Membrane Corr.	1			kPa
Moisture Content	58			%
Bulk Density	1.65			Mg/m3
Dry Density	1.04			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	12.0			%
Cu	5			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
All specimens prepared from top of undisturbed sample tube suitable material.

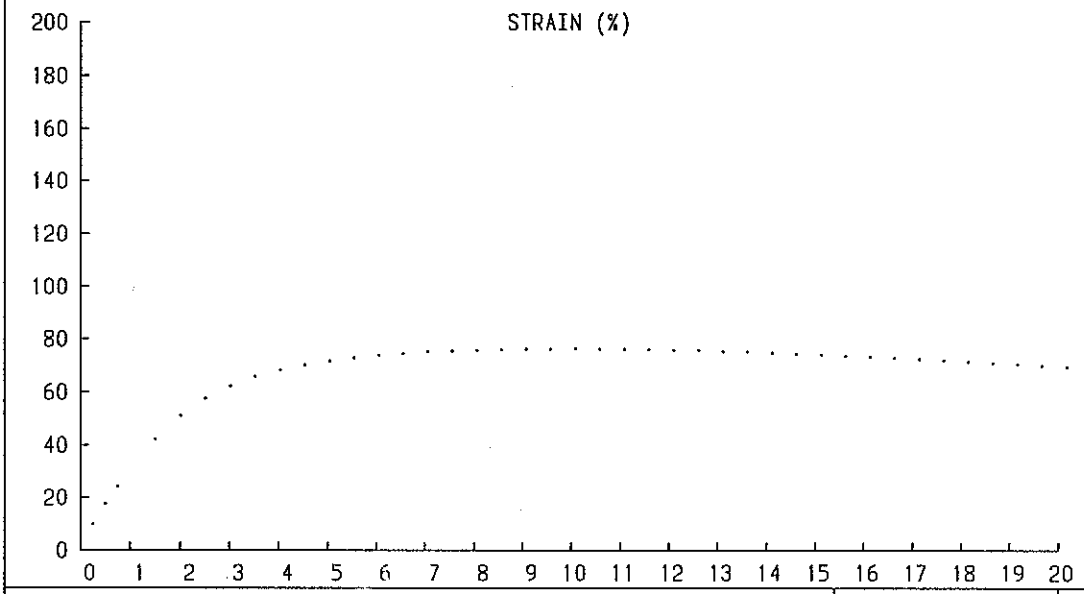
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

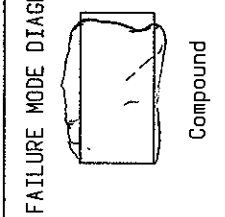
NORWEST HOLST SOIL ENGINEERING LIMITED

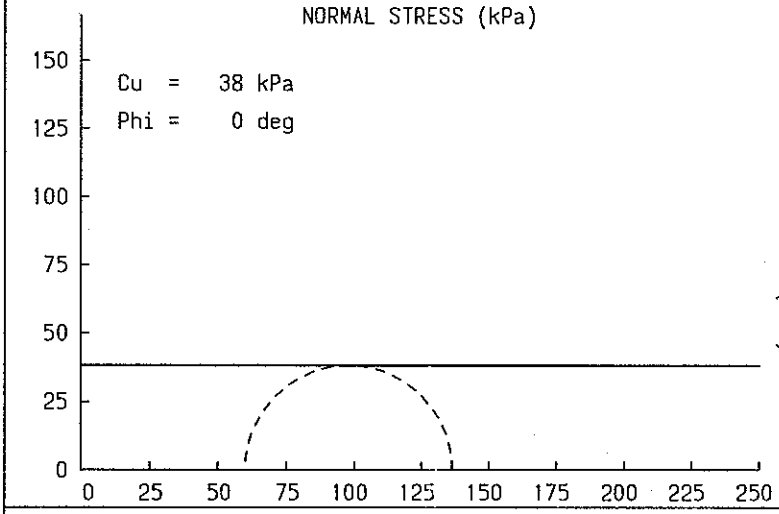
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft greyish brown very silty CLAY.	Hole ID	BH F4
		Sample No	
		Depth	3.50 m







	1	2	3	
Cell Pressure	60			kPa
Deviator Stress	77			kPa
...Corrected	76			kPa
Membrane Corr.	1			kPa
Moisture Content	41			%
Bulk Density	1.79			Mg/m3
Dry Density	1.27			Mg/m3
Diameter	102.0			mm
Length	198.3			mm
Failure Strain	10.1			%
Cu	38			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

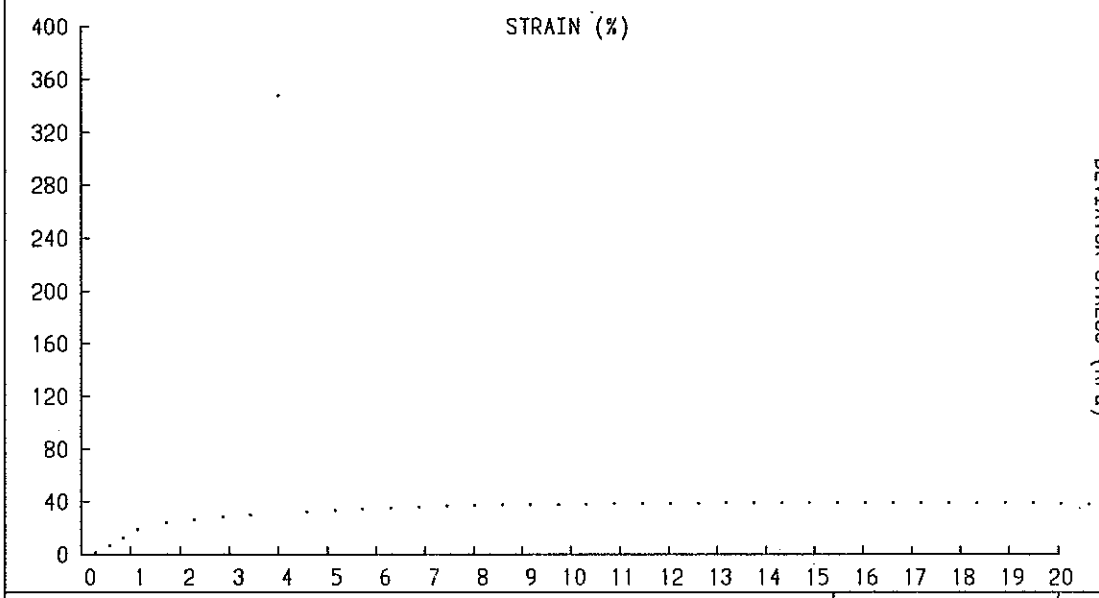
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

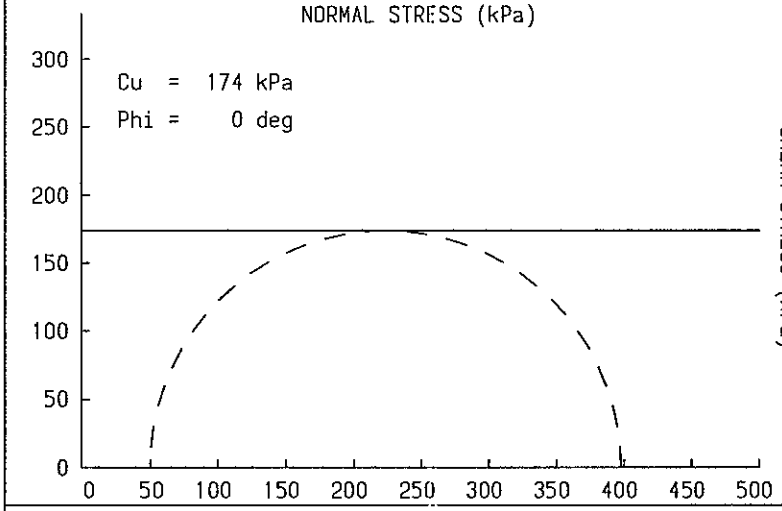
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft greyish brown sandy CLAY with a little thin laminations and a little organic CLAY.	Hole ID	BH G3
		Sample No	
		Depth	3.00 m



FAILURE MODE DIAGRAM

Brittle



	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	348			kPa
...Corrected	348			kPa
Membrane Corr.	0			kPa
Moisture Content	40			%
Bulk Density	1.83			Mg/m3
Dry Density	1.31			Mg/m3
Diameter	103.1			mm
Length	174.5			mm
Failure Strain	4.0			%
Cu	174			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.
Test run at slow speed.

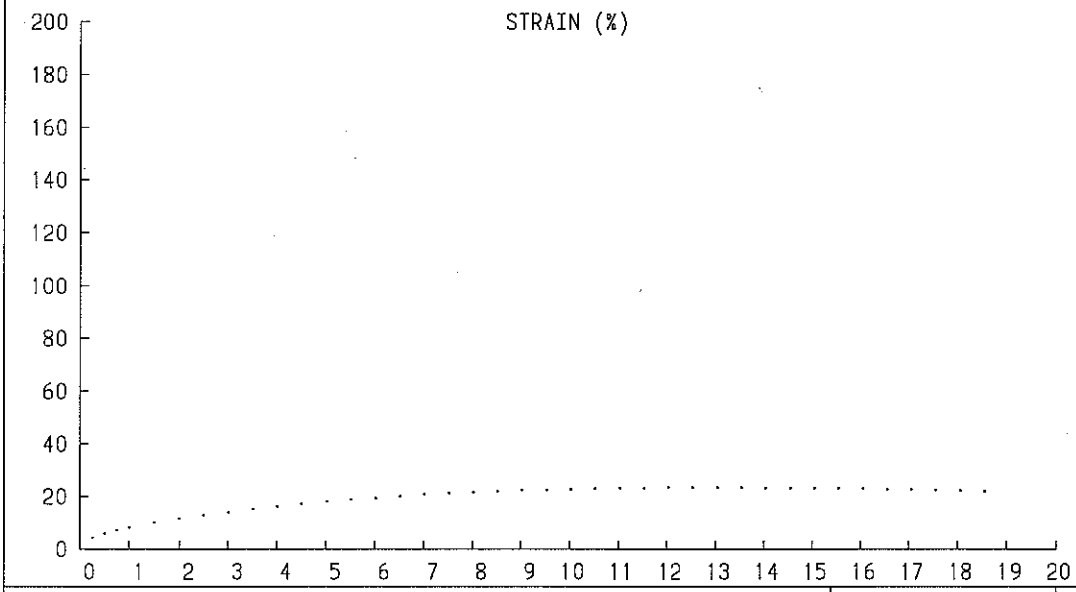
Test Type : Single Stage
Undisturbed
Rate : 1% per minute
Orientated and loaded with vertical axis

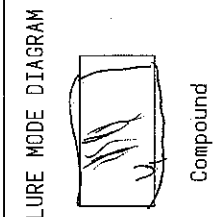
NORWEST HOLST SOIL ENGINEERING LIMITED

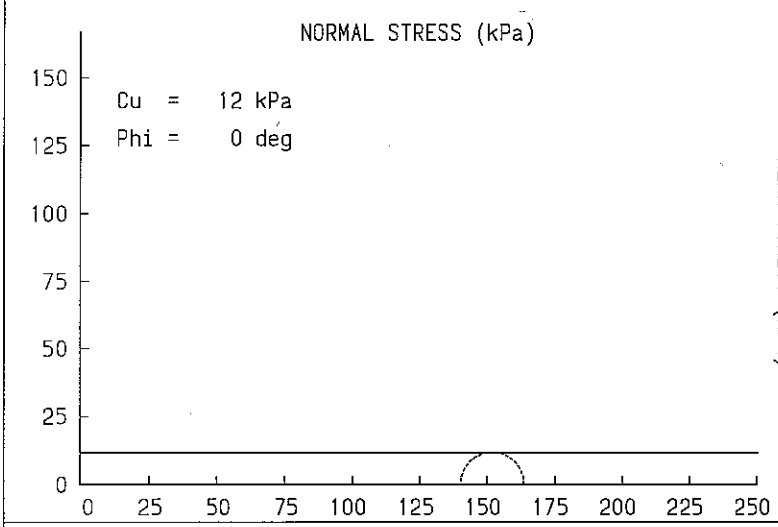
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft grey organic CLAY.	Hole ID	BHG4
		Sample No	
		Depth	9.30 m







	1	2	3	
Cell Pressure	140			kPa
Deviator Stress	24			kPa
...Corrected	24			kPa
Membrane Corr.	1			kPa
Moisture Content	65			%
Bulk Density	1.60			Mg/m3
Dry Density	0.97			Mg/m3
Diameter	102.5			mm
Length	199.3			mm
Failure Strain	12.5			%
Cu	12			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

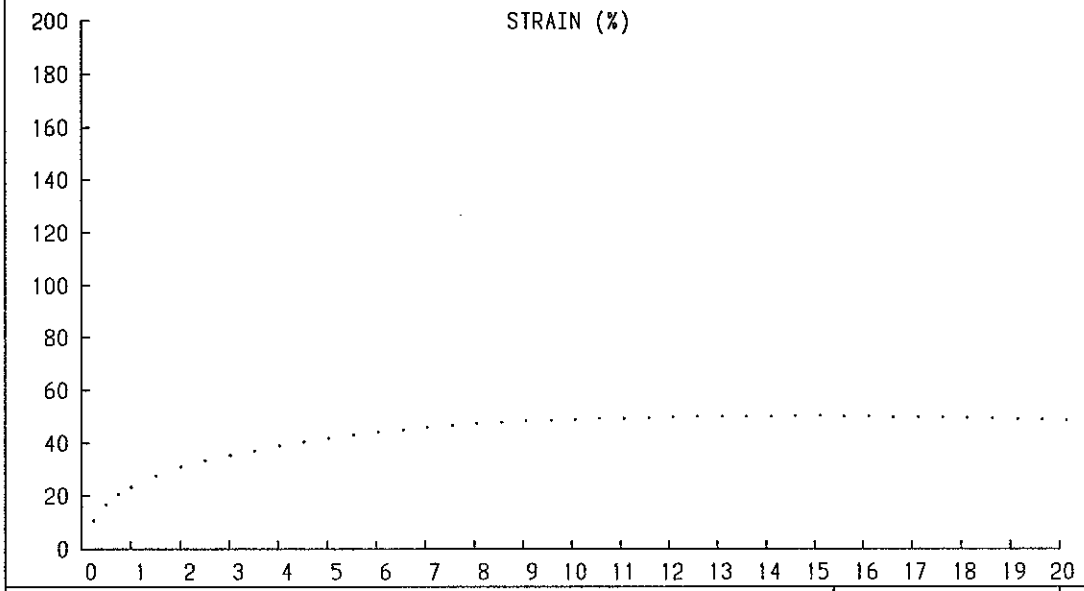
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

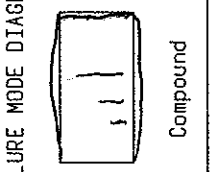
NORWEST HOLST SOIL ENGINEERING LIMITED

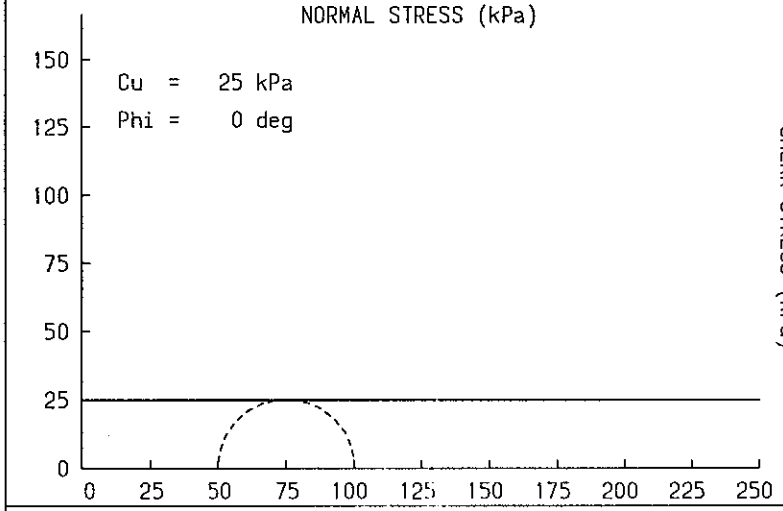
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft grey mottled brown very silty CLAY with gleyed rootlet traces.	Hole ID	BHG5
		Sample No	
		Depth	3.00 m







	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	51			kPa
...Corrected	50			kPa
Membrane Corr.	1			kPa
Moisture Content	39			%
Bulk Density	1.84			Mg/m3
Dry Density	1.32			Mg/m3
Diameter	102.6			mm
Length	198.5			mm
Failure Strain	14.6			%
Cu	25			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
All specimens prepared from top of undisturbed sample tube suitable material.

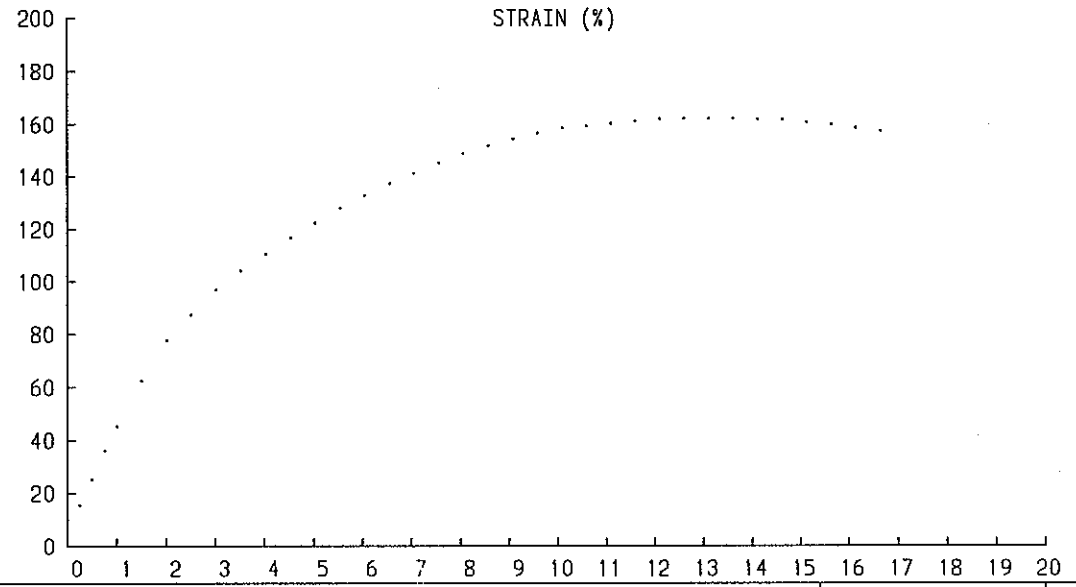
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

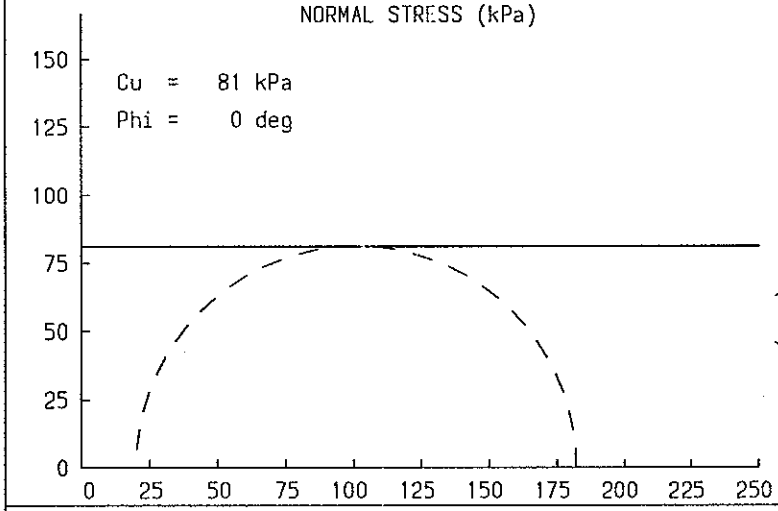
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Firm brown and grey mottled sandy CLAY.	Hole ID	BHG6
		Sample No	
		Depth	1.00 m



FAILURE MODE DIAGRAM

Brittle



	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	163			kPa
...Corrected	162			kPa
Membrane Corr.	1			kPa
Moisture Content	26			%
Bulk Density	1.99			Mg/m3
Dry Density	1.58			Mg/m3
Diameter	102.8			mm
Length	198.1			mm
Failure Strain	12.6			%
Cu	81			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
All specimens prepared from top of undisturbed sample tube suitable material.

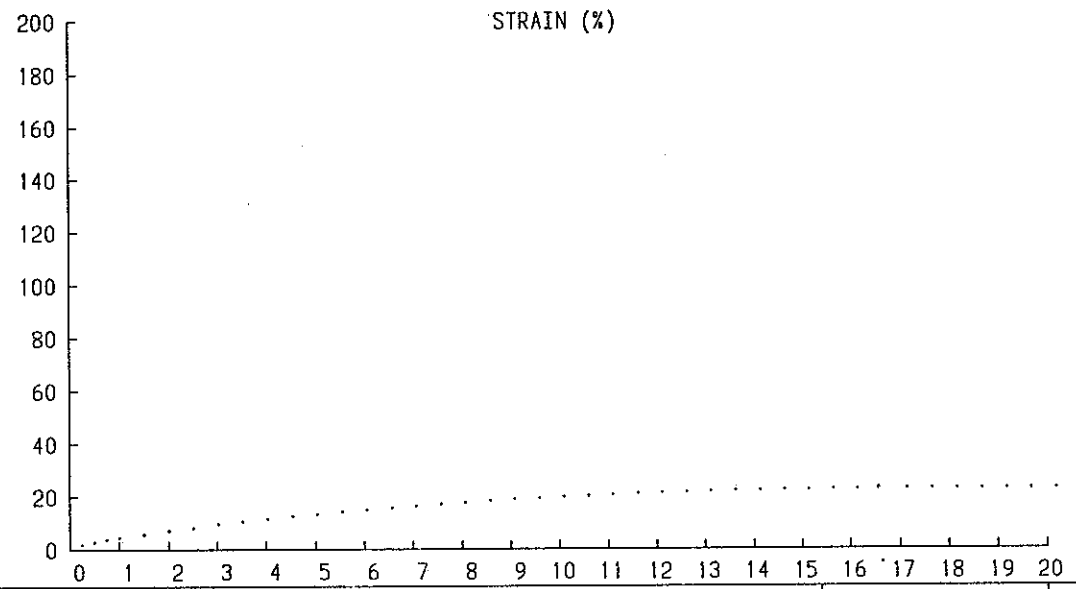
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

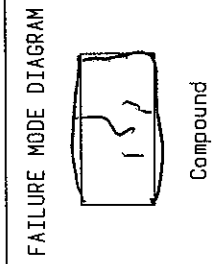
NORWEST HOLST SOIL ENGINEERING LIMITED

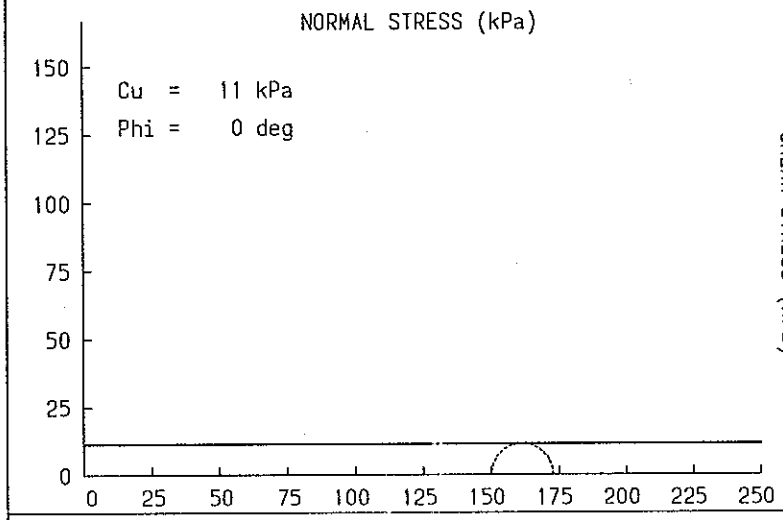
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft grey very sandy CLAY with occasional pockets of black brown firm fibrous peat.	Hole ID	BHH1
		Sample No	
		Depth	10.00 m







	1	2	3	
Cell Pressure	150			kPa
Deviator Stress	24			kPa
...Corrected	23			kPa
Membrane Corr.	1			kPa
Moisture Content	40			%
Bulk Density	1.87			Mg/m3
Dry Density	1.34			Mg/m3
Diameter	101.4			mm
Length	198.2			mm
Failure Strain	20.0			%
Cu	11			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
All specimens prepared from top of undisturbed sample tube suitable material.

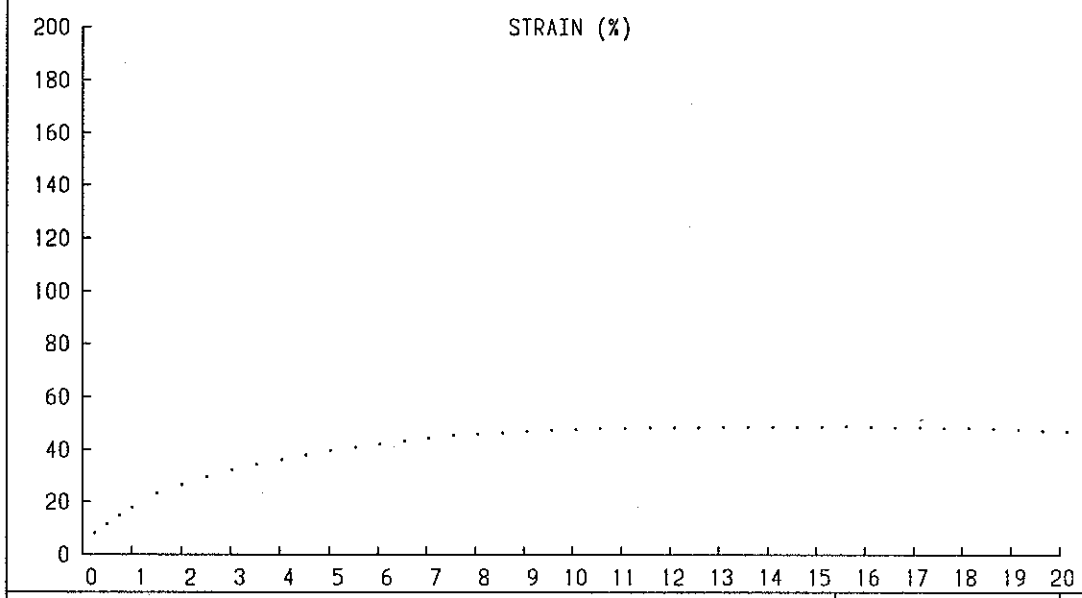
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

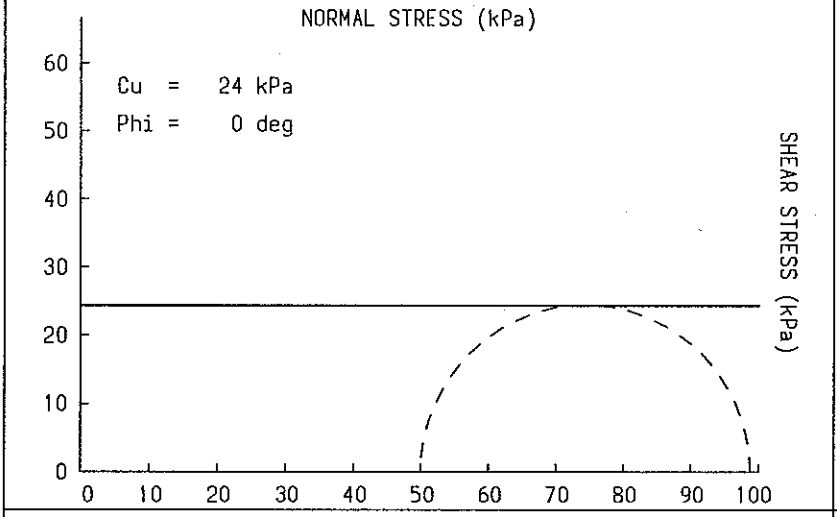
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft dark grey very silty CLAY.	Hole ID	BHH2
		Sample No	
		Depth	3.00 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	50			kPa
...Corrected	49			kPa
Membrane Corr.	1			kPa
Moisture Content	43			%
Bulk Density	1.79			Mg/m3
Dry Density	1.25			Mg/m3
Diameter	102.1			mm
Length	198.5			mm
Failure Strain	15.6			%
Cu	24			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
All specimens prepared from top of undisturbed sample tube suitable material.

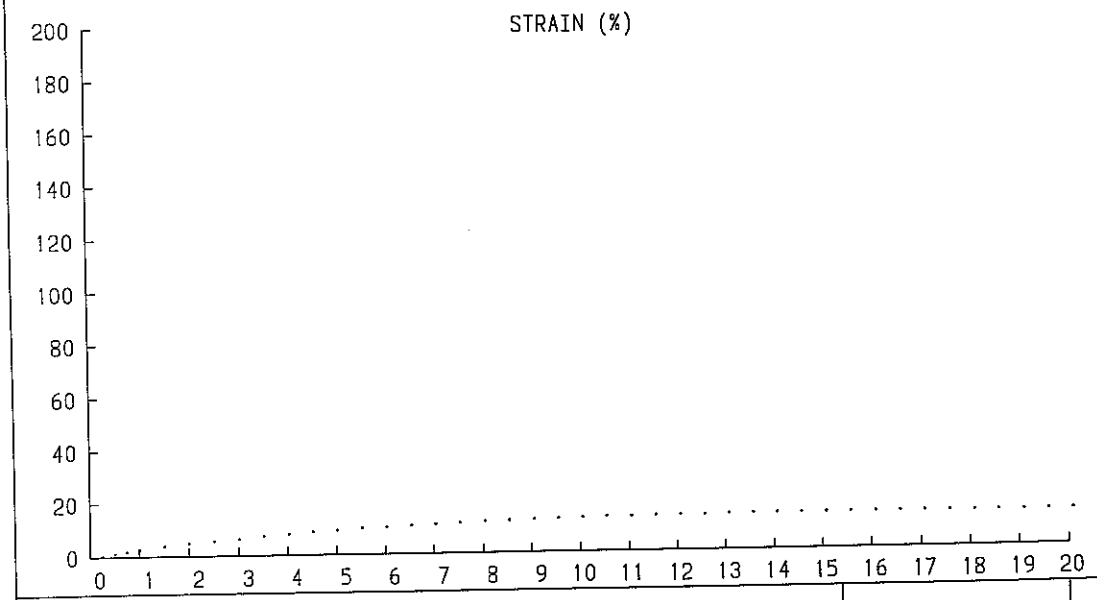
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

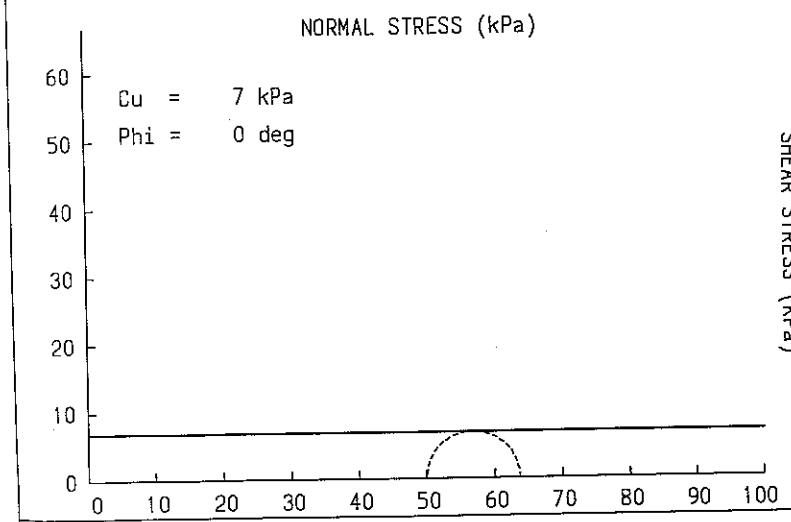
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Soft grey occasionally thinly laminated CLAY with occasional fine to medium gravel size pockets of brownish black firm fibrous peat	Hole ID	BHH3
		Sample No	
		Depth	3.00 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	14			kPa
...Corrected	14			kPa
Membrane Corr.	1			kPa
Moisture Content	49			%
Bulk Density	1.74			Mg/m3
Dry Density	1.16			Mg/m3
Diameter	104.8			mm
Length	199.0			mm
Failure Strain	14.6			%
Cu	7			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

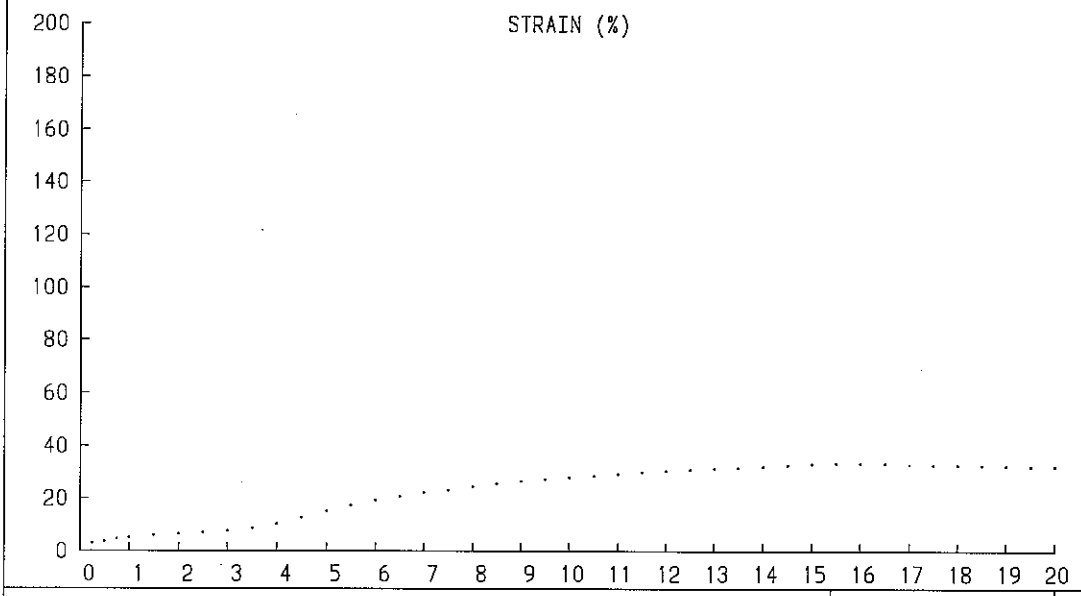
\. Ref: /117-26/m4bhh330.QTX 2.05

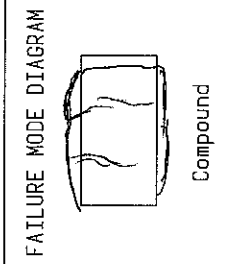
NORWEST HOLST SOIL ENGINEERING LIMITED

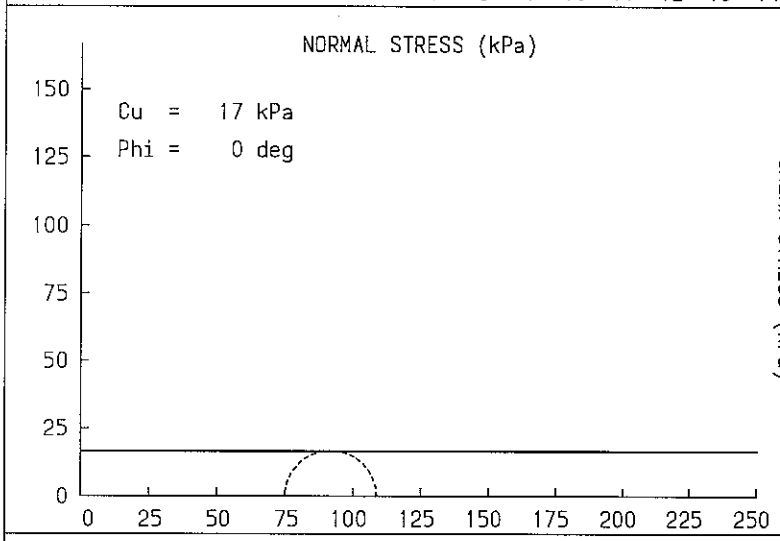
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Plastic amorphous very strongly decomposed PEAT.	Hole ID	BHH5
		Sample No	
		Depth	5.00 m







	1	2	3	
Cell Pressure	75			kPa
Deviator Stress	34			kPa
...Corrected	34			kPa
Membrane Corr.	1			kPa
Moisture Content	341			%
Bulk Density	0.85			Mg/m3
Dry Density	0.19			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	15.5			%
Cu	17			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

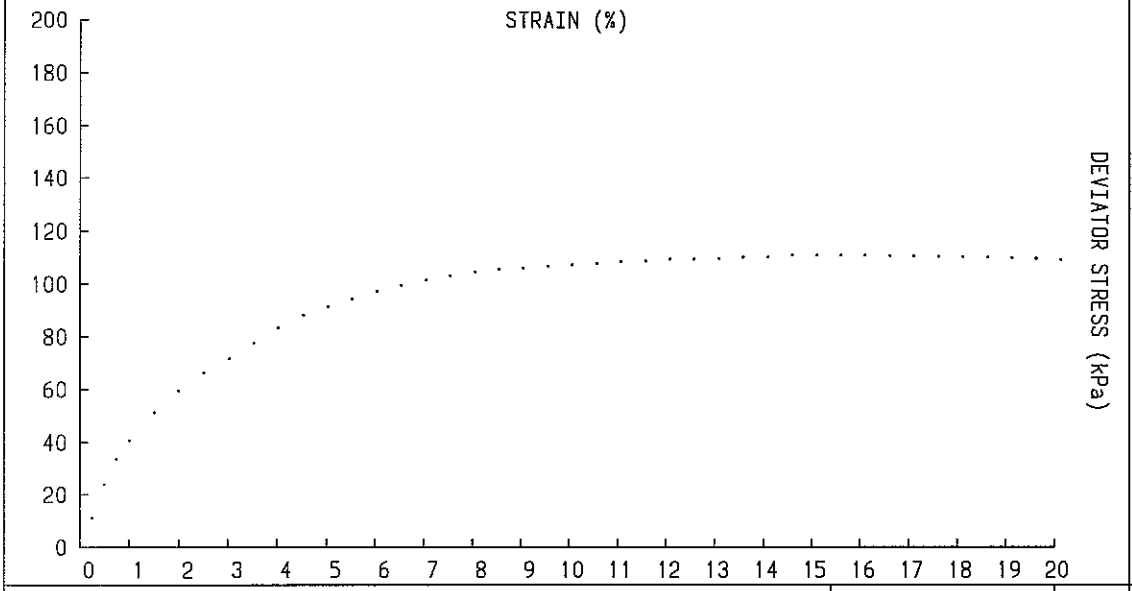
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

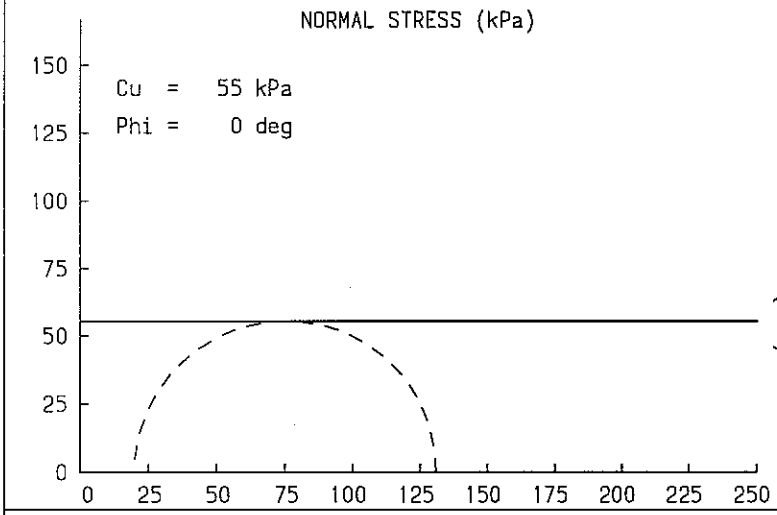
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm grey mottled brown slightly fissured CLAY with a little fine to coarse subangular gravel and gleying.	Hole ID	BHH6
		Sample No	
		Depth	1.10 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	112			kPa
...Corrected	111			kPa
Membrane Corr.	1			kPa
Moisture Content	28			%
Bulk Density	1.95			Mg/m3
Dry Density	1.53			Mg/m3
Diameter	103.9			mm
Length	198.7			mm
Failure Strain	16.1			%
Cu	55			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

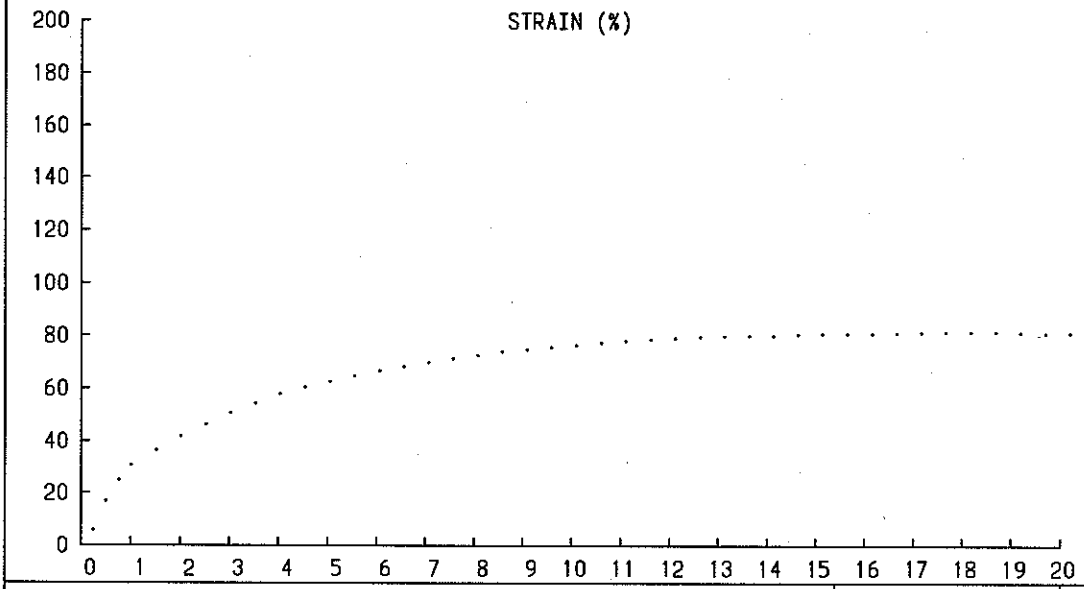
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

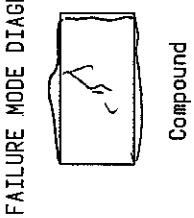
NORWEST HOLST SOIL ENGINEERING LIMITED

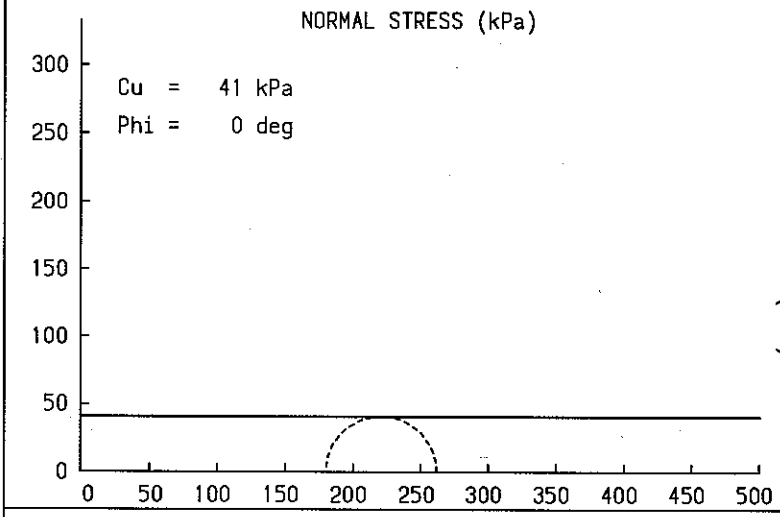
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Soft to firm blueish grey mottled grey very silty CLAY with some decomposed roots with a little coarse rounded gravel	Hole ID	BHH6
		Sample No	
		Depth	11.20 m







	1	2	3	
Cell Pressure	180			kPa
Deviator Stress	83			kPa
...Corrected	82			kPa
Membrane Corr.	1			kPa
Moisture Content	30			%
Bulk Density	2.00			Mg/m3
Dry Density	1.54			Mg/m3
Diameter	102.2			mm
Length	198.0			mm
Failure Strain	18.2			%
Cu	41			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

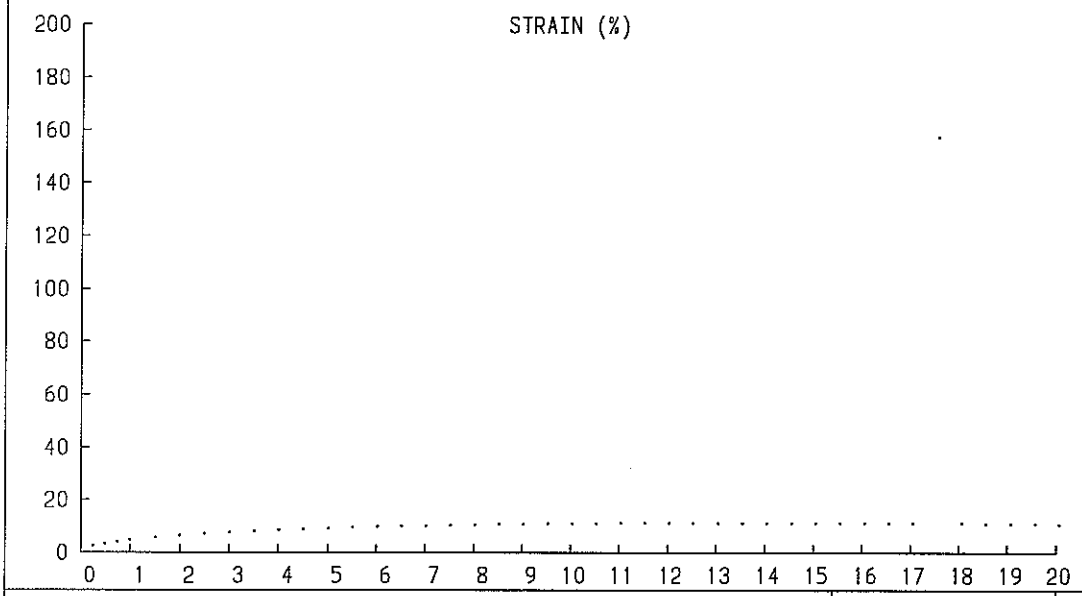
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

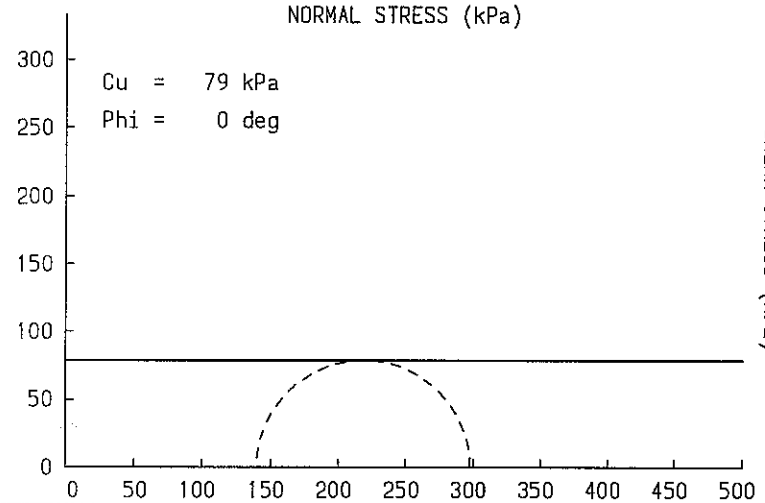
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 NEWPORT.	Contract	F10895
Soil description	Soft grey CLAY with a little fine to medium sized pockets of black/mottled grey orgainic clay.	Hole ID	BHH7
		Sample No	
		Depth	9.00 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	140			kPa
Deviator Stress	159			kPa
...Corrected	158			kPa
Membrane Corr.	1			kPa
Moisture Content	72			%
Bulk Density	1.60			Mg/m3
Dry Density	0.93			Mg/m3
Diameter	103.2			mm
Length	199.3			mm
Failure Strain	17.6			%
Cu	79			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

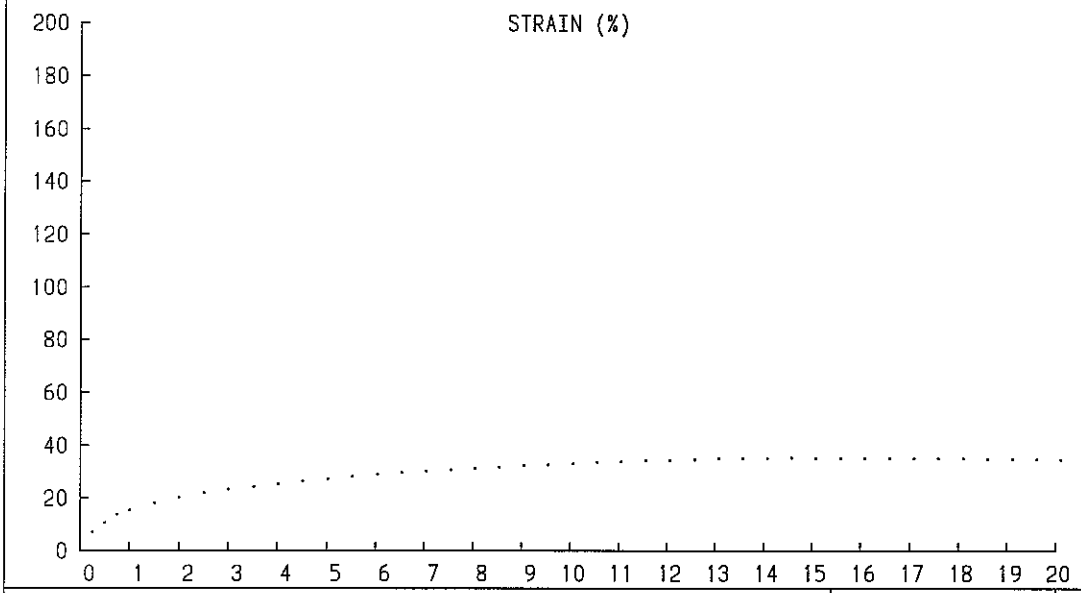
Q.A. Ref: /127-03/M4NEWh7.QTX 2.05

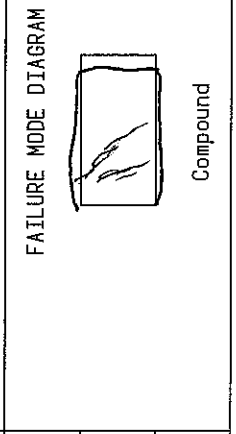
NORWEST HOLST SOIL ENGINEERING LIMITED

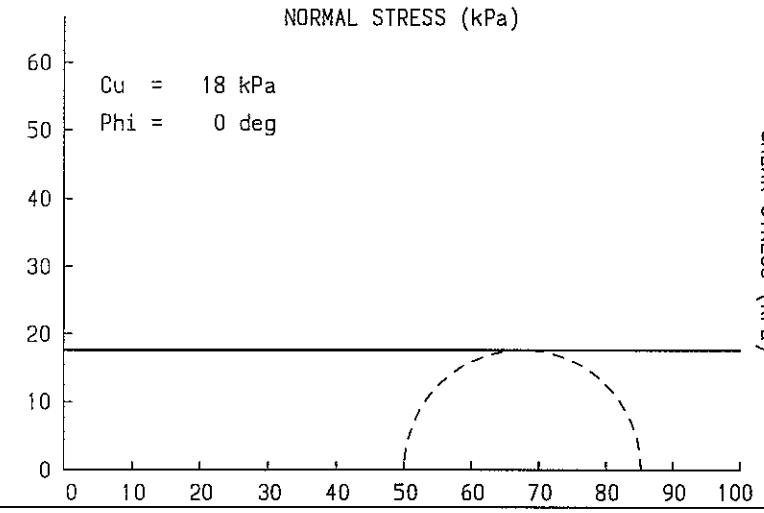
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 NEWPORT.	Contract	F10895
Soil description	Soft to firm occasionally thinly laminated dark grey mottled brown slightly sandy, slightly organic CLAY.	Hole ID	BHI1
		Sample No	
		Depth	2.95 m







	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	36			kPa
...Corrected	35			kPa
Membrane Corr.	1			kPa
Moisture Content	60			%
Bulk Density	1.63			Mg/m3
Dry Density	1.02			Mg/m3
Diameter	104.0			mm
Length	198.9			mm
Failure Strain	14.6			%
Cu	18			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

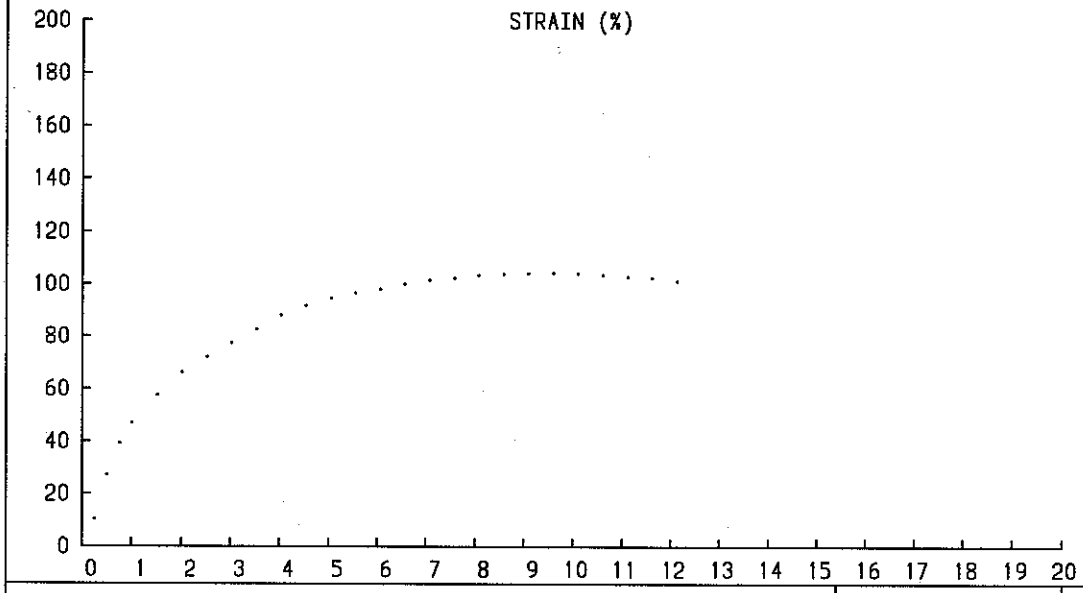
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

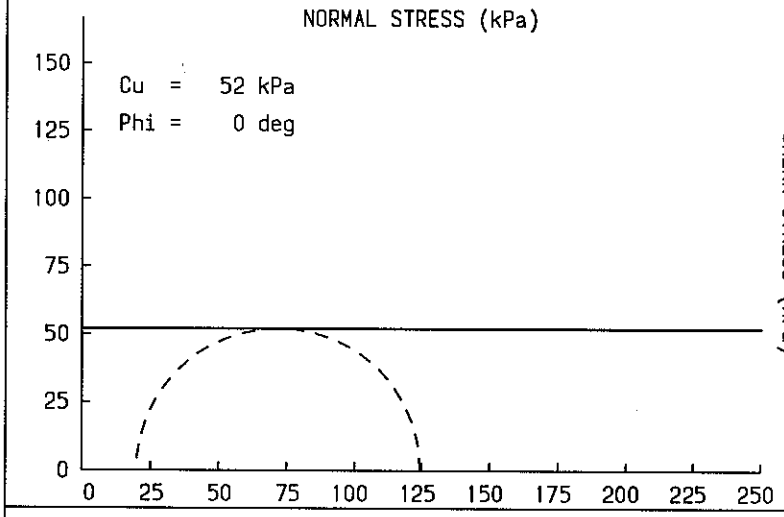
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm brown mottled grey sandy CLAY with occasional rootlets	Hole ID	BHI2
		Sample No	
		Depth	1.05 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	105			kPa
...Corrected	104			kPa
Membrane Corr.	1			kPa
Moisture Content	32			%
Bulk Density	1.89			Mg/m3
Dry Density	1.43			Mg/m3
Diameter	102.9			mm
Length	197.9			mm
Failure Strain	9.6			%
Cu	52			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

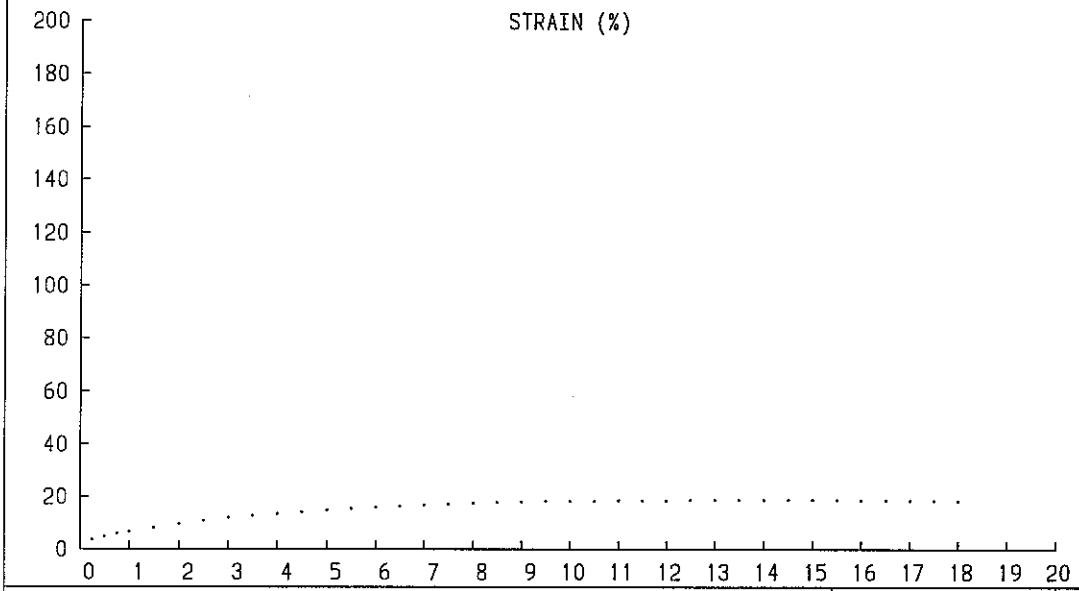
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

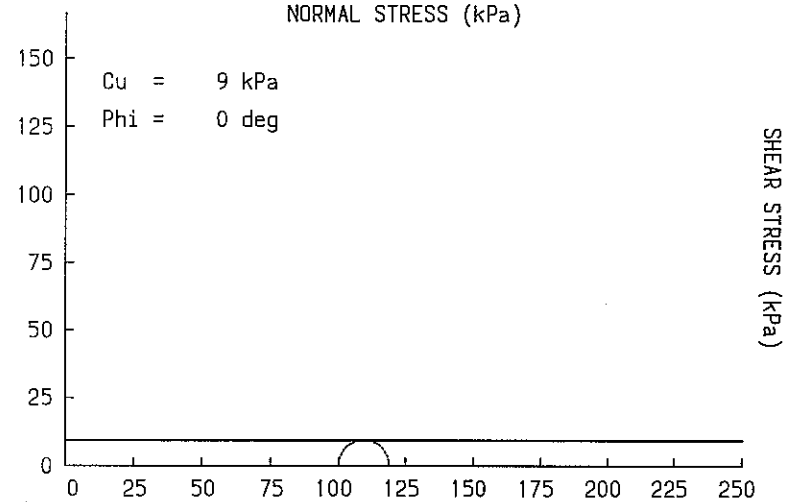
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft dark grey mottled black slightly organic CLAY.	Hole ID	BHI3
		Sample No	
		Depth	5.50 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	100			kPa
Deviator Stress	20			kPa
...Corrected	19			kPa
Membrane Corr.	1			kPa
Moisture Content	57			%
Bulk Density	1.79			Mg/m3
Dry Density	1.14			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	14.0			%
Cu	9			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

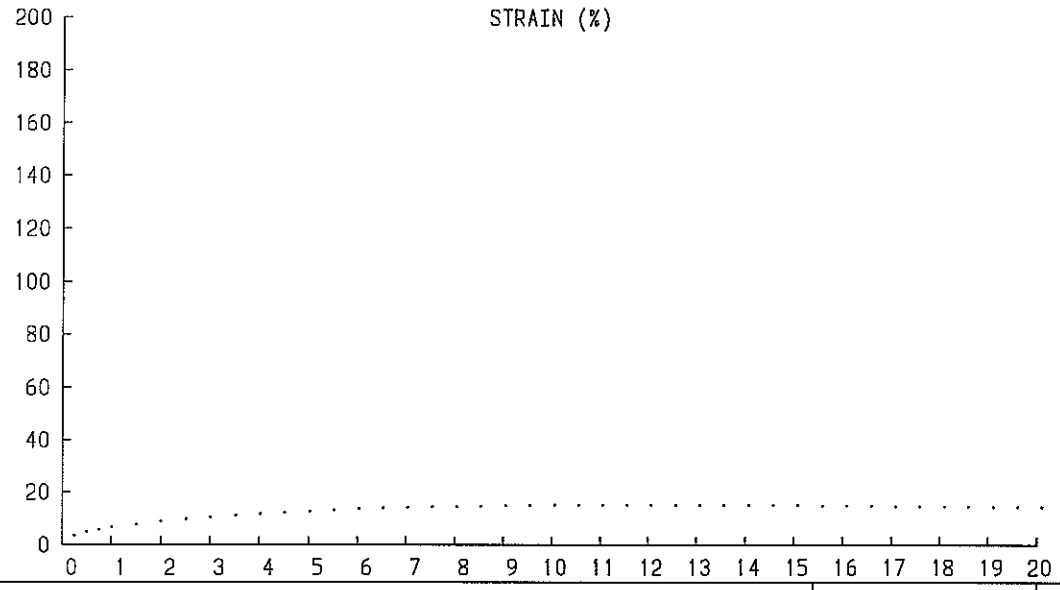
Test Type : Single Stage
Undisturbed
Rate : 2% per minute.
Orientated and loaded with vertical axis

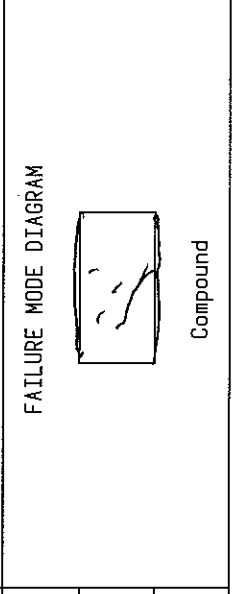
NORWEST HOLST SOIL ENGINEERING LIMITED

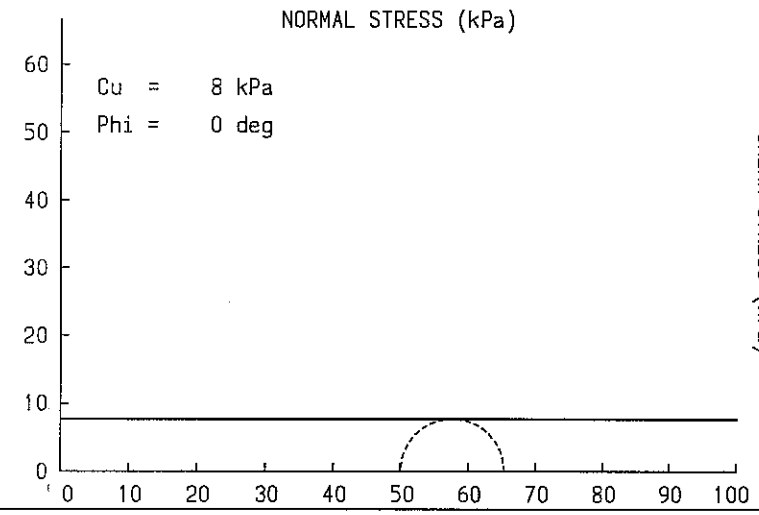
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Soft greyish black very silty CLAY.	Hole ID	BHI4
		Sample No	
		Depth	3.15 m







	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	16			kPa
...Corrected	15			kPa
Membrane Corr.	1			kPa
Moisture Content	61			%
Bulk Density	1.66			Mg/m3
Dry Density	1.03			Mg/m3
Diameter	102.2			mm
Length	198.9			mm
Failure Strain	12.6			%
Cu	8			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

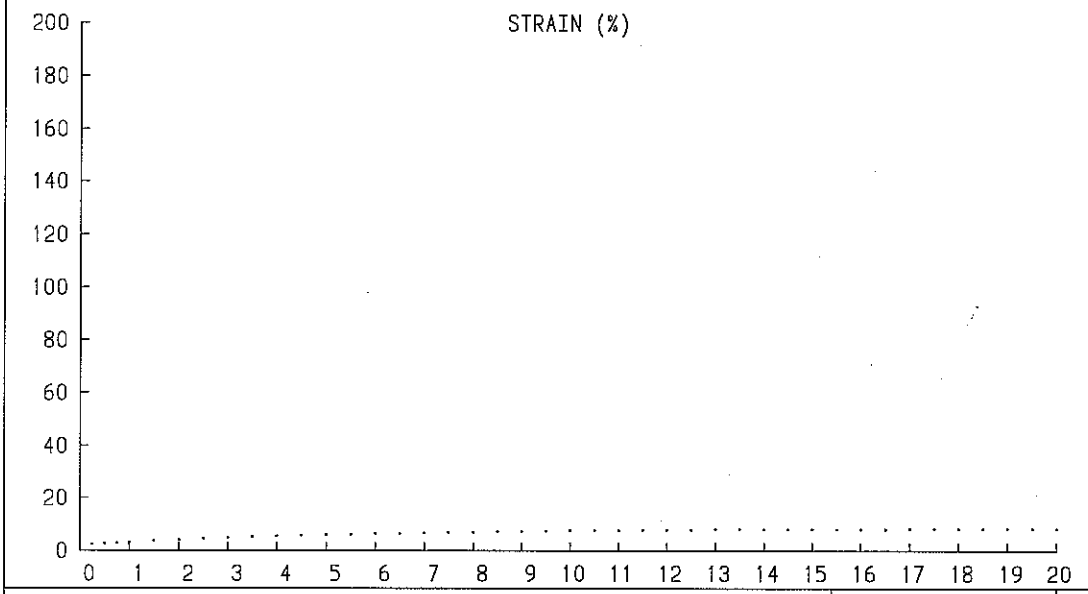
Q.A. Ref: /117-27/m4i4315.QTX 2.05

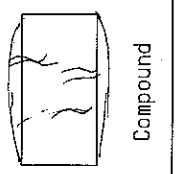
NORWEST HOLST SOIL ENGINEERING LIMITED

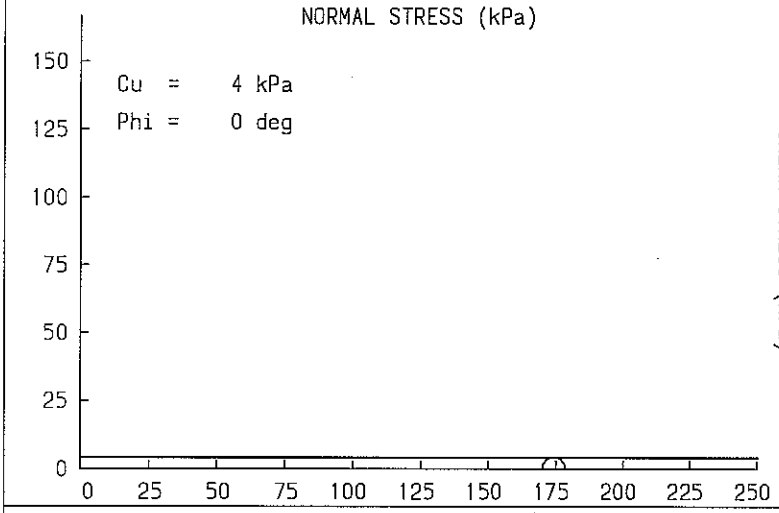
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft blueish grey, very silty slightly organic CLAY.	Hole ID	BHI4
		Sample No	
		Depth	11.00 m







	1	2	3	
Cell Pressure	170			kPa
Deviator Stress	10			kPa
...Corrected	9			kPa
Membrane Corr.	1			kPa
Moisture Content	18			%
Bulk Density	2.06			Mg/m3
Dry Density	1.75			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	19.0			%
Cu	4			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

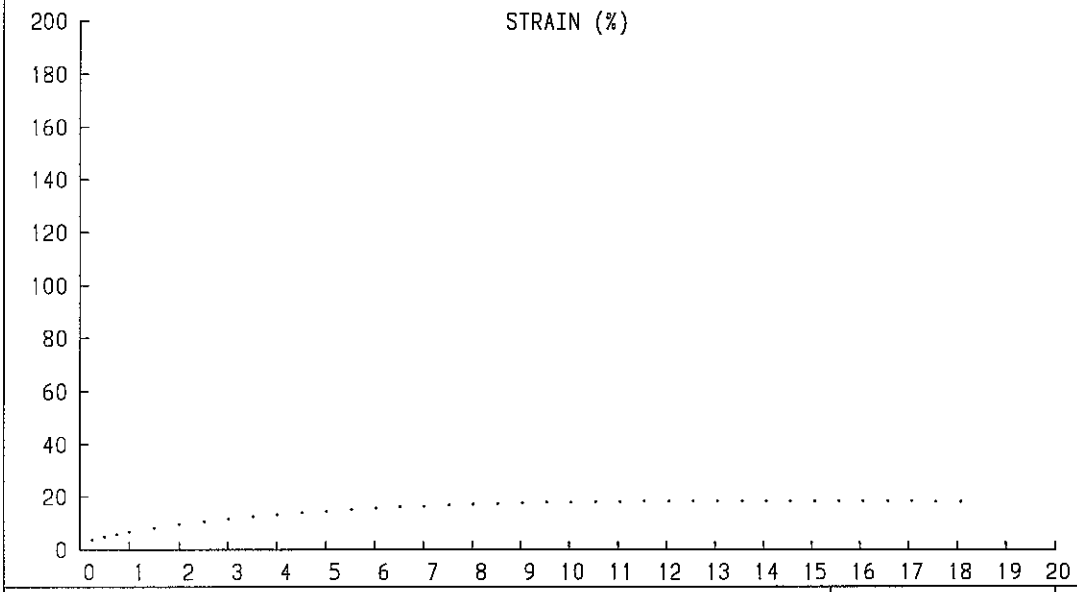
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

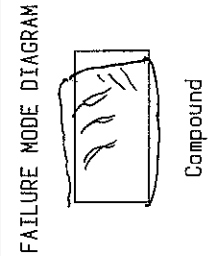
NORWEST HOLST SOIL ENGINEERING LIMITED

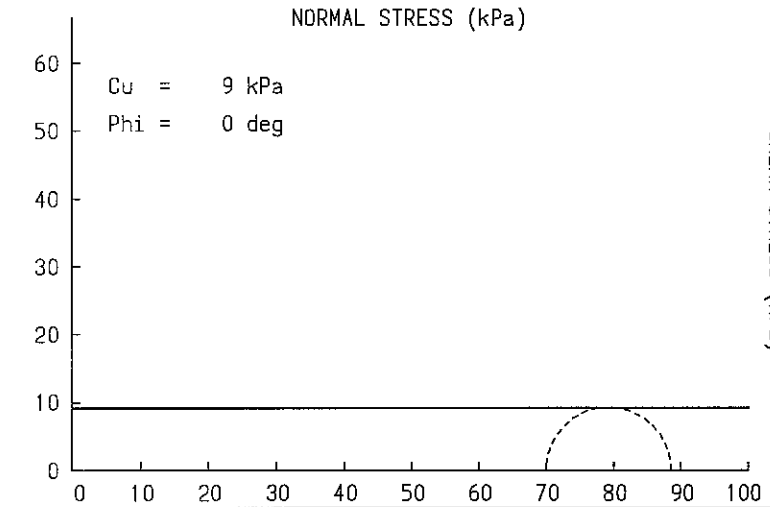
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft grey occasionally thinly laminated, CLAY with some organic strongly decompossed rootlets.	Hole ID	BHJ1
		Sample No	
		Depth	4.40 m







	1	2	3	
Cell Pressure	70			kPa
Deviator Stress	19			kPa
...Corrected	18			kPa
Membrane Corr.	1			kPa
Moisture Content	50			%
Bulk Density	1.71			Mg/m3
Dry Density	1.14			Mg/m3
Diameter	103.0			mm
Length	199.2			mm
Failure Strain	14.1			%
Cu	9			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

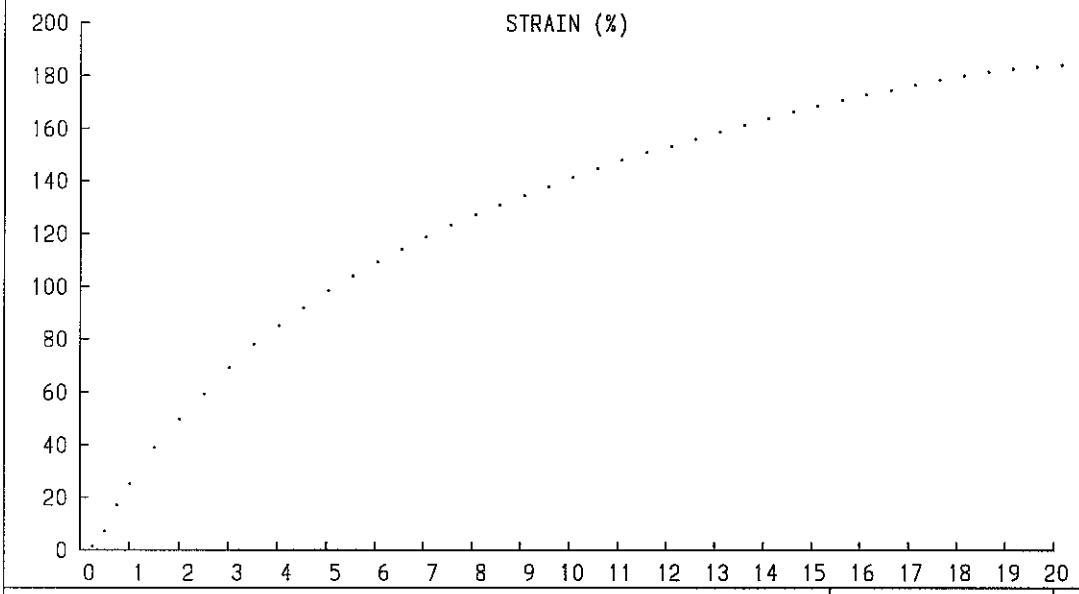
Test Type : Single Stage
Undisturbed
Rate : 2% per minute.
Orientated and loaded with vertical axis

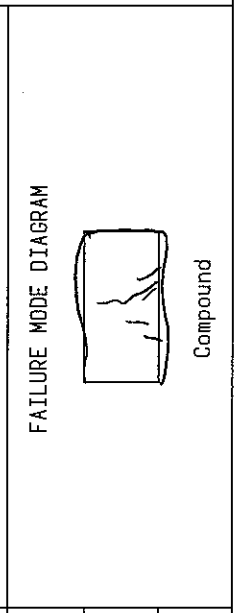
NORWEST HOLST SOIL ENGINEERING LIMITED

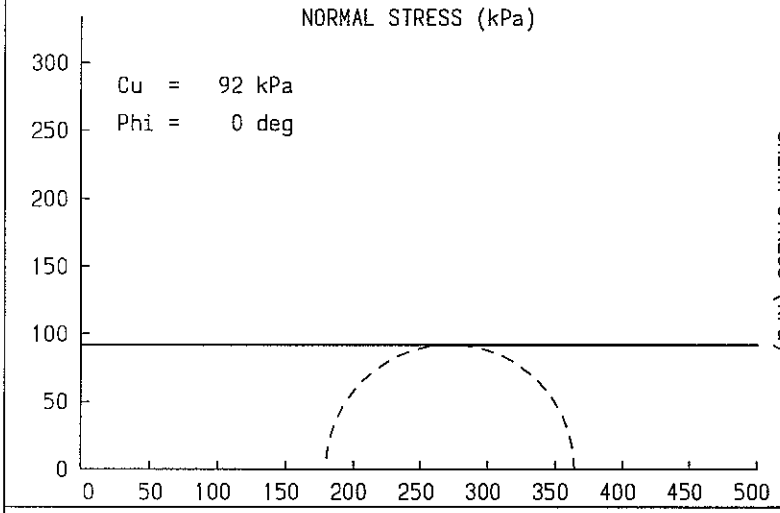
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm to stiff reddish brown CLAY with fine to medium very weak angular mudstone lithorelics and gleyed root traces	Hole ID	BHJ1
		Sample No	
		Depth	12.10 m







	1	2	3	
Cell Pressure	180			kPa
Deviator Stress	185			kPa
...Corrected	184			kPa
Membrane Corr.	1			kPa
Moisture Content	22			%
Bulk Density	2.03			Mg/m3
Dry Density	1.66			Mg/m3
Diameter	102.5			mm
Length	198.4			mm
Failure Strain	20.0			%
Cu	92			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

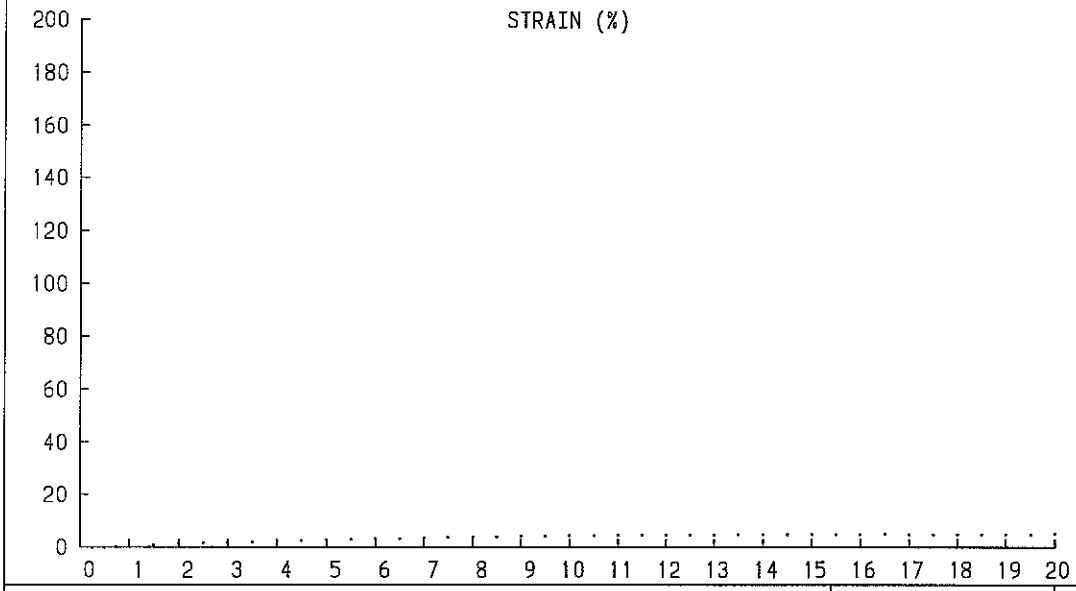
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

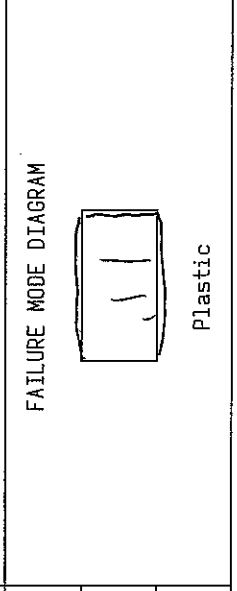
NORWEST HOLST SOIL ENGINEERING LIMITED

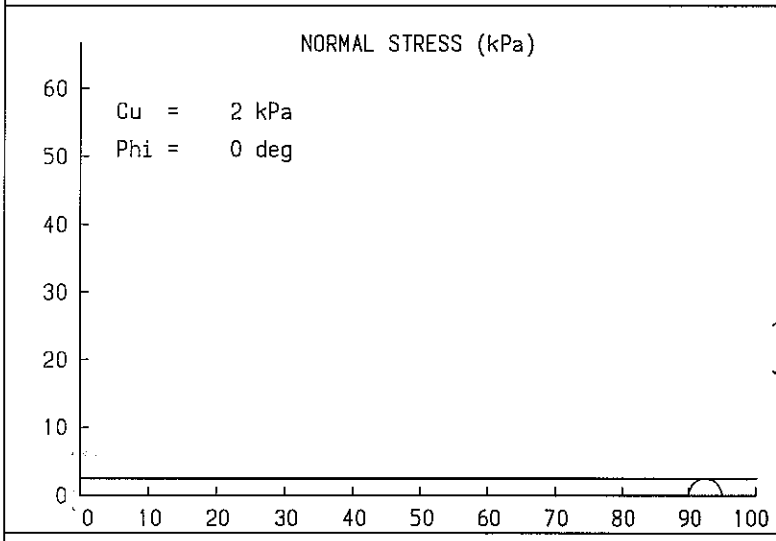
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Very soft grey very silty organic CLAY.	Hole ID	BHJ2
		Sample No	
		Depth	6.50 m







	1	2	3	
Cell Pressure	90			kPa
Deviator Stress	6			kPa
...Corrected	5			kPa
Membrane Corr.	1			kPa
Moisture Content	55			%
Bulk Density	1.85			Mg/m3
Dry Density	1.19			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	20.0			%
Cu	2			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

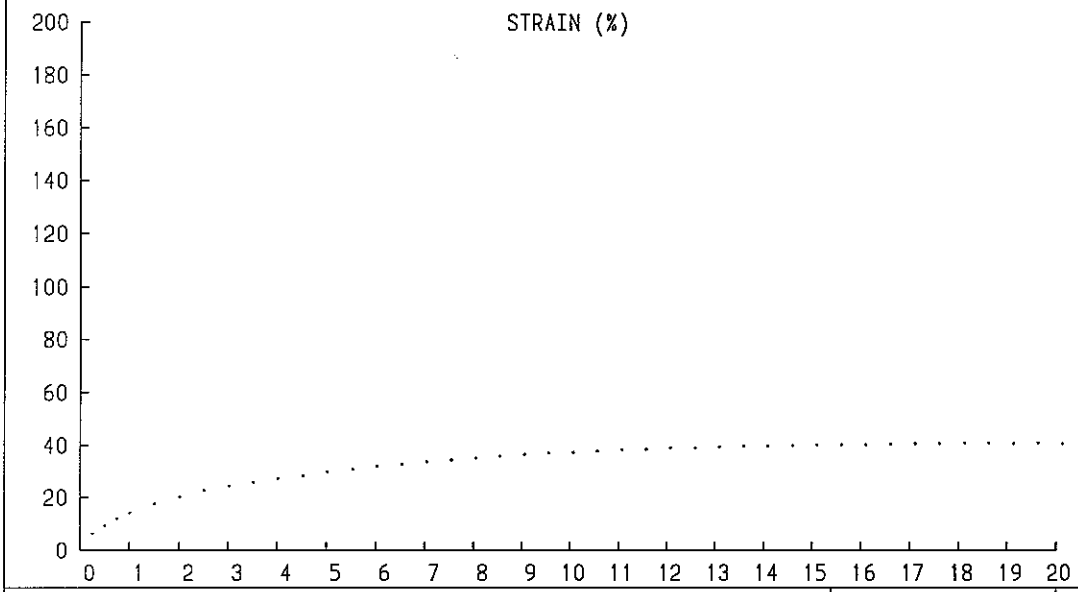
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

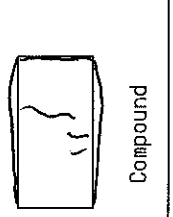
NORWEST HOLST SOIL ENGINEERING LIMITED

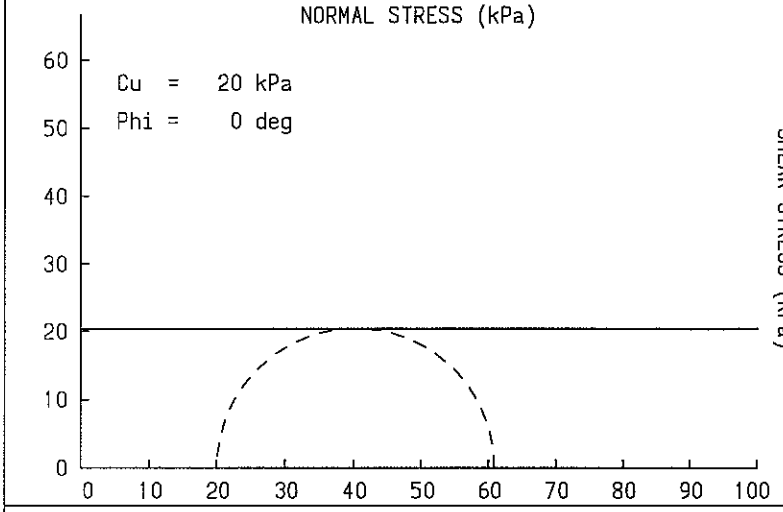
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Soft to firm dark grey mottled brown very silty CLAY	Hole ID	BHJ3
		Sample No	
		Depth	1.00 m







	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	42			kPa
...Corrected	41			kPa
Membrane Corr.	1			kPa
Moisture Content	36			%
Bulk Density	1.86			Mg/m3
Dry Density	1.37			Mg/m3
Diameter	103.0			mm
Length	198.6			mm
Failure Strain	18.1			%
Cu	20			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

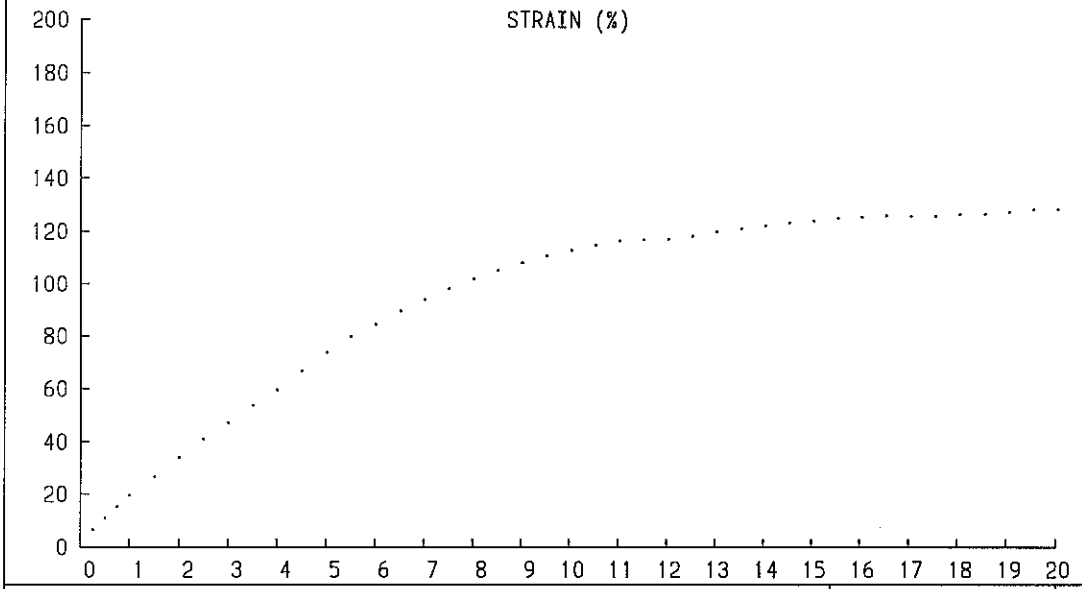
Q.A. Ref: /117-24/m4bhj310.QTX 2.05

NORWEST HOLST SOIL ENGINEERING LIMITED

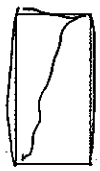
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

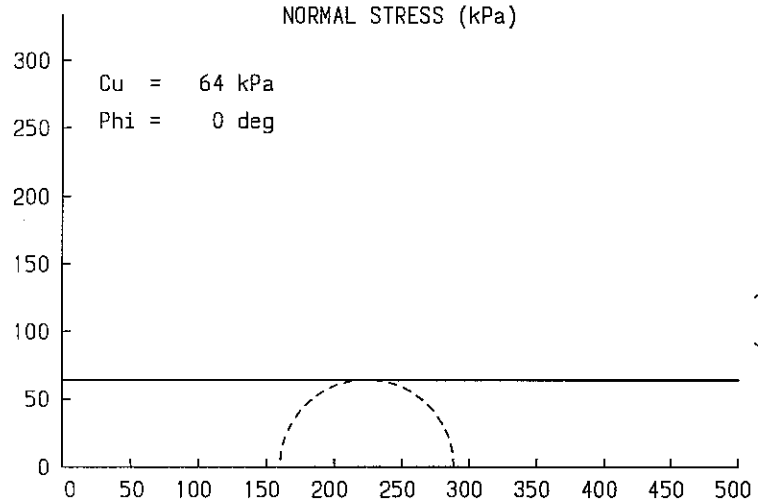
Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Firm reddish brown friable CLAY with some medium sized,weak angular mudstone lithorelics with some lenses of fine to medium sand	Hole ID	BHJ3
		Sample No	
		Depth	11.30 m



FAILURE MODE DIAGRAM



Brittle



	1	2	3	
Cell Pressure	160			kPa
Deviator Stress	130			kPa
...Corrected	129			kPa
Membrane Corr.	1			kPa
Moisture Content	18			%
Bulk Density	2.20			Mg/m3
Dry Density	1.86			Mg/m3
Diameter	102.1			mm
Length	199.4			mm
Failure Strain	20.0			%
Cu	64			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

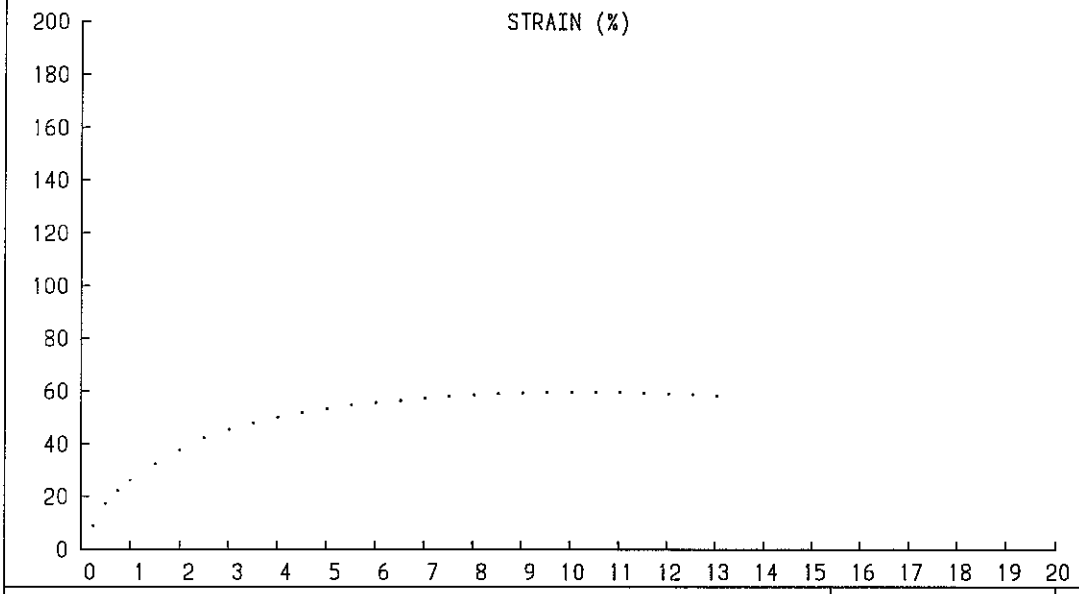
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

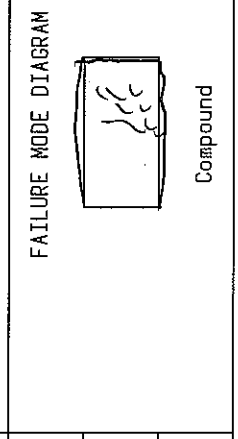
NORWEST HOLST SOIL ENGINEERING LIMITED

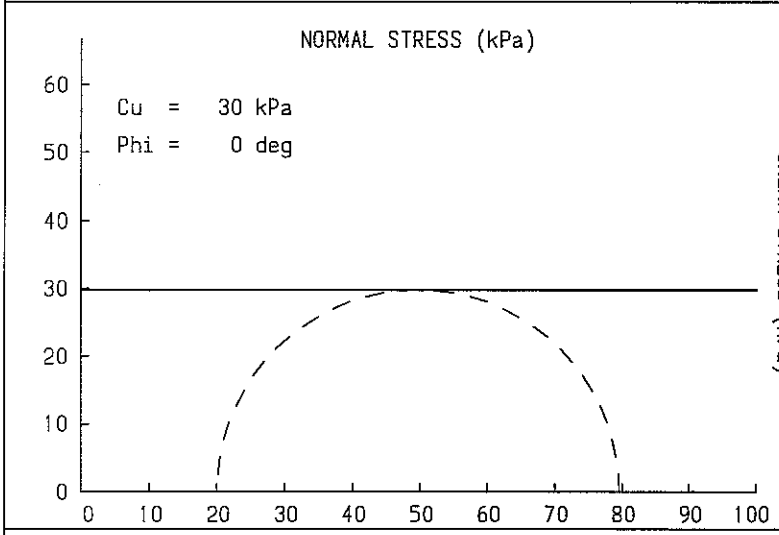
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm grey mottled brown slightly fissured CLAY.	Hole ID	BHJ4
		Sample No	
		Depth	1.00 m







	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	60			kPa
...Corrected	60			kPa
Membrane Corr.	1			kPa
Moisture Content	33			%
Bulk Density	1.88			Mg/m3
Dry Density	1.41			Mg/m3
Diameter	102.9			mm
Length	199.4			mm
Failure Strain	10.0			%
Cu	30			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

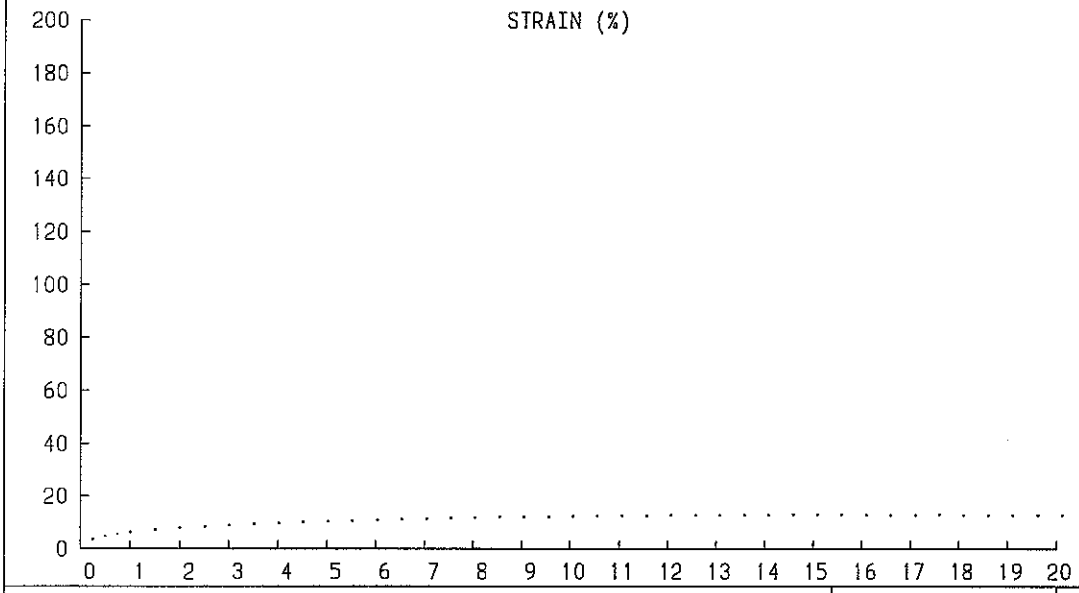
Q.A. Ref: /117-27/m4j4100.QTX 2.05

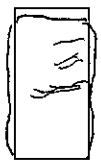
NORWEST HOLST SOIL ENGINEERING LIMITED

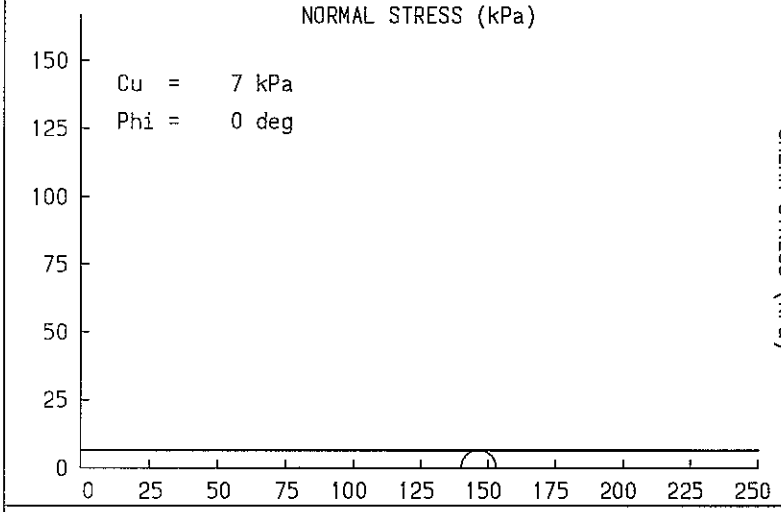
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Soft grey very silty CLAY with a little fine to medium gravel.	Hole ID	BHJ4
		Sample No	
		Depth	8.00 m







	1	2	3	
Cell Pressure	140			kPa
Deviator Stress	14			kPa
...Corrected	13			kPa
Membrane Corr.	1			kPa
Moisture Content	69			%
Bulk Density	1.49			Mg/m3
Dry Density	0.88			Mg/m3
Diameter	102.7			mm
Length	198.8			mm
Failure Strain	15.1			%
Cu	7			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

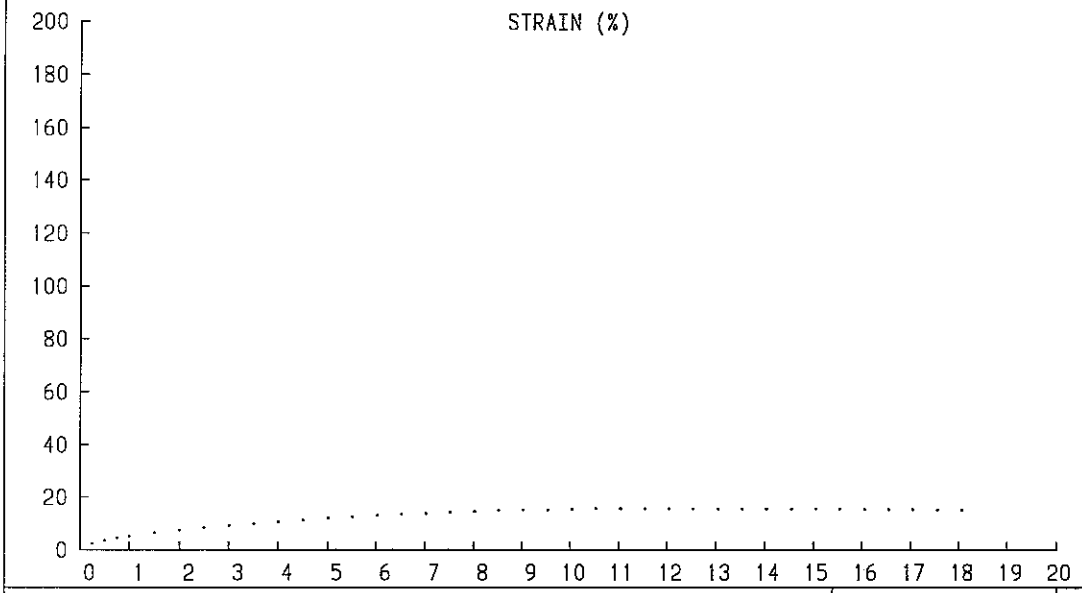
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

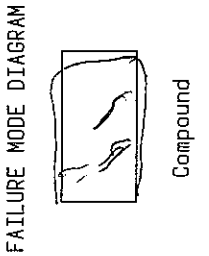
NORWEST HOLST SOIL ENGINEERING LIMITED

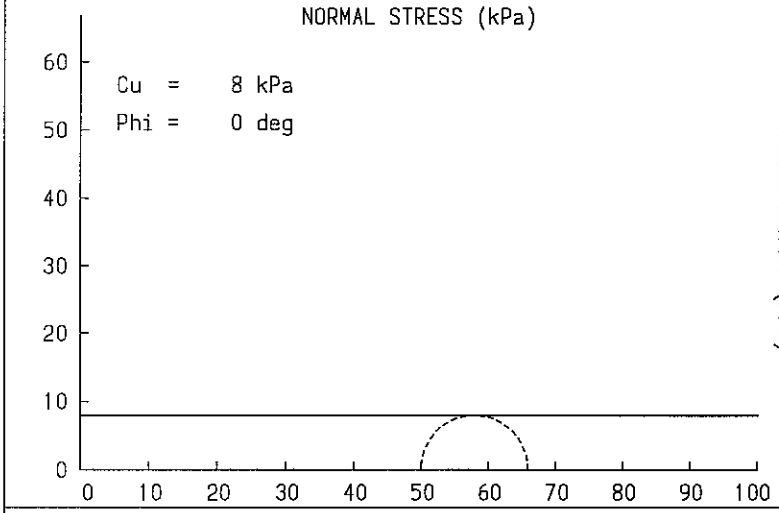
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft brown grey very silty slightly organic CLAY.	Hole ID	BHJ5
		Sample No	
		Depth	3.00 m







	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	17			kPa
...Corrected	16			kPa
Membrane Corr.	1			kPa
Moisture Content	57			%
Bulk Density	1.66			Mg/m3
Dry Density	1.06			Mg/m3
Diameter	101.9			mm
Length	199.3			mm
Failure Strain	13.0			%
Cu	8			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

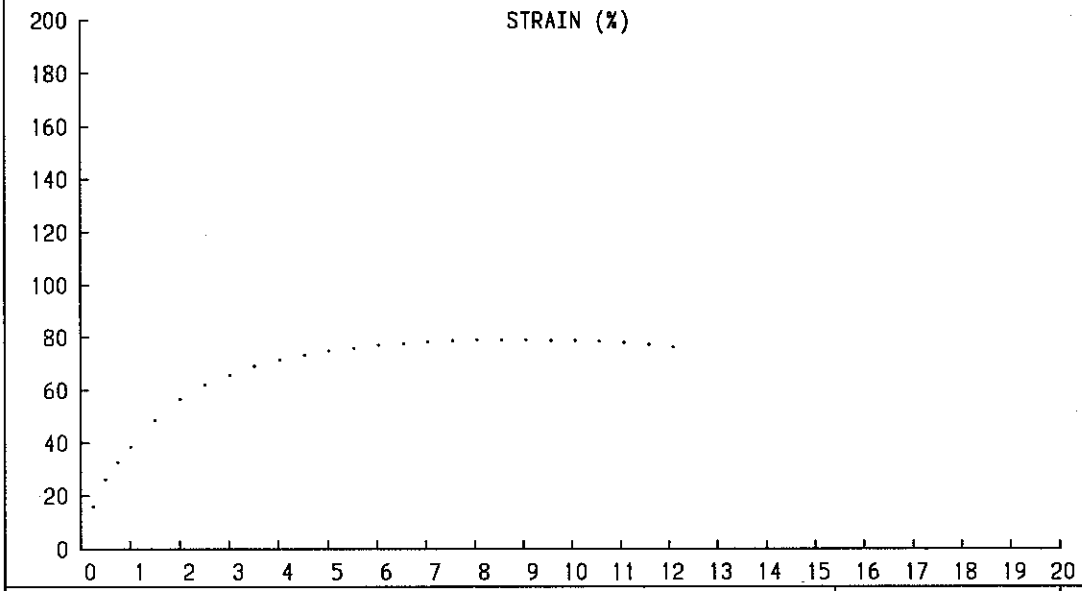
Test Type : Single Stage
Undisturbed
Rate : 2% per minute.
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

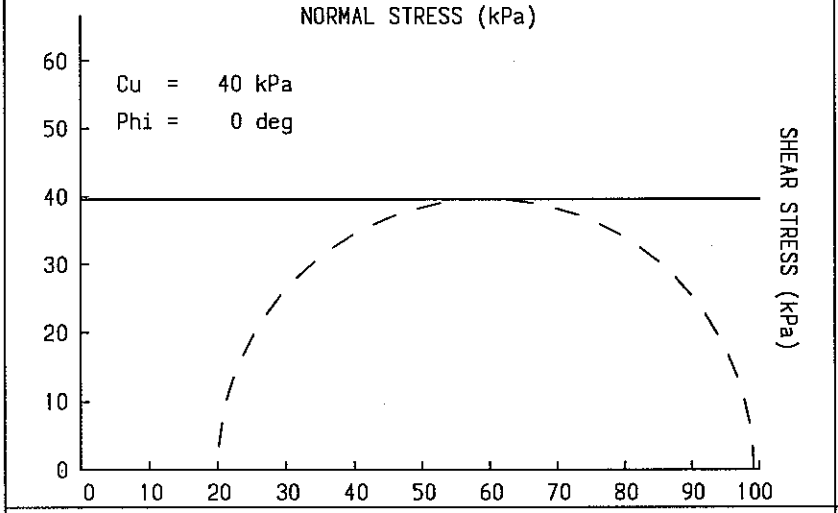
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Firm grey mottled brown sandy CLAY with some rootlets.	Hole ID	BHK1
		Sample No	
		Depth	1.00 m



FAILURE MODE DIAGRAM

Brittle



	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	80			kPa
...Corrected	79			kPa
Membrane Corr.	1			kPa
Moisture Content	35			%
Bulk Density	1.87			Mg/m3
Dry Density	1.39			Mg/m3
Diameter	102.8			mm
Length	198.5			mm
Failure Strain	8.6			%
Cu	40			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

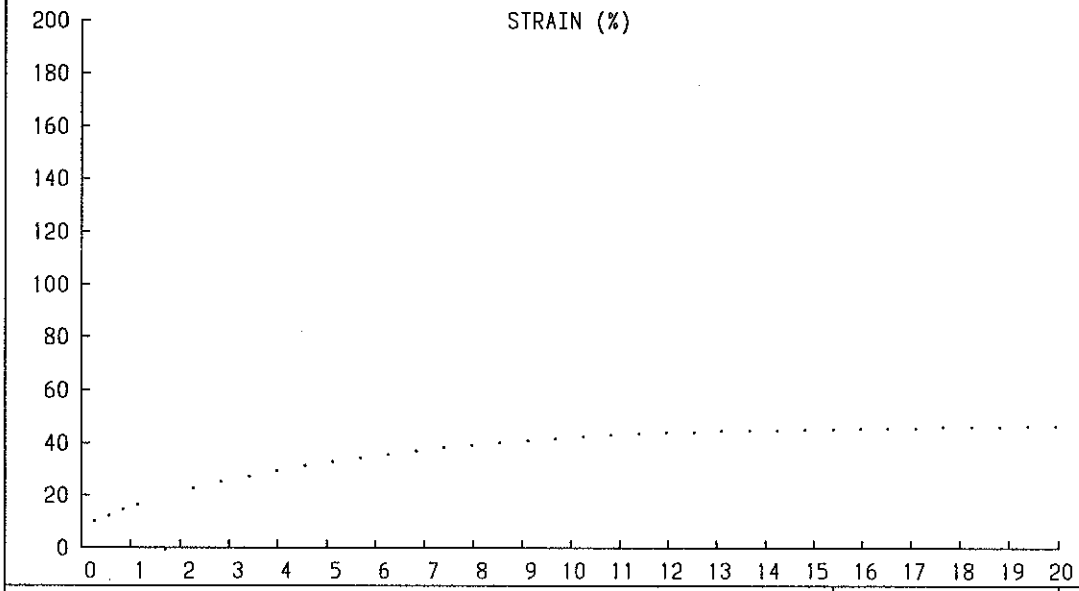
Q.A. Ref: /018-30/M4BK1.QTX 2.05

NORWEST HOLST SOIL ENGINEERING LIMITED

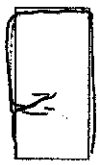
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

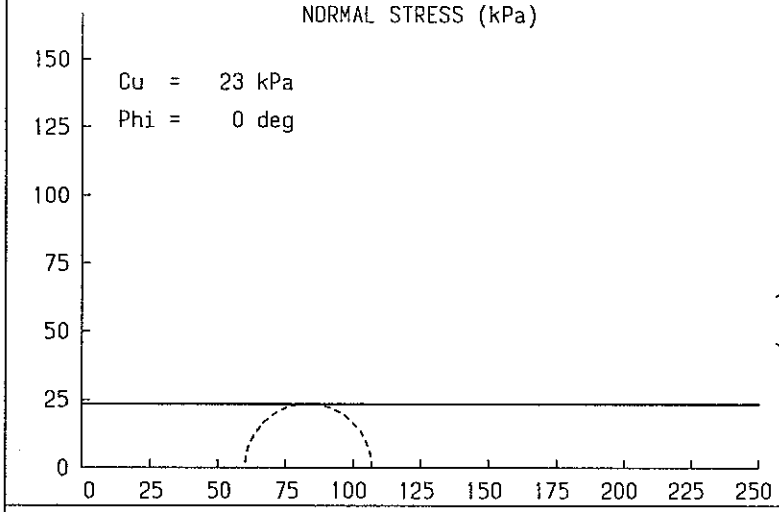
Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft grey slightly sandy CLAY with rootlets.	Hole ID	BHK1
		Sample No	
		Depth	2.80 m



FAILURE MODE DIAGRAM



Compound



	1	2	3	
Cell Pressure	60			kPa
Deviator Stress	48			kPa
...Corrected	47			kPa
Membrane Corr.	1			kPa
Moisture Content	42			%
Bulk Density	1.74			Mg/m3
Dry Density	1.23			Mg/m3
Diameter	103.5			mm
Length	175.5			mm
Failure Strain	20.0			%
Cu	23			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
All specimens prepared from top of undisturbed sample tube suitable material.

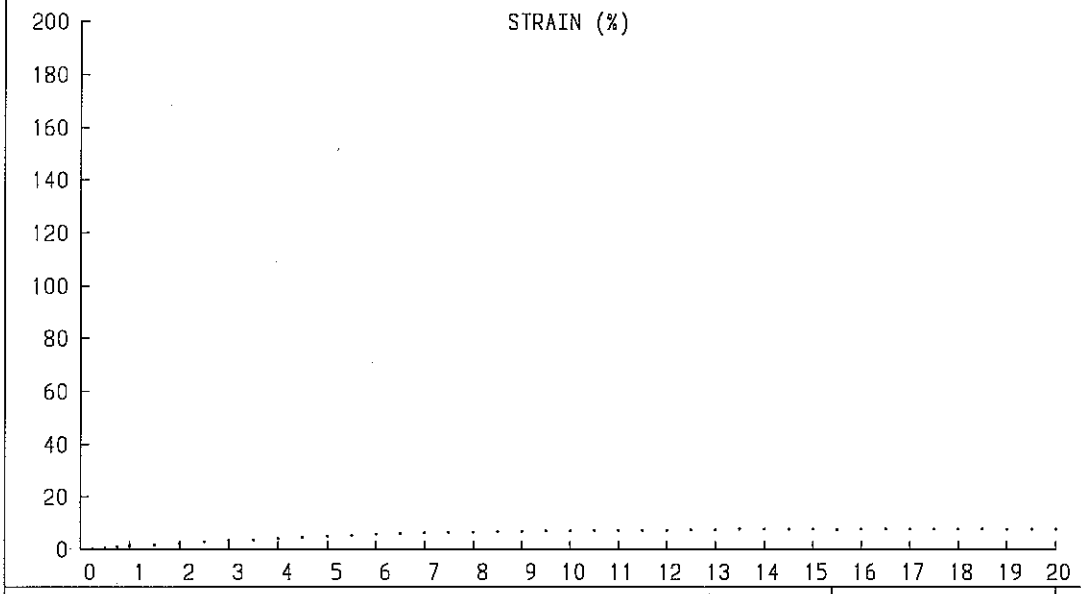
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

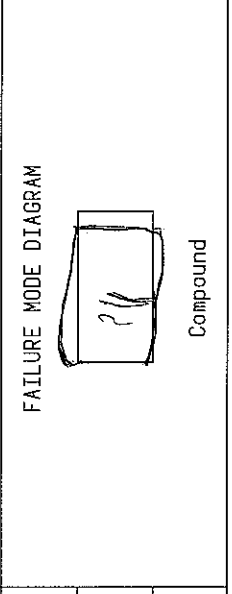
NORWEST HOLST SOIL ENGINEERING LIMITED

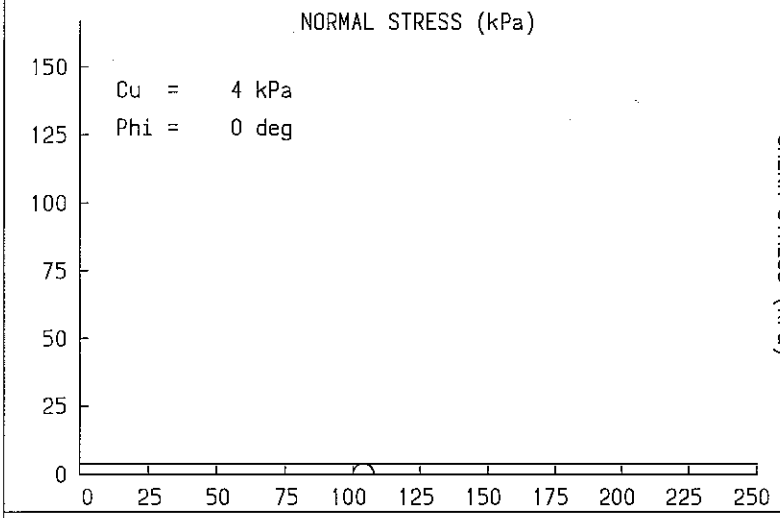
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Very soft grey slightly sandy CLAY.	Hole ID	BHK1
		Sample No	
		Depth	5.00 m







	1	2	3	
Cell Pressure	100			kPa
Deviator Stress	9			kPa
...Corrected	8			kPa
Membrane Corr.	1			kPa
Moisture Content	70			%
Bulk Density	1.70			Mg/m3
Dry Density	1.00			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	17.5			%
Cu	4			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample tube
suitable material.

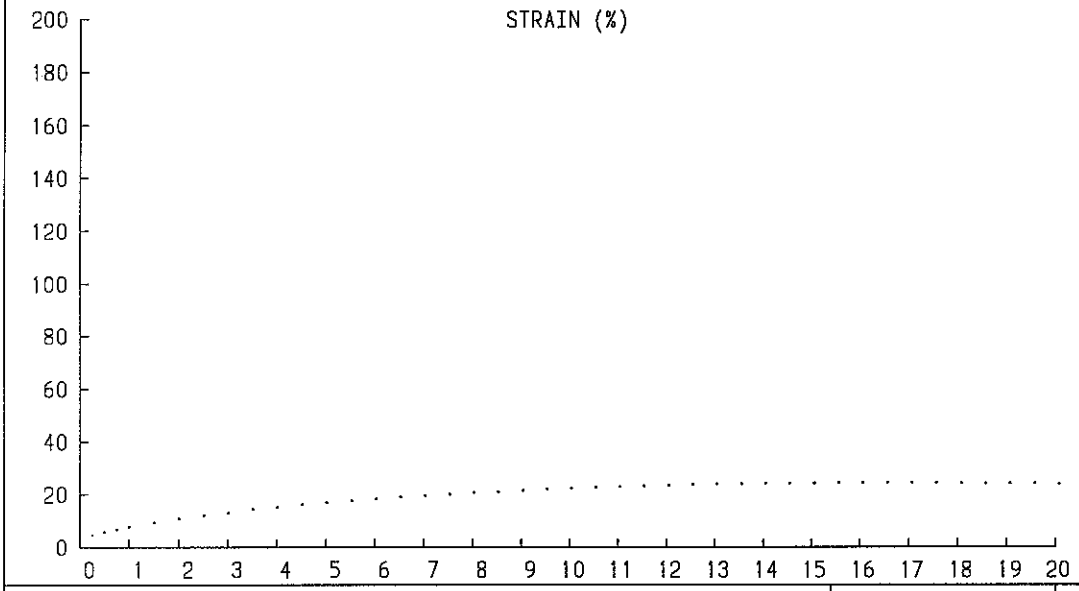
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

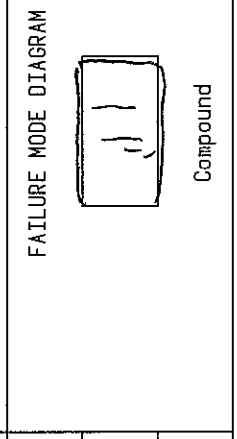
NORWEST HOLST SOIL ENGINEERING LIMITED

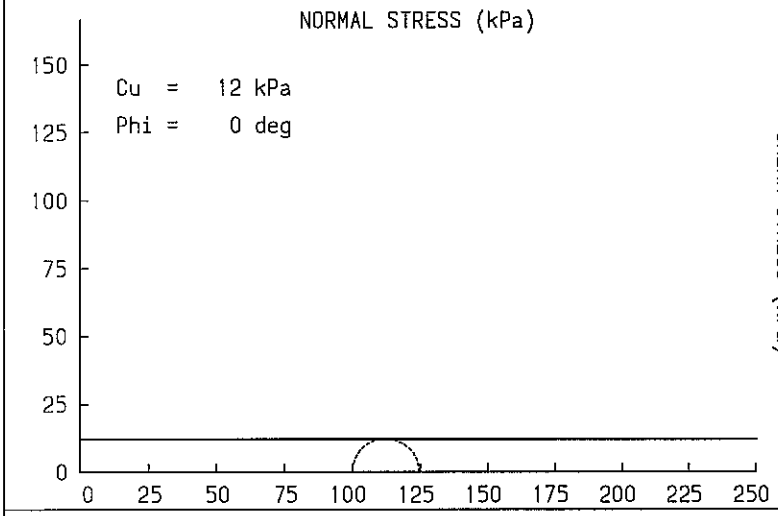
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Very soft blueish grey slightly organic CLAY.	Hole ID	BHK2
		Sample No	
		Depth	7.50 m







	1	2	3	
Cell Pressure	100			kPa
Deviator Stress	25			kPa
...Corrected	24			kPa
Membrane Corr.	1			kPa
Moisture Content	72			%
Bulk Density	1.58			Mg/m3
Dry Density	0.92			Mg/m3
Diameter	101.9			mm
Length	199.2			mm
Failure Strain	16.6			%
Cu	12			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

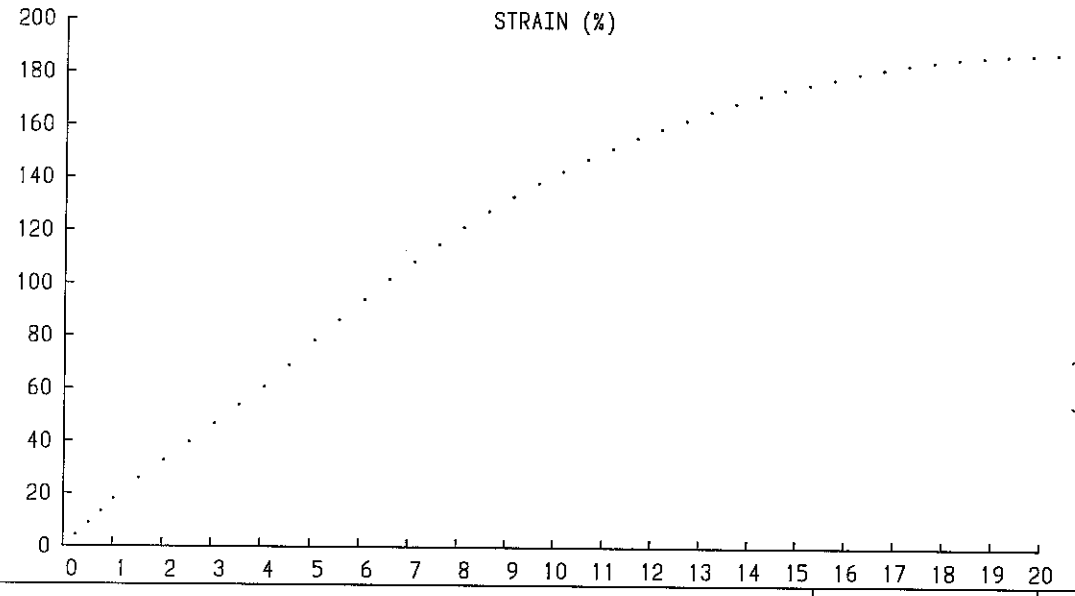
Q.A. Ref: /117-27/m4k2750.QTX 2.05

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

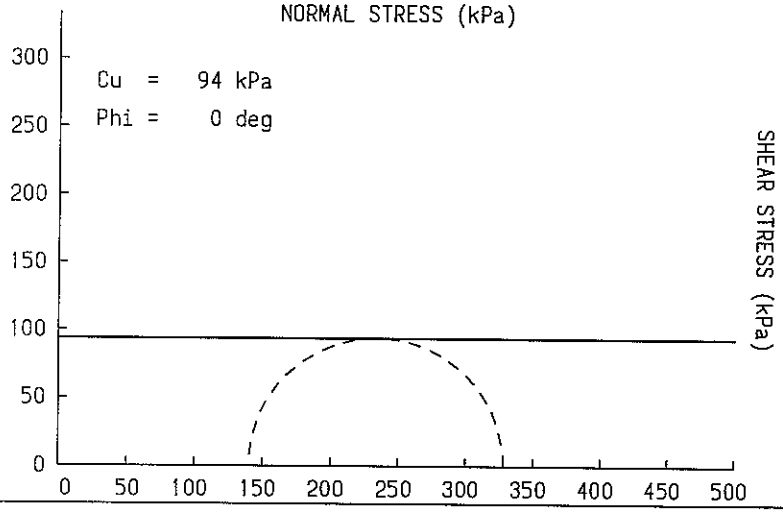
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm light grey mottled blue completely weathered slightly sandy MUDSTONE	Hole ID	BHK3
		Sample No	
		Depth	9.40 m



FAILURE MODE DIAGRAM

Brittle



	1	2	3	
Cell Pressure	140			kPa
Deviator Stress	189			kPa
...Corrected	188			kPa
Membrane Corr.	1			kPa
Moisture Content	21			%
Bulk Density	2.12			Mg/m3
Dry Density	1.75			Mg/m3
Diameter	102.8			mm
Length	196.9			mm
Failure Strain	20.0			%
Cu	94			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

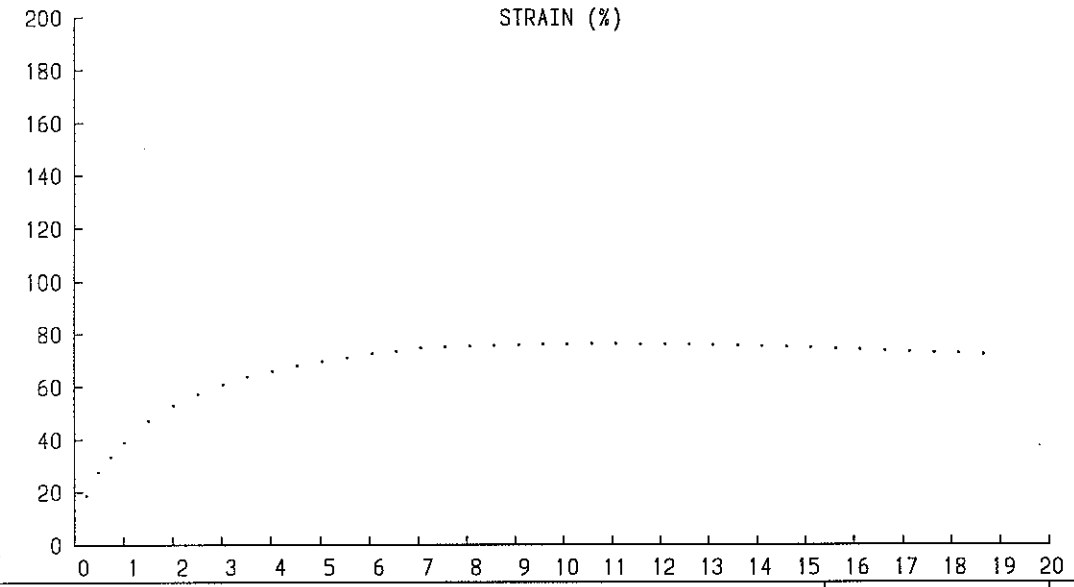
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

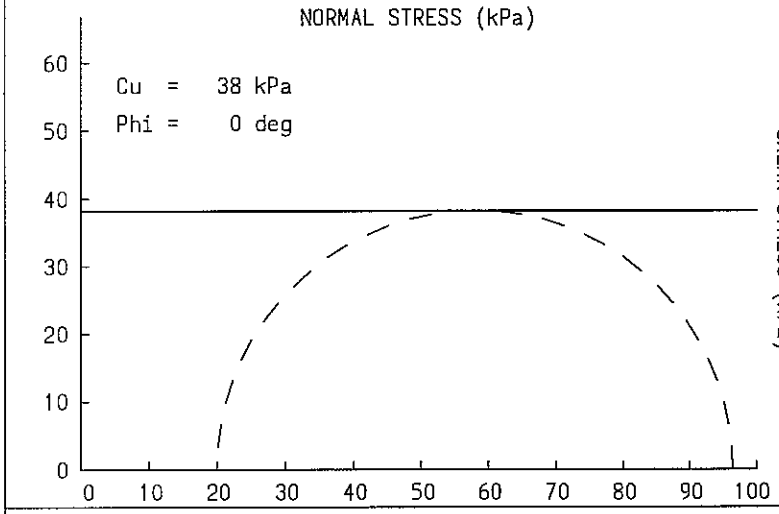
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm greyish brown occasionally thinly laminated CLAY	Hole ID	BHK5
		Sample No	
		Depth	1.00 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	77			kPa
...Corrected	76			kPa
Membrane Corr.	1			kPa
Moisture Content	35			%
Bulk Density	1.88			Mg/m3
Dry Density	1.39			Mg/m3
Diameter	103.1			mm
Length	198.4			mm
Failure Strain	10.6			%
Cu	38			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

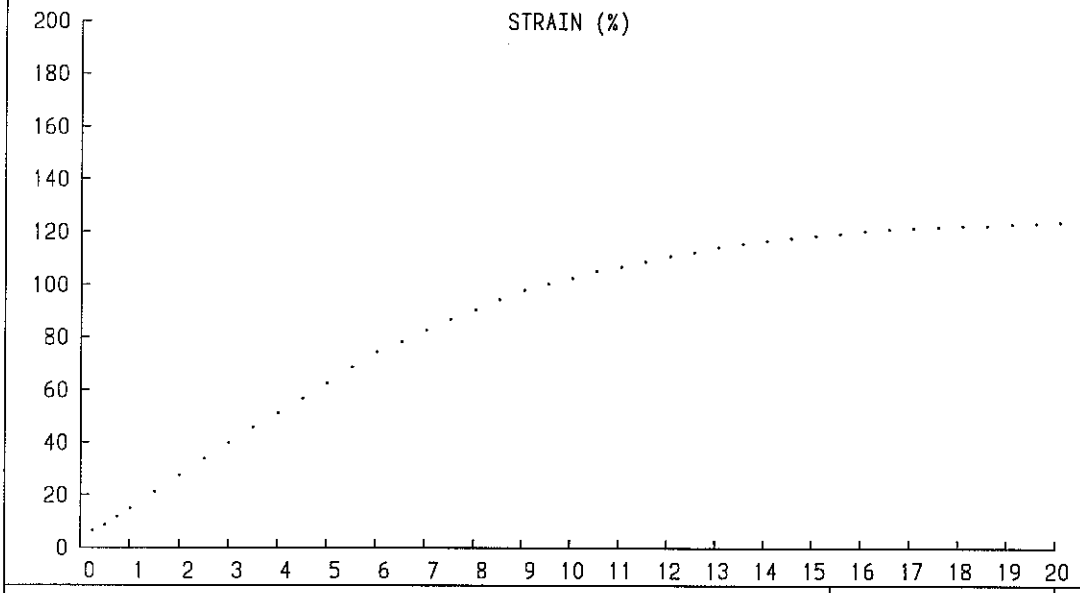
Q.A. Ref: /117-24/m4bhk510.QTX 2.05

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

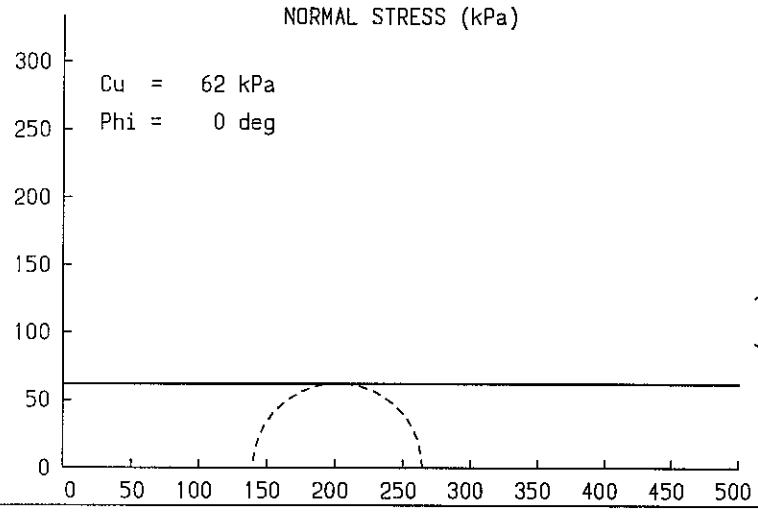
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Reddish brown sandy clayey SILT with gravel size pockets of sandy very silty clay and occasional fine to medium angular to subrounded gravel	Hole ID	BHK5
		Sample No	
		Depth	9.20 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	140			kPa
Deviator Stress	125			kPa
...Corrected	124			kPa
Membrane Corr.	1			kPa
Moisture Content	12			%
Bulk Density	2.28			Mg/m3
Dry Density	2.03			Mg/m3
Diameter	104.3			mm
Length	199.0			mm
Failure Strain	20.0			%
Cu	62			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

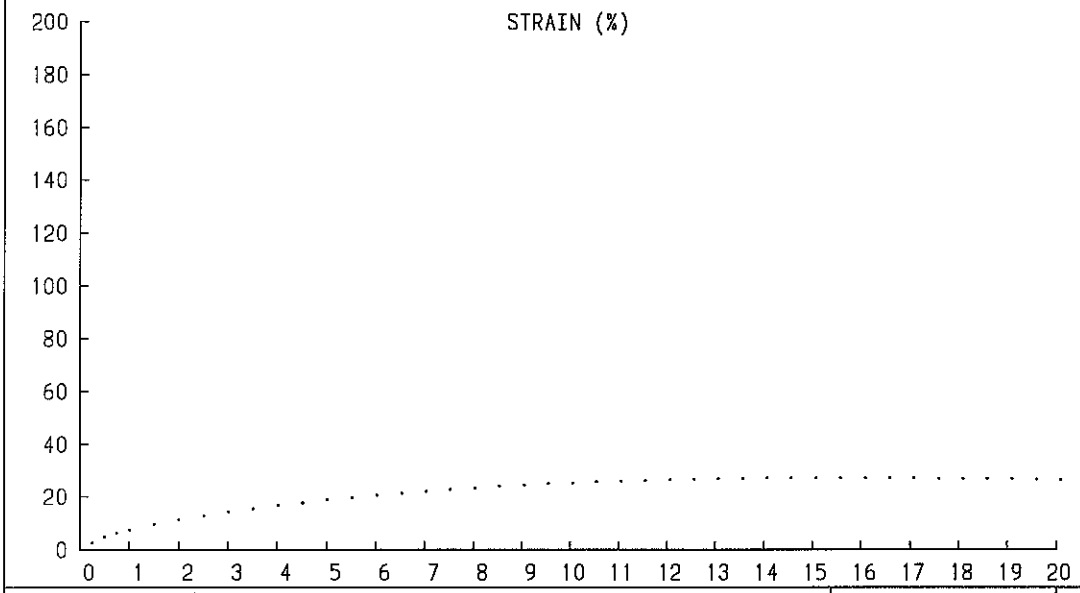
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

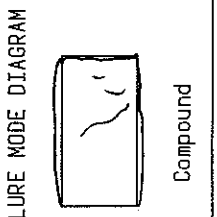
NORWEST HOLST SOIL ENGINEERING LIMITED

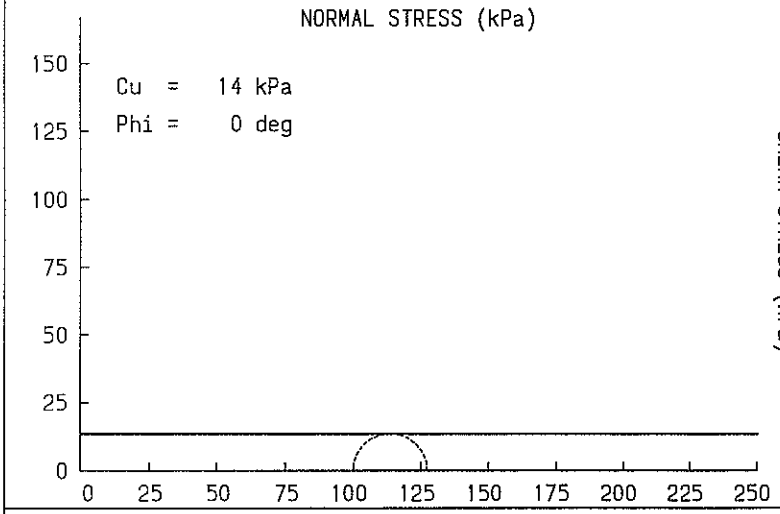
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Soft to firm dark grey mottled black sandy CLAY with occasional thin beds of firm black fiberous peat	Hole ID	BHL1
		Sample No	
		Depth	7.30 m







	1	2	3	
Cell Pressure	100			kPa
Deviator Stress	28			kPa
...Corrected	27			kPa
Membrane Corr.	1			kPa
Moisture Content	84			%
Bulk Density	1.52			Mg/m3
Dry Density	0.83			Mg/m3
Diameter	101.2			mm
Length	199.0			mm
Failure Strain	16.1			%
Cu	14			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

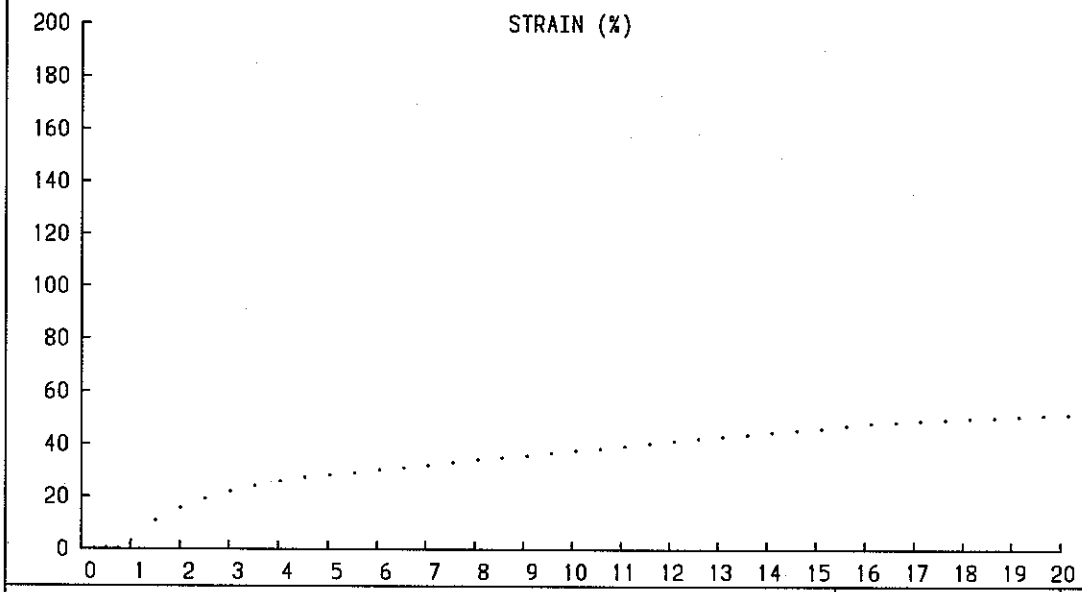
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

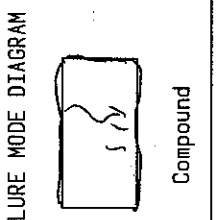
NORWEST HOLST SOIL ENGINEERING LIMITED

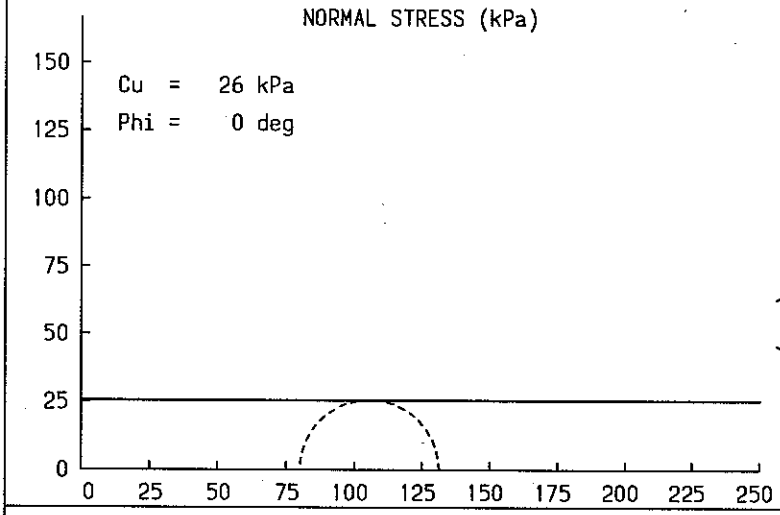
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm dark brownish black amorphous PEAT	Hole ID	BHL2
		Sample No	
		Depth	5.00 m







	1	2	3	
Cell Pressure	80			kPa
Deviator Stress	52			kPa
...Corrected	51			kPa
Membrane Corr.	1			kPa
Moisture Content	289			%
Bulk Density	1.06			Mg/m3
Dry Density	0.27			Mg/m3
Diameter	103.2			mm
Length	198.4			mm
Failure Strain	20.0			%
Cu	26			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

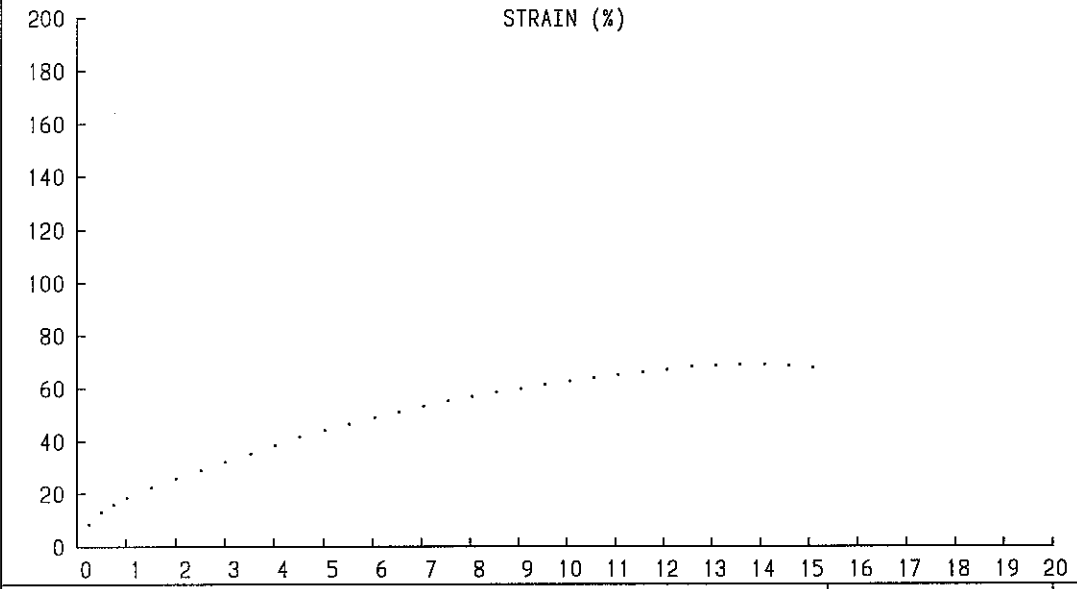
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

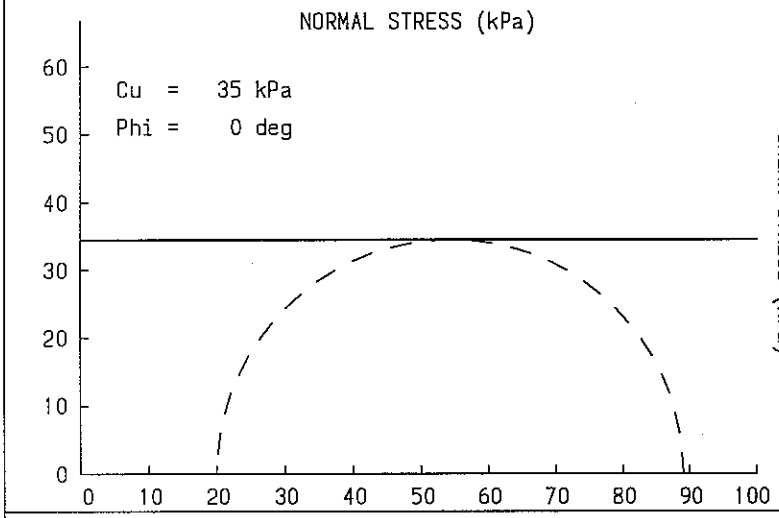
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Soft grey mottled grey brown very silty CLAY with occasional rootlets	Hole ID	BHL4
		Sample No	
		Depth	1.00 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	70			kPa
...Corrected	69			kPa
Membrane Corr.	1			kPa
Moisture Content	35			%
Bulk Density	1.89			Mg/m3
Dry Density	1.40			Mg/m3
Diameter	102.6			mm
Length	198.9			mm
Failure Strain	13.6			%
Cu	35			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

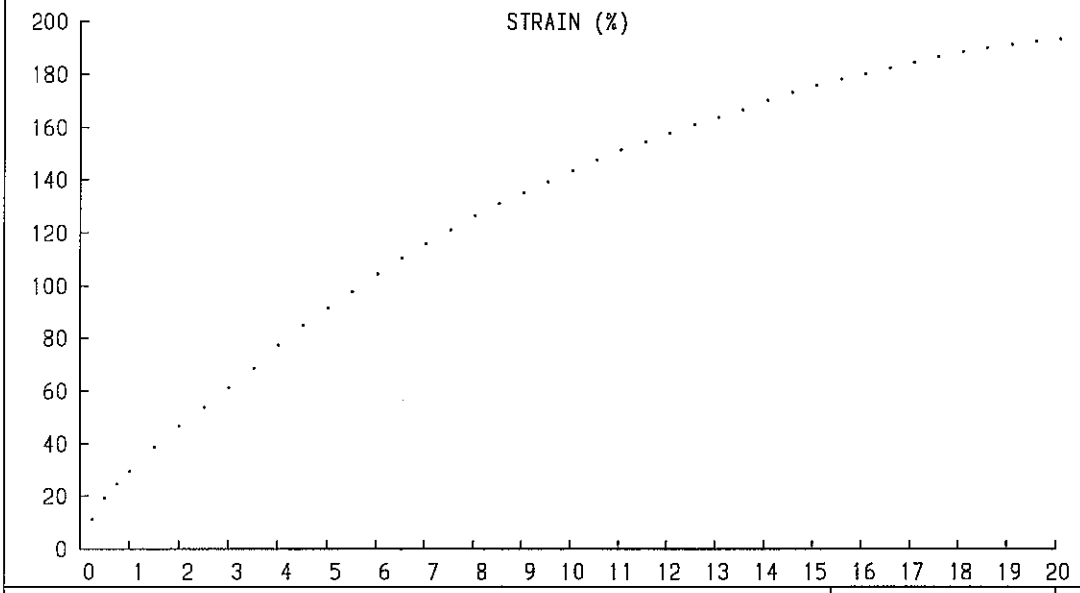
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

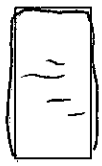
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

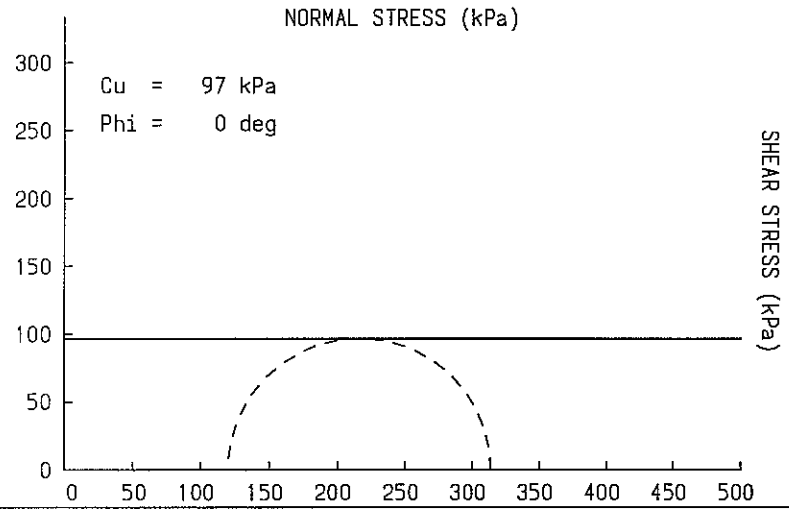
Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm reddish brown CLAY.	Hole ID	BHL4
		Sample No	
		Depth	7.50 m



FAILURE MODE DIAGRAM



Compound



	1	2	3	
Cell Pressure	120			kPa
Deviator Stress	195			kPa
...Corrected	194			kPa
Membrane Corr.	1			kPa
Moisture Content	20			%
Bulk Density	2.16			Mg/m3
Dry Density	1.79			Mg/m3
Diameter	102.3			mm
Length	198.9			mm
Failure Strain	20.0			%
Cu	97			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

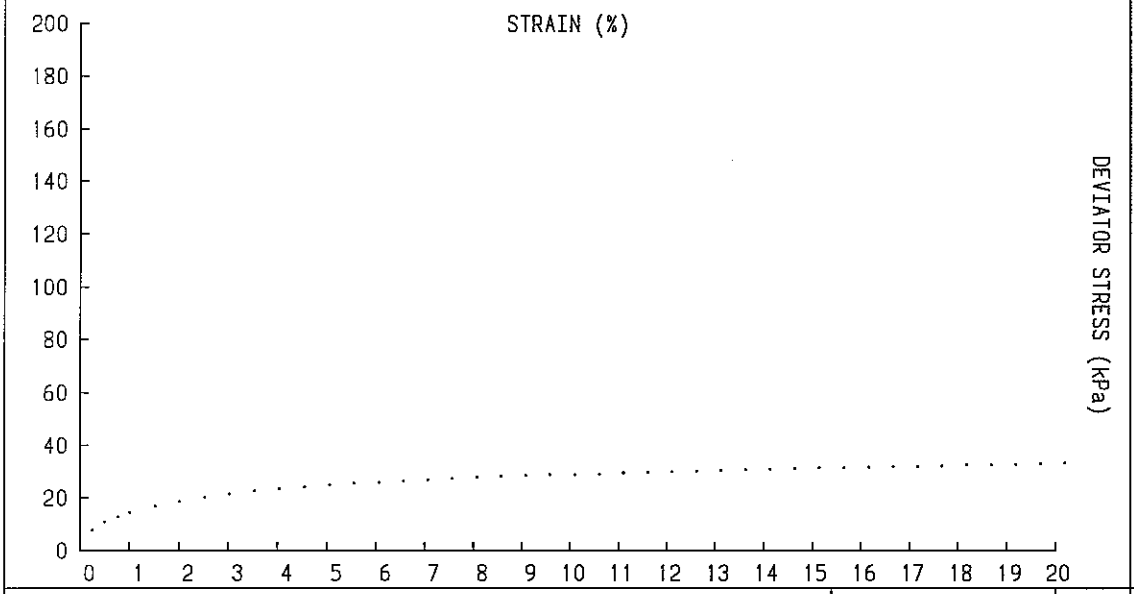
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

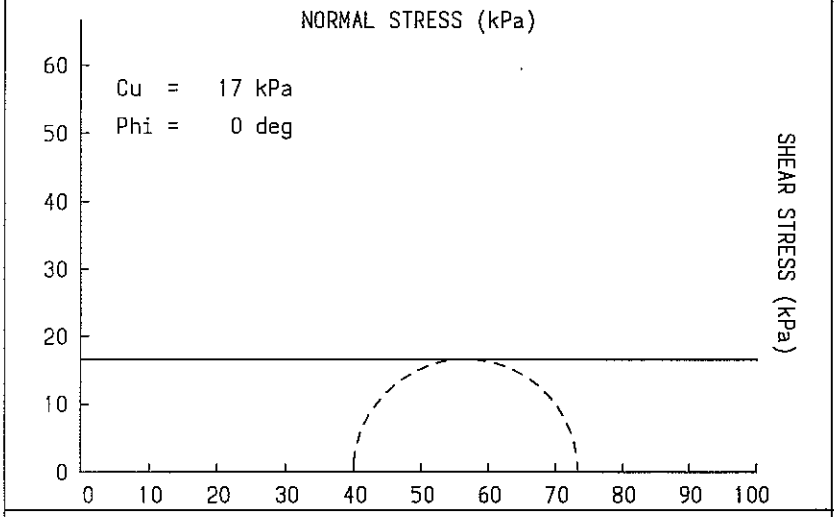
NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Soft to firm grey mottled black very silty organic CLAY with some decomposed plant material	Hole ID	BHL5
		Sample No	
		Depth	2.50 m





	1	2	3	
Cell Pressure	40			kPa
Deviator Stress	34			kPa
...Corrected	33			kPa
Membrane Corr.	1			kPa
Moisture Content	50			%
Bulk Density	1.74			Mg/m3
Dry Density	1.16			Mg/m3
Diameter	102.4			mm
Length	198.0			mm
Failure Strain	20.0			%
Cu	17			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

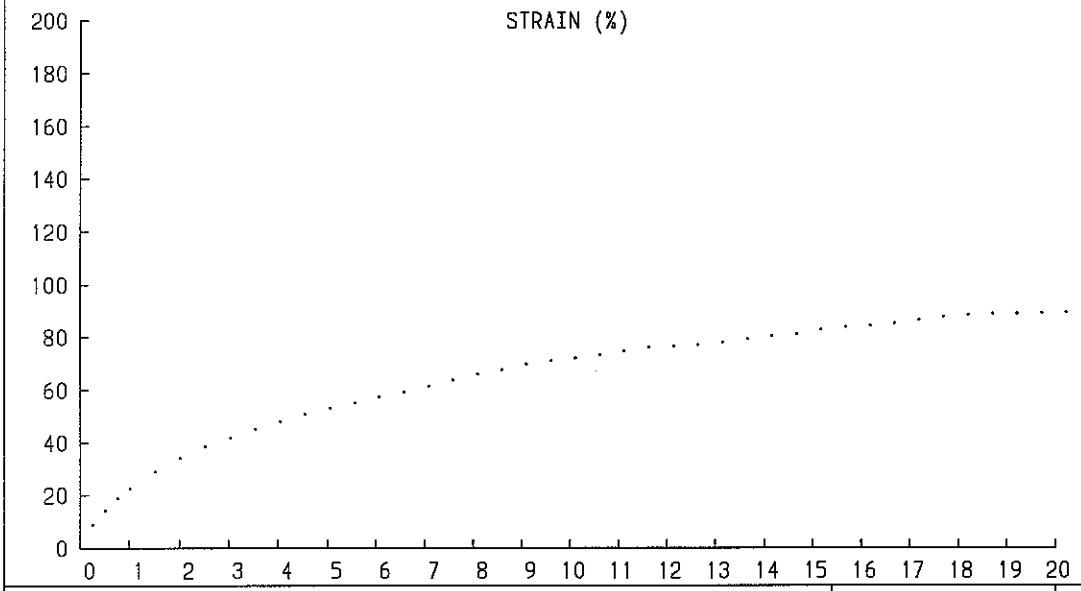
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

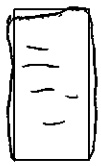
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

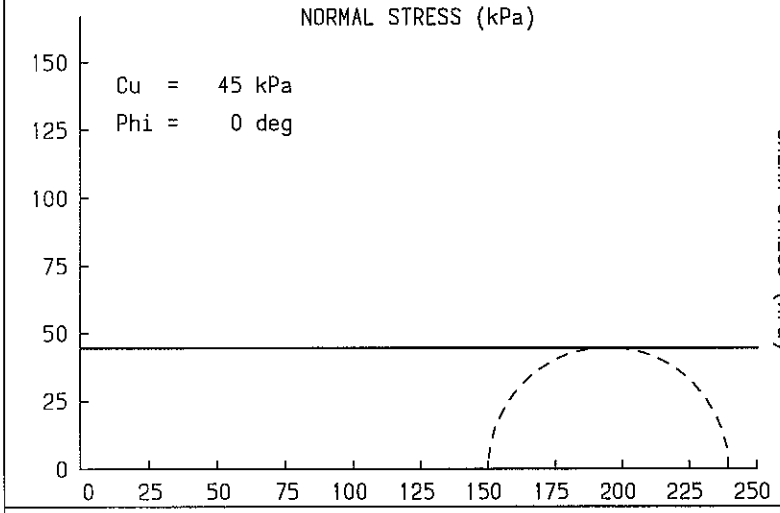
Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Reddish brown highly weathered weak to very weak silty MUDSTONE.	Hole ID	BHL5
		Sample No	
		Depth	10.50 m



FAILURE MODE DIAGRAM



Compound



	1	2	3	
Cell Pressure	150			kPa
Deviator Stress	91			kPa
...Corrected	89			kPa
Membrane Corr.	1			kPa
Moisture Content	21			%
Bulk Density	2.13			Mg/m3
Dry Density	1.77			Mg/m3
Diameter	102.8			mm
Length	197.7			mm
Failure Strain	20.0			%
Cu	45			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

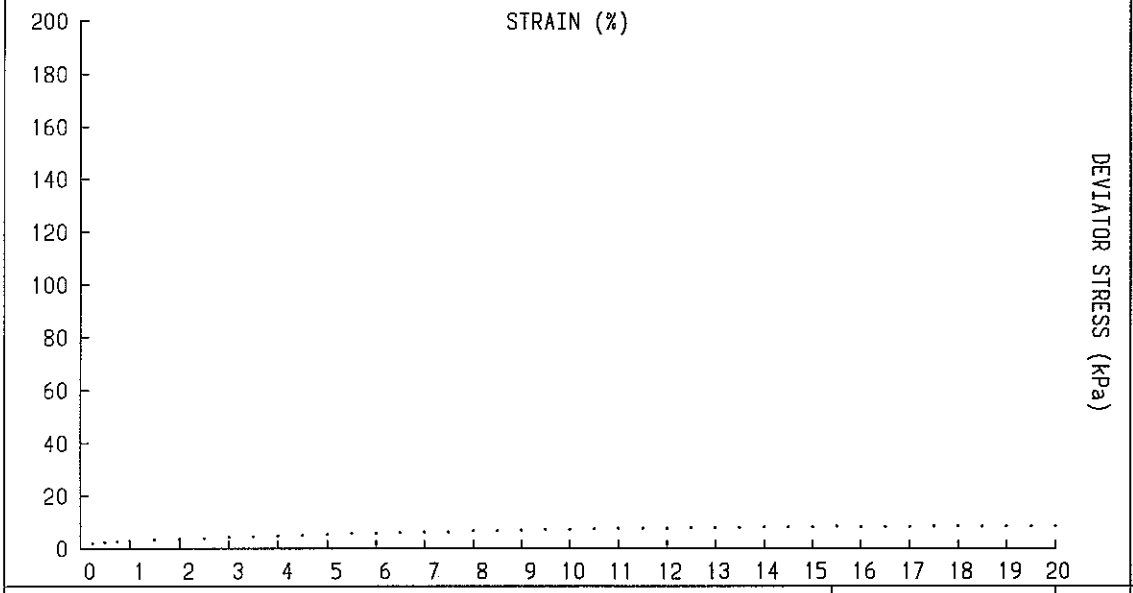
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

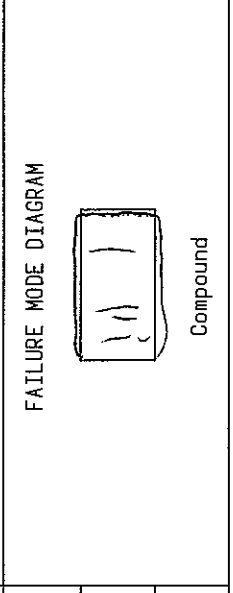
NORWEST HOLST SOIL ENGINEERING LIMITED

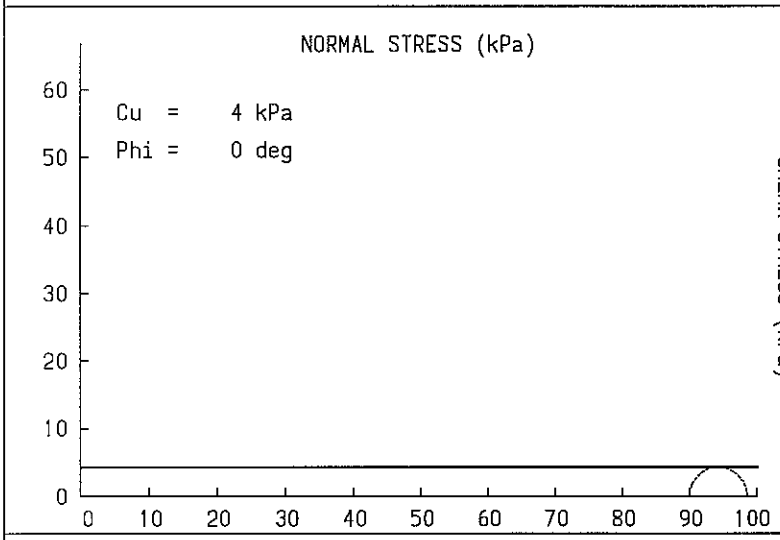
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Very soft grey sandy CLAY with occasional decomposed organic material.	Hole ID	BHM1
		Sample No	
		Depth	6.00 m







	1	2	3	
Cell Pressure	90			kPa
Deviator Stress	10			kPa
...Corrected	9			kPa
Membrane Corr.	1			kPa
Moisture Content	43			%
Bulk Density	1.99			Mg/m3
Dry Density	1.40			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	20.0			%
Cu	4			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

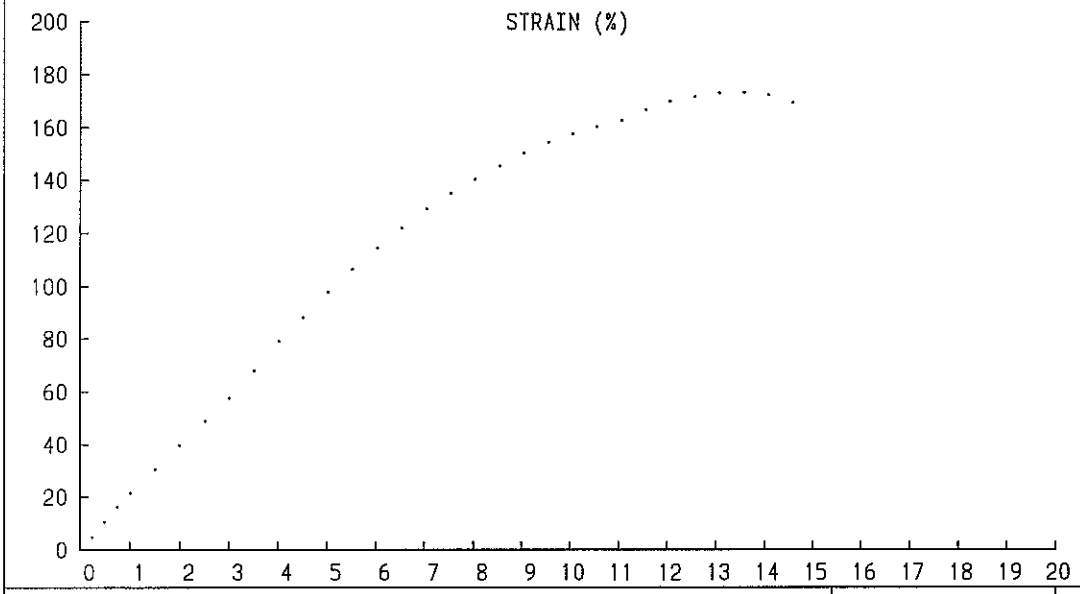
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

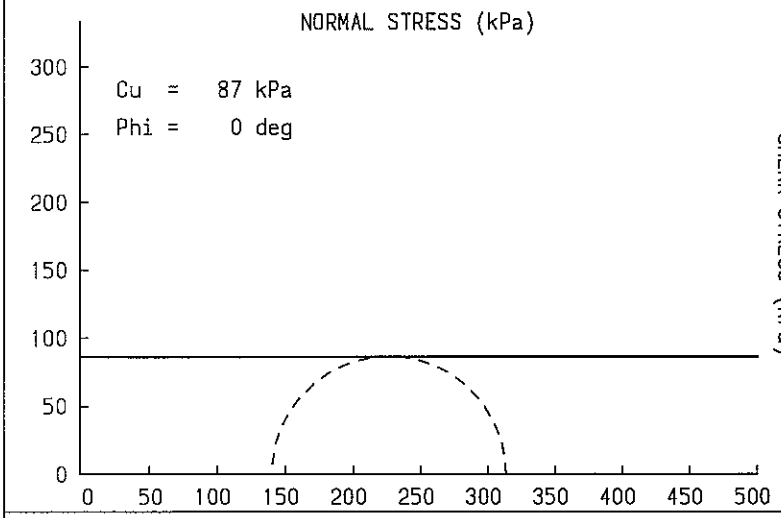
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Reddish brown highly weathered very silty MUDSTONE	Hole ID	BHM1
		Sample No	
		Depth	9.50 m



FAILURE MODE DIAGRAM

Brittle



	1	2	3	
Cell Pressure	140			kPa
Deviator Stress	174			kPa
...Corrected	173			kPa
Membrane Corr.	1			kPa
Moisture Content	22			%
Bulk Density	2.16			Mg/m3
Dry Density	1.78			Mg/m3
Diameter	102.9			mm
Length	198.8			mm
Failure Strain	13.6			%
Cu	87			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

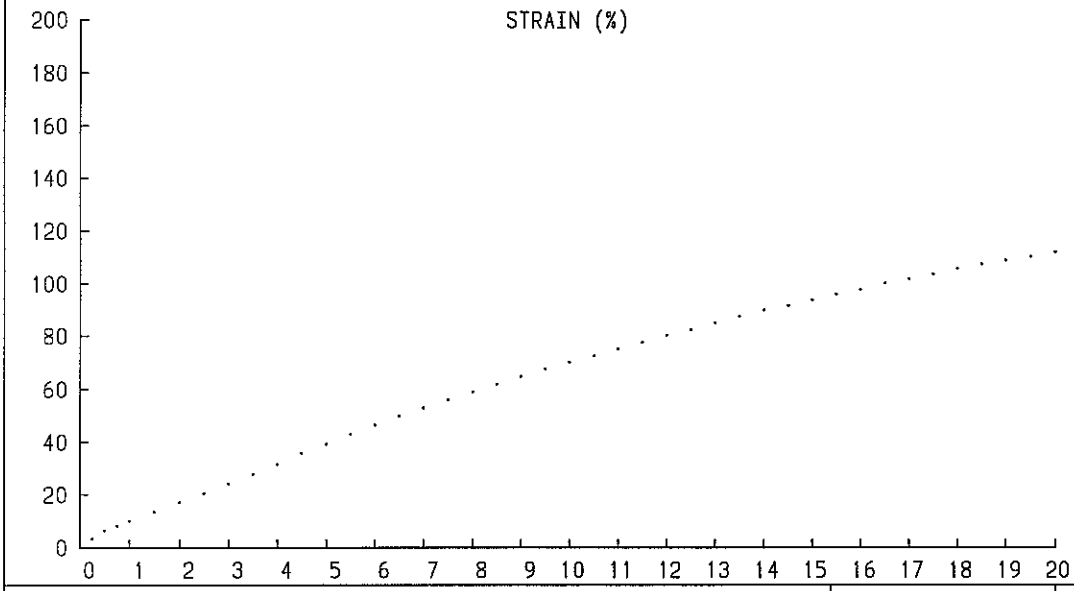
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

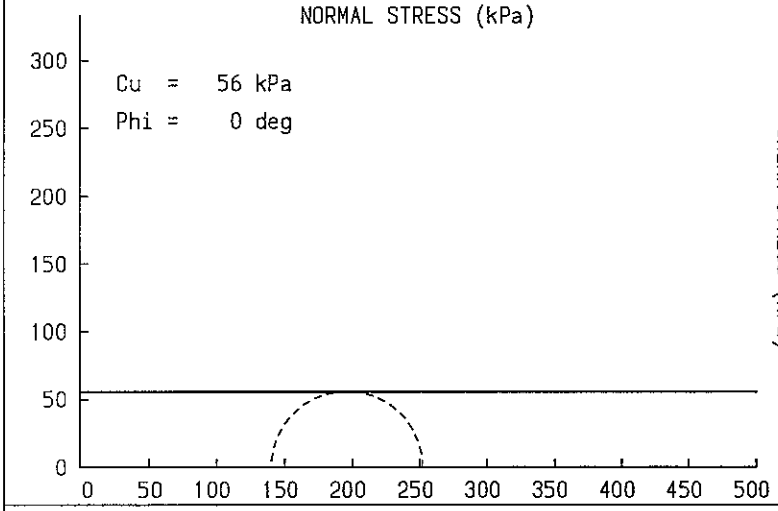
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm brown fine sandy CLAY with a little fine subangular to subrounded gravel.	Hole ID	BHM2
		Sample No	
		Depth	7.00 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	140			kPa
Deviator Stress	113			kPa
...Corrected	112			kPa
Membrane Corr.	1			kPa
Moisture Content	17			%
Bulk Density	2.31			Mg/m3
Dry Density	1.98			Mg/m3
Diameter	102.0			mm
Length	200.0			mm
Failure Strain	20.0			%
Cu	56			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

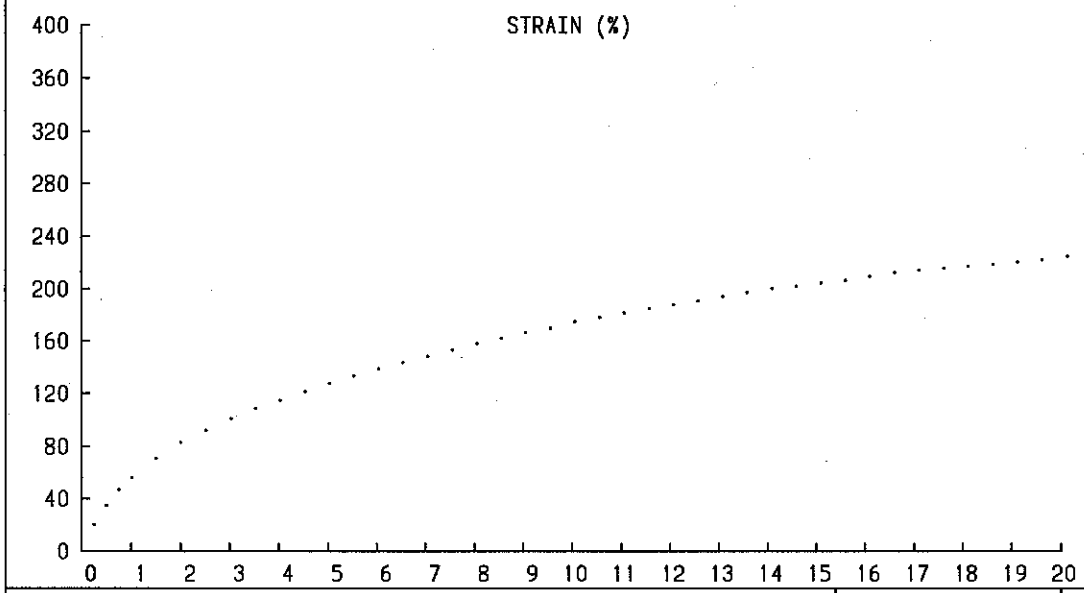
Q.A. Ref: /117-27/m4m2700.QTX 2.05

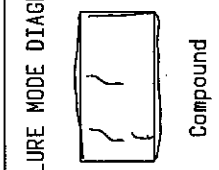
NORWEST HOLST SOIL ENGINEERING LIMITED

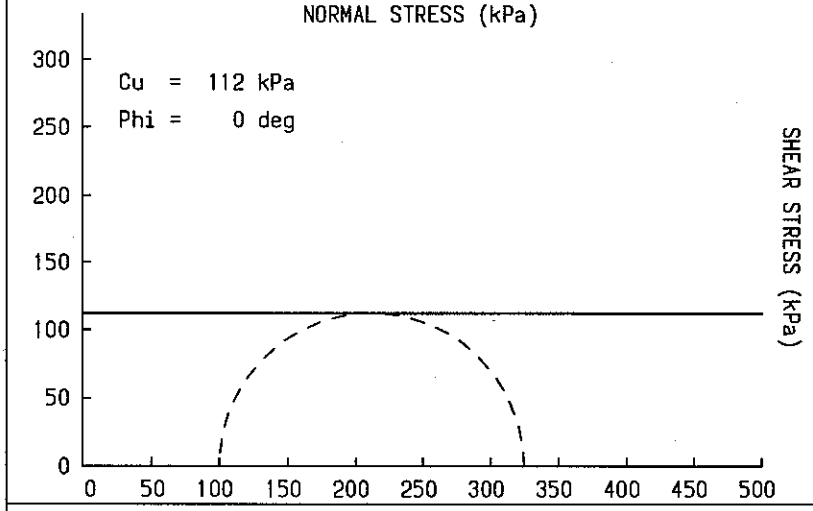
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Stiff reddish brown occasionally thinly laminated completely to highly weathered MUDSTONE (MARL)	Hole ID	BHM4
		Sample No	
		Depth	6.50 m







	1	2	3	
Cell Pressure	100			kPa
Deviator Stress	225			kPa
...Corrected	224			kPa
Membrane Corr.	1			kPa
Moisture Content	29			%
Bulk Density	1.94			Mg/m3
Dry Density	1.50			Mg/m3
Diameter	103.0			mm
Length	198.7			mm
Failure Strain	20.0			%
Cu	112			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

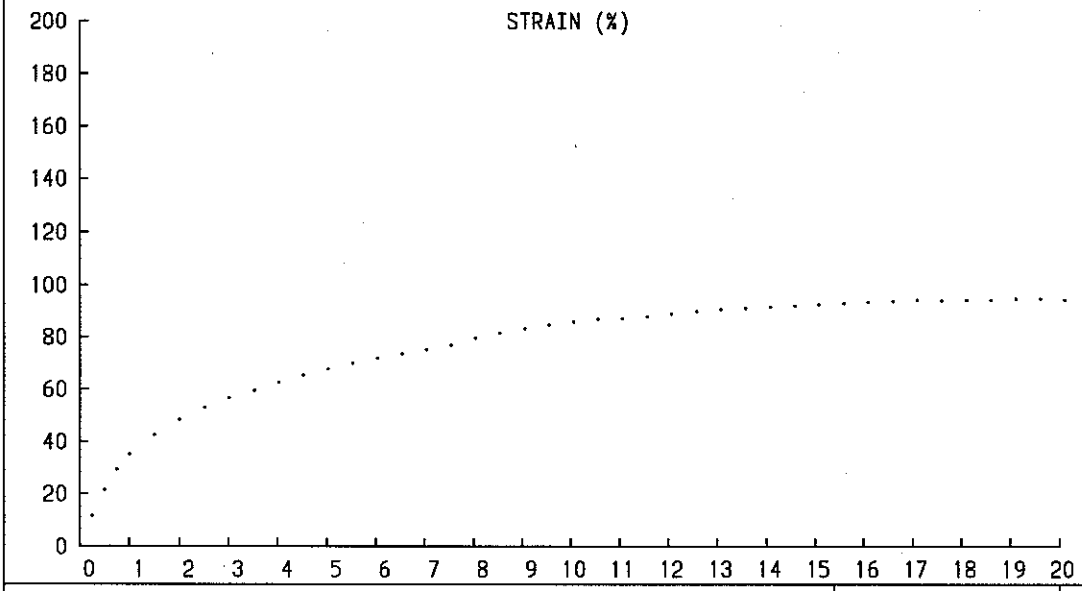
Q.A. Ref: /117-26/M4BHM465.QTX 2.05

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

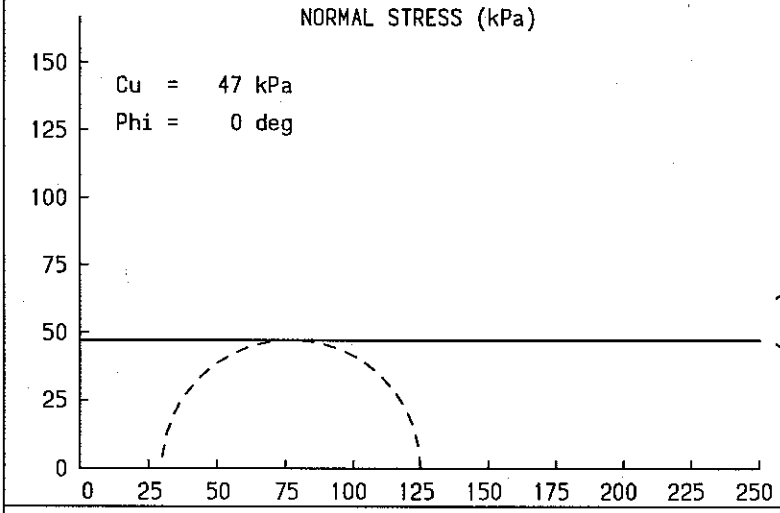
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm reddish brown sandy CLAY with a little subangular to subrounded gravel	Hole ID	BHN1
		Sample No	
		Depth	1.50 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	30			kPa
Deviator Stress	96			kPa
...Corrected	95			kPa
Membrane Corr.	1			kPa
Moisture Content	17			%
Bulk Density	2.10			Mg/m3
Dry Density	1.79			Mg/m3
Diameter	103.1			mm
Length	198.9			mm
Failure Strain	19.6			%
Cu	47			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

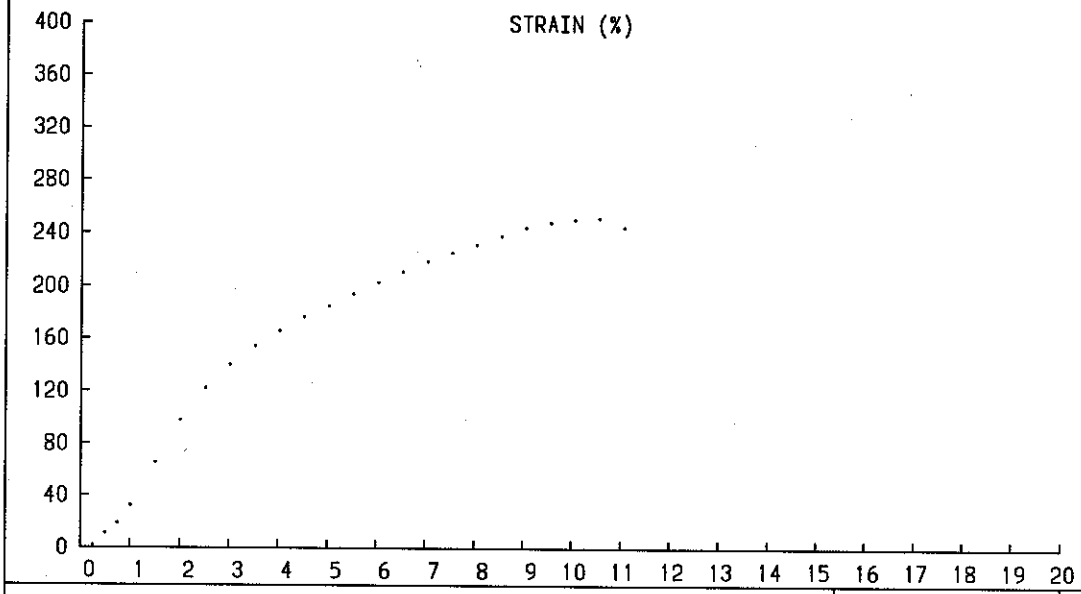
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

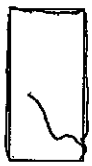
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

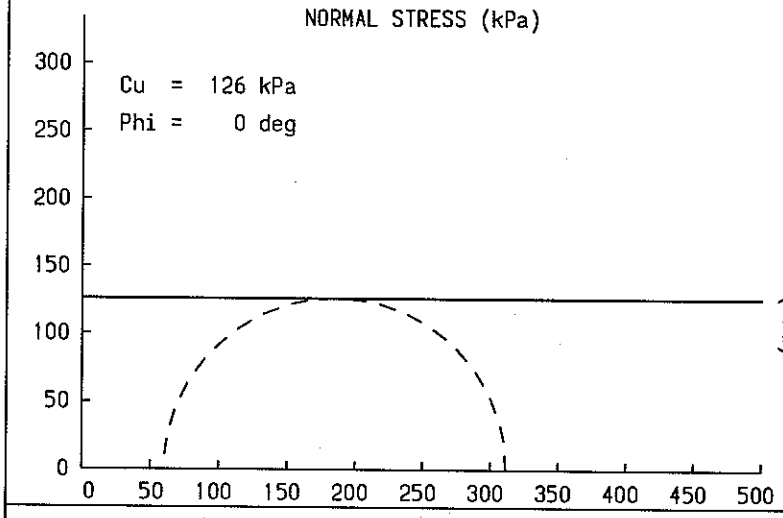
Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Stiff reddish brown friable thinly laminated highly weathered clayey SANDSTONE	Hole ID	BHN1
		Sample No	
		Depth	3.50 m



FAILURE MODE DIAGRAM



Brittle



	1	2	3	
Cell Pressure	60			kPa
Deviator Stress	252			kPa
...Corrected	252			kPa
Membrane Corr.	1			kPa
Moisture Content	16			%
Bulk Density	2.15			Mg/m3
Dry Density	1.85			Mg/m3
Diameter	103.0			mm
Length	198.8			mm
Failure Strain	10.6			%
Cu	126			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

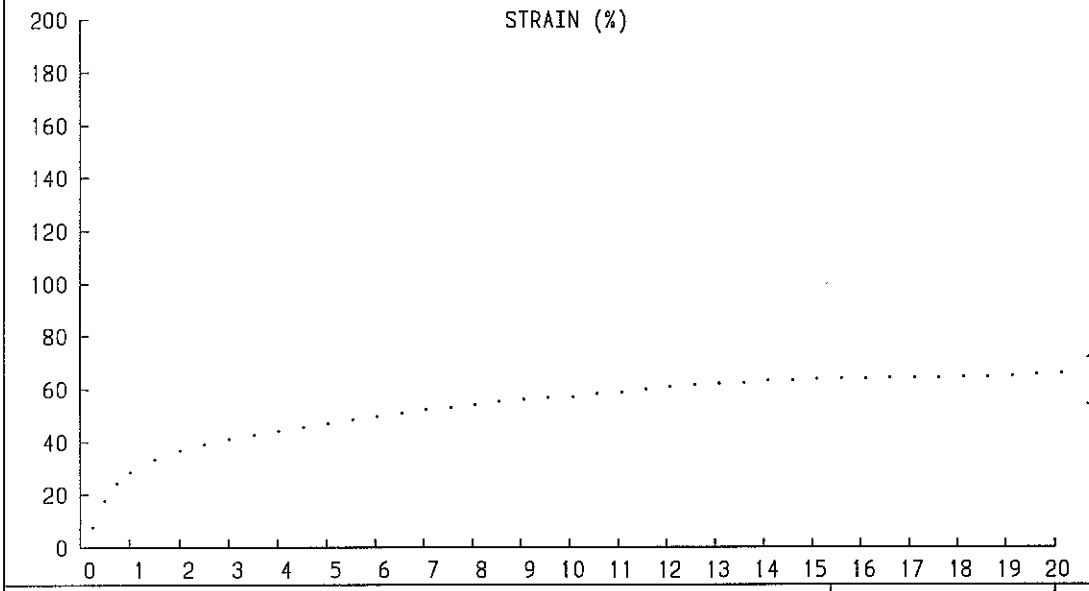
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LIMITED

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

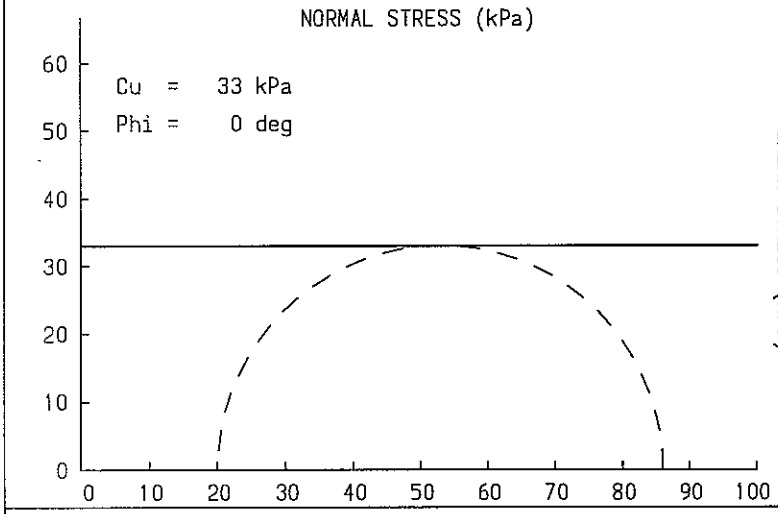
Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Firm reddish brown mottled blackish brown very sandy CLAY with much fine to coarse gravel	Hole ID	BHN2
		Sample No	
		Depth	1.00 m



FAILURE MODE DIAGRAM

Compound



	1	2	3	
Cell Pressure	20			kPa
Deviator Stress	67			kPa
...Corrected	66			kPa
Membrane Corr.	1			kPa
Moisture Content	13			%
Bulk Density	1.97			Mg/m3
Dry Density	1.74			Mg/m3
Diameter	103.2			mm
Length	198.6			mm
Failure Strain	20.0			%
Cu	33			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

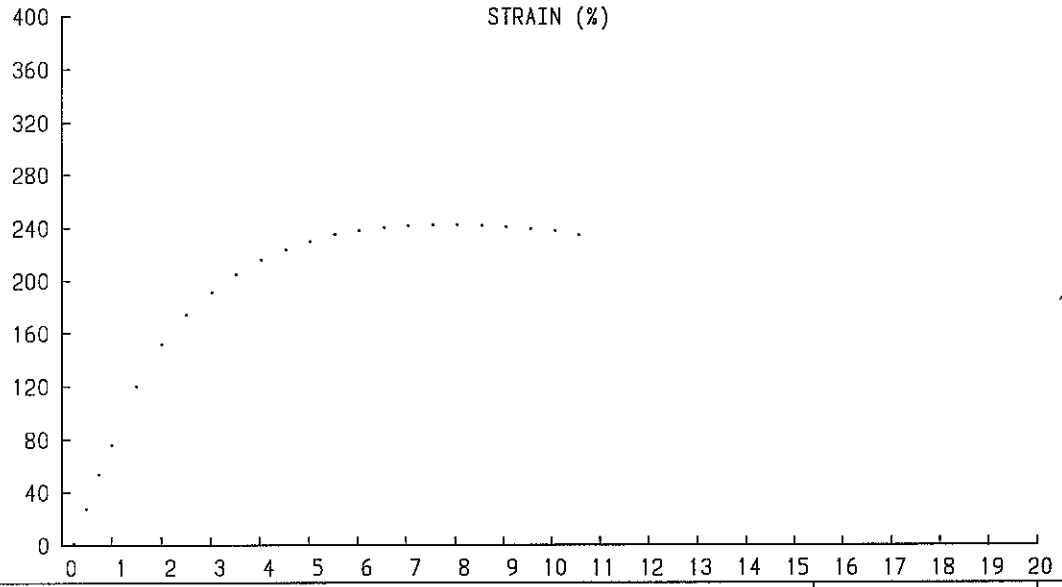
Q.A. Ref: /117-27/m4n210.QTX 2.05

NORWEST HOLST SOIL ENGINEERING LIMITED

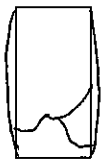
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

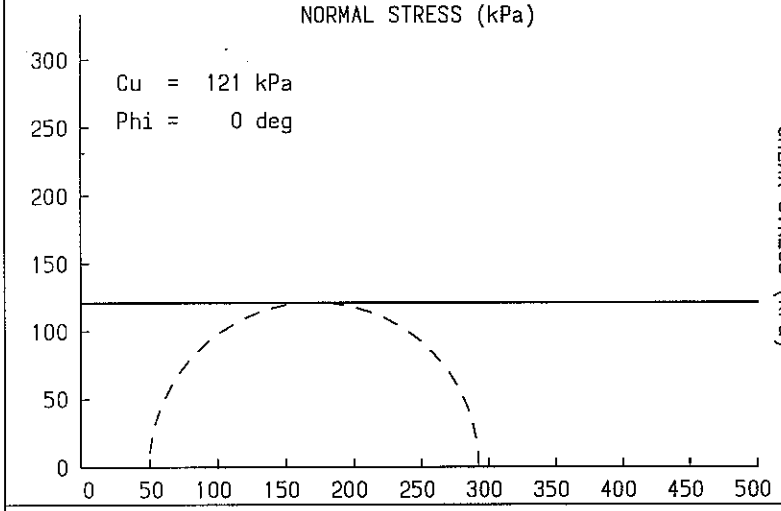
Location	M4 RELIEF ROAD,NEWPORT	Contract	F10895
Soil description	Stiff reddish brown friable thinly laminated very silty CLAY with some fine sand	Hole ID	BHN2
		Sample No	
		Depth	2.70 m



FAILURE MODE DIAGRAM



Brittle



	1	2	3	
Cell Pressure	50			kPa
Deviator Stress	243			kPa
...Corrected	242			kPa
Membrane Corr.	1			kPa
Moisture Content	20			%
Bulk Density	2.06			Mg/m3
Dry Density	1.72			Mg/m3
Diameter	101.9			mm
Length	198.5			mm
Failure Strain	8.1			%
Cu	121			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
All specimens prepared from top of undisturbed sample tube suitable material.

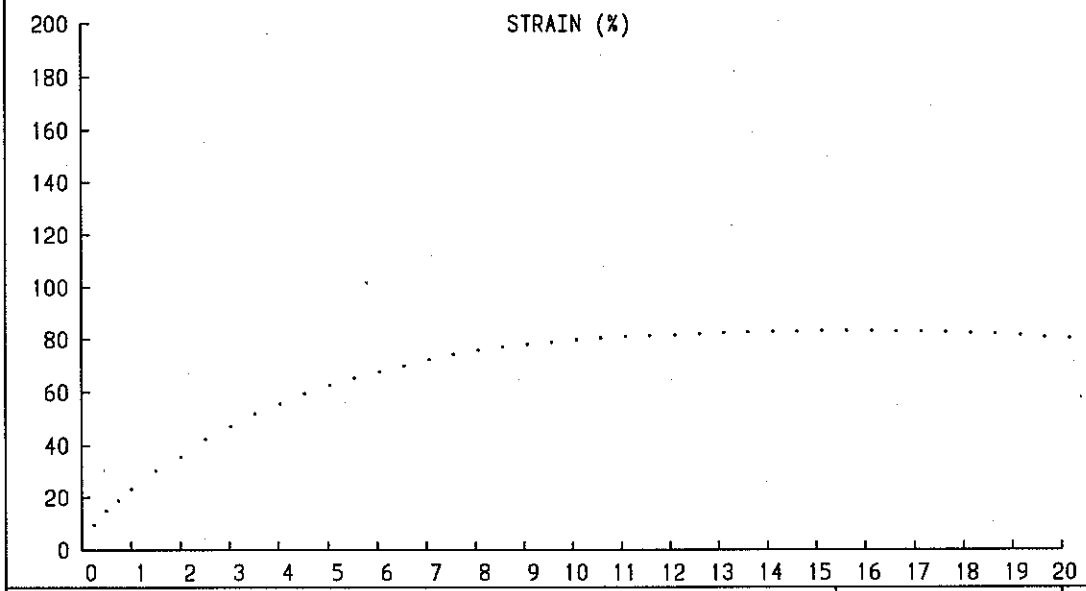
Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

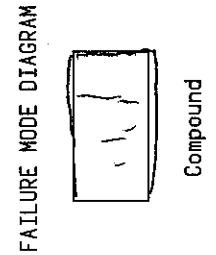
NORWEST HOLST SOIL ENGINEERING LIMITED

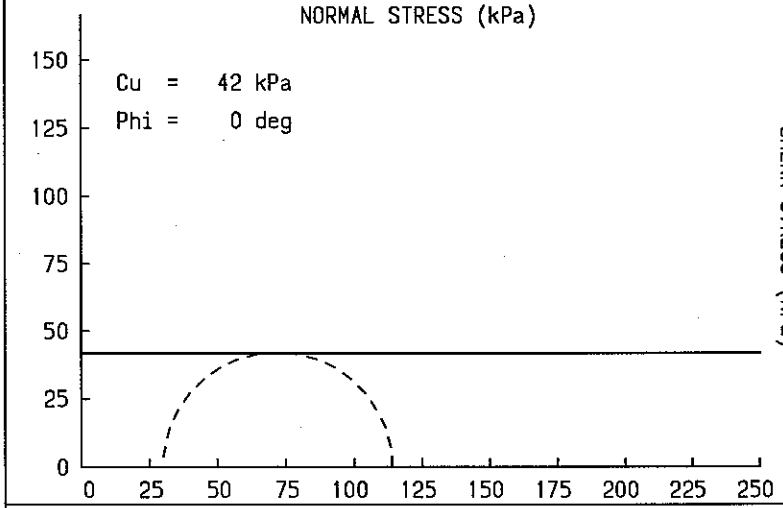
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Soft to firm reddish brown slightly sandy CLAY with a little fine to coarse rounded gravel with occasional rootlets	Hole ID	BHN10B
		Sample No	
		Depth	1.50 m







	1	2	3	
Cell Pressure	30			kPa
Deviator Stress	85			kPa
...Corrected	84			kPa
Membrane Corr.	1			kPa
Moisture Content	24			%
Bulk Density	2.05			Mg/m3
Dry Density	1.65			Mg/m3
Diameter	102.4			mm
Length	198.3			mm
Failure Strain	15.1			%
Cu	42			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

NORWEST HOLST SOIL ENGINEERING LTD

Consolidated Undrained Multi-stage Triaxial Compression Test with measurement of Pore Pressure (BS1377:1990 Part 8)

Site : M4 RELIEF ROAD
Borehole : BHA1

F No. : F10895
Depth : 3.05m

	Specimen	1	2	3
INITAL	Density Mg/m³	2.23	2.25	2.27
	Moisture Content	15	15	14
	Dry Density Mg/m³	1.94	1.97	2.00
	Void Ratios	0.37	0.35	0.33
AFTER CONSOLIDATION	Density Mg/m³	2.25	2.27	2.29
	Moisture Content	15	14	13
	Dry Density Mg/m³	1.97	2.00	2.02
FINAL	Density Mg/m³			
	Moisture Content			

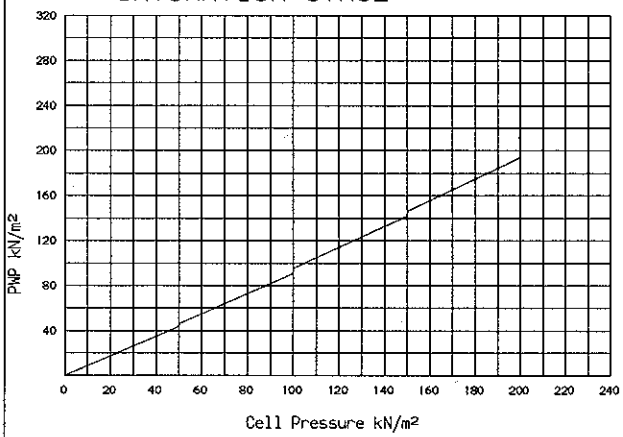
Specimen Type Undisturbed

Specimen Dimensions
103.7 mm dia x 199.2 mm long

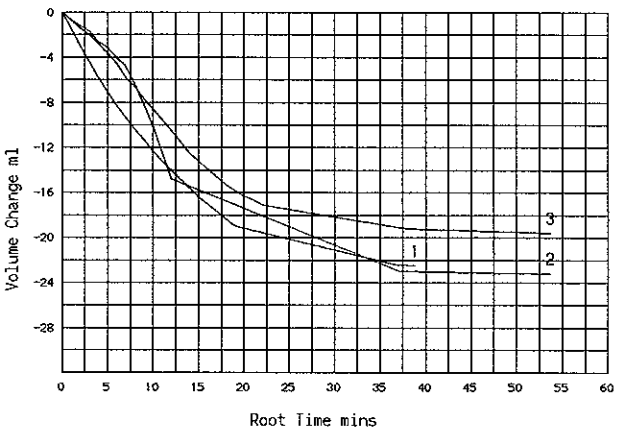
Soil Description
Firm reddish brown very silty CLAY with some gravel.

Notes
Side drains fitted.
Saturation by back pressure with cell pressure increments of 50kPa and differential pressure of 10kPa
Drained at Top

SATURATION STAGE



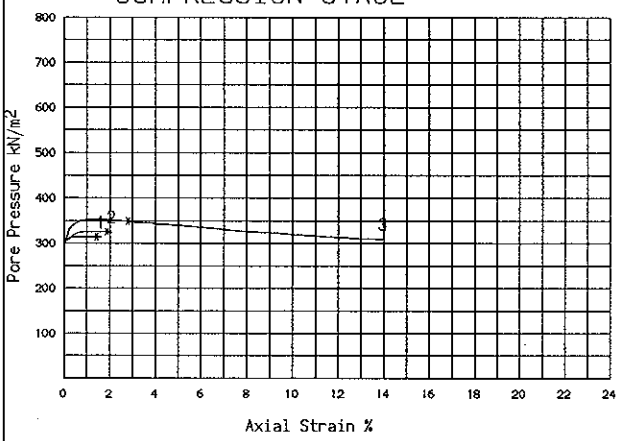
CONSOLIDATION STAGE



SATURATION STAGE	Specimen	1	2	3
	Initial pwp kN/m²	0		
	Saturated pwp kN/m²	194		
	Final Cell Pressure kN/m²	200		
	B value	0.96		

CONSOLIDATION STAGE kN/m²	Specimen	1	2	3
	Cell Pressure kN/m²	330	360	420
	Back Pressure kN/m²	300	300	300
	Effective Cell Pressure kN/m²	30	60	120
	Initial pwp kN/m²	322	342	384
	Final pwp kN/m²	300	300	300
	Pwp dissipation %	100	100	100
	C_{v3} m²/year	0.67	0.81	0.50
	m_{v3} m²/MN	0.62	0.34	0.14

COMPRESSION STAGE



COMPRESSION STAGE	Specimen	1	2	3
	Calc Time to Failure mins	636	520	832
	Rate of Strain % strain/hour	0.28	0.23	0.72
	Membrain Correction kN/m²	0.15	0.15	0.23
	Filter Drain Correction kN/m²	3.50	3.50	3.50

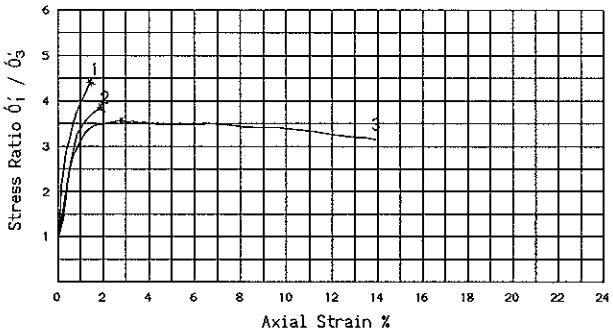
NORWEST HOLST SOIL ENGINEERING LTD

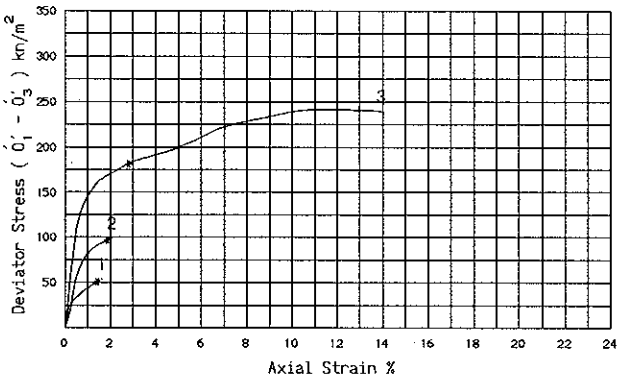
Consolidated Undrained Multi-stage Triaxial Compression Test with measurement of Pore Pressure (BS1377:1990 Part8)

Site : M4 RELIEF ROAD F No. : F10895

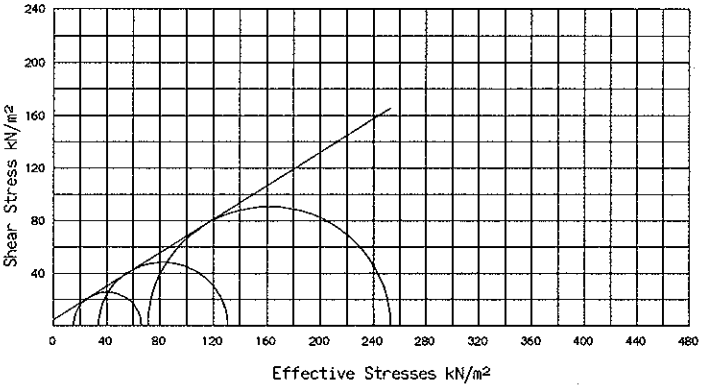
Borehole : BHA1 Depth : 3.05m

COMPRESSION STAGE





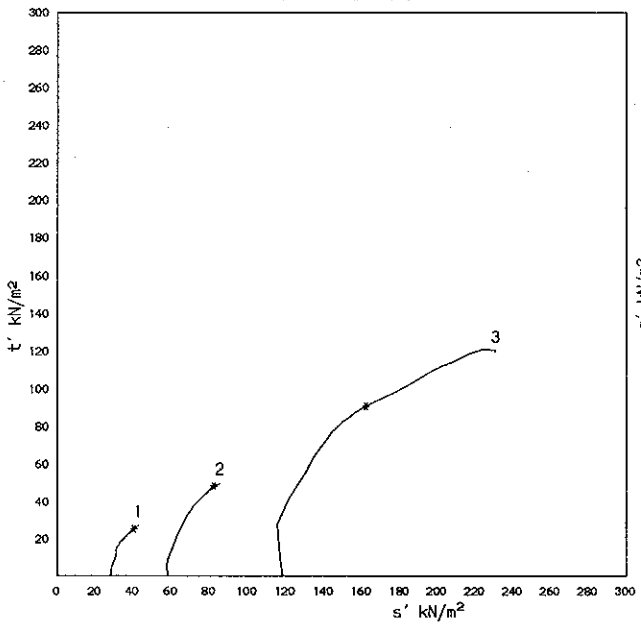
MOHR CIRCLES

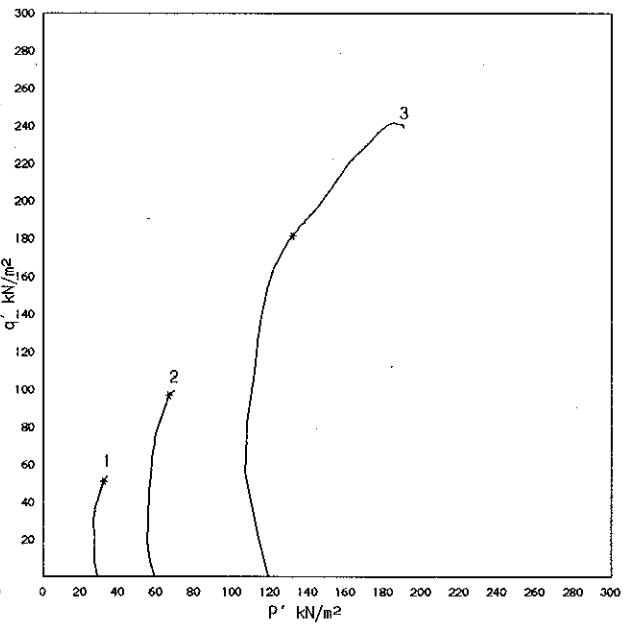


	Specimen	1	2	3
COMPRESSION STAGE kN/m²	Cell Pressure	330	360	420
	Inital pwp	300	300	300
	Inital 03'	30	60	120
FAILURE CONDITIONS AT MAX STRESS RATIO	Axial Strain %	1.4	1.9	2.8
	(0_1 - 0_3) f	51	96	181
	Of	315	326	349
	0_3' f	15	34	71
	0_1' f	66	130	252
	Af	0.29	0.27	0.27
	Time to failure hours	5.1	8.1	3.9
MODE OF FAILURE				

Shear Strength Parameters	C' 4.6kN/m² Ø' 32.5°

STRESS FIELD PLOTS





NORWEST HOLST SOIL ENGINEERING LTD

Consolidated Undrained Multi-stage Triaxial Compression Test with measurement of Pore Pressure (BS1377:1990 Part 8)

Site : M4 NEWPORT
Borehole : BHB1A

F No. : F10895
Depth : 6.00m

	Specimen	1	2	3
INITAL	Density Mg/m³	2.33	2.34	2.38
	Moisture Content	12	11	11
	Dry Density Mg/m³	2.08	2.11	2.14
	Void Ratios	0.28	0.25	0.24
AFTER CONSOLIDATION	Density Mg/m³	2.34	2.38	2.39
	Moisture Content	11	11	11
	Dry Density Mg/m³	2.11	2.14	2.16
FINAL	Density Mg/m³			
	Moisture Content			

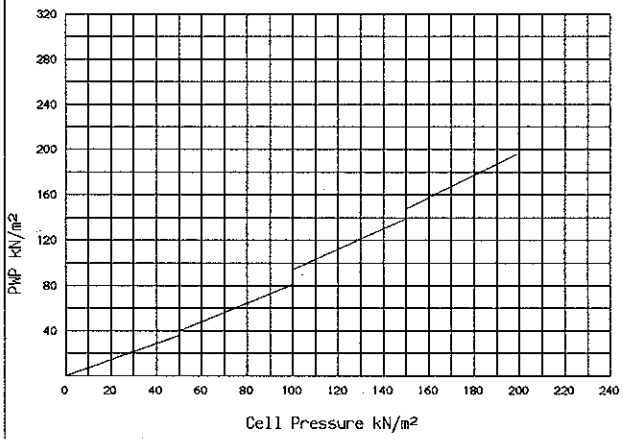
Specimen Type Undisturbed

Specimen Dimensions
103.3 mm dia x 199.0 mm long

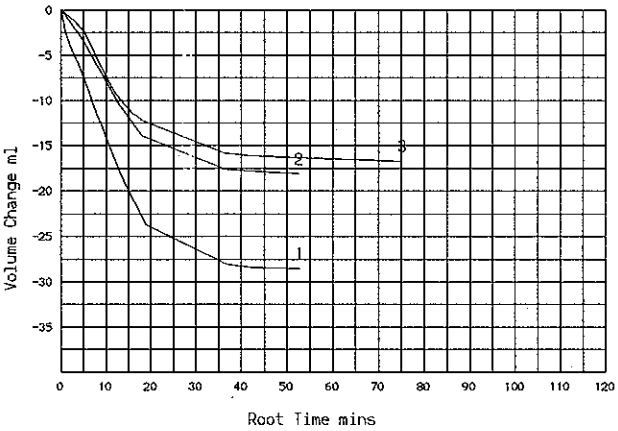
Soil Description
Stiff reddish brown very silty CLAY with some gravel.

Notes
Side drains fitted.
Saturation by back pressure with cell pressure increments of 50kPa and differential pressure of 10kPa

SATURATION STAGE



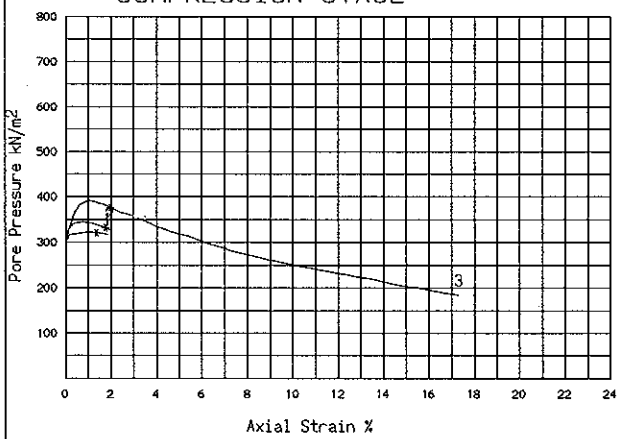
CONSOLIDATION STAGE



SATURATION STAGE	Specimen	1	2	3
	Initial pwp kN/m²	0		
	Saturated pwp kN/m²	197		
	Final Cell Pressure kN/m²	200		
	B value	0.98		

CONSOLIDATION STAGE kN/m²	Specimen	1	2	3
	Cell Pressure kN/m²	360	420	540
	Back Pressure kN/m²	300	300	300
	Effective Cell Pressure kN/m²	60	120	240
	Initial pwp kN/m²	355	387	459
	Final pwp kN/m²	300	300	300
	Pwp dissipation %	100	100	100
	C_{v3} m²/year	0.46	0.50	0.57
	m_{v3} m²/MN	0.32	0.13	0.07

COMPRESSION STAGE



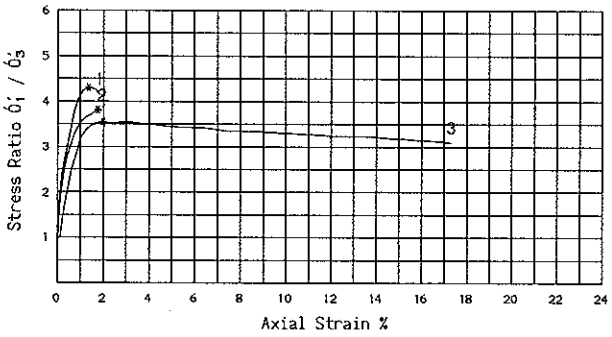
COMPRESSION STAGE	Specimen	1	2	3
	Calc Time to Failure mins	911	832	720
	Rate of Strain % strain/hour	0.20	0.19	0.83
	Membrain Correction kN/m²	0.15	0.16	0.16
	Filter Drain Correction kN/m²	3.50	3.50	3.50

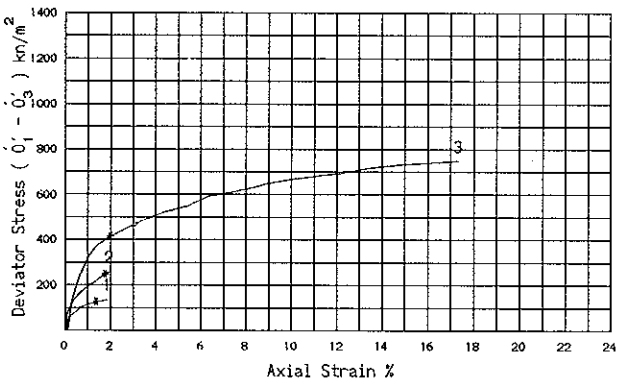
NORWEST HOLST SOIL ENGINEERING LTD

Consolidated Undrained Multi-stage Triaxial Compression Test with measurement of Pore Pressure (BS1377:1990 Part8)

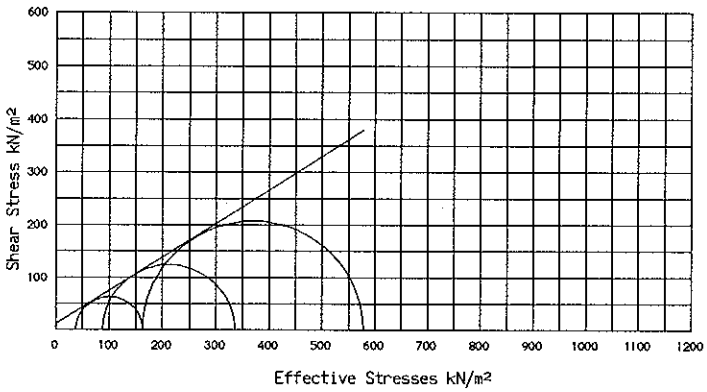
Site : M4 NEWPORT
F No. : F10895
Borehole : BHB1A
Depth : 6.00m

COMPRESSION STAGE





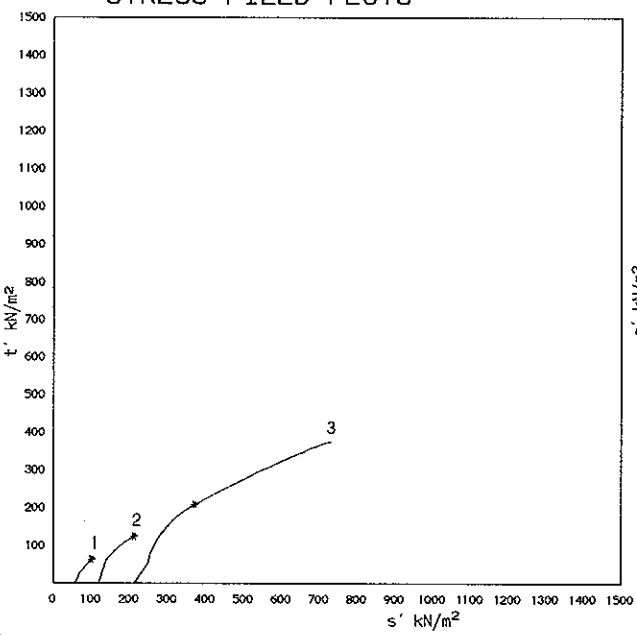
MOHR CIRCLES

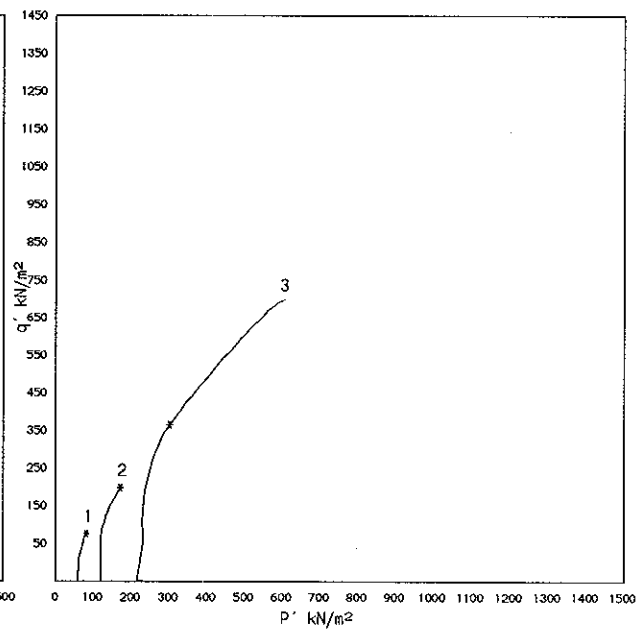


	Specimen	1	2	3
COMPRESSION STAGE kN/m²	Cell Pressure	360	420	540
	Inital pwp	300	300	300
	Inital σ3'	60	120	240
FAILURE CONDITIONS AT MAX STRESS RATIO	Axial Strain %	1.4	1.8	2.0
	(σ1 - σ3) f	125	247	414
	σf	322	332	377
	σ3' f	38	88	163
	σ1' f	163	335	577
	Af	0.18	0.13	0.19
	Time to failure hours	6.8	9.3	2.4
MODE OF FAILURE				

Shear Strength Parameters	C' 11.1 kN/m²	Ø' 32.5°

STRESS FIELD PLOTS





NORWEST HOLST SOIL ENGINEERING LTD

Consolidated Undrained Multi-stage Triaxial Compression Test with measurement of Pore Pressure (BS1377:1990 Part 8)

Site : M4 RELIEF ROAD
Borehole : BHB17

F No. : F10895
Depth : 1.00m

	Specimen	1	2	3
INITAL	Density Mg/m³	2.12	2.19	2.20
	Moisture Content	19	21	20
	Dry Density Mg/m³	1.79	1.81	1.83
	Void Ratios	0.48	0.46	0.45
AFTER CONSOLIDATION	Density Mg/m³	2.19	2.20	2.22
	Moisture Content	21	20	19
	Dry Density Mg/m³	1.81	1.83	1.86
FINAL	Density Mg/m³			
	Moisture Content			

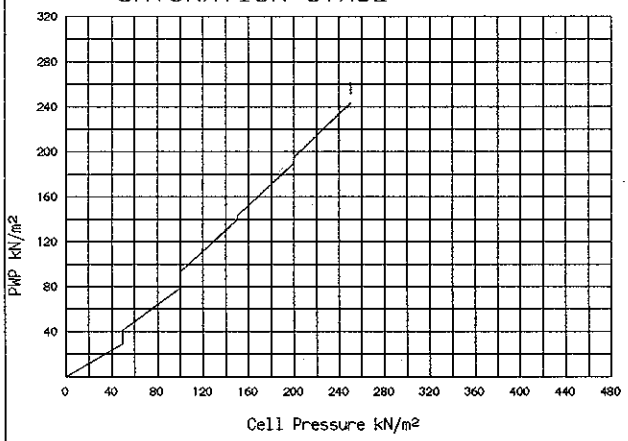
Specimen Type Undisturbed

Specimen Dimensions
102.4 mm dia x 149.5 mm long

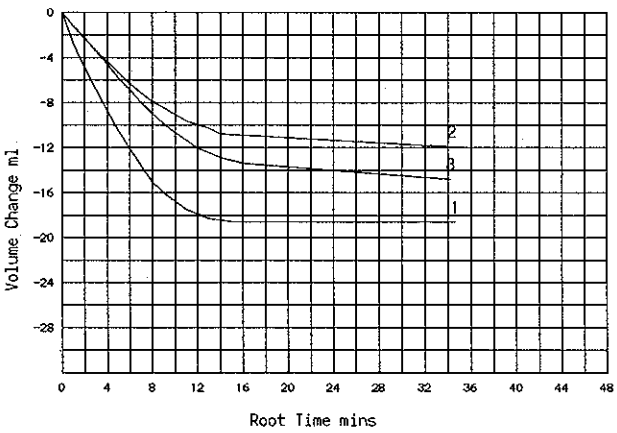
Soil Description
Firm to stiff reddish brown mottled grey highly weathered MUDSTONE.

Notes
Side drains fitted.
Saturation by back pressure with cell pressure increments of 50kPa and differential pressure of 10kPa
Drained at Top

SATURATION STAGE



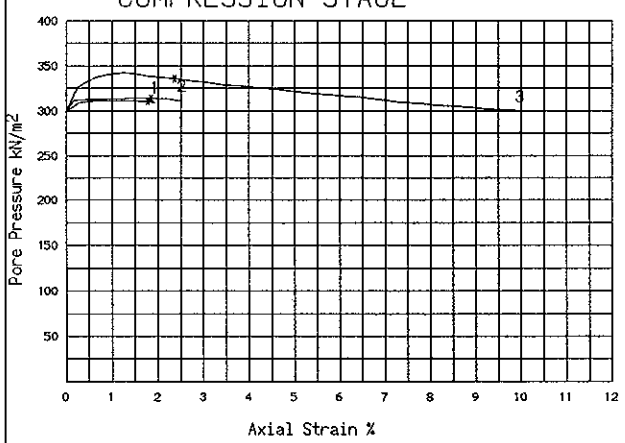
CONSOLIDATION STAGE



SATURATION STAGE	Specimen	1	2	3
	Initial pwp kN/m²	0		
	Saturated pwp kN/m²	243		
	Final Cell Pressure kN/m²	250		
	B value	0.96		

CONSOLIDATION STAGE kN/m²	Specimen	1	2	3
	Cell Pressure kN/m²	325	350	400
	Back Pressure kN/m²	300	300	300
	Effective Cell Pressure kN/m²	25	50	100
	Initial pwp kN/m²	318	329	355
	Final pwp kN/m²	300	300	300
	Pwp dissipation %	100	100	100
	C_{v3} m²/year	4.35	2.23	2.15
	m_{v3} m²/MN	0.84	0.34	0.23

COMPRESSION STAGE



COMPRESSION STAGE	Specimen	1	2	3
	Calc Time to Failure mins	145	281	290
	Rate of Strain % strain/hour	0.84	0.43	1.04
	Membrain Correction kN/m²	0.16	0.16	0.24
	Filter Drain Correction kN/m²	3.50	3.50	3.50

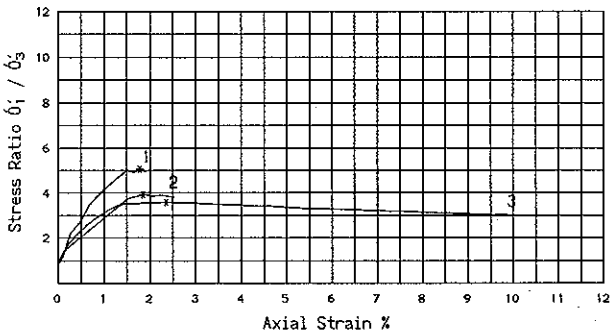
NORWEST HOLST SOIL ENGINEERING LTD

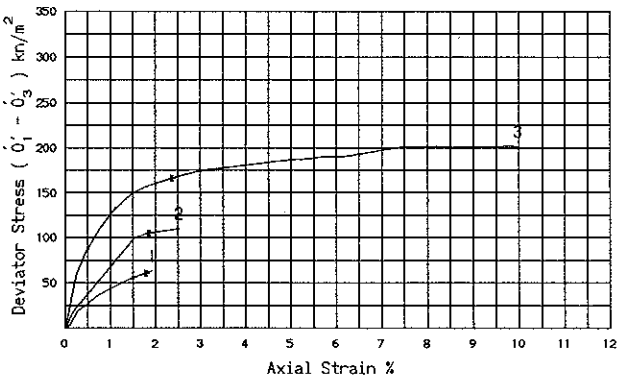
Consolidated Undrained Multi-stage Triaxial Compression Test with measurement of Pore Pressure (BS1377:1990 Part8)

Site : M4 RELIEF ROAD F No. : F10895

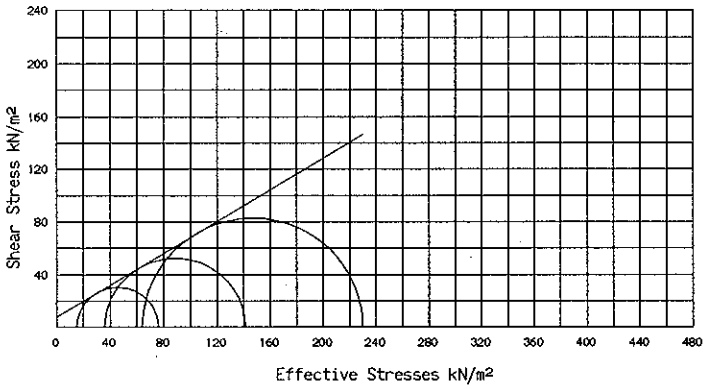
Borehole : BHB17 Depth : 1.00m

COMPRESSION STAGE





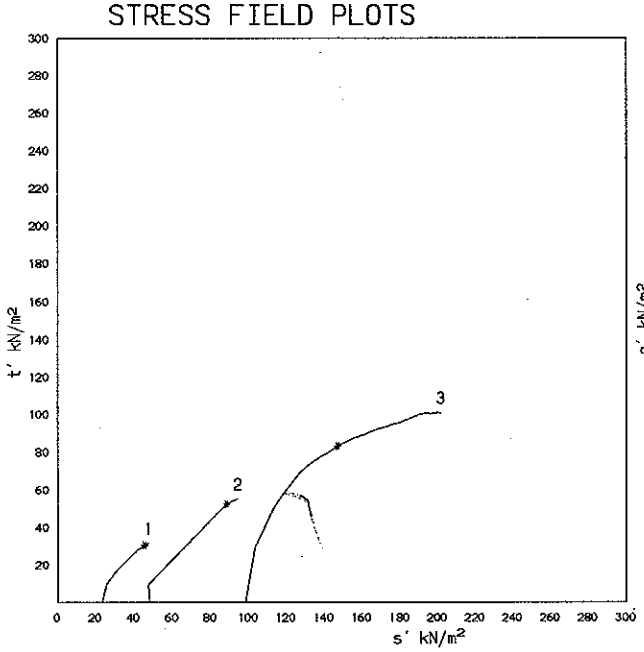
MOHR CIRCLES

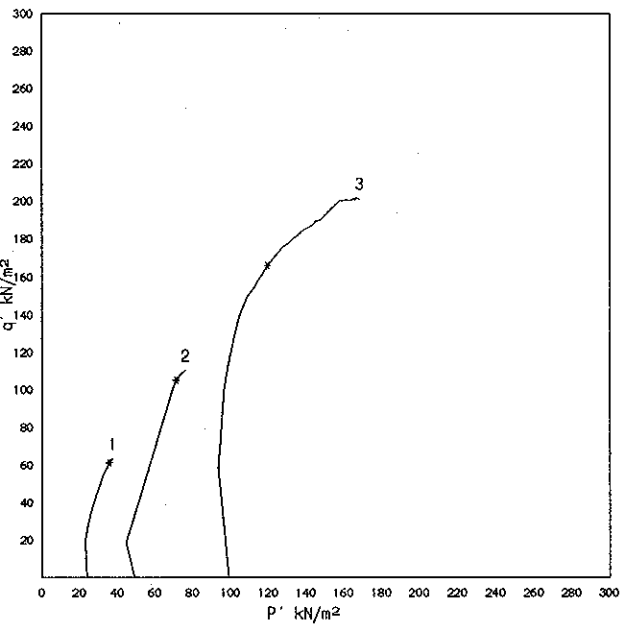


	Specimen	1	2	3
COMPRESSION STAGE kN/m²	Cell Pressure	325	350	400
	Inital pwp	300	300	300
	Inital 03'	25	50	100
FAILURE CONDITIONS AT MAX STRESS RATIO	Axial Strain %	1.8	1.9	2.4
	(0_1 - 0_3) f	61	105	165
	Of	310	314	336
	0_3' f	15	36	64
	0_1' f	76	141	229
	Af	0.16	0.13	0.22
	Time to failure hours	2.1	4.3	2.3
MODE OF FAILURE				

Shear Strength Parameters	C' 8.1kN/m² Ø' 31.0°

STRESS FIELD PLOTS





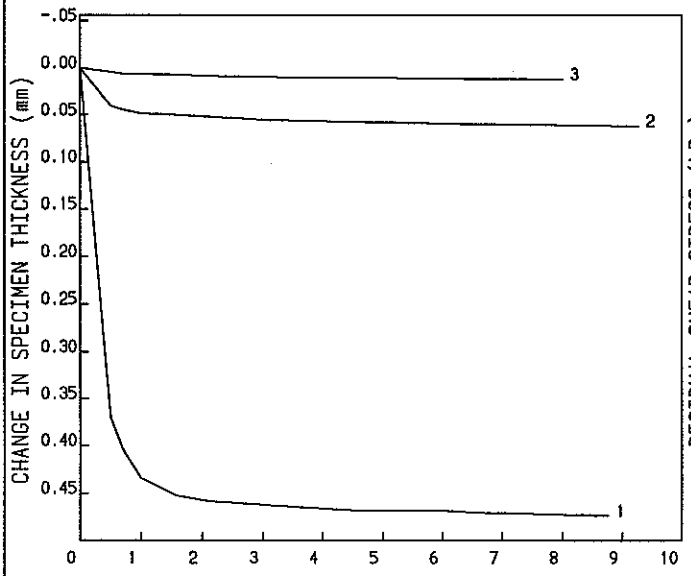
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

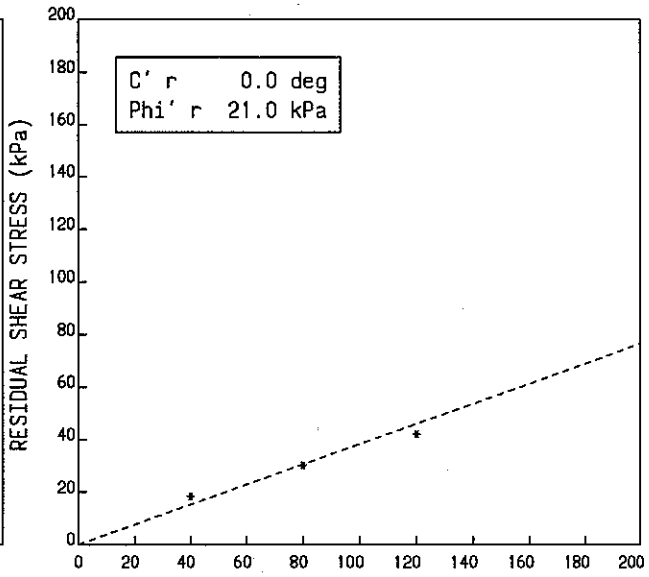
Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown CLAY with much mudstone gravel.	Hole ID	BHB4
		Sample Type	C
		Depth	4.15 m

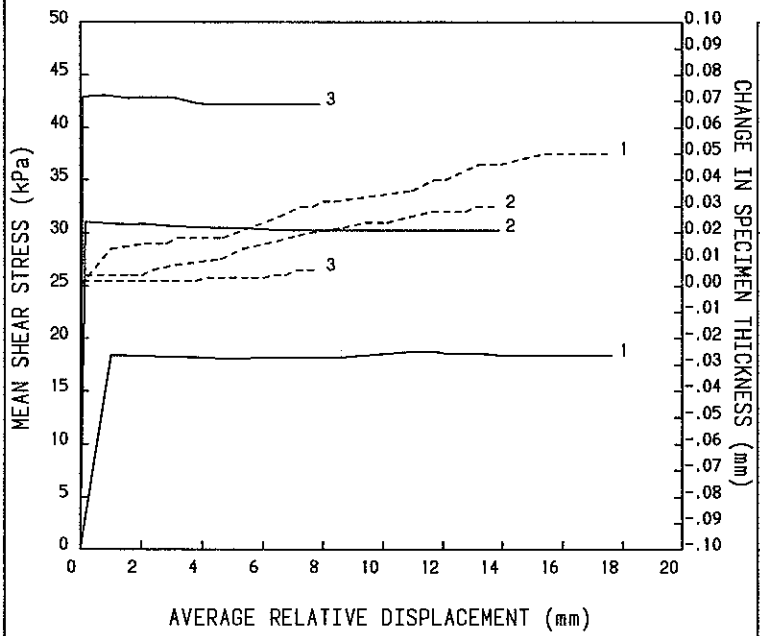
CONSOLIDATION STAGE



COULOMB GRAPH



SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.093 deg/min
Inside specimen radius	34.800 mm
Outside specimen radius	50.000 mm
Initial specimen thickness	5.200 mm
Initial moisture content	20 %
Final moisture content	24 %

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
40	18.42	13.94
80	30.27	6.47
120	42.21	4.17

Natural moisture content is 8.7%.
Specimen wet up to specified moisture content.
Test performed below calibrated range of load rings.

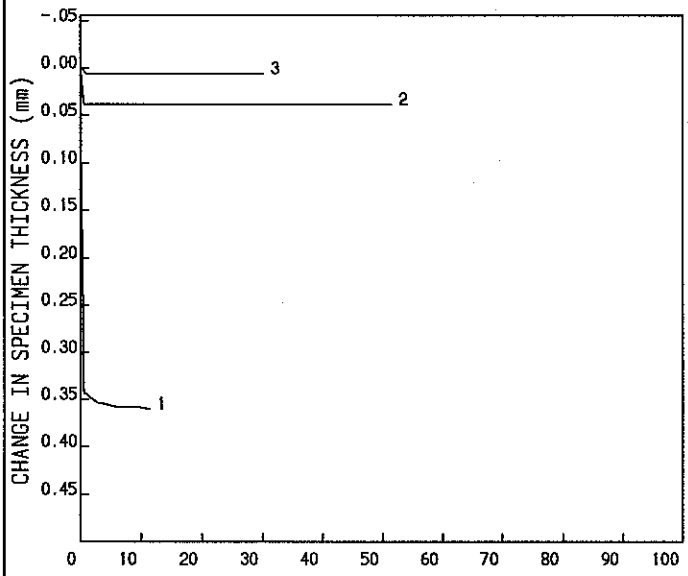
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

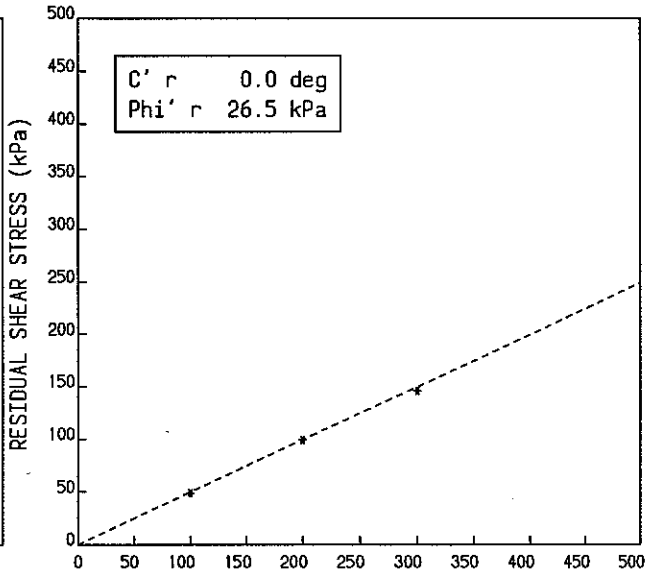
Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very hard reddish brown MUDSTONE.	Hole ID	BHB6
		Sample Type	C
		Depth	9.00 m

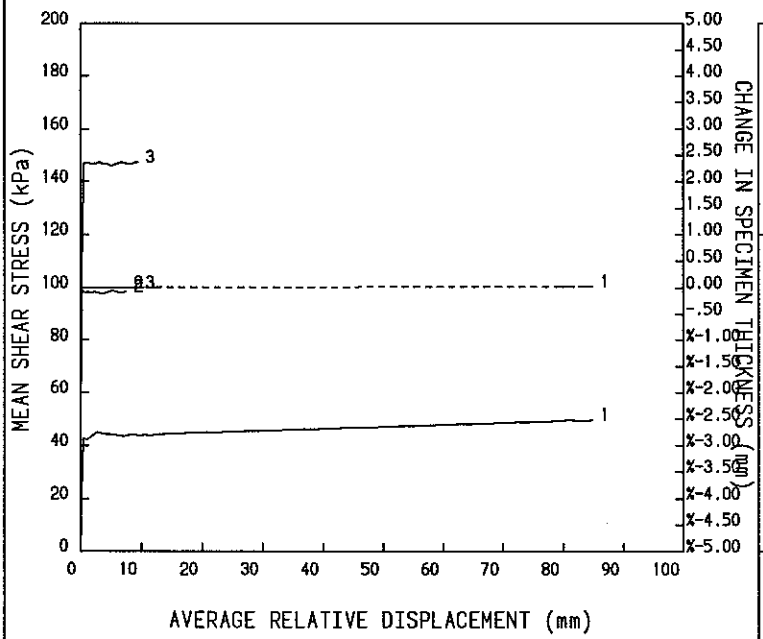
CONSOLIDATION STAGE



COULOMB GRAPH



SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.064 deg/min
Inside specimen radius	34.900 mm
Outside specimen radius	50.000 mm
Initial specimen thickness	5.200 mm
Initial moisture content	18 %
Final moisture content	13 %

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
100	49.03	91.54
200	99.40	12.69
300	145.93	4.97

Natural moisture content is 1.2%.
Specimen wet up to specified moisture content.
Residual strength not well defined due to nature of the specimen.

Q.A. Ref: /038-06/M4B6900.RNG 2.01

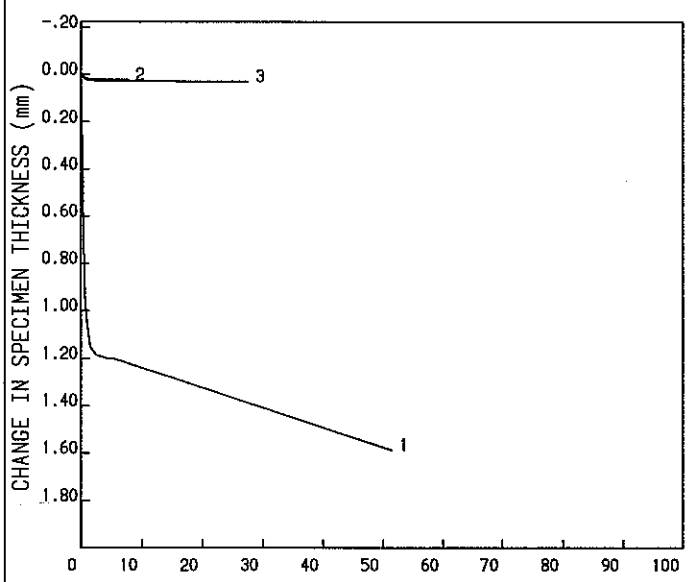
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greyish green moderately to highly weathered MUDSTONE.	Hole ID	BHB7
		Sample Type	C
		Depth	7.80 m

CONSOLIDATION STAGE



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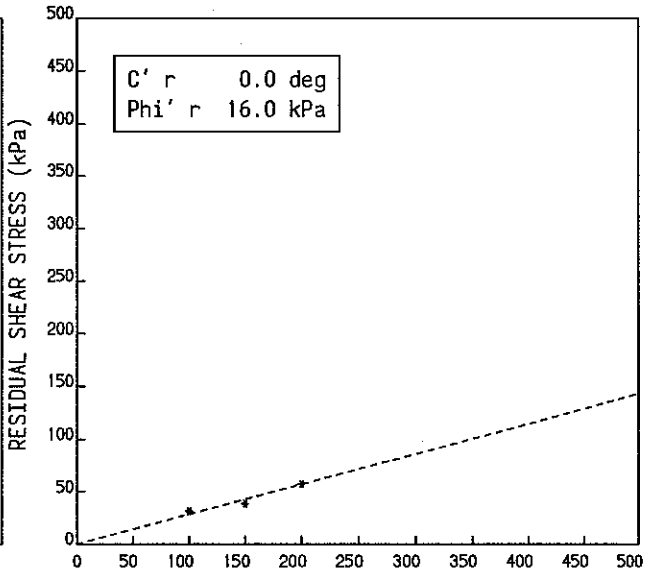
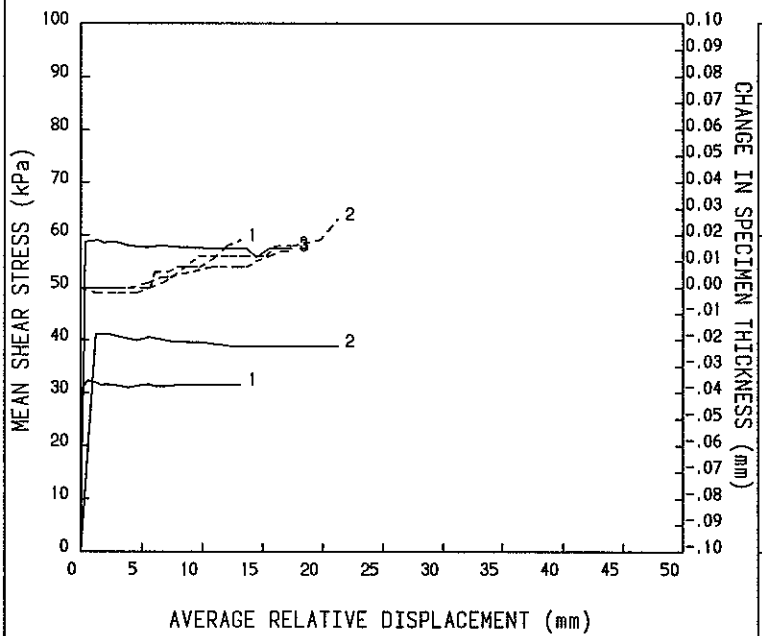


SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.109	deg/min
Inside specimen radius	34.900	mm
Outside specimen radius	50.000	mm
Initial specimen thickness	5.200	mm
Initial moisture content	29	%
Final moisture content	26	%

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
100	31.50	7.95
150	38.85	12.35
200	57.43	10.75

Natural moisture content is 7.8%.
Specimen wet up to specified moisture content.
Test performed below calibrated range of load rings.

Q.A. Ref: /028-11/m4b7780.RNG 2.01

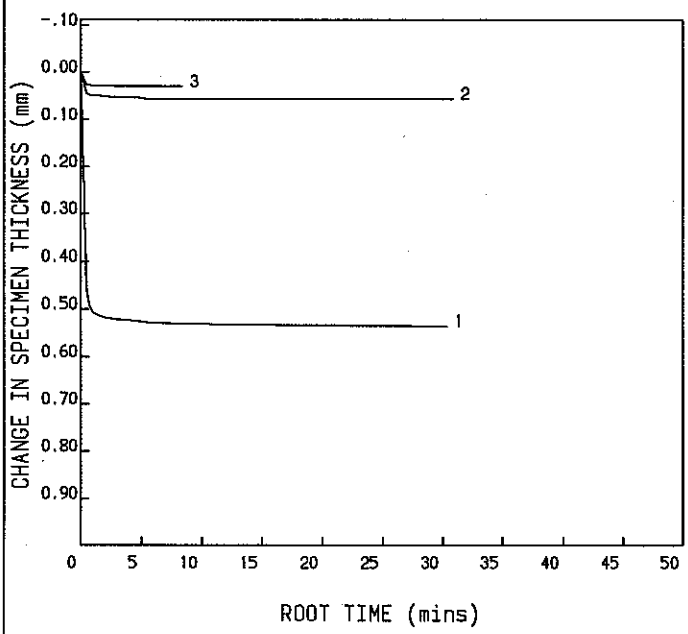
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very hard reddish brown MUDSTONE.	Hole ID	BHB8
		Sample Type	C
		Depth	16.60 m

CONSOLIDATION STAGE



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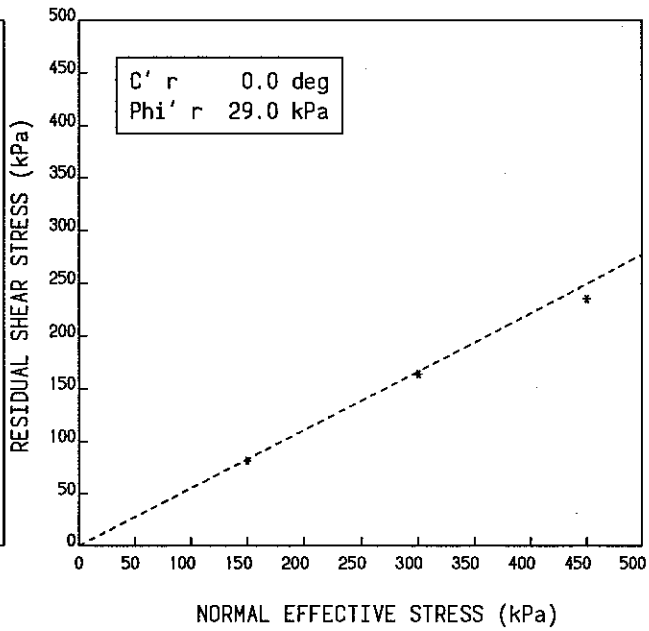
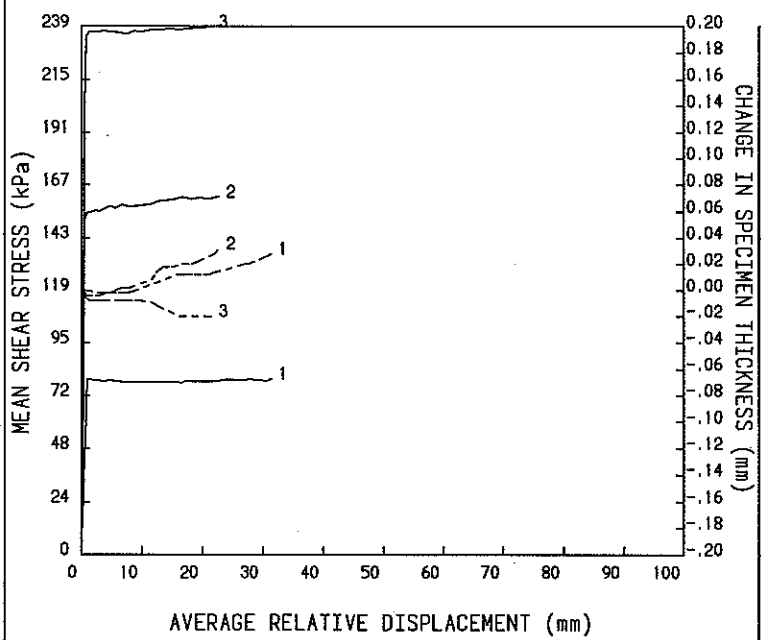


SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.192 deg/min
Inside specimen radius	34.900 mm
Outside specimen radius	50.000 mm
Initial specimen thickness	5.200 mm
Initial moisture content	20 %
Final moisture content	11 %

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
150	81.84	83.56
300	163.76	30.07
450	235.30	7.39

Natural moisture content is 1.6%.
Specimen wet up to specified moisture content.
Residual values not well defined due to nature of specimen.

Q.A. Ref: /038-06/M4B81660.RNG 2.01

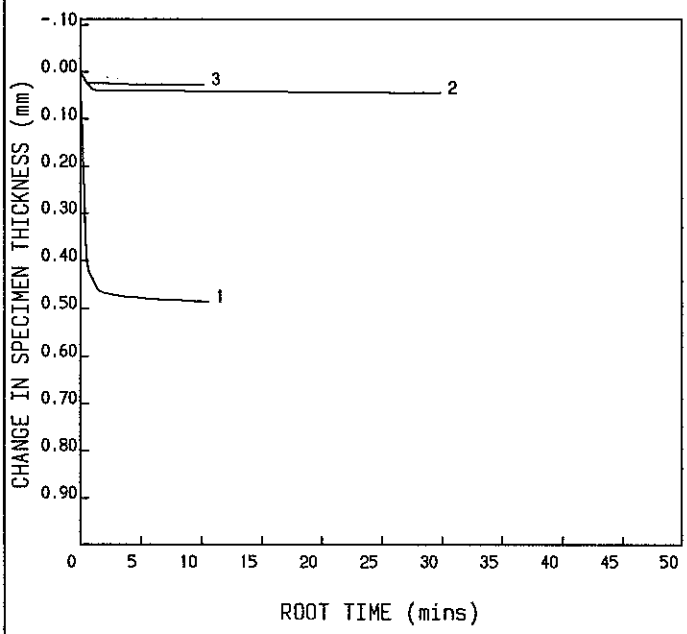
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown MUDSTONE.	Hole ID	BHB9
		Sample Type	C
		Depth	3.70 m

CONSOLIDATION STAGE



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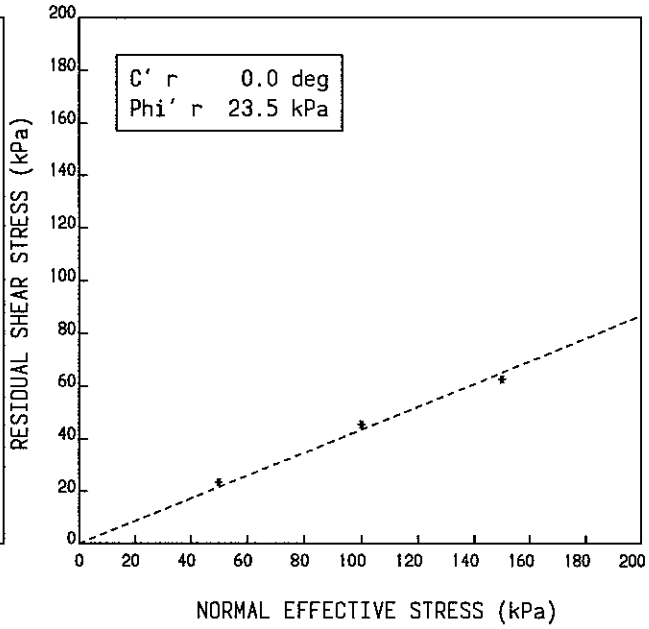

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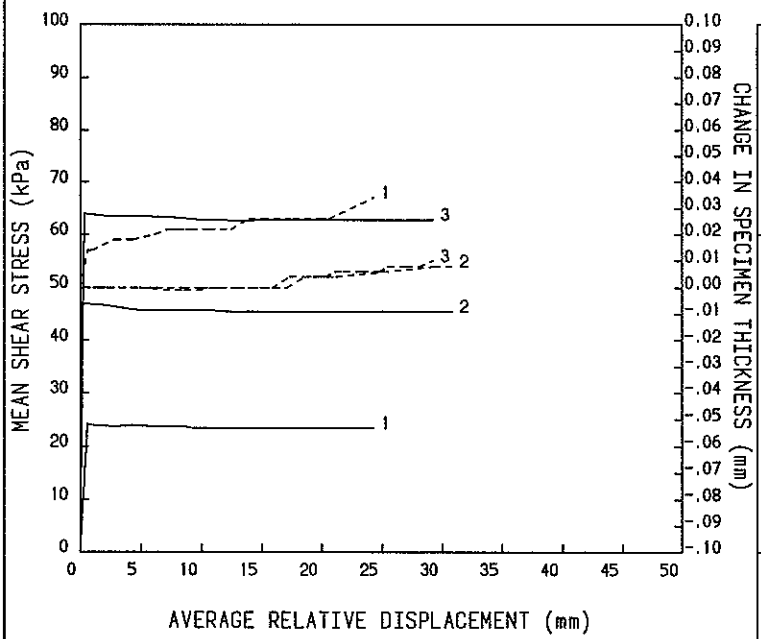


RESULTS TABLE

Rate of displacement	0.213 deg/min
Inside specimen radius	34.900 mm
Outside specimen radius	50.000 mm
Initial specimen thickness	5.100 mm
Initial moisture content	20 %
Final moisture content	17 %

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
50	23.43	9.11
100	45.45	14.15
150	62.79	15.89

Natural moisture content is 4.3%.
Specimen wet up to specified moisture content.
Test performed below calibrated range of load rings.

Q.A. Ref: /028-18/m4b9370.RNG 2.01

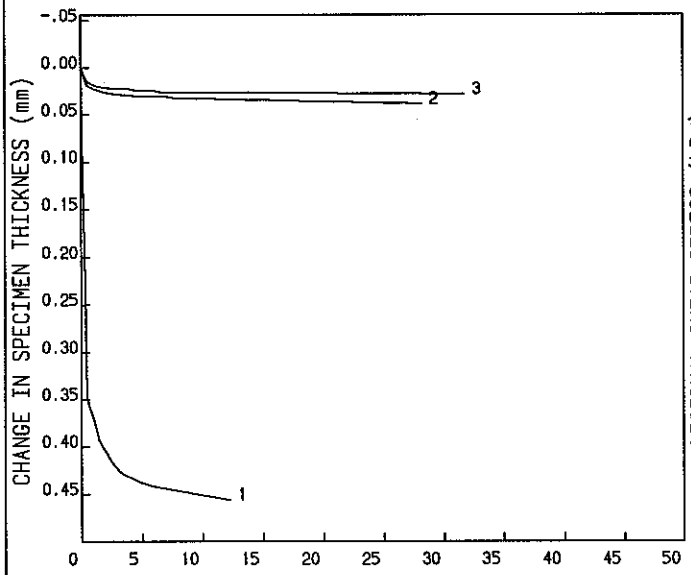
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Purplish brown mottled greyish green weathered MUDSTONE.	Hole ID	BHB9
		Sample Type	C
		Depth	9.30 m

CONSOLIDATION STAGE



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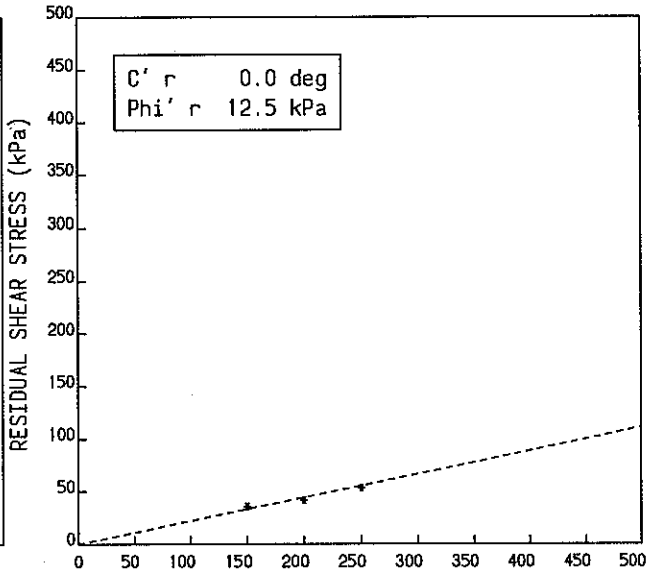
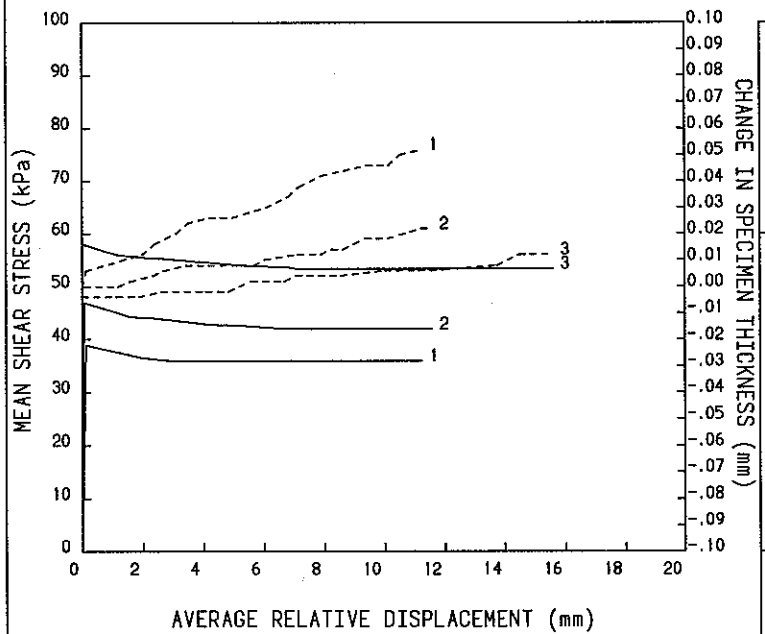


SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.048 deg/min
Inside specimen radius	34.900 mm
Outside specimen radius	50.000 mm
Initial specimen thickness	5.100 mm
Initial moisture content	22 %
Final moisture content	26 %

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
150	35.98	3.10
200	41.98	7.14
250	53.38	7.07

Natural moisture content is 22%.
Specimen dried back to specified moisture content.
Test performed below calibrated range of load rings.

Q.A. Ref: /028-25/m4b9930.RNG 2.01

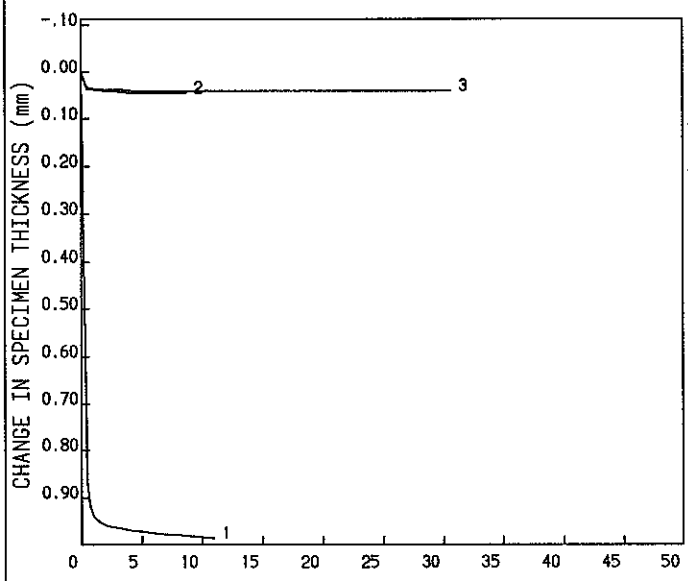
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown weathered MUDSTONE.	Hole ID	BHB10
		Sample Type	C
		Depth	13.50 m

CONSOLIDATION STAGE



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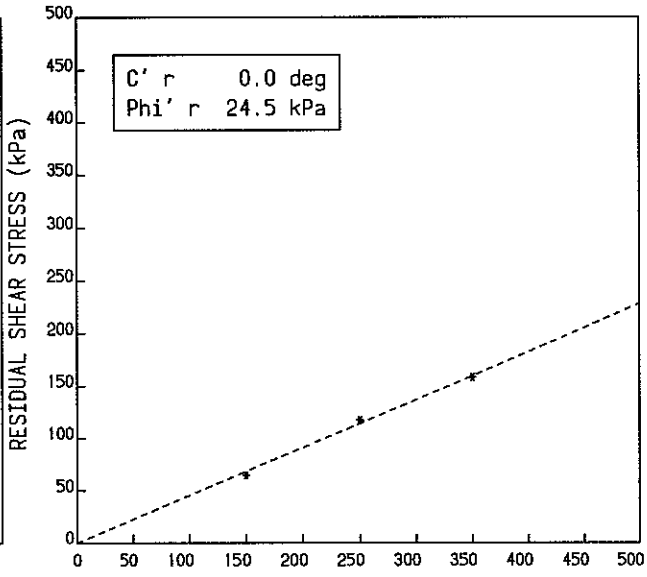
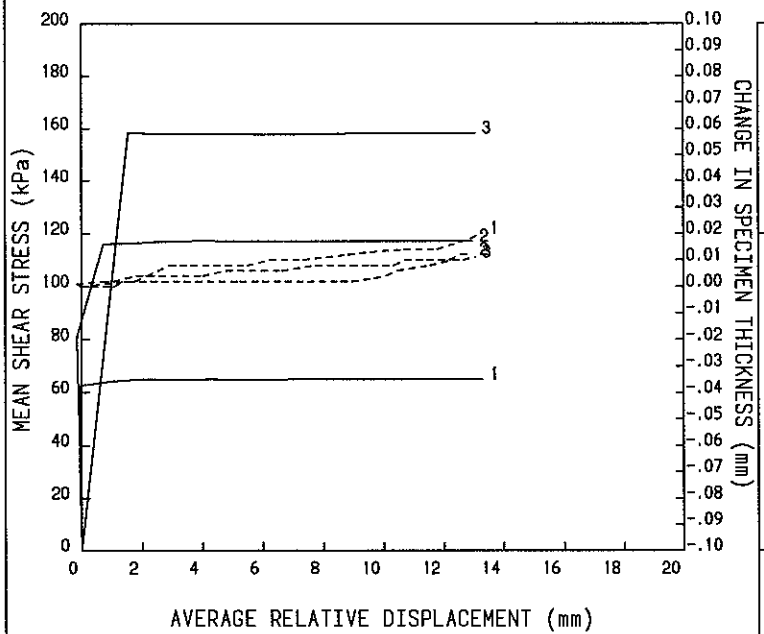


SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.152 deg/min
Inside specimen radius	34.900 mm
Outside specimen radius	50.000 mm
Initial specimen thickness	5.300 mm
Initial moisture content	23 %
Final moisture content	19 %

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
150	65.04	8.84
250	117.16	4.79
350	158.19	8.97

Natural moisture content is 3.1%.
Specimen wet up to specified moisture content.
Test of first stage performed below calibrated range of load rings.

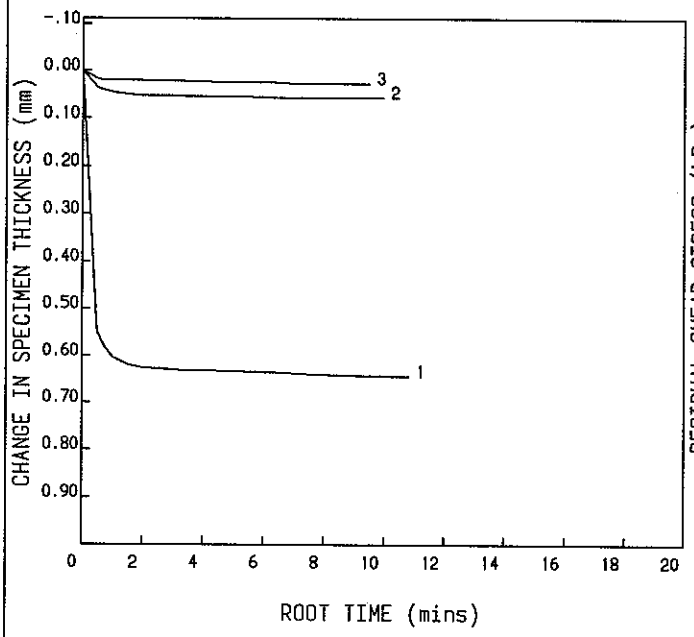
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

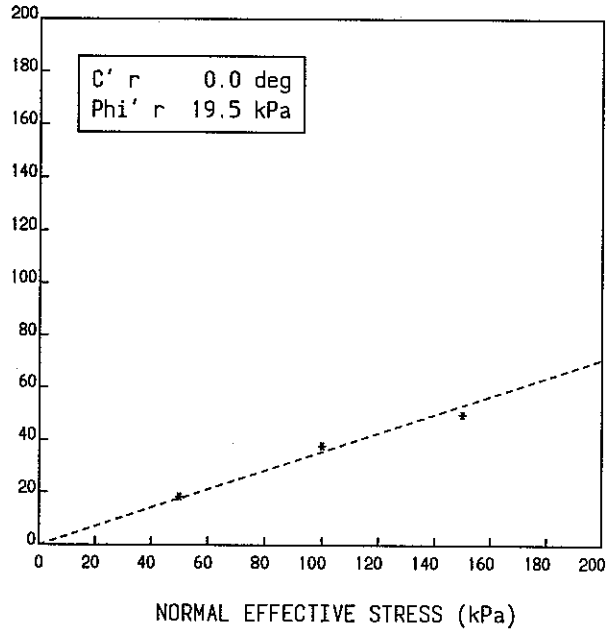
Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown MUDSTONE.	Hole ID	BHB12
		Sample Type	C
		Depth	3.20 m

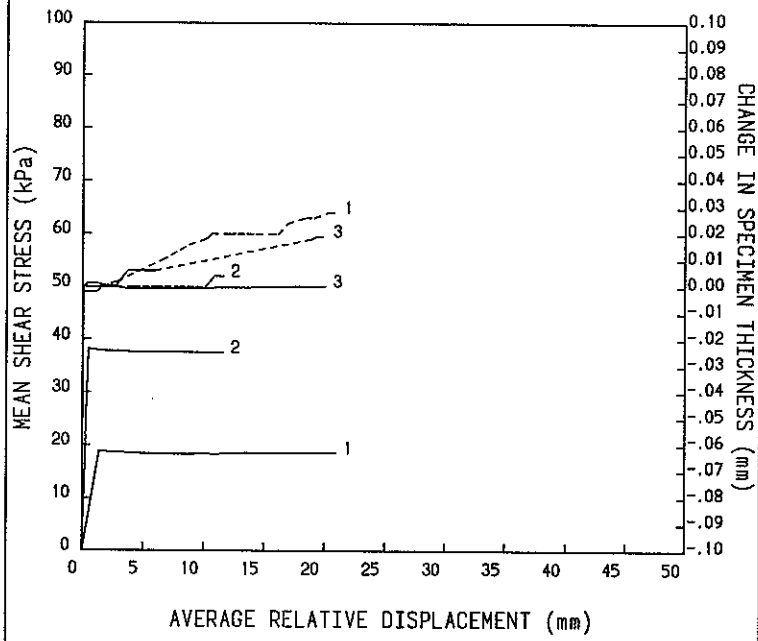
CONSOLIDATION STAGE



COULOMB GRAPH



SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.115 deg/min
Inside specimen radius	34.900 mm
Outside specimen radius	50.000 mm
Initial specimen thickness	5.100 mm
Initial moisture content	20 %
Final moisture content	16 %

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
50	18.50	13.59
100	37.67	4.21
150	49.58	3.76

Natural moisture content is 6.1%.
Specimen wet up to specified moisture content.
Test performed below calibrated range of load rings.

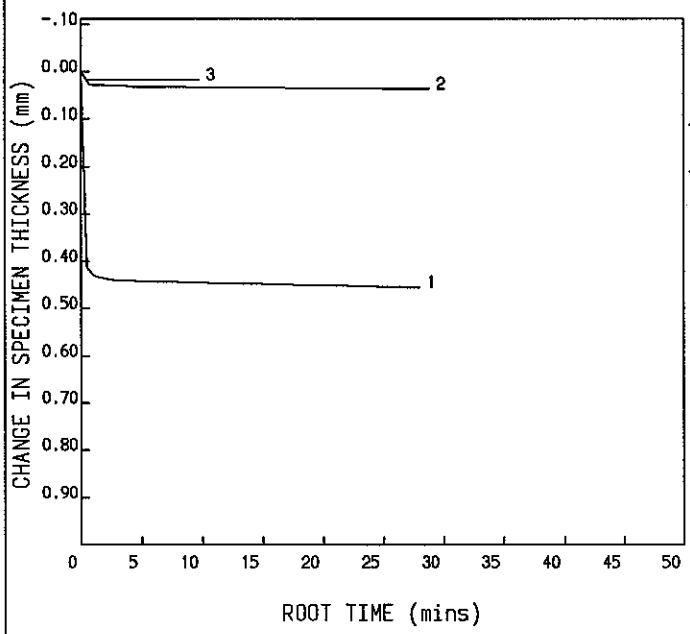
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

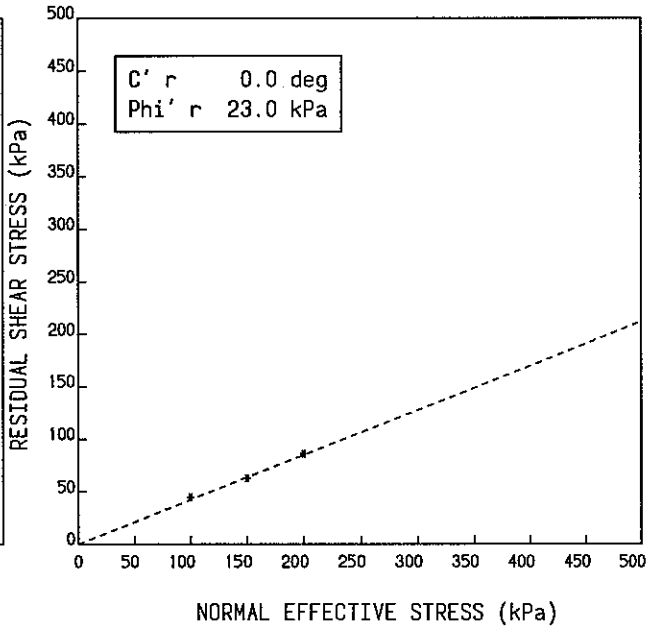
Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Very hard reddish brown MUDSTONE.	Hole ID	BHB13
		Sample Type	C
		Depth	13.70 m

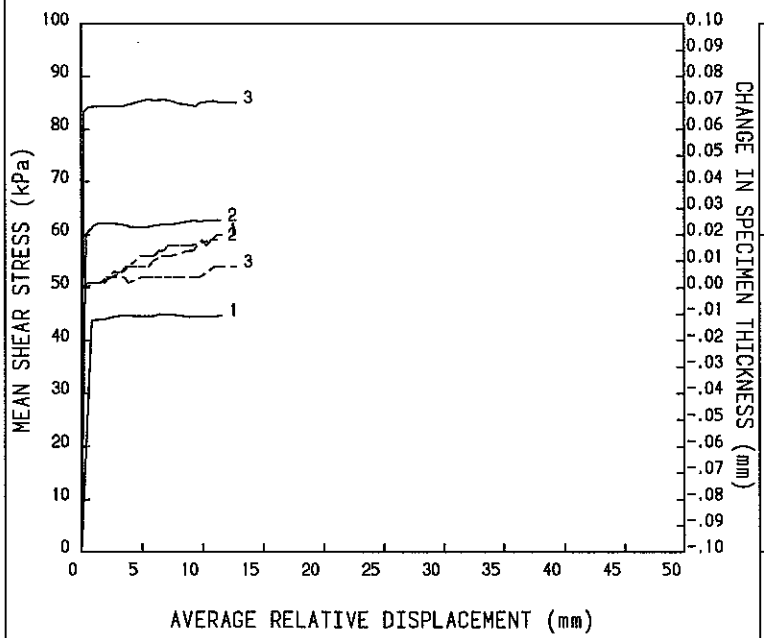
CONSOLIDATION STAGE



COULOMB GRAPH



SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.048	deg/min
Inside specimen radius	34.900	mm
Outside specimen radius	50.000	mm
Initial specimen thickness	5.200	mm
Initial moisture content	21	%
Final moisture content	21	%

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
100	45.02	21.94
150	62.75	14.79
200	85.81	15.75

Natural moisture content is 1.6%.
Specimen wet up to specified moisture content.
Test performed below calibrated range of load rings.

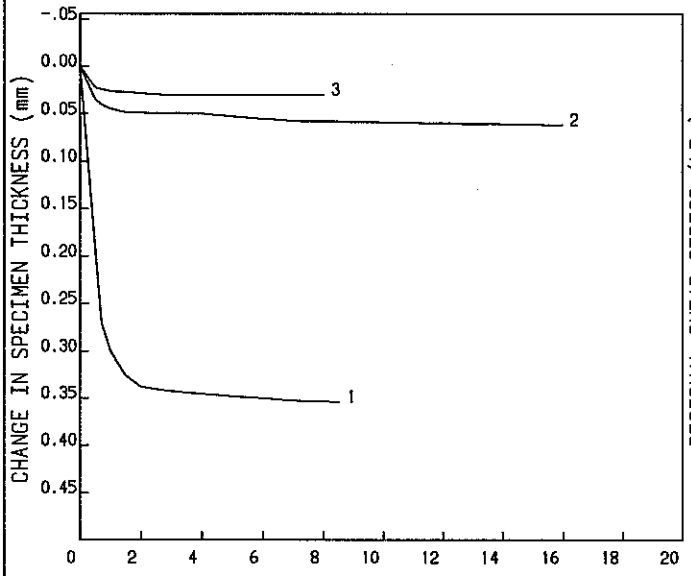
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

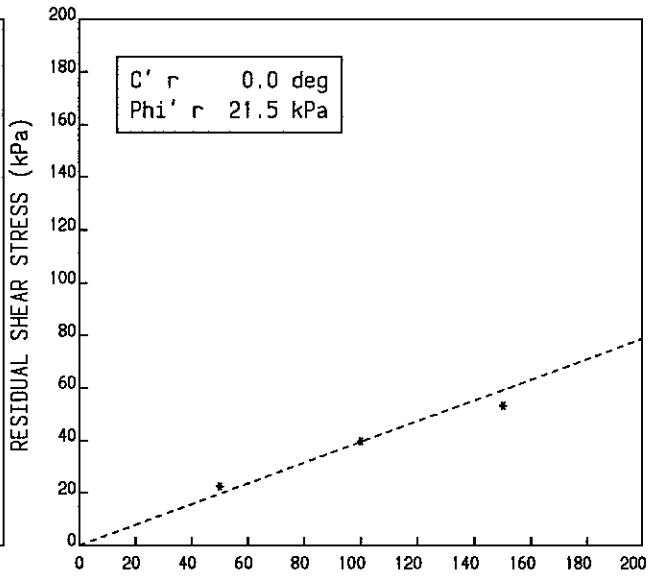
Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greenish grey weathered MUDSTONE.	Hole ID	BHB15
		Sample Type	C
		Depth	4.40 m

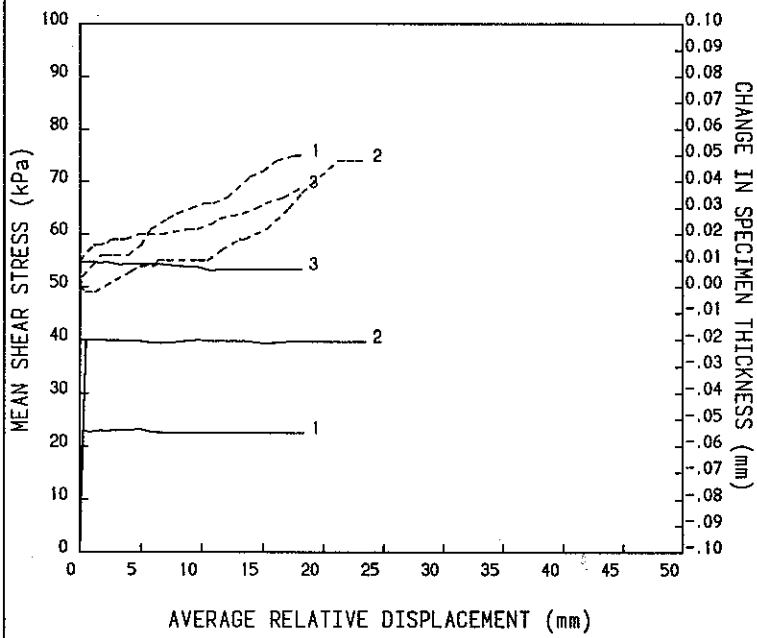
CONSOLIDATION STAGE



COULOMB GRAPH



SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.096 deg/min
Inside specimen radius	34.900 mm
Outside specimen radius	50.000 mm
Initial specimen thickness	5.200 mm
Initial moisture content	21 %
Final moisture content	8.3 %

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
50	22.55	8.01
100	39.69	17.16
150	53.38	11.51

Natural moisture content is 2.5%.
Specimen wet up to specified moisture content.
Test performed below calibrated range of load rings.

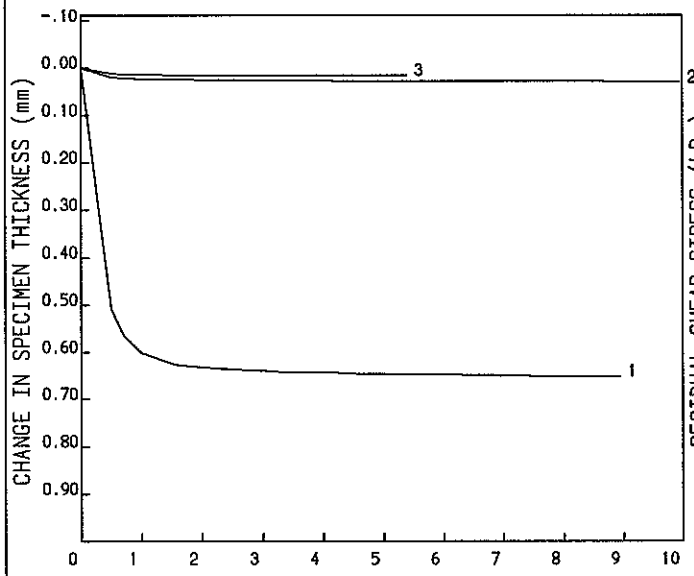
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

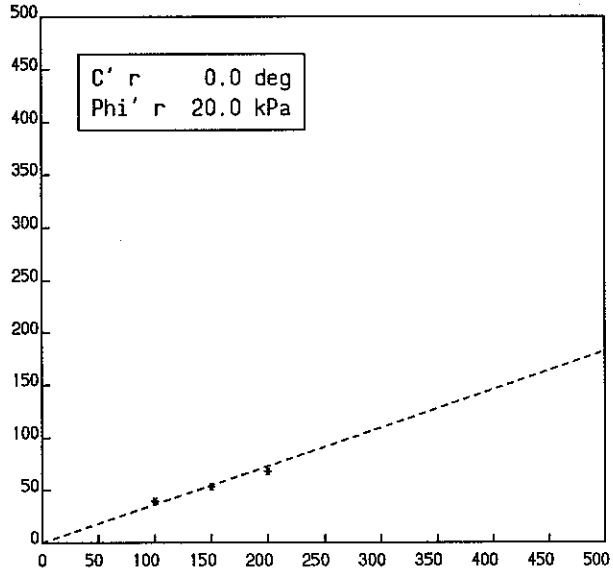
Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown weathered MUDSTONE.	Hole ID	BHB15
		Sample Type	Core
		Depth	7.00 m

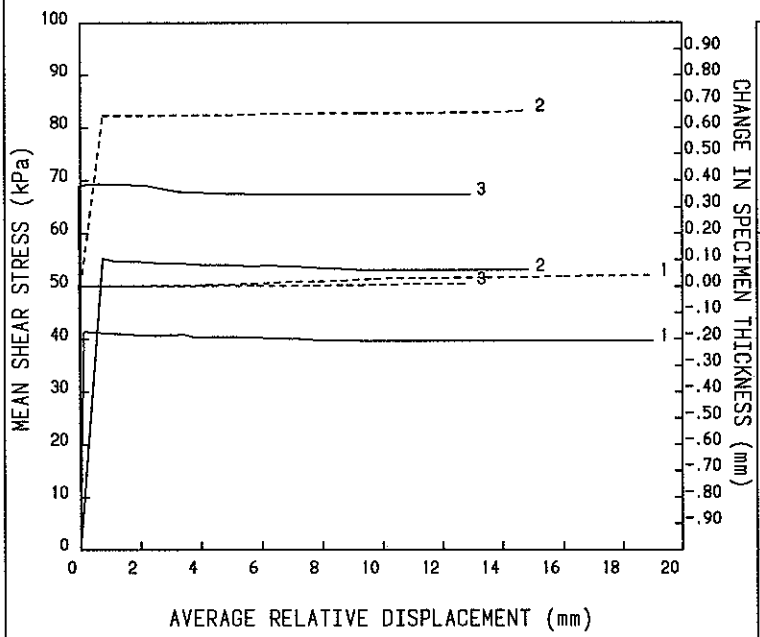
CONSOLIDATION STAGE



COULOMB GRAPH



SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.173 deg/min
Inside specimen radius	34.800 mm
Outside specimen radius	50.000 mm
Initial specimen thickness	5.200 mm
Initial moisture content	20 %
Final moisture content	7.6 %

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
100	39.69	9.74
150	53.06	9.28
200	67.44	5.86

Natural moisture content is 6.5%.
Specimen wet up to specified moisture content.
Test performed below calibrated range of load rings.

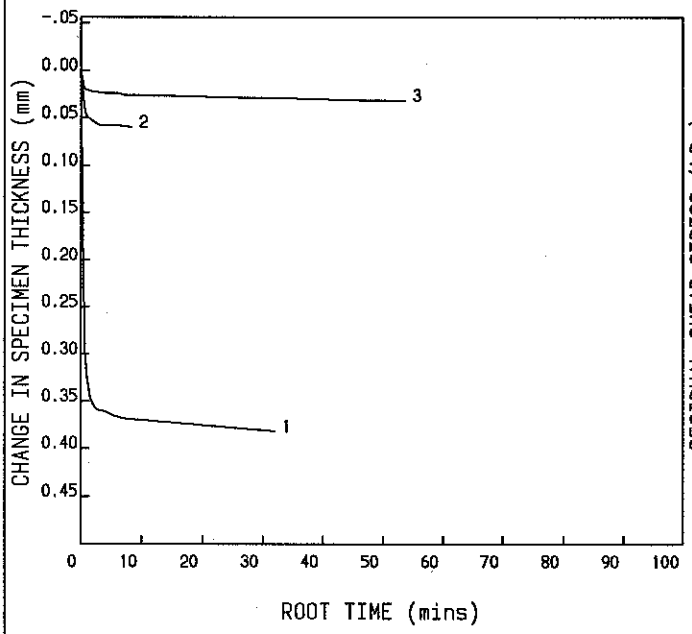
NORWEST HOLST SOIL ENGINEERING LIMITED

SMALL RING SHEAR

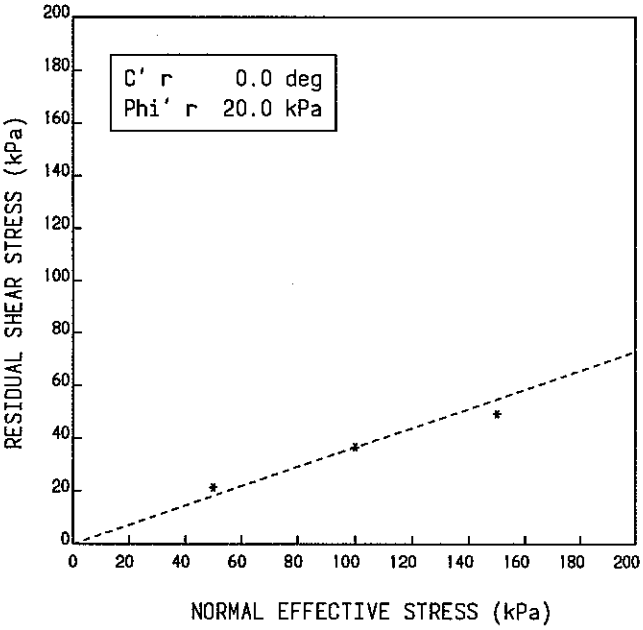
Test method: BS 1377:Part 7:1990 Clause 6

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown moderately weathered sandy MUDSTONE.	Hole ID	BHB17
		Sample Type	C
		Depth	5.70 m

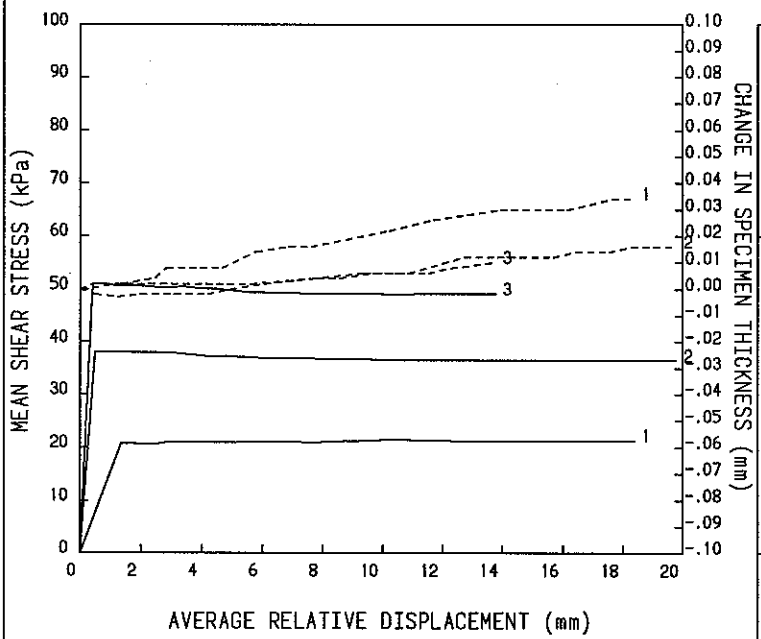
CONSOLIDATION STAGE



COULOMB GRAPH



SHEARING STAGE



RESULTS TABLE

Rate of displacement	0.117	deg/min
Inside specimen radius	34.900	mm
Outside specimen radius	50.000	mm
Initial specimen thickness	5.200	mm
Initial moisture content	19	%
Final moisture content	16	%

Normal Effective Stress (kPa)	Residual Shear Stress (kPa)	Average Relative Displacement (mm)
50	21.20	12.83
100	36.49	10.14
150	49.07	7.84

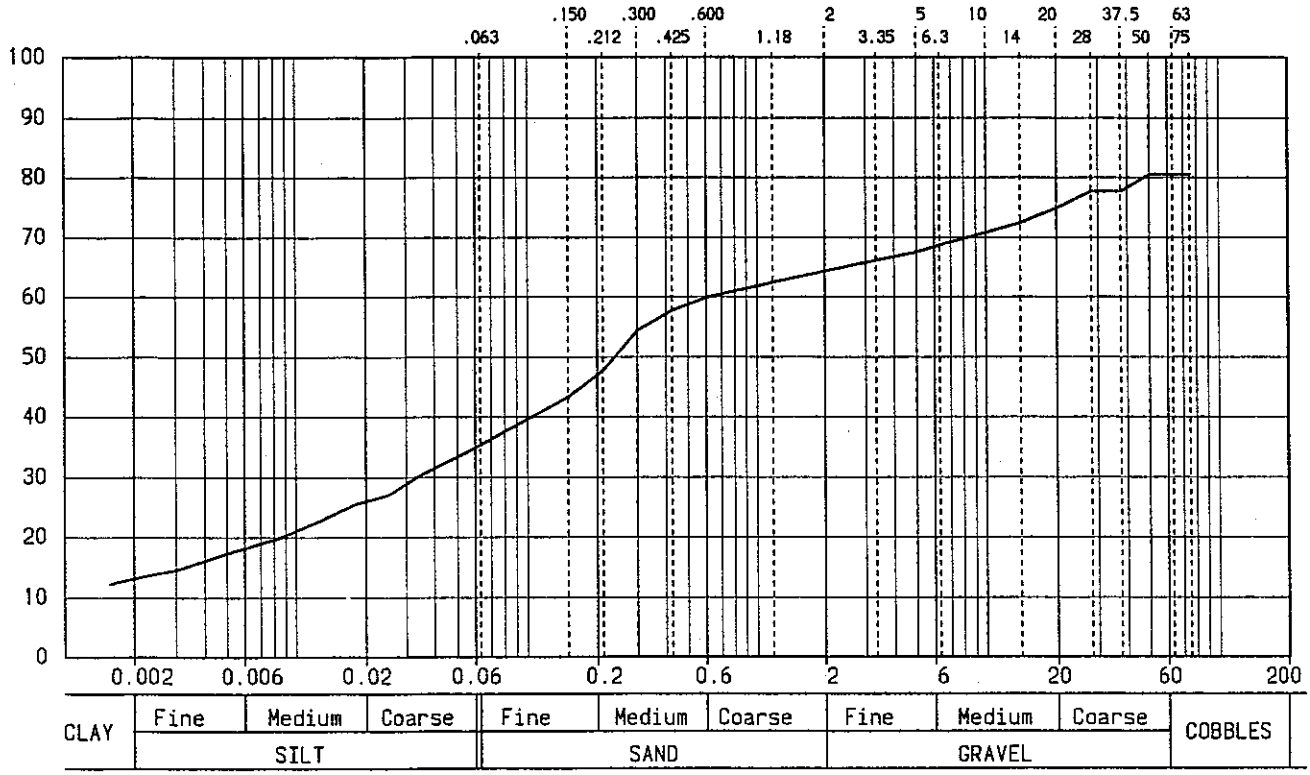
Natural moisture content is 6.5%.
Specimen wet up to specified moisture content.
Test performed below calibrated range of load rings.

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to medium subangular to subrounded mudstone and sandstone gravel and cobbles.	Hole ID	BHA1
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	80.6	0.04837	33.1
63.000	80.6	0.03477	30.4
50.000	80.6	0.02509	27.1
37.500	77.7	0.01790	25.6
28.000	77.7	0.01248	22.7
20.000	75.0	0.00827	19.8
14.000	72.4	0.00501	17.4
10.000	70.8	0.00398	16.1
6.300	68.7	0.00310	14.8
5.000	67.6	0.00156	12.3
3.350	66.2		
2.000	64.4		
1.180	62.5		
0.600	59.9		
0.425	57.8		
0.300	54.4		
0.212	47.7		
0.150	43.5		
0.063	35.4		

Type of sample BULK

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	13
Silt	23
Sand	29
Gravel	16
Cobbles	19

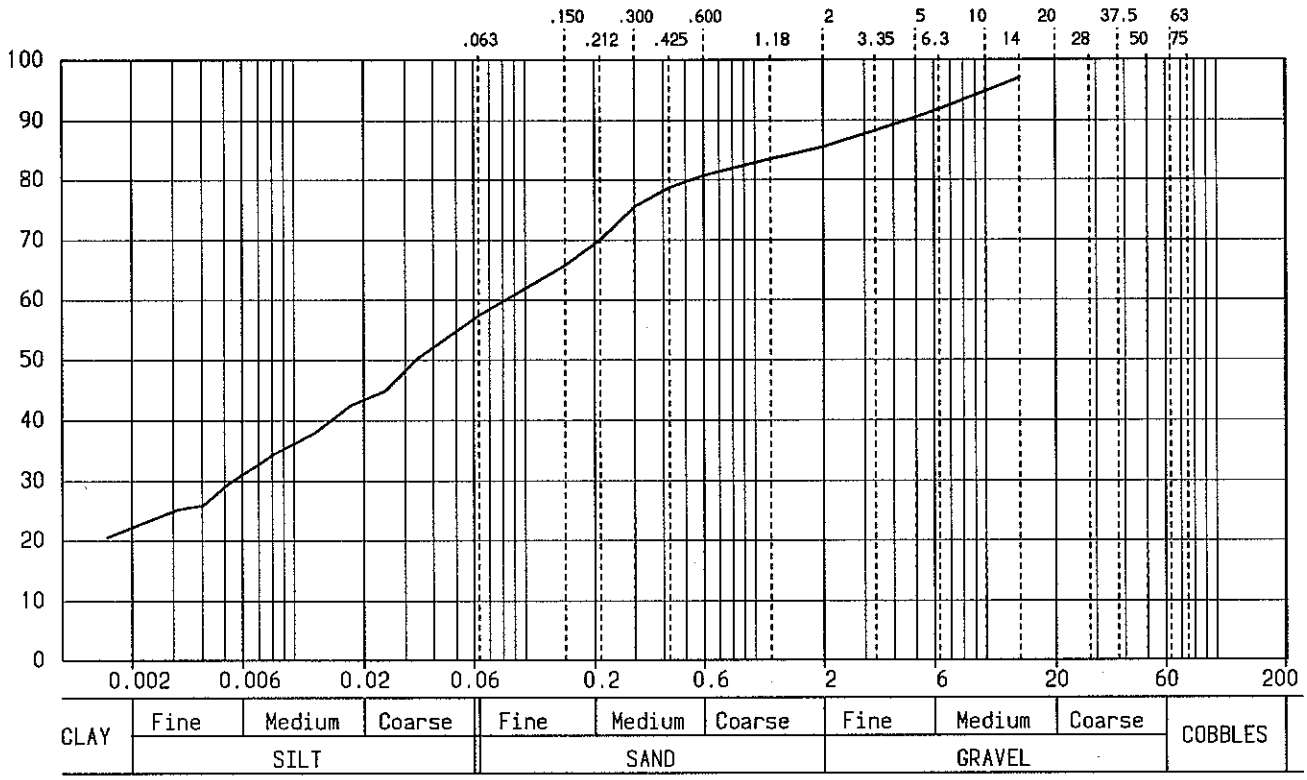
Q.A. Ref: /127-09/m4ba15.PSD 2.06 : U/Hr203.43/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to medium sandstone and mudstone gravel and occasional fine gravel size coal fragments	Hole ID	BHA1
		Sample No.	
		Depth	2.40m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04733	54.1
63.000	100.0	0.03405	50.1
50.000	100.0	0.02462	44.9
37.500	100.0	0.01757	42.6
28.000	100.0	0.01228	38.0
20.000	100.0	0.00812	34.4
14.000	97.0	0.00518	29.5
10.000	94.9	0.00406	25.9
6.300	91.9	0.00312	25.2
5.000	90.5	0.00156	20.6
3.350	88.3		
2.000	85.6		
1.180	83.5		
0.600	80.8		
0.425	78.7		
0.300	75.6		
0.212	70.0		
0.150	65.8		
0.063	57.5		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	22
Silt	36
Sand	28
Gravel	14
Cobbles	0

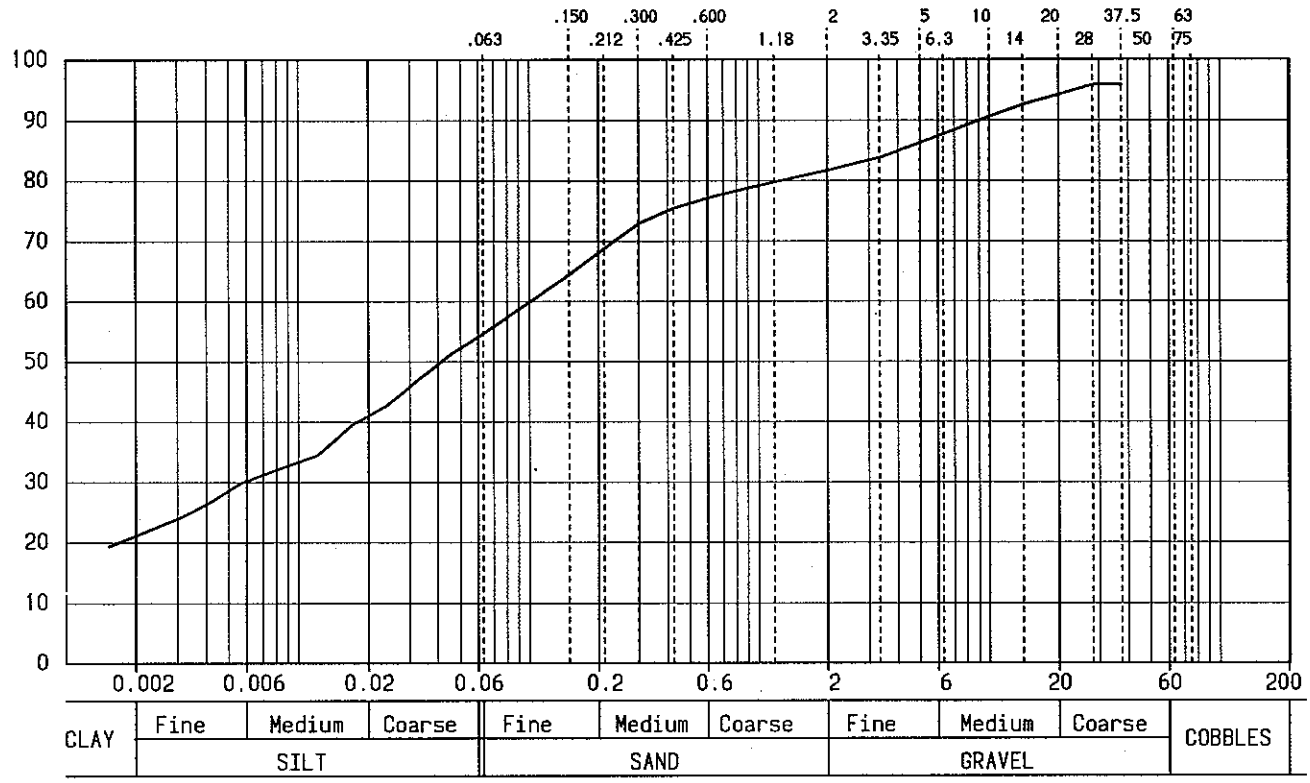
Q.A. Ref: /028-14/m4a124.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some gravel.	Hole ID	BHA1
		Sample No.	
		Depth	3.05m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04566	51.3
63.000	100.0	0.03299	47.0
50.000	100.0	0.02381	42.7
37.500	95.9	0.01708	39.6
28.000	95.9	0.01199	34.4
20.000	94.2	0.00909	32.9
14.000	92.7	0.00557	29.8
10.000	90.6	0.00417	26.7
6.300	87.8	0.00314	24.3
5.000	86.3	0.00153	19.3
3.350	83.9		
2.000	81.8		
1.180	79.8		
0.600	77.2		
0.425	75.5		
0.300	72.9		
0.212	68.8		
0.150	64.5		
0.063	54.6		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	21
Silt	34
Sand	27
Gravel	18
Cobbles	0

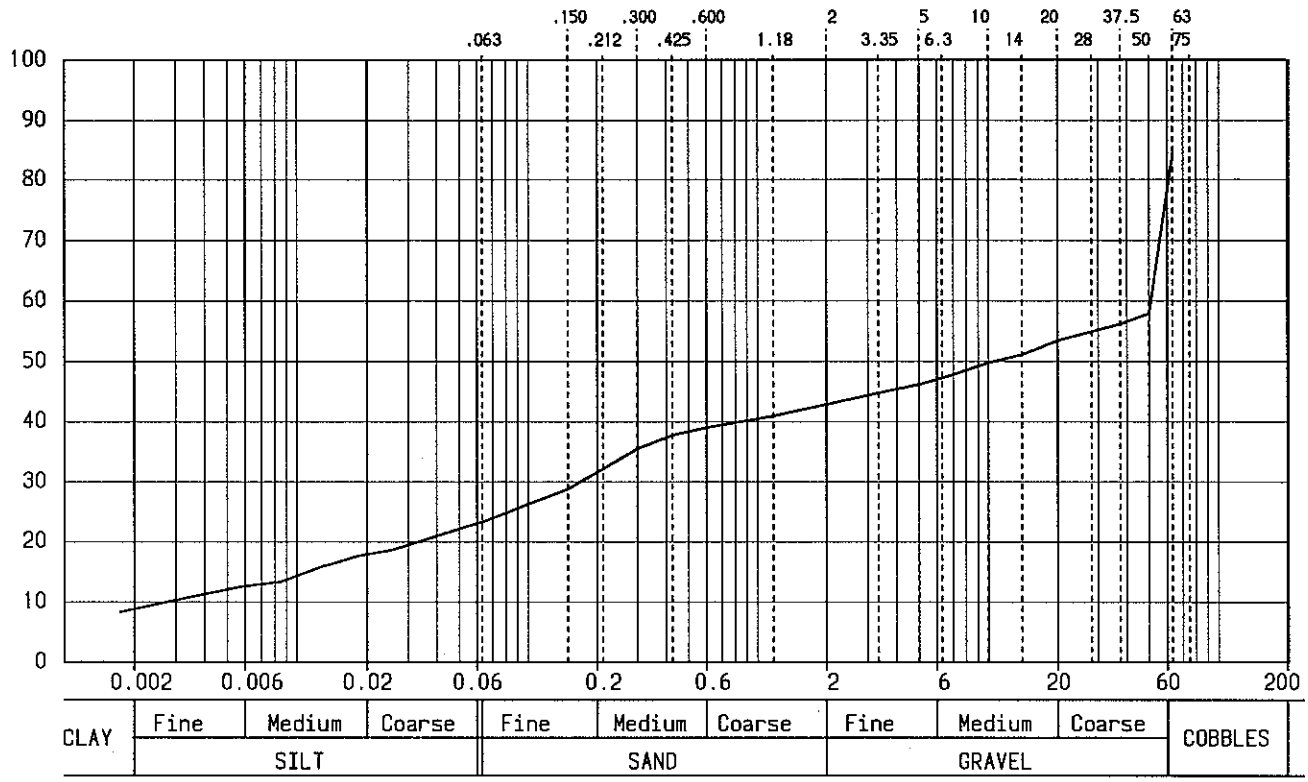
Q.A. Ref: /018-13/M4RNA130.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown occasional thinly laminated sandy CLAY with subanglur to subrounded gravel and occasional cobbles.	Hole ID	BHA2
		Sample No.	
		Depth	1.90m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05002	22.1
63.000	84.4	0.03589	20.4
50.000	57.9	0.02574	18.7
37.500	56.2	0.01834	17.8
28.000	55.0	0.01277	15.9
20.000	53.5	0.00848	13.4
14.000	51.1	0.00563	12.5
10.000	49.7	0.00174	8.4
6.300	47.2		
5.000	46.2		
3.350	44.8		
2.000	42.9		
1.180	41.0		
0.600	39.1		
0.425	37.8		
0.300	35.6		
0.212	32.2		
0.150	28.8		
0.063	23.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	9
Silt	14
Sand	20
Gravel	36
Cobbles	21

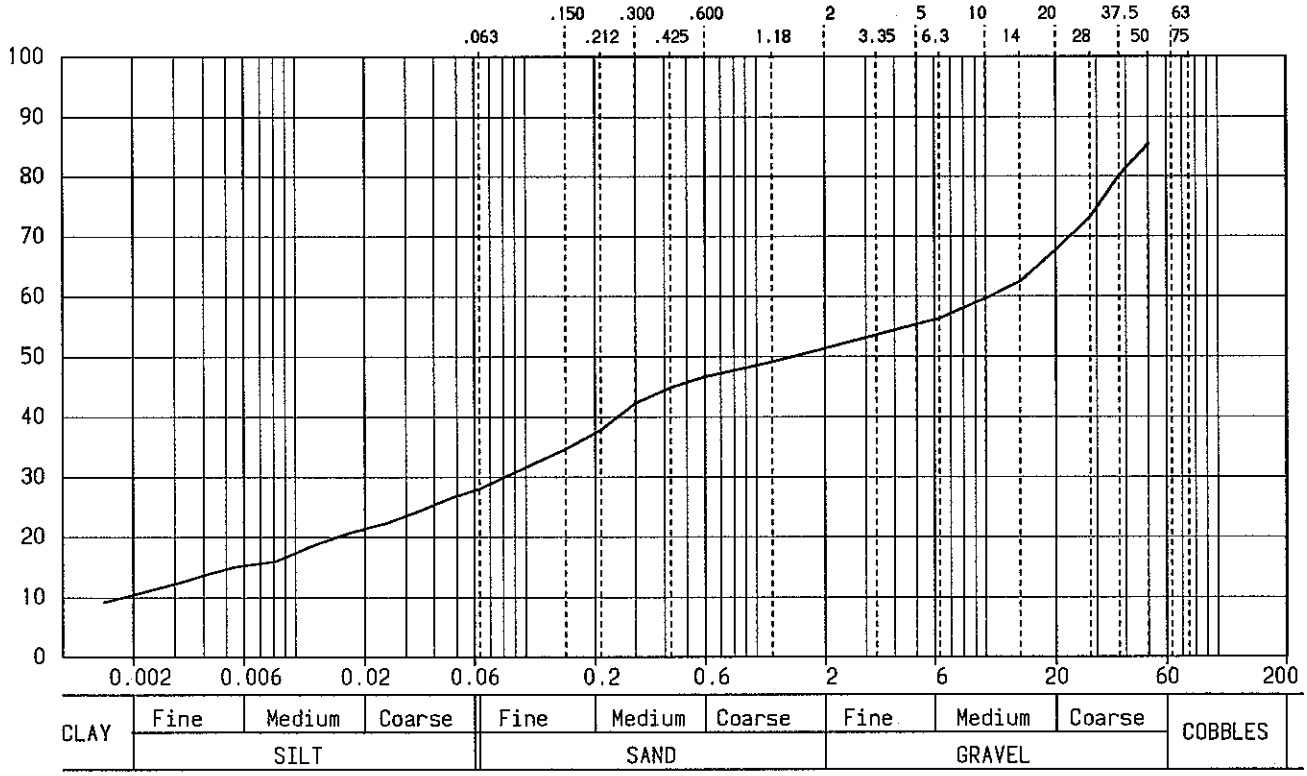
Q.A. Ref: /028-12/M4BA219.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some subangular and subrounded gravel.	Hole ID	BHA2
		Sample No.	
		Depth	4.10m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04761	26.6
63.000	100.0	0.03429	24.4
50.000	85.5	0.02465	22.4
37.500	80.2	0.01764	20.9
28.000	73.3	0.01229	18.9
20.000	67.8	0.00819	16.0
14.000	62.5	0.00544	15.0
10.000	59.7	0.00416	13.9
6.300	56.3	0.00317	12.5
5.000	55.4	0.00150	9.2
3.350	53.6		
2.000	51.4		
1.180	49.2		
0.600	46.7		
0.425	44.9		
0.300	42.4		
0.212	37.9		
0.150	34.7		
0.063	28.1		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	10
Silt	18
Sand	23
Gravel	49
Cobbles	0

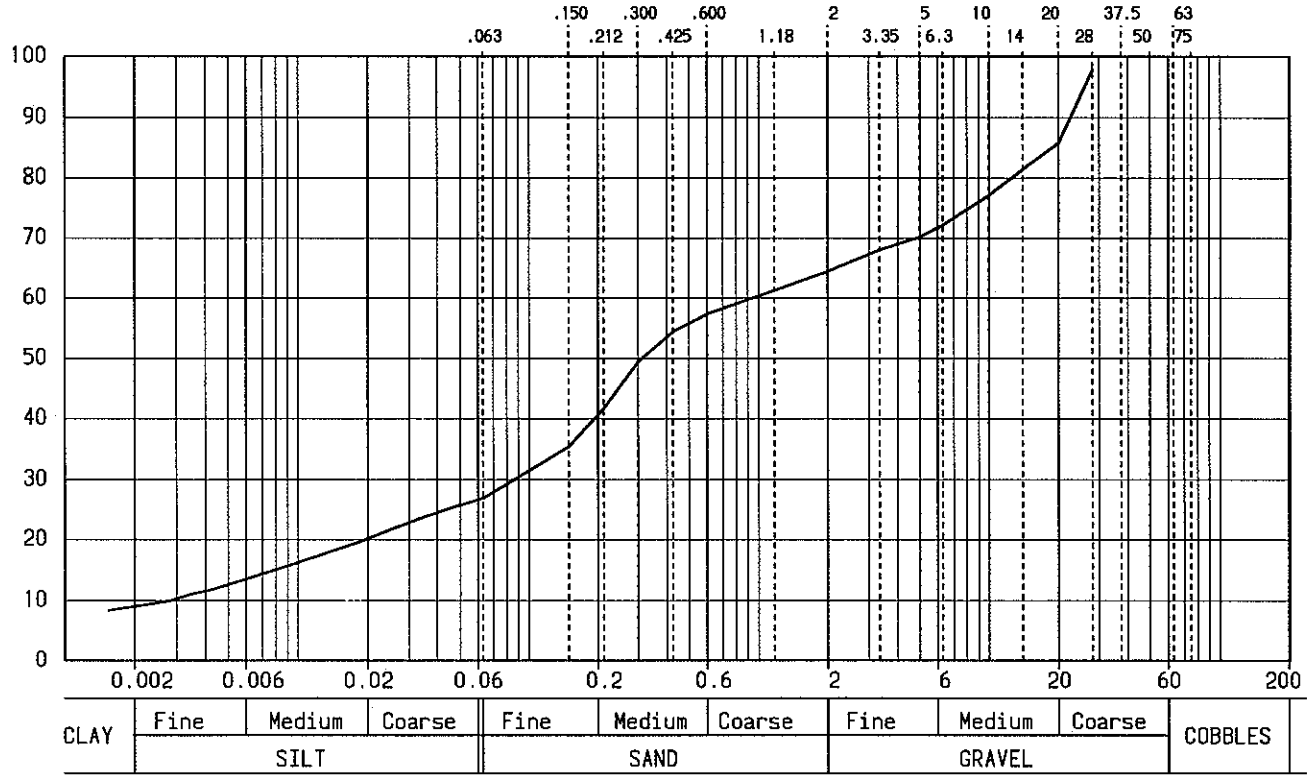
Q.A. Ref: /028-14/m4ba2.PSD 2.06 : U/Hr203.01/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some gravel	Hole ID	BHA3
		Sample No.	
		Depth	1.50m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	97.9
20.000	85.8
14.000	81.5
10.000	77.1
6.300	72.2
5.000	70.2
3.350	68.0
2.000	64.5
1.180	61.3
0.600	57.4
0.425	54.5
0.300	49.5
0.212	41.7
0.150	35.5
0.063	26.9

Particle Size	Cumulative % Passing
0.04944	25.7
0.03537	23.9
0.02533	21.8
0.01816	19.6
0.01261	17.6
0.00833	15.3
0.00417	11.6
0.00348	11.0
0.00286	10.0
0.00153	8.4

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.69 (Measured)

Clay	9
Silt	18
Sand	38
Gravel	35
Cobbles	0

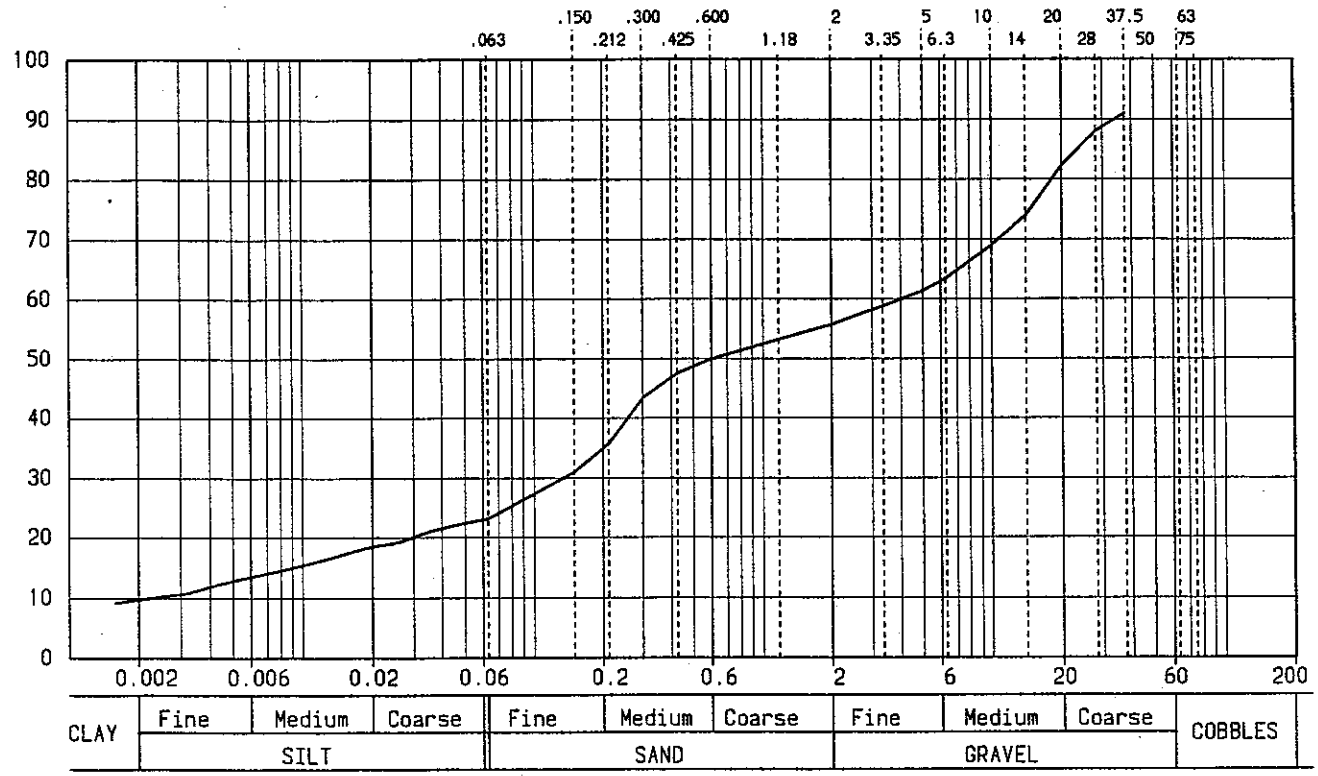
Q.A. Ref: /018-21/m4a315.PSD 2.06 : U/Hr203.43/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown clayey SAND and GRAVEL	Hole ID	BHA3
		Sample No.	
		Depth	2.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05063	22.5
63.000	100.0	0.03612	21.2
50.000	100.0	0.02586	19.3
37.500	91.1	0.01842	18.2
28.000	88.1	0.01277	16.5
20.000	82.4	0.00843	14.7
14.000	74.0	0.00533	13.2
10.000	69.1	0.00415	12.1
6.300	63.5	0.00320	10.8
5.000	61.4	0.00159	9.3
3.350	58.9		
2.000	55.8		
1.180	53.2		
0.600	50.0		
0.425	47.6		
0.300	43.4		
0.212	35.7		
0.150	31.0		
0.063	23.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

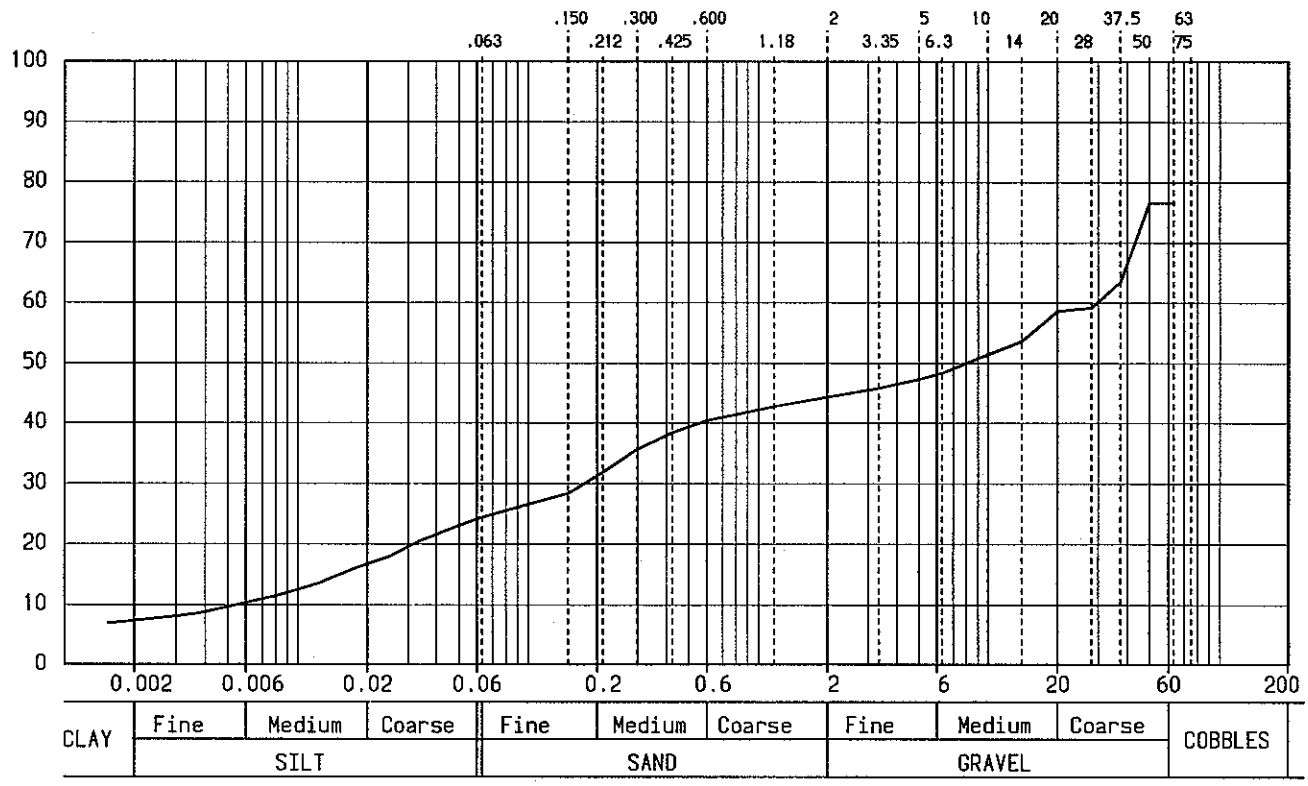
Clay	10
Silt	13
Sand	33
Gravel	44
Cobbles	0

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown slightly clayey sandy GRAVEL with occasional cobbles.	Hole ID	BHB1A
		Sample No.	
		Depth	1.05m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04769	22.8
63.000	76.6	0.03435	20.6
50.000	76.6	0.02482	18.0
37.500	63.6	0.01781	16.2
28.000	59.2	0.01245	13.7
20.000	58.6	0.00824	11.5
14.000	53.7	0.00471	9.4
10.000	51.5	0.00376	8.6
6.300	48.4	0.00298	8.1
5.000	47.4	0.00154	6.9
3.350	45.8		
2.000	44.3		
1.180	42.8		
0.600	40.5		
0.425	38.5		
0.300	35.7		
0.212	31.9		
0.150	28.4		
0.063	24.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	7
Silt	18
Sand	20
Gravel	32
Cobbles	23

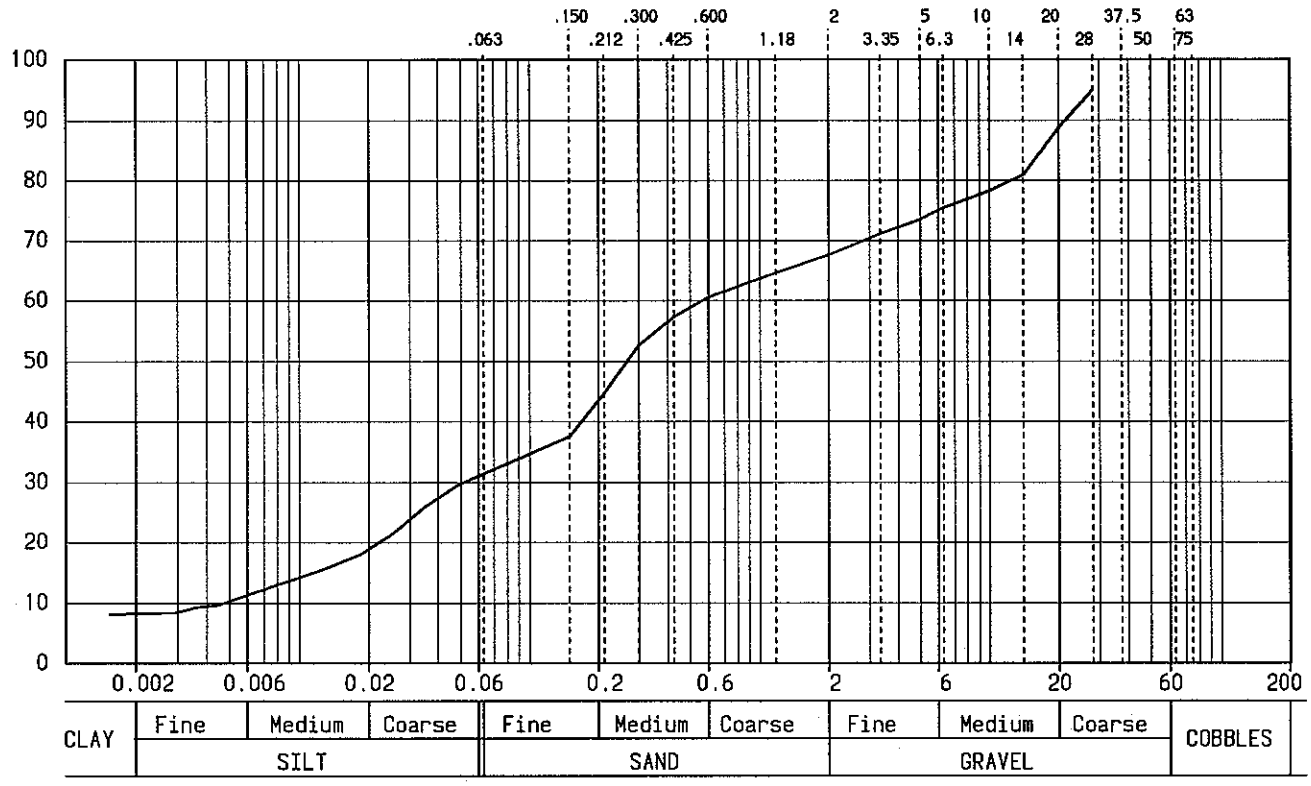
Q.A. Ref: /018-13/M4RNB110.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown sandy CLAY with some subrounded gravel.	Hole ID	BHB1A
		Sample No.	
		Depth	2.10m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04870	29.6
63.000	100.0	0.03515	26.0
50.000	100.0	0.02544	21.6
37.500	100.0	0.01832	18.0
28.000	95.0	0.01272	15.6
20.000	88.8	0.00839	13.2
14.000	80.9	0.00447	9.6
10.000	78.3	0.00364	9.4
6.300	75.5	0.00294	8.4
5.000	73.5	0.00154	8.2
3.350	71.2		
2.000	67.7		
1.180	64.7		
0.600	60.7		
0.425	57.4		
0.300	52.7		
0.212	44.8		
0.150	37.6		
0.063	31.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	8
Silt	24
Sand	36
Gravel	32
Cobbles	0

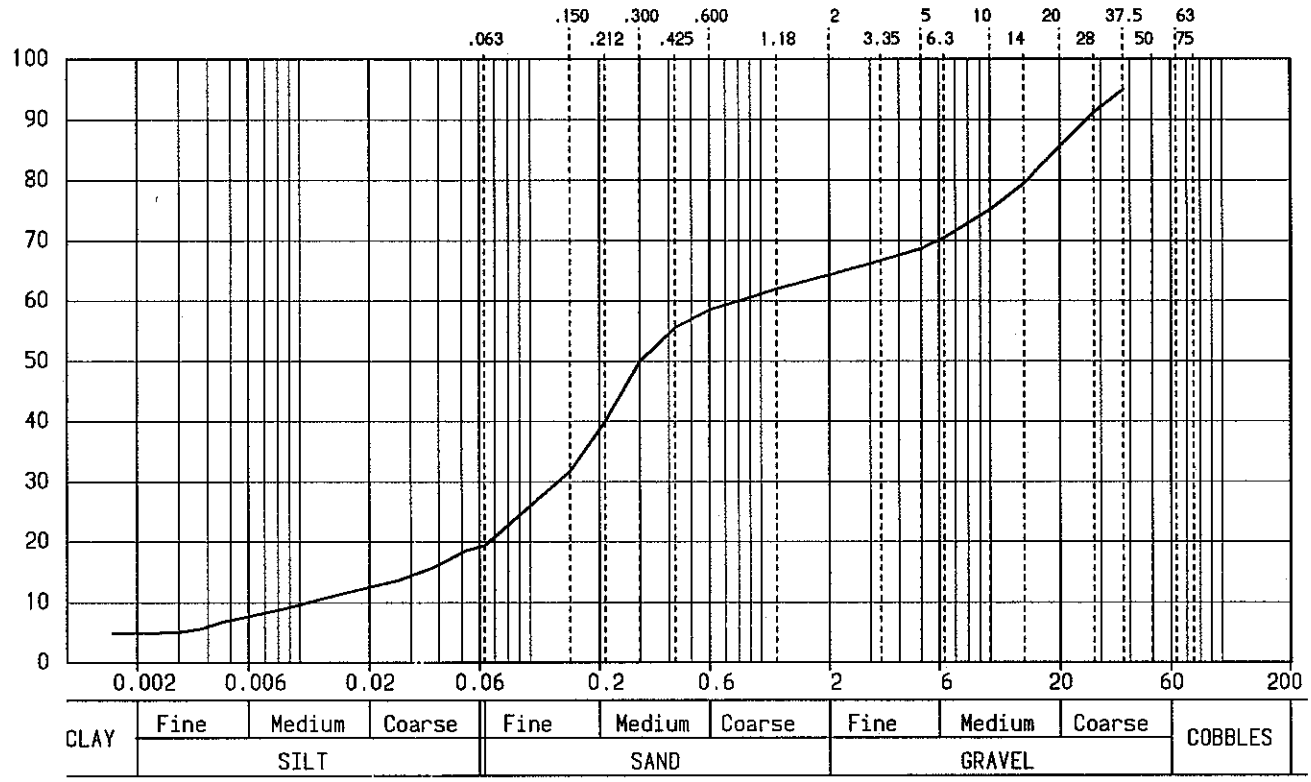
Q.A. Ref: /018-15/M4B1A21.PSD 2.06 : U/Hr192.34/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown clayey SAND with much subangular gravel.	Hole ID	BHB1A
		Sample No.	
		Depth	4.15m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	100.0
50.000	100.0
37.500	94.9
28.000	91.2
20.000	85.6
14.000	79.5
10.000	75.1
6.300	70.5
5.000	68.7
3.350	66.7
2.000	64.3
1.180	62.0
0.600	58.5
0.425	55.6
0.300	50.0
0.212	40.0
0.150	31.8
0.063	19.4

Particle Size	Cumulative % Passing
0.05202	18.5
0.03727	15.7
0.02660	13.6
0.01892	12.4
0.01307	10.8
0.00859	9.0
0.00453	6.7
0.00371	5.7
0.00299	5.1
0.00156	4.9

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	5
Silt	14
Sand	45
Gravel	36
Cobbles	0

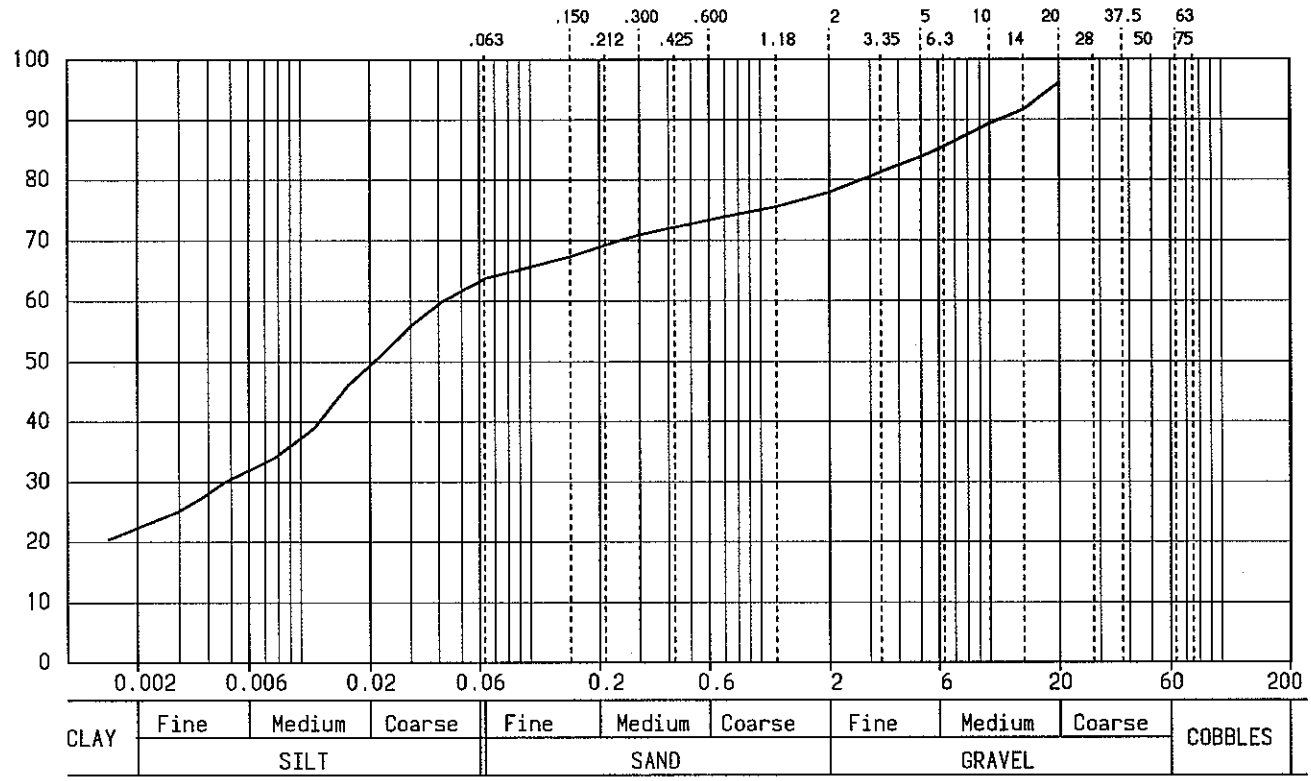
Q.A. Ref: /018-13/M4BB1A.PSD 2.06 : U/Hr192.36/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Stiff reddish brown very silty CLAY with some gravel.	Hole ID	BHB1A
		Sample No.	
		Depth	6.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05760	62.9
63.000	100.0	0.04160	60.0
50.000	100.0	0.03024	56.0
37.500	100.0	0.02210	51.0
28.000	100.0	0.01609	46.2
20.000	96.2	0.01150	39.0
14.000	91.7	0.00770	34.0
10.000	89.4	0.00470	30.0
6.300	85.5	0.00375	27.3
5.000	83.8	0.00294	25.0
3.350	81.3	0.00149	20.4
2.000	78.0		
1.180	75.6		
0.600	73.4		
0.425	72.3		
0.300	70.9		
0.212	69.2		
0.150	67.3		
0.063	63.7		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	22
Silt	42
Sand	14
Gravel	22
Cobbles	0

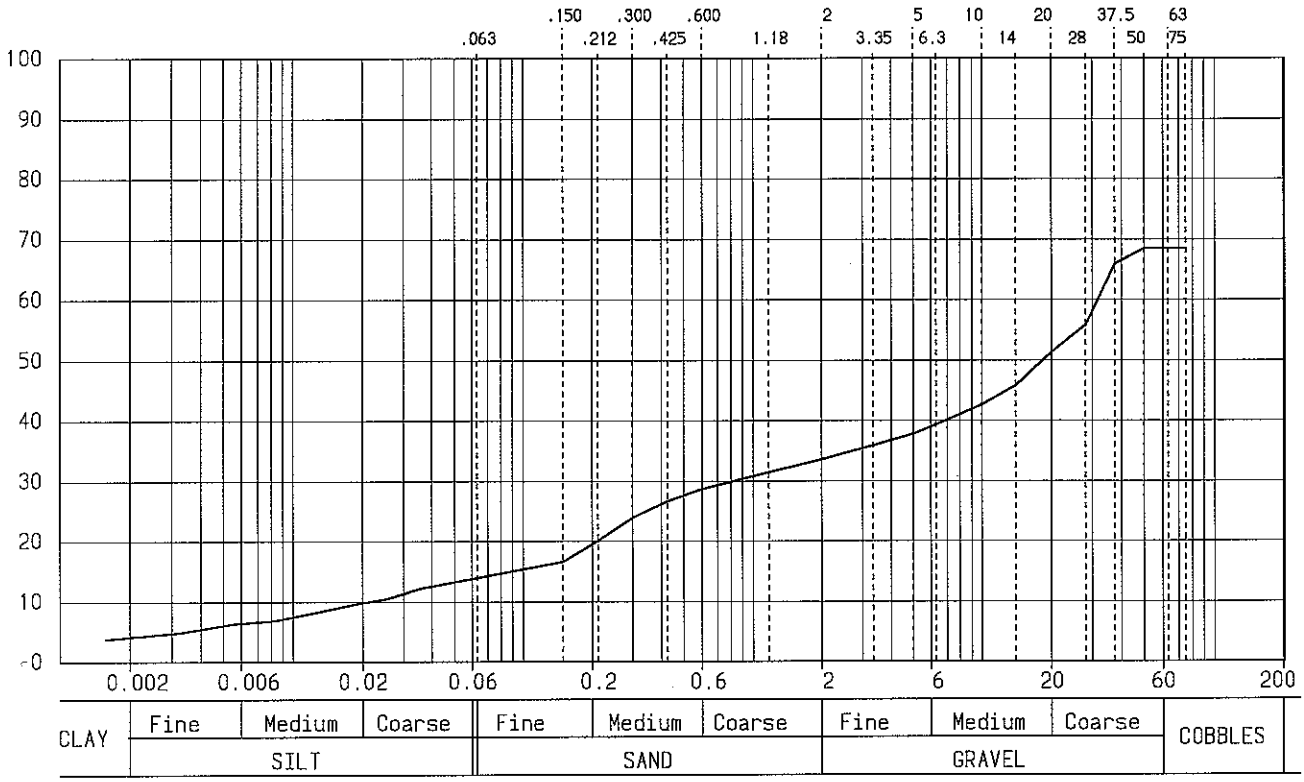
Q.A. Ref: /018-14/M4BB1A6.PSD 2.06 : C/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Medium dense reddish brown slightly clayey sandy GRAVEL with some cobbles.	Hole ID	BHB2
		Sample No.	
		Depth	1.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	68.5	0.04937	13.3
63.000	68.5	0.03533	12.2
50.000	68.5	0.02547	10.5
37.500	66.0	0.01819	9.6
28.000	55.9	0.01265	8.3
20.000	51.4	0.00836	6.9
14.000	45.8	0.00554	6.4
10.000	42.7	0.00424	5.6
6.300	39.4	0.00322	4.9
5.000	37.9	0.00157	3.8
3.350	35.9		
2.000	33.6		
1.180	31.4		
0.600	28.7		
0.425	26.7		
0.300	24.0		
0.212	20.2		
0.150	16.6		
0.063	14.0		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	4
Silt	9
Sand	20
Gravel	35
Cobbles	32

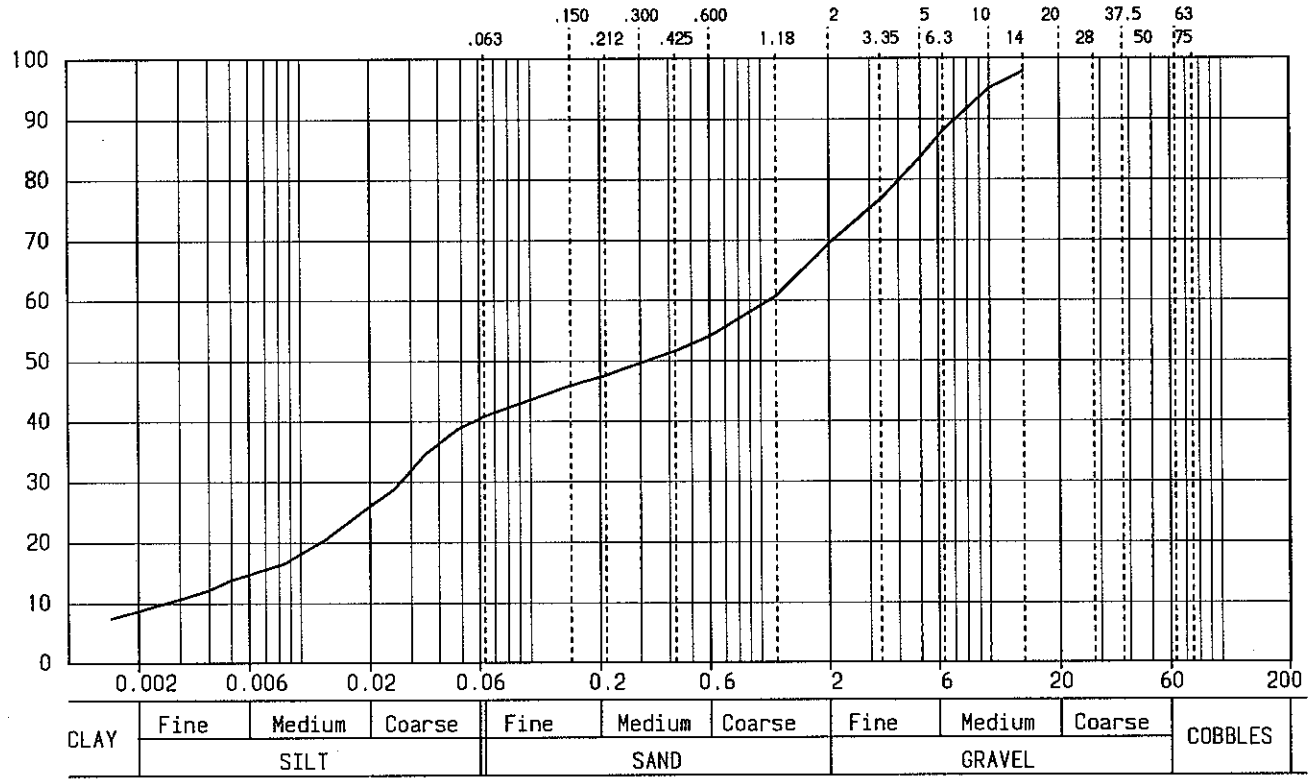
Q.A. Ref: /028-05/M4BHB2.PSD 2.06 : U/Hr192.34/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown mottled greyish green completely weathered MUDSTONE, very weak to weak marl.	Hole ID	BHB2
		Sample No.	
		Depth	2.80m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04836	38.8
63.000	100.0	0.03496	34.6
50.000	100.0	0.02544	28.9
37.500	100.0	0.01833	25.0
28.000	100.0	0.01283	20.6
20.000	100.0	0.00851	16.7
14.000	98.0	0.00494	13.8
10.000	95.2	0.00398	12.2
6.300	88.2	0.00313	10.9
5.000	83.8	0.00153	7.5
3.350	76.8		
2.000	69.5		
1.180	60.8		
0.600	54.1		
0.425	51.7		
0.300	49.7		
0.212	47.6		
0.150	45.9		
0.063	40.8		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	9
Silt	32
Sand	29
Gravel	30
Cobbles	0

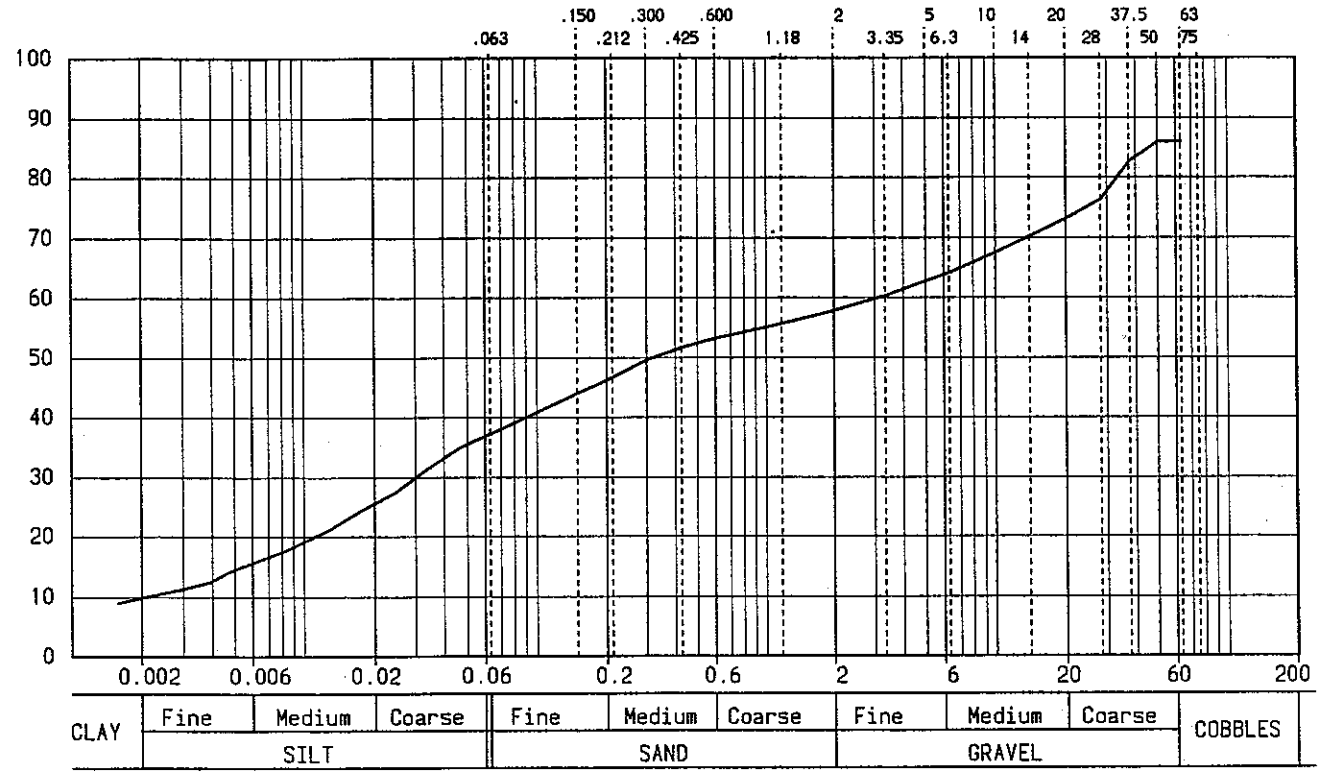
Q.A. Ref: /028-13/M4B2.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some subangular fine to medium sandstone and mudstone gravel and occasional cobbles	Hole ID	BHB3
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04691	35.1
63.000	86.0	0.03405	31.4
50.000	86.0	0.02472	27.5
37.500	82.7	0.01781	24.6
28.000	76.4	0.01250	20.9
20.000	73.1	0.00831	17.7
14.000	70.2	0.00485	14.4
10.000	67.5	0.00392	12.5
6.300	64.1	0.00309	11.5
5.000	62.8	0.00158	9.0
3.350	60.3		
2.000	58.0		
1.180	55.7		
0.600	53.2		
0.425	51.7		
0.300	49.7		
0.212	46.7		
0.150	44.1		
0.063	37.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	10
Silt	27
Sand	21
Gravel	28
Cobbles	14

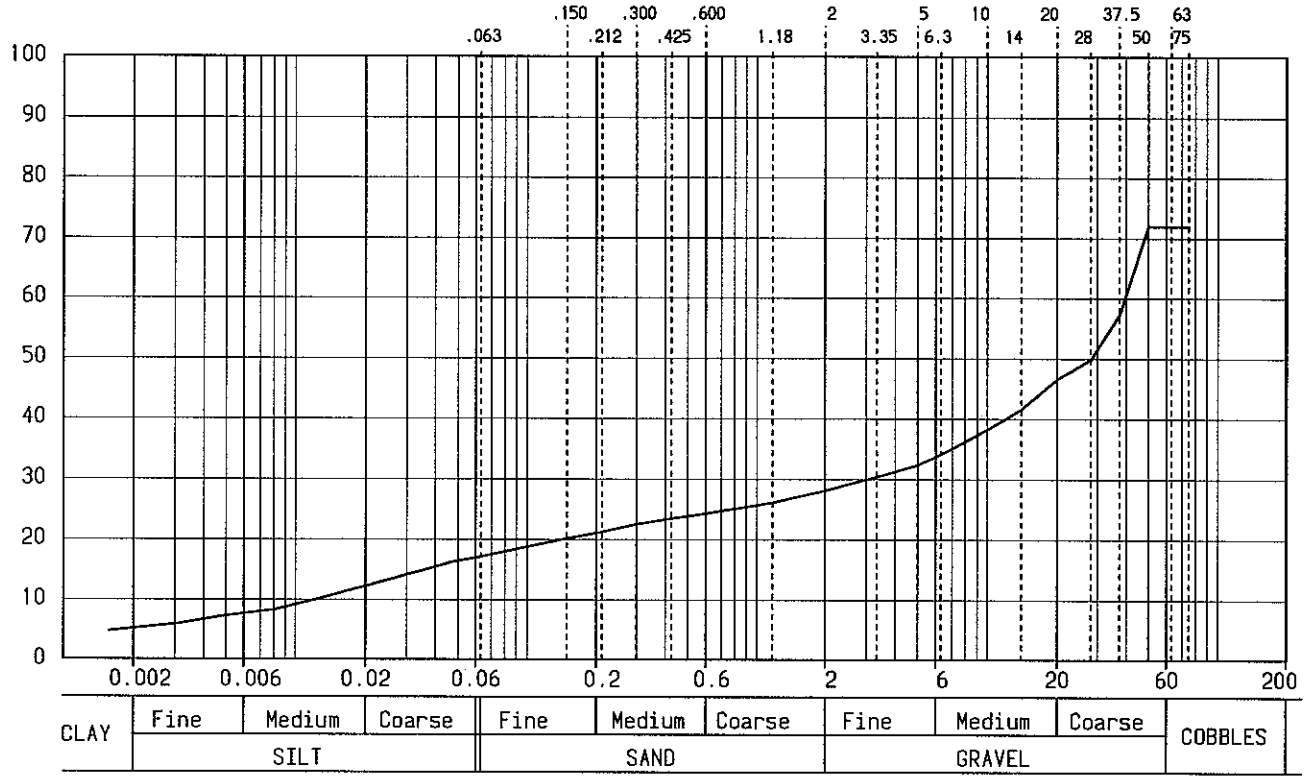
Q.A. Ref: /127-10/M48B305.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown slighttly clayey sandy GRAVEL with cobbles.	Hole ID	BHB16A
		Sample No.	
		Depth	1.90m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	72.0	0.04733	16.3
63.000	72.0	0.03420	14.8
50.000	72.0	0.02472	13.2
37.500	57.3	0.01781	11.8
28.000	49.9	0.01250	10.0
20.000	46.6	0.00831	8.4
14.000	41.7	0.00482	7.2
10.000	38.2	0.00390	6.6
6.300	34.0	0.00307	6.0
5.000	32.4	0.00157	4.8
3.350	30.4		
2.000	28.2		
1.180	26.2		
0.600	24.4		
0.425	23.5		
0.300	22.6		
0.212	21.3		
0.150	20.3		
0.063	17.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	5
Silt	12
Sand	11
Gravel	44
Cobbles	28

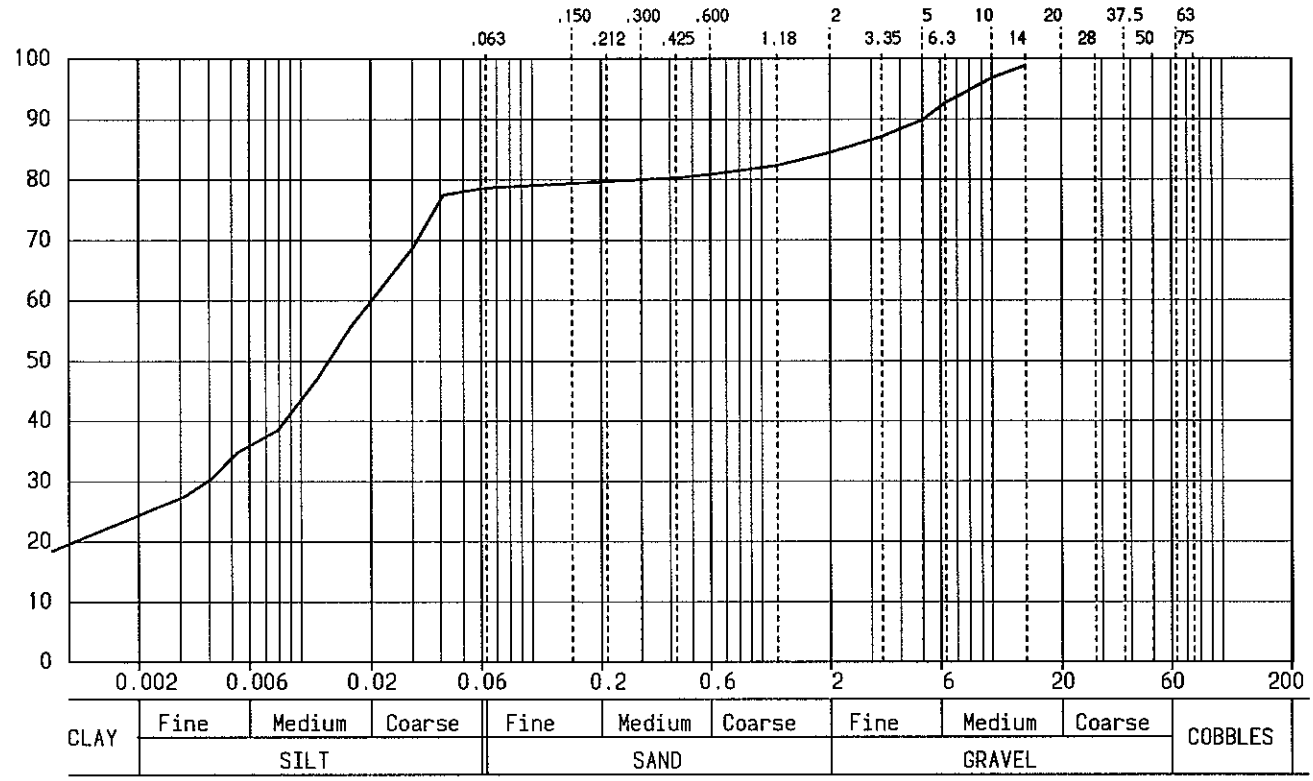
Q.A. Ref: /028-16/M4b16a.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Firm to stiff reddish brown mottled grey highly weathered MUDSTONE.	Hole ID	BHB17
		Sample No.	
		Depth	1.00m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	99.0
10.000	96.9
6.300	92.7
5.000	89.9
3.350	87.1
2.000	84.5
1.180	82.4
0.600	80.8
0.425	80.3
0.300	80.0
0.212	79.7
0.150	79.4
0.063	78.6

Particle Size	Cumulative % Passing
0.05785	78.4
0.04115	77.5
0.03059	69.0
0.02241	62.4
0.01638	55.8
0.01171	47.0
0.00792	38.6
0.00531	34.8
0.00409	30.4
0.00313	27.6
0.00085	18.5

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	24
Silt	54
Sand	6
Gravel	16
Cobbles	0

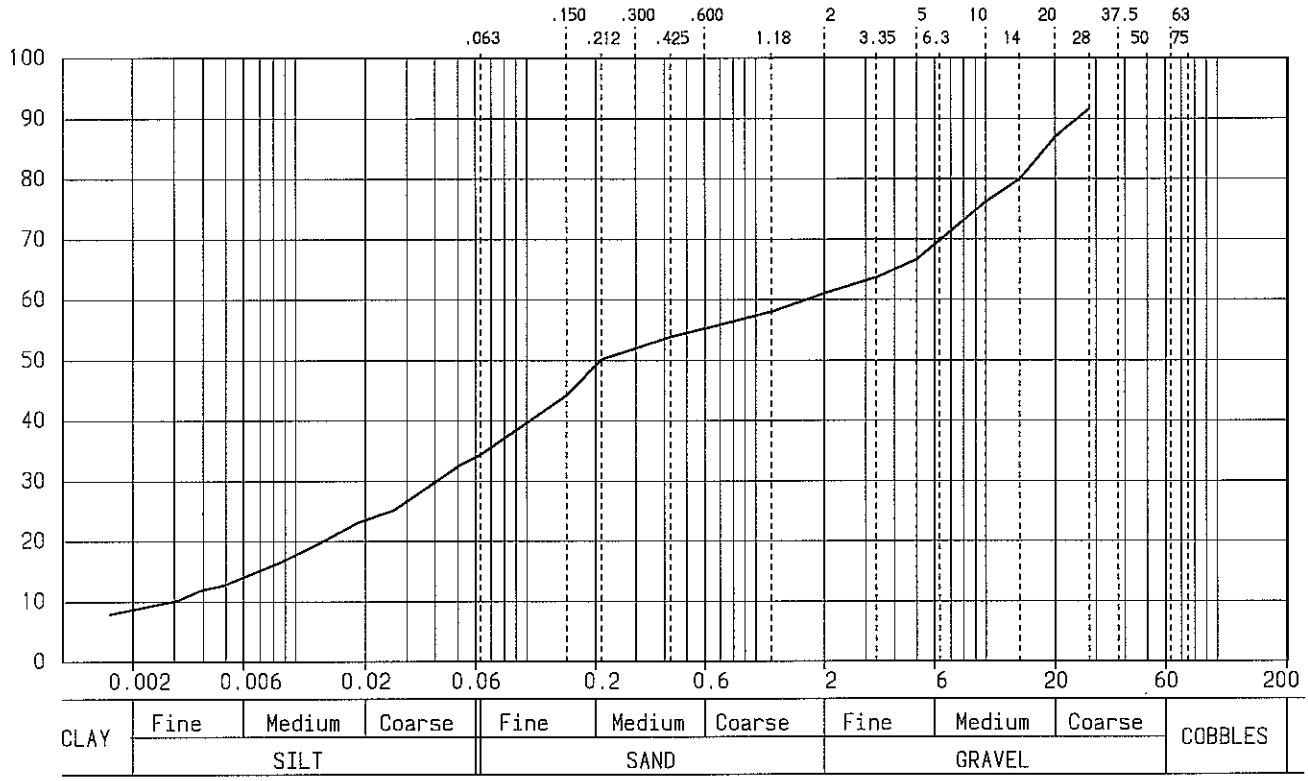
Q.A. Ref: /018-14/M4BB171.PSD 2.06 : U/Hr203.01/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown micaceous sandy CLAY with some subangular gravel of micaceous sandstone.	Hole ID	BHB19
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05043	32.6
63.000	100.0	0.03630	28.7
50.000	100.0	0.02608	25.1
37.500	100.0	0.01860	23.2
28.000	91.7	0.01294	19.9
20.000	87.0	0.00855	16.6
14.000	80.0	0.00489	12.7
10.000	76.2	0.00390	11.9
6.300	69.9	0.00310	10.2
5.000	66.7	0.00159	8.0
3.350	63.8		
2.000	61.1		
1.180	58.1		
0.600	55.3		
0.425	53.9		
0.300	52.0		
0.212	50.2		
0.150	44.3		
0.063	34.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	9
Silt	25
Sand	27
Gravel	39
Cobbles	0

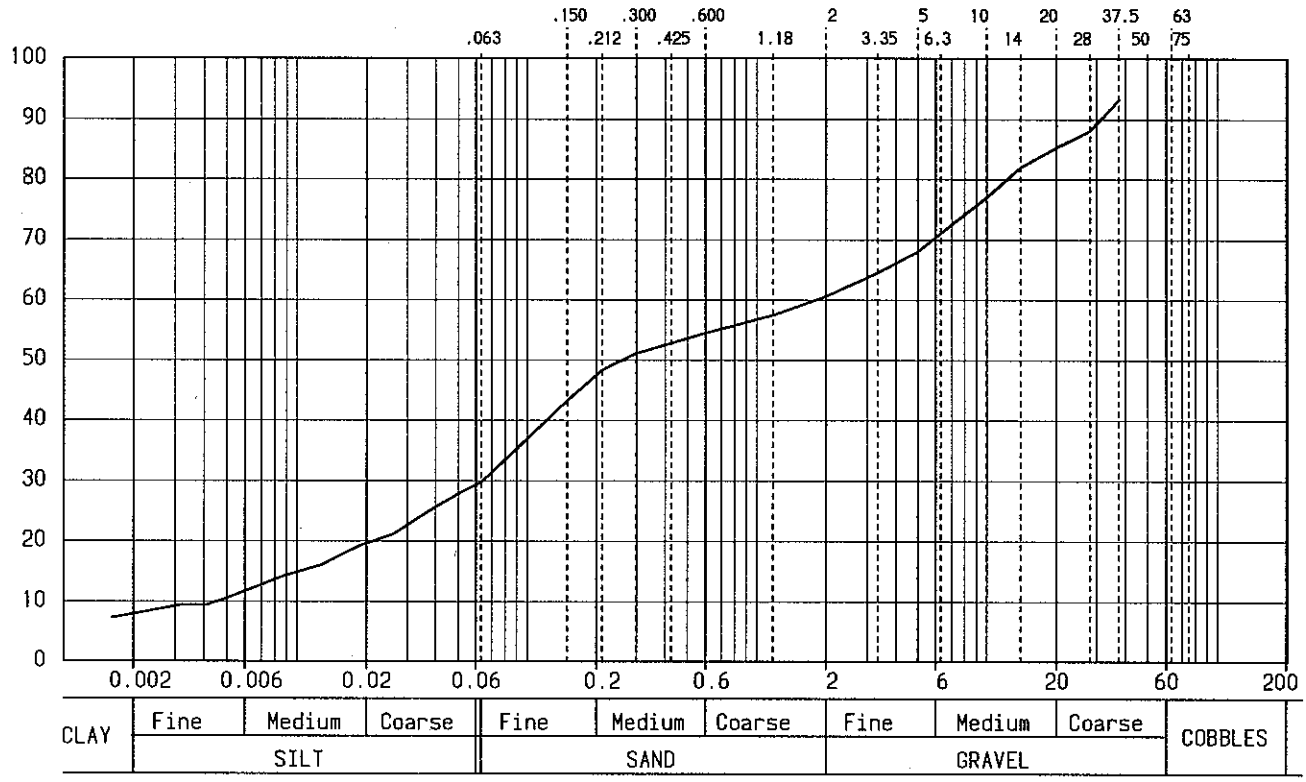
Q.A. Ref: /028-02/M4B19.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown fine to medium thinly and thickly laminated, highly to completely weathered micaceous silty SANDSTONE.	Hole ID	BHB19
		Sample No.	
		Depth	1.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05043	28.0
63.000	100.0	0.03630	24.7
50.000	100.0	0.02615	21.2
37.500	93.3	0.01867	19.3
28.000	88.2	0.01300	16.2
20.000	85.3	0.00856	14.1
14.000	82.0	0.00520	10.8
10.000	77.1	0.00413	9.4
6.300	71.2	0.00320	9.4
5.000	68.1	0.00161	7.3
3.350	64.6		
2.000	60.7		
1.180	57.5		
0.600	54.5		
0.425	52.9		
0.300	51.1		
0.212	48.4		
0.150	43.3		
0.063	29.7		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	8
Silt	22
Sand	31
Gravel	39
Cobbles	0

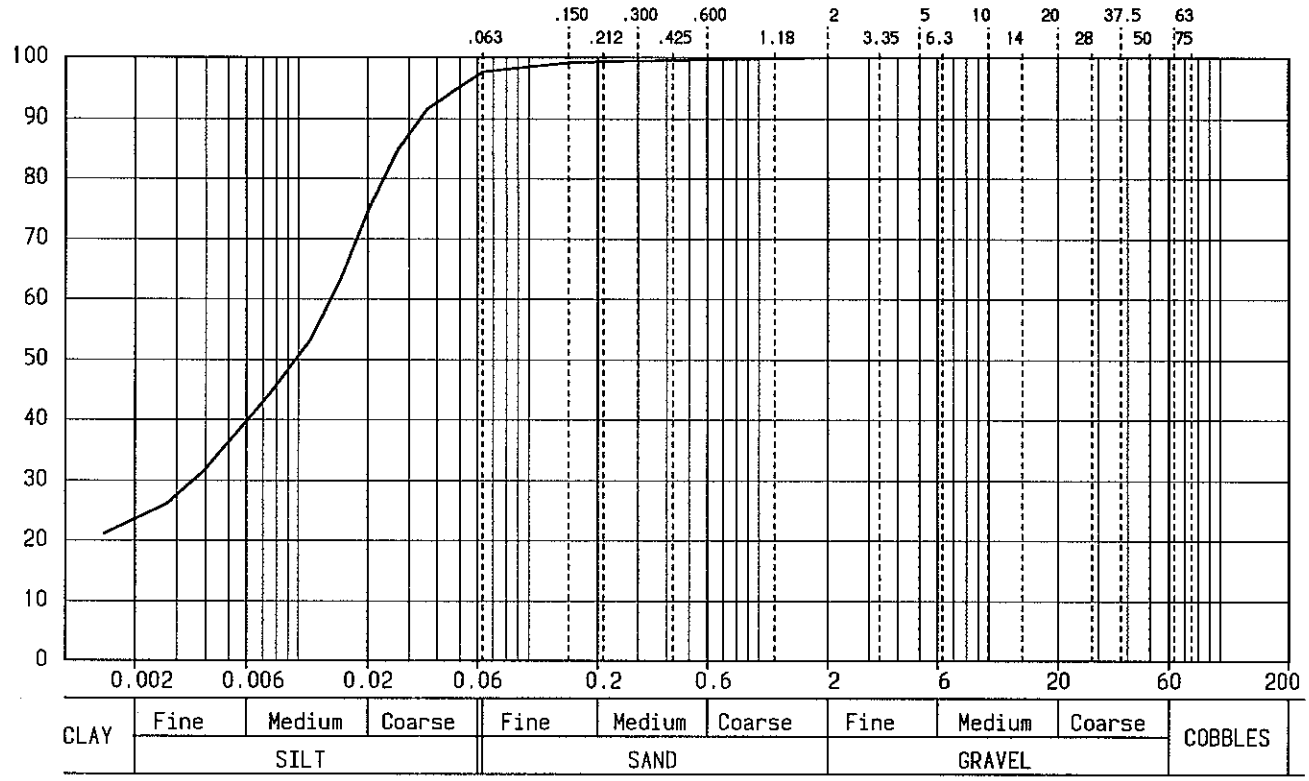
Q.A. Ref: /028-13/M4B191.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Firm to stiff reddish brown very clayey completely weathered MUDSTONE.	Hole ID	BHC2
		Sample No.	
		Depth	1.50m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.7
0.425	99.6
0.300	99.5
0.212	99.4
0.150	99.2
0.063	97.7

Particle Size	Cumulative % Passing
0.04980	95.1
0.03622	91.6
0.02692	84.8
0.02028	75.2
0.01534	63.6
0.01111	53.0
0.00754	44.4
0.00391	31.5
0.00328	28.9
0.00271	26.0
0.00147	21.2

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	24
Silt	74
Sand	2
Gravel	0
Cobbles	0

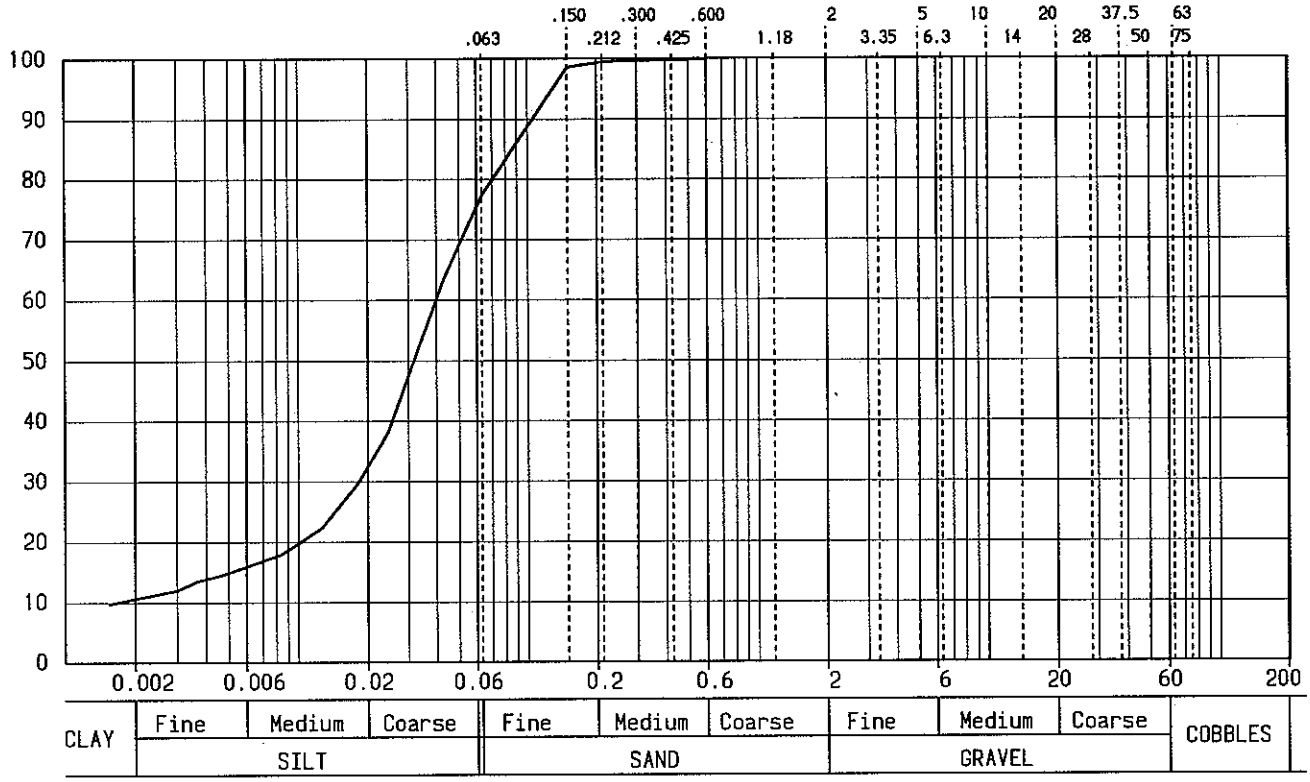
Q.A. Ref: /018-14/M4BC215.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft brown very clayey SILT.	Hole ID	BHC2
		Sample No.	
		Depth	3.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05726	73.9
63.000	100.0	0.04307	63.5
50.000	100.0	0.03254	51.0
37.500	100.0	0.02442	38.1
28.000	100.0	0.01790	29.6
20.000	100.0	0.01263	22.3
14.000	100.0	0.00837	17.9
10.000	100.0	0.00460	14.5
6.300	100.0	0.00371	13.5
5.000	100.0	0.00298	12.0
3.350	100.0	0.00155	9.8
2.000	100.0		
1.180	100.0		
0.600	99.9		
0.425	99.9		
0.300	99.7		
0.212	99.5		
0.150	98.7		
0.063	77.4		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	11
Silt	66
Sand	23
Gravel	0
Cobbles	0

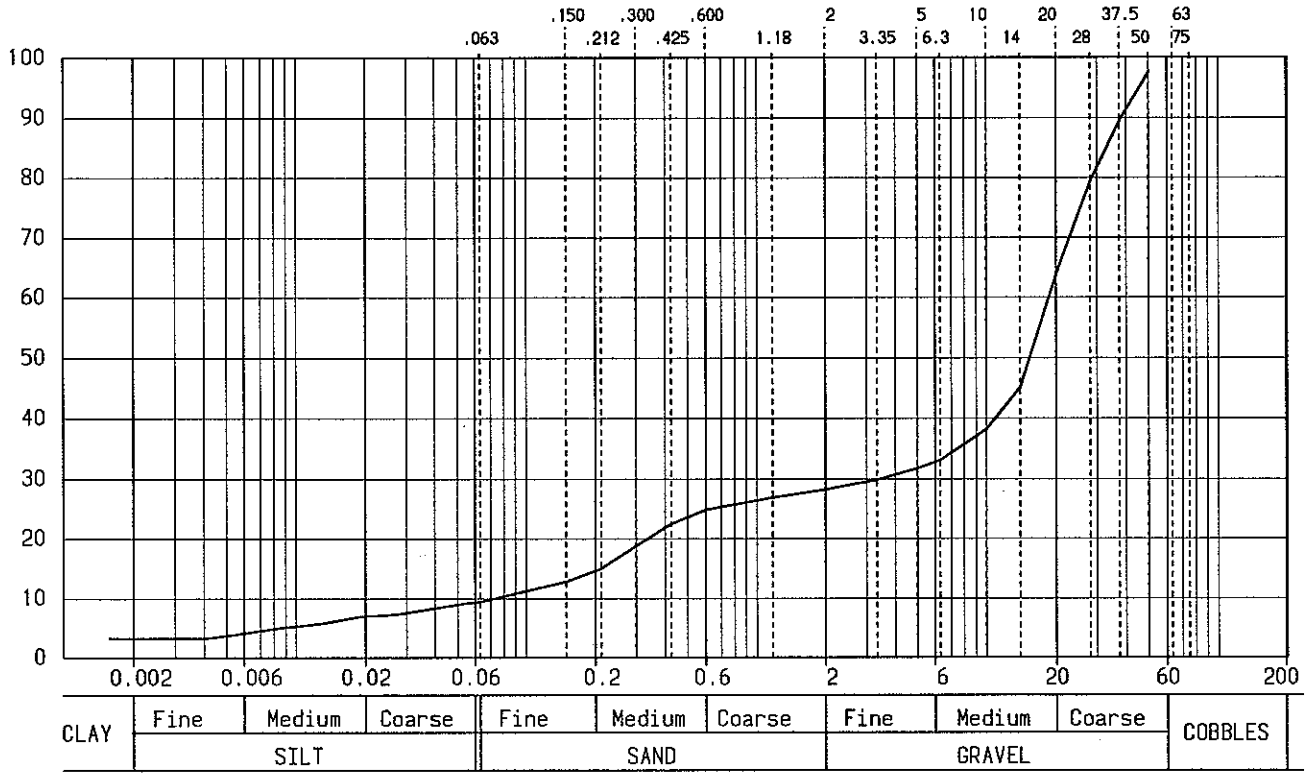
Q.A. Ref: /018-15/M4BC235.PSD 2.06 : U/Hr192.36/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown mottled greyish green slightly clayey sandy GRAVEL	Hole ID	BHC3
		Sample No.	
		Depth	1.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05246	9.2
63.000	100.0	0.03740	8.1
50.000	97.6	0.02663	7.3
37.500	89.6	0.01888	7.0
28.000	79.5	0.01307	5.8
20.000	64.0	0.00857	5.1
14.000	45.2	0.00495	3.8
10.000	38.3	0.00398	3.3
6.300	33.1	0.00312	3.3
5.000	31.8	0.00158	3.3
3.350	29.9		
2.000	28.3		
1.180	26.9		
0.600	24.9		
0.425	22.6		
0.300	18.8		
0.212	15.0		
0.150	12.8		
0.063	9.5		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	3
Silt	6
Sand	19
Gravel	72
Cobbles	0

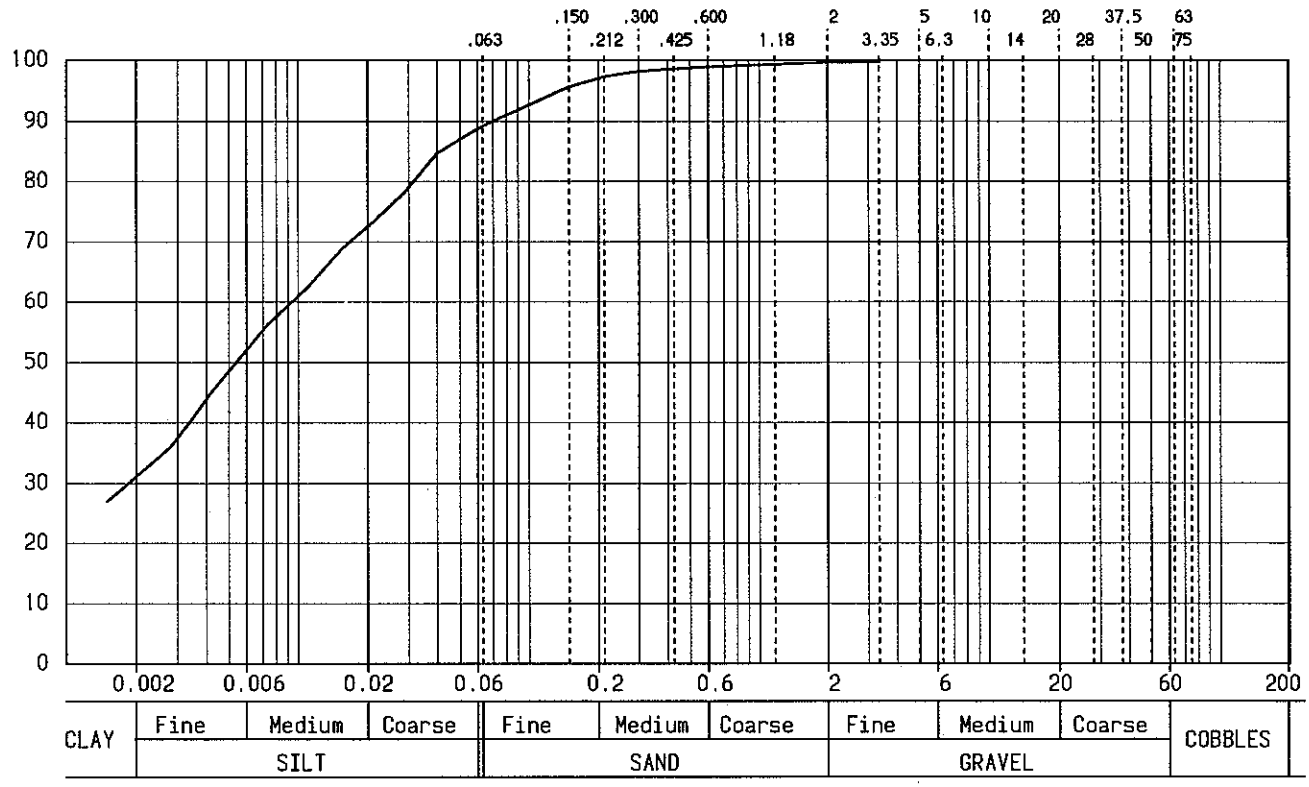
Q.A. Ref: /028-14/m4bc315.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown occasionaly mottled greyish green highly to moderatly weathered very weak silty MUDSTONE marl.	Hole ID	BHC3
		Sample No.	
		Depth	3.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05517	87.9
63.000	100.0	0.03985	84.7
50.000	100.0	0.02927	78.6
37.500	100.0	0.02132	73.4
28.000	100.0	0.01545	68.9
20.000	100.0	0.01096	62.5
14.000	100.0	0.00736	56.4
10.000	100.0	0.00420	45.1
6.300	100.0	0.00344	40.6
5.000	100.0	0.00280	36.1
3.350	99.8	0.00149	27.1
2.000	99.7		
1.180	99.4		
0.600	99.0		
0.425	98.7		
0.300	98.2		
0.212	97.4		
0.150	95.7		
0.063	89.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	31
Silt	59
Sand	10
Gravel	0
Cobbles	0

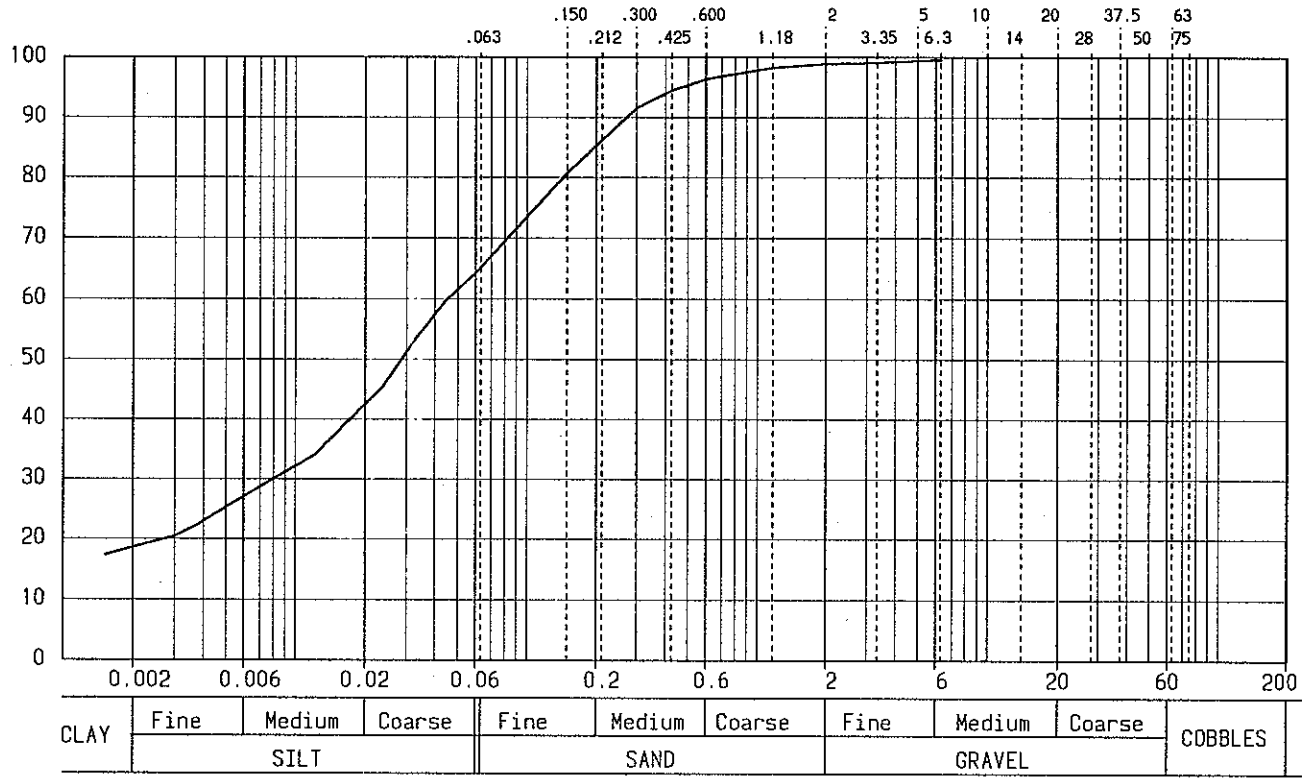
Q.A. Ref: /018-30/M4BC3.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft reddish brown very sandy CLAY.	Hole ID	BHC4
		Sample No.	
		Depth	0.90m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.06059	64.6
63.000	100.0	0.04405	59.6
50.000	100.0	0.03223	52.9
37.500	100.0	0.02364	45.4
28.000	100.0	0.01713	40.0
20.000	100.0	0.01206	34.0
14.000	100.0	0.00799	29.9
10.000	100.0	0.00468	24.6
6.300	99.6	0.00378	22.4
5.000	99.5	0.00298	20.5
3.350	99.2	0.00152	17.3
2.000	99.0		
1.180	98.3		
0.600	96.4		
0.425	94.6		
0.300	91.6		
0.212	86.3		
0.150	80.7		
0.063	65.2		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	19
Silt	46
Sand	34
Gravel	1
Cobbles	0

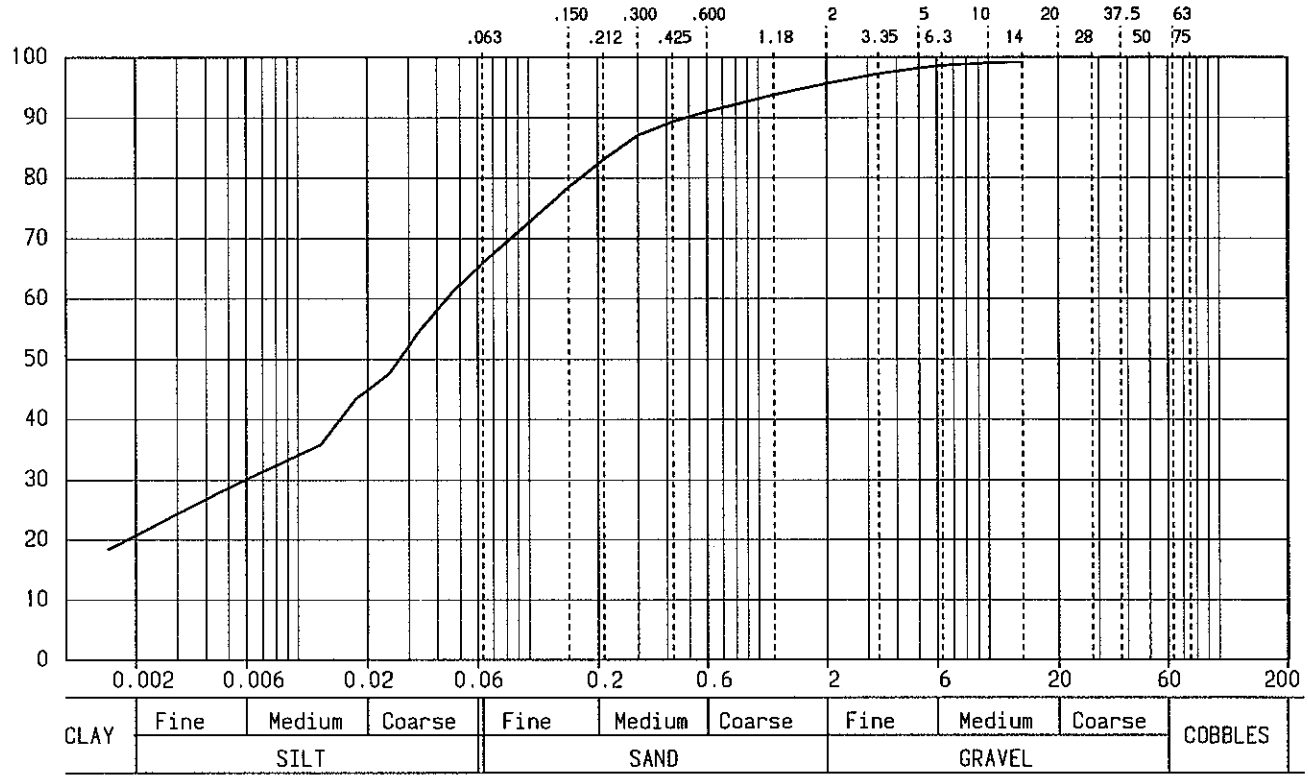
Q.A. Ref: /018-12/m4rnc409.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown mottled greyish green sandy CLAY with a little subangular to subrounded fine siliceous gravel.	Hole ID	BHC4
		Sample No.	
		Depth	1.90m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04649	61.1
63.000	100.0	0.03376	54.9
50.000	100.0	0.02459	47.6
37.500	100.0	0.01767	43.4
28.000	100.0	0.01247	35.8
20.000	100.0	0.00945	33.7
14.000	99.2	0.00580	29.9
10.000	99.1	0.00432	27.4
6.300	98.6	0.00325	25.0
5.000	98.2	0.00151	18.4
3.350	97.3		
2.000	95.7		
1.180	93.8		
0.600	91.0		
0.425	89.3		
0.300	87.1		
0.212	83.1		
0.150	78.6		
0.063	66.0		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	21
Silt	45
Sand	30
Gravel	4
Cobbles	0

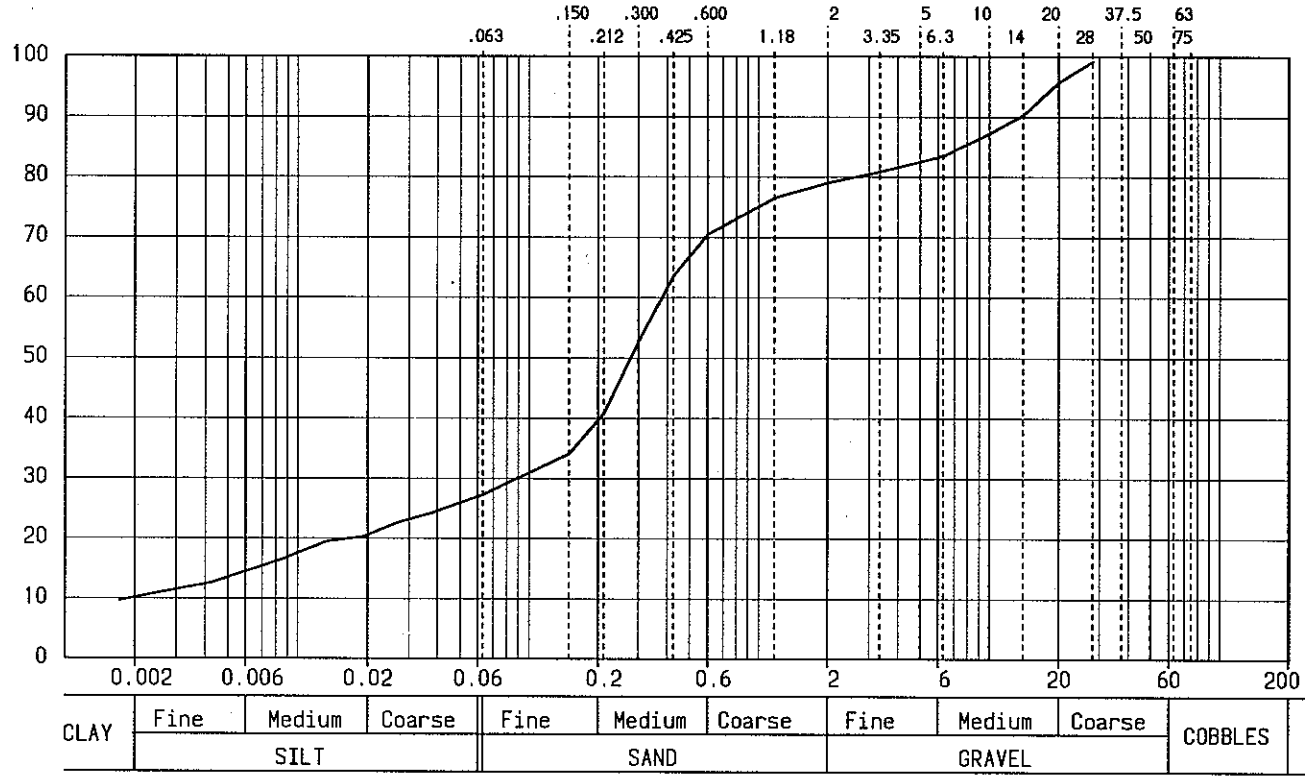
Q.A. Ref: /028-16/M4C4.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown sandy CLAY with some fine to coarse gravel.	Hole ID	BHC7
		Sample No.	
		Depth	2.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05320	26.3
63.000	100.0	0.03793	24.3
50.000	100.0	0.02701	22.6
37.500	100.0	0.01927	20.4
28.000	99.2	0.01327	19.5
20.000	95.8	0.00874	16.7
14.000	90.2	0.00436	12.7
10.000	87.3	0.00171	9.6
6.300	83.6		
5.000	82.6		
3.350	80.9		
2.000	79.1		
1.180	76.6		
0.600	70.5		
0.425	63.6		
0.300	52.7		
0.212	40.9		
0.150	34.2		
0.063	27.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

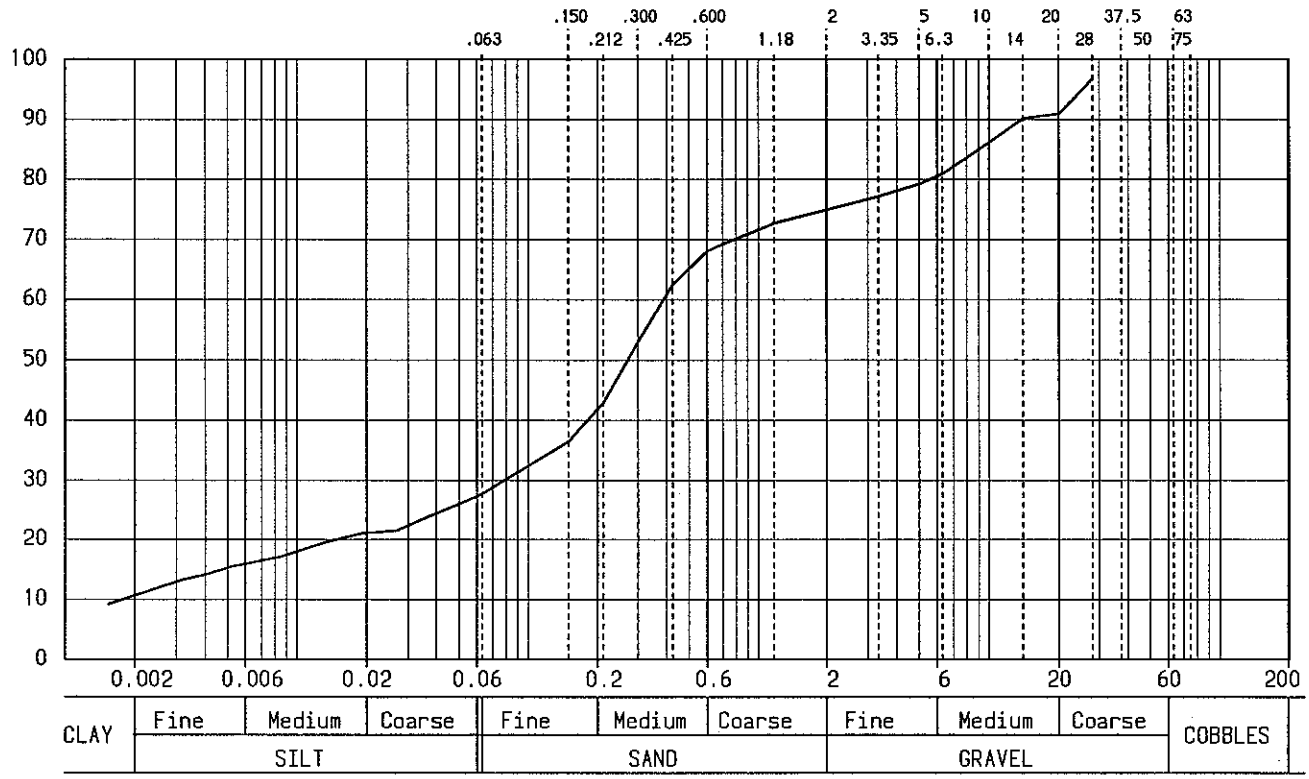
Clay	10
Silt	17
Sand	52
Gravel	21
Cobbles	0

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown sandy CLAY with some subangular sandstone and mudstone gravel	Hole ID	BHC5A
		Sample No.	
		Depth	1.05m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05286	26.4
63.000	100.0	0.03768	24.1
50.000	100.0	0.02689	21.5
37.500	100.0	0.01904	21.1
28.000	96.9	0.01313	19.5
20.000	90.9	0.00863	17.2
14.000	90.2	0.00519	15.5
10.000	86.2	0.00411	14.2
6.300	81.0	0.00319	13.2
5.000	79.3	0.00154	9.2
3.350	77.2		
2.000	75.0		
1.180	72.8		
0.600	68.2		
0.425	62.6		
0.300	53.0		
0.212	43.0		
0.150	36.5		
0.063	27.8		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	11
Silt	17
Sand	47
Gravel	25
Cobbles	0

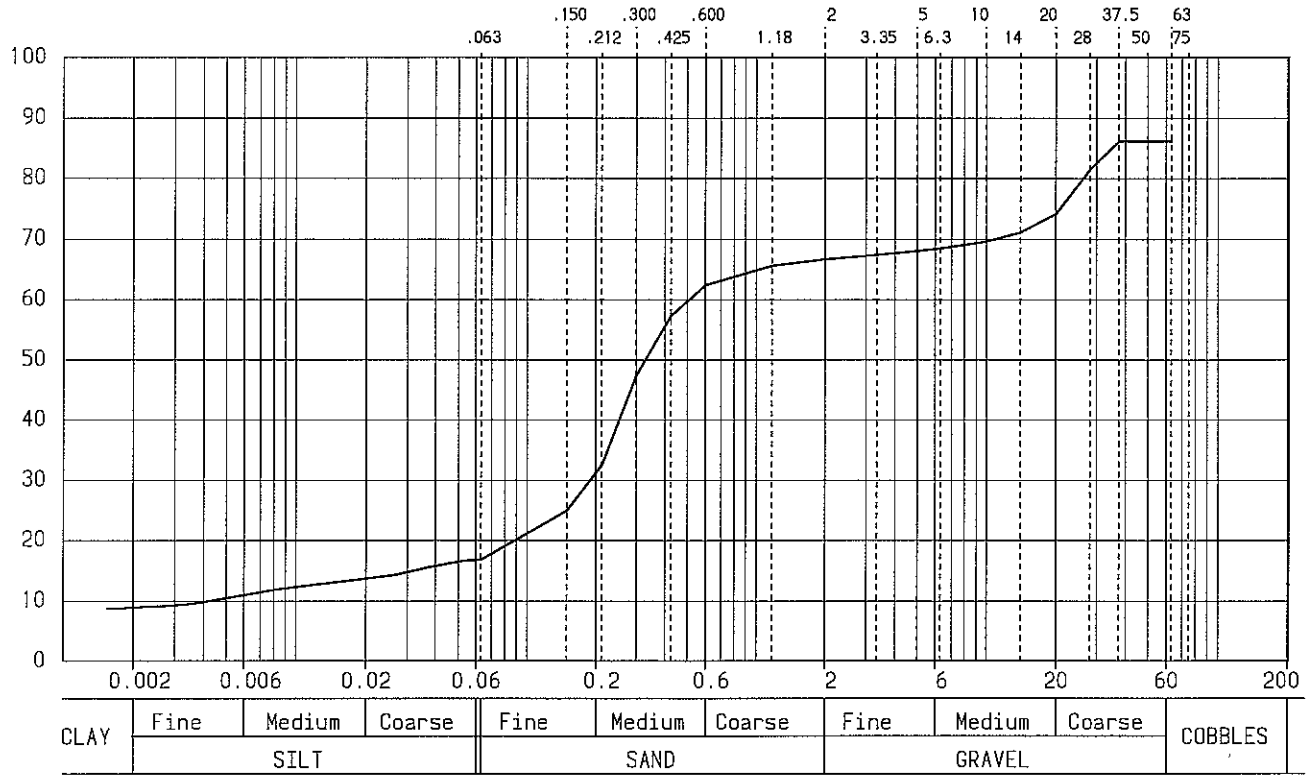
Q.A. Ref: /028-14/m4bc5a1.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown clayey SAND with some gravel and occasional cobbles.	Hole ID	BHC5A
		Sample No.	
		Depth	2.15m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	86.2
50.000	86.2
37.500	86.2
28.000	81.5
20.000	74.2
14.000	71.2
10.000	69.6
6.300	68.5
5.000	68.1
3.350	67.5
2.000	66.7
1.180	65.6
0.600	62.4
0.425	57.3
0.300	47.5
0.212	32.6
0.150	25.0
0.063	16.8

Particle Size	Cumulative % Passing
0.05210	16.6
0.03711	15.6
0.02646	14.3
0.01880	13.6
0.01295	12.8
0.00849	11.9
0.00435	10.1
0.00359	9.6
0.00292	9.2
0.00154	8.7

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	9
Silt	8
Sand	50
Gravel	19
Cobbles	14

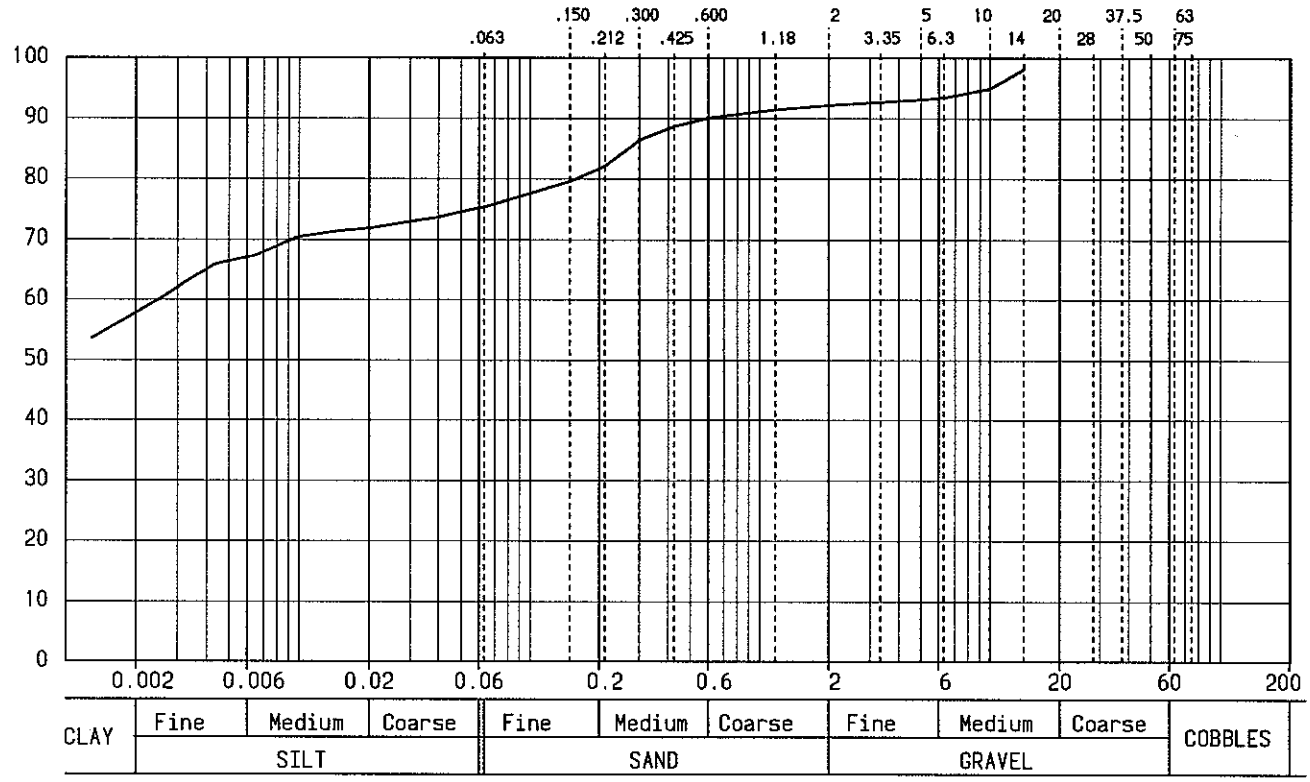
Q.A. Ref: /028-02/M4BHC5A.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown slightly sandy CLAY with a little fine to medium gravel.	Hole ID	BHC5A
		Sample No.	
		Depth	3.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05552	74.9
63.000	100.0	0.03959	73.7
50.000	100.0	0.02817	72.8
37.500	100.0	0.02004	71.9
28.000	100.0	0.01423	71.3
20.000	100.0	0.00982	70.4
14.000	98.2	0.00653	67.5
10.000	95.0	0.00435	66.0
6.300	93.5	0.00335	63.3
5.000	93.1	0.00258	60.3
3.350	92.7	0.00129	53.7
2.000	92.2		
1.180	91.4		
0.600	90.1		
0.425	88.7		
0.300	86.3		
0.212	82.2		
0.150	79.6		
0.063	75.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	58
Silt	17
Sand	17
Gravel	8
Cobbles	0

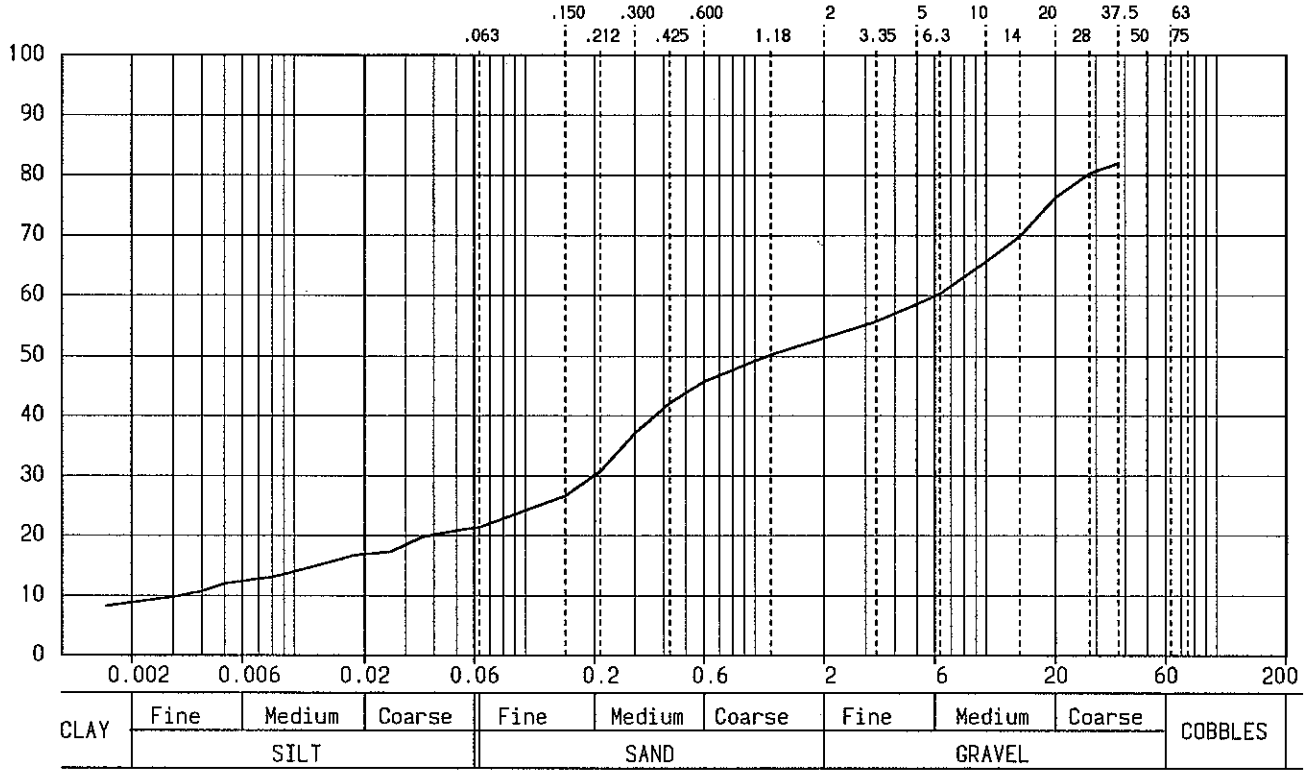
Q.A. Ref: /018-30/M4BC5A.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown clayey SAND and GRAVEL.	Hole ID	BHC6
		Sample No.	
		Depth	1.60m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05023	20.8
63.000	100.0	0.03575	19.8
50.000	100.0	0.02566	17.3
37.500	82.1	0.01821	16.7
28.000	80.4	0.01262	15.1
20.000	76.3	0.00831	13.2
14.000	69.8	0.00500	12.0
10.000	65.7	0.00397	10.7
6.300	60.4	0.00309	9.9
5.000	58.6	0.00155	8.3
3.350	55.8		
2.000	53.0		
1.180	50.3		
0.600	45.9		
0.425	42.3		
0.300	37.1		
0.212	30.9		
0.150	26.7		
0.063	21.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	9
Silt	12
Sand	32
Gravel	47
Cobbles	0

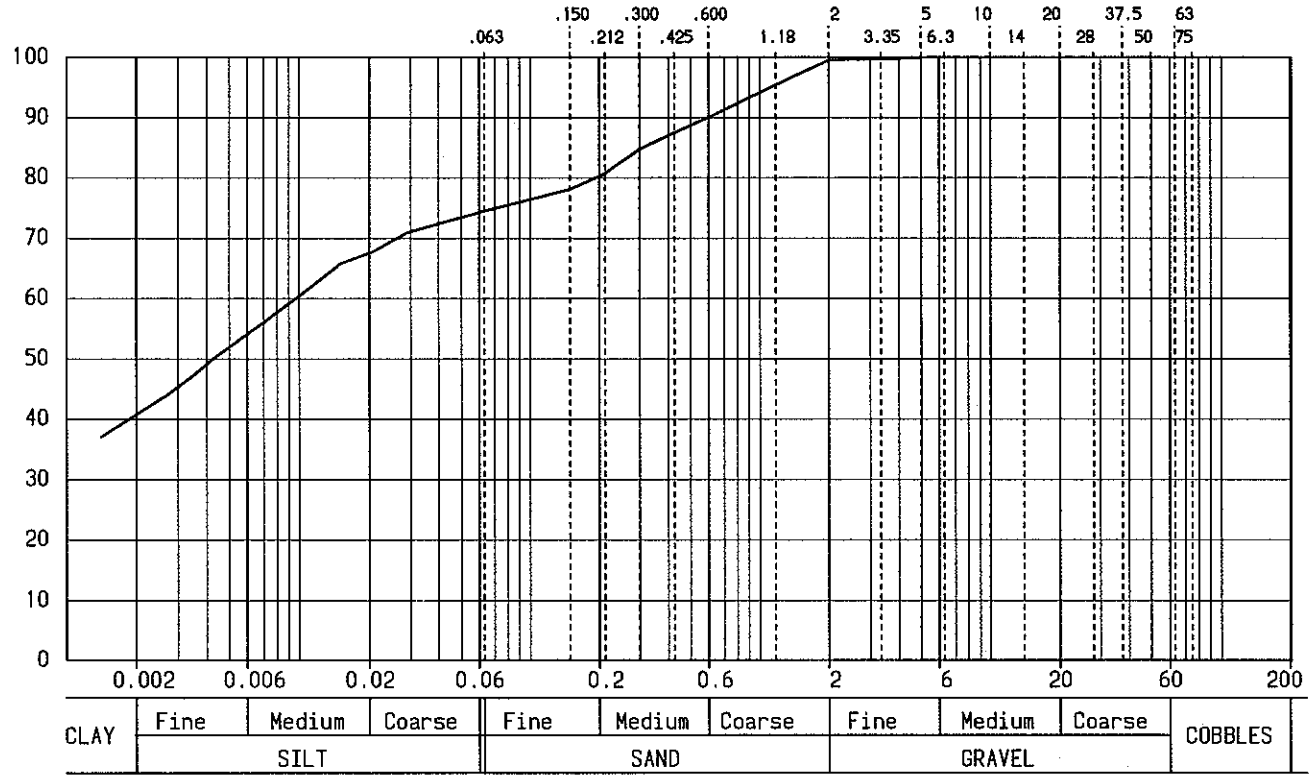
Q.A. Ref: /028-14/m4BC6.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Firm brown and grey sandy CLAY.	Hole ID	BHC7
		Sample No.	
		Depth	1.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05668	74.0
63.000	100.0	0.04049	72.5
50.000	100.0	0.02891	71.0
37.500	100.0	0.02084	67.9
28.000	100.0	0.01493	65.7
20.000	100.0	0.01052	61.1
14.000	100.0	0.00705	56.1
10.000	100.0	0.00434	50.3
6.300	100.0	0.00348	47.2
5.000	99.9	0.00273	44.1
3.350	99.9	0.00141	37.0
2.000	99.6		
1.180	95.5		
0.600	90.1		
0.425	87.6		
0.300	84.8		
0.212	80.8		
0.150	78.1		
0.063	74.5		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	41
Silt	34
Sand	25
Gravel	0
Cobbles	0

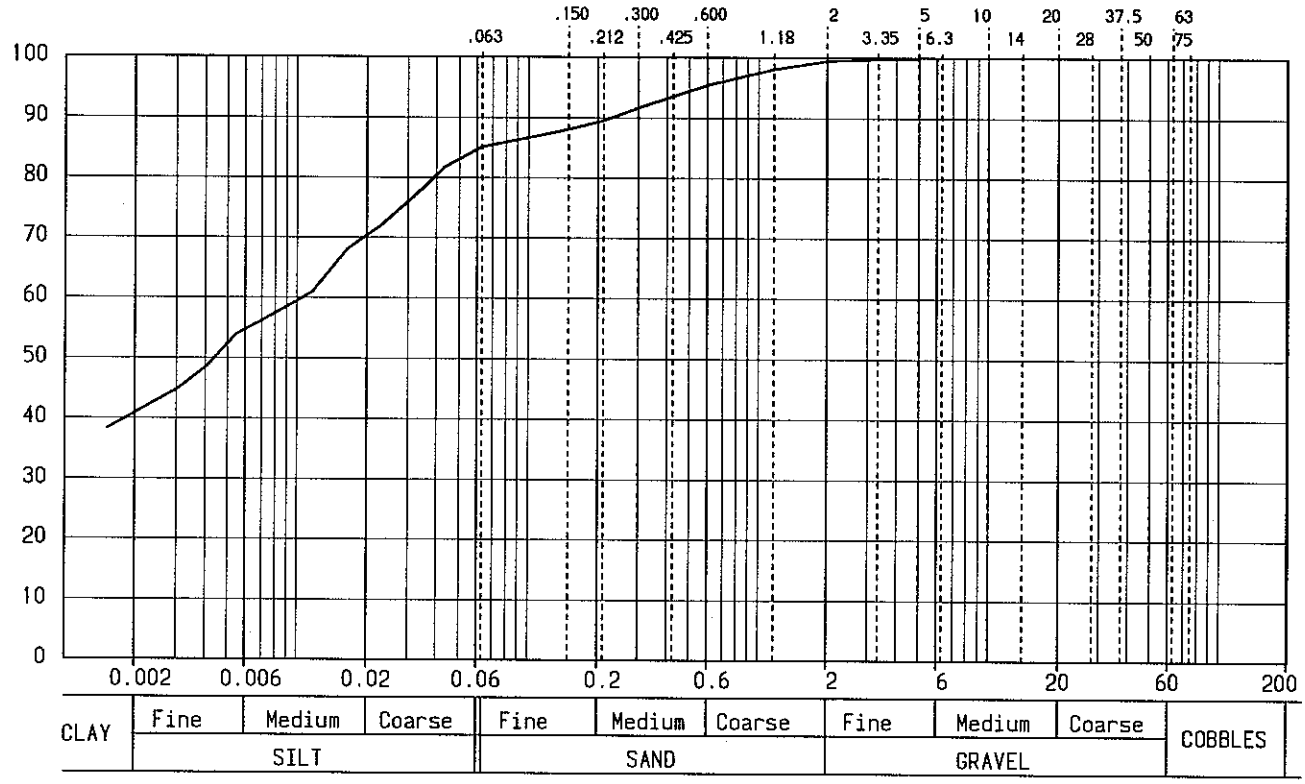
Q.A. Ref: /018-15/M4BC71.PSD 2.06 : U/Hr192.36/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown mottled grey slightly sandy CLAY.	Hole ID	BHC7
		Sample No.	
		Depth	3.40m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.06041	84.7
63.000	100.0	0.04342	81.7
50.000	100.0	0.03151	76.6
37.500	100.0	0.02280	71.9
28.000	100.0	0.01641	68.1
20.000	100.0	0.01162	61.0
14.000	100.0	0.00885	58.3
10.000	100.0	0.00545	53.9
6.300	100.0	0.00411	48.8
5.000	99.9	0.00311	45.1
3.350	99.8	0.00152	38.3
2.000	99.5		
1.180	98.1		
0.600	95.5		
0.425	93.6		
0.300	91.7		
0.212	89.5		
0.150	88.1		
0.063	85.1		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	41
Silt	45
Sand	14
Gravel	0
Cobbles	0

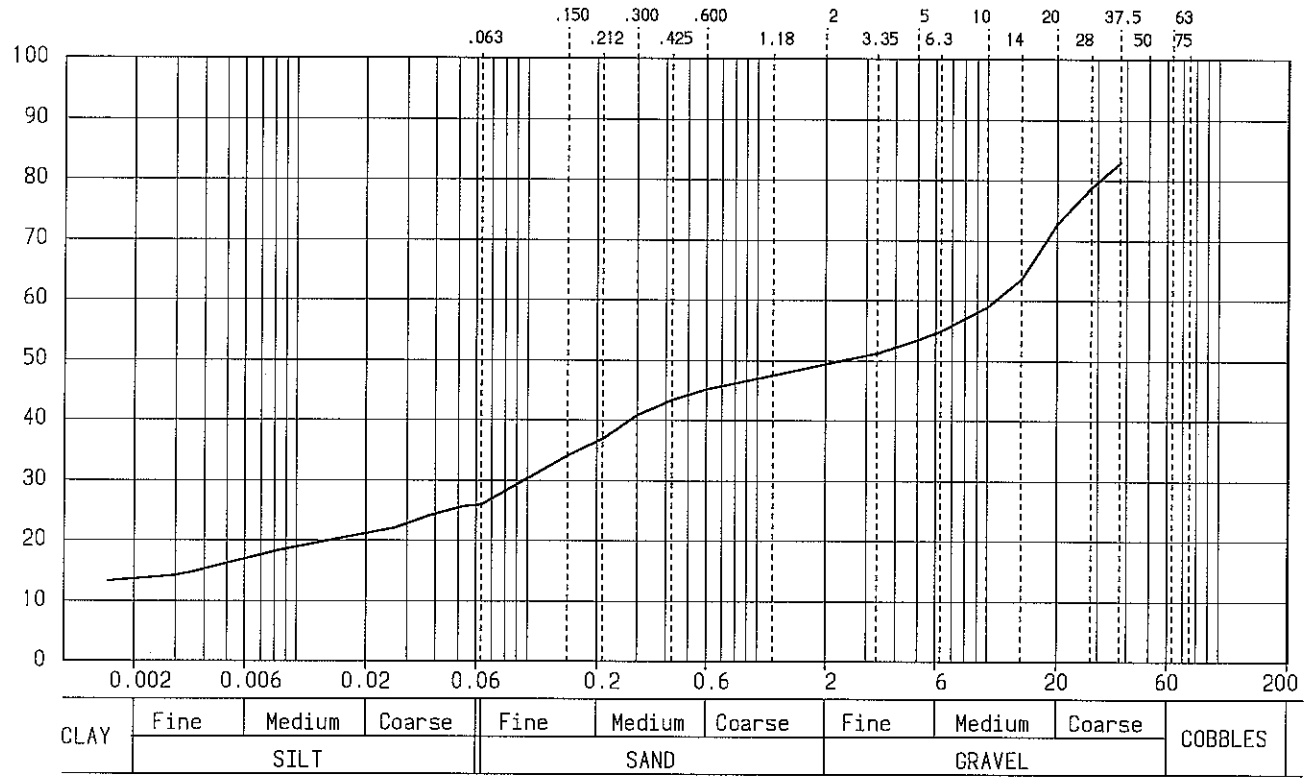
Q.A. Ref: /028-13/M4BC7.PSD 2.06 U/Hr211.53/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Medium dense reddish brown clayey sandy subrounded and occasional subangular GRAVEL.	Hole ID	BHC8
		Sample No.	
		Depth	7.60m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05210	25.7
63.000	100.0	0.03711	24.0
50.000	100.0	0.02646	22.1
37.500	83.0	0.01880	21.0
28.000	78.9	0.01295	19.8
20.000	72.8	0.00849	18.4
14.000	63.6	0.00435	15.6
10.000	59.0	0.00359	14.8
6.300	55.0	0.00292	14.2
5.000	53.5	0.00154	13.4
3.350	51.2		
2.000	49.5		
1.180	47.6		
0.600	45.2		
0.425	43.4		
0.300	40.9		
0.212	37.0		
0.150	34.2		
0.063	26.0		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	14
Silt	12
Sand	23
Gravel	51
Cobbles	0

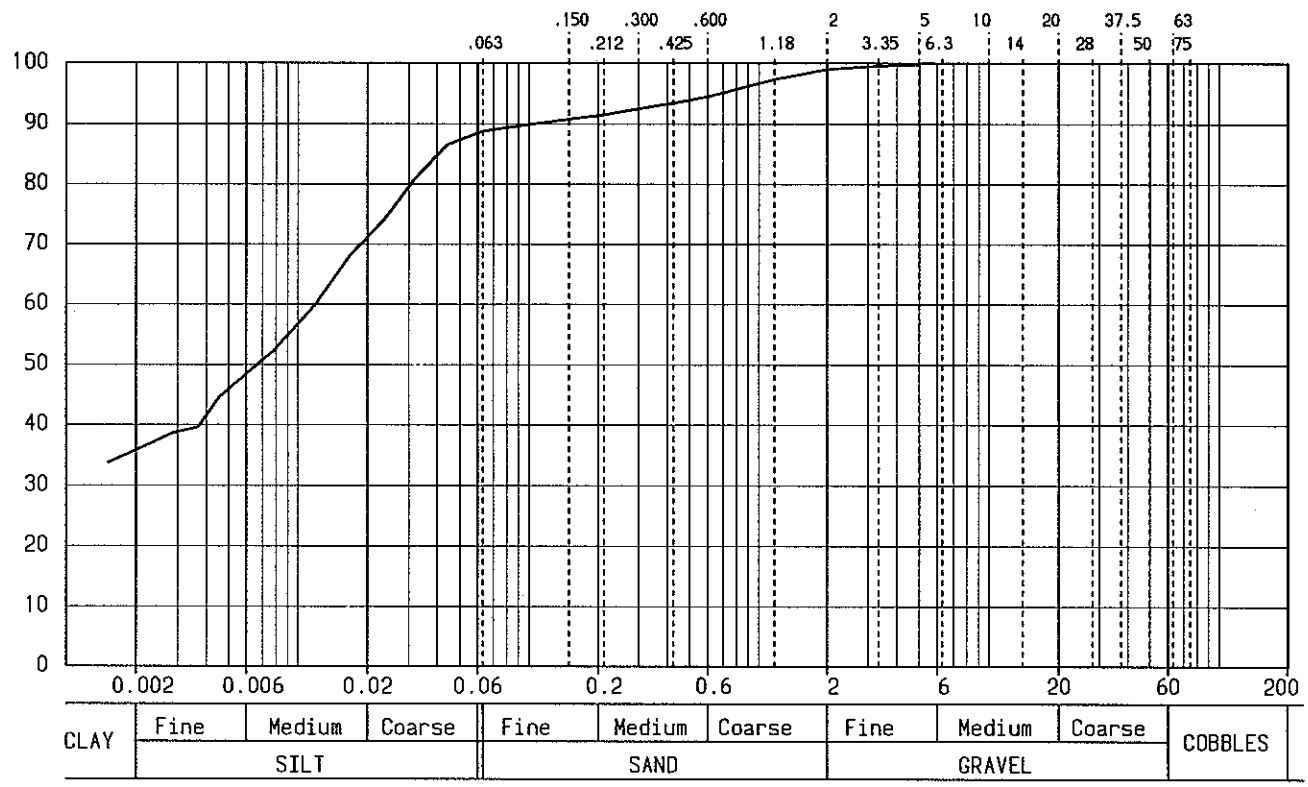
Q.A. Ref: /028-02/M4BHC8.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Dark grey very silty CLAY.	Hole ID	BHD1
		Sample No.	
		Depth	5.30m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.06182	88.7
63.000	100.0	0.04409	86.6
50.000	100.0	0.03191	80.8
37.500	100.0	0.02317	73.8
28.000	100.0	0.01673	68.1
20.000	100.0	0.01181	59.8
14.000	100.0	0.00789	52.4
10.000	100.0	0.00456	44.5
6.300	100.0	0.00367	39.6
5.000	99.9	0.00291	38.8
3.350	99.7	0.00151	33.8
2.000	99.1		
1.180	97.4		
0.600	94.6		
0.425	93.4		
0.300	92.6		
0.212	91.6		
0.150	90.9		
0.063	88.8		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	36
Silt	53
Sand	10
Gravel	1
Cobbles	0

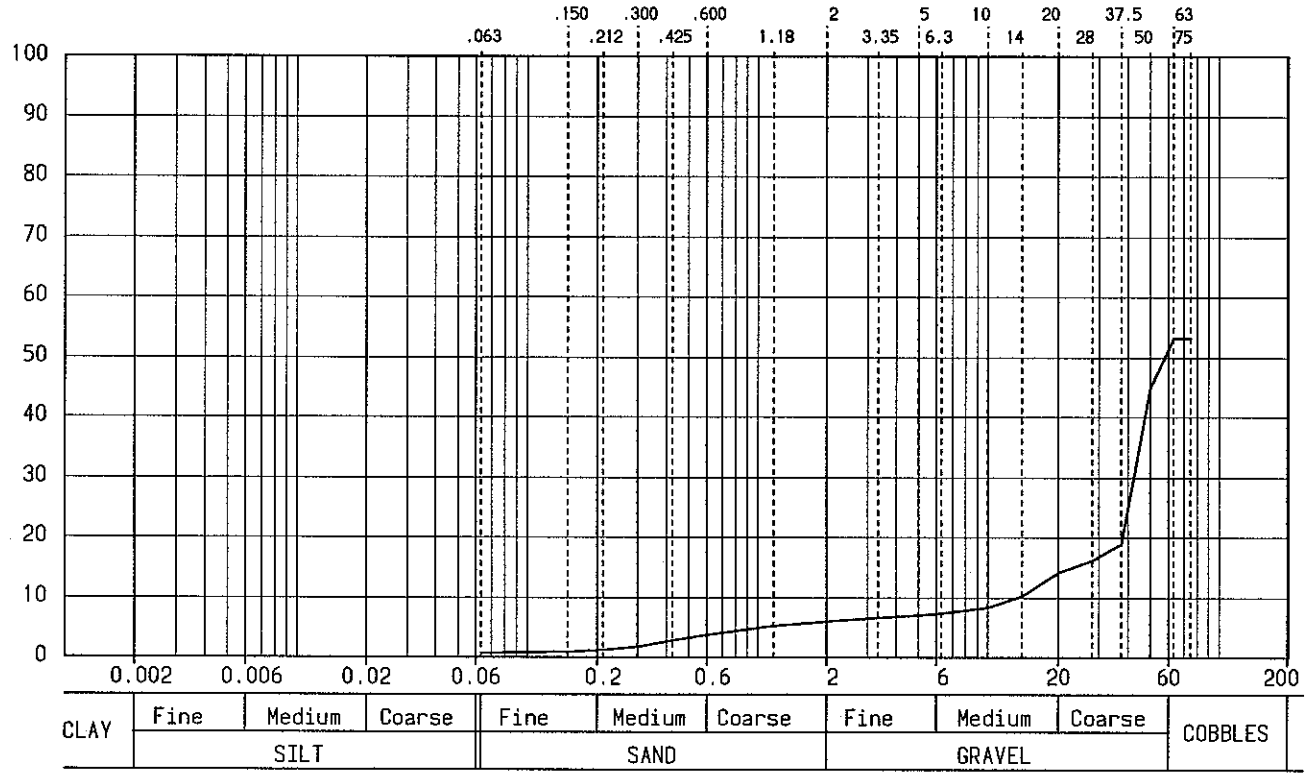
Q.A. Ref: /028-13/M4D1.PSD 2.06 : U/Hr203.43/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very dense brown sandy subrounded siliceous GRAVEL and COBBLES.	Hole ID	BHD1
		Sample No.	
		Depth	10.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	53.3		
63.000	53.3		
50.000	44.9		
37.500	19.0		
28.000	16.2		
20.000	14.3		
14.000	10.3		
10.000	8.4		
6.300	7.5		
5.000	7.1		
3.350	6.7		
2.000	6.1		
1.180	5.3		
0.600	3.8		
0.425	2.8		
0.300	1.9		
0.212	1.2		
0.150	1.0		
0.063	0.7		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	2
Silt	
Sand	5
Gravel	45
Cobbles	48

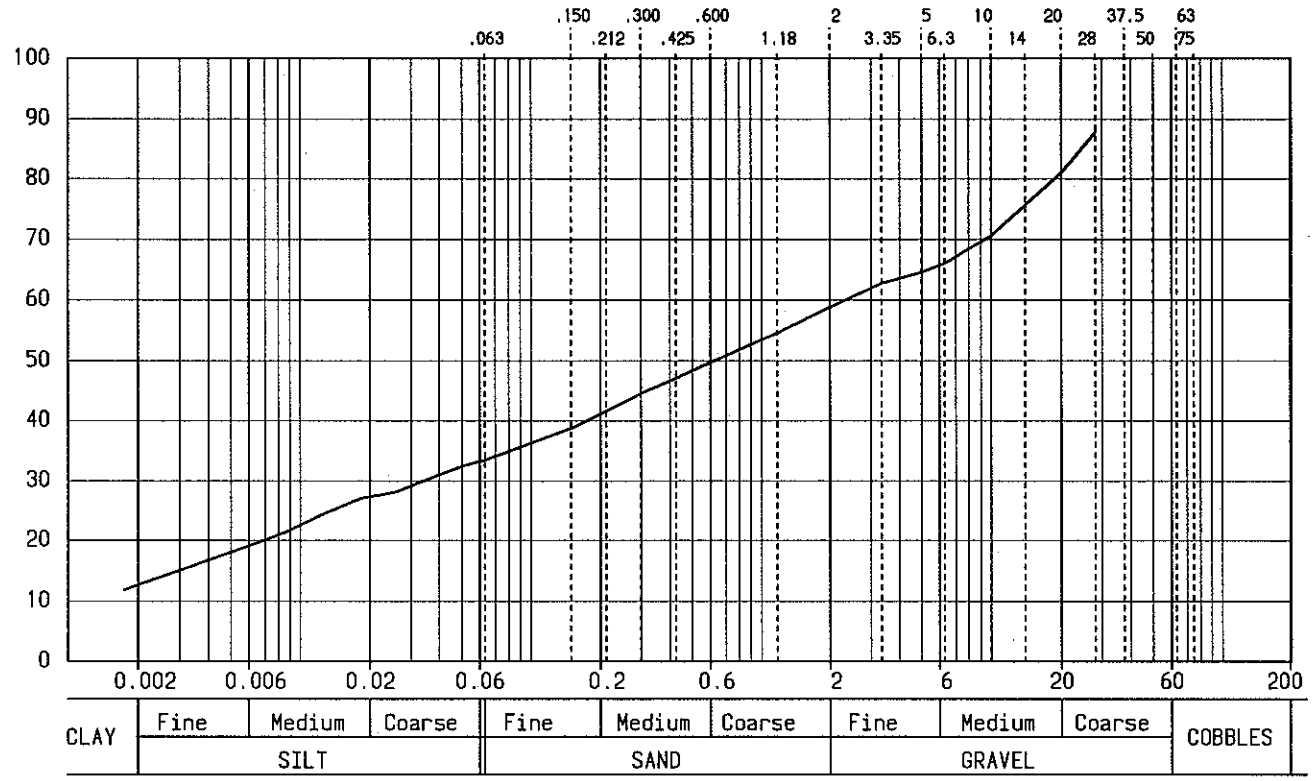
Q.A. Ref: /028-14/m4D110.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some subrounded silicous gravel. (Reworked mudstone marl.)	Hole ID	BHD1
		Sample No.	
		Depth	11.60m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05082	32.5
63.000	100.0	0.03630	30.4
50.000	100.0	0.02596	28.2
37.500	100.0	0.01845	27.1
28.000	87.9	0.01281	24.6
20.000	81.1	0.00848	21.3
14.000	75.7	0.00514	18.3
10.000	70.7	0.00173	11.9
6.300	66.0		
5.000	64.6		
3.350	62.8		
2.000	58.9		
1.180	54.6		
0.600	49.7		
0.425	47.1		
0.300	44.6		
0.212	41.6		
0.150	38.8		
0.063	33.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	13
Silt	21
Sand	25
Gravel	41
Cobbles	0

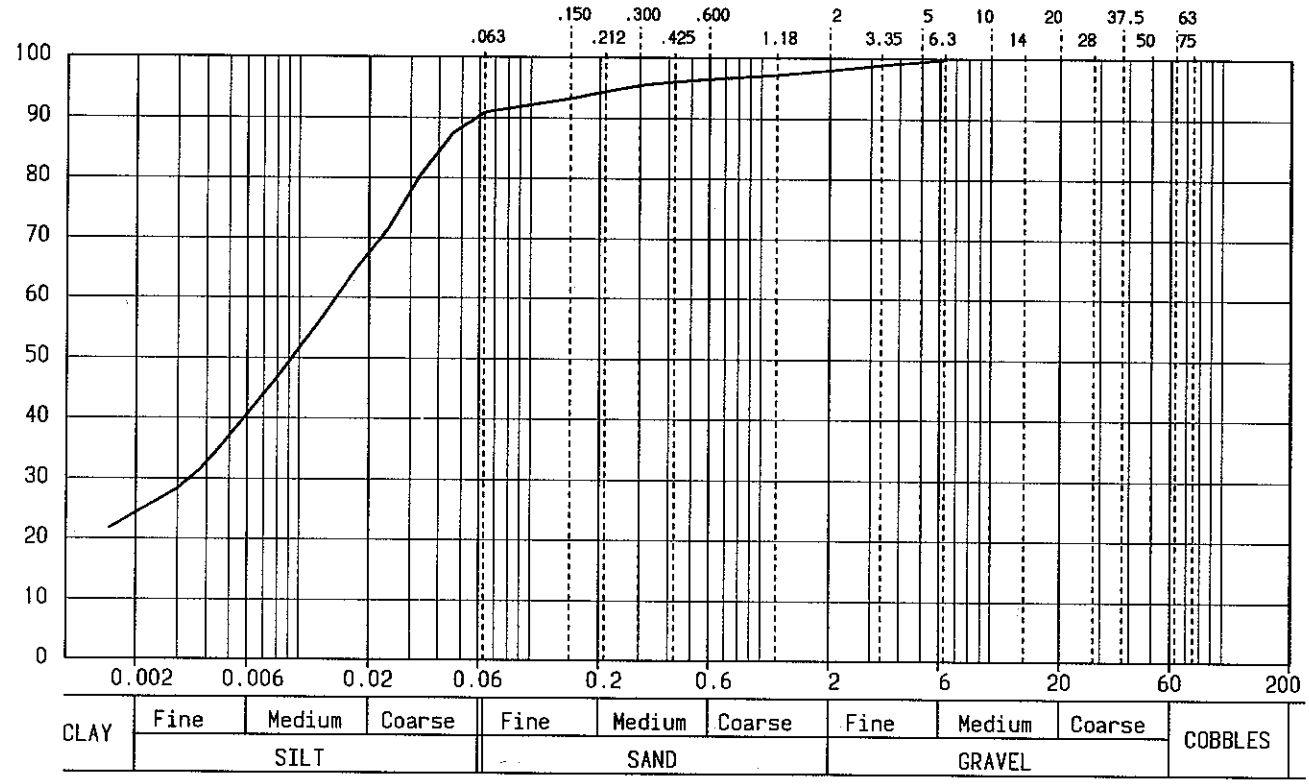
Q.A. Ref: /028-12/M4BD111.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown slightly sandy CLAY.	Hole ID	BHD1
		Sample No.	
		Depth	14.90m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04594	87.4
63.000	100.0	0.03313	80.5
50.000	100.0	0.02402	71.4
37.500	100.0	0.01729	64.5
28.000	100.0	0.01212	56.0
20.000	100.0	0.00807	46.9
14.000	100.0	0.00467	35.7
10.000	100.0	0.00374	31.4
6.300	99.8	0.00298	28.2
5.000	99.5	0.00153	21.9
3.350	99.0		
2.000	98.1		
1.180	97.3		
0.600	96.5		
0.425	96.1		
0.300	95.5		
0.212	94.4		
0.150	93.3		
0.063	90.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	24
Silt	67
Sand	7
Gravel	2
Cobbles	0

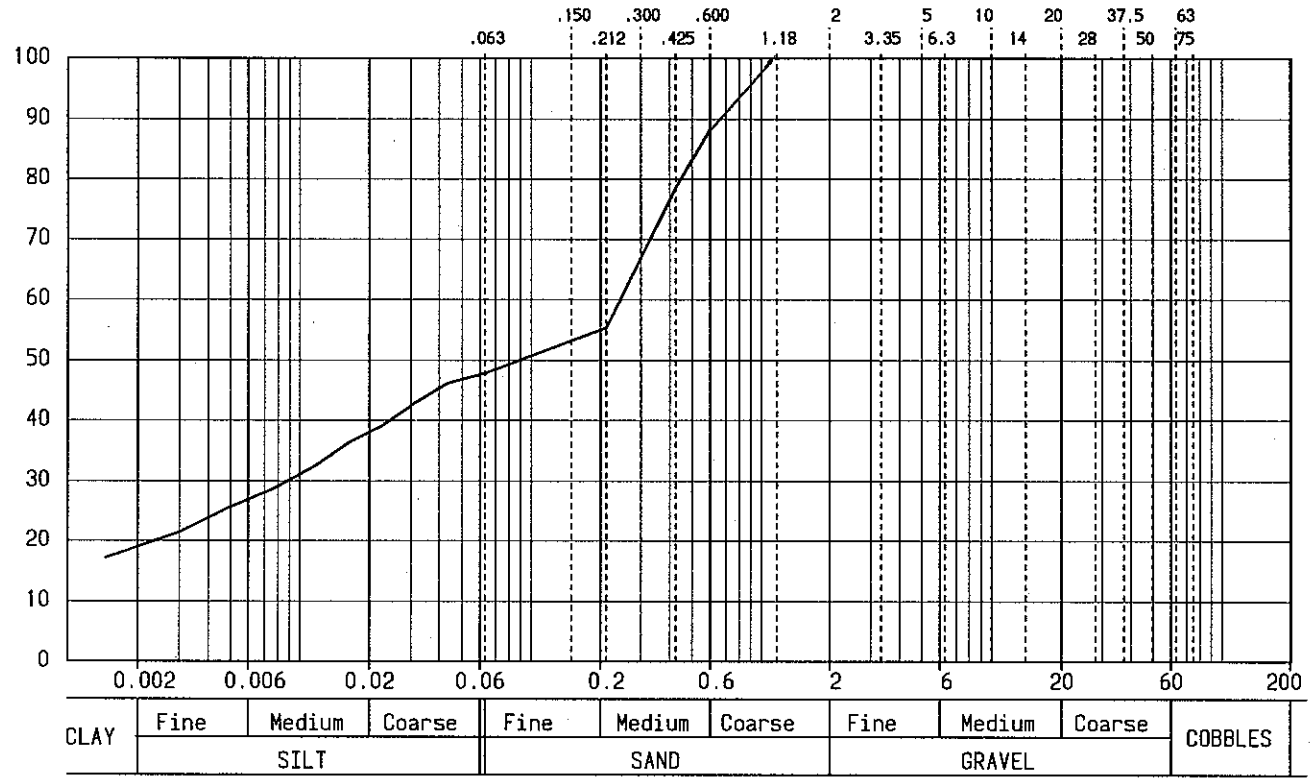
Q.A. Ref: /018-30/M4BD1.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Dark grey, slightly organic sandy CLAY.	Hole ID	BHD3
		Sample No.	
		Depth	5.10m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.06009	47.7
63.000	100.0	0.04303	46.2
50.000	100.0	0.03128	42.9
37.500	100.0	0.02278	39.2
28.000	100.0	0.01644	36.5
20.000	100.0	0.01160	32.5
14.000	100.0	0.00775	28.8
10.000	100.0	0.00495	25.7
6.300	100.0	0.00389	23.6
5.000	100.0	0.00301	21.6
3.350	100.0	0.00145	17.2
2.000	100.0		
1.180	100.0		
0.600	88.4		
0.425	78.7		
0.300	67.0		
0.212	55.4		
0.150	53.3		
0.063	47.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	19
Silt	29
Sand	52
Gravel	0
Cobbles	0

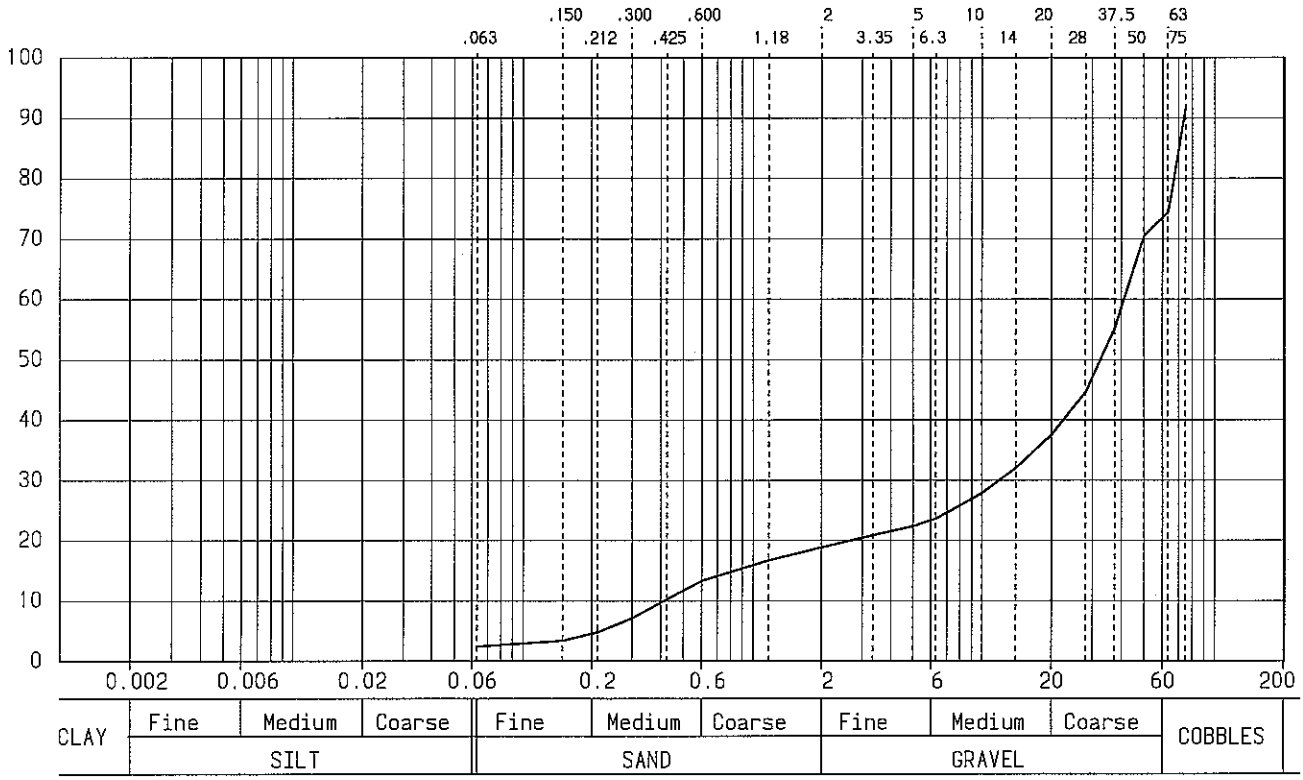
Q.A. Ref: /028-13/M4D3.PSD 2.06 U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey sandy subrounded to rounded GRAVEL with some cobbles.	Hole ID	BHD3
		Sample No.	
		Depth	8.10m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	91.9		
63.000	74.5		
50.000	70.5		
37.500	55.3		
28.000	44.6		
20.000	37.6		
14.000	32.1		
10.000	27.9		
6.300	23.7		
5.000	22.3		
3.350	20.9		
2.000	18.8		
1.180	16.7		
0.600	13.3		
0.425	10.2		
0.300	7.1		
0.212	4.7		
0.150	3.4		
0.063	2.5		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	3
Silt	
Sand	16
Gravel	55
Cobbles	26

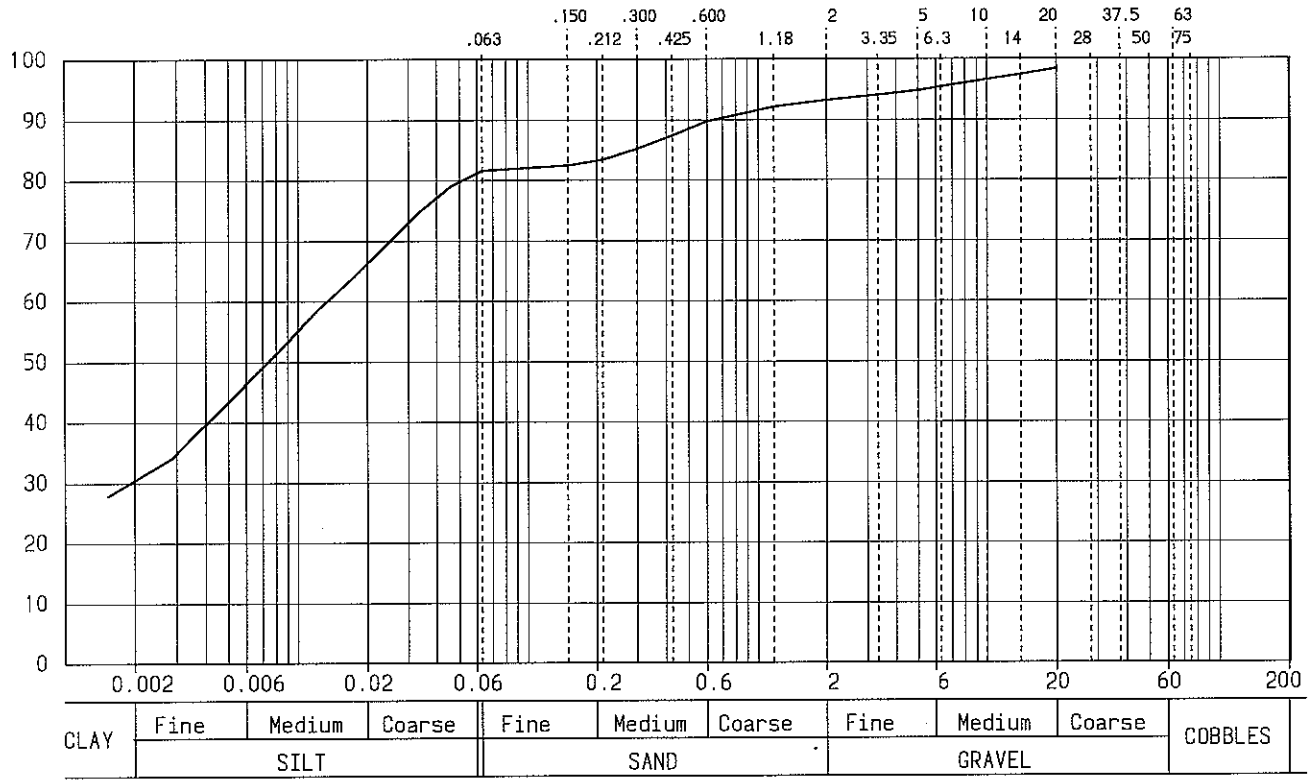
Q.A. Ref: /018-30/M4BD3.PSD 2.06 : U/Hr211.52/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greenish grey lightly to completely weathered mudstone very weak to weak.	Hole ID	BHD3
		Sample No.	
		Depth	12.70m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04649	79.2
63.000	100.0	0.03337	74.7
50.000	100.0	0.02401	69.3
37.500	100.0	0.01727	63.9
28.000	100.0	0.01204	58.5
20.000	98.5	0.00802	51.3
14.000	97.5	0.00432	41.0
10.000	96.7	0.00355	37.8
6.300	95.5	0.00288	34.2
5.000	94.8	0.00153	27.9
3.350	94.1		
2.000	93.3		
1.180	92.2		
0.600	89.8		
0.425	87.4		
0.300	85.3		
0.212	83.4		
0.150	82.4		
0.063	81.6		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	31
Silt	50
Sand	12
Gravel	7
Cobbles	0

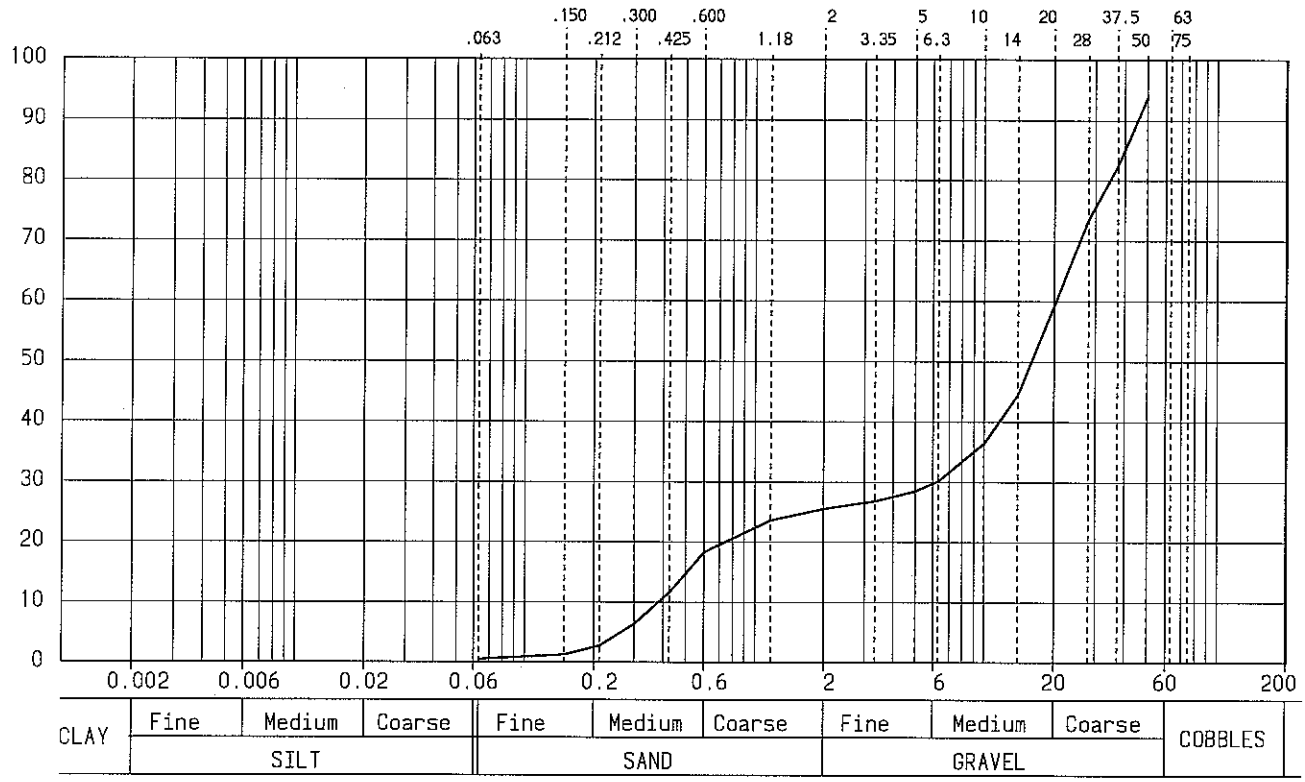
Q.A. Ref: /028-02/M4BD3.PSD 2.06 : U/Hr203.45/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown slightly clayey sandy GRAVEL.	Hole ID	BHD4
		Sample No.	
		Depth	12.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	100.0		
50.000	93.9		
37.500	82.6		
28.000	73.7		
20.000	59.4		
14.000	44.6		
10.000	36.4		
6.300	30.2		
5.000	28.5		
3.350	26.8		
2.000	25.5		
1.180	23.6		
0.600	18.3		
0.425	11.7		
0.300	6.4		
0.212	2.8		
0.150	1.3		
0.063	0.6		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	1
Silt	
Sand	25
Gravel	74
Cobbles	0

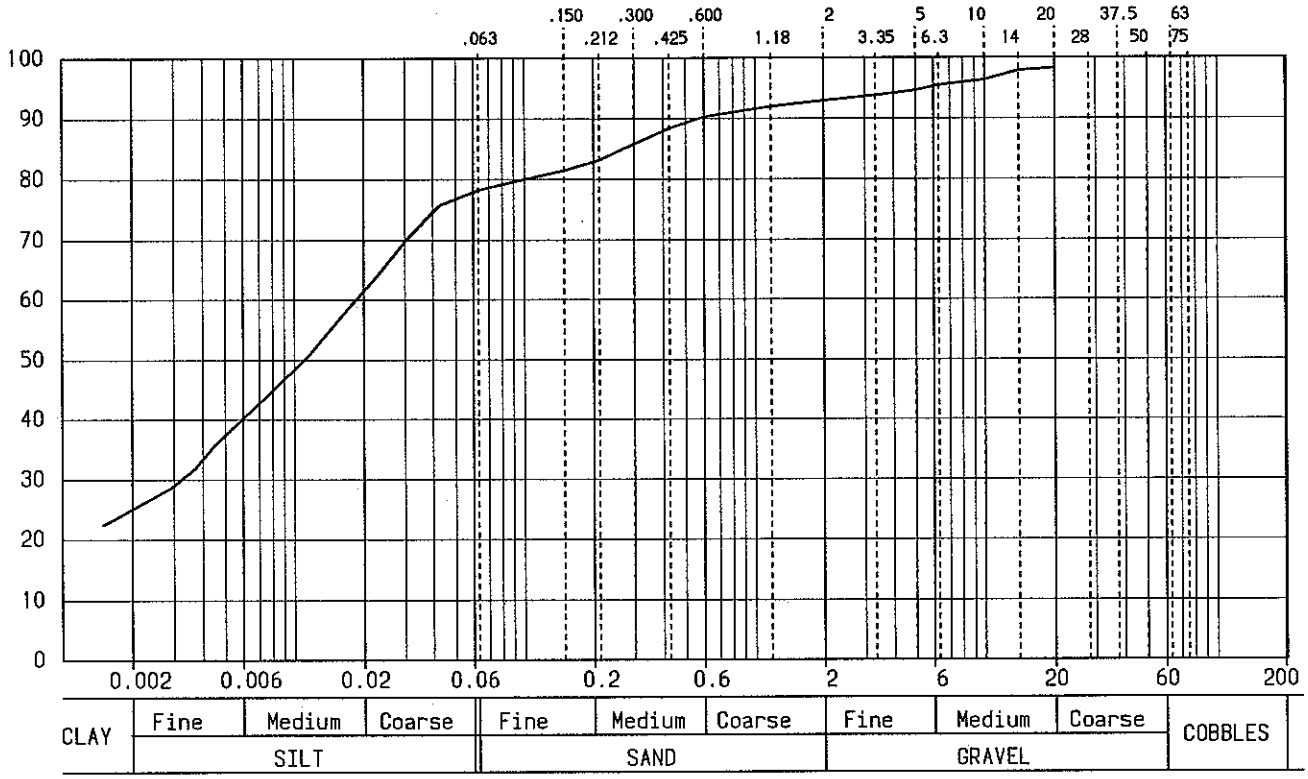
Q.A. Ref: /018-30/M4BD4.PSD 2.06 : U/Hr211.52/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown mottled greyish green slightly sandy very silty CLAY with a little gravel	Hole ID	BHD4
		Sample No.	
		Depth	13.70m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05961	78.0
63.000	100.0	0.04262	75.8
50.000	100.0	0.03094	70.4
37.500	100.0	0.02254	63.8
28.000	100.0	0.01637	57.7
20.000	98.3	0.01155	50.8
14.000	97.9	0.00772	44.2
10.000	96.3	0.00456	35.9
6.300	95.5	0.00371	31.9
5.000	94.7	0.00293	28.7
3.350	93.8	0.00150	22.5
2.000	92.9		
1.180	92.0		
0.600	90.4		
0.425	88.4		
0.300	85.9		
0.212	83.2		
0.150	81.5		
0.063	78.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	25
Silt	53
Sand	15
Gravel	7
Cobbles	0

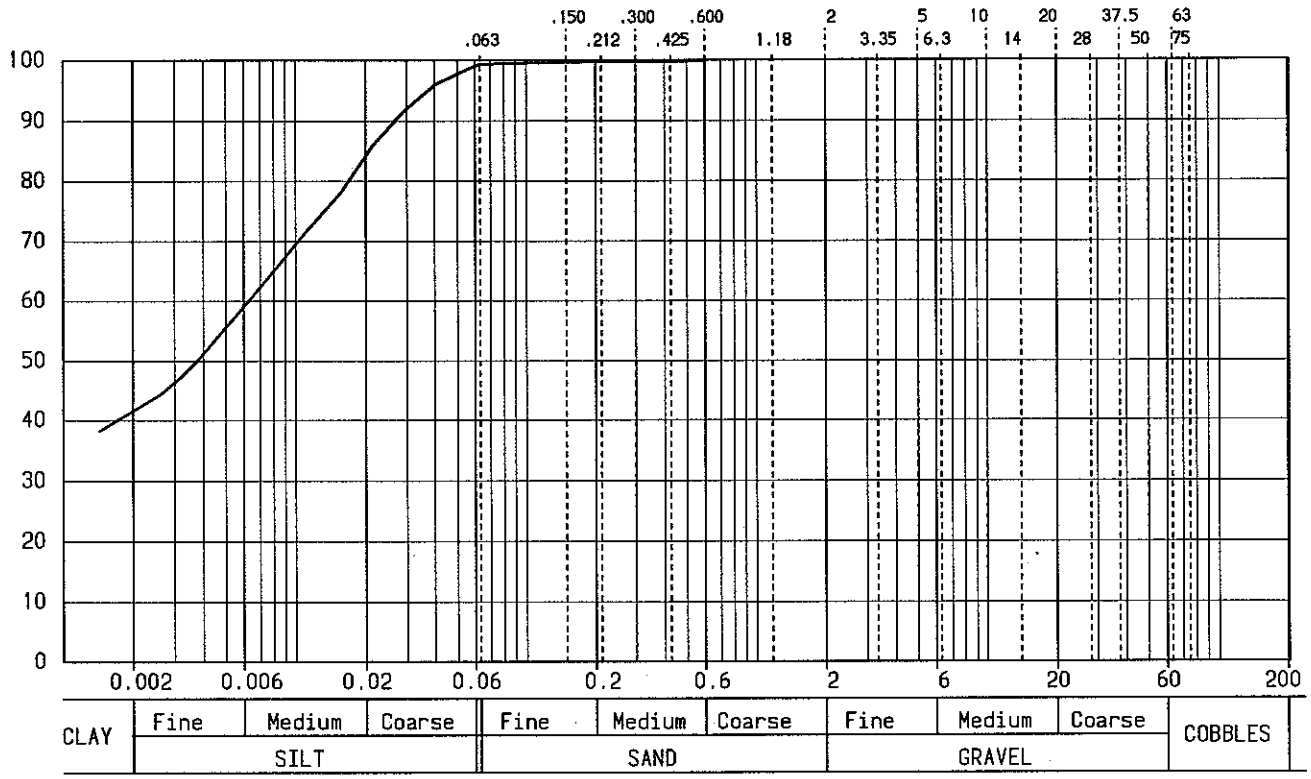
Q.A. Ref: /028-14/m4d4.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey mottled brown very silty CLAY.	Hole ID	BHD5
		Sample No.	
		Depth	6.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05668	98.6
63.000	100.0	0.04057	96.2
50.000	100.0	0.02931	91.6
37.500	100.0	0.02127	85.9
28.000	100.0	0.01555	78.1
20.000	100.0	0.01095	71.5
14.000	100.0	0.00736	63.3
10.000	100.0	0.00378	50.1
6.300	100.0	0.00317	47.3
5.000	100.0	0.00262	44.4
3.350	100.0	0.00142	38.2
2.000	100.0		
1.180	100.0		
0.600	99.9		
0.425	99.9		
0.300	99.8		
0.212	99.8		
0.150	99.7		
0.063	99.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	42
Silt	57
Sand	1
Gravel	0
Cobbles	0

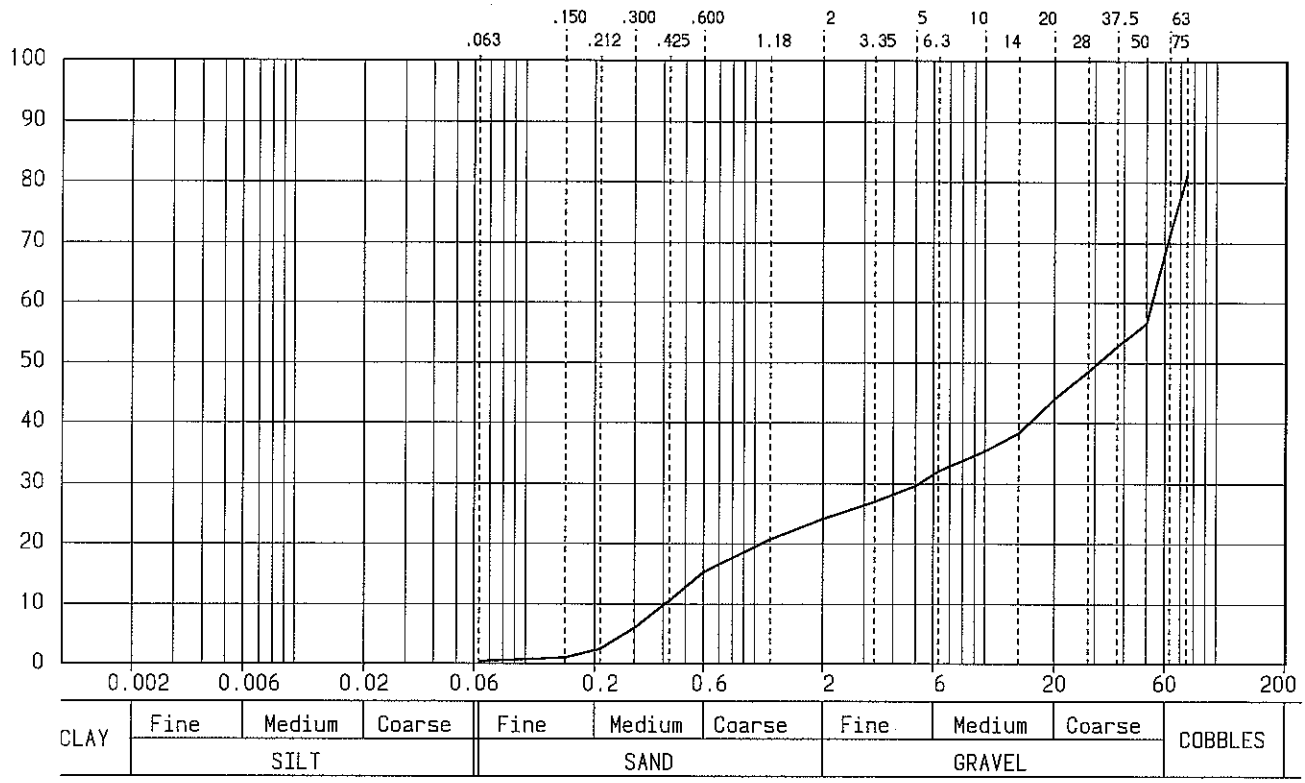
Q.A. Ref: /127-19/M4BD56.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Greyish brown very sandy subround and occasional siliceous GRAVEL, with some cobbles.	Hole ID	BHD5
		Sample No.	
		Depth	11.50m



Particle Size	Cumulative % Passing
75.000	81.4
63.000	71.6
50.000	56.6
37.500	52.9
28.000	48.6
20.000	44.0
14.000	38.3
10.000	35.4
6.300	32.1
5.000	29.7
3.350	27.0
2.000	24.2
1.180	20.8
0.600	15.4
0.425	10.6
0.300	6.0
0.212	2.5
0.150	1.1
0.063	0.4

Particle Size	Cumulative % Passing

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

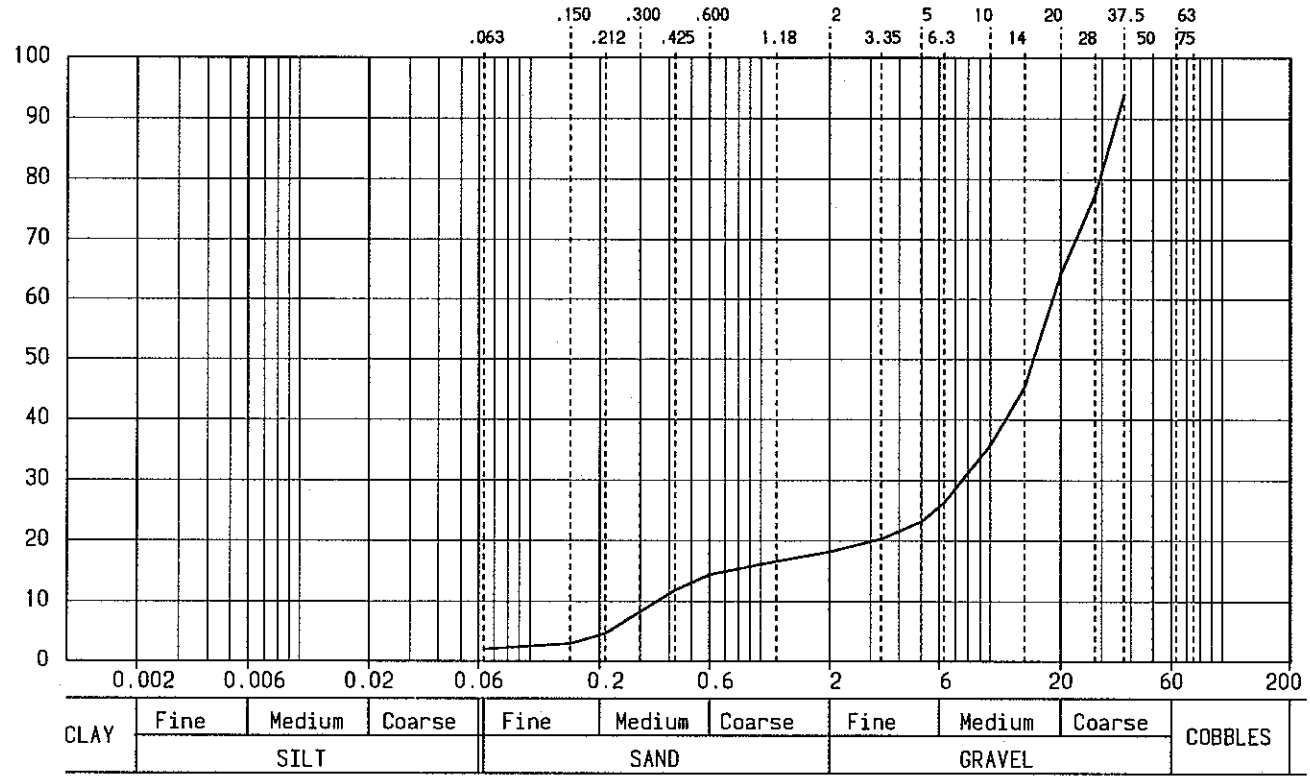
Clay	0
Silt	
Sand	24
Gravel	44
Cobbles	32

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Greyish brown sandy GRAVEL.	Hole ID	BHD6
		Sample No.	
		Depth	8.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	100.0		
50.000	100.0		
37.500	94.0		
28.000	77.6		
20.000	64.3		
14.000	45.5		
10.000	35.8		
6.300	26.4		
5.000	23.2		
3.350	20.4		
2.000	18.2		
1.180	16.7		
0.600	14.5		
0.425	11.9		
0.300	8.3		
0.212	4.7		
0.150	3.0		
0.063	2.0		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	2
Silt	
Sand	16
Gravel	82
Cobbles	0

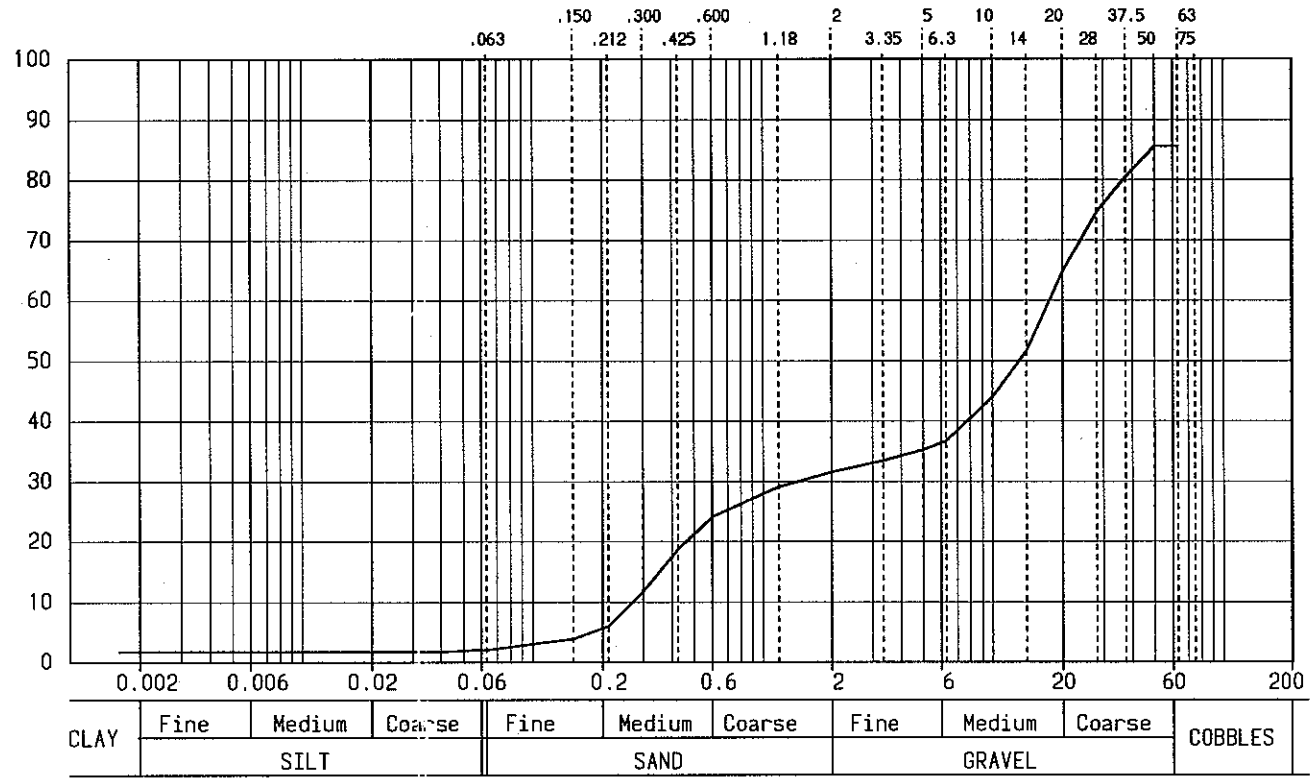
Q.A. Ref: /127-12/m4bd6.PSD 2.06 : U/

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown sandy GRAVEL with occasional cobbles.	Hole ID	BHD6
		Sample No.	
		Depth	13.80m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05717	2.1
63.000	85.7	0.04047	1.9
50.000	85.7	0.02861	1.9
37.500	80.6	0.02023	1.9
28.000	74.7	0.01388	1.9
20.000	64.9	0.00905	1.9
14.000	51.7	0.00474	1.9
10.000	44.0	0.00386	1.9
6.300	36.8	0.00310	1.9
5.000	35.3	0.00163	1.9
3.350	33.5		
2.000	31.6		
1.180	29.1		
0.600	24.1		
0.425	18.7		
0.300	11.8		
0.212	6.0		
0.150	3.9		
0.063	2.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	2
Silt	1
Sand	29
Gravel	54
Cobbles	14

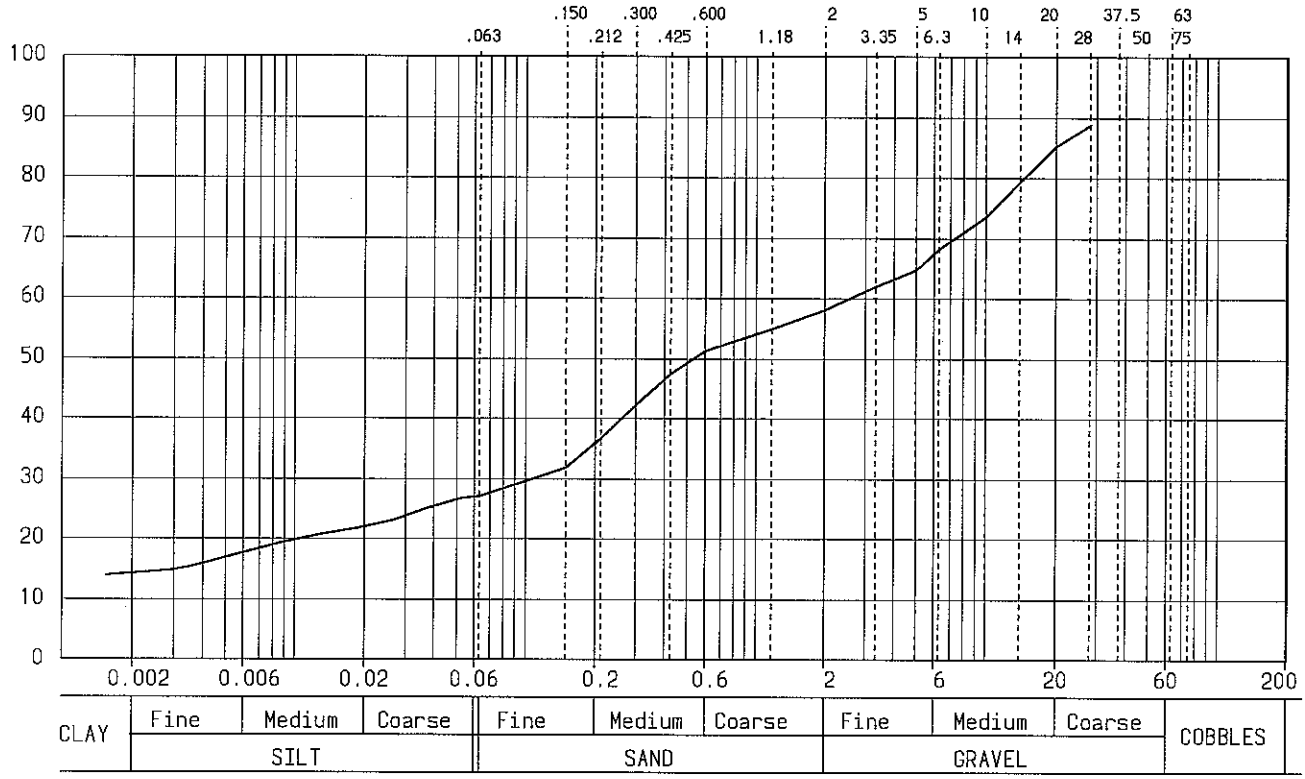
Q.A. Ref: /028-13/M4D6.PSD 2.06 : U/Hr203.43/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	MADE GROUND: Soft brown sandy clay with some subangular gravel sized fragments of concrete and rubble with occasional rootlets.	Hole ID	BHD7
		Sample No.	
		Depth	1.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05210	26.8
63.000	100.0	0.03711	25.1
50.000	100.0	0.02646	23.1
37.500	100.0	0.01880	21.9
28.000	88.8	0.01295	20.7
20.000	85.3	0.00849	19.3
14.000	79.4	0.00435	16.3
10.000	73.6	0.00359	15.5
6.300	68.3	0.00292	14.9
5.000	64.8	0.00154	14.0
3.350	62.0		
2.000	58.1		
1.180	55.0		
0.600	51.3		
0.425	47.5		
0.300	42.3		
0.212	36.7		
0.150	31.9		
0.063	27.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	14
Silt	13
Sand	31
Gravel	42
Cobbles	0

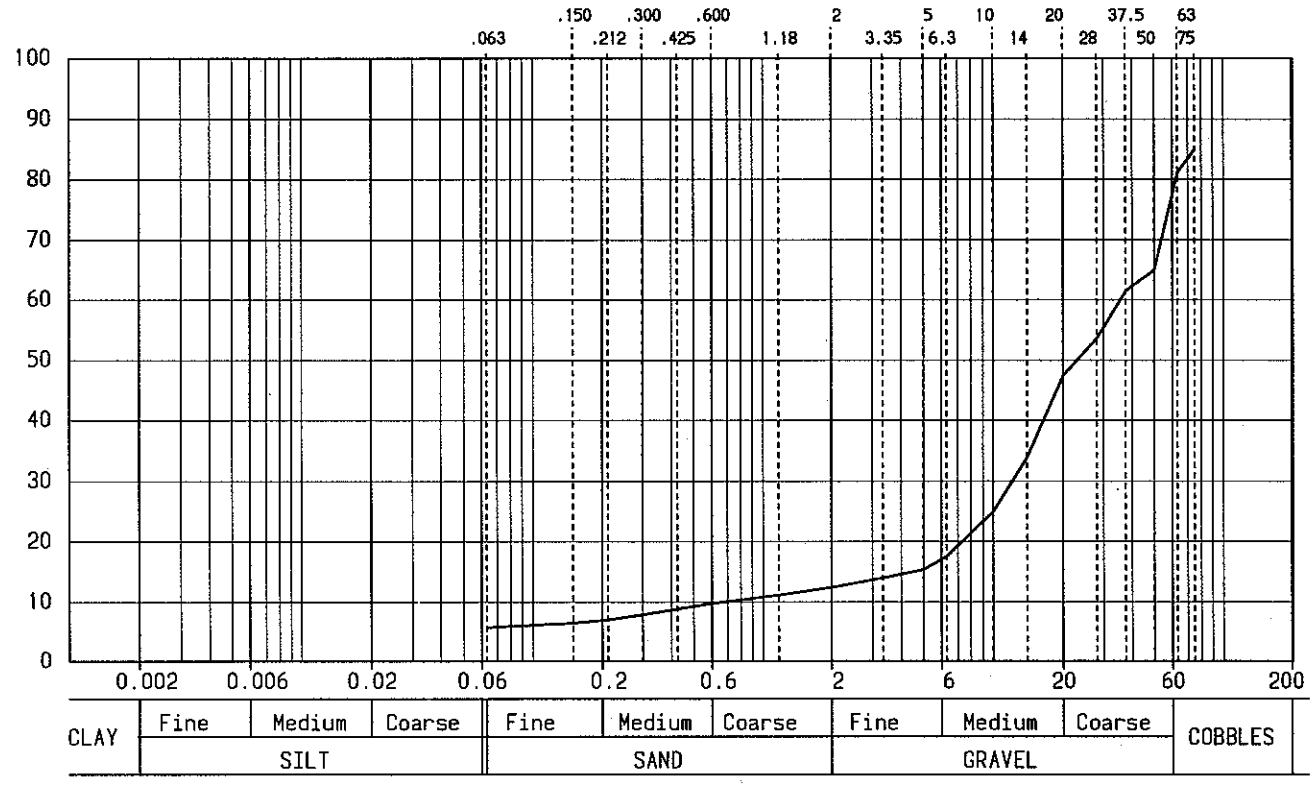
Q.A. Ref: /028-02/M4BHD7.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey brown sandy siliceous GRAVEL with some cobbles.	Hole ID	BHD7
		Sample No.	
		Depth	11.50m



Particle Size	Cumulative % Passing
75.000	85.0
63.000	81.1
50.000	65.0
37.500	61.5
28.000	53.7
20.000	47.4
14.000	34.0
10.000	25.0
6.300	17.6
5.000	15.4
3.350	14.0
2.000	12.4
1.180	11.1
0.600	9.7
0.425	8.8
0.300	7.9
0.212	7.0
0.150	6.5
0.063	5.8

Particle Size	Cumulative % Passing

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	6
Silt	
Sand	7
Gravel	65
Cobbles	22

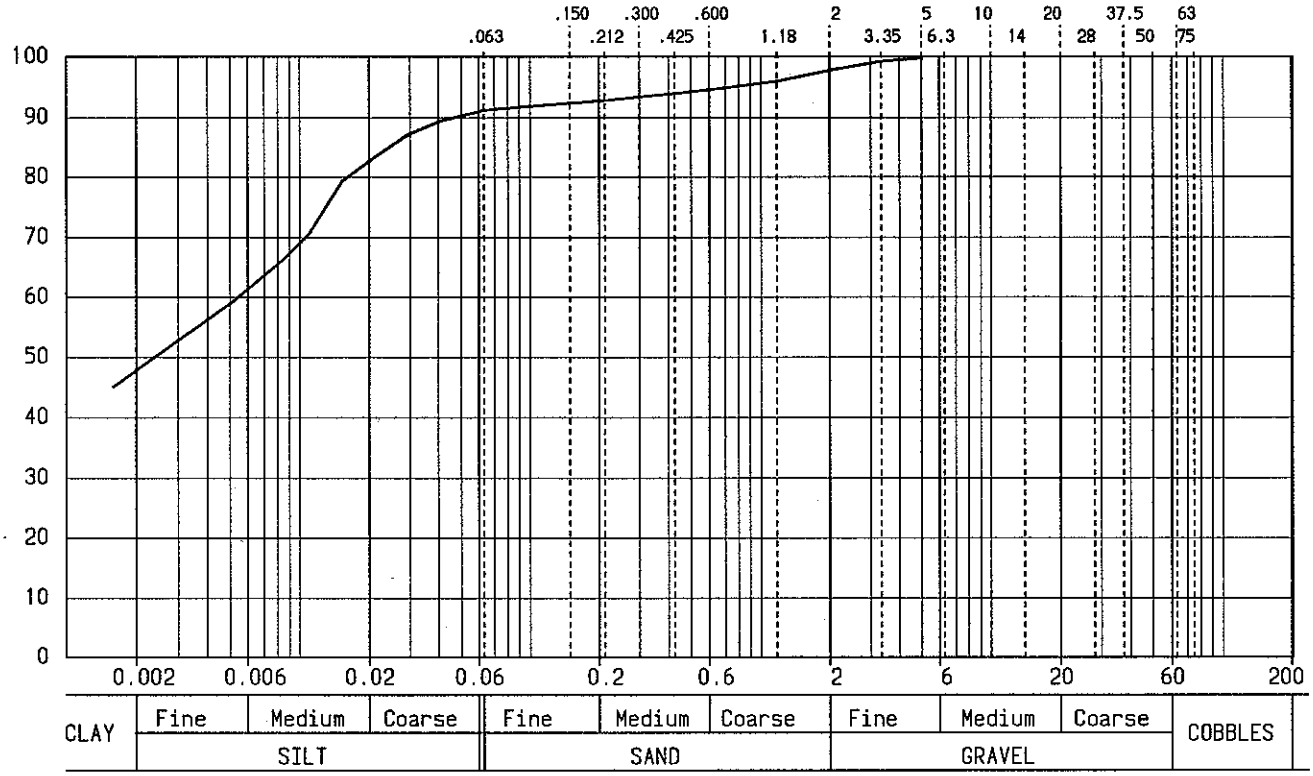
Q.A. Ref: /028-12/m4bhd711.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF RD, NEWPORT	Contract	F10895
Soil description	Brown mottled grey very silty CLAY	Hole ID	BHD8
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05735	90.8
63.000	100.0	0.04088	89.5
50.000	100.0	0.02931	87.1
37.500	100.0	0.02117	83.4
28.000	100.0	0.01530	79.4
20.000	100.0	0.01097	70.7
14.000	100.0	0.00843	66.3
10.000	100.0	0.00526	59.6
6.300	100.0	0.00159	45.1
5.000	99.8		
3.350	99.3		
2.000	97.8		
1.180	96.0		
0.600	94.6		
0.425	94.0		
0.300	93.5		
0.212	92.9		
0.150	92.4		
0.063	91.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	48
Silt	43
Sand	7
Gravel	2
Cobbles	0

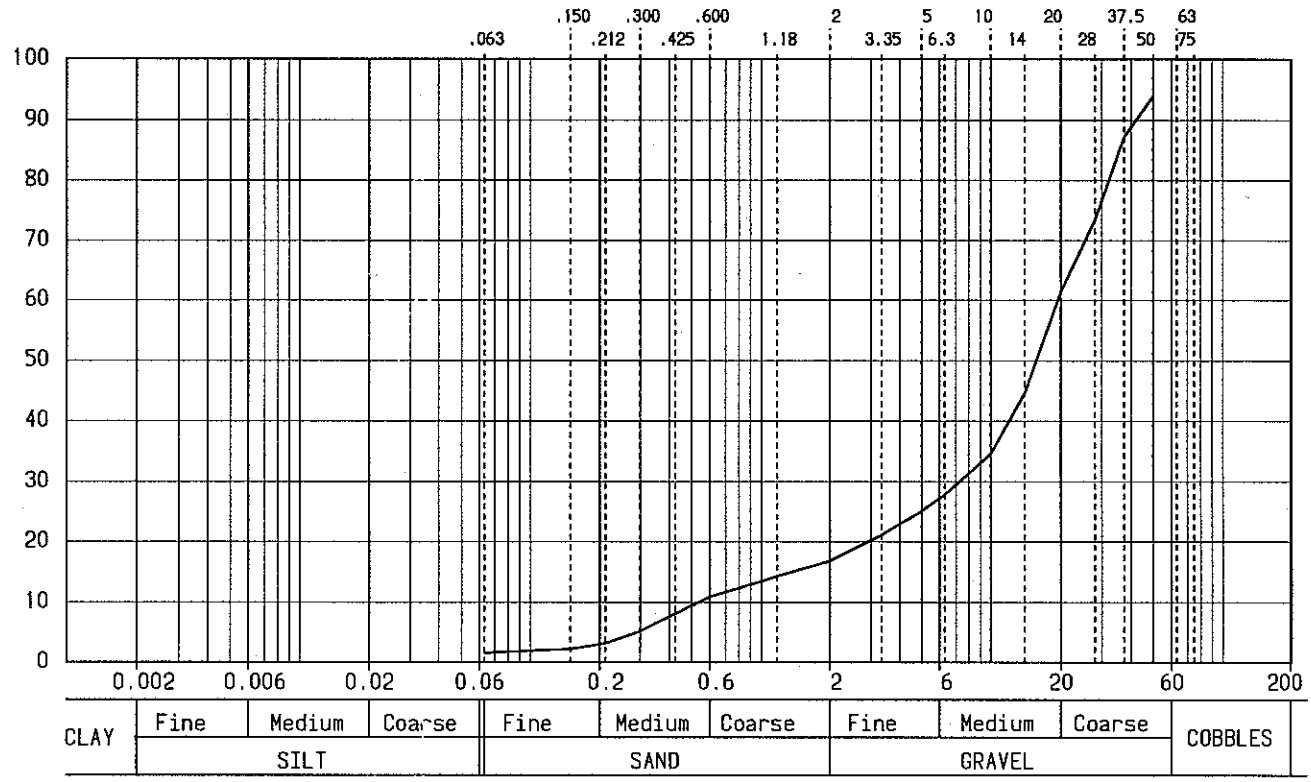
Q.A. Ref: /028-11/M4D8050.PSD 2.06 : U/Hr211.57/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey slightly sandy subangular to sub rounded gravel.	Hole ID	BHE1/A
		Sample No.	
		Depth	8.50m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	100.0
50.000	94.0
37.500	87.3
28.000	73.6
20.000	61.5
14.000	44.7
10.000	34.6
6.300	27.9
5.000	25.1
3.350	21.2
2.000	16.9
1.180	14.3
0.600	11.0
0.425	8.1
0.300	5.2
0.212	3.2
0.150	2.3
0.063	1.6

Particle Size	Cumulative % Passing

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	2
Silt	
Sand	15
Gravel	83
Cobbles	0

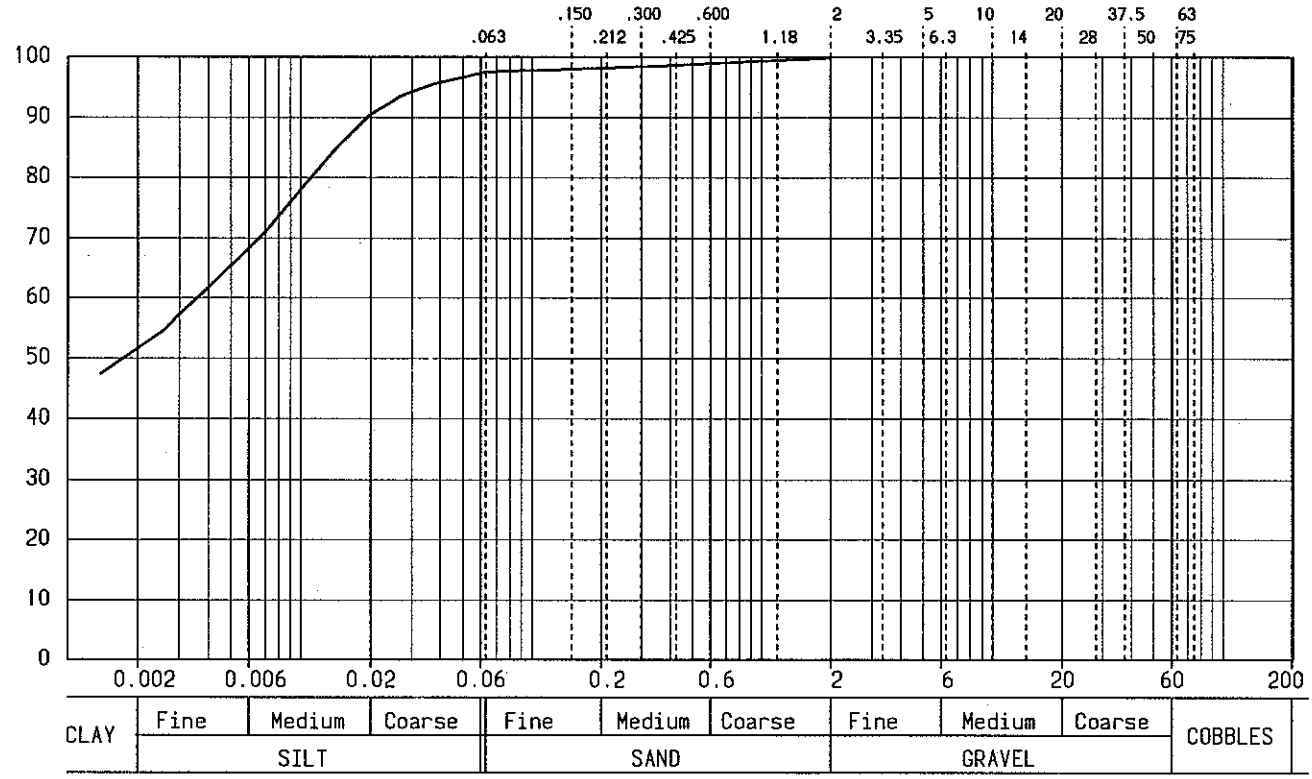
Q.A. Ref: /127-12/M4Be1/a.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Browm mottled greyish brown thinly laminated very silty CLAY.	Hole ID	BHE2
		Sample No.	
		Depth	0.20m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05286	96.9
63.000	100.0	0.03773	95.6
50.000	100.0	0.02704	93.6
37.500	100.0	0.01955	90.3
28.000	100.0	0.01429	85.0
20.000	100.0	0.01019	78.4
14.000	100.0	0.00692	70.8
10.000	100.0	0.00381	61.0
6.300	100.0	0.00314	58.0
5.000	100.0	0.00257	54.7
3.350	100.0	0.00138	47.5
2.000	99.9		
1.180	99.5		
0.600	98.9		
0.425	98.7		
0.300	98.4		
0.212	98.2		
0.150	98.0		
0.063	97.6		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	52
Silt	46
Sand	2
Gravel	0
Cobbles	0

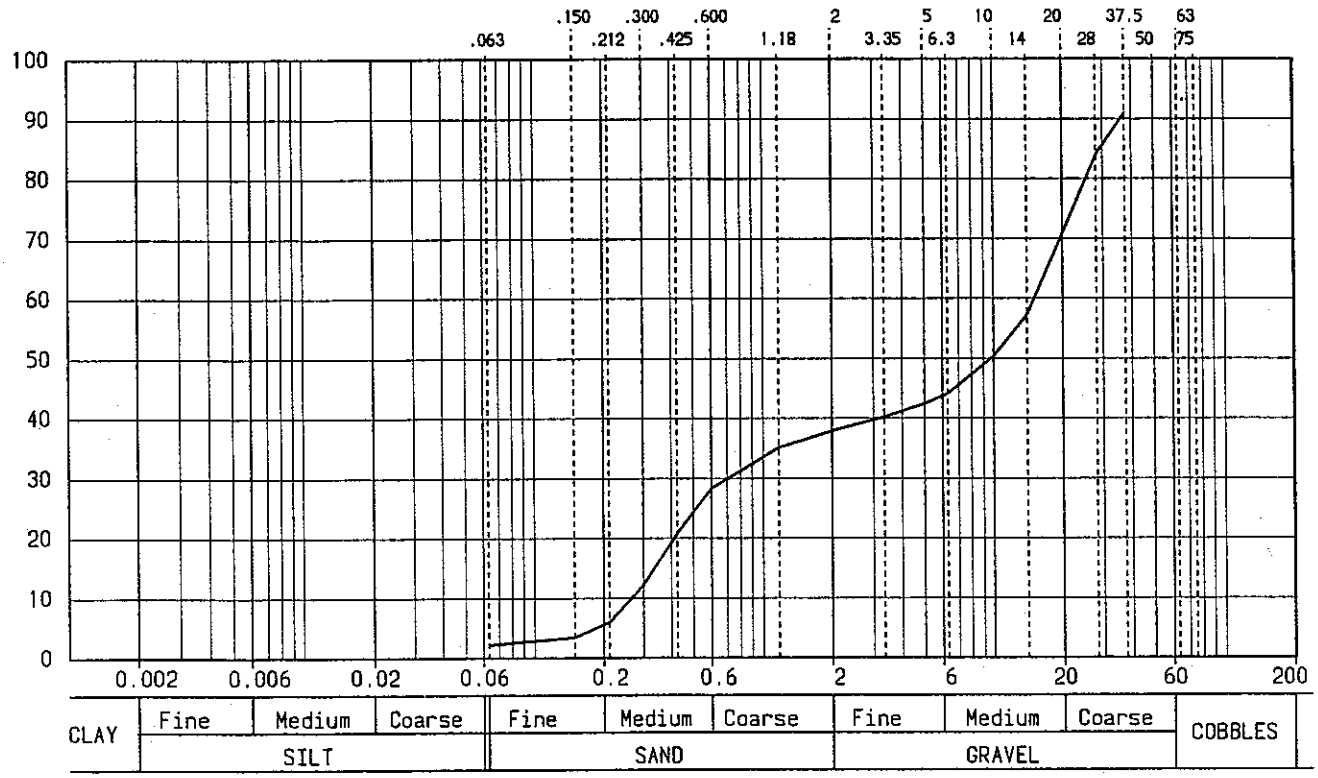
Q.A. Ref: /127-12/m4be22.PSD 2.06 : U/Hr203.43/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Dense greyish brown subangular to subrounded very sandy GRAVEL.	Hole ID	BHE2
		Sample No.	
		Depth	10.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	100.0		
50.000	100.0		
37.500	91.1		
28.000	84.0		
20.000	70.9		
14.000	57.3		
10.000	50.4		
6.300	44.2		
5.000	42.4		
3.350	40.3		
2.000	37.9		
1.180	35.2		
0.600	28.4		
0.425	20.9		
0.300	12.2		
0.212	6.1		
0.150	3.5		
0.063	2.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	2
Silt	
Sand	36
Gravel	62
Cobbles	0

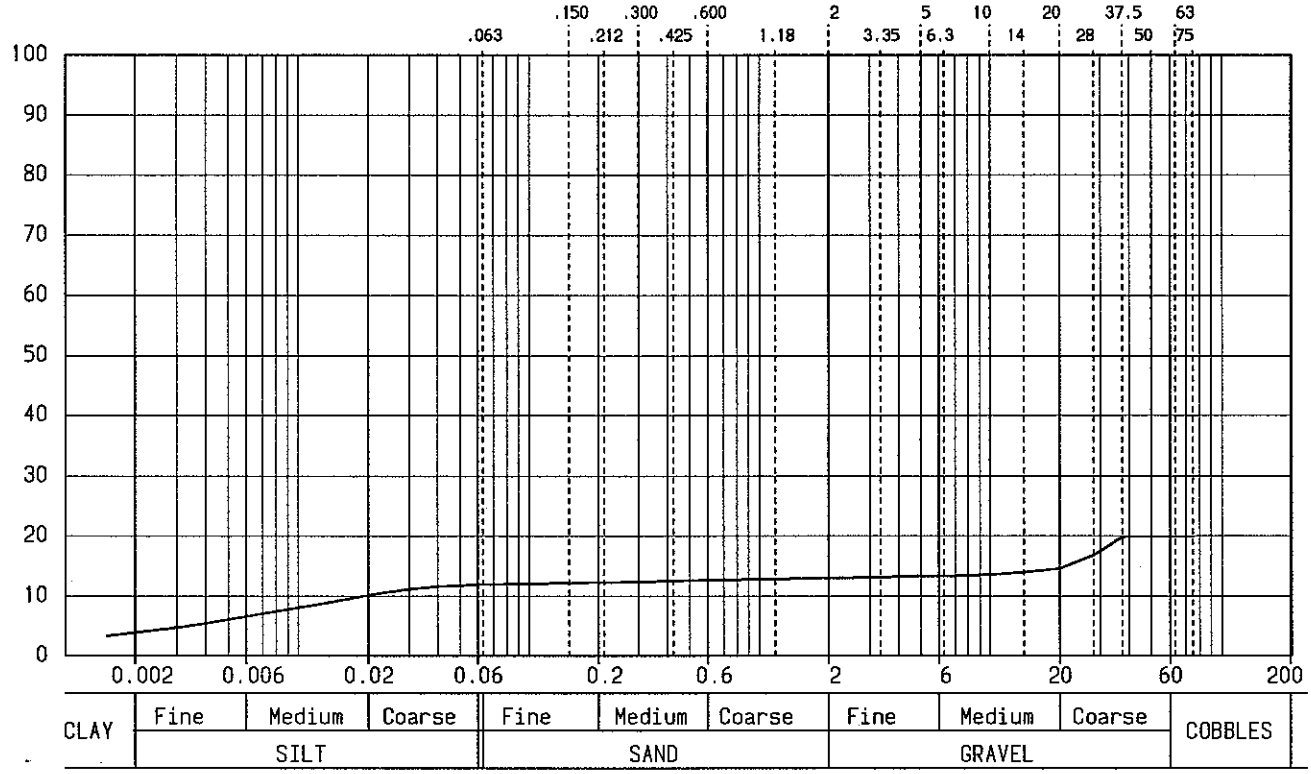
Q.A. Ref: /127-10/m4be210.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF RD, NEWPORT	Contract	F10895
Soil description	Brown slightly sandy gravelly COBBLES	Hole ID	BHE3
		Sample No.	
		Depth	8.90m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	19.9	0.05740	11.9
63.000	19.9	0.04099	11.6
50.000	19.9	0.02955	11.2
37.500	19.9	0.02155	10.4
28.000	16.9	0.01574	9.5
20.000	14.7	0.01119	8.4
14.000	14.0	0.00756	7.3
10.000	13.6	0.00392	5.5
6.300	13.4	0.00330	5.0
5.000	13.3	0.00273	4.5
3.350	13.2	0.00150	3.4
2.000	13.0		
1.180	12.9		
0.600	12.7		
0.425	12.5		
0.300	12.4		
0.212	12.3		
0.150	12.2		
0.063	11.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	4
Silt	8
Sand	1
Gravel	7
Cobbles	80

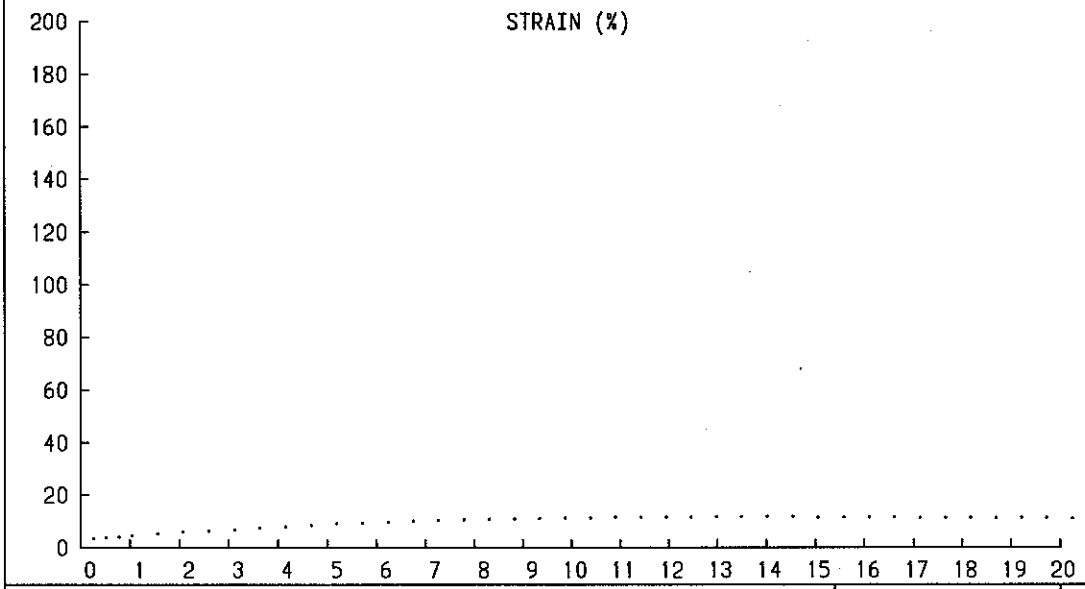
Q.A. Ref: /028-11/M4E389.PSD 2.06 : U/Hr203.423/Rh3.989

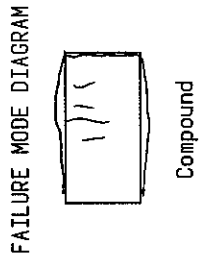
NORWEST HOLST SOIL ENGINEERING LIMITED

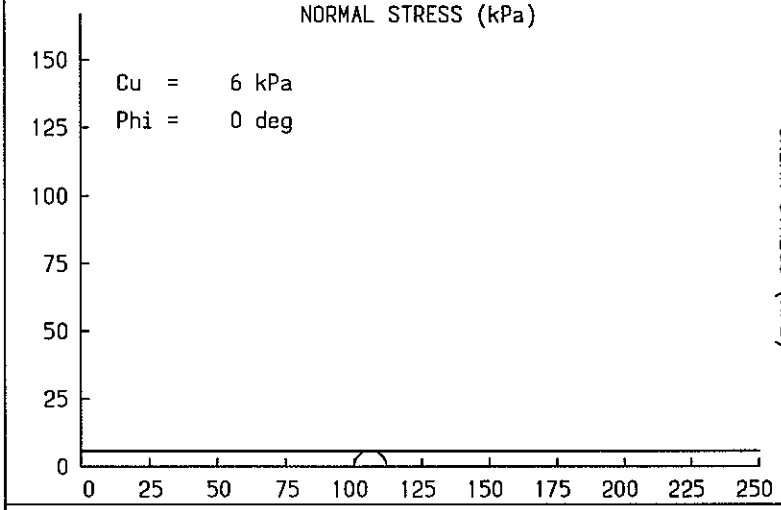
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT PWP

Test method: BS 1377:Part 7:1990 Clause 8 and 9

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Very soft dark grey very silty organic CLAY	Hole ID	BHE4
		Sample No	
		Depth	7.15 m







	1	2	3	
Cell Pressure	100			kPa
Deviator Stress	13			kPa
...Corrected	12			kPa
Membrane Corr.	1			kPa
Moisture Content	71			%
Bulk Density	1.66			Mg/m3
Dry Density	0.97			Mg/m3
Diameter	102.3			mm
Length	192.6			mm
Failure Strain	13.5			%
Cu	6			kPa

Membrane thickness 0.3mm
High density rubber latex membrane used
Specimen prepared from top of undisturbed sample in suitable material.

Test Type : Single Stage
Undisturbed
Rate : 2% per minute
Orientated and loaded with vertical axis

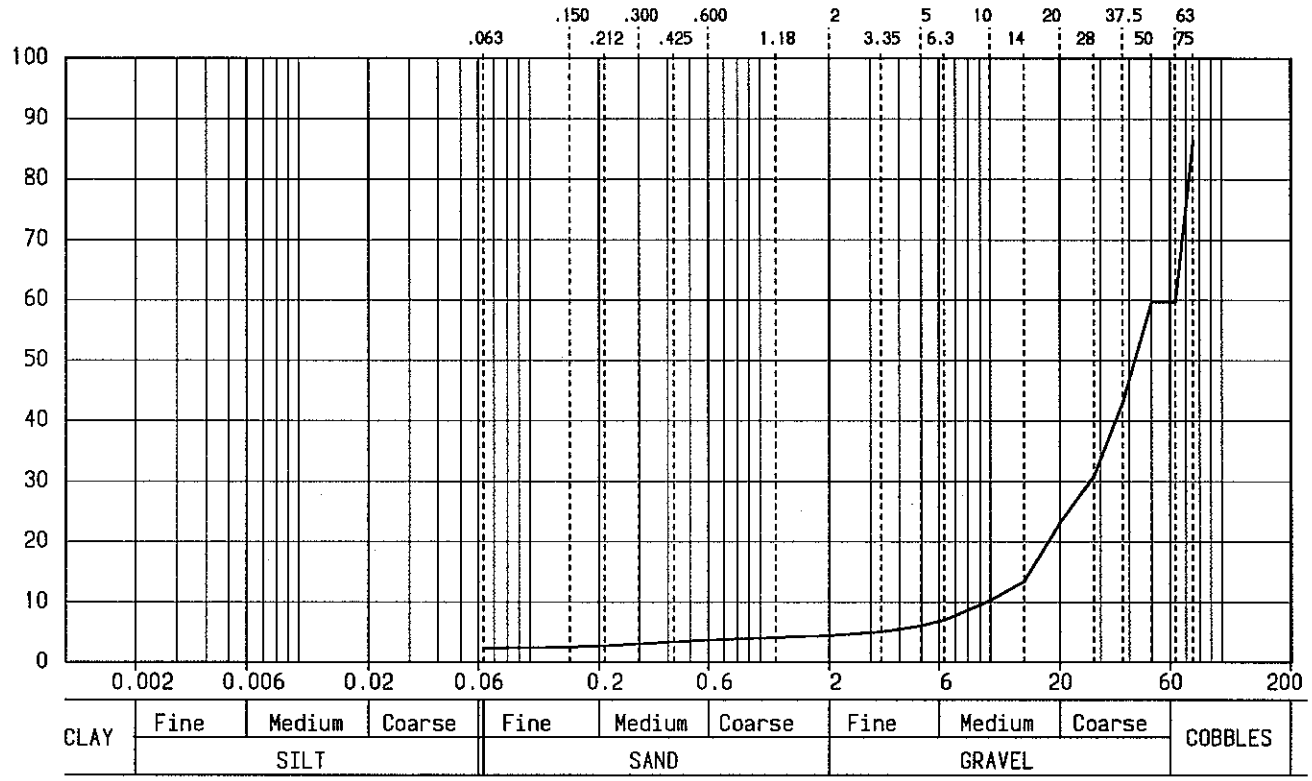
Q.A. Ref: /018-29/m4be4.QTX 2.05

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey subangular to subrounded GRAVEL and COBBLES.	Hole ID	BHE4
		Sample No.	
		Depth	9.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	86.2		
63.000	59.7		
50.000	59.7		
37.500	43.1		
28.000	30.9		
20.000	23.2		
14.000	13.5		
10.000	10.2		
6.300	7.0		
5.000	6.0		
3.350	5.1		
2.000	4.5		
1.180	4.1		
0.600	3.7		
0.425	3.4		
0.300	3.1		
0.212	2.8		
0.150	2.6		
0.063	2.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	3
Silt	
Sand	2
Gravel	55
Cobbles	40

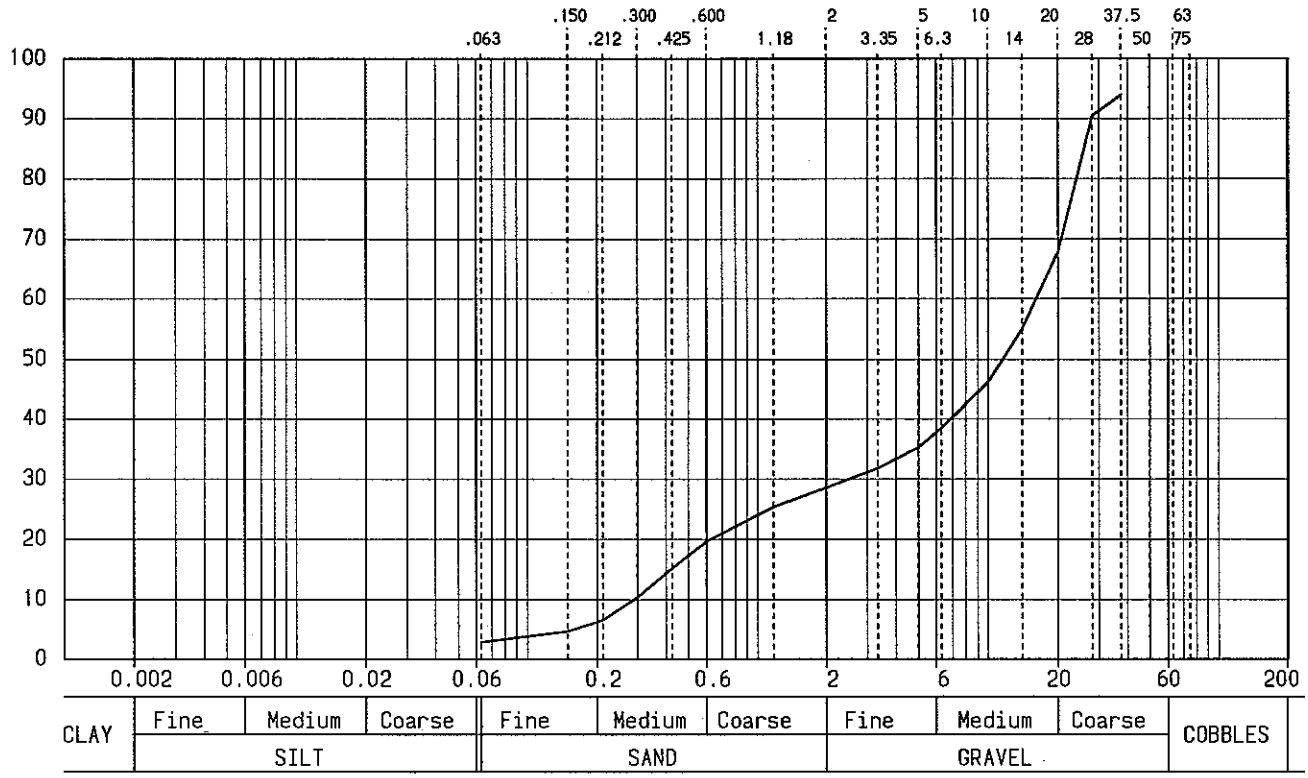
Q.A. Ref: /018-13/M4BE495.PSD 2.06 : C/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Greyish brown sandy GRAVEL	Hole ID	BHE5
		Sample No.	
		Depth	11.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	100.0		
50.000	100.0		
37.500	94.0		
28.000	90.5		
20.000	68.0		
14.000	55.2		
10.000	46.3		
6.300	38.6		
5.000	35.3		
3.350	31.8		
2.000	28.6		
1.180	25.4		
0.600	19.7		
0.425	15.3		
0.300	10.4		
0.212	6.6		
0.150	4.7		
0.063	2.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	3
Silt	
Sand	26
Gravel	71
Cobbles	0

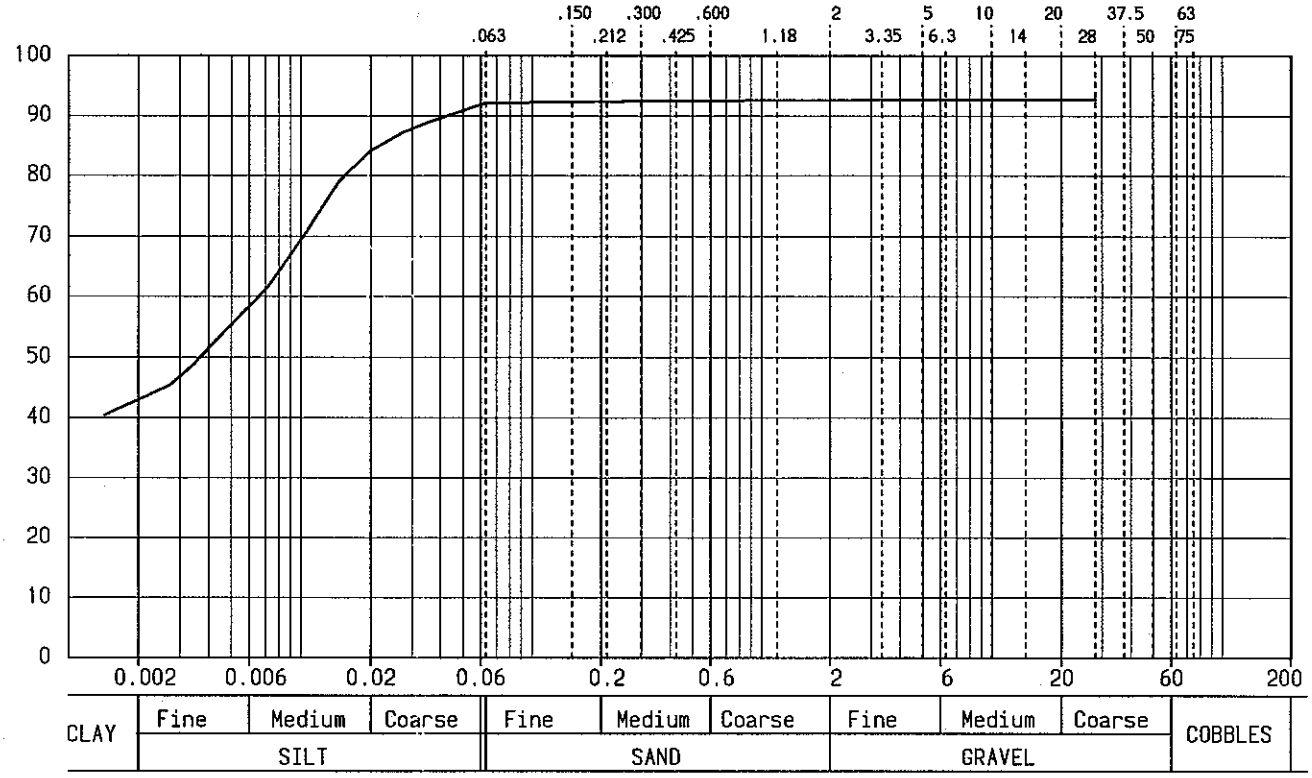
Q.A. Ref: /028-14/m4e5.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Greyish brown very silty slightly organic CLAY.	Hole ID	BHE6
		Sample No.	
		Depth	2.45m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05310	91.3
63.000	100.0	0.03807	89.4
50.000	100.0	0.02735	87.2
37.500	100.0	0.01976	84.0
28.000	92.7	0.01443	79.0
20.000	92.7	0.01042	70.6
14.000	92.7	0.00713	61.5
10.000	92.7	0.00420	52.4
6.300	92.7	0.00340	48.6
5.000	92.7	0.00272	45.5
3.350	92.7	0.00142	40.5
2.000	92.7		
1.180	92.6		
0.600	92.6		
0.425	92.5		
0.300	92.5		
0.212	92.4		
0.150	92.3		
0.063	92.2		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	43
Silt	50
Sand	0
Gravel	7
Cobbles	0

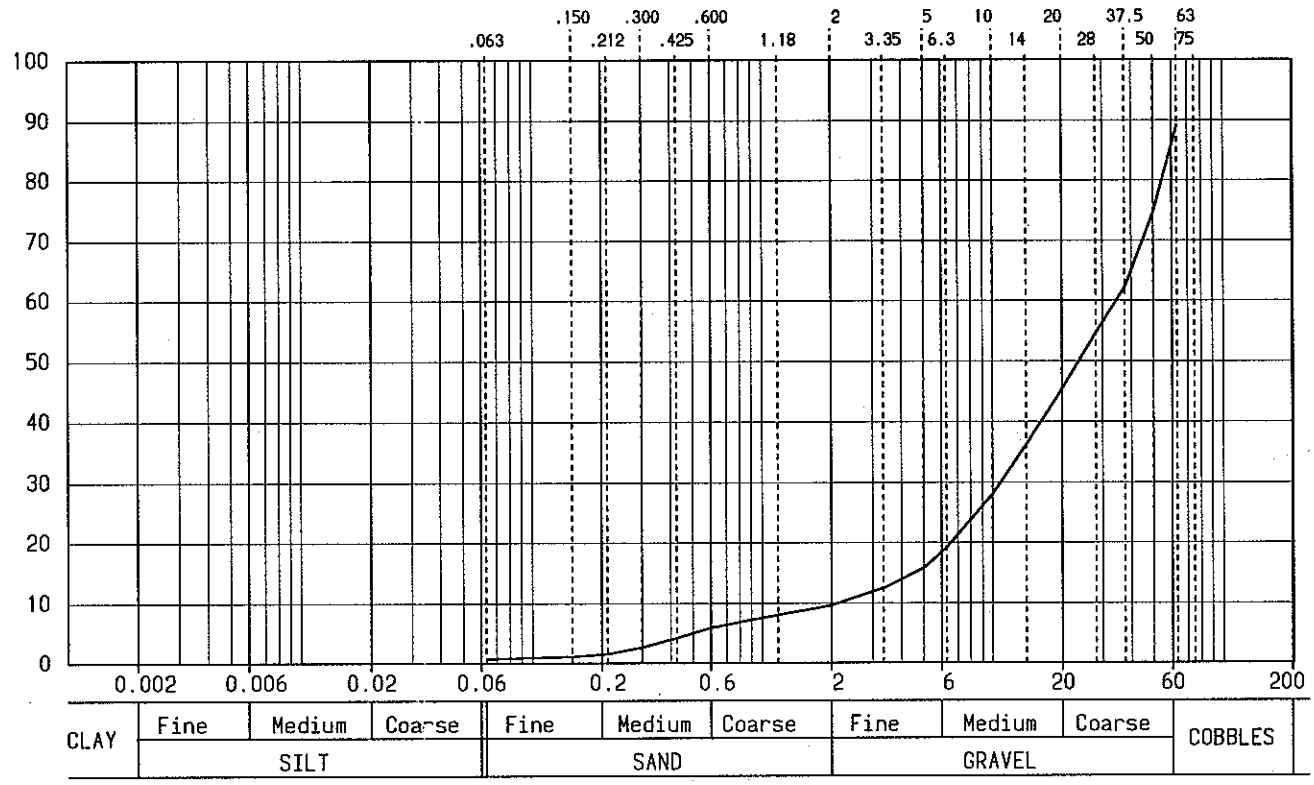
Q.A. Ref: /018-13/WHIB1725.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Dark grey sandy GRAVEL with occasional cobbles.	Hole ID	BHE6
		Sample No.	
		Depth	8.20m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	89.3		
50.000	74.7		
37.500	62.3		
28.000	54.8		
20.000	45.4		
14.000	36.4		
10.000	28.1		
6.300	19.3		
5.000	15.8		
3.350	12.5		
2.000	9.7		
1.180	8.0		
0.600	6.0		
0.425	4.3		
0.300	2.7		
0.212	1.6		
0.150	1.2		
0.063	0.8		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	0
Silt	
Sand	9
Gravel	77
Cobbles	14

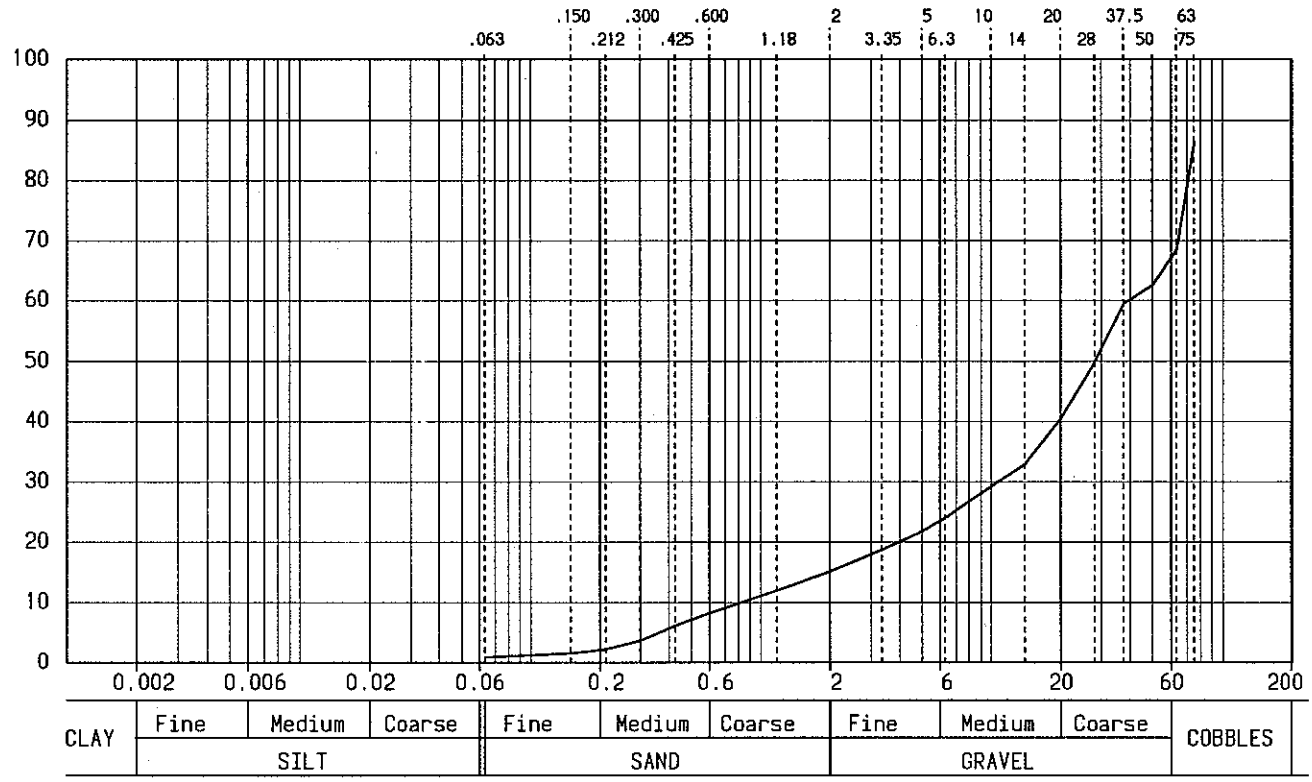
Q.A. Ref: /127-12/M4BE6.PSD 2.06 : U/

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Dark grey sandy GRAVEL with some cobbles.	Hole ID	BHE6
		Sample No.	
		Depth	13.00m



Particle Size	Cumulative % Passing
75.000	86.2
63.000	68.5
50.000	62.6
37.500	59.5
28.000	49.9
20.000	40.5
14.000	32.9
10.000	29.2
6.300	24.0
5.000	21.8
3.350	18.8
2.000	15.2
1.180	12.0
0.600	8.3
0.425	6.1
0.300	3.8
0.212	2.2
0.150	1.6
0.063	0.9

Particle Size	Cumulative % Passing

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	1
Silt	
Sand	14
Gravel	52
Cobbles	33

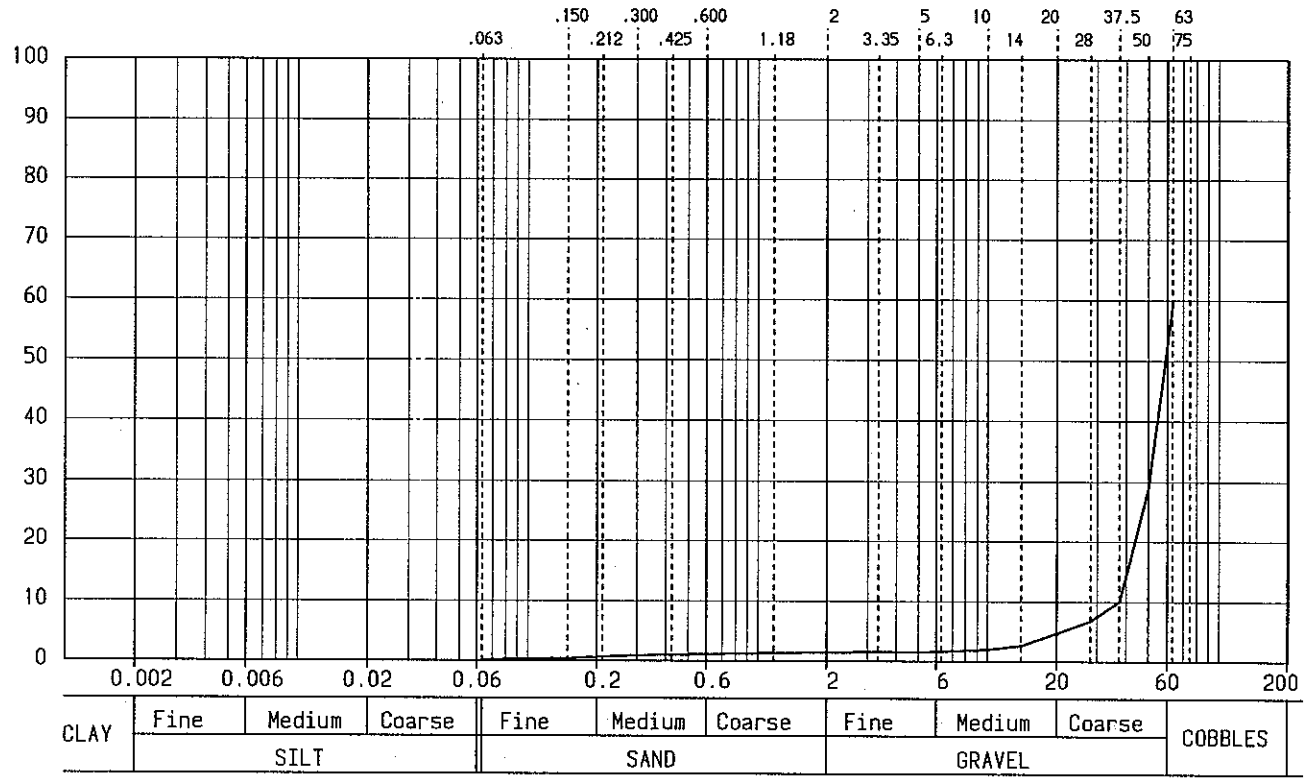
Q.A. Ref: /127-12/M4BE613.PSD 2.06 : U/

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Very dense dark grey sandy subround and occasional subangular siliceous GRAVEL with many cobbles.	Hole ID	BHF1
		Sample No.	
		Depth	8.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	59.5		
50.000	28.9		
37.500	10.1		
28.000	6.9		
20.000	4.8		
14.000	2.7		
10.000	2.1		
6.300	1.7		
5.000	1.7		
3.350	1.6		
2.000	1.5		
1.180	1.4		
0.600	1.2		
0.425	1.1		
0.300	0.9		
0.212	0.7		
0.150	0.5		
0.063	0.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

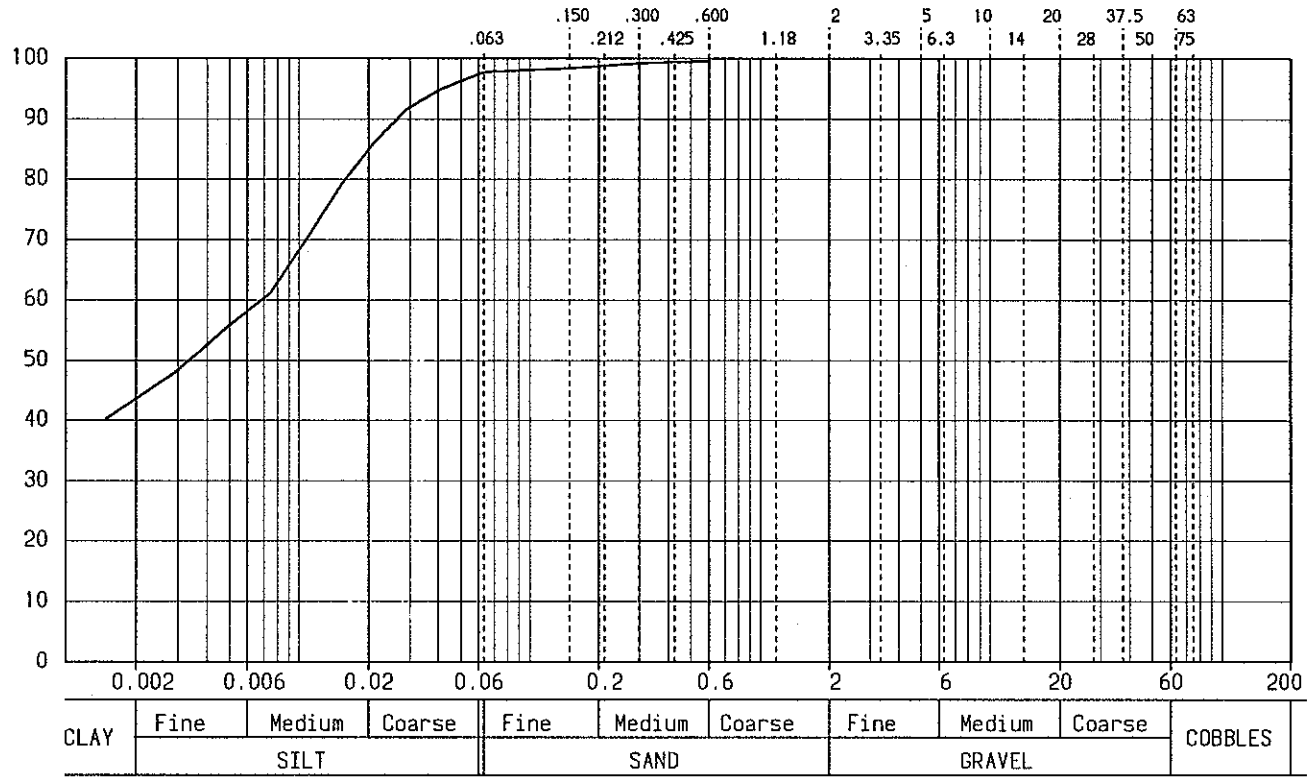
Clay	0
Silt	
Sand	1
Gravel	52
Cobbles	47

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft brown mottled grey very silty CLAY.	Hole ID	BH F2
		Sample No.	
		Depth	3.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05624	97.0
63.000	100.0	0.04026	94.8
50.000	100.0	0.02898	91.5
37.500	100.0	0.02109	86.0
28.000	100.0	0.01540	79.5
20.000	100.0	0.01100	70.7
14.000	100.0	0.00746	61.1
10.000	100.0	0.00478	55.3
6.300	100.0	0.00376	51.6
5.000	100.0	0.00292	48.0
3.350	100.0	0.00148	40.3
2.000	100.0		
1.180	100.0		
0.600	99.6		
0.425	99.5		
0.300	99.3		
0.212	98.9		
0.150	98.5		
0.063	97.8		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	44
Silt	54
Sand	2
Gravel	0
Cobbles	0

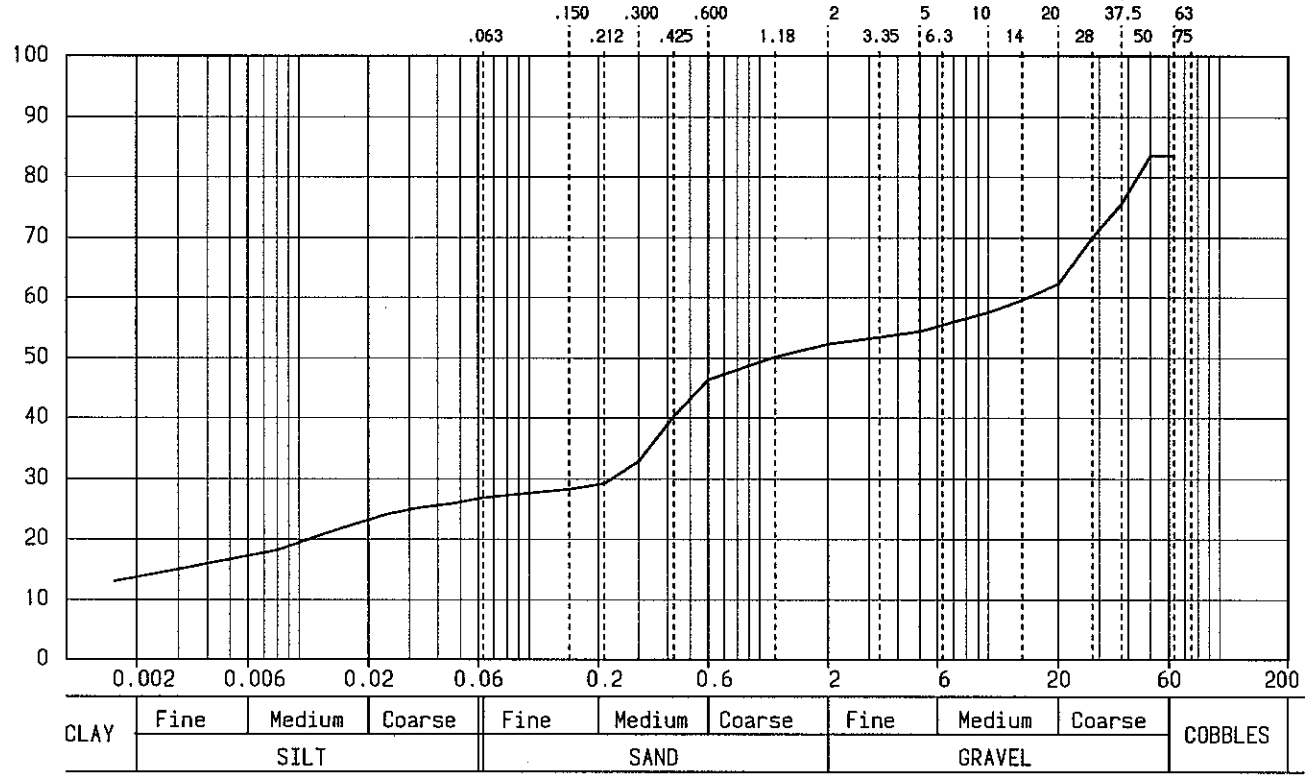
Q.A. Ref: /018-09/M4F235.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Dark grey organic very clayey subrounded siliceous GRAVEL.	Hole ID	BHF2
		Sample No.	
		Depth	12.10m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04684	25.9
63.000	83.6	0.03337	25.2
50.000	83.6	0.02388	24.1
37.500	75.7	0.01718	22.5
28.000	70.1	0.01202	20.6
20.000	62.4	0.00801	18.2
14.000	59.6	0.00414	16.0
10.000	57.6	0.00160	13.0
6.300	55.5		
5.000	54.4		
3.350	53.4		
2.000	52.3		
1.180	50.2		
0.600	46.4		
0.425	40.3		
0.300	32.9		
0.212	29.2		
0.150	28.3		
0.063	26.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	14
Silt	14
Sand	25
Gravel	31
Cobbles	16

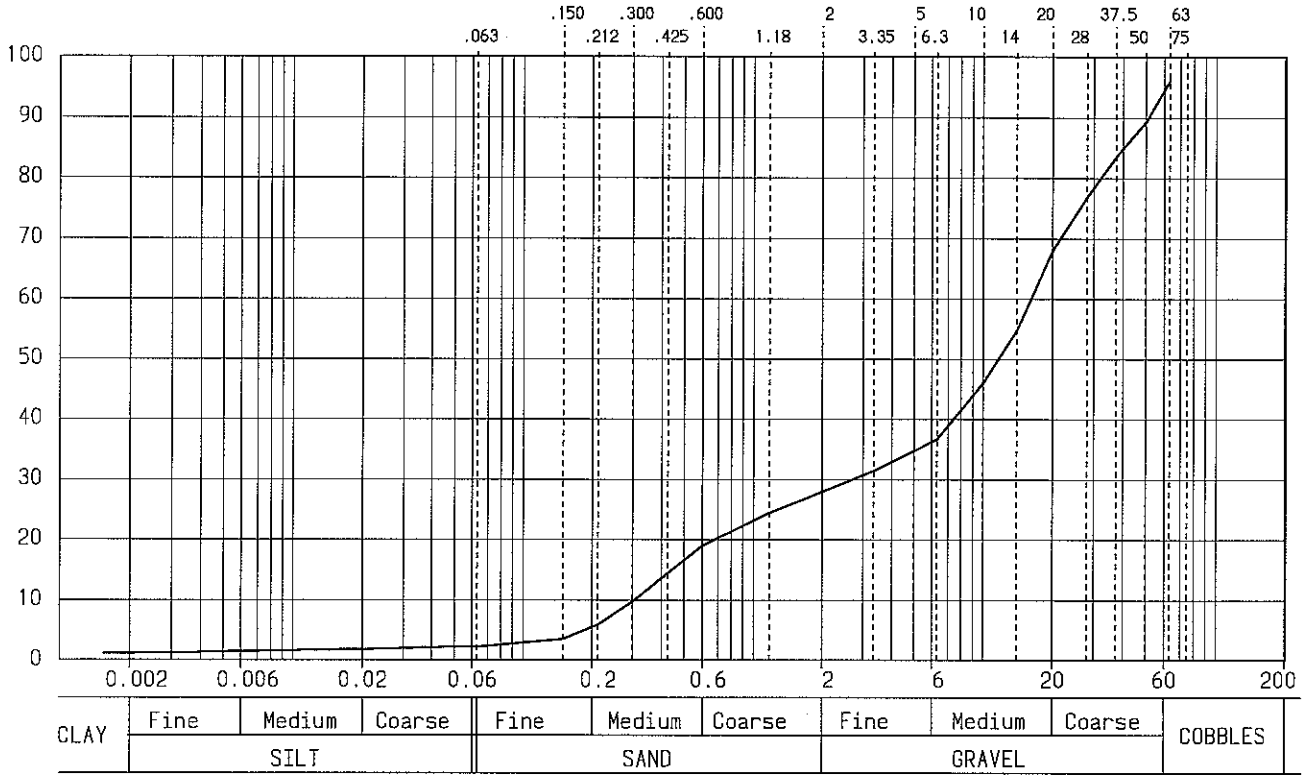
Q.A. Ref: /028-13/M4F212.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Dark grey very sandy subrounded GRAVEL with occasional cobbles.	Hole ID	BHF3
		Sample No.	
		Depth	16.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05210	2.2
63.000	96.3	0.03711	2.1
50.000	89.4	0.02646	1.9
37.500	83.7	0.01880	1.8
28.000	77.0	0.01295	1.7
20.000	68.1	0.00849	1.6
14.000	54.8	0.00435	1.4
10.000	46.0	0.00359	1.3
6.300	36.7	0.00292	1.2
5.000	34.7	0.00154	1.2
3.350	31.4		
2.000	28.0		
1.180	24.5		
0.600	19.1		
0.425	14.5		
0.300	9.8		
0.212	6.0		
0.150	3.5		
0.063	2.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	1
Silt	1
Sand	26
Gravel	67
Cobbles	5

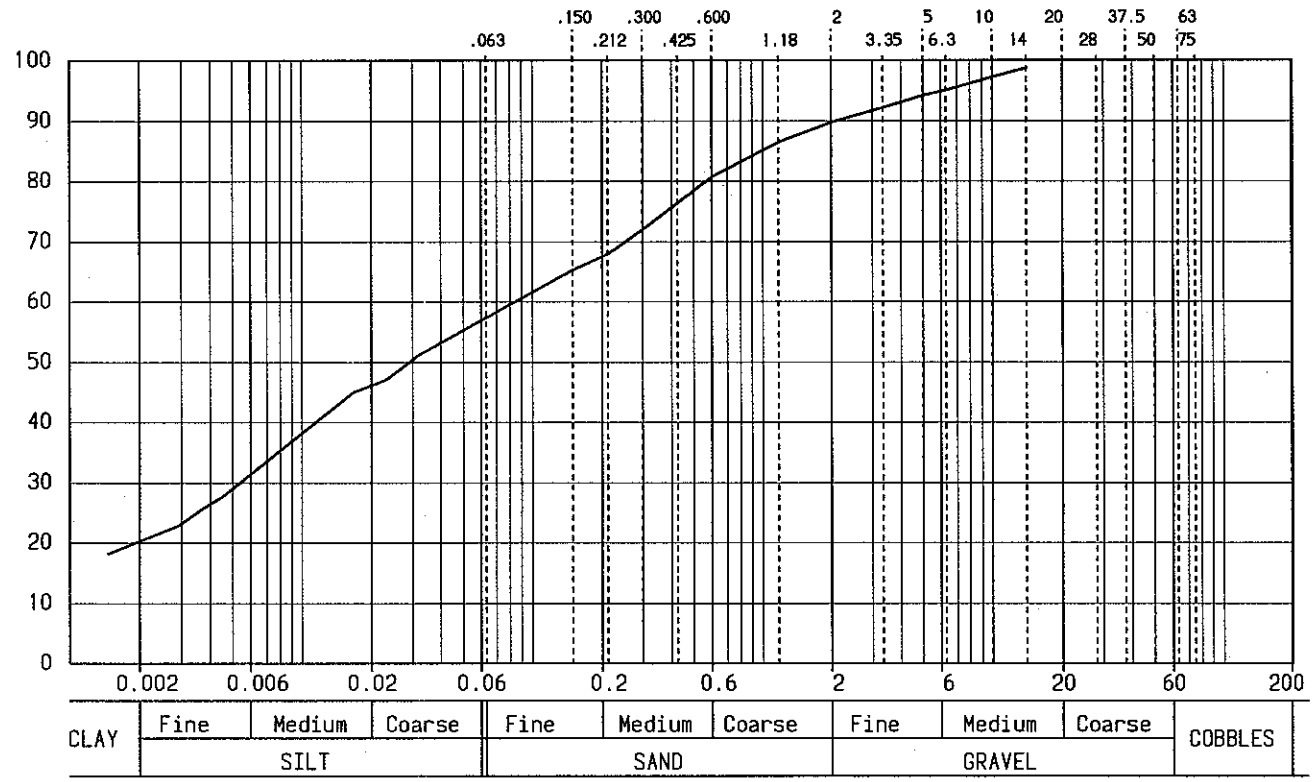
Q.A. Ref: /028-02/M4BHF3.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown mottled greenish grey thinly laminated weathered weak mudstone.	Hole ID	BHF3
		Sample No.	
		Depth	19.80m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.06150	57.2
63.000	100.0	0.04431	54.3
50.000	100.0	0.03196	51.1
37.500	100.0	0.02314	47.1
28.000	100.0	0.01656	45.0
20.000	100.0	0.01166	40.3
14.000	98.7	0.00782	35.0
10.000	97.3	0.00456	27.9
6.300	95.1	0.00366	25.5
5.000	94.2	0.00293	22.9
3.350	92.2	0.00146	18.2
2.000	89.8		
1.180	86.5		
0.600	80.8		
0.425	76.4		
0.300	72.0		
0.212	68.0		
0.150	65.4		
0.063	57.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	20
Silt	38
Sand	32
Gravel	10
Cobbles	0

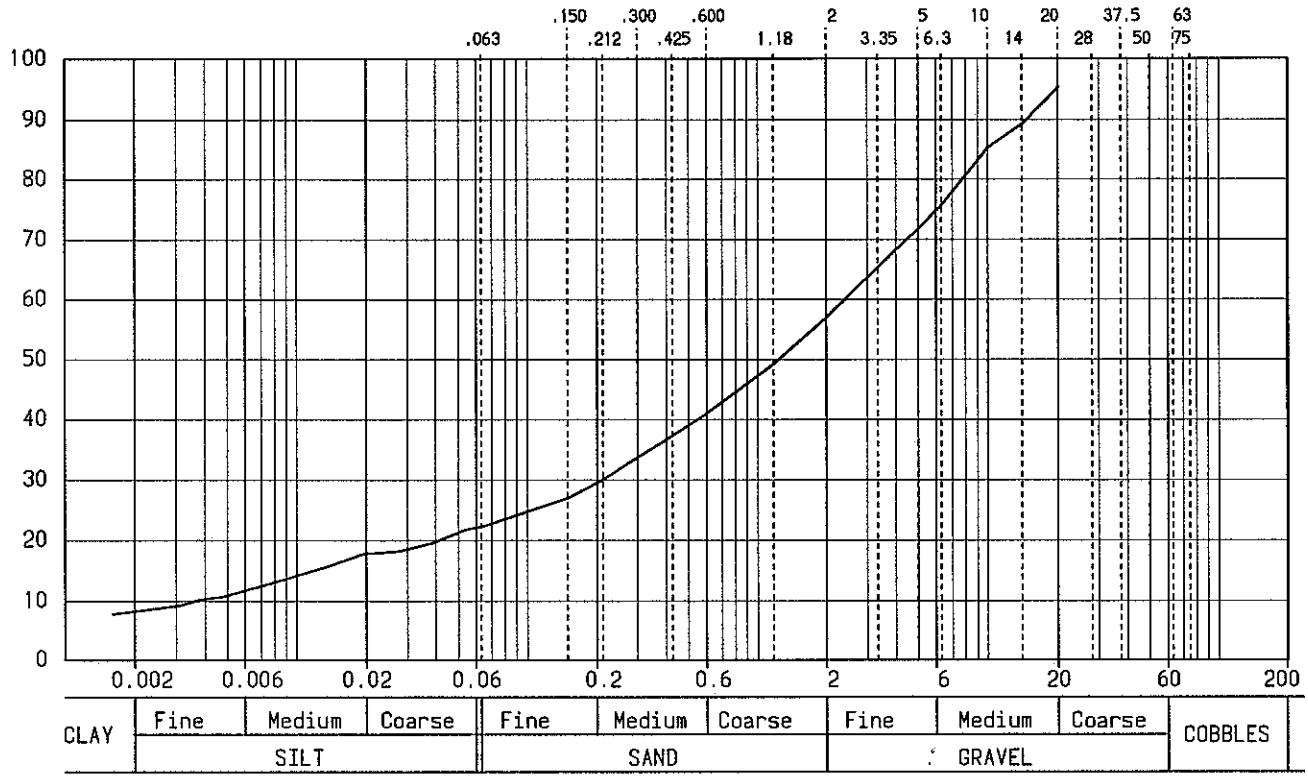
Q.A. Ref: /028-12/M4BF3.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	MADE GROUND: Black grey slightly sandy gravel of brick, ash and some rubble.	Hole ID	BHF4
		Sample No.	
		Depth	2.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05409	21.8
63.000	100.0	0.03850	19.6
50.000	100.0	0.02735	18.2
37.500	100.0	0.01936	17.8
28.000	100.0	0.01337	15.7
20.000	95.4	0.00877	13.6
14.000	89.3	0.00480	10.7
10.000	85.4	0.00386	10.4
6.300	75.7	0.00309	9.3
5.000	71.8	0.00161	7.9
3.350	65.4		
2.000	57.0		
1.180	49.2		
0.600	41.1		
0.425	37.3		
0.300	33.8		
0.212	30.0		
0.150	27.1		
0.063	22.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	8
Silt	14
Sand	35
Gravel	43
Cobbles	0

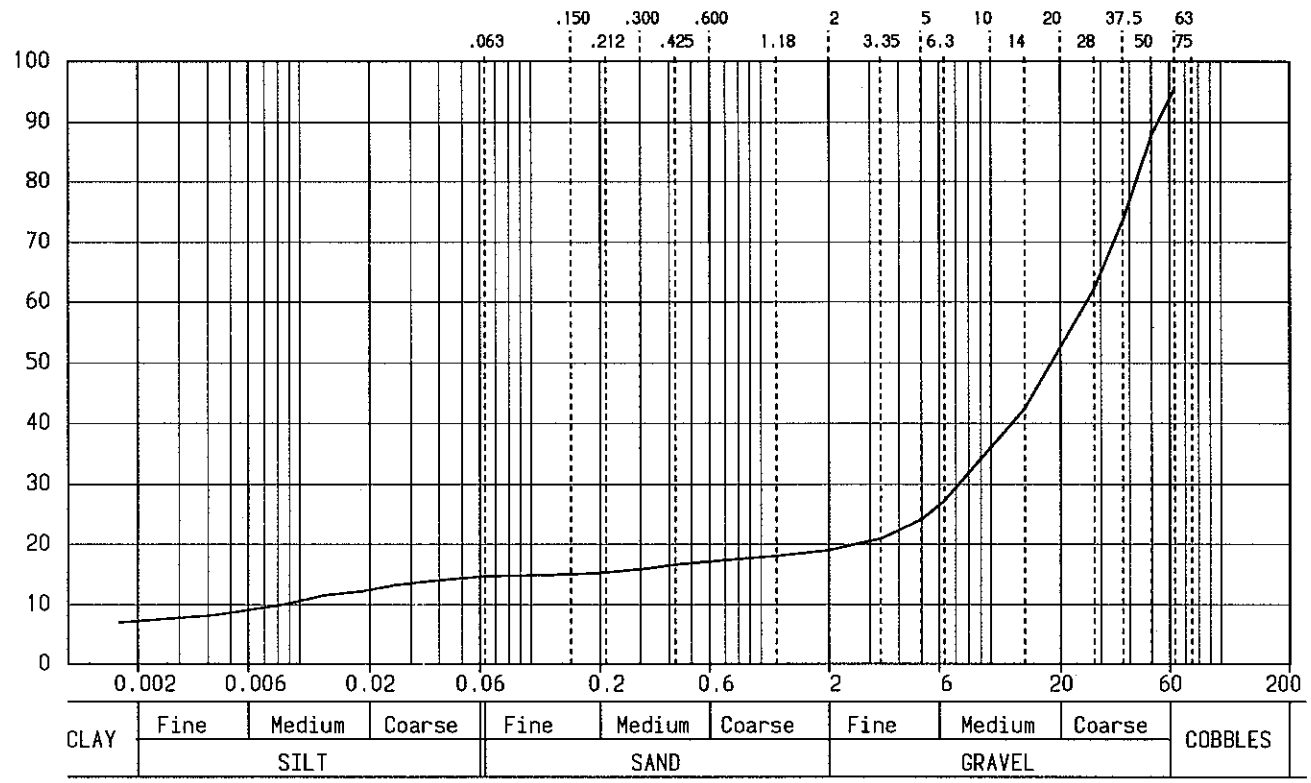
Q.A. Ref: /028-14/m4f42.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey sandy subrounded siliceous GRAVEL with some cobbles.	Hole ID	BHF4
		Sample No.	
		Depth	12.50m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	95.7
50.000	87.8
37.500	73.7
28.000	62.4
20.000	52.7
14.000	42.6
10.000	36.2
6.300	27.4
5.000	24.2
3.350	21.0
2.000	19.0
1.180	18.1
0.600	17.2
0.425	16.6
0.300	15.9
0.212	15.4
0.150	15.1
0.063	14.8

Particle Size	Cumulative % Passing
0.05082	14.5
0.03617	13.9
0.02577	13.3
0.01845	12.2
0.01273	11.6
0.00845	9.9
0.00423	8.2
0.00165	7.0

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	7
Silt	8
Sand	4
Gravel	75
Cobbles	6

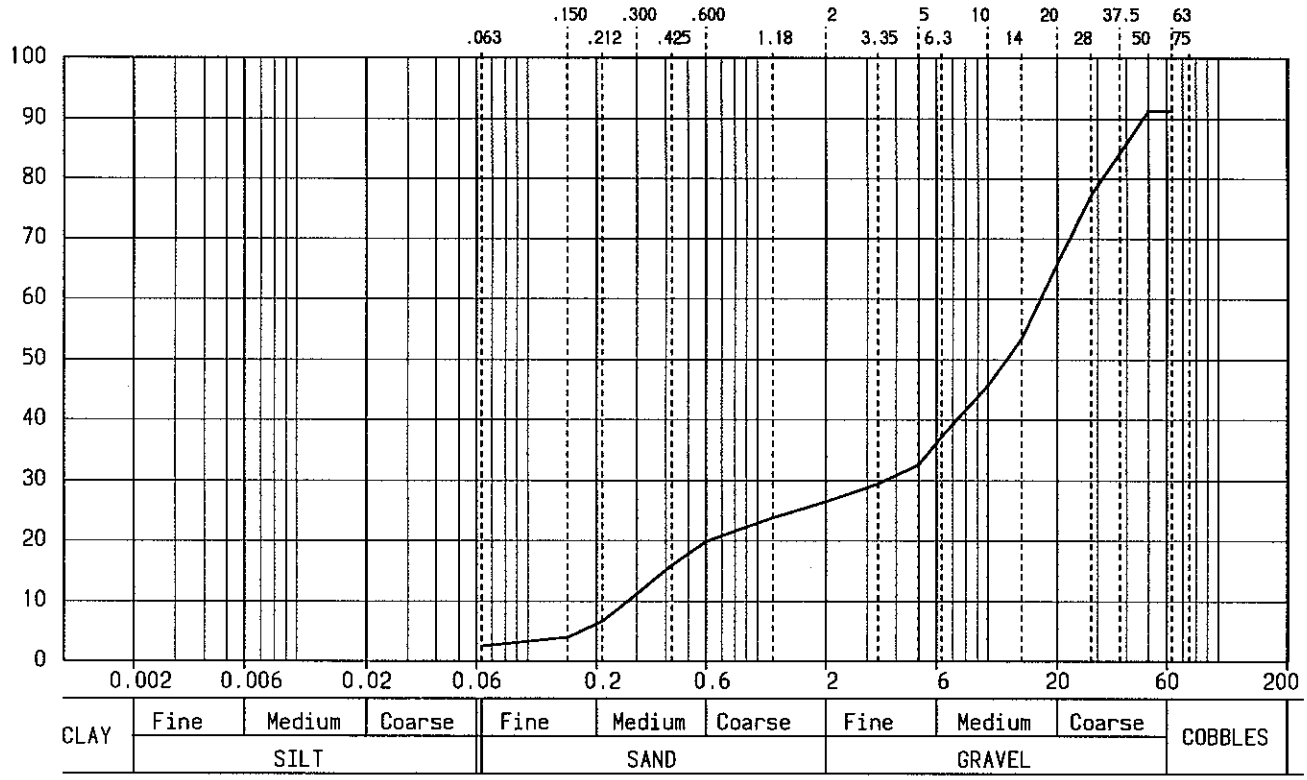
Q.A. Ref: /028-13/M4F4.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey slightly sandy GRAVEL with occasional cobbles.	Hole ID	BHF4
		Sample No.	
		Depth	17.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	91.3		
50.000	91.3		
37.500	84.4		
28.000	77.3		
20.000	66.0		
14.000	53.5		
10.000	45.7		
6.300	37.3		
5.000	32.6		
3.350	29.4		
2.000	26.5		
1.180	23.9		
0.600	19.9		
0.425	16.0		
0.300	11.2		
0.212	6.7		
0.150	4.1		
0.063	2.5		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	2
Silt	
Sand	24
Gravel	65
Cobbles	9

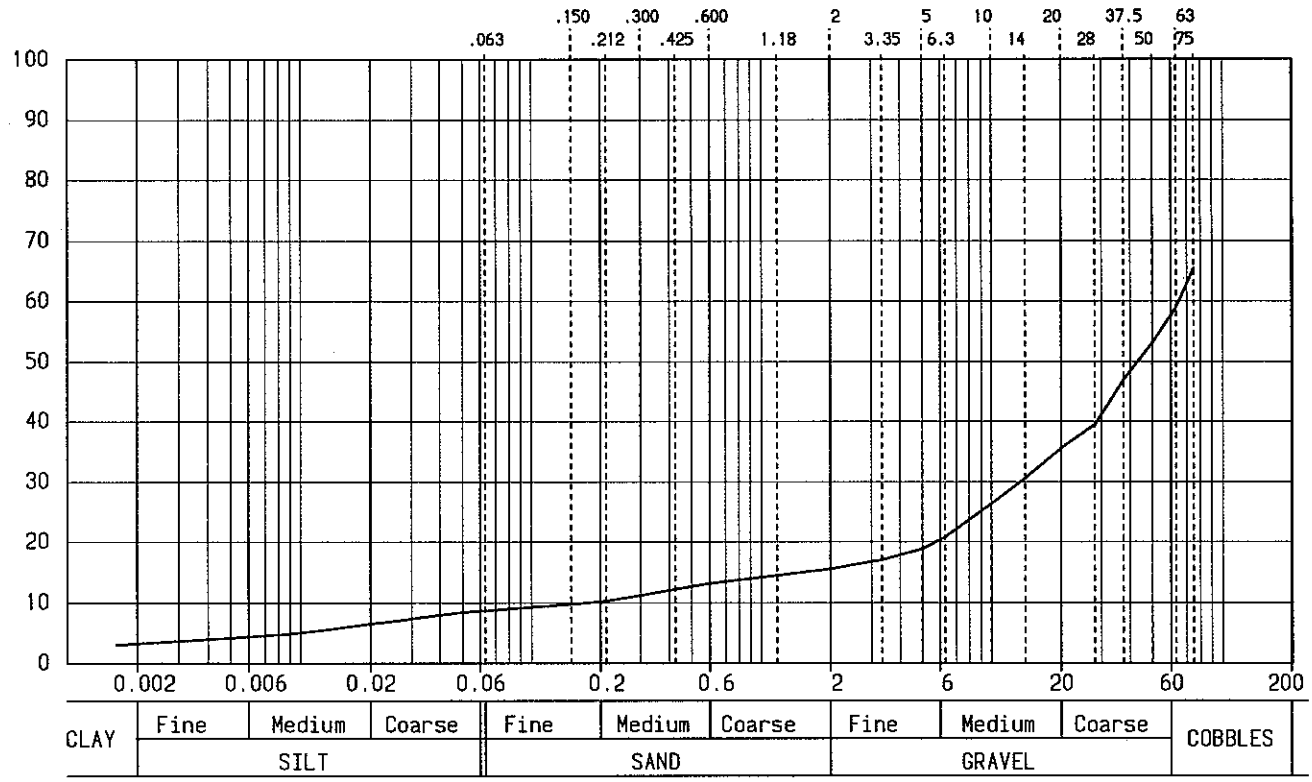
Q.A. Ref: /018-30/M4BF4.PSD 2.06 : U/

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey slightly sandy silceous GRAVEL and COBBLES.	Hole ID	BHF5
		Sample No.	
		Depth	15.00m



Particle Size	Cumulative % Passing
75.000	65.6
63.000	59.1
50.000	53.2
37.500	47.0
28.000	39.5
20.000	35.6
14.000	30.6
10.000	26.4
6.300	20.8
5.000	18.8
3.350	17.0
2.000	15.5
1.180	14.6
0.600	13.2
0.425	12.2
0.300	11.2
0.212	10.3
0.150	9.8
0.063	8.7

Particle Size	Cumulative % Passing
0.05218	8.5
0.03722	7.9
0.02663	7.1
0.01901	6.5
0.01319	5.7
0.00871	4.8
0.00502	4.3
0.00173	3.2
0.00326	3.8
0.00163	3.2

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	3
Silt	6
Sand	7
Gravel	42
Cobbles	42

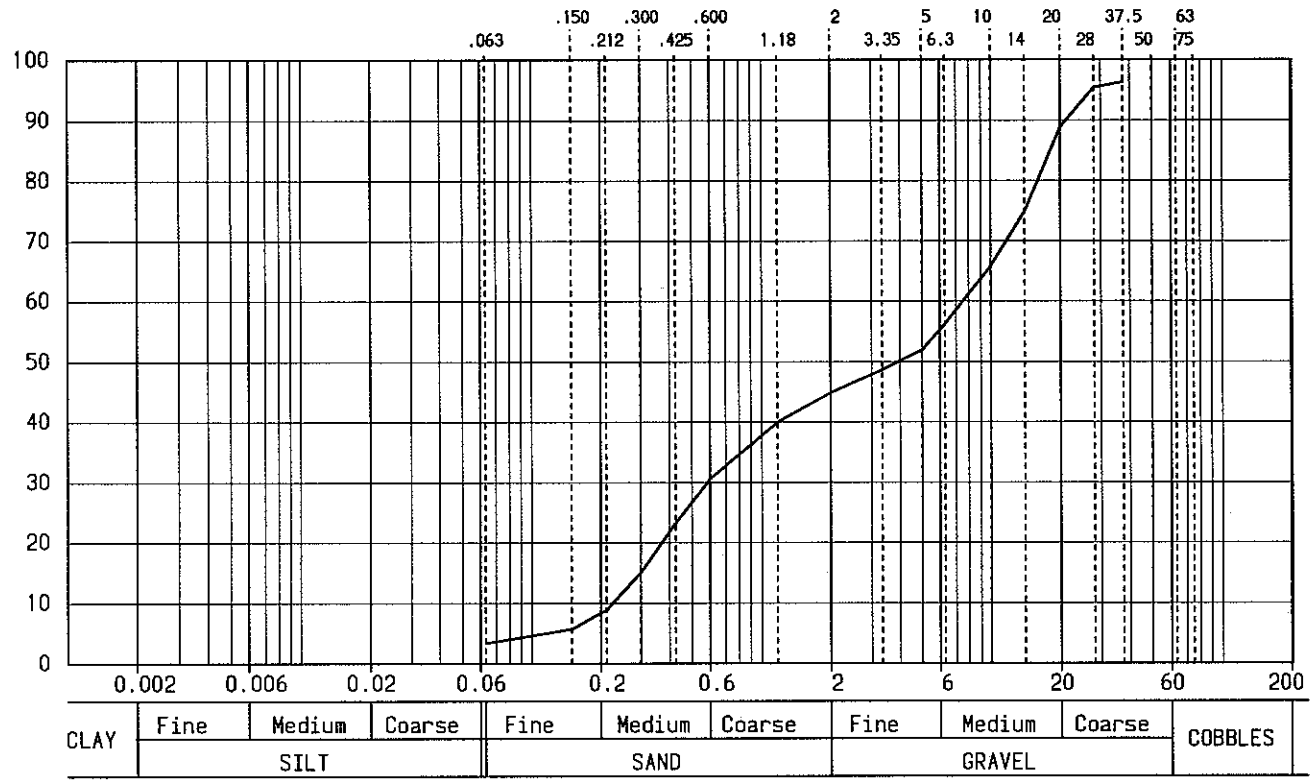
Q.A. Ref: /028-13/M4BF5.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey brown sandy siliceous GRAVEL.	Hole ID	BHF5
		Sample No.	
		Depth	19.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	100.0		
50.000	100.0		
37.500	96.3		
28.000	95.5		
20.000	88.9		
14.000	75.0		
10.000	65.9		
6.300	56.3		
5.000	52.0		
3.350	48.7		
2.000	44.9		
1.180	40.1		
0.600	30.6		
0.425	23.3		
0.300	15.1		
0.212	8.9		
0.150	5.7		
0.063	3.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	3
Silt	
Sand	42
Gravel	55
Cobbles	0

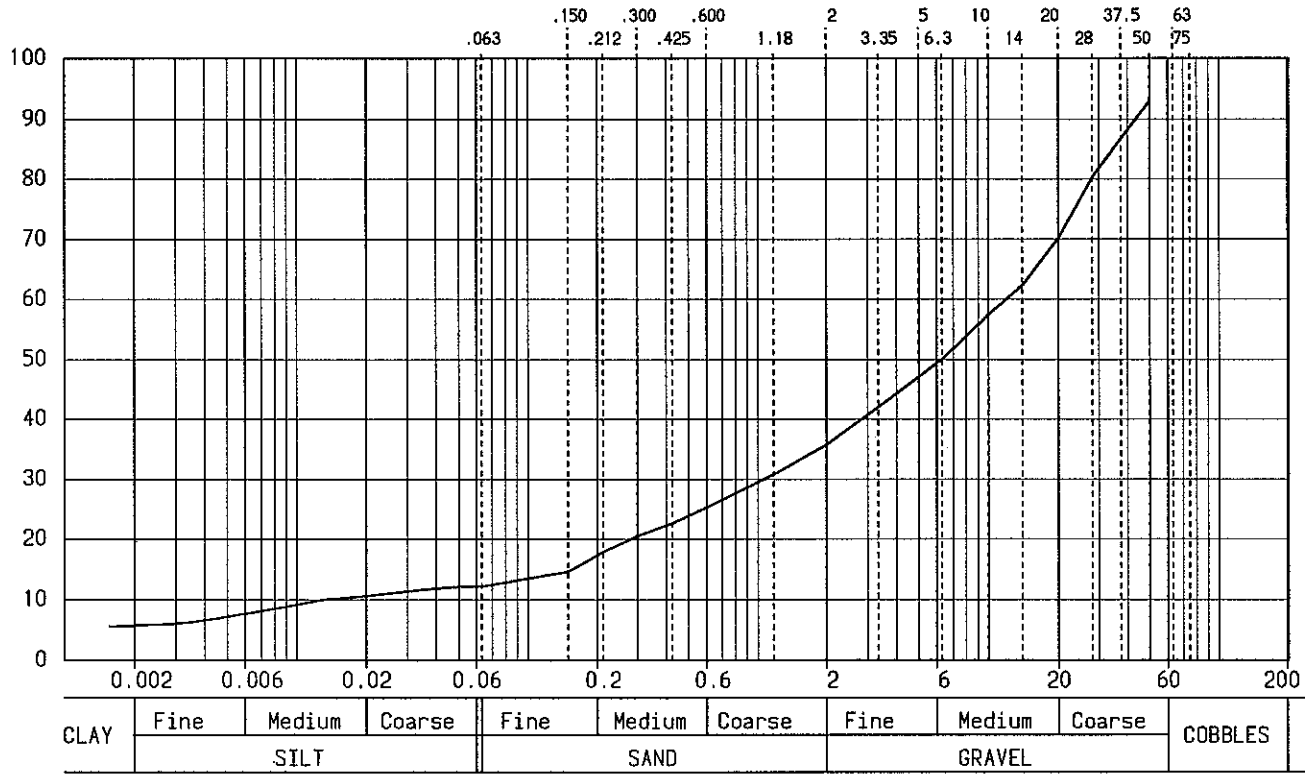
Q.A. Ref: /028-12/M4F5.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	MADE GROUND: Very loose dark grey slightly clayey, sandy subangular gravel of ash, brick and shale.	Hole ID	BHF6
		Sample No.	
		Depth	1.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05204	12.2
63.000	100.0	0.03693	11.8
50.000	93.1	0.02627	11.2
37.500	86.8	0.01869	10.5
28.000	80.3	0.01288	10.0
20.000	70.2	0.00849	8.7
14.000	62.4	0.00424	6.8
10.000	57.5	0.00354	6.4
6.300	50.1	0.00290	6.1
5.000	47.1	0.00155	5.6
3.350	42.0		
2.000	35.8		
1.180	30.8		
0.600	25.3		
0.425	22.7		
0.300	20.6		
0.212	17.9		
0.150	14.7		
0.063	12.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	6
Silt	6
Sand	24
Gravel	64
Cobbles	0

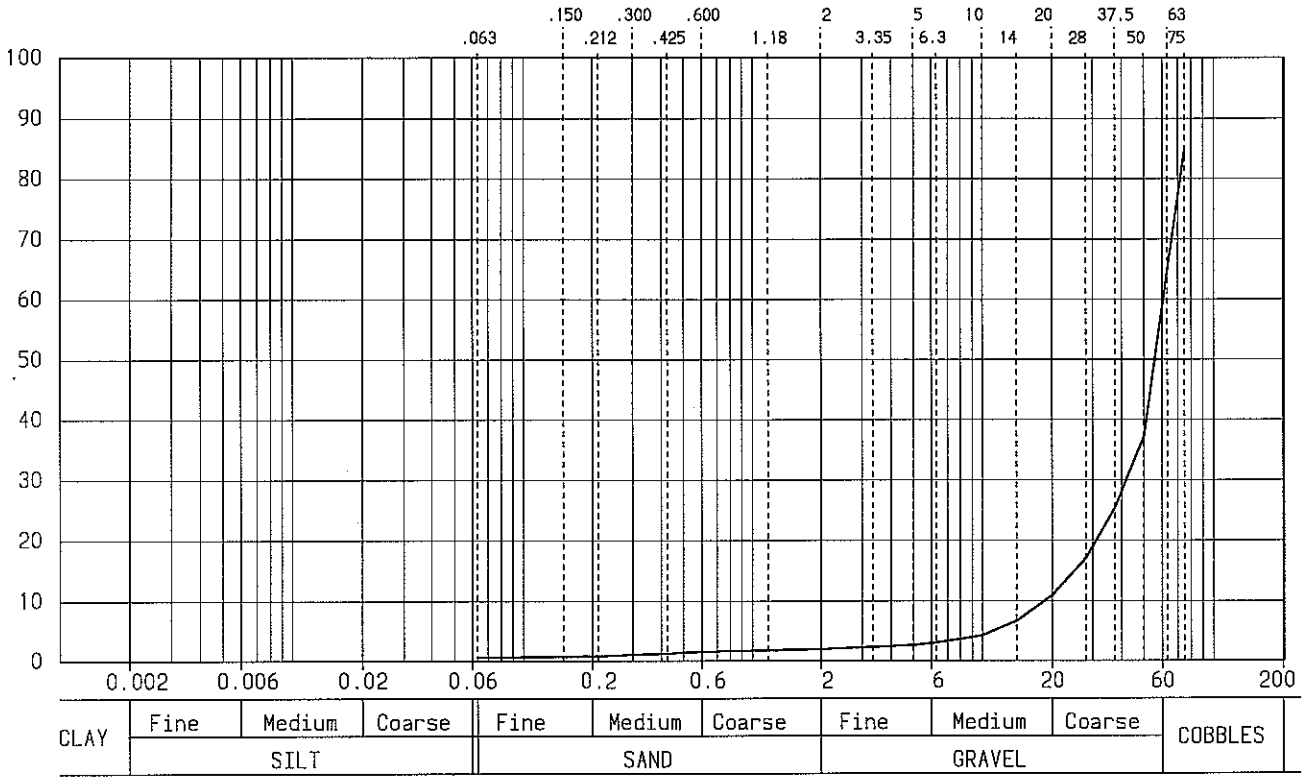
Q.A. Ref: /028-14/m4f6.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Dense grey subangular siliceous GRAVEL with much cobbles.	Hole ID	BHF6
		Sample No.	
		Depth	18.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	85.2		
63.000	65.2		
50.000	37.2		
37.500	25.5		
28.000	17.2		
20.000	11.0		
14.000	6.7		
10.000	4.3		
6.300	3.1		
5.000	2.7		
3.350	2.3		
2.000	2.0		
1.180	1.8		
0.600	1.6		
0.425	1.3		
0.300	1.1		
0.212	0.9		
0.150	0.8		
0.063	0.6		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Measured)

Clay	1
Silt	
Sand	1
Gravel	57
Cobbles	41

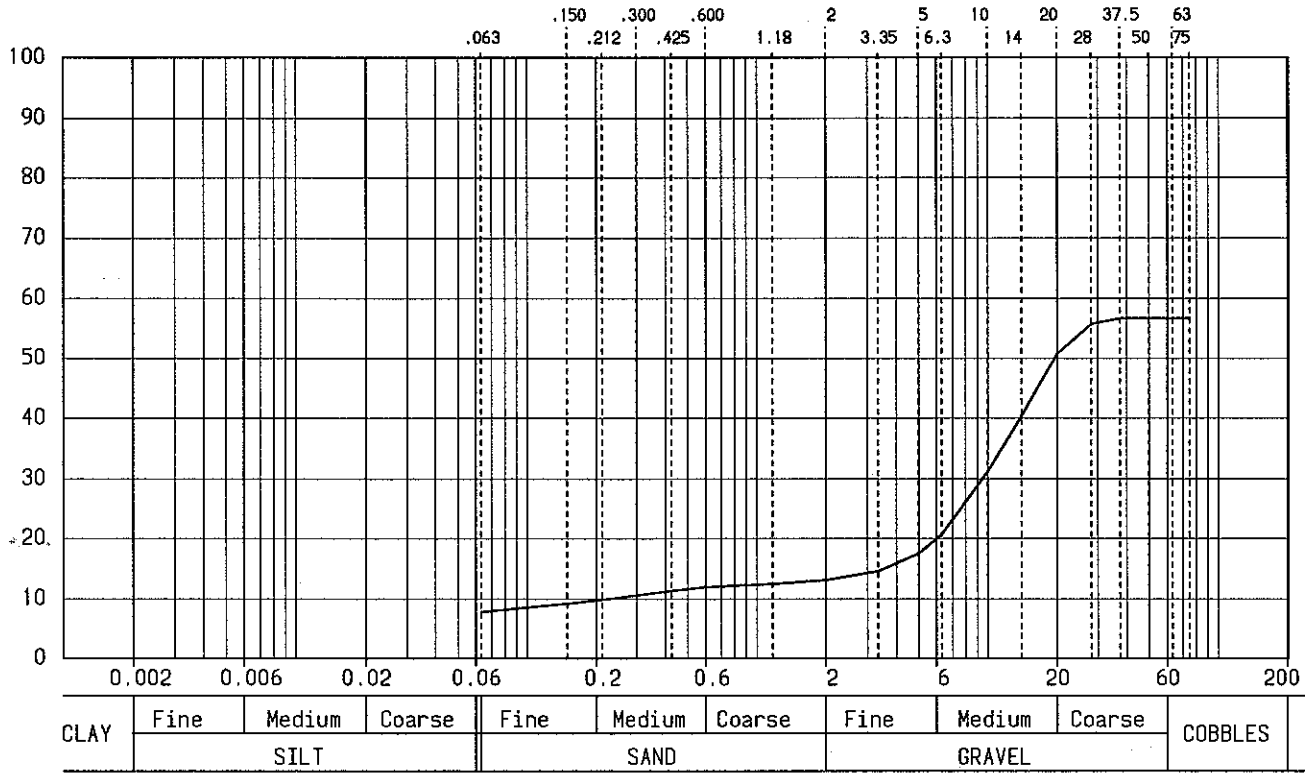
Q.A. Ref: /028-05/M4TPB100.PSD 2.06 : U/Hr192.34/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Dense greyish brown slightly sandy GRAVEL and COBBLES	Hole ID	BHG1
		Sample No.	
		Depth	16.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	56.7		
63.000	56.7		
50.000	56.7		
37.500	56.7		
28.000	55.8		
20.000	50.8		
14.000	40.4		
10.000	31.3		
6.300	20.8		
5.000	17.6		
3.350	14.7		
2.000	13.2		
1.180	12.6		
0.600	11.9		
0.425	11.3		
0.300	10.6		
0.212	9.9		
0.150	9.3		
0.063	7.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	8
Silt	
Sand	5
Gravel	44
Cobbles	43

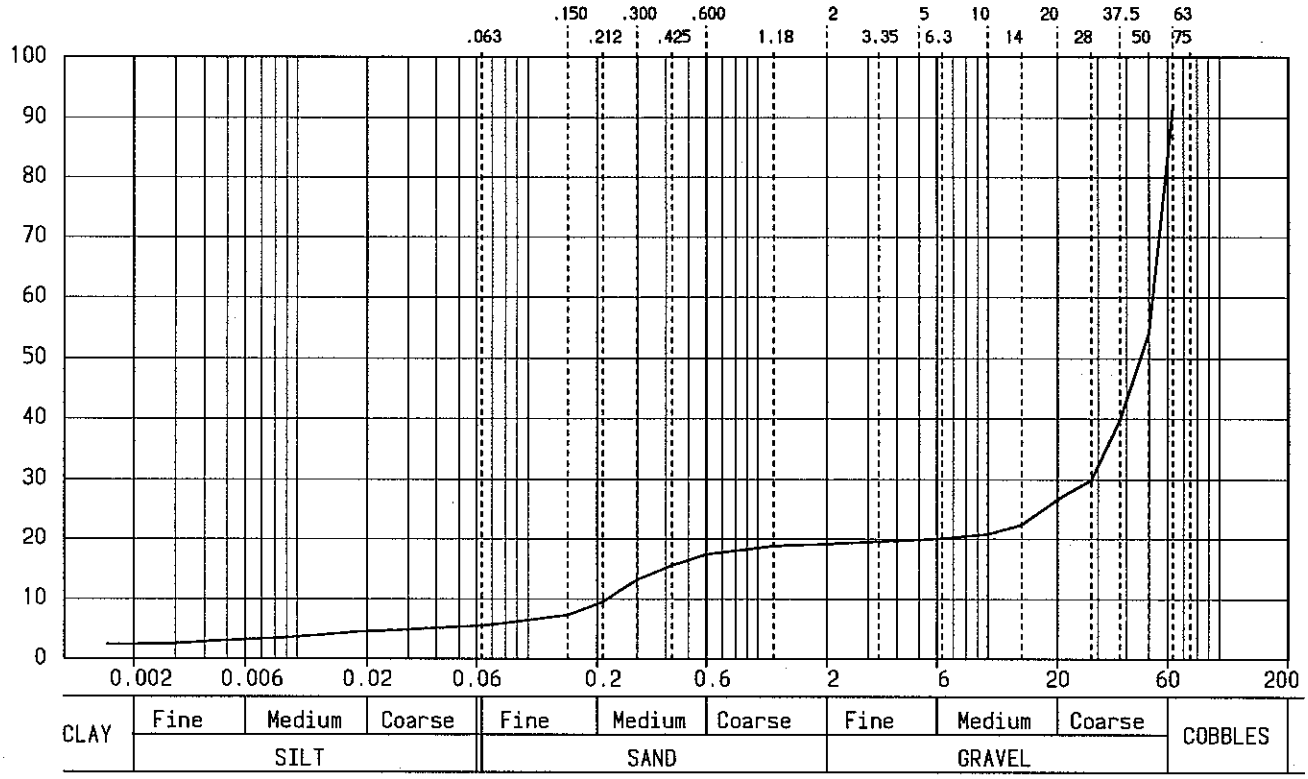
Q.A. Ref: /028-14/m4g1.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Dense grey sandy subrounded siliceous GRAVEL with occasional cobbles.	Hole ID	BHG2
		Sample No.	
		Depth	13.50m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	92.1
50.000	54.3
37.500	40.0
28.000	30.0
20.000	26.7
14.000	22.5
10.000	20.9
6.300	20.1
5.000	20.0
3.350	19.6
2.000	19.2
1.180	18.8
0.600	17.4
0.425	15.6
0.300	13.2
0.212	9.6
0.150	7.3
0.063	5.5

Particle Size	Cumulative % Passing
0.05164	5.4
0.03674	5.1
0.02614	4.7
0.01855	4.5
0.01283	4.1
0.00843	3.6
0.00431	3.0
0.00356	2.7
0.00290	2.5
0.00152	2.5

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	3
Silt	2
Sand	14
Gravel	65
Cobbles	16

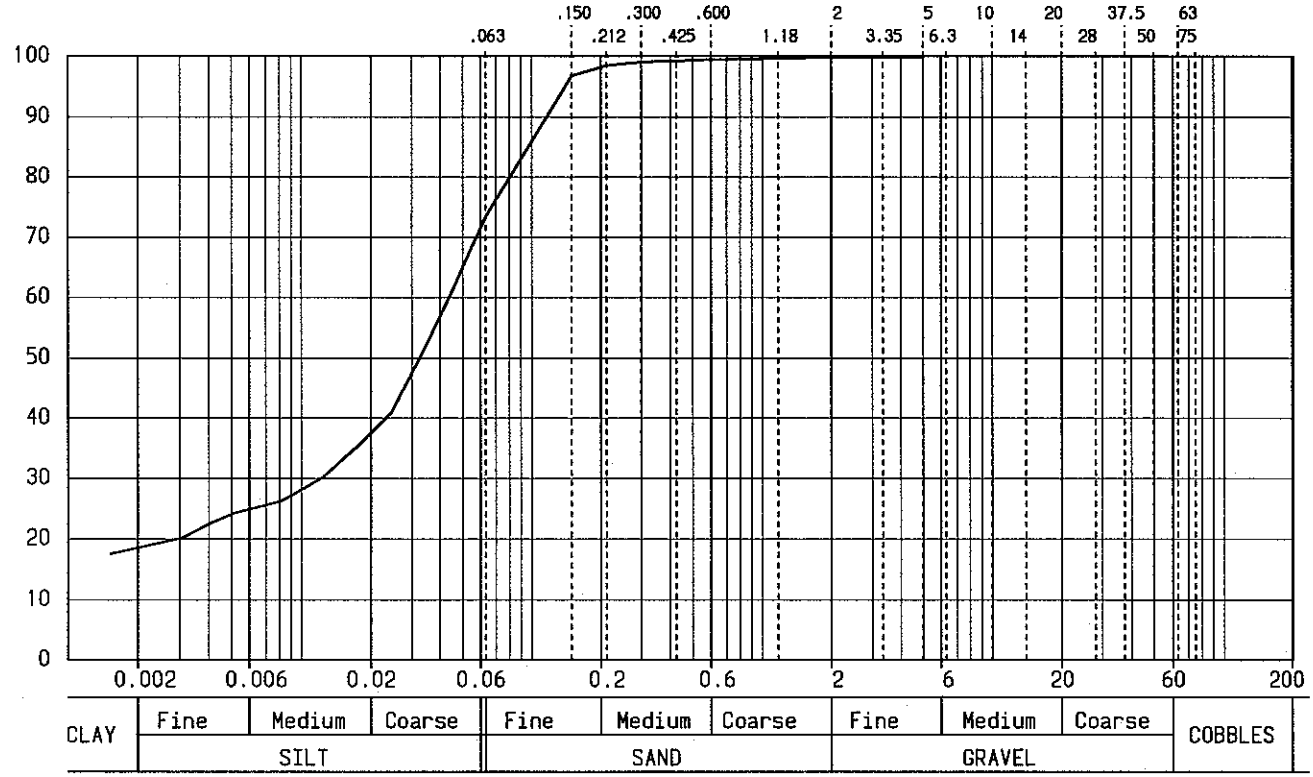
Q.A. Ref: /028-12/M4BG2.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft dark grey sandy CLAY.	Hole ID	BHG3
		Sample No.	
		Depth	13.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05961	71.4
63.000	100.0	0.04457	60.8
50.000	100.0	0.03308	50.5
37.500	100.0	0.02439	40.9
28.000	100.0	0.01762	35.5
20.000	100.0	0.01234	30.2
14.000	100.0	0.00817	26.2
10.000	100.0	0.00515	24.2
6.300	100.0	0.00401	22.6
5.000	99.9	0.00310	20.3
3.350	99.9	0.00153	17.6
2.000	99.9		
1.180	99.7		
0.600	99.5		
0.425	99.3		
0.300	99.1		
0.212	98.6		
0.150	96.9		
0.063	73.4		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	19
Silt	55
Sand	26
Gravel	0
Cobbles	0

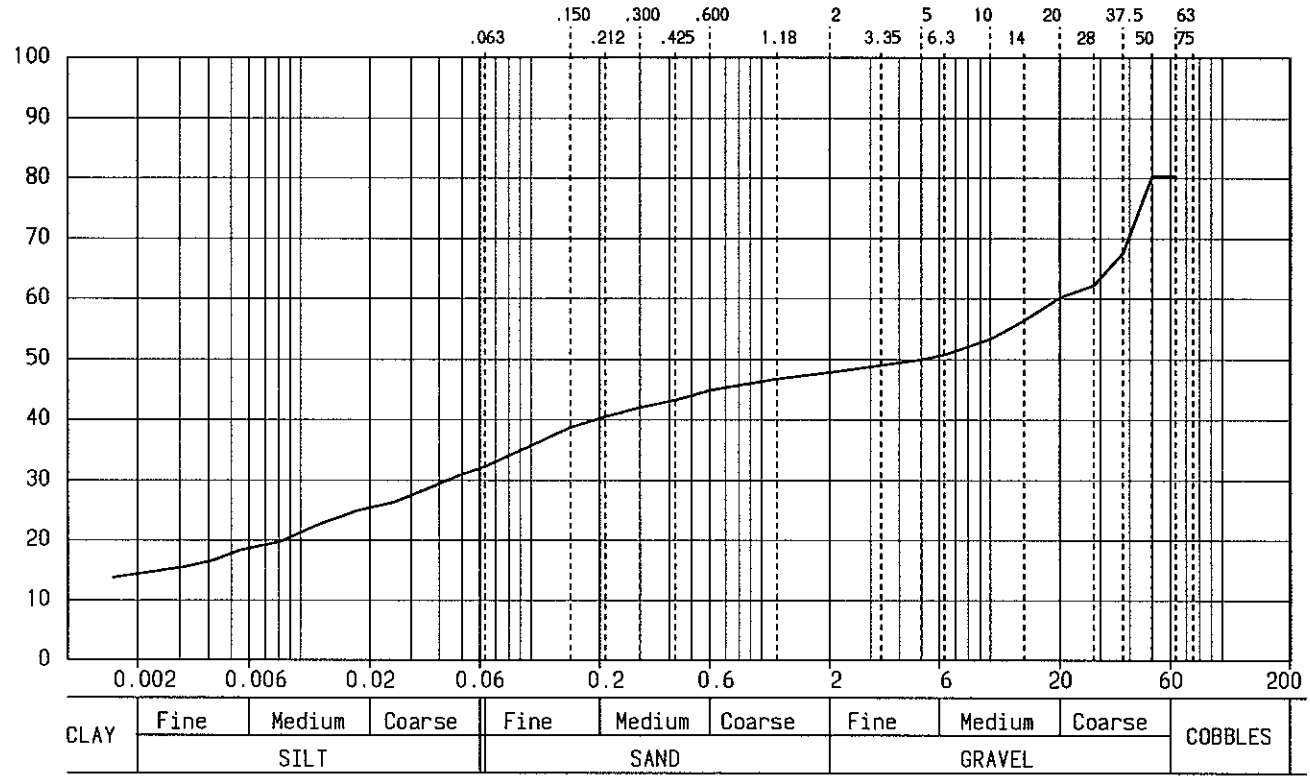
Q.A. Ref: /028-02/M4BHG3.PSD 2.06 : U/Hr192.36/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown completely to highly weathered sandy weak mudstone, with occasional cobbles.	Hole ID	BHG4
		Sample No.	
		Depth	12.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04843	30.8
63.000	80.4	0.03477	28.5
50.000	80.4	0.02495	26.3
37.500	67.6	0.01778	25.0
28.000	62.3	0.01236	22.9
20.000	60.2	0.00821	19.8
14.000	56.4	0.00546	18.3
10.000	53.4	0.00418	16.7
6.300	50.8	0.00318	15.6
5.000	50.0	0.00156	13.8
3.350	49.0		
2.000	47.9		
1.180	46.8		
0.600	44.9		
0.425	43.4		
0.300	42.1		
0.212	40.6		
0.150	38.8		
0.063	32.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	14
Silt	17
Sand	16
Gravel	33
Cobbles	20

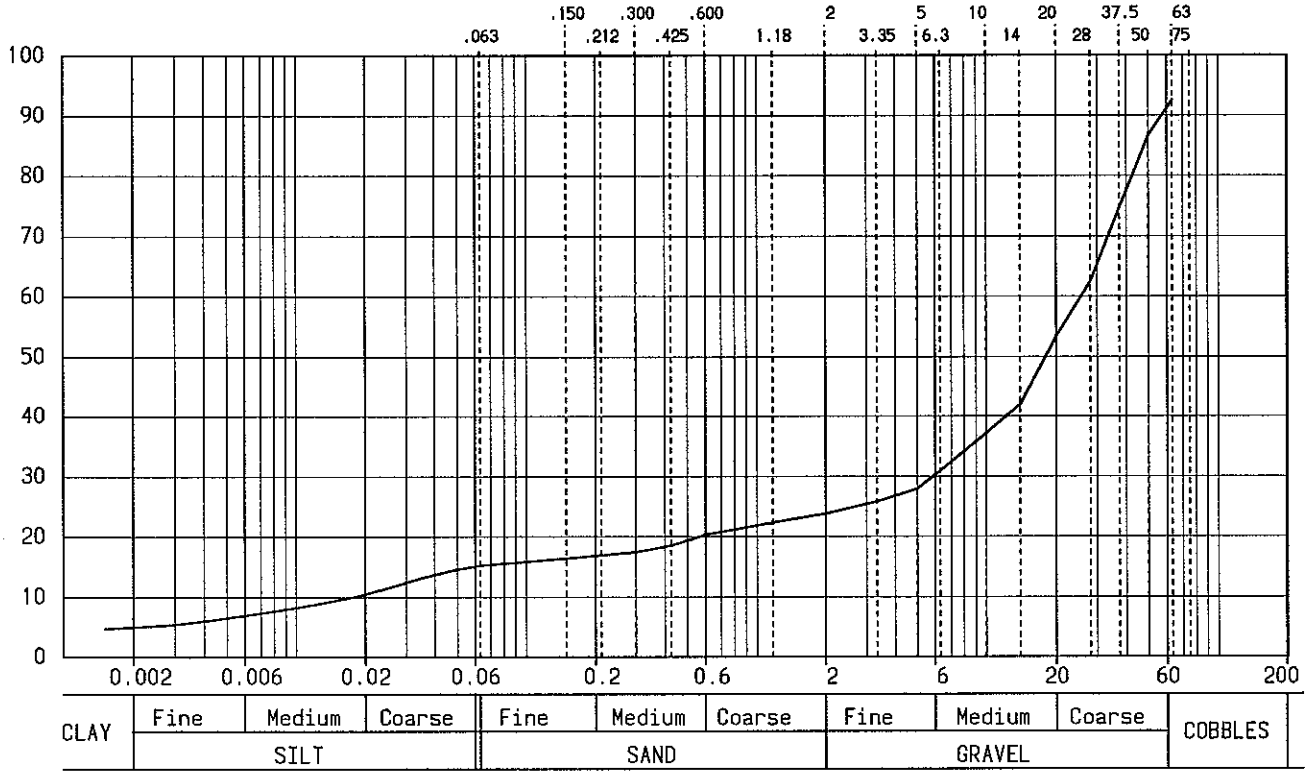
Q.A. Ref: /028-13/M4G4.PSD 2.06 : U/Hr203.01/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Medium dense grey brown silty sandy subrounded and occasional subangular siliceous GRAVEL with occasional cobbles.	Hole ID	BHG5
		Sample No.	
		Depth	13.10m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04864	14.5
63.000	92.5	0.03496	13.1
50.000	86.7	0.02518	11.5
37.500	74.9	0.01808	10.1
28.000	62.6	0.01256	9.0
20.000	53.4	0.00829	7.8
14.000	42.0	0.00440	6.3
10.000	37.2	0.00360	5.8
6.300	30.9	0.00291	5.5
5.000	28.0	0.00152	4.8
3.350	25.9		
2.000	23.8		
1.180	22.4		
0.600	20.4		
0.425	18.6		
0.300	17.5		
0.212	17.0		
0.150	16.4		
0.063	15.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	5
Silt	10
Sand	9
Gravel	67
Cobbles	9

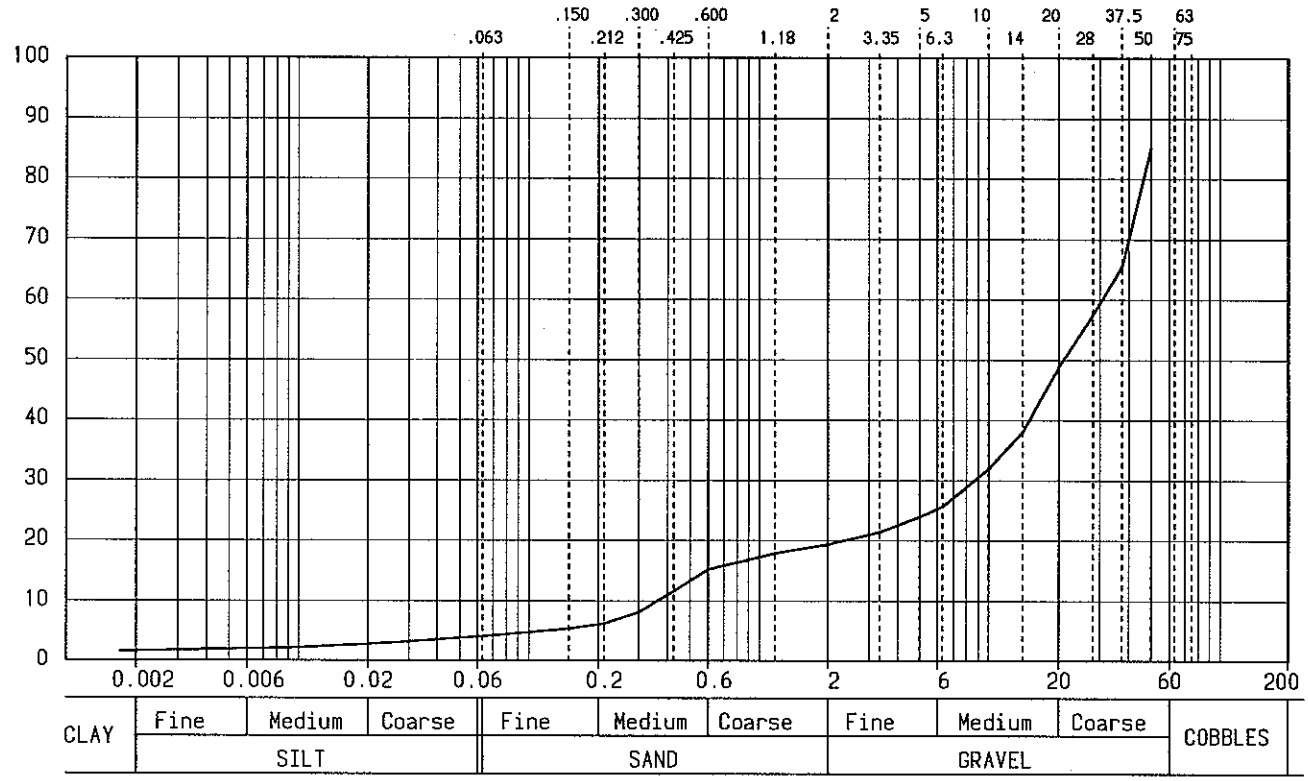
Q.A. Ref: /028-10/m4bhg513.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brownish grey sandy subrounded to subangular GRAVEL.	Hole ID	BHG6
		Sample No.	
		Depth	13.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05213	4.0
63.000	100.0	0.03736	3.5
50.000	85.3	0.02679	3.1
37.500	65.7	0.01912	2.8
28.000	57.6	0.01325	2.5
20.000	48.9	0.00872	2.2
14.000	38.2	0.00445	1.9
10.000	32.0	0.00170	1.6
6.300	25.7		
5.000	23.9		
3.350	21.4		
2.000	19.3		
1.180	17.9		
0.600	15.3		
0.425	11.7		
0.300	8.1		
0.212	6.3		
0.150	5.4		
0.063	4.1		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	2
Silt	2
Sand	15
Gravel	81
Cobbles	0

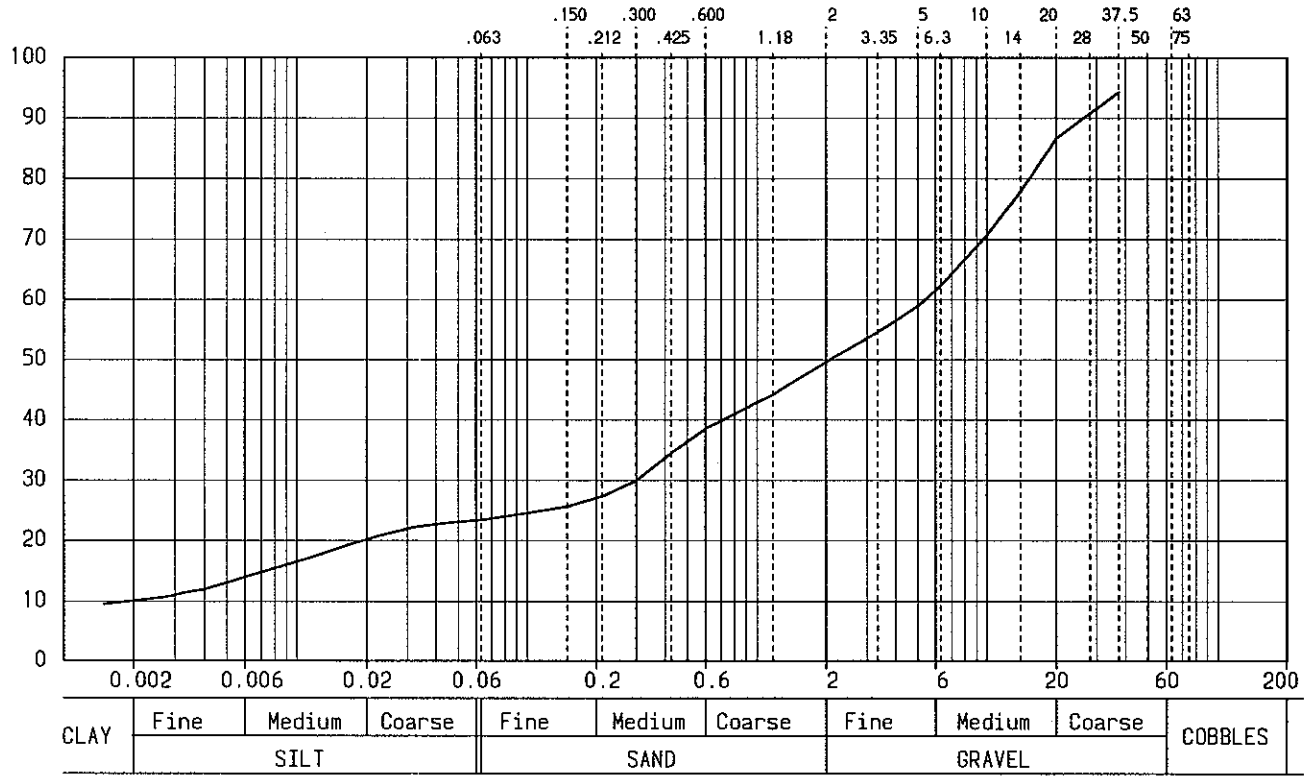
Q.A. Ref: /028-17/M4G6.PSD 2.06 : U/Hr211.57/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	MADE GROUND: Brownish grey clay with some gravel sized pieces of brick, concrete and rubble.	Hole ID	BHH1
		Sample No.	
		Depth	1.45m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04548	23.0
63.000	100.0	0.03247	22.2
50.000	100.0	0.02331	21.0
37.500	94.4	0.01683	19.3
28.000	90.9	0.01181	17.4
20.000	86.8	0.00788	15.4
14.000	77.9	0.00401	12.0
10.000	70.7	0.00335	11.5
6.300	62.4	0.00276	10.8
5.000	59.0	0.00148	9.5
3.350	54.7		
2.000	49.6		
1.180	44.3		
0.600	38.6		
0.425	34.5		
0.300	30.0		
0.212	27.3		
0.150	25.7		
0.063	23.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	10
Silt	14
Sand	26
Gravel	50
Cobbles	0

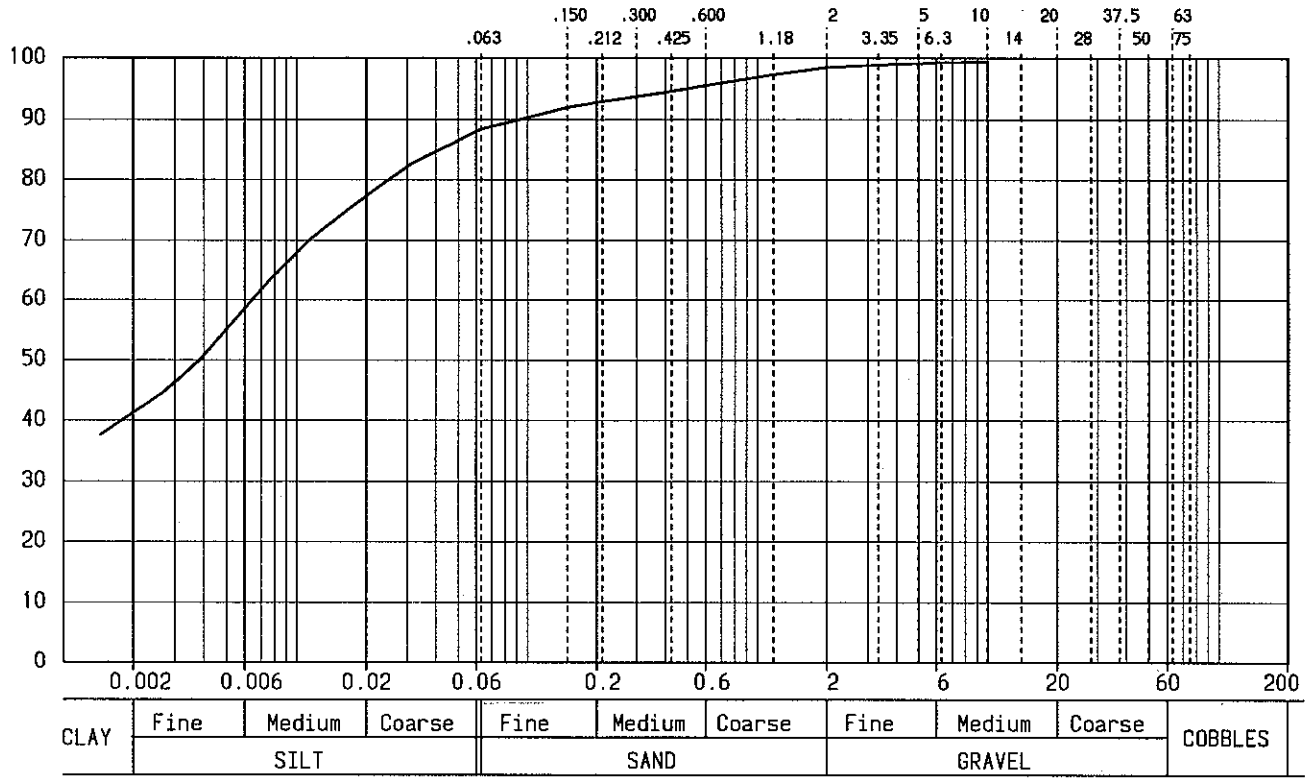
Q.A. Ref: /028-16/M4H1.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey very silty organic CLAY.	Hole ID	BHH1
		Sample No.	
		Depth	14.10m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.06230	88.3
63.000	100.0	0.04449	85.5
50.000	100.0	0.03177	82.8
37.500	100.0	0.02276	79.0
28.000	100.0	0.01632	74.8
20.000	100.0	0.01136	70.2
14.000	100.0	0.00757	63.2
10.000	99.6	0.00386	50.2
6.300	99.4	0.00324	47.4
5.000	99.2	0.00266	44.6
3.350	98.9	0.00144	37.7
2.000	98.5		
1.180	97.3		
0.600	95.6		
0.425	94.7		
0.300	93.8		
0.212	92.9		
0.150	92.0		
0.063	88.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	41
Silt	48
Sand	10
Gravel	1
Cobbles	0

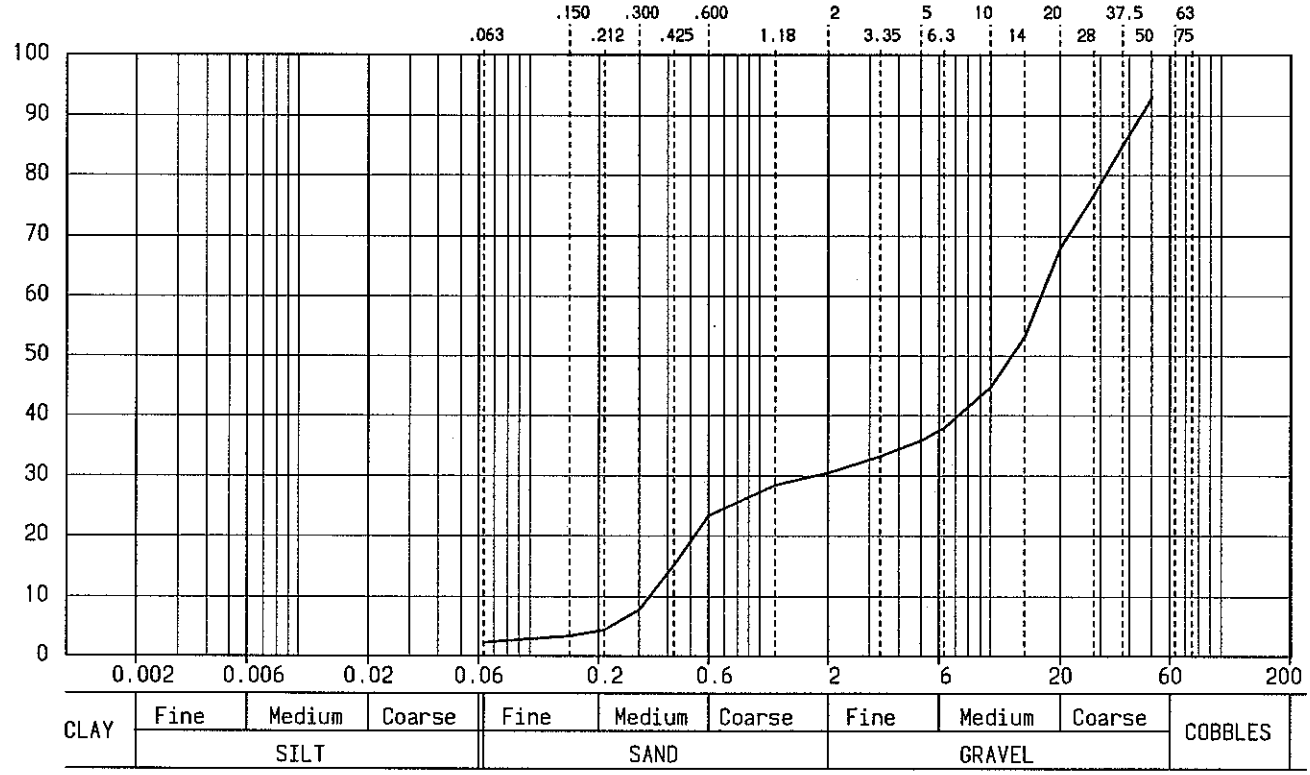
Q.A. Ref: /018-30/M4BH1.PSD 2.06 : U/Hr192.36/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD NEWPORT	Contract	F10895
Soil description	Reddish brown sandy GRAVEL	Hole ID	BHH1
		Sample No.	
		Depth	14.15m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	100.0		
50.000	93.0		
37.500	85.1		
28.000	76.8		
20.000	68.0		
14.000	53.3		
10.000	44.8		
6.300	38.0		
5.000	35.9		
3.350	33.3		
2.000	30.5		
1.180	28.5		
0.600	23.5		
0.425	15.2		
0.300	7.9		
0.212	4.5		
0.150	3.4		
0.063	2.3		

Type of sample BULK

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Measured)

Clay	3
Silt	
Sand	28
Gravel	69
Cobbles	0

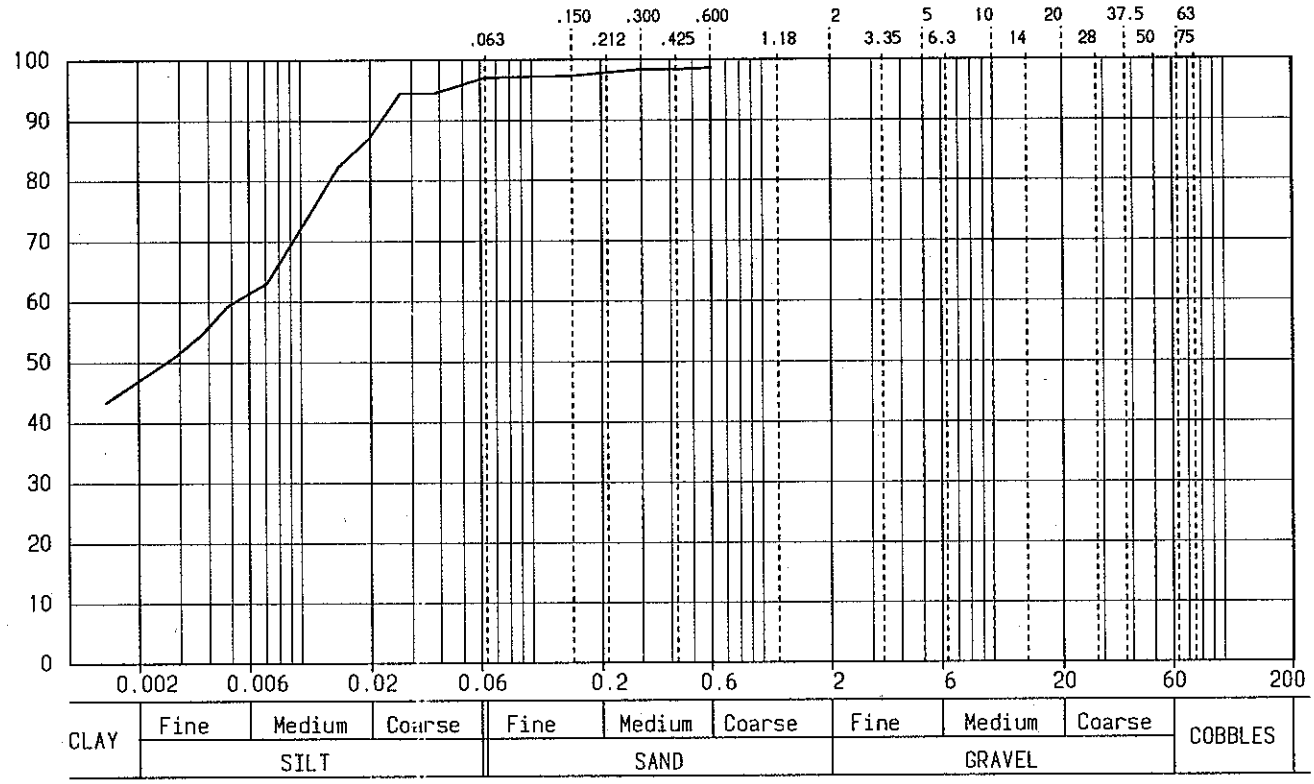
Q.A. Ref: /038-14/M4H11415.PSD 2.06 : U/

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft to fine brown mottled grey, very silty CLAY with occasional rootlets.	Hole ID	BH H2
		Sample No.	
		Depth	1.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05298	96.2
63.000	100.0	0.03790	94.5
50.000	100.0	0.02680	94.5
37.500	100.0	0.01988	87.3
28.000	100.0	0.01449	82.3
20.000	100.0	0.01045	73.4
14.000	100.0	0.00718	63.2
10.000	100.0	0.00482	59.3
6.300	100.0	0.00374	54.7
5.000	100.0	0.00287	51.1
3.350	100.0	0.00144	43.5
2.000	100.0		
1.180	100.0		
0.600	98.7		
0.425	98.5		
0.300	98.4		
0.212	97.9		
0.150	97.4		
0.063	97.0		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	47
Silt	50
Sand	3
Gravel	0
Cobbles	0

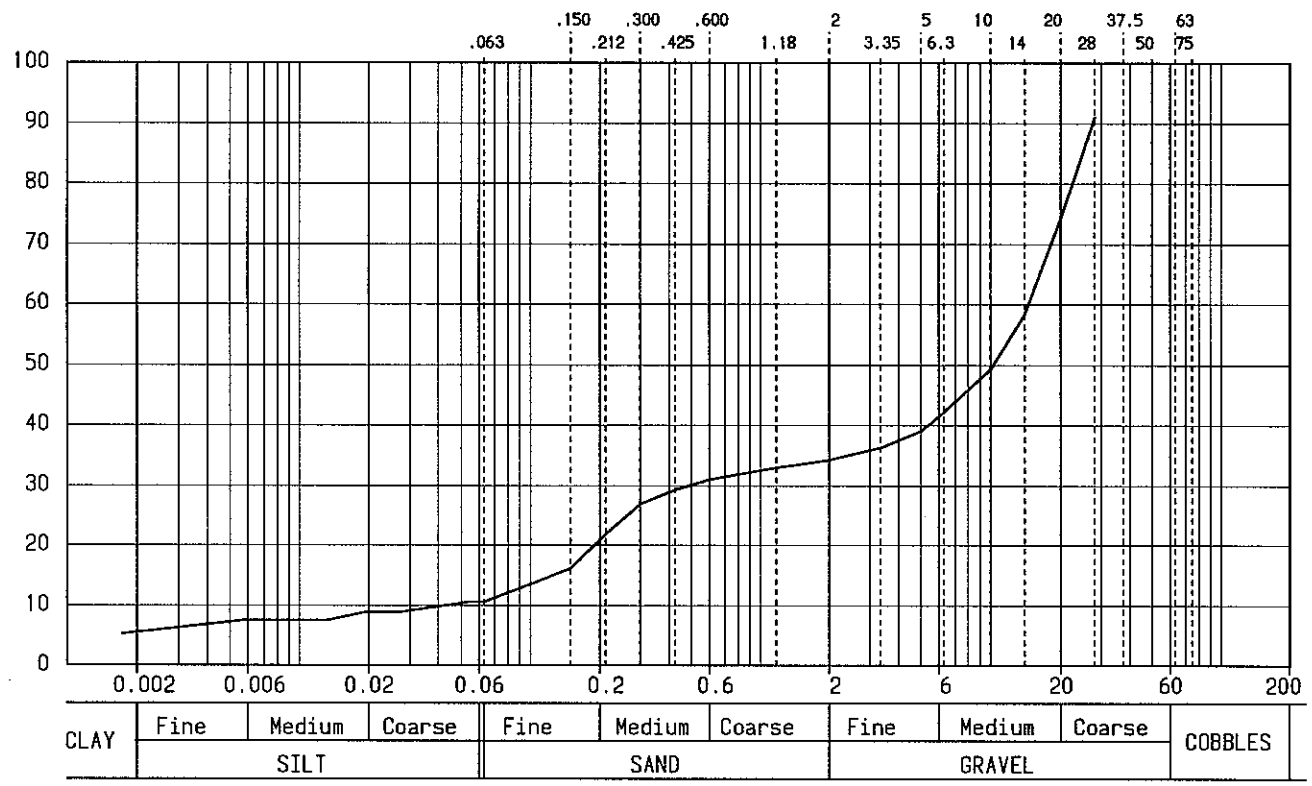
Q.A. Ref: /018-09/M4H21.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown mottled grey slightly clayey sandy siliceous GRAVEL.	Hole ID	BHH2
		Sample No.	
		Depth	13.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05448	10.6
63.000	100.0	0.03861	9.8
50.000	100.0	0.02736	8.9
37.500	100.0	0.01935	8.9
28.000	91.0	0.01332	7.5
20.000	74.4	0.00868	7.5
14.000	58.4	0.00572	7.5
10.000	49.3	0.00172	5.3
6.300	42.2		
5.000	39.0		
3.350	36.3		
2.000	34.3		
1.180	33.0		
0.600	31.1		
0.425	29.3		
0.300	26.9		
0.212	22.0		
0.150	16.2		
0.063	10.6		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	6
Silt	4
Sand	24
Gravel	66
Cobbles	0

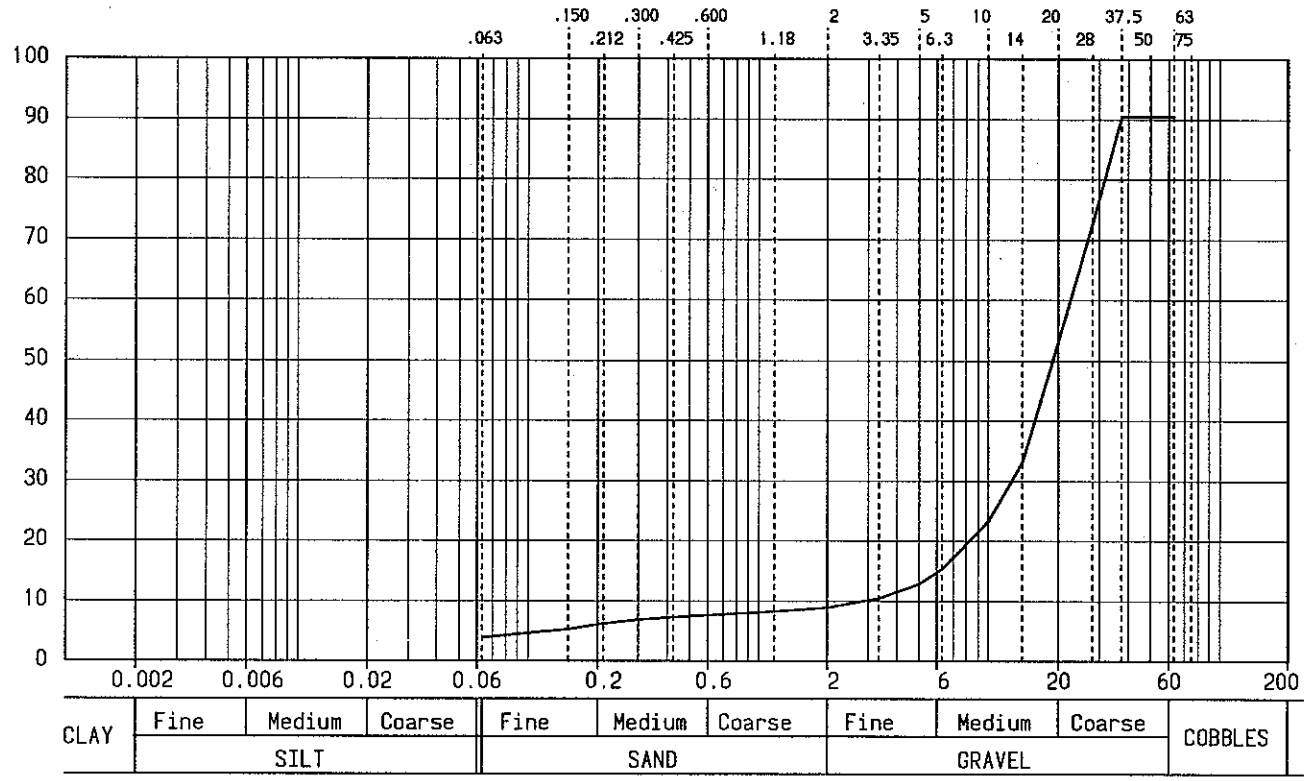
Q.A. Ref: /028-16/M4H2.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown slightly clayey very sandy subrounded GRAVEL with occasional cobbles.	Hole ID	BHH3
		Sample No.	
		Depth	12.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	90.5		
50.000	90.5		
37.500	90.5		
28.000	72.7		
20.000	53.2		
14.000	33.1		
10.000	23.3		
6.300	15.4		
5.000	12.8		
3.350	10.5		
2.000	9.0		
1.180	8.2		
0.600	7.7		
0.425	7.3		
0.300	6.9		
0.212	6.3		
0.150	5.4		
0.063	3.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Measured)

Clay	4
Silt	
Sand	5
Gravel	82
Cobbles	9

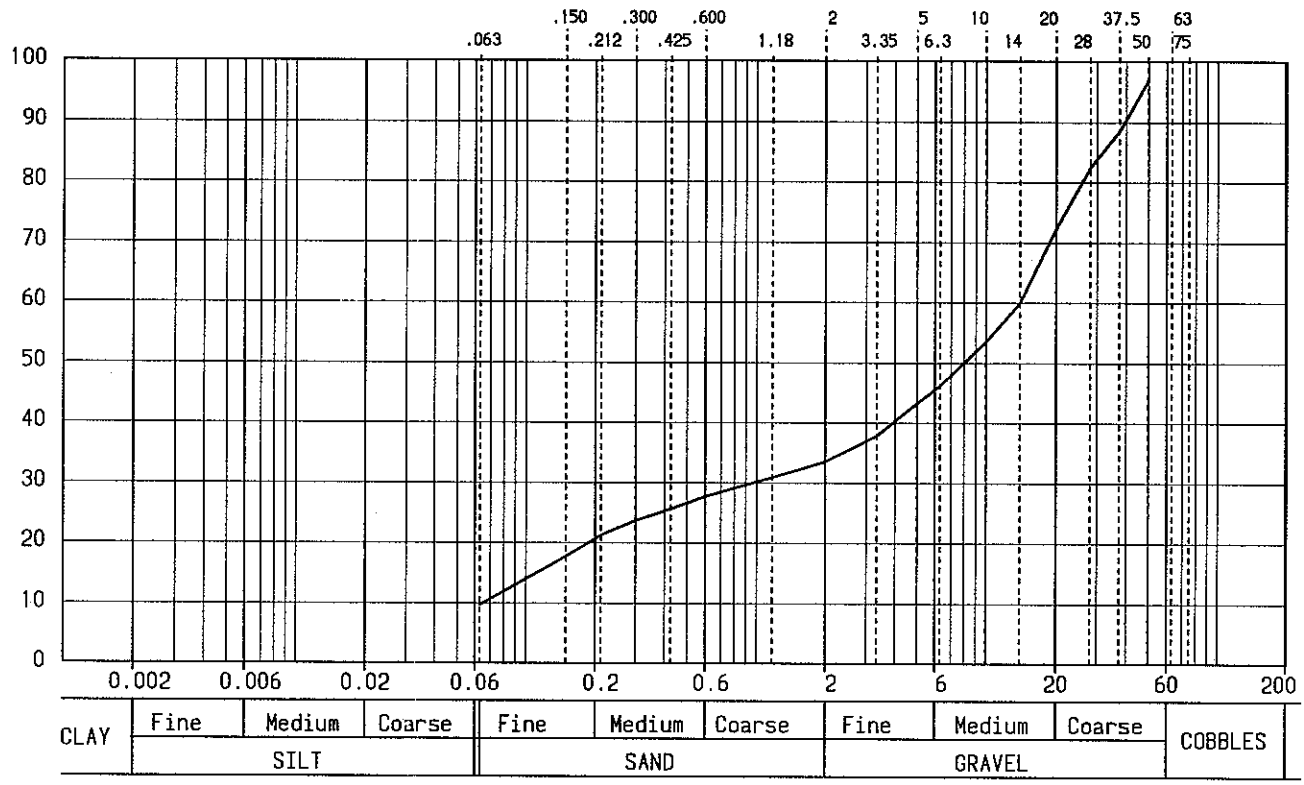
Q.A. Ref: /018-13/M4H3125.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown and greyish brown sandy subanglar to subrounded sandstone and mudstone GRAVEL.	Hole ID	BHH4
		Sample No.	
		Depth	13.45m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0		
63.000	100.0		
50.000	97.0		
37.500	88.7		
28.000	82.6		
20.000	72.4		
14.000	60.0		
10.000	53.6		
6.300	46.3		
5.000	43.3		
3.350	37.9		
2.000	33.6		
1.180	31.0		
0.600	27.7		
0.425	25.6		
0.300	23.7		
0.212	21.3		
0.150	17.8		
0.063	9.8		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Measured)

Clay	9
Silt	
Sand	24
Gravel	67
Cobbles	0

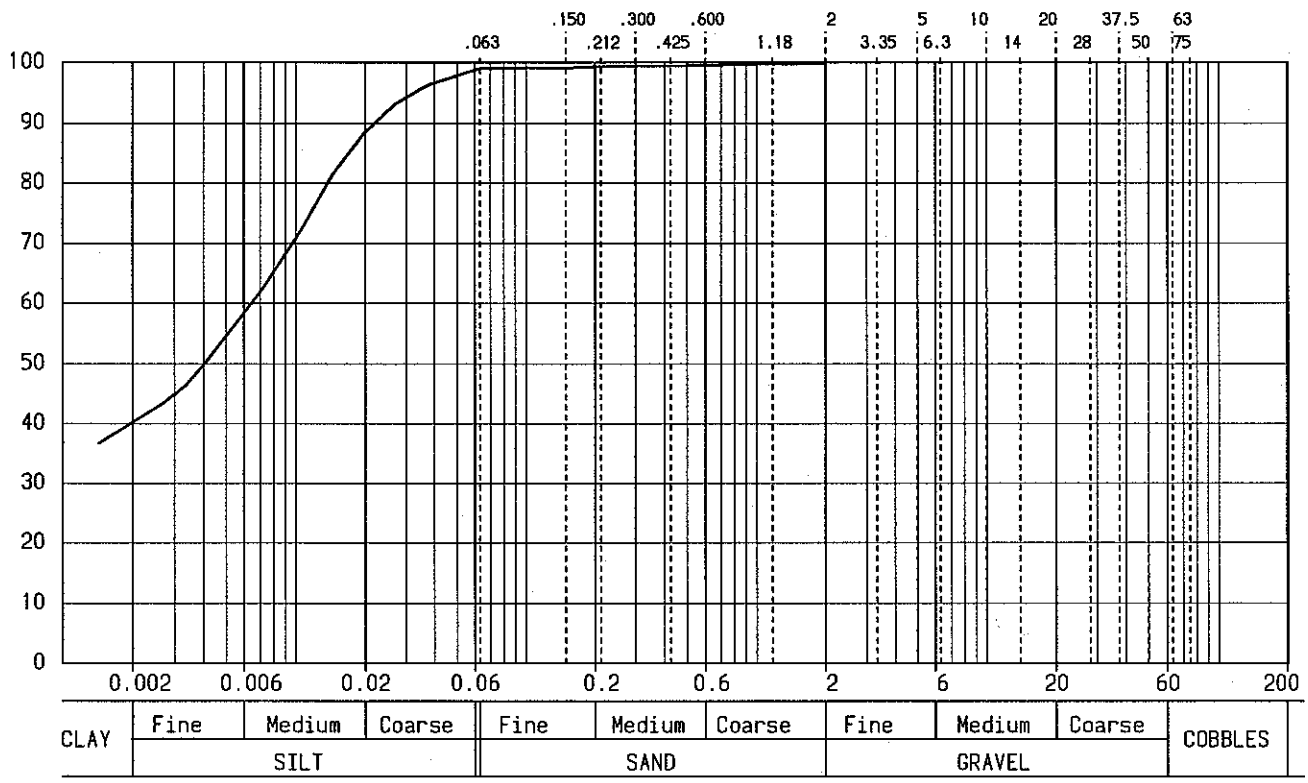
Q.A. Ref: /018-13/M4H41345.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey mottled grey brown very silty CLAY.	Hole ID	BHH5
		Sample No.	
		Depth	4.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05211	98.1
63.000	100.0	0.03729	96.4
50.000	100.0	0.02692	93.2
37.500	100.0	0.01963	88.2
28.000	100.0	0.01443	81.5
20.000	100.0	0.01041	72.0
14.000	100.0	0.00712	62.1
10.000	100.0	0.00406	50.1
6.300	100.0	0.00332	46.2
5.000	100.0	0.00268	43.4
3.350	100.0	0.00142	36.7
2.000	99.9		
1.180	99.8		
0.600	99.6		
0.425	99.6		
0.300	99.5		
0.212	99.4		
0.150	99.2		
0.063	99.1		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	40
Silt	59
Sand	1
Gravel	0
Cobbles	0

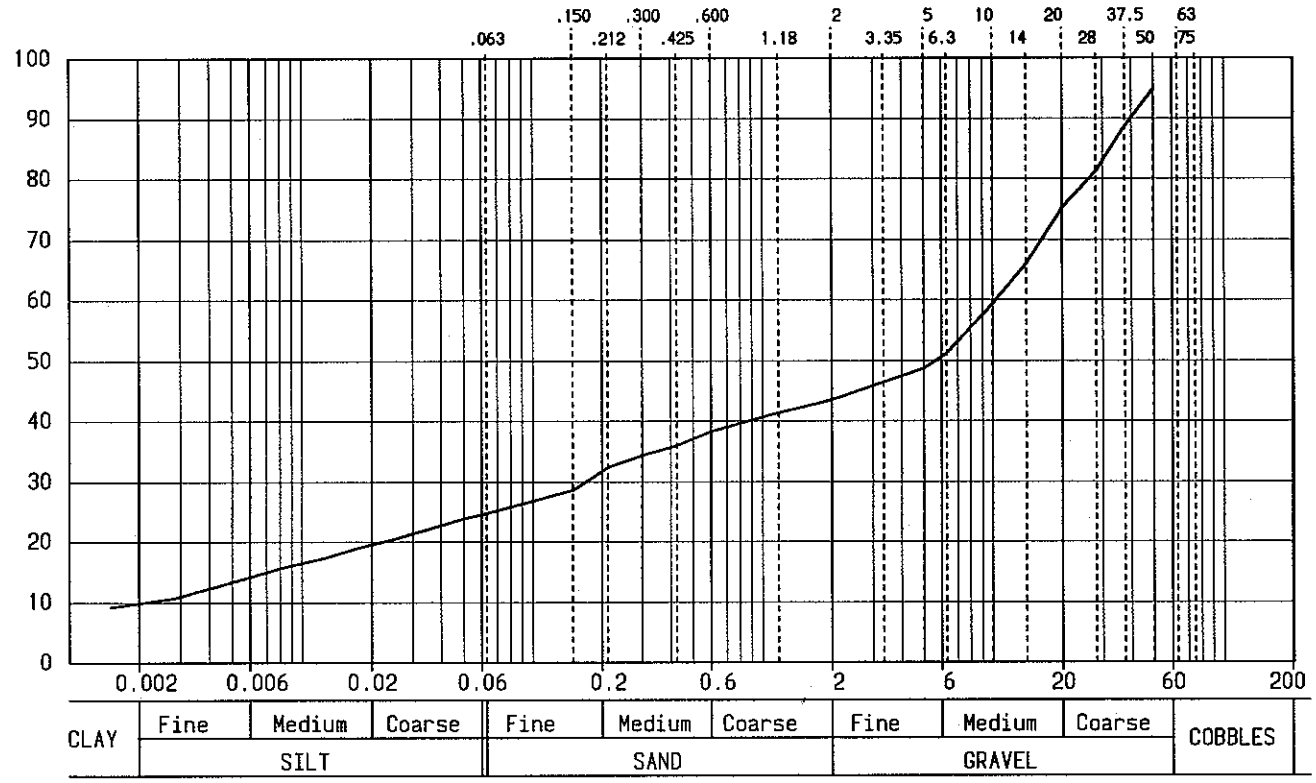
Q.A. Ref: /127-19/M4BH54.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown mottled grey sandy CLAY with much gravel.	Hole ID	BHH5
		Sample No.	
		Depth	11.60m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04824	23.7
63.000	100.0	0.03454	22.0
50.000	95.0	0.02472	20.4
37.500	88.7	0.01764	19.1
28.000	81.4	0.01226	17.3
20.000	75.3	0.00809	15.7
14.000	66.1	0.00418	12.6
10.000	59.4	0.00346	11.7
6.300	51.3	0.00282	10.7
5.000	48.7	0.00150	9.3
3.350	46.4		
2.000	43.6		
1.180	41.4		
0.600	38.3		
0.425	36.1		
0.300	34.4		
0.212	32.4		
0.150	28.6		
0.063	24.8		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	10
Silt	15
Sand	19
Gravel	56
Cobbles	0

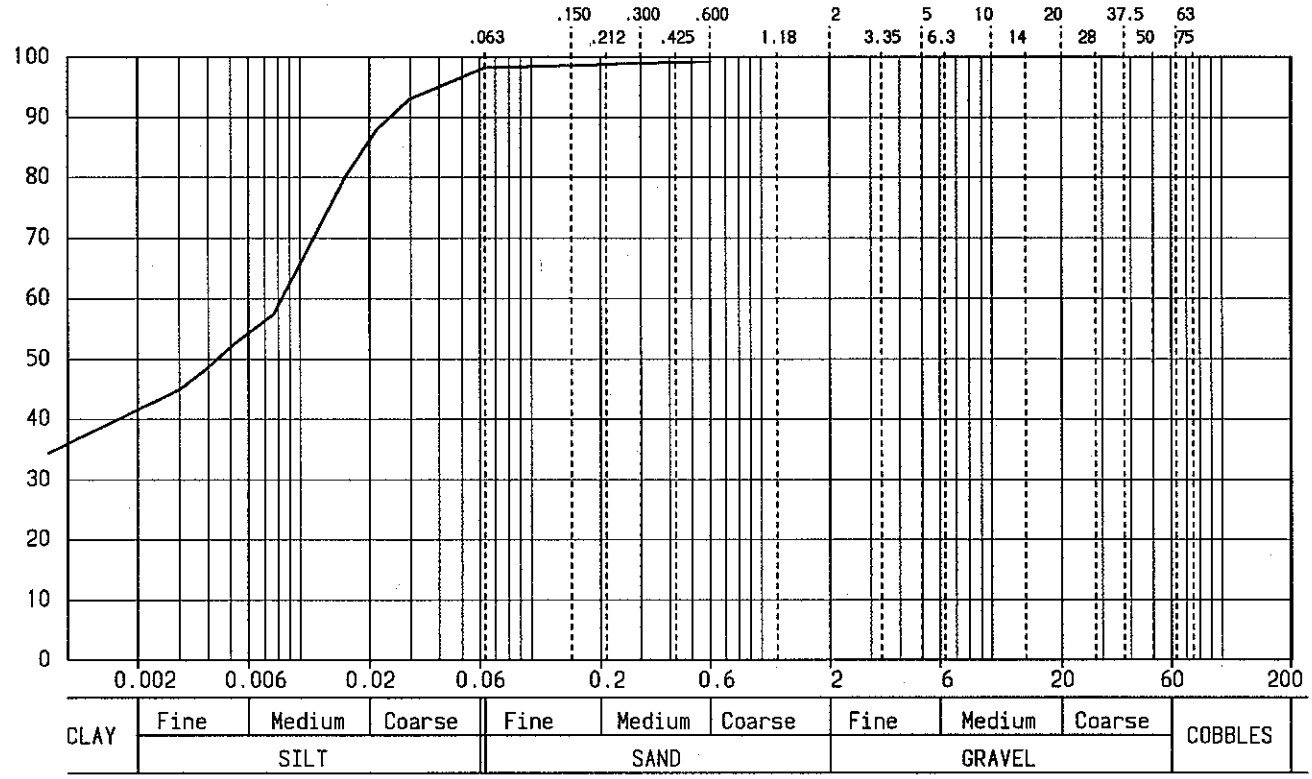
Q.A. Ref: /018-13/M4BH511.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Dark grey occasional thinly laminated very silty organic CLAY, fine to medium gravel sized pockets of brown black spongey to firm fibrous peat.	Hole ID	BHH7
		Sample No.	
		Depth	5.55m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05785	97.7
63.000	100.0	0.04139	95.4
50.000	100.0	0.02960	93.0
37.500	100.0	0.02144	88.0
28.000	100.0	0.01569	80.1
20.000	100.0	0.01124	69.6
14.000	100.0	0.00767	57.5
10.000	100.0	0.00515	52.4
6.300	100.0	0.00396	48.5
5.000	100.0	0.00303	45.0
3.350	100.0	0.00082	34.4
2.000	100.0		
1.180	100.0		
0.600	99.3		
0.425	99.2		
0.300	99.1		
0.212	98.9		
0.150	98.7		
0.063	98.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	42
Silt	56
Sand	2
Gravel	0
Cobbles	0

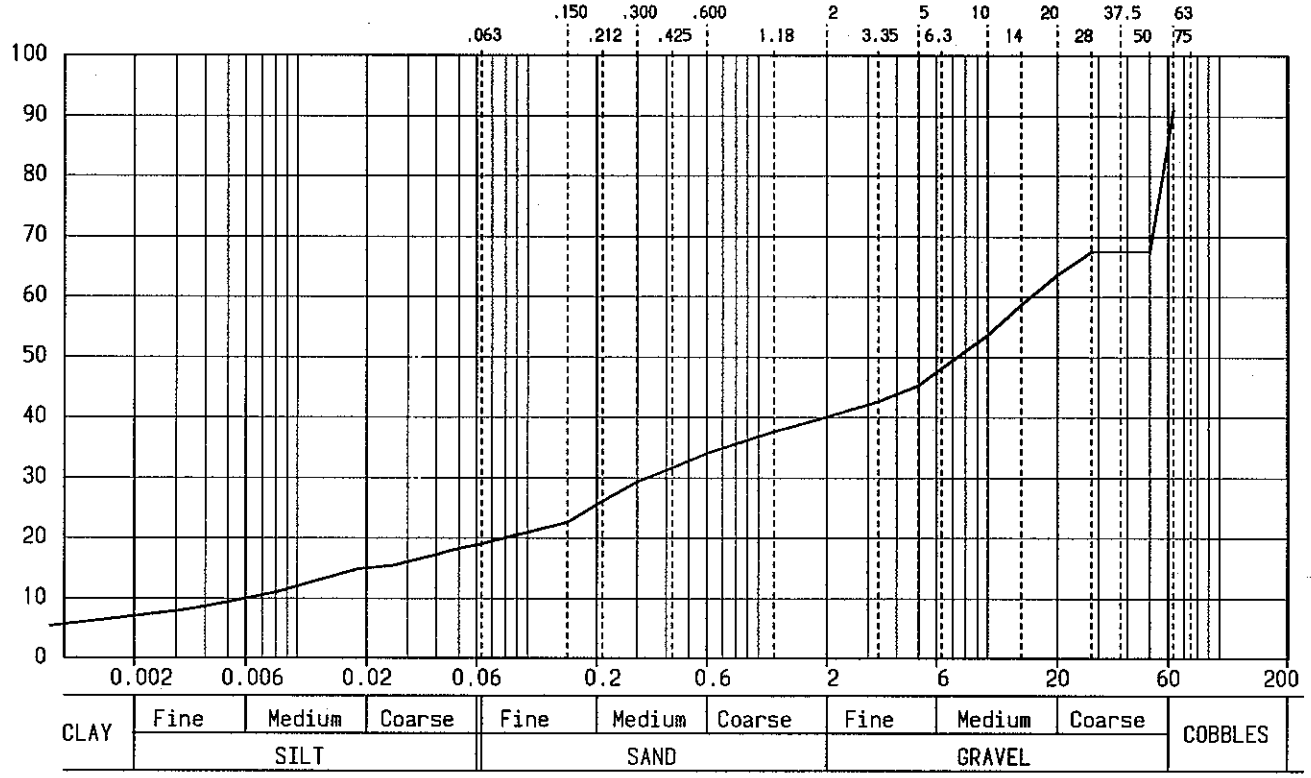
Q.A. Ref: /018-13/M4BH7555.PSD 2.06 : U/Hr203.01/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Greyish brown clayey very sandy subangular GRAVEL with occasional cobbles.	Hole ID	BH1
		Sample No.	
		Depth	12.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05063	18.3
63.000	91.0	0.03621	16.9
50.000	67.5	0.02589	15.5
37.500	67.5	0.01838	15.0
28.000	67.5	0.01277	13.3
20.000	63.7	0.00846	11.2
14.000	58.8	0.00536	9.6
10.000	53.7	0.00417	8.8
6.300	48.2	0.00321	8.1
5.000	45.4	0.00087	5.4
3.350	42.7		
2.000	40.2		
1.180	37.7		
0.600	34.1		
0.425	31.7		
0.300	29.4		
0.212	26.1		
0.150	22.7		
0.063	19.1		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	7
Silt	12
Sand	21
Gravel	46
Cobbles	14

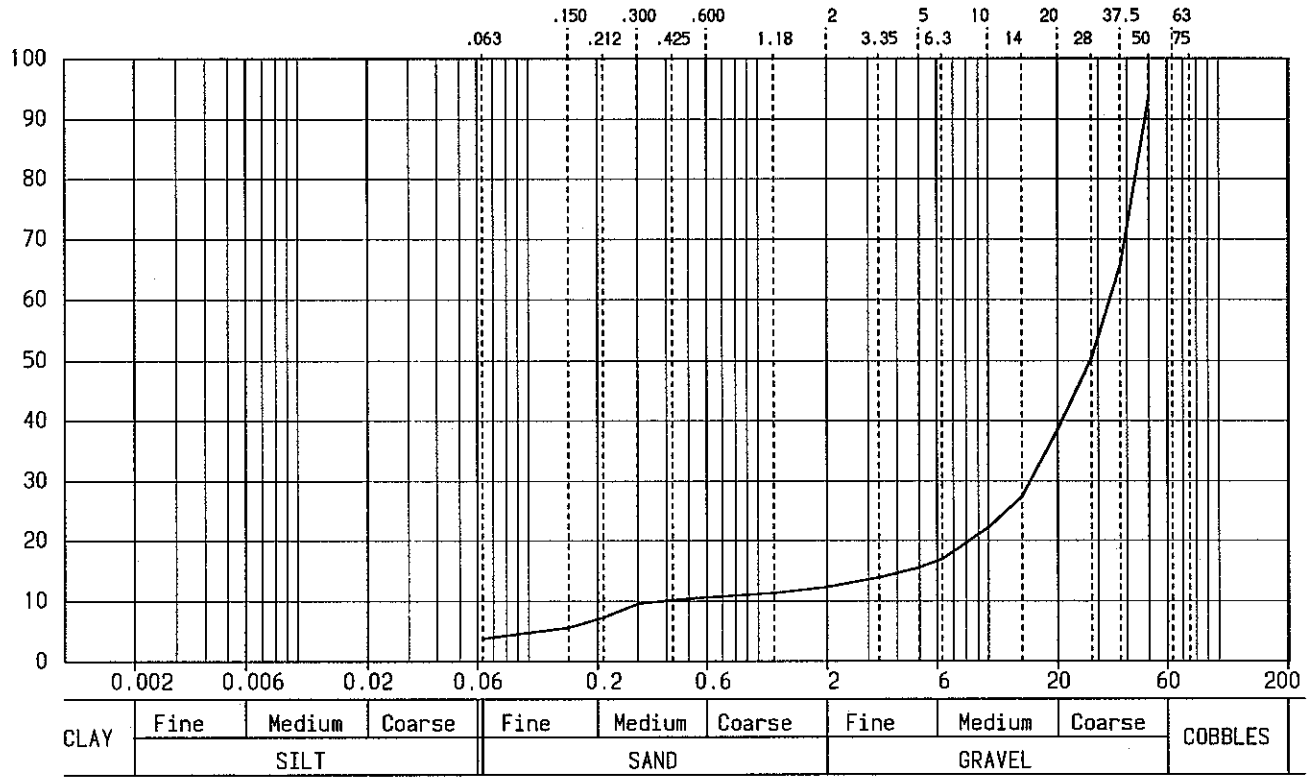
Q.A. Ref: /018-13/M4BI112.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Greyish brown slightly clayey sandy subangular GRAVEL.	Hole ID	BH1
		Sample No.	
		Depth	15.50m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	100.0
50.000	93.7
37.500	65.8
28.000	50.5
20.000	38.7
14.000	27.4
10.000	22.3
6.300	17.0
5.000	15.6
3.350	13.9
2.000	12.3
1.180	11.4
0.600	10.6
0.425	10.2
0.300	9.5
0.212	7.3
0.150	5.7
0.063	3.8

Particle Size	Cumulative % Passing

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Measured)

Clay	5
Silt	
Sand	8
Gravel	87
Cobbles	0

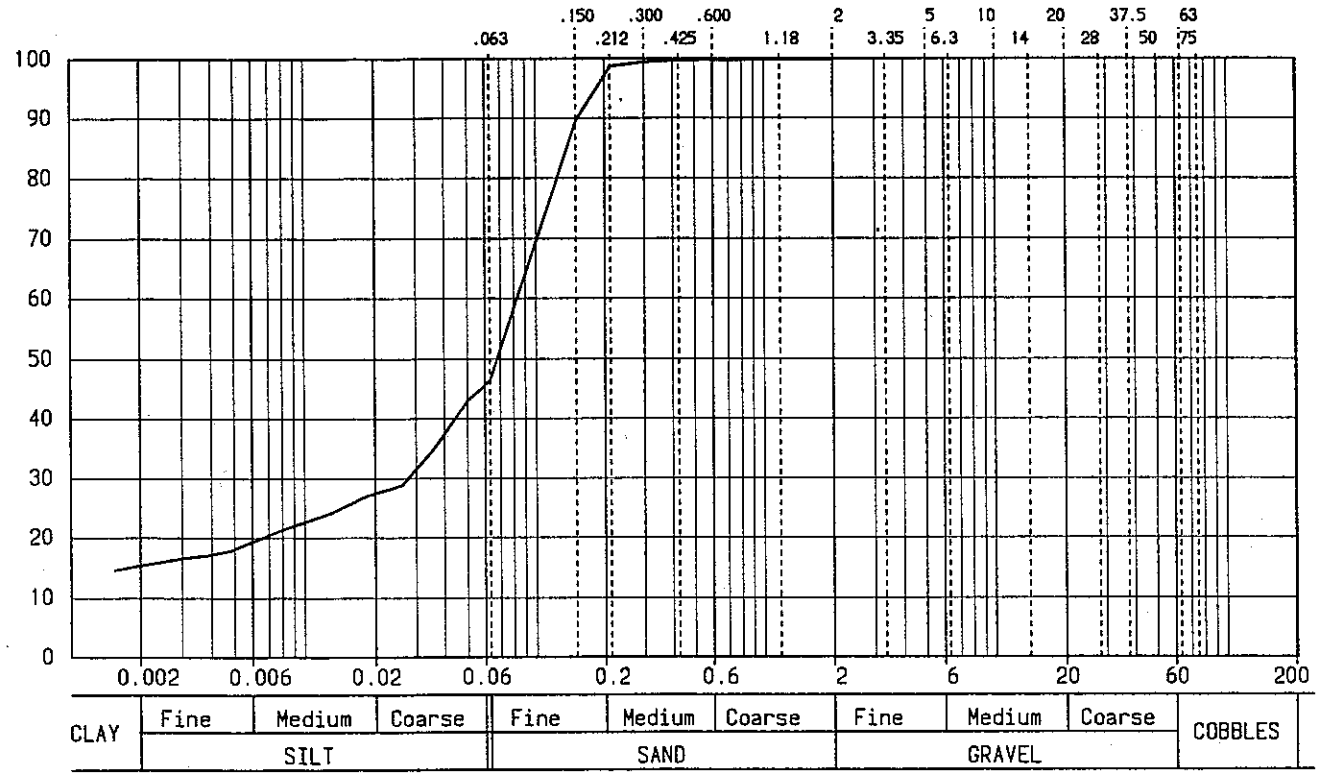
Q.A. Ref: /018-13/M4I1155.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey very sandy CLAY.	Hole ID	BHI2
		Sample No.	
		Depth	9.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05003	43.0
63.000	100.0	0.03625	35.0
50.000	100.0	0.02611	28.8
37.500	100.0	0.01855	27.1
28.000	100.0	0.01283	24.2
20.000	100.0	0.00842	21.7
14.000	100.0	0.00479	17.9
10.000	100.0	0.00381	17.1
6.300	100.0	0.00302	16.7
5.000	100.0	0.00155	14.6
3.350	100.0		
2.000	100.0		
1.180	99.9		
0.600	99.9		
0.425	99.7		
0.300	99.5		
0.212	98.8		
0.150	89.6		
0.063	46.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	15
Silt	31
Sand	54
Gravel	0
Cobbles	0

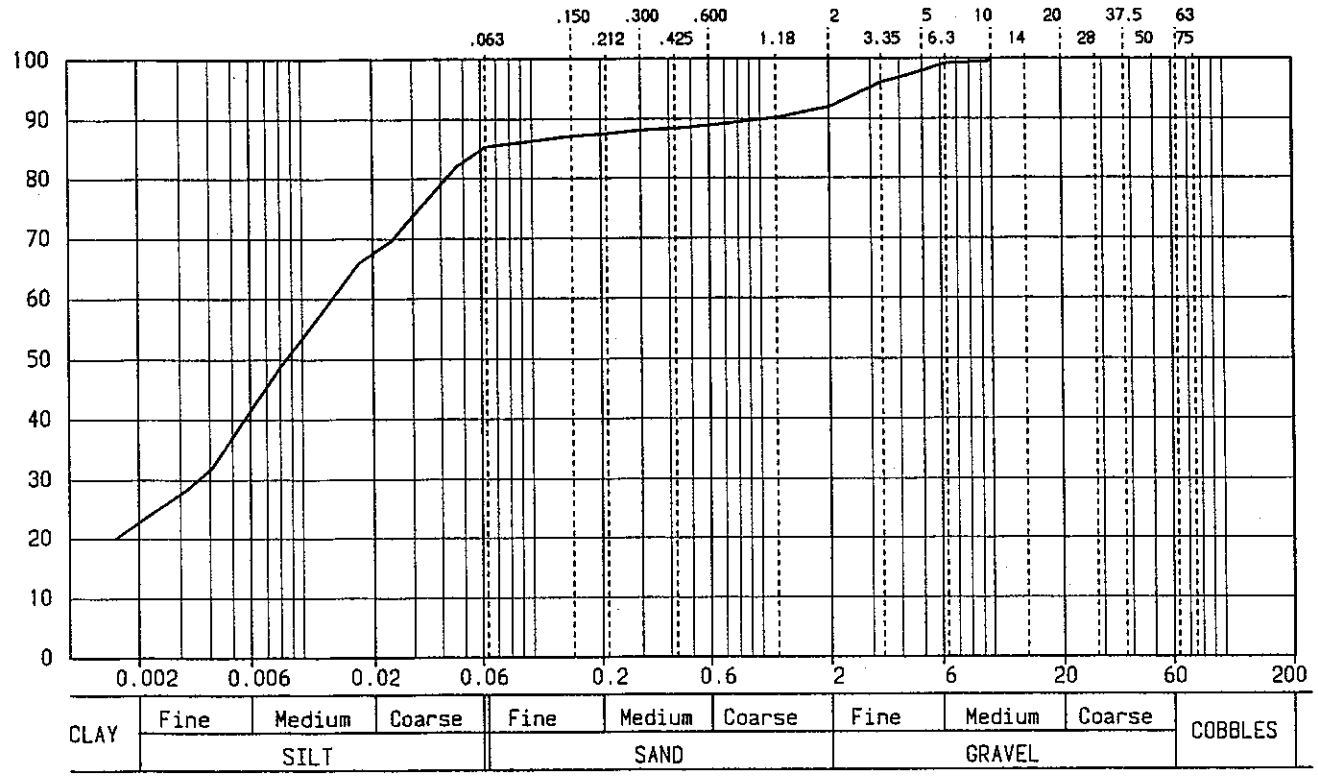
Q.A. Ref: /127-10/m4bI295.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown mottled grey, completely to highly weathered sandy MUDSTONE, very weak to weak MARL	Hole ID	BHI2
		Sample No.	
		Depth	12.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04670	82.0
63.000	100.0	0.03367	75.9
50.000	100.0	0.02425	69.8
37.500	100.0	0.01734	66.0
28.000	100.0	0.01217	58.0
20.000	100.0	0.00813	49.0
14.000	100.0	0.00523	38.2
10.000	99.7	0.00412	32.1
6.300	99.3	0.00318	28.3
5.000	98.0	0.00159	20.3
3.350	96.1		
2.000	92.0		
1.180	90.2		
0.600	88.9		
0.425	88.4		
0.300	88.0		
0.212	87.6		
0.150	87.2		
0.063	85.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

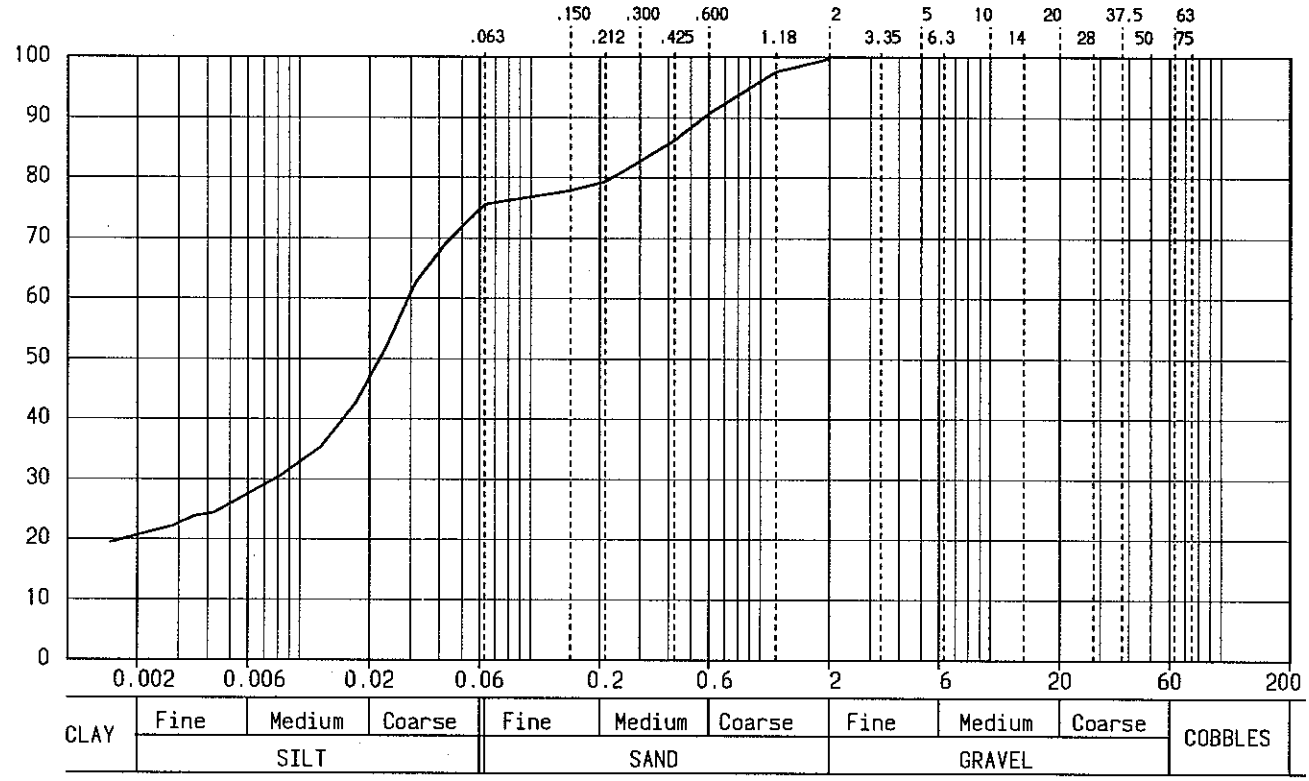
Clay	23
Silt	62
Sand	7
Gravel	8
Cobbles	0

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey very silty, occasional fine sandy CLAY with occasional fine grain sized pockets of firm blackish brown fibrous peat.	Hole ID	BHJ4
		Sample No.	
		Depth	9.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05865	74.4
63.000	100.0	0.04280	69.3
50.000	100.0	0.03144	62.5
37.500	100.0	0.02349	51.9
28.000	100.0	0.01734	42.7
20.000	100.0	0.01228	35.4
14.000	100.0	0.00817	30.5
10.000	100.0	0.00424	24.4
6.300	100.0	0.00350	23.8
5.000	100.0	0.00285	22.3
3.350	100.0	0.00152	19.5
2.000	99.8		
1.180	97.7		
0.600	90.7		
0.425	86.3		
0.300	82.8		
0.212	79.4		
0.150	77.9		
0.063	75.6		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	21
Silt	55
Sand	24
Gravel	0
Cobbles	0

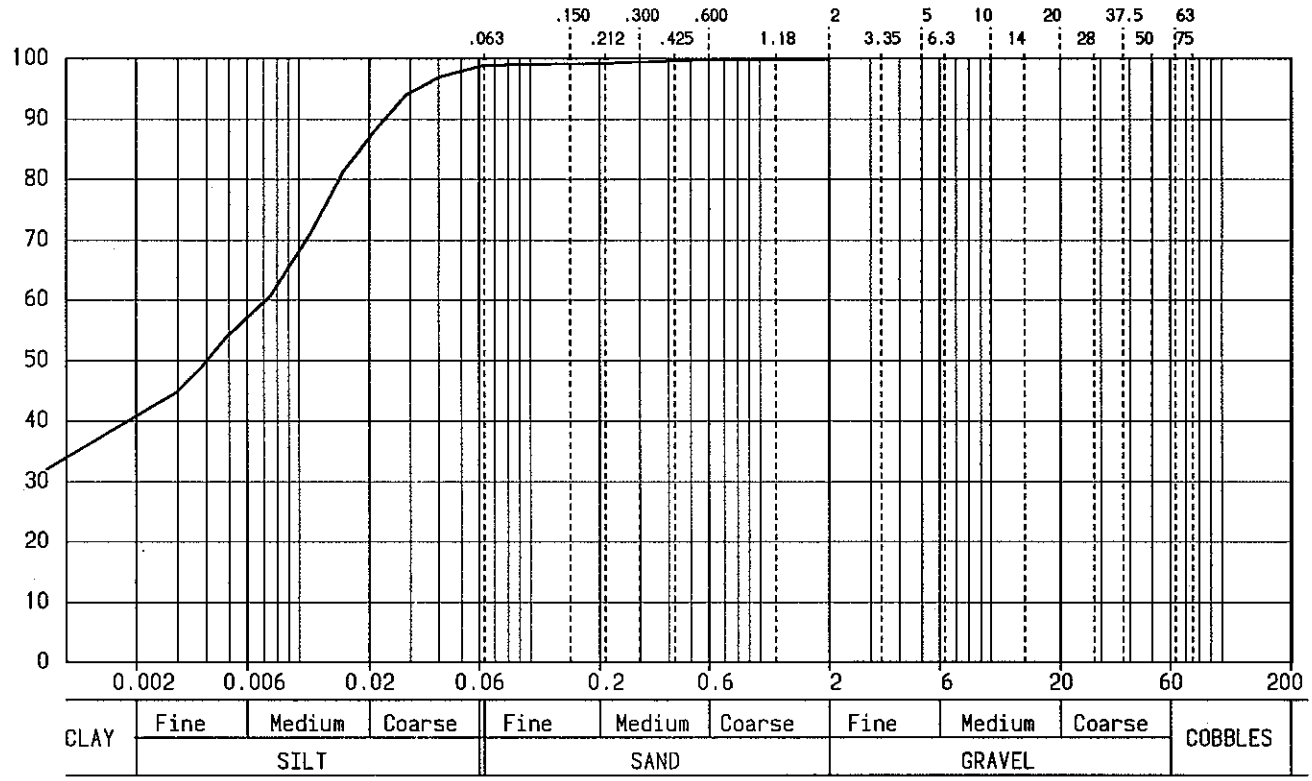
Q.A. Ref: /028-13/M4J4.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Soft grey slightly sandy CLAY with rootlets.	Hole ID	BHK1
		Sample No.	
		Depth	2.80m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05636	98.5
63.000	100.0	0.04018	97.0
50.000	100.0	0.02887	94.0
37.500	100.0	0.02105	88.0
28.000	100.0	0.01537	81.3
20.000	100.0	0.01105	70.9
14.000	100.0	0.00751	60.8
10.000	100.0	0.00483	53.7
6.300	100.0	0.00381	48.9
5.000	100.0	0.00296	44.8
3.350	100.0	0.00082	32.1
2.000	99.9		
1.180	99.9		
0.600	99.8		
0.425	99.7		
0.300	99.5		
0.212	99.4		
0.150	99.2		
0.063	99.0		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	41
Silt	58
Sand	1
Gravel	0
Cobbles	0

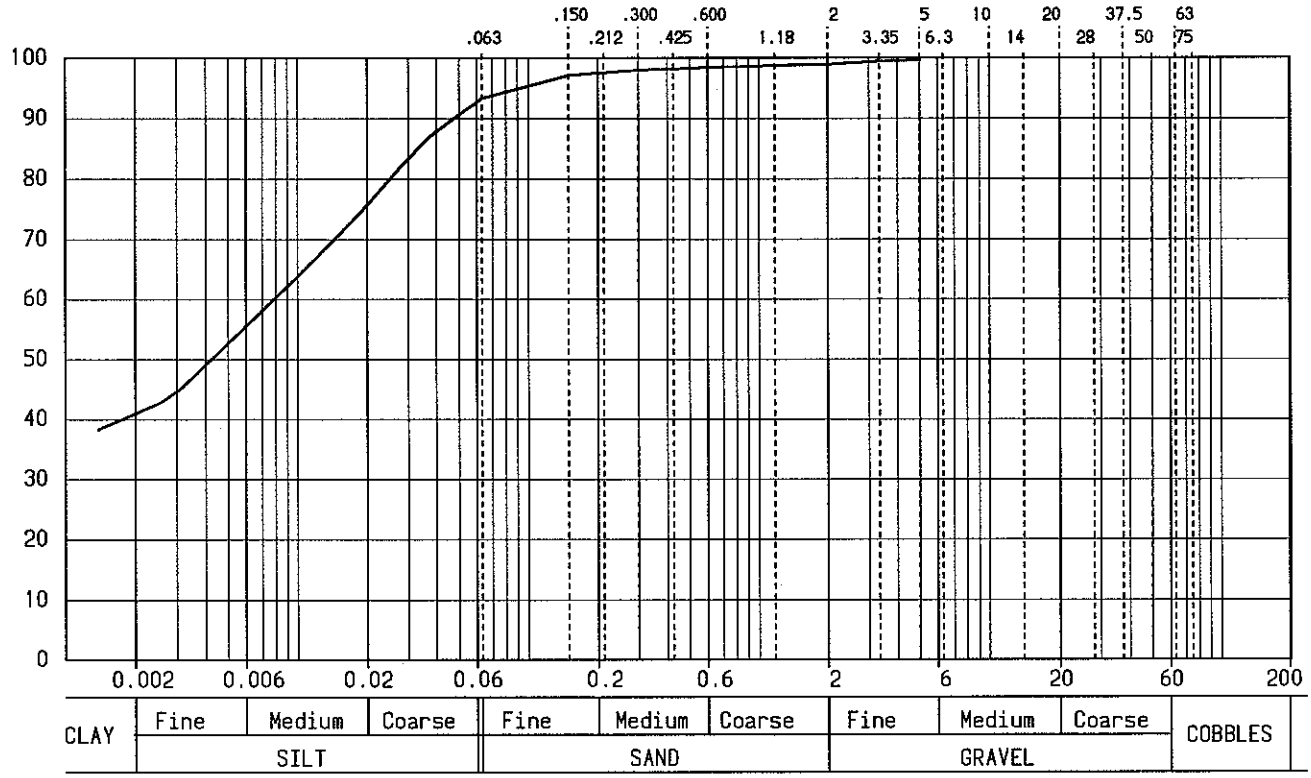
Q.A. Ref: /018-13/M4BK128.PSD 2.06 : U/Hr203.43/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Blueish grey completely weathered silty MUDSTONE very weak (MARL)	Hole ID	BHK2
		Sample No.	
		Depth	8.60m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05186	91.0
63.000	100.0	0.03773	87.1
50.000	100.0	0.02764	81.9
37.500	100.0	0.02028	76.1
28.000	100.0	0.01482	70.5
20.000	100.0	0.01050	64.7
14.000	100.0	0.00708	58.2
10.000	100.0	0.00376	48.1
6.300	100.0	0.00314	45.2
5.000	99.7	0.00257	42.9
3.350	99.5	0.00138	38.4
2.000	99.0		
1.180	98.7		
0.600	98.4		
0.425	98.3		
0.300	98.0		
0.212	97.7		
0.150	97.2		
0.063	93.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	41
Silt	52
Sand	6
Gravel	1
Cobbles	0

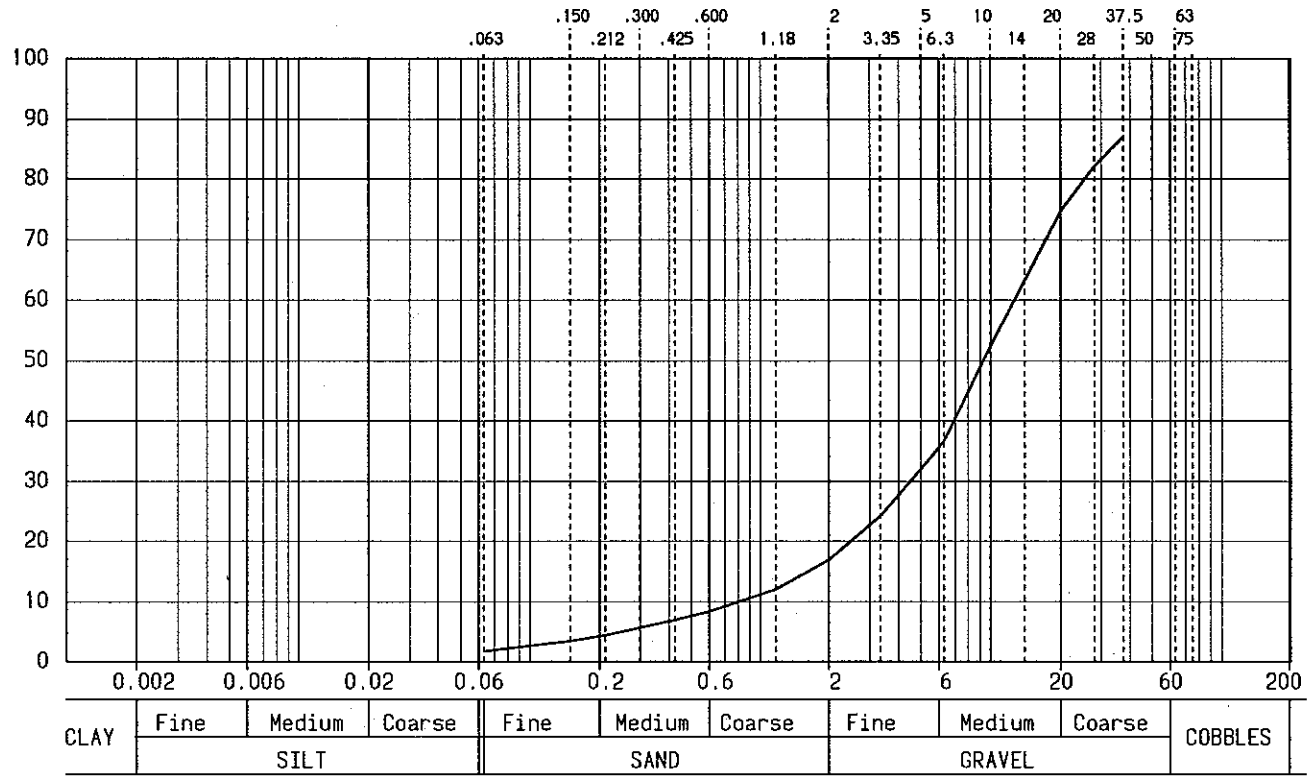
Q.A. Ref: /127-05/m4bk2860.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	MADE GROUND: Dark grey sandy gravel and clinker.	Hole ID	BHK4
		Sample No.	
		Depth	* See below



Particle Size	Cumulative % Passing
75.000	100.0
63.000	100.0
50.000	100.0
37.500	87.1
28.000	82.2
20.000	74.8
14.000	63.4
10.000	52.6
6.300	36.8
5.000	32.0
3.350	24.2
2.000	17.0
1.180	12.1
0.600	8.4
0.425	7.0
0.300	5.8
0.212	4.5
0.150	3.5
0.063	1.8

Particle Size	Cumulative % Passing

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

* GROUND LEVEL.

Clay	2
Silt	
Sand	15
Gravel	83
Cobbles	0

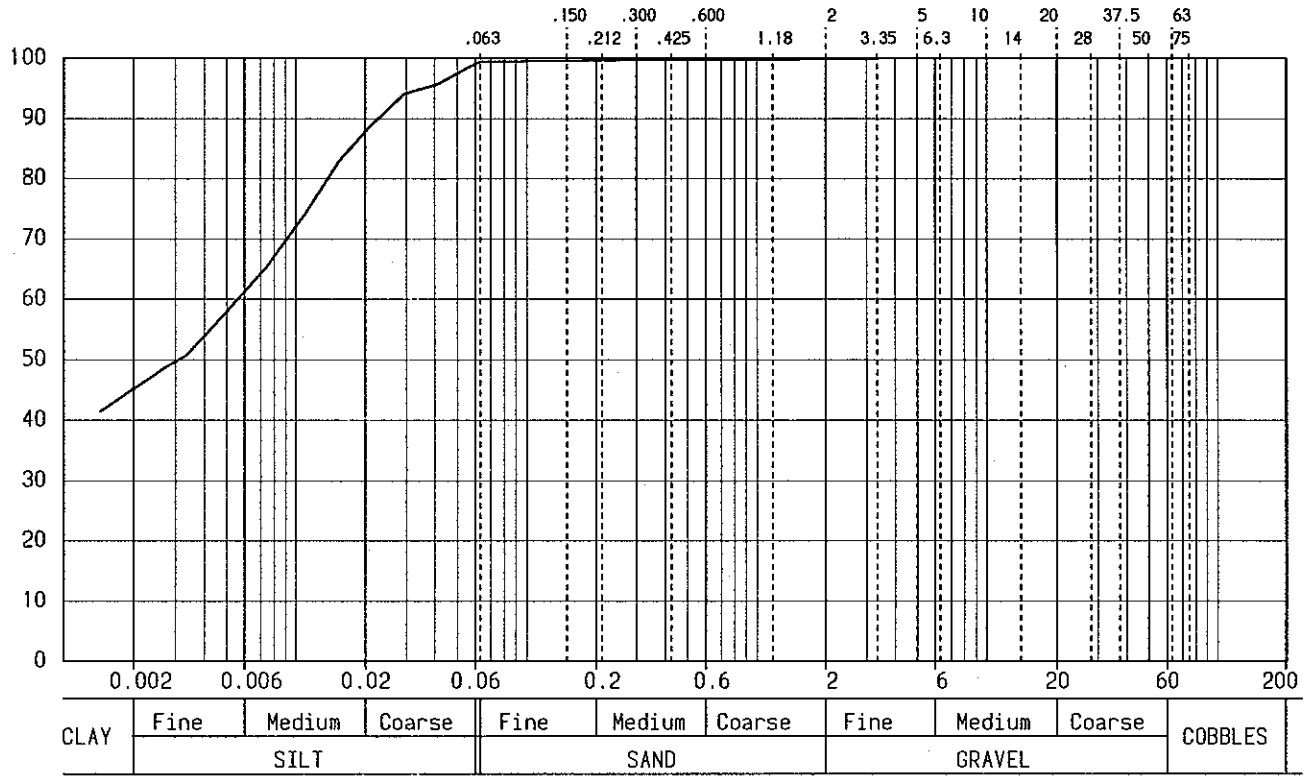
Q.A. Ref: /127-12/M4Bk4.PSD 2.06 : U/

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey slightly sandy CLAY.	Hole ID	BHL1
		Sample No.	
		Depth	4.55m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05748	98.7
63.000	100.0	0.04120	95.7
50.000	100.0	0.02936	94.1
37.500	100.0	0.02123	89.0
28.000	100.0	0.01539	83.0
20.000	100.0	0.01093	74.1
14.000	100.0	0.00736	65.2
10.000	100.0	0.00414	54.7
6.300	100.0	0.00337	50.8
5.000	100.0	0.00271	48.7
3.350	99.9	0.00143	41.5
2.000	99.9		
1.180	99.9		
0.600	99.8		
0.425	99.8		
0.300	99.8		
0.212	99.7		
0.150	99.6		
0.063	99.5		

Type of sample BULK

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	45
Silt	55
Sand	0
Gravel	0
Cobbles	0

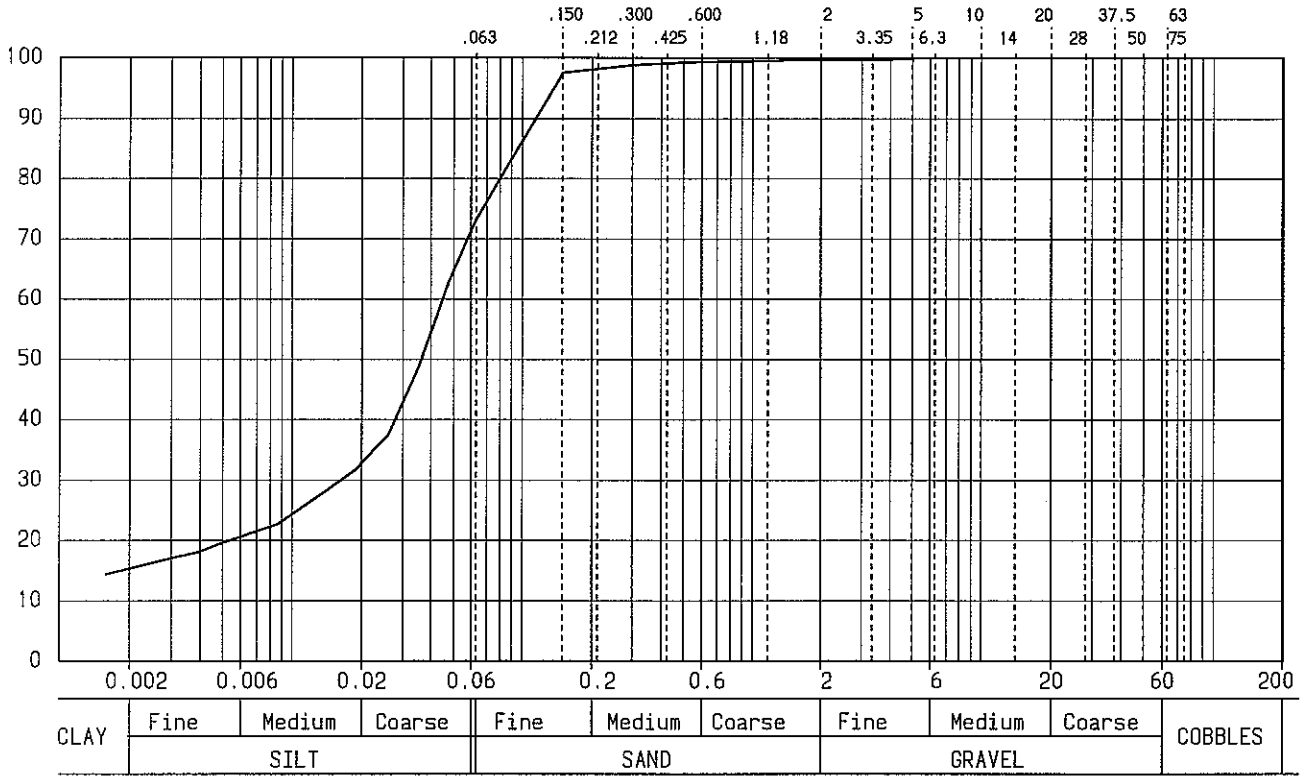
Q.A. Ref: /127-19/m4bl145.PSD 2.06 : U/Hr192.34/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Grey slightly sandy very silty CLAY.	Hole ID	BHL2
		Sample No.	
		Depth	7.65m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04761	62.9
63.000	100.0	0.03538	48.8
50.000	100.0	0.02596	37.5
37.500	100.0	0.01869	31.7
28.000	100.0	0.01298	27.4
20.000	100.0	0.00858	22.7
14.000	100.0	0.00488	19.5
10.000	100.0	0.00389	18.0
6.300	100.0	0.00308	17.2
5.000	99.9	0.00158	14.5
3.350	99.8		
2.000	99.8		
1.180	99.6		
0.600	99.4		
0.425	99.2		
0.300	98.9		
0.212	98.3		
0.150	97.6		
0.063	73.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	15
Silt	59
Sand	26
Gravel	0
Cobbles	0

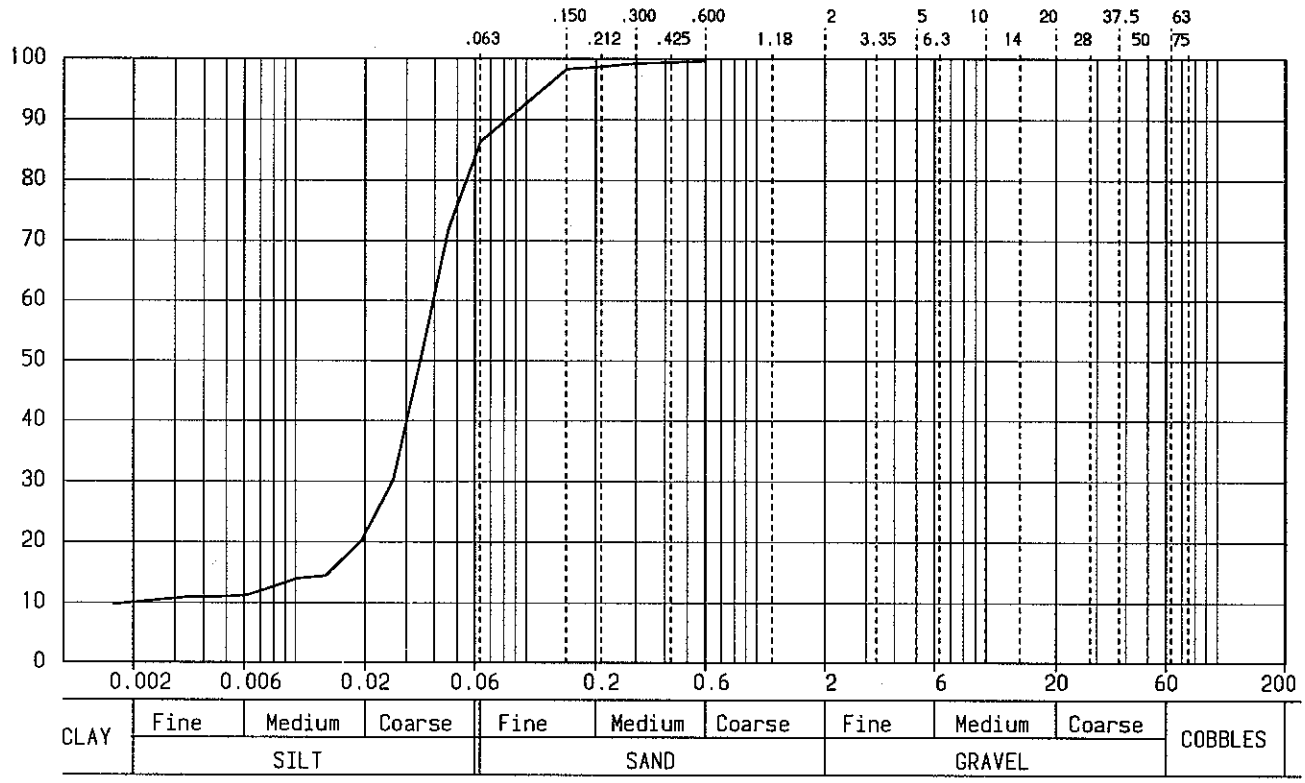
Q.A. Ref: /127-04/M4BL2765.PSD 2.06 : U/Hr203.43/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Grey slightly organic clayey SILT.	Hole ID	BHL4
		Sample No.	
		Depth	5.60m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.06139	85.2
63.000	100.0	0.04592	71.9
50.000	100.0	0.03510	50.9
37.500	100.0	0.02652	30.3
28.000	100.0	0.01932	20.2
20.000	100.0	0.01347	14.4
14.000	100.0	0.01015	14.0
10.000	100.0	0.00618	11.3
6.300	100.0	0.00458	10.9
5.000	100.0	0.00341	10.9
3.350	100.0	0.00164	9.7
2.000	100.0		
1.180	100.0		
0.600	99.7		
0.425	99.5		
0.300	99.3		
0.212	98.8		
0.150	98.3		
0.063	86.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	10
Silt	76
Sand	14
Gravel	0
Cobbles	0

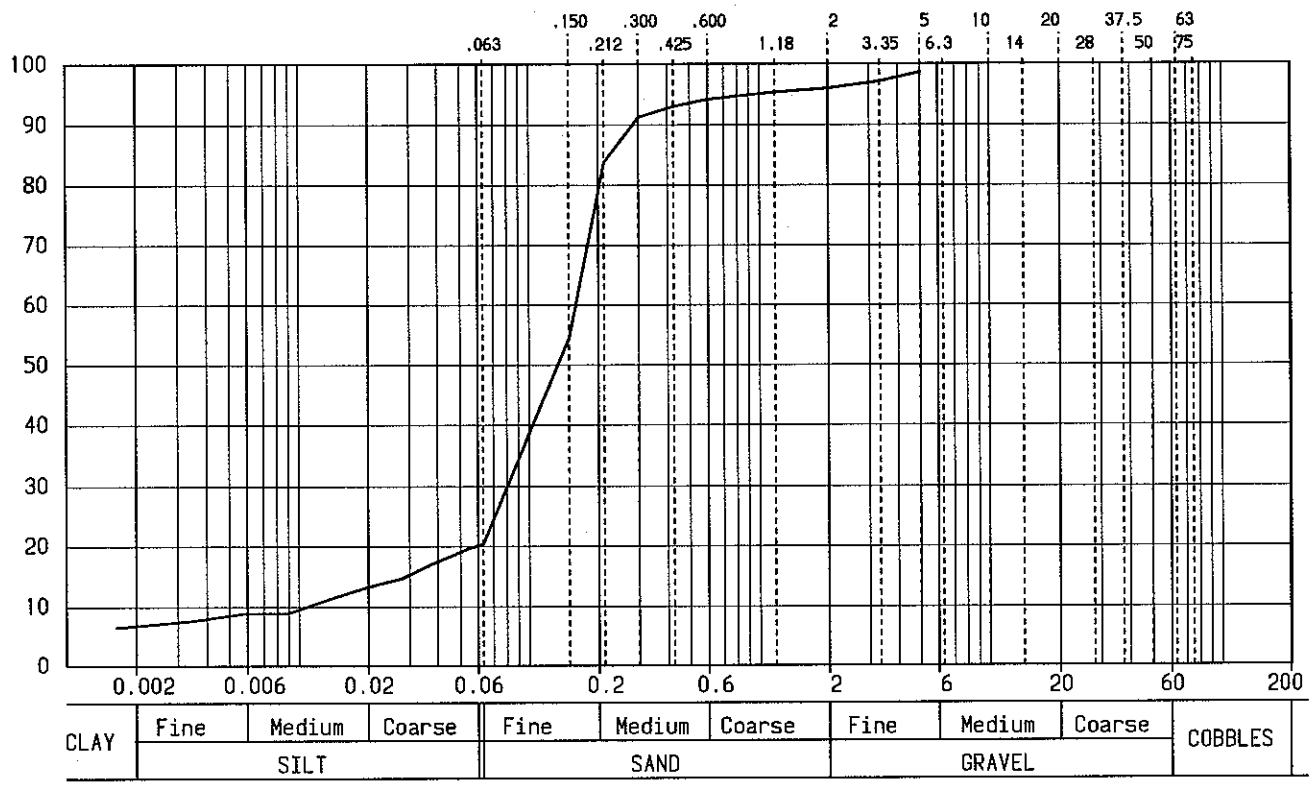
Q.A. Ref: /028-16/M4L4.PSD 2.06 · U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Light greyish brown slightly clayey SAND with a little gravel	Hole ID	BHM2
		Sample No.	
		Depth	7.80m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	98.6
3.350	97.2
2.000	96.0
1.180	95.4
0.600	94.2
0.425	93.1
0.300	91.2
0.212	83.8
0.150	54.5
0.063	20.5

Particle Size	Cumulative % Passing
0.05415	19.6
0.03859	17.2
0.02753	14.6
0.01955	13.3
0.01350	11.3
0.00886	9.0
0.00584	9.0
0.00444	8.3
0.00336	7.6
0.00163	6.6

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

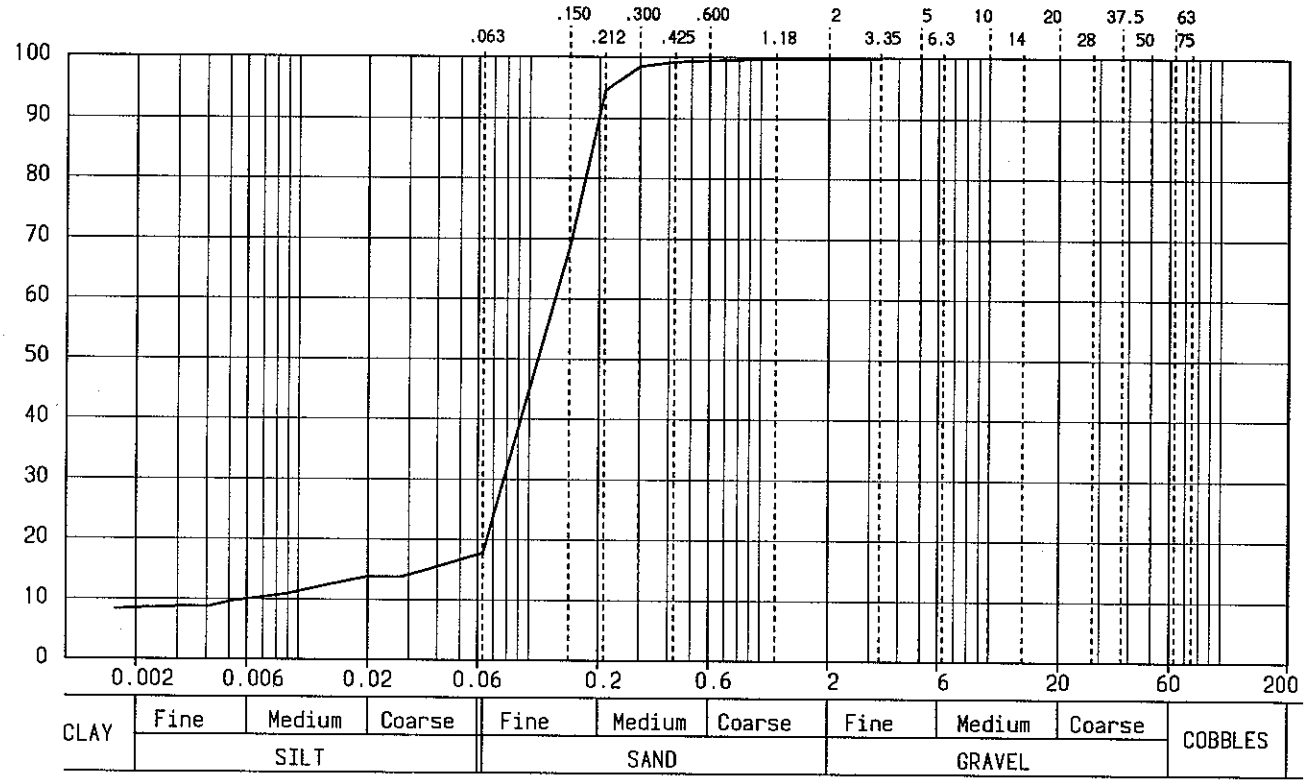
Clay	7
Silt	13
Sand	76
Gravel	4
Cobbles	0

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Loose light brown speckled white fine SAND with very occasional soft, black, fine gravel sized grains of coal.	Hole ID	BHM3
		Sample No.	
		Depth	8.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05529	17.1
63.000	100.0	0.03927	15.5
50.000	100.0	0.02788	13.8
37.500	100.0	0.01972	13.8
28.000	100.0	0.01357	12.5
20.000	100.0	0.00888	10.9
14.000	100.0	0.00510	9.6
10.000	100.0	0.00410	8.8
6.300	100.0	0.00321	8.8
5.000	100.0	0.00163	8.4
3.350	99.9		
2.000	99.8		
1.180	99.8		
0.600	99.5		
0.425	99.3		
0.300	98.6		
0.212	94.6		
0.150	68.6		
0.063	17.8		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	8
Silt	10
Sand	82
Gravel	0
Cobbles	0

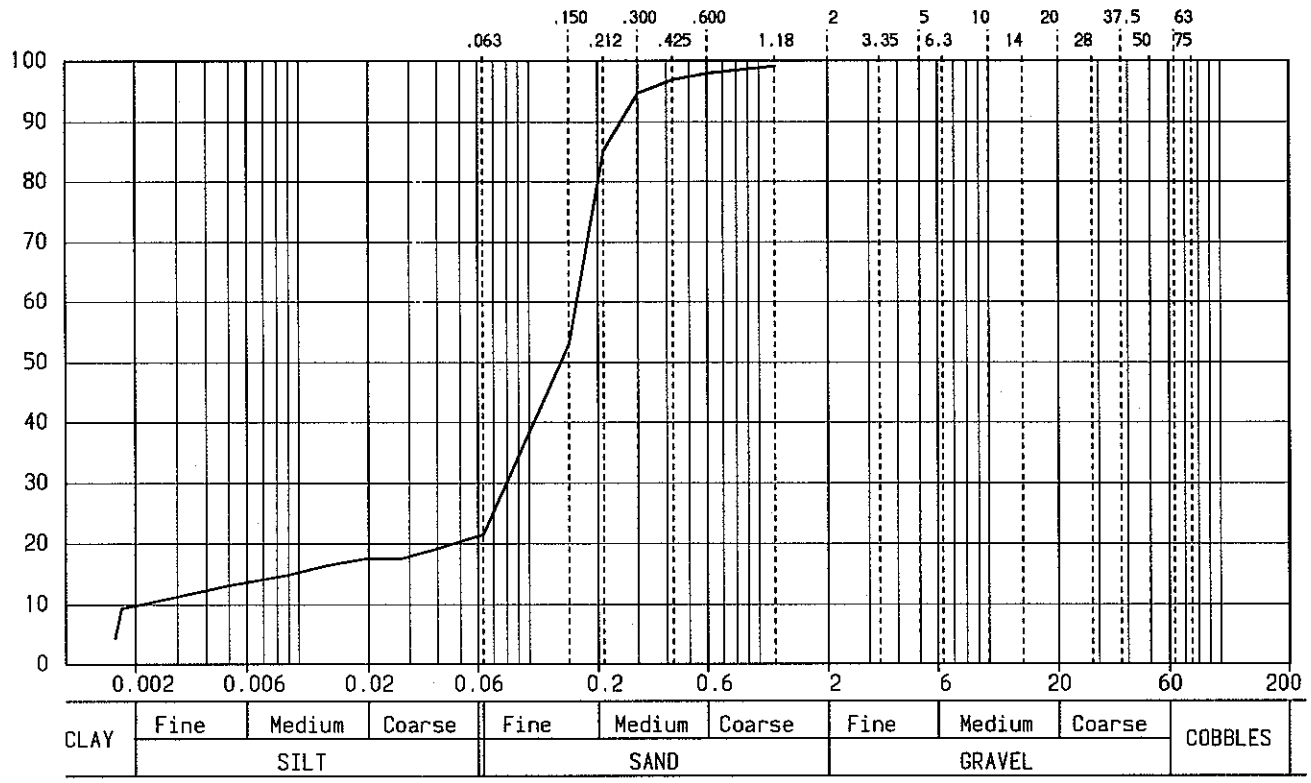
Q.A. Ref: /028-13/M4M3.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Loose light brown speckeled white fine SAND.	Hole ID	BHM3
		Sample No.	
		Depth	10.30m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05529	20.9
63.000	100.0	0.03923	19.2
50.000	100.0	0.02783	17.6
37.500	100.0	0.01968	17.6
28.000	100.0	0.01353	16.5
20.000	100.0	0.00885	14.8
14.000	100.0	0.00500	13.2
10.000	100.0	0.00173	9.3
6.300	100.0	0.00310	4.4
5.000	100.0	0.00163	4.4
3.350	100.0		
2.000	100.0		
1.180	99.1		
0.600	98.0		
0.425	97.0		
0.300	94.8		
0.212	85.2		
0.150	53.0		
0.063	21.5		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	10
Silt	12
Sand	78
Gravel	0
Cobbles	0

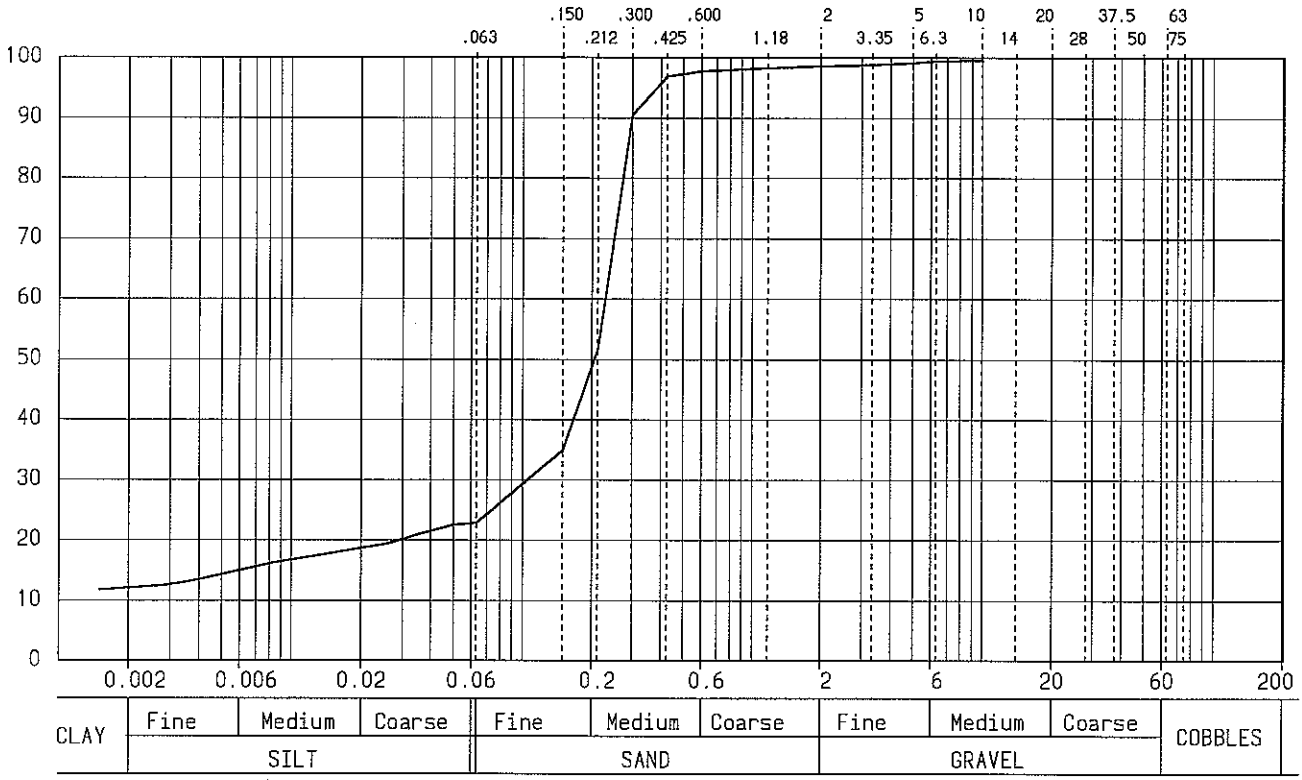
Q.A. Ref: /028-13/M4BH3.PSD 2.06 : U/Hr203.43/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Soft to firm brown very clayey SAND with a little fine to medium gravel.	Hole ID	BHM7
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05036	22.6
63.000	100.0	0.03588	21.1
50.000	100.0	0.02560	19.4
37.500	100.0	0.01819	18.4
28.000	100.0	0.01254	17.4
20.000	100.0	0.00823	16.2
14.000	100.0	0.00421	13.7
10.000	99.7	0.00348	13.0
6.300	99.5	0.00283	12.5
5.000	99.1	0.00150	11.8
3.350	98.9		
2.000	98.7		
1.180	98.3		
0.600	97.8		
0.425	96.9		
0.300	90.5		
0.212	51.7		
0.150	34.9		
0.063	22.9		

Type of sample UNDISTURBED

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	12
Silt	11
Sand	76
Gravel	1
Cobbles	0

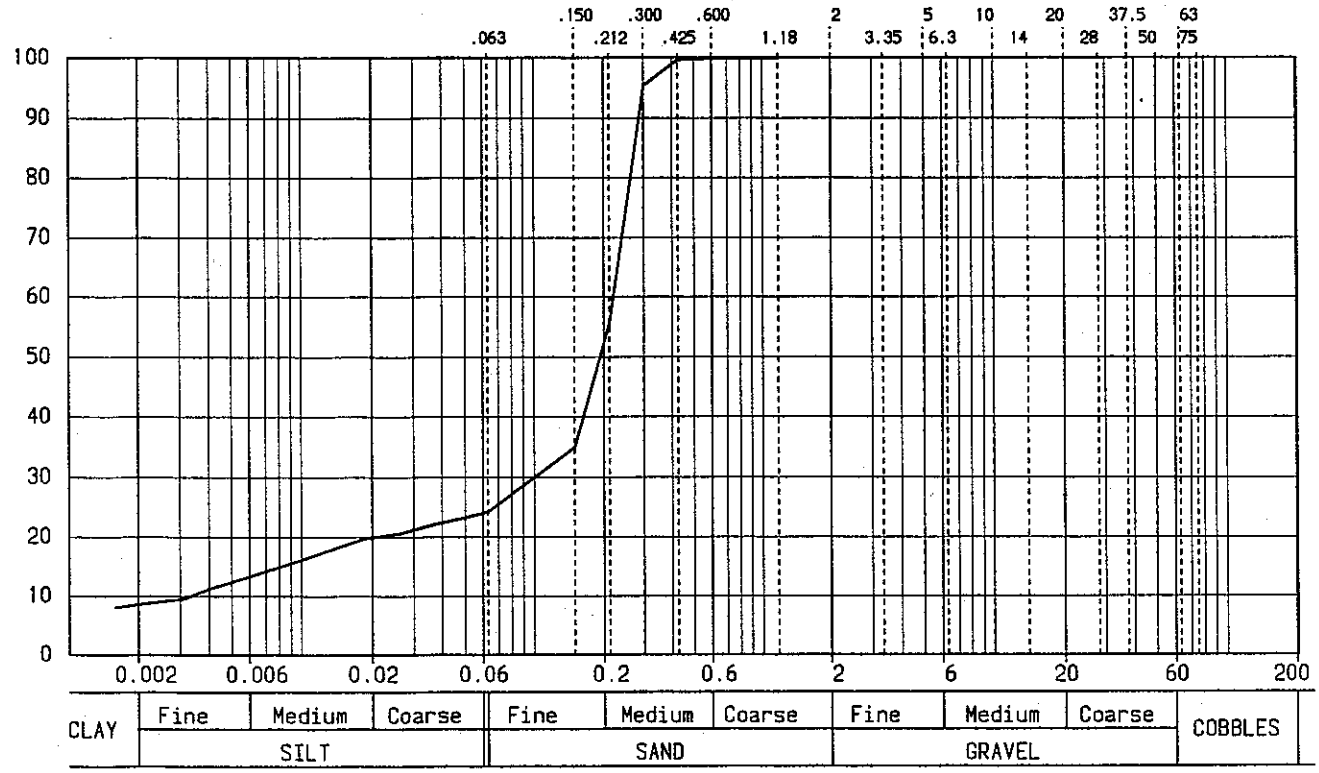
Q.A. Ref: /028-05/M4BM7.PSD 2.06 : U/Hr192.34/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown slightly clayey SAND	Hole ID	BHM7
		Sample No.	
		Depth	1.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05164	23.4
63.000	100.0	0.03670	22.2
50.000	100.0	0.02611	20.7
37.500	100.0	0.01853	19.8
28.000	100.0	0.01281	17.7
20.000	100.0	0.00843	15.3
14.000	100.0	0.00488	12.3
10.000	100.0	0.00393	11.1
6.300	100.0	0.00309	9.6
5.000	100.0	0.00157	8.1
3.350	100.0		
2.000	100.0		
1.180	100.0		
0.600	99.9		
0.425	99.7		
0.300	95.4		
0.212	55.8		
0.150	34.9		
0.063	24.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	9
Silt	15
Sand	76
Gravel	0
Cobbles	0

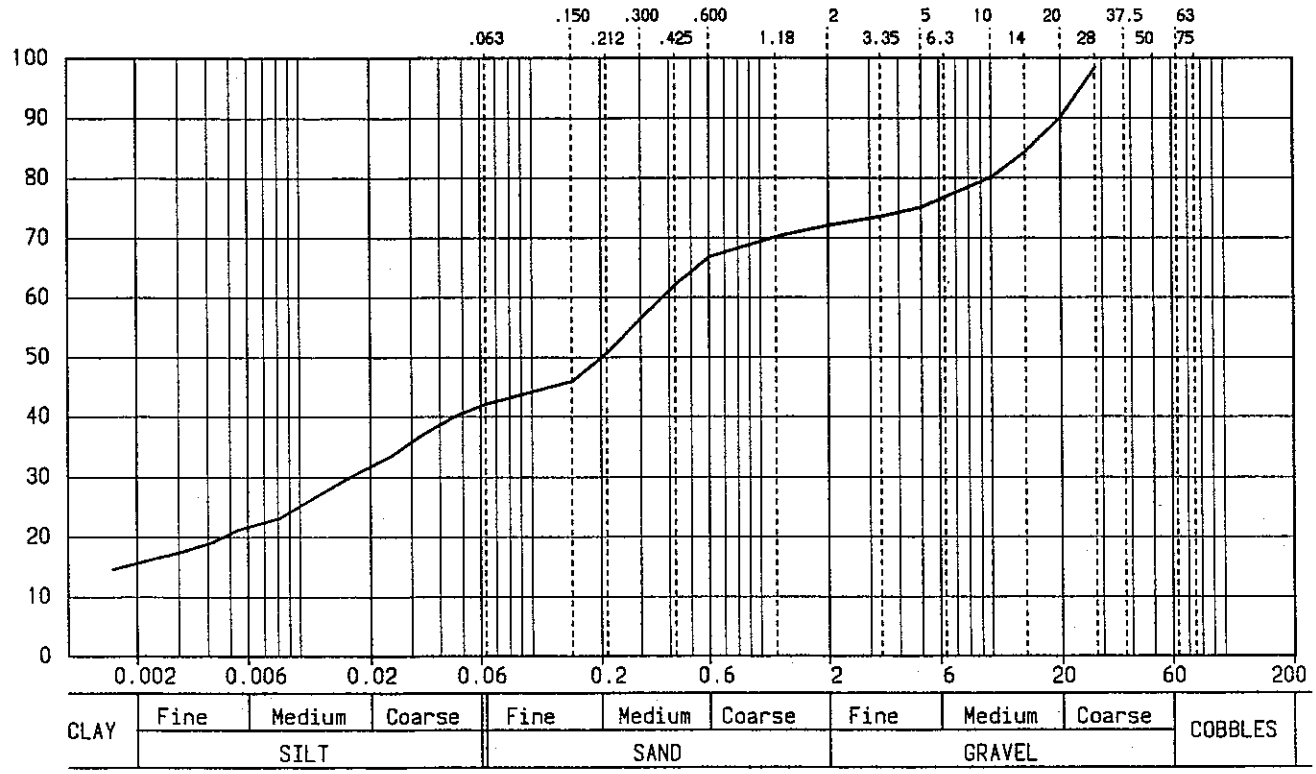
Q.A. Ref: /127-10/m4M715.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some gravel	Hole ID	BHN1
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04705	40.3
63.000	100.0	0.03391	37.2
50.000	100.0	0.02449	33.6
37.500	100.0	0.01760	30.7
28.000	98.5	0.01229	27.3
20.000	90.2	0.00819	23.3
14.000	84.4	0.00545	21.3
10.000	80.2	0.00418	19.2
6.300	76.9	0.00318	17.7
5.000	75.2	0.00156	14.6
3.350	73.6		
2.000	72.1		
1.180	70.2		
0.600	66.8		
0.425	62.1		
0.300	56.6		
0.212	50.7		
0.150	46.0		
0.063	42.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	16
Silt	26
Sand	30
Gravel	28
Cobbles	0

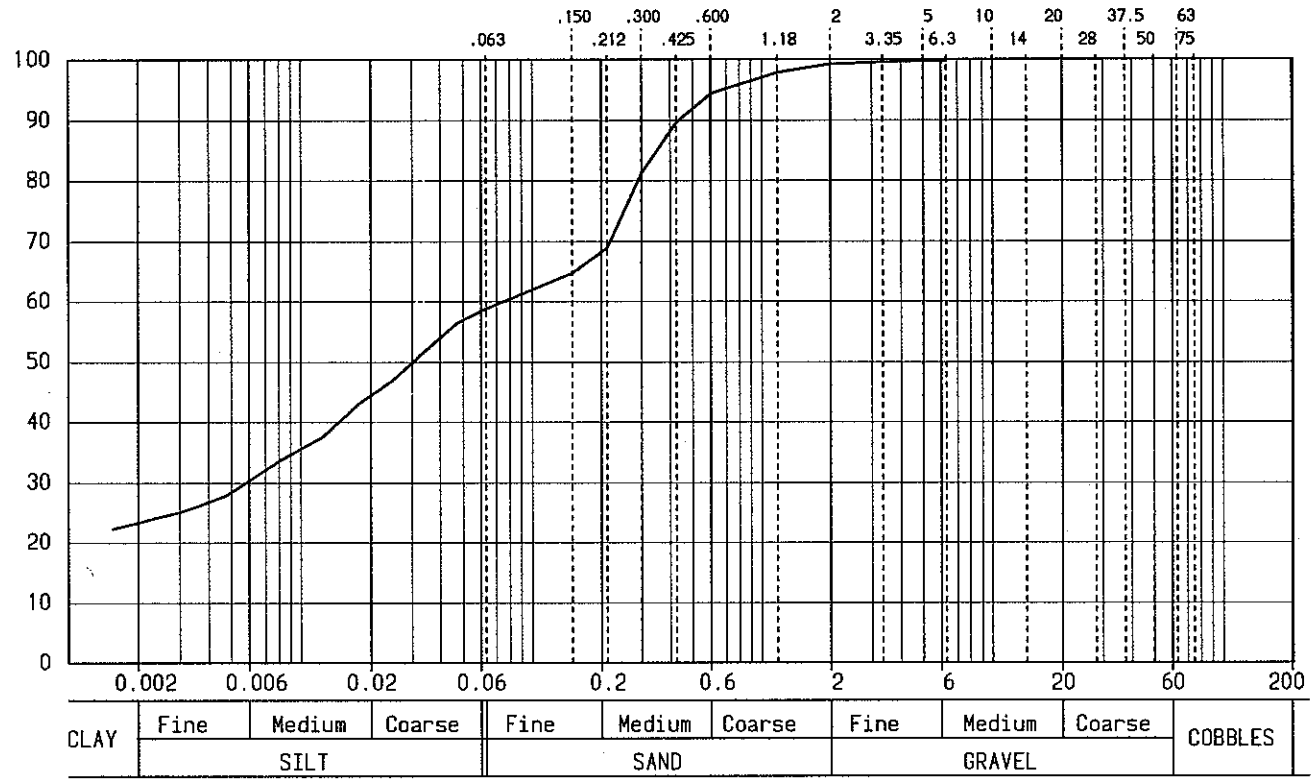
Q.A. Ref: /127-10/m4n105.PSD 2.06 : U/Hr203.01/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown sandy CLAY.	Hole ID	BHN9
		Sample No.	
		Depth	2.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04740	56.6
63.000	100.0	0.03420	51.7
50.000	100.0	0.02465	46.9
37.500	100.0	0.01769	43.1
28.000	100.0	0.01239	37.6
20.000	100.0	0.00819	33.8
14.000	100.0	0.00479	27.9
10.000	100.0	0.00385	26.6
6.300	99.8	0.00303	25.2
5.000	99.8	0.00154	22.4
3.350	99.6		
2.000	99.3		
1.180	98.0		
0.600	94.4		
0.425	89.6		
0.300	81.3		
0.212	69.0		
0.150	64.8		
0.063	58.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	23
Silt	36
Sand	40
Gravel	1
Cobbles	0

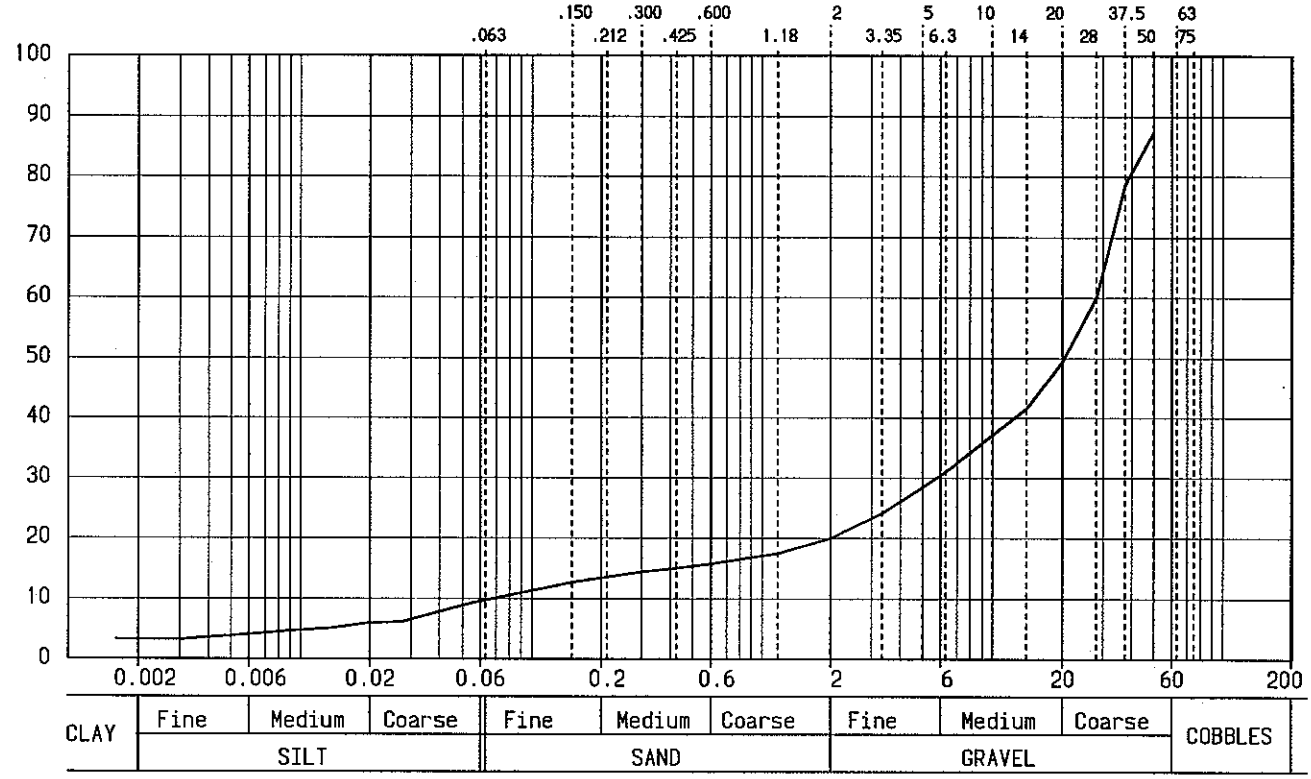
Q.A. Ref: /127-12/M4Bn92.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown slightly clayey sandy GRAVEL with sandstone fragments.	Hole ID	BHN10B
		Sample No.	
		Depth	6.20m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05439	9.3
63.000	100.0	0.03885	7.8
50.000	87.5	0.02777	6.1
37.500	78.8	0.01965	6.0
28.000	60.1	0.01355	5.1
20.000	49.4	0.00886	4.6
14.000	41.6	0.00483	3.8
10.000	37.1	0.00389	3.6
6.300	31.0	0.00311	3.3
5.000	28.5	0.00160	3.3
3.350	24.2		
2.000	20.0		
1.180	17.5		
0.600	15.7		
0.425	15.1		
0.300	14.4		
0.212	13.6		
0.150	12.7		
0.063	9.8		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	3
Silt	7
Sand	10
Gravel	80
Cobbles	0

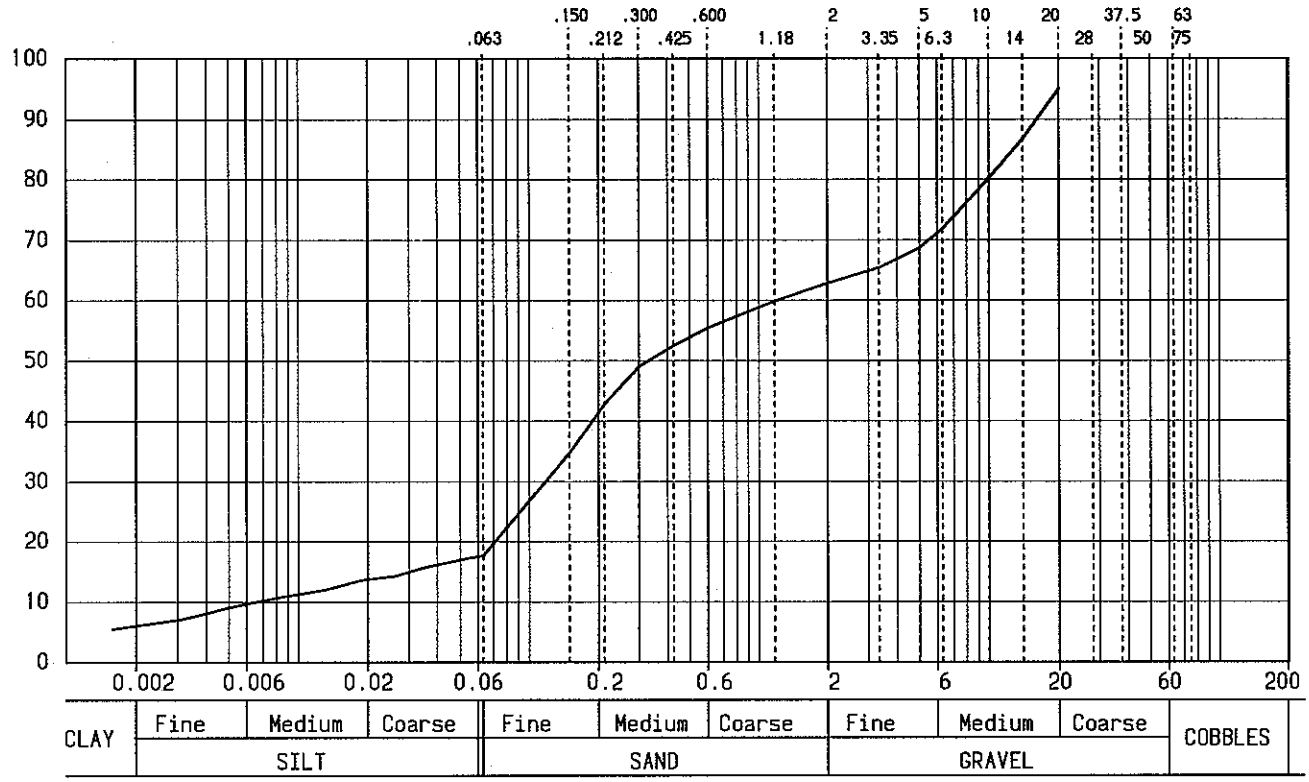
Q.A. Ref: /018-15/M4BHN101.PSD 2.06 : U/Hr203.43/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Purplish brown clayey SAND and GRAVEL.	Trial Pit	TPB100
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05190	17.1
63.000	100.0	0.03692	15.9
50.000	100.0	0.02632	14.3
37.500	100.0	0.01868	13.6
28.000	100.0	0.01292	12.0
20.000	95.0	0.00847	10.8
14.000	86.8	0.00489	9.0
10.000	80.3	0.00394	8.1
6.300	71.8	0.00310	7.1
5.000	68.7	0.00157	5.5
3.350	65.5		
2.000	62.9		
1.180	59.9		
0.600	55.5		
0.425	52.6		
0.300	49.1		
0.212	42.8		
0.150	34.7		
0.063	17.7		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	6
Silt	12
Sand	45
Gravel	37
Cobbles	0

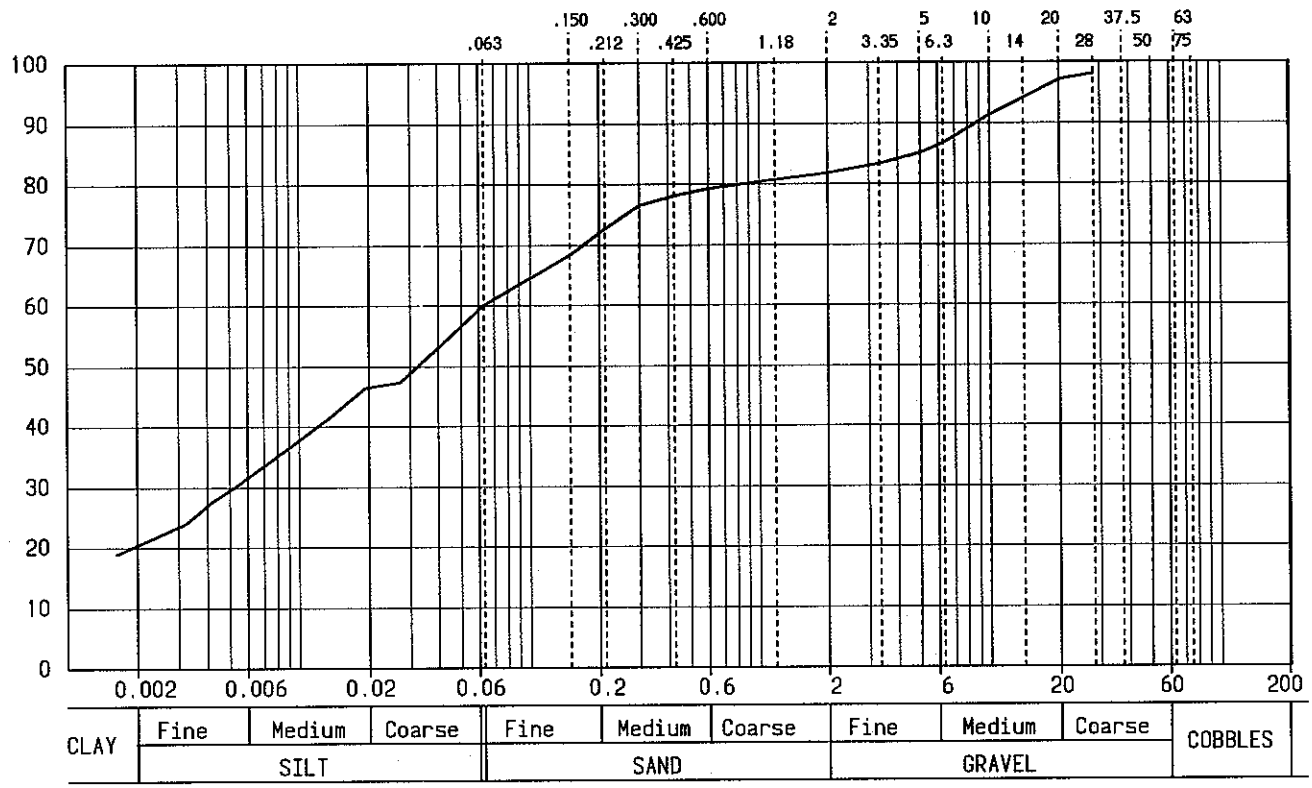
Q.A. Ref: /018-15/M4TB1005.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Purplish brown sandy CLAY with some siltstone.	Trial Pit	TPB100
		Sample No.	
		Depth	2.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05372	57.7
63.000	100.0	0.03825	52.5
50.000	100.0	0.02723	47.3
37.500	100.0	0.01927	46.5
28.000	98.1	0.01331	41.3
20.000	97.2	0.00873	36.2
14.000	94.1	0.00526	30.1
10.000	91.3	0.00416	27.5
6.300	86.7	0.00324	24.1
5.000	85.1	0.00163	18.9
3.350	83.3		
2.000	81.9		
1.180	80.8		
0.600	79.3		
0.425	78.1		
0.300	76.5		
0.212	72.7		
0.150	68.4		
0.063	60.1		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	20
Silt	40
Sand	22
Gravel	18
Cobbles	0

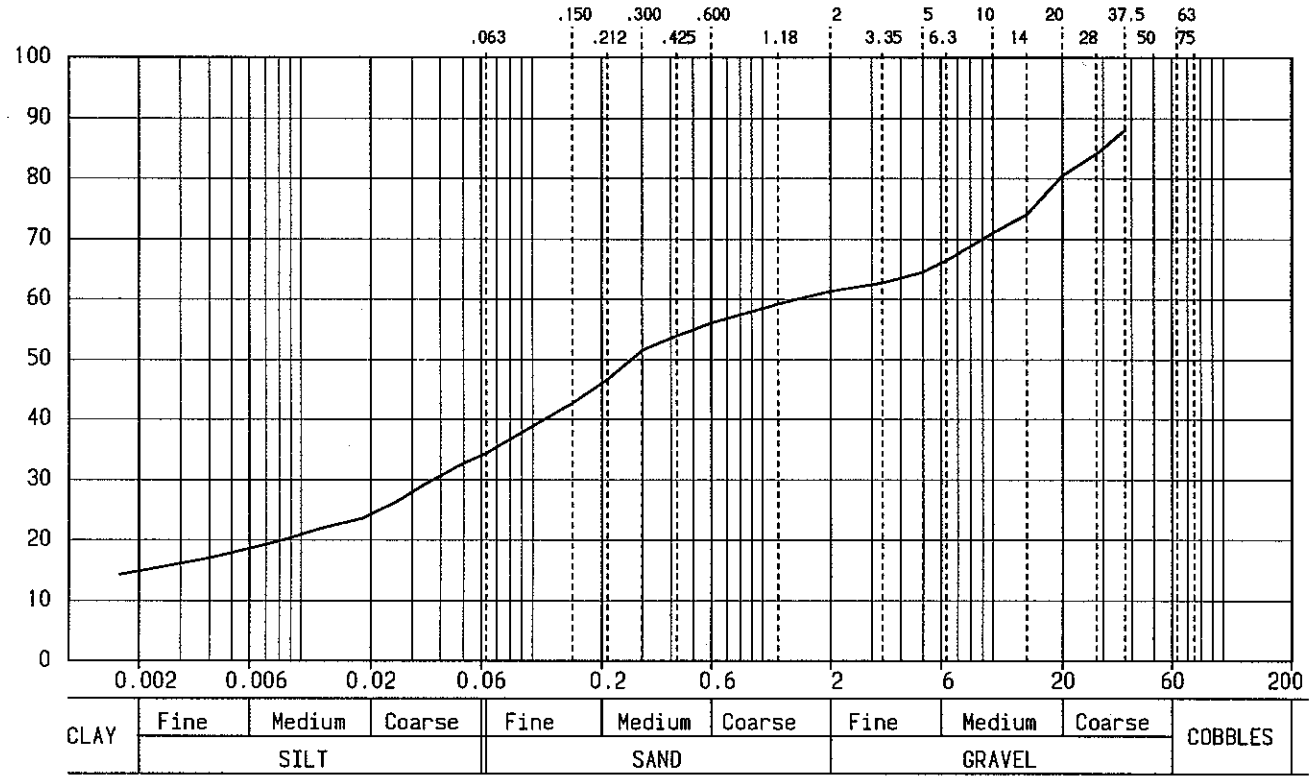
Q.A. Ref: /018-14/M4TB1002.PSD 2.06 : U/Hr203.43/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY very micacous and angular gravel.	Trial Pit	TPB101
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing
75.000	100.0
63.000	100.0
50.000	100.0
37.500	88.1
28.000	84.2
20.000	80.5
14.000	74.1
10.000	71.1
6.300	66.4
5.000	64.6
3.350	62.8
2.000	61.4
1.180	59.3
0.600	56.1
0.425	54.0
0.300	51.6
0.212	46.7
0.150	42.8
0.063	34.4

Particle Size	Cumulative % Passing
0.04887	32.5
0.03523	29.6
0.02544	26.3
0.01829	23.6
0.01266	22.1
0.00835	20.1
0.00417	17.2
0.00164	14.3

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	15
Silt	19
Sand	27
Gravel	39
Cobbles	0

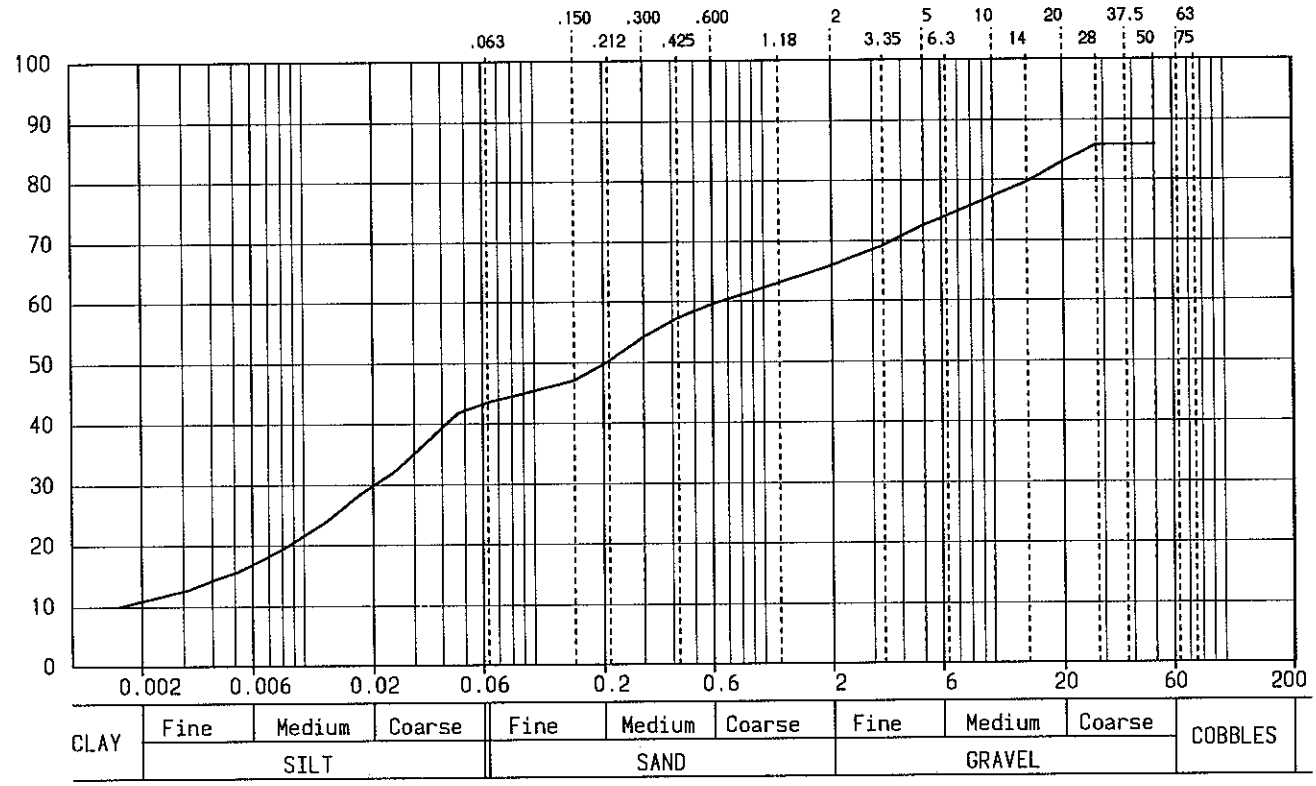
Q.A. Ref: /028-12/M4TB101.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some gravel.	Trial Pit	TPB101
		Sample No.	
		Depth	1.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04665	41.8
63.000	100.0	0.03387	36.8
50.000	85.9	0.02452	32.1
37.500	85.9	0.01764	28.5
28.000	85.9	0.01237	23.8
20.000	83.1	0.00822	19.7
14.000	79.8	0.00523	15.8
10.000	77.4	0.00408	14.4
6.300	74.1	0.00314	12.7
5.000	72.6	0.00157	10.0
3.350	69.2		
2.000	66.0		
1.180	63.1		
0.600	59.6		
0.425	57.4		
0.300	54.2		
0.212	50.3		
0.150	47.2		
0.063	43.5		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	11
Silt	33
Sand	22
Gravel	31
Cobbles	3

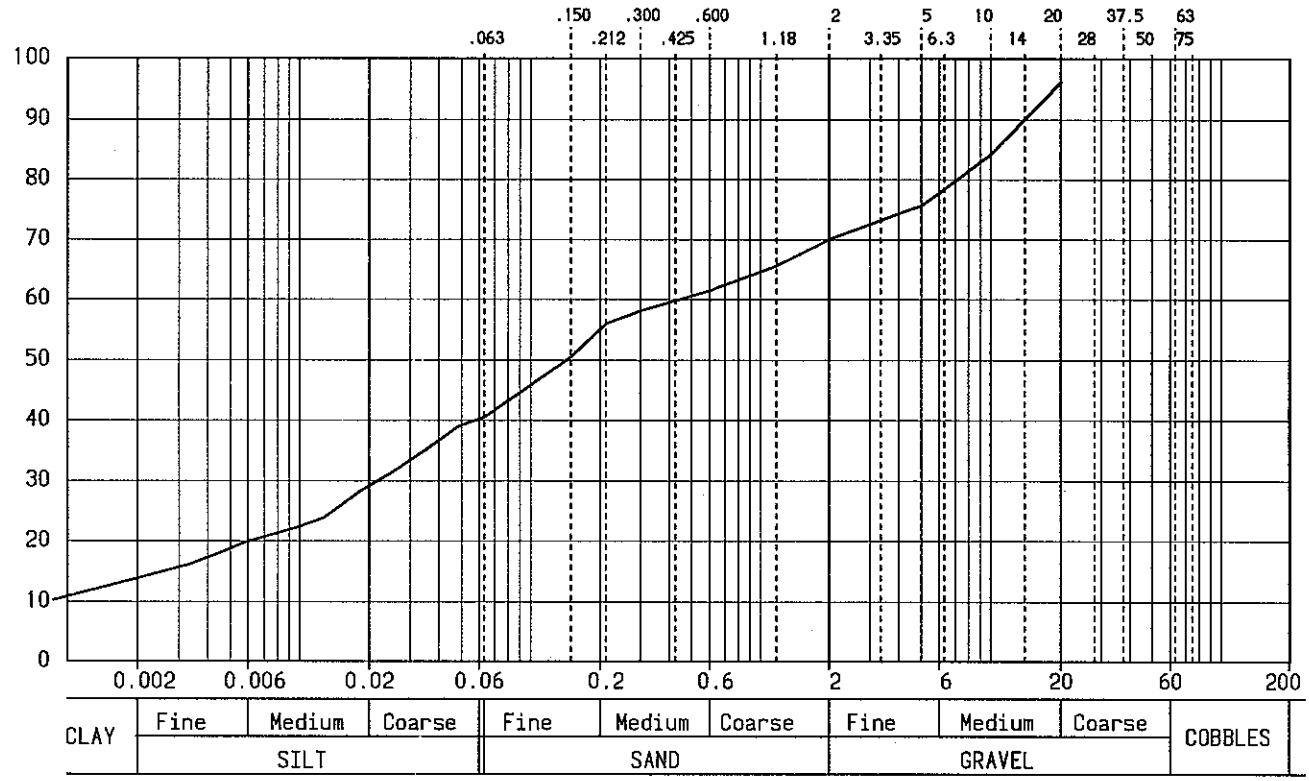
Q.A. Ref: /028-16/M4B101.PSD 2.06 : U/Hr192.36/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some gravel.	Trial Pit	TPB102
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04823	38.9
63.000	100.0	0.03482	35.1
50.000	100.0	0.02508	31.5
37.500	100.0	0.01804	28.2
28.000	100.0	0.01264	23.8
20.000	96.2	0.00958	22.3
14.000	90.1	0.00586	20.0
10.000	84.3	0.00437	17.9
6.300	78.5	0.00328	16.1
5.000	75.7	0.00087	10.2
3.350	73.3		
2.000	70.1		
1.180	65.7		
0.600	61.5		
0.425	59.8		
0.300	58.2		
0.212	56.0		
0.150	50.5		
0.063	40.6		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	14
Silt	26
Sand	30
Gravel	30
Cobbles	0

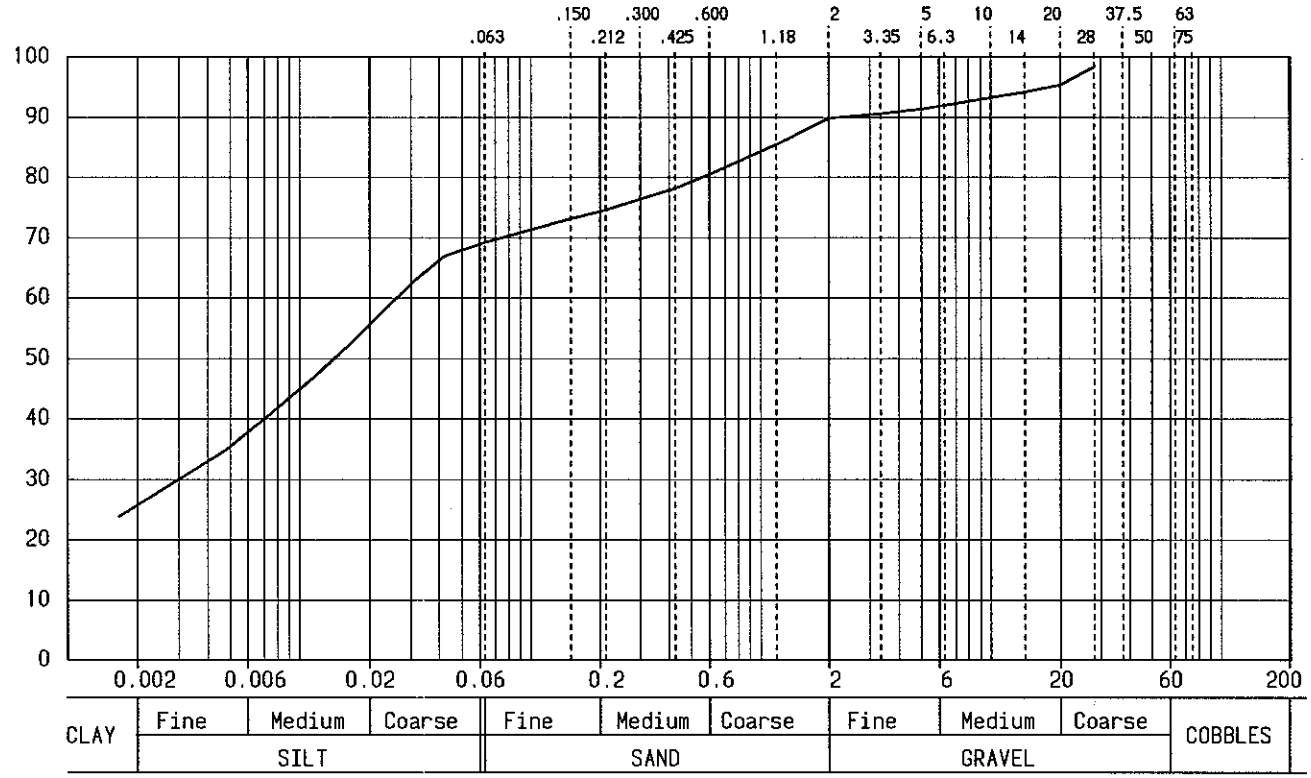
Q.A. Ref: /018-14/M4TB1025.PSD 2.06 : U/Hr203.42/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some gravel..	Trial Pit	TPB102
		Sample No.	
		Depth	1.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05895	68.9
63.000	100.0	0.04224	67.0
50.000	100.0	0.03076	62.7
37.500	100.0	0.02247	57.6
28.000	98.4	0.01638	52.4
20.000	95.4	0.01158	47.1
14.000	94.2	0.00778	41.4
10.000	93.3	0.00480	35.0
6.300	92.0	0.00166	23.9
5.000	91.3		
3.350	90.7		
2.000	89.9		
1.180	85.6		
0.600	80.5		
0.425	78.3		
0.300	76.4		
0.212	74.6		
0.150	73.1		
0.063	69.2		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	26
Silt	43
Sand	21
Gravel	10
Cobbles	0

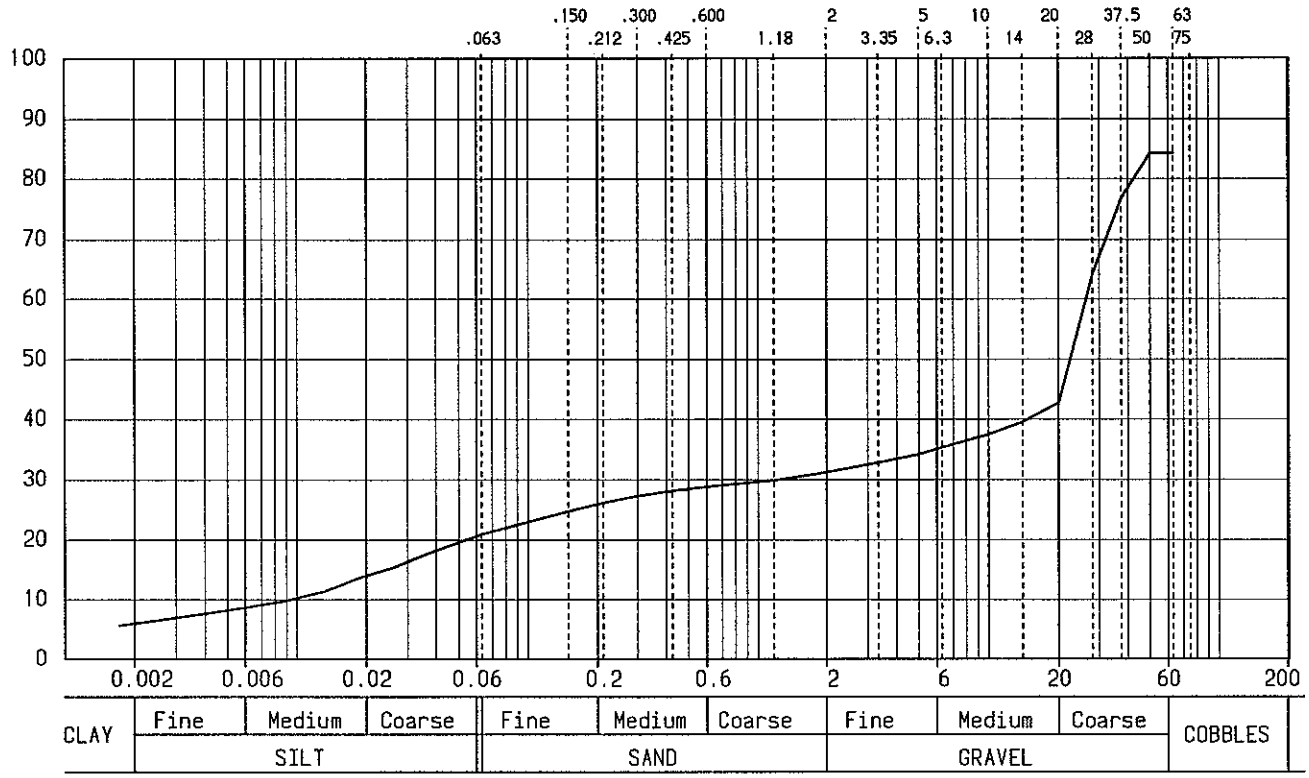
Q.A. Ref: /028-13/M4TB102.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown clayey slightly sandy GRAVEL with occasional cobbles	Trial Pit	TPB103
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04989	19.7
63.000	84.3	0.03598	17.6
50.000	84.3	0.02596	15.4
37.500	76.9	0.01863	13.7
28.000	64.4	0.01304	11.4
20.000	42.8	0.00862	9.7
14.000	39.6	0.00474	8.0
10.000	37.5	0.00172	5.7
6.300	35.4		
5.000	34.2		
3.350	32.8		
2.000	31.3		
1.180	29.9		
0.600	28.8		
0.425	28.2		
0.300	27.3		
0.212	26.1		
0.150	24.8		
0.063	20.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	6
Silt	15
Sand	10
Gravel	53
Cobbles	16

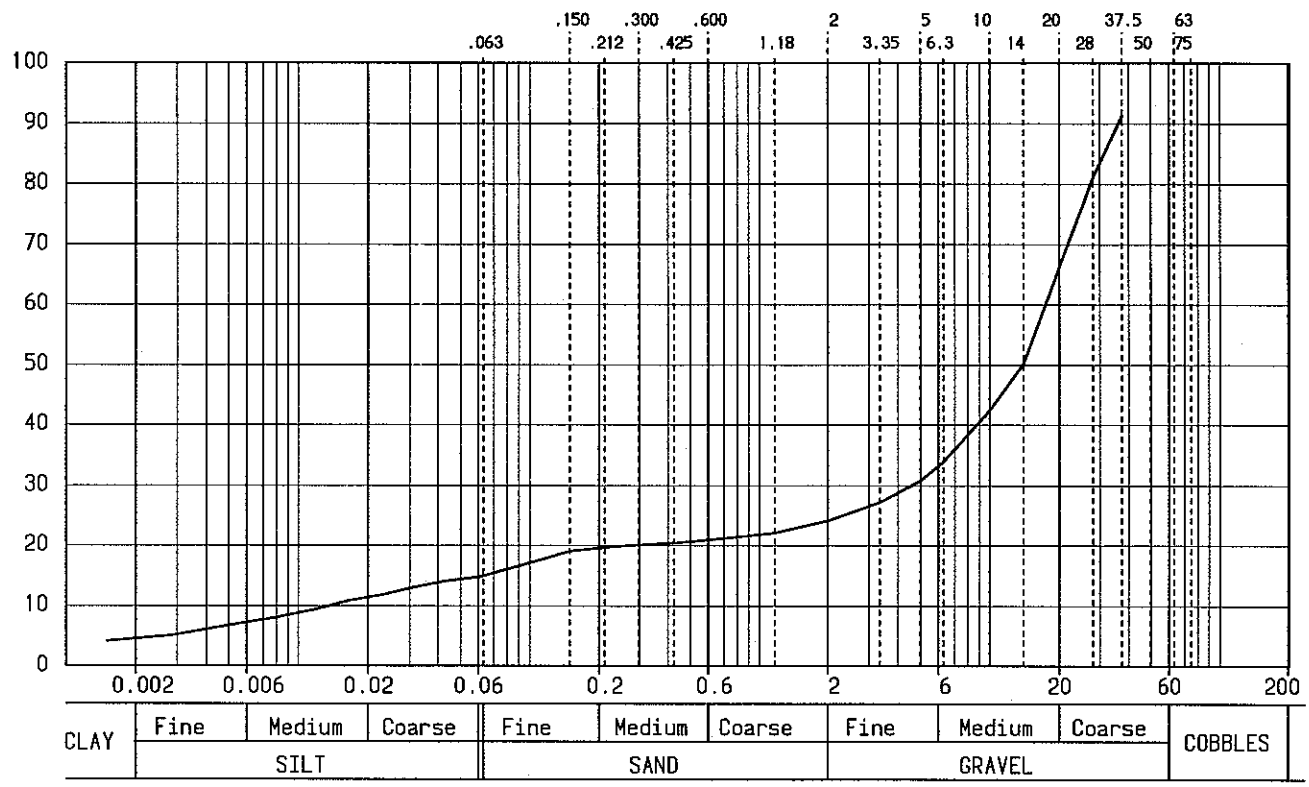
Q.A. Ref: /028-14/m4TB103.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Purplish brown clayey slightly sandy GRAVEL.	Trial Pit	TPB103
		Sample No.	
		Depth	1.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05961	14.8
63.000	100.0	0.04292	14.1
50.000	100.0	0.03120	13.0
37.500	91.3	0.02272	11.8
28.000	81.2	0.01642	10.8
20.000	66.4	0.01162	9.3
14.000	50.3	0.00779	7.9
10.000	42.5	0.00435	6.4
6.300	34.0	0.00354	5.7
5.000	30.8	0.00286	5.1
3.350	27.2	0.00150	4.1
2.000	24.2		
1.180	22.2		
0.600	20.9		
0.425	20.5		
0.300	20.2		
0.212	19.8		
0.150	19.1		
0.063	14.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	5
Silt	10
Sand	9
Gravel	76
Cobbles	0

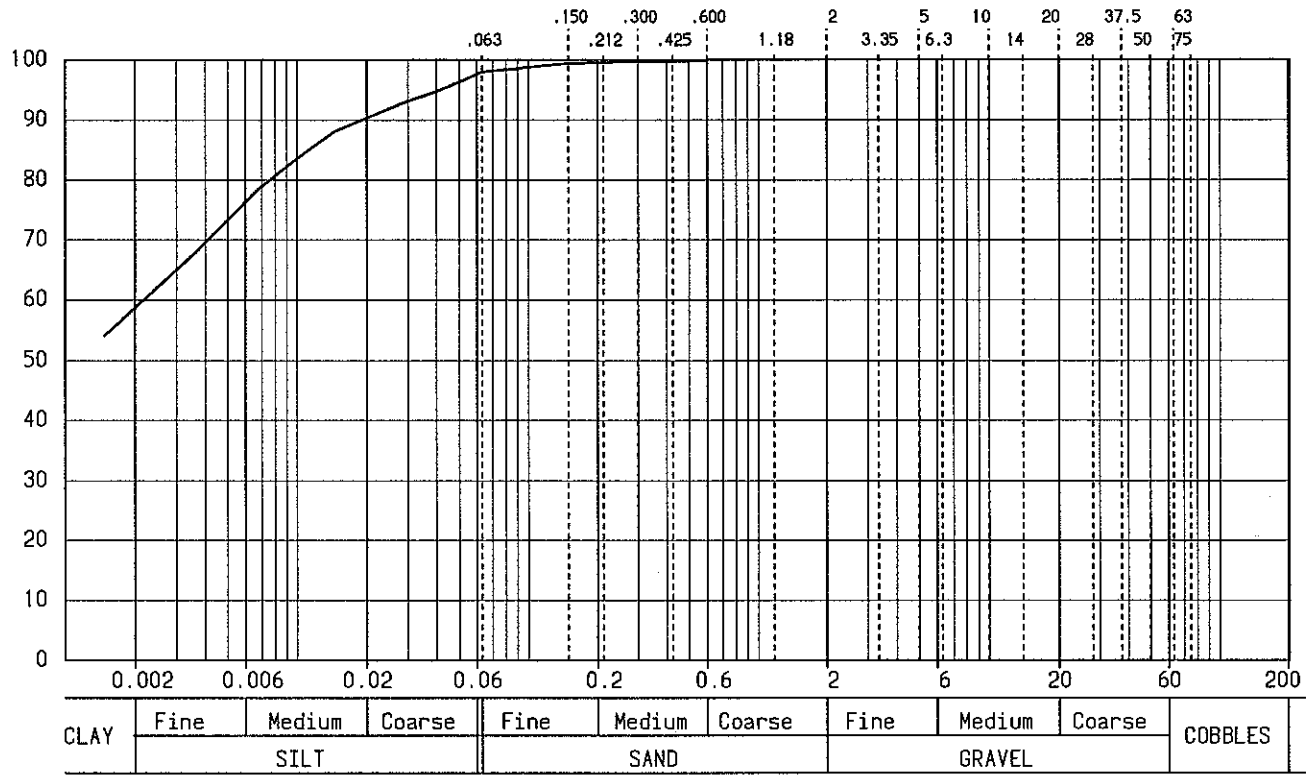
Q.A. Ref: /018-16/m4tb1031.PSD 2 06 : U/Hr192.36/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Greyish mottled reddish brown very silty CLAY.	Trial Pit	TPB105
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05446	97.0
63.000	100.0	0.03911	94.7
50.000	100.0	0.02802	92.7
37.500	100.0	0.02011	90.4
28.000	100.0	0.01442	88.1
20.000	100.0	0.01015	83.8
14.000	100.0	0.00682	78.5
10.000	100.0	0.00365	68.0
6.300	100.0	0.00147	54.1
5.000	100.0		
3.350	100.0		
2.000	100.0		
1.180	100.0		
0.600	99.9		
0.425	99.8		
0.300	99.8		
0.212	99.7		
0.150	99.5		
0.063	98.0		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	59
Silt	39
Sand	2
Gravel	0
Cobbles	0

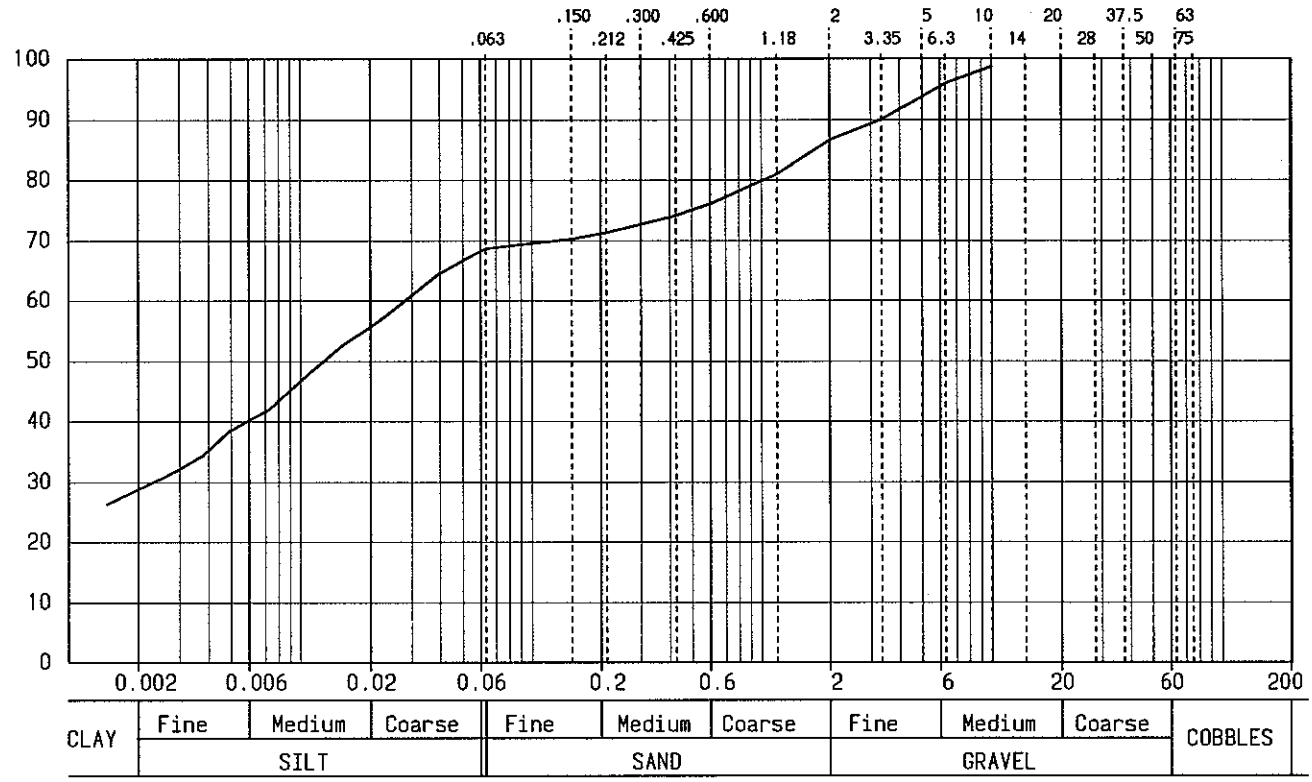
Q.A. Ref: /028-14/m4TB105.PSD 2.06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with a little fine gravel.	Trial Pit	TPB105
		Sample No.	
		Depth	1.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05433	67.4
63.000	100.0	0.03934	64.5
50.000	100.0	0.02874	60.4
37.500	100.0	0.02096	56.2
28.000	100.0	0.01518	52.8
20.000	100.0	0.01076	47.8
14.000	100.0	0.00726	42.1
10.000	98.8	0.00489	38.4
6.300	96.1	0.00379	34.5
5.000	93.8	0.00291	31.9
3.350	90.1	0.00146	26.4
2.000	86.7		
1.180	81.1		
0.600	76.1		
0.425	74.2		
0.300	72.7		
0.212	71.3		
0.150	70.3		
0.063	68.7		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	29
Silt	40
Sand	18
Gravel	13
Cobbles	0

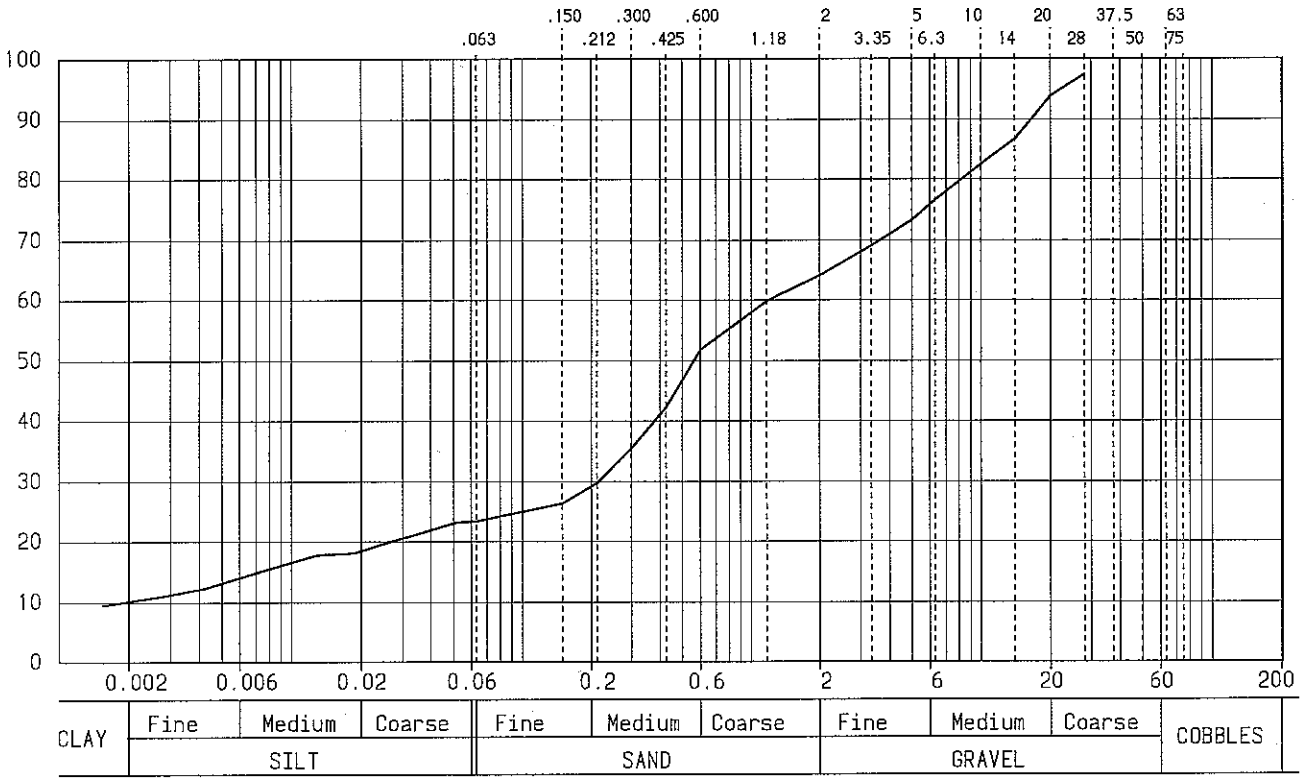
Q.A. Ref: /028-13/M4TB1051.PSD 2.06 : U/Hr192.364/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Trial Pit	TPN100
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05153	23.2
63.000	100.0	0.03675	21.6
50.000	100.0	0.02621	19.9
37.500	100.0	0.01871	18.1
28.000	97.5	0.01285	17.8
20.000	93.9	0.00847	15.8
14.000	86.8	0.00423	12.3
10.000	82.6	0.00352	11.8
6.300	76.7	0.00289	11.1
5.000	73.4	0.00155	9.5
3.350	69.1		
2.000	64.1		
1.180	60.0		
0.600	51.9		
0.425	42.3		
0.300	35.4		
0.212	29.7		
0.150	26.3		
0.063	23.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	10
Silt	13
Sand	41
Gravel	36
Cobbles	0

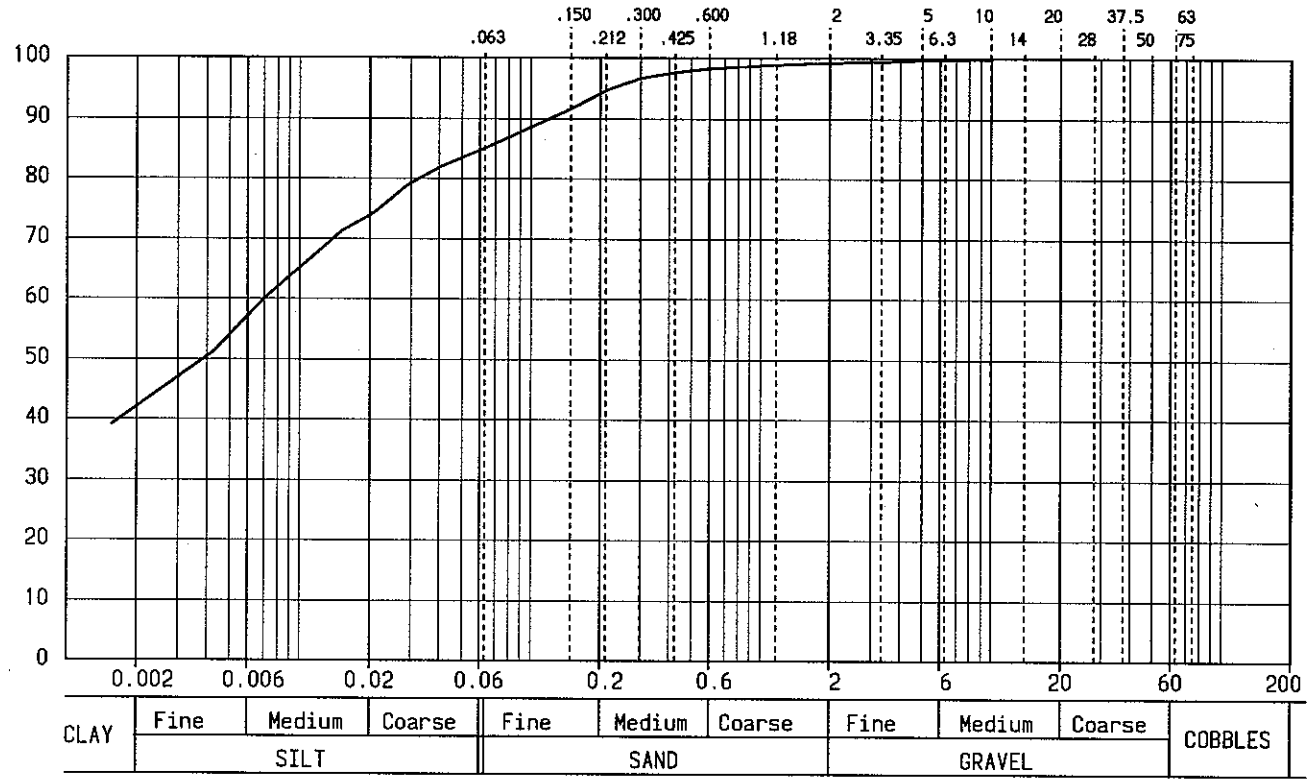
Q.A. Ref: /018-20/M4TN100.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown mottled greyish green CLAY with a little gravel and some sandstone.	Trial Pit	TPN100
		Sample No.	
		Depth	2.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05507	84.2
63.000	100.0	0.03962	81.9
50.000	100.0	0.02867	78.7
37.500	100.0	0.02088	74.4
28.000	100.0	0.01508	71.3
20.000	100.0	0.01068	66.1
14.000	100.0	0.00720	60.4
10.000	99.9	0.00426	51.2
6.300	99.8	0.00155	39.2
5.000	99.7		
3.350	99.5		
2.000	99.2		
1.180	99.0		
0.600	98.4		
0.425	97.7		
0.300	96.7		
0.212	94.8		
0.150	91.6		
0.063	85.1		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	42
Silt	43
Sand	14
Gravel	1
Cobbles	0

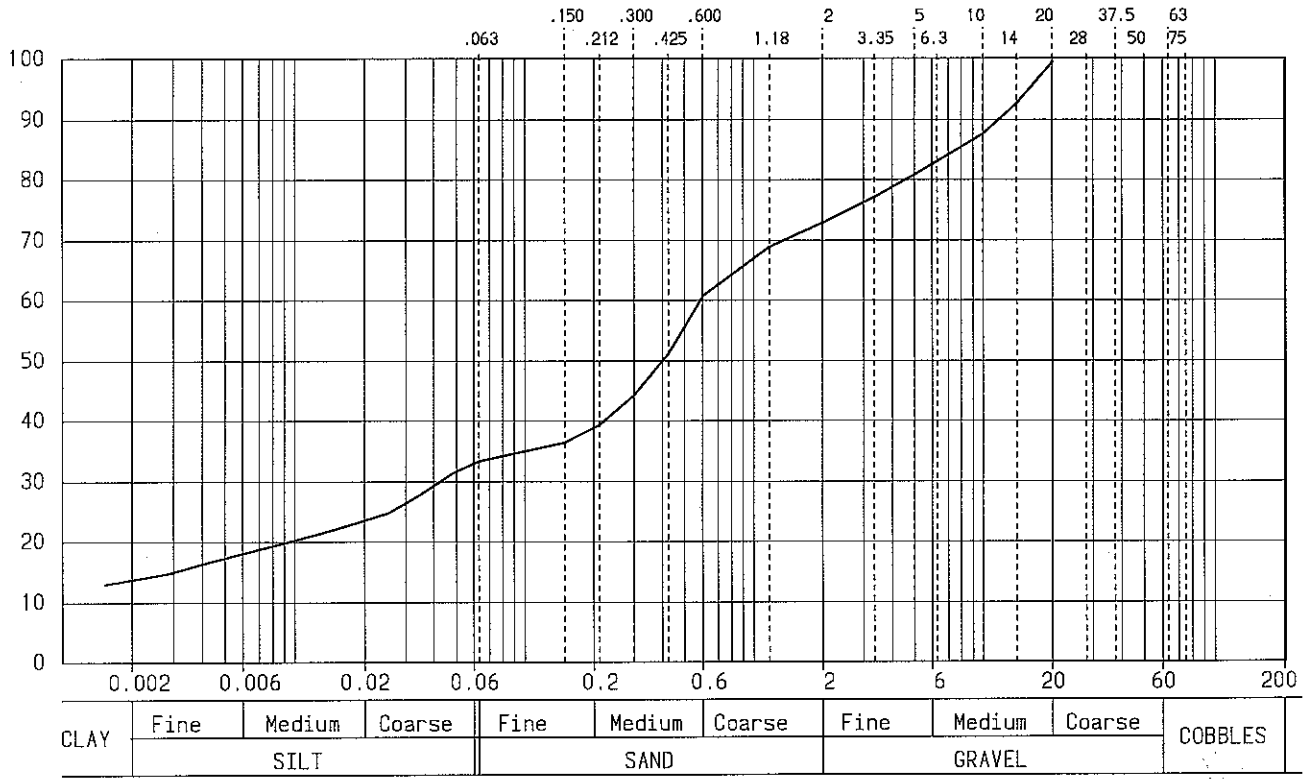
Q.A. Ref: /028-12/M4TN1002.PSD 2.06 : C/Hr211.53/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Trial Pit	TPN101
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04877	31.5
63.000	100.0	0.03524	27.9
50.000	100.0	0.02538	24.8
37.500	100.0	0.01813	23.1
28.000	100.0	0.01256	21.3
20.000	99.5	0.00827	19.5
14.000	92.7	0.00425	16.6
10.000	87.6	0.00352	15.7
6.300	83.1	0.00286	14.9
5.000	80.9	0.00152	13.1
3.350	77.2		
2.000	72.9		
1.180	69.0		
0.600	60.8		
0.425	51.3		
0.300	44.2		
0.212	39.4		
0.150	36.4		
0.063	33.4		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	14
Silt	19
Sand	40
Gravel	27
Cobbles	0

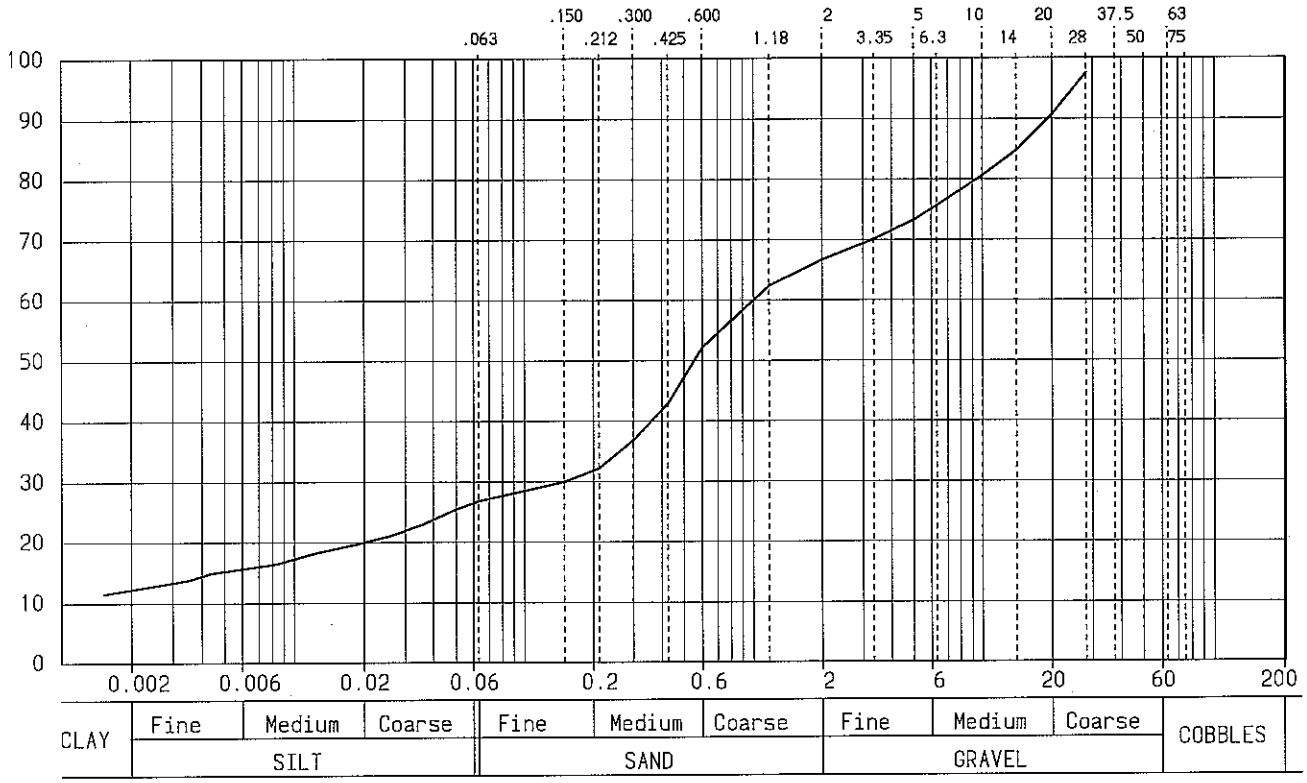
Q.A. Ref: /018-20/M4TN101.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Trial Pit	TPN101
		Sample No.	
		Depth	2.20m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04924	25.3
63.000	100.0	0.03543	22.8
50.000	100.0	0.02538	21.0
37.500	100.0	0.01811	19.7
28.000	97.6	0.01253	18.3
20.000	90.7	0.00827	16.5
14.000	84.8	0.00437	15.0
10.000	80.6	0.00358	13.9
6.300	75.7	0.00289	13.3
5.000	73.3	0.00152	11.6
3.350	70.1		
2.000	66.7		
1.180	62.4		
0.600	52.2		
0.425	43.0		
0.300	36.9		
0.212	32.2		
0.150	30.0		
0.063	26.8		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	12
Silt	15
Sand	40
Gravel	33
Cobbles	0

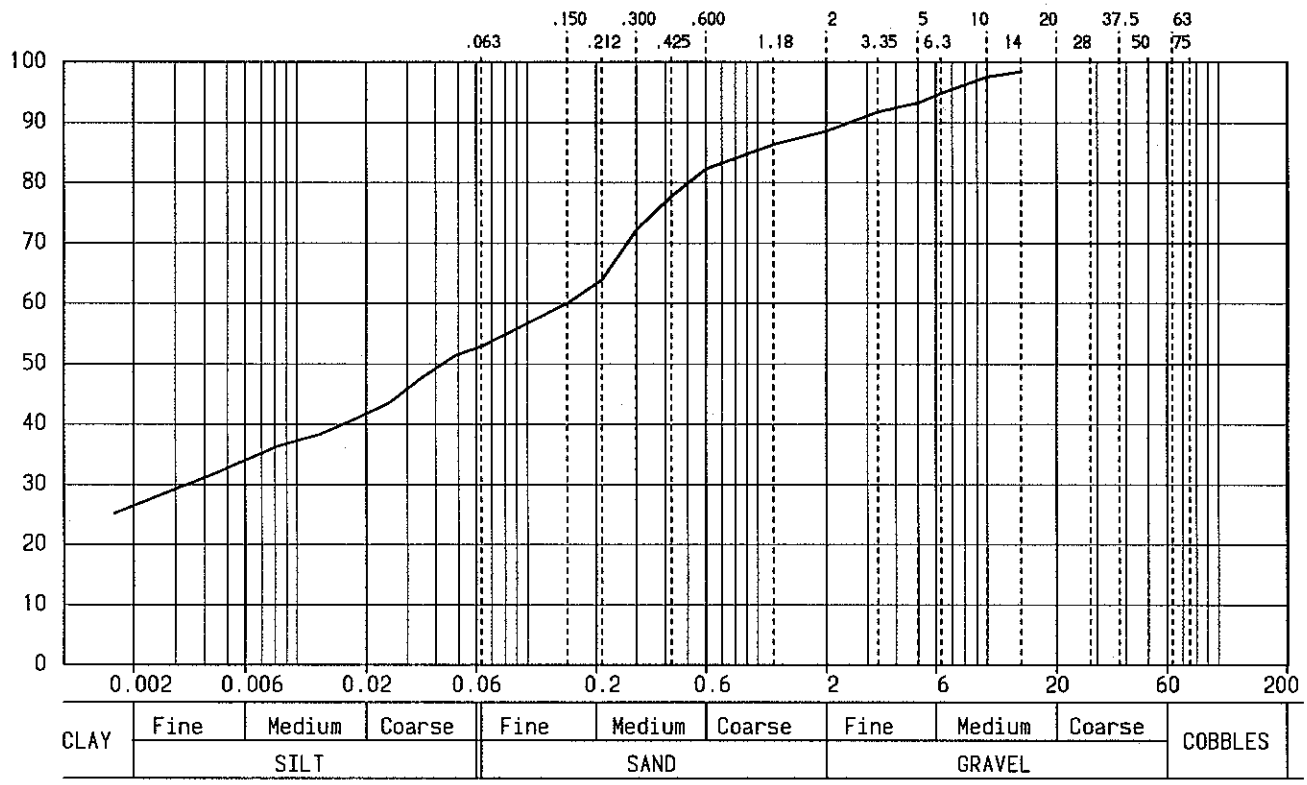
Q.A. Ref: /018-20/M4TN1012.PSD 2.06 : U/Hr203.423/Rh3.989

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown sandy CLAY with a little gravel.	Trial Pit	TPN102
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04887	51.5
63.000	100.0	0.03508	47.8
50.000	100.0	0.02524	43.6
37.500	100.0	0.01804	41.0
28.000	100.0	0.01250	38.3
20.000	100.0	0.00821	36.4
14.000	98.5	0.00437	31.8
10.000	97.6	0.00164	25.2
6.300	94.8		
5.000	93.3		
3.350	91.8		
2.000	88.6		
1.180	86.5		
0.600	82.4		
0.425	77.8		
0.300	72.2		
0.212	63.9		
0.150	60.0		
0.063	52.9		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	27
Silt	26
Sand	36
Gravel	11
Cobbles	0

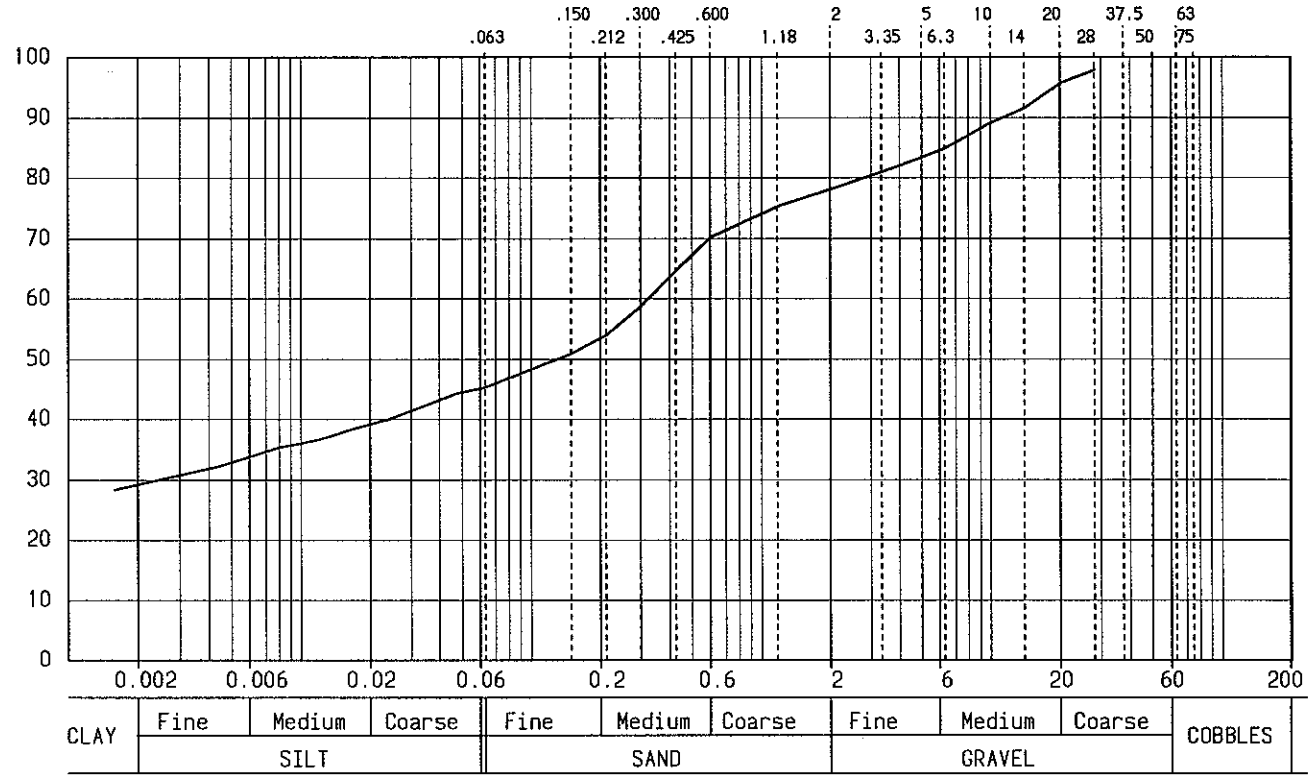
Q.A. Ref: /028-13/M4N102.PSD 2.06 : U/Hr211.52/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel.	Trial Pit	TPN103
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04698	44.3
63.000	100.0	0.03367	42.2
50.000	100.0	0.02412	40.0
37.500	100.0	0.01720	38.6
28.000	97.9	0.01193	36.7
20.000	95.6	0.00784	35.3
14.000	91.6	0.00456	32.4
10.000	89.2	0.00159	28.3
6.300	84.9		
5.000	83.4		
3.350	81.0		
2.000	78.1		
1.180	75.2		
0.600	70.2		
0.425	64.6		
0.300	58.7		
0.212	54.0		
0.150	50.9		
0.063	45.3		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	29
Silt	16
Sand	33
Gravel	22
Cobbles	0

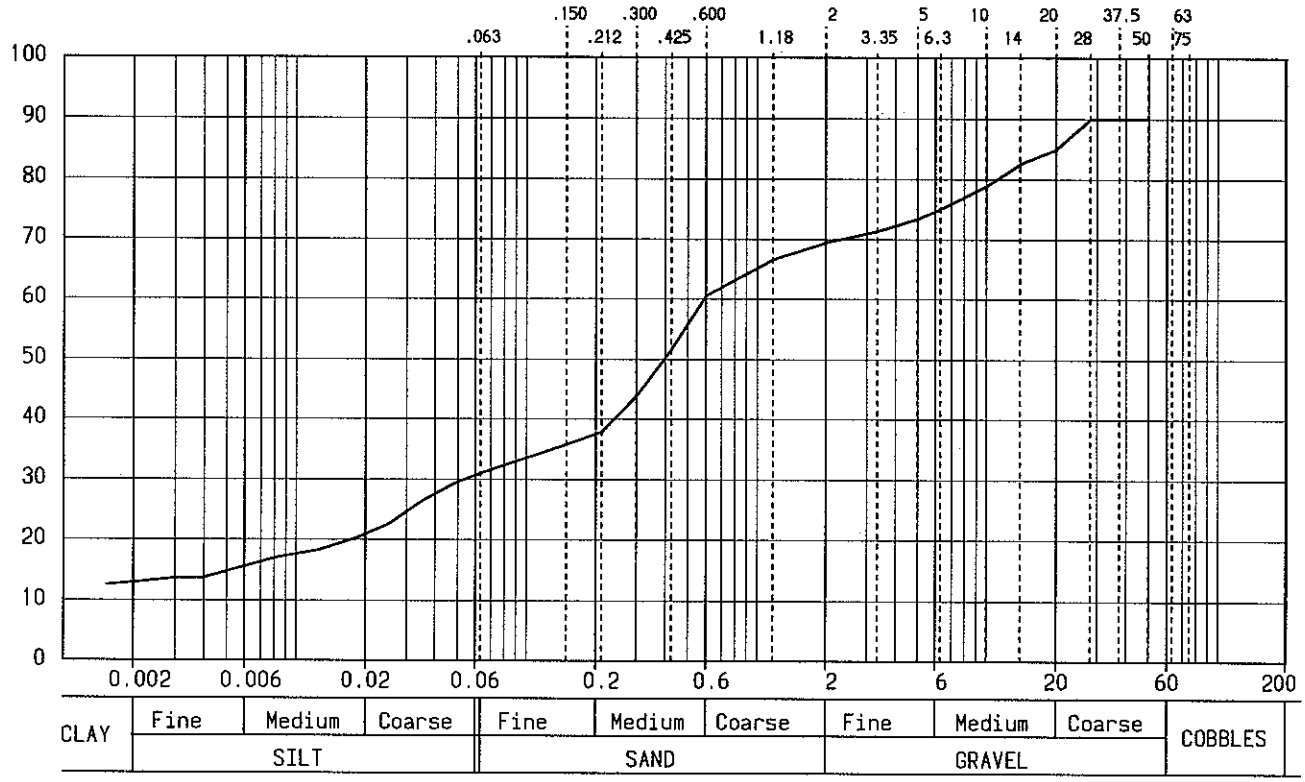
Q.A. Ref: /028-16/M4TPN103.PSD 2 06 : U/Hr211.527/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some gravel.	Trial Pit	TPN103
		Sample No.	
		Depth	1.40m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.04877	29.3
63.000	100.0	0.03505	26.4
50.000	89.9	0.02528	22.7
37.500	89.9	0.01810	20.3
28.000	89.9	0.01254	18.3
20.000	85.0	0.00823	17.1
14.000	82.5	0.00394	13.7
10.000	78.9	0.00305	13.7
6.300	75.0	0.00154	12.5
5.000	73.4		
3.350	71.4		
2.000	69.4		
1.180	66.6		
0.600	60.6		
0.425	51.6		
0.300	43.8		
0.212	37.9		
0.150	35.8		
0.063	31.0		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	0
Silt	32
Sand	38
Gravel	30
Cobbles	0

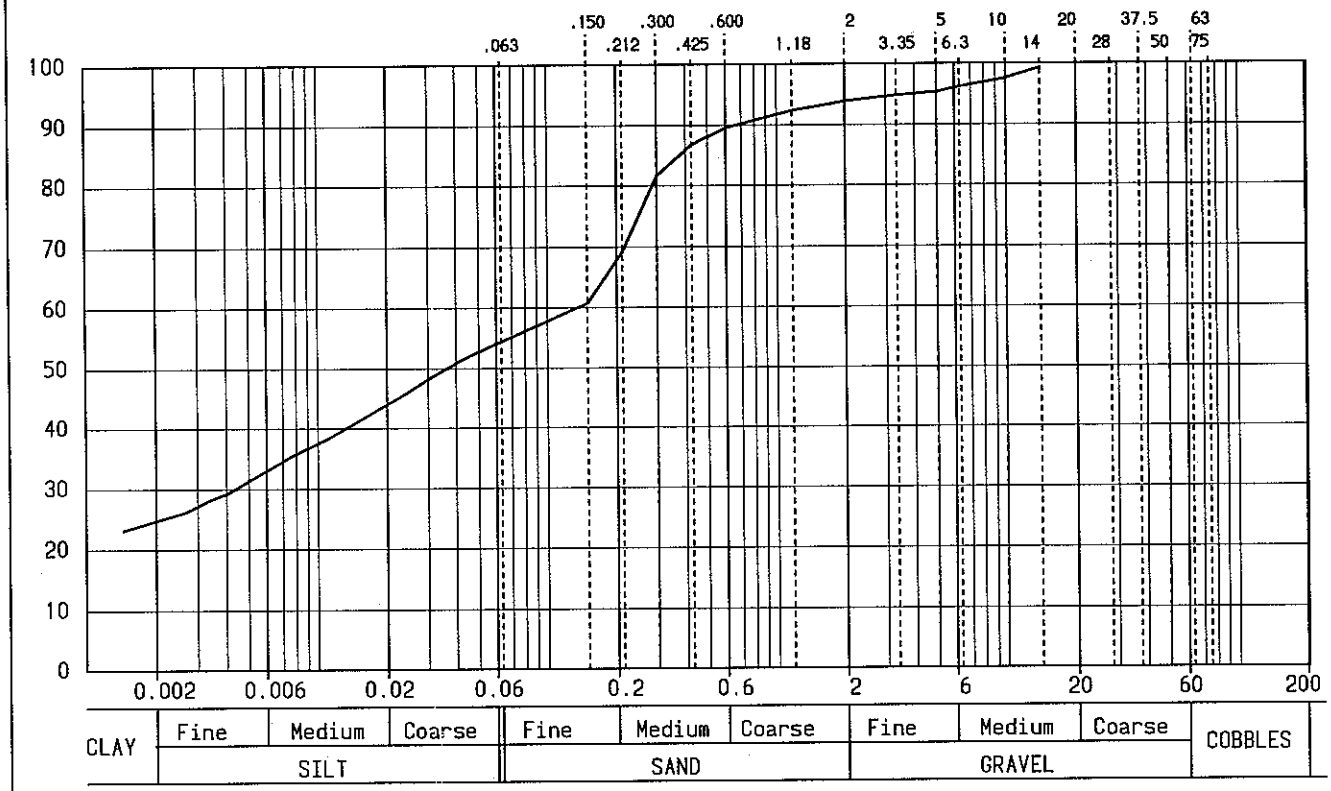
Q.A. Ref: /028-13/M4TN103.PSD 2.06 : U/Hr192.34/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Brown slightly sandy CLAY with a little gravel.	Trial Pit	TPP101
		Sample No.	
		Depth	0.50m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.05982	54.1
63.000	100.0	0.04307	51.5
50.000	100.0	0.03109	48.5
37.500	100.0	0.02246	45.2
28.000	100.0	0.01619	42.1
20.000	100.0	0.01135	38.5
14.000	99.3	0.00754	35.2
10.000	97.6	0.00408	29.3
6.300	96.2	0.00334	28.1
5.000	95.3	0.00271	26.3
3.350	94.9	0.00144	23.2
2.000	93.9		
1.180	92.5		
0.600	89.5		
0.425	86.8		
0.300	81.6		
0.212	69.2		
0.150	60.8		
0.063	54.5		

Type of sample BULK

Test sample taken from trimmings and/or test specimens

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	25
Silt	30
Sand	39
Gravel	6
Cobbles	0

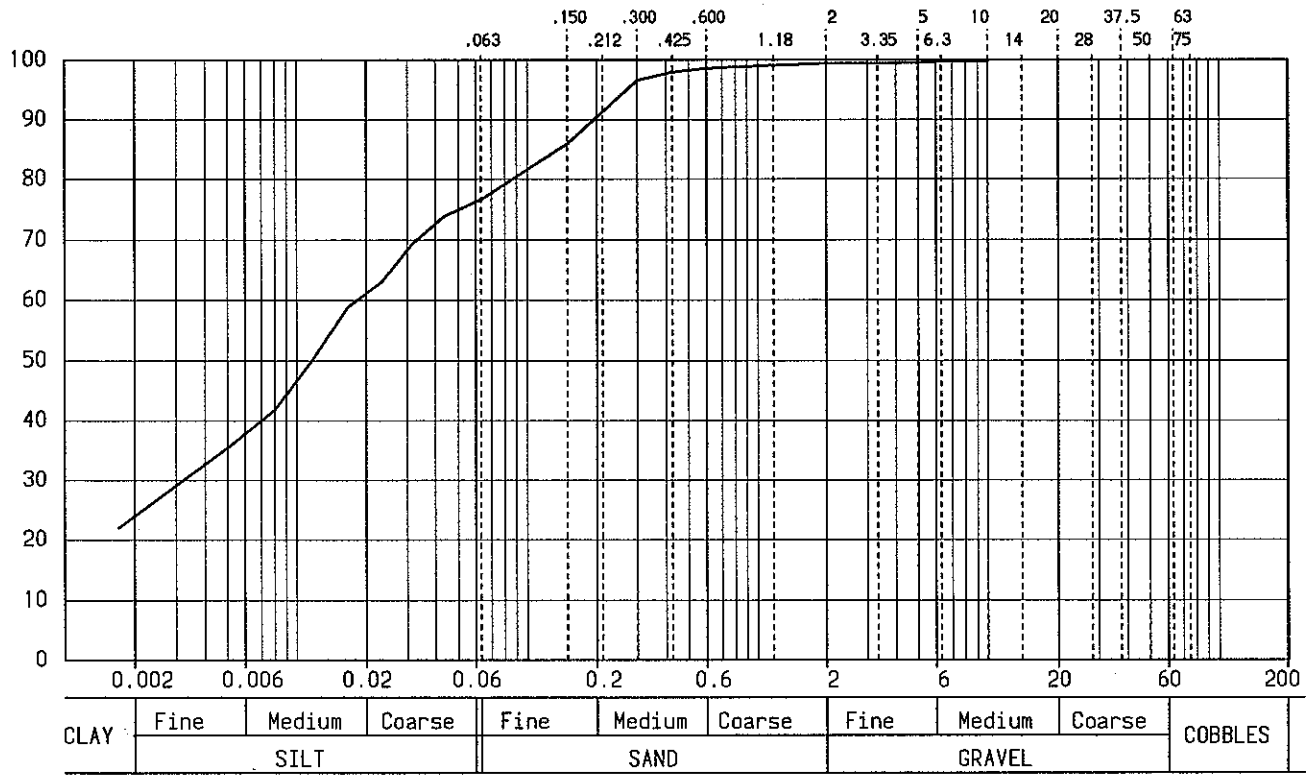
Q.A. Ref: /018-16/M4TP1015.PSD 2.06 : U/Hr192.34/Rh3.963

NORWEST HOLST SOIL ENGINEERING LIMITED

PARTICLE SIZE DISTRIBUTION TEST

Test method: BS1377 : 1990 : Part 2 : Clause 9.2 & 9.5

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown slightly sandy very silty CLAY	Trial Pit	TPP101
		Sample No.	
		Depth	1.00m



Particle Size	Cumulative % Passing	Particle Size	Cumulative % Passing
75.000	100.0	0.06086	76.4
63.000	100.0	0.04366	73.9
50.000	100.0	0.03162	69.4
37.500	100.0	0.02310	63.0
28.000	100.0	0.01666	58.8
20.000	100.0	0.01187	50.5
14.000	100.0	0.00803	41.9
10.000	99.8	0.00515	35.8
6.300	99.8	0.00170	22.1
5.000	99.6		
3.350	99.6		
2.000	99.5		
1.180	99.2		
0.600	98.7		
0.425	98.0		
0.300	96.7		
0.212	91.4		
0.150	85.9		
0.063	76.7		

Type of sample BULK

Prepared to appropriate size by quartering and riffling

Comments/Remarks Method of pretreatment: N/A

Particle density 2.65 (Assumed)

Clay	24
Silt	53
Sand	23
Gravel	0
Cobbles	0

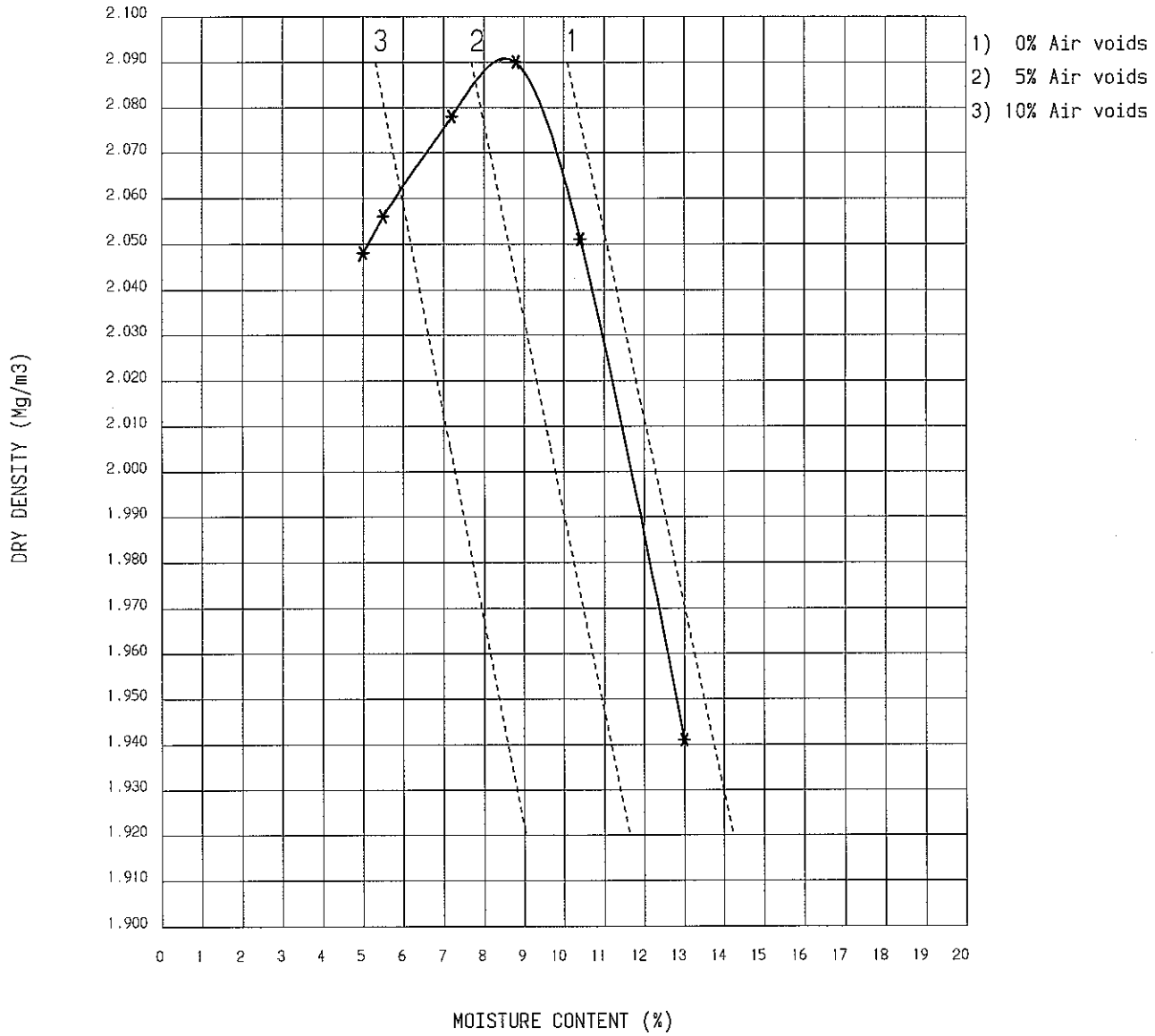
Q.A. Ref: /028-14/m4TP101.PSD 2.06 : U/Hr211.57/Rh4.059

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown sandy CLAY with some mudstone.	Hole ID	TPB100
		Sample No	
		Depth	0.50 m



Moisture Content	Dry Density
5.0	2.048
5.5	2.056
7.2	2.078
8.8	2.090
10.4	2.051
13.0	1.941

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.09 Mg/m3
Gravel > 20mm	1.8 %	OPTIMUM MOISTURE CONTENT	8.5 %
Gravel > 37.5mm	0.0 %		
Compaction Type	4.5kg hand rammer.		

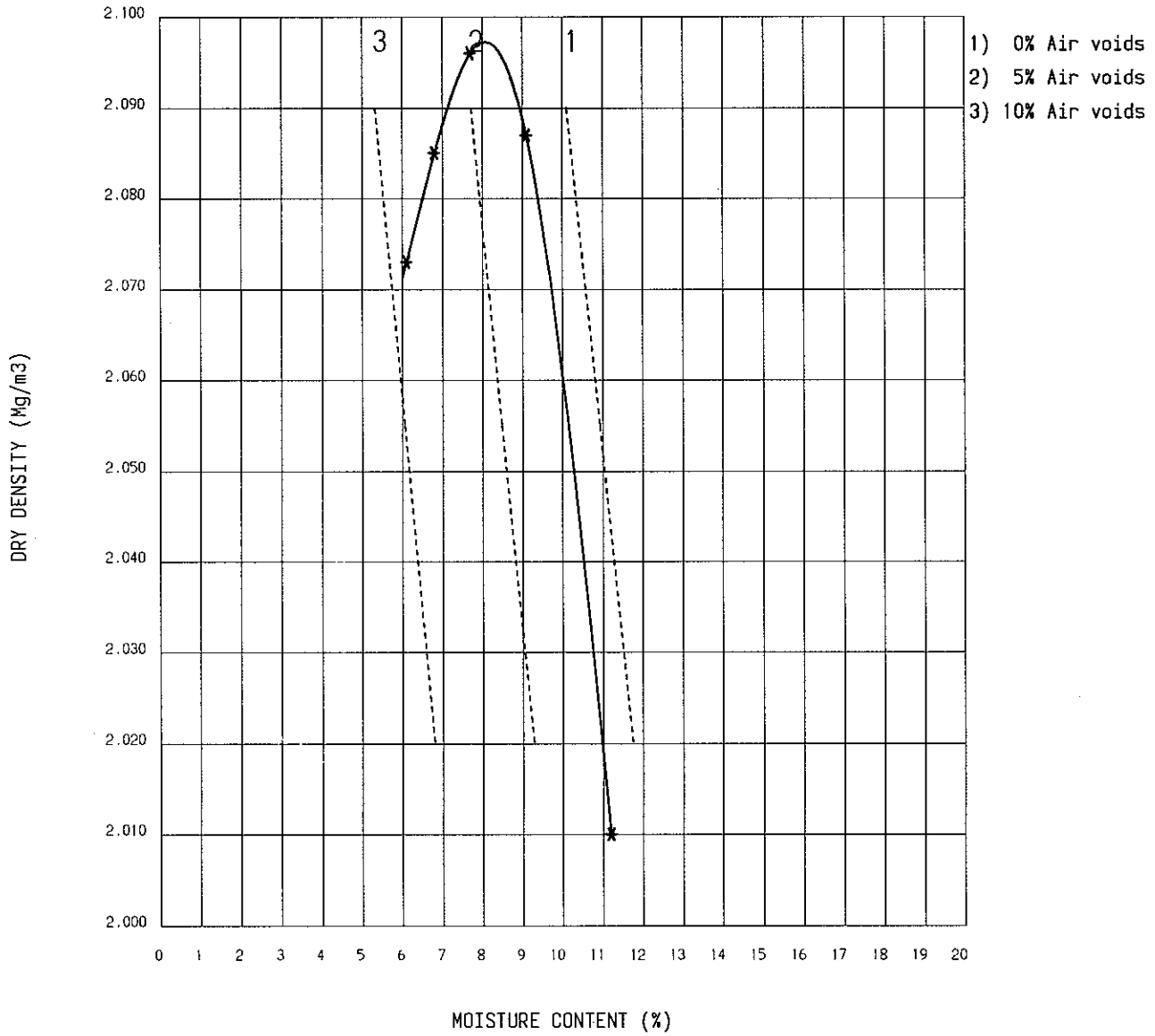
Q.A. Ref: /028-05/M4TPB100.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown clayey SAND with some siltstone gravel.	Hole ID	TPB100
		Sample No	
		Depth	2.50 m



Moisture Content	Dry Density
6.1	2.073
6.8	2.085
7.7	2.096
9.1	2.087
11.2	2.010

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.10 Mg/m3
Gravel > 20mm	0.2 %	OPTIMUM MOISTURE CONTENT	8.0 %
Gravel > 37.5mm	0.0 %		
Compaction Type	4.5kg rammer		

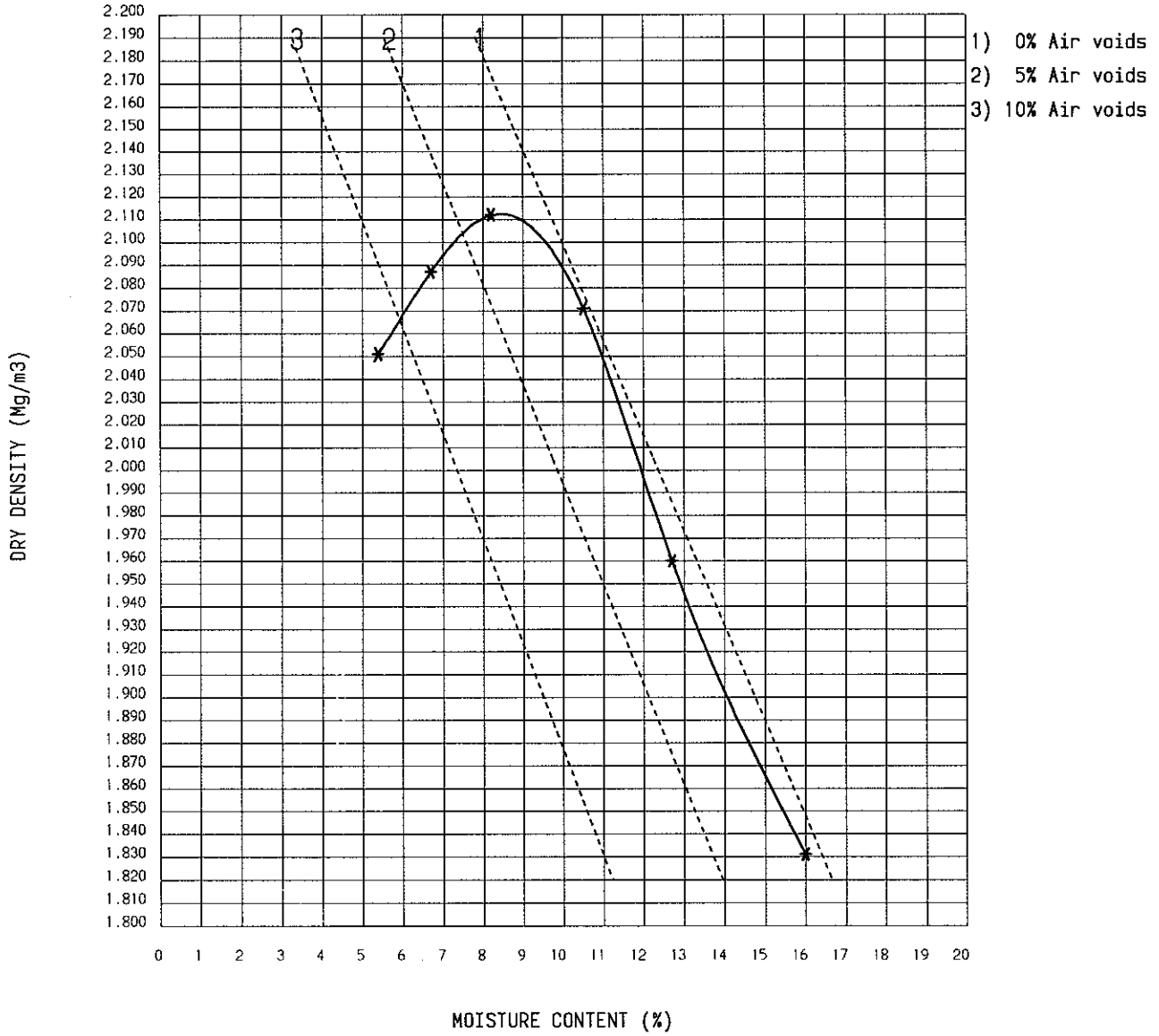
Q.A. Ref: /028-17/M4B100.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown clayey SAND with much gravel, some cobbles and mudstone.	Hole ID	TPB101
		Sample No	
		Depth	1.00 m



Moisture Content	Dry Density
5.4	2.051
6.7	2.087
8.2	2.112
10.5	2.071
12.7	1.960
16.0	1.831

Remarks: Not to British Standard. Material mass retained on 10mm greater than 10% (11%) Completed after removing gravel >20mm.

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.11 Mg/m3
Gravel > 20mm	18.0 %	OPTIMUM MOISTURE CONTENT	8.4 %
Gravel > 37.5mm	9.6 %		
Compaction Type	4.5kg rammer		

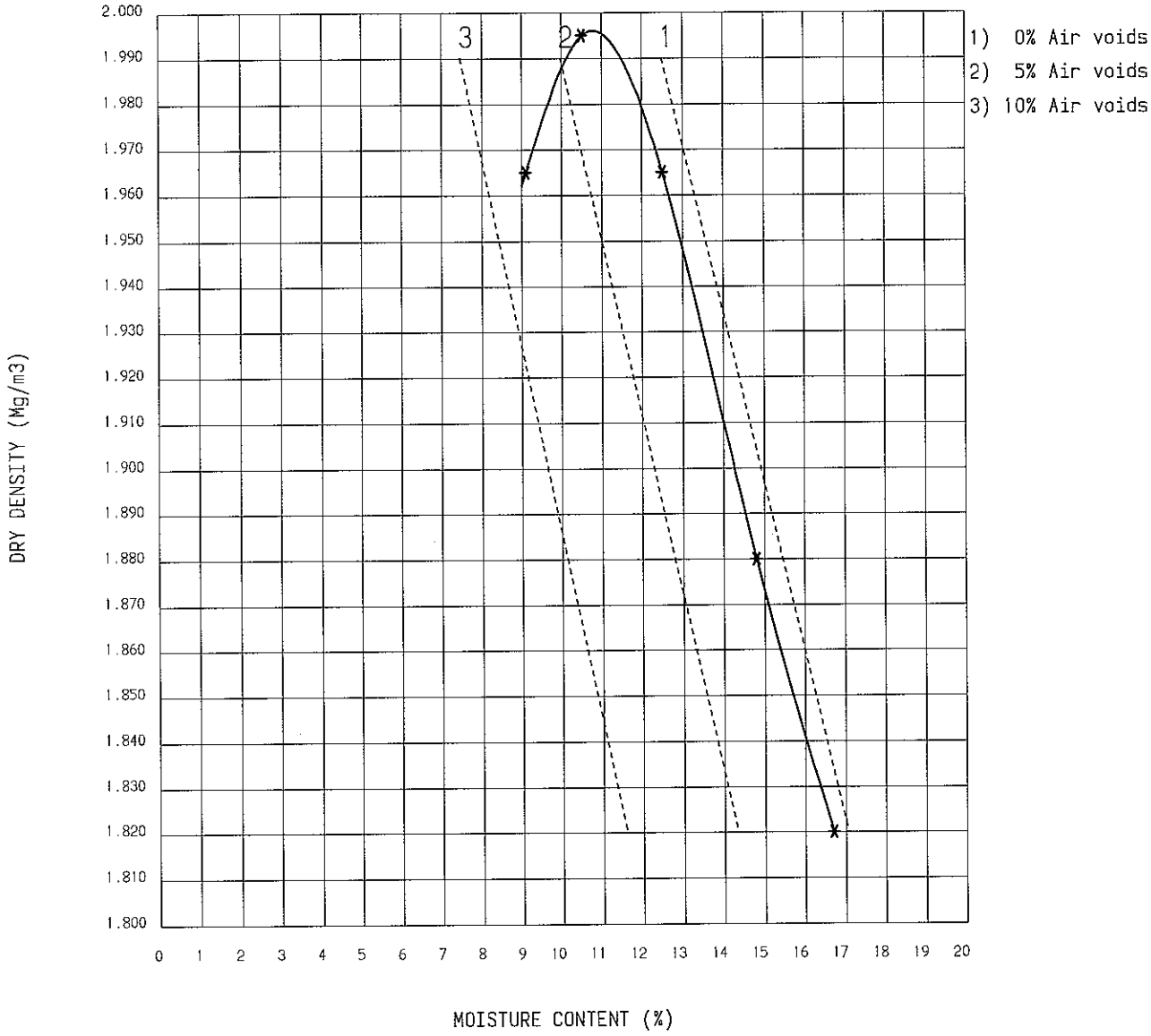
Q.A. Ref: /028-18/M4TB101.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some gravel and mudstone.	Hole ID	TPB102
		Sample No	
		Depth	0.50 m



Moisture Content	Dry Density
9.1	1.965
10.5	1.995
12.5	1.965
14.8	1.880
16.7	1.820

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.00 Mg/m3
Gravel > 20mm	1.4 %	OPTIMUM MOISTURE CONTENT	11 %
Gravel > 37.5mm	0.0 %		
Compaction Type	4.5kg rammer		

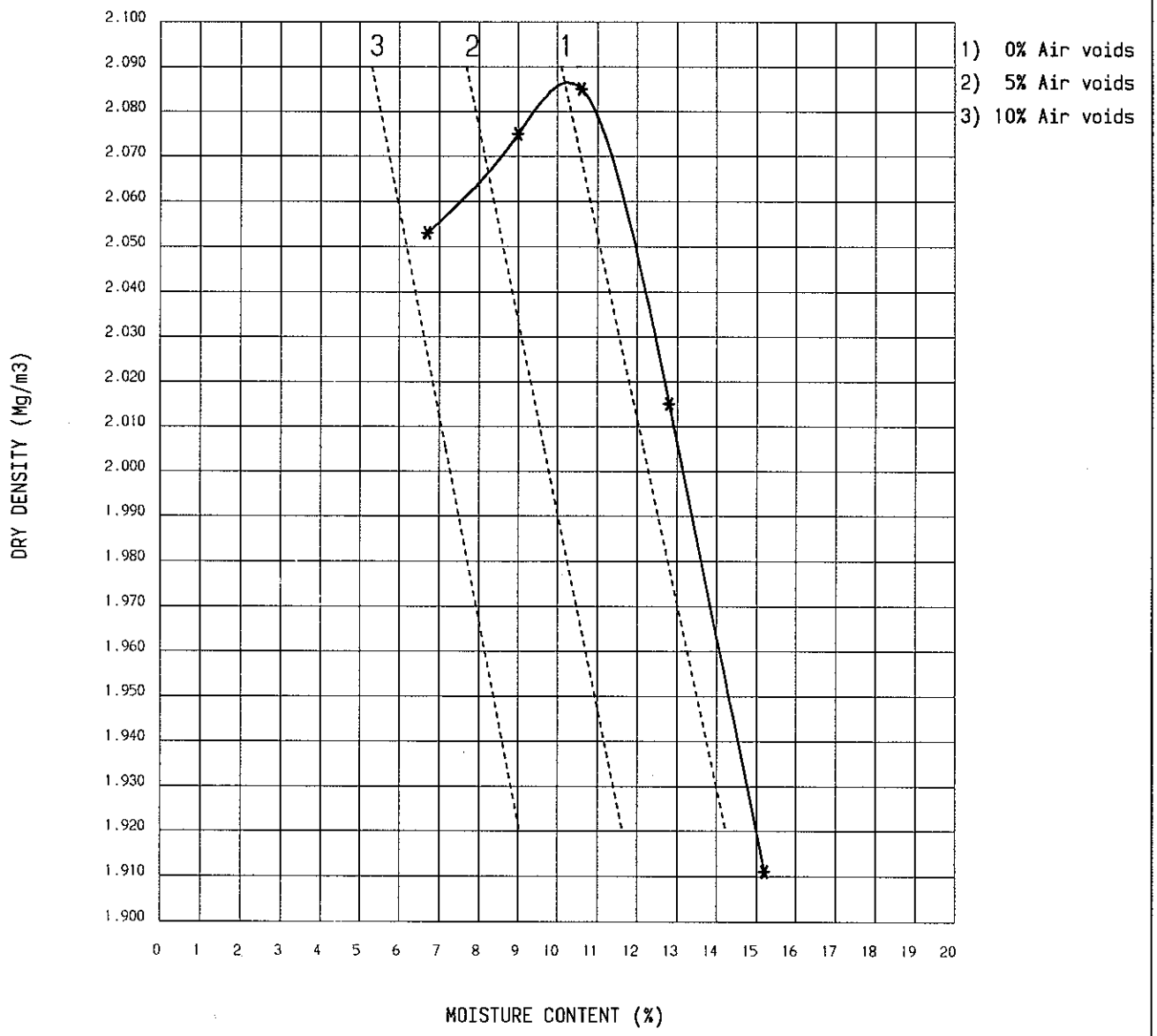
Q.A. Ref: /028-03/M4TPB102.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some fine to coarse gravel and cobbles.	Hole ID	TPB102
		Sample No	
		Depth	1.00 m



Moisture Content	Dry Density
6.7	2.053
9.0	2.075
10.6	2.085
12.8	2.015
15.2	1.911

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.09 Mg/m3
Gravel > 20mm	3.9 %	OPTIMUM MOISTURE CONTENT	10 %
Gravel > 37.5mm	2.1 %		
Compaction Type	4.5kg rammer		

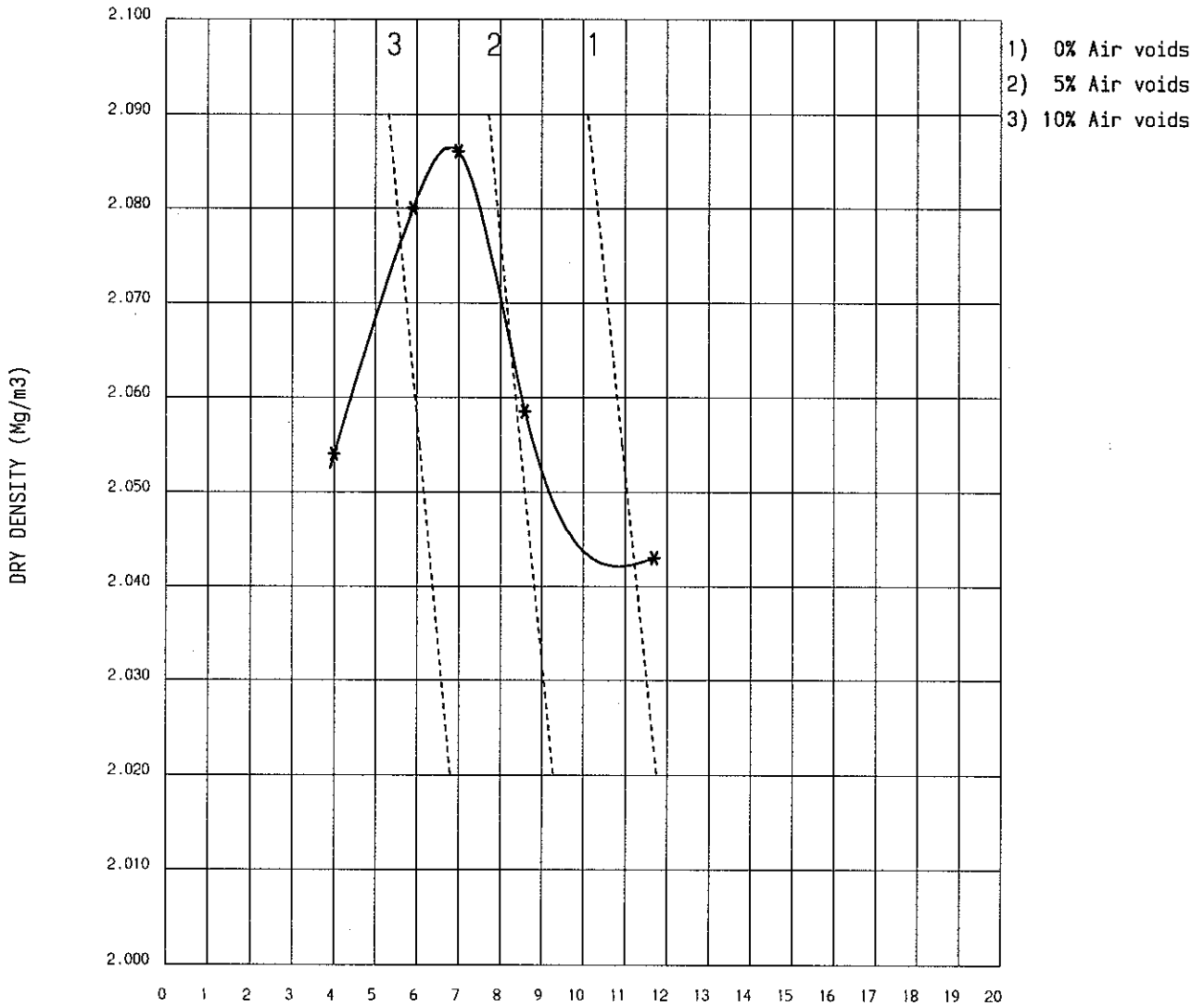
Q.A. Ref: /028-17/M4B102.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown clayey SAND with some mudstone.	Hole ID	TPB103
		Sample No	
		Depth	1.00 m



Moisture Content	Dry Density
4.0	2.054
5.9	2.080
7.0	2.086
8.6	2.059
11.7	2.043

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.09 Mg/m3
Gravel > 20mm	15.0 %	OPTIMUM MOISTURE CONTENT	6.7 %
Gravel > 37.5mm	0.0 %		
Compaction Type	4.5kg rammer		

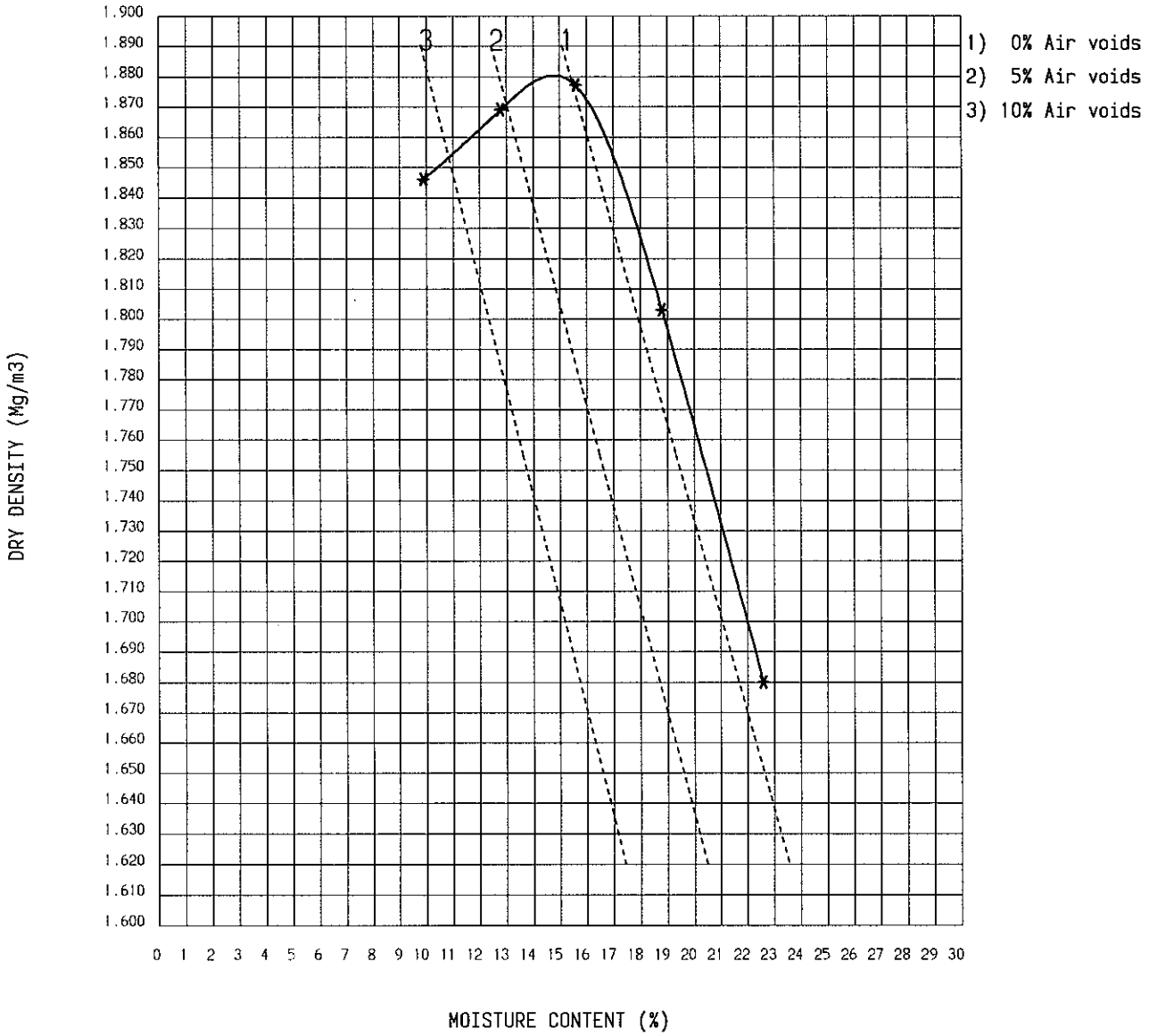
Q.A. Ref: /028-17/M4b103.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Grey greenish mottled reddish brown CLAY.	Hole ID	TPB105
		Sample No	
		Depth	0.50 m



Moisture Content	Dry Density
9.9	1.846
12.8	1.869
15.6	1.877
18.8	1.803
22.6	1.680

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	1.88 Mg/m3
Gravel > 20mm	0.0 %	OPTIMUM MOISTURE CONTENT	15 %
Gravel > 37.5mm	0.0 %		
Compaction Type	4.5kg rammer		

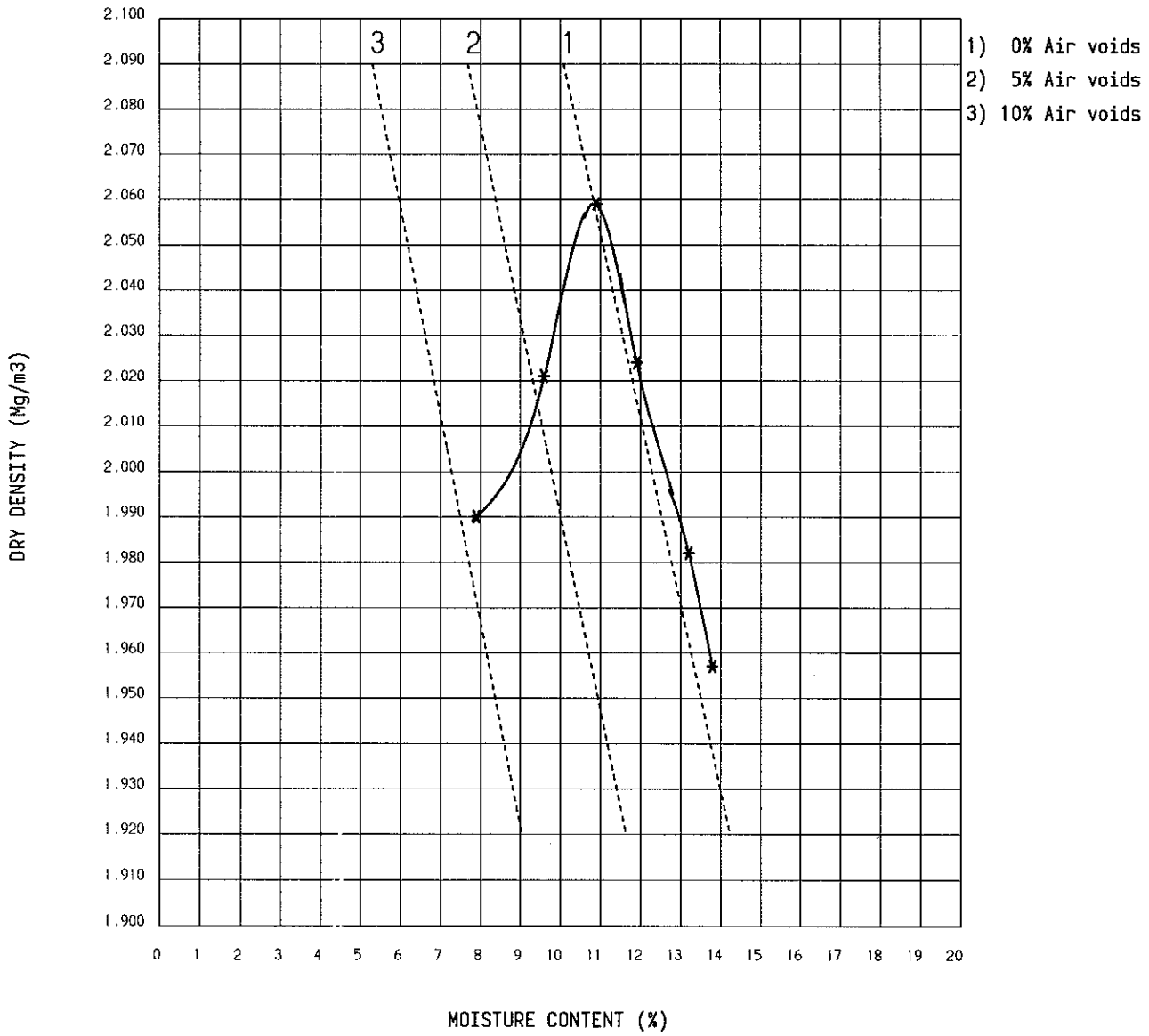
Q.A. Ref: /028-17/M4B105.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with a little fine to medium gravel.	Hole ID	TPB105
		Sample No	
		Depth	1.00 m



Moisture Content	Dry Density
7.9	1.990
9.6	2.021
10.9	2.059
11.9	2.024
13.2	1.982
13.8	1.957

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.06 Mg/m3
Gravel > 20mm	0.3 %	OPTIMUM MOISTURE CONTENT	11 %
Gravel > 37.5mm	0.0 %		
Compaction Type	4.5kg rammer		

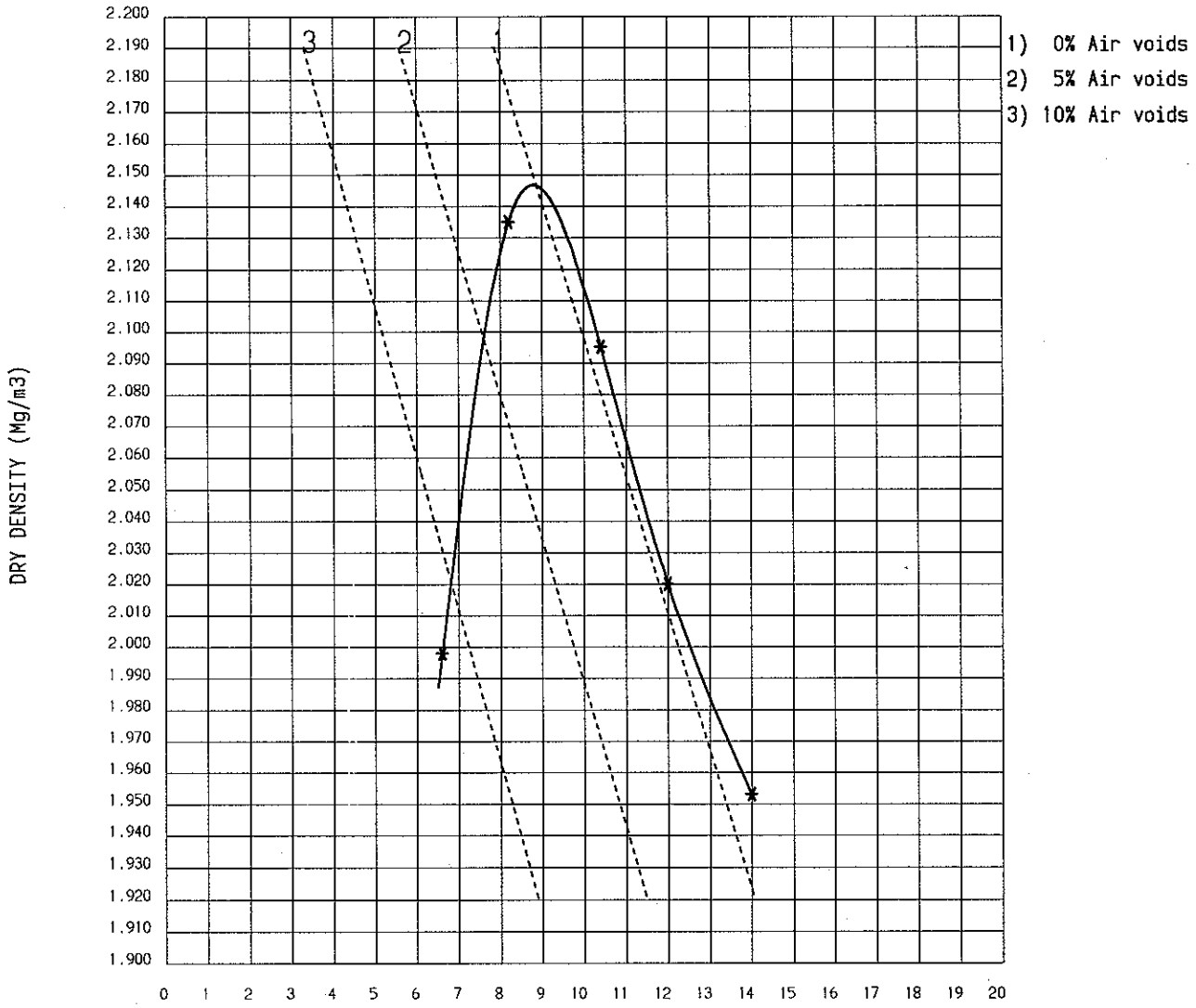
Q.A. Ref: /028-17/M4TPB105.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN100
		Sample No	1
		Depth	0.50 m



Moisture Content	Dry Density
6.6	1.998
8.2	2.135
10.4	2.095
12.0	2.020
14.0	1.953

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.15 Mg/m3
Gravel > 20mm	15.7 %	OPTIMUM MOISTURE CONTENT	8.7 %
Gravel > 37.5mm	0.0 %		
Compaction Type	4.5kg rammer		

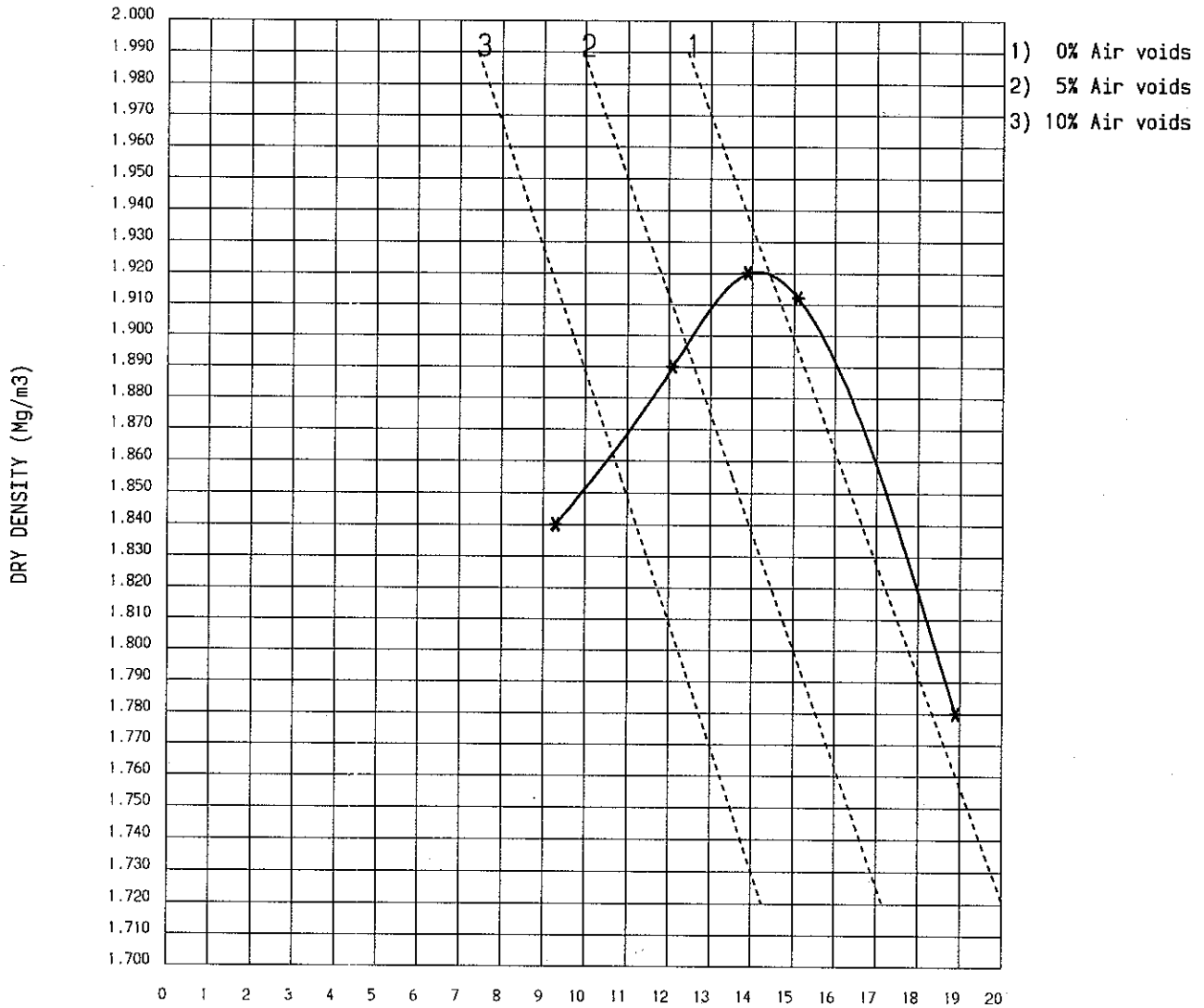
Q.A. Ref: /028-11/M4TN1001.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greyish green CLAY with a little gravel and some sandstone.	Hole ID	TPN100
		Sample No	
		Depth	2.00 m



Moisture Content	Dry Density
9.3	1.840
12.1	1.890
13.9	1.920
15.1	1.912
18.9	1.780

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	1.92 Mg/m3
Gravel > 20mm	0.3 %	OPTIMUM MOISTURE CONTENT	14 %
Gravel > 37.5mm	0.0 %		
Compaction Type	4.5kg rammer		

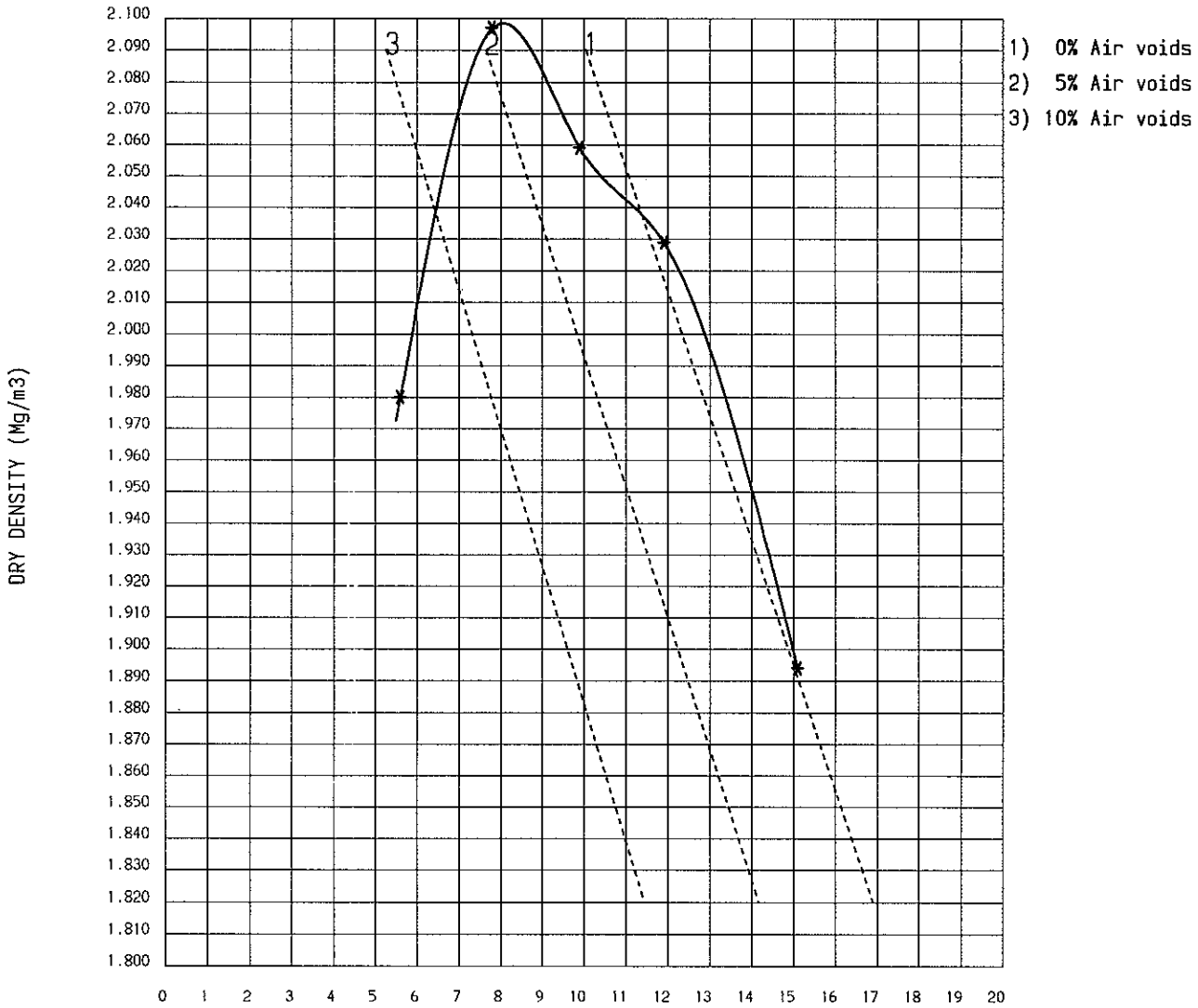
Q.A. Ref: /028-13/M4TN100.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN101
		Sample No	
		Depth	0.50 m



Moisture Content	Dry Density
5.6	1.980
7.8	2.097
9.9	2.059
11.9	2.029
15.1	1.894

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.10 Mg/m3
Gravel > 20mm	11.4 %	OPTIMUM MOISTURE CONTENT	8.0 %
Gravel > 37.5mm	3.8 %		
Compaction Type	4.5kg rammer		

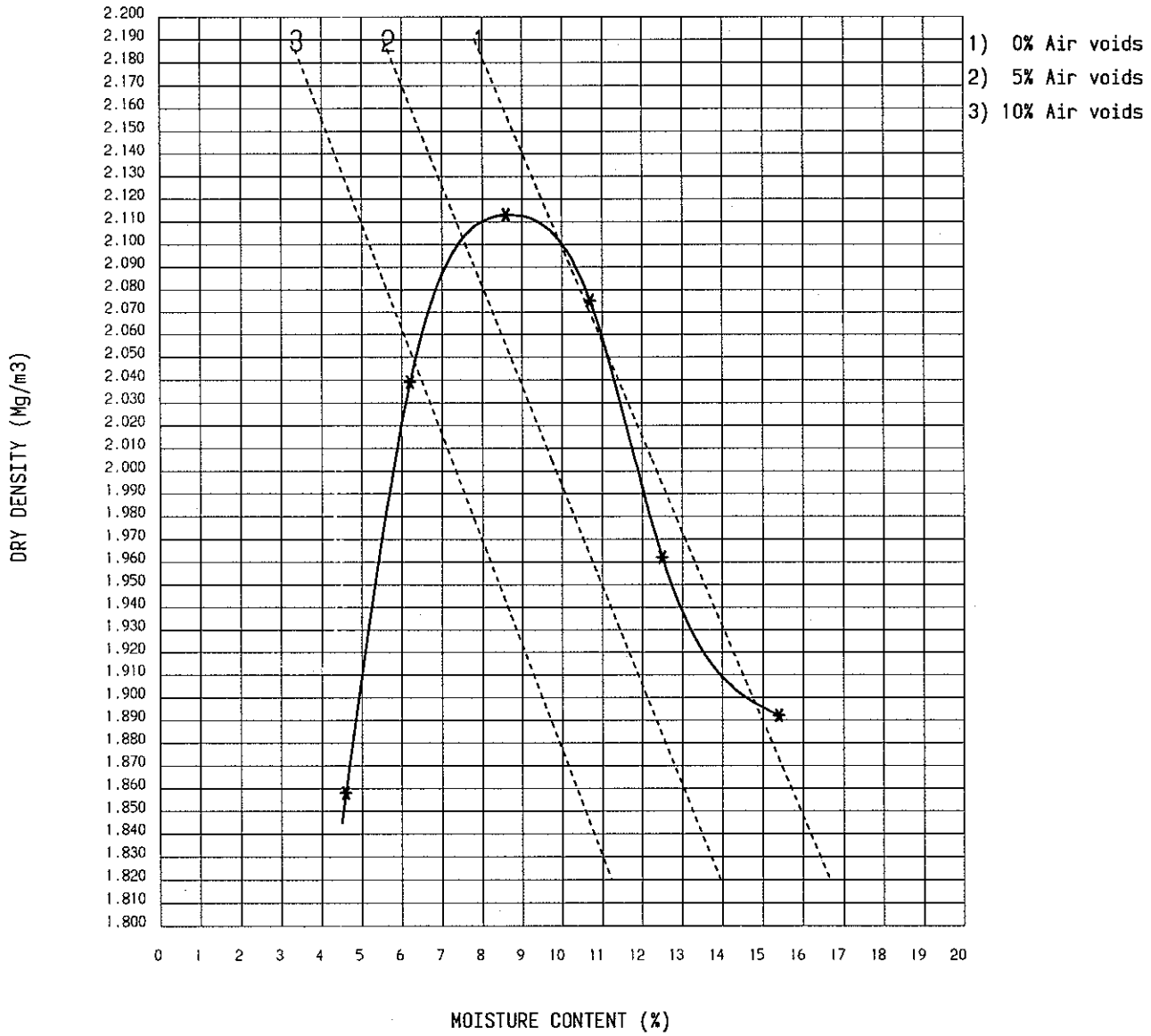
Q.A. Ref: /028-18/M4TN101.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel and occasional cobbles.	Hole ID	TPN101
		Sample No	
		Depth	2.20 m



Moisture Content	Dry Density
4.6	1.858
6.2	2.039
8.6	2.113
10.7	2.075
12.5	1.962
15.4	1.892

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.11 Mg/m3
Gravel > 20mm	12.8 %	OPTIMUM MOISTURE CONTENT	8.7 %
Gravel > 37.5mm	4.6 %		
Compaction Type	4.5kg rammer		

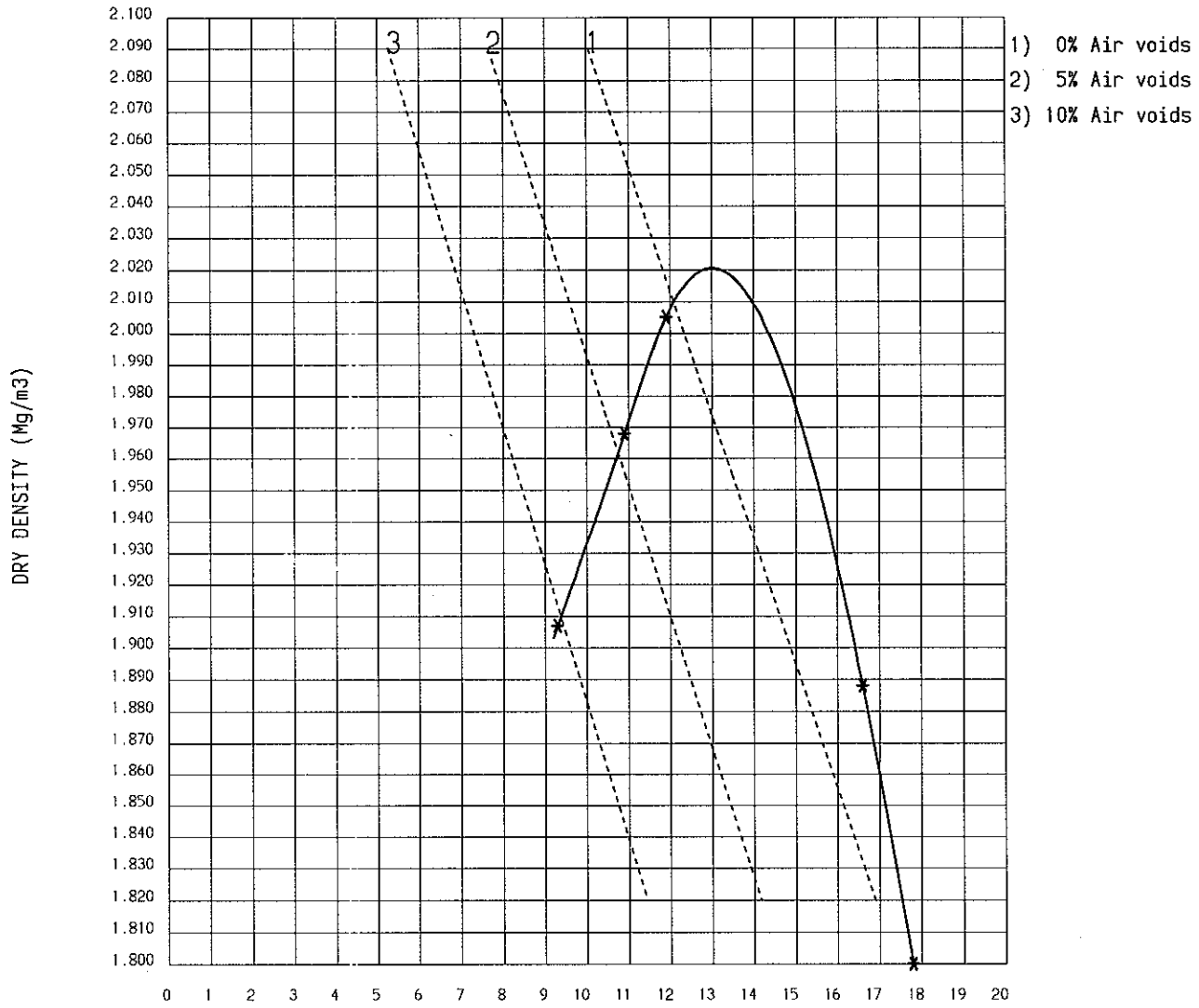
Q.A. Ref: /028-11/M4tpn101.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	
		Depth	0.50 m



Moisture Content	Dry Density
9.3	1.907
10.9	1.968
11.9	2.005
16.6	1.888
17.8	1.800

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.02 Mg/m3
Gravel > 20mm	6.4 %	OPTIMUM MOISTURE CONTENT	13 %
Gravel > 37.5mm	2.4 %		
Compaction Type	4.5kg rammer		

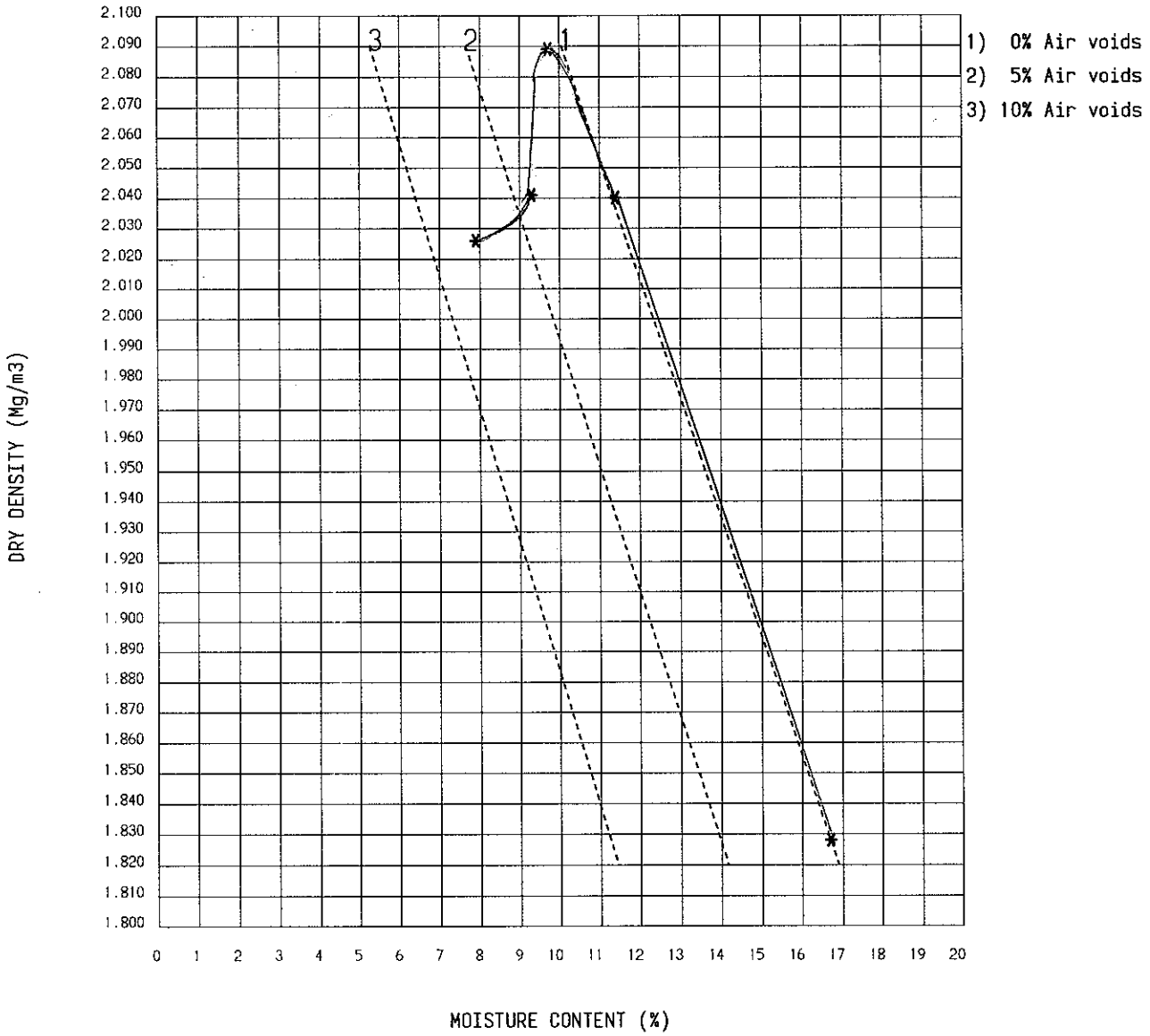
Q.A. Ref: /028-16/M4N103.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	
		Depth	1.40 m



Moisture Content	Dry Density
7.9	2.026
9.3	2.041
9.7	2.089
11.4	2.040
16.7	1.828

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.11 Mg/m3
Gravel > 20mm	6.1 %	OPTIMUM MOISTURE CONTENT	10 %
Gravel > 37.5mm	1.4 %		
Compaction Type	4.5kg rammer		

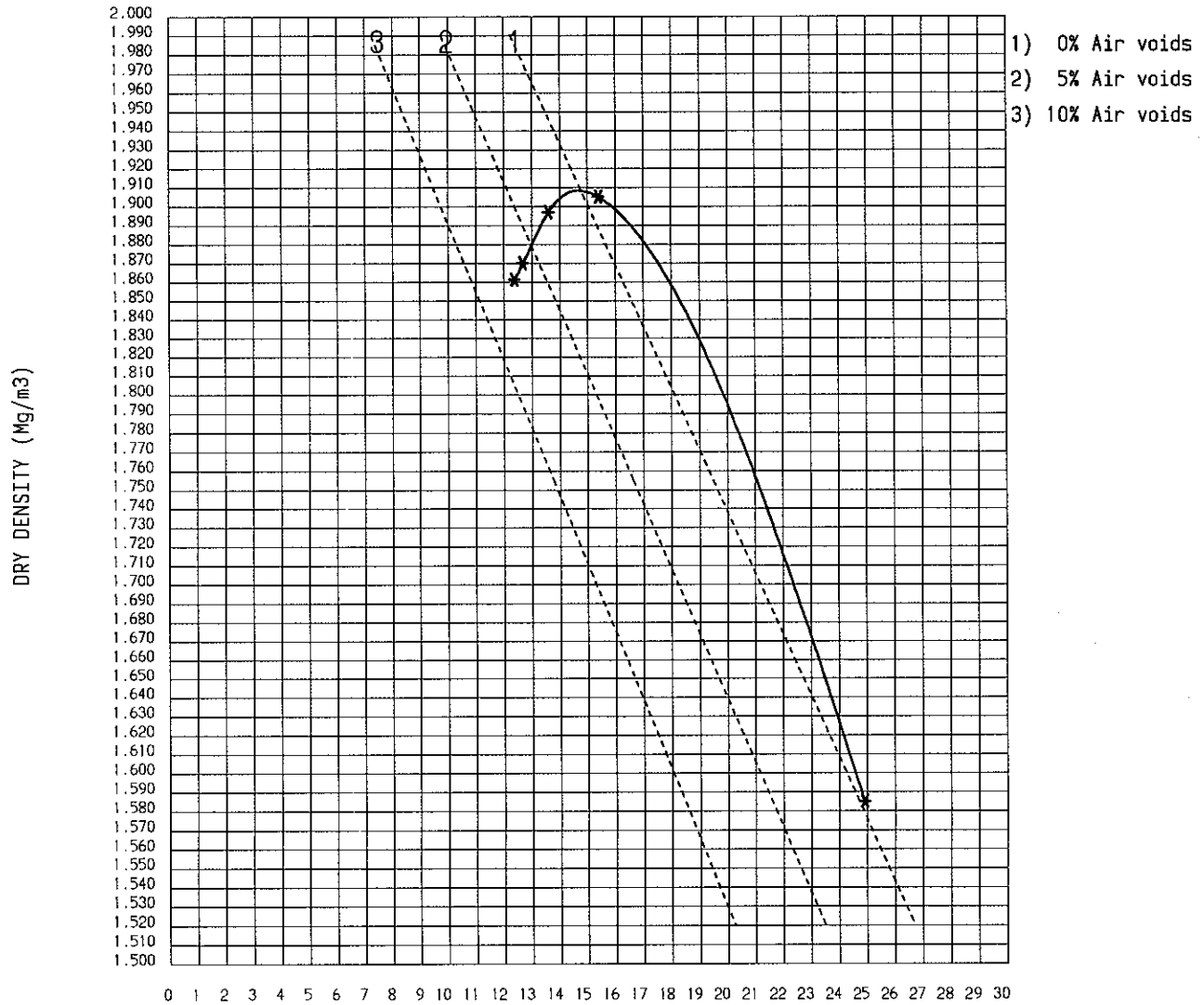
Q.A. Ref: /028-13/M4TN103.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: BS 1377:Part 4:1990 Clause 3

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown slightly sandy CLAY with some gravel.	Hole ID	TPP101
		Sample No	
		Depth	0.50 m



Moisture Content	Dry Density
12.4	1.861
12.7	1.870
13.6	1.897
15.4	1.905
24.9	1.585

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	1.91 Mg/m3
Gravel > 20mm	5.8 %	OPTIMUM MOISTURE CONTENT	15 %
Gravel > 37.5mm	3.1 %		
Compaction Type	4.5kg rammer		

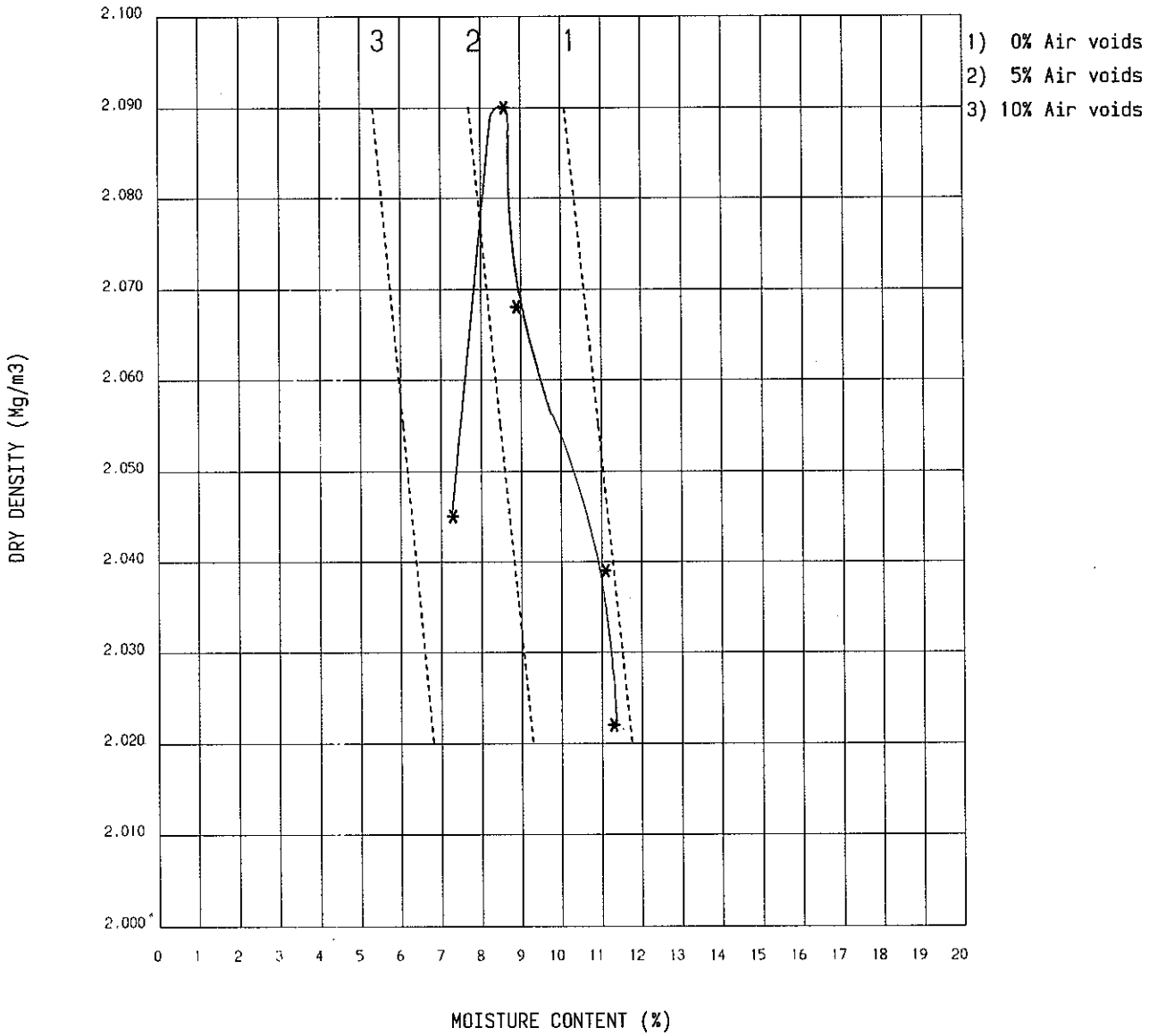
Q.A. Ref: /028-17/M4P101.CMP 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

COMPACTION TEST RESULTS

Test method: Amended to comply with BS1377:1990: Part 4: Clauses 3 and 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some mudstone with a little medium gravel.	Hole ID	TPP101
		Sample No	
		Depth	1.00 m



Moisture Content	Dry Density
7.3	2.045
8.6	2.090
8.9	2.068
11.1	2.039
11.3	2.022

Remarks

Particle Density	2.65 Assumed	MAXIMUM DRY DENSITY	2.09 Mg/m3
Gravel > 20mm	0.2 %	OPTIMUM MOISTURE CONTENT	8.5 %
Gravel > 37.5mm	0.0 %		
Compaction Type	4.5kg rammer		

Q.A. Ref: /028-18/M4TPP101.CMP 2.02

Ground Investigation Report

NR/SR/F10895 APRIL 1998

GROUND INVESTIGATION

M4 RELIEF ROAD

FOR

THE WELSH OFFICE

Consulting Engineer
Ove Arup and Partners

VOLUME 4

Norwest Holst Soil Engineering Ltd

SGE GROUPE

NORWEST HOLST SOIL ENGINEERING LIMITED - Parkside Lane, Dewsbury Road,
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NR/SR/F10895 APRIL 1998

GROUND INVESTIGATION

M4 RELIEF ROAD

FOR

THE WELSH OFFICE

Consulting Engineer
Ove Arup and Partners

VOLUME 4

AGS ASSOCIATION OF GEOTECHNICAL SPECIALISTS
FPS FEDERATION OF PILING SPECIALISTS
BRITISH DRILLING ASSOCIATION LTD
SGE GROUPE
NAMAS TESTING No. 1265 SI
Registered in England No. 980795.
Registered Office: Parkside Lane, Dewsbury Road, Leeds LS11 5SX

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

VOLUME 1	**TEXT** **APPENDIX ONE : EXPLORATORY HOLE LOGS** **Borehole Records 'A' to 'L' Holes**
VOLUME 2	**APPENDIX ONE : EXPLORATORY HOLE LOGS** **Borehole Records 'M' to 'P' Holes** **Trial Pit Records** **APPENDIX TWO : INSITU TEST RESULTS** **Borehole Vane Results** **Permeability Test Results** **Groundwater Monitoring Records** **Geophysics report**
VOLUME 3	**APPENDIX THREE : LABORATARY TEST RESULTS** **SOIL SUMMARIES** **Laboratory Vane Results** **Shear Strength Plots- undrained triaxials** **effective triaxials** **ring shear** **Particle Size Distribution Graphs** **Compaction Graphs**
VOLUME 4	**APPENDIX THREE : LABORATORY TEST RESULTS** **MCV Plots** **CBR Plots** **Oedometer Plots** **ROCK SUMMARIES** **Point Load Test Results** **CHEMICAL CONTAMINATION RESULTS**
VOLUME 5	**APPENDIX FOUR : DRAWINGS** **Plans** **Sections**

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

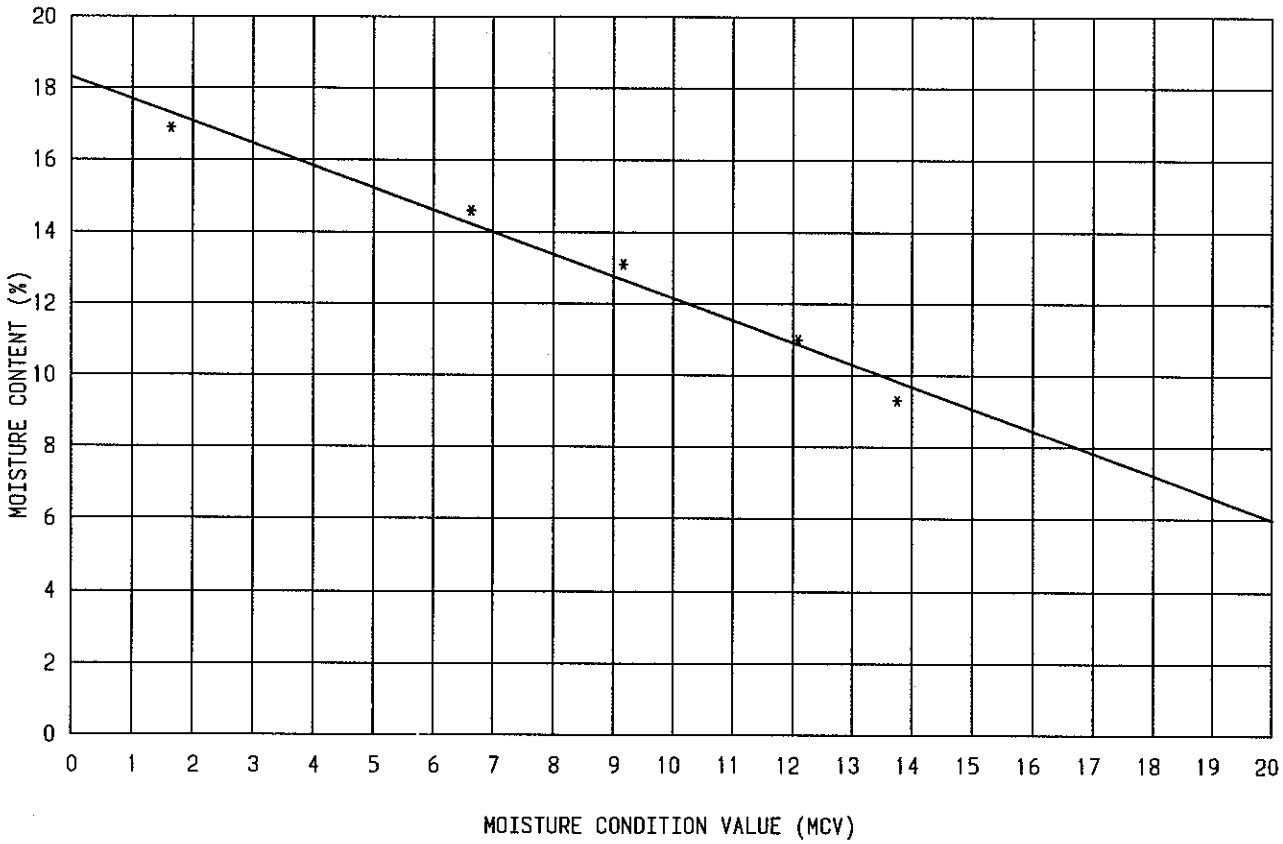
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Purplish brown slightly sandy CLAY with some mudstone.	Hole ID	TPB100
		Sample Type	
		Depth	0.50 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	13.1	14.6	16.9	11.0	9.3	
MCV	9.2	6.6	1.6	12.1	13.8	
HAND VANE VALUE (kPa)	TOO STIFF	59	36	TOO STIFF	TOO STIFF	
DRY DENSITY (Mg/m3)	1.98	1.90	1.83	2.04	2.06	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	18.3
SLOPE	(tan <between line and MCV axis)	-0.62
SENSITIVITY	(1/slope)	1.62
MATERIAL > 20.0 mm		2.0%

TEST REMARKS

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

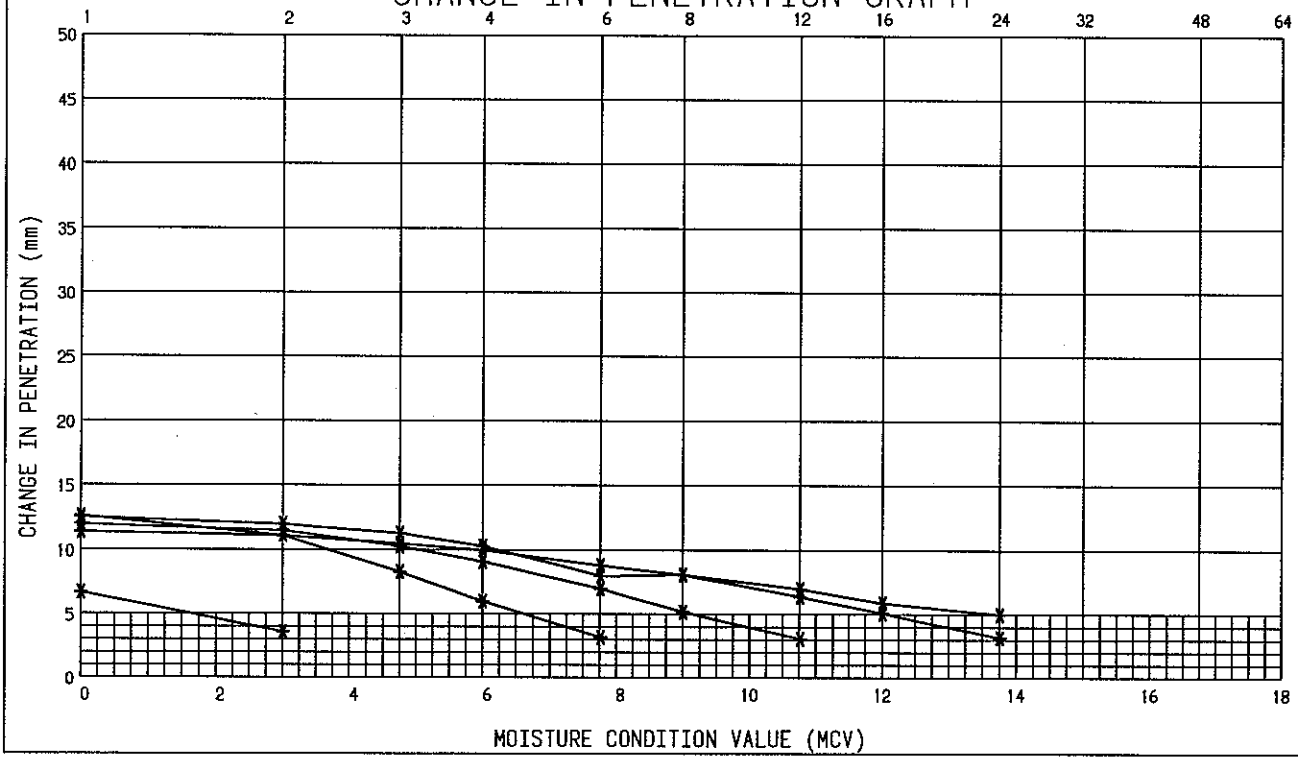
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Purplish brown slightly sandy CLAY with some mudstone.	Hole ID	TPB100
		Sample Type	
		Depth	0.50 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	77.9	12.0	75.9	12.6	66.2	6.7	82.7	12.5	83.5	11.4		
2	72.0	11.5	69.7	11.1	62.3	3.6	76.5	12.0	77.8	11.1		
3	68.3	10.3	65.9	8.3	61.4	20.9	72.9	11.3	74.5	10.5		
4	65.9	9.1	63.3	6.0	59.5	19.7	70.2	10.3	72.1	10.0		
6	62.7	7.0	60.2	3.2	58.9	17.2	65.7	8.0	68.8	8.8		
8	60.5	5.2	58.6	3.2	58.7	13.9	64.5	8.1	66.7	8.1		
12	58.0	3.1	57.6	14.1			61.6	6.4	64.0	7.0		
16	56.8		57.3	11.1			59.9	5.1	62.1	5.9		
24	55.7		57.0	7.1			57.7	3.2	60.0	5.0		
32	55.3						56.4	6.6	58.6			
48	54.9						55.2	4.2	57.0			
64							54.8		56.2			
96							54.5		55.0			
128												
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /018-29/M4TB100.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

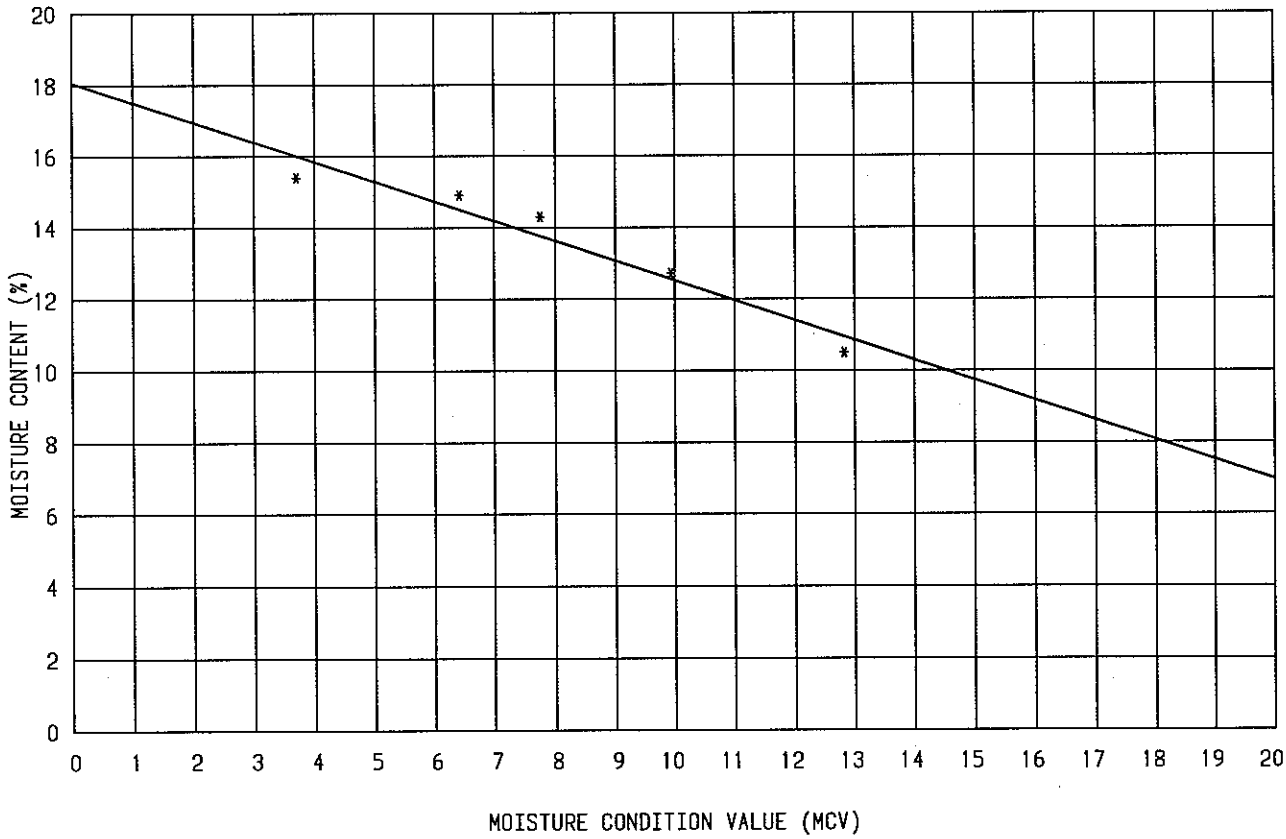
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown slightly clayey SAND with some siltstone.	Hole ID	TPB100
		Sample Type	
		Depth	2.50 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	12.7	10.5	14.3	14.9	15.4	
MCV	9.9	12.8	7.8	6.4	3.7	
HAND VANE VALUE (kPa)	TOO STIFF	TOO STIFF	78	66	46	
DRY DENSITY (Mg/m3)	1.99	2.05	1.90	1.87	1.85	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	18.1
SLOPE	(tan <between line and MCV axis)	-0.56
SENSITIVITY	(1/slope)	1.80
MATERIAL > 20.0 mm		9.4%

TEST REMARKS

Q.A. Ref: /028-11/M4tb100.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

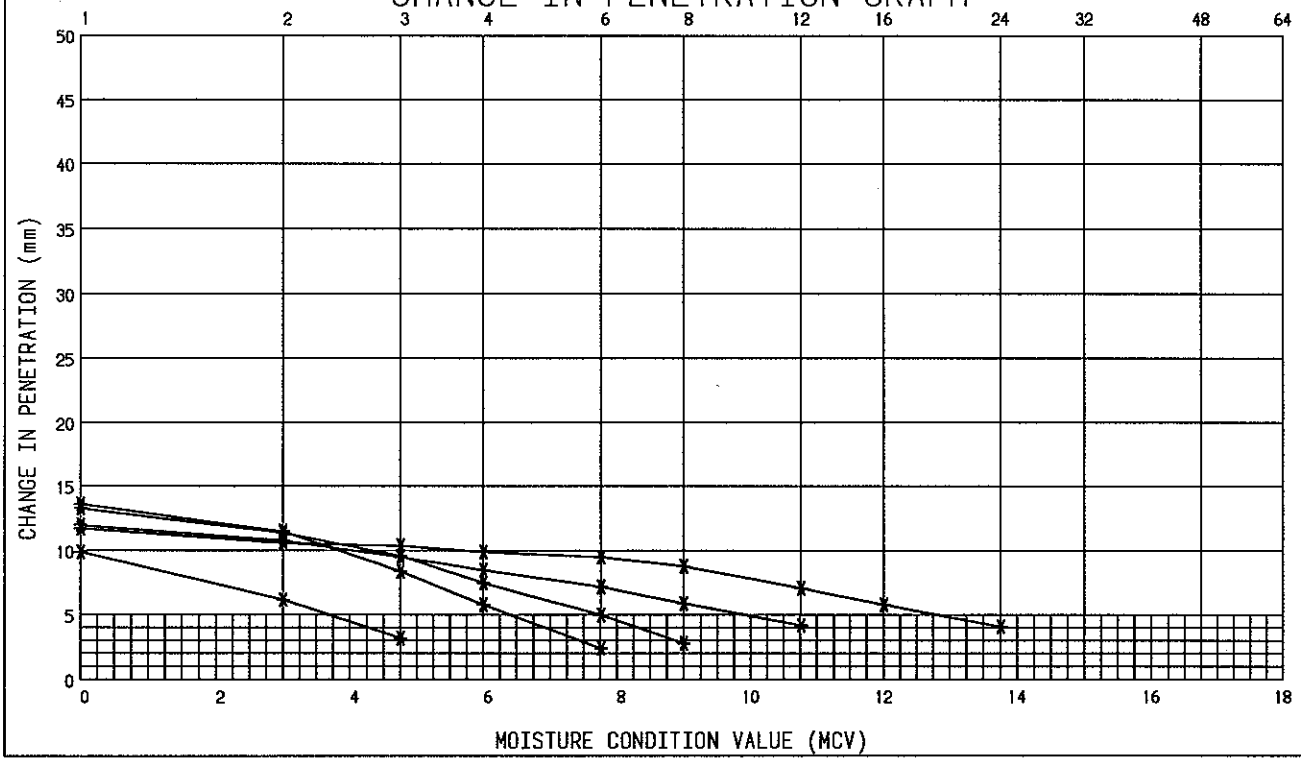
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown slightly clayey SAND with some siltstone.	Hole ID	TPB100
		Sample Type	
		Depth	2.50 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	78.0	12.0	81.7	11.7	78.5	13.3	77.4	13.6	70.7	9.9		
2	71.9	10.8	76.0	10.6	71.5	11.4	70.6	11.5	65.0	6.2		
3	68.4	9.5	72.6	10.4	67.9	9.6	66.7	8.4	61.8	3.2		
4	66.0	8.5	70.0	9.9	65.2	7.5	63.8	5.8	60.8			
6	63.1	7.2	67.4	9.5	62.2	5.0	60.5	2.4	58.9			
8	61.1	5.9	65.4	8.8	60.1	2.8	59.1		58.8			
12	58.9	4.2	62.2	7.1	58.3		58.3		58.6			
16	57.5		60.1	5.8	57.7		58.0					
24	55.9		57.9	4.1	57.2		58.1					
32	55.2		56.6		57.3							
48	54.7		55.1									
64			54.3									
96			53.8									
128												
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-11/M4tb100.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

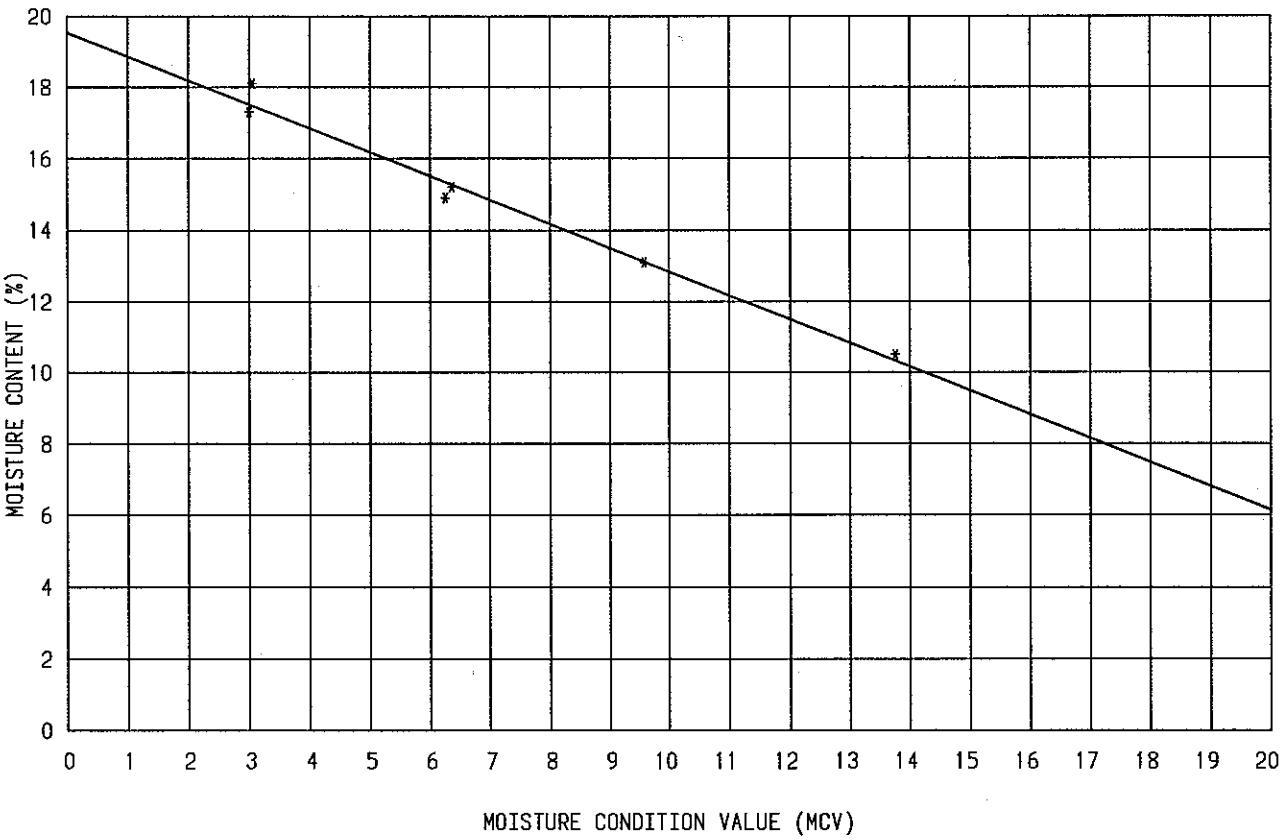
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown clayey SAND with much gravel and occasional cobbles.	Hole ID	TPB101
		Sample Type	B
		Depth	1.00 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	6
MOISTURE CONTENT (%)	14.9	18.1	17.3	10.5	13.1	15.2
MCV	6.3	3.1	3.0	13.8	9.6	6.4
HAND VANE VALUE (kPa)	46.0kPa	21.0kPa	23.0kPa	TOO STIFF	TOO STIFF	55.5kPa
DRY DENSITY (Mg/m3)	1.89	1.78	1.80	2.06	1.97	1.88

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	19.5
SLOPE	(tan <between line and MCV axis)	-0.67
SENSITIVITY	(1/slope)	1.49
MATERIAL > 20.0 mm		20.6%

TEST REMARKS

Q.A. Ref: /028-18/m4b10110.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

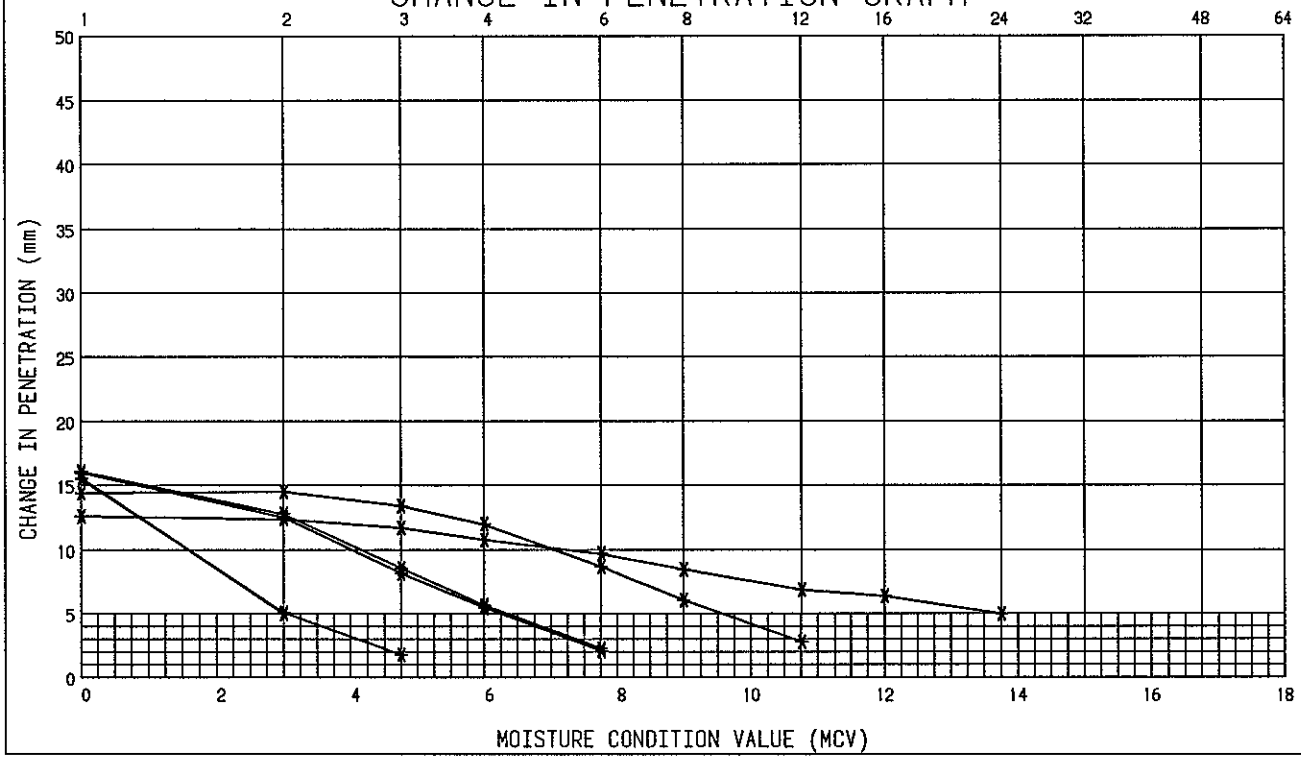
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown clayey SAND with much gravel and occasional cobbles.	Hole ID	TPB101
		Sample Type	B
		Depth	1.00 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5		6	
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	78.8	16.0	75.3	15.5	75.4	15.6	84.4	12.6	82.5	14.4	79.1	16.1
2	70.5	12.5	64.2	5.1	64.3	5.0	78.2	12.4	75.6	14.5	70.8	12.8
3	65.8	8.2	60.5	1.8	60.2	15.9	74.5	11.7	71.2	13.4	66.1	8.6
4	62.8	5.5	59.8	17.8	59.8	11.2	71.8	10.8	68.1	12.0	63.0	5.7
6	59.2	2.1	59.4	16.4	59.3	5.6	68.2	9.7	63.8	8.7	59.3	2.3
8	58.0	7.8	59.1	14.9	59.3	2.5	65.8	8.5	61.1	6.1	58.0	
12	57.6	3.8	58.7	12.5			62.8	6.9	57.8	2.8	57.5	
16	57.3						61.0	6.4	56.1		57.3	
24	57.1						58.5	5.0	55.1		57.0	
32							57.3		55.0			
48							55.9		55.0			
64							54.6					
96							53.5					
128												
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-18/m4b10110.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

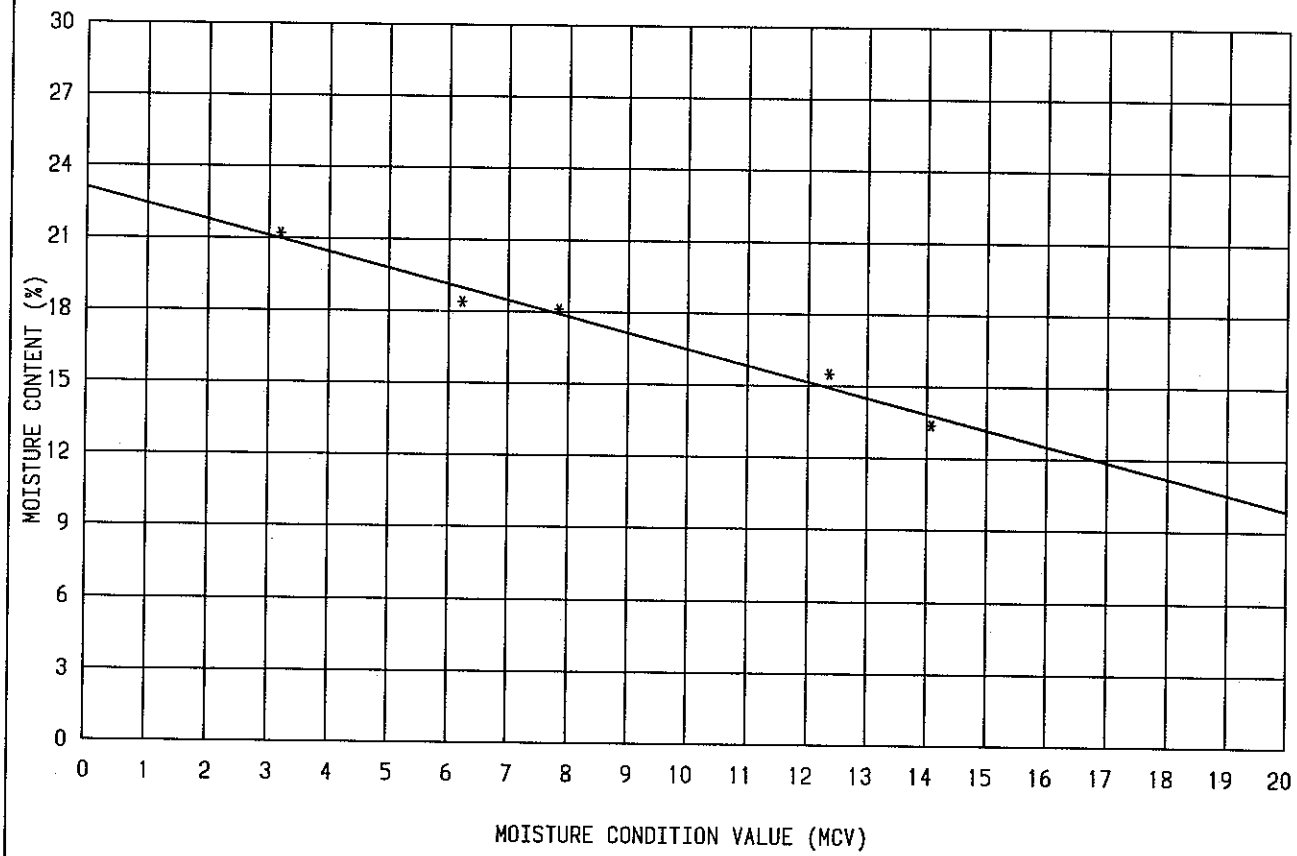
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown clayey SAND with some gravel.	Hole ID	TPB102
		Sample Type	Bulk
		Depth	0.50 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	18.1	15.5	18.4	21.2	13.4	
MCV	7.8	12.4	6.2	3.2	14.1	
HAND VANE VALUE (kPa)	78	TOO STIFF	58	39	TOO STIFF	
DRY DENSITY (Mg/m3)	1.79	1.88	1.76	1.67	1.95	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	23.1
SLOPE	(tan <between line and MCV axis)	-0.66
SENSITIVITY	(1/slope)	1.51
MATERIAL > 20.0 mm		7.4%

TEST REMARKS

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

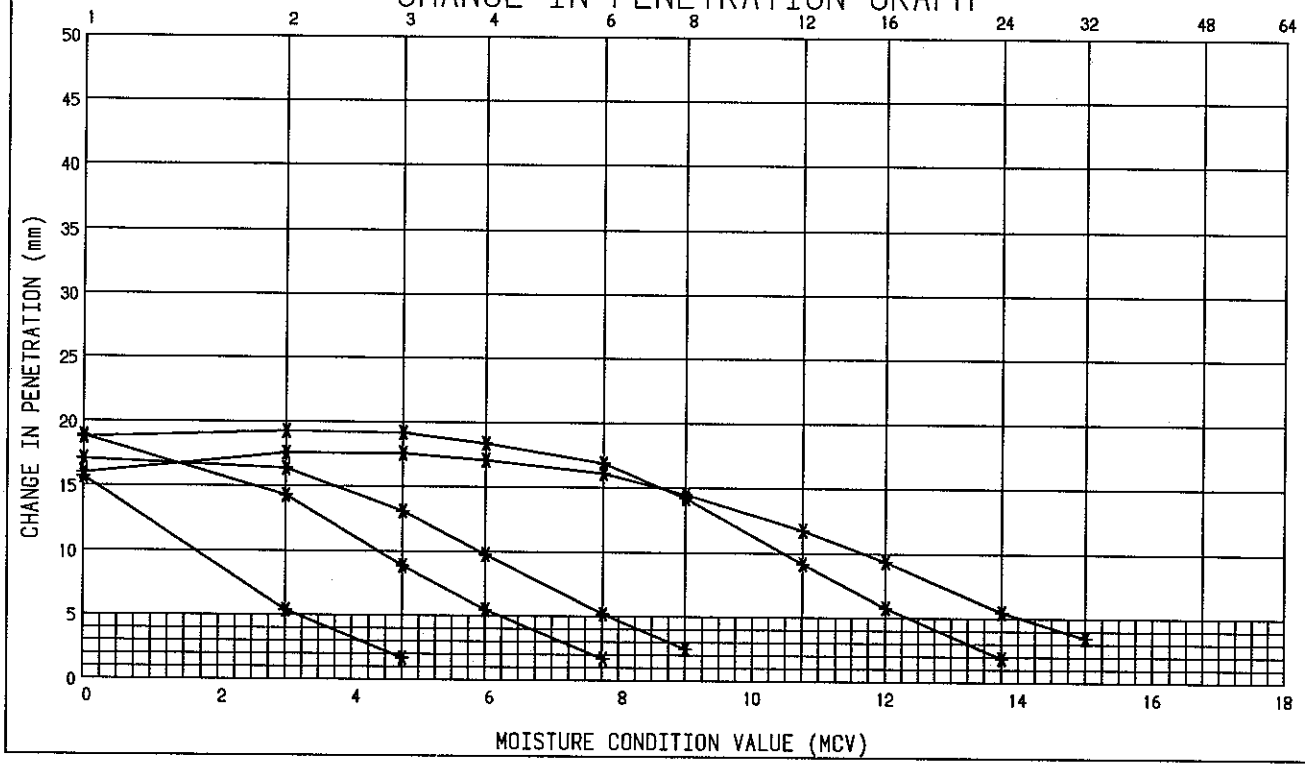
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown clayey SAND with some gravel.	Hole ID	TPB102
		Sample Type	Bulk
		Depth	0.50 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	86.9	17.1	100.8	18.8	85.5	18.9	79.8	15.7	99.5	16.0		
2	78.5	16.4	91.8	19.3	76.0	14.3	68.9	5.4	92.0	17.6		
3	73.3	13.1	86.3	19.2	70.1	8.9	65.1	1.7	87.1	17.6		
4	69.8	9.8	82.0	18.4	66.6	5.5	64.1		83.5	17.1		
6	65.0	5.2	76.5	16.9	62.7	1.7	63.6		78.3	16.1		
8	62.1	2.5	72.5	14.2	61.7		63.5		74.4	14.5		
12	60.2		67.1	9.2	61.2		63.4		69.5	11.8		
16	60.0		63.6	5.8	61.1				66.4	9.4		
24	59.8		59.6	1.9	61.0				62.2	5.5		
32	59.6		58.3						59.9	3.5		
48			57.9						57.7			
64			57.8						57.0			
96			57.7						56.7			
128									56.4			
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /018-14/m4tb1025.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

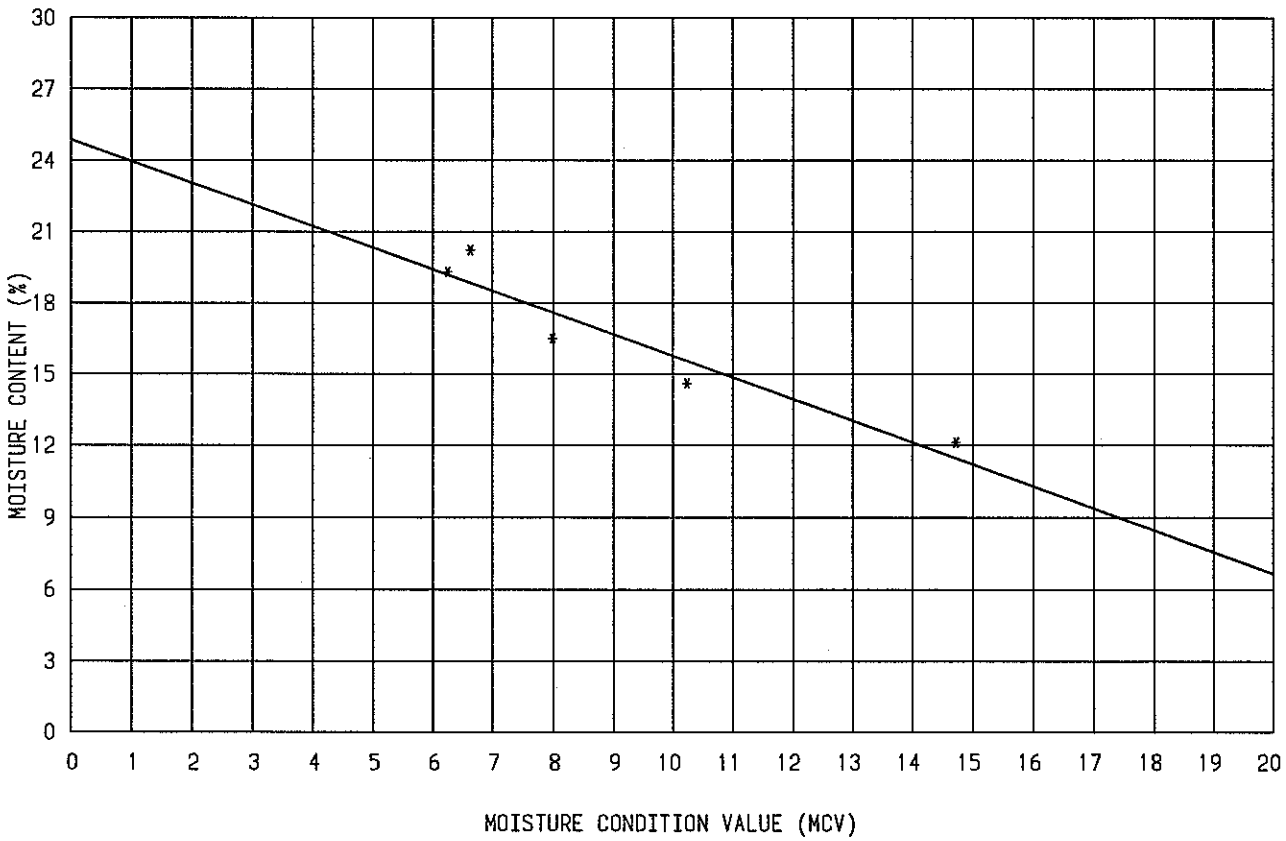
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel and occasional cobbles.	Hole ID	TPB102
		Sample Type	B
		Depth	1.00 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	14.6	12.1	16.5	19.3	20.2	
MCV	10.2	14.7	8.0	6.3	6.6	
HAND VANE VALUE (kPa)	TOO STIFF	TOO STIFF	83.5kPa	34.5kPa	30.0kPa	
DRY DENSITY (Mg/m3)	1.95	2.06	1.88	1.78	1.73	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	24.9
SLOPE	(tan <between line and MCV axis)	-0.91
SENSITIVITY	(1/slope)	1.10
MATERIAL > 20.0 mm		3.5%

TEST REMARKS

Q.A. Ref: /028-18/m4b10210.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

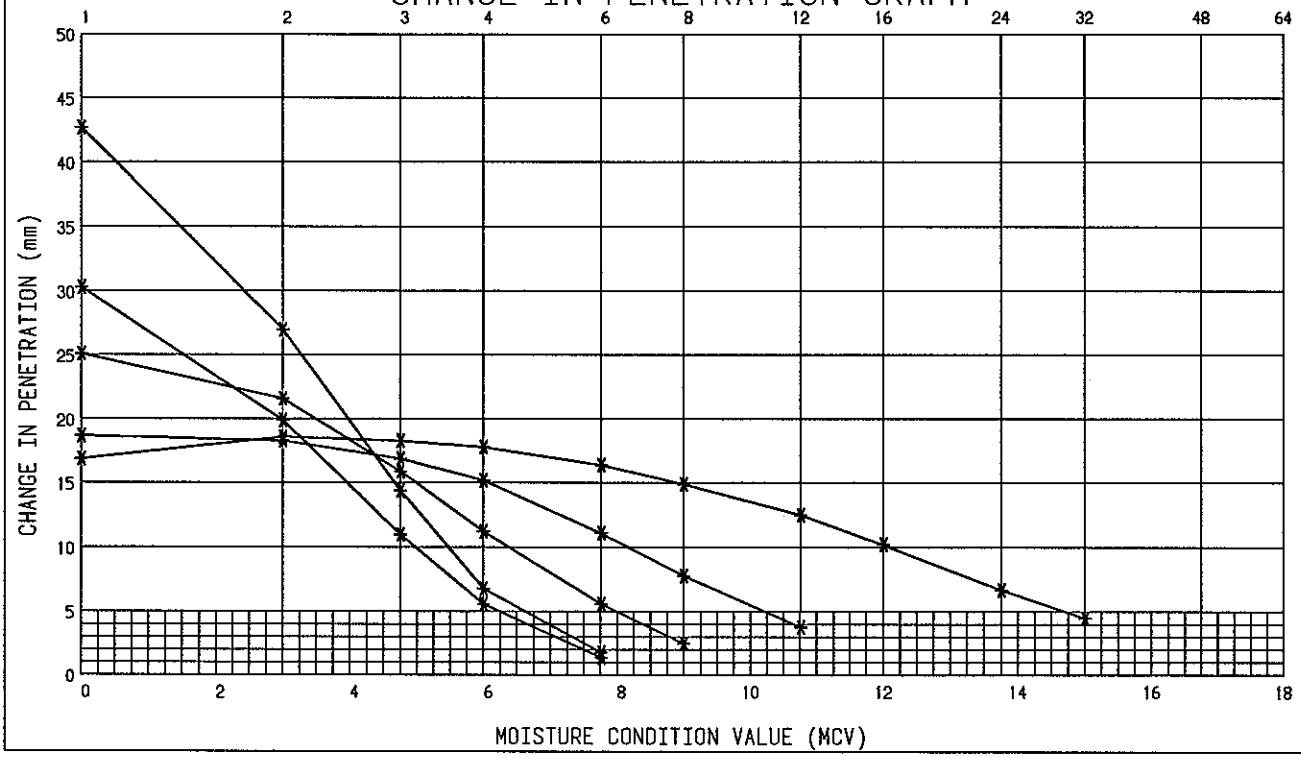
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel and occasional cobbles.	Hole ID	TPB102
		Sample Type	B
		Depth	1.00 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	90.1	18.7	98.1	16.9	93.2	25.1	95.1	30.3	109.7	42.7		
2	80.9	18.3	90.4	18.6	80.6	21.6	79.5	19.9	87.8	27.0		
3	75.2	16.9	85.1	18.3	73.1	15.9	70.4	11.0	74.9	14.4		
4	71.4	15.2	81.2	17.8	68.1	11.2	64.8	5.6	67.0	6.8		
6	66.1	11.1	75.7	16.4	62.3	5.6	60.3	1.4	61.6	1.8		
8	62.6	7.8	71.8	14.9	59.0	2.5	59.6		60.8			
12	58.3	3.8	66.8	12.5	57.2		59.4		60.5			
16	56.2		63.4	10.2	56.9		59.2		60.2			
24	55.0		59.3	6.7	56.7		58.9		59.8			
32	54.8		56.9	4.5	56.5							
48	54.5		54.3									
64			53.2									
96			52.6									
128			52.4									
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-18/m4b10210.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

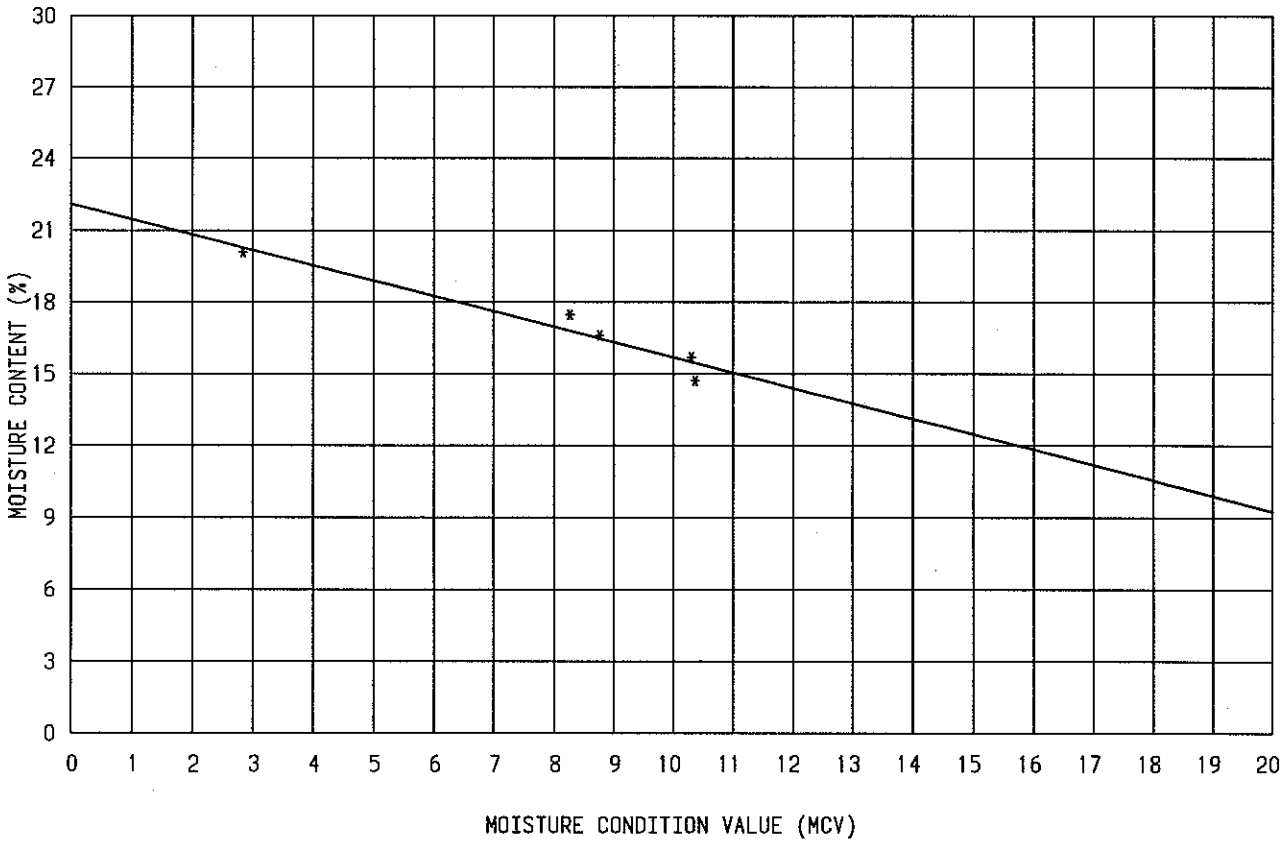
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with gravel.	Hole ID	TPB103
		Sample Type	
		Depth	0.50 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	20.1	16.6	15.7	17.4	14.7	
MCV	2.8	8.8	10.3	8.3	10.4	
HAND VANE VALUE (kPa)	18	80	121	78	TOO STIFF	
DRY DENSITY (Mg/m3)	1.70	1.85	1.87	1.84	1.89	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	22.1
SLOPE	(tan <between line and MCV axis)	-0.64
SENSITIVITY	(1/slope)	1.56
MATERIAL > 20.0 mm		13.7%

TEST REMARKS

Q.A. Ref: /028-11/M4TB103.MCV 2.0

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

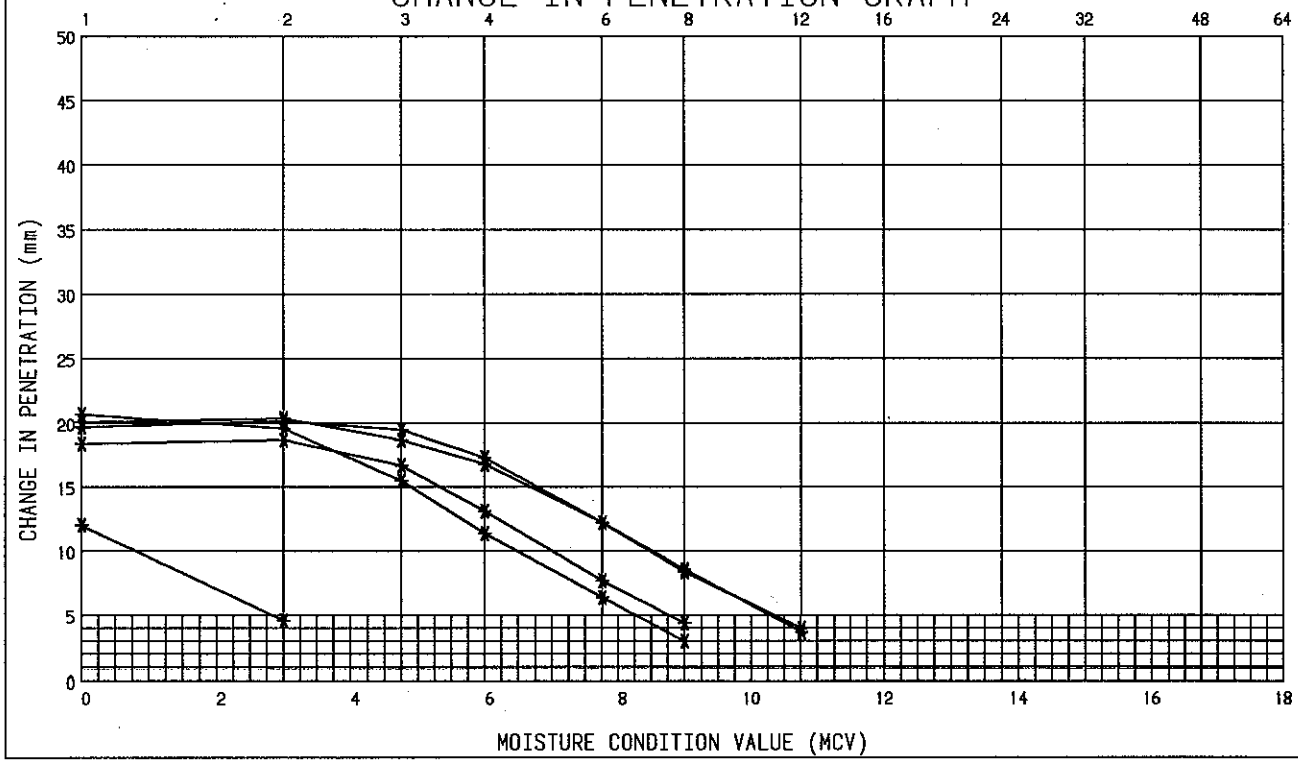
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with gravel.	Hole ID	TPB103
		Sample Type	
		Depth	0.50 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	74.0	12.0	89.9	18.4	95.9	19.7	90.9	20.7	95.9	20.1		
2	65.1	4.6	81.1	18.7	86.5	20.2	80.7	19.6	86.4	20.4		
3	62.4	18.0	75.7	16.7	80.8	19.5	74.5	15.5	80.0	18.7		
4	62.0	13.1	71.5	13.1	76.2	17.3	70.2	11.4	75.8	16.8		
6	61.5	6.6	65.8	7.7	70.2	12.2	64.7	6.4	69.9	12.2		
8	60.5	2.7	62.4	4.4	66.3	8.6	61.1	3.0	66.0	8.4		
12			59.0	5.1	61.3	3.7	59.0	12.6	61.3	4.0		
16			58.4	3.4	58.9		58.8	8.5	59.0	6.6		
24			58.1	1.4	58.0		58.3	3.5	57.7	2.2		
32			58.0		57.7		58.1		57.6			
48					57.6				57.3			
64												
96												
128												
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-11/M4TB103.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

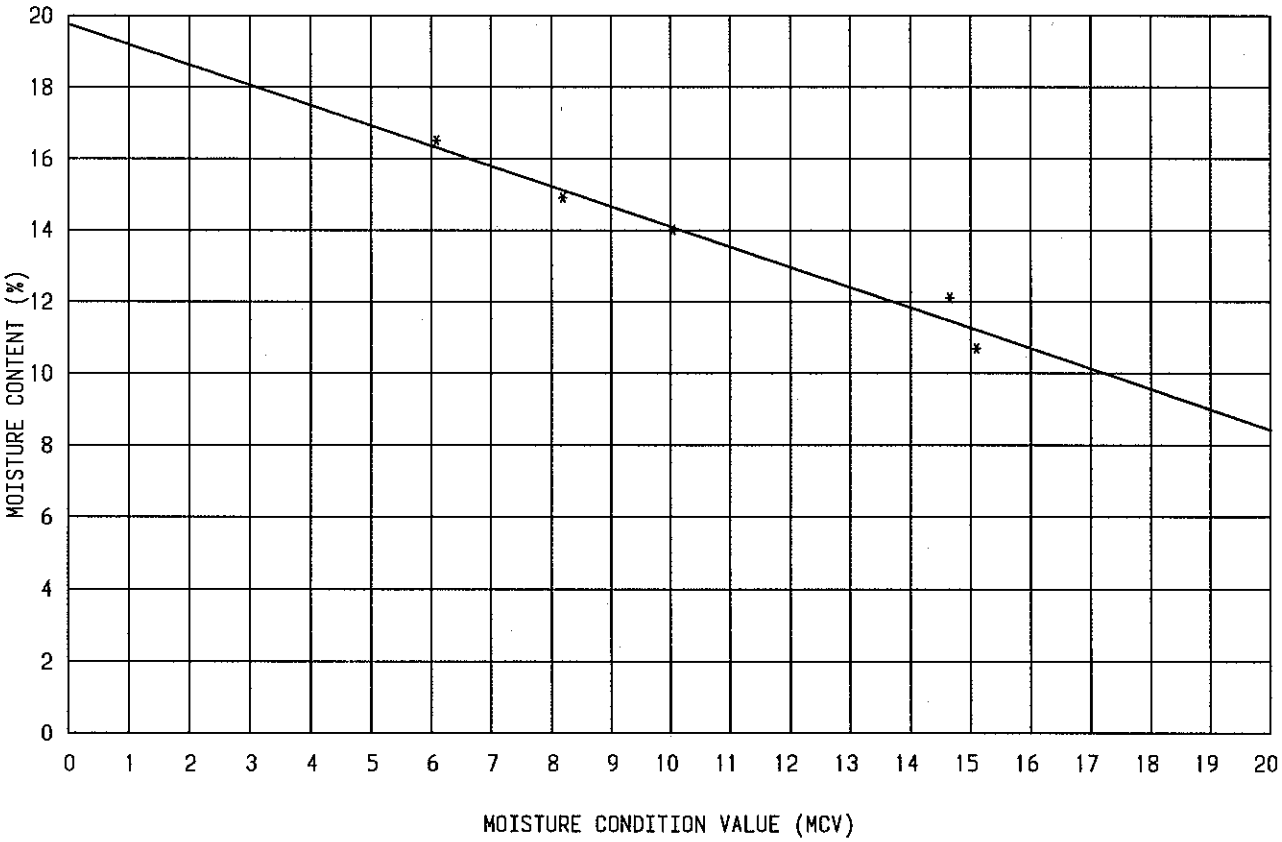
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown clayey SAND with some mudstone.	Hole ID	TPB103
		Sample Type	Bulk.
		Depth	1.00 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	14.0	10.7	12.1	14.9	16.5	
MCV	10.0	15.1	14.6	8.2	6.1	
HAND VANE VALUE (kPa)	TOO STIFF	TOO STIFF	TOO STIFF	82	43	
DRY DENSITY (Mg/m3)	1.96	2.09	2.03	1.90	1.83	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	19.8
SLOPE	(tan <between line and MCV axis)	-0.57
SENSITIVITY	(1/slope)	1.76
MATERIAL > 20.0 mm		6.3%

TEST REMARKS

Q.A. Ref: /028-12/M4TB1031.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

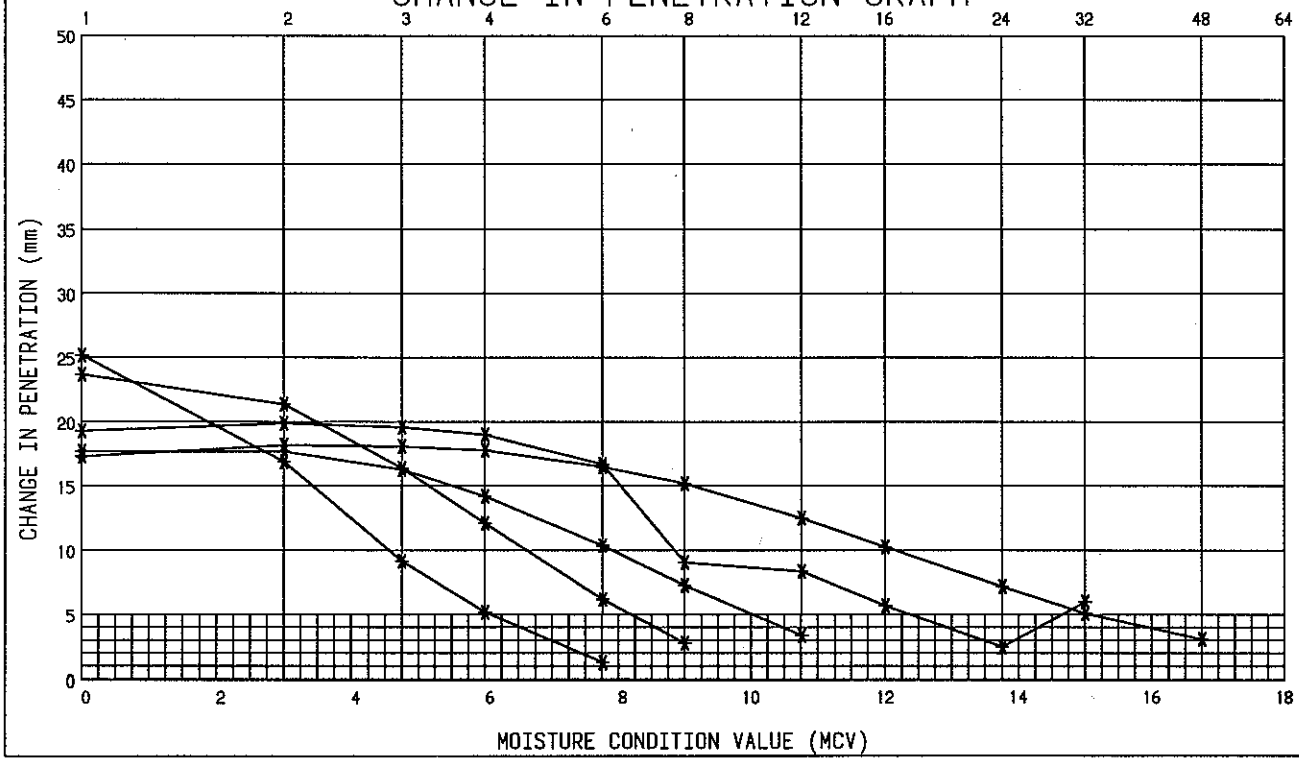
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown clayey SAND with some mudstone.	Hole ID	TPB103
		Sample Type	Bulk.
		Depth	1.00 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	88.0	17.7	99.3	17.3	97.9	19.3	92.8	23.7	89.2	25.2		
2	79.8	17.7	90.9	18.2	88.6	19.9	81.0	21.4	75.9	16.9		
3	74.4	16.3	85.7	18.1	82.7	19.6	73.7	16.4	68.0	9.2		
4	70.3	14.2	82.0	17.8	78.6	19.0	69.1	12.1	64.0	5.2		
6	65.4	10.4	76.5	16.5	72.8	16.7	63.0	6.2	59.8	1.3		
8	62.1	7.3	72.7	15.2	68.7	9.1	59.6	2.8	59.0	16.3		
12	58.1	3.4	67.6	12.5	63.1	8.4	57.3	12.6	58.8	10.6		
16	56.1		64.2	10.3	59.6	5.7	57.0	8.5	58.8	6.6		
24	55.0		60.0	7.2	56.1	2.5	56.8	3.5	58.5	2.2		
32	54.8		57.5	5.1	59.6	6.0	56.8					
48	54.7		55.1	3.1	54.7							
64			53.9		53.9							
96			52.8		53.6							
128			52.4		53.6							
192			52.0									
256												

CHANGE IN PENETRATION GRAPH



NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

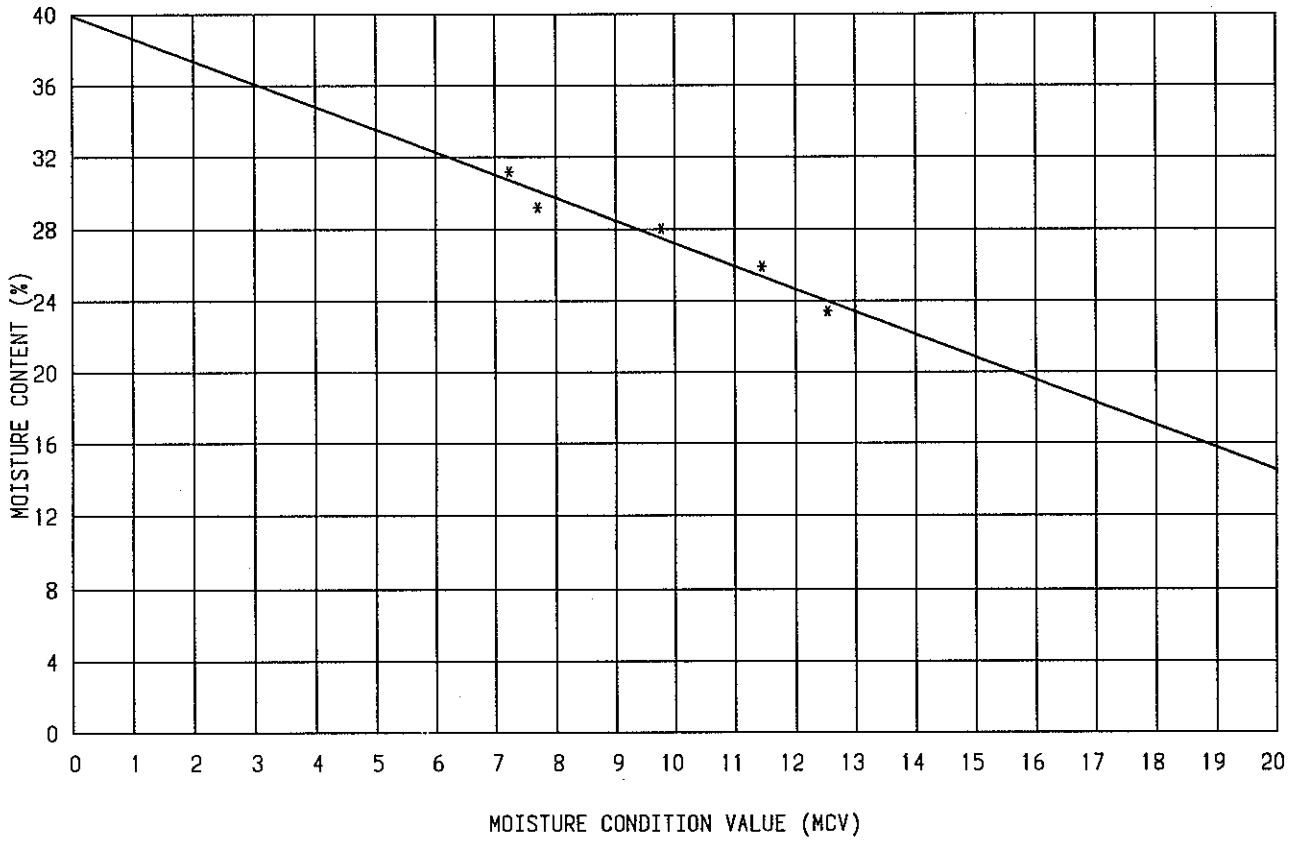
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Grey greenish mottled reddish brown CLAY.	Hole ID	TPB105
		Sample Type	Bulk.
		Depth	0.50 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	23.4	25.9	28.0	29.2	31.2	
MCV	12.5	11.5	9.8	7.7	7.2	
HAND VANE VALUE (kPa)	TOO STIFF	95	64.5	43.5	35	
DRY DENSITY (Mg/m3)	1.68	1.61	1.53	1.49	1.45	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	39.9
SLOPE	(tan <between line and MCV axis)	-1.27
SENSITIVITY	(1/slope)	0.79
MATERIAL > 20.0 mm		0.0%

TEST REMARKS

Q.A. Ref: /028-17/M4B105.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

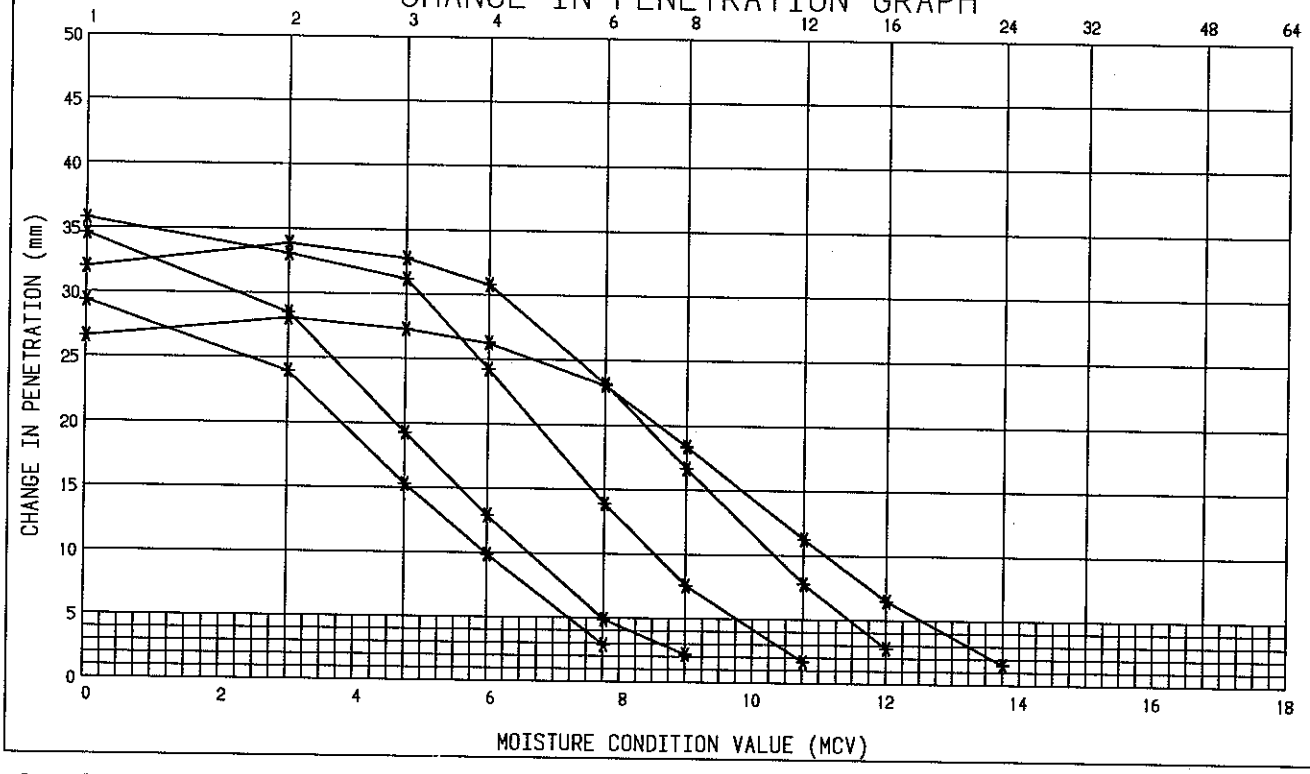
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Grey greenish mottled reddish brown CLAY.	Hole ID	TPB105
		Sample Type	Bulk.
		Depth	0.50 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	120.7	26.6	128.6	32.0	125.9	35.8	114.3	34.6	107.1	29.4		
2	108.3	28.1	113.7	33.9	105.8	33.1	96.7	28.5	92.7	24.0		
3	100.0	27.3	103.7	32.8	97.8	31.2	86.4	19.3	83.6	15.3		
4	94.1	26.3	96.6	30.8	90.1	24.3	79.7	12.9	77.7	9.9		
6	85.8	23.1	86.6	23.2	79.3	13.9	71.2	4.9	70.4	2.9		
8	80.2	18.4	79.8	16.7	72.7	7.6	68.2	2.2	68.7	1.2		
12	72.7	11.3	70.9	7.8	66.6	1.7	67.1	1.9	68.3	10.9		
16	67.8	6.5	65.8	2.8	65.8	6.0	66.8		67.8	9.7		
24	62.7	1.6	63.4	8.4	65.4	2.3	66.3		67.5	7.5		
32	61.8		63.1	6.6	65.1		66.0					
48	61.4		63.1	4.3	64.9							
64	61.3		63.0									
96	61.1											
128												
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-17/M4B105.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

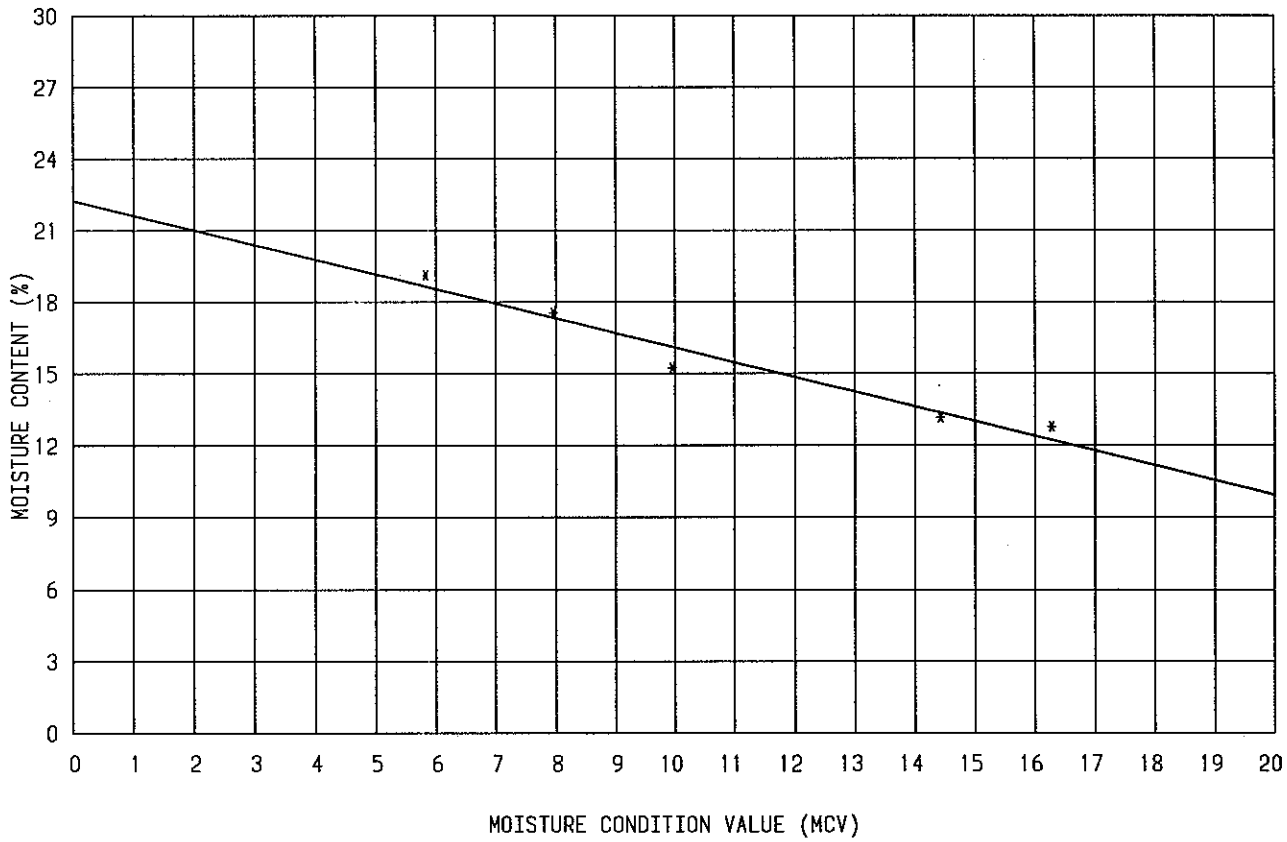
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with a little fine to medium gravel.	Hole ID	TPB105
		Sample Type	
		Depth	1.00 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	15.2	19.1	17.5	13.1	12.8	
MCV	10.0	5.8	8.0	14.4	16.3	
HAND VANE VALUE (kPa)	104	27	70	TOO STIFF	TOO STIFF	
DRY DENSITY (Mg/m3)	1.93	1.79	1.86	2.02	2.03	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	22.3
SLOPE	(tan <between line and MCV axis)	-0.61
SENSITIVITY	(1/slope)	1.63
MATERIAL > 20.0 mm		0.0%

TEST REMARKS

Q.A. Ref: /028-17/m4tb1052.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

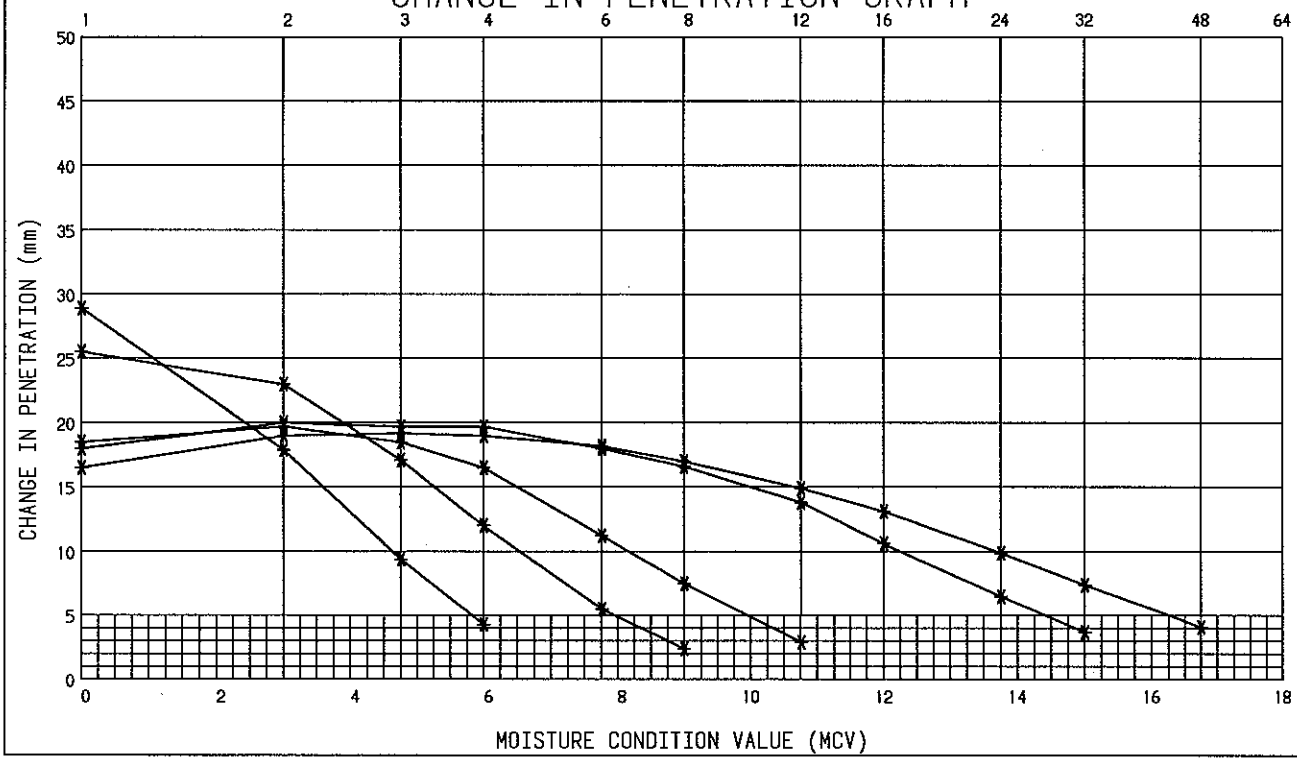
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with a little fine to medium gravel.	Hole ID	TPB105
		Sample Type	
		Depth	1.00 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	91.2	18.5	92.2	28.9	94.9	25.5	102.0	18.0	103.6	16.5		
2	82.7	19.7	77.2	17.9	82.6	23.0	93.8	20.0	96.3	19.0		
3	76.9	18.5	68.5	9.4	74.7	17.1	88.0	19.7	90.9	19.2		
4	72.7	16.5	63.3	4.3	69.4	12.0	84.0	19.7	87.1	19.0		
6	66.8	11.2	59.6	9.5	62.8	5.5	78.0	18.0	81.5	18.2		
8	63.0	7.5	59.3	8.8	59.6	2.4	73.8	16.6	77.3	17.0		
12	58.4	2.9	59.1	7.1	57.6		68.3	13.8	71.7	14.9		
16	56.2		59.0	5.8	57.4		64.3	10.6	68.1	13.1		
24	55.6				57.3		60.0	6.5	63.3	9.9		
32	55.5				57.2		57.2	3.7	60.3	7.4		
48	55.5						54.5		56.8	4.1		
64							53.7		55.0			
96							53.5		53.4			
128							53.5		52.9			
192									52.7			
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-17/m4tb1052.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

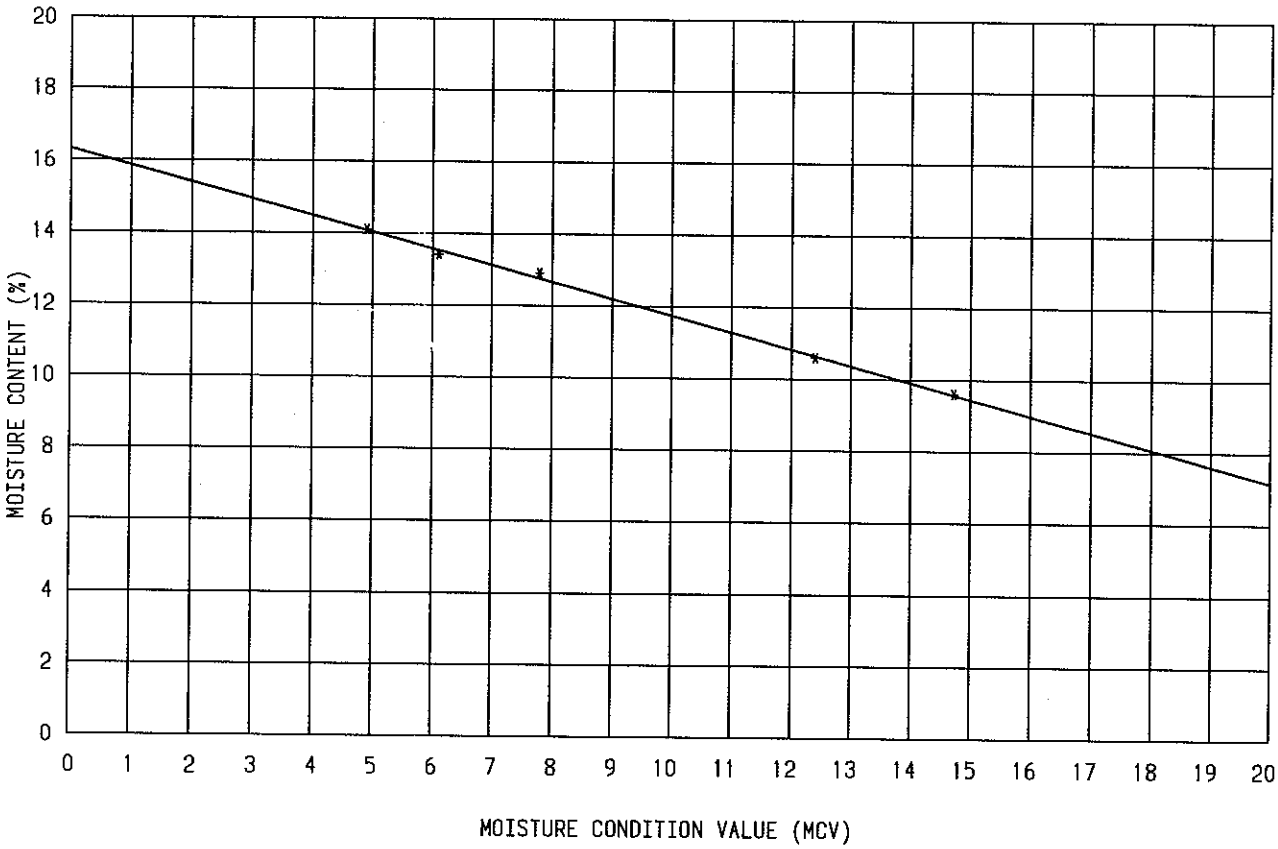
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN100
		Sample Type	
		Depth	0.50 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	13.4	9.6	10.6	12.9	14.1	
MCV	6.1	14.7	12.4	7.8	4.9	
HAND VANE VALUE (kPa)	71	TOO STIFF	TOO STIFF	72	52	
DRY DENSITY (Mg/m3)	1.98	2.14	2.10	1.98	1.93	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	16.3
SLOPE	(tan <between line and MCV axis)	-0.46
SENSITIVITY	(1/slope)	2.19
MATERIAL > 20.0 mm		21.0%

TEST REMARKS

Q.A. Ref: /018-29/M4N100.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

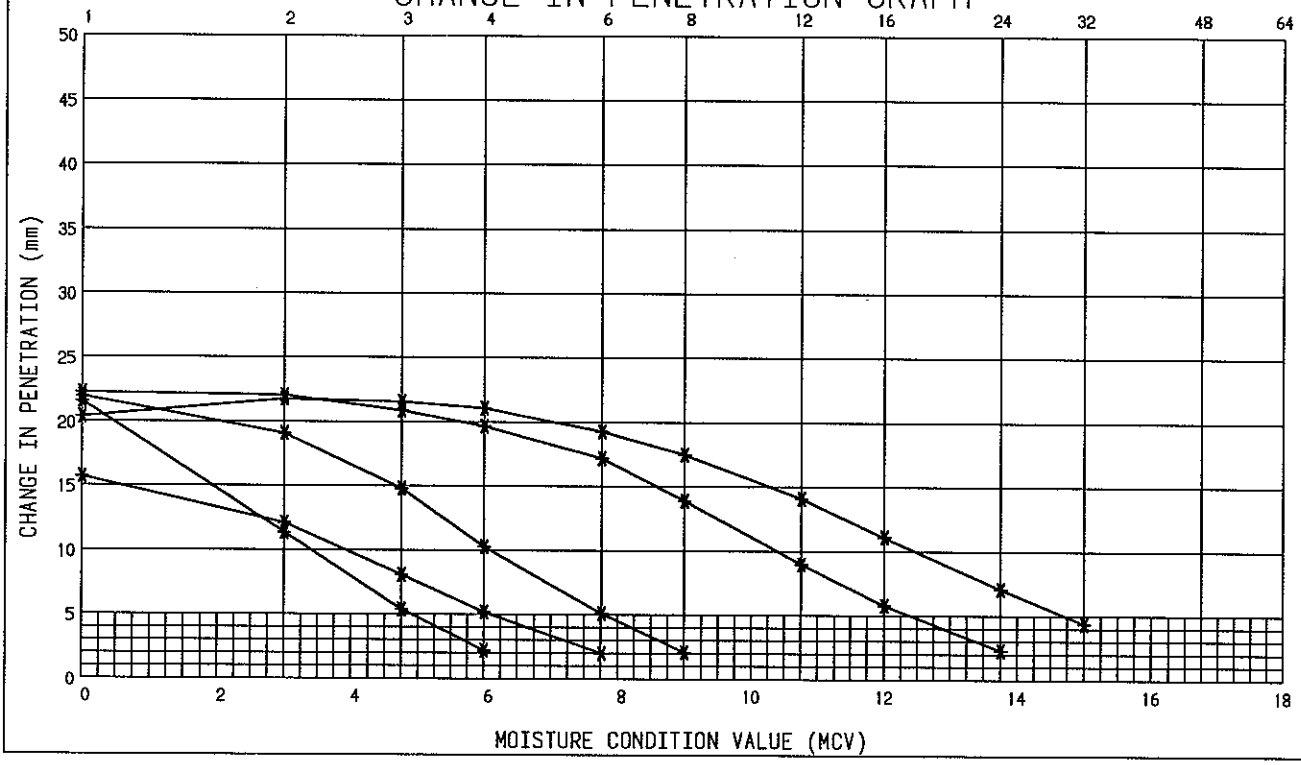
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN100
		Sample Type	
		Depth	0.50 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	75.7	15.7	104.7	20.4	100.0	22.3	87.3	22.0	80.1	21.6		
2	67.4	12.1	95.0	21.8	89.0	22.1	76.1	19.1	67.8	11.4		
3	62.9	8.1	88.8	21.6	82.3	20.9	69.9	14.8	61.8	5.4		
4	60.0	5.2	84.3	21.1	77.7	19.7	65.3	10.3	58.5	2.2		
6	56.7	2.0	77.8	19.3	71.7	17.2	60.1	5.1	56.6	18.2		
8	55.3		73.2	17.5	66.9	13.9	57.0	2.1	56.4	15.3		
12	54.8		67.2	14.1	61.4	9.0	55.1	14.4	56.4	10.5		
16	54.8		63.2	11.1	58.0	5.8	55.0	12.2	56.3	7.1		
24	54.7		58.5	7.1	54.5	2.3	55.0	8.9				
32			55.7	4.4	53.0		54.9	6.6				
48			53.1		52.4							
64			52.1		52.2							
96			51.4		52.2							
128			51.3									
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /018-29/M4N100.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

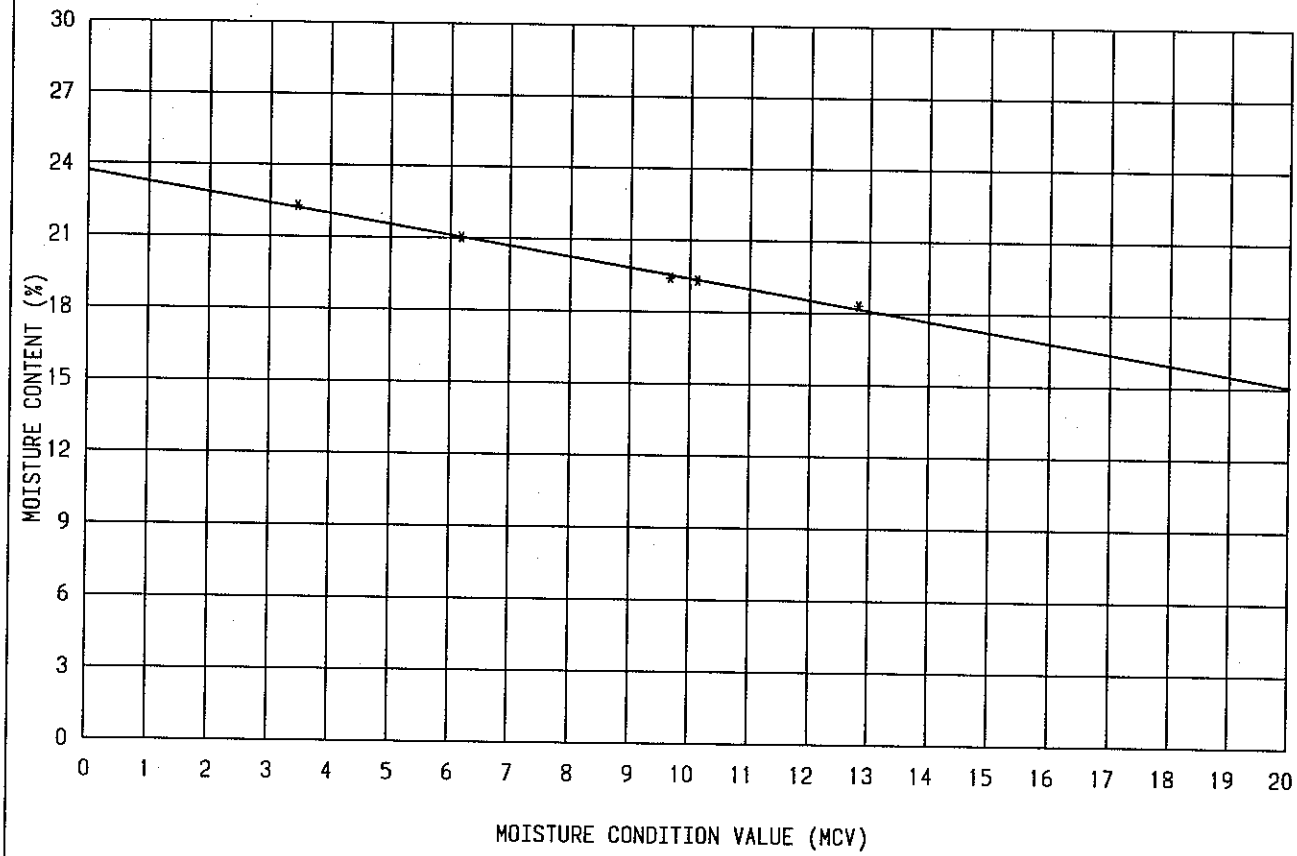
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greyish green CLAY with a little gravel and some sandstone.	Hole ID	TPN100
		Sample Type	Bulk
		Depth	2.00 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	18.3	19.3	19.4	21.0	22.3	
MCV	12.8	10.1	9.7	6.2	3.5	
HAND VANE VALUE (kPa)	TOO STIFF	83	77	52	20	
DRY DENSITY (Mg/m3)	1.82	1.78	1.75	1.65	1.65	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	23.7
SLOPE	(tan <between line and MCV axis)	-0.43
SENSITIVITY	(1/slope)	2.31
MATERIAL > 20.0 mm		0.4%

TEST REMARKS

Q.A. Ref: /028-13/M4tn100.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

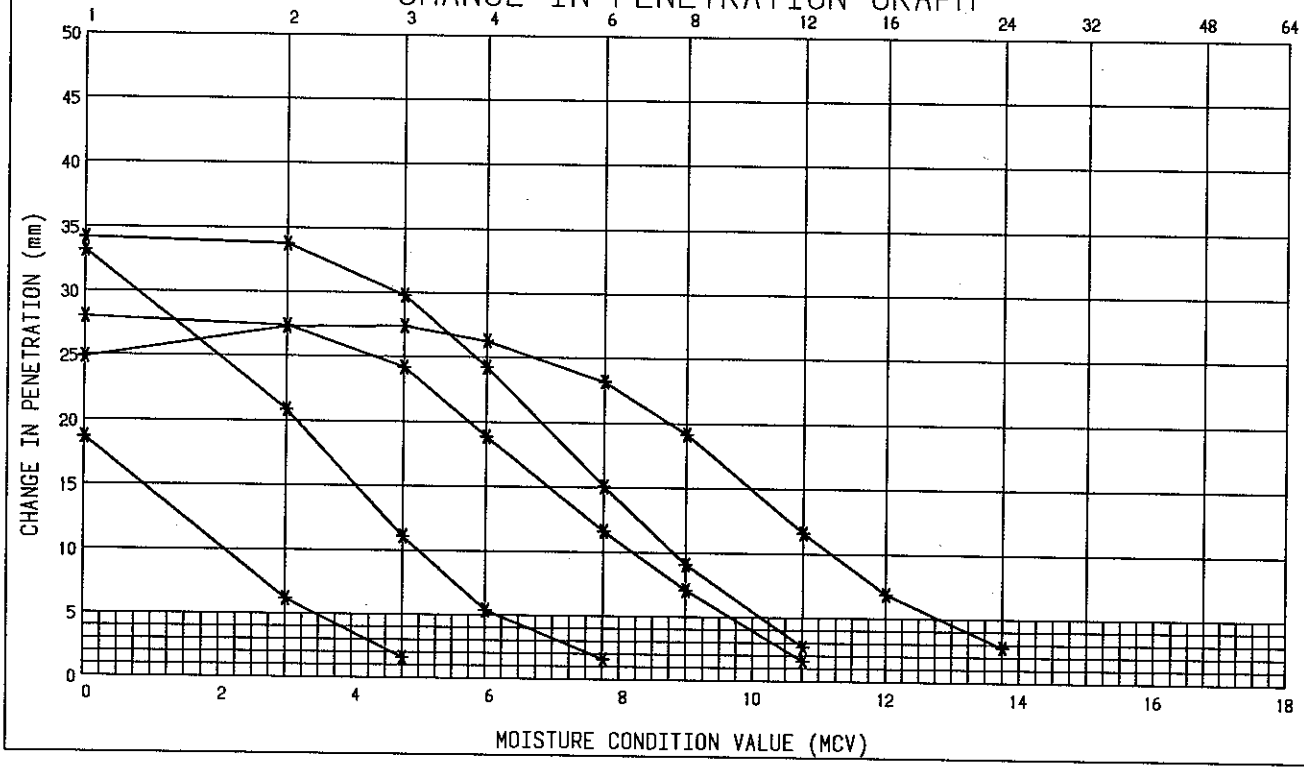
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greyish green CLAY with a little gravel and some sandstone.	Hole ID	TPN100
		Sample Type	Bulk
		Depth	2.00 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	116.1	24.9	118.5	34.2	107.4	28.0	100.2	33.2	82.6	18.7		
2	104.5	27.3	102.3	33.8	94.1	27.4	83.1	20.9	69.5	6.2		
3	97.0	27.4	91.8	29.8	85.5	24.2	72.9	11.1	64.7	1.6		
4	91.2	26.3	84.3	24.3	79.4	18.9	67.0	5.4	63.9			
6	83.0	23.2	74.8	15.1	71.6	11.6	62.7	1.6	63.4			
8	77.2	19.2	68.5	9.1	66.7	7.1	62.2		63.3			
12	69.6	11.6	62.0	2.7	61.3	1.6	61.8		63.1			
16	64.9	6.9	60.0		60.5		61.6					
24	59.8	2.8	59.7		60.0		61.1					
32	58.0		59.4		59.6							
48	58.0		59.3		59.7							
64	58.0											
96	57.0											
128												
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-13/M4tn100.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

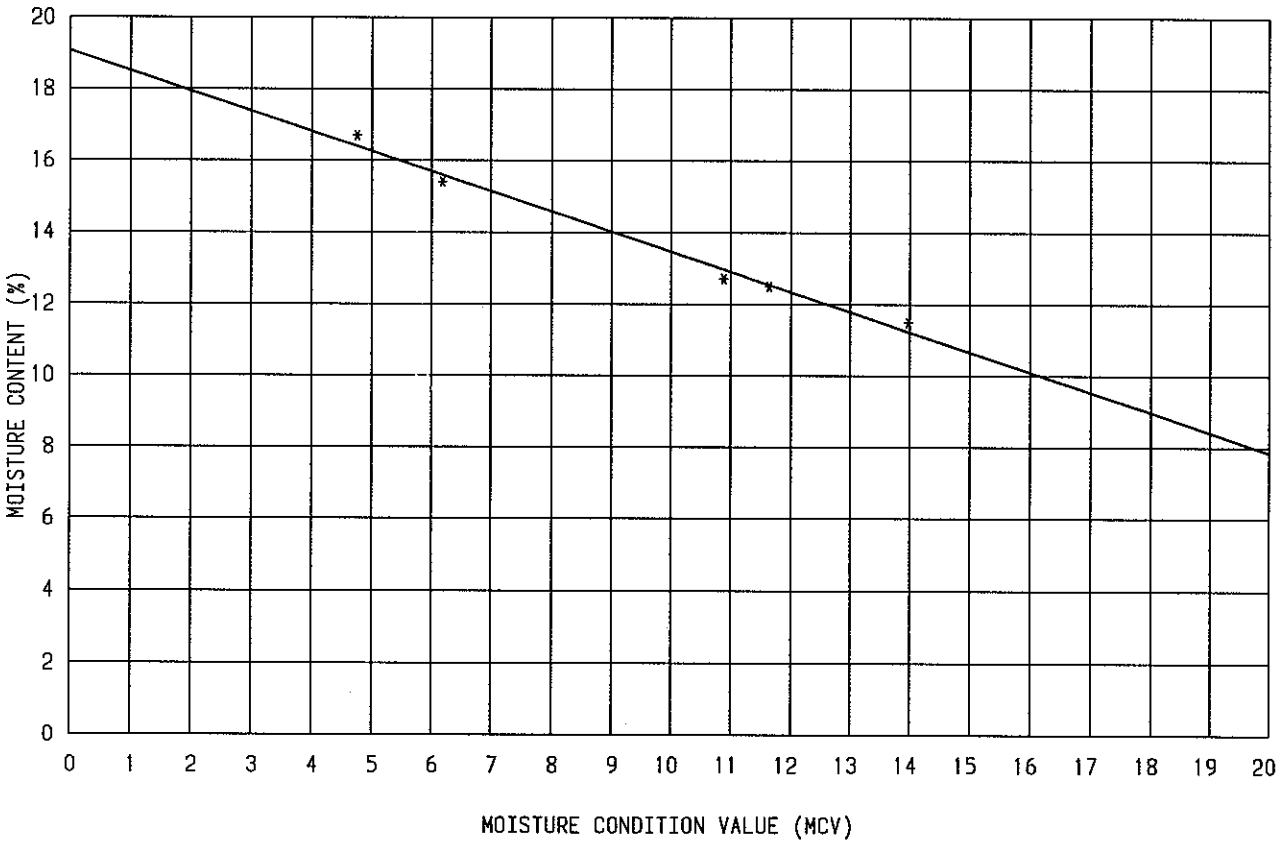
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN101
		Sample Type	Bulk
		Depth	0.50 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	15.4	11.5	12.5	12.7	16.7	
MCV	6.2	14.0	11.6	10.9	4.8	
HAND VANE VALUE (kPa)	64	TOO STIFF	TOO STIFF	TOO STIFF	30	
DRY DENSITY (Mg/m3)	1.88	2.06	2.02	1.99	1.85	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	19.1
SLOPE	(tan <between line and MCV axis)	-0.56
SENSITIVITY	(1/slope)	1.78
MATERIAL > 20.0 mm		9.6%

TEST REMARKS

Q.A. Ref: /028-02/M4TPN101.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

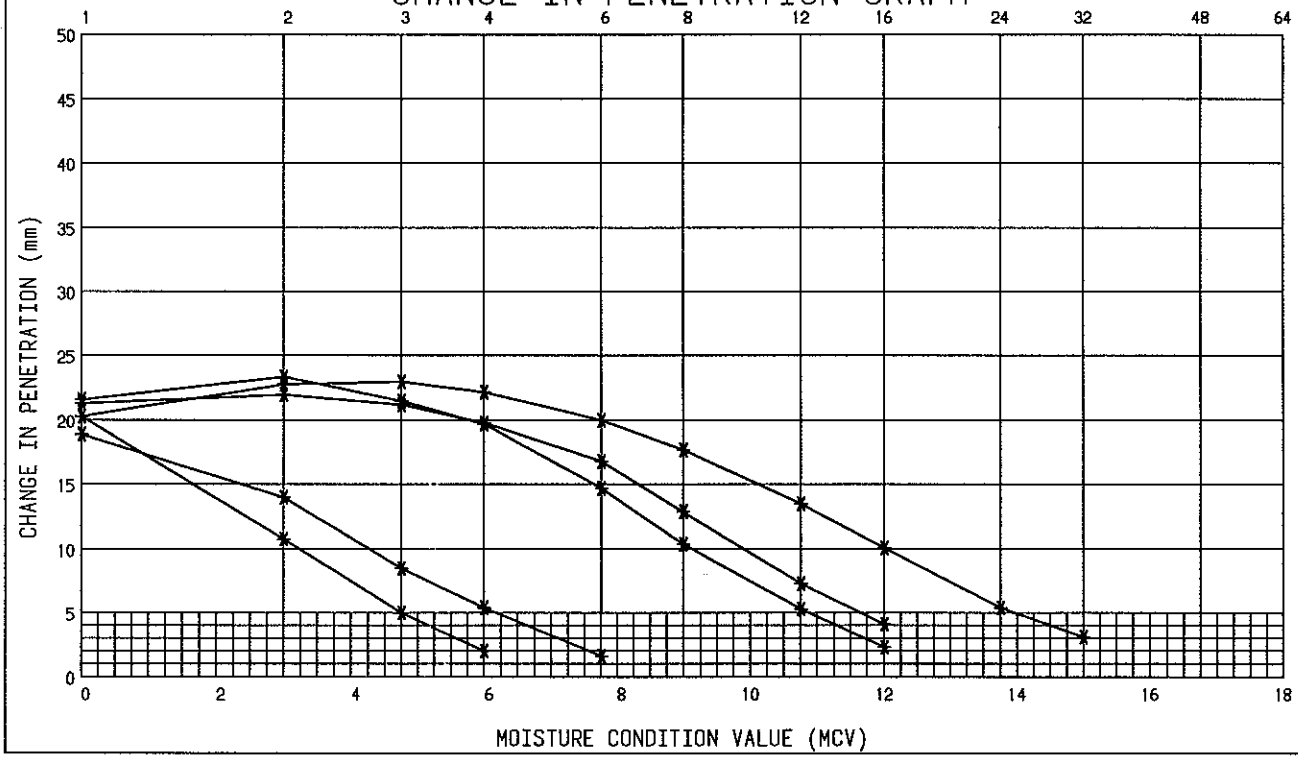
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN101
		Sample Type	Bulk
		Depth	0.50 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	81.6	18.9	105.6	20.3	98.8	21.3	98.3	21.6	80.1	20.3		
2	71.6	14.0	96.2	22.8	88.8	22.0	88.6	23.4	68.7	10.8		
3	65.9	8.5	90.2	23.0	82.1	21.2	81.5	21.5	63.0	5.0		
4	62.7	5.4	85.3	22.2	77.5	19.8	76.7	19.7	59.8	2.0		
6	58.9	1.6	78.2	20.0	71.0	16.8	69.7	14.7	58.2			
8	57.6		73.4	17.7	66.8	12.9	65.2	10.4	57.9			
12	57.4		67.2	13.5	60.9	7.3	60.0	5.3	58.0			
16	57.3		63.1	10.1	57.7	4.1	57.0	2.3	57.8			
24	57.3		58.2	5.4	54.2		55.0					
32			55.7	3.1	53.9		54.8					
48			53.7		53.6		54.7					
64			53.0		53.6		54.7					
96			52.8									
128			52.6									
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-02/M4TPN101.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

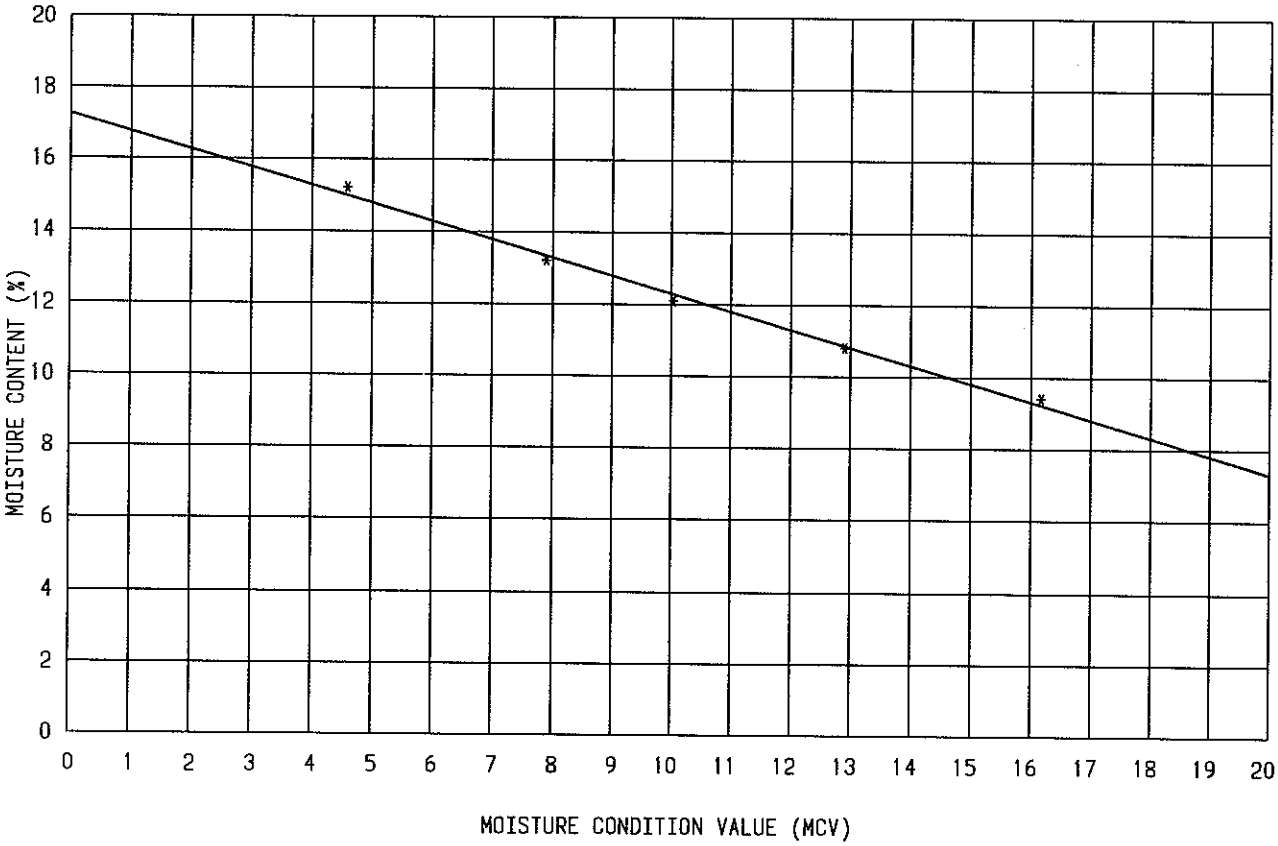
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel and occasional cobbles.	Hole ID	TPN101
		Sample Type	
		Depth	2.20 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	15.2	12.1	13.2	9.4	10.8	
MCV	4.6	10.0	7.9	16.2	12.9	
HAND VANE VALUE (kPa)	36	60	40	TOO STIFF	TOO STIFF	
DRY DENSITY (Mg/m3)	1.91	2.02	1.96	2.16	2.08	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	17.3
SLOPE	(tan <between line and MCV axis)	-0.50
SENSITIVITY	(1/slope)	2.01
MATERIAL > 20.0 mm		6.4%

TEST REMARKS

Q.A. Ref: /018-29/M4N101.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

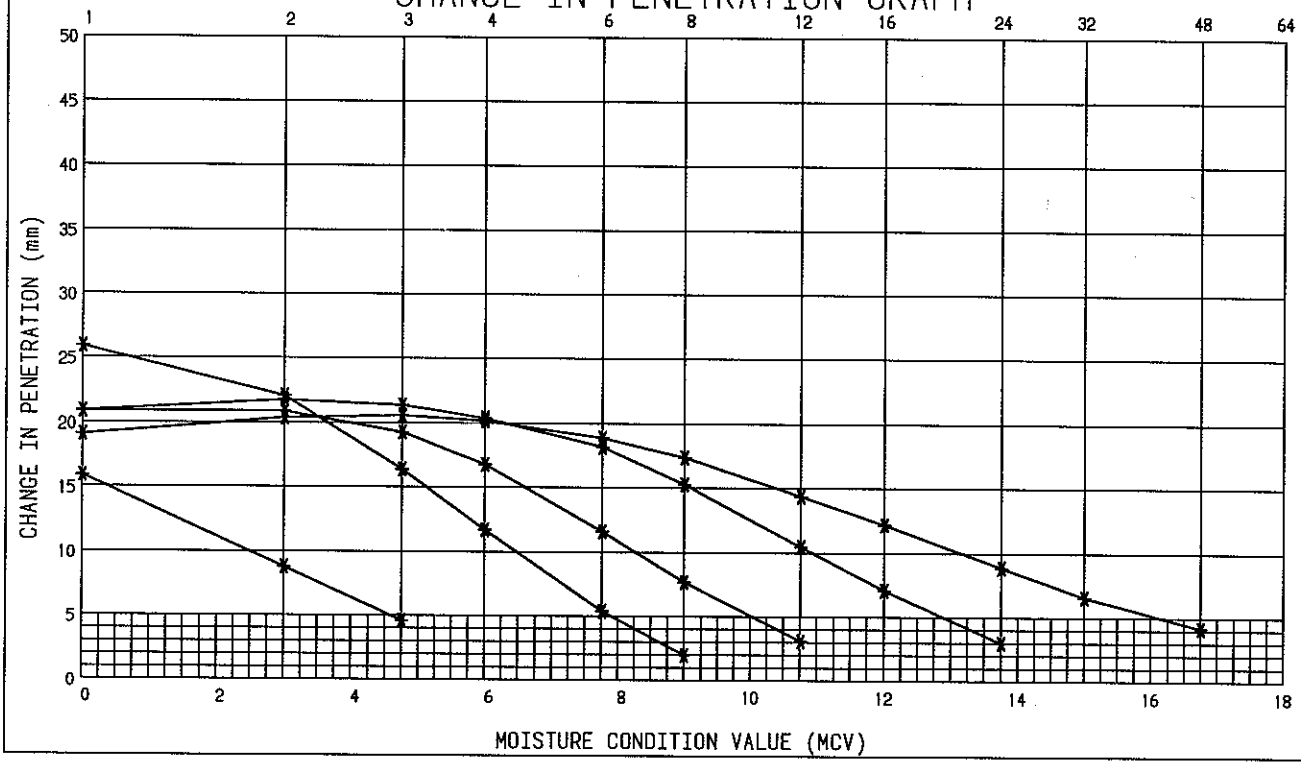
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel and occasional cobbles.	Hole ID	TPN101
		Sample Type	
		Depth	2.20 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	74.3	15.9	93.1	20.9	93.4	25.9	104.8	19.1	100.9	20.9		
2	65.2	8.8	82.9	20.9	79.7	22.1	95.6	20.4	90.8	21.8		
3	60.9	4.6	76.7	19.3	72.3	16.4	90.0	20.6	84.6	21.4		
4	58.4		72.2	16.8	67.5	11.7	85.7	20.2	80.0	20.4		
6	56.8		66.1	11.6	61.1	5.4	79.6	18.9	73.6	18.2		
8	56.4		62.0	7.7	57.6	2.0	75.2	17.4	69.0	15.3		
12	56.3		57.4	3.1	55.9		69.4	14.4	63.2	10.5		
16			55.4		55.8		65.5	12.2	59.6	7.1		
24			54.5		55.7		60.7	8.9	55.4	3.0		
32			54.3		55.6		57.8	6.6	53.7			
48			54.3				55.0	4.2	52.7			
64							53.3		52.5			
96							51.8		52.4			
128							51.2					
192							50.8					
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /018-29/M4N101.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

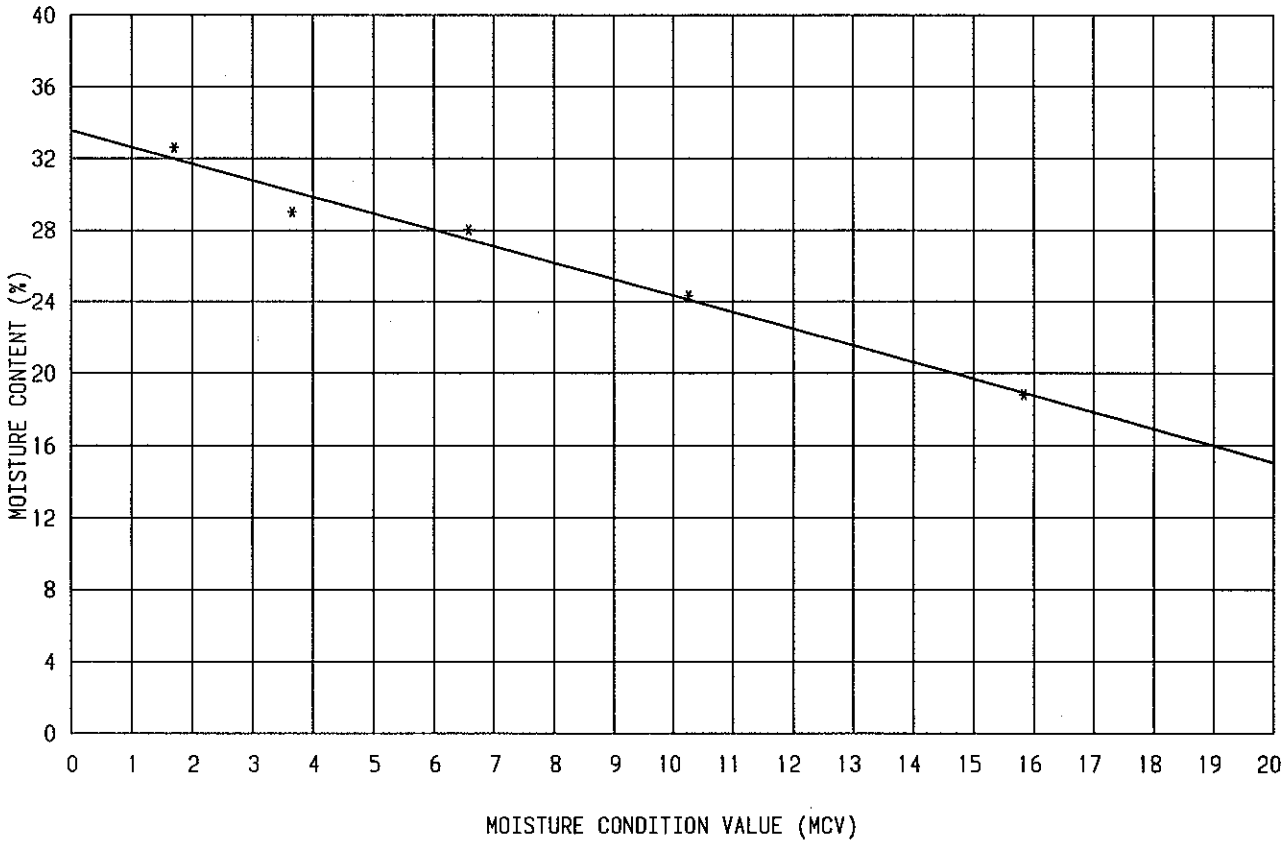
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown sandy CLAY with some medium gravel.	Hole ID	TPN102
		Sample Type	Bulk.
		Depth	0.50 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	24.3	28.0	29.0	32.6	18.8	
MCV	10.2	6.6	3.7	1.7	15.8	
HAND VANE VALUE (kPa)	63	24	14.5	11	TOO STIFF	
DRY DENSITY (Mg/m3)	1.63	1.51	1.47	1.41	1.80	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	33.6
SLOPE	(tan <between line and MCV axis)	-0.92
SENSITIVITY	(1/slope)	1.08
MATERIAL > 20.0 mm		2.2%

TEST REMARKS

Q.A. Ref: /028-17/M4N102.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

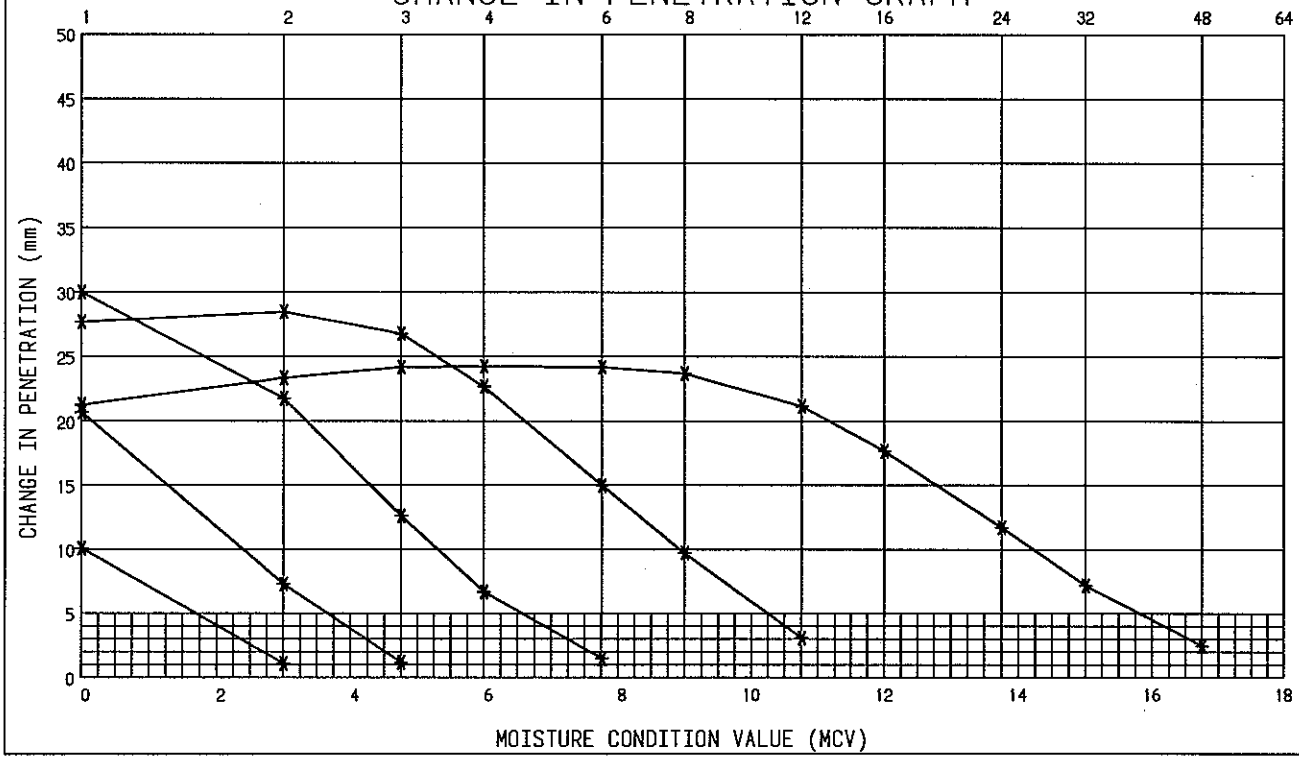
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown sandy CLAY with some medium gravel.	Hole ID	TPN102
		Sample Type	Bulk.
		Depth	0.50 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	114.9	27.7	103.0	30.0	89.3	20.7	79.2	10.1	122.8	21.3		
2	101.8	28.5	88.7	21.8	75.5	7.3	70.1	1.1	112.8	23.4		
3	93.3	26.8	79.1	12.6	69.1	1.2	69.9		106.3	24.2		
4	87.2	22.7	73.0	6.7	68.6		69.1		101.5	24.3		
6	78.9	15.0	67.4	1.5	68.3		69.1		94.4	24.2		
8	73.3	9.7	66.9		68.2		69.0		89.4	23.7		
12	66.5	3.1	66.5		67.9				82.1	21.2		
16	64.5		66.3						77.2	17.7		
24	63.9		65.9						70.2	11.7		
32	63.6								65.7	7.2		
48	63.4								60.9	2.5		
64									59.5			
96									58.5			
128									58.5			
192									58.4			
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-17/M4N102.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

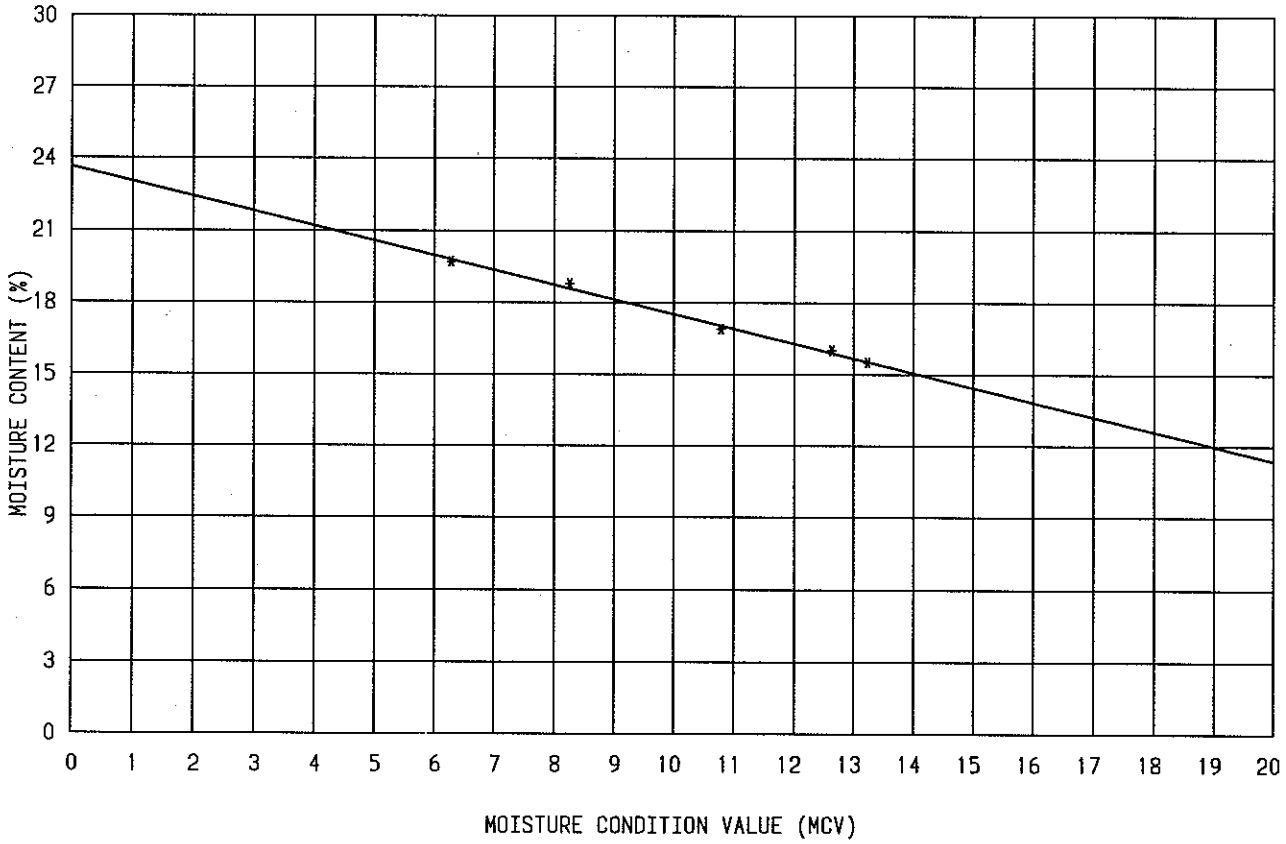
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel.	Hole ID	TPN103
		Sample Type	
		Depth	0.50 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	18.8	19.7	16.9	15.5	16.0	
MCV	8.3	6.3	10.8	13.2	12.6	
HAND VANE VALUE (kPa)	84	70	TOO STIFF	TOO STIFF	TOO STIFF	
DRY DENSITY (Mg/m3)	1.79	1.75	1.86	1.90	1.89	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	23.7
SLOPE	(tan <between line and MCV axis)	-0.61
SENSITIVITY	(1/slope)	1.63
MATERIAL > 20.0 mm		7.6%

TEST REMARKS

Q.A. Ref: /028-12/M4TN103.MCV 2.G1

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

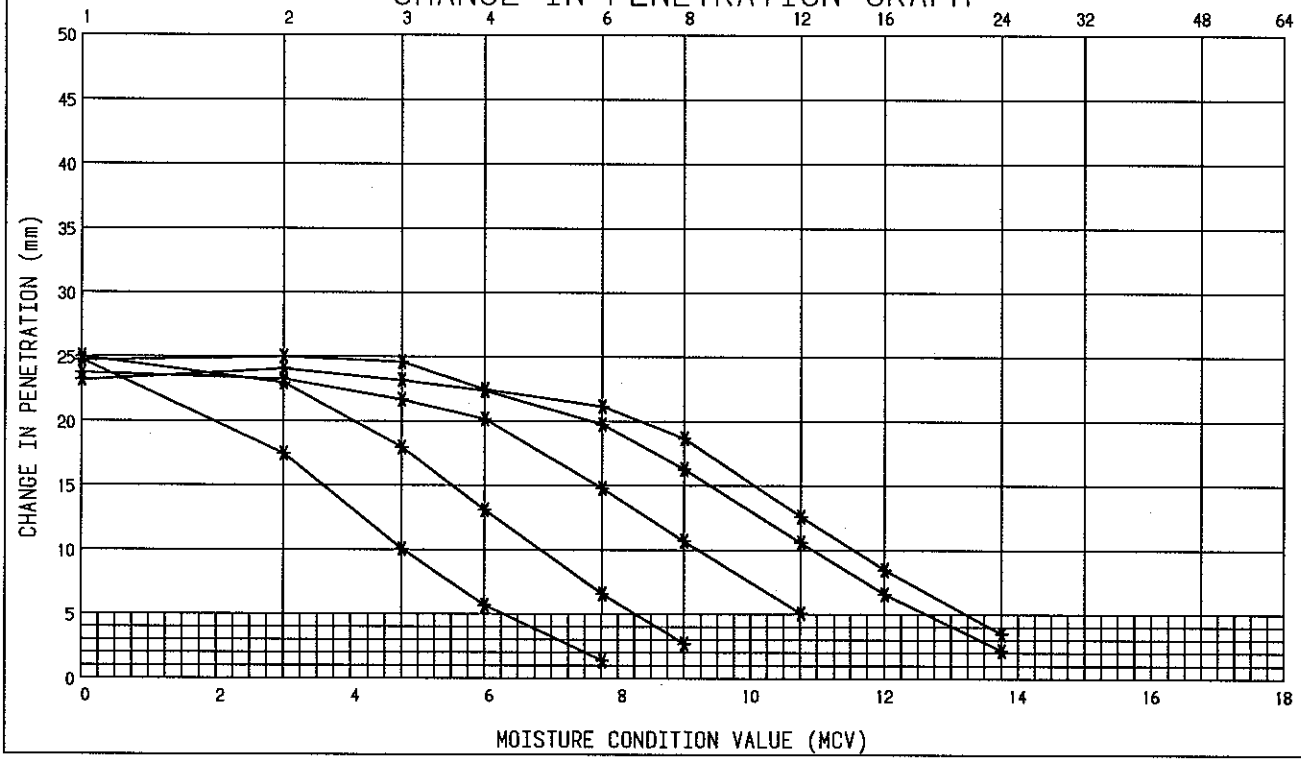
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel.	Hole ID	TPN103
		Sample Type	
		Depth	0.50 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	97.6	25.0	91.0	24.8	102.9	23.8	112.0	24.7	108.6	23.2		
2	85.0	23.0	78.5	17.5	91.2	23.3	100.9	25.0	97.4	24.1		
3	77.5	18.0	70.9	10.1	84.0	21.7	93.6	24.6	90.3	23.2		
4	72.6	13.1	66.2	5.7	79.1	20.2	87.3	22.5	85.4	22.4		
6	66.0	6.6	61.8	1.4	72.3	14.8	80.9	21.2	78.2	19.8		
8	62.0	2.7	61.0		67.9	10.7	75.9	18.7	73.3	16.3		
12	59.5		60.8		62.3	5.1	69.0	12.6	67.1	10.6		
16	59.5		60.5		58.9		64.8	8.5	63.0	6.6		
24	59.4		60.4		57.5		59.7	3.5	58.4	2.2		
32	59.3				57.2		57.2		57.0			
48					57.2		56.4		56.5			
64							56.3		56.4			
96							56.2		56.2			
128												
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-12/M4TN103.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

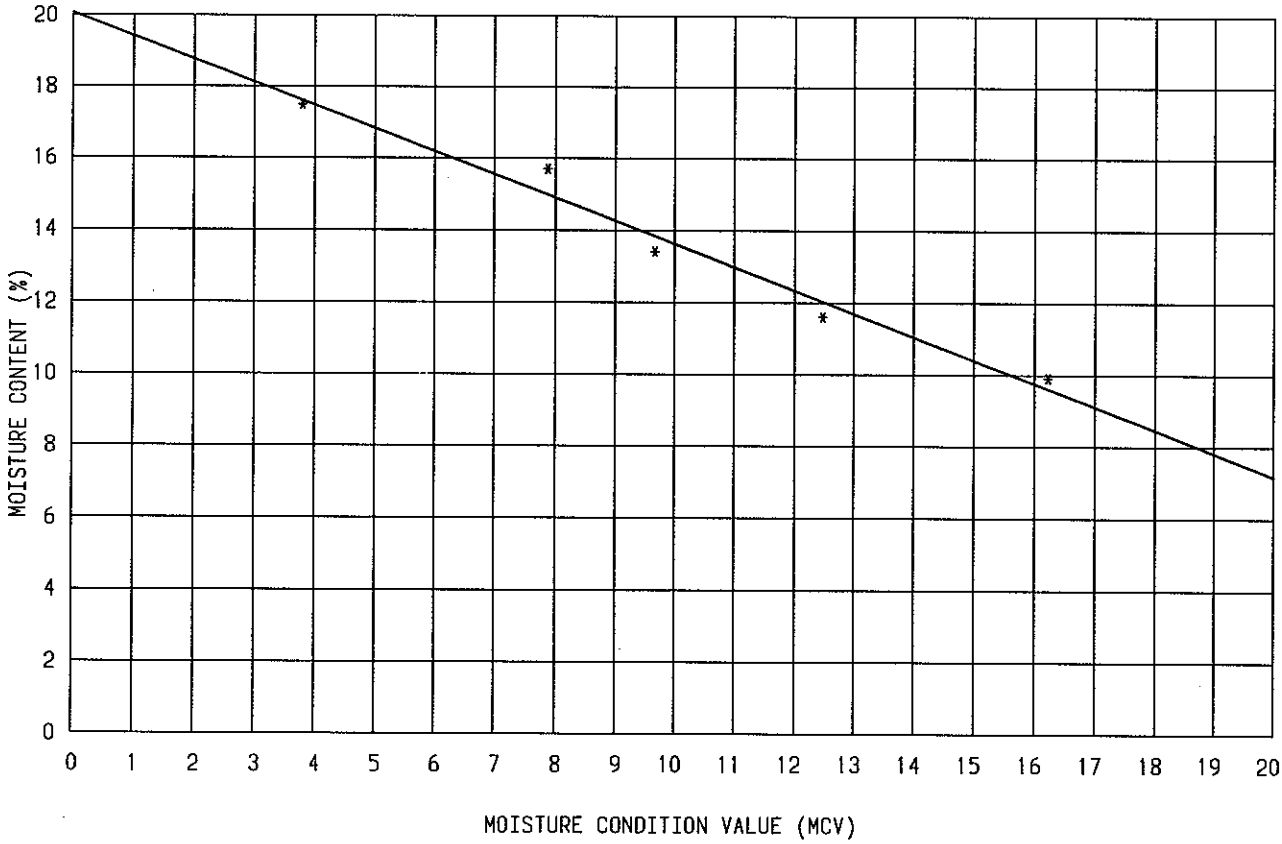
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some fine to coarse gravel.	Hole ID	TPN103
		Sample Type	Bulk.
		Depth	1.40 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	
MOISTURE CONTENT (%)	17.5	9.9	11.6	13.4	15.7	
MCV	3.8	16.2	12.5	9.7	7.9	
HAND VANE VALUE (kPa)	29	TOO STIFF	TOO STIFF	86	36	
DRY DENSITY (Mg/m3)	1.81	2.11	2.04	1.96	1.85	

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	20.1
SLOPE	(tan <between line and MCV axis)	-0.64
SENSITIVITY	(1/slope)	1.55
MATERIAL > 20.0 mm		7.2%

TEST REMARKS

Q.A. Ref: /028-17/M4N103.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

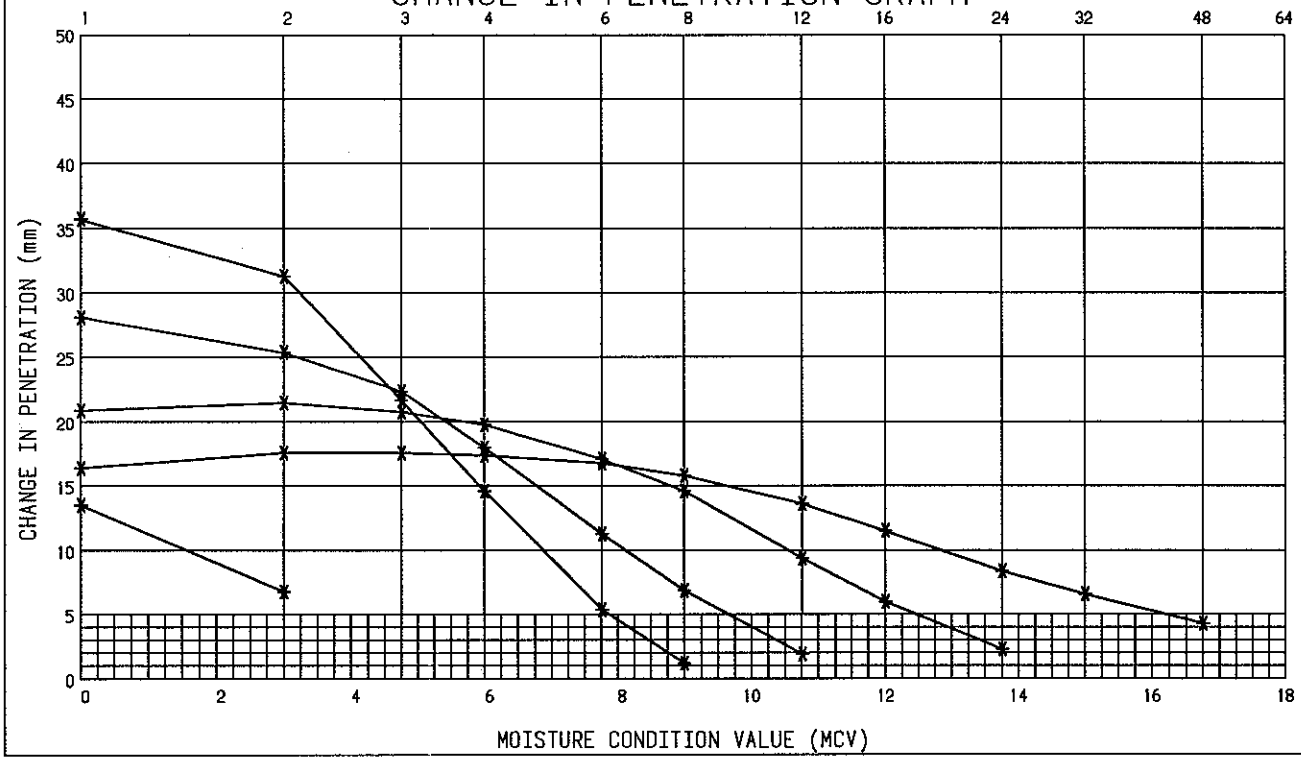
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some fine to coarse gravel.	Hole ID	TPN103
		Sample Type	Bulk.
		Depth	1.40 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5			
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	73.1	13.5	99.8	16.4	100.3	20.9	101.7	28.1	107.7	35.7		
2	63.8	6.8	92.2	17.6	90.2	21.5	87.4	25.4	89.9	31.3		
3	60.6	17.0	87.1	17.6	83.8	20.8	79.2	22.4	79.2	21.7		
4	59.6	16.1	83.4	17.4	79.4	19.8	73.6	18.0	72.0	14.6		
6	59.2	13.6	78.2	16.8	72.7	17.1	66.5	11.3	62.8	5.4		
8	57.0	10.9	74.6	15.8	68.7	14.6	62.0	6.9	58.6	1.2		
12			69.5	13.6	63.0	9.4	56.8	1.9	57.5	10.9		
16			66.0	11.5	59.6	6.0	55.6		57.4	9.7		
24			61.4	8.4	55.6	2.3	55.2		57.4	7.5		
32			58.8	6.6	54.1		55.1		57.4	6.4		
48			55.9	4.3	53.6		54.9					
64			54.5		53.6							
96			53.0		53.3							
128			52.2									
192			51.6									
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-17/M4N103.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

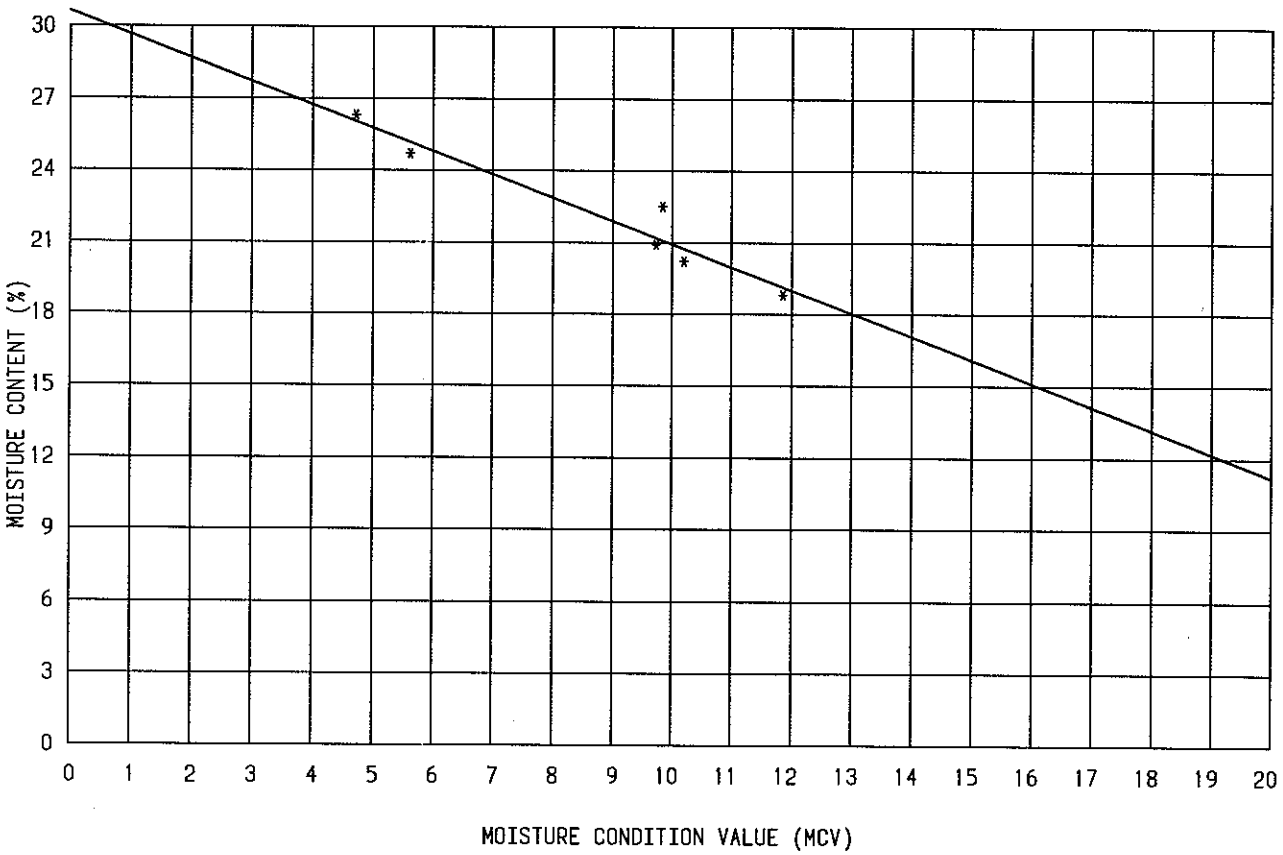
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown slightly sandy CLAY with some gravel.	Hole ID	TPP101
		Sample Type	Bulk.
		Depth	0.50 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	6
MOISTURE CONTENT (%)	22.5	20.9	24.7	26.3	20.2	18.8
MCV	9.8	9.7	5.6	4.7	10.2	11.9
HAND VANE VALUE (kPa)	88	64	34	19	73	111
DRY DENSITY (Mg/m3)	1.66	1.70	1.58	1.53	1.72	1.77

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	30.6
SLOPE	(tan <between line and MCV axis)	-0.97
SENSITIVITY	(1/slope)	1.03
MATERIAL > 20.0 mm		3.3%

TEST REMARKS

Q.A. Ref: /028-17/M4tpp101.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

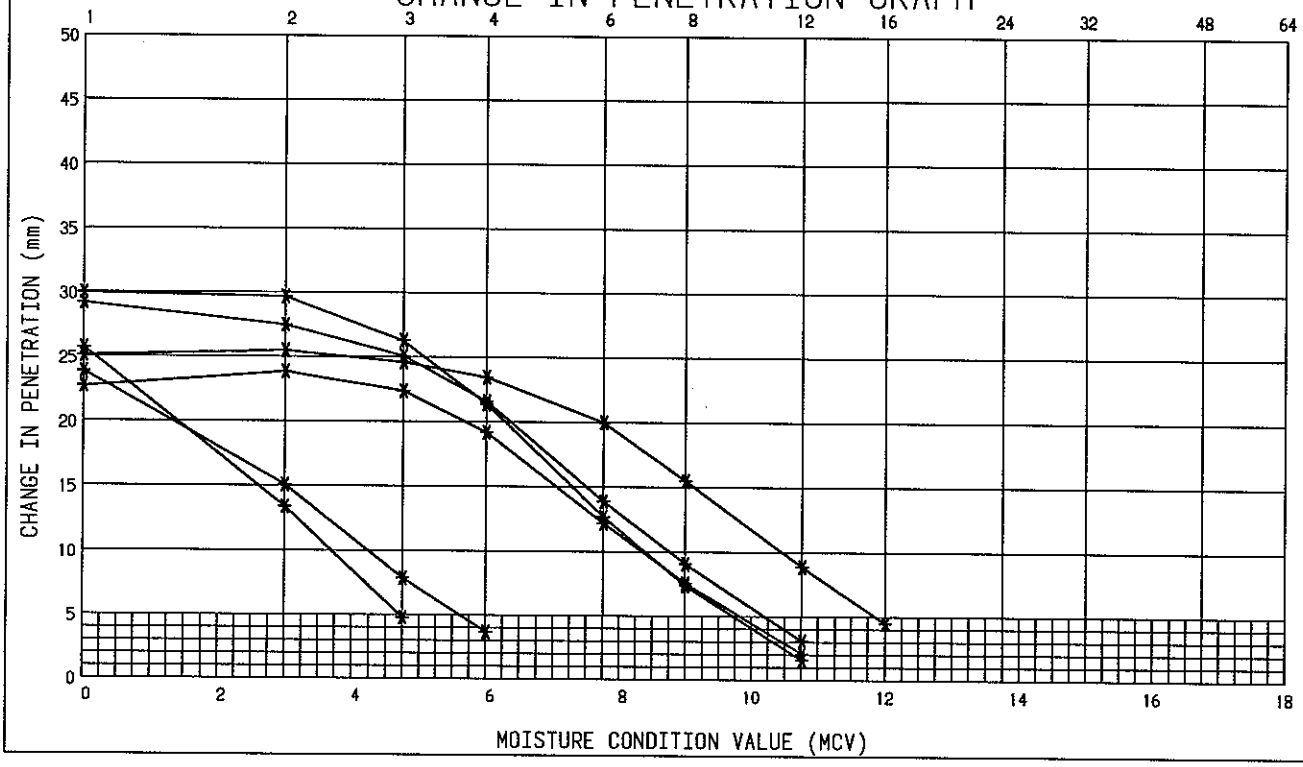
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown slightly sandy CLAY with some gravel.	Hole ID	TPP101
		Sample Type	Bulk.
		Depth	0.50 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5		6	
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	104.8	22.7	113.9	30.0	93.1	23.9	94.5	25.7	113.1	29.2	113.1	25.1
2	94.1	23.9	99.3	29.7	81.0	15.1	80.8	13.4	98.3	27.5	101.0	25.5
3	87.1	22.4	90.0	26.3	73.6	7.9	72.0	4.8	89.8	25.1	93.4	24.6
4	82.1	19.2	83.9	21.4	69.2	3.7	68.8		83.9	21.6	88.0	23.5
6	75.0	12.2	75.0	12.7	66.7		67.7		75.6	13.9	80.5	20.0
8	70.2	7.6	69.6	7.4	65.9		67.4		70.8	9.1	75.5	15.5
12	64.7	2.1	63.7	1.6	65.7		67.2		64.7	3.1	68.8	8.9
16	62.9		62.5		65.5				62.3		64.5	4.5
24	62.8		62.3						61.7		60.5	
32	62.6		62.2						61.7		60.0	
48	62.6		62.1						61.6		59.9	
64											60.0	
96												
128												
192												
256												

CHANGE IN PENETRATION GRAPH



Q.A. Ref: /028-17/M4tpp101.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

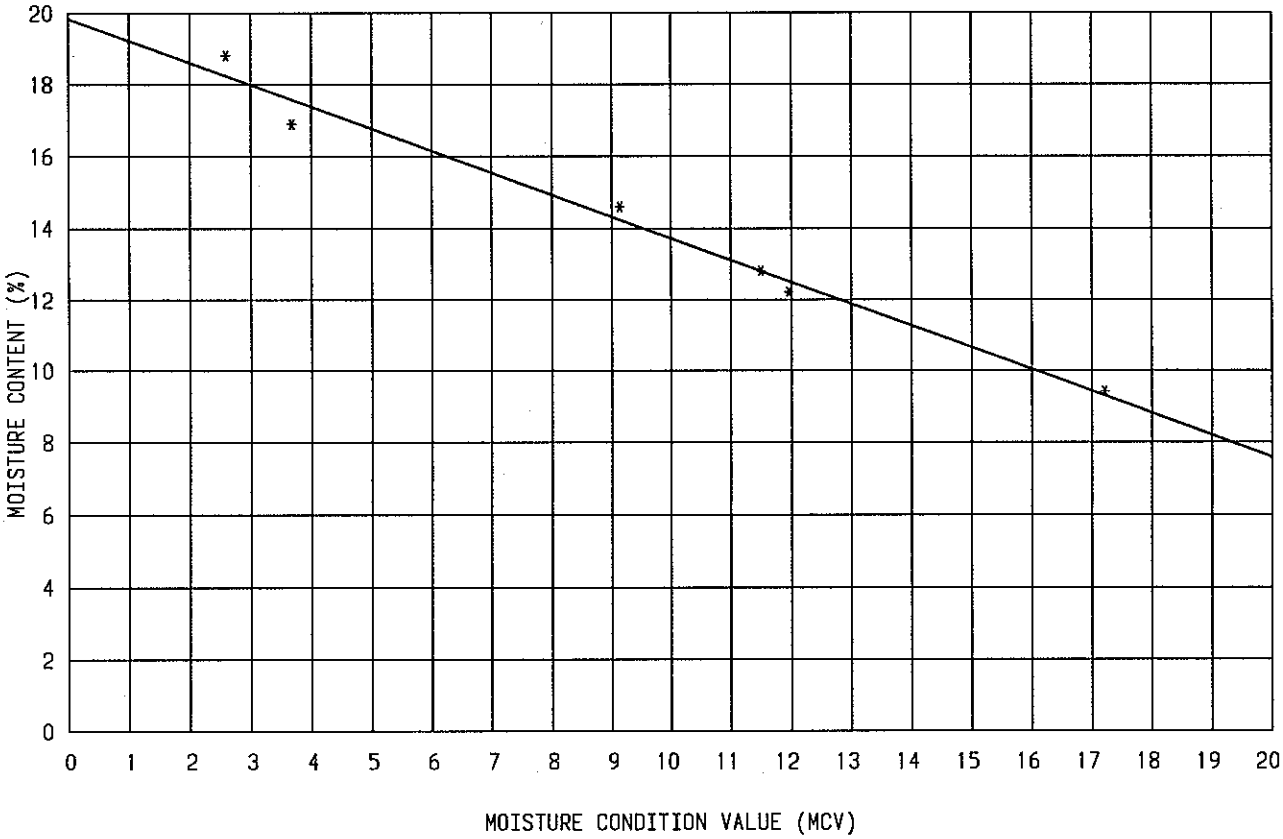
BS1377:1990:Part 4:Clause 5 (Page 1 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some mudstone with a little medium gravel.	Hole ID	TPP101
		Sample Type	Bulk.
		Depth	1.00 m

MOISTURE CONDITION VALUES & MOISTURE CONTENTS

TEST NUMBER	1	2	3	4	5	6
MOISTURE CONTENT (%)	12.8	14.6	16.9	18.8	9.4	12.2
MCV	11.5	9.1	3.7	2.6	17.2	12.0
HAND VANE VALUE (kPa)	TOO STIFF	63	20	13	TOO STIFF	TOO STIFF
DRY DENSITY (Mg/m3)	2.01	1.94	1.84	1.75	2.09	2.03

CALIBRATION LINE



CHARACTERISTICS OF CALIBRATION LINE

INTERCEPT	(extrapolation to Moisture Content axis)	19.8
SLOPE	(tan <between line and MCV axis)	-0.61
SENSITIVITY	(1/slope)	1.63
MATERIAL > 20.0 mm		0.2%

TEST REMARKS

NORWEST HOLST SOIL ENGINEERING LIMITED

MOISTURE CONDITION VALUE TEST RESULTS

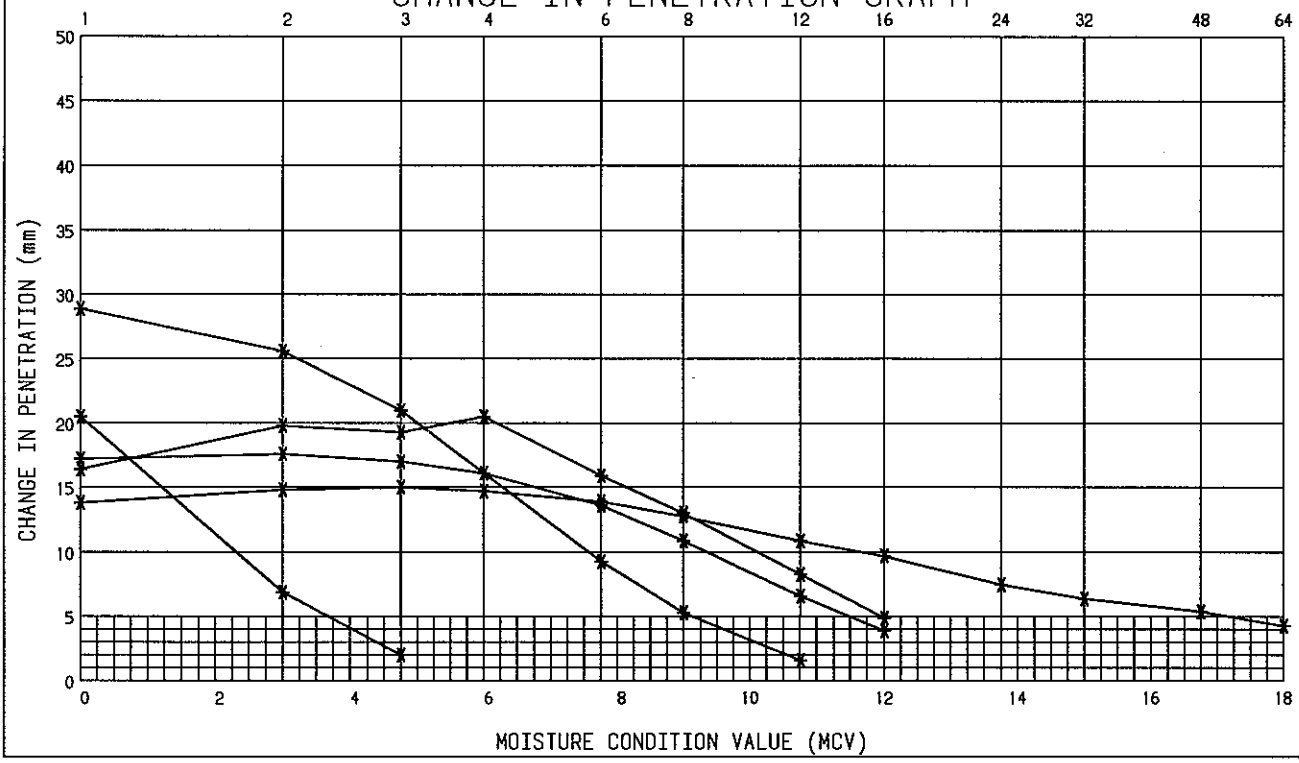
BS1377:1990:Part 4:Clause 5 (Page 2 of 2)

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some mudstone with a little medium gravel.	Hole ID	TPP101
		Sample Type	Bulk.
		Depth	1.00 m

PENETRATION MEASUREMENTS

TEST	1		2		3		4		5		6	
BLOWS	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration	Pene-tration	Change in Pene-tration
1	90.8	17.2	100.4	28.9	78.7	20.5	60.9	1.2	94.9	13.8	95.0	16.4
2	82.4	17.6	85.5	25.6	64.3	6.9	60.3	8.7	88.2	14.8	86.5	19.8
3	77.3	17.0	77.0	21.0	59.1	2.0	60.0	%9939.0	84.2	15.0	80.8	19.3
4	73.6	16.1	71.5	16.1	58.2		59.7	1.7	81.1	14.7	78.6	20.5
6	68.3	13.6	64.1	9.3	57.7				76.7	13.9	70.7	15.9
8	64.8	10.9	59.9	5.3	57.4				73.4	12.8	66.7	13.0
12	60.3	6.6	56.0	1.6	57.1				69.2	10.9	61.5	8.3
16	57.5	3.9	55.4						66.4	9.7	58.1	4.9
24	54.7		54.8						62.8	7.5	54.8	
32	53.9		54.6						60.6	6.4	53.7	
48	53.7		54.4						58.3	5.4	53.2	
64	53.6								56.7	4.3	53.2	
96									55.3			
128									54.2			
192									52.9			
256									52.4			

CHANGE IN PENETRATION GRAPH



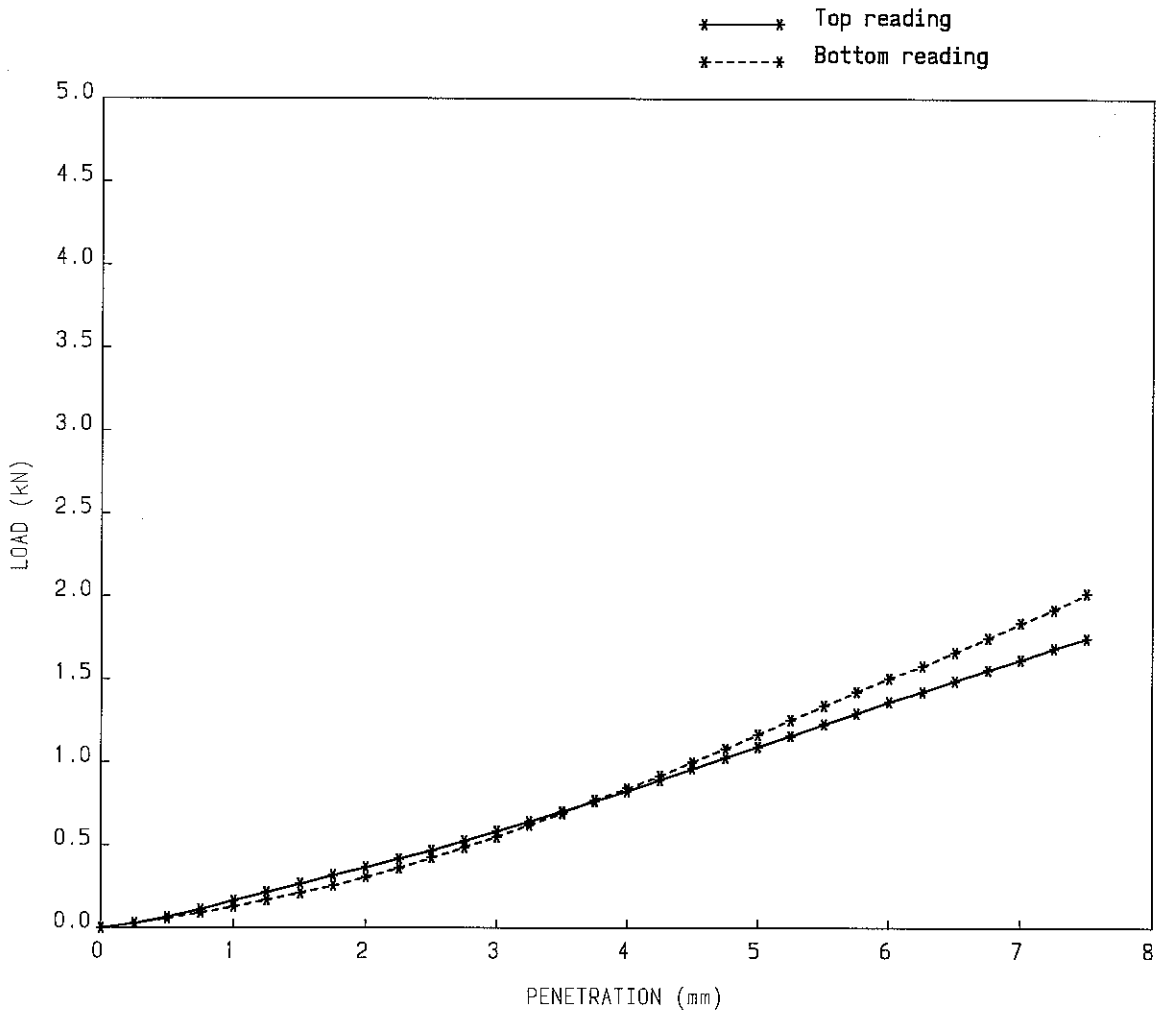
Q.A. Ref: /028-17/M4P101.MCV 2.01

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown sandy CLAY with some mudstone.	Hole ID	TPB100A
		Sample No	
		Depth	0.50 m



Seating Load	10N	Natural M/C	13%
Surcharge weight	15.1Kg		
Moisture Content @ Top	13%		
Moisture Content @ Middle	13%		
Moisture Content @ Bottom	13%		
Bulk Density	2.19 Mg/m3	Gravel >20.0mm	2.0%
Dry Density	1.94 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			5.5
2.5	0.47	13.2	3.6
5.0	1.1	20.0	5.5
BASE			5.8
2.5	0.42	13.2	3.2
5.0	1.2	20.0	5.8

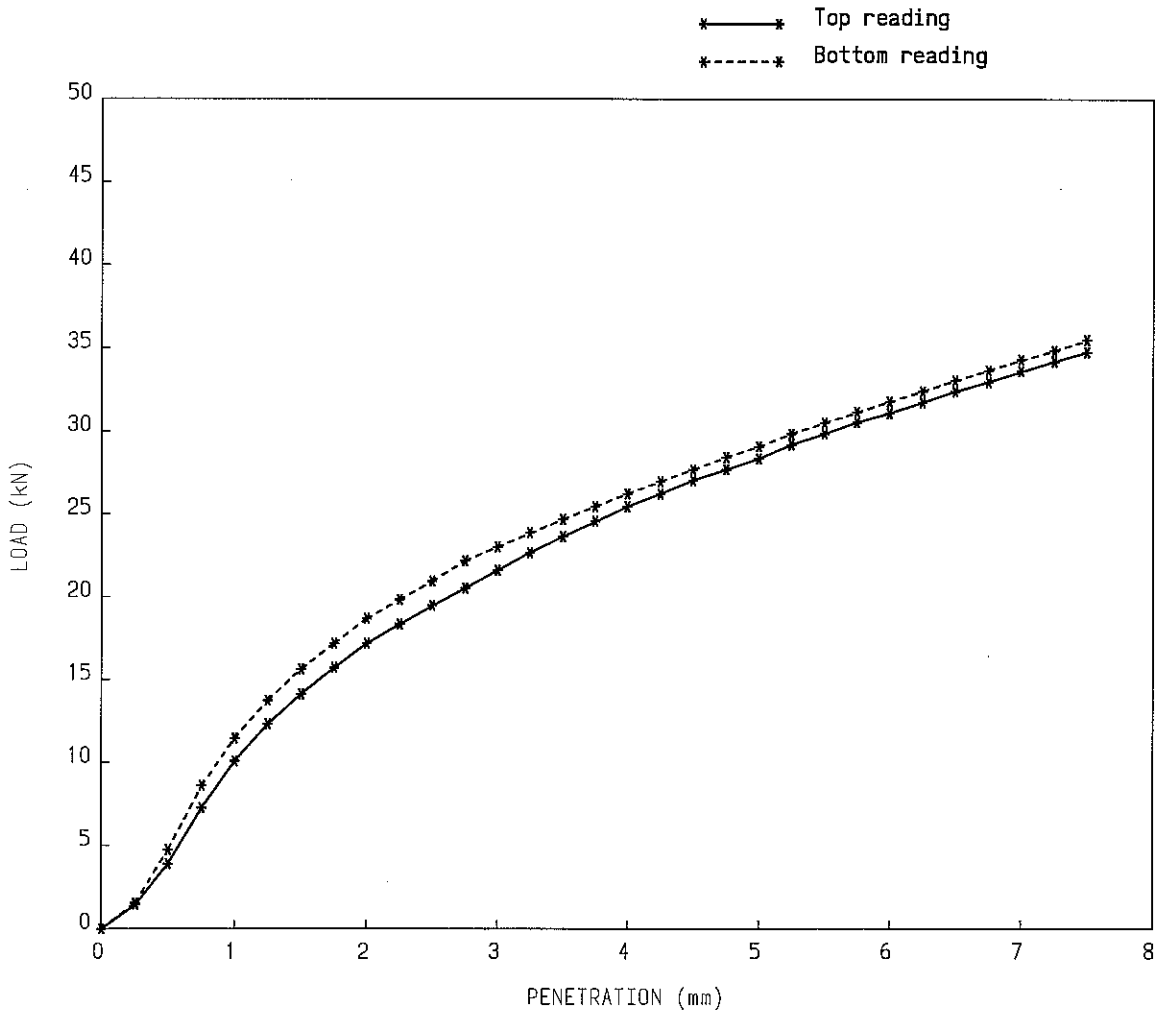
Q.A. Ref: /028-05/M4TB100A.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown sandy CLAY with some mudstone.	Hole ID	TPB100B
		Sample No	
		Depth	0.50 m



Seating Load	250N	Natural M/C	13%
Surcharge weight	15.1Kg		
Moisture Content @ Top	4.9%		
Moisture Content @ Middle	5.1%		
Moisture Content @ Bottom	5.0%		
Bulk Density	2.15 Mg/m3	Gravel >20.0mm	2.0%
Dry Density	2.05 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Too stiff for hand vane.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			148
2.5	19	13.2	148
5.0	28	20.0	142
BASE			159
2.5	21	13.2	159
5.0	29	20.0	145

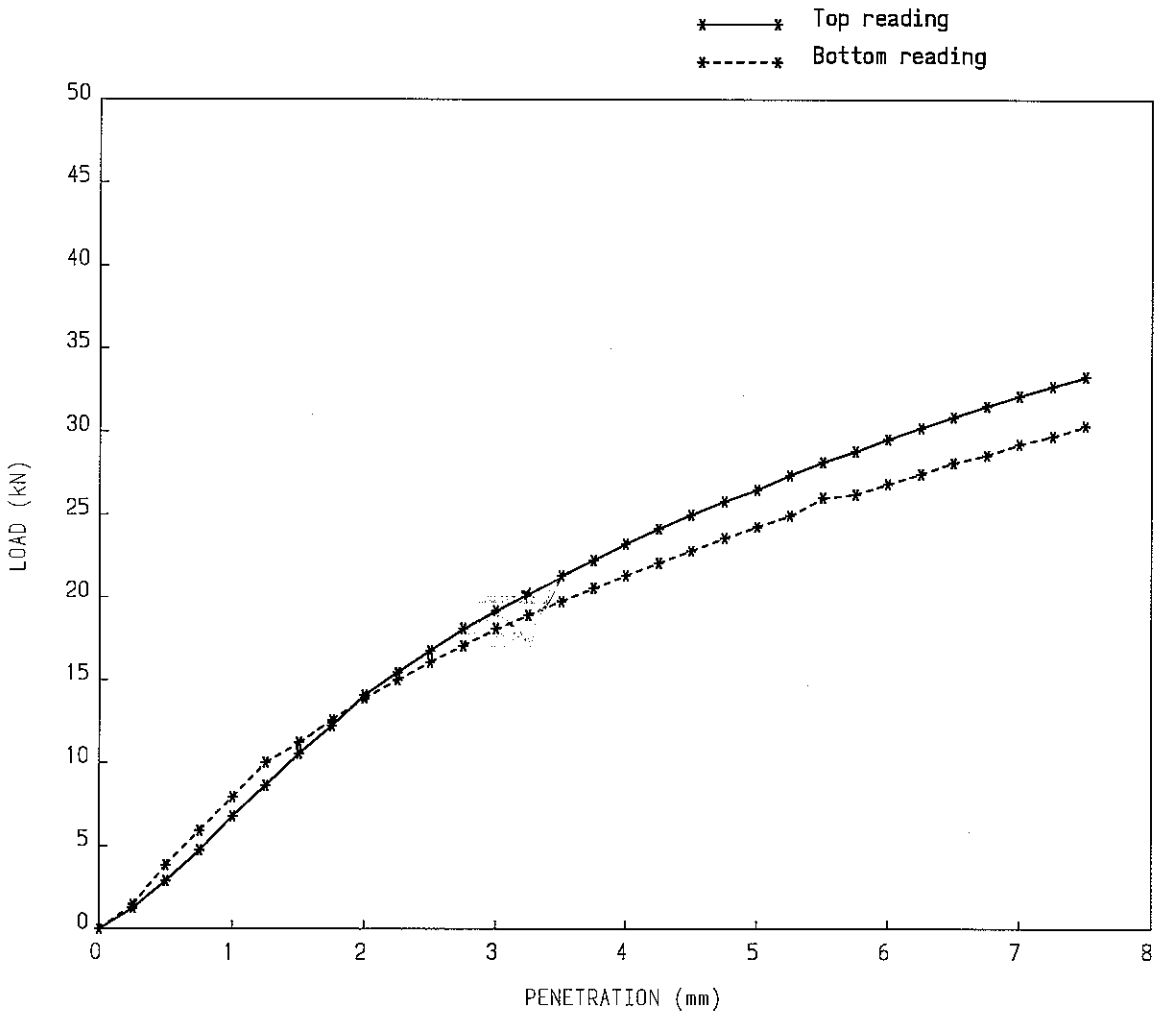
Q.A. Ref: /028-05/M4TB100B.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown sandy CLAY with some mudstone.	Hole ID	TPB100C
		Sample No	
		Depth	0.50 m



Seating Load	250N	Natural M/C	13%
Surcharge weight	15.2Kg		
Moisture Content @ Top	5.4%		
Moisture Content @ Bottom	5.5%		
Bulk Density	2.17 Mg/m3	Gravel >20.0mm	2.0%
Dry Density	2.06 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Too stiff for hand vane.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			133
2.5	17	13.2	127
5.0	27	20.0	133
BASE			122
2.5	16	13.2	122
5.0	24	20.0	121

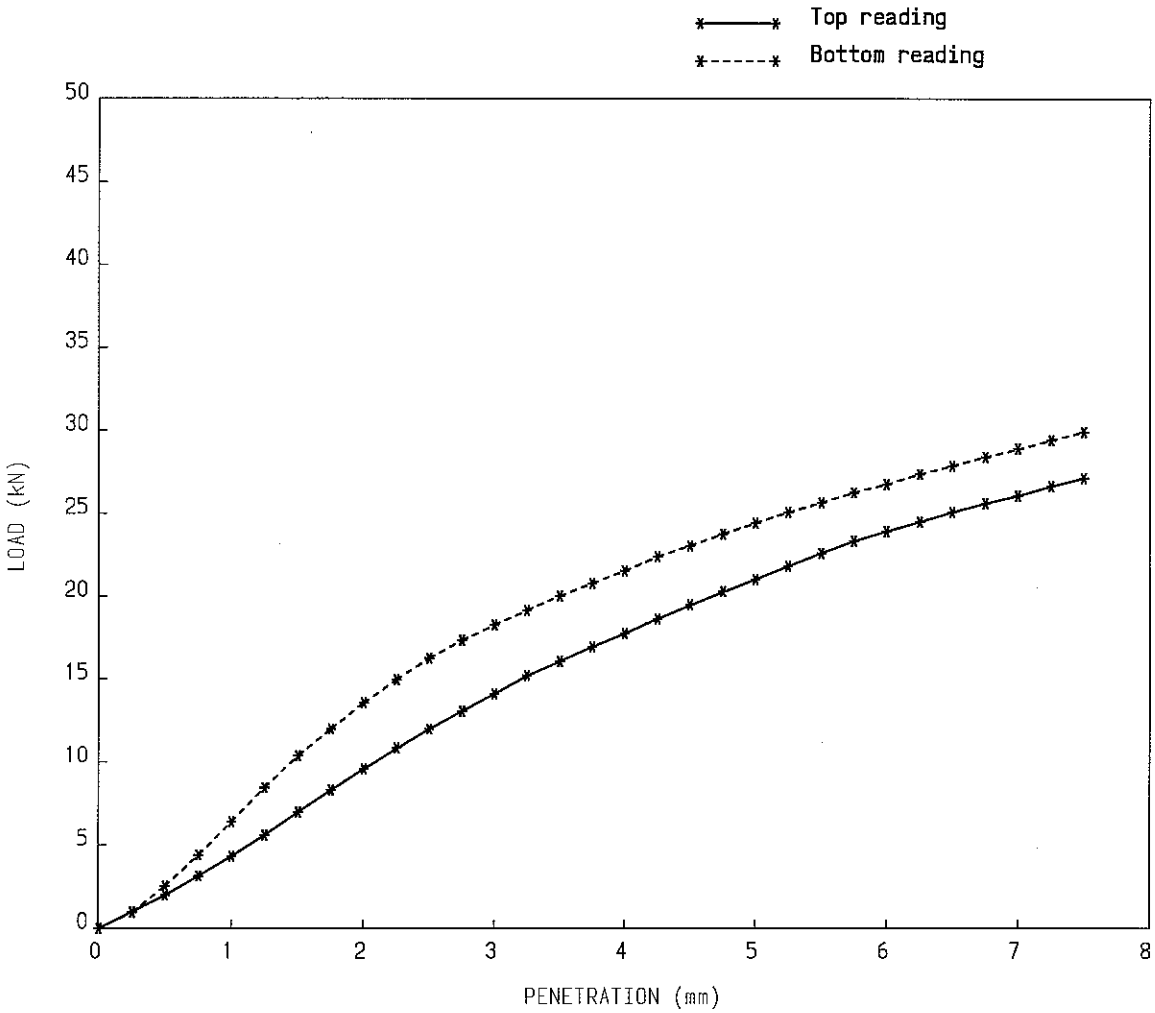
Q.A. Ref: /028-05/M4TB100C.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown sandy CLAY with some mudstone.	Hole ID	TPB100D
		Sample No	
		Depth	0.50 m



Seating Load	250N	Natural M/C	13%
Surcharge weight	15.1Kg		
Moisture Content @ Top	7.2%		
Moisture Content @ Middle	7.2%		
Moisture Content @ Bottom	7.2%		
Bulk Density	2.23 Mg/m3	Gravel >20.0mm	2.0%
Dry Density	2.08 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Too stiff for hand vane.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			105
2.5	12	13.2	91
5.0	21	20.0	105
BASE			123
2.5	16	13.2	123
5.0	24	20.0	122

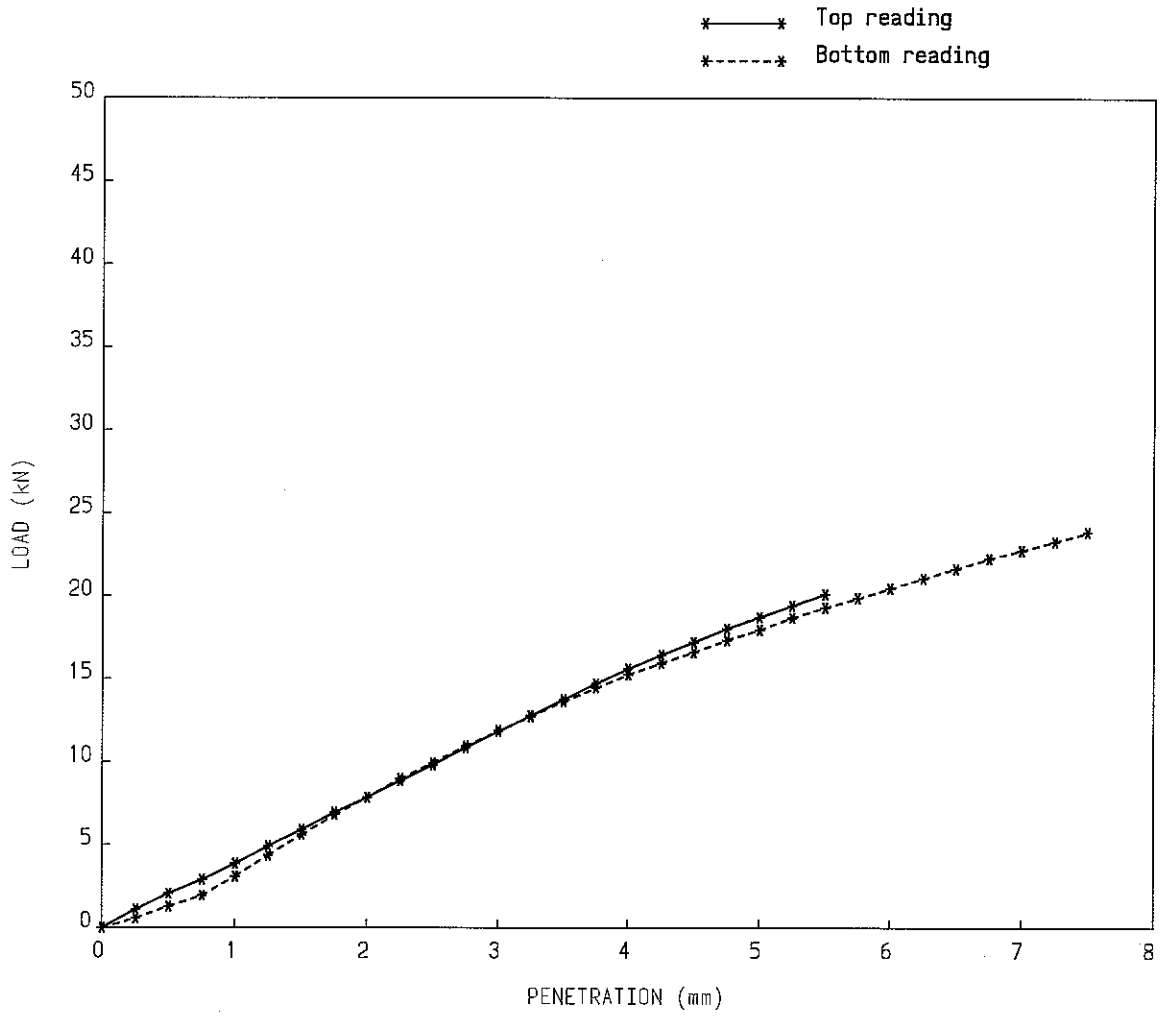
Q.A. Ref: /028-05/M4TB100D.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown sandy CLAY with some mudstone.	Hole ID	TPB100E
		Sample No	
		Depth	0.50 m



Seating Load	250N	Natural M/C	13%
Surcharge weight	15.1Kg		
Moisture Content @ Top	9.3%		
Moisture Content @ Middle	8.7%		
Moisture Content @ Bottom	8.3%		
Bulk Density	2.28 Mg/m3	Gravel >20.0mm	2.0%
Dry Density	2.09 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Top test stopped due to approaching ring limit.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			94
2.5	9.8	13.2	75
5.0	19	20.0	94
BASE			90
2.5	9.9	13.2	75
5.0	18	20.0	90

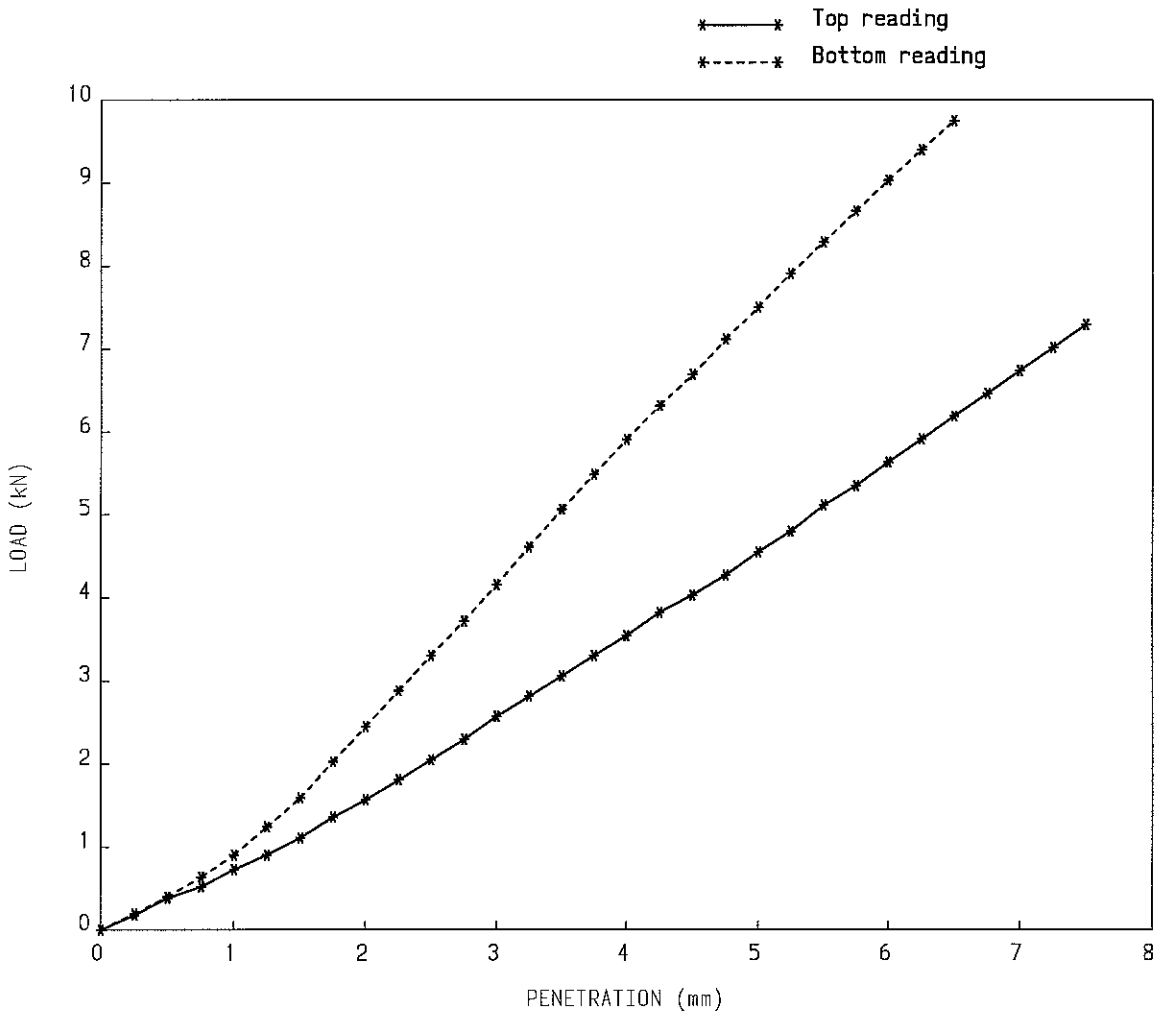
Q.A. Ref: /028-05/M4TB100E.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown sandy CLAY with some mudstone.	Hole ID	TPB100F
		Sample No	
		Depth	0.50 m



Seating Load	T250-B50N	Natural M/C	13%
Surcharge weight	15.1Kg		
Moisture Content @ Top	11%		
Moisture Content @ Middle	10%		
Moisture Content @ Bottom	9.9%		
Bulk Density	2.27 Mg/m3	Gravel >20.0mm	2.0%
Dry Density	2.05 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Test of top performed below calibrated range of load ring. Bottom test stopped due to approaching ring limit.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			23
2.5	2.1	13.2	16
5.0	4.6	20.0	23
BASE			38
2.5	3.3	13.2	25
5.0	7.5	20.0	38

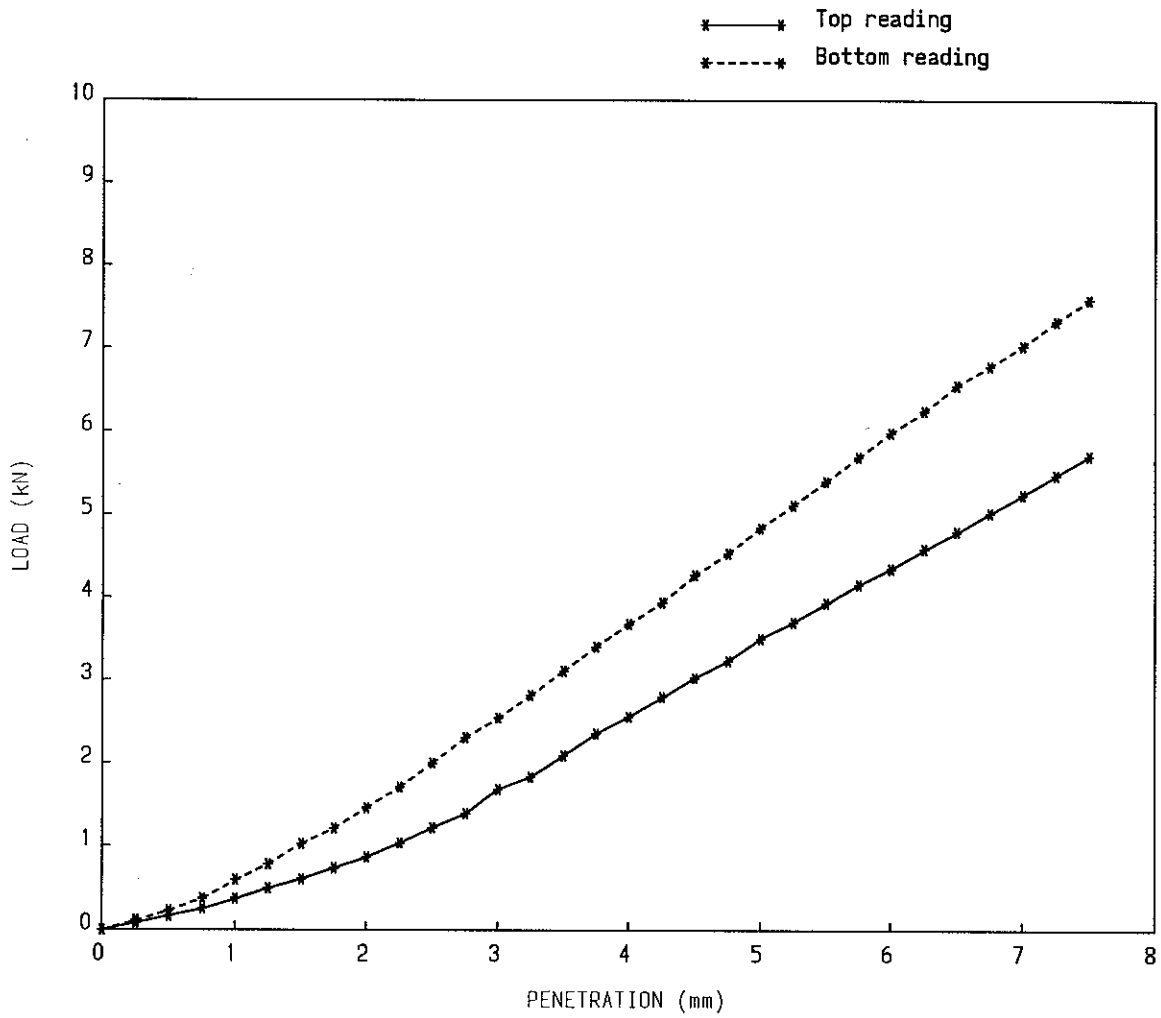
Q.A. Ref: /028-05/M4TB100F.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown slightly clayey SAND with some siltstone.	Hole ID	TPB100
		Sample No	1
		Depth	2.50 m



Seating Load	50N	Natural M/C	11%
Surcharge weight	4.2kg		
Moisture Content @ Top	12%		
Moisture Content @ Bottom	11%		
Bulk Density	2.23 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.01 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Undisturbed.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			18
2.5	1.2	13.2	9.2
5.0	3.5	20.0	18
BASE			24
2.5	2.0	13.2	15
5.0	4.8	20.0	24

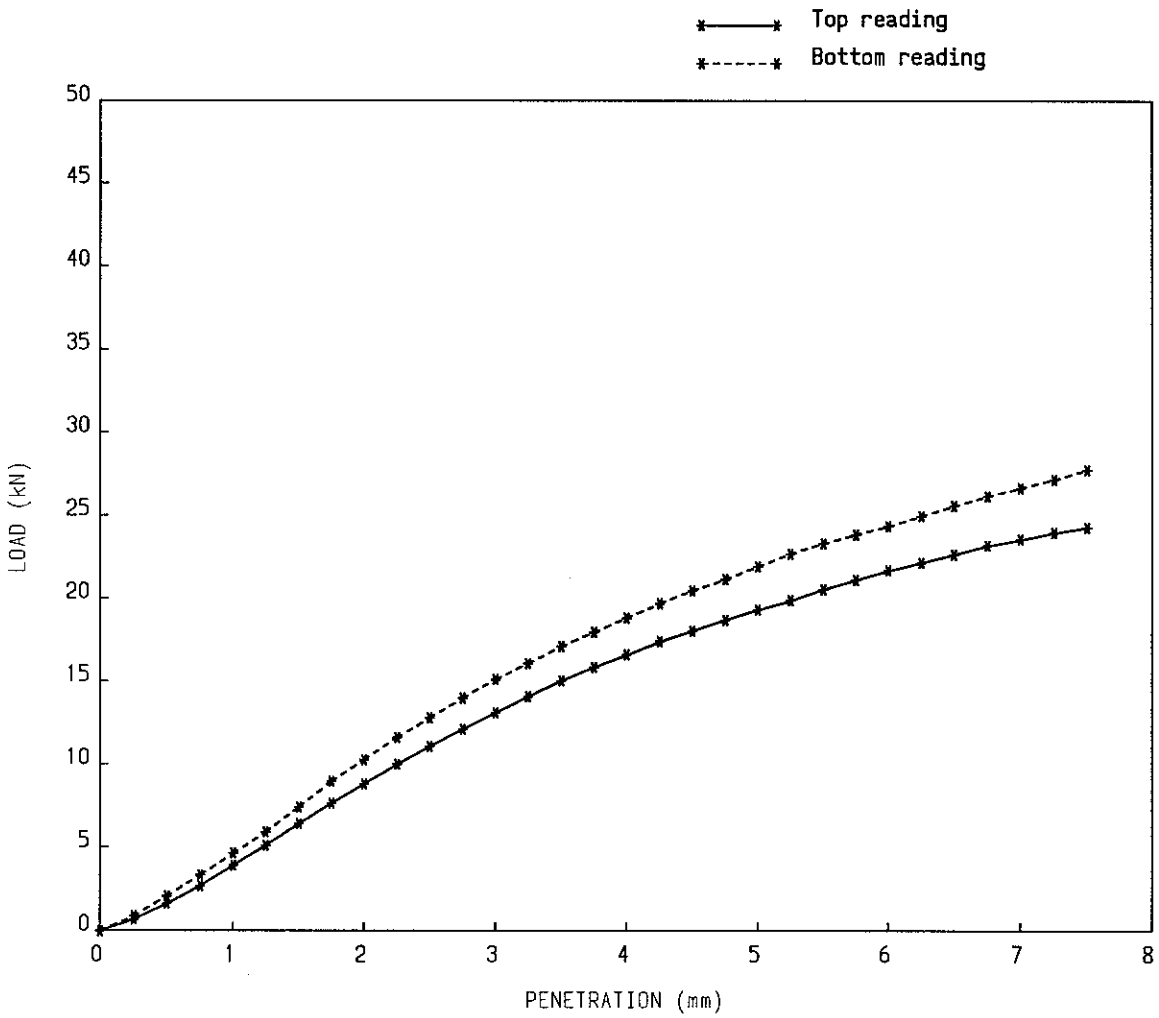
Q.A. Ref: /028-17/M4B13.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown slightly clayey SAND with some siltstone.	Hole ID	TPB100
		Sample No	2
		Depth	2.50 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.1kg		
Moisture Content @ Top	7.0%		
Moisture Content @ Middle	6.8%		
Moisture Content @ Bottom	6.7%		
Bulk Density	2.23 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.09 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Undisturbed.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			97
2.5	11	13.2	84
5.0	19	20.0	97
BASE			110
2.5	13	13.2	97
5.0	22	20.0	110

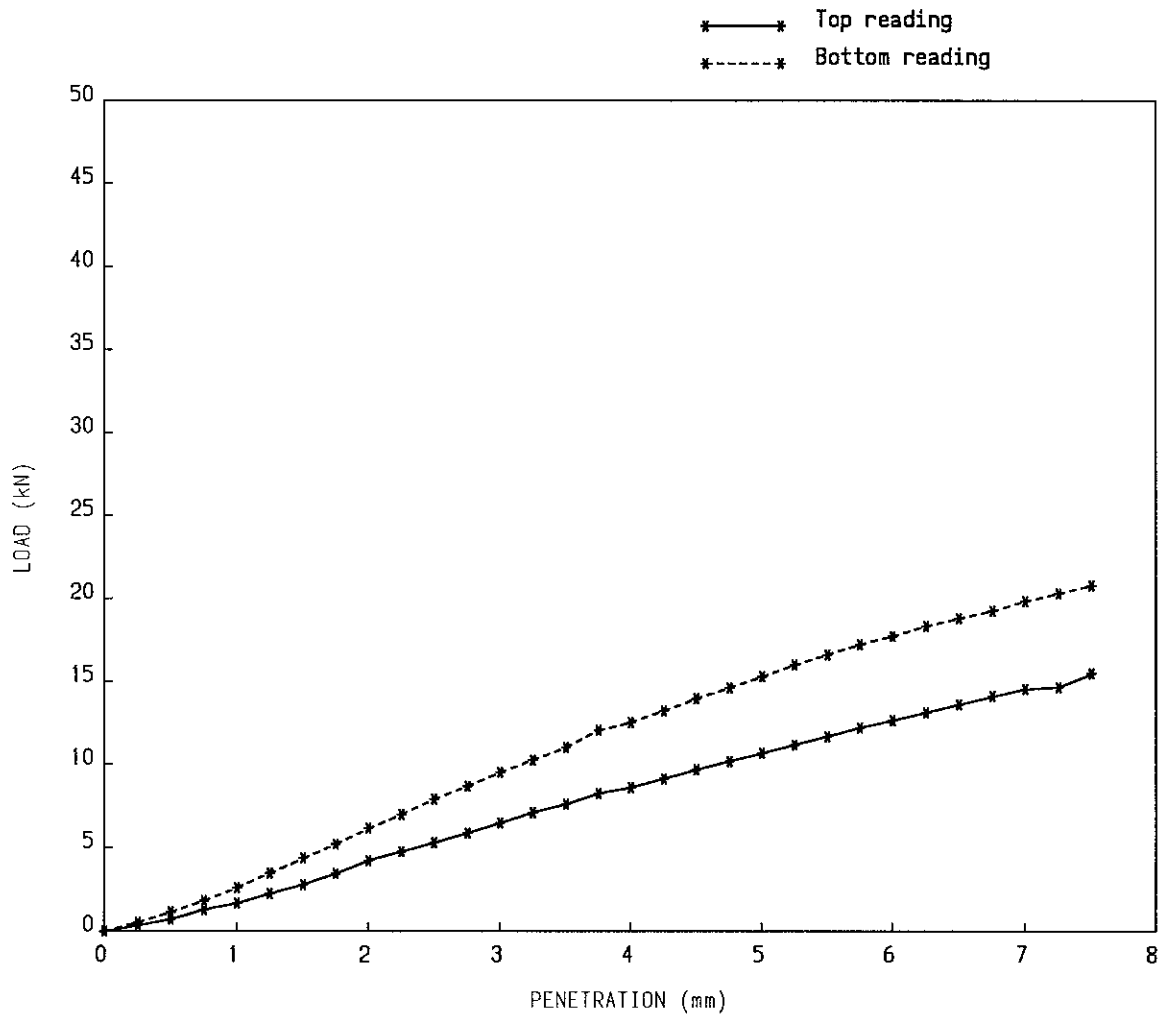
Q.A. Ref: /028-17/M4B12.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown slightly clayey SAND with some siltstone.	Hole ID	TPB100
		Sample No	3
		Depth	2.50 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.1kg		
Moisture Content @ Top	9.6%		
Moisture Content @ Middle	9.1%		
Moisture Content @ Bottom	8.7%		
Bulk Density	2.28 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.09 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Undisturbed.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			53
2.5	5.3	13.2	40
5.0	11	20.0	53
BASE			77
2.5	7.9	13.2	60
5.0	15	20.0	77

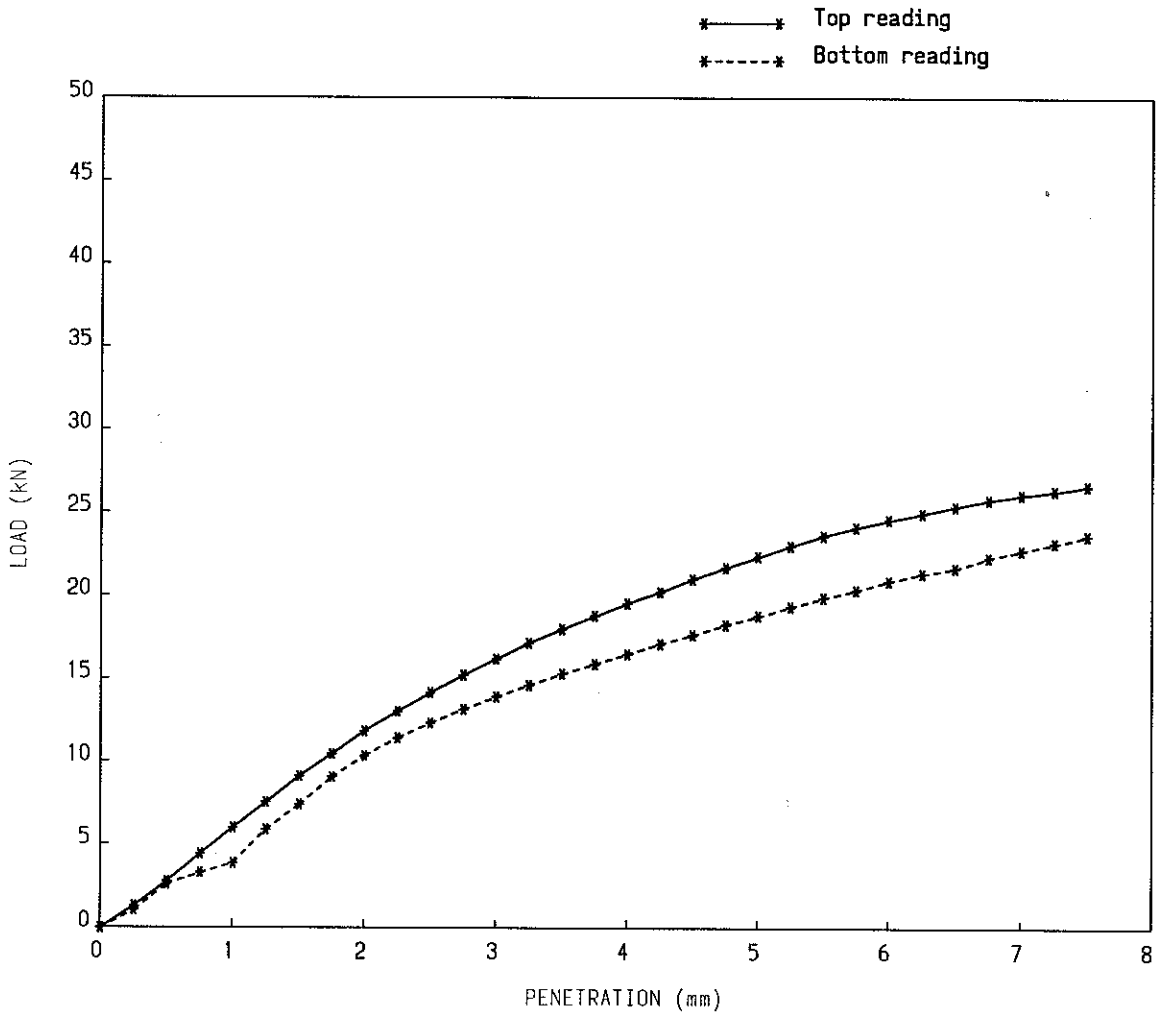
Q.A. Ref: /028-17/M4B13.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown slightly clayey SAND with some siltstone.	Hole ID	TPB100
		Sample No	4
		Depth	2.50 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.1kg		
Moisture Content @ Top	6.0%		
Moisture Content @ Middle	6.2%		
Moisture Content @ Bottom	6.1%		
Bulk Density	2.20 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.07 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Undisturbed.
Compaction type : Rammer compaction with 4.5kg effort
Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			112
2.5	14	13.2	107
5.0	22	20.0	112
BASE			94
2.5	12	13.2	94
5.0	19	20.0	94

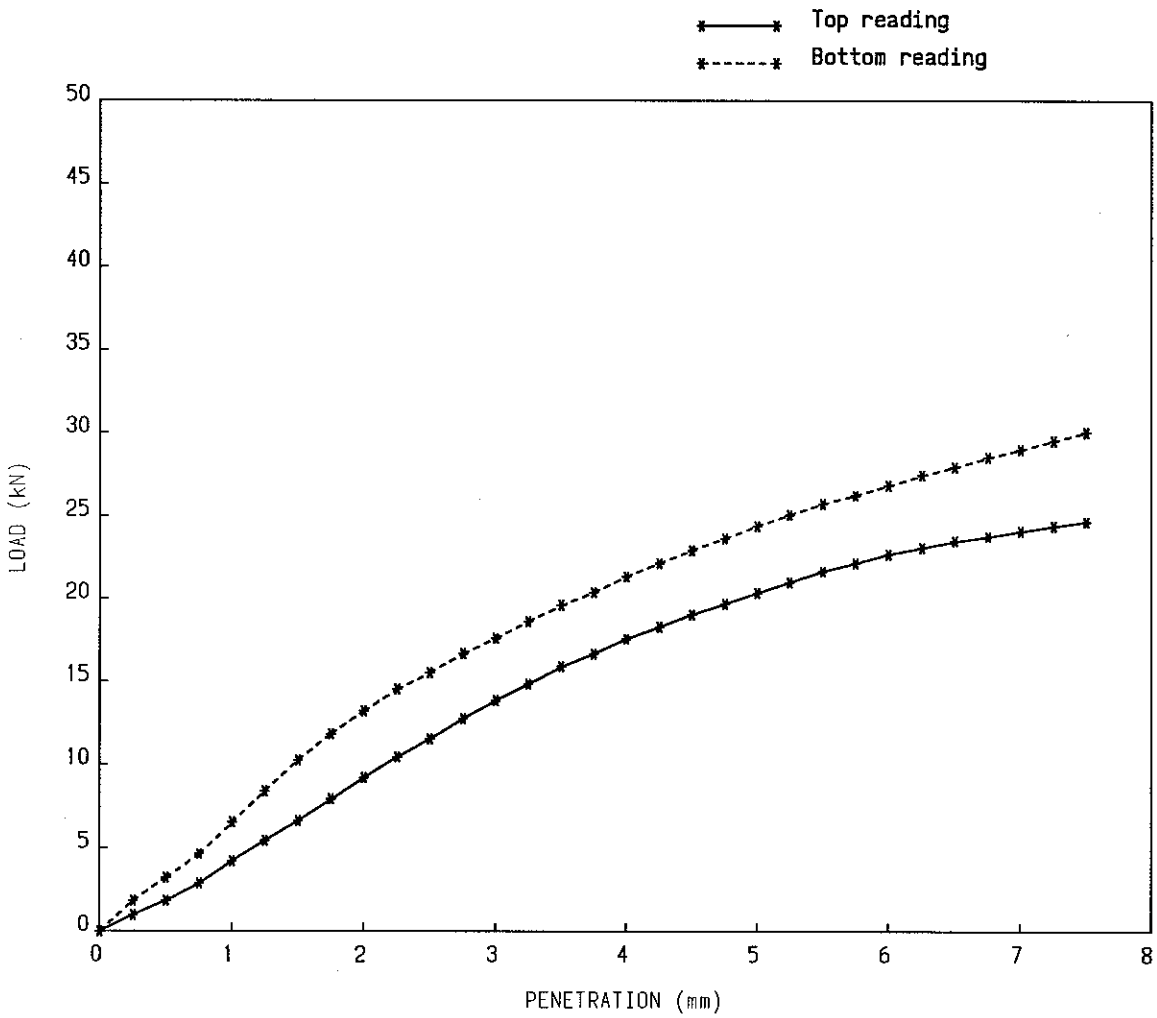
Q.A. Ref: /028-17/M4B14.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Purplish brown slightly clayey SAND with some siltstone.	Hole ID	TPB100
		Sample No	5
		Depth	2.50 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.1kg		
Moisture Content @ Top	7.7%		
Moisture Content @ Bottom	7.6%		
Bulk Density	2.26 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.10 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Undisturbed.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			102
2.5	12	13.2	87
5.0	20	20.0	102
BASE			122
2.5	16	13.2	118
5.0	24	20.0	122

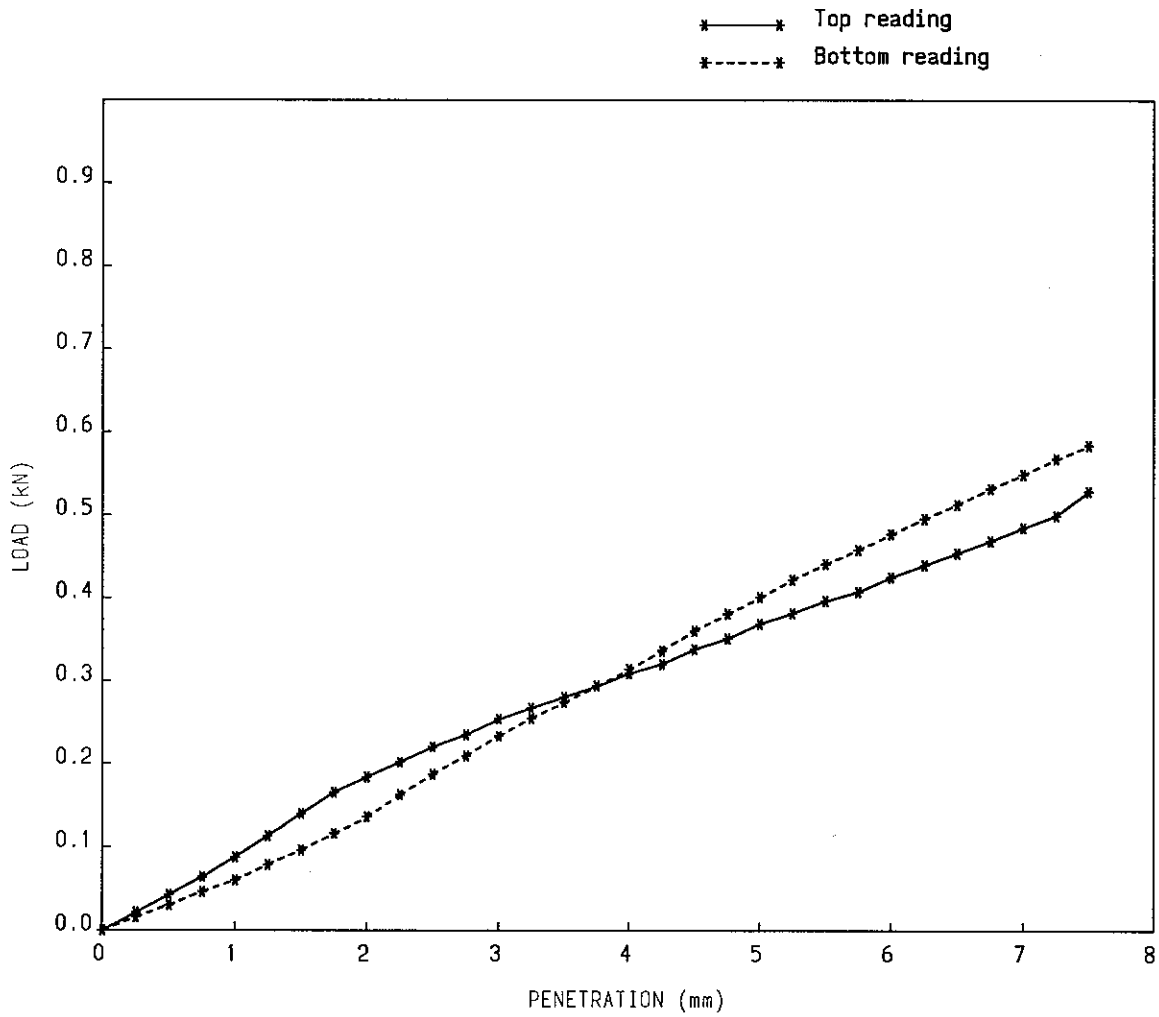
Q.A. Ref: /028-17/M4B15.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown clayey SAND with much gravel, some cobbles and mudstone.	Hole ID	TPB101
		Sample No	1
		Depth	1.00 m



Seating Load	10N	Natural M/C	14%
Surcharge weight	15.2kg		
Moisture Content @ Top	16%		
Moisture Content @ Bottom	16%		
Bulk Density	2.12 Mg/m3	Gravel >20.0mm	20.5%
Dry Density	1.83 Mg/m3	Gravel >37.5mm	11.0%

Type of specimen : Bulk.
Compaction type : Rammer compaction with 4.5kg effort
Remarks : Not to British Standard. Material mass retained on 37.5mm sieve greater than 10% (11%). Hence test completed after removing gravel >20mm.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			1.8
2.5	0.22	13.2	1.7
5.0	0.37	20.0	1.8
BASE			2.0
2.5	0.19	13.2	1.4
5.0	0.40	20.0	2.0

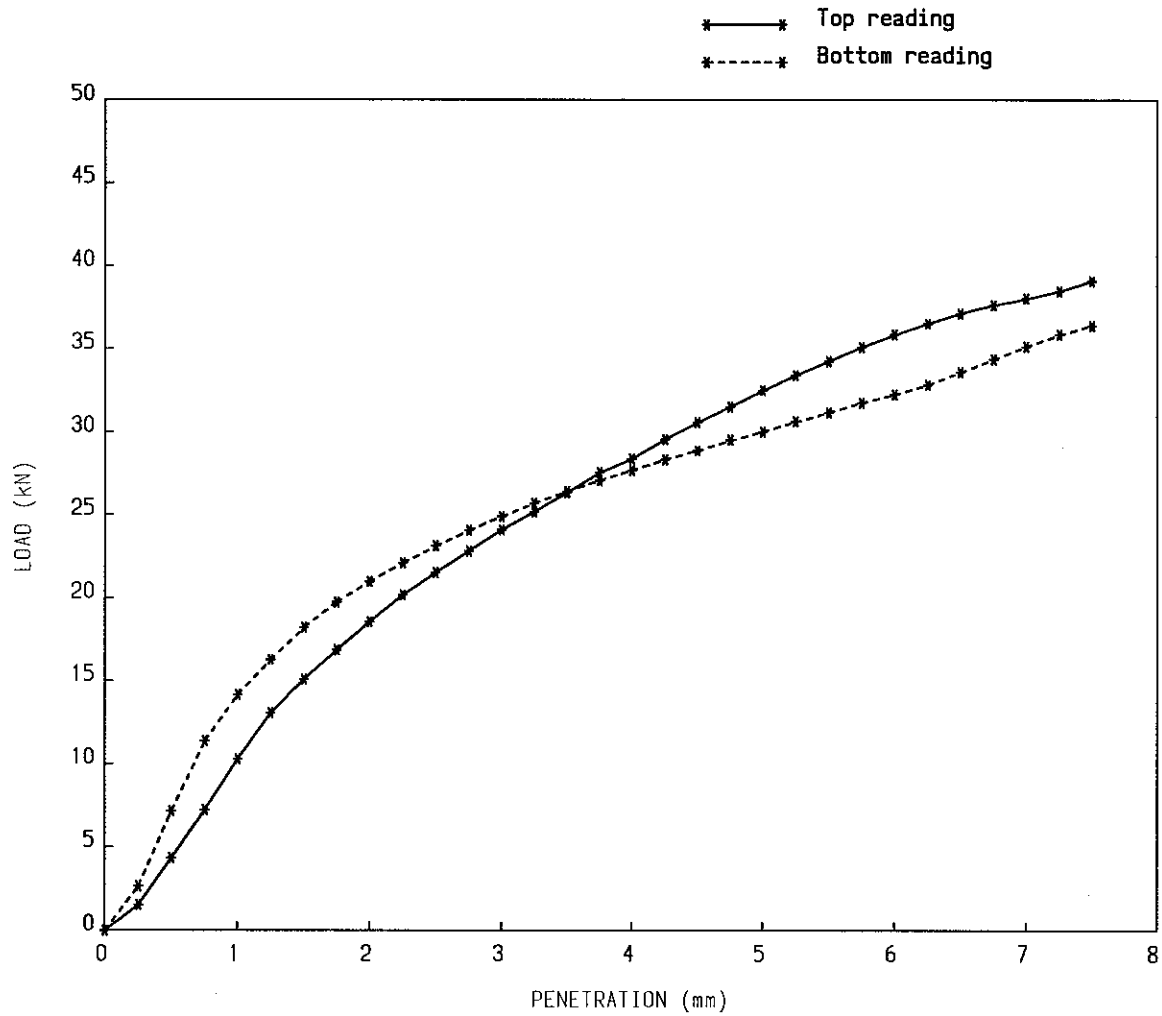
Q.A. Ref: /028-18/M4TB1011.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown clayey SAND with much gravel, some cobbles and mudstone.	Hole ID	TPB101
		Sample No	2
		Depth	1.00 m



Seating Load	250N	Natural M/C	14%
Surcharge weight	15.0kg		
Moisture Content @ Top	5.3%		
Moisture Content @ Bottom	5.4%		
Bulk Density	2.16 Mg/m3	Gravel >20.0mm	20.5%
Dry Density	2.05 Mg/m3	Gravel >37.5mm	11.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Not to British Standard. Material mass retained on 37.5mm sieve greater than 10% (11%). Hence test completed after removing gravel >20mm.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			163
2.5	22	13.2	163
5.0	33	20.0	163
BASE			175
2.5	23	13.2	175
5.0	30	20.0	150

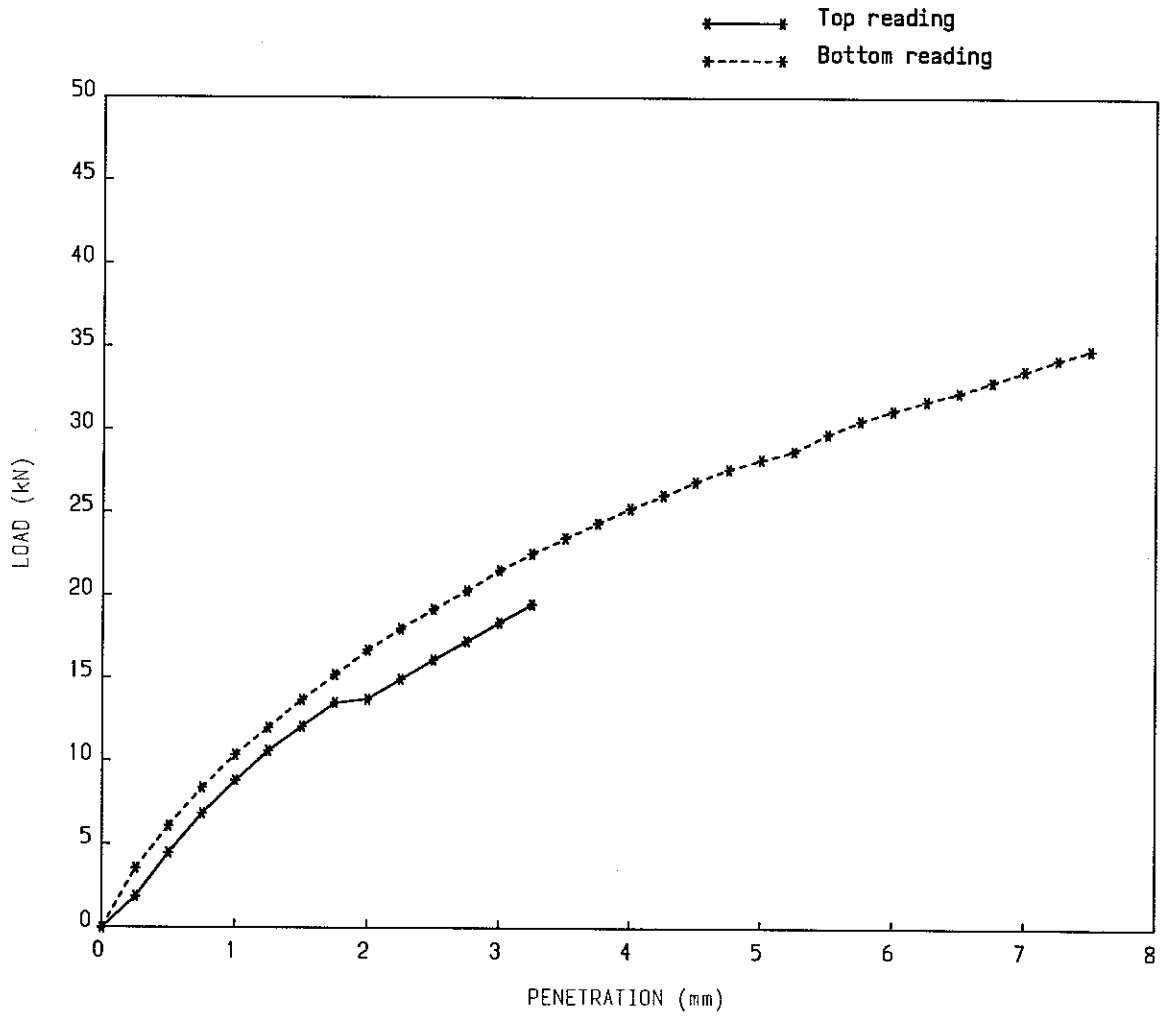
Q.A. Ref: /028-18/M4TB1012.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown clayey SAND with much gravel, some cobbles and mudstone.	Hole ID	TPB101
		Sample No	3
		Depth	1.00 m



Seating Load	250N	Natural M/C	14%
Surcharge weight	15.4kg		
Moisture Content @ Top	6.8%		
Moisture Content @ Middle	6.7%		
Moisture Content @ Bottom	6.7%		
Bulk Density	2.23 Mg/m3	Gravel >20.0mm	20.5%
Dry Density	2.09 Mg/m3	Gravel >37.5mm	11.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Not to British Standard. Material mass retained on 37.5mm sieve greater than 10% (11%). Hence test completed after removing gravel >20mm.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			122
2.5	16	13.2	122
5.0	0.37	20.0	1.8
BASE			145
2.5	19	13.2	145
5.0	28	20.0	141

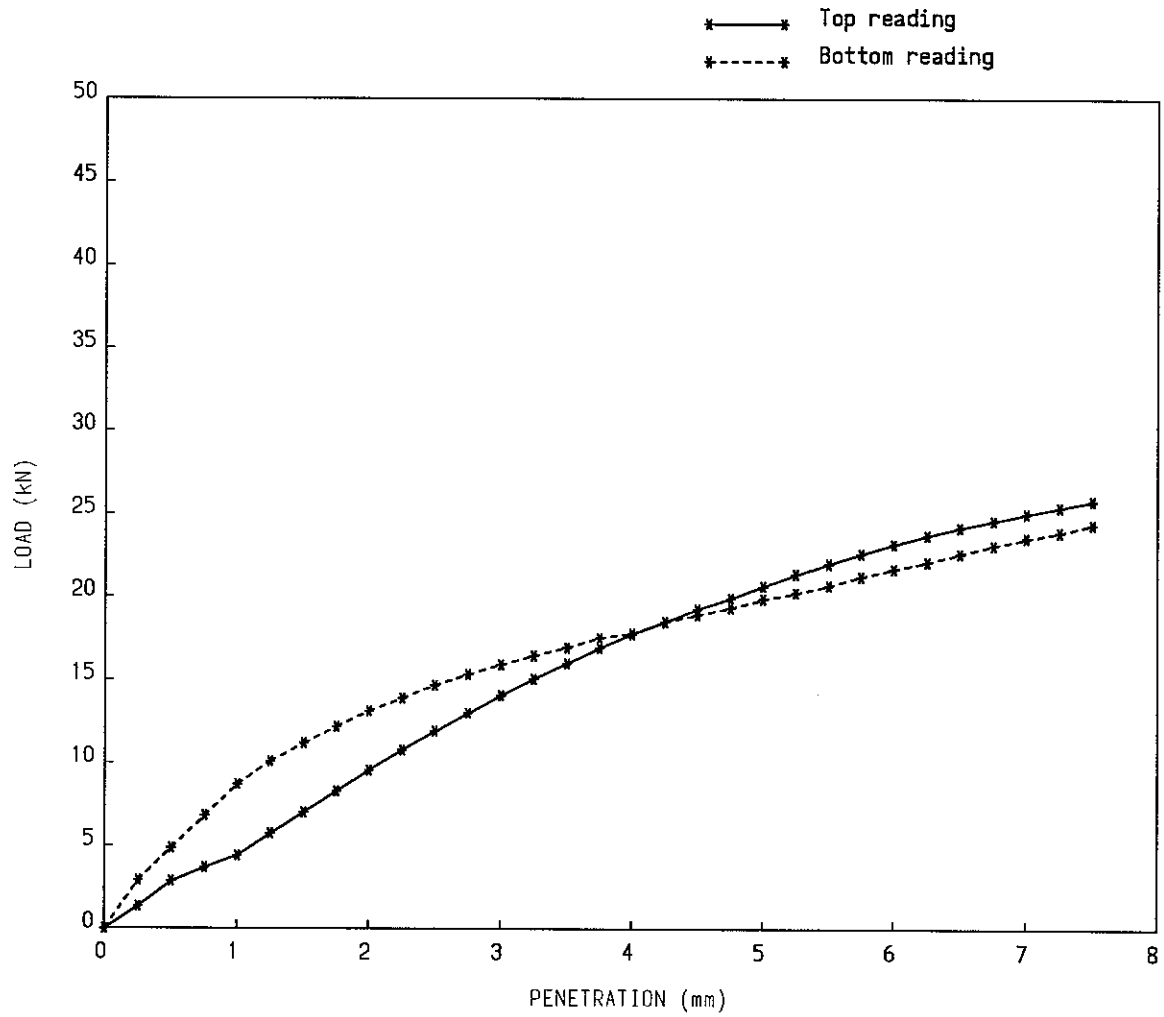
Q.A. Ref: /028-18/M4TB1013.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown clayey SAND with much gravel, some cobbles and mudstone.	Hole ID	TPB101
		Sample No	4
		Depth	1.00 m



Seating Load	250N	Natural M/C	14%
Surcharge weight	15.2kg		
Moisture Content @ Top	8.5%		
Moisture Content @ Bottom	7.9%		
Bulk Density	2.29 Mg/m3	Gravel >20.0mm	20.5%
Dry Density	2.11 Mg/m3	Gravel >37.5mm	11.0%

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			103
2.5	12	13.2	90
5.0	21	20.0	103
BASE			111
2.5	15	13.2	111
5.0	20	20.0	99

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Not to British Standard. Material mass retained on 37.5mm sieve greater than 10% (11%). Hence test completed after removing gravel >20mm.

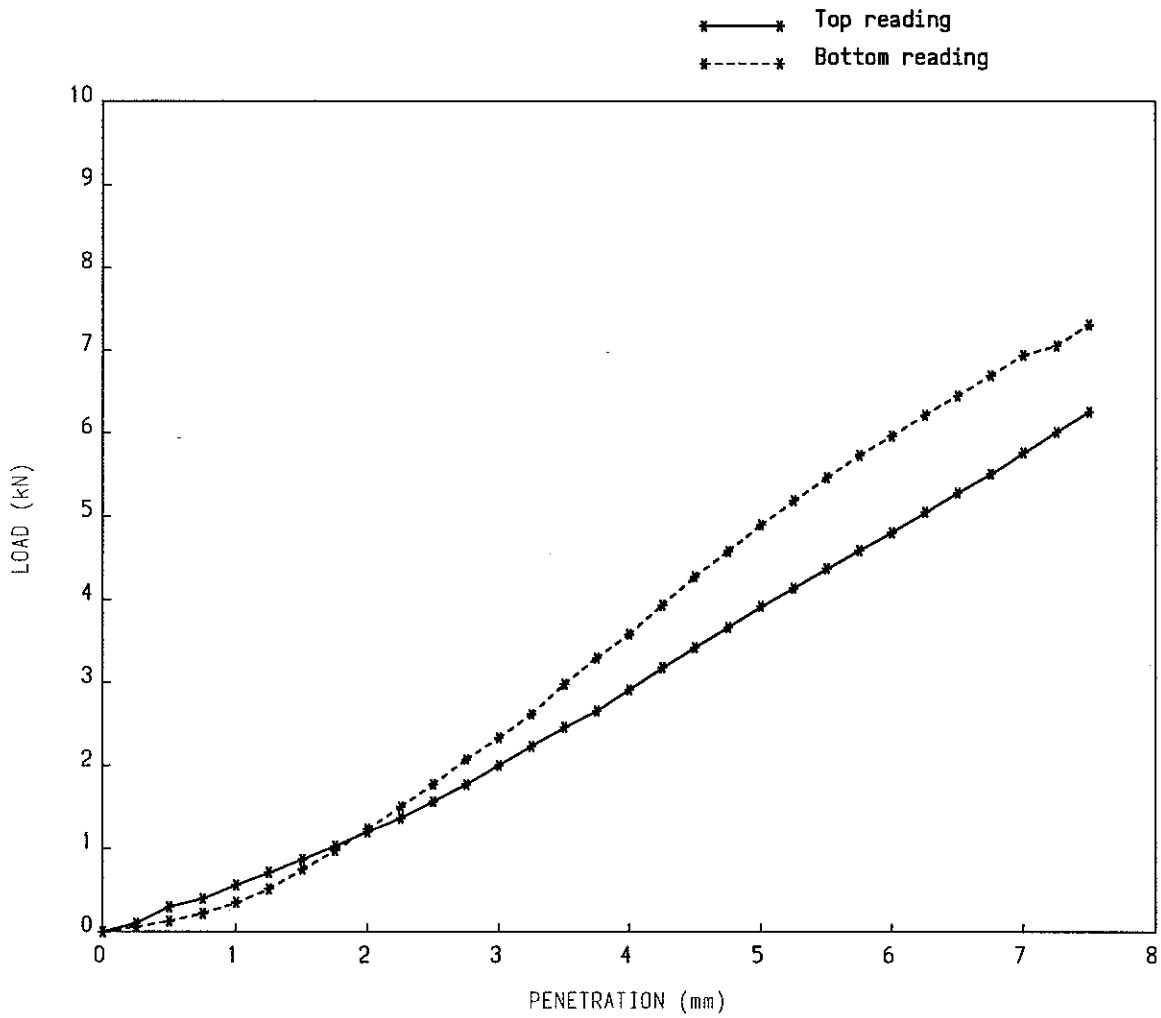
Q.A. Ref: /028-18/M4TB1014.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown clayey SAND with much gravel, some cobbles and mudstone.	Hole ID	TPB101
		Sample No	5
		Depth	1.00 m



Seating Load	50N	Natural M/C	14%
Surcharge weight	15.0kg		
Moisture Content @ Top	10%		
Moisture Content @ Bottom	11%		
Bulk Density	2.29 Mg/m3	Gravel >20.0mm	20.5%
Dry Density	2.07 Mg/m3	Gravel >37.5mm	11.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Not to British Standard. Material mass retained on 37.5mm sieve greater than 10% (11%). Hence test completed after removing gravel >20mm.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			20
2.5	1.6	13.2	12
5.0	3.9	20.0	20
BASE			25
2.5	1.8	13.2	13
5.0	4.9	20.0	25

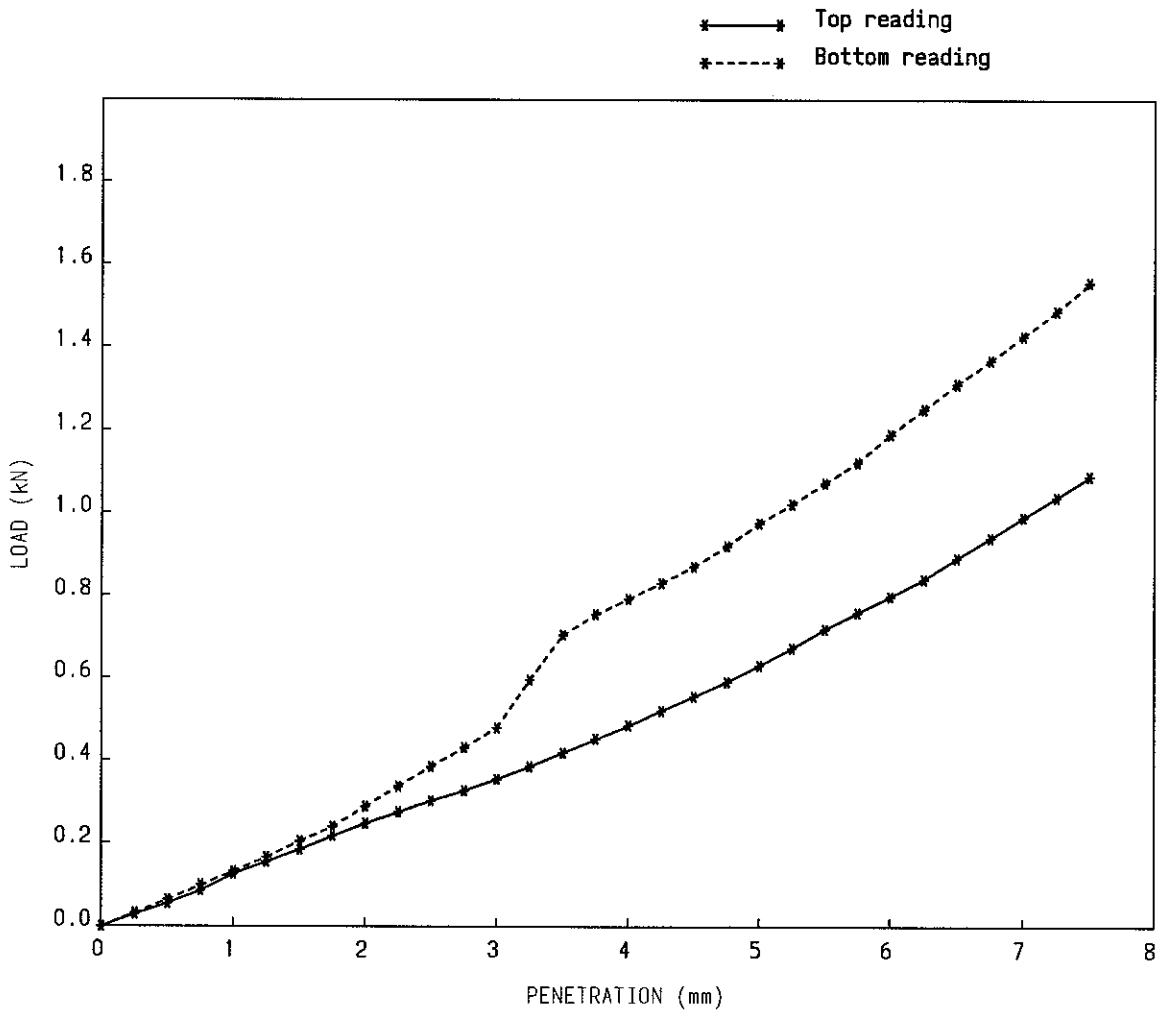
Q.A. Ref: /028-18/M4TB1015.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown clayey SAND with much gravel, some cobbles and mudstone.	Hole ID	TPB101
		Sample No	6
		Depth	1.00 m



Seating Load	10N	Natural M/C	14%
Surcharge weight	15.0kg		
Moisture Content @ Top	13%		
Moisture Content @ Bottom	13%		
Bulk Density	2.21 Mg/m3	Gravel >20.0mm	20.5%
Dry Density	1.96 Mg/m3	Gravel >37.5mm	11.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Not to British Standard. Material mass retained on 37.5mm sieve greater than 10% (11%). Hence test completed after removing gravel >20mm.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			3.1
2.5	0.30	13.2	2.3
5.0	0.63	20.0	3.1
BASE			4.9
2.5	0.39	13.2	2.9
5.0	0.98	20.0	4.9

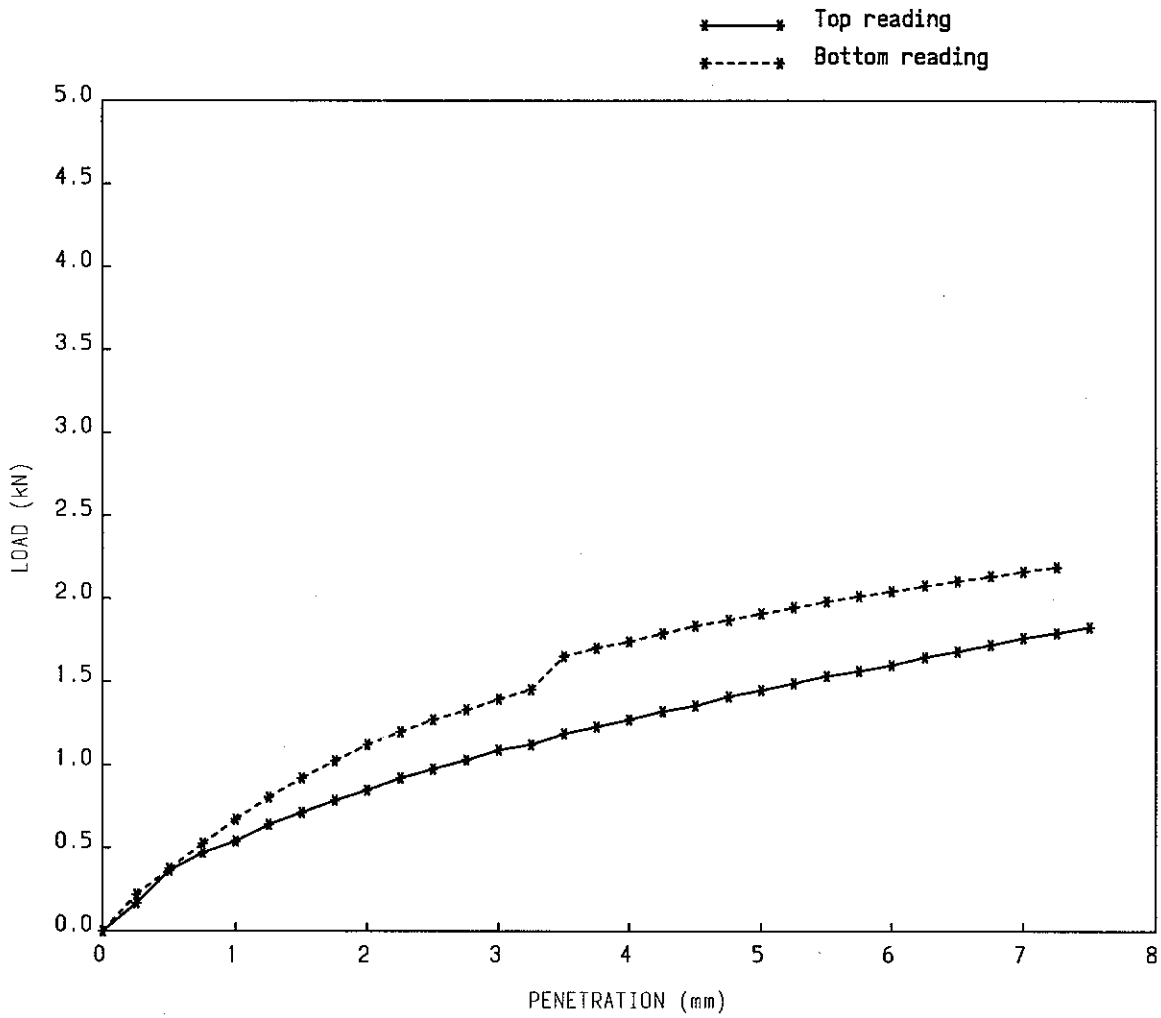
Q.A. Ref: /028-18/m4tb1016.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel and cobbles.	Hole ID	TPB102
		Sample No	1
		Depth	1.00 m



Seating Load	10N	Natural M/C	16%
Surcharge weight	15.1kg		
Moisture Content @ Top	16%		
Moisture Content @ Middle	15%		
Moisture Content @ Bottom	15%		
Bulk Density	2.20 Mg/m3	Gravel >20.0mm	4.4%
Dry Density	1.91 Mg/m3	Gravel >37.5mm	2.5%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			7.4
2.5	0.98	13.2	7.4
5.0	1.4	20.0	7.2
BASE			9.6
2.5	1.3	13.2	9.6
5.0	1.9	20.0	9.6

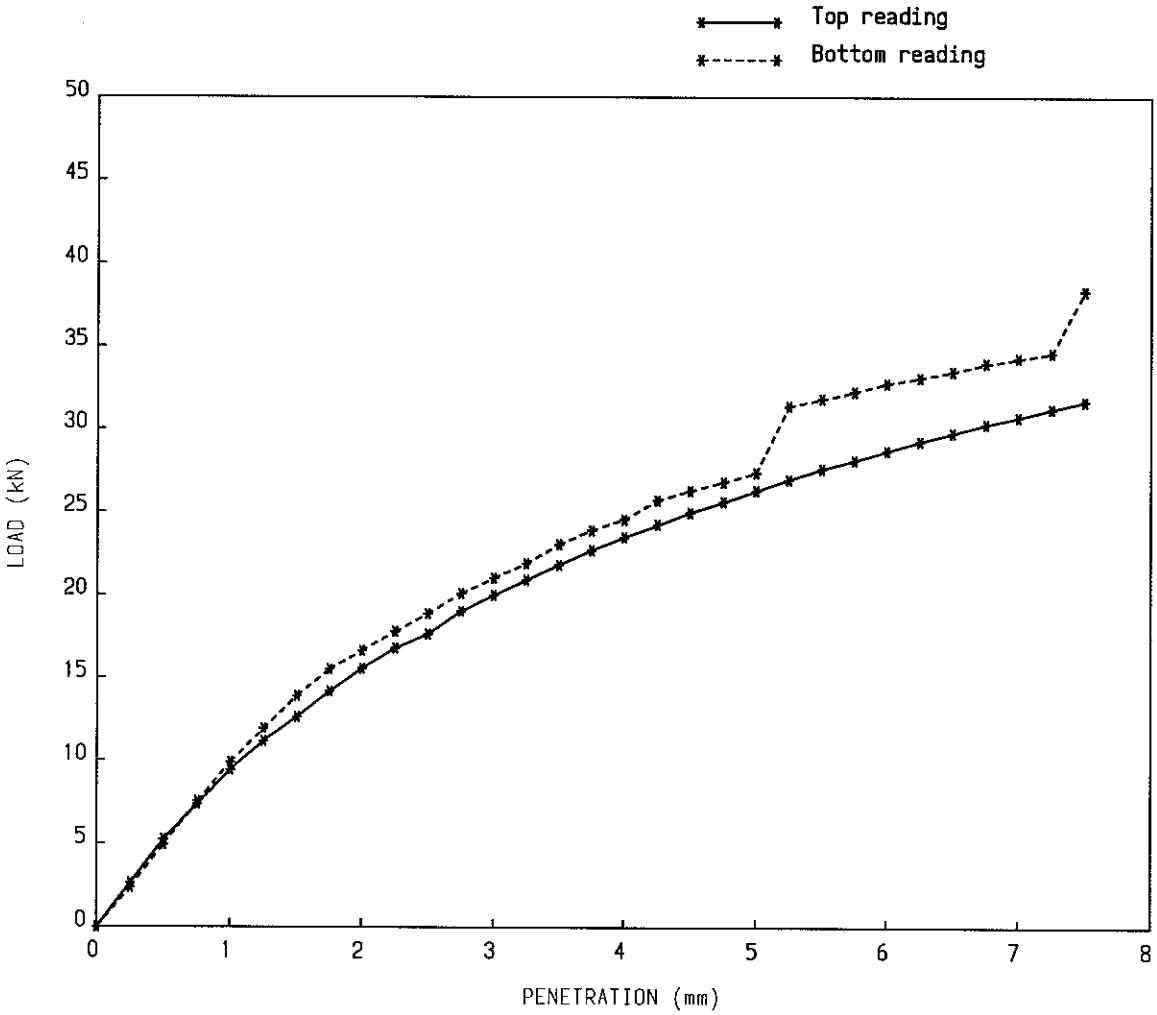
Q.A. Ref: /028-17/M4PB1021.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel and cobbles.	Hole ID	TPB102
		Sample No	2
		Depth	1.00 m



Seating Load	250N	Natural M/C	16%
Surcharge weight	15.2kg		
Moisture Content @ Top	6.7%		
Moisture Content @ Middle	6.6%		
Moisture Content @ Bottom	6.7%		
Bulk Density	2.19 Mg/m3	Gravel >20.0mm	4.4%
Dry Density	2.05 Mg/m3	Gravel >37.5mm	2.5%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			134
2.5	18	13.2	134
5.0	26	20.0	131
BASE			143
2.5	19	13.2	143
5.0	27	20.0	137

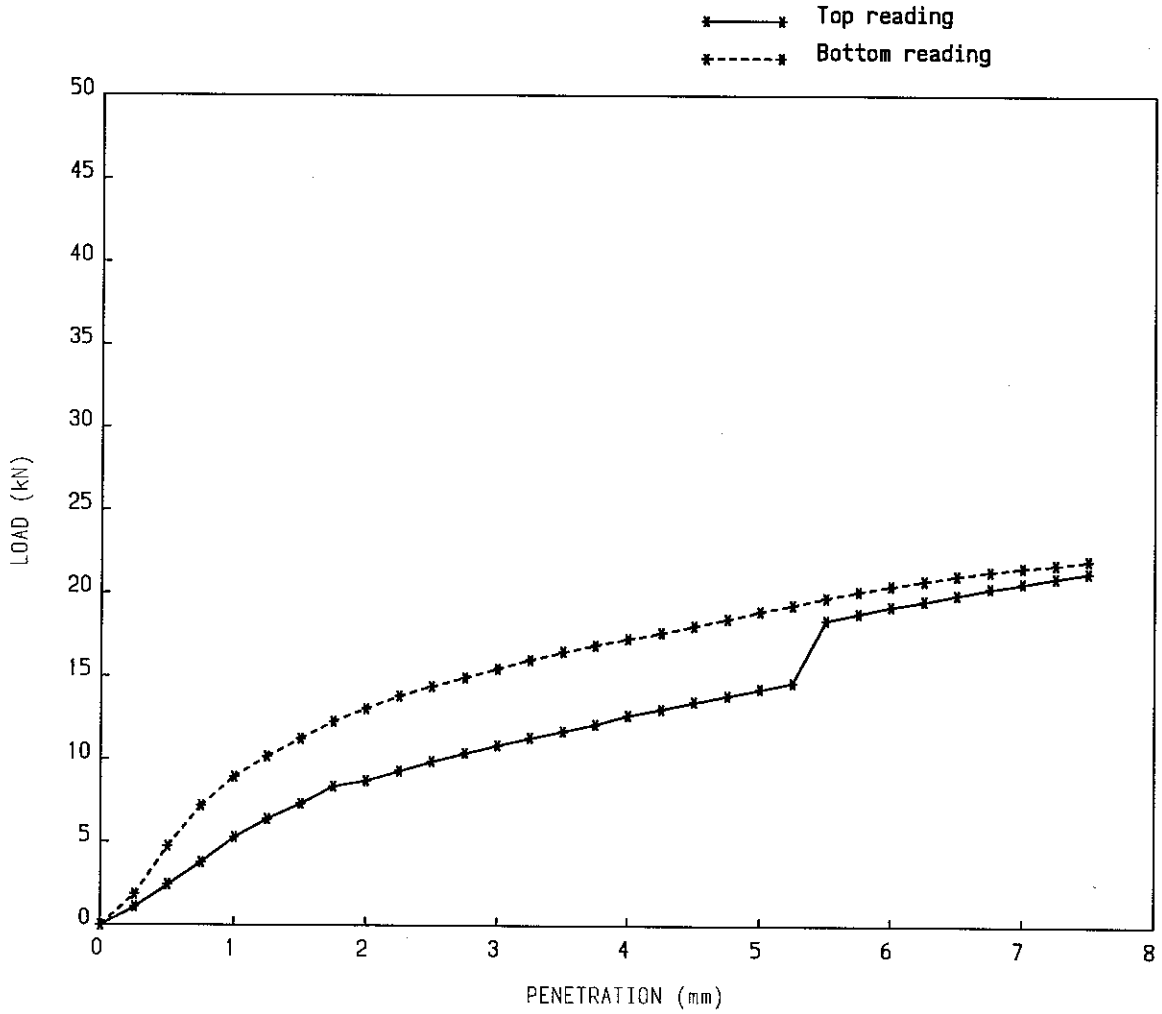
Q.A. Ref: /028-17/M4PB1022.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel and cobbles.	Hole ID	TPB102
		Sample No	3
		Depth	1.00 m



Seating Load	250N	Natural M/C	16%
Surcharge weight	15.0kg		
Moisture Content @ Top	9.2%		
Moisture Content @ Middle	9.1%		
Moisture Content @ Bottom	8.8%		
Bulk Density	2.26 Mg/m3	Gravel >20.0mm	4.4%
Dry Density	2.08 Mg/m3	Gravel >37.5mm	2.5%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			75
2.5	9.9	13.2	75
5.0	14	20.0	71
BASE			109
2.5	14	13.2	109
5.0	19	20.0	95

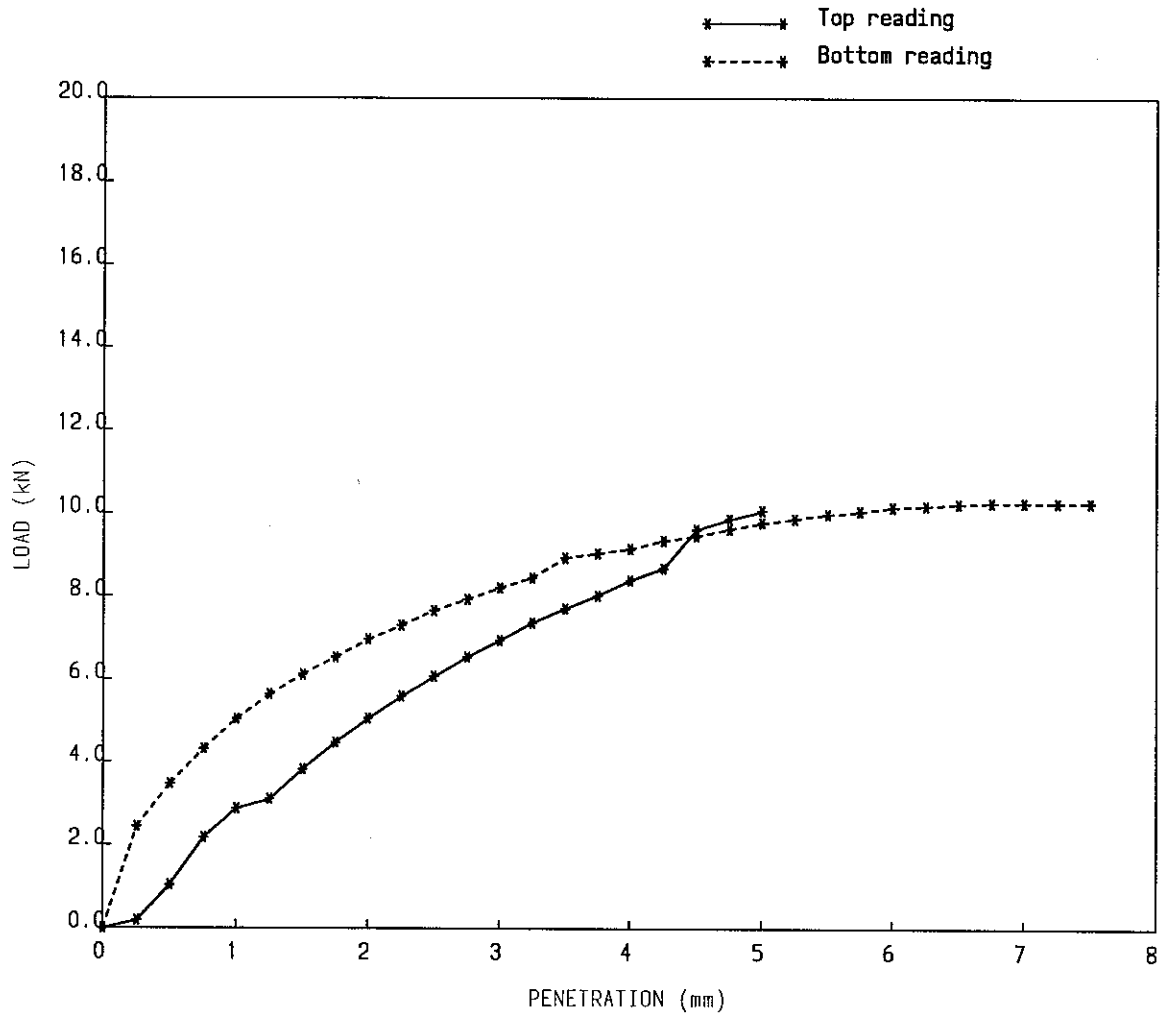
Q.A. Ref: /028-17/M4PB1023.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel and cobbles.	Hole ID	TPB102
		Sample No	4
		Depth	1.00 m



Seating Load	250N	Natural M/C	16%
Surcharge weight	15.2kg		
Moisture Content @ Top	11%		
Moisture Content @ Middle	11%		
Moisture Content @ Bottom	11%		
Bulk Density	2.31 Mg/m3	Gravel >20.0mm	4.4%
Dry Density	2.09 Mg/m3	Gravel >37.5mm	2.5%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENETRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			50
2.5	6.1	13.2	46
5.0	10	20.0	50
BASE			58
2.5	7.7	13.2	58
5.0	9.8	20.0	49

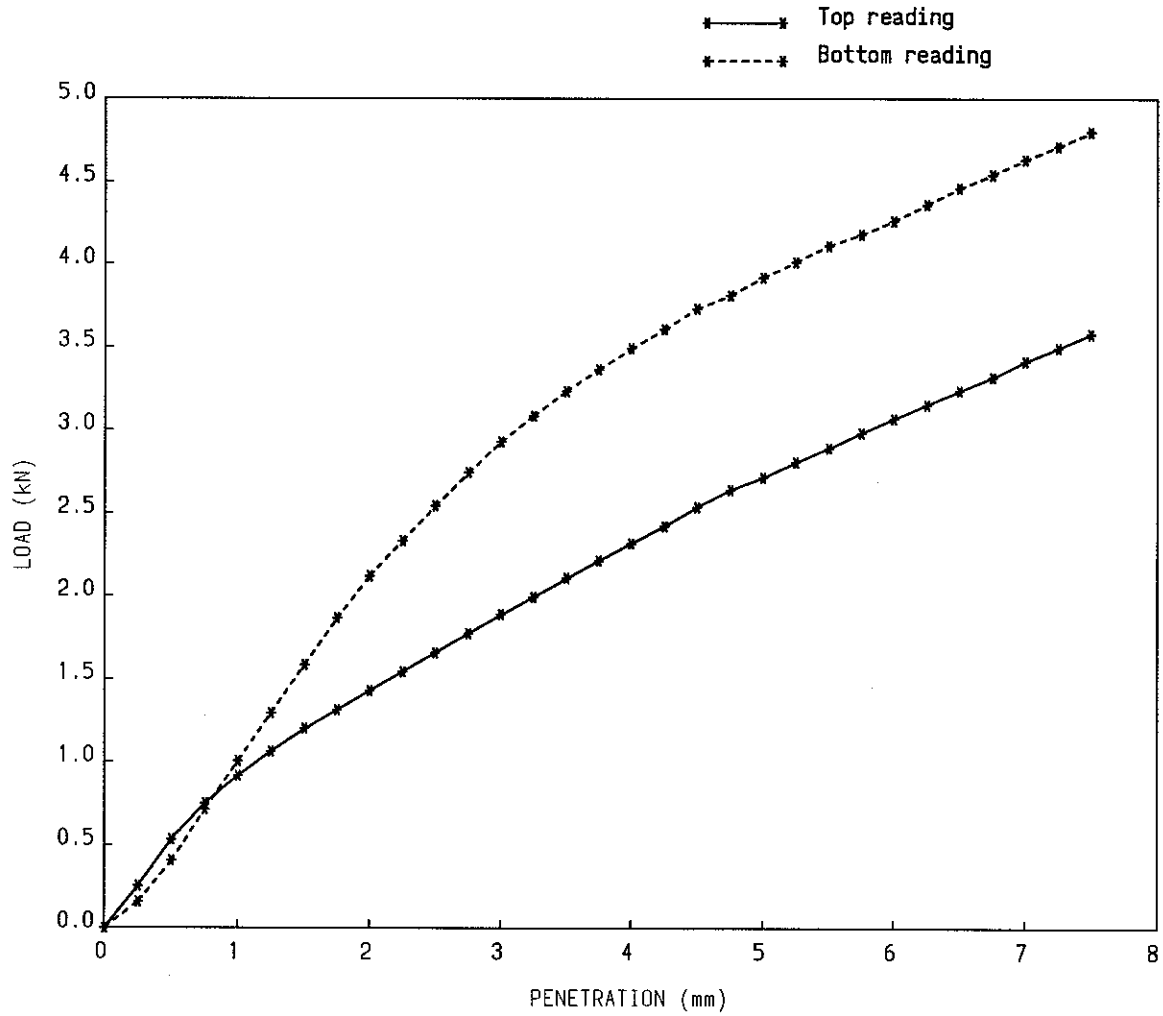
Q.A. Ref: /028-17/M4PB1024.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel and cobbles.	Hole ID	TPB102
		Sample No	5
		Depth	1.00 m



Seating Load	250N	Natural M/C	16%
Surcharge weight	15.0kg		
Moisture Content @ Top	13%		
Moisture Content @ Middle	13%		
Moisture Content @ Bottom	13%		
Bulk Density	2.27 Mg/m3	Gravel >20.0mm	4.4%
Dry Density	2.02 Mg/m3	Gravel >37.5mm	2.5%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			14
2.5	1.7	13.2	13
5.0	2.7	20.0	14
BASE			20
2.5	2.5	13.2	19
5.0	3.9	20.0	20

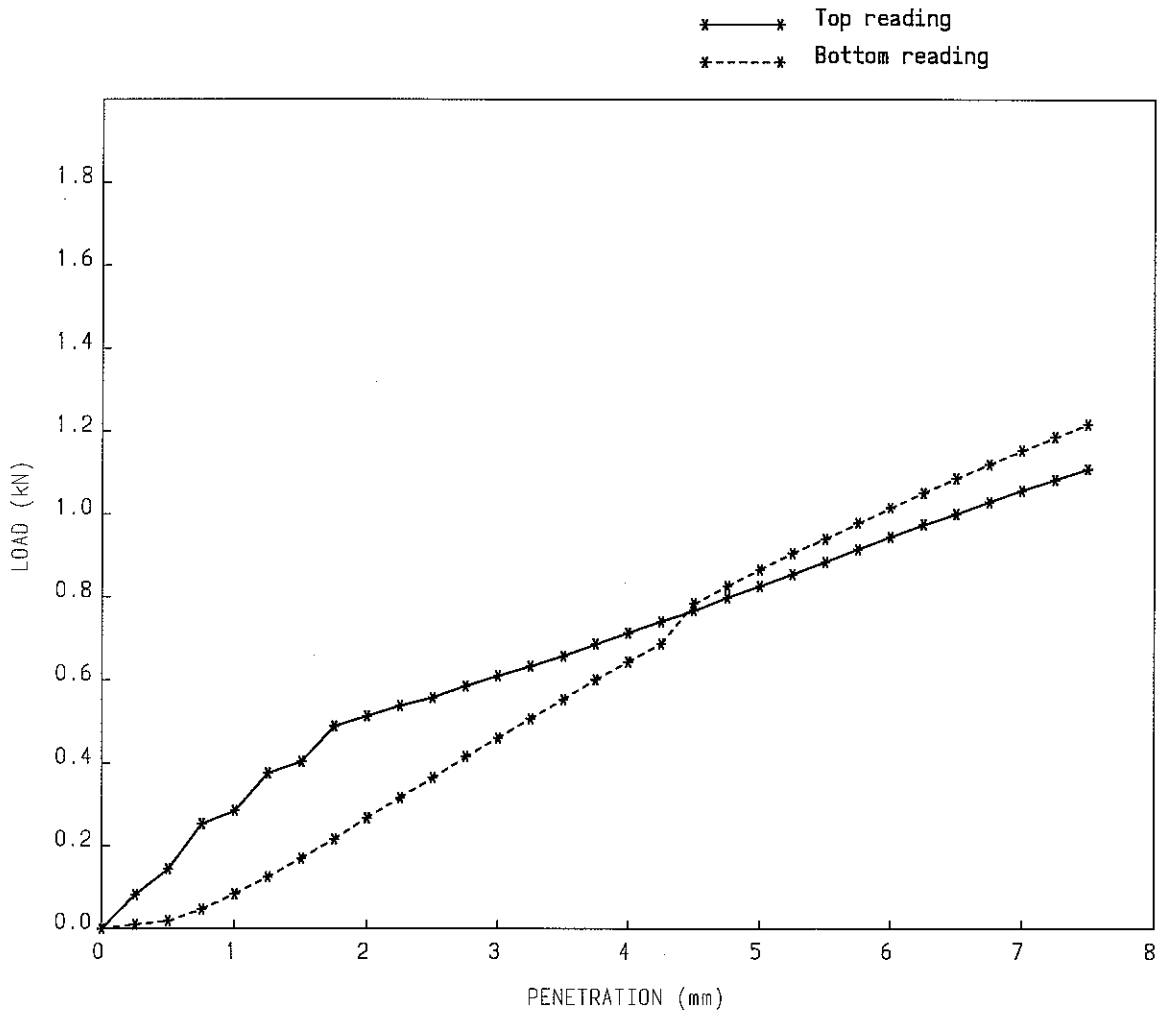
Q.A. Ref: /028-17/M4PB1025.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some gravel and mudstone.	Hole ID	TPB102A
		Sample No	
		Depth	0.50 m



Seating Load	10	Natural M/C	17%
Surcharge weight	15.1Kg		
Moisture Content @ Top	17%		
Moisture Content @ Middle	17%		
Moisture Content @ Bottom	17%		
Bulk Density	2.12 Mg/m3	Gravel >20.0mm	1.6%
Dry Density	1.82 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			4.2
2.5	0.56	13.2	4.2
5.0	0.83	20.0	4.1
BASE			4.3
2.5	0.36	13.2	2.8
5.0	0.87	20.0	4.3

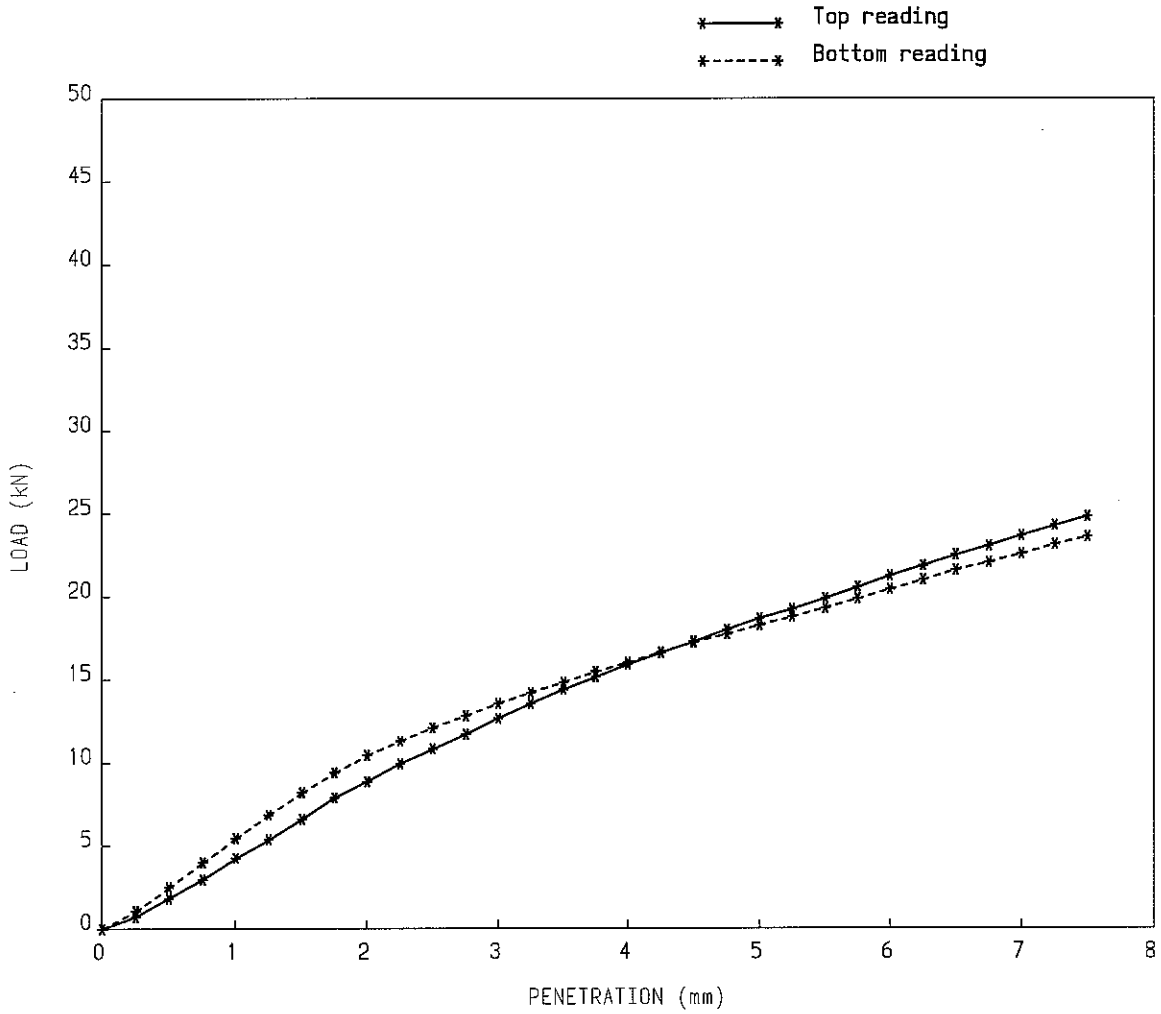
Q.A. Ref: /028-03/M4TB102A.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some gravel and mudstone.	Hole ID	TPB102B
		Sample No	
		Depth	0.50 m



Seating Load	250	Natural M/C	9.2%
Surcharge weight	15.1Kg		
Moisture Content @ Top	9.2%		
Moisture Content @ Middle	9.2%		
Moisture Content @ Bottom	9.0%		
Bulk Density	2.14 Mg/m3	Gravel >20.0mm	1.6%
Dry Density	1.97 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Too stiff for hand vane test.

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PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			93
2.5	11	13.2	82
5.0	19	20.0	93
BASE			92
2.5	12	13.2	92
5.0	18	20.0	91

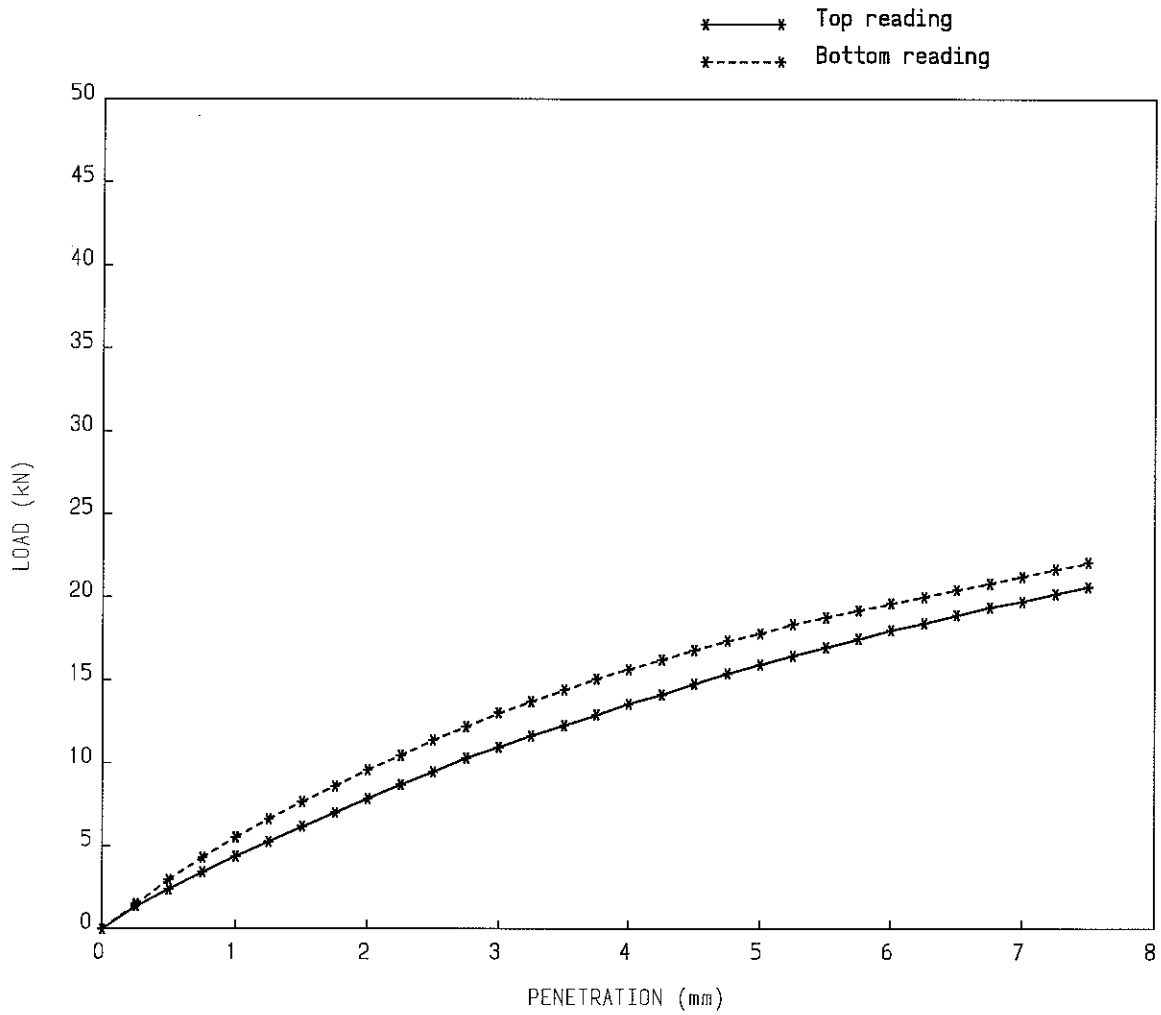
Q.A. Ref: /028-03/M4TB102B.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some gravel and mudstone.	Hole ID	TPB102C
		Sample No	
		Depth	0.50 m



Seating Load	250	Natural M/C	17%
Surcharge weight	15.1Kg		
Moisture Content @ Top	11%		
Moisture Content @ Middle	11%		
Moisture Content @ Bottom	10%		
Bulk Density	2.20 Mg/m3	Gravel >20.0mm	1.6%
Dry Density	2.00 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Too stiff for hand vane test.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			80
2.5	9.4	13.2	72
5.0	16	20.0	80
BASE			89
2.5	11	13.2	86
5.0	18	20.0	89

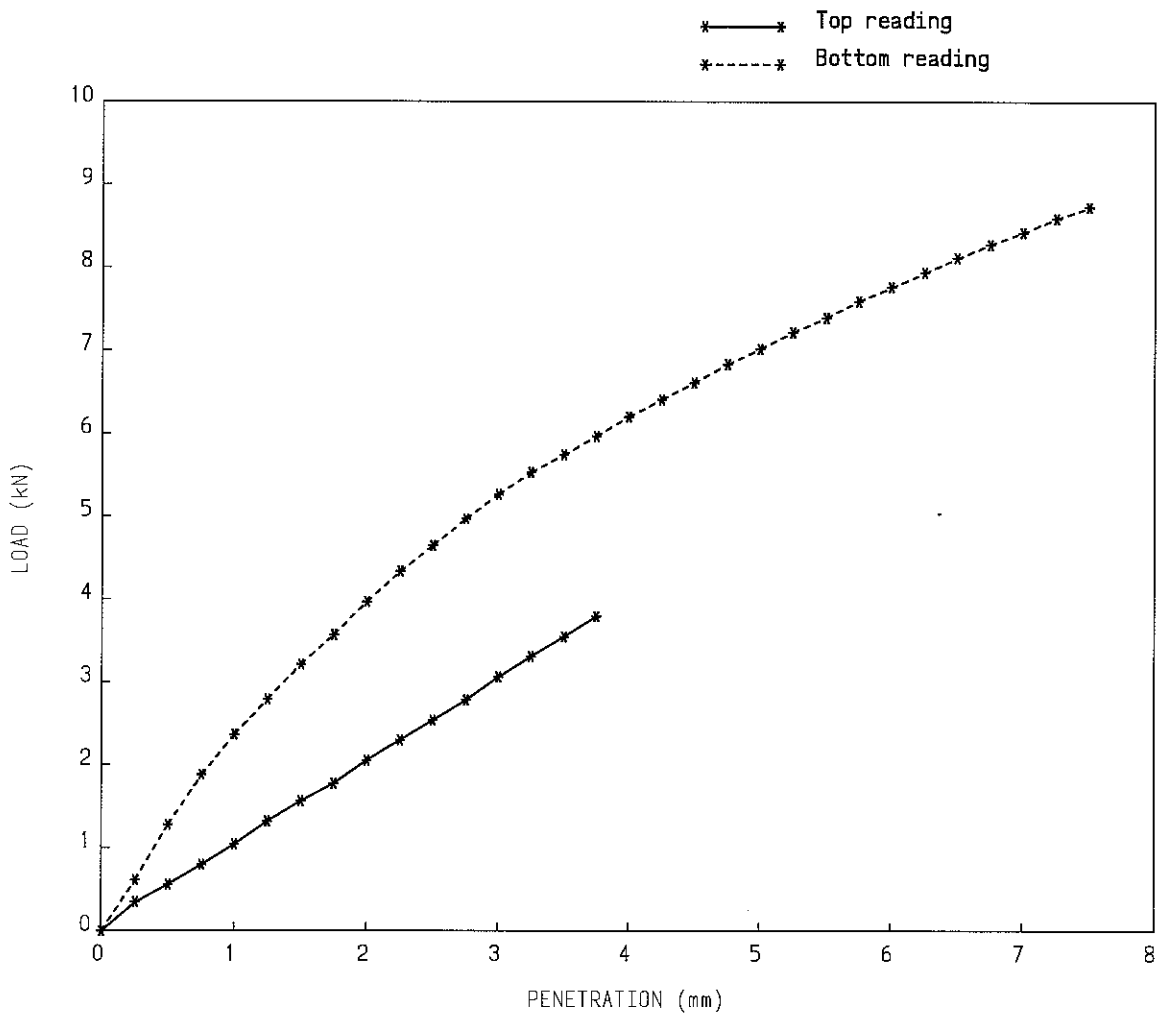
Q.A. Ref: /028-03/M4TB102C.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some gravel and mudstone.	Hole ID	TPB102D
		Sample No	
		Depth	0.50 m



Seating Load	250	Natural M/C	17%
Surcharge weight	15.1Kg		
Moisture Content @ Top	12%		
Moisture Content @ Middle	13%		
Moisture Content @ Bottom	13%		
Bulk Density	2.21 Mg/m3	Gravel >20.0mm	1.6%
Dry Density	1.97 Mg/m3	Gravel >37.5mm	0.0%

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			80
2.5	2.5	13.2	19
5.0	16	20.0	80
BASE			35
2.5	4.6	13.2	35
5.0	7.0	20.0	35

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Top test stopped due to not reaching lower limit.

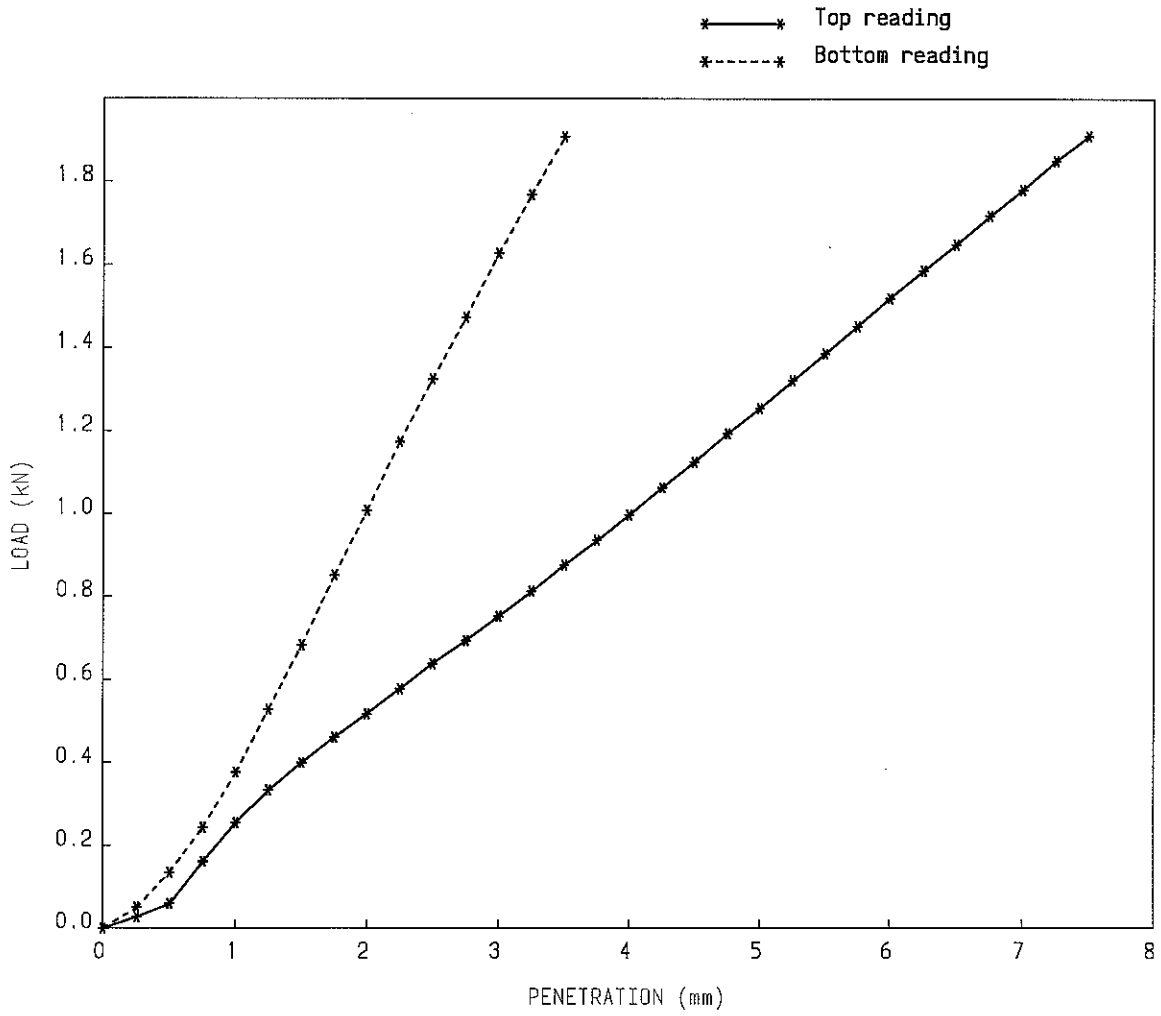
Q.A. Ref: /028-03/M4TB102D.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some gravel and mudstone.	Hole ID	TPB102E
		Sample No	
		Depth	0.50 m



Seating Load	10N	Natural M/C	17%
Surcharge weight	15.1Kg		
Moisture Content @ Top	15%		
Moisture Content @ Middle	15%		
Moisture Content @ Bottom	14%		
Bulk Density	2.16 Mg/m3	Gravel >20.0mm	1.6%
Dry Density	1.88 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks : Bottom test stopped due to approaching ring limit.

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			6.3
2.5	0.64	13.2	4.8
5.0	1.3	20.0	6.3
BASE			10
2.5	1.3	13.2	10
5.0	----	20.0	----

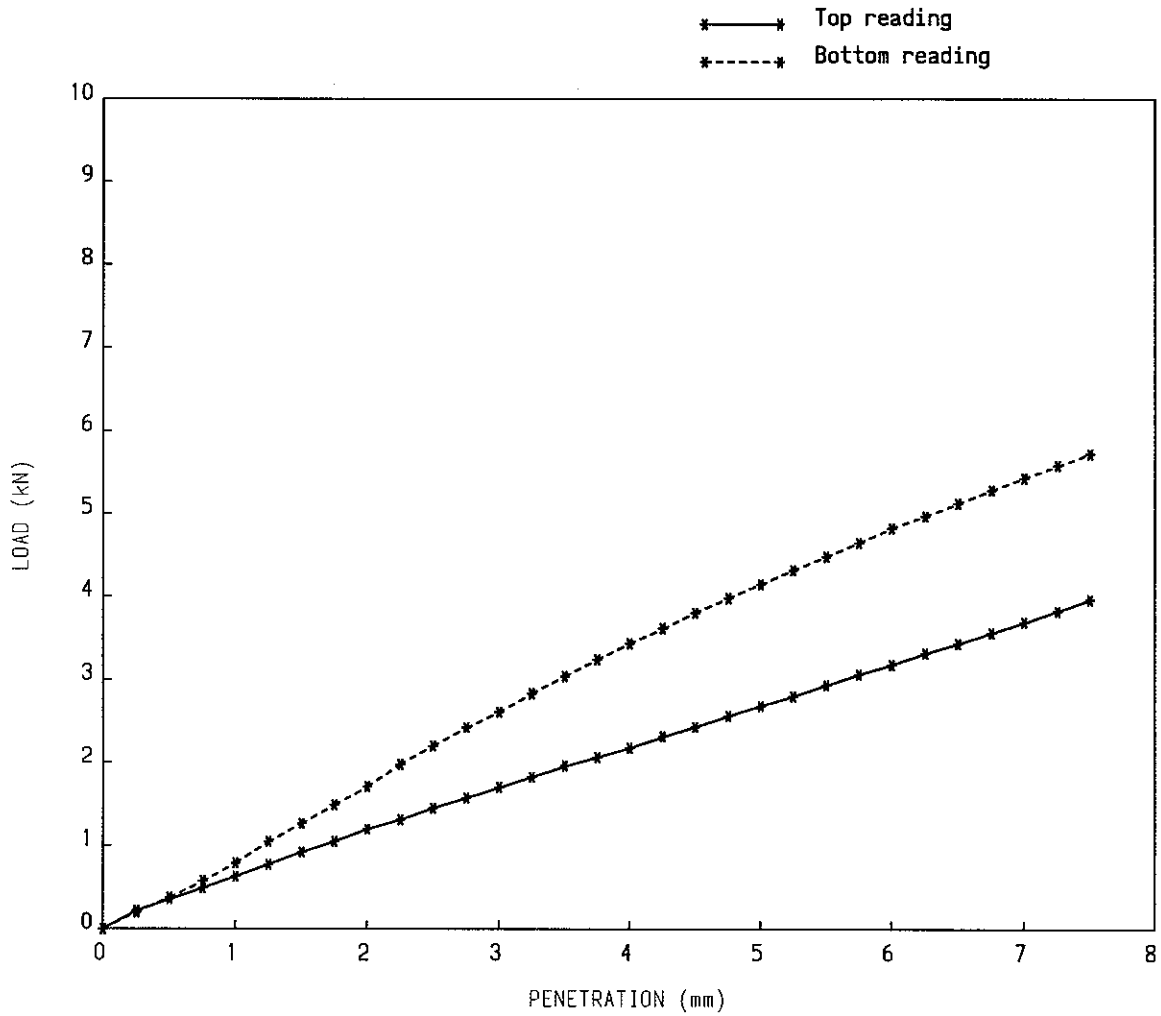
Q.A. Ref: /028-05/M4TB102E.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Dark reddish brown sandy CLAY with some mudstone.	Hole ID	TPB103
		Sample No	1
		Depth	1.00 m



Seating Load	50N	Natural M/C	11%
Surcharge weight	15.1kg		
Moisture Content @ Top	12%		
Moisture Content @ Middle	12%		
Moisture Content @ Bottom	11%		
Bulk Density	2.28 Mg/m3	Gravel >20.0mm	16.7%
Dry Density	2.04 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			13
2.5	1.5	13.2	11
5.0	2.7	20.0	13
BASE			21
2.5	2.2	13.2	17
5.0	4.2	20.0	21

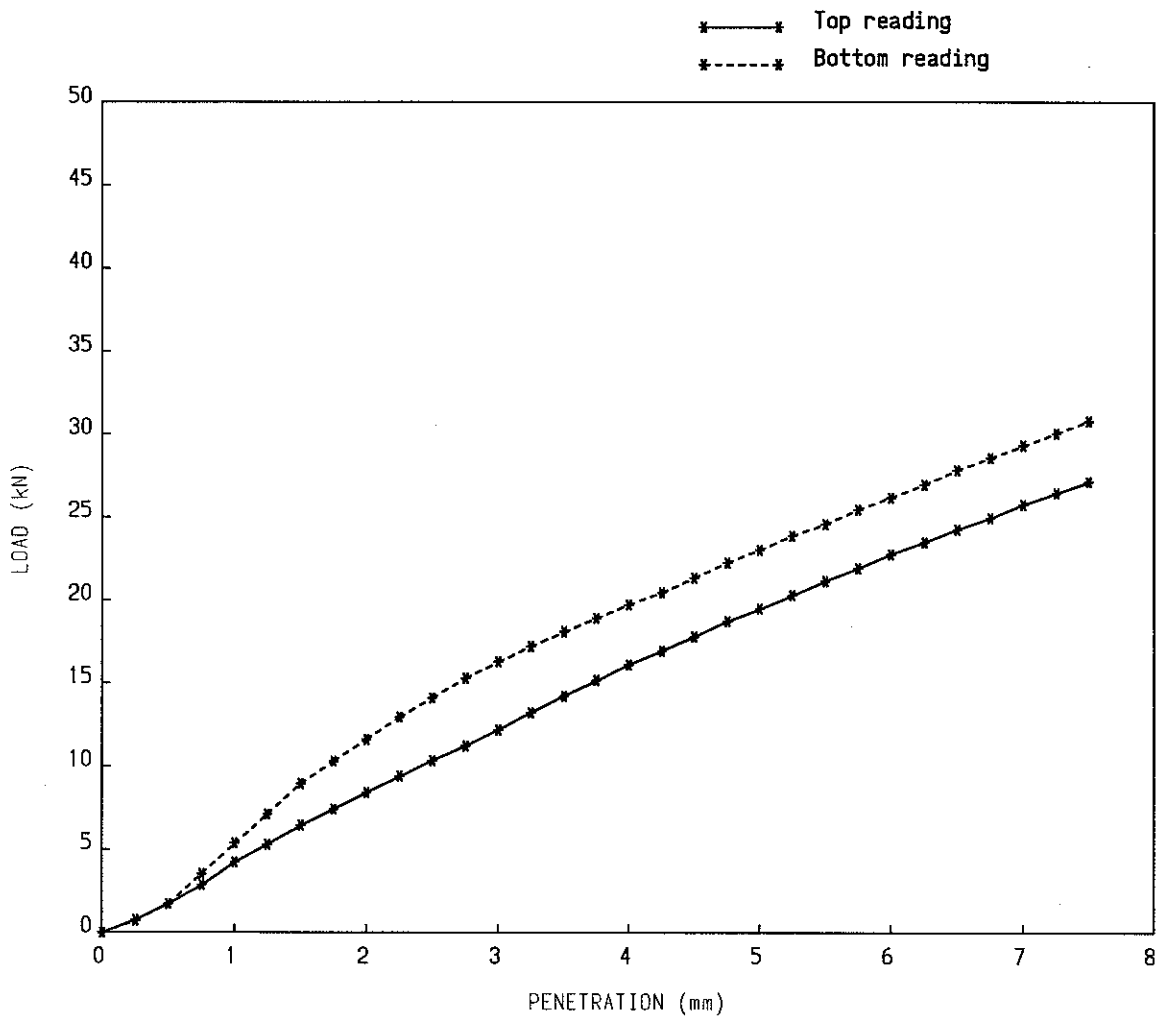
Q.A. Ref: /028-17/M4TB1031.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Dark reddish brown sandy CLAY with some mudstone.	Hole ID	TPB103
		Sample No	1
		Depth	1.00 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.1kg		
Moisture Content @ Top	3.9%		
Moisture Content @ Middle	4.1%		
Moisture Content @ Bottom	4.1%		
Bulk Density	2.14 Mg/m3	Gravel >20.0mm	16.7%
Dry Density	2.05 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			97
2.5	10	13.2	78
5.0	19	20.0	97
BASE			115
2.5	14	13.2	107
5.0	23	20.0	115

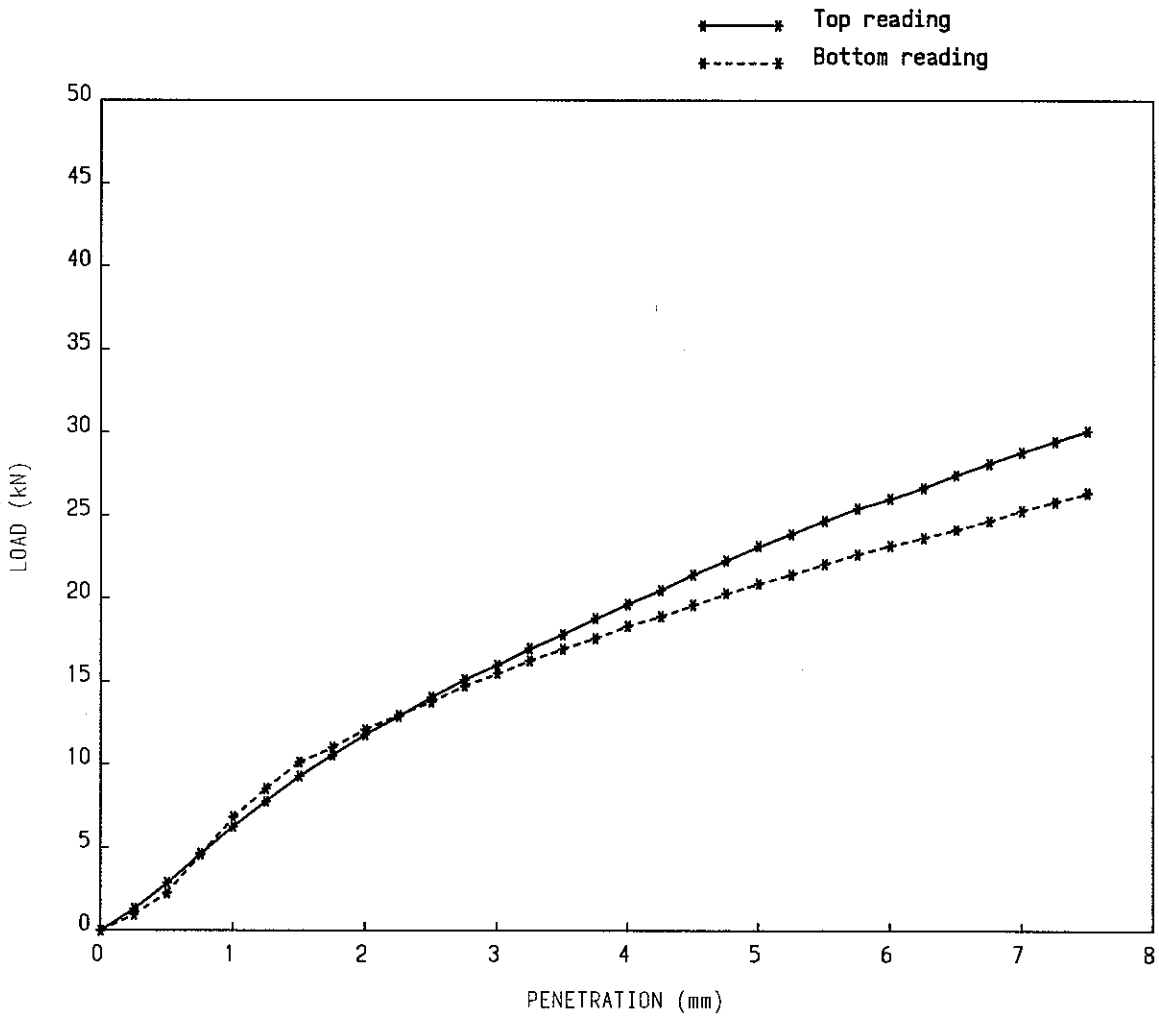
Q.A. Ref: /028-17/M4TB1032.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Dark reddish brown sandy CLAY with some mudstone.	Hole ID	TPB103
		Sample No	3
		Depth	1.00 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.1kg		
Moisture Content @ Top	6.0%		
Moisture Content @ Middle	5.9%		
Moisture Content @ Bottom	5.9%		
Bulk Density	2.20 Mg/m3	Gravel >20.0mm	16.7%
Dry Density	2.08 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			116
2.5	14	13.2	106
5.0	23	20.0	116
BASE			104
2.5	14	13.2	104
5.0	21	20.0	104

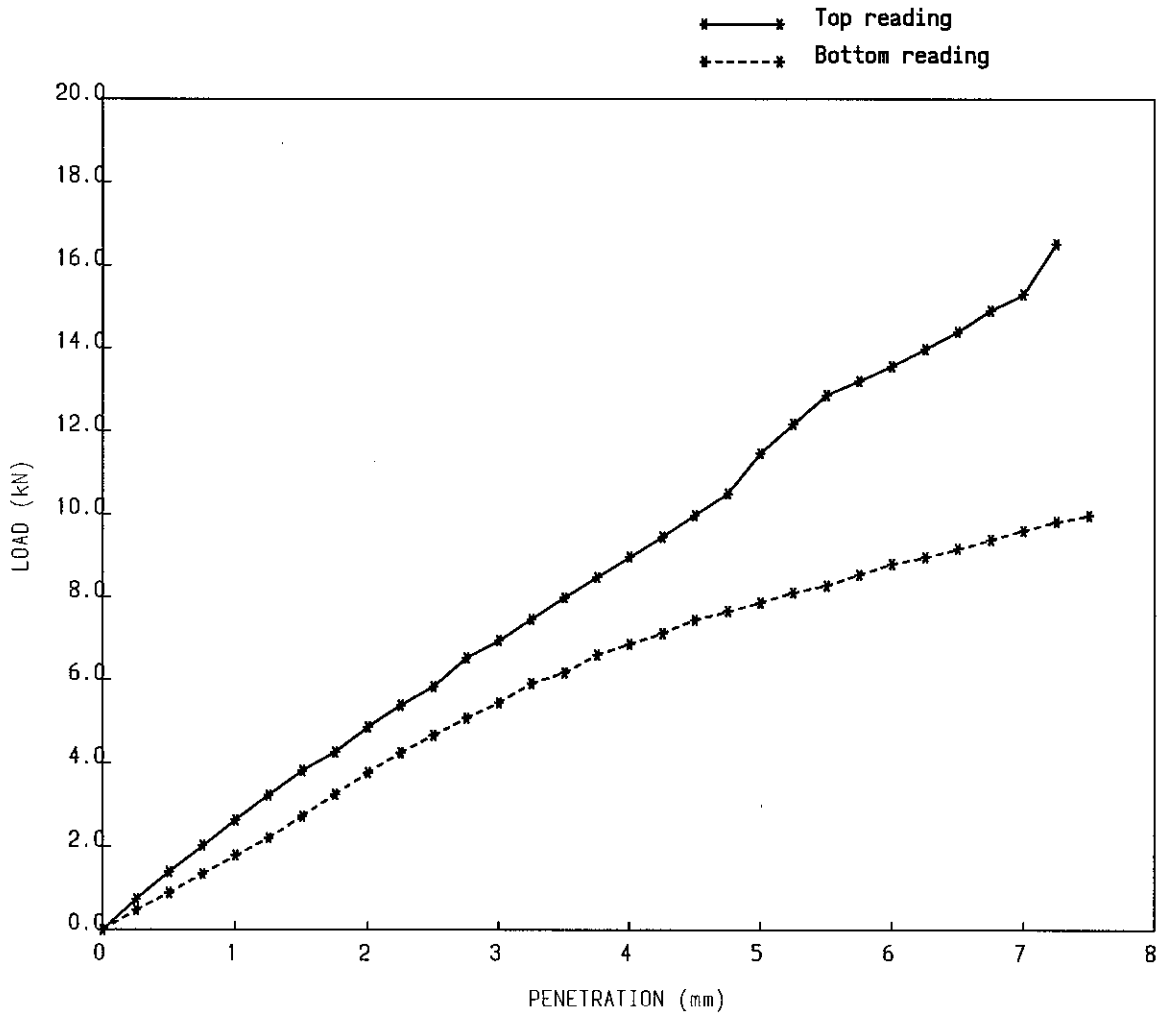
Q.A. Ref: /028-17/M4TB1033.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Dark reddish brown sandy CLAY with some mudstone.	Hole ID	TPB103
		Sample No	4
		Depth	1.00 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	14.2kg		
Moisture Content @ Top	8.0%		
Moisture Content @ Bottom	9.2%		
Bulk Density	2.26 Mg/m3	Gravel >20.0mm	16.7%
Dry Density	2.09 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			57
2.5	5.8	13.2	44
5.0	11	20.0	57
BASE			39
2.5	4.7	13.2	35
5.0	7.9	20.0	39

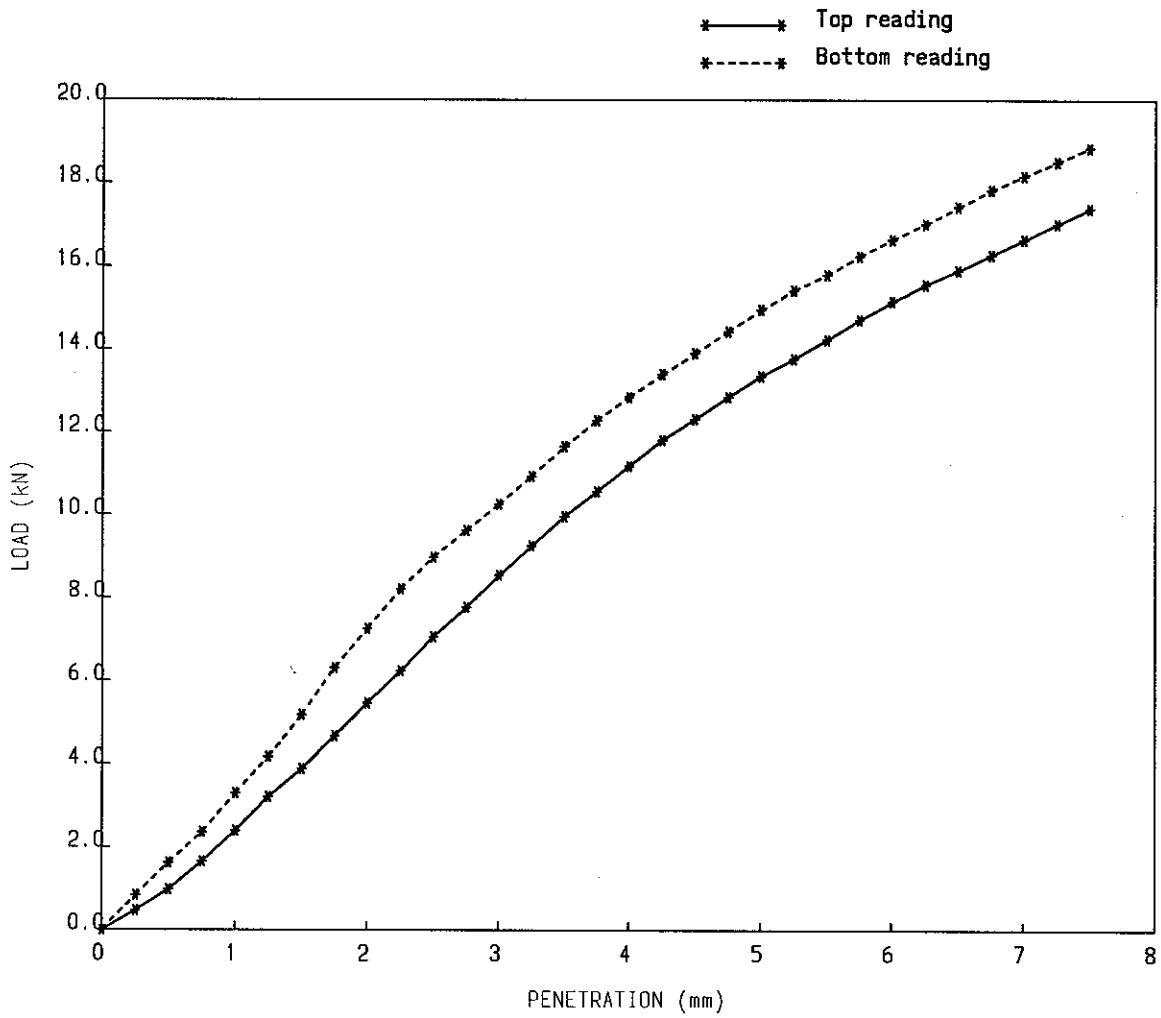
Q.A. Ref: /028-17/M4TB1034.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Dark reddish brown sandy CLAY with some mudstone.	Hole ID	TPB103
		Sample No	5
		Depth	1.00 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.1kg		
Moisture Content @ Top	8.2%		
Moisture Content @ Middle	8.7%		
Moisture Content @ Bottom	9.7%		
Bulk Density	2.29 Mg/m3	Gravel >20.0mm	16.7%
Dry Density	2.10 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			67
2.5	7.1	13.2	53
5.0	13	20.0	67
BASE			75
2.5	9.0	13.2	68
5.0	15	20.0	75

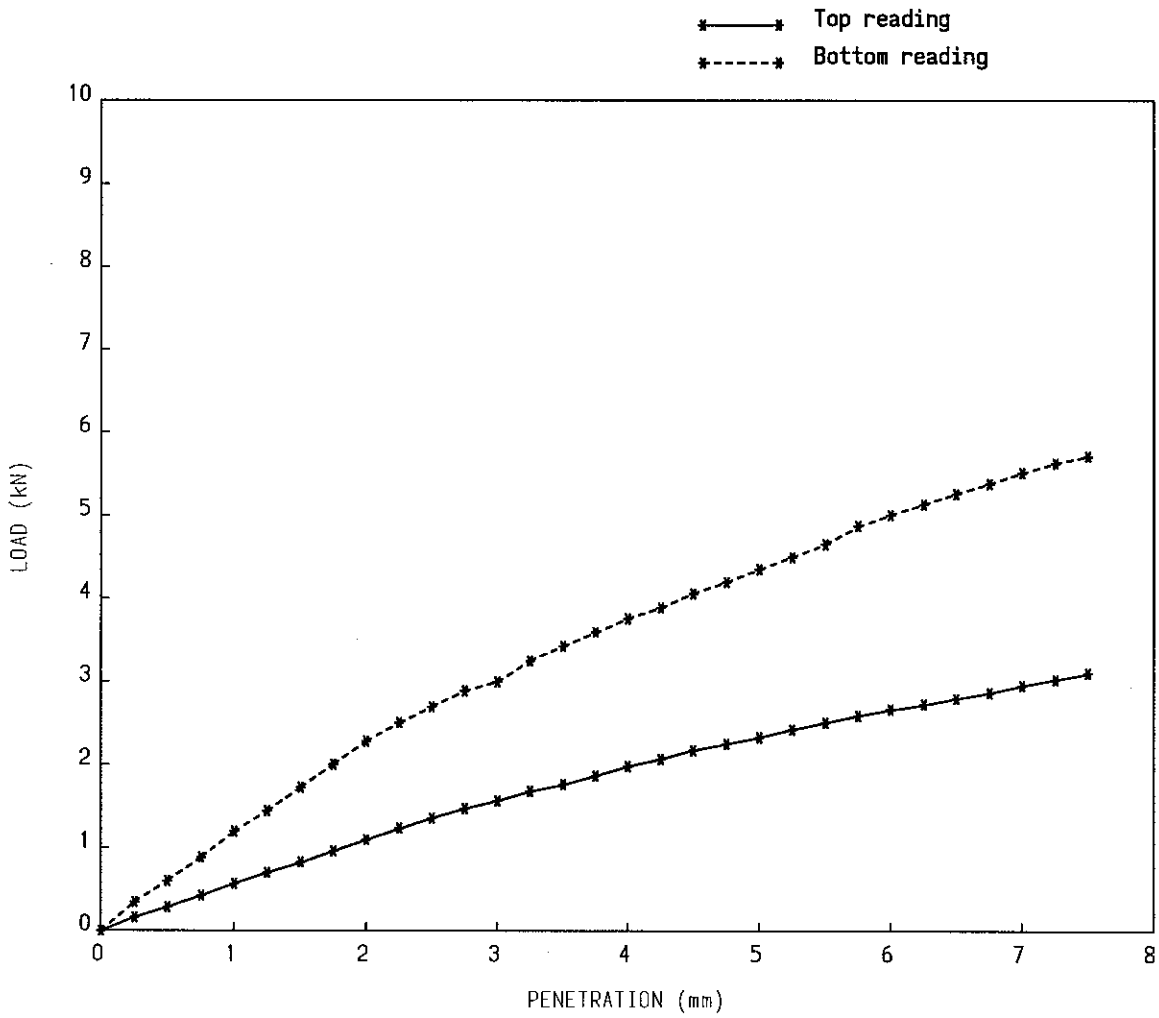
Q.A. Ref: /028-17/M4TB1035.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Dark reddish brown sandy CLAY with some mudstone.	Hole ID	TPB103
		Sample No	6
		Depth	1.00 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.0kg		
Moisture Content @ Top	11%		
Moisture Content @ Bottom	9.9%		
Bulk Density	2.25 Mg/m3	Gravel >20.0mm	16.7%
Dry Density	2.04 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			12
2.5	1.4	13.2	10
5.0	2.3	20.0	12
BASE			22
2.5	2.7	13.2	20
5.0	4.4	20.0	22

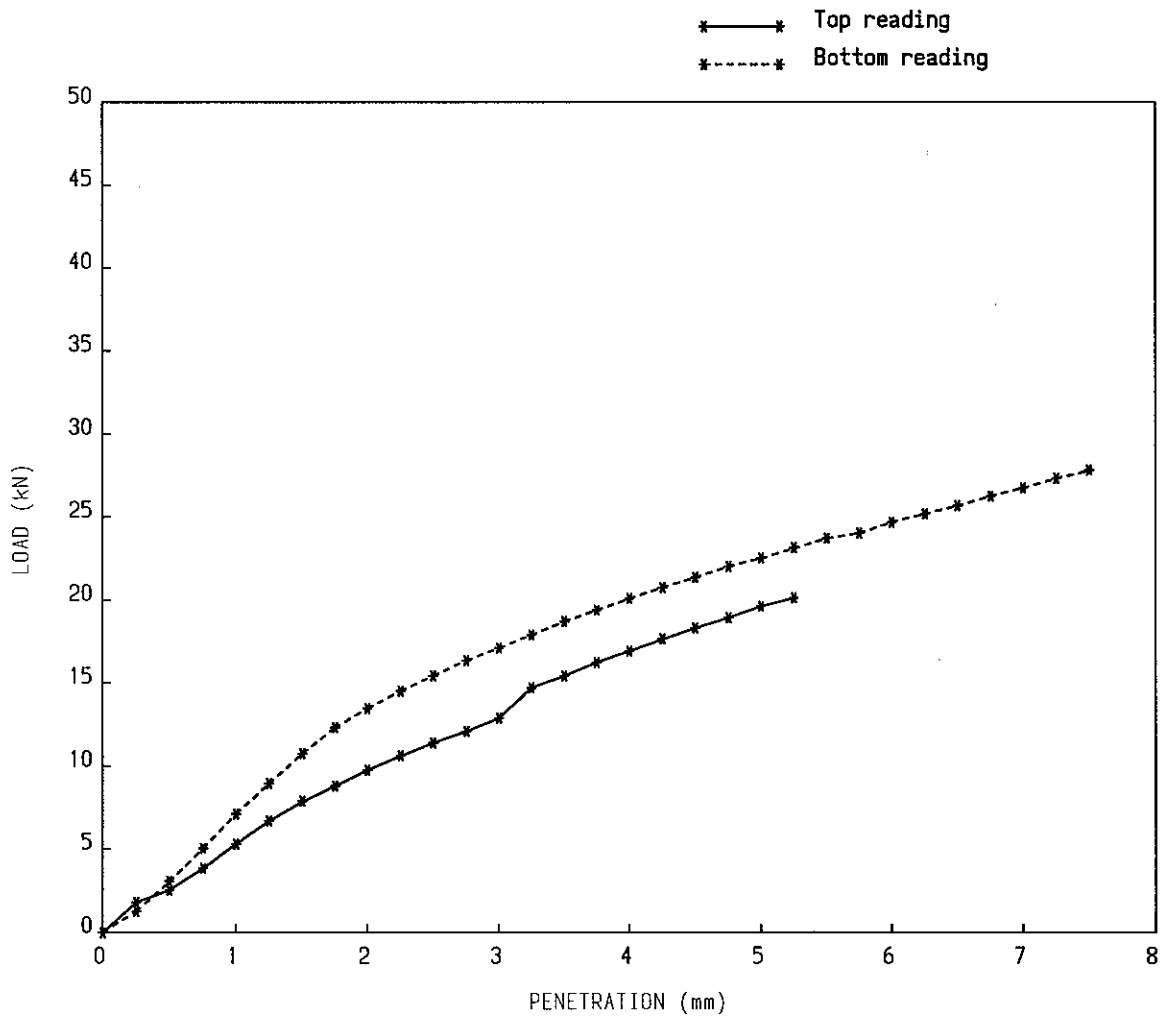
Q.A. Ref: /028-17/M4TB1036.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Dark reddish brown sandy CLAY with some mudstone.	Hole ID	TPB103
		Sample No	7
		Depth	1.00 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.0kg		
Moisture Content @ Top	7.0%		
Moisture Content @ Bottom	6.9%		
Bulk Density	2.23 Mg/m3	Gravel >20.0mm	16.7%
Dry Density	2.09 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			98
2.5	11	13.2	87
5.0	20	20.0	98
BASE			117
2.5	15	13.2	117
5.0	23	20.0	113

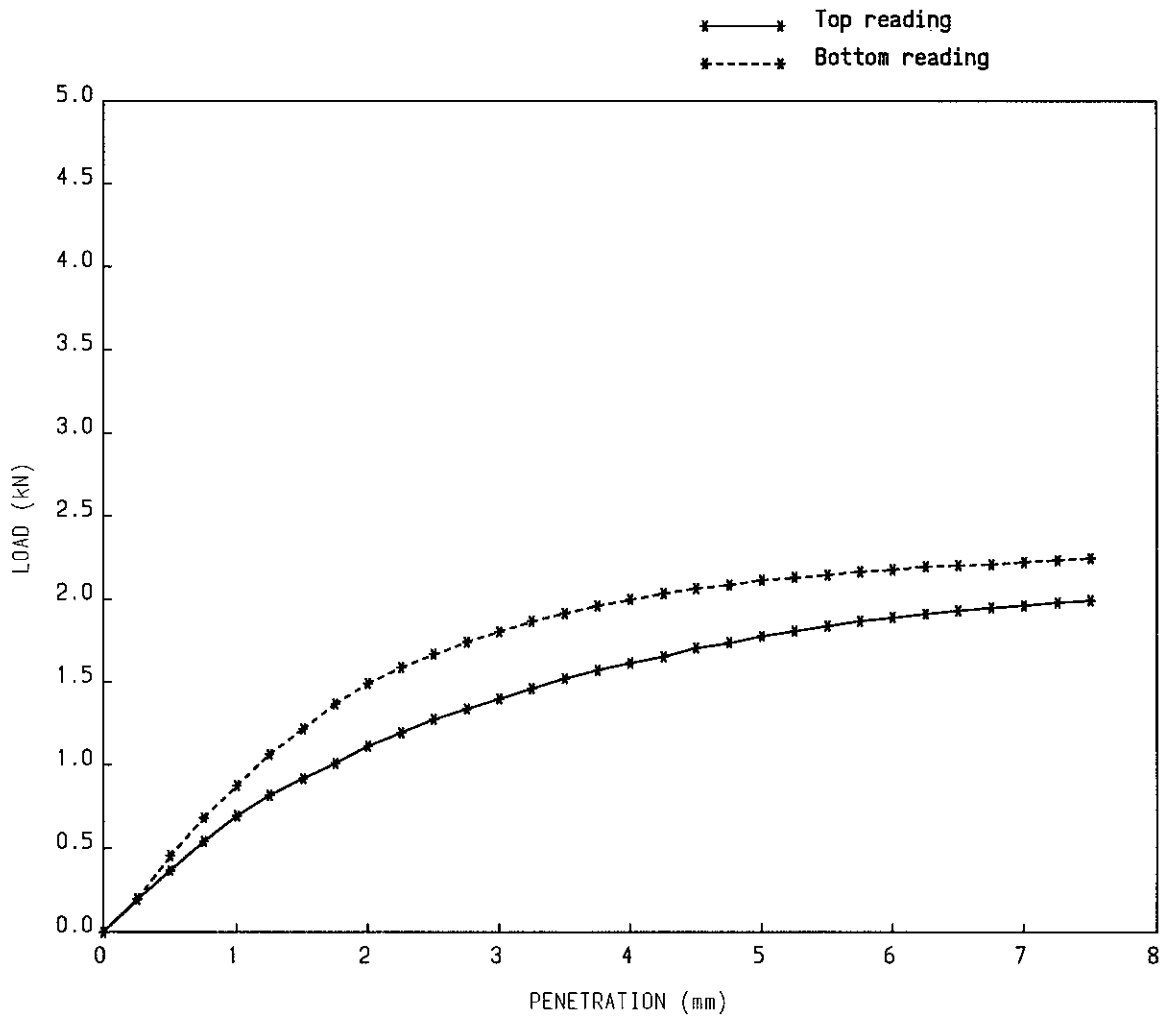
Q.A. Ref: /028-17/M4TB1037.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Grey greenish mottled reddish brown CLAY.	Hole ID	TPB105
		Sample No	1
		Depth	0.50 m



Seating Load	250N	Natural M/C	23%
Surcharge weight	15.2kg		
Moisture Content @ Top	23%		
Moisture Content @ Middle	23%		
Moisture Content @ Bottom	23%		
Bulk Density	2.06 Mg/m3	Gravel >20.0mm	0.0%
Dry Density	1.68 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			9.7
2.5	1.3	13.2	9.7
5.0	1.8	20.0	8.9
BASE			13
2.5	1.7	13.2	13
5.0	2.1	20.0	11

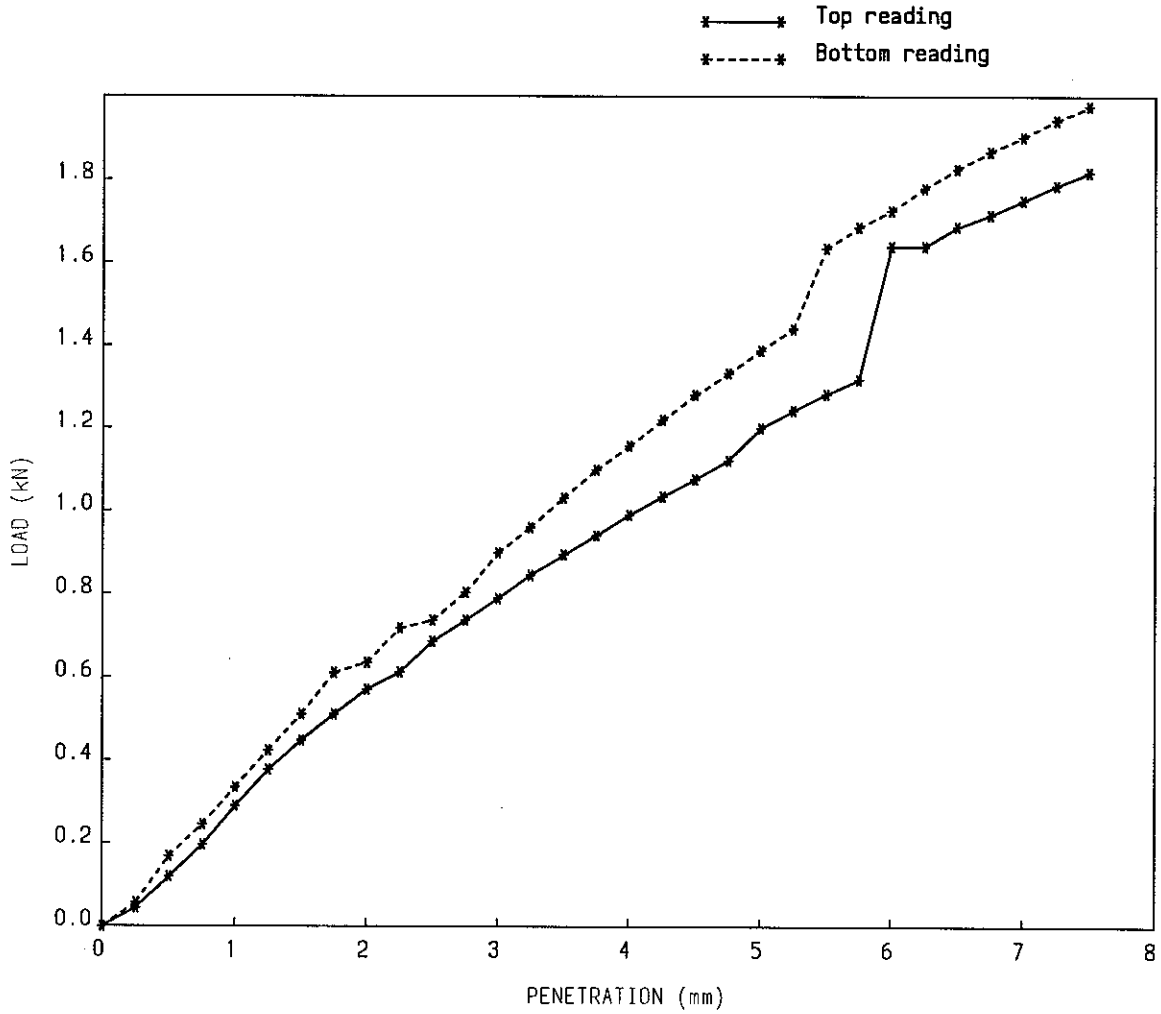
Q.A. Ref: /028-17/M4B105.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with a little fine to medium gravel.	Hole ID	TPB105
		Sample No	1
		Depth	1.00 m



Seating Load	10N	Natural M/C	14%
Surcharge weight	15.1kg		
Moisture Content @ Top	14%		
Moisture Content @ Bottom	14%		
Bulk Density	2.23 Mg/m3	Gravel >20.0mm	0.3%
Dry Density	1.96 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.
Compaction type : Rammer compaction with 4.5kg effort
Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			6.0
2.5	0.69	13.2	5.2
5.0	1.2	20.0	6.0
BASE			6.9
2.5	0.74	13.2	5.6
5.0	1.4	20.0	6.9

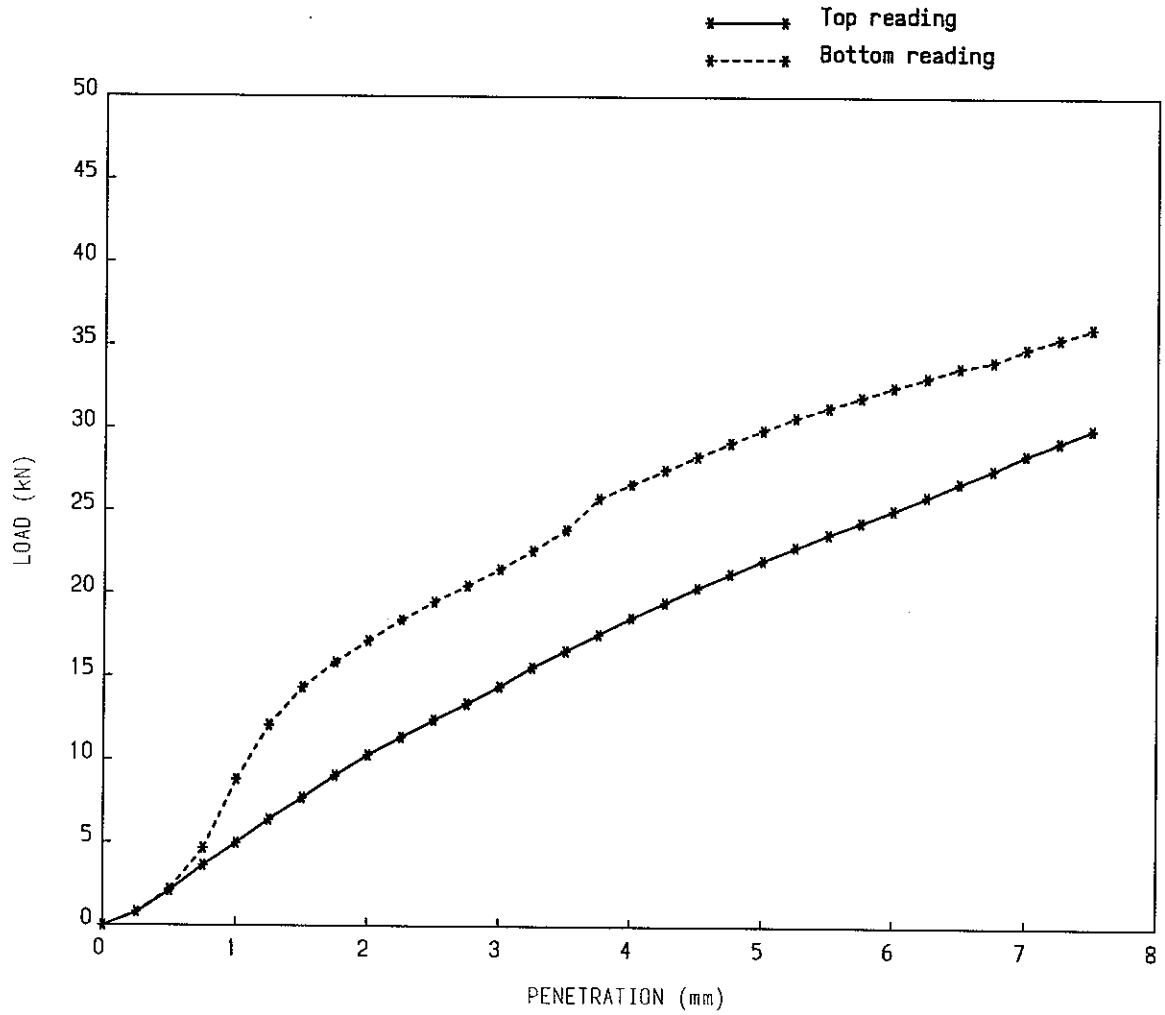
Q.A. Ref: /028-17/M4TB1051.CBR 2 04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with a little fine to medium gravel.	Hole ID	TPB105
		Sample No	2
		Depth	1.00 m



Seating Load	250N	Natural M/C	14%
Surcharge weight	15.3kg		
Moisture Content @ Top	8.0%		
Moisture Content @ Middle	7.7%		
Moisture Content @ Bottom	7.9%		
Bulk Density	2.15 Mg/m3	Gravel >20.0mm	0.3%
Dry Density	1.99 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			110
2.5	12	13.2	94
5.0	22	20.0	110
BASE			150
2.5	19	13.2	148
5.0	30	20.0	150

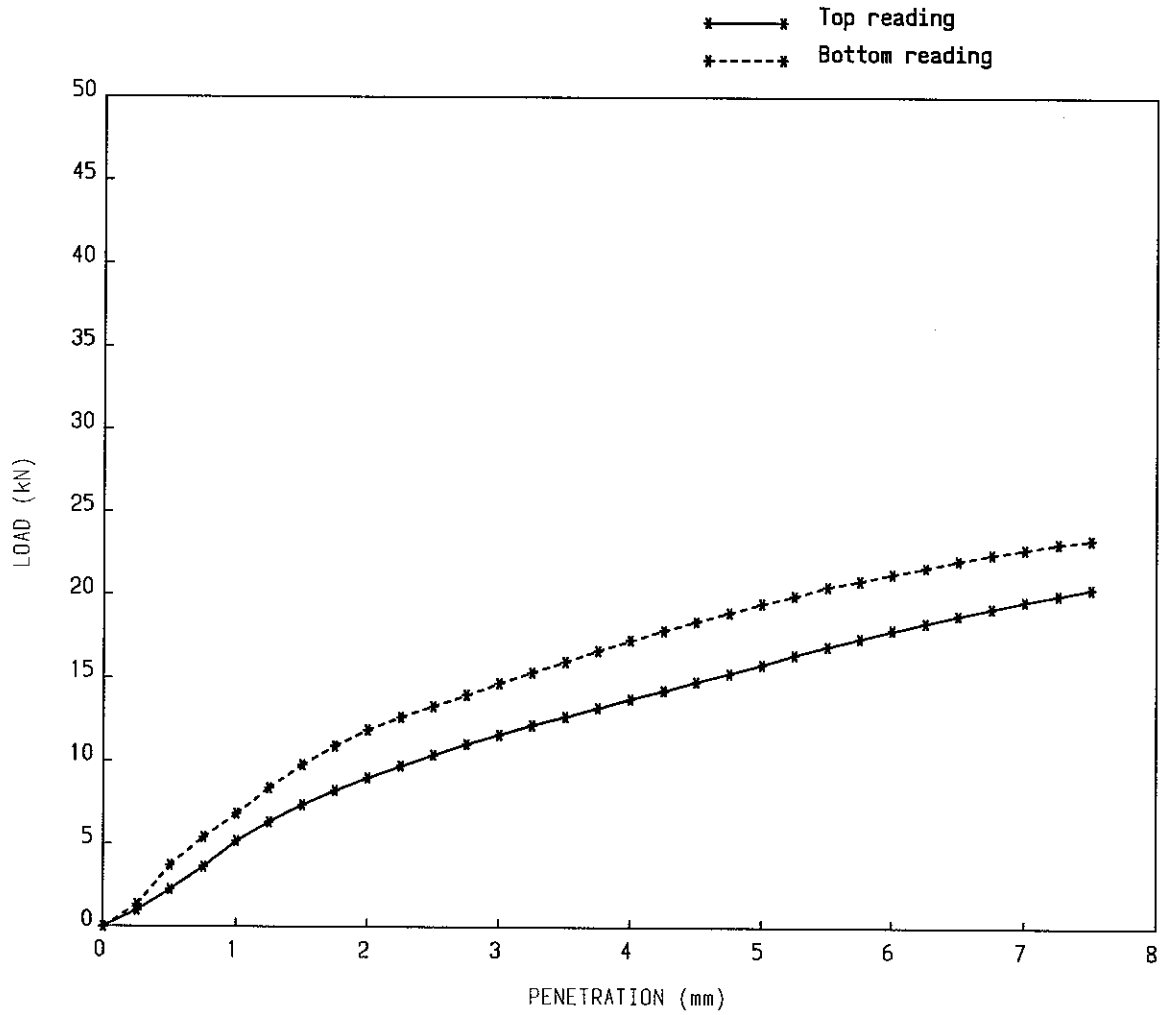
Q.A. Ref: /028-17/M4TP1052.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with a little fine to medium gravel.	Hole ID	TPB105
		Sample No	3
		Depth	1.00 m



Seating Load	250N	Natural M/C	14%
Surcharge weight	15kg		
Moisture Content @ Top	9.6%		
Moisture Content @ Middle	9.6%		
Moisture Content @ Bottom	9.7%		
Bulk Density	2.21 Mg/m3	Gravel >20.0mm	0.3%
Dry Density	2.02 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			79
2.5	10	13.2	79
5.0	16	20.0	79
BASE			101
2.5	13	13.2	101
5.0	19	20.0	97

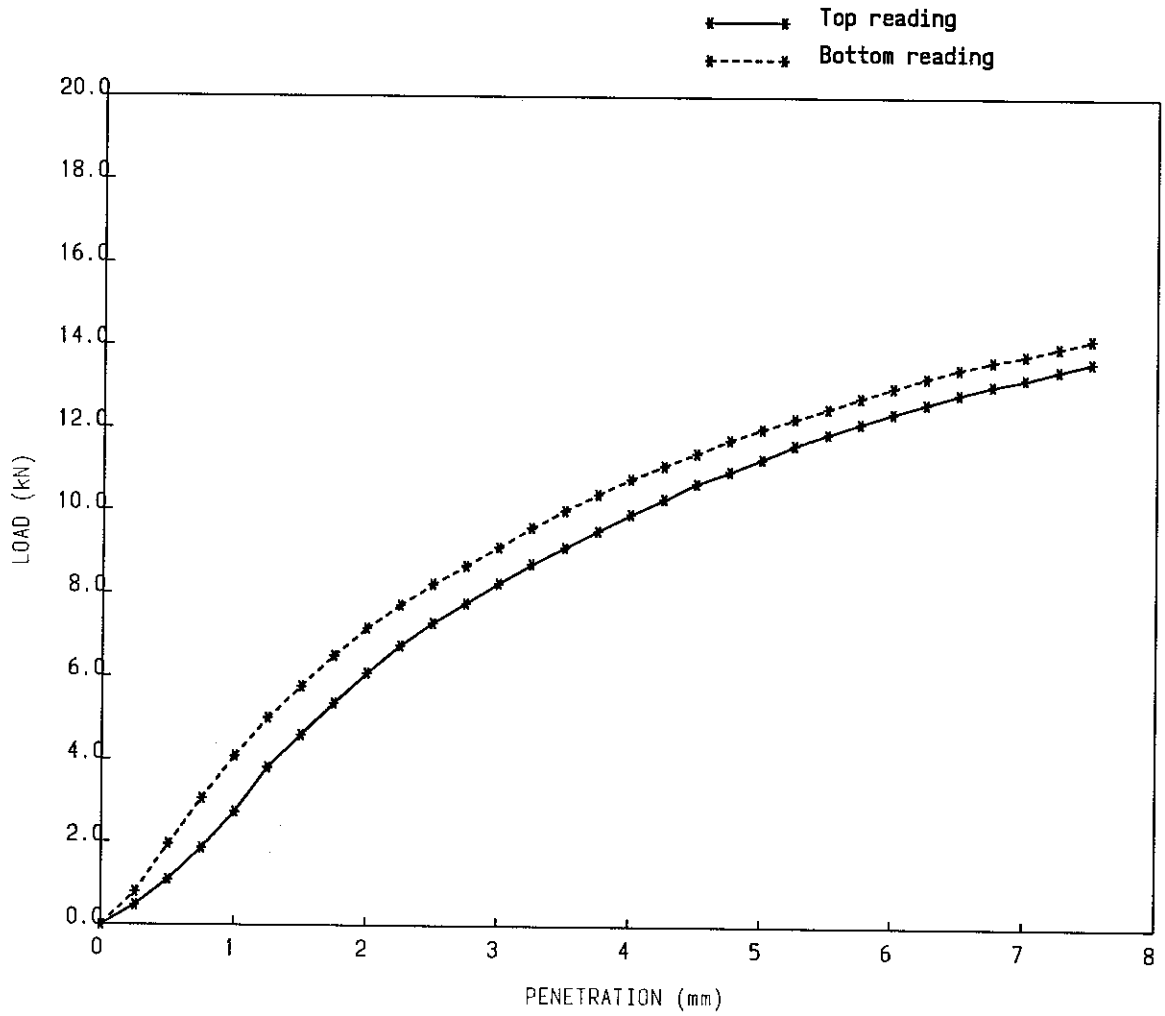
Q.A. Ref: /028-17/M4TP1053.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with a little fine to medium gravel.	Hole ID	TPB105
		Sample No	4
		Depth	1.00 m



Seating Load	250N	Natural M/C	14%
Surcharge weight	15.1kg		
Moisture Content @ Top	11%		
Moisture Content @ Middle	11%		
Moisture Content @ Bottom	11%		
Bulk Density	2.28 Mg/m3	Gravel >20.0mm	0.3%
Dry Density	2.06 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			56
2.5	7.3	13.2	55
5.0	11	20.0	56
BASE			62
2.5	8.2	13.2	62
5.0	12	20.0	60

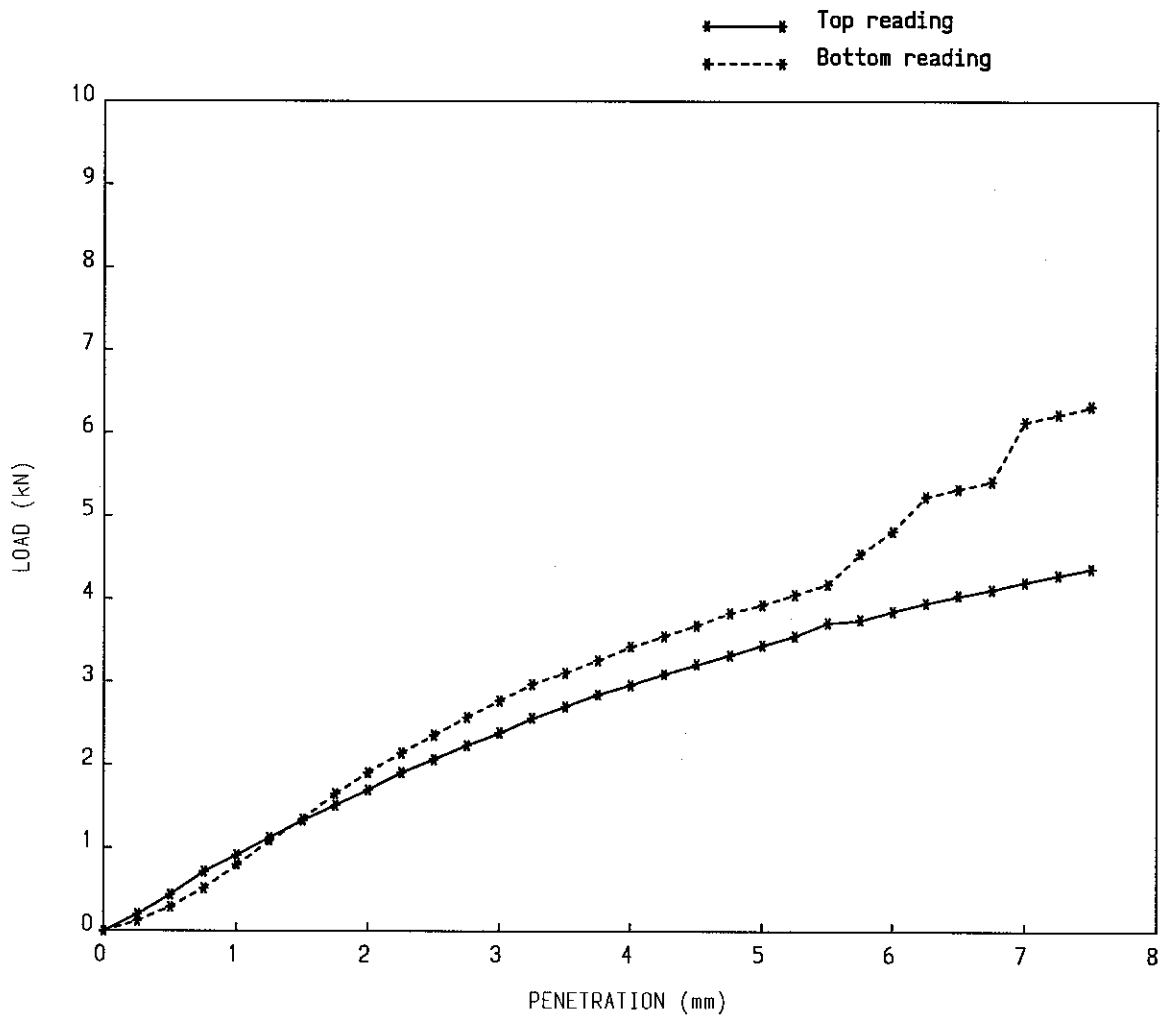
Q.A. Ref: /028-17/M4TP1054.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with a little fine to medium gravel.	Hole ID	TPB105
		Sample No	5
		Depth	1.00 m



Seating Load	10N	Natural M/C	14%
Surcharge weight	15.2kg		
Moisture Content @ Top	14%		
Moisture Content @ Bottom	13%		
Bulk Density	2.24 Mg/m3	Gravel >20.0mm	0.3%
Dry Density	1.98 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			17
2.5	2.1	13.2	16
5.0	3.5	20.0	17
BASE			20
2.5	2.4	13.2	18
5.0	3.9	20.0	20

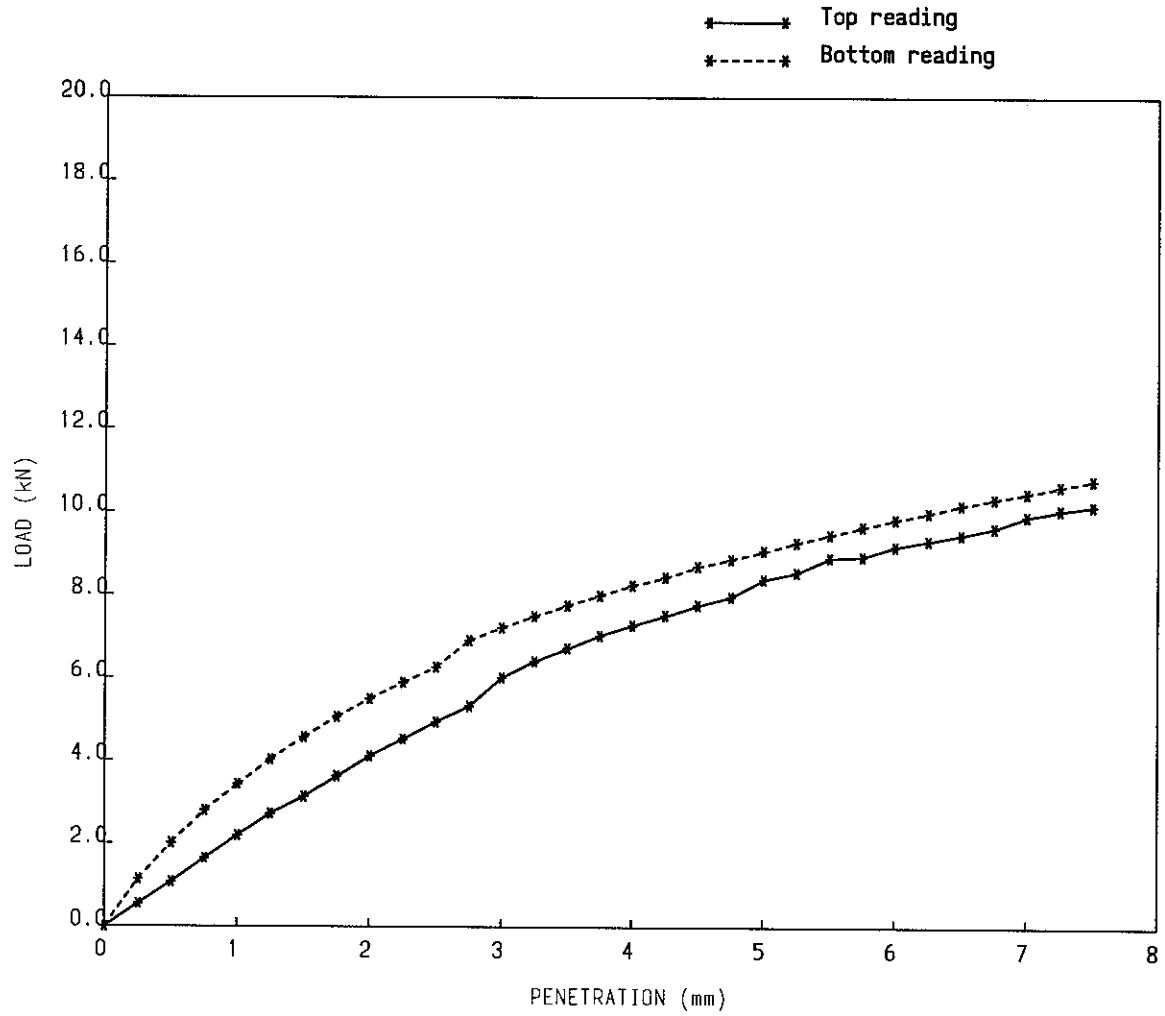
Q.A. Ref: /028-17/M4TB1055.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with a little fine to medium gravel.	Hole ID	TPB105
		Sample No	6
		Depth	1.00 m



Seating Load	250N	Natural M/C	14%
Surcharge weight	15.2kg		
Moisture Content @ Top	12%		
Moisture Content @ Middle	12%		
Moisture Content @ Bottom	12%		
Bulk Density	2.27 Mg/m3	Gravel >20.0mm	0.3%
Dry Density	2.02 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			42
2.5	4.9	13.2	37
5.0	8.4	20.0	42
BASE			47
2.5	6.3	13.2	47
5.0	9.1	20.0	45

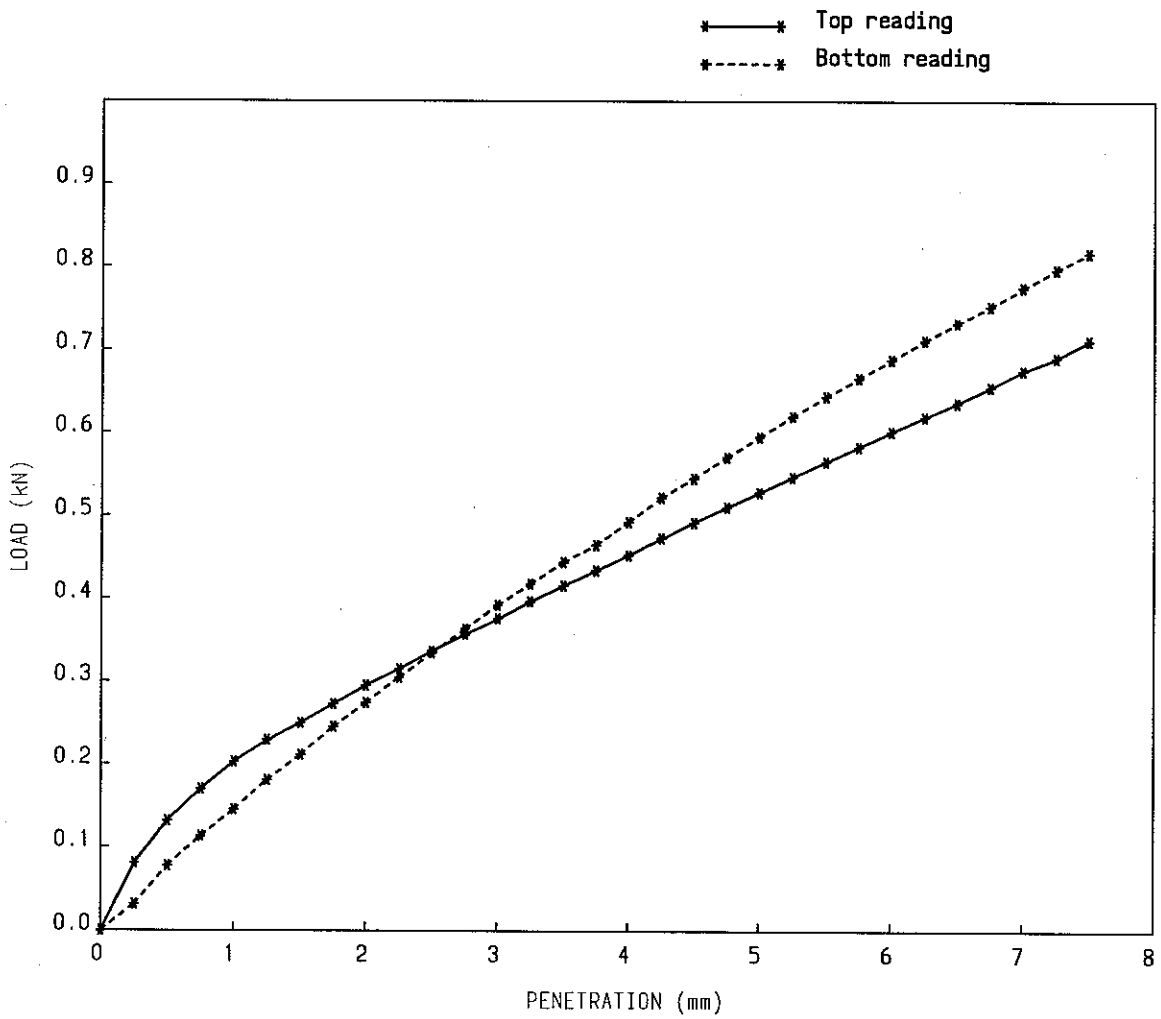
Q.A. Ref: /028-17/M4TB1056.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN100
		Sample No	1
		Depth	0.50 m



Seating Load	10	Natural M/C	13%
Surcharge weight	15.1		
Moisture Content @ Top	14%		
Moisture Content @ Middle	14%		
Moisture Content @ Bottom	14%		
Bulk Density	2.23 Mg/m3	Gravel >20.0mm	17.8%
Dry Density	1.95 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			2.6
2.5	0.34	13.2	2.6
5.0	0.53	20.0	2.6
BASE			3.0
2.5	0.33	13.2	2.5
5.0	0.60	20.0	3.0

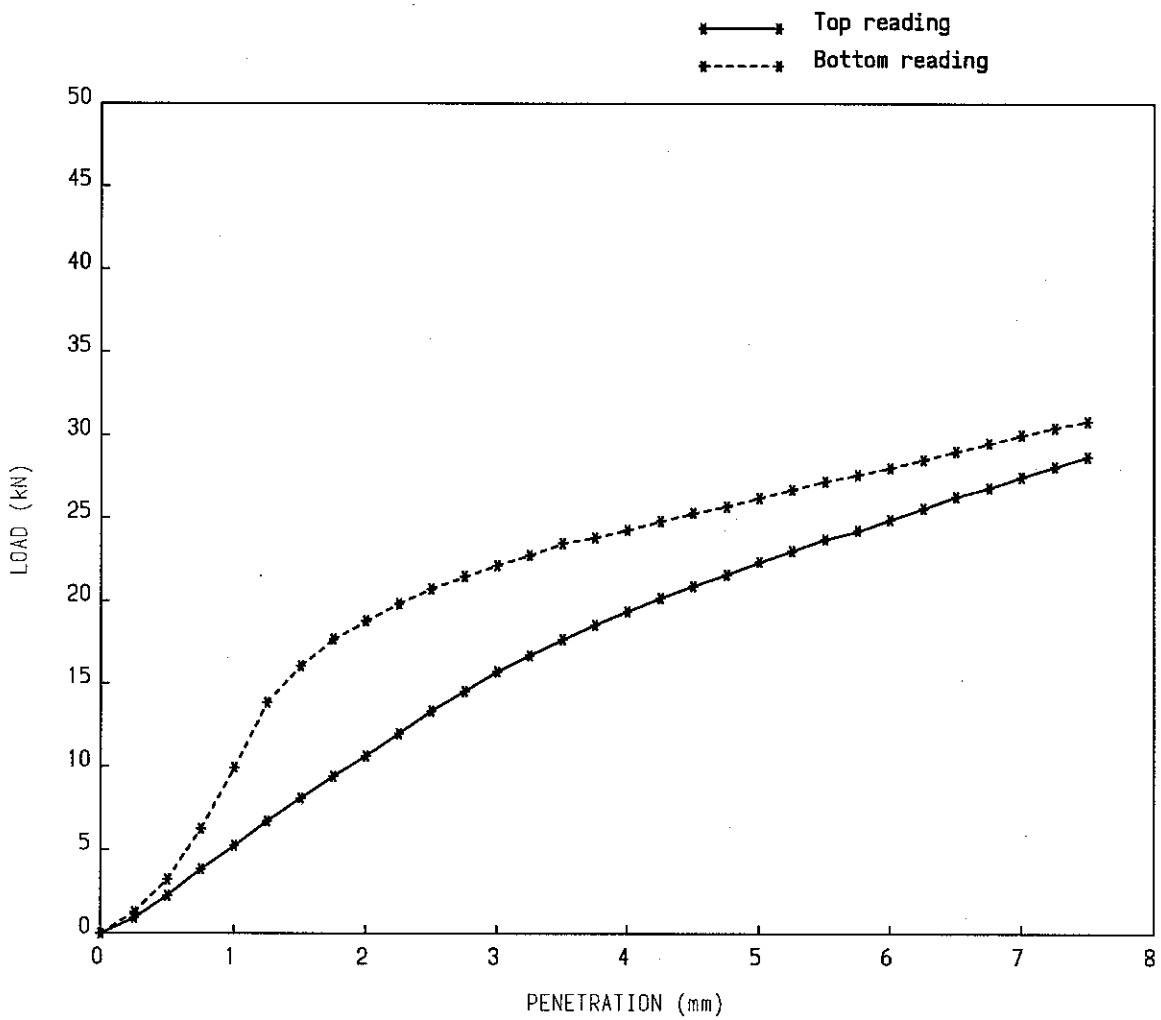
Q.A. Ref: /028-11/M4TN1001.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN100
		Sample No	2
		Depth	0.50 m



Seating Load	250	Natural M/C	13%
Surcharge weight	15.3		
Moisture Content @ Top	6.6%		
Moisture Content @ Bottom	6.5%		
Bulk Density	2.13 Mg/m3	Gravel >20.0mm	17.9%
Dry Density	2.00 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			112
2.5	13	13.2	101
5.0	22	20.0	112
BASE			157
2.5	21	13.2	157
5.0	26	20.0	131

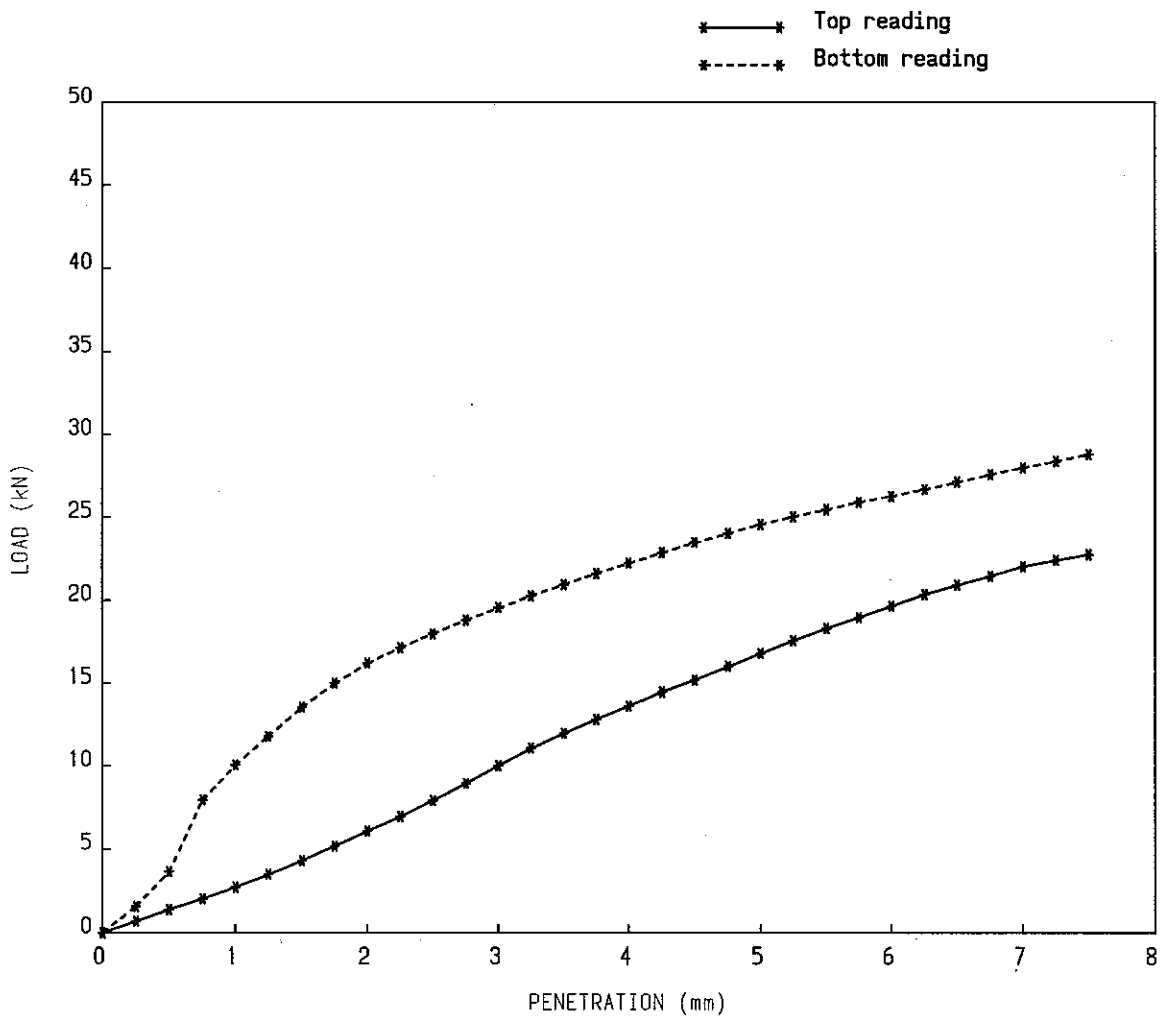
Q.A. Ref: /028-11/M4TN1002.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN100
		Sample No	3
		Depth	0.50 m



Seating Load	250	Natural M/C	13%
Surcharge weight	15.1		
Moisture Content @ Top	8.4%		
Moisture Content @ Bottom	8.0%		
Bulk Density	2.31 Mg/m3	Gravel >20.0mm	17.9%
Dry Density	2.13 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			84
2.5	7.9	13.2	60
5.0	17	20.0	84
BASE			136
2.5	18	13.2	136
5.0	25	20.0	123

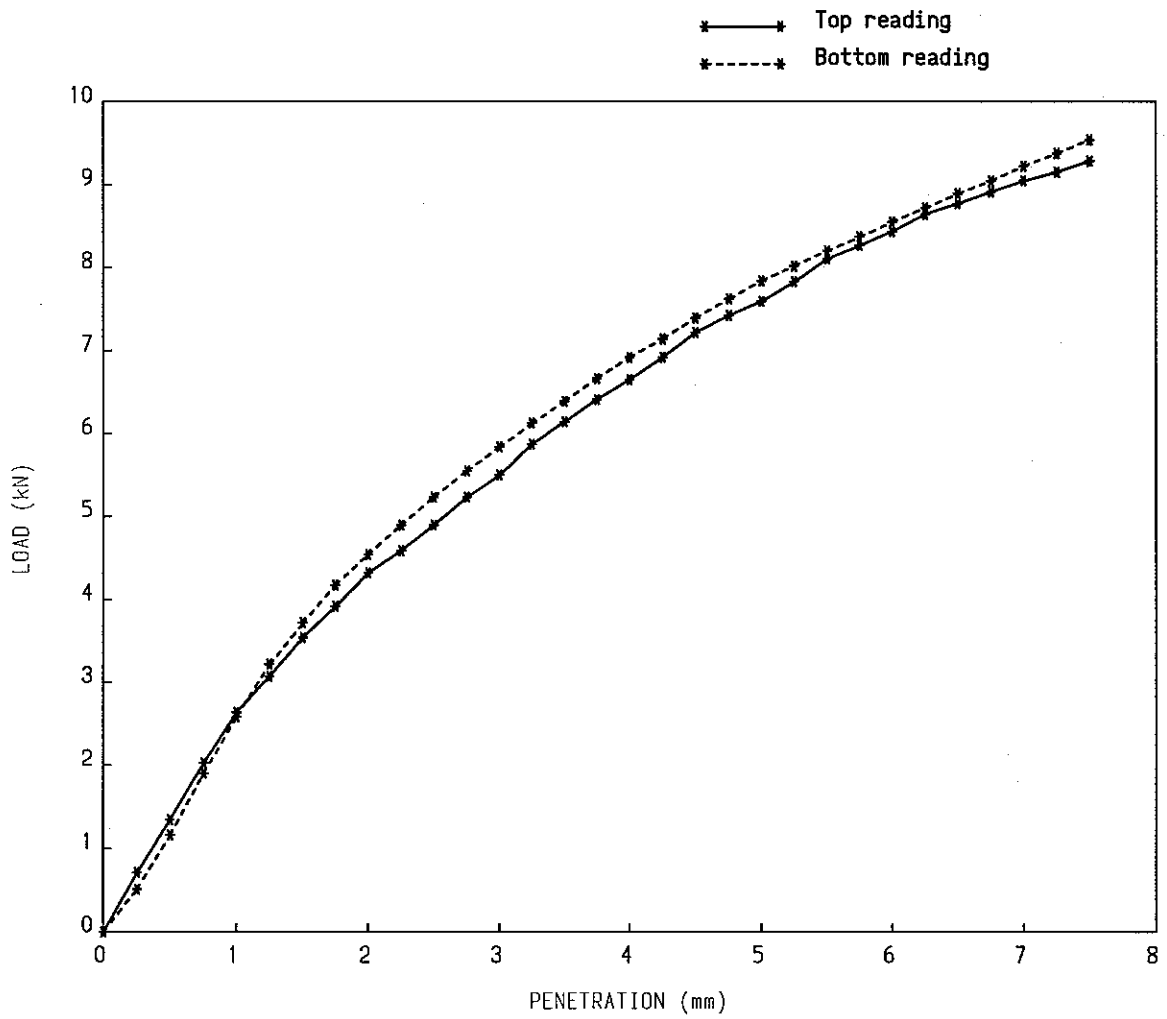
Q.A. Ref: /028-11/M4TN1003.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN100
		Sample No	4
		Depth	0.50 m



Seating Load	250	Natural M/C	13%
Surcharge weight	15.3		
Moisture Content @ Top	10%		
Moisture Content @ Bottom	10%		
Bulk Density	2.31 Mg/m3	Gravel >20.0mm	17.9%
Dry Density	2.10 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			38
2.5	4.9	13.2	37
5.0	7.6	20.0	38
BASE			40
2.5	5.2	13.2	40
5.0	7.8	20.0	39

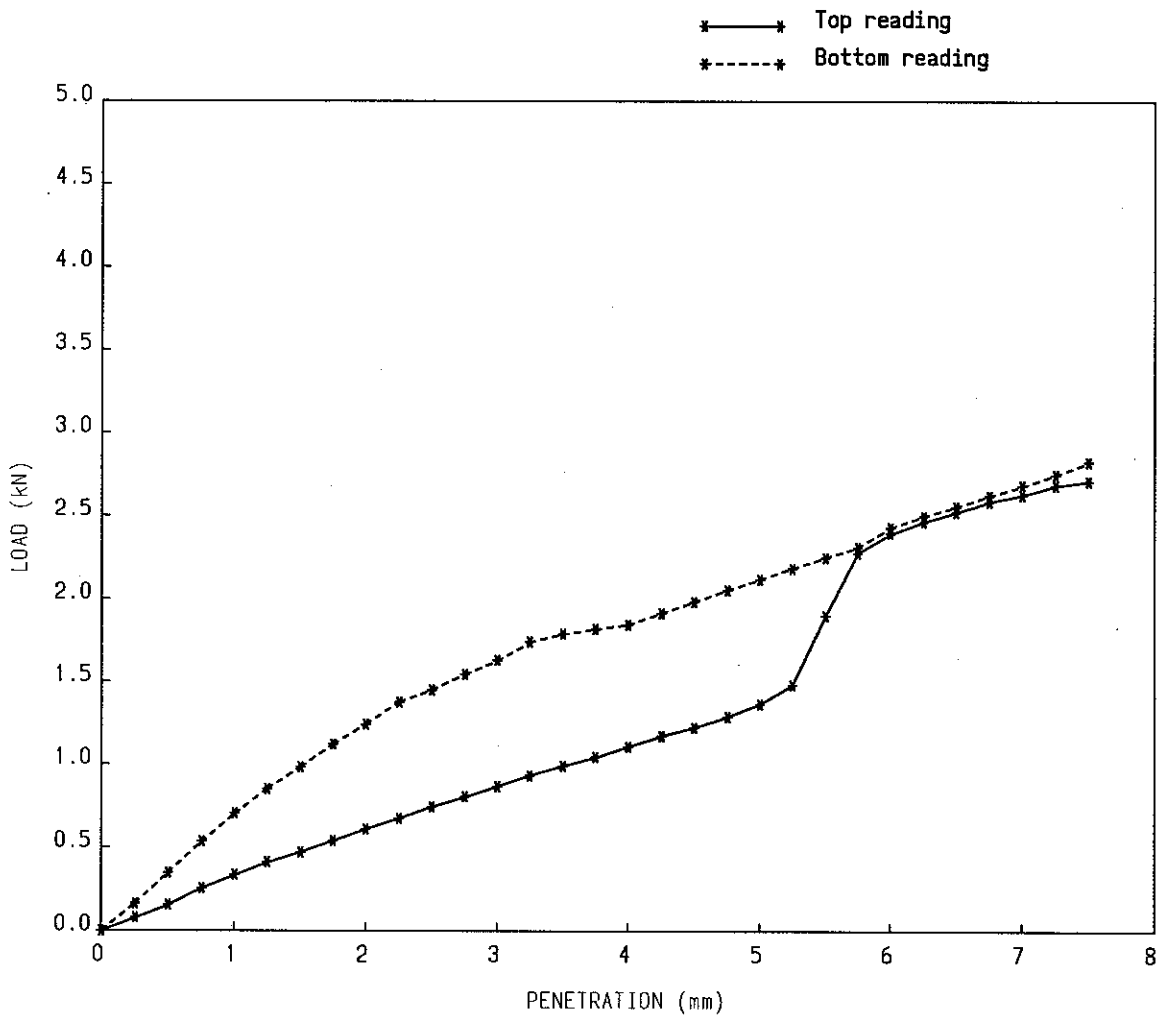
Q.A. Ref: /028-11/M4TN1004.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN100
		Sample No	5
		Depth	0.50 m



Seating Load	10	Natural M/C	13%
Surcharge weight	15.1		
Moisture Content @ Top	12%		
Moisture Content @ Middle	12%		
Moisture Content @ Bottom	11%		
Bulk Density	2.26 Mg/m3	Gravel >20.0mm	17.9%
Dry Density	2.02 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			6.8
2.5	0.75	13.2	5.7
5.0	1.4	20.0	6.8
BASE			11
2.5	1.5	13.2	11
5.0	2.1	20.0	11

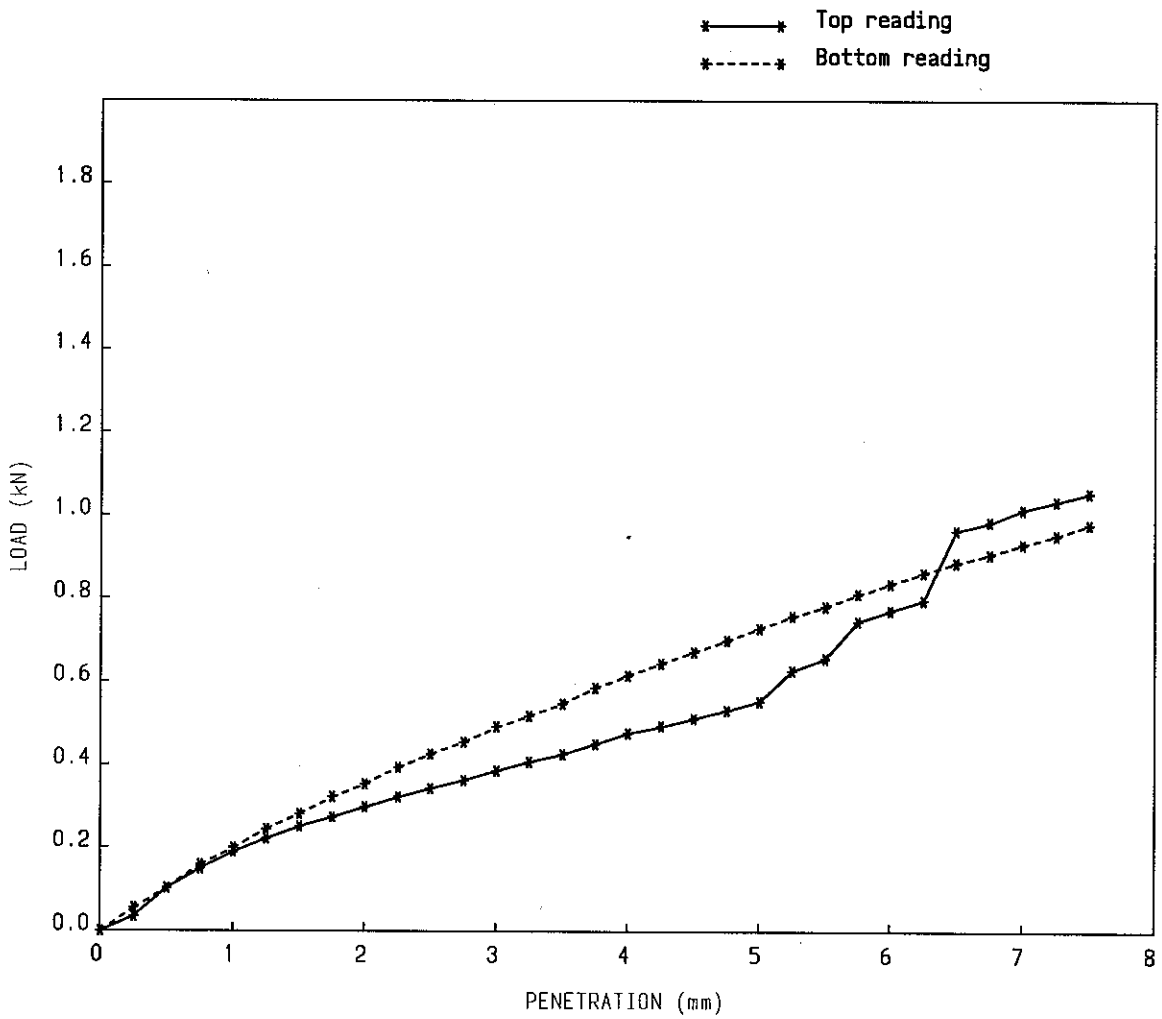
Q.A. Ref: /028-11/M4TN1005.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greyish green CLAY with a little gravel and some sandstone.	Hole ID	TPN100
		Sample No	1
		Depth	2.00 m



Seating Load	10N	Natural M/C	19%
Surcharge weight	15.1kg		
Moisture Content @ Top	19%		
Moisture Content @ Middle	19%		
Moisture Content @ Bottom	19%		
Bulk Density	2.12 Mg/m3	Gravel >20.0mm	0.4%
Dry Density	1.78 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			2.8
2.5	0.34	13.2	2.6
5.0	0.55	20.0	2.8
BASE			3.6
2.5	0.43	13.2	3.2
5.0	0.73	20.0	3.6

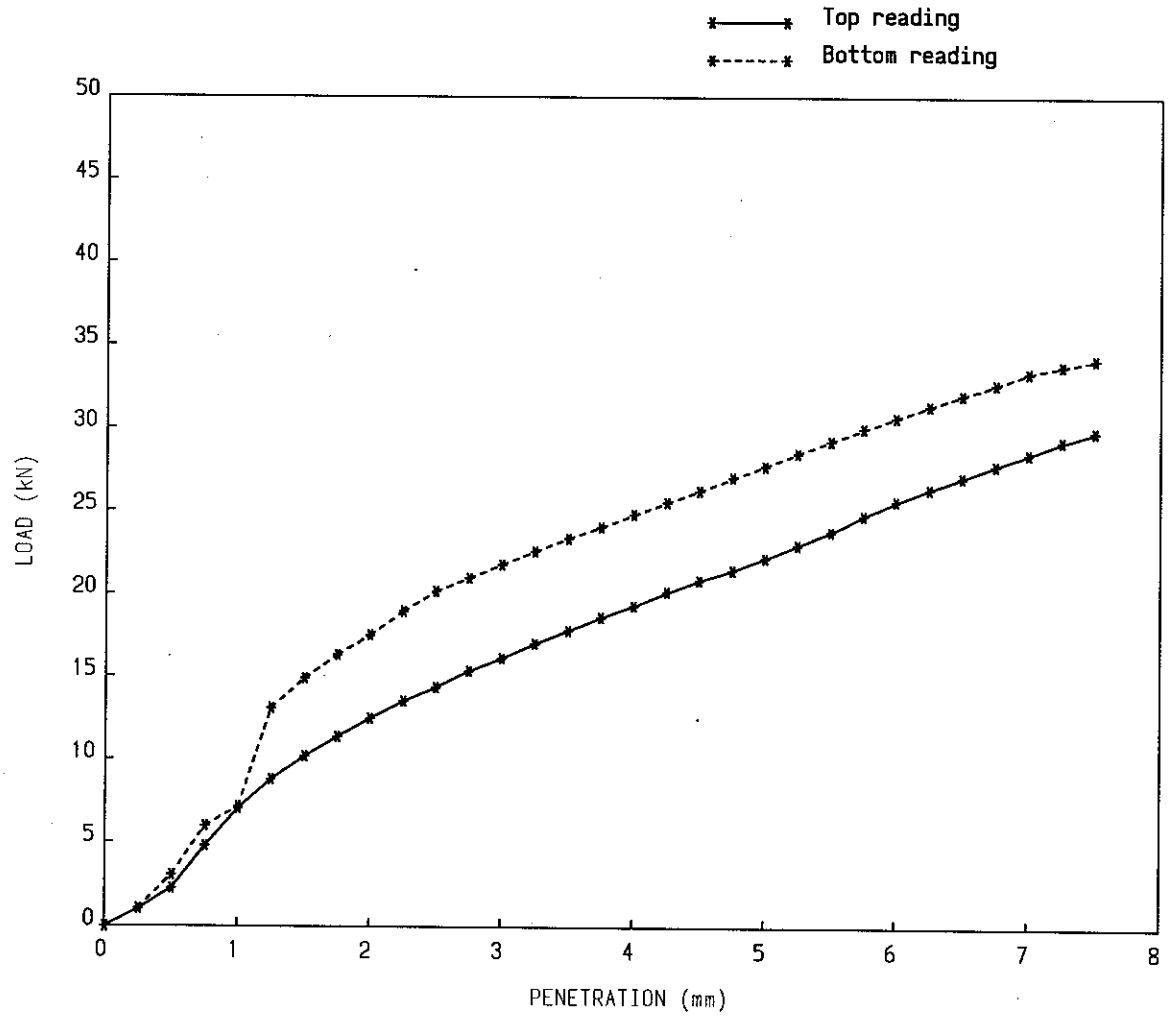
Q.A. Ref: /028-13/M4tn100.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greyish green CLAY with a little gravel.	Hole ID	TPN100
		Sample No	2
		Depth	2.00 m



Seating Load	250N	Natural M/C	19%
Surcharge weight	15kg		
Moisture Content @ Top	9.6%		
Moisture Content @ Middle	9.5%		
Moisture Content @ Bottom	8.9%		
Bulk Density	2.01 Mg/m3	Gravel >20.0mm	0.4%
Dry Density	1.84 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			111
2.5	14	13.2	109
5.0	22	20.0	111
BASE			153
2.5	20	13.2	153
5.0	28	20.0	139

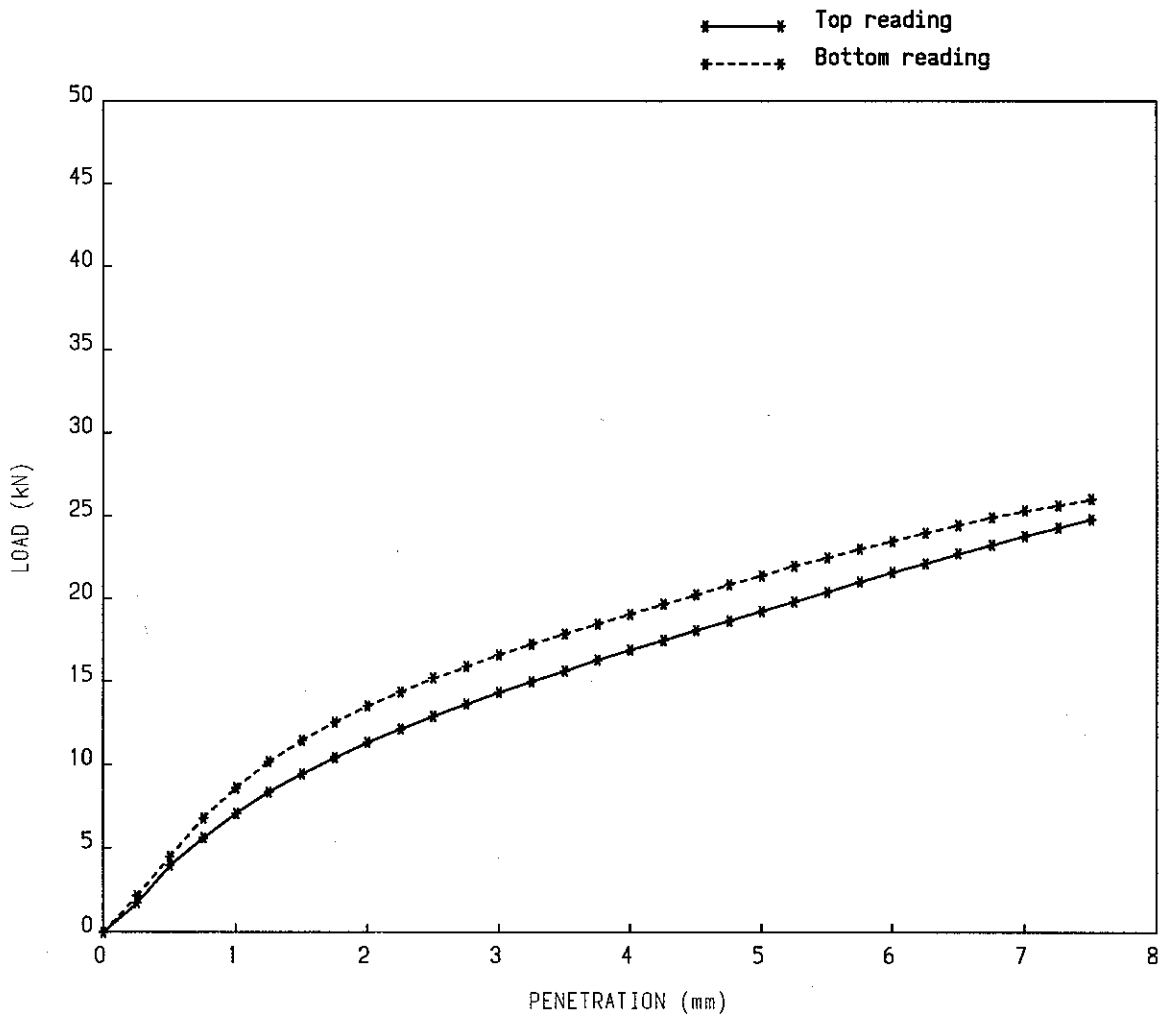
Q.A. Ref: /028-13/M4T1002.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greyish green CLAY with a little gravel and some sandstone.	Hole ID	TPN100
		Sample No	3
		Depth	2.00 m



Seating Load	250N	Natural M/C	19%
Surcharge weight	15.4kg		
Moisture Content @ Top	12%		
Moisture Content @ Middle	12%		
Moisture Content @ Bottom	12%		
Bulk Density	2.12 Mg/m3	Gravel >20.0mm	0.4%
Dry Density	1.89 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			98
2.5	13	13.2	98
5.0	19	20.0	96
BASE			115
2.5	15	13.2	115
5.0	21	20.0	107

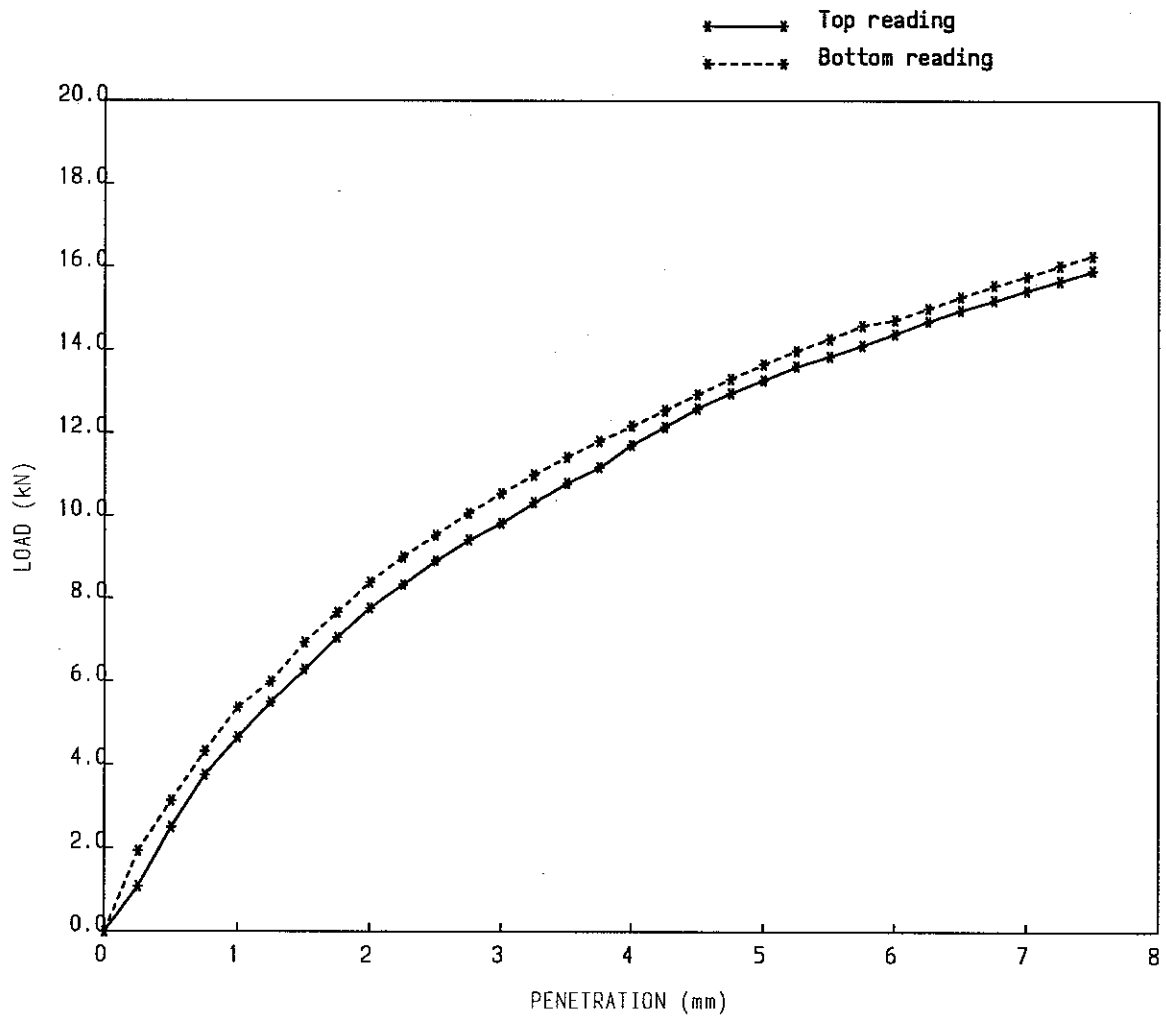
Q.A. Ref: /028-13/M4T1003.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greyish green CLAY with a little gravel and some sandstone.	Hole ID	TPN100
		Sample No	4
		Depth	2.00 m



Seating Load	250N	Natural M/C	19%
Surcharge weight	15.0kg		
Moisture Content @ Top	14%		
Moisture Content @ Middle	14%		
Moisture Content @ Bottom	14%		
Bulk Density	2.19 Mg/m3	Gravel >20.0mm	0.4%
Dry Density	1.92 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			68
2.5	8.9	13.2	68
5.0	13	20.0	66
BASE			72
2.5	9.5	13.2	72
5.0	14	20.0	68

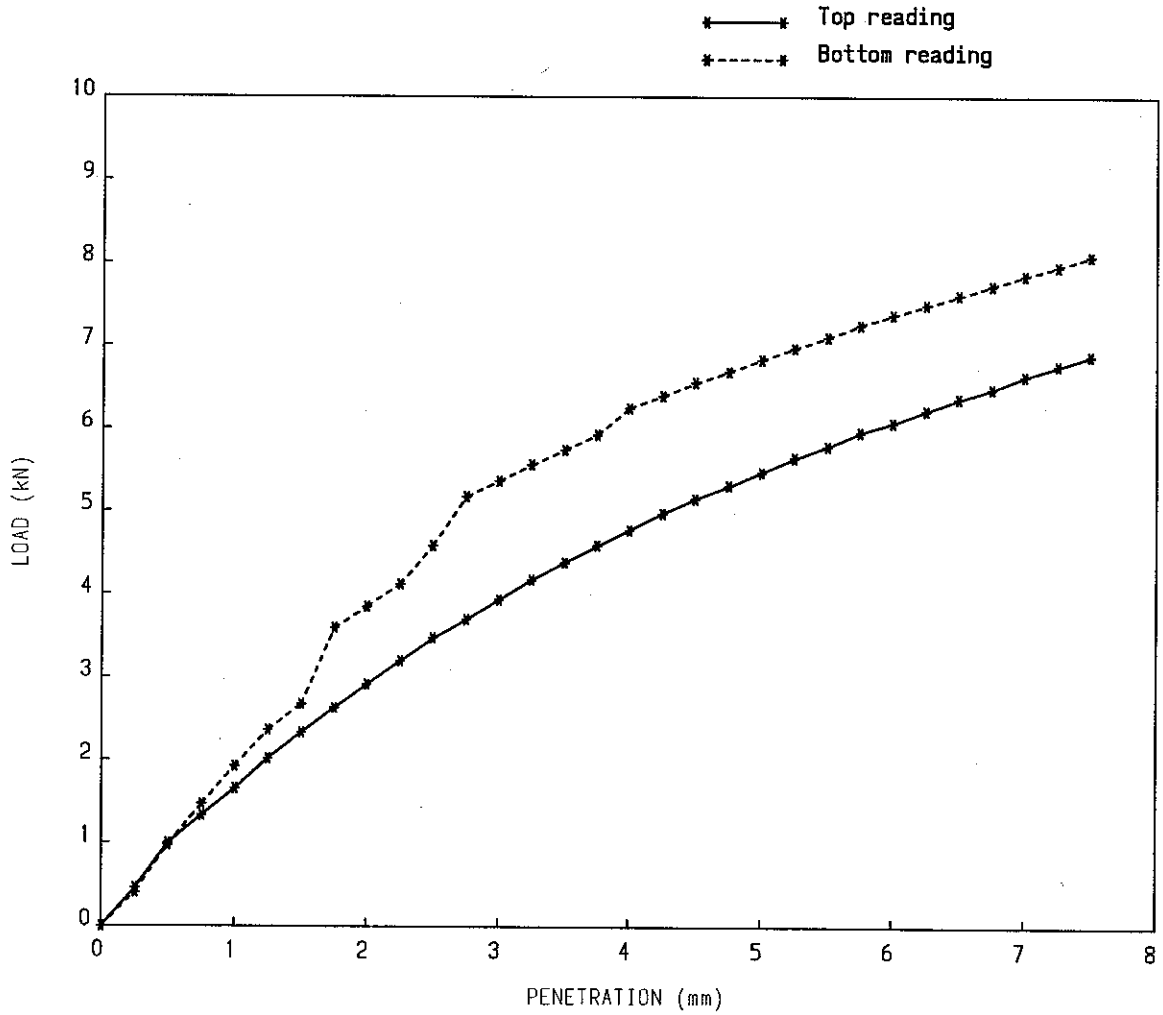
Q.A. Ref: /028-13/M4T1004.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown mottled greyish green CLAY with a little gravel and some sandstone.	Hole ID	TPN100
		Sample No	5
		Depth	2.00 m



Seating Load	50N	Natural M/C	19%
Surcharge weight	15.0kg		
Moisture Content @ Top	15%		
Moisture Content @ Middle	15%		
Moisture Content @ Bottom	15%		
Bulk Density	2.20 Mg/m3	Gravel >20.0mm	0.4%
Dry Density	1.91 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			27
2.5	3.5	13.2	26
5.0	5.5	20.0	27
BASE			35
2.5	4.6	13.2	35
5.0	6.8	20.0	34

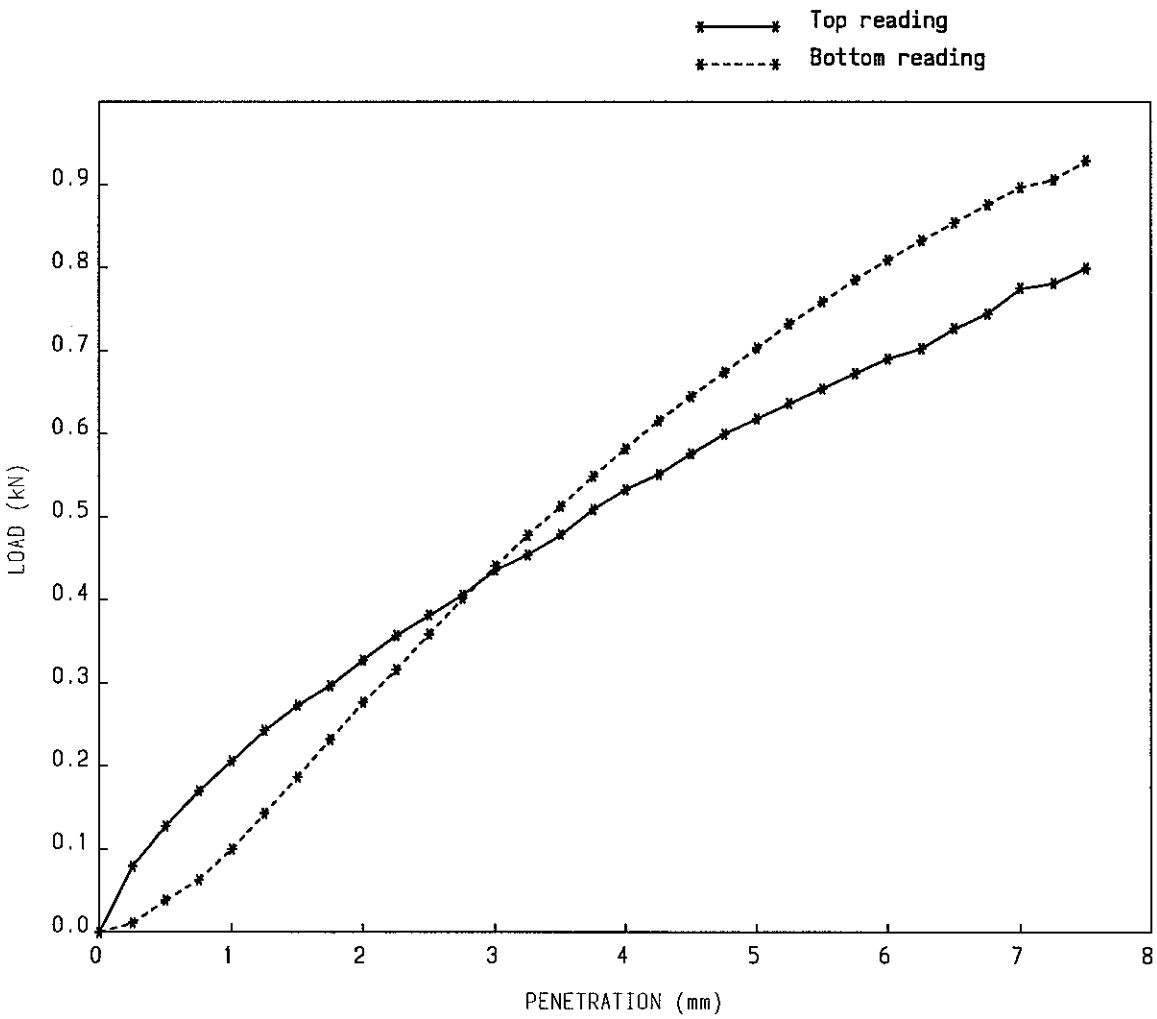
Q.A. Ref: /028-13/M4T1005.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN101
		Sample No	1
		Depth	0.50 m



Seating Load	10N	Natural M/C	15%
Surcharge weight	15.1kg		
Moisture Content @ Top	15%		
Moisture Content @ Middle	15%		
Moisture Content @ Bottom	15%		
Bulk Density	2.18 Mg/m3	Gravel >20.0mm	13.1%
Dry Density	1.89 Mg/m3	Gravel >37.5mm	4.4%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			3.1
2.5	0.38	13.2	2.9
5.0	0.62	20.0	3.1
BASE			3.5
2.5	0.36	13.2	2.7
5.0	0.70	20.0	3.5

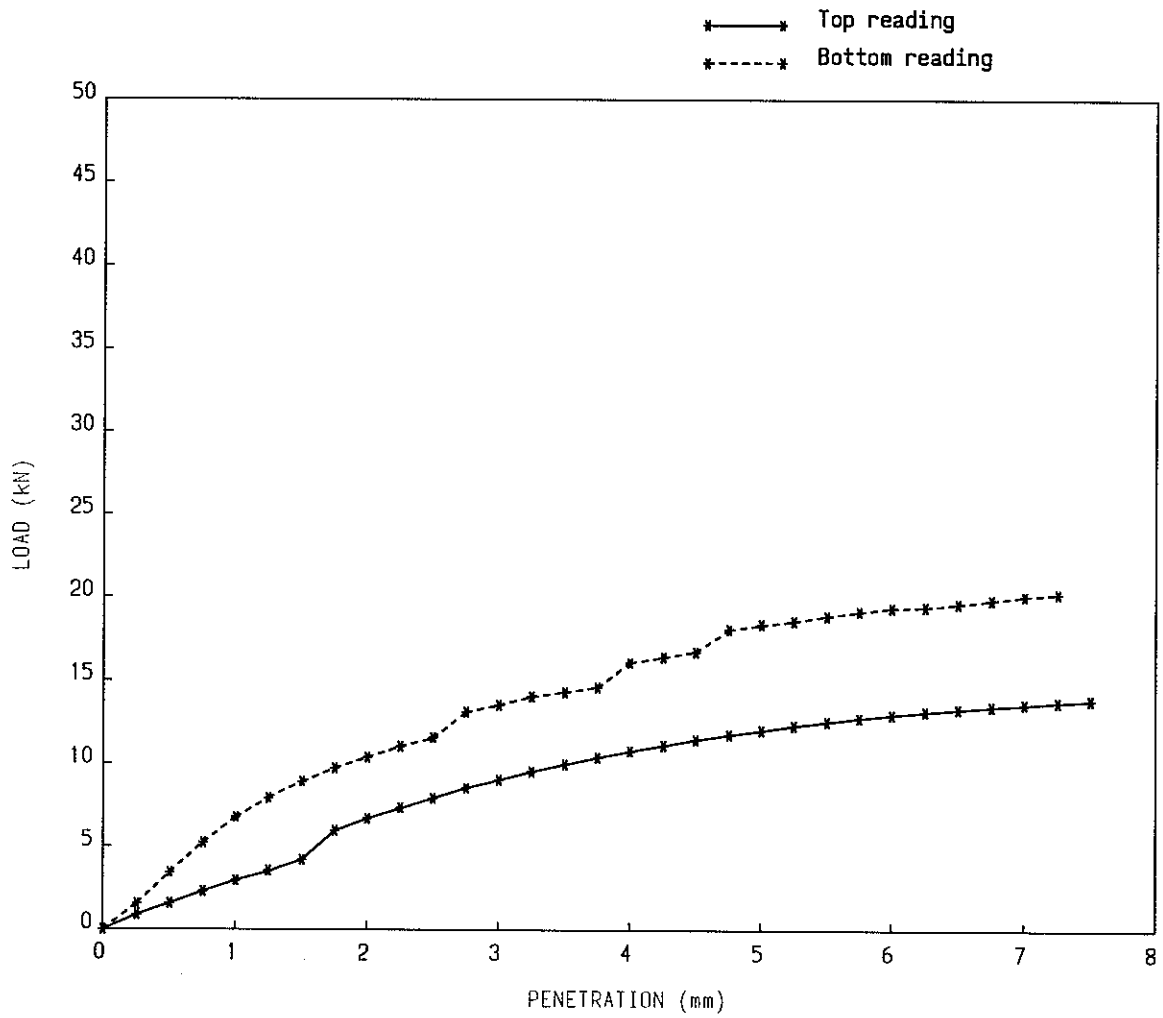
Q.A. Ref: /028-18/M4PN1011.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN101
		Sample No	2
		Depth	0.50 m



Seating Load	250N	Natural M/C	15%
Surcharge weight	15.1kg		
Moisture Content @ Top	10%		
Moisture Content @ Middle	9.9%		
Moisture Content @ Bottom	9.4%		
Bulk Density	2.26 Mg/m3	Gravel >20.0mm	13.1%
Dry Density	2.06 Mg/m3	Gravel >37.5mm	4.4%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			60
2.5	7.9	13.2	60
5.0	12	20.0	60
BASE			92
2.5	12	13.2	88
5.0	18	20.0	92

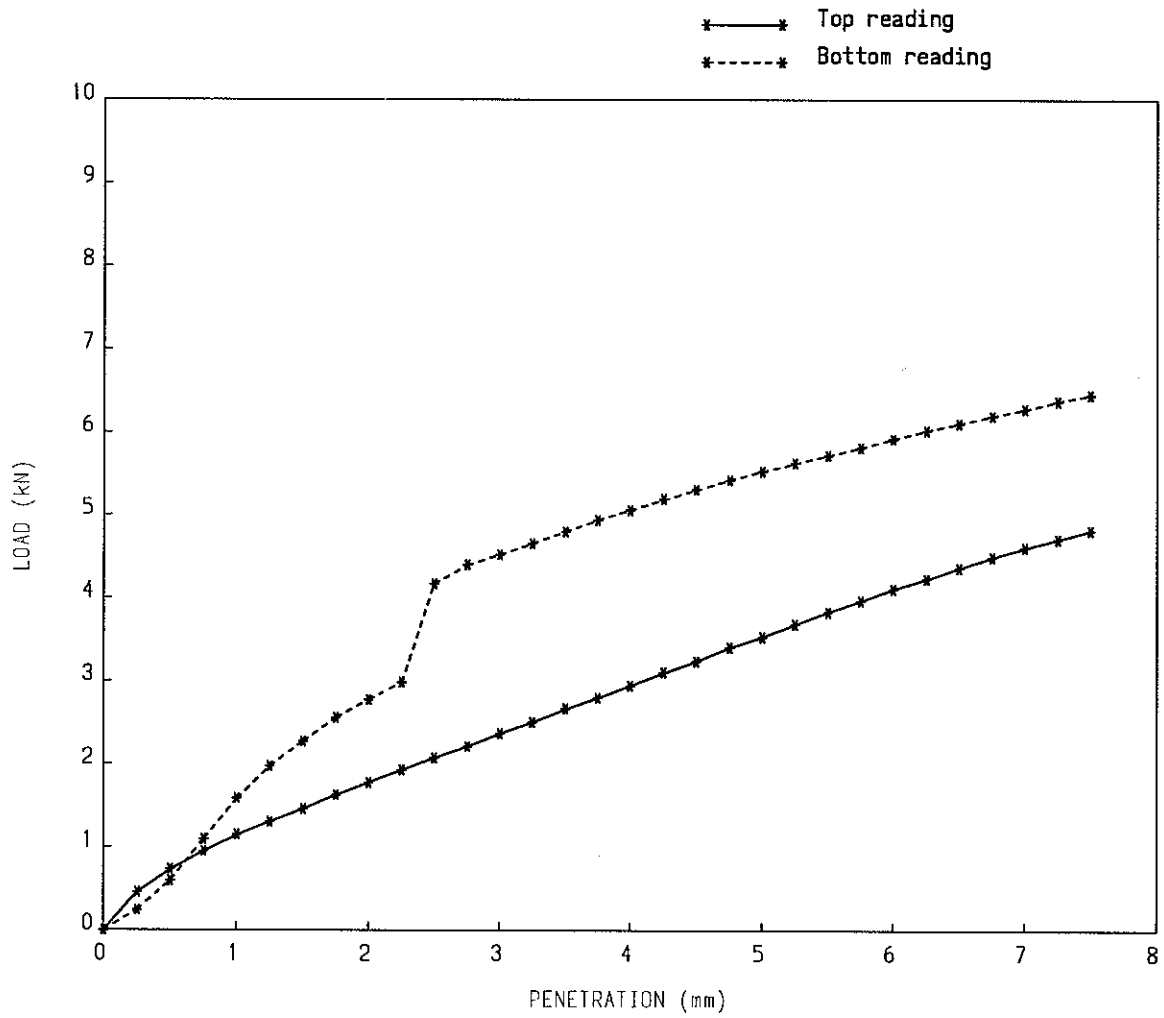
Q.A. Ref: /028-18/M4PN1012.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN101
		Sample No	3
		Depth	0.50 m



Seating Load	250N	Natural M/C	15%
Surcharge weight	15.1kg		
Moisture Content @ Top	13%		
Moisture Content @ Middle	11%		
Moisture Content @ Bottom	12%		
Bulk Density	2.27 Mg/m3	Gravel >20.0mm	13.1%
Dry Density	2.03 Mg/m3	Gravel >37.5mm	4.4%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			18
2.5	2.1	13.2	16
5.0	3.5	20.0	18
BASE			32
2.5	4.2	13.2	32
5.0	5.5	20.0	28

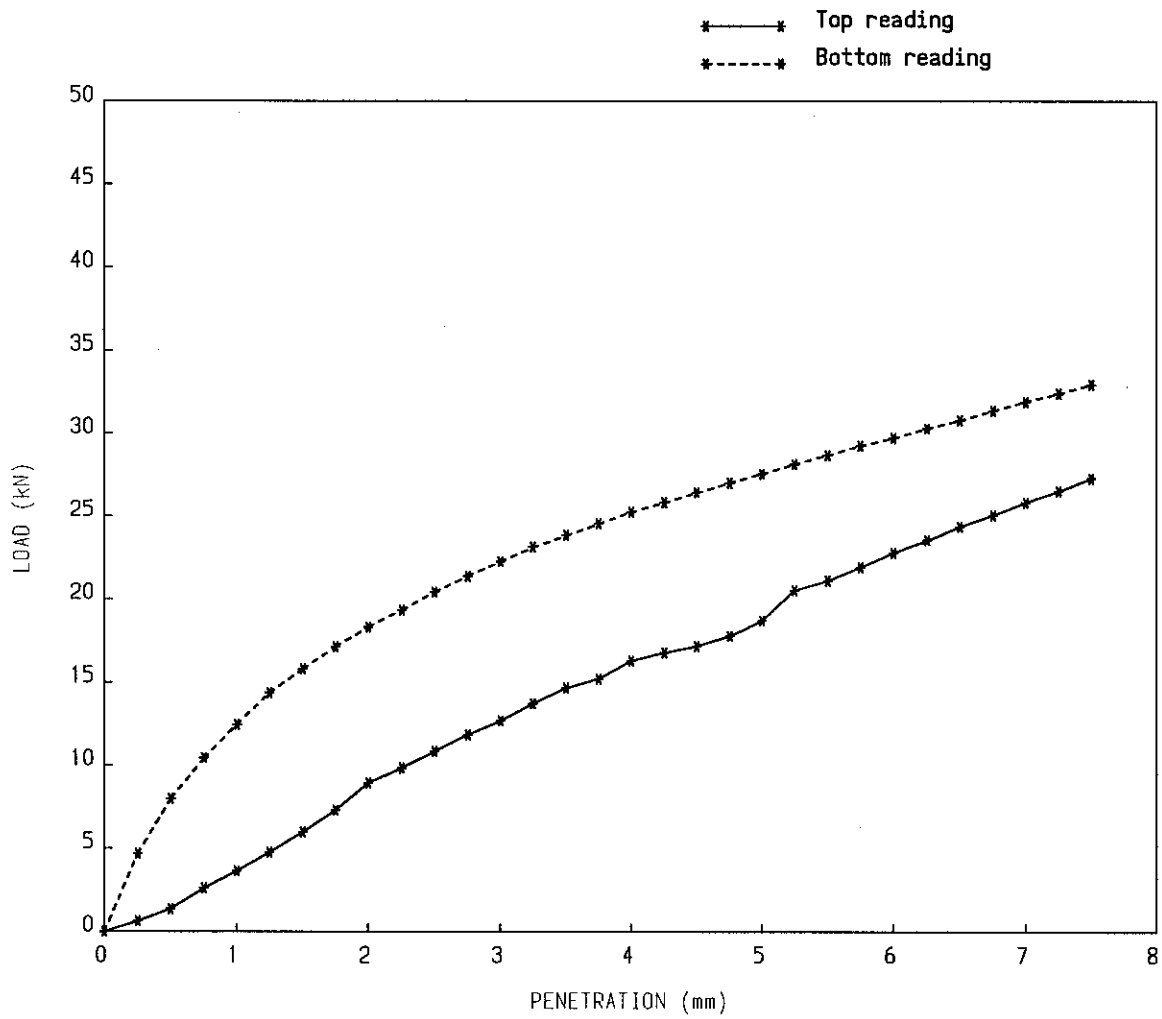
Q.A. Ref: /028-18/M4PN1013.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN101
		Sample No	4
		Depth	0.50 m



Seating Load	250N	Natural M/C	15%
Surcharge weight	14.9kg		
Moisture Content @ Top	5.6%		
Moisture Content @ Bottom	5.6%		
Bulk Density	2.09 Mg/m3	Gravel >20.0mm	13.1%
Dry Density	1.98 Mg/m3	Gravel >37.5mm	4.4%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			94
2.5	11	13.2	82
5.0	19	20.0	94
BASE			155
2.5	20	13.2	155
5.0	28	20.0	138

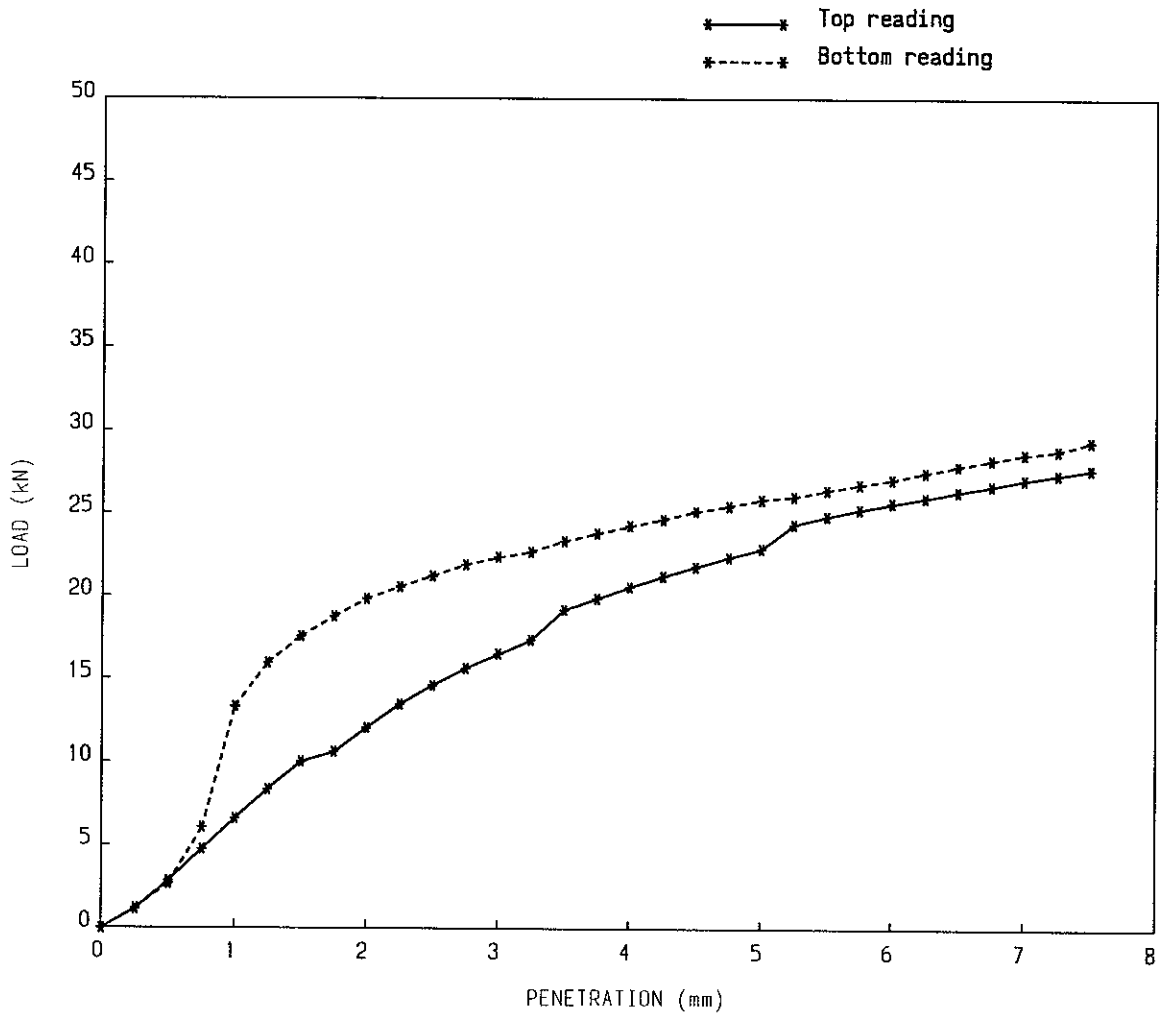
Q.A. Ref: /028-18/M4PN1014.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel.	Hole ID	TPN101
		Sample No	5
		Depth	0.50 m



Seating Load	250N	Natural M/C	15%
Surcharge weight	15.1kg		
Moisture Content @ Top	7.9%		
Moisture Content @ Bottom	7.7%		
Bulk Density	2.26 Mg/m3	Gravel >20.0mm	13.1%
Dry Density	2.10 Mg/m3	Gravel >37.5mm	4.4%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			114
2.5	15	13.2	111
5.0	23	20.0	114
BASE			161
2.5	21	13.2	161
5.0	26	20.0	129

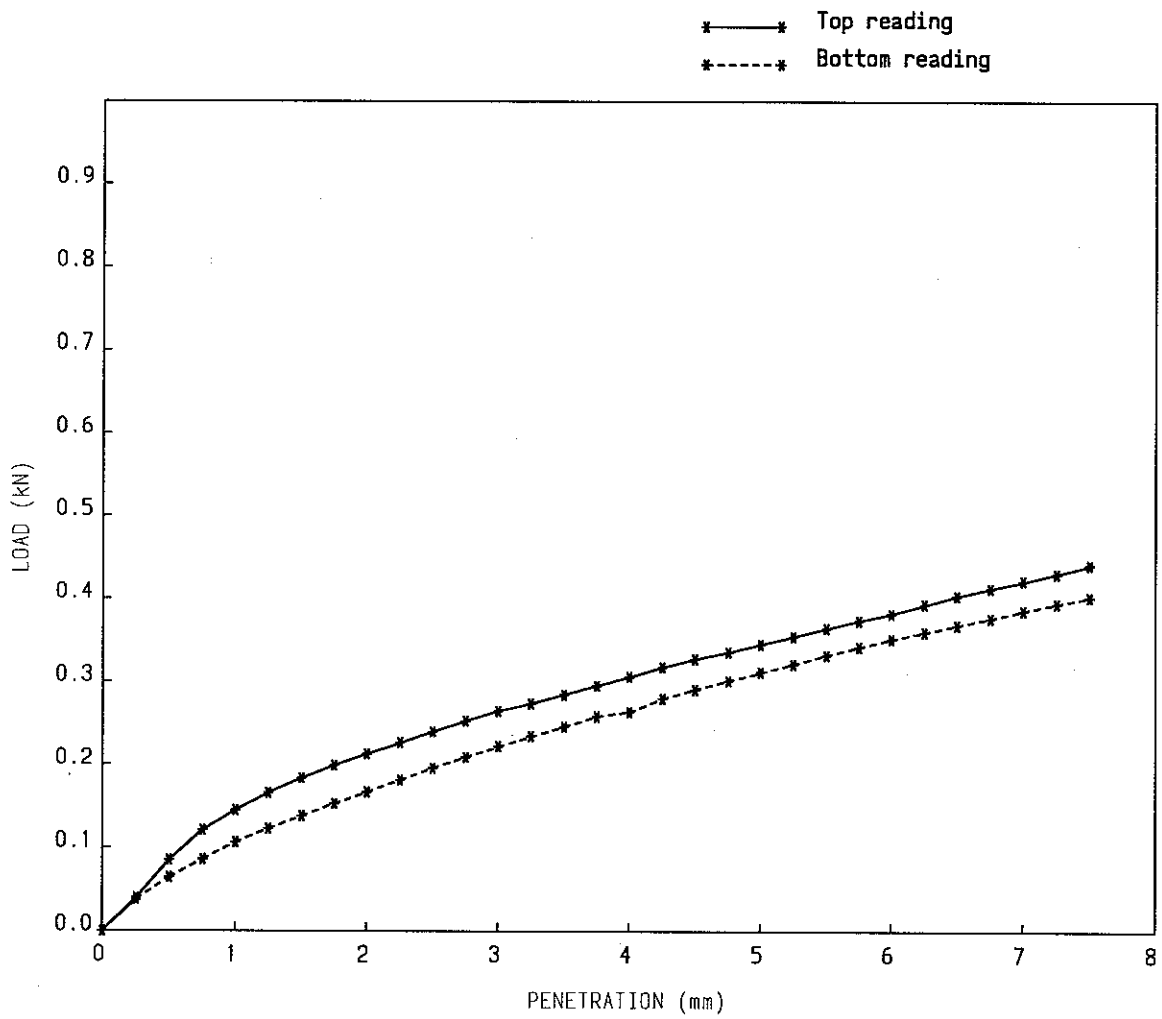
Q.A. Ref: /028-18/M4PN1015.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel and occasional cobbles.	Hole ID	TPN101
		Sample No	1
		Depth	2.20 m



Seating Load	10	Natural M/C	16%
Surcharge weight	15.1		
Moisture Content @ Top	16%		
Moisture Content @ Middle	15%		
Moisture Content @ Bottom	15%		
Bulk Density	2.18 Mg/m3	Gravel >20.0mm	14.8%
Dry Density	1.89 Mg/m3	Gravel >37.5mm	5.3%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			1.8
2.5	0.24	13.2	1.8
5.0	0.35	20.0	1.7
BASE			1.6
2.5	0.20	13.2	1.5
5.0	0.31	20.0	1.6

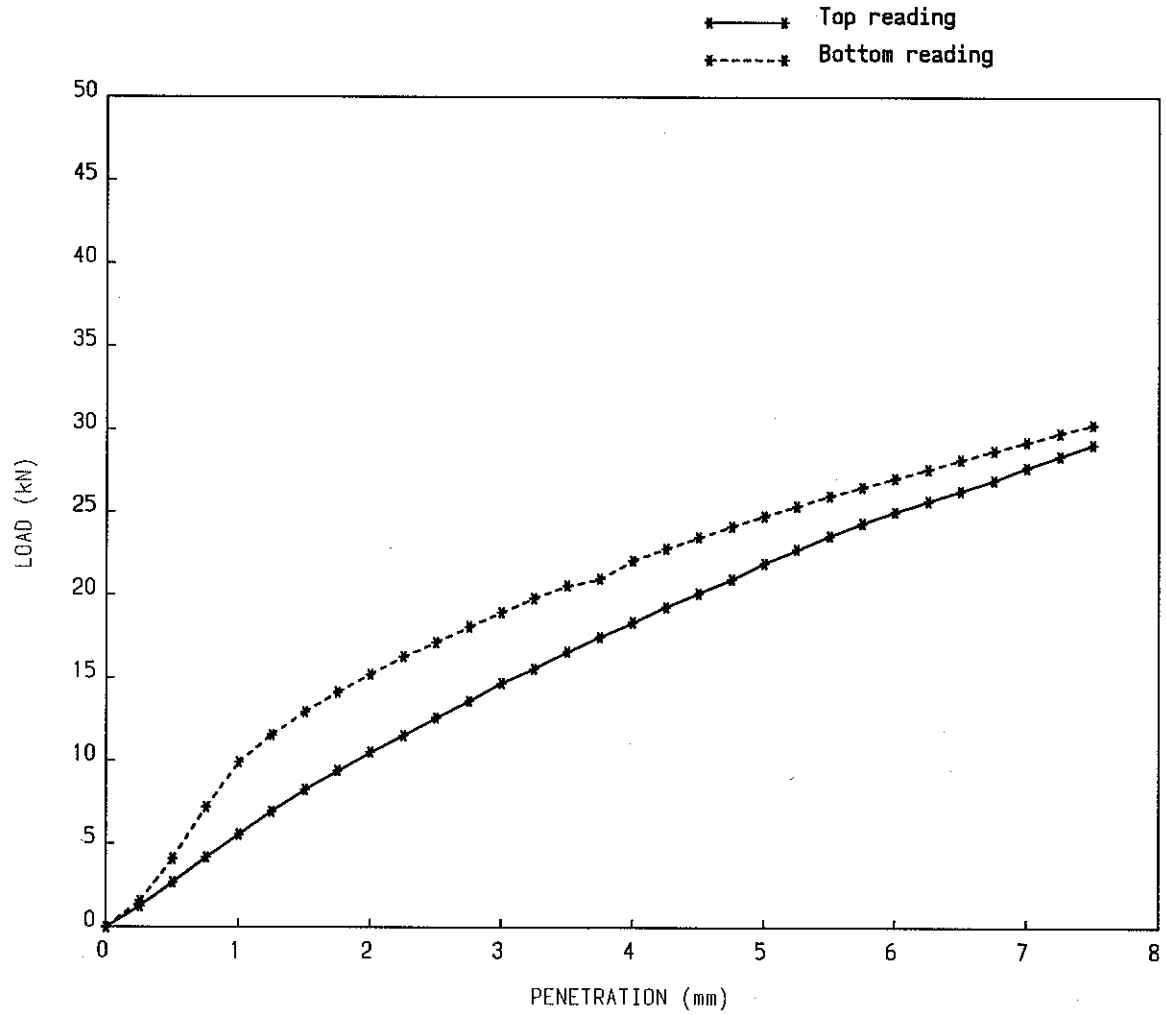
Q.A. Ref: /028-11/M4TN101.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel and occasional cobbles.	Hole ID	TPN101
		Sample No	2
		Depth	2.20 m



Seating Load	10	Natural M/C	16%
Surcharge weight	15.1		
Moisture Content @ Top	6.2%		
Moisture Content @ Middle	5.9%		
Moisture Content @ Bottom	6.5%		
Bulk Density	2.16 Mg/m3	Gravel >20.0mm	14.8%
Dry Density	2.04 Mg/m3	Gravel >37.5mm	5.3%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			110
2.5	13	13.2	95
5.0	22	20.0	110
BASE			130
2.5	17	13.2	130
5.0	25	20.0	124

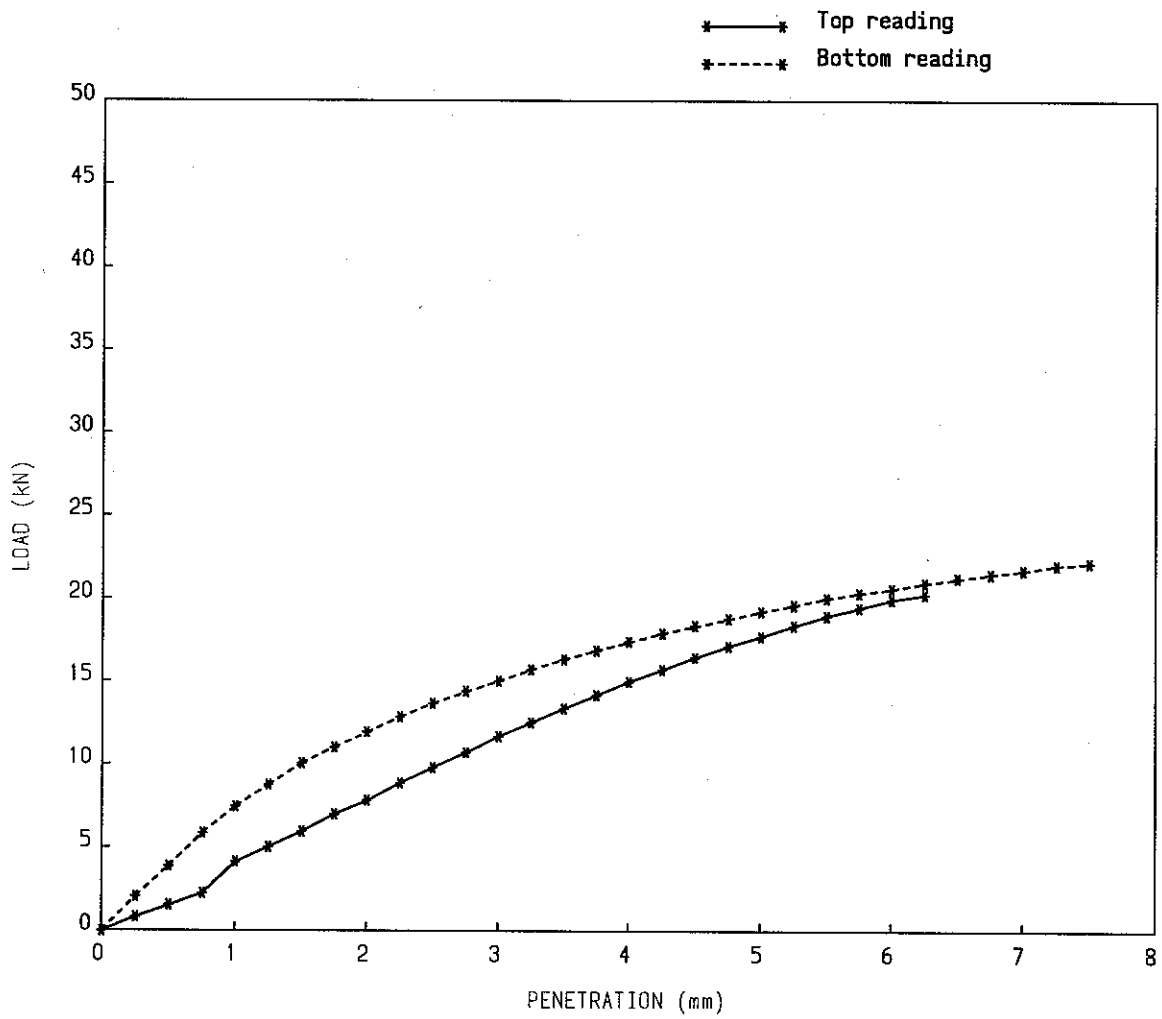
Q.A. Ref: /028-11/M4TN1012.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orange brown sandy CLAY with some gravel and occasional cobbles.	Hole ID	TPN101
		Sample No	3
		Depth	2.20 m



Seating Load	250	Natural M/C	16%
Surcharge weight	15.1		
Moisture Content @ Top	8.7%		
Moisture Content @ Middle	8.5%		
Moisture Content @ Bottom	8.5%		
Bulk Density	2.30 Mg/m3	Gravel >20.0mm	14.8%
Dry Density	2.11 Mg/m3	Gravel >37.5mm	5.3%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			89
2.5	9.8	13.2	74
5.0	18	20.0	89
BASE			104
2.5	14	13.2	104
5.0	19	20.0	96

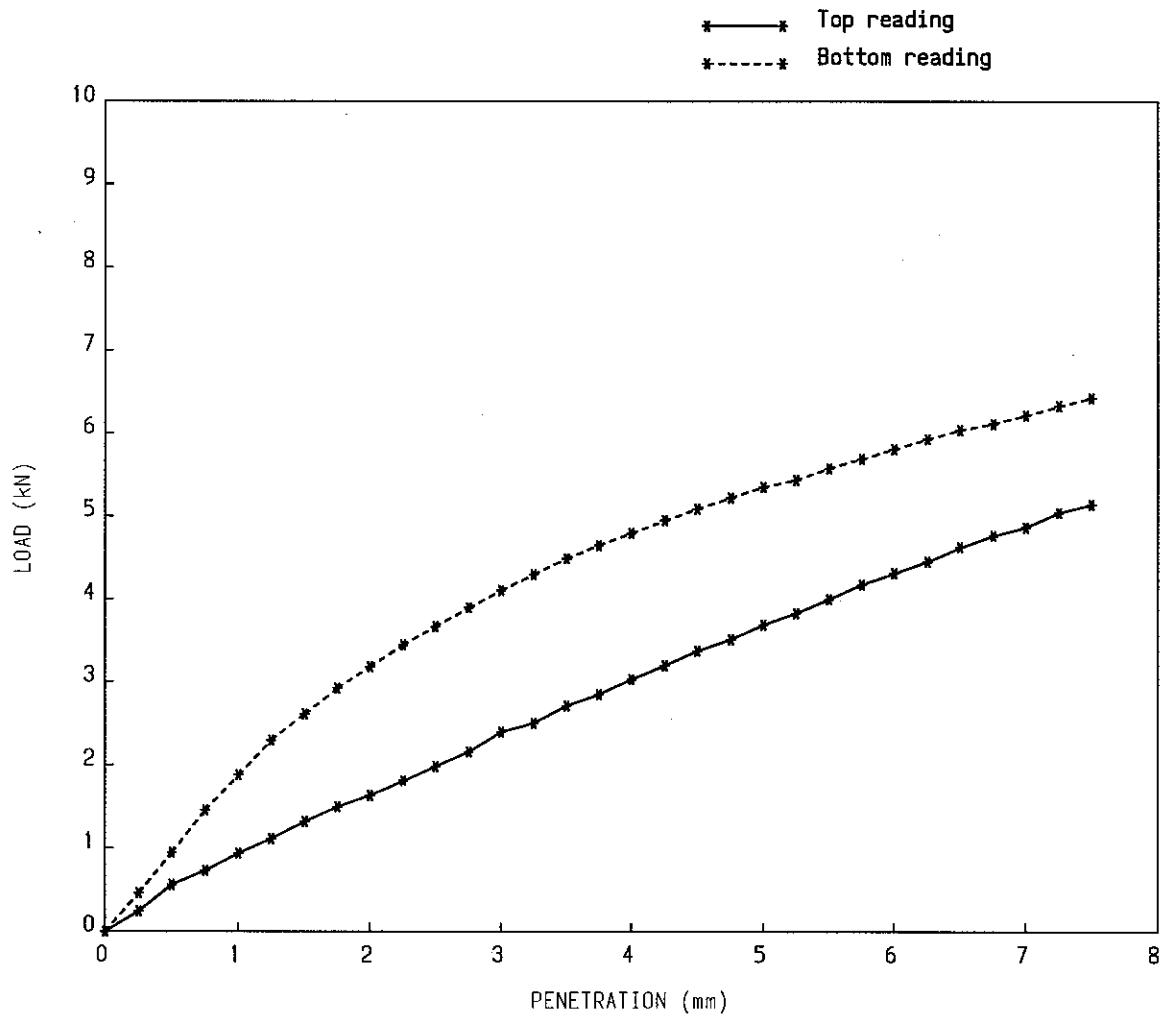
Q.A. Ref: /028-11/M4TN1013.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel and occasional cobbles.	Hole ID	TPN101
		Sample No	4
		Depth	2.20 m



Seating Load	250	Natural M/C	11%
Surcharge weight	15.1		
Moisture Content @ Top	11%		
Moisture Content @ Middle	11%		
Moisture Content @ Bottom	10%		
Bulk Density	2.30 Mg/m3	Gravel >20.0mm	14.8%
Dry Density	2.08 Mg/m3	Gravel >37.5mm	5.3%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			18
2.5	2.0	13.2	15
5.0	3.7	20.0	18
BASE			28
2.5	3.7	13.2	28
5.0	5.4	20.0	27

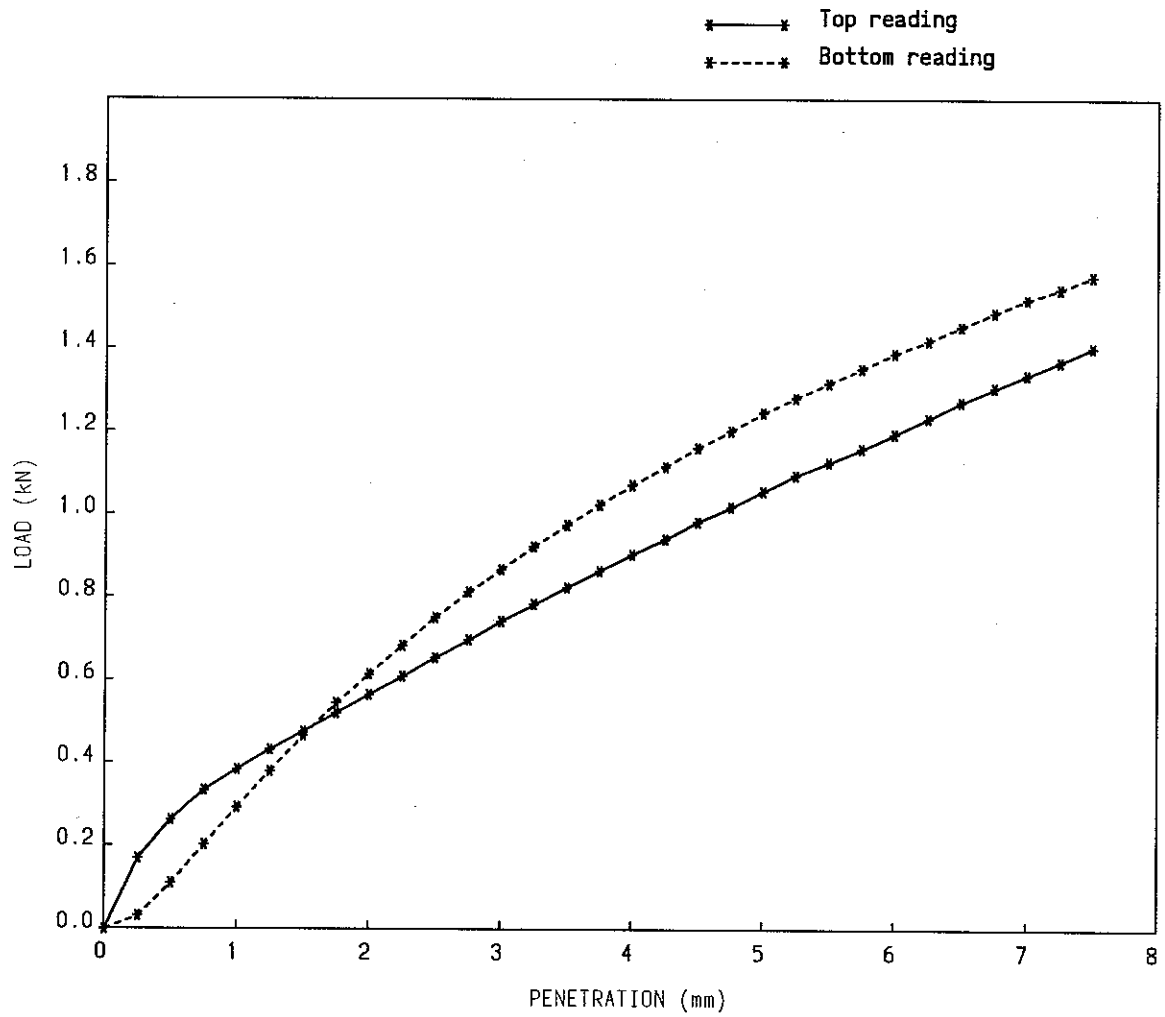
Q.A. Ref: /028-11/M4TN1014.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel and occasional cobbles.	Hole ID	TPN101
		Sample No	5
		Depth	2.20 m



Seating Load	10	Natural M/C	16%
Surcharge weight	15.1		
Moisture Content @ Top	12%		
Moisture Content @ Middle	13%		
Moisture Content @ Bottom	13%		
Bulk Density	2.21 Mg/m3	Gravel >20.0mm	14.8%
Dry Density	1.96 Mg/m3	Gravel >37.5mm	5.3%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			5.3
2.5	0.65	13.2	5.0
5.0	1.1	20.0	5.3
BASE			6.2
2.5	0.75	13.2	5.7
5.0	1.2	20.0	6.2

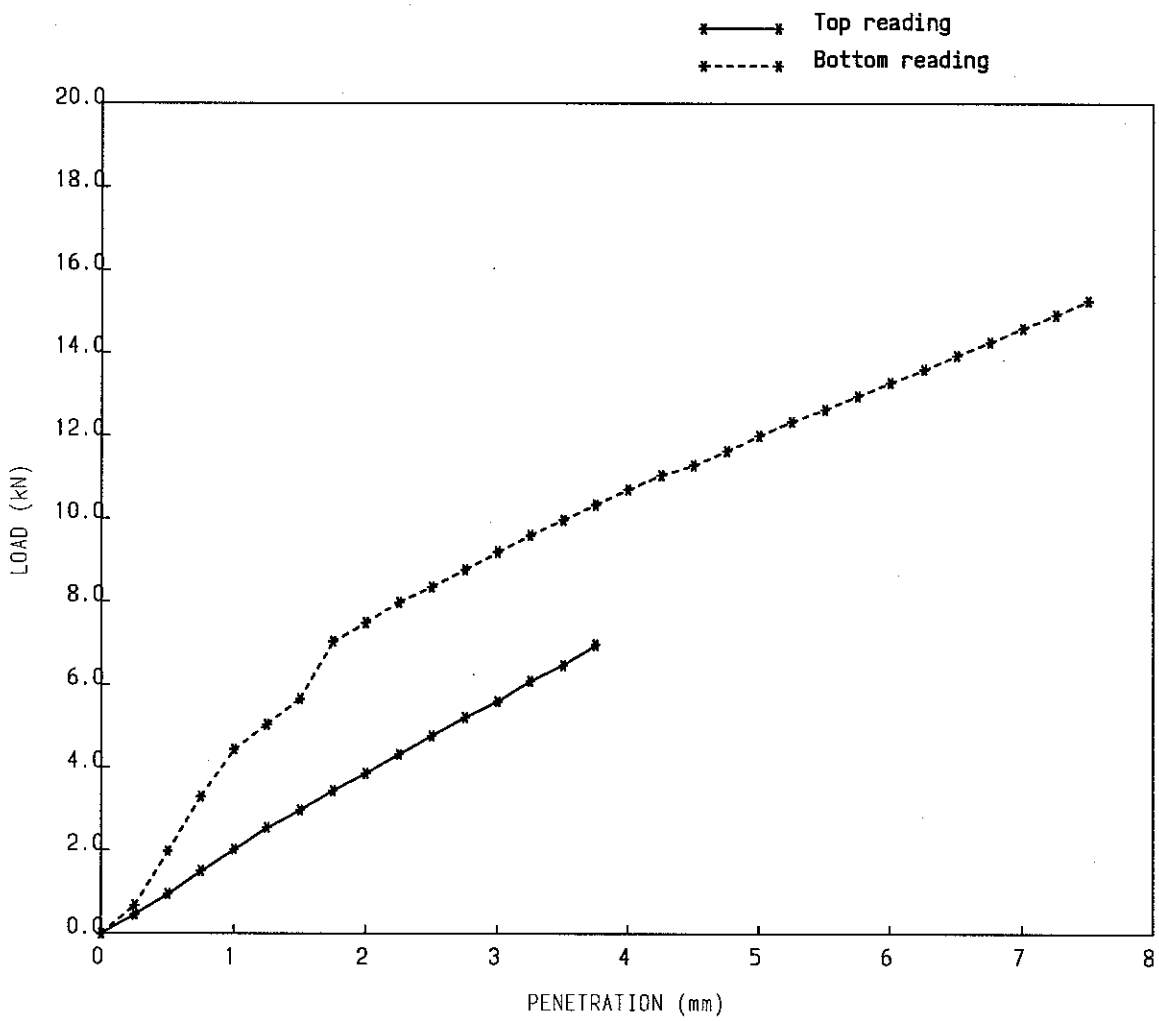
Q.A. Ref: /028-11/M4TN1015.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELEIF ROAD, NEWPORT	Contract	F10895
Soil description	Orangish brown sandy CLAY with some gravel and occasional cobbles.	Hole ID	TPN101
		Sample No	6
		Depth	2.20 m



Seating Load	250	Natural M/C	16%
Surcharge weight	15.1		
Moisture Content @ Top	4.7%		
Moisture Content @ Bottom	4.5%		
Bulk Density	1.94 Mg/m3	Gravel >20.0mm	14.8%
Dry Density	1.86 Mg/m3	Gravel >37.5mm	5.3%

Type of specimen : Bulk

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			36
2.5	4.8	13.2	36
5.0	1.1	20.0	5.3
BASE			63
2.5	8.4	13.2	63
5.0	12	20.0	60

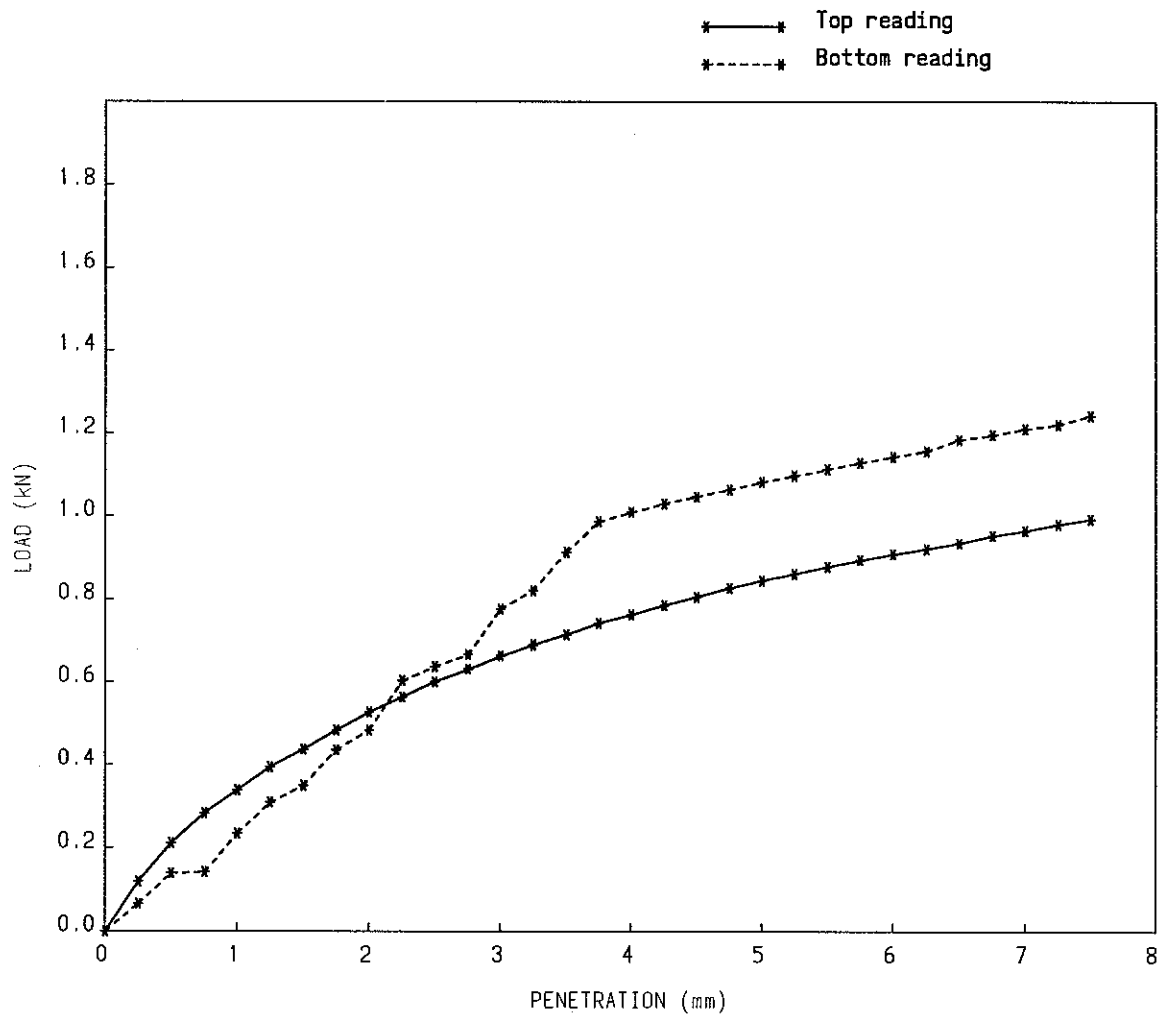
Q.A. Ref: /028-11/M4TN1016.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	1
		Depth	0.50 m



Seating Load	10N	Natural M/C	19%
Surcharge weight	14.9kg		
Moisture Content @ Top	18%		
Moisture Content @ Bottom	17%		
Bulk Density	2.12 Mg/m3	Gravel >20.0mm	7.6%
Dry Density	1.80 Mg/m3	Gravel >37.5mm	2.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			4.6
2.5	0.60	13.2	4.6
5.0	0.85	20.0	4.2
BASE			5.4
2.5	0.64	13.2	4.8
5.0	1.1	20.0	5.4

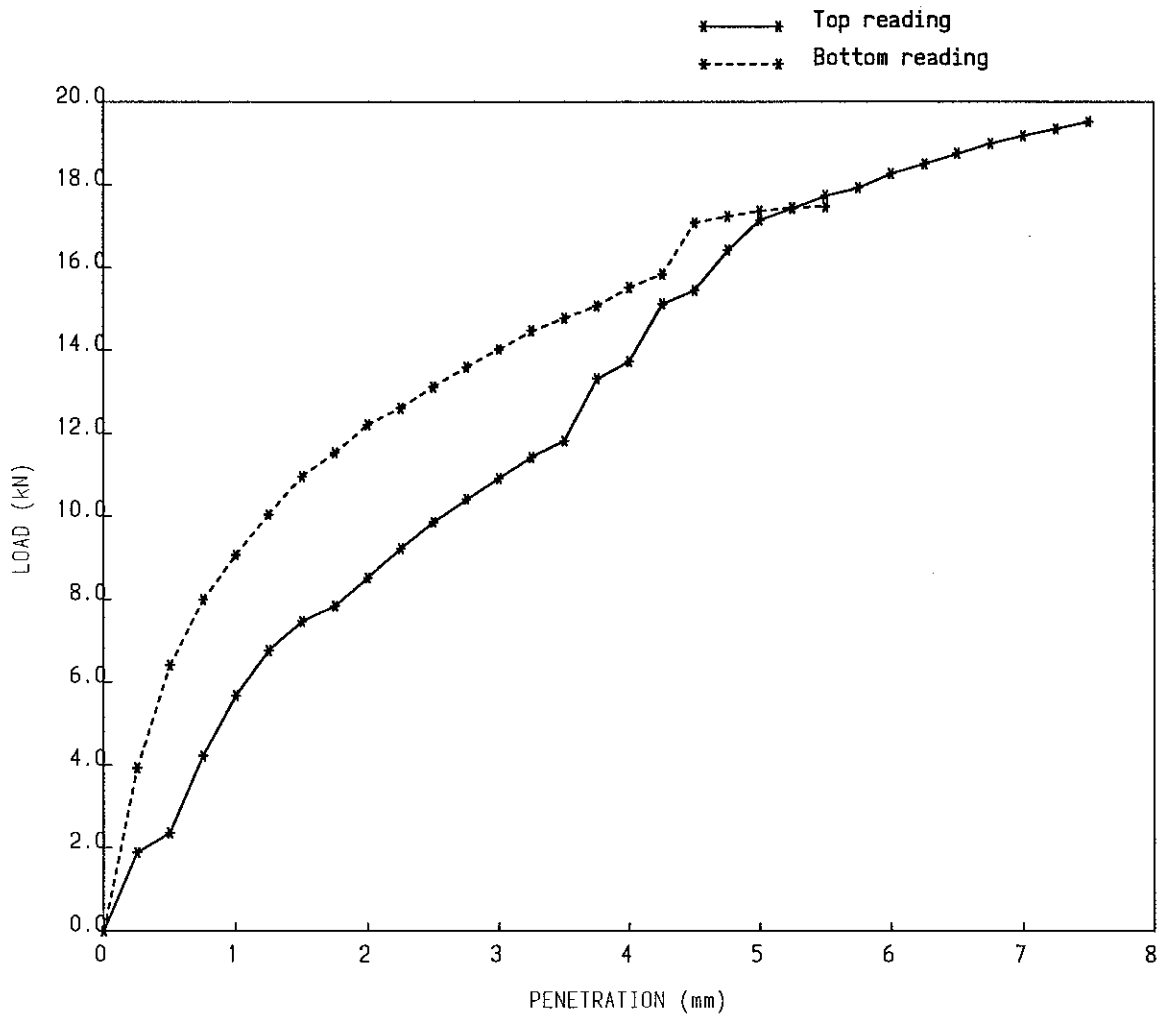
Q.A. Ref: /028-16/M4N1031.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	2
		Depth	0.50 m



Seating Load	250N	Natural M/C	19%
Surcharge weight	15.2kg		
Moisture Content @ Top	12%		
Moisture Content @ Middle	11%		
Moisture Content @ Bottom	11%		
Bulk Density	2.18 Mg/m3	Gravel >20.0mm	7.6%
Dry Density	1.97 Mg/m3	Gravel >37.5mm	2.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			86
2.5	9.9	13.2	75
5.0	17	20.0	86
BASE			99
2.5	13	13.2	99
5.0	17	20.0	87

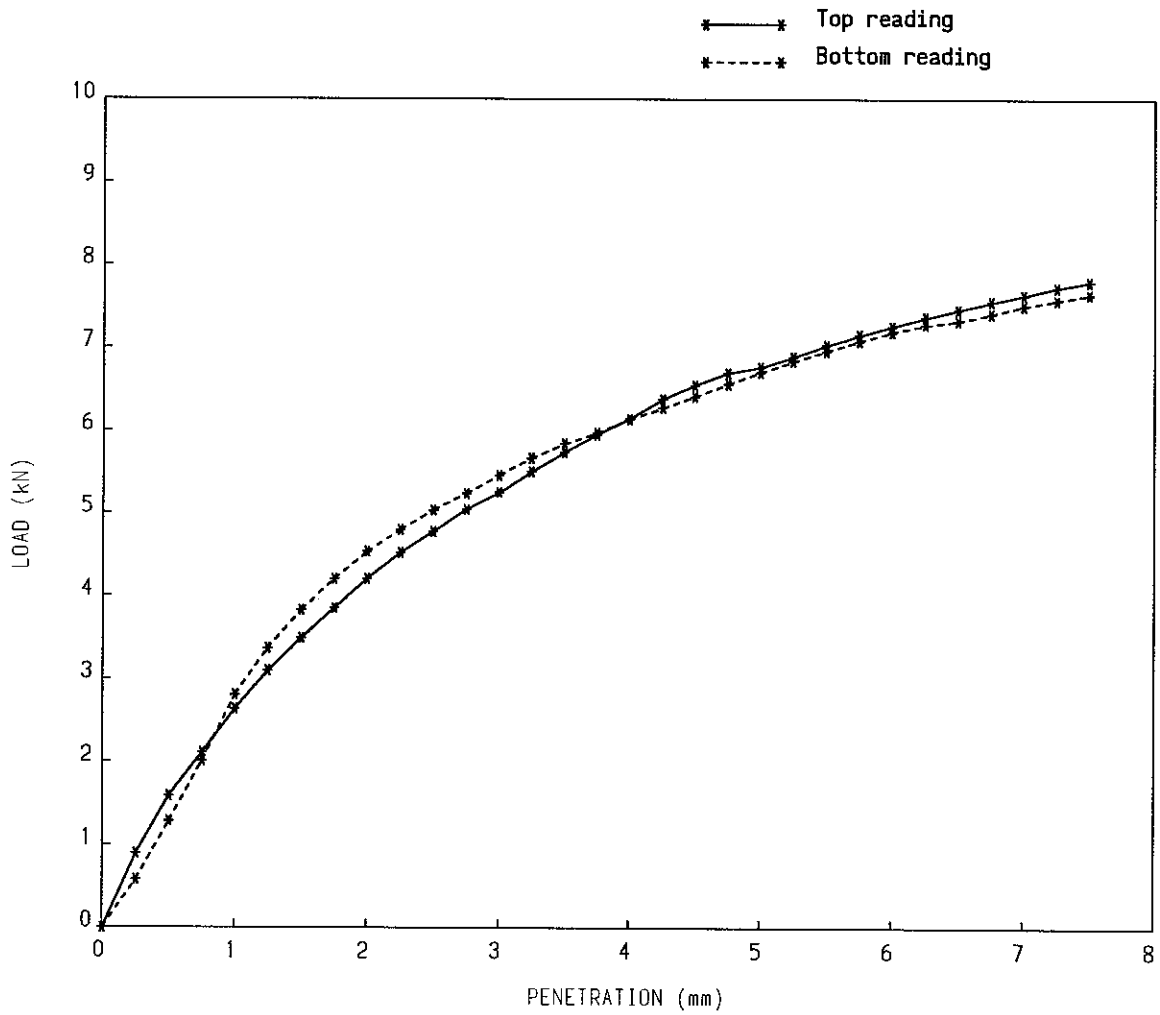
Q.A. Ref: /028-16/M4N1032.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	3
		Depth	0.50 m



Seating Load	250N	Natural M/C	19%
Surcharge weight	15kg		
Moisture Content @ Top	12%		
Moisture Content @ Bottom	12%		
Bulk Density	2.24 Mg/m3	Gravel >20.0mm	7.6%
Dry Density	2.01 Mg/m3	Gravel >37.5mm	2.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			36
2.5	4.8	13.2	36
5.0	6.8	20.0	34
BASE			38
2.5	5.0	13.2	38
5.0	6.7	20.0	34

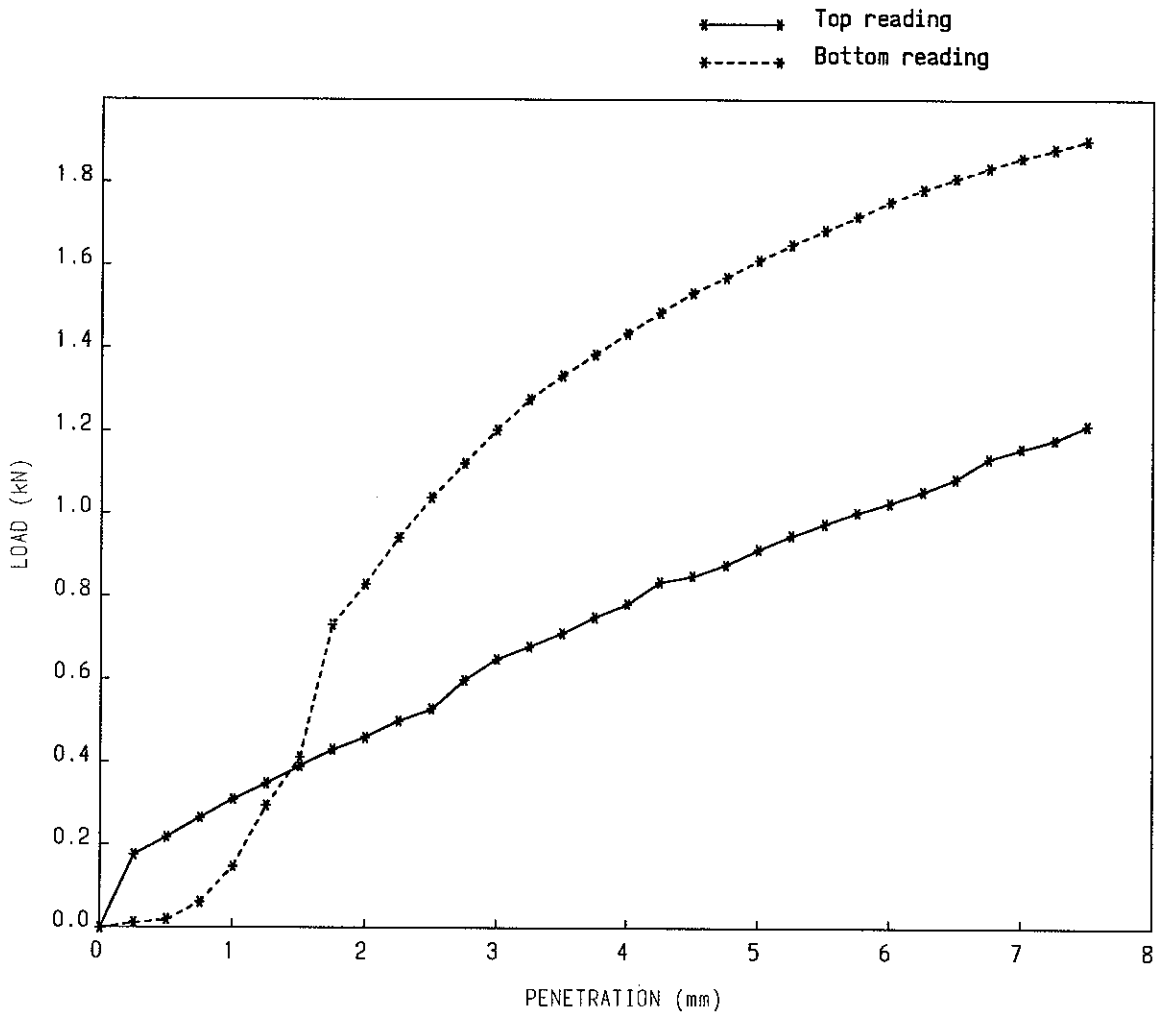
Q.A. Ref: /028-16/M4N1033.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	4
		Depth	0.50 m



Seating Load	10N	Natural M/C	19%
Surcharge weight	15kg		
Moisture Content @ Top	17%		
Moisture Content @ Middle	16%		
Moisture Content @ Bottom	16%		
Bulk Density	2.20 Mg/m3	Gravel >20.0mm	7.6%
Dry Density	1.89 Mg/m3	Gravel >37.5mm	2.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			4.6
2.5	0.53	13.2	4.0
5.0	0.91	20.0	4.6
BASE			8.1
2.5	1.0	13.2	7.9
5.0	1.6	20.0	8.1

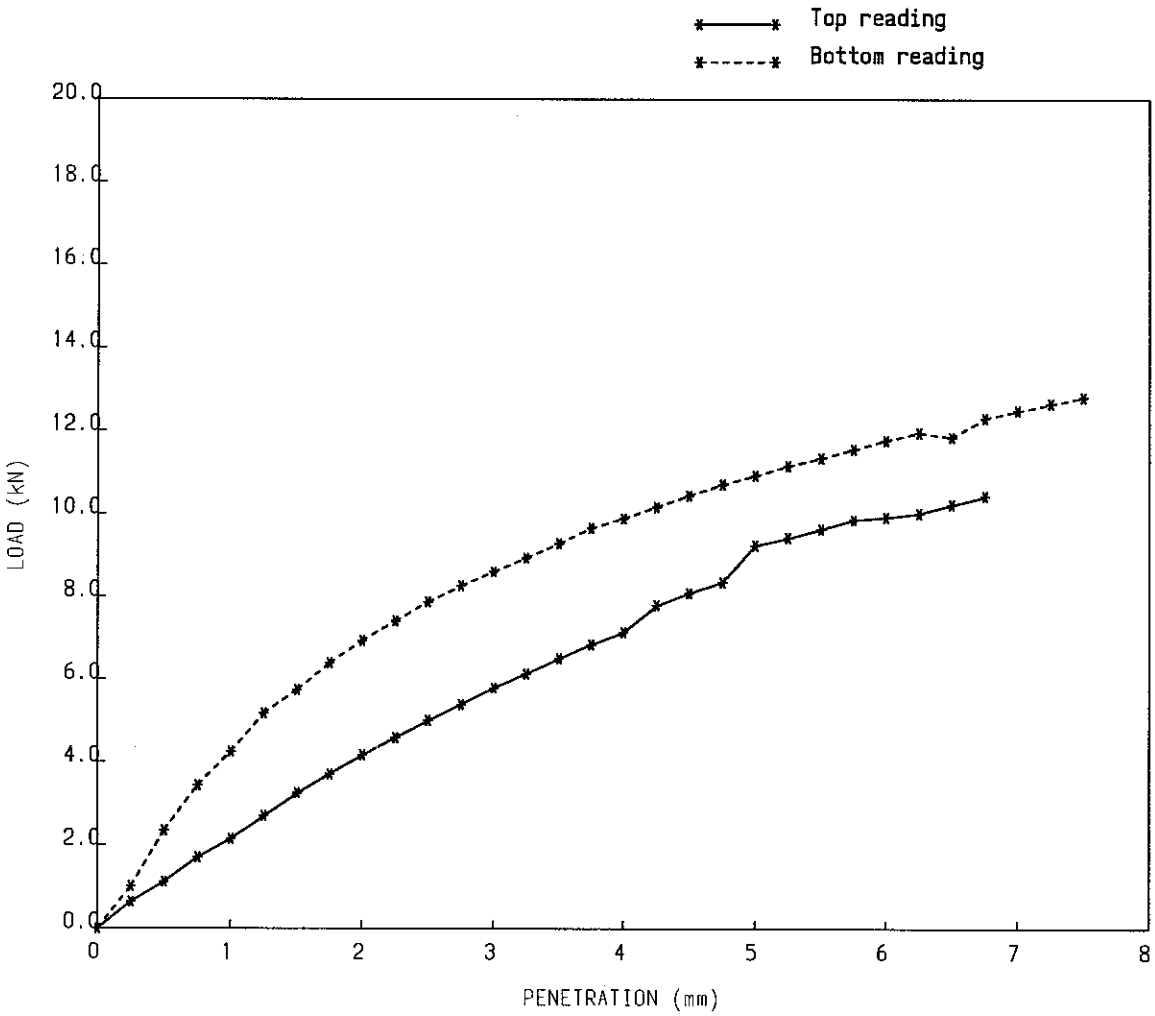
Q.A. Ref: /028-16/M4N1034.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	5
		Depth	0.50 m



Seating Load	50N	Natural M/C	19%
Surcharge weight	15kg		
Moisture Content @ Top	11%		
Moisture Content @ Bottom	11%		
Bulk Density	2.20 Mg/m3	Gravel >20.0mm	7.6%
Dry Density	1.99 Mg/m3	Gravel >37.5mm	2.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			46
2.5	5.0	13.2	38
5.0	9.2	20.0	46
BASE			60
2.5	7.9	13.2	60
5.0	11	20.0	55

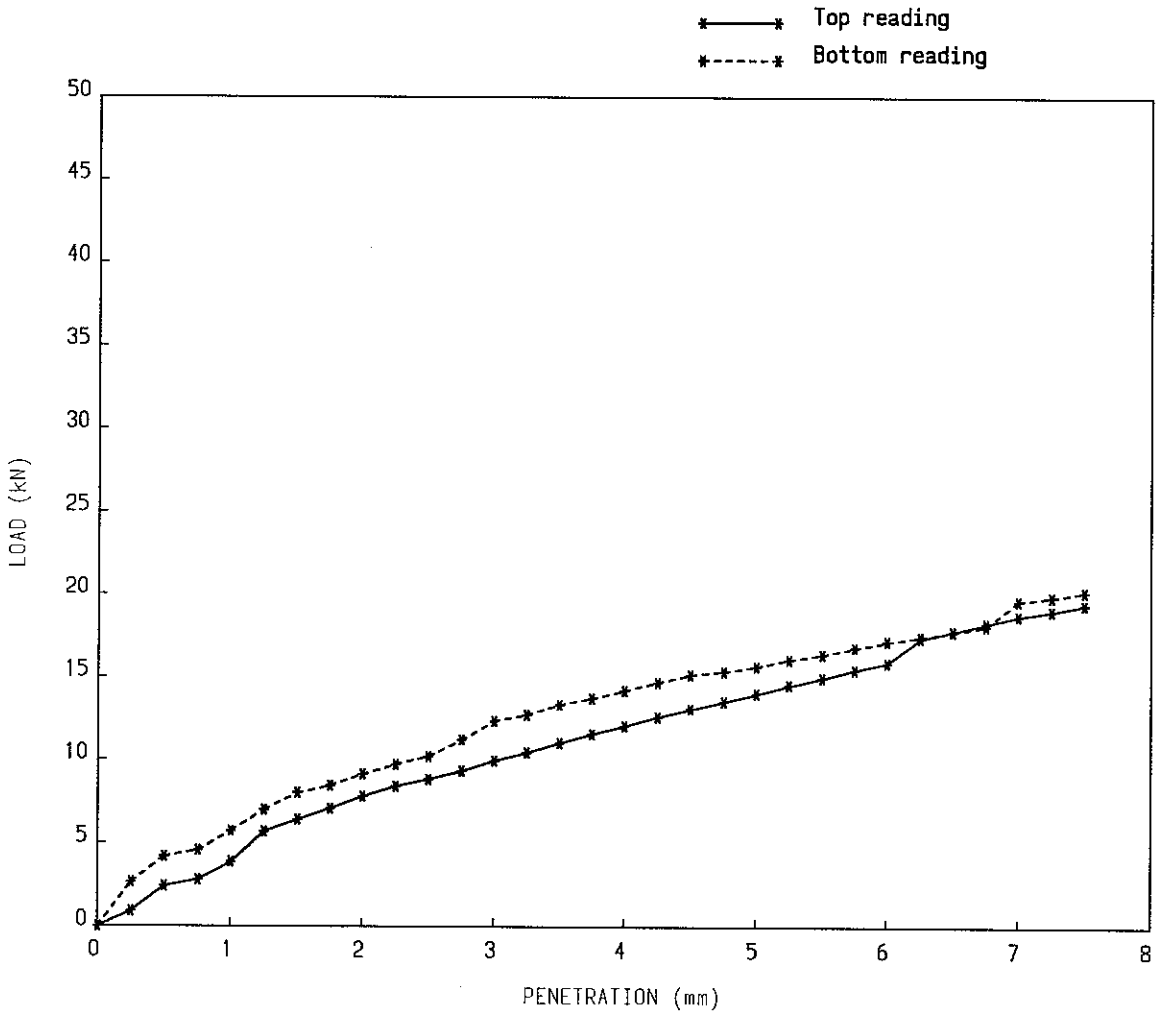
Q.A. Ref: /028-16/M4N1035.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown sandy CLAY with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	6
		Depth	0.50 m



Seating Load	250N	Natural M/C	19%
Surcharge weight	15kg		
Moisture Content @ Top	9.4%		
Moisture Content @ Middle	8.9%		
Moisture Content @ Bottom	9.5%		
Bulk Density	2.09 Mg/m3	Gravel >20.0mm	7.6%
Dry Density	1.91 Mg/m3	Gravel >37.5mm	2.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENETRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			70
2.5	8.9	13.2	67
5.0	14	20.0	70
BASE			78
2.5	10	13.2	77
5.0	16	20.0	78

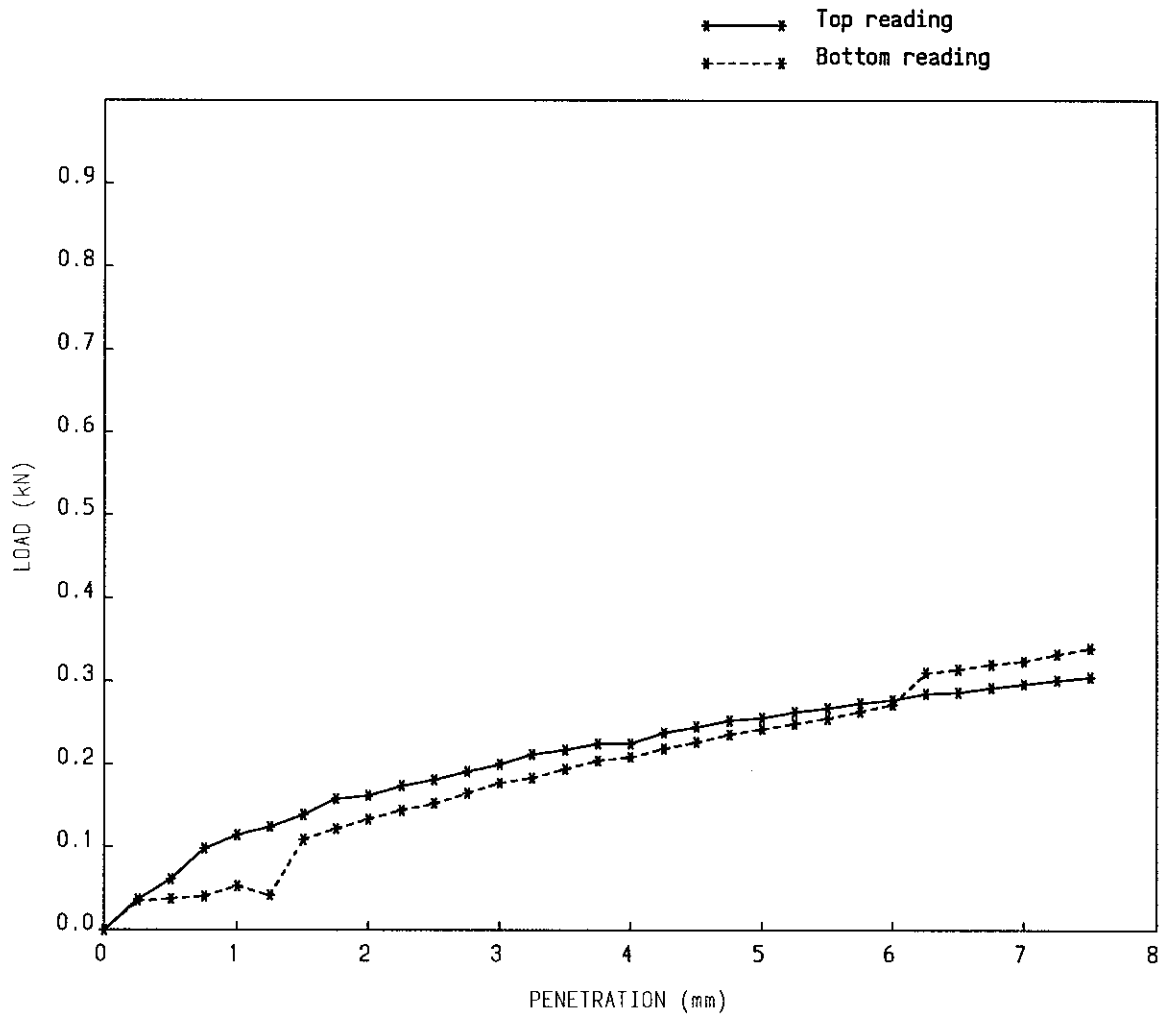
Q.A. Ref: /028-16/M4N1036.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	1
		Depth	1.40 m



Seating Load	10N	Natural M/C	17%
Surcharge weight	15.1kg		
Moisture Content @ Top	16%		
Moisture Content @ Bottom	17%		
Bulk Density	2.13 Mg/m3	Gravel >20.0mm	7.1%
Dry Density	1.83 Mg/m3	Gravel >37.5mm	1.6%

Type of specimen : Undisturbed.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			1.4
2.5	0.18	13.2	1.4
5.0	0.26	20.0	1.3
BASE			1.2
2.5	0.15	13.2	1.2
5.0	0.24	20.0	1.2

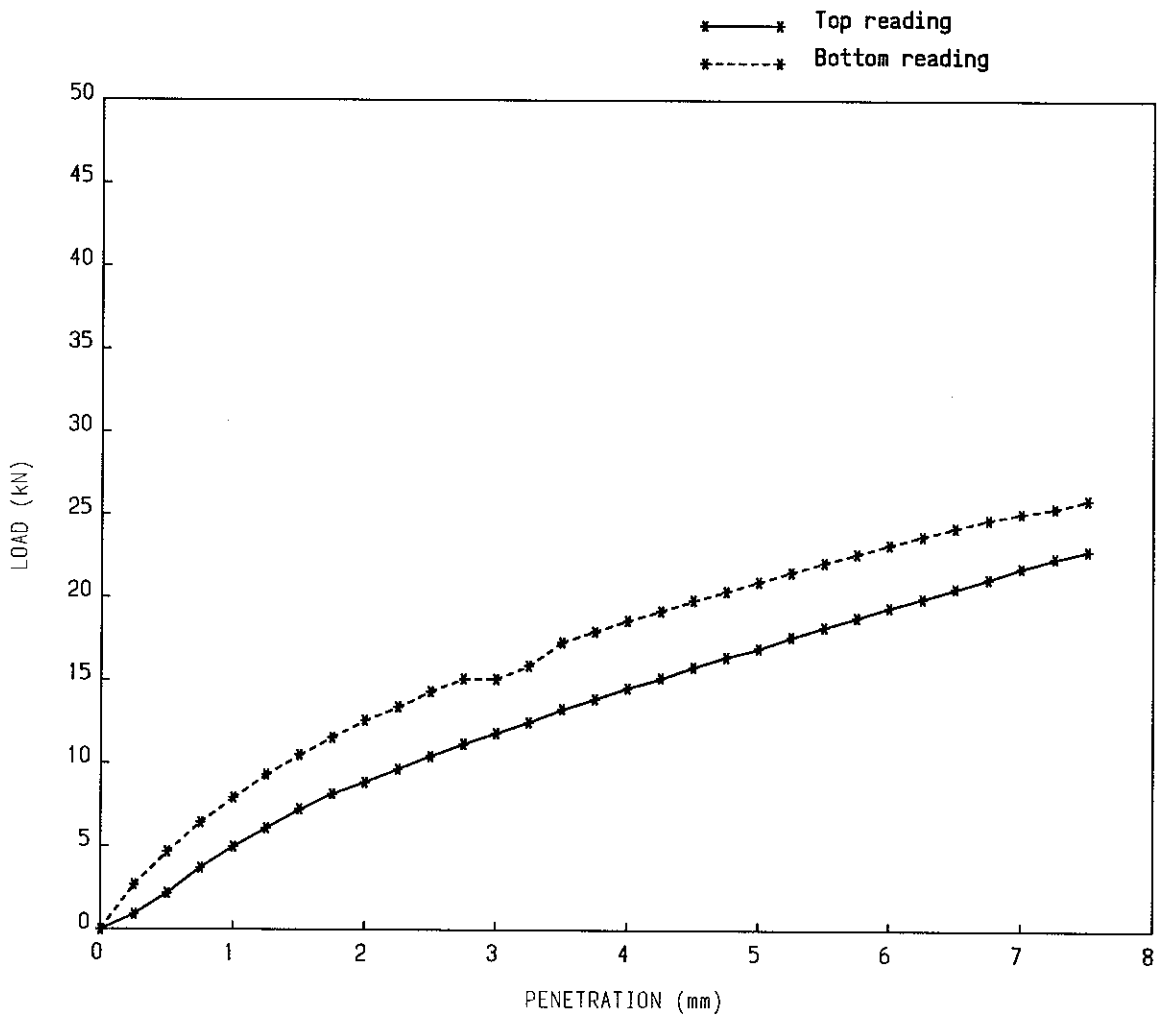
Q.A. Ref: /028-13/M4TN103.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	2
		Depth	1.40 m



Seating Load	250N	Natural M/C	17%
Surcharge weight	15.2kg		
Moisture Content @ Top	8.1%		
Moisture Content @ Bottom	7.6%		
Bulk Density	2.19 Mg/m3	Gravel >20.0mm	7.1%
Dry Density	2.03 Mg/m3	Gravel >37.5mm	1.6%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			85
2.5	10	13.2	79
5.0	17	20.0	85
BASE			109
2.5	14	13.2	109
5.0	21	20.0	105

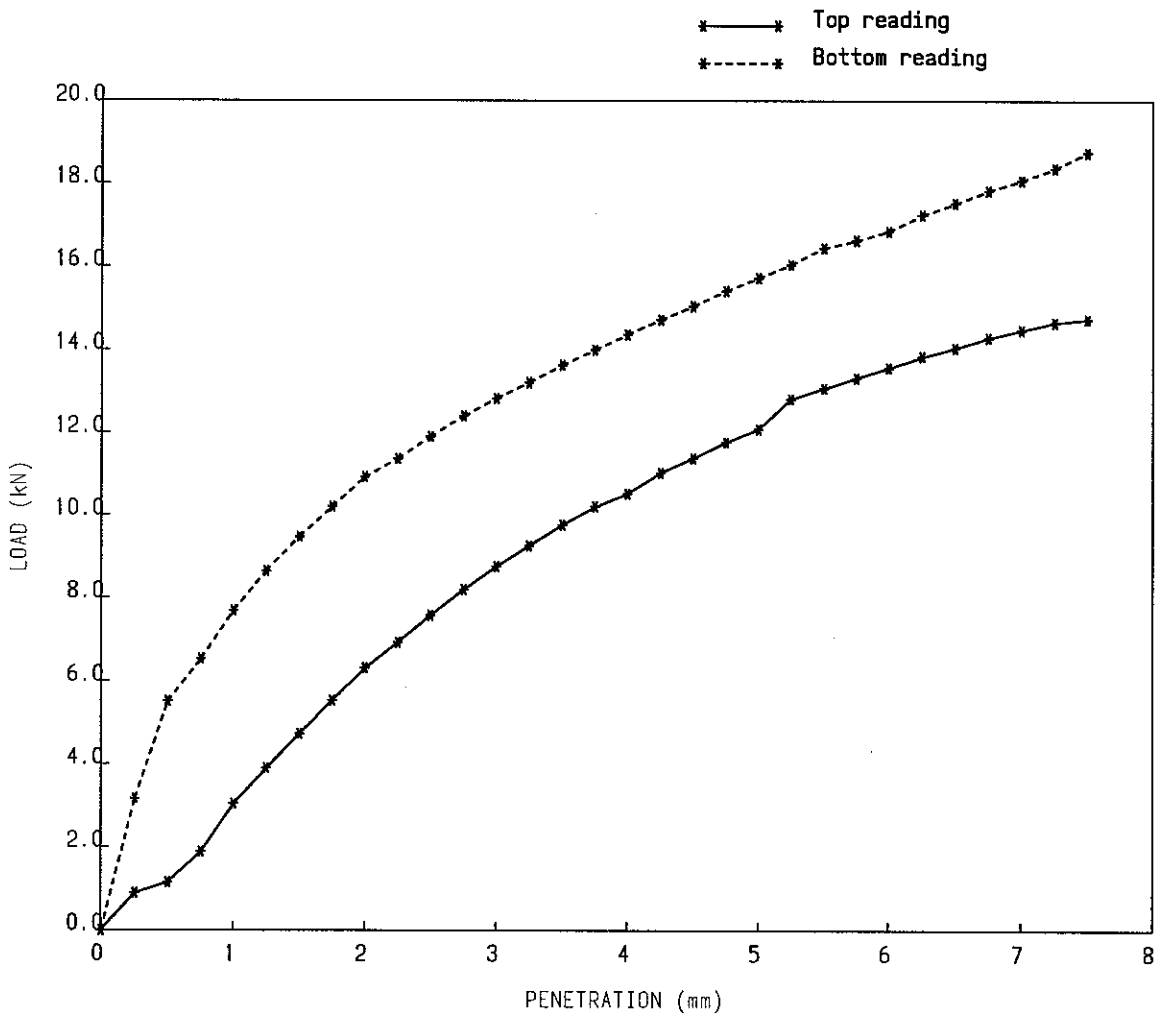
Q.A. Ref: /028-13/M4TN1032.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	3
		Depth	1.40 m



Seating Load	250N	Natural M/C	17%
Surcharge weight	15.2kg		
Moisture Content @ Top	10%		
Moisture Content @ Middle	9.3%		
Moisture Content @ Bottom	8.6%		
Bulk Density	2.23 Mg/m3	Gravel >20.0mm	7.1%
Dry Density	2.04 Mg/m3	Gravel >37.5mm	1.6%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			60
2.5	7.6	13.2	57
5.0	12	20.0	60
BASE			90
2.5	12	13.2	90
5.0	16	20.0	79

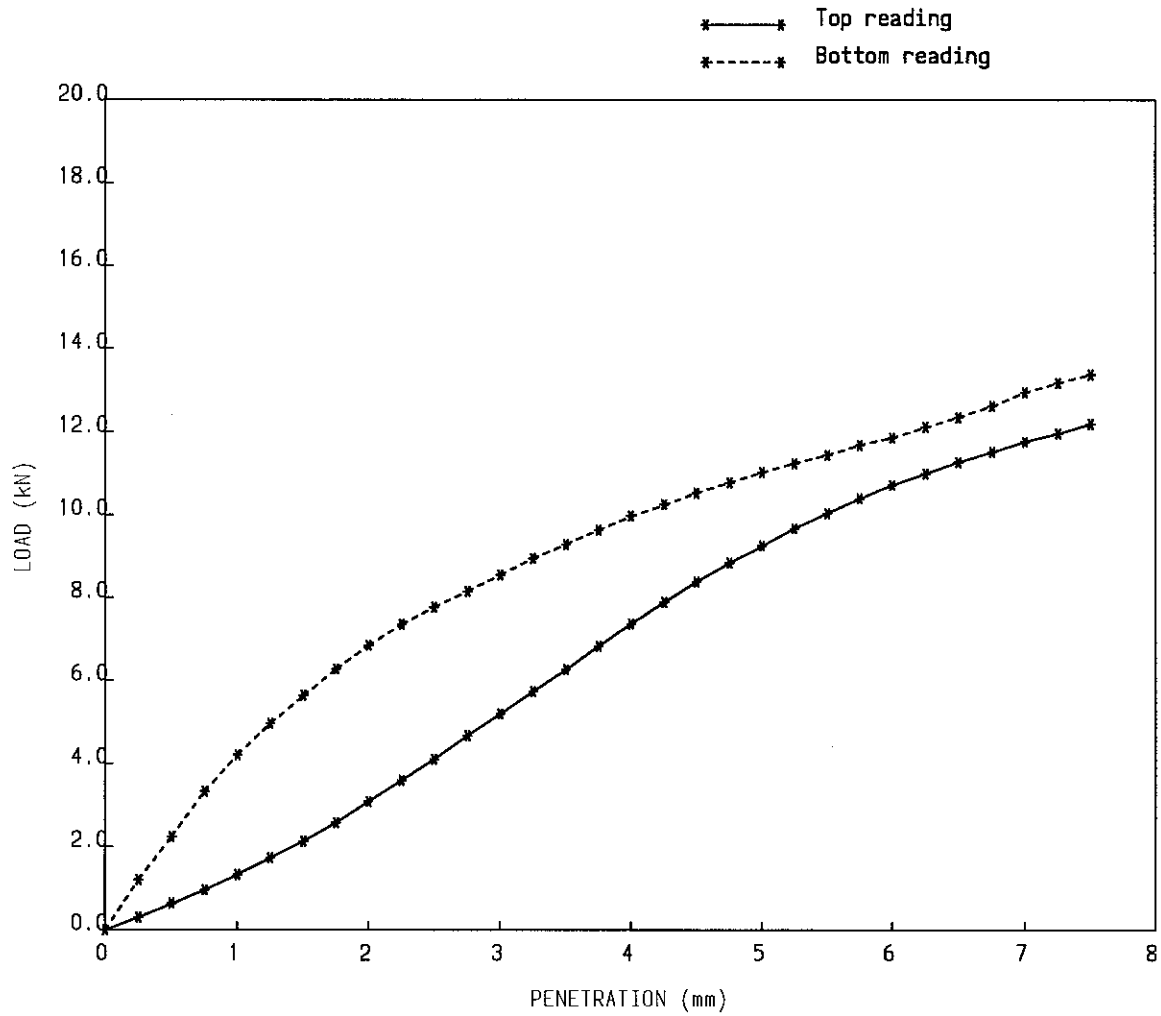
Q.A. Ref: /028-13/M4TN1033.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	4
		Depth	1.40 m



Seating Load	250N	Natural M/C	17%
Surcharge weight	15.1kg		
Moisture Content @ Top	9.8%		
Moisture Content @ Bottom	9.6%		
Bulk Density	2.29 Mg/m3	Gravel >20.0mm	7.1%
Dry Density	2.09 Mg/m3	Gravel >37.5mm	1.6%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENETRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			46
2.5	4.1	13.2	31
5.0	9.3	20.0	46
BASE			59
2.5	7.8	13.2	59
5.0	11	20.0	55

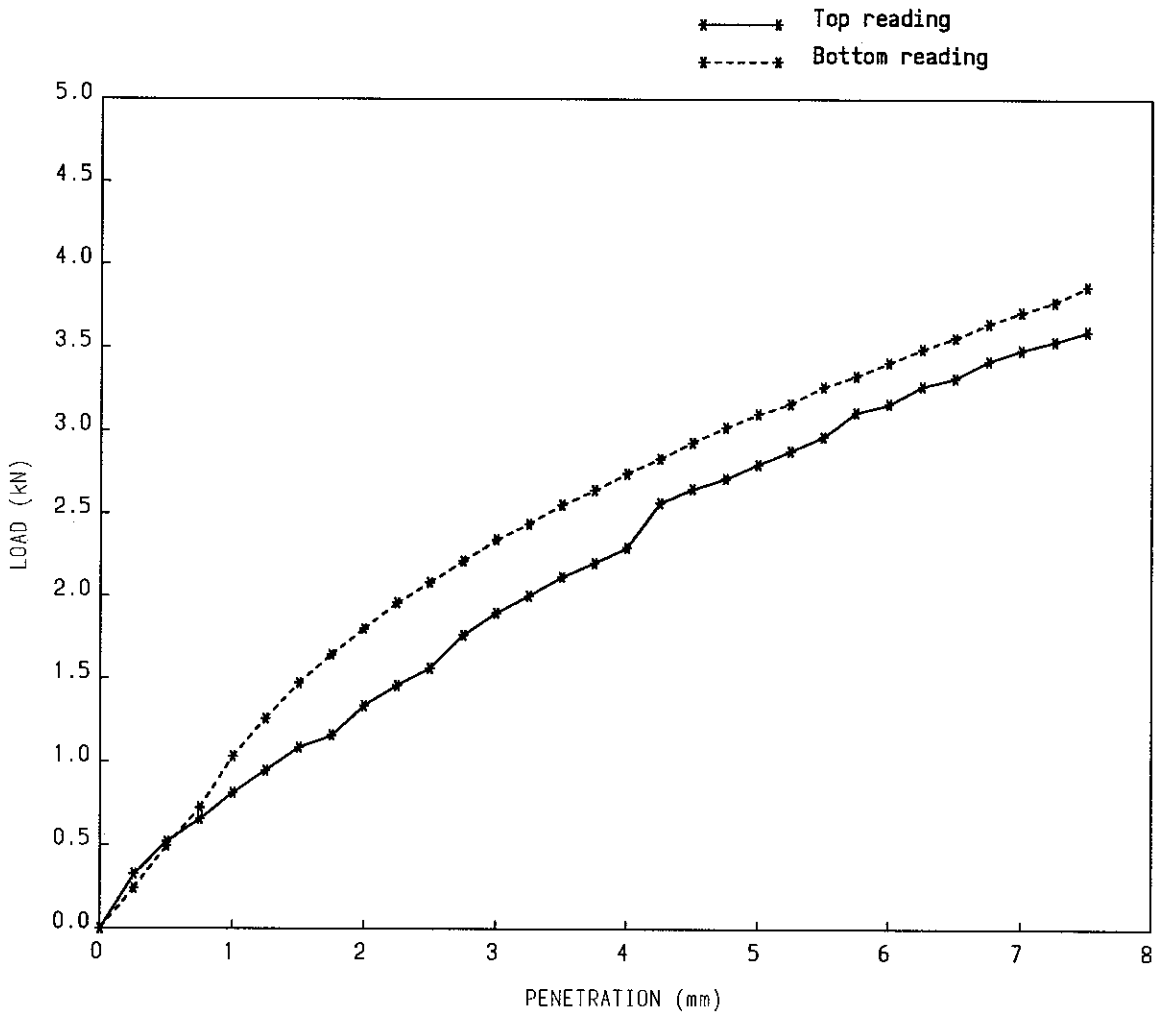
Q.A. Ref: /028-13/M4TN1034.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some fine to coarse gravel.	Hole ID	TPN103
		Sample No	5
		Depth	1.40 m



Seating Load	250N	Natural M/C	17%
Surcharge weight	15.7kg		
Moisture Content @ Top	12%		
Moisture Content @ Middle	12%		
Moisture Content @ Bottom	11%		
Bulk Density	2.27 Mg/m3	Gravel >20.0mm	7.1%
Dry Density	2.04 Mg/m3	Gravel >37.5mm	1.6%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			14
2.5	1.6	13.2	12
5.0	2.8	20.0	14
BASE			16
2.5	2.1	13.2	16
5.0	3.1	20.0	16

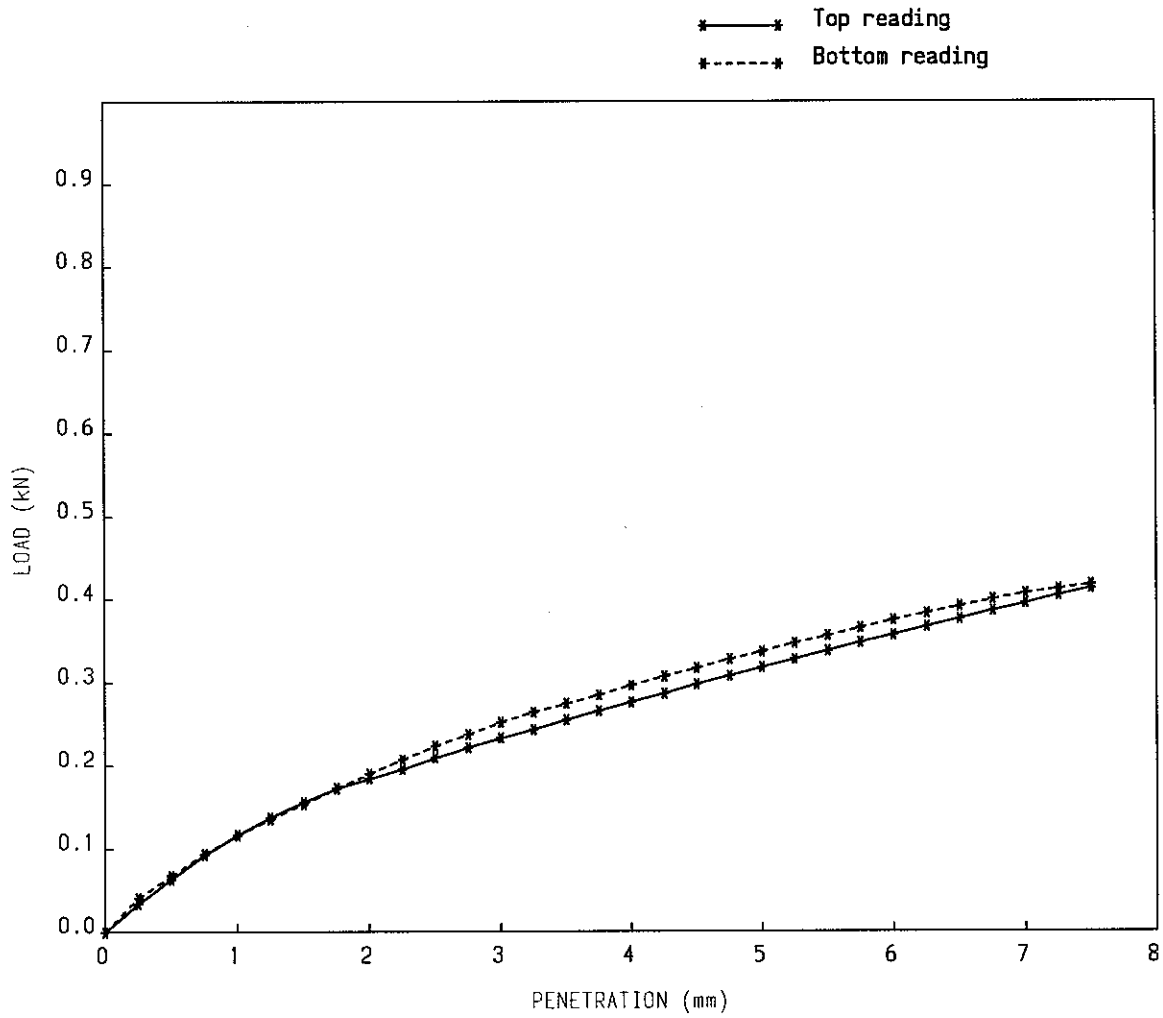
Q.A. Ref: /028-13/M4TN1035.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown slightly sandy CLAY with some gravel.	Hole ID	TPP101
		Sample No	1
		Depth	0.50 m



Seating Load	10N	Natural M/C	26%
Surcharge weight	15.1kg		
Moisture Content @ Top	25%		
Moisture Content @ Middle	25%		
Moisture Content @ Bottom	25%		
Bulk Density	1.98 Mg/m3	Gravel >20.0mm	7.4%
Dry Density	1.59 Mg/m3	Gravel >37.5mm	3.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			1.6
2.5	0.21	13.2	1.6
5.0	0.32	20.0	1.6
BASE			1.7
2.5	0.22	13.2	1.7
5.0	0.34	20.0	1.7

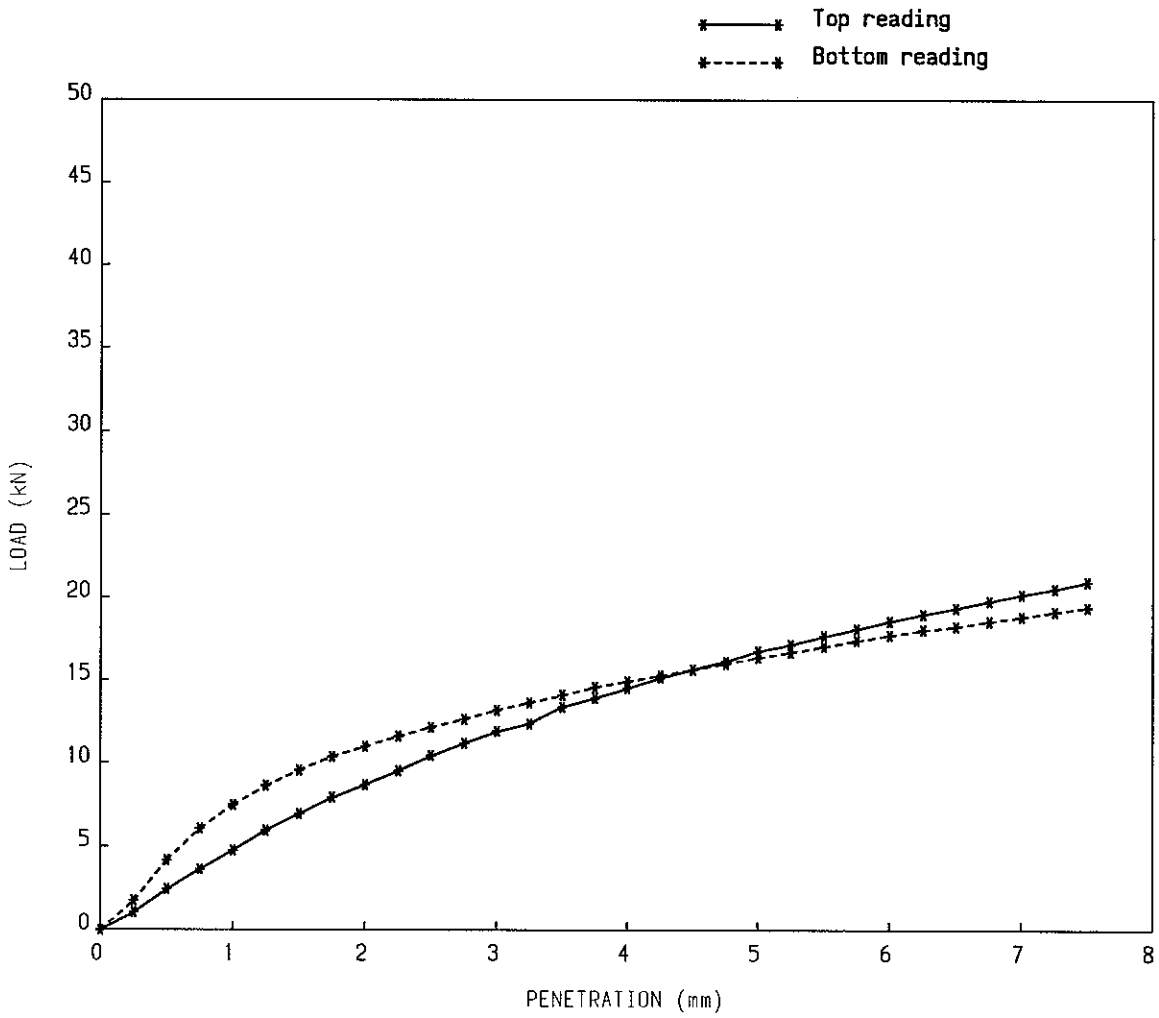
Q.A. Ref: /028-17/M4P1011.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown slightly sandy CLAY with some gravel.	Hole ID	TPP101
		Sample No	2
		Depth	0.50 m



Seating Load	250N	Natural M/C	26%
Surcharge weight	15.1kg		
Moisture Content @ Top	13%		
Moisture Content @ Middle	12%		
Moisture Content @ Bottom	12%		
Bulk Density	2.07 Mg/m3	Gravel >20.0mm	7.4%
Dry Density	1.84 Mg/m3	Gravel >37.5mm	3.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			84
2.5	10	13.2	79
5.0	17	20.0	84
BASE			92
2.5	12	13.2	92
5.0	16	20.0	82

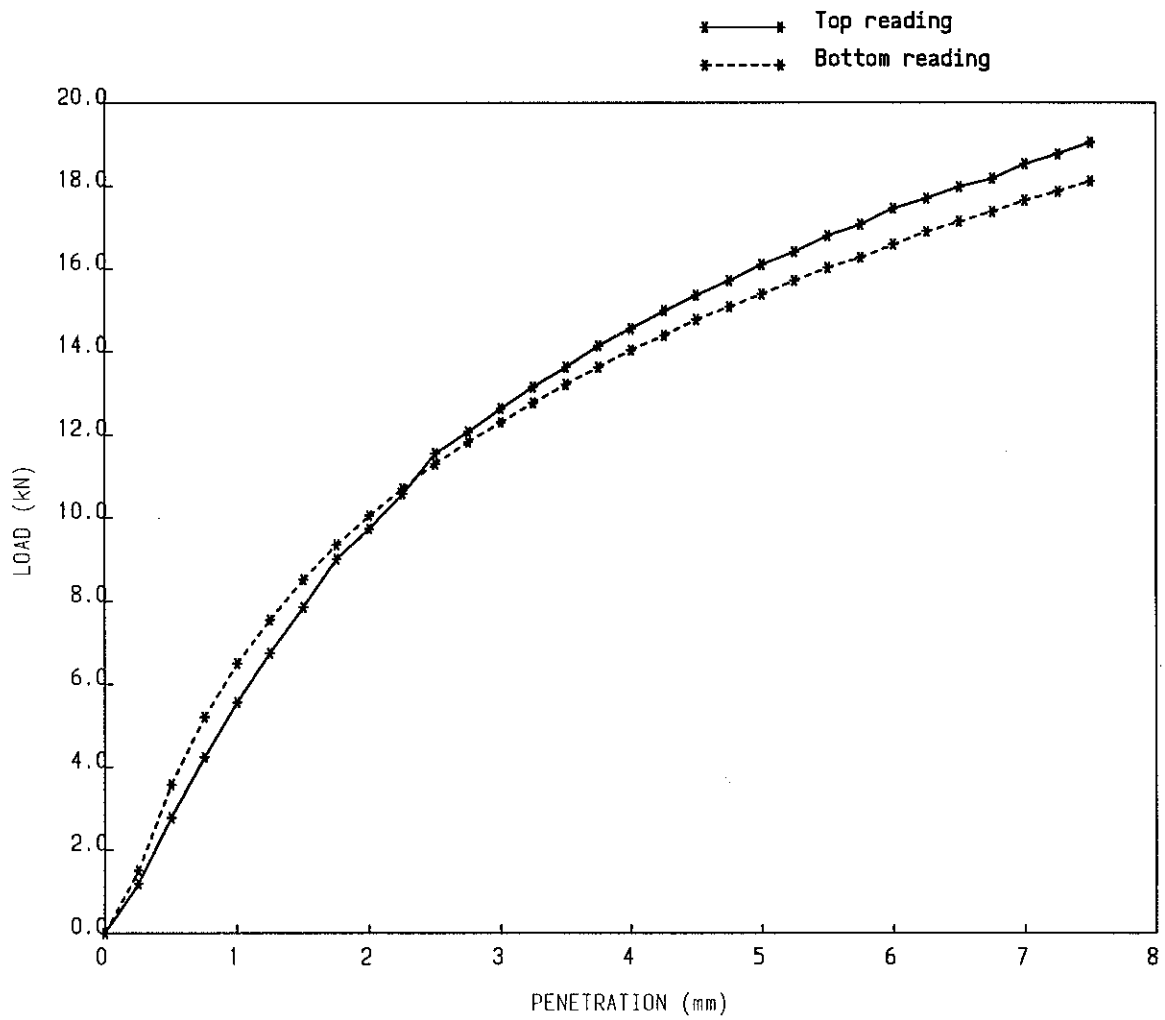
Q.A. Ref: /028-17/M4P1012.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown slightly sandy CLAY with some gravel.	Hole ID	TPP101
		Sample No	3
		Depth	0.50 m



Seating Load	250N	Natural M/C	26%
Surcharge weight	15.1kg		
Moisture Content @ Top	13%		
Moisture Content @ Bottom	13%		
Bulk Density	2.11 Mg/m3	Gravel >20.0mm	7.4%
Dry Density	1.87 Mg/m3	Gravel >37.5mm	3.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			87
2.5	12	13.2	87
5.0	16	20.0	81
BASE			86
2.5	11	13.2	86
5.0	15	20.0	77

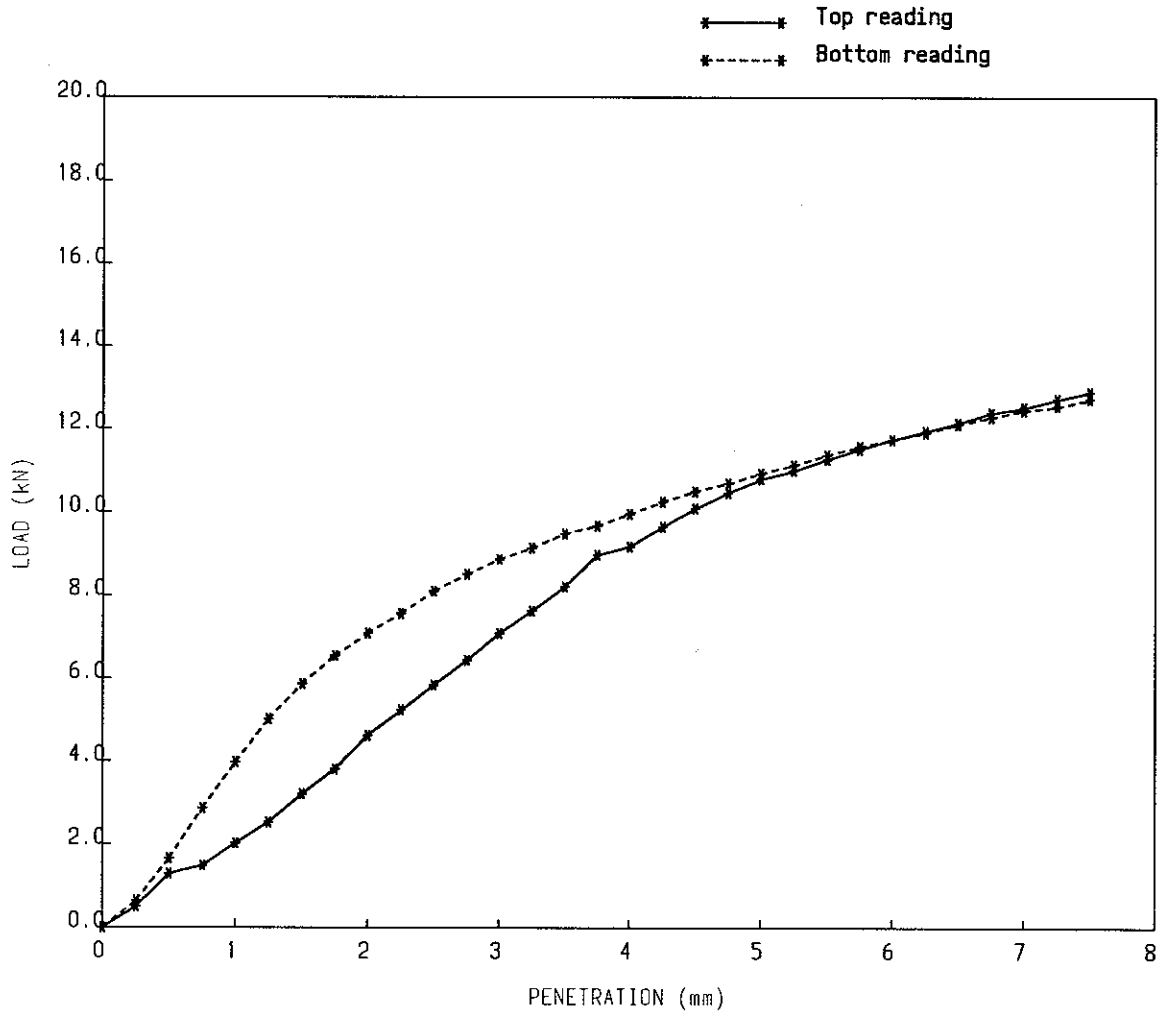
Q.A. Ref: /028-17/M4P1013.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown slightly sandy CLAY with some gravel.	Hole ID	TPP101
		Sample No	4
		Depth	0.50 m



Seating Load	250N	Natural M/C	26%
Surcharge weight	15.2kg		
Moisture Content @ Top	14%		
Moisture Content @ Bottom	13%		
Bulk Density	2.15 Mg/m3	Gravel >20.0mm	7.4%
Dry Density	1.90 Mg/m3	Gravel >37.5mm	3.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			54
2.5	5.8	13.2	44
5.0	11	20.0	54
BASE			61
2.5	8.1	13.2	61
5.0	11	20.0	55

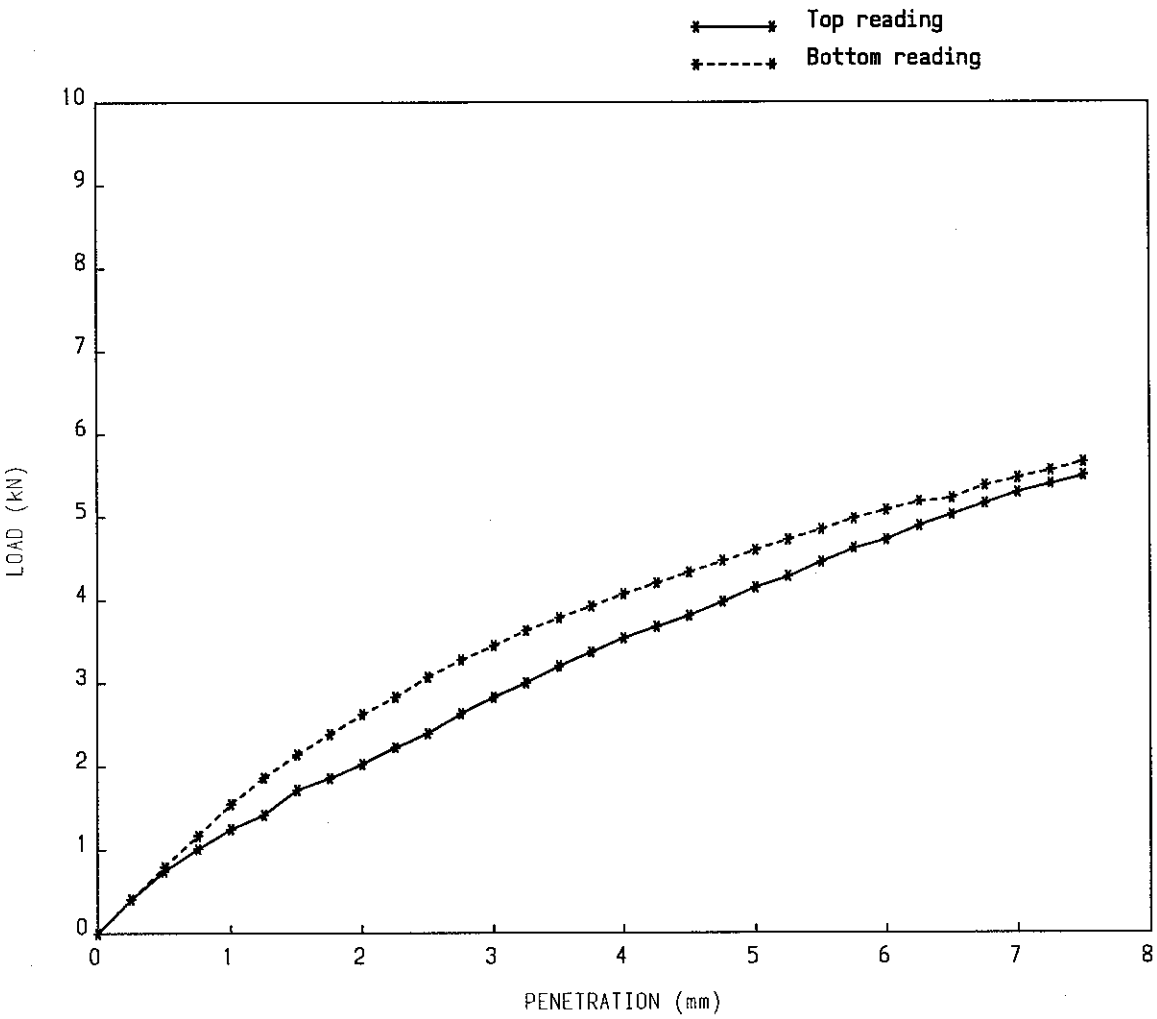
Q.A. Ref: /028-17/M4P1014.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown slightly sandy CLAY with some gravel.	Hole ID	TPP101
		Sample No	5
		Depth	0.50 m



Seating Load	250N	Natural M/C	26%
Surcharge weight	15.1kg		
Moisture Content @ Top	15%		
Moisture Content @ Middle	15%		
Moisture Content @ Bottom	16%		
Bulk Density	2.20 Mg/m3	Gravel >20.0mm	7.4%
Dry Density	1.90 Mg/m3	Gravel >37.5mm	3.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			21
2.5	2.4	13.2	18
5.0	4.2	20.0	21
BASE			23
2.5	3.1	13.2	23
5.0	4.6	20.0	23

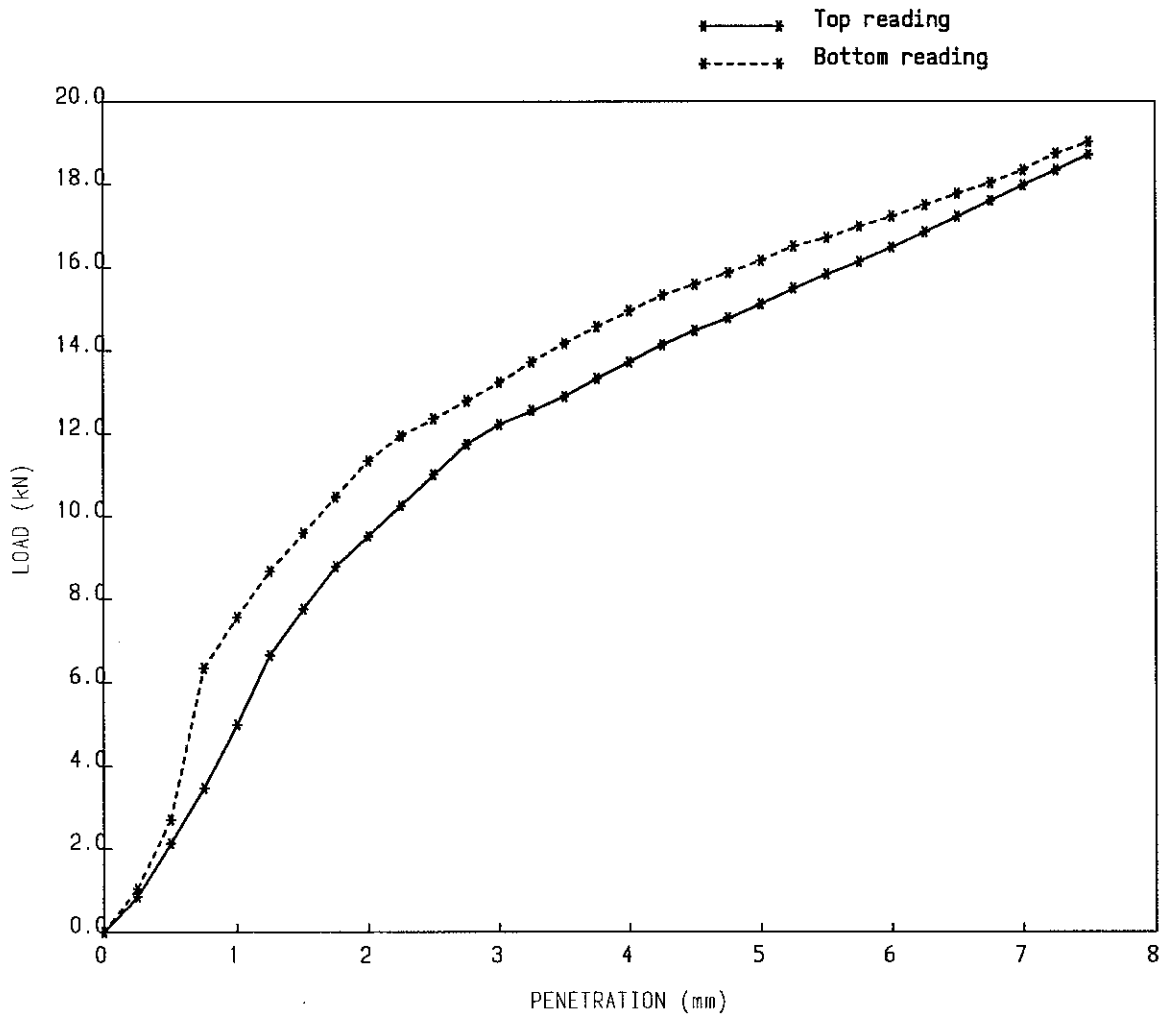
Q.A. Ref: /028-17/M4P1015.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Brown slightly sandy CLAY with some gravel.	Hole ID	TPP101
		Sample No	6
		Depth	0.50 m



Seating Load	250N	Natural M/C	26%
Surcharge weight	15.0kg		
Moisture Content @ Top	12%		
Moisture Content @ Bottom	12%		
Bulk Density	2.09 Mg/m3	Gravel >20.0mm	7.4%
Dry Density	1.86 Mg/m3	Gravel >37.5mm	3.8%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			83
2.5	11	13.2	83
5.0	15	20.0	76
BASE			94
2.5	12	13.2	94
5.0	16	20.0	81

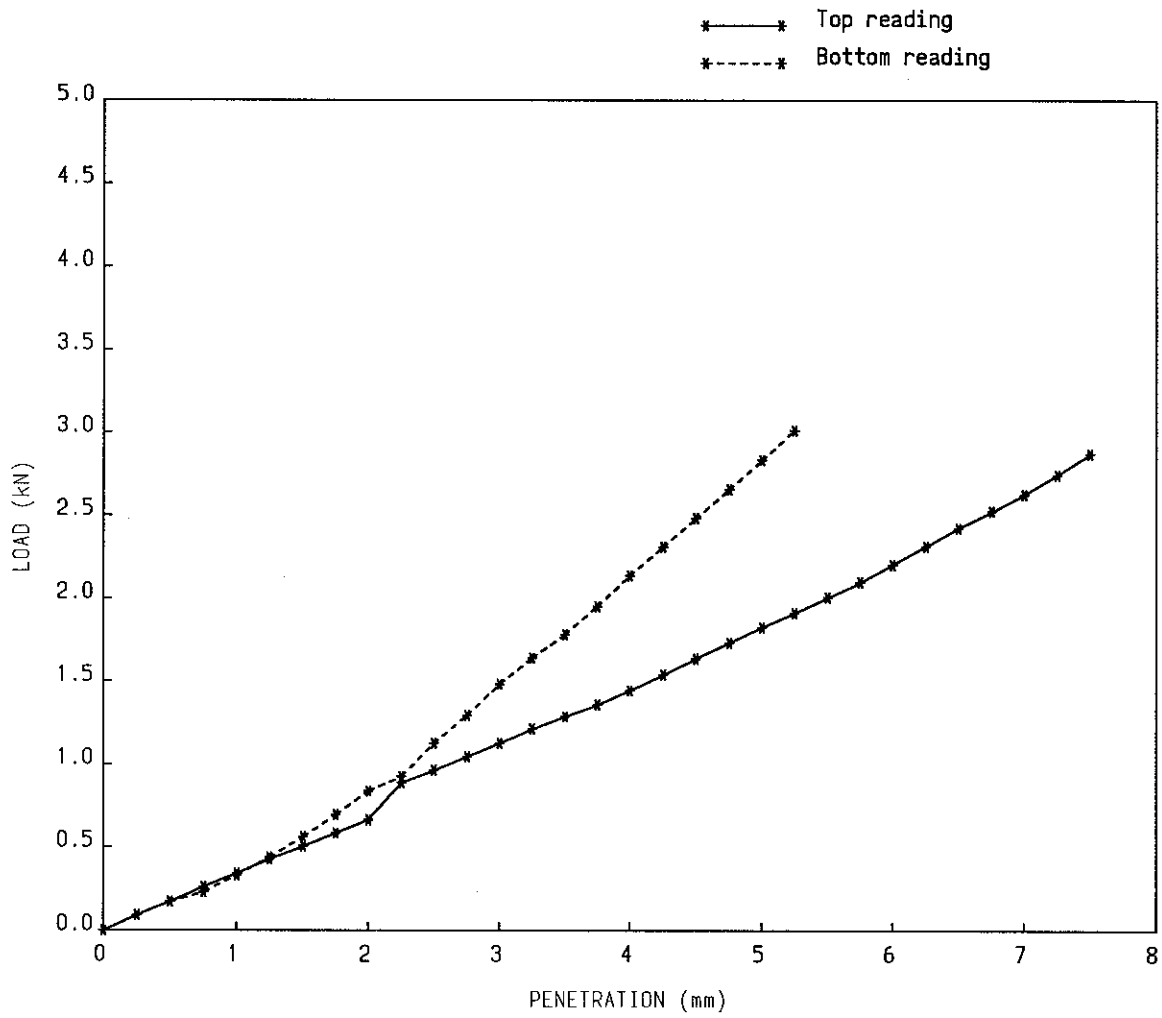
Q.A. Ref: /028-17/M4P1016.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some mudstone and a little medium gravel.	Hole ID	TPP101
		Sample No	1
		Depth	1.00 m



Seating Load	10N	Natural M/C	11%
Surcharge weight	15.0kg		
Moisture Content @ Top	11%		
Moisture Content @ Middle	11%		
Moisture Content @ Bottom	11%		
Bulk Density	2.27 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.04 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			9.1
2.5	0.96	13.2	7.3
5.0	1.8	20.0	9.1
BASE			14
2.5	1.1	13.2	8.5
5.0	2.8	20.0	14

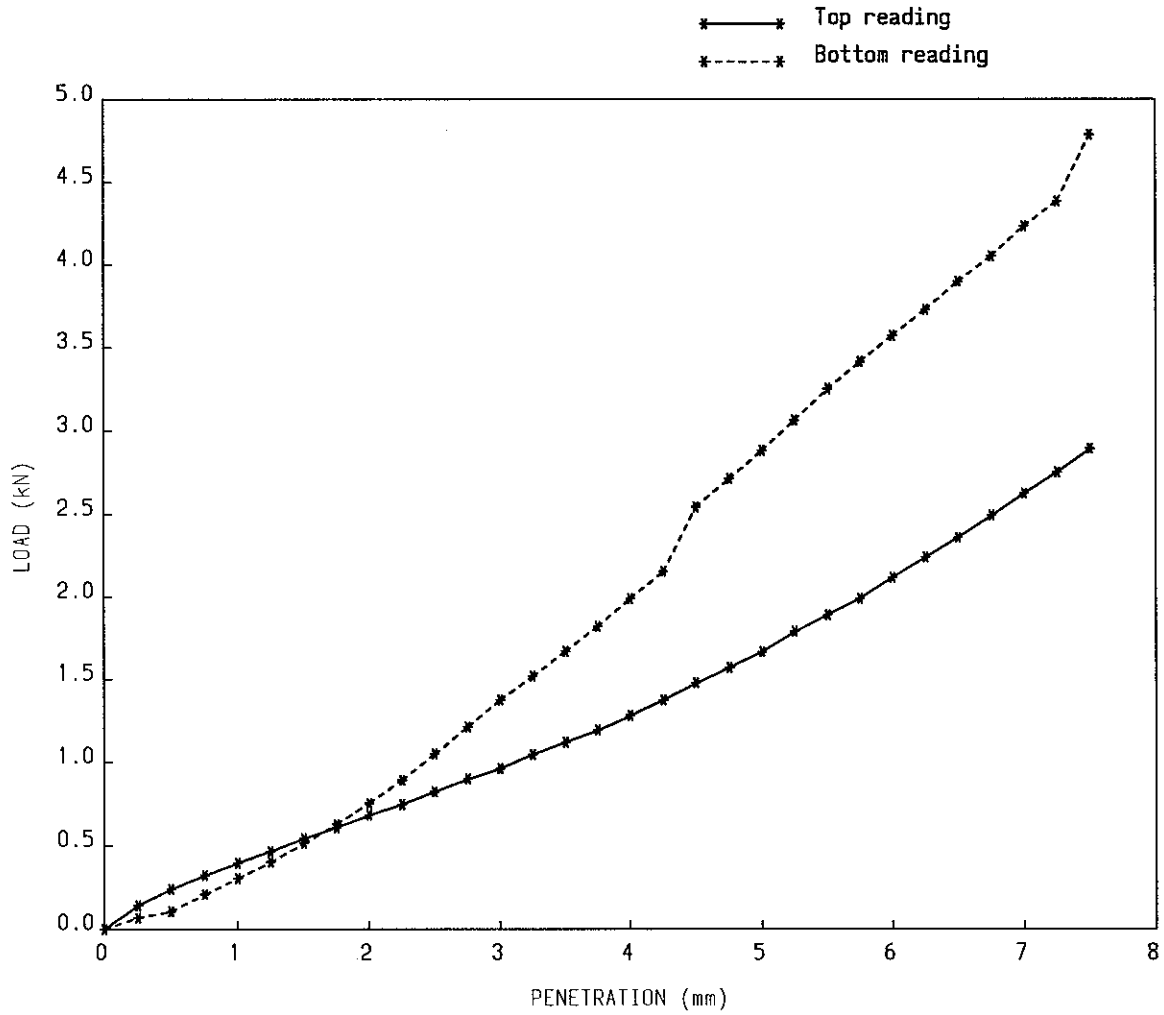
Q.A. Ref: /028-18/M4TP101.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some mudstone and a little medium gravel.	Hole ID	TPP101
		Sample No	2
		Depth	1.00 m



Seating Load	50N	Natural M/C	11%
Surcharge weight	15.2kg		
Moisture Content @ Top	11%		
Moisture Content @ Middle	11%		
Moisture Content @ Bottom	11%		
Bulk Density	2.27 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.04 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			8.3
2.5	0.83	13.2	6.3
5.0	1.7	20.0	8.3
BASE			14
2.5	1.1	13.2	8.0
5.0	2.9	20.0	14

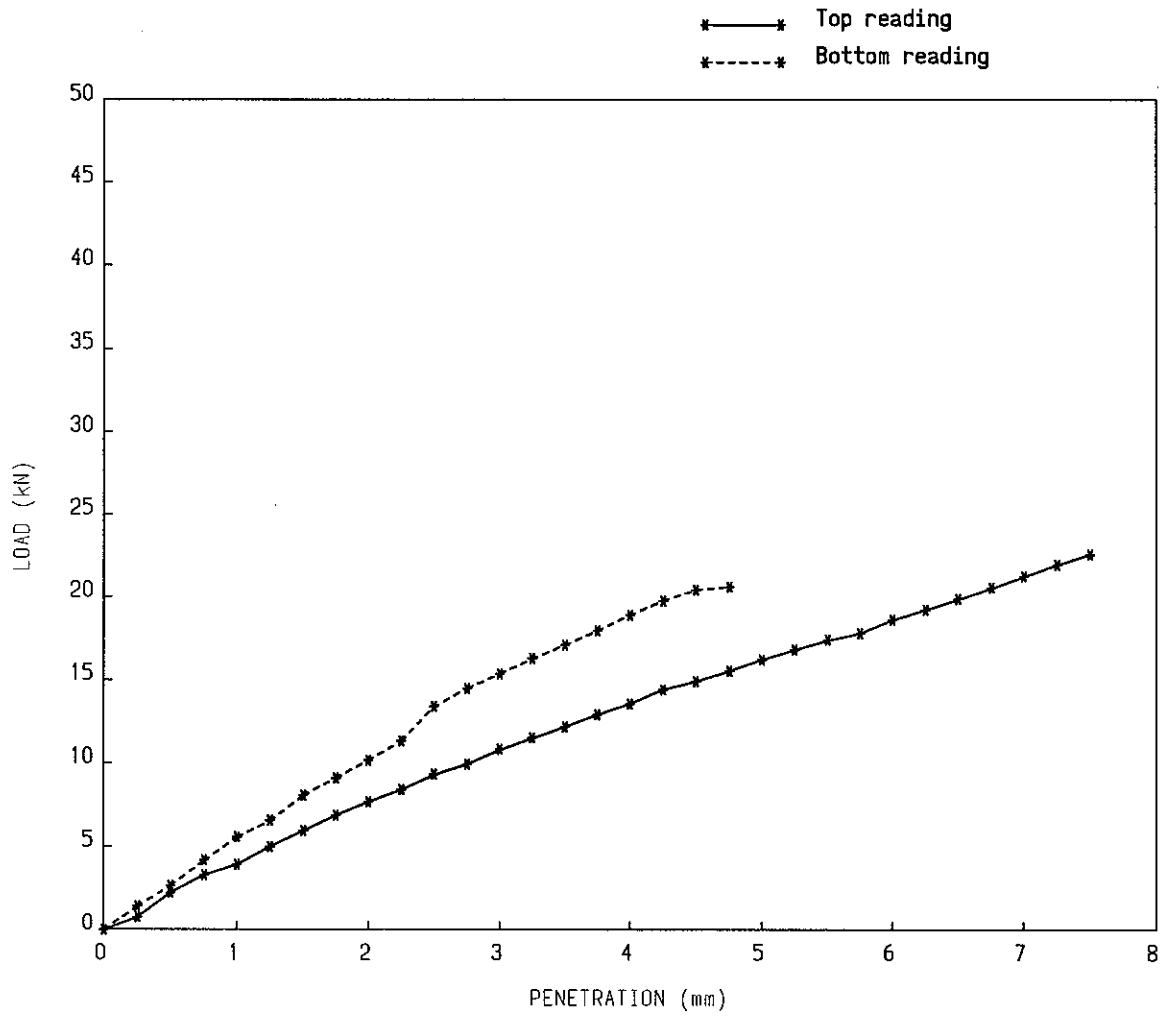
Q.A. Ref: /028-18/M4TP1012.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some mudstone and a little medium gravel.	Hole ID	TPP101
		Sample No	3
		Depth	1.00 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.2kg		
Moisture Content @ Top	8.4%		
Moisture Content @ Middle	8.7%		
Moisture Content @ Bottom	8.6%		
Bulk Density	2.27 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.09 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			81
2.5	9.3	13.2	71
5.0	16	20.0	81
BASE			101
2.5	13	13.2	101
5.0	2.9	20.0	14

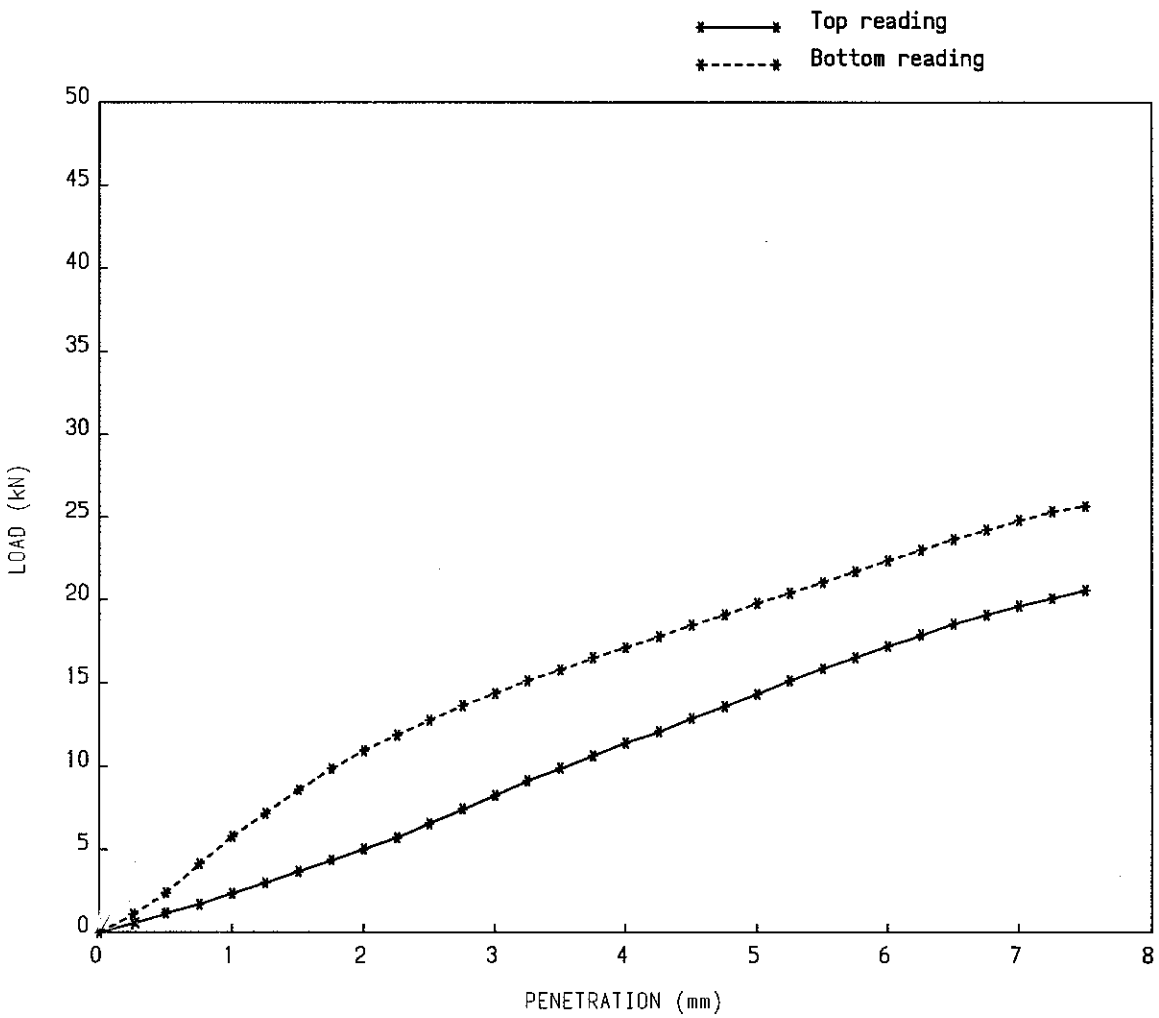
Q.A. Ref: /028-18/M4TP1013.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some mudstone and a little medium gravel.	Hole ID	TPP101
		Sample No	4
		Depth	1.00 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.0kg		
Moisture Content @ Top	8.9%		
Moisture Content @ Middle	9.0%		
Moisture Content @ Bottom	8.9%		
Bulk Density	2.25 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.07 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			72
2.5	6.6	13.2	50
5.0	14	20.0	72
BASE			99
2.5	13	13.2	97
5.0	20	20.0	99

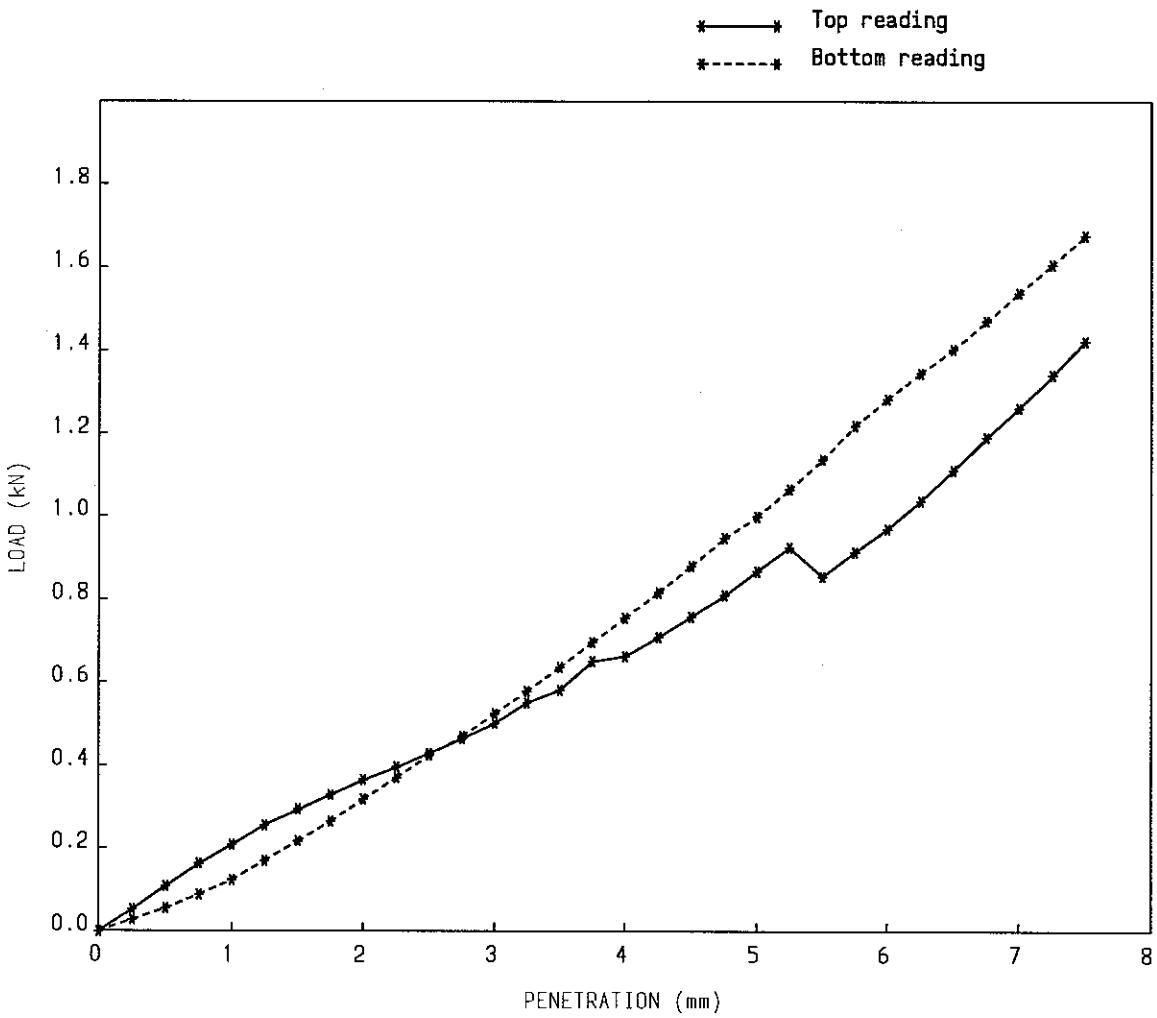
Q.A. Ref: /028-18/M4TP1014.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some mudstone and a little medium gravel.	Hole ID	TPP101
		Sample No	5
		Depth	1.00 m



Seating Load	10N	Natural M/C	11%
Surcharge weight	15.2kg		
Moisture Content @ Top	12%		
Moisture Content @ Middle	11%		
Moisture Content @ Bottom	11%		
Bulk Density	2.25 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.07 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			4.3
2.5	0.43	13.2	3.3
5.0	0.87	20.0	4.3
BASE			5.0
2.5	0.42	13.2	3.2
5.0	1.00	20.0	5.0

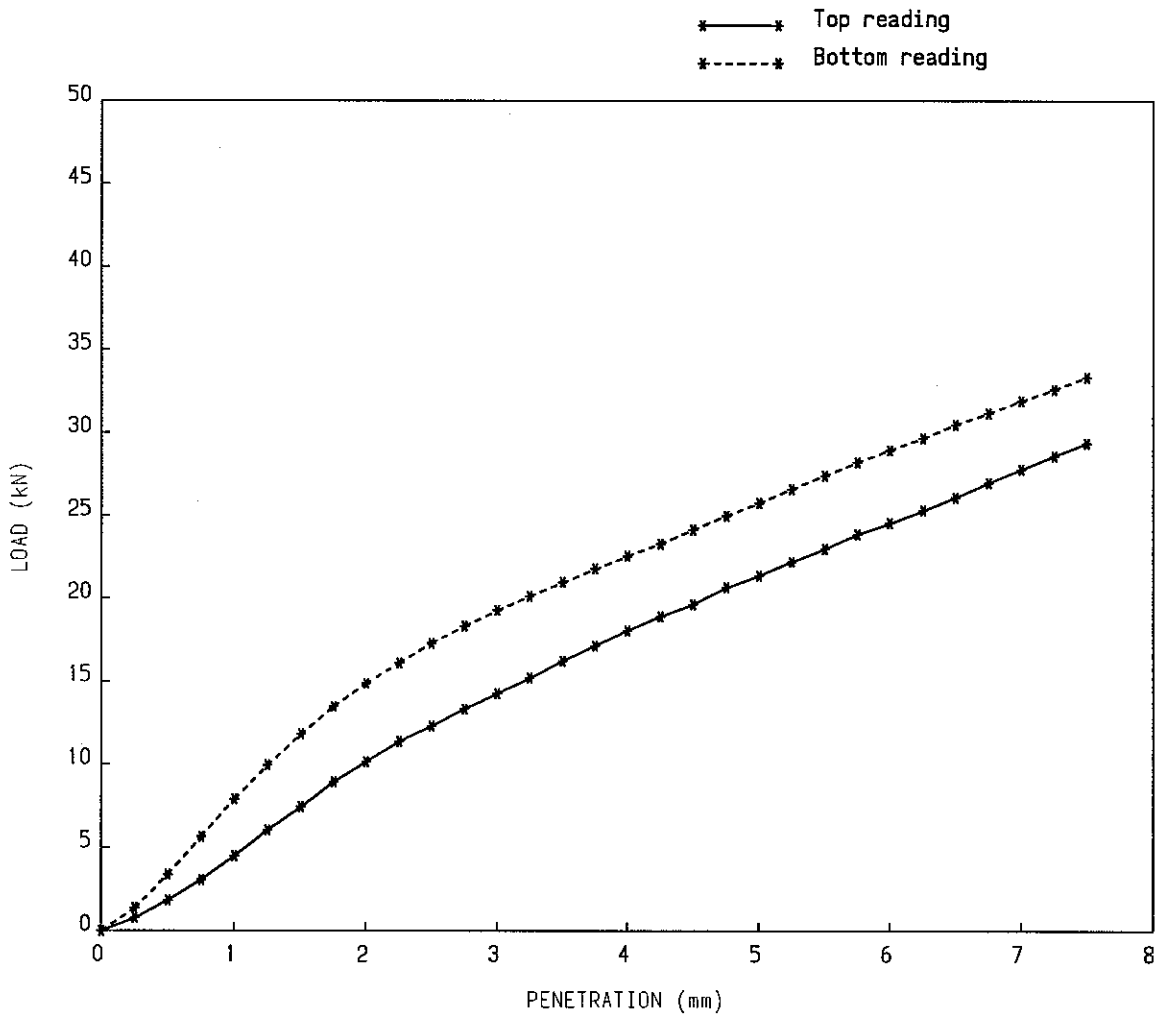
Q.A. Ref: /028-18/M4TP1015.CBR 2.04

NORWEST HOLST SOIL ENGINEERING LIMITED

UNSOAKED CALIFORNIA BEARING RATIO TEST RESULTS

Test method: BS 1377:1990: Part 4: Clause 7

Location	M4 RELIEF ROAD, NEWPORT.	Contract	F10895
Soil description	Reddish brown clayey SAND with some mudstone and a little medium gravel.	Hole ID	TPP101
		Sample No	6
		Depth	1.00 m



Seating Load	250N	Natural M/C	11%
Surcharge weight	15.0kg		
Moisture Content @ Top	7.1%		
Moisture Content @ Middle	7.2%		
Moisture Content @ Bottom	7.5%		
Bulk Density	2.19 Mg/m3	Gravel >20.0mm	0.2%
Dry Density	2.05 Mg/m3	Gravel >37.5mm	0.0%

Type of specimen : Bulk.

Compaction type : Rammer compaction with 4.5kg effort

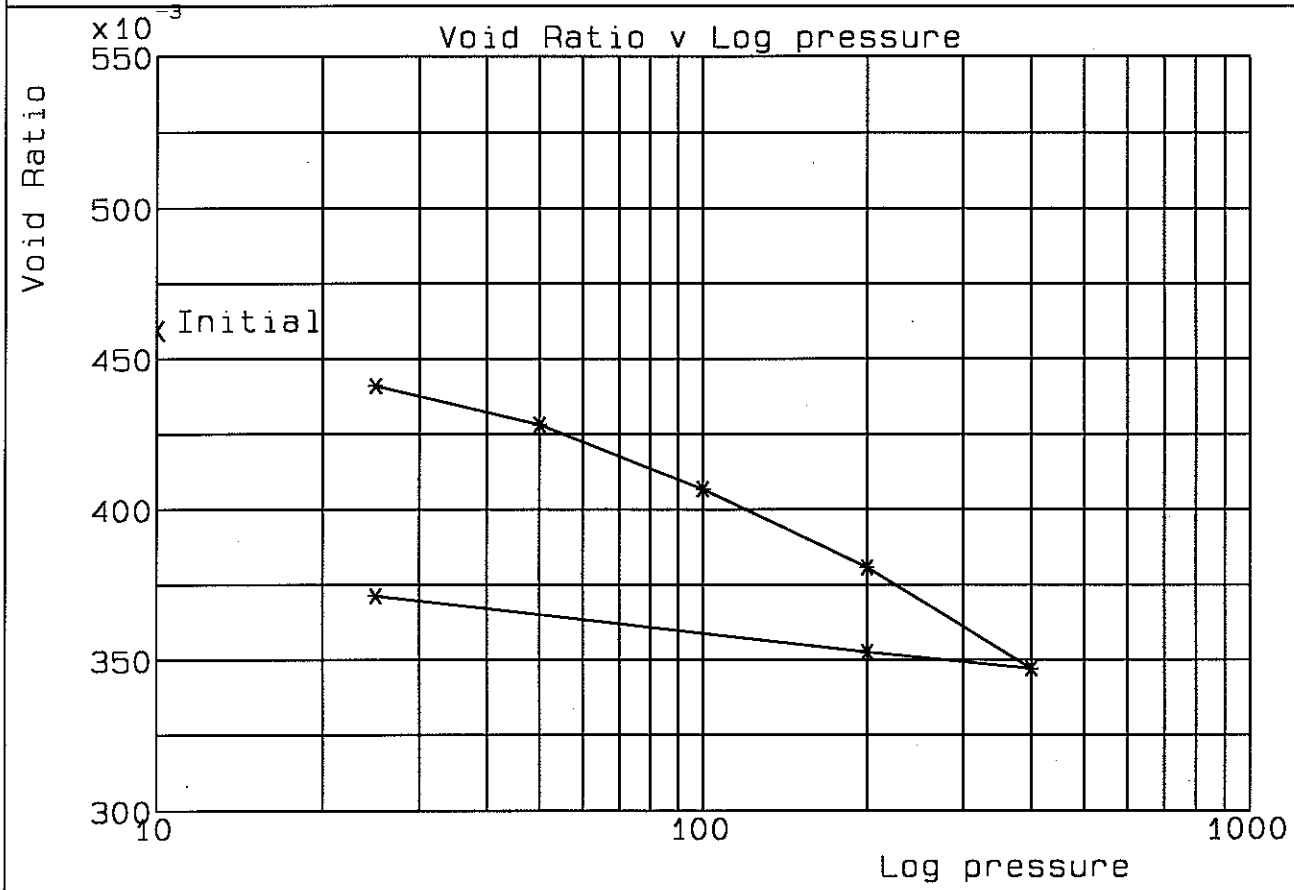
Remarks :

PENE-TRATION (mm)	LOAD (kN)	STANDARD LOAD (kN)	CBR (%)
TOP			107
2.5	12	13.2	93
5.0	21	20.0	107
BASE			131
2.5	17	13.2	131
5.0	26	20.0	129

Q.A. Ref: /028-18/M4TP1016.CBR 2.04

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: A2 Sample: D Depth: 1.00m



	Initial Values	Final Values
Sample dimensions Initial height 19.10 mm area 4376.7sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	16.8	17.1
Bulk Density Mg/cum	2.12	2.26
Dry Density Mg/cum	1.82	1.93
Void Ratio e	0.459	0.370
[illegible]%	[illegible]	[illegible]

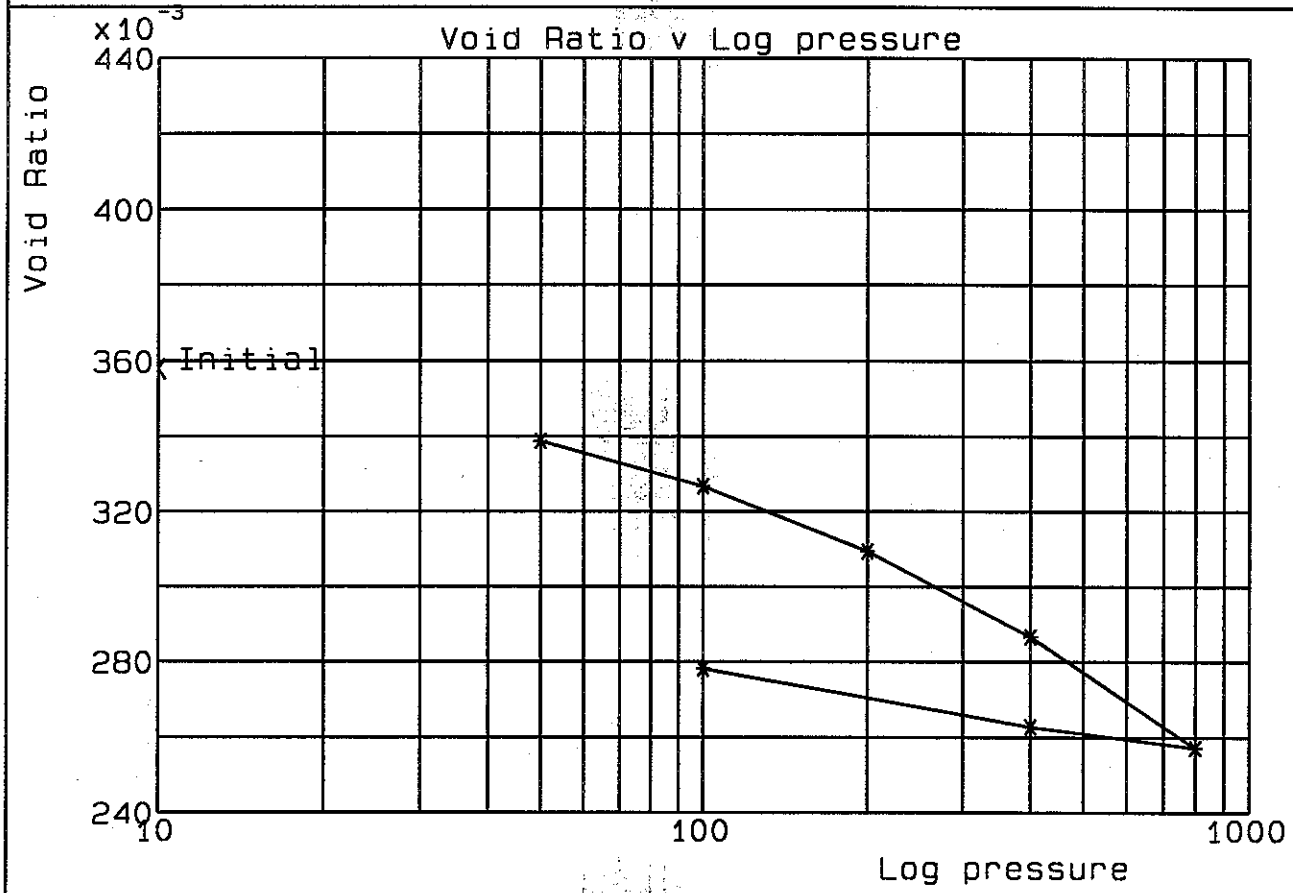
Pressure kPa
1
25
50
100
200
400
200
25

Laboratory Coefficients	
m_v sqm/MN	c_v sqm/yr
0.528	2.00
0.358	1.49
0.297	2.02
0.185	3.60
0.122	4.69

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: B3 Sample: F Depth: 3.00m



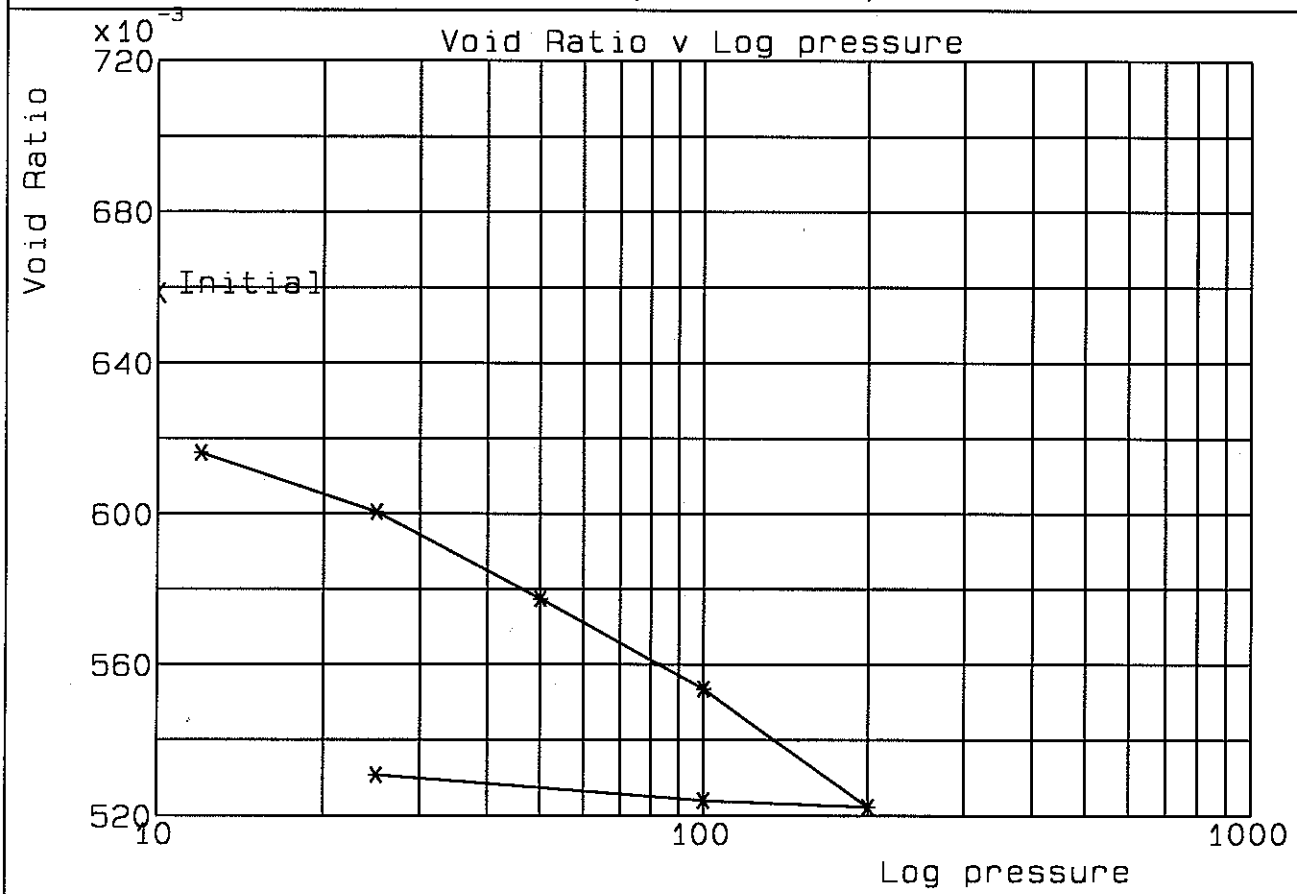
	Initial Values	Final Values
Sample dimensions Initial height 19.20 mm area 4359.2sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	14.5	14.4
Bulk Density Mg/cum	2.23	2.37
Dry Density Mg/cum	1.95	2.07
Void Ratio e	0.358	0.278

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.288	
50	0.181	7.11
100	0.130	6.61
200	0.087	9.07
400	0.057	8.57
800		
400		
100		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: C1 Sample: J Depth: 1.50m

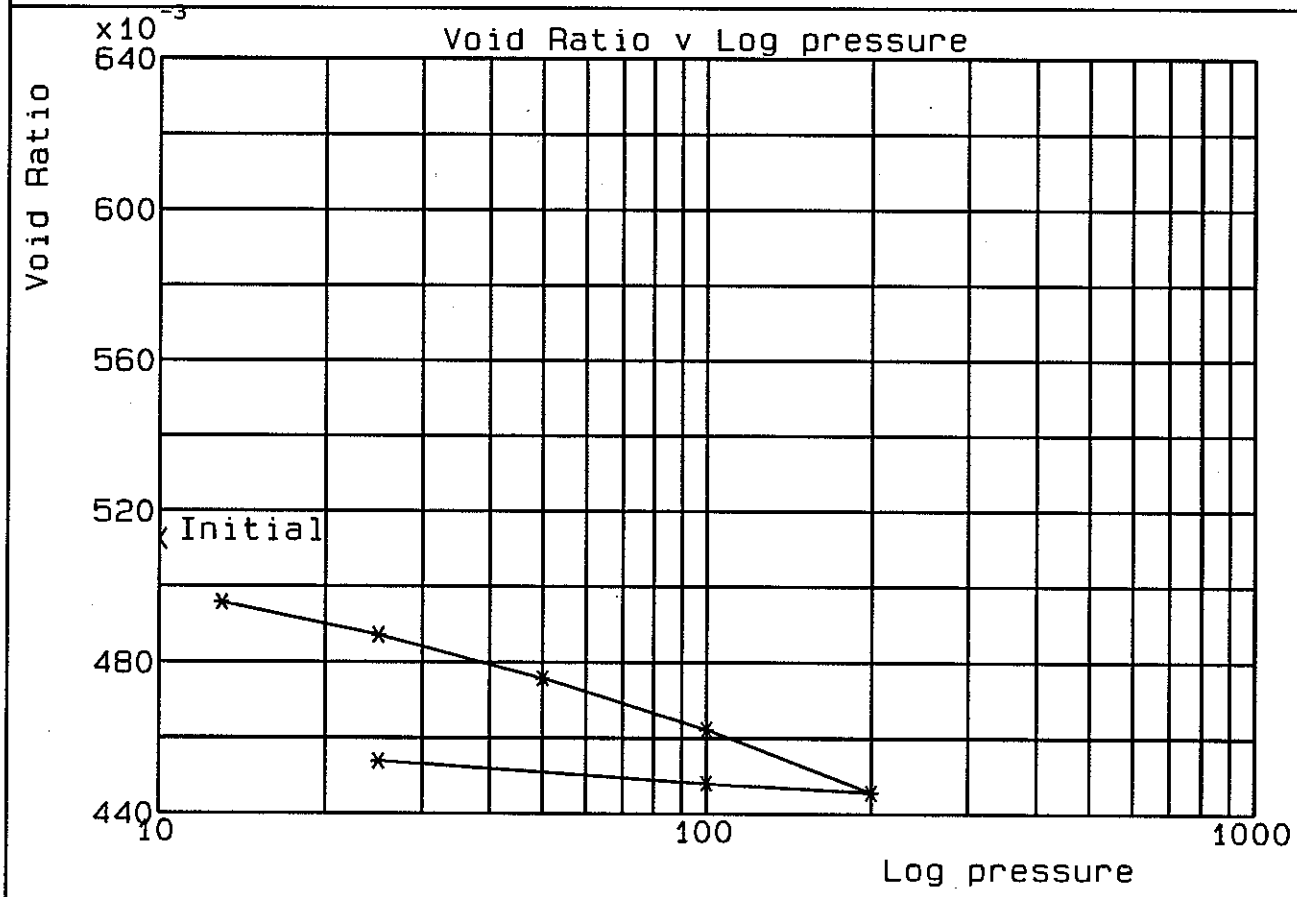


			Pressure kPa	Laboratory Coefficients	
				m_v sqm/MN	c_v sqm/yr
Sample dimensions			1	2.364	0.47
Initial height 19.00 mm			12	0.748	0.84
area 4359.2sq.mm			25	0.576	1.26
			50	0.303	2.04
Particle density (measured)			100	0.202	2.69
2.70			200		
	Initial Values	Final Values	100		
			25		
Moisture Content %	24.3	22.2			
Bulk Density Mg/cum	2.02	2.15			
Dry Density Mg/cum	1.63	1.76			
Void Ratio e	0.659	0.531			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: C1 Sample: A Depth: 3.50m



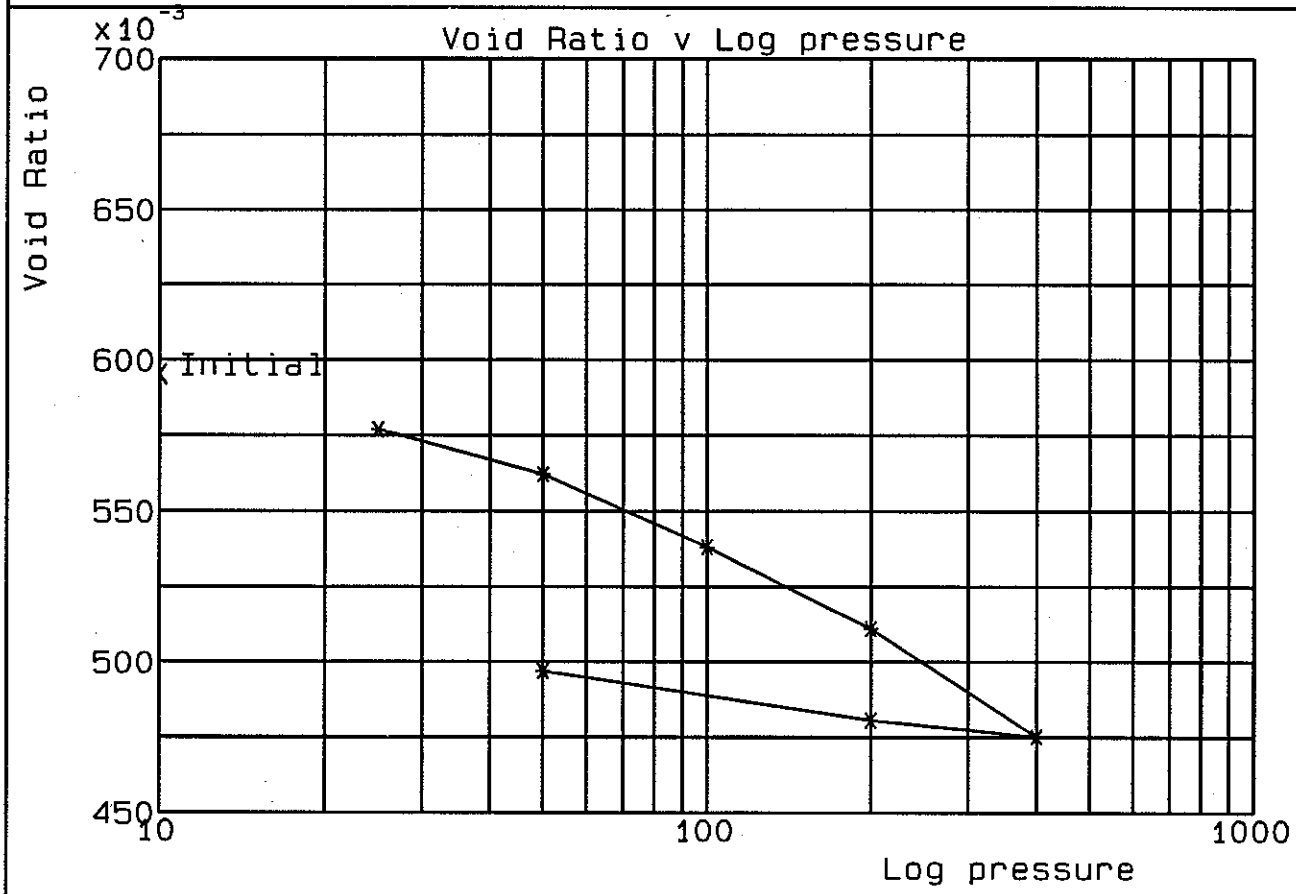
	Initial Values	Final Values
Sample dimensions Initial height 18.95 mm area 4388.5sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	19.0	19.0
Bulk Density Mg/cum	2.10	2.17
Dry Density Mg/cum	1.75	1.82
Void Ratio e	0.512	0.454

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.935	7.78
13	0.476	
25	0.307	15.20
50	0.184	27.66
100	0.114	23.06
200		
100		
25		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: C2 Sample: A Depth: 1.50m

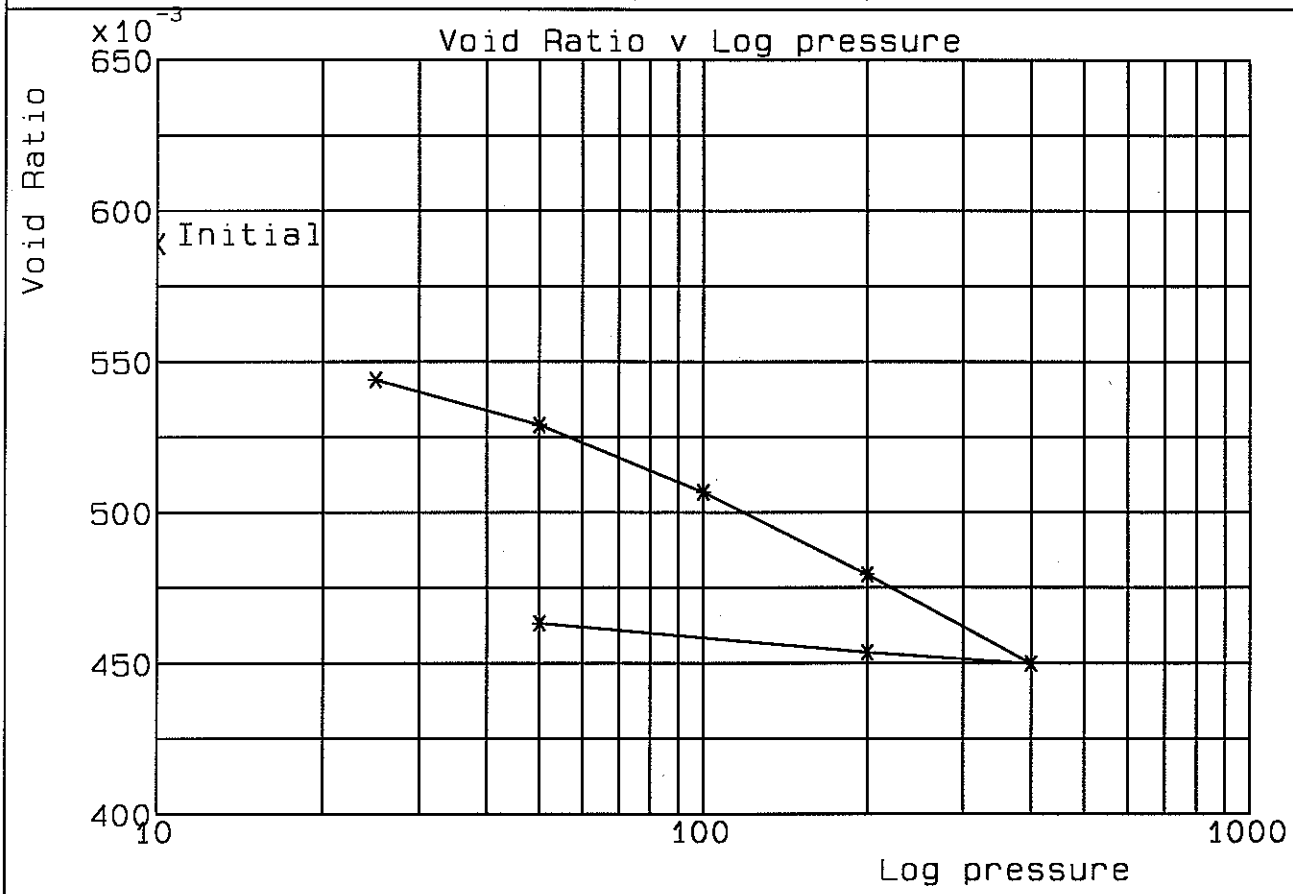


			Pressure kPa	Laboratory Coefficients	
Sample dimensions			1	m_v sqm/MN	c_v sqm/yr
Initial height 18.90 mm			25	0.480	7.97
area 4353.3sq.mm			50	0.373	4.57
			100	0.308	4.89
Particle density (assumed)			200	0.177	6.68
2.65			400	0.118	7.48
	Initial Values	Final Values	200		
			50		
Moisture Content %	23.7	23.7			
Bulk Density Mg/cum	2.05	2.19			
Dry Density Mg/cum	1.66	1.77			
Void Ratio e	0.595	0.497			
[illegible]	[illegible]	[illegible]			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: C2 Sample: F Depth: 3.50m

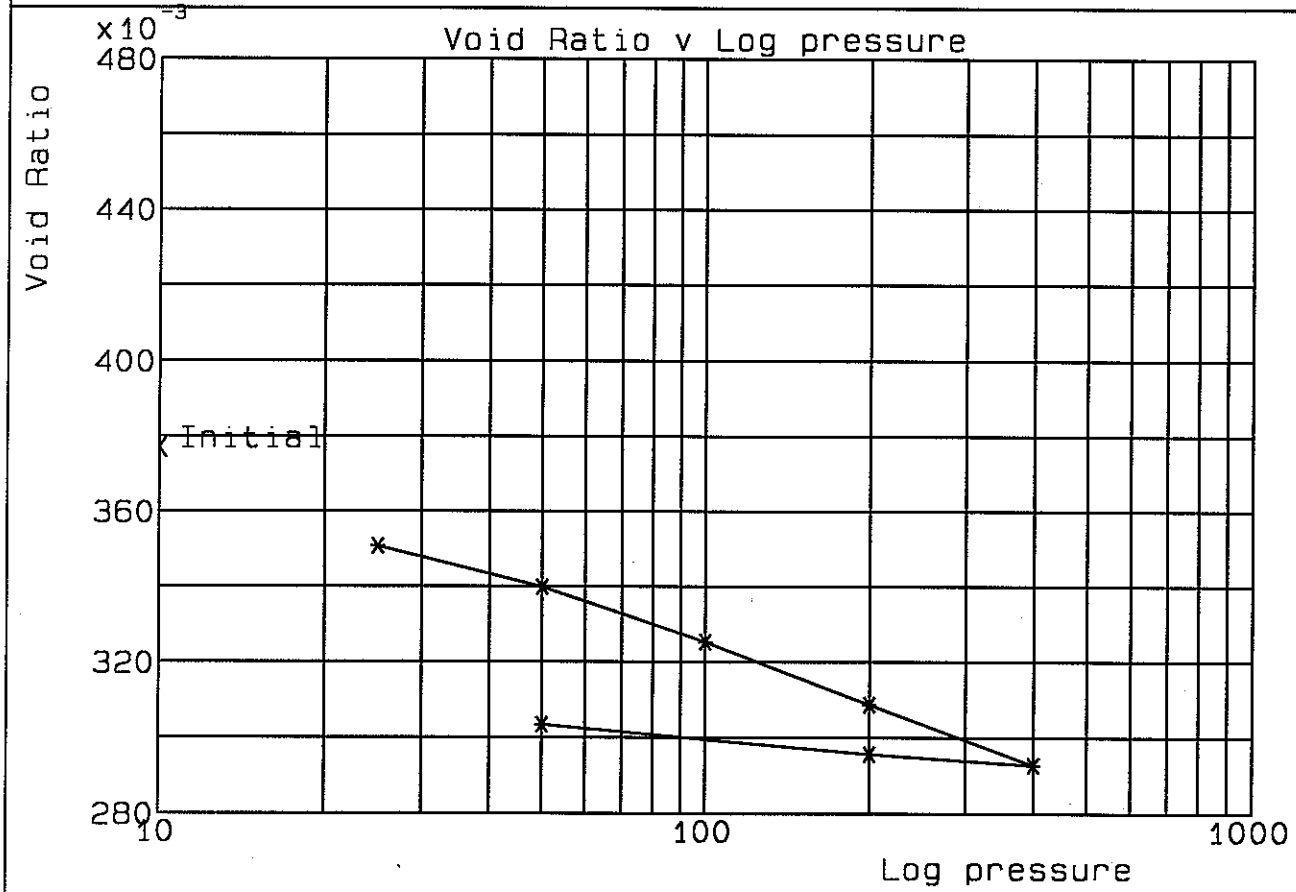


			Pressure kPa	Laboratory Coefficients	
				m_v sqm/MN	c_v sqm/yr
Sample dimensions			1	1.186	1.93
Initial height 18.95 mm			25	0.387	3.23
area 4382.6sq.mm			50	0.293	5.70
			100	0.181	4.73
Particle density (assumed) 2.65			200	0.099	8.48
			400		
	Initial Values	Final Values	200		
			50		
Moisture Content %	23.9	21.9			
Bulk Density Mg/cum	2.07	2.21			
Dry Density Mg/cum	1.67	1.81			
Void Ratio e	0.589	0.463			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: C4 Sample: G Depth: 0.90m



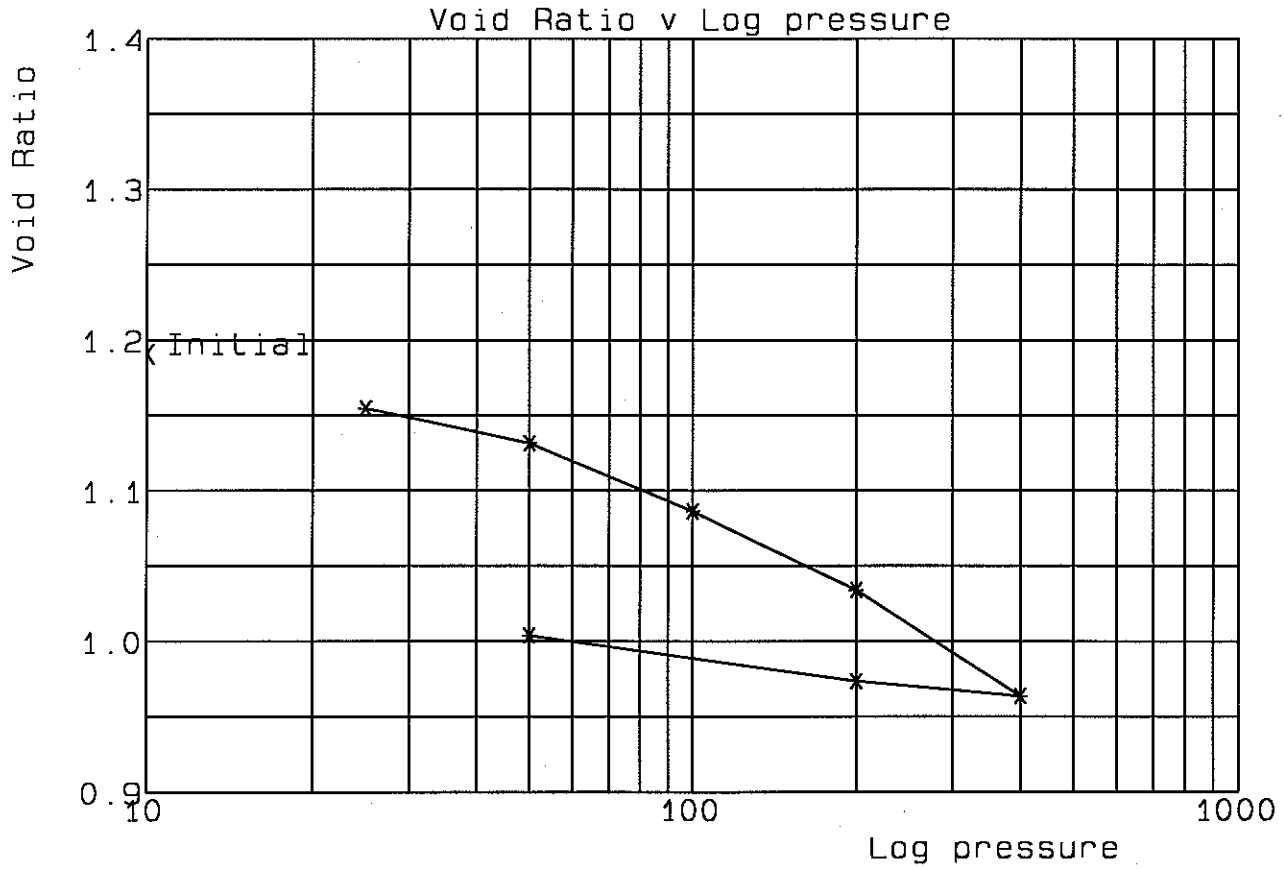
	Initial Values	Final Values
Sample dimensions Initial height 19.10 mm area 4359.2sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	14.9	15.2
Bulk Density Mg/cum	2.21	2.34
Dry Density Mg/cum	1.92	2.03
Void Ratio e	0.377	0.303

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.801	1.83
25	0.322	1.96
50	0.217	4.45
100	0.125	7.04
200	0.061	7.93
400		
200		
50		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: C7 Sample: D Depth: 1.00m

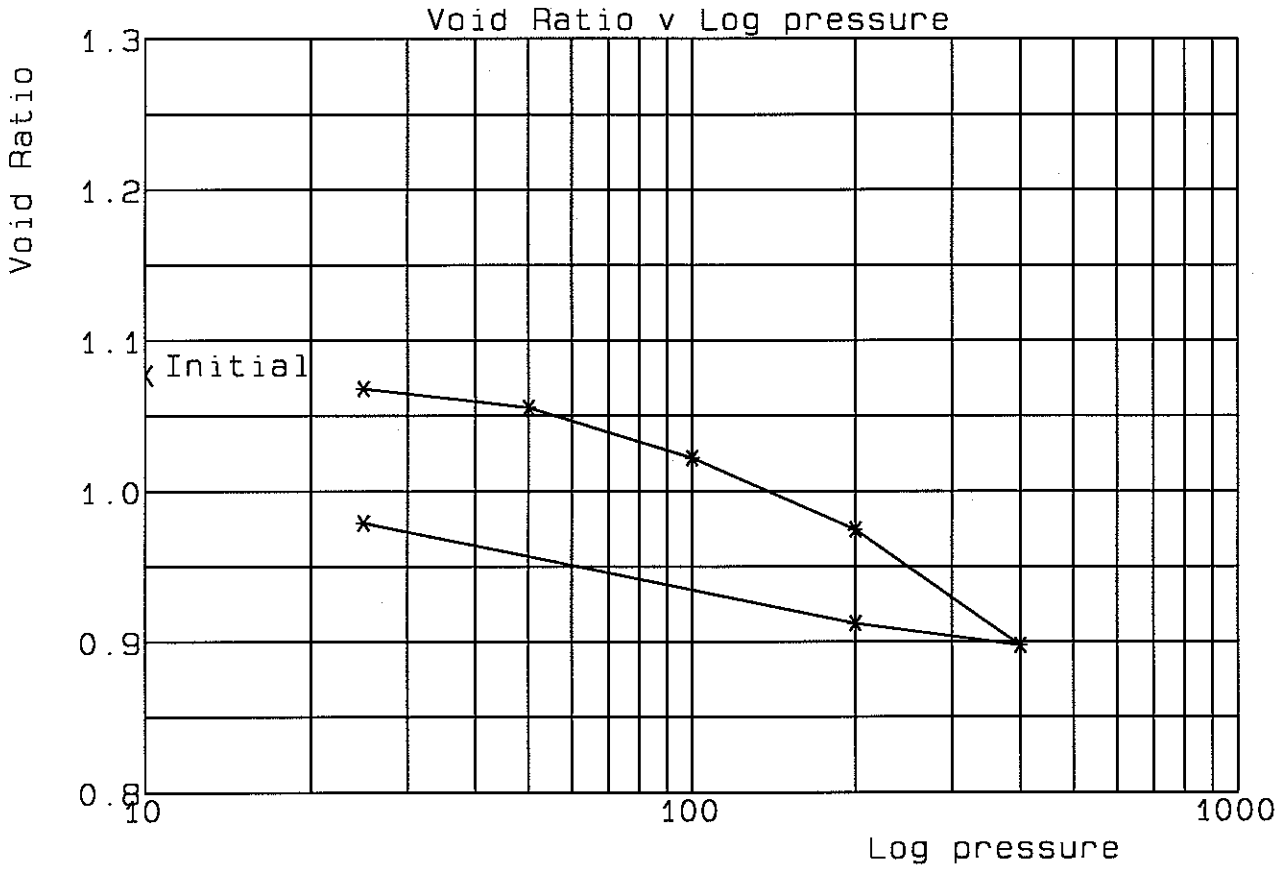


			Pressure kPa	Laboratory Coefficients	
				m_v sqm/MN	c_v sqm/yr
Sample dimensions			1	0.692	
Initial height 19.00 mm			25	0.432	1.66
area 4394.3sq.mm			50	0.423	1.76
			100	0.251	1.95
Particle density (assumed)			200	0.173	1.65
2.65			400		
	Initial Values	Final Values	200		
			50		
Moisture Content %	41.9	40.5			
Bulk Density Mg/cum	1.72	1.86			
Dry Density Mg/cum	1.21	1.32			
Void Ratio e	1.191	1.004			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: C8 Sample: E Depth: 1.00m

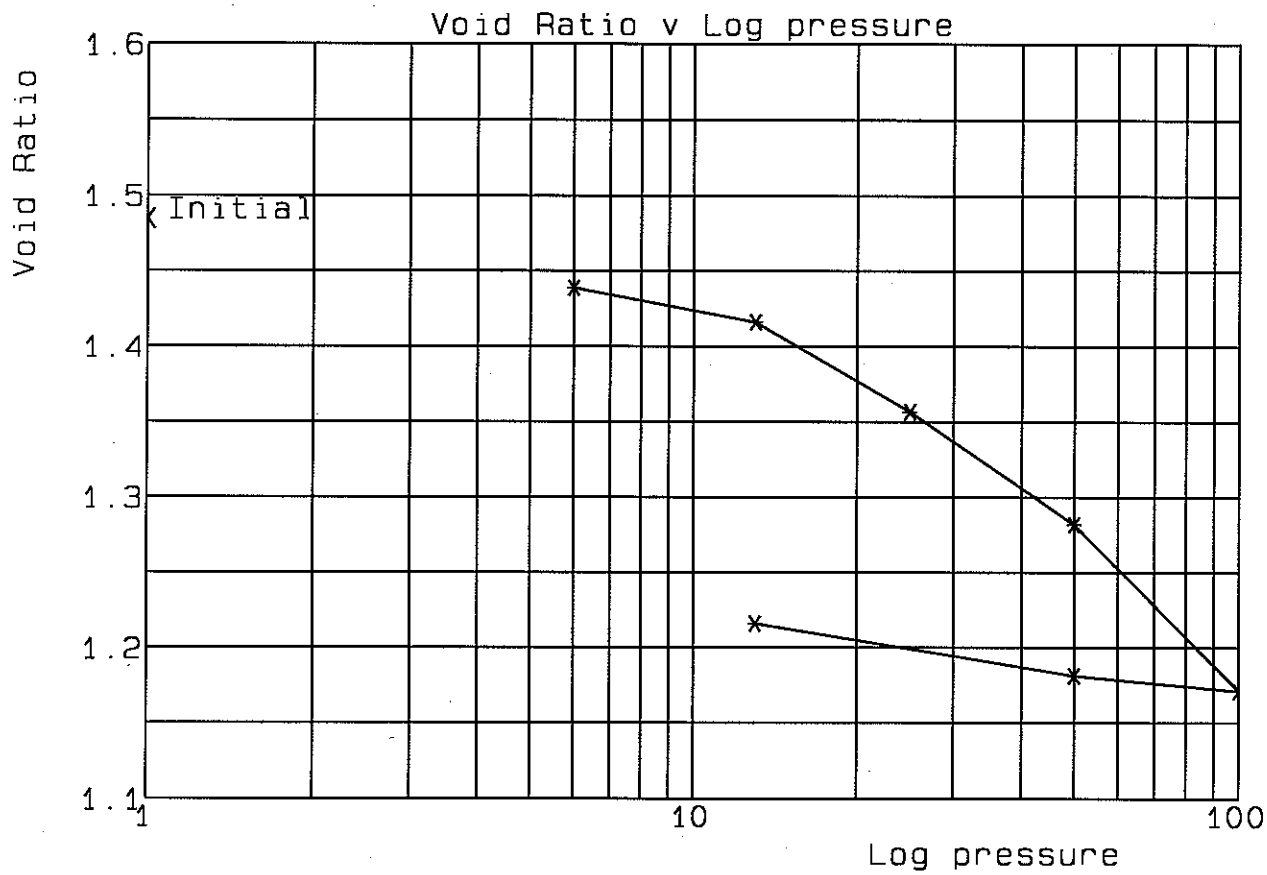


			Pressure kPa	Laboratory Coefficients	
				m_v sqm/MN	c_v sqm/yr
Sample dimensions			1	0.181	
Initial height 19.00 mm			25	0.243	1.06
area 4394.3sq.mm			50	0.321	0.84
			100	0.236	0.75
Particle density (assumed)			200	0.195	0.72
2.65			400		
	Initial Values	Final Values	200		
			25		
Moisture Content %	40.5	40.5			
Bulk Density Mg/cum	1.79	1.88			
Dry Density Mg/cum	1.28	1.34			
Void Ratio e	1.077	0.979			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: D2 Sample: C Depth: 1.70m



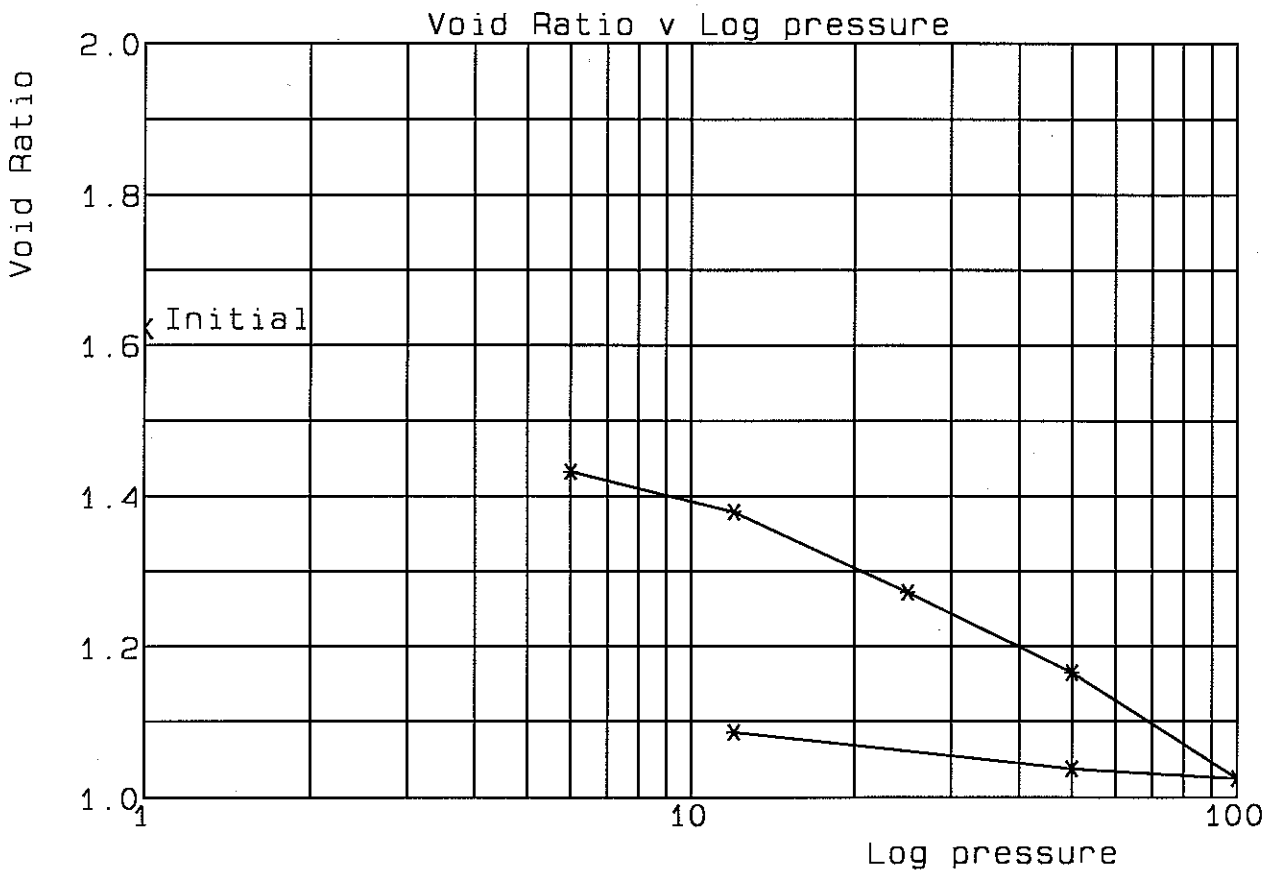
	Initial Values	Final Values
Sample dimensions Initial height 19.00 mm area 4376.7sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	56.8	50.7
Bulk Density Mg/cum	1.67	1.80
Dry Density Mg/cum	1.07	1.20
Void Ratio e	1.484	1.216
[illegible]		[illegible]

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	3.838	0.43
6	1.318	0.53
13	2.052	0.48
25	1.265	0.68
50	0.973	0.71
100		
50		
13		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: D2 Sample: C Depth: 6.00m



	Initial Values	Final Values
Sample dimensions Initial height 18.80 mm area 4359.2sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	62.4	46.8
Bulk Density Mg/cum	1.64	1.87
Dry Density Mg/cum	1.01	1.27
Void Ratio e	1.622	1.086
	91.5	94.2

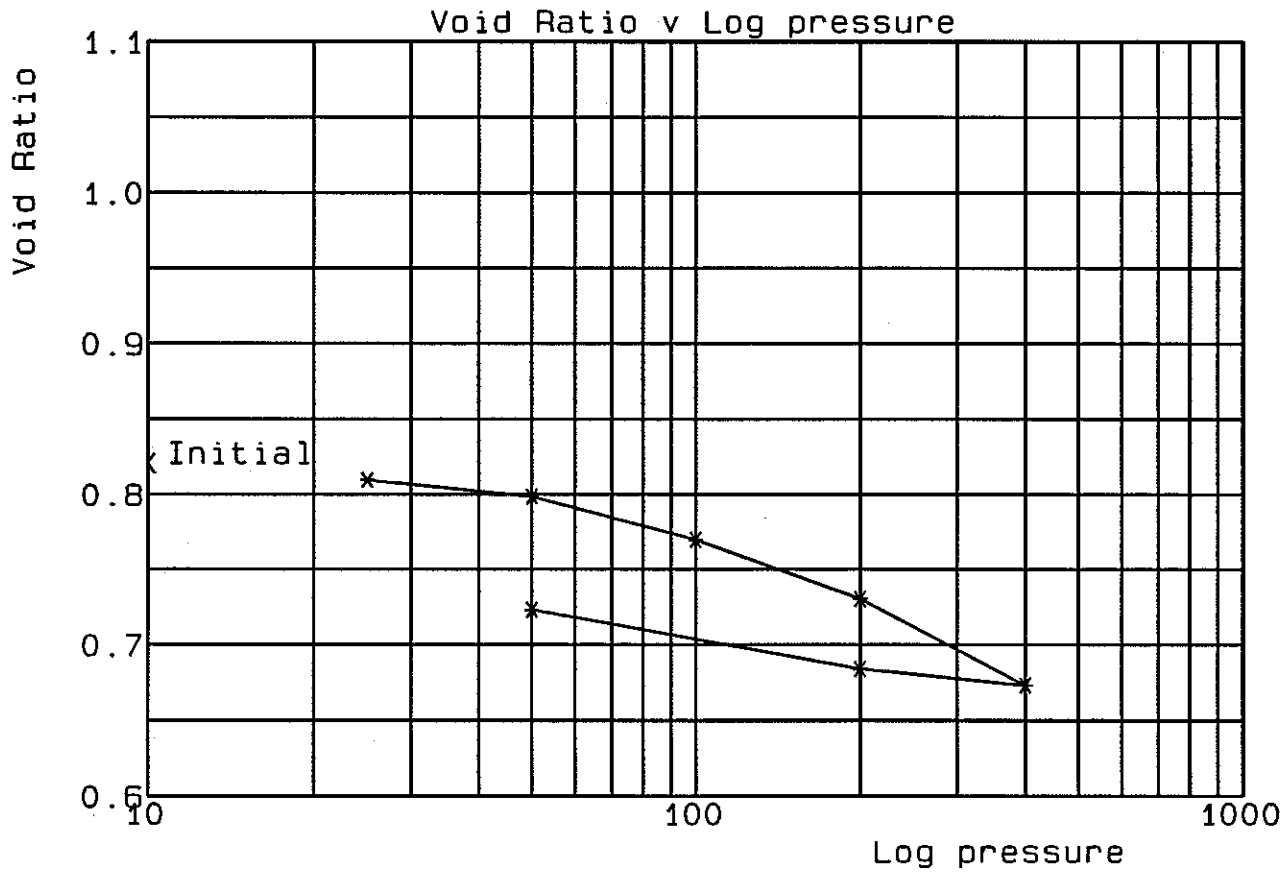
Pressure kPa
1
6
12
25
50
100
50
12

Laboratory Coefficients	
m_v sqm/MN	c_v sqm/yr
15.082	0.16
3.651	0.37
3.468	0.32
1.876	0.50
1.300	0.54

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: D3 Sample: A Depth: 1.00m

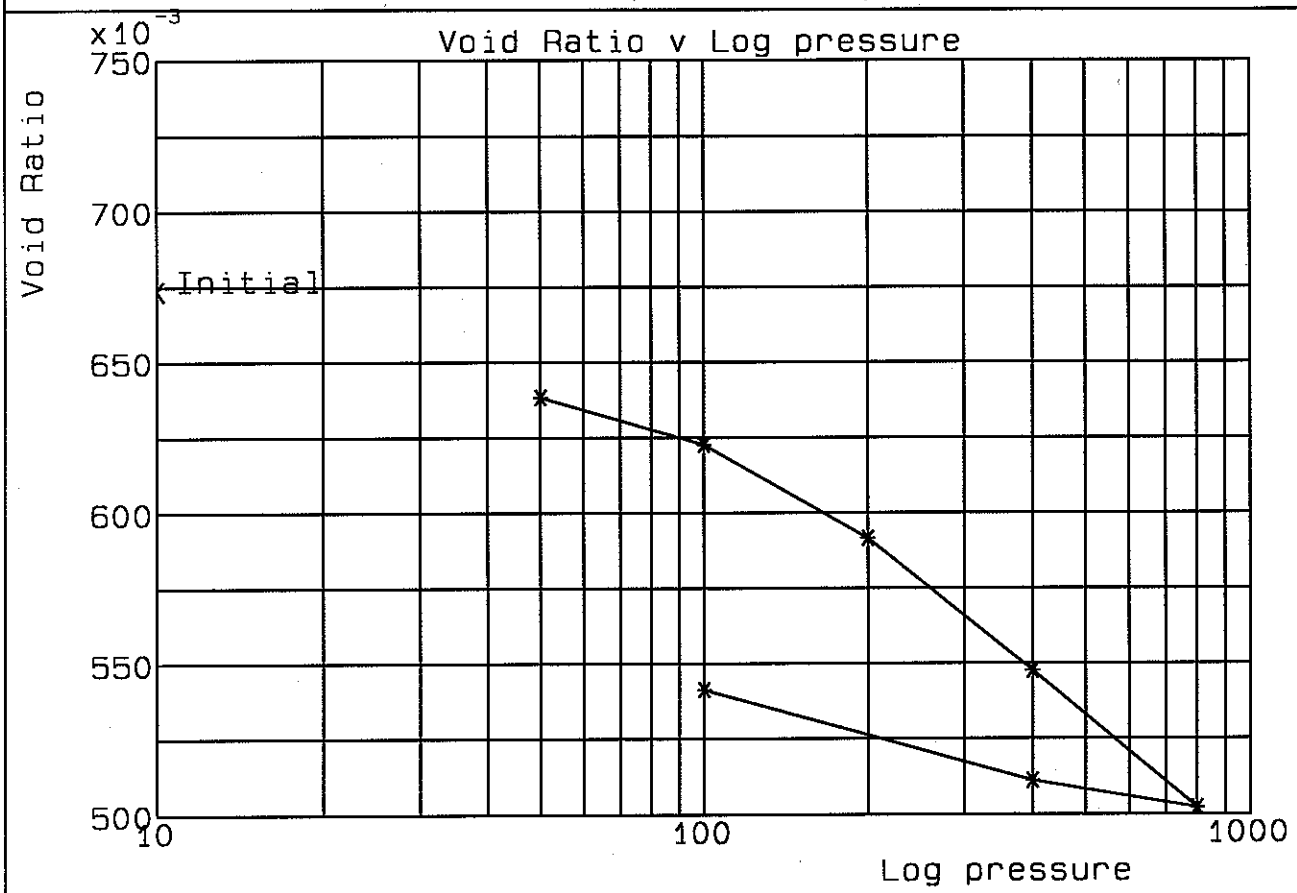


			Pressure kPa	Laboratory Coefficients	
				m_v sqm/MN	c_v sqm/yr
Sample dimensions			1	0.255	
Initial height 18.95 mm			25	0.244	0.69
area 4370.9sq.mm			50	0.322	0.48
			100	0.222	0.59
Particle density (assumed)			200	0.165	0.49
2.65			400		
	Initial Values	Final Values	200		
			50		
Moisture Content %	32.3	31.9			
Bulk Density Mg/cum	1.93	2.03			
Dry Density Mg/cum	1.46	1.54			
Void Ratio e	0.821	0.723			
[illegible]	[illegible]	117.			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: D4 Sample: G Depth: 1.05m

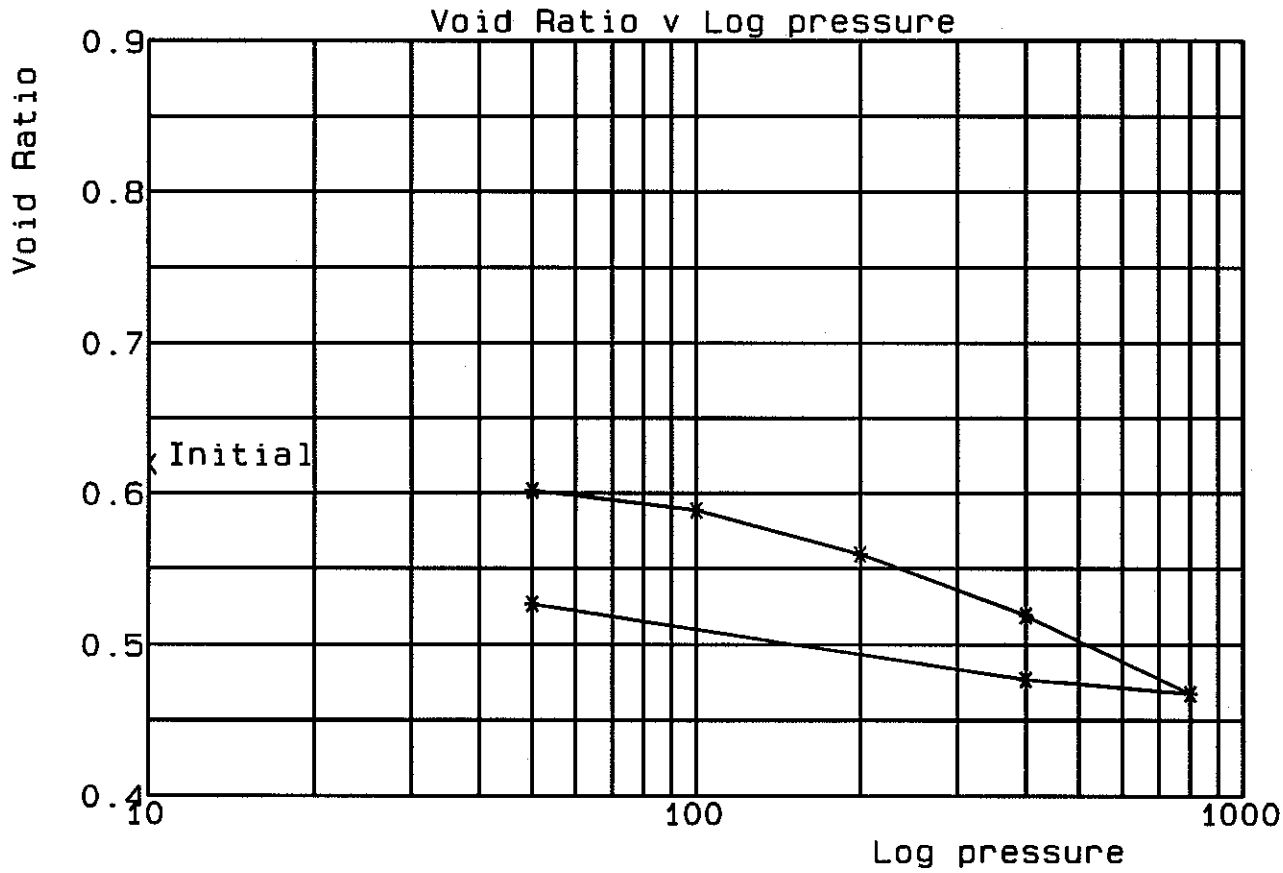


			Pressure kPa	Laboratory Coefficients	
				m_v sqm/MN	c_v sqm/yr
Sample dimensions			1	0.431	
Initial height 19.10 mm			50	0.191	0.91
area 4347.5sq.mm			100	0.191	0.60
			200	0.122	0.50
Particle density (assumed)			400	0.073	0.70
2.65			800		
	Initial Values	Final Values	400		
			100		
Moisture Content %	26.7	27.9			
Bulk Density Mg/cum	2.01	2.20			
Dry Density Mg/cum	1.58	1.72			
Void Ratio e	0.674	0.541			
S ...	[illegible]	[illegible]			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: D8 Sample: A Depth: 1.00m

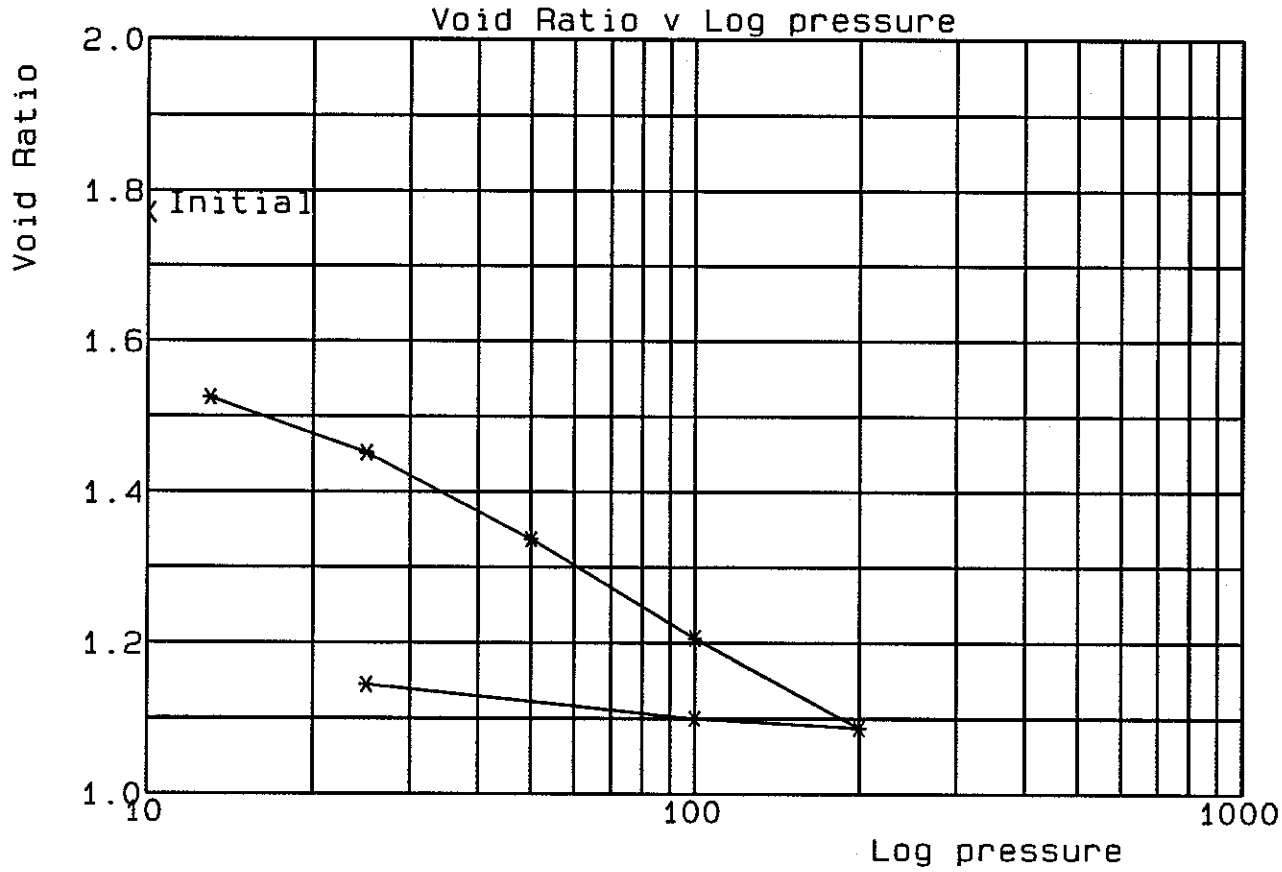


			Pressure kPa	Laboratory Coefficients	
				m_v sqm/MN	c_v sqm/yr
Sample dimensions			1	0.217	
Initial height 19.00 mm			50	0.165	0.71
area 4370.9sq.mm			100	0.184	0.53
			200	0.129	0.60
Particle density (assumed)			400	0.085	0.70
2.65			800		
	Initial Values	Final Values	400		
			50		
Moisture Content %	24.5	26.0			
Bulk Density Mg/cum	2.04	2.19			
Dry Density Mg/cum	1.64	1.74			
Void Ratio e	0.619	0.527			
[illegible]	[illegible]	[illegible]			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: D8 Sample: G Depth: 5.50m

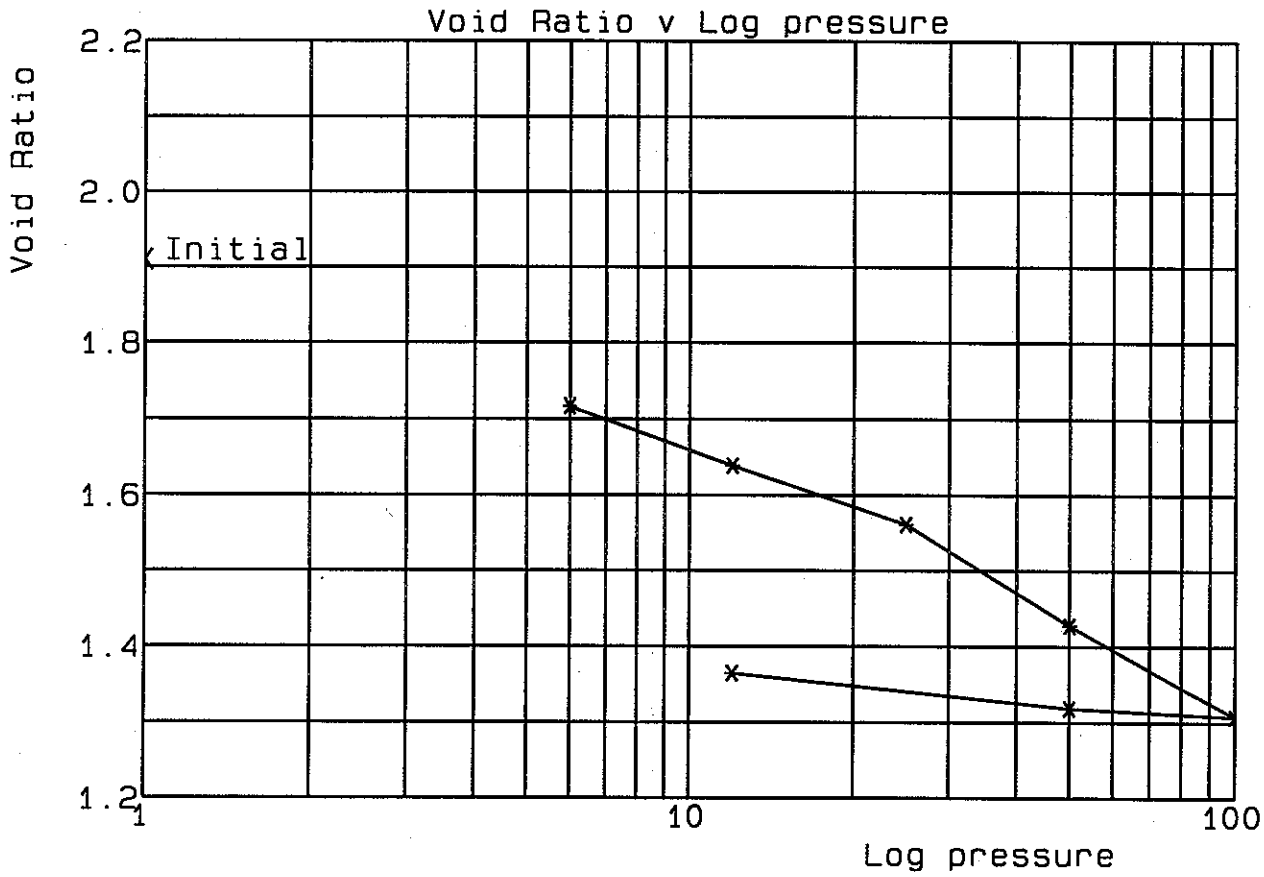


			Pressure kPa	Laboratory Coefficients	
Sample dimensions			1	m_v sqm/MN	c_v sqm/yr
Initial height 18.90 mm			13	7.502	0.21
area 4347.5sq.mm			25	2.414	0.39
			50	1.872	0.42
Particle density (assumed)			100	1.121	1.29
2.65			200	0.540	0.82
	Initial Values	Final Values	100		
			25		
Moisture Content %	68.5	51.0			
Bulk Density Mg/cum	1.61	1.87			
Dry Density Mg/cum	0.96	1.24			
Void Ratio e	1.770	1.145			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: E1 Sample: B Depth: 3.00m



			Pressure kPa	Laboratory Coefficients	
Sample dimensions				m_v sqm/MN	c_v sqm/yr
Initial height 18.90 mm			1	13.833	0.16
area 4388.5sq.mm			6	4.751	0.17
			12	2.262	0.38
			25	2.094	0.42
Particle density (assumed) 2.65			50	0.987	0.73
			100		
	Initial Values	Final Values	50		
			12		
Moisture Content %	72.8	57.9			
Bulk Density Mg/cum	1.57	1.77			
Dry Density Mg/cum	0.91	1.12			
Void Ratio e	1.909	1.365			
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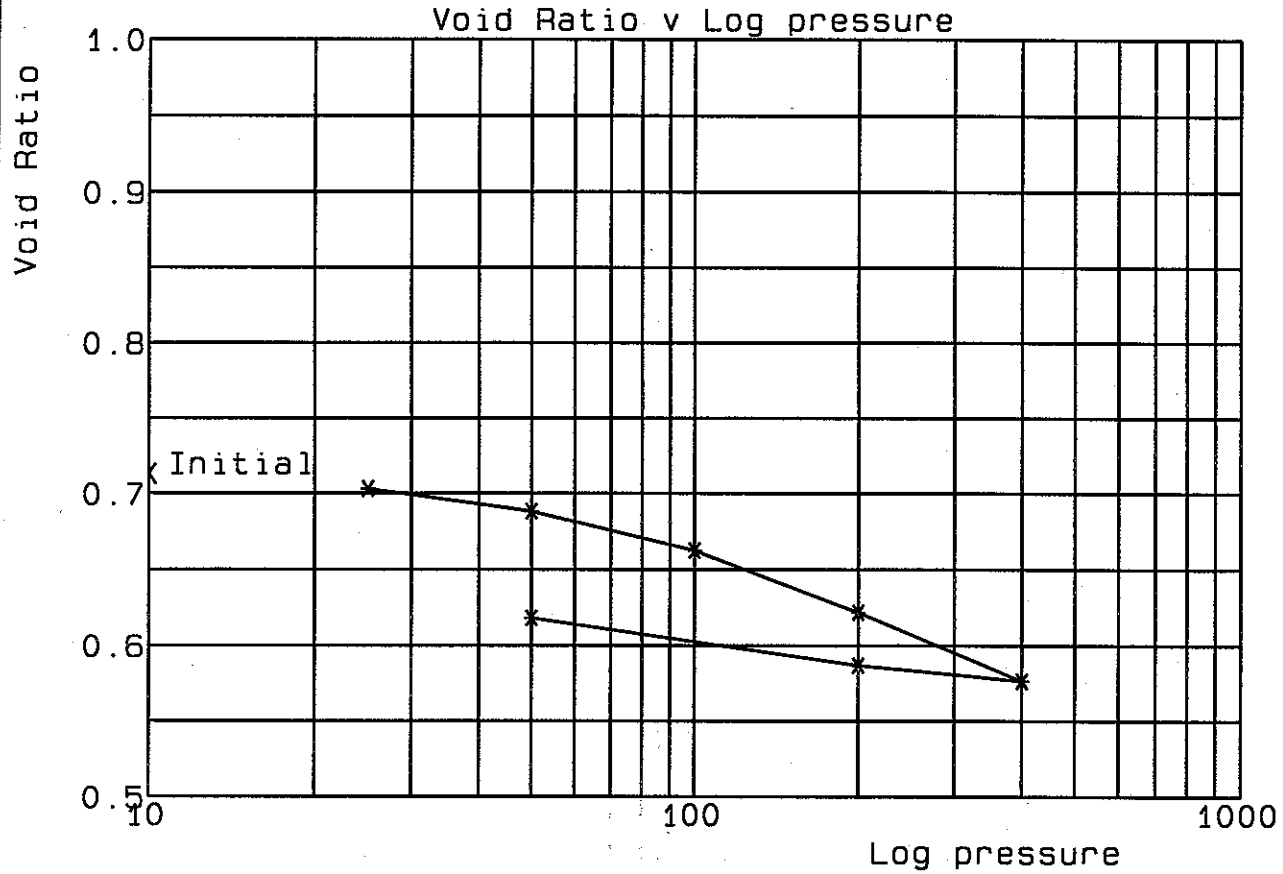
NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: E2 Sample: B Depth: 1.00m



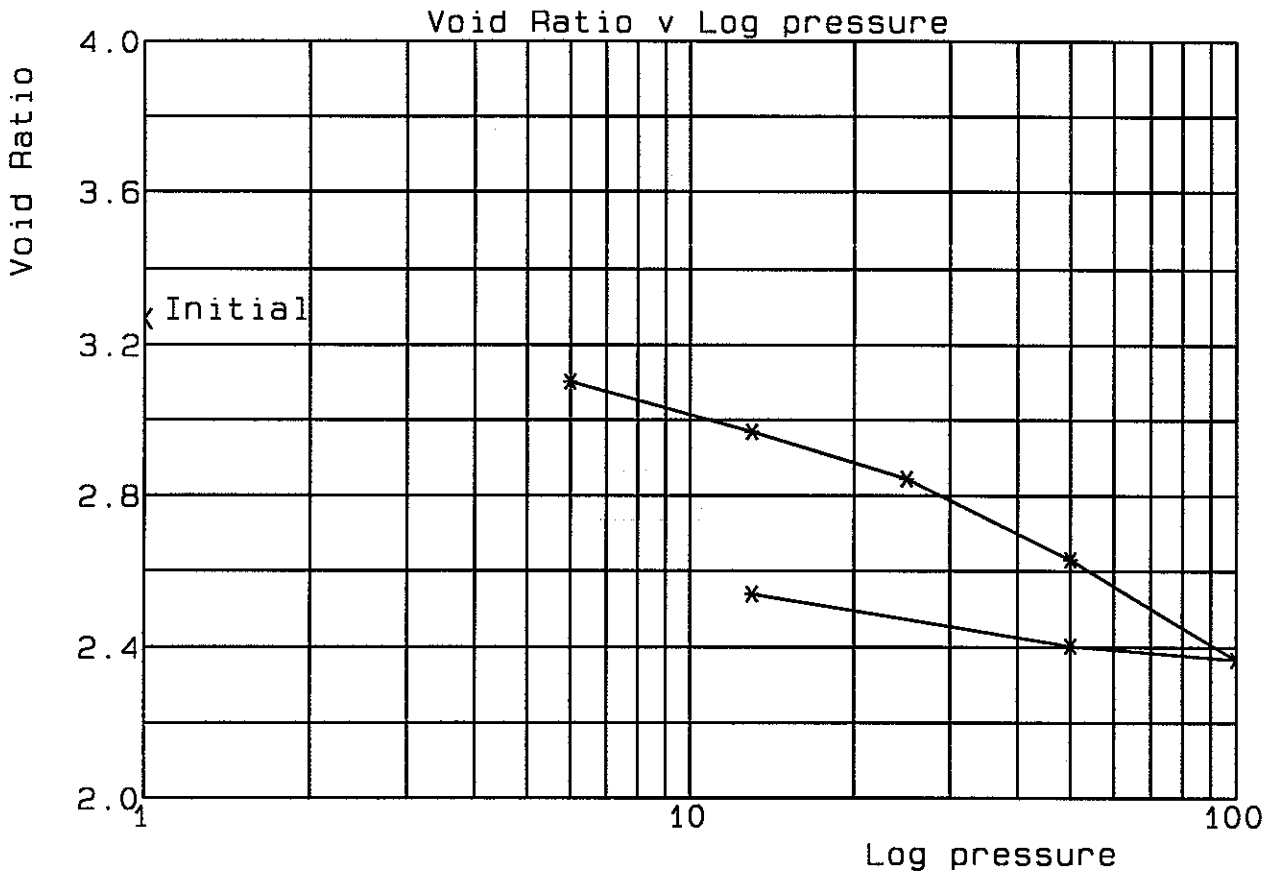
	Initial Values	Final Values
Sample dimensions Initial height 19.10 mm area 4359.2sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	28.5	30.1
Bulk Density Mg/cum	1.99	2.13
Dry Density Mg/cum	1.55	1.64
Void Ratio e	0.713	0.618

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.242	
25	0.348	0.43
50	0.303	0.63
100	0.245	0.52
200	0.141	0.64
400		
200		
50		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: E2 Sample: B Depth: 8.10m



	Initial Values	Final Values
Moisture Content %	122.3	108.3
Bulk Density Mg/cum	1.38	1.56
Dry Density Mg/cum	0.62	0.75
Void Ratio e	3.267	2.539

Sample dimensions
Initial height 18.90 mm
area 4376.7sq.mm

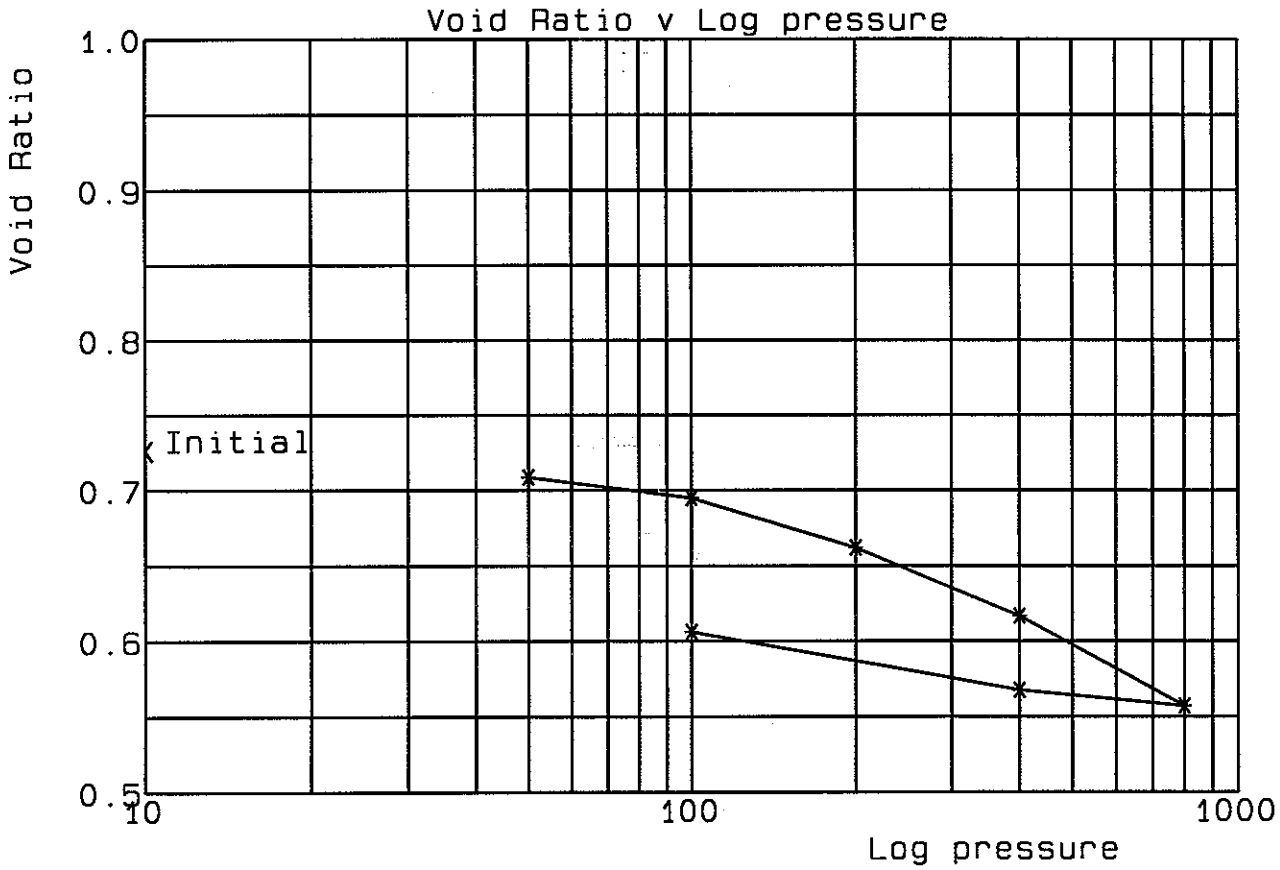
Particle density (assumed)
2.65

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1		
6	8.091	0.38
13	4.632	0.30
25	2.612	0.70
50	2.232	0.43
100	1.452	0.48
50		
13		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: E4 Sample: G Depth: 1.10m



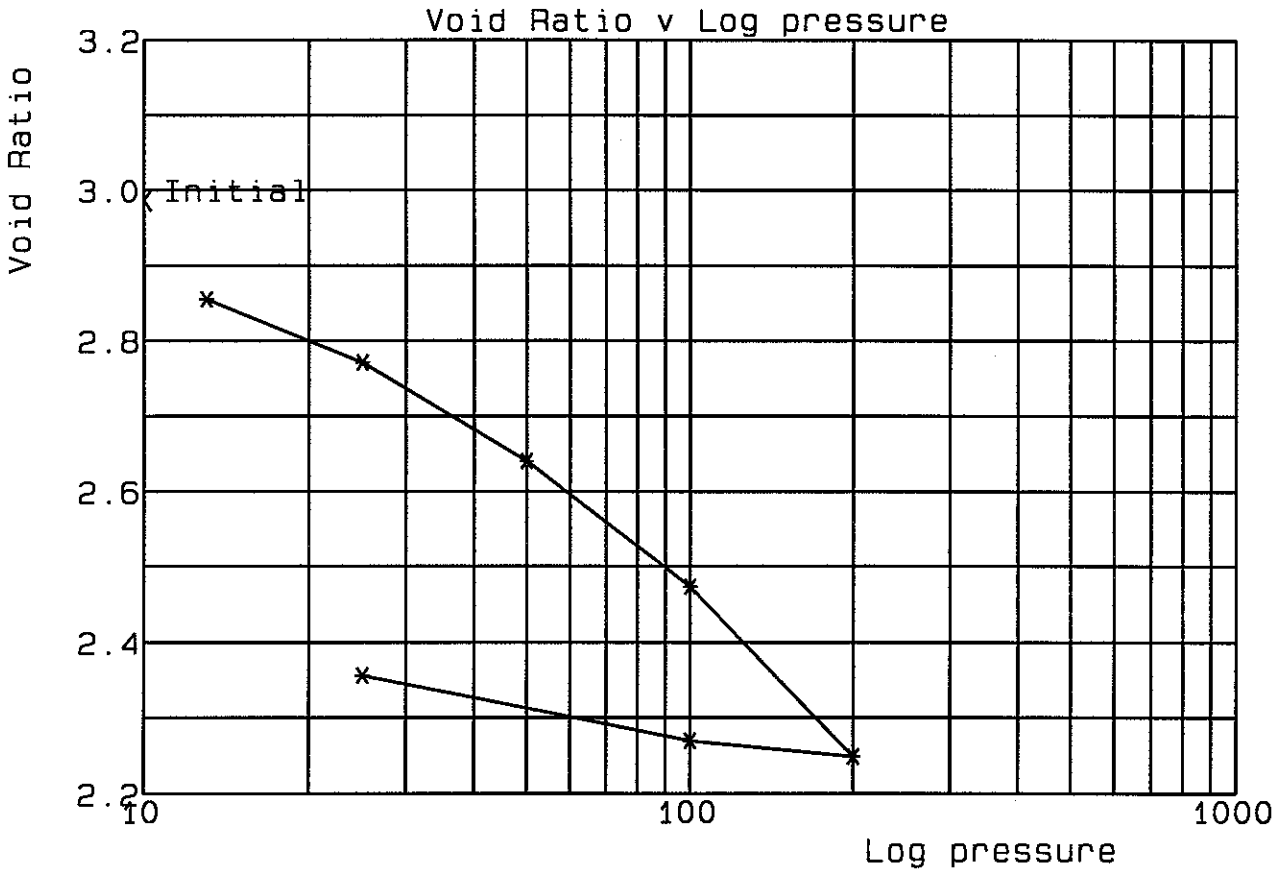
	Initial Values	Final Values
Sample dimensions Initial height 19.00 mm area 4376.7sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	29.0	27.4
Bulk Density Mg/cum	1.98	2.10
Dry Density Mg/cum	1.54	1.65
Void Ratio e	0.726	0.608
-		

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.206	
50	0.162	0.93
100	0.141	0.56
200	0.137	0.61
400	0.092	0.65
800		
400		
100		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: E5 Sample: C Depth: 5.10m



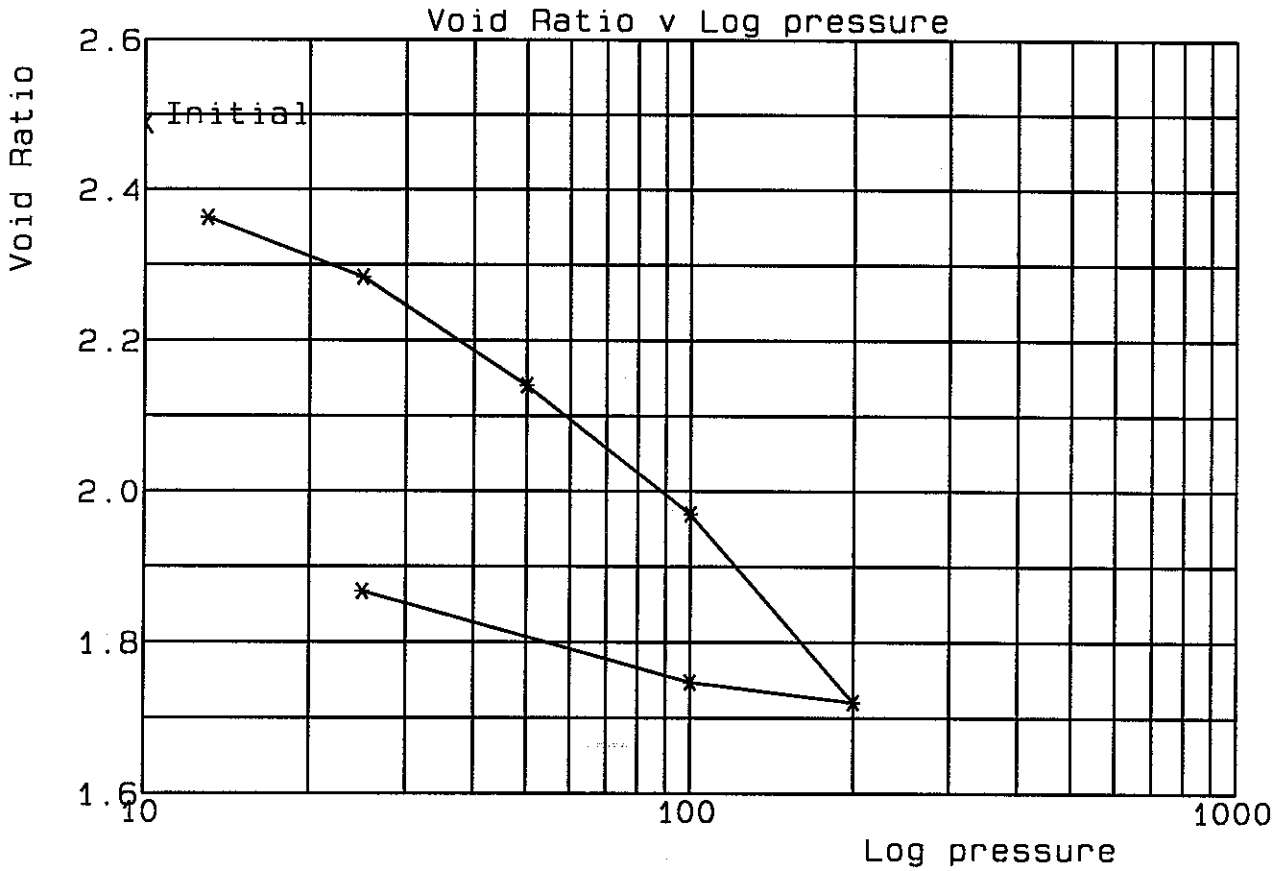
	Initial Values	Final Values
Sample dimensions Initial height 18.90 mm area 4376.7sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	67.9	122.5
Bulk Density Mg/cum	1.60	1.76
Dry Density Mg/cum	0.66	0.79
Void Ratio e	2.986	2.356

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	2.776	0.44
13	1.828	0.59
25	1.380	0.65
50	0.919	0.76
100	0.647	0.85
200		
100		
25		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: E6 Sample: C Depth: 6.00m



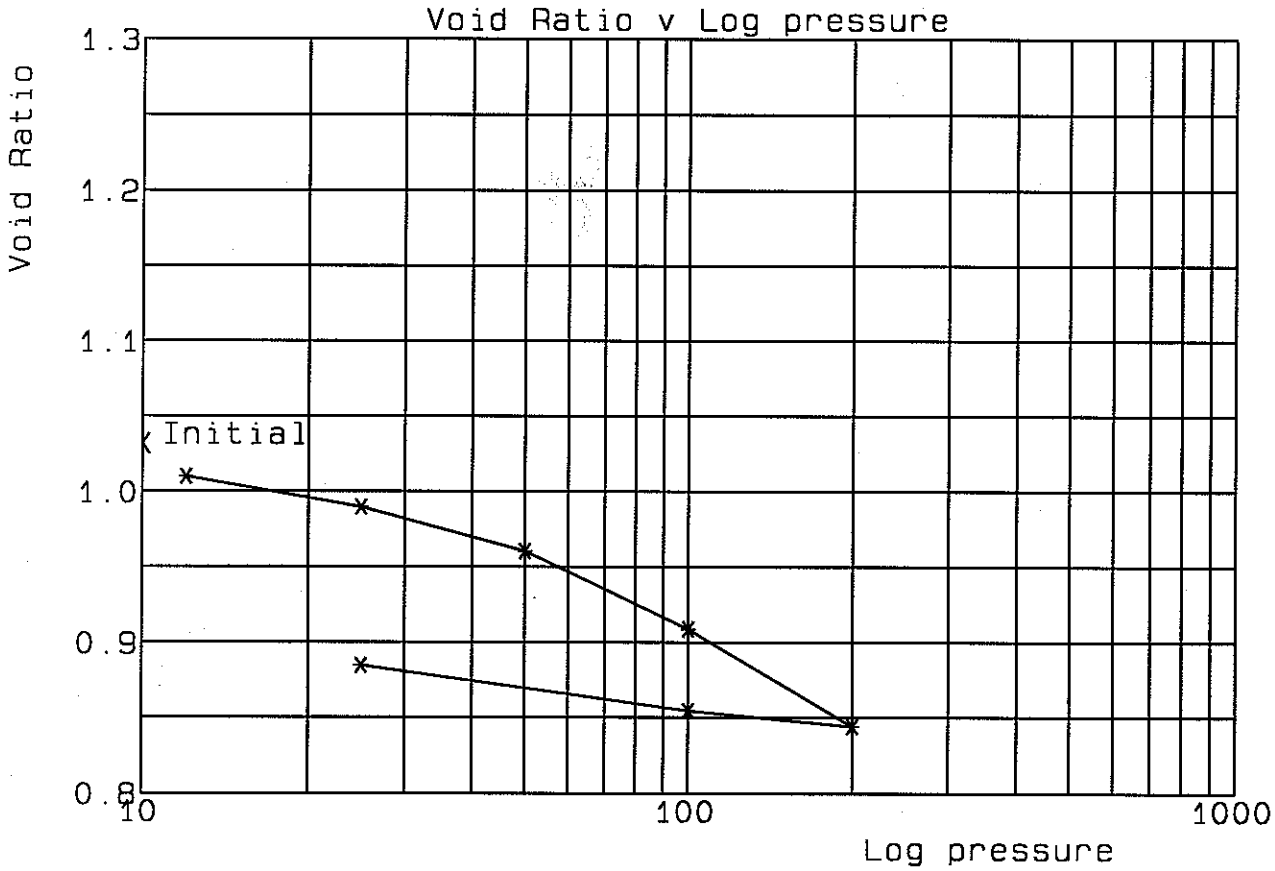
	Initial Values	Final Values
Sample dimensions Initial height 18.90 mm area 4370.9sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	95.0	77.8
Bulk Density Mg/cum	1.48	1.64
Dry Density Mg/cum	0.76	0.92
Void Ratio e	2.488	1.867

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	3.045	0.37
13	1.962	0.50
25	1.745	0.52
50	1.087	0.61
100	0.838	0.56
200		
100		
25		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: F2 Sample: H Depth: 3.50m



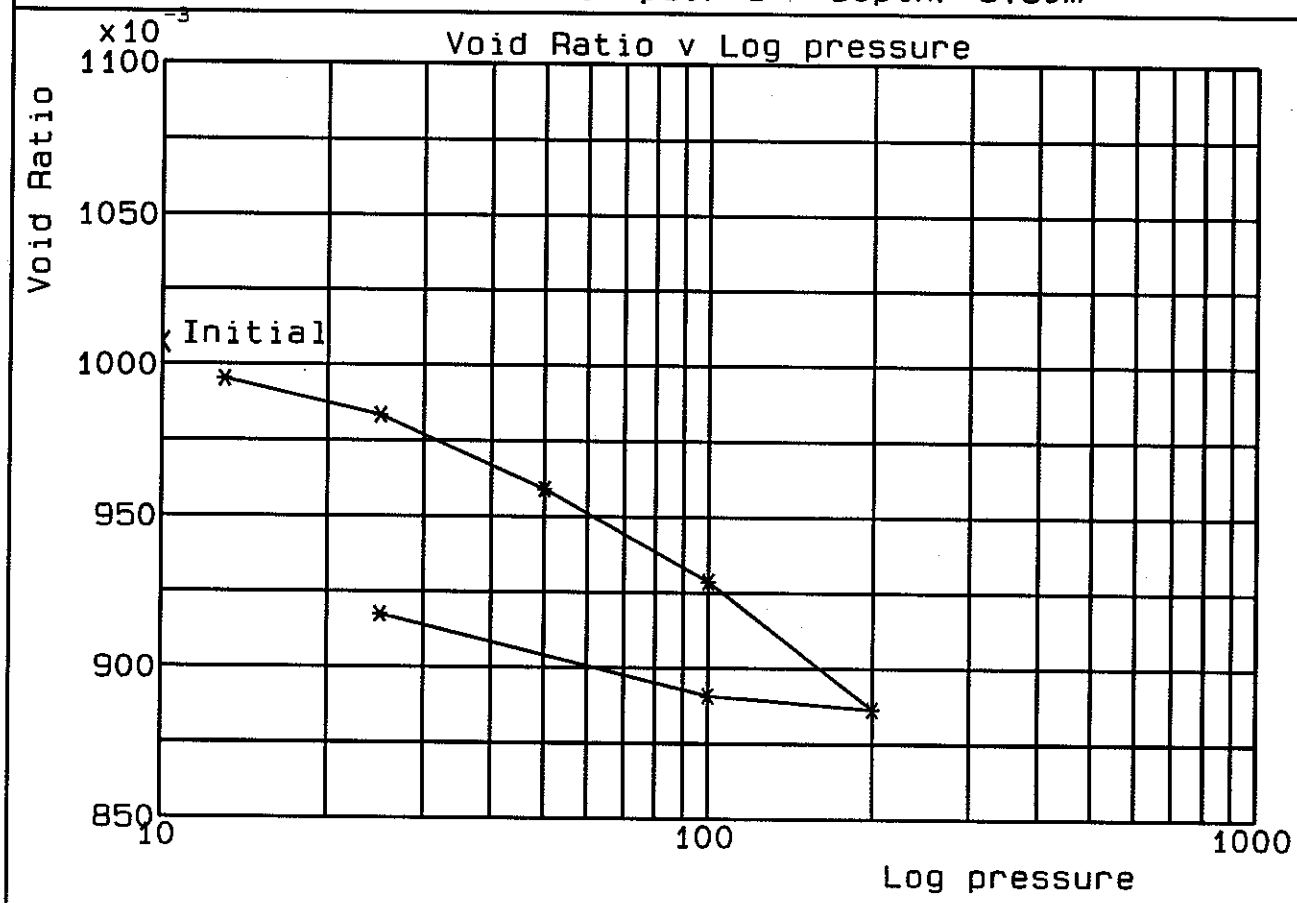
	Initial Values	Final Values
Sample dimensions Initial height 19.10 mm area 4359.2sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	39.8	37.0
Bulk Density Mg/cum	1.82	1.93
Dry Density Mg/cum	1.30	1.41
Void Ratio e	1.032	0.885

Pressure kPa	Laboratory Coefficients m_v sqm/MN	Laboratory Coefficients c_v sqm/yr
1	0.994	0.90
12	0.778	0.66
25	0.586	1.18
50	0.526	1.32
100	0.339	1.39
200		
100		
25		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: F4 Sample: I Depth: 3.50m



	Initial Values	Final Values
Sample dimensions Initial height 19.00 mm area 4370.9sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	38.8	38.4
Bulk Density Mg/cum	1.83	1.91
Dry Density Mg/cum	1.32	1.38
Void Ratio e	1.007	0.918

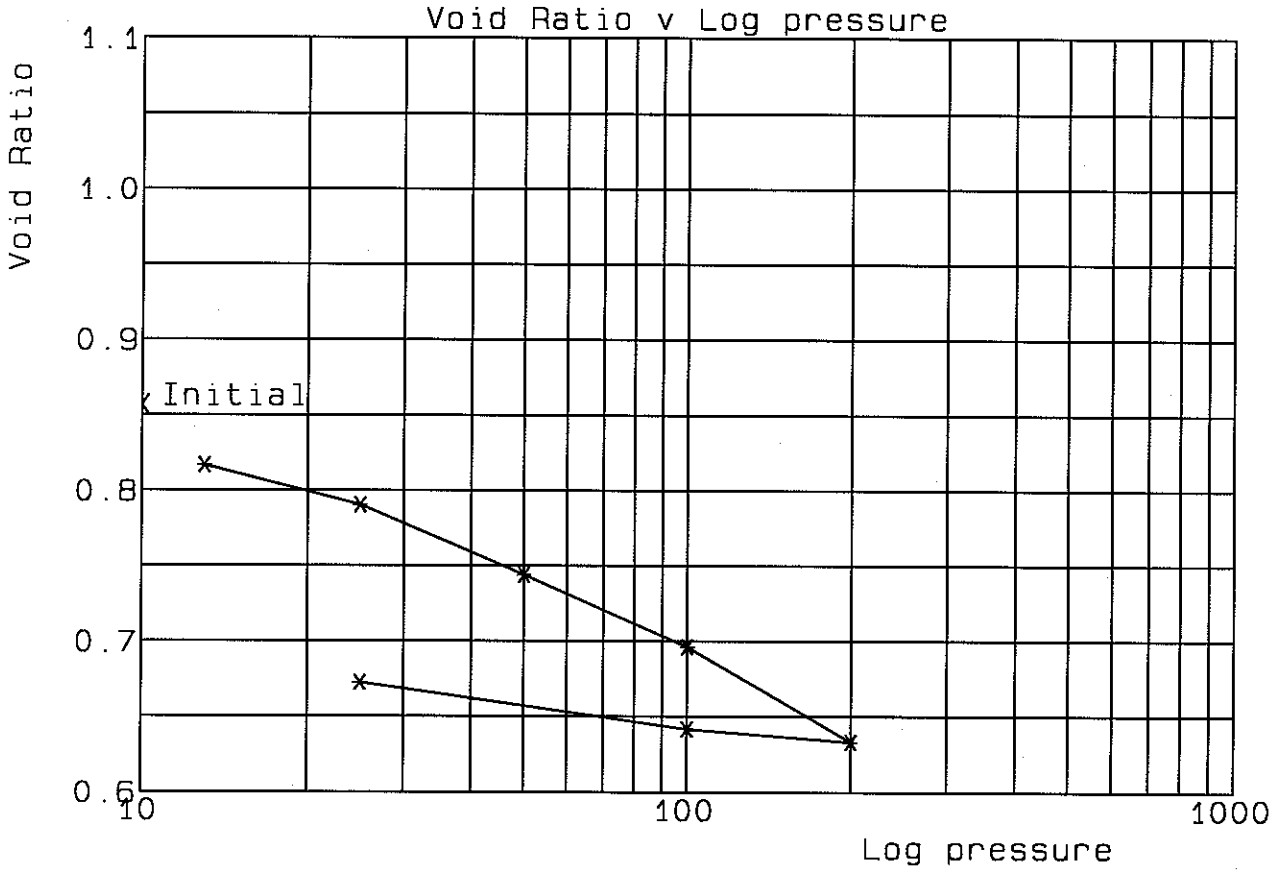
Pressure kPa
1
13
25
50
100
200
100
25

Laboratory Coefficients	
m_v sqm/MN	c_v sqm/yr
0.500	1.81
0.494	0.85
0.490	1.76
0.311	1.74
0.219	1.94

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: H1 Sample: A Depth: 3.00m



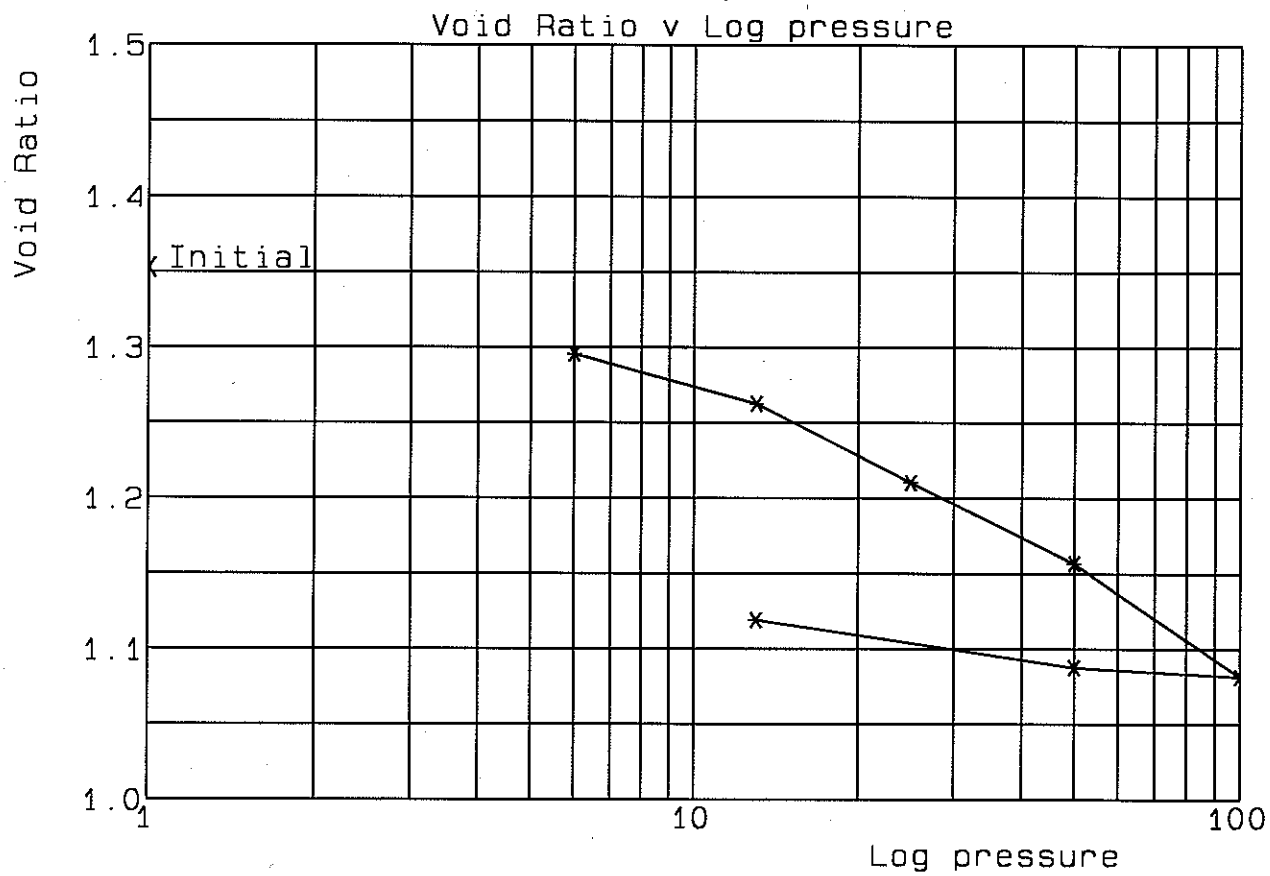
	Initial Values	Final Values
Sample dimensions Initial height 19.00 mm area 4376.7sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	34.2	30.7
Bulk Density Mg/cum	1.91	2.07
Dry Density Mg/cum	1.43	1.58
Void Ratio e	0.857	0.672

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	1.820	15.83
13	1.206	0.39
25	1.037	0.52
50	0.547	0.72
100	0.372	0.75
200		
100		
25		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: H1 Sample: A Depth: 6.90m



Sample dimensions
Initial height 18.95 mm
area 4376.7sq.mm

Particle density (assumed)
2.65

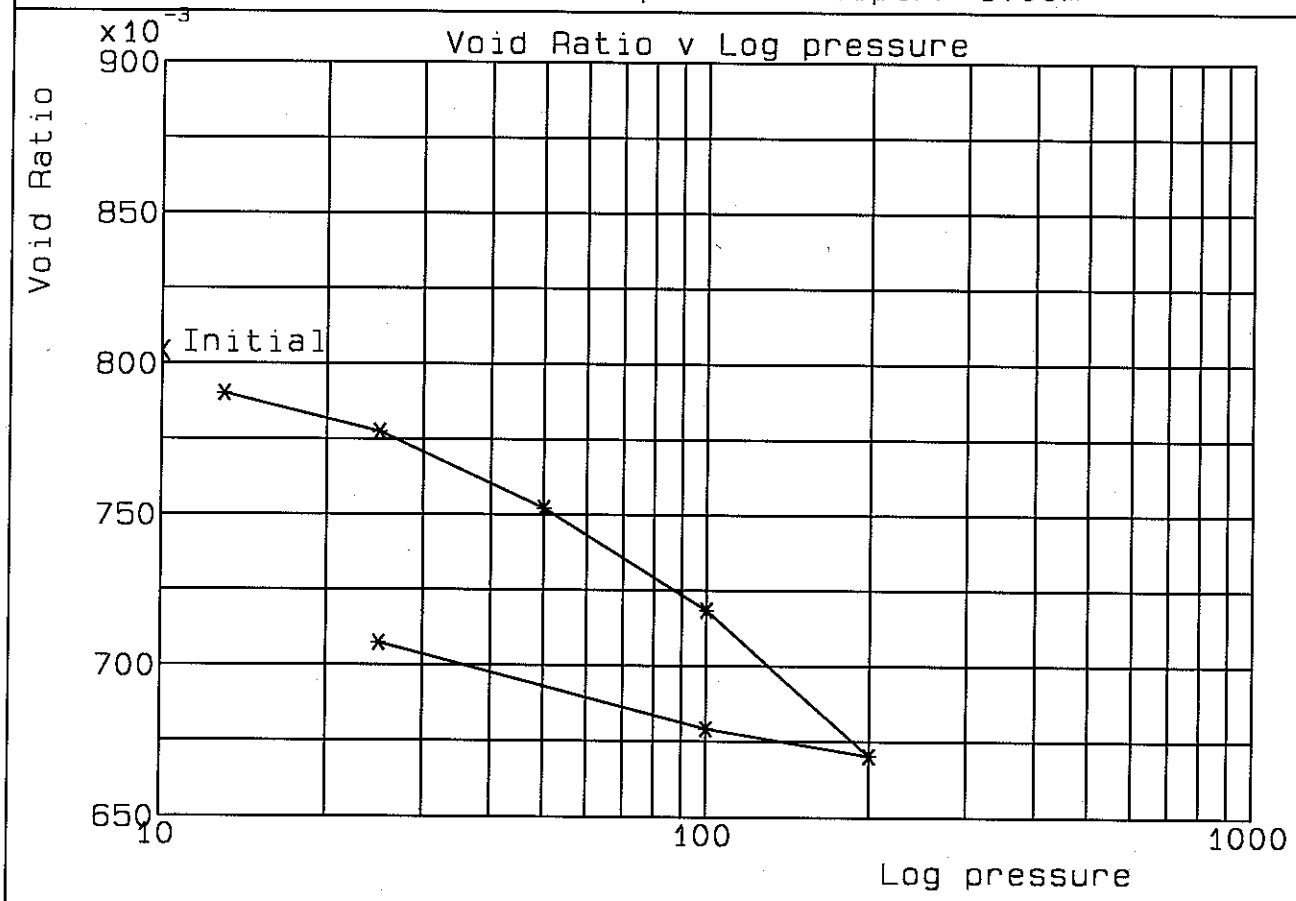
	Initial Values	Final Values
Moisture Content %	52.8	46.9
Bulk Density Mg/cum	1.72	1.84
Dry Density Mg/cum	1.13	1.25
Void Ratio e	1.353	1.119

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	5.046	0.27
6	5.473	0.35
13	1.921	0.46
25	0.966	0.67
50	0.700	0.71
100		
50		
13		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: H2 Sample: A Depth: 1.00m



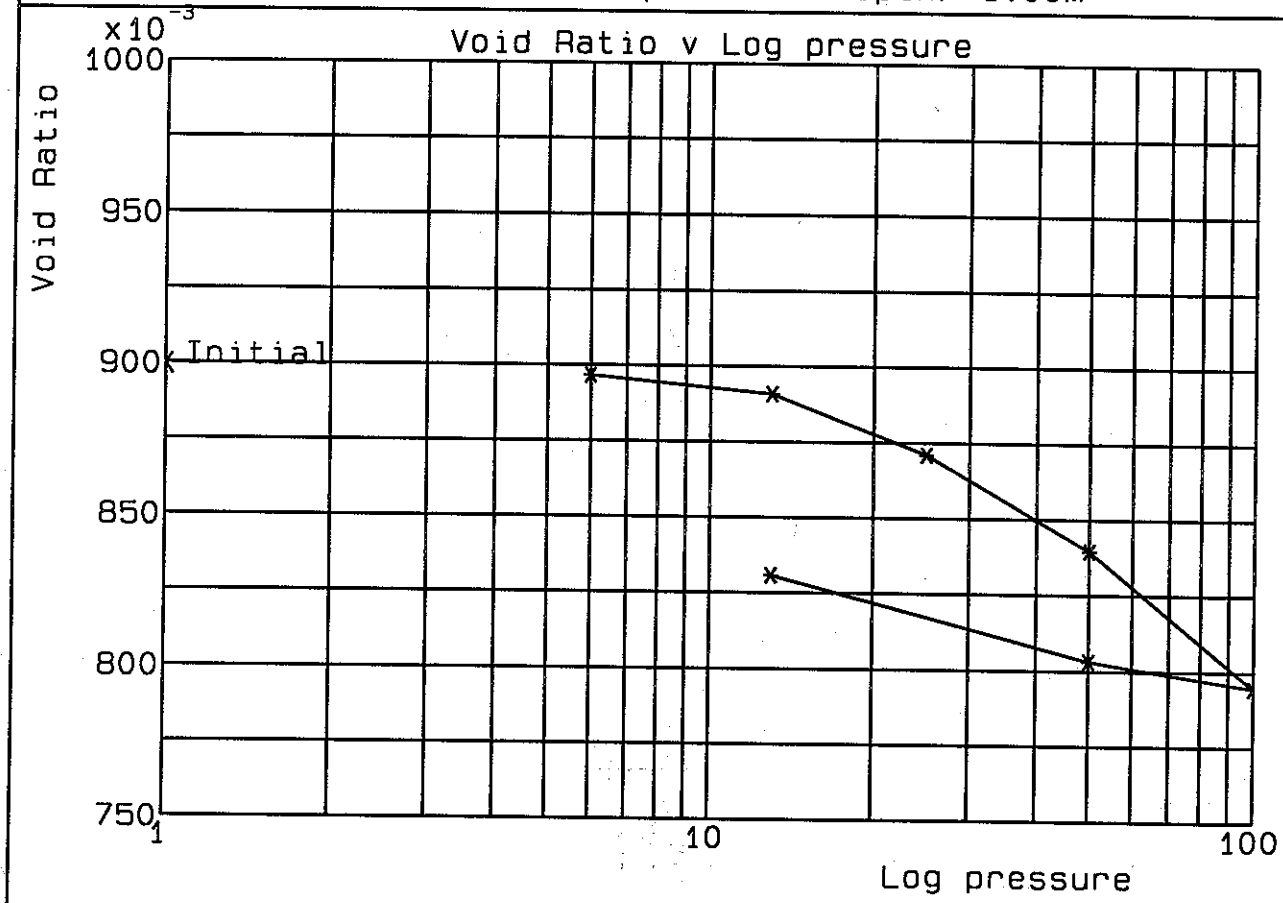
	Initial Values	Final Values
Sample dimensions Initial height 19.05 mm area 4347.5sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	31.4	31.2
Bulk Density Mg/cum	1.93	2.04
Dry Density Mg/cum	1.47	1.55
Void Ratio e	0.804	0.707

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.649	
13	0.591	0.62
25	0.571	0.60
50	0.385	0.79
100	0.280	0.79
200		
100		
25		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: H4 Sample: F Depth: 1.00m



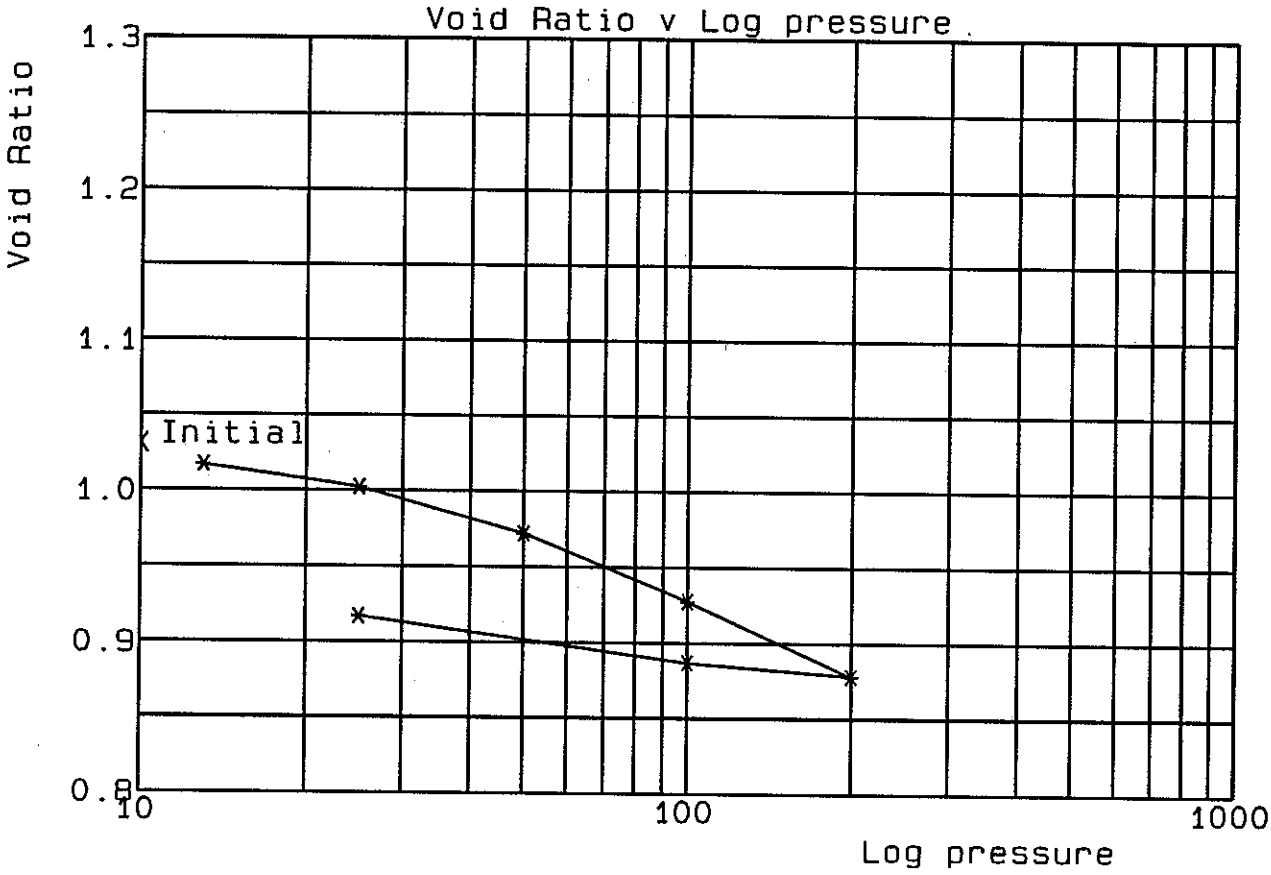
	Initial Values	Final Values
Sample dimensions Initial height 19.10 mm area 4370.9sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	35.3	35.3
Bulk Density Mg/cum	1.89	1.96
Dry Density Mg/cum	1.40	1.45
Void Ratio e	0.900	0.831

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.327	
6	0.434	0.41
13	0.872	0.48
25	0.672	0.68
50	0.490	0.67
100		
50		
13		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: H5 Sample: J Depth: 3.10m



			Pressure kPa	Laboratory Coefficients	
Sample dimensions				m_v sqm/MN	c_v sqm/yr
Initial height 19.05 mm			1	0.583	1.17
area 4370.9sq.mm			13	0.599	1.01
			25	0.605	0.95
			50	0.451	1.04
Particle density (assumed) 2.65			100	0.257	1.32
			200		
	Initial Values	Final Values	100		
			25		
Moisture Content %	39.9	38.8			
Bulk Density Mg/cum	1.83	1.92			
Dry Density Mg/cum	1.30	1.38			
Void Ratio e	1.031	0.917			
[illegible]	[illegible]	[illegible]			

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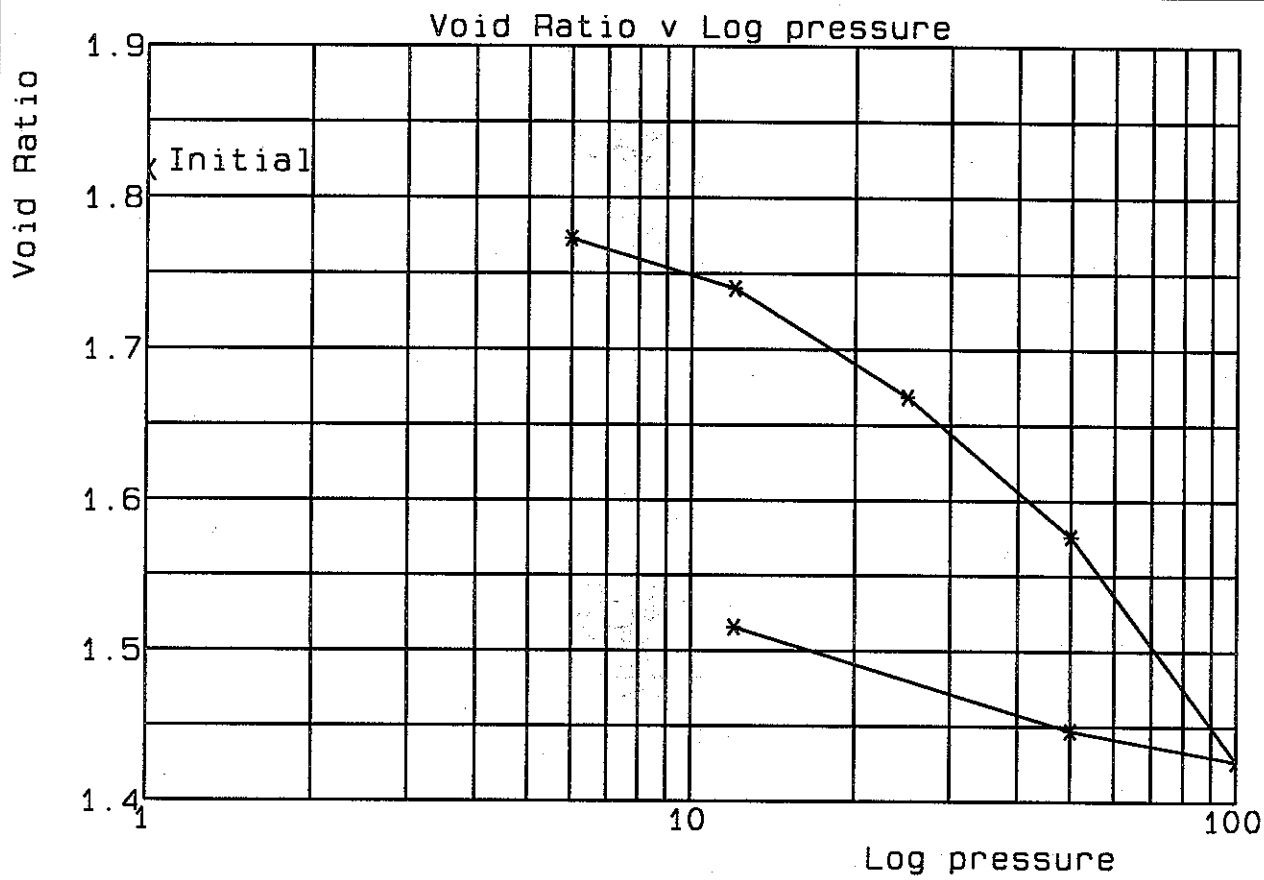
Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: H6 Sample: G Depth: 6.60m



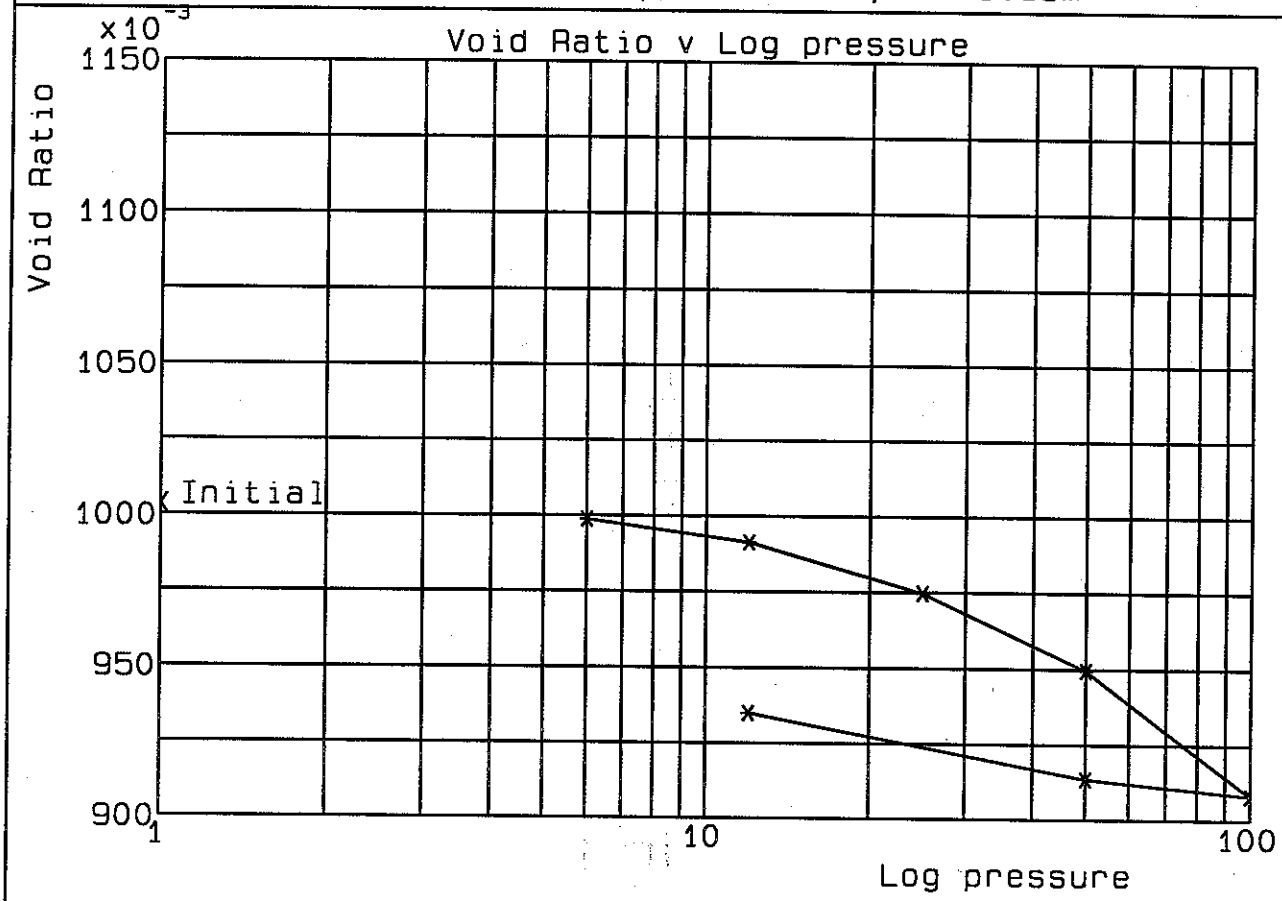
	Initial Values	Final Values
Sample dimensions Initial height 18.85 mm area 4382.6sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	68.0	61.0
Bulk Density Mg/cum	1.58	1.70
Dry Density Mg/cum	0.94	1.05
Void Ratio e	1.817	1.515

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	3.282	0.69
6	1.967	0.79
12	2.006	0.56
25	1.387	0.72
50	1.159	0.61
100		
50		
12		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: H7 Sample: E Depth: 3.65m



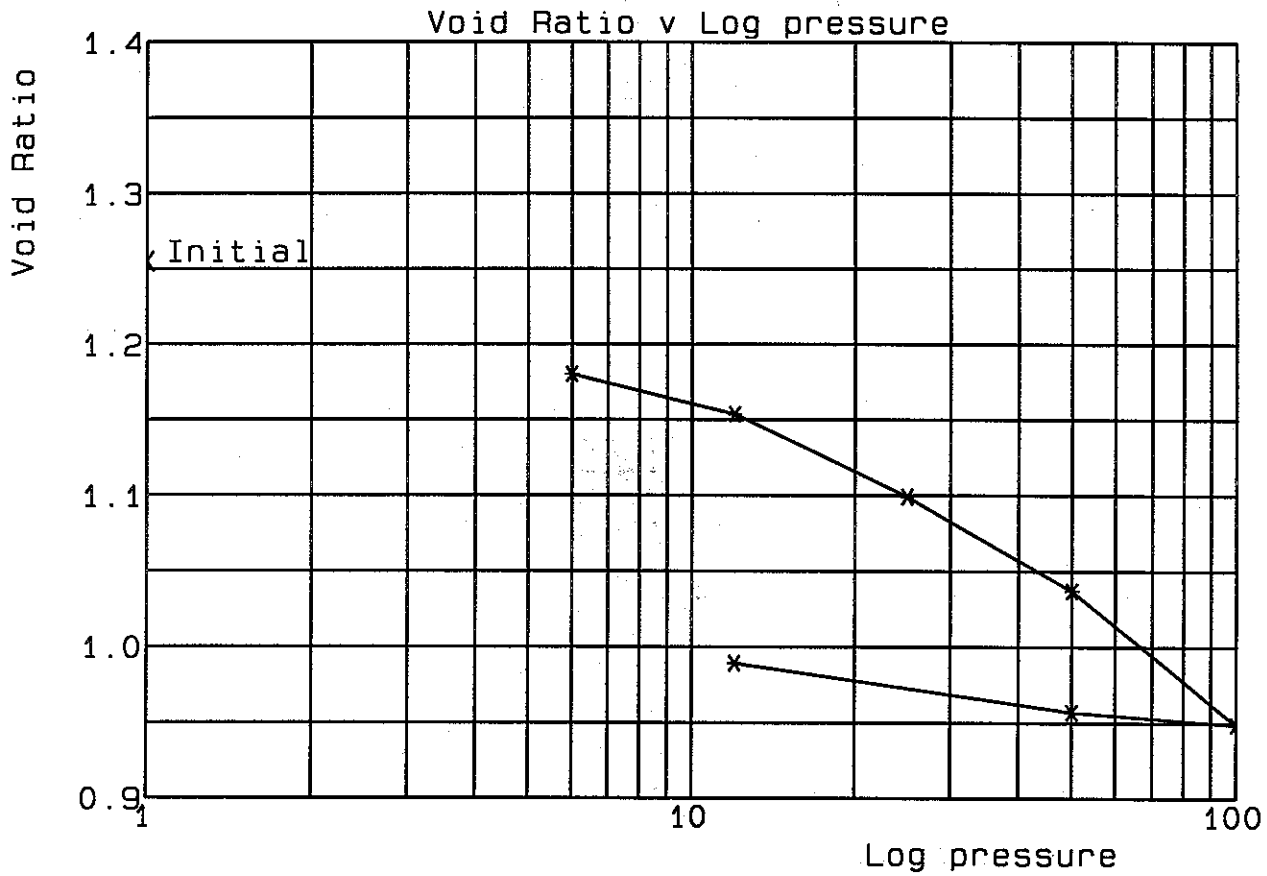
	Initial Values	Final Values
Sample dimensions Initial height 19.06 mm area 4359.2sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	38.9	38.7
Bulk Density Mg/cum	1.84	1.90
Dry Density Mg/cum	1.32	1.37
Void Ratio e	1.003	0.935

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.349	
6	0.612	0.21
12	0.645	0.84
25	0.509	0.83
50	0.426	0.68
100		
50		
12		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: I1 Sample: F Depth: 5.00m



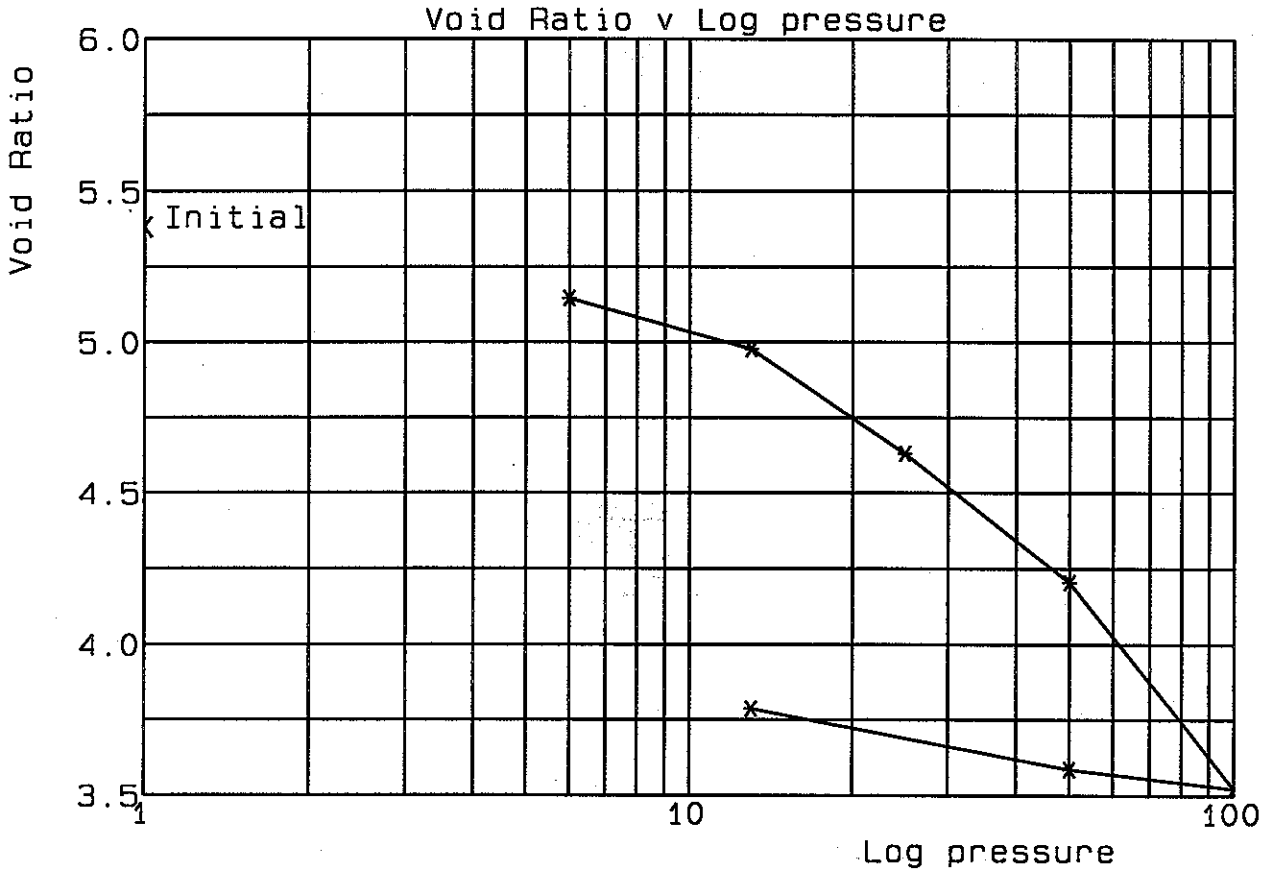
	Initial Values	Final Values
Sample dimensions Initial height 18.85 mm area 4359.2sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	49.0	41.3
Bulk Density Mg/cum	1.75	1.88
Dry Density Mg/cum	1.18	1.33
Void Ratio e	1.255	0.989

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	6.897	0.22
6	2.030	0.32
12	1.944	0.38
25	1.183	0.48
50	0.867	0.52
100		
50		
12		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: I3 Sample: G Depth: 3.30m



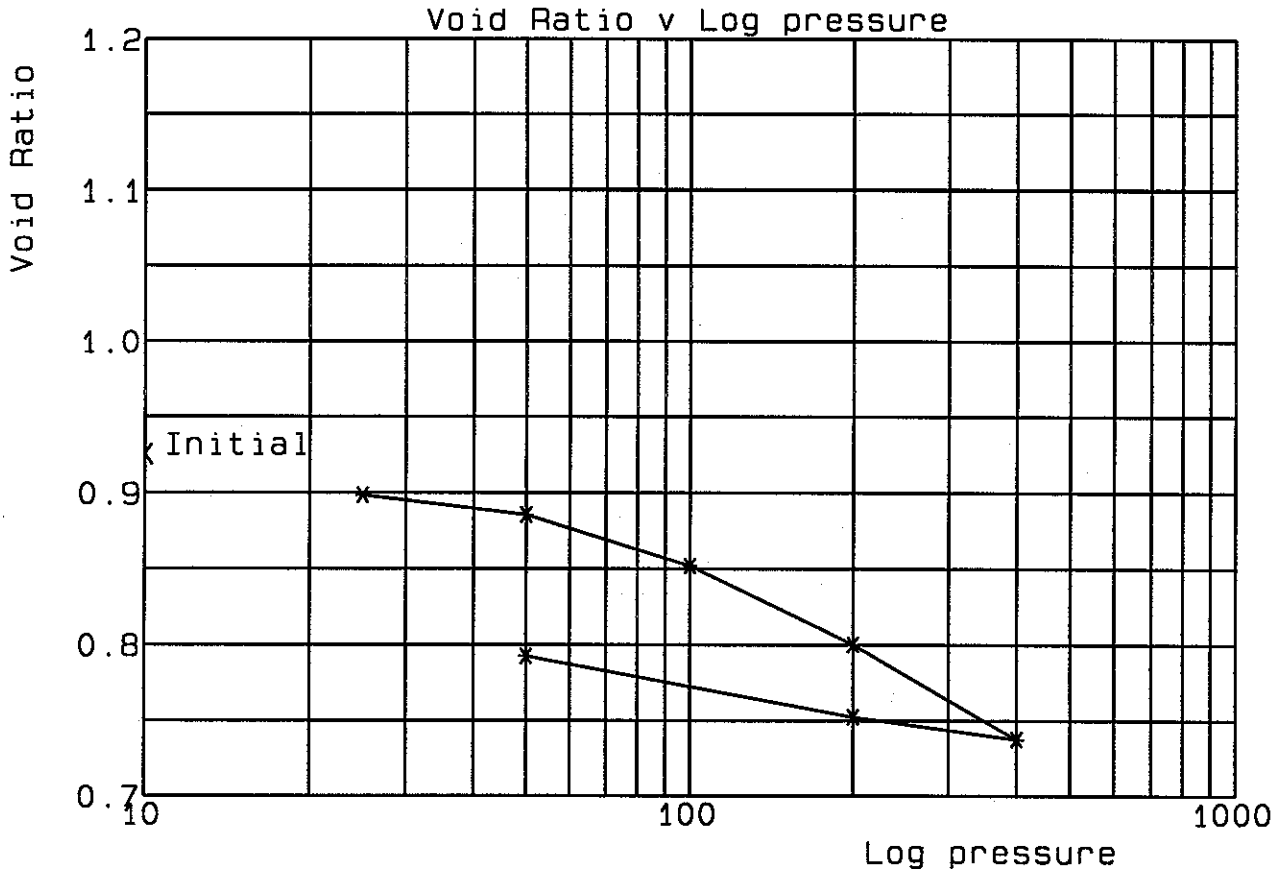
	Initial Values	Final Values
Sample dimensions Initial height 18.80 mm area 4370.9sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	197.9	145.5
Bulk Density Mg/cum	1.24	1.36
Dry Density Mg/cum	0.42	0.55
Void Ratio e	5.382	3.786

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	7.735	1.57
6	3.922	1.33
13	4.828	1.11
25	3.020	1.15
50	2.621	0.85
100		
50		
13		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: I4 Sample: I Depth: 1.05m

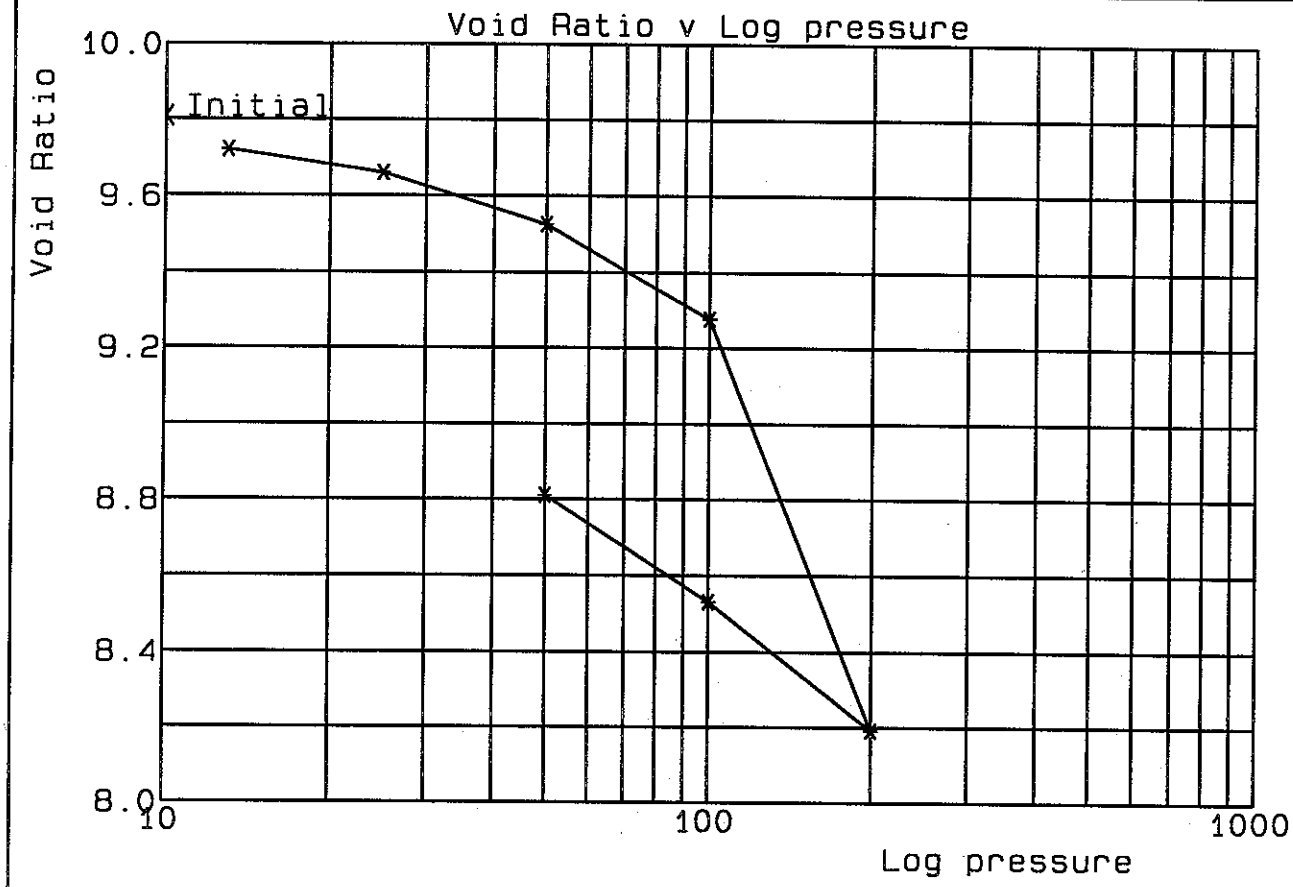


			Pressure kPa	Laboratory Coefficients	
Sample dimensions			1	m_v sqm/MN	c_v sqm/yr
Initial height 19.00 mm			25	0.586	
area 4370.9sq.mm			50	0.269	0.95
			100	0.357	0.67
Particle density (assumed)			200	0.280	0.46
2.65			400	0.174	0.60
	Initial Values	Final Values	200		
			50		
Moisture Content %	35.9	35.9			
Bulk Density Mg/cum	1.87	2.01			
Dry Density Mg/cum	1.38	1.48			
Void Ratio e	0.925	0.791			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: J1 Sample: I Depth: 6.50m



	Initial Values	Final Values
Moisture Content %	331.4	321.4
Bulk Density Mg/cum	1.06	1.14
Dry Density Mg/cum	0.25	0.27
Void Ratio e	9.808	8.811
[illegible]	9.3	[illegible]

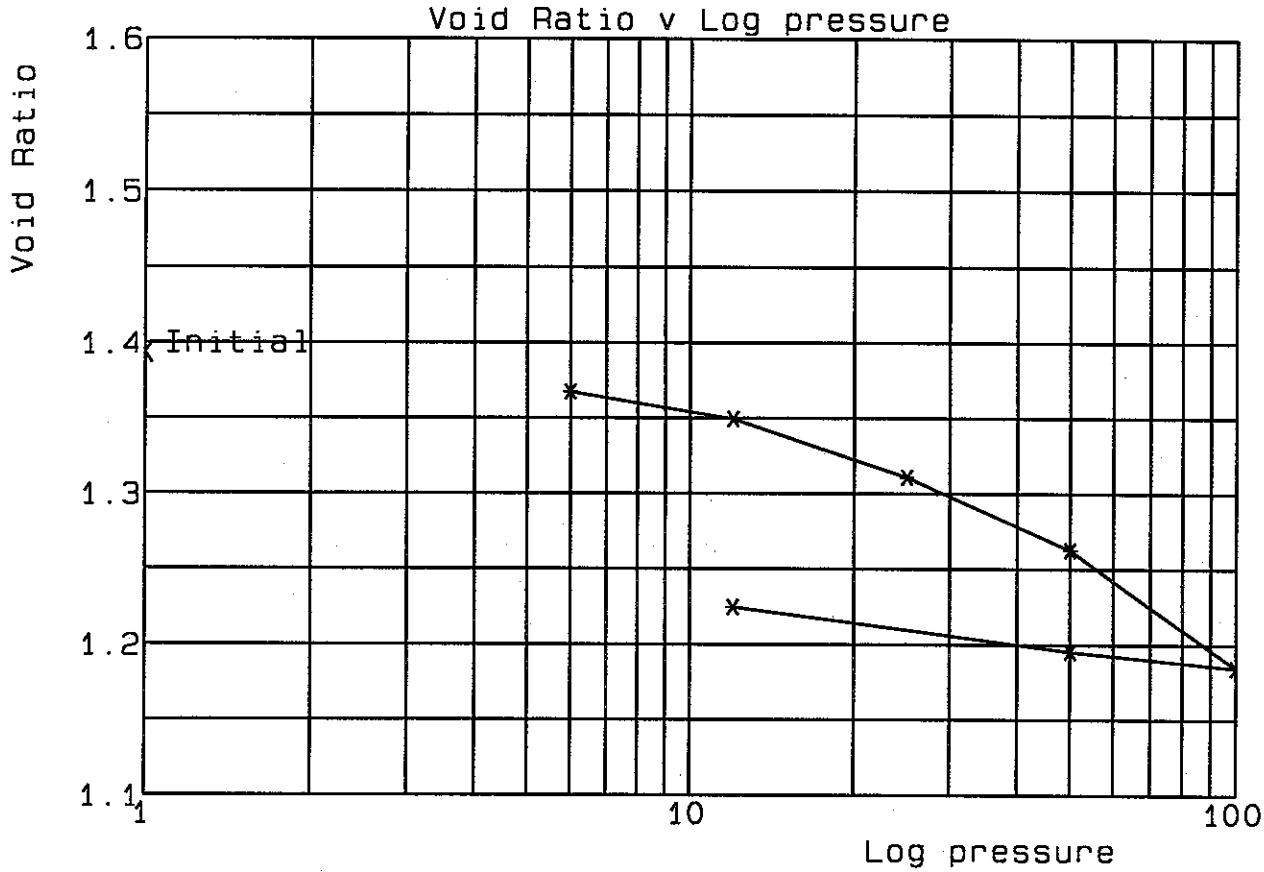
Sample dimensions
Initial height 19.00 mm
area 4370.9sq.mm

Particle density (assumed) 2.65

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.682	
13	0.473	2.59
25	0.508	1.51
50	0.471	1.15
100	1.056	0.26
200		
100		
50		

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: J3 Sample: I Depth: 3.00m



			Pressure kPa	Laboratory Coefficients	
				m_v sqm/MN	c_v sqm/yr
Sample dimensions Initial height 18.90 mm area 4359.2sq.mm			1	2.271	0.56
			6	1.257	0.63
			12	1.265	0.62
			25	0.833	0.94
Particle density (assumed) 2.65			50	0.693	1.10
			100		
	Initial Values	Final Values	50		
			12		
Moisture Content %	53.9	50.7			
Bulk Density Mg/cum	1.70	1.80			
Dry Density Mg/cum	1.11	1.19			
Void Ratio e	1.393	1.225			

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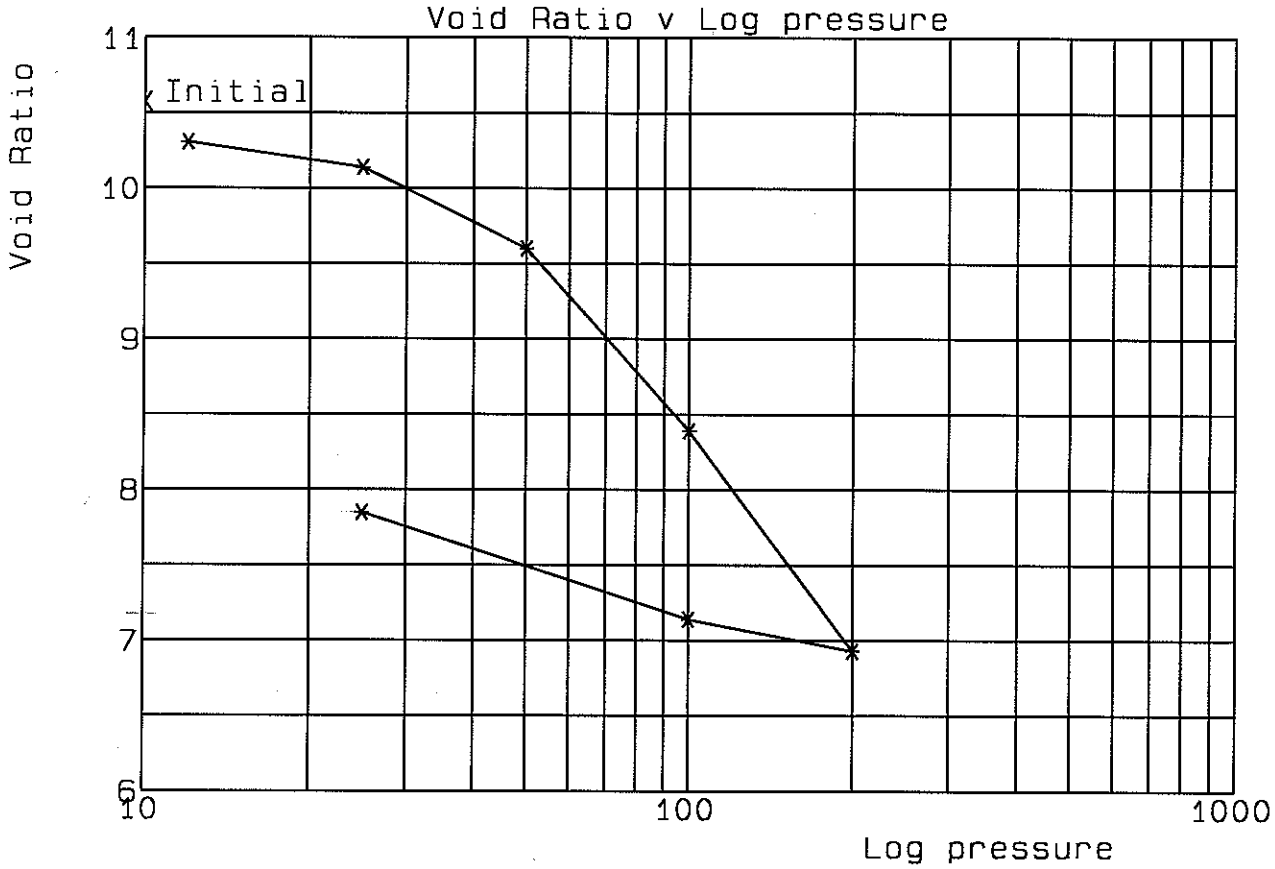
Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: J4 Sample: F Depth: 5.10m



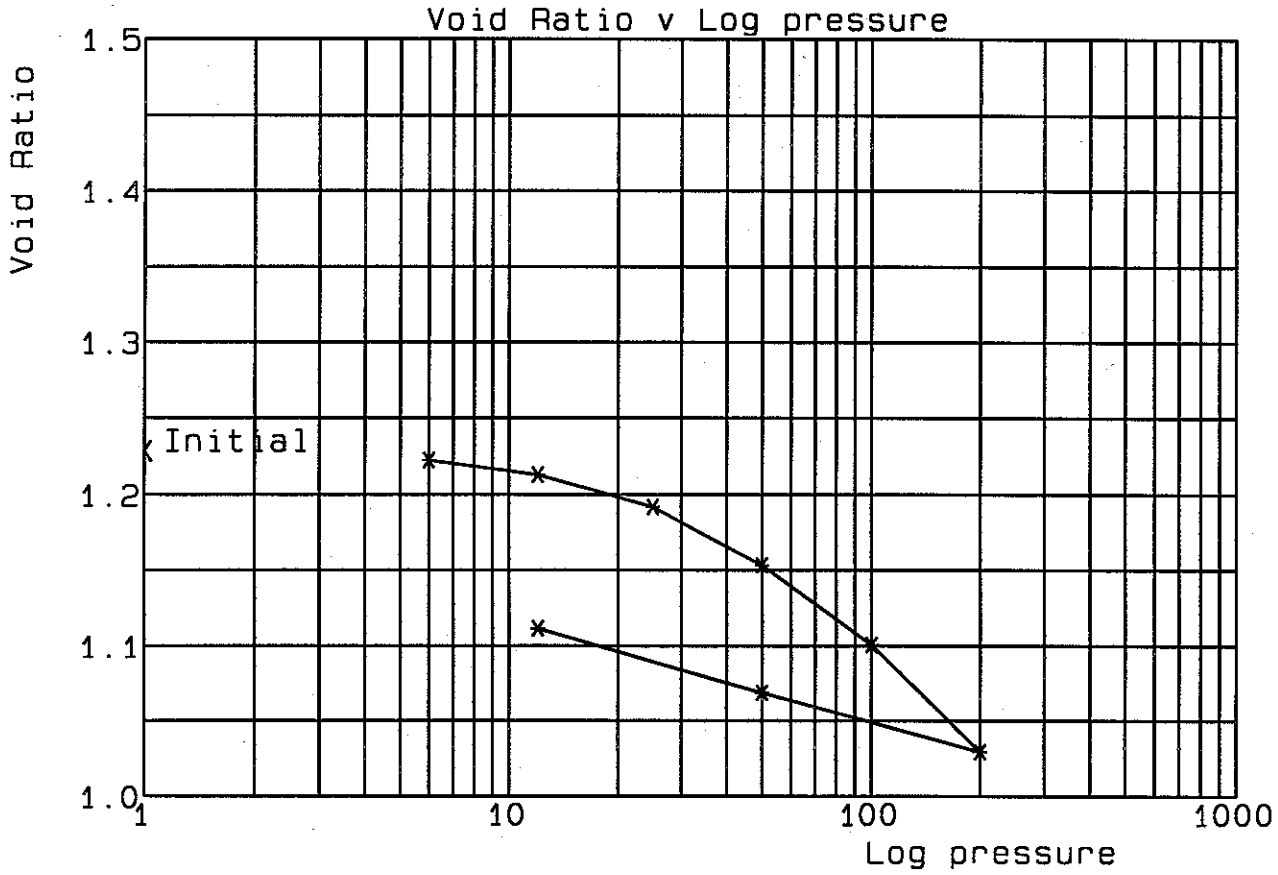
	Initial Values	Final Values
Sample dimensions Initial height 19.00 mm area 4359.2sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	444.0	305.4
Bulk Density Mg/cum	1.02	1.21
Dry Density Mg/cum	0.23	0.30
Void Ratio e	10.571	7.848

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	2.125	3.91
12	1.148	1.02
25	1.934	0.56
50	2.281	0.26
100	1.553	1.28
200		
100		
25		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: J5 Sample: J Depth: 1.00m

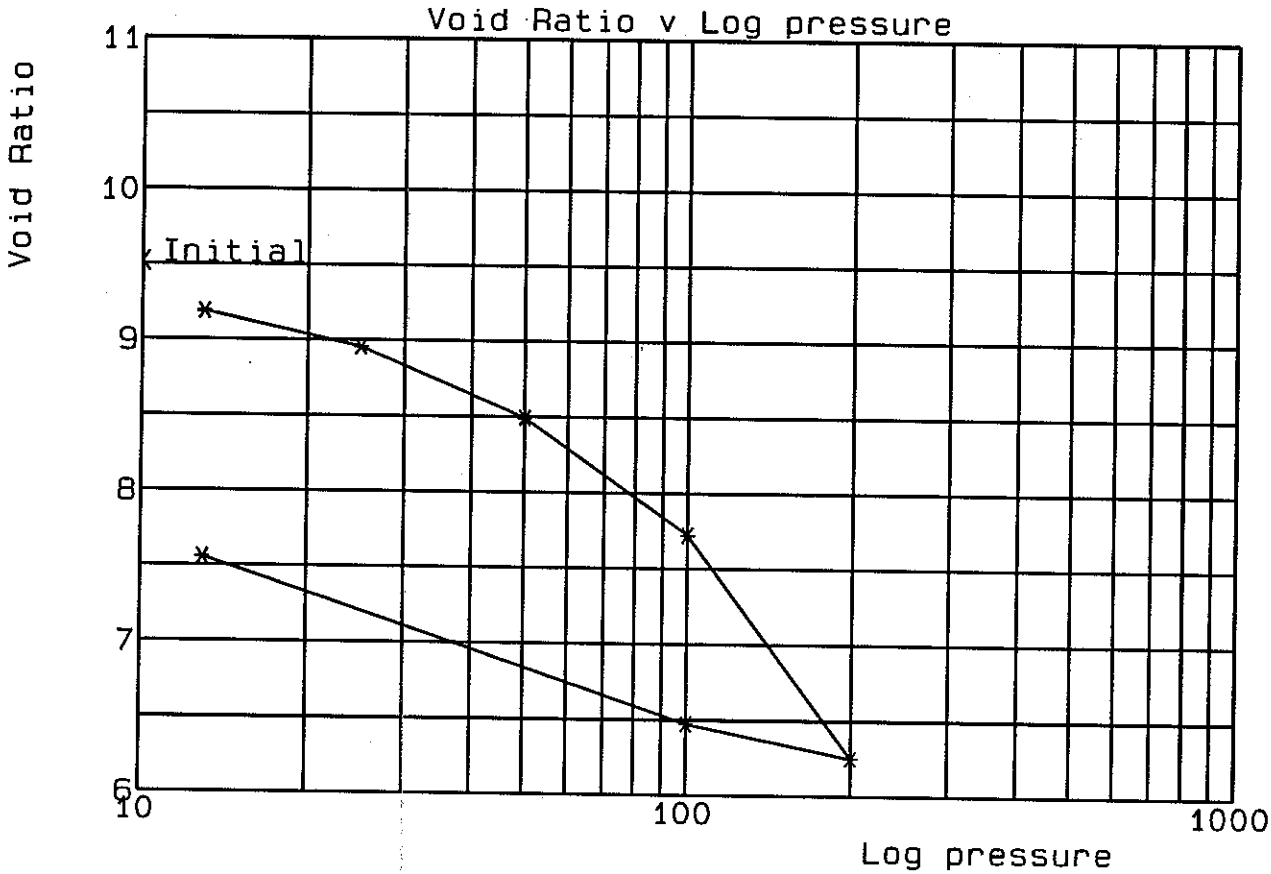


			Pressure kPa	Laboratory Coefficients	
Sample dimensions Initial height 19.10 mm area 4382.6sq.mm			1	m_v sqm/MN	c_v sqm/yr
			6	0.589	
			12	0.709	0.93
			25	0.730	1.02
Particle density (assumed) 2.65			50	0.705	1.27
			100	0.490	0.86
	Initial Values	Final Values	200	0.339	1.01
			50		
Moisture Content %	47.6	46.6	12		
Bulk Density Mg/cum	1.76	1.84			
Dry Density Mg/cum	1.19	1.26			
Void Ratio e	1.228	1.111			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: J5 Sample: G Depth: 5.10m



Sample dimensions
Initial height 18.80 mm
area 4370.9sq.mm

Particle density (assumed) 2.65

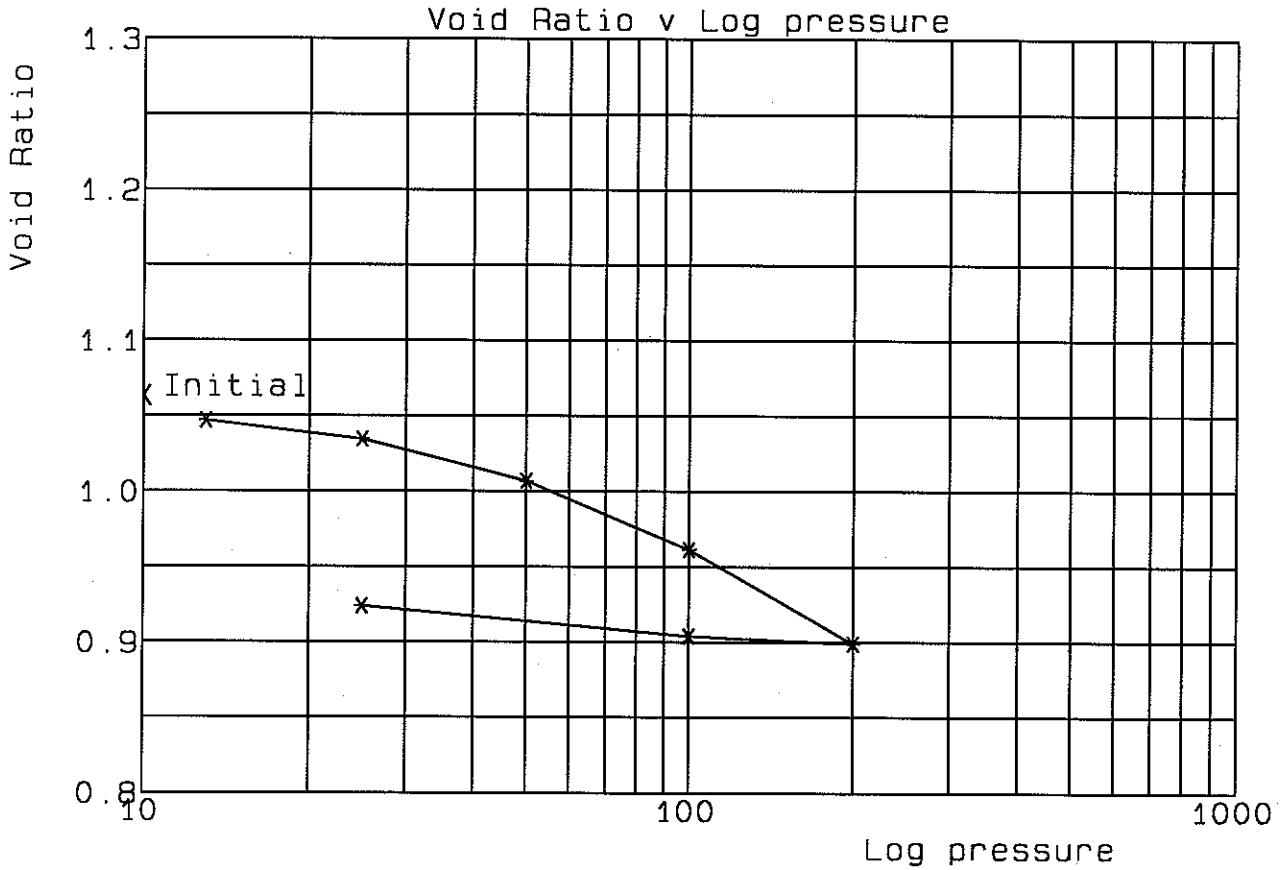
	Initial Values	Final Values
Moisture Content %	326.3	286.3
Bulk Density Mg/cum	1.07	1.20
Dry Density Mg/cum	0.25	0.31
Void Ratio e	9.515	7.556

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	2.651	14.09
13	1.904	1.18
25	1.861	9.19
50	1.622	6.28
100	1.687	1.84
200		
100		
13		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: K1 Sample: E Depth: 2.80m



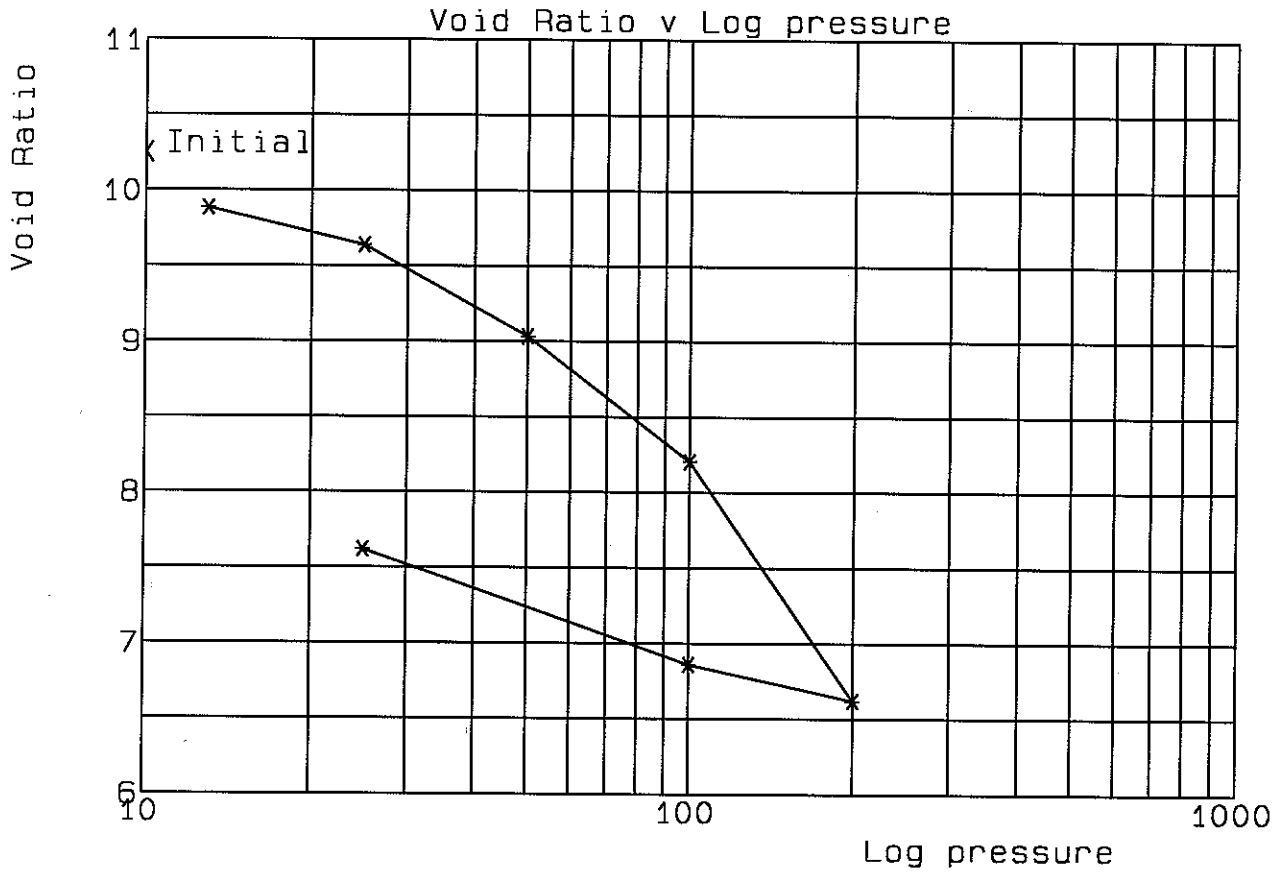
	Initial Values	Final Values
Sample dimensions Initial height 18.85 mm area 4376.7sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	40.9	38.4
Bulk Density Mg/cum	1.81	1.91
Dry Density Mg/cum	1.28	1.38
Void Ratio e	1.063	0.924

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.670	4.47
13	0.504	1.23
25	0.544	1.42
50	0.451	1.68
100	0.319	1.73
200		
100		
25		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: K1 Sample: C Depth: 6.40m



			Pressure kPa	Laboratory Coefficients	
Sample dimensions				m_v sqm/MN	c_v sqm/yr
Initial height 18.95 mm			1	2.759	
area 4370.9sq.mm			13	1.891	1.00
			25	2.270	0.69
			50	1.651	0.67
Particle density (assumed) 2.65			100	1.720	0.75
			200		
	Initial Values	Final Values	100		
			25		
Moisture Content %	330.5	297.7			
Bulk Density Mg/cum	1.01	1.22			
Dry Density Mg/cum	0.24	0.31			
Void Ratio e	10.246	7.620			

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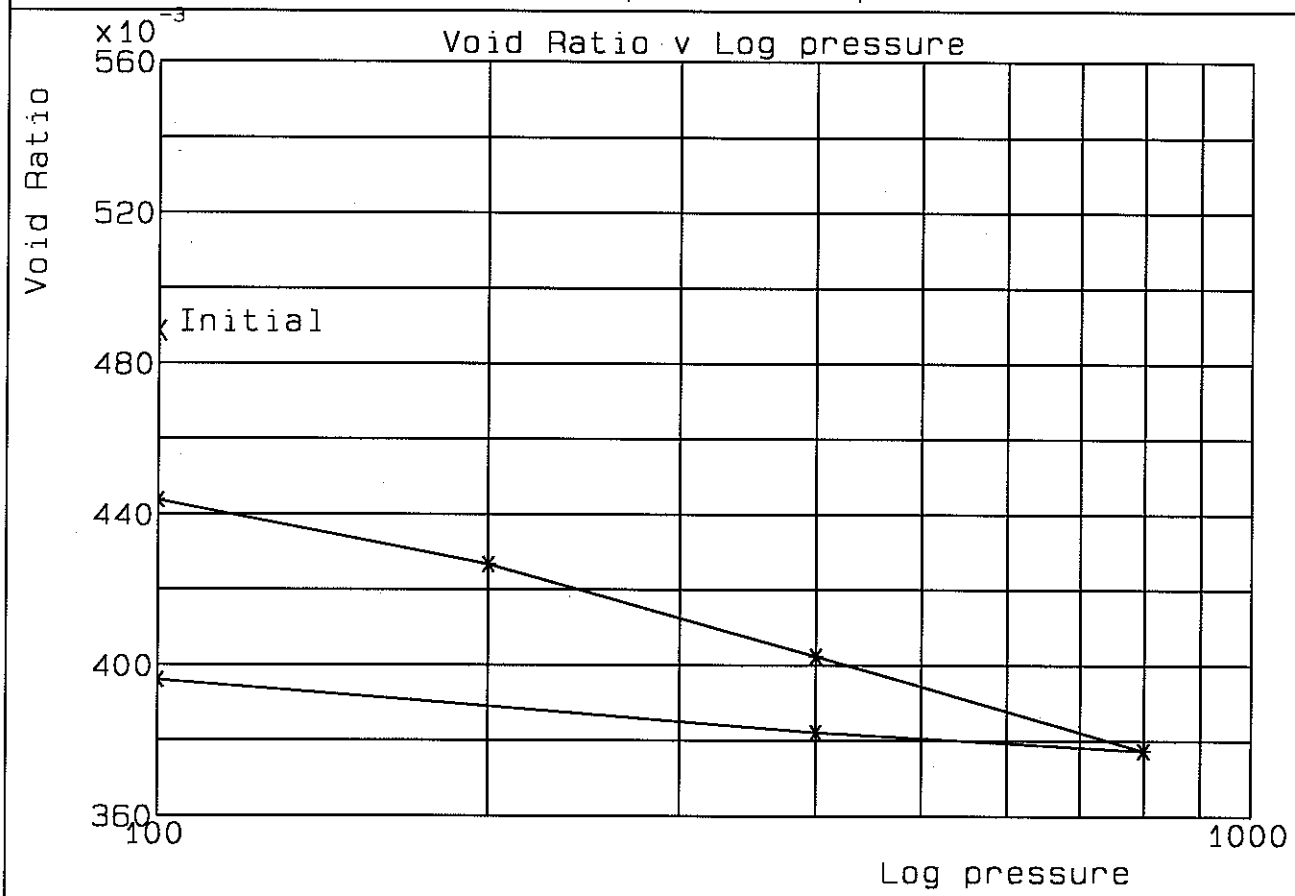
Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: K1 Sample: D Depth: 10.00m

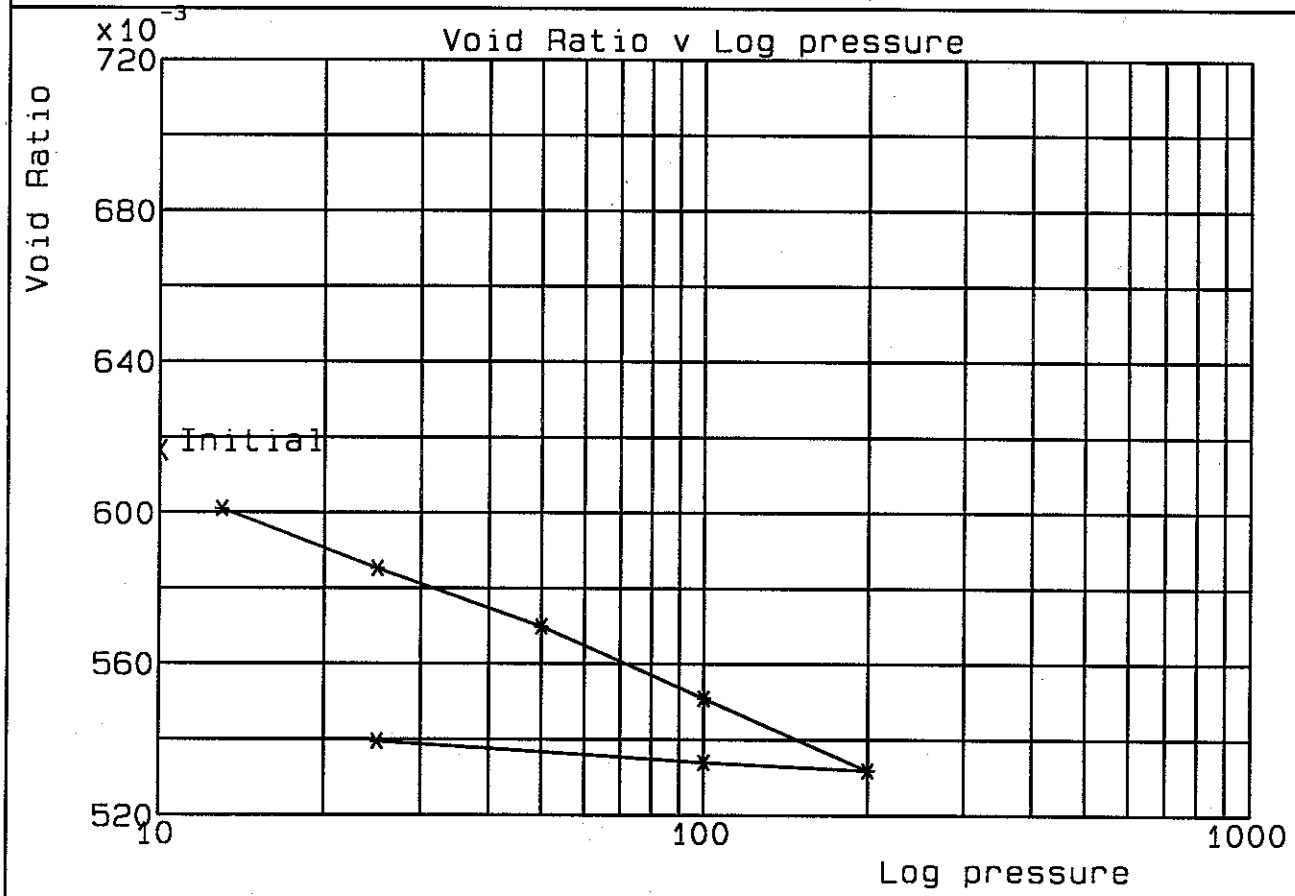


			Pressure kPa	Laboratory Coefficients	
				m_v sqm/MN	c_v sqm/yr
Sample dimensions			1	0.304	
Initial height 19.05 mm			100	0.118	6.06
area 4412.0sq.mm			200	0.085	5.19
			400	0.045	
Particle density (assumed)			800		
2.65			400		
	Initial Values	Final Values	100		
Moisture Content %	18.1	18.7			
Bulk Density Mg/cum	2.10	2.25			
Dry Density Mg/cum	1.78	1.90			
Void Ratio e	0.489	0.396			
[illegible]	[illegible]	[illegible]			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: K2 Sample: J Depth: 1.00m



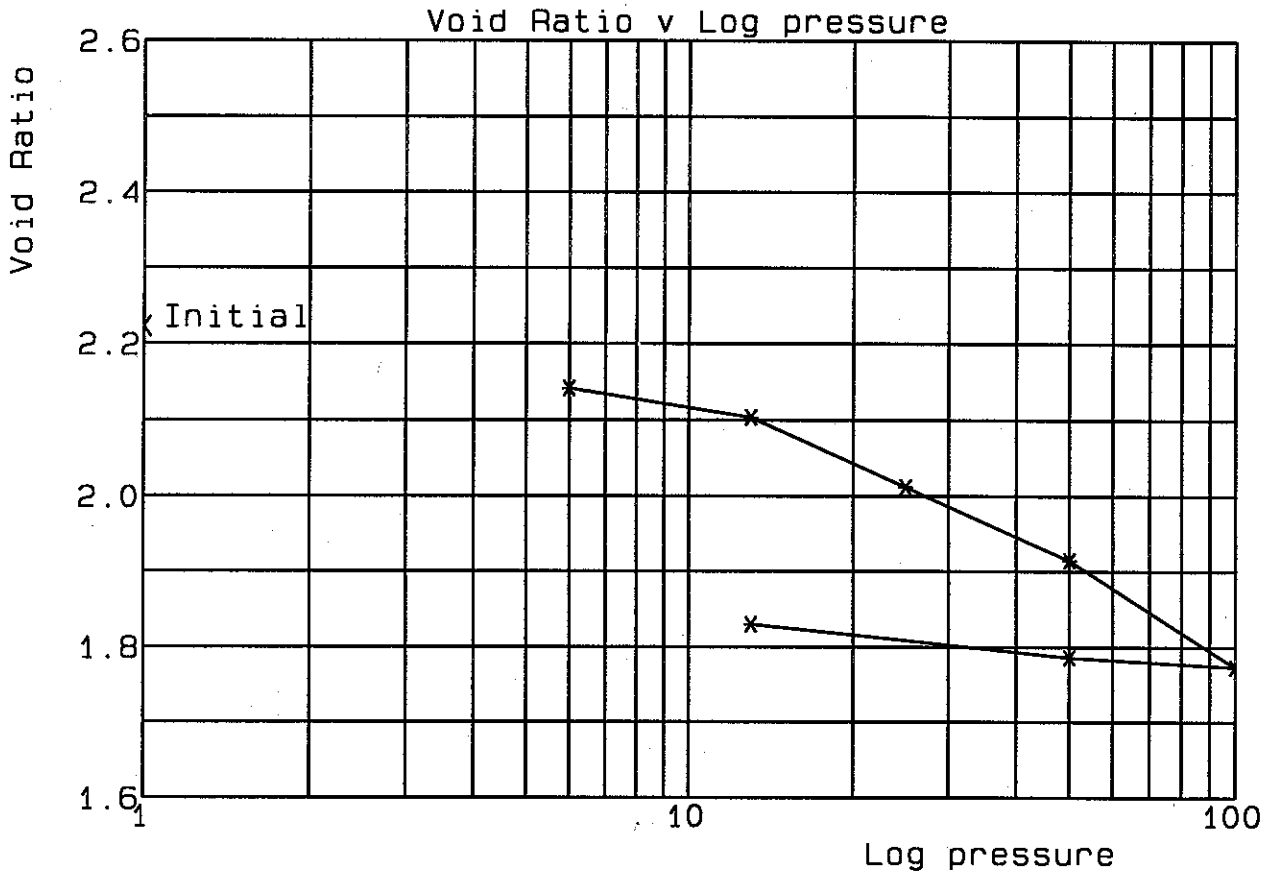
	Initial Values	Final Values
Sample dimensions Initial height 19.05 mm area 4370.9sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	23.0	22.7
Bulk Density Mg/cum	2.02	2.11
Dry Density Mg/cum	1.64	1.72
Void Ratio e	0.616	0.539

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	0.810	1.77
13	0.821	
25	0.388	3.98
50	0.243	6.09
100	0.123	5.76
200	0.014	
100		
25		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: K3 Sample: H Depth: 6.00m



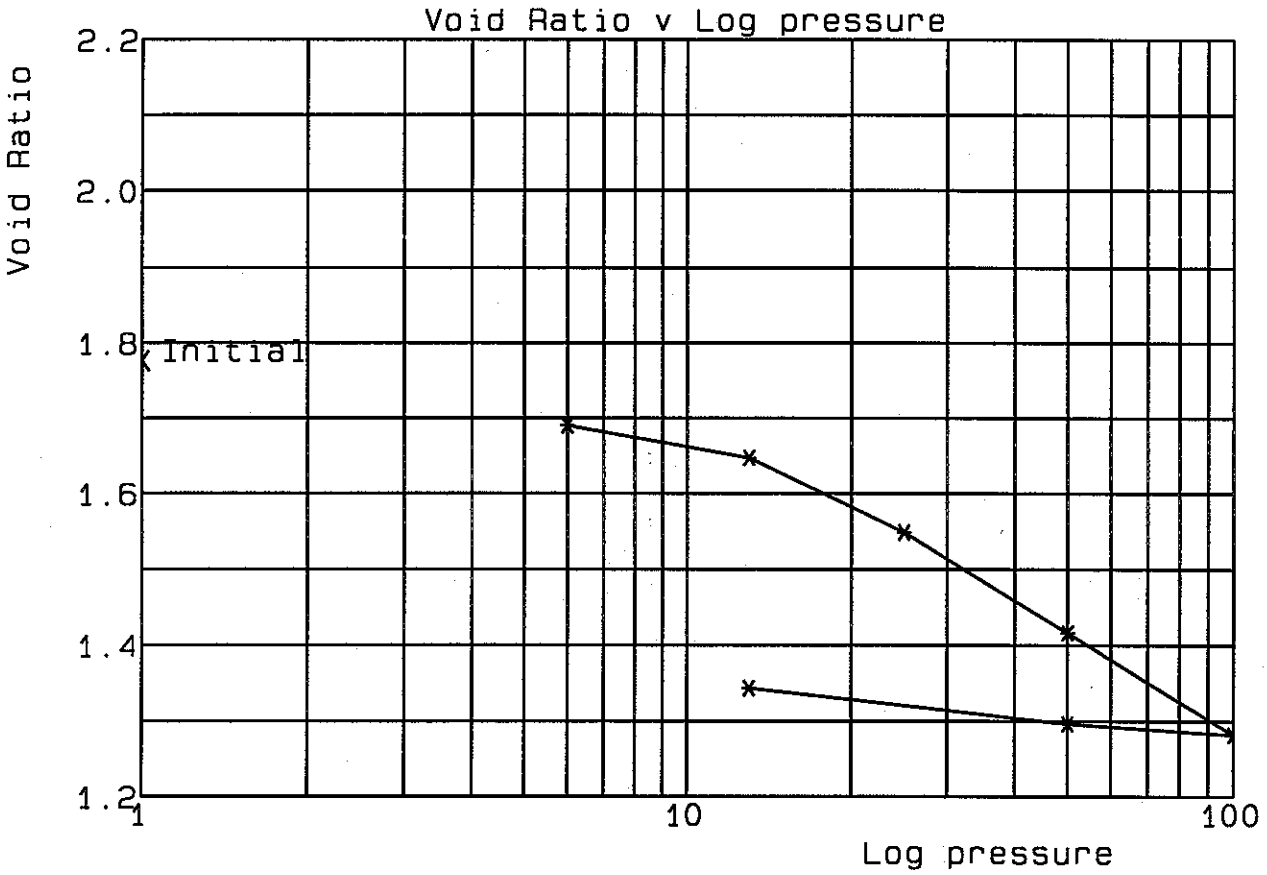
	Initial Values	Final Values
Sample dimensions Initial height 18.90 mm area 4353.3sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	81.1	73.1
Bulk Density Mg/cum	1.49	1.62
Dry Density Mg/cum	0.82	0.94
Void Ratio e	2.222	1.830

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	5.225	0.74
6	1.713	0.72
13	2.463	0.87
25	1.291	2.32
50	0.970	3.14
100		
50		
13		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: K4 Sample: A Depth: 4.50m



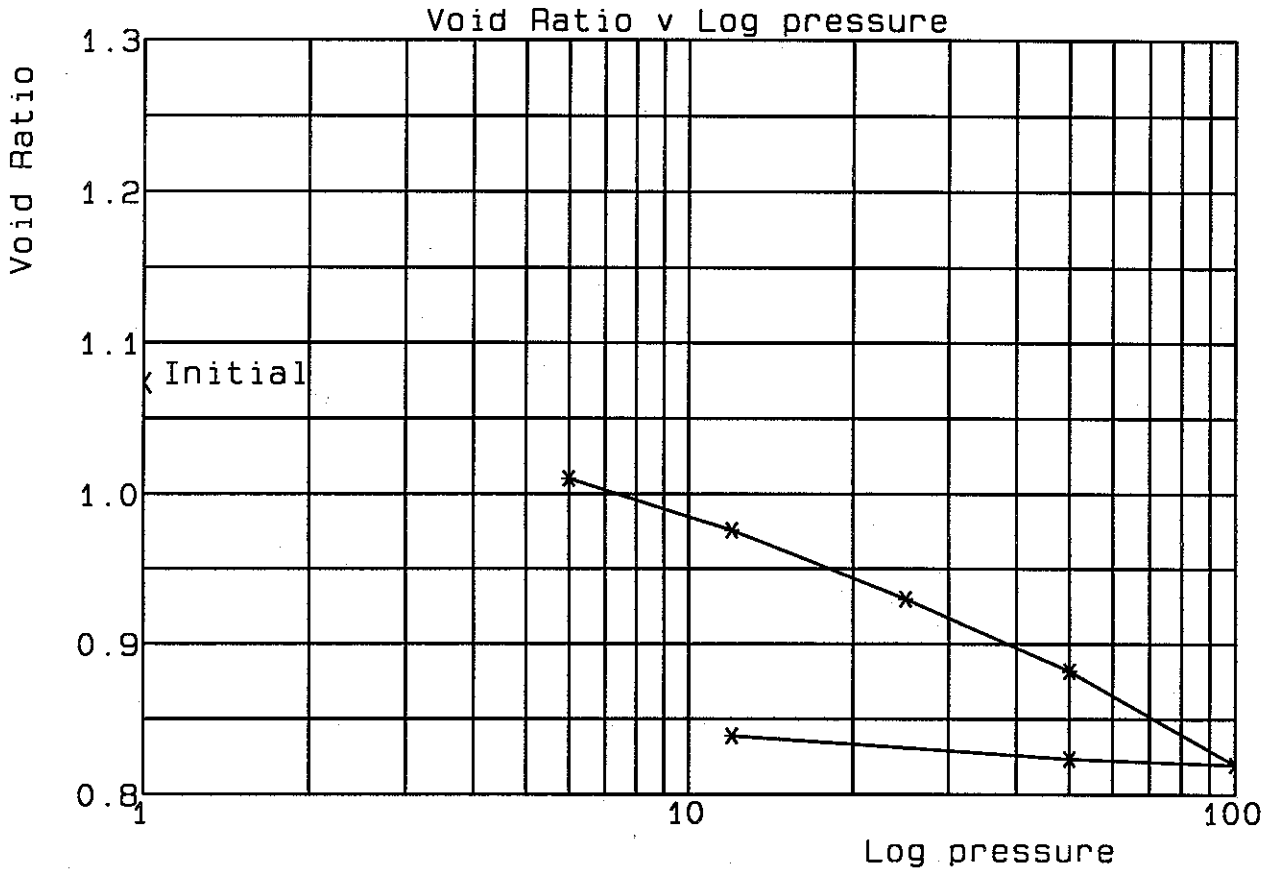
	Initial Values	Final Values
Sample dimensions Initial height 18.90 mm area 4370.9sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	69.9	56.4
Bulk Density Mg/cum	1.62	1.77
Dry Density Mg/cum	0.95	1.13
Void Ratio e	1.776	1.343

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	6.459	0.71
6	2.278	0.78
13	3.107	0.63
25	2.075	0.67
50	1.114	1.04
100		
50		
13		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: K5 Sample: G Depth: 7.40m



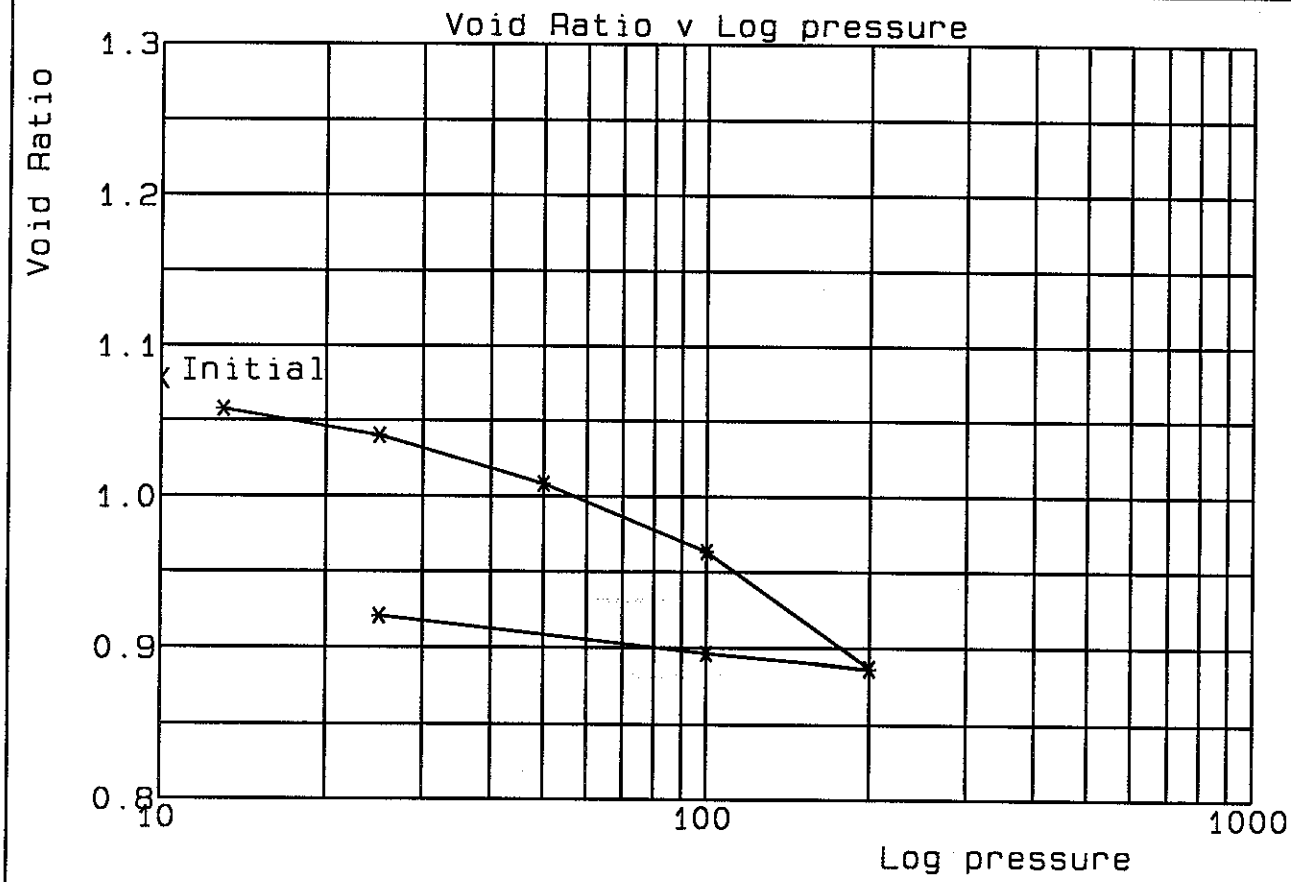
	Initial Values	Final Values
Sample dimensions Initial height 18.80 mm area 4382.6sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	41.6	35.7
Bulk Density Mg/cum	1.81	1.96
Dry Density Mg/cum	1.28	1.44
Void Ratio e	1.073	0.839
[illegible]	[illegible]	42.8

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1		
6	6.328	0.69
12	2.853	0.97
25	1.790	2.09
50	0.997	2.18
100	0.661	4.28
50		
12		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: L1 Sample: H Depth: 1.00m

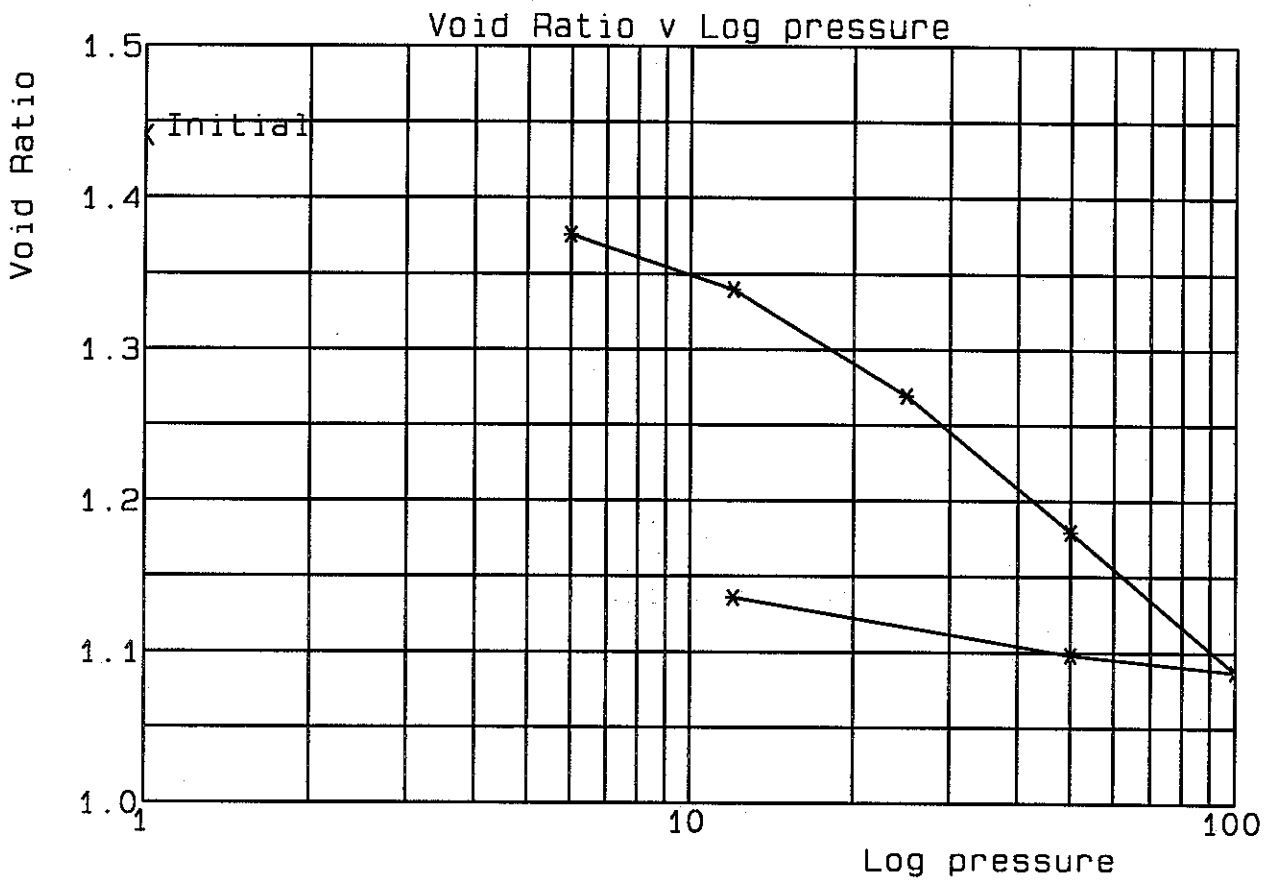


			Pressure kPa	Laboratory Coefficients	
Sample dimensions			1	m_v sqm/MN	c_v sqm/yr
Initial height 19.05 mm			13	0.819	1.57
area 4347.5sq.mm			25	0.707	1.46
			50	0.622	1.51
Particle density (assumed)			100	0.445	1.76
2.65			200	0.390	1.64
	Initial Values	Final Values			
Moisture Content %	42.5	39.6			
Bulk Density Mg/cum	1.82	1.93			
Dry Density Mg/cum	1.28	1.38			
Void Ratio e	1.077	0.921			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: L2 Sample: A Depth: 3.00m



	Initial Values	Final Values
Sample dimensions Initial height 18.85 mm area 4382.6sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	56.7	47.3
Bulk Density Mg/cum	1.70	1.83
Dry Density Mg/cum	1.09	1.24
Void Ratio e	1.440	1.136
	.3	.3

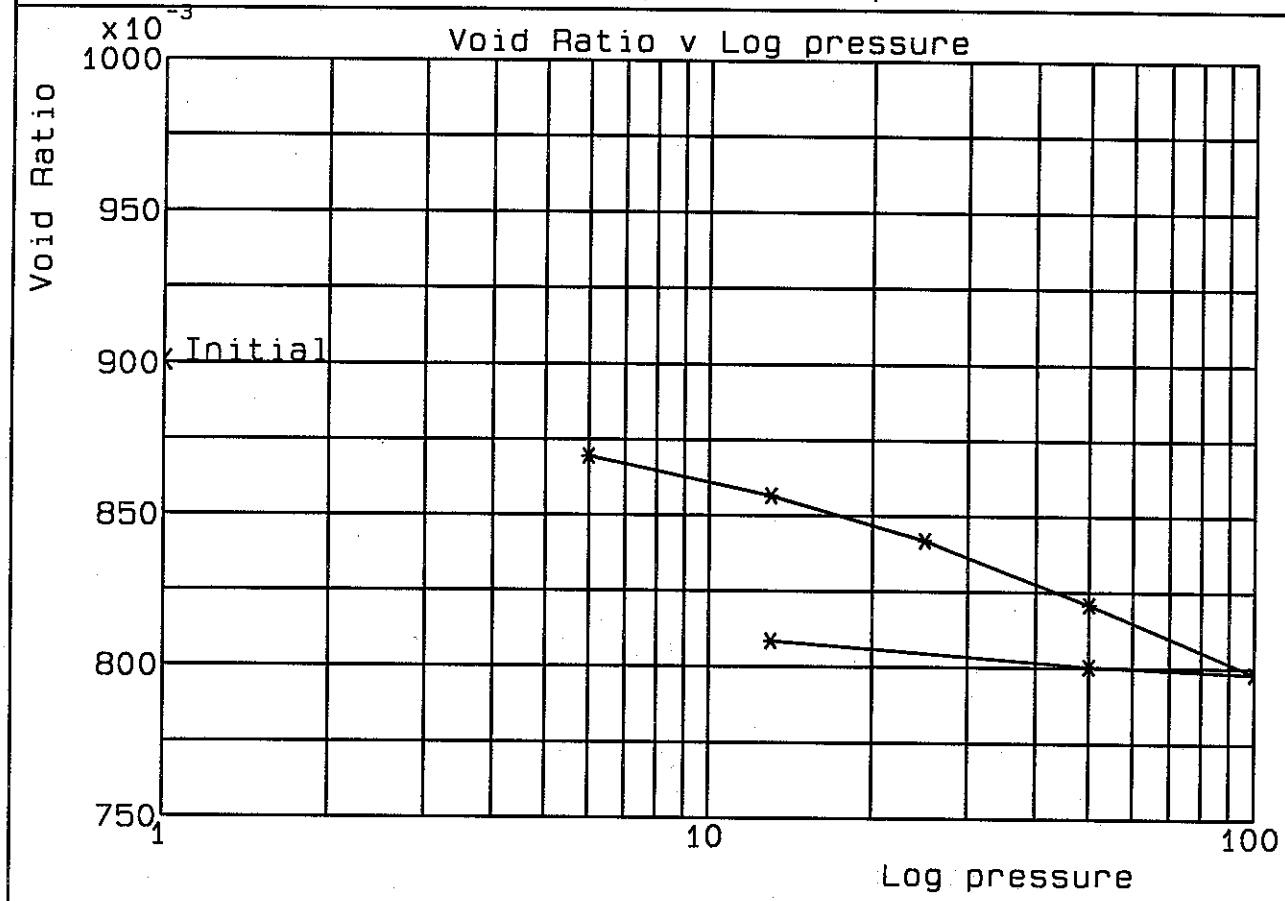
Pressure kPa
1
6
12
25
50
100
50
12

Laboratory Coefficients	
m_v sqm/MN	c_v sqm/yr
5.526	0.38
2.525	0.53
2.324	0.49
1.582	0.56
0.846	0.93

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: L4 Sample: A Depth: 4.60m



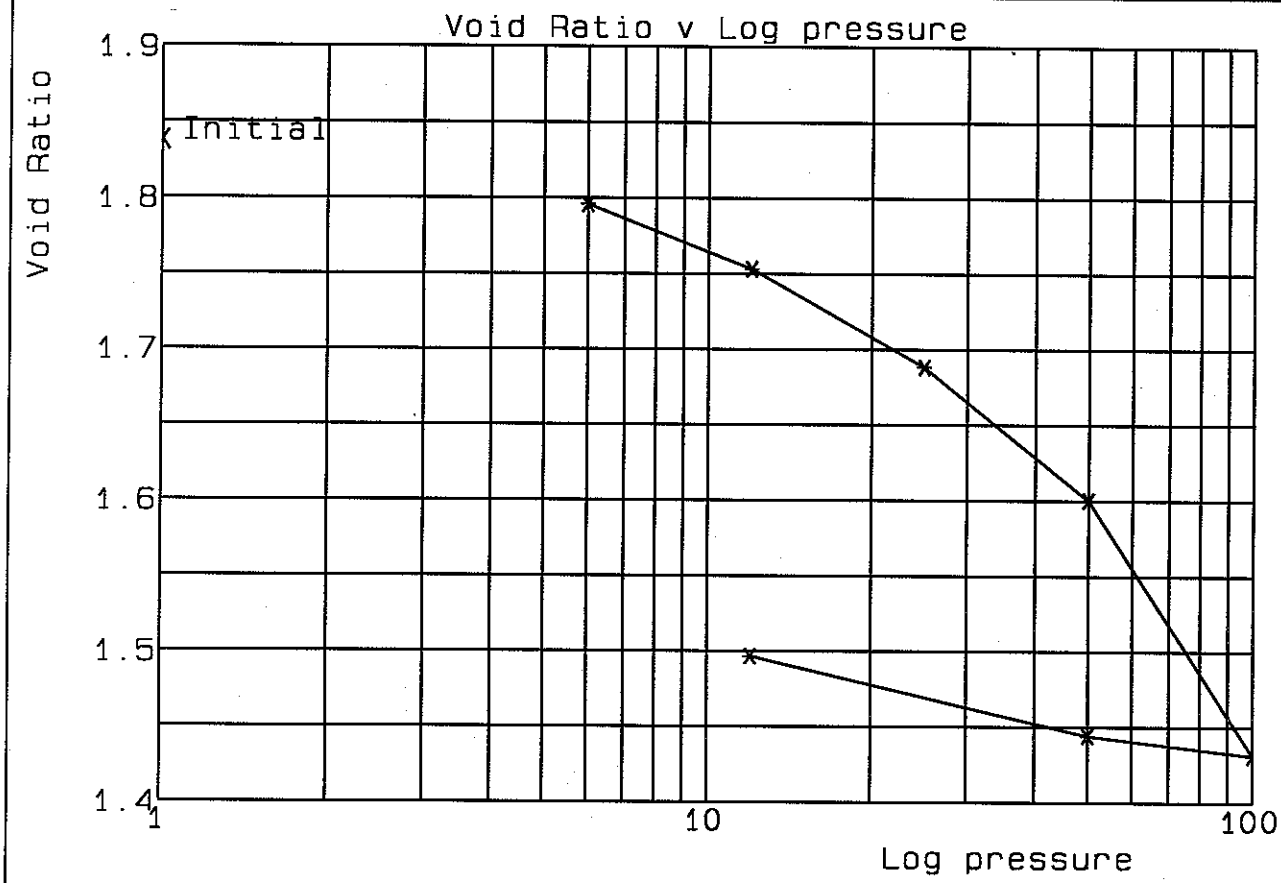
	Initial Values	Final Values
Sample dimensions Initial height 18.90 mm area 4370.9sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	36.5	31.8
Bulk Density Mg/cum	1.90	1.93
Dry Density Mg/cum	1.39	1.47
Void Ratio e	0.901	0.808

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	3.417	9.14
6	0.991	0.66
13	0.655	7.26
25	0.459	2.99
50	0.251	12.21
100		
50		
13		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: L5 Sample: H Depth: 6.50m



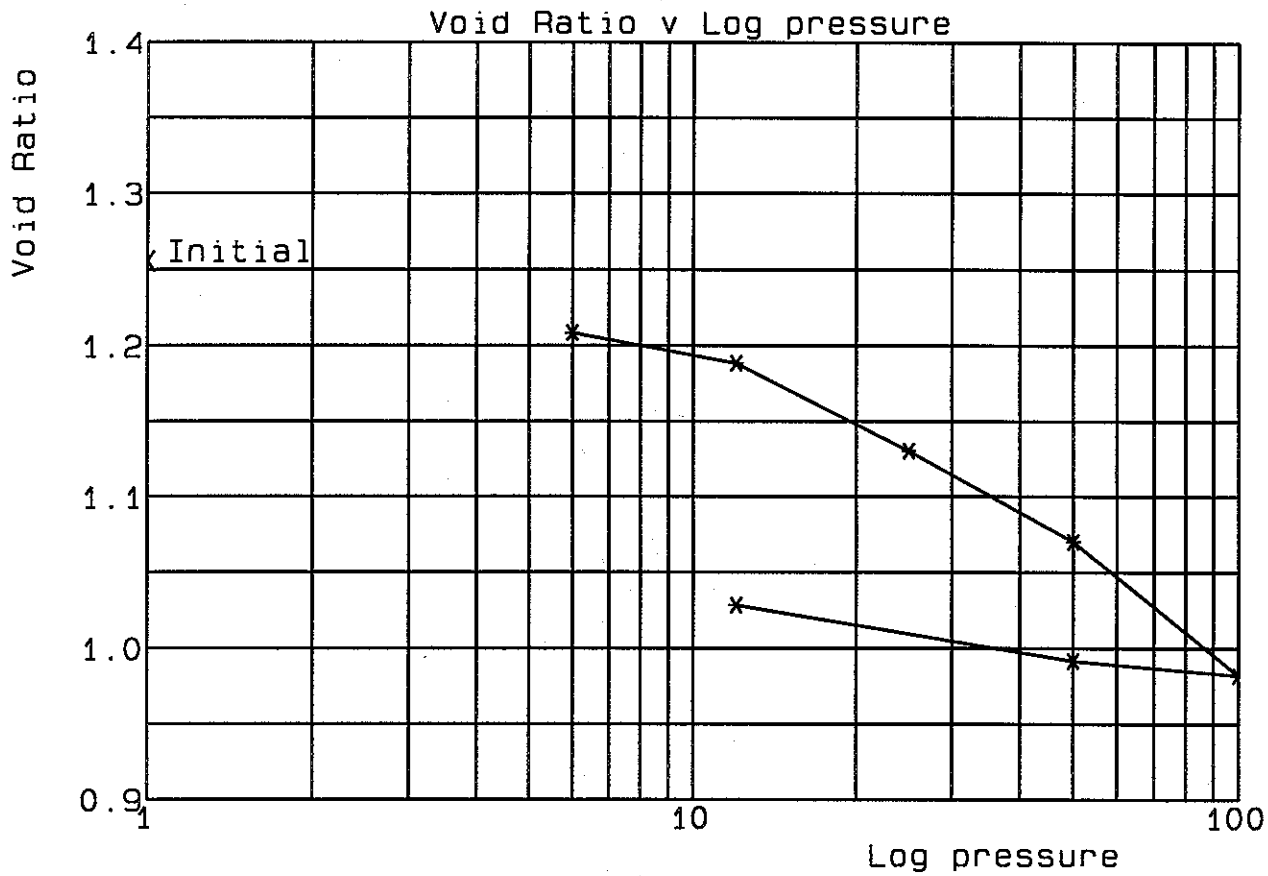
	Initial Values	Final Values
Sample dimensions Initial height 18.95 mm area 4359.2sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	96.2	61.5
Bulk Density Mg/cum	1.83	1.71
Dry Density Mg/cum	0.93	1.06
Void Ratio e	1.838	1.497

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	3.089	0.50
6	2.535	0.67
12	1.816	0.52
25	1.308	1.15
50	1.302	0.71
100		
50		
12		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: L6 Sample: C Depth: 3.50m

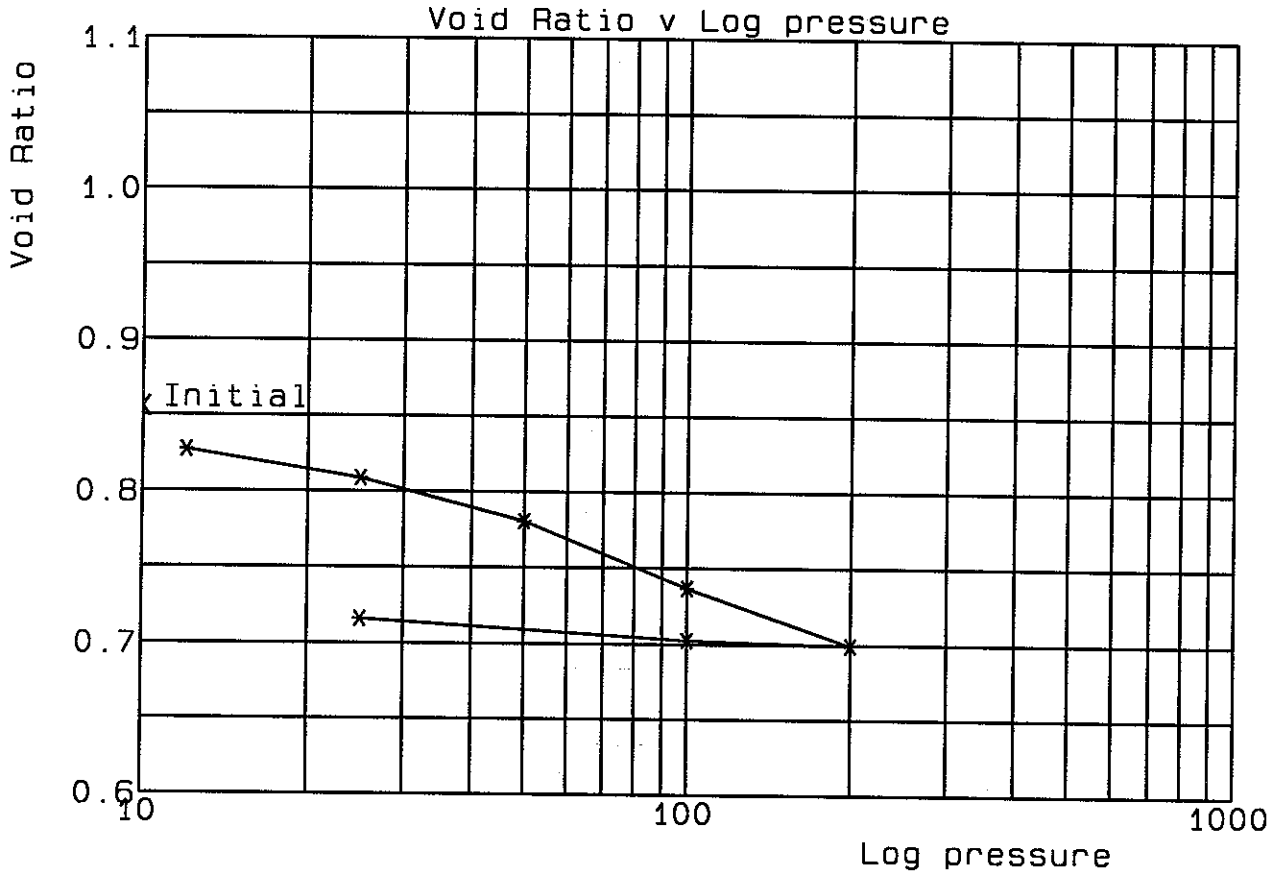


			Pressure kPa	Laboratory Coefficients	
				m_v sqm/MN	c_v sqm/yr
Sample dimensions			1	4.344	0.65
Initial height 18.80 mm			6	1.512	0.53
area 4359.2sq.mm			12	2.037	0.78
			25	1.129	1.04
Particle density (assumed)			50	0.852	1.23
2.65			100		
	Initial Values	Final Values	50		
			12		
Moisture Content %	51.4	46.7			
Bulk Density Mg/cum	1.78	1.92			
Dry Density Mg/cum	1.18	1.31			
Void Ratio e	1.255	1.028			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: M1 Sample: F Depth: 1.50m



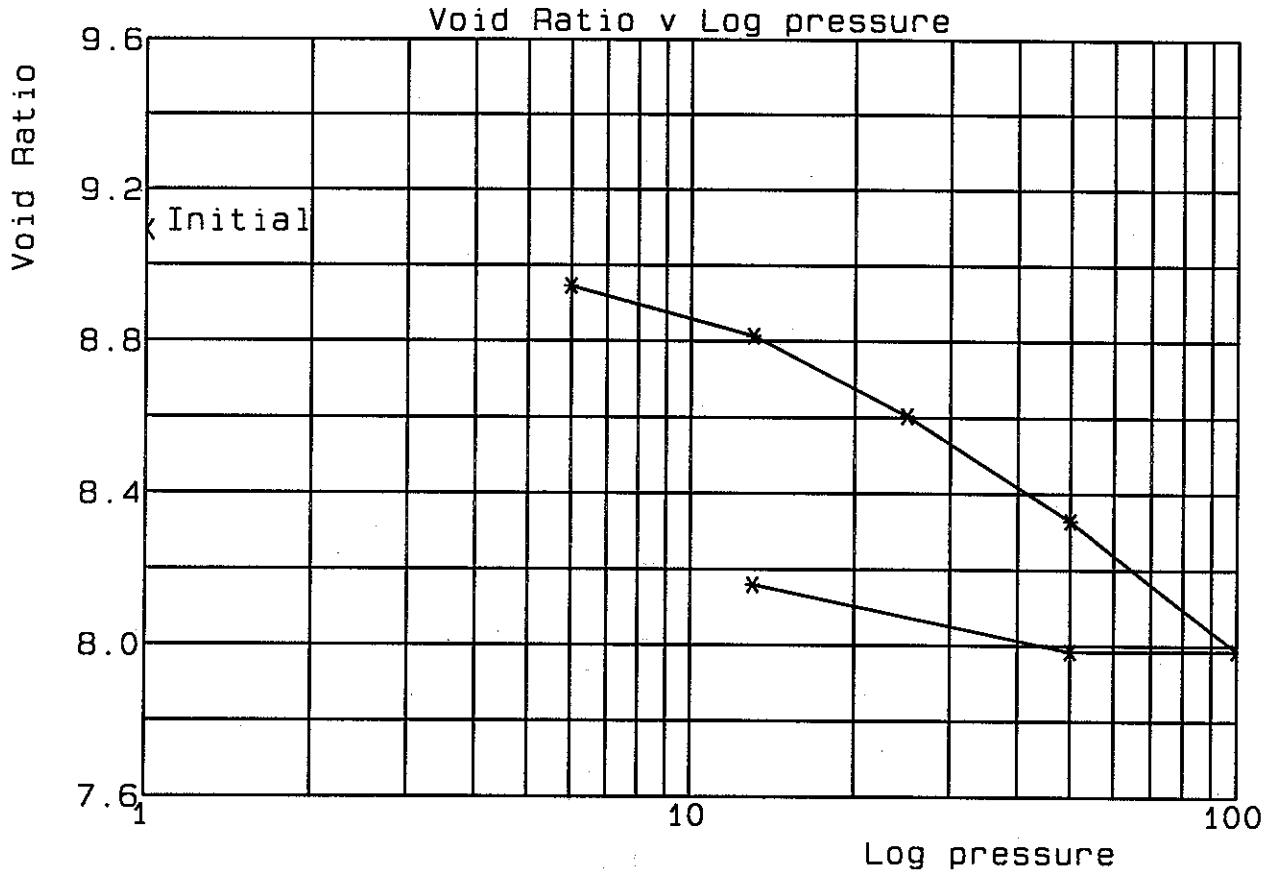
	Initial Values	Final Values
Sample dimensions Initial height 18.85 mm area 4382.6sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	34.0	30.6
Bulk Density Mg/cum	1.91	2.02
Dry Density Mg/cum	1.43	1.54
Void Ratio e	0.855	0.716
[illegible]	[illegible]	[illegible]

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1		
12	1.410	2.05
25	0.779	1.26
50	0.627	1.13
100	0.490	1.87
200	0.216	3.01
100		
25		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: M2 Sample: H Depth: 1.50m

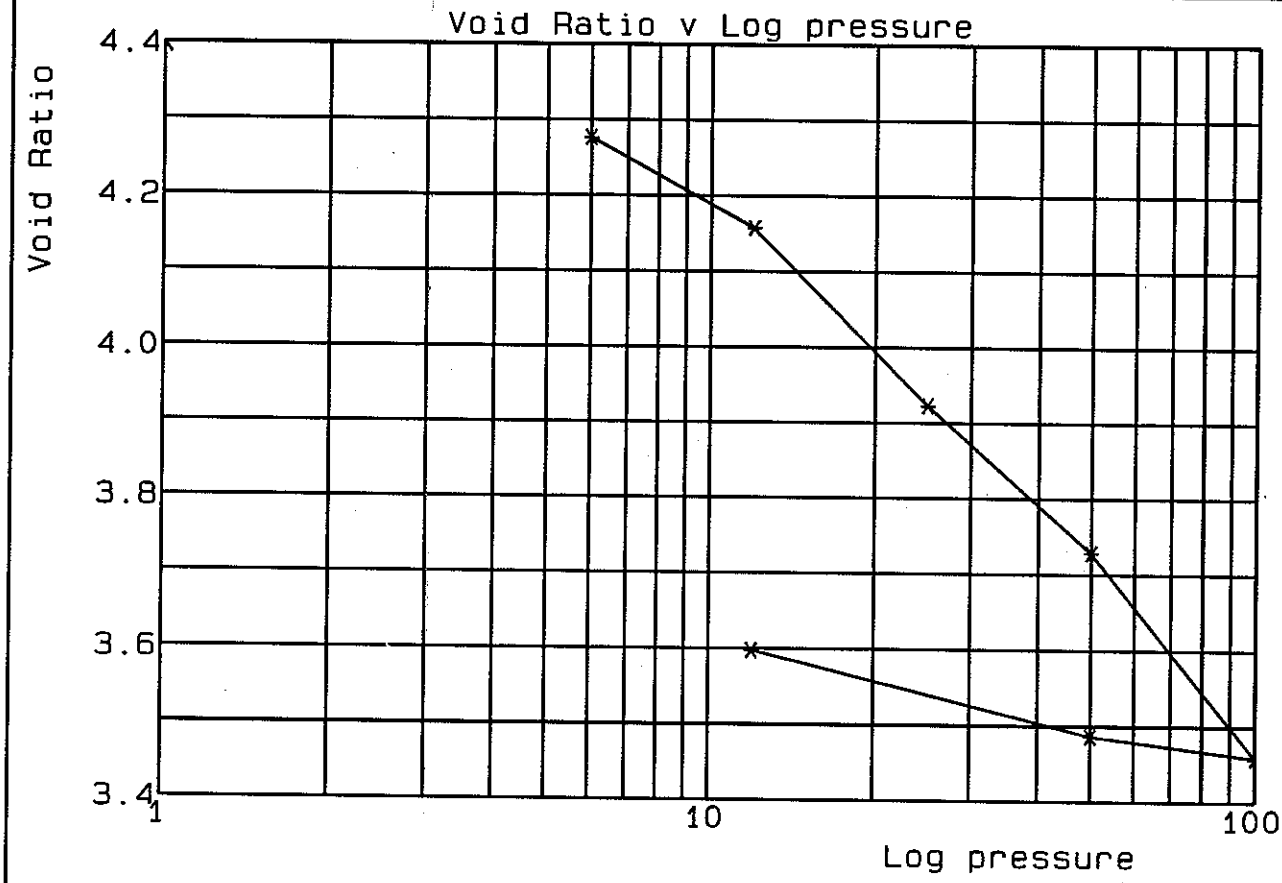


			Pressure kPa	Laboratory Coefficients	
Sample dimensions			1	m_v sqm/MN	c_v sqm/yr
Initial height 18.80 mm			6	3.036	6.83
area 4370.9sq.mm			13	1.882	0.85
			25	1.778	6.68
Particle density (assumed)			50	1.149	21.06
2.65			100	0.734	7.91
	Initial Values	Final Values	50		
			13		
Moisture Content %	328.9	310.4			
Bulk Density Mg/cum	1.13	1.19			
Dry Density Mg/cum	0.26	0.29			
Void Ratio e	9.091	8.160			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: M5 Sample: F Depth: 1.50m

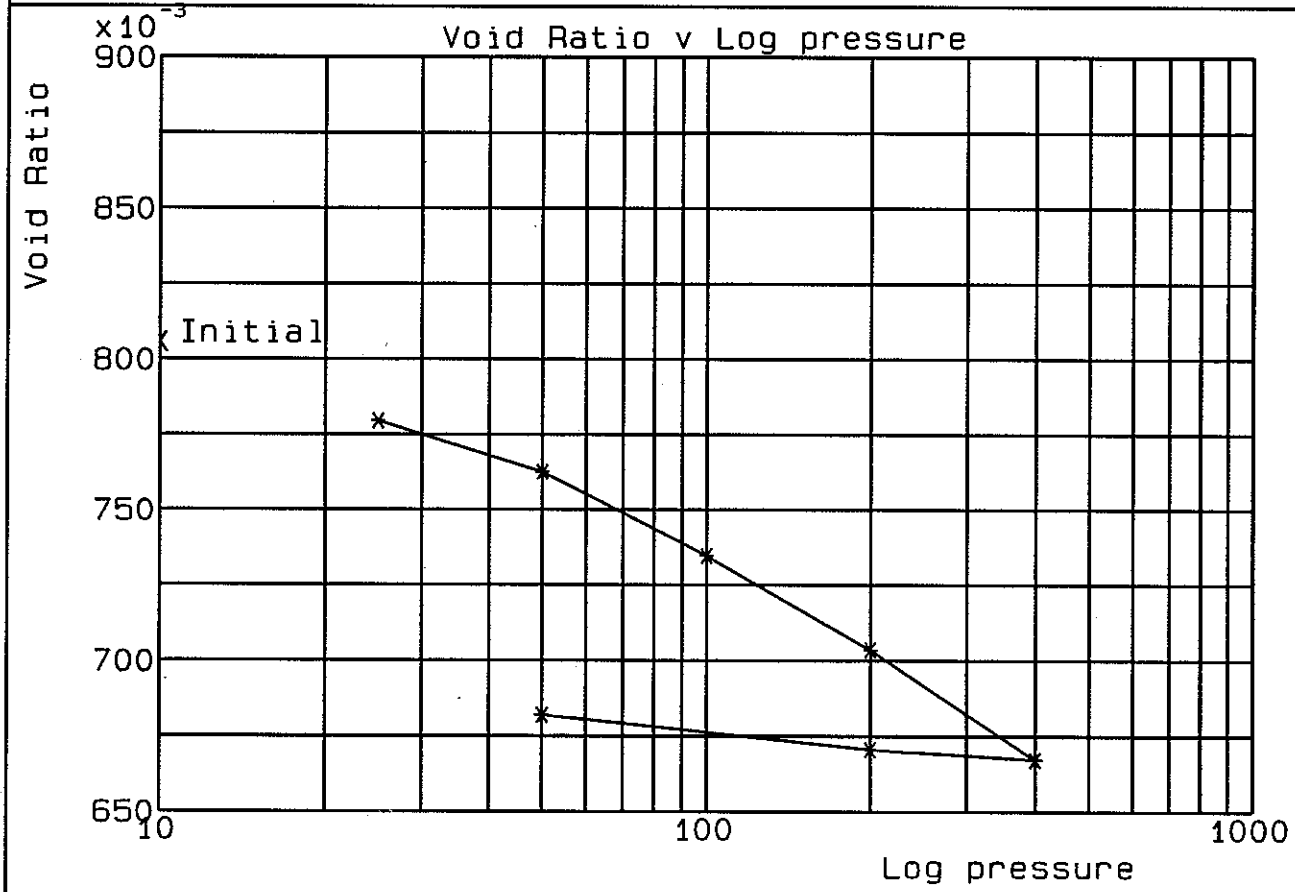


			Pressure kPa	Laboratory Coefficients	
Sample dimensions				m_v sqm/MN	c_v sqm/yr
Initial height 18.85 mm			1	4.786	0.52
area 4359 2sq.mm			6	3.747	0.37
			12	3.495	0.33
			25	1.578	0.96
Particle density (assumed)			50	1.144	3.03
2.65			100		
	Initial Values	Final Values	50		
			12		
Moisture Content %	159.7	136.6			
Bulk Density Mg/cum	1.27	1.36			
Dry Density Mg/cum	0.49	0.58			
Void Ratio e	4.400	3.598			

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: N9 Sample: H Depth: 1.00m



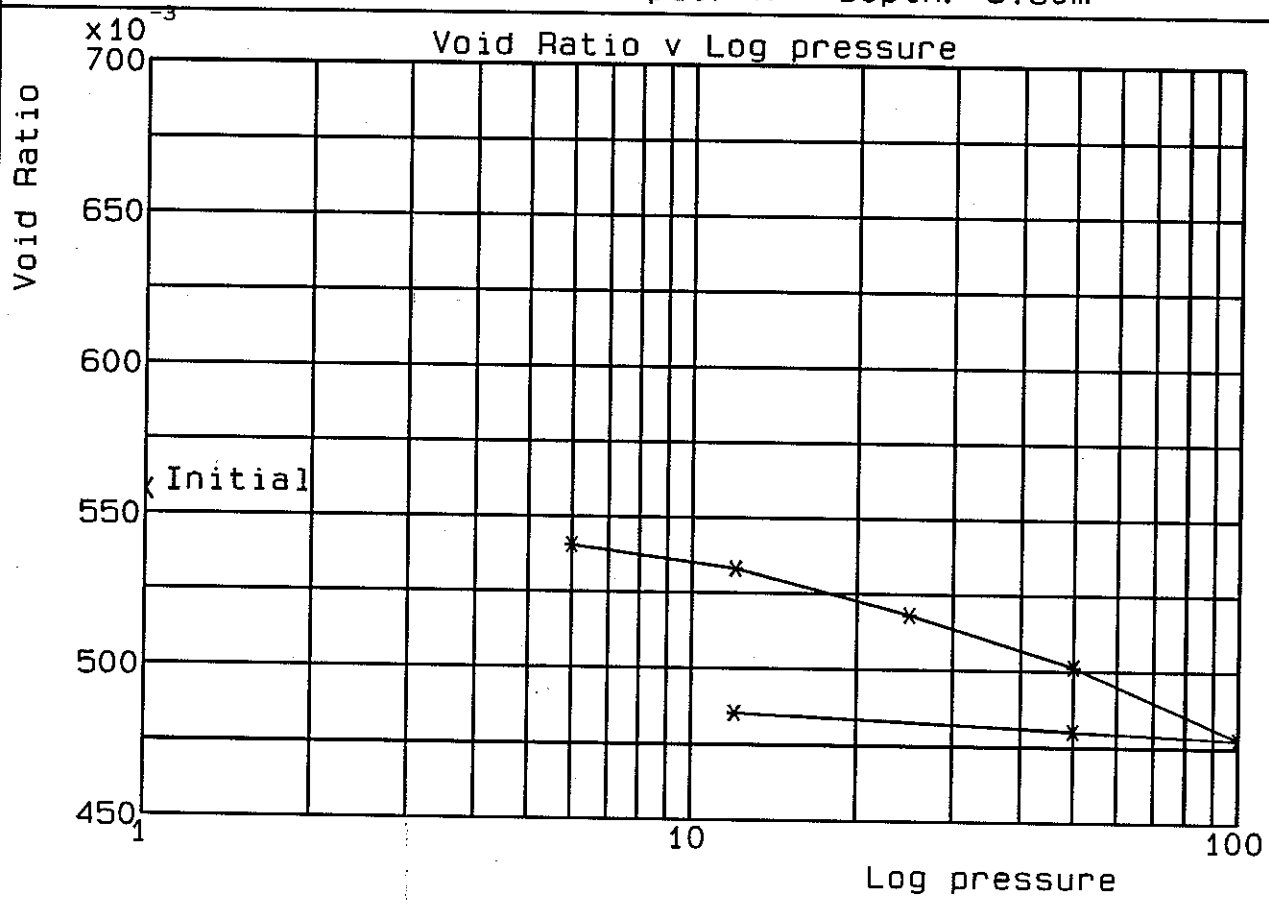
	Initial Values	Final Values
Sample dimensions Initial height 19.15 mm area 4341.6sq.mm		
Particle density (assumed) 2.65		
Moisture Content %	29.5	27.9
Bulk Density Mg/cum	1.90	2.02
Dry Density Mg/cum	1.47	1.58
Void Ratio e	0.806	0.682

Pressure kPa	Laboratory Coefficients	
	m_v sqm/MN	c_v sqm/yr
1	0.608	2.02
25	0.379	0.97
50	0.318	1.14
100	0.179	1.62
200	0.107	3.11
400		
200		
50		

NORWEST HOLST SOIL ENGINEERING LTD

Job: M4, NEWPORT — Oedometer Consolidation

BoreHole: N10B Sample: H Depth: 3.50m



	Initial Values	Final Values
Moisture Content %	20.4	19.7
Bulk Density Mg/cum	2.05	2.13
Dry Density Mg/cum	1 70	1.78
Void Ratio e	0.558	0.485

Sample dimensions
Initial height 19.15 mm
area 4365.0sq.mm

Particle density (assumed)
2.65

Pressure kPa	Laboratory Coefficients m_v sqm/MN	c_v sqm/yr
1	2.285	0.41
6	0.810	0.53
12	0.759	0.53
25	0.439	0.98
50	0.314	1.19
100		
50		
12		

NORWEST HOLST SOIL ENGINEERING LTD

KEY TO SYMBOLS AND LETTERS

Hole ID	■	Indicates results on rock and soil summary sheets

Type	U	Undisturbed sample
	P	Piston sample
	D	Small disturbed sample
	B	Bulk disturbed sample
	C	Rock core

Triaxial /ShearBox	UU	Unconsolidated quick undrained	*(Single)
	UUM	" " "	(Multi)
	UU3	" " "	(Set of 3)
	UUR	" " "	*(Remoulded single)
	UUMR	" " "	(Remoulded multi)
	CD	Consolidated drained	*(Single)
	CDM	" "	(Multi)
	CDR	" "	*(Remoulded single)
	CDRM	" "	(Remoulded multi)
	CU	Consolidated undrained	*(Single)
	CUM	" "	(Multi)
	CUR	" "	*(Remoulded single)
	CURM	" "	(Remoulded multi)
	OTHR	Other	* *NB Single stage tests reported assuming*
	Sh p	Shearbox Peak	*Ø=zero for total stress and c'=zero for*
	Sh r	Shearbox Residual	*effective stress tests.*
	RS r	Ring Shear	

The effective stress parameters are dashed (') on the summary sheets as opposed to the shear strength symbols (c'/=Ø') which are common column headings to total stress results as well.

Consol/Oedometer	Oedometer consolidation Mv quoted for 'p0 to p0+100kPa'

PSD	Frc	Combined Clay/Silt fraction

SO3	t	Total soil sulphate content
	a	Sulphate aqueous extract 2:1 soil/water
	w	Water sulphate content
	d	Total soil sulphur content
Cl	a	Acid soluble chloride ions
	w	Water soluble chloride ions
	d	Dissolved chloride ions
Other	c	Carbonate content (as CO2)
	l	Loss on ignition
	+	Organic content

Compaction	2.5kg	2.5kg Rammer effort
	4.5kg	4.5kg Rammer effort
	Vibro	Vibrating hammer

CBR	t	Top result
	b	Bottom result
	m	Multi point CBR test - highest value

	U/S	Unsuitable sample
	═══	Test scheduled but not complete
	=TX= <TX>	Triaxial test scheduled /Unsuitable
	=ES= <ES>	Effective stress test scheduled/Unsuitable
	=SB= <SB>	Shearbox scheduled/Unsuitable

ROCK GEOTECHNICAL

F10895

M4 RELIEF ROAD, NEWPORT

Borehole	Depth (m)	Test Condition	10% Fines kN	ACV
B7	14.60	Natural	95	26.3
B14	19.50	Natural	160	21.6
B14	25.20	Natural	140	23.4
B17	10.30	Natural	150	22.5
N2	6.80	Natural	110	Insuff. Material
N5	12.30	Natural	160	25.8
N12	4.20	Natural	200	20.5
P1	5.90	Natural	170	21.6
P10	2.60	Natural	180	19.9
P12	6.60	Natural	140	25.1

Ten per cent fines value testing in accordance with BS 812:Part 111:1990.

Aggregate crushing value (ACV) tested in accordance with BS 812:Part 110:1990.

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHA3	5.50	C	0.518	0.693	A							1.2							
			0.306	0.426	D														
BHA3	8.20	C																	
BHA3	11.50	C	3.719	4.945	D							1.4							
			2.150	3.078	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHB10	5.00	C			A D							8.3						Red brown mudstone
BHB10	7.30	C	0.020 0.014	0.027 0.020	A D							6.0						
BHB10	8.60	C	0.405 1.385	0.512 1.865	A D							1.8						Red brown mudstone
BHB10	11.30	C	0.147 0.123	0.205 0.148	D A							4.9						Red brown mudstone
BHB10	15.20	C	2.942 1.025	3.253 1.422	A D	17.0			4.10		7.00	1.5	2.60 b 2.56 d					Grey sandstone
BHB10	18.20	C	0.148 0.046	0.199 0.064	A D							3.7						Green mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB10	20.00	C	0.296	0.396	A							3.2							Green mudstone
			0.239	0.330	D														
BHB10	22.60	C	0.803	0.815	L							1.6							Brown mudstone
			0.090	0.126	D														
BHB10	25.10	C	0.906	1.279	A							2.7							Brown mudstone
			0.653	0.907	D														
BHB10	27.30	C	1.298	1.612	A							4.0							Brown mudstone
			0.404	0.562	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHB11	4.10	C	4.202	5.677	A							2.1						Reddish brown sandstone
			6.038	7.905	D													
BHB11	6.40	C	2.850	3.938	D							1.7						Reddish brown sandstone
			5.916	7.227	A													
BHB11	10.40	C	0.010	0.014	D							7.1						Red brown mudstone
			0.080	0.103	A													
BHB11	13.20	C	3.404	4.569	D							1.9						Red brown sandstone
			3.396	4.460	A													

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB12	1.50	C			A							20							Reddish brown mudstone
					D														
BHB12	5.20	C	0.008	0.012	A							8.1							Reddish brown mudstone
			0.010	0.013	D														
BHB12	8.00	C	0.428	0.552	A							3.8							Reddish brown mudstone
			0.127	0.177	D														
BHB12	9.80	C	0.117	0.142	A							5.9							Reddish brown mudstone
			0.038	0.053	D														
BHB12	11.80	C	0.029	0.039	A							7.9							Reddish brown mudstone
			0.018	0.026	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB13	5.70	C																	Reddish brown mudstone
BHB13	6.60	C	4.388 1.411	6.087 1.697	D A							1.9							Grey sandstone
BHB13	8.80	C	0.505 0.506	0.694 0.689	D A							11							Grey sandstone
BHB13	10.00	C	0.040 0.056	0.054 0.076	D A							4.7							Reddish brown sandstone
BHB13	11.60	C	1.636 4.028	2.283 5.414	D A	74.1					4.40	1.6	2.63 b 2.61 d						Grey sandstone
BHB13	14.50	C																	Red brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB13	17.30	C	0.111	0.155	D							4.7							Red brown mudstone
			0.094	0.133	A														
BHB13	19.40	C	0.269	0.343	A							1.8							Red brown mudstone
			0.340	0.490	D														
BHB13	21.50	C	0.055	0.077	D							2.9							Red brown mudstone
			1.697	2.220	A														
BHB13	25.40	C	0.112	0.155	D							4.7							Red brown mudstone
			0.281	0.395	A														
BHB13	27.60	C	0.047	0.065	D							5.4							Red brown mudstone
			0.096	0.127	A														
BHB13	29.80	C	0.262	0.360	D							1.9							Grey sandstone
			0.209	0.272	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB13	31.60	C	0.101 0.074	0.134 0.103	A D							2.9							Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHB14	2.20	C																Brown sandstone
BHB14	5.00	C																Reddish brown mudstone
BHB14	6.20	C	0.225 0.058	0.284 0.080	A D							3.3						Reddish brown mudstone
BHB14	8.60	C																Reddish brown mudstone
BHB14	10.40	C																Reddish brown mudstone
BHB14	12.30	C	0.026 0.029	0.034 0.039	A D							5.3						Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB14	14.40	C	0.722 0.296	0.946 0.411	A D							2.7							Grey sandstone
BHB14	16.70	C	4.681 13.841	4.793 11.636	D A	80.3			8.10		6.00	1.5	2.60 b 2.56 d						Grey sandstone
BHB14	19.50	C	2.091 3.744	2.709 4.901	A D	62.7					7.53	1.3	2.63 b 2.60 d						Grey sandstone
BHB14	22.20	C	1.020 0.450	1.319 0.630	A D							2.7							Reddish brown mudstone
BHB14	25.20	C	5.022 1.351	6.325 1.860	A D	28.2			5.00	96.03	7.30	3.7	2.63 b 2.59 d						Brown sandstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB15	2.40	C																	Reddish brown sandstone
BHB15	5.30	C																	Reddish brown mudstone
BHB15	6.20	C	0.054 0.057	0.075 0.076	D A							4.1							Reddish brown mudstone
BHB15	9.00	C	0.428 0.980	0.592 1.345	A D	20.7					8.00	2.0	2.60 b 2.55 d						Reddish brown sandstone
BHB15	11.50	C																	Reddish brown mudstone
BHB15	13.20	C	2.068 0.200	2.545 0.279	A D							2.2							Reddish brown sandstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB15	14.90	C	1.318	1.810	D							2.0							Reddish brown sandstone
			2.374	2.728	A														
BHB15	16.20	C	0.204	0.287	D							3.5							Reddish brown mudstone
			0.171	0.211	A														
BHB15	18.50	C			D							4.8							Reddish brown mudstone
			0.976	1.030	L														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB16	4.70	C																	Reddish brown sandstone
BHB16	6.80	C																	Grey sandstone
BHB16	8.95	C	0.275 0.342	0.357 0.476	A D							3.1							Grey sandstone
BHB16	12.00	C																	Reddish brown mudstone
BHB16	13.70	C	1.580 1.221	2.134 1.691	A D							2.0							Reddish brown mudstone
BHB16	15.50	C	0.494 0.115	0.685 0.155	A D							3.3							Grey sandstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB16	17.60	C	0.298	0.411	D				0.65			3.1							Reddish brown sandstone
			0.450	0.595	A														
BHB16	19.70	C	0.078	0.107	D							4.4							Reddish brown mudstone
			0.560	0.701	A														
BHB16	22.30	C	0.041	0.057	D							5.1							Reddish brown mudstone
			0.033	0.045	A														
BHB16	23.90	C																	Reddish brown sandstone
BHB16	24.80	C																	Reddish brown sandstone
BHB16	26.80	C																	Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB17	4.55	C	0.018 0.017	0.026 0.024	D A							5.8							Reddish brown mudstone
BHB17	6.10	C	0.669 0.031	0.923 0.044	A D							3.1							Reddish brown mudstone
BHB17	7.60	C	7.120 2.857	9.101 3.885	A D	80.0					4.10	1.3	2.62 b 2.61 d						Grey sandstone
BHB17	9.30	C	1.063 4.216	1.478 5.505	D A							1.3							Grey sandstone
BHB17	10.30	C	2.237 1.379	2.605 1.920	A D	76.0			6.50		7.30	1.4	2.60 b 2.57 d						Grey sandstone
BHB17	12.10	C	4.964 3.423	6.699 4.606	D A	76.5					4.90	0.9	2.64 b 2.61 d						Grey conglomerate

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB17	13.50	C	0.350	0.469	D							4.7							Green mudstone
			0.491	0.657	A														
BHB17	16.20	C	1.142	1.578	D							1.4							Reddish brown mudstone
			3.978	5.022	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB18	2.20	C	0.027	0.036	D							11							Brown sandstone
			0.009	0.013	A														
BHB18	4.60	C	0.011	0.015	A							8.8							Red brown mudstone
			0.010	0.014	D														
BHB18	7.70	C	0.163	0.225	D							4.9							Red brown mudstone
			0.075	0.102	A														
BHB18	9.10	C	0.512	0.711	D							2.1							Red brown mudstone
			2.524	3.377	A														
BHB18	11.40	C	0.020	0.027	D							5.9							Red brown mudstone
			0.030	0.041	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB19A	16.30	C	0.015	0.019	A							9.6							Brown mudstone
			0.020	0.027	D														
BHB19A	18.20	C	0.191	0.260	A	2.9						5.0	2.43 b						Reddish brown mudstone
			0.304	0.417	D								2.24 d						

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB1	8.50	C	5.052 1.159	6.395 1.625	A D							1.4							Reddish brown mudstone
BHB1	9.70	C																	Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB2	9.60	C	0.708	0.869	A							2.1							Reddish brown mudstine
			0.368	0.515	D														
BHB2	11.60	C	0.014	0.019	D							5.1							Reddish brown mudstone
			0.019	0.026	A														
BHB2	13.60	C	0.269	0.368	D							4.8							Reddish brown mudstone
			0.350	0.435	A														
BHB2	15.70	C	0.046	0.064	D							6.1							Reddish brown mudstone
			0.079	0.108	A														
BHB2	19.85	C	0.067	0.092	D							4.8							Reddish brown mudstone
			0.040	0.051	A														
BHB2	22.20	C	0.343	0.461	A							3.9							Reddish brown mudstone
			0.172	0.238	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB2	24.20	C	0.235	0.322	D							3.1							Reddish brown mudstone
			0.305	0.402	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB3	5.30	C																	Reddish brown sandstone
BHB3	6.35	C	3.355 0.127	4.230 0.177	A D							2.1							Reddish brown mudstone
BHB3	9.20	C	1.047 7.647	1.446 9.272	D A	87.6					6.80	1.0	2.63 b 2.60 d						Reddish brown sandstone
BHB3	10.50	C	0.156 2.467	0.217 3.215	D A							1.3							Reddish brown sandstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB4	6.40	C																	Reddish brown mudstone
BHB4	9.50	C	4.064 3.030	5.297 4.130	A D							1.7							Reddish brown sandstone
BHB4	11.70	C	0.417 0.507	0.567 0.687	D A							3.6							Reddish brown mudstone
BHB4	12.80	C	1.678 0.399	2.164 0.554	A D	52.2					3.00	1.6	2.63 b 2.61 d						Reddish brown mudstone
BHB4	14.60	C	1.165 2.211	1.587 3.062	A D							1.2							Reddish brown sandstone
BHB4	16.40	C	0.583 0.444	0.786 0.611	A D							2.3							Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB5	2.60	C																	Reddish brown mudstone
BHB5	4.60	C	4.868	6.749	A							1.2							Red brown mudstone
			4.898	6.497	D														
BHB5	7.10	C	2.260	3.068	A							1.5							Red brown mudstone
			0.290	0.405	D														
BHB5	8.20	C	5.297	6.754	A							1.3							Red brown mudstone
			2.432	3.372	D														
BHB5	10.45	C	0.208	0.288	A							2.2							Red brown mudstone
			0.135	0.188	D														
BHB5	12.60	C	0.453	0.630	D							2.1							Red brown mudstone
			0.330	0.466	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB5	14.60	C																	Red brown mudstone
BHB5	15.20	C	0.228 0.250	0.315 0.325	D A	9.9					12.52	2.9	2.63 b 2.58 d						Red brown mudstone
BHB5	18.90	C	1.369 2.123	1.880 2.829	A D							2.0							Red brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
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Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB6	10.40	C	2.366	2.849	A	96.4					5.10	1.5	2.62 b						Purplish grey sandstone
			1.330	1.853	D							5.3	2.58 d						
BHB6	12.90	C	0.411	0.572	D														Purplish grey sandstone
			1.983	2.484	A							2.8							
BHB6	13.70	C	3.023	4.122	A														Purplish grey sandstone
			1.442	1.987	D							2.4							

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
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Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB7	6.40	C	0.014	0.018	A							9.4							Red brown mudstone
			0.006	0.008	D														
BHB7	8.20	C	3.396	4.460	A							2.8							Purplish grey sandstone
			4.003	5.163	D														
BHB7	10.20	C	1.264	1.738	D	27.5					5.80	1.9	2.60 b						Purplish grey conglomerate
			3.021	3.761	A								2.56 d						
BHB7	12.50	C	3.142	4.182	D							2.0							Purplish grey conglomerate
			3.561	4.532	A														
BHB7	13.80	C	3.726	4.694	A	46.2					6.40	1.5	2.63 b						Pinkish grey sandstone
			1.069	1.485	D							1.5	2.59 d						
BHB7	14.60	C	1.183	1.636	D	46.0			2.40		5.05		2.59 b						Pinkish grey sandstone
			1.908	2.370	A							1.6	2.56 d						

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHB7	16.90	C	1.090	1.507	D							1.8						Pinkish grey sandstone
			3.936	4.810	A													
BHB7	19.80	C	0.636	0.864	D							3.6						Reddish brown mudstone
			0.778	1.002	A													
BHB7	23.30	C	0.086	0.101	A							9.3						Reddish brown mudstone
			0.034	0.043	D													
BHB7	26.40	C	0.018	0.025	D							3.6						Reddish brown mudstone
			0.224	0.279	A													
BHB7	28.80	C	3.604	4.575	A	52.1					4.40	1.9	2.61 b					Reddish brown mudstone
			1.084	1.501	D								2.58 d					

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB7	31.70	C	1.175 4.872	1.642 6.118	D A							1.8							Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB8	5.30	C																	Reddish brown sandstone
BHB8	7.90	C																	Reddish brown mudstone
BHB8	10.60	C	2.715 1.209	3.423 1.679	A D							2.3							Reddish brown sandstone
BHB8	12.30	C	3.203 4.370	4.405 5.311	D A							1.9							Greenish grey sandstone
BHB8	14.40	C	0.029 0.111	0.039 0.145	D A							4.2							mudstone
BHB8	15.60	C	1.890 5.201	2.644 6.324	D A							1.2							Grey sandstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB8	19.70	C	1.085	1.455	D							2.4							Red brown mudstone
			1.633	2.119	A														
BHB8	22.10	C																	Red brown mudstone
BHB8	24.90	C	0.046	0.064	D	7.3					14.60	2.4	2.55 b						Red brown mudstone
			1.126	1.383	A								2.47 d						
BHB8	27.30	C	0.817	1.126	D							1.7							Red brown mudstone
			2.900	3.684	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHB9	4.85	C																	Red brown mudstone
BHB9▪	9.30	C																	Purplish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHC5	6.70	C	0.007	0.009	D							21							Reddish brown mudstone
			0.017	0.022	A														
BHC5	9.30	C	0.012	0.016	A							23							Reddish brown mudstone
			0.076	0.095	D														
BHC5	11.70	C	0.012	0.016	A							19							Reddish brown mudstone
			0.007	0.009	D														
BHC5	13.30	C	0.007	0.008	A							21							Reddish brown mudstone
			0.007	0.009	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHD4	15.70	C			D							17							Reddish brown mudstone
			0.067	0.086	A														
BHD4	27.70	C	0.693	0.836	D							6.6							Reddish brown mudstone
			0.693	0.895	A														
BHD4	30.60	C	0.013	0.017	A							13							Reddish brown mudstone
					D														
BHD4	32.90	C	0.121	0.153	D							12							Reddish brown mudstone
			0.194	0.248	A														
BHD4	33.80	C	0.176	0.202	A							9.9							Reddish brown mudstone
			0.065	0.082	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHD5	17.00	C	0.006	0.008	D A							20							Reddish brown mudstone
BHD5	19.50	C	0.008	0.010	D A							16							Reddish brown mudstone
BHD5	23.80	C	0.007	0.009	D A							14							Reddish brown mudstone
BHD5	25.40	C			A D							16							Reddish brown mudstone
BHD5	26.80	C	0.023	0.030	A D							14							Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing			UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
			Is	Is(50)	Type														
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHD6	18.70	C																	Reddish brown mudstone
BHD6	25.70	C																	Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHD7	16.00	C	0.025	0.031	D							22							Reddish brown mudstone
			0.016	0.020	A														
BHD7	21.10	C	0.007	0.009	D							15							Reddish brown mudstone
			0.007	0.009	A														
BHD7	22.60	C			D							15							Reddish brown mudstone
			0.006	0.008	A														
BHD7	25.75	C			D							18							Reddish brown mudstone
			0.005	0.007	A														
BHD7	29.40	C	0.013	0.017	D							11							Reddish brown mudstone
			0.059	0.078	A														
BHD7	34.80	C	0.007	0.009	D							14							Reddish brown mudstone
			0.095	0.121	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHE3A	16.20	C	0.006	0.008	A D							27							Reddish brown mudstone
BHE3A	18.70	C	0.029 0.027	0.036 0.035	A D							17							Reddish brown mudstone
BHE3A	20.30	C	0.027 0.024	0.034 0.031	D A							20							Reddish brown mudstone
BHE3A	22.50	C	0.014 0.013	0.018 0.017	A D							22							Reddish brown mudstone
BHE3A	24.20	C	0.031 0.055	0.039 0.070	A D							19							Reddish brown mudstone
BHE3A	26.50	C	0.013 0.026	0.017 0.034	A D							18							Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHF1	14.80	C	0.008	0.010	A							14							Reddish brown mudstone
			0.007	0.009	D														
BHF1	24.50	C	0.007	0.009	D							21							Reddish brown mudstone
			0.007	0.009	A														
BHF1	25.40	C	0.006	0.008	A	0.0						24	2.09 b						Reddish brown mudstone
					D								1.69 d						
BHF1	37.10	C	0.014	0.018	D							14							Reddish brown mudstone
			0.072	0.074	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHF2	30.70	C	0.085	0.084	L							29							Reddish brown mudstone
			0.294	0.256	L														
BHF2	32.10	C	0.315	0.388	A							31							Reddish brown mudstone
			0.129	0.166	D														
BHF2	33.10	C	0.071	0.089	D							27							Reddish brown mudstone
			0.123	0.160	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHF3	33.10	C	0.064	0.089	D							3.7							Reddish brown mudstone
			0.047	0.058	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHF4	20.90	C	0.006	0.008	A							21							Reddish brown mudstone
			0.009	0.011	D														
BHF4	26.80	C	0.089	0.095	D							14							Reddish brown mudstone
			0.118	0.146	A														
BHF4	33.80	C			D							15							Reddish brown mudstone
			0.007	0.009	A														
BHF4	38.40	C	0.097	0.123	D							7.0							Reddish brown mudstone
			0.330	0.423	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHF5	24.30	C	0.026	0.033	A D							10						Reddish brown mudstone
BHF5	33.00	C				0.0						28	2.01 b 1.57 d					Reddish brown mudstone
BHF5	38.20	C	0.008	0.010	A D							16						Reddish brown mudstone
BHF5	40.80	C	0.008	0.010	A D							12						Reddish brown mudstone
BHF5	42.60	C	0.006	0.008	D A							16						Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHF6	23.60	C	0.292	0.366	A							9.5							Reddish brown mudstone
			0.049	0.062	D														
BHF6	28.00	C			D							19							Reddish brown mudstone
			0.006	0.008	A														
BHF6	32.50	C	0.007	0.009	D							19							Reddish brown mudstone
			0.049	0.063	A														
BHF6	37.00	C	0.013	0.017	D							16							Reddish brown mudstone
			0.025	0.030	A														
BHF6	39.10	C	0.020	0.026	A							20							Reddish brown mudstone
			0.007	0.009	D														
BHF6	41.80	C			D							21							Reddish brown mudstone
			0.013	0.017	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHF6	47.50	C	0.151	0.173	A							14							Reddish brown mudstone
			0.020	0.025	D														
BHF6	50.30	C	0.025	0.032	A							18							Reddish brown mudstone
			0.007	0.009	D														
BHF6	51.50	C	0.046	0.061	A							15							Reddish brown mudstone
			0.013	0.017	D														
BHF6	51.80	C	0.061	0.080	A							9.7							Reddish brown mudstone
			0.027	0.035	D														
BHF6	54.10	C	0.137	0.161	A							13							Reddish brown mudstone
			0.054	0.069	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHG1	20.80	C	0.006	0.008	A							33							Reddish brown mudstone
					D														
BHG1	21.40	C			D							19							Reddish brown mudstone
			0.005	0.007	A														
BHG1	26.75	C	0.007	0.009	A							17							Reddish brown mudstone
					D														
BHG1	29.30	C			D							14							Reddish brown mudstone
			0.005	0.007	A														
BHG1	30.60	C	0.012	0.016	A							17							Reddish brown mudstone
			0.008	0.009	D														
BHG1	43.60	C	0.014	0.018	D							16							Reddish brown mudstone
			0.029	0.036	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHG1	48.60	C	0.145	0.178	A							12							Reddish brown mudstone
			0.232	0.287	D														
BHG1	49.80	C	0.097	0.119	A							12							Reddish brown mudstone
			0.076	0.097	D														
BHG1	52.80	C	0.389	0.479	A							11							Reddish brown mudstone
			0.096	0.120	D														
BHG1	54.80	C	0.391	0.433	A							9.3							Reddish brown mudstone
			0.209	0.261	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHG2	19.80	C	0.006	0.008	A D							30							Reddish brown mudstone
BHG2	24.65	C			D A							24							Reddish brown mudstone
BHG2	27.70	C	0.013 0.007	0.017 0.009	A D							24							Reddish brown mudstone
BHG2	28.20	C	0.022 0.007	0.030 0.009	A D							20							Reddish brown mudstone
BHG2	29.50	C	0.006	0.008	D A							15							Reddish brown mudstone
BHG2	32.40	C	0.013	0.017	D A							17							Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHG2	34.50	C	0.024	0.032	A							18							Reddish brown mudstone
			0.007	0.009	D														
BHG2	37.20	C	0.021	0.026	D							10							Reddish brown mudstone
			0.674	0.834	A														
BHG2	40.40	C	0.007	0.009	A							17							Reddish brown mudstone
			0.007	0.009	D														
BHG2	42.65	C	0.007	0.008	D							17							Reddish brown mudstone
			0.019	0.024	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHG3	18.40	C																	Reddish brown mudstone
BHG3	23.30	C	0.167 0.087	0.203 0.109	D A							15							Reddish brown mudstone
BHG3	23.80	C	0.024 0.028	0.032 0.036	A D							17							Reddish brown mudstone
BHG3	37.00	C																	Reddish brown mudstone
BHG3	38.50	C	0.014 0.103	0.018 0.122	D A							15							Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHG4	14.70	C	0.024	0.027	A							1.9							Greyish green mudstone
			0.014	0.018	D														
BHG4	19.20	C	0.040	0.047	A							19							Reddish brown mudstone
			0.007	0.009	D														
BHG4	25.10	C	0.022	0.028	A							20							Reddish brown mudstone
			0.007	0.009	D														
BHG4	26.80	C	0.042	0.054	D							16							Reddish brown mudstone
			0.178	0.218	A														
BHG4	28.00	C	0.007	0.009	D							18							Reddish brown mudstone
			0.036	0.047	A														
BHG4	31.70	C	0.289	0.396	D							2.6							Reddish brown mudstone
			0.193	0.245	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHG4	34.30	C	0.006	0.006	A D							16							Reddish brown mudstone
BHG4	36.50	C																	Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHG6	25.90	C	0.130 0.042	0.167 0.053	A D							16							Reddish brown mudstone
BHG6	28.00	C	0.028 0.042	0.035 0.053	A D							15							Reddish brown mudstone
BHG6	29.80	C	0.008 0.014	0.010 0.018	A D							23							Reddish brown mudstone
BHG6	31.90	C	0.006 0.007	0.008 0.009	A D							16							Reddish brown mudstone
BHG6	32.30	C	0.007 0.037	0.009 0.041	D A	0.0						19	2.00 b 1.70 d						Reddish brown mudstone
BHG6	34.50	C	0.038 0.014	0.047 0.018	A D							14							Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHG6	35.30	C																	Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHH7	21.10	C	0.007	0.009	A							18							Reddish brown mudstone
			0.007	0.009	D														
BHH7	22.00	C	0.253	0.298	A							12							Reddish brown mudstone
			0.102	0.130	D														
BHH7	25.90	C	0.160	0.203	D							7.5							Reddish brown mudstone
			0.502	0.575	A														
BHH7	27.40	C	0.562	0.711	D							6.0							Reddish brown mudstone
			0.455	0.565	A														
BHH7	29.40	C	0.744	0.921	A							6.8							Reddish brown mudstone
			0.397	0.497	D														
BHH7	31.30	C	0.847	1.032	A							21							Reddish brown mudstone
			0.730	0.917	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHH7	33.70	C	4.142 3.201	5.160 3.977	A D							4.7							Reddish brown mudstone
BHH7	34.50	C				41.2					15.10	4.4	2.53 b 2.42 d						Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHJ2	15.40	C	0.474	0.593	A							8.6							Reddish brown mudstone
			0.485	0.607	D														
BHJ2	16.30	C																	
BHJ2	17.90	C																	
BHJ2	19.20	C	0.174	0.179	A							10							Reddish brown mudstone
			0.007	0.009	D														
BHJ2	23.20	C																	
BHJ2	26.20	C			A							23							Reddish brown mudstone
					D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHL3	13.90	C	0.181	0.225	D							8.0							Reddish brown mudstone
			0.280	0.337	A														
BHL3	20.00	C	1.041	1.279	A							8.0							Reddish brown mudstone
			0.174	0.214	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHM2	13.40	C																	
BHM2	14.80	C																	
BHM2	15.10	C																	
BHM2	20.00	C																	

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHM4	9.50	C	2.204 2.472	2.761 2.870	D A							3.7						Grey sandstone
BHM4	10.00	C				55.8					11.00	3.1	2.46 b 2.39 d					Grey sandstone
BHM4	12.70	C	4.390 4.252	5.605 5.370	A D							1.8						Pinkish red purple conglomerate
BHM4	13.60	C				22.2					17.00	6.9	2.34 b 2.19 d					Greyish green conglomerate
BHM4	18.20	C	1.849 1.276	2.247 1.611	A D							6.1						Greyish green sandstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHM5	13.80	C	1.616	2.025	D							1.7							Yellowish brown dolomite
			1.382	1.564	A														
BHM5	15.50	C																	
BHM5	16.50	C																	

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN10B	7.40	C	2.513 2.528	3.204 3.159	A D							0.8							Dolomite
BHN10B	7.80	C				24.0					11.00	1.4	2.59 b 2.55 d						Dolomite
BHN10B	9.20	C	2.824 3.809	3.268 4.712	A D							1.5							Red brown sandstone
BHN10B	10.60	C	0.261 0.066	0.332 0.092	A D							2.9							Red brown mudstone
BHN10B	11.10	C				0.7						10	2.23 b 2.02 d						Red brown mudstone
BHN10B	13.00	C	0.059 0.061	0.074 0.076	D A							12							Red brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN10B	13.70	C	0.052 0.014	0.067 0.018	A D							10							Red brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN11	1.10	C	0.696 0.479	0.839 0.598	A D							1.7							Yellow brown limestone
BHN11	3.60	C	5.811 7.482	7.339 9.093	D A							0.3							Yellow brown limestone
BHN11	5.80	C				32.0					4.71	0.5	2.62 b 2.60 d						Yellowish brown conglomerate
BHN11	7.70	C	3.304 2.455	4.119 2.955	D A							1.8							Yellowish brown conglomerate
BHN11	9.70	C	4.027 2.780	4.896 3.526	D A							1.5							Yellowish brown conglomerate

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN12	0.30	C	3.289	4.062	D							1.3							Limestone
			3.504	4.195	A														
BHN12	3.60	C							11.40										Limestone
BHN12	6.20	C				131.8					5.50	0.9	2.69 b 2.67 d						Limestone
BHN12	7.90	C	4.702	5.848	D							0.9							Limestone
			6.820	7.858	A														
BHN12	8.20	C	6.251	7.890	D							0.6							Limestone
			6.431	7.758	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN1A	4.00	C				0.2						17	2.20 b 1.89 d						Greyish green sandstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN2	5.00	C	0.026	0.032	A							16							Reddish brown mudstone
			0.015	0.019	D														
BHN2	6.35	C	2.906	3.802	A	76.6				99.54	11.28	3.3	2.47 b						Light brown Dolomite
			1.829	2.272	D								2.40 d						
BHN2	8.70	C	4.895	6.180	A							4.8							Limestone
			5.689	6.828	D														
BHN2	10.60	C	0.224	0.269	A							8.1							Brown sandstone
			0.098	0.124	D														
BHN2	11.40	C	0.144	0.181	A							4.9							Limestone
			0.168	0.213	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN3	6.40	C																	Reddish brown mudstone
BHN3	8.25	C	3.367 1.815	4.282 2.237	A D							4.3							Reddish brown Dolomite
BHN3	8.60	C	1.653 2.536	2.081 3.031	D A	71.0					12.30	4.5	2.51 b 2.42 d						Reddish brown Dolomite
BHN3	9.60	C	4.142 5.271	5.117 6.546	A D							1.9							Yellowish brown Dolomite
BHN3	10.60	C	2.116 1.190	2.385 1.465	A D							9.0							Yellowish brown Dolomite
BHN3	12.30	C	4.569 6.762	5.699 7.913	D A							1.6							Reddish brown mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN4	2.60	C	0.015	0.019	A							23							Red mudstone
			0.013	0.017	D														
BHN4	4.10	C	0.034	0.042	D							16							Red mudstone
			0.044	0.055	A														
BHN4	6.60	C	0.023	0.029	D							12							Red mudstone
			0.052	0.063	A														
BHN4	8.60	C	0.740	0.926	D							5.6							Reddish brown mudstone
			7.290	9.043	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN5	2.70	C				30.9					8.60	2.2	2.58 b 2.52 d						Yellowish brown Dolomite
BHN5	4.40	C	1.421 1.651	1.793 2.015	D A							3.0							Yellowish brown Dolomite
BHN5	6.10	C	0.304 0.441	0.384 0.540	D A							6.3							
BHN5	7.90	C	1.288 1.569	1.623 1.979	D A							2.9							Yellowish brown Dolomite
BHN5	9.70	C	1.113 1.220	1.115 1.270	A D							4.0							Yellowish brown Dolomite
BHN5	12.30	C				99.0			9.20		2.40	1.5	2.40 b 2.37 d						Brown Dolomite

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN5	15.60	C	1.034	1.294	A							4.4							Brown Dolomite
			0.621	0.785	D														
BHN5	17.30	C	5.027	5.842	A							1.9							Brown sandstone
			6.486	7.662	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHN6	2.80	C	1.694	2.121	D							3.9						Yellowish brown Limestone
			2.240	2.761	A													
BHN6	4.60	C	2.084	2.788	A							4.7						Yellowish brown Limestone
			0.842	1.066	D													
BHN6	5.80	C	0.265	0.334	D							5.6						Yellowish brown Limestone
			0.354	0.455	A													
BHN6	7.00	C				0.7						10	2.35 b					Reddish brown mudstone
													2.13 d					
BHN6	8.60	C	0.323	0.407	A							5.5						Yellowish brown Dolomite
			0.134	0.169	D													
BHN6	11.30	C	6.925	8.628	D							1.4						Yellowish brown Dolomite
			4.658	5.652	A													

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN6	13.30	C	0.923	1.145	A							4.5							Yellow dolomite
			0.419	0.521	D														
BHN6	15.20	C	0.765	0.941	A							6.1							Reddish brown Dolomite
			0.583	0.727	D														
BHN6	16.50	C	2.948	3.485	A	22.2					6.90	1.5	2.73 b						Reddish brown Dolomite
			0.817	1.041	D								2.69 d						
BHN6	17.80	C	0.319	0.401	D							6.4							Reddish brown mudstone
			0.404	0.482	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN7	4.10	C	1.550	2.036	A							2.8							Yellowish brown Dolomite
			1.334	1.688	D														
BHN7	6.40	C	0.209	0.261	D	31.0					13.00	3.9	2.63 b						Yellowish brown Dolomite
			0.797	0.943	A								2.55 d						
BHN7	8.20	C	2.177	2.735	D							3.2							Yellowish brown Dolomite
			2.482	3.154	A														
BHN7	10.30	C	0.574	0.719	D							5.0							Yellowish brown Dolomite
			0.474	0.575	A														
BHN7	11.90	C	0.777	0.966	D							3.2							Yellowish brown Dolomite
			1.679	2.127	A														
BHN7	13.80	C	1.988	2.489	D							4.3							Yellowish brown Dolomite
			1.812	2.317	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN7	16.20	C	4.000	4.801	D							2.6							Brown dolomite
			2.884	3.726	A														
BHN7	17.20	C	4.476	5.690	A							1.7							Brown dolomite
			2.442	3.054	D														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHN8	4.80	C																
BHN8	5.40	C	1.011	1.272	D							3.9						Brown dolomite
			1.352	1.463	A													
BHN8	6.00	C	1.345	1.484	A							0.2						Brown dolomite
			2.101	2.680	D													
BHN8	7.20	C	0.698	0.880	D							2.7						Reddish brown conglomerate
			0.692	0.849	A													
BHN8	8.60	C	3.084	3.884	D							3.1						Reddish brown conglomerate
			1.914	2.511	A													

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHN9	7.60	C	1.984	2.506	D							1.8							Reddish brown conglomerate
			3.388	4.110	A														
BHN9	8.40	C	3.932	5.233	A							2.8							Reddish brown conglomerate
			5.478	6.699	D														
BHN9	9.80	C	3.246	3.976	D							3.8							Reddish brown conglomerate
			1.668	1.689	A														
BHN9	11.00	C	3.194	4.092	A							1.9							Reddish brown conglomerate
			3.764	4.689	D														
BHN9	12.60	C	0.167	0.212	D							1.9							Reddish brown conglomerate
			1.059	1.194	A														
BHN9	14.80	C	2.231	2.625	D							1.0							Reddish brown conglomerate
			10.157	11.830	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHP10	3.30	C				83.6					11.00	0.9	2.52 b 2.50 d					Brown sandstone
BHP10	4.40	C	4.647 4.203	5.709 5.418	D A							0.4						Brown sandstone
BHP10	5.40	C				97.6					3.50	0.2	2.75 b 2.75 d					Grey limestone
BHP10	6.10	C	5.201 5.469	6.697 6.757	A D							0.2						Yellowish brown limestone
BHP10	7.00	C	10.078 10.290	11.483 12.003	A D							0.2						Yellowish brown limestone
BHP10	9.20	C	5.162 5.923	6.069 7.322	A D							1.6						Yellowish brown limestone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP11	1.70	C	12.678	14.047	D							1.1							Brown conglomerate
			6.570	7.347	A														
BHP11	2.70	C																	
BHP11	3.80	C	0.067	0.086	D							8.0							Reddish brown mudstone
			0.213	0.230	A														
BHP11	5.20	C	0.264	0.323	A							6.3							Brown dolomite
			0.340	0.430	D														
BHP11	7.00	C	1.238	1.533	D							3.8							Brown conglomerate
			0.782	0.811	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP12	2.20	C	0.057 0.081	0.072 0.099	D A							14							Reddish brown mudstone
BHP12	3.80	C				118.7					8.90	2.0	2.61 b 2.56 d						Grey limestone
BHP12	4.10	C							11.30										Grey limestone
BHP12	5.30	C	1.190 1.965	1.486 2.446	D A							2.3							Grey limestone
BHP12	8.95	C	0.170 1.523	0.215 1.934	D A							2.6							Grey limestone
BHP12	11.30	C				71.2					7.30	1.4	2.70 b 2.67 d						Grey limestone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP12	12.10	C	3.797 5.348	4.611 6.341	A D							1.4							Grey mudstone

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHP1	1.20	C	3.099	3.792	D													Yellowish brown Dolomite
			3.354	4.327	A													
BHP1	2.80	C	3.339	4.194	D							0.4						Yellow Dolomite
			3.044	3.740	A													
BHP1	4.20	C	6.956	8.700	D							0.5						Yellow Dolomite
			5.270	6.479	A													
BHP1	5.90	C	5.017	6.237	D	80.0			9.75		6.00	0.6	2.74 b					Yellow Limestone
			5.627	6.125	A								2.73 d					
						80.0					6.00	0.6						
BHP1	6.90	C	3.525	4.331	D							0.4						Grey Limestone
			3.683	4.768	A													
BHP1	8.10	C				115.0					5.00	0.3	2.68 b					Grey Limestone
													2.67 d					

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP1	9.90	C	5.588	6.826	D							0.3							Grey Limestone
			5.684	6.725	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP2	3.20	C	1.526	1.956	A							3.9							Brown conglomerate
			1.134	1.432	D														
BHP2	4.30	C																	
BHP2	5.20	C	1.046	1.306	D							4.1							Brown conglomerate
			1.132	1.387	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP3	1.50	C	6.656	7.227	L							0.9							Brown limestone
			12.217	10.251	L														
BHP3	3.50	C	3.615	4.081	A							1.8							Brown limestone
BHP3	4.30	C	5.486	6.492	A							0.3							Grey limestone
			5.661	7.111	D														
BHP3	6.20	C	8.197	10.019	D							0.6							Grey limestone
			8.066	9.131	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s	GPa	
BHP4	1.40	C				42.9					8.50	1.5	2.60 b 2.56 d					Brown conglomerate
BHP4	2.80	C	1.280 1.520	1.615 1.890	A D							3.5						Brown conglomerate
BHP4	4.50	C	0.383 0.779	0.462 0.976	A D							7.4						Brown conglomerate

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP5	2.60	C	1.046	1.305	A							5.6							Brown conglomerate
			0.710	0.897	D														
BHP5	3.50	C																	
BHP5	5.50	C	1.346	1.700	D							2.3							Brown dolomite
			1.524	1.973	A														
BHP5	6.00	C	6.925	8.628	D							0.8							Grey limestone
			5.324	6.858	A														
BHP5	7.40	C				152.7					4.98	0.2	2.73 b						Grey limestone
													2.72 d						

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP6	2.80	C																	
BHP6	3.90	C																	
BHP6	5.00	C				13.0					18.43	1.9	2.39 b 2.34 d						Brown conglomerate
BHP6	6.50	C	0.697 0.676	0.920 0.863	A D							3.6							Brown dolomite
BHP6	8.00	C	0.817 1.338	1.041 1.651	D A							3.6							Brown dolomite

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP7	2.60	C	0.624	0.753	A							5.2							Brown conglomerate
			0.824	1.028	D														
BHP7	3.30	C	0.607	0.728	A							5.3							Brown conglomerate
			0.594	0.734	D														
BHP7	4.20	C				11.0					12.42	1.2	2.37 b						Brown conglomerate
													2.34 d						
BHP7	7.50	C	2.826	3.611	D							2.1							Brown conglomerate
			4.573	5.243	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave S-Wave Velocity		Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP8	2.60	C	0.376	0.472	D							6.9							Brown conglomerate
			0.519	0.640	A														
BHP8	4.10	C	0.320	0.384	A							9.2							Brown dolomite
			0.236	0.300	D														
BHP8	7.10	C	0.138	0.176	D							5.1							Red brown mudstone
			0.561	0.687	A														

CONSOLIDATED SUMMARY OF ALL LABORATORY ROCK TESTS
F10895 - M4 RELIEF ROAD

NORWEST HOLST SOIL ENGINEERING LIMITED
PRINT RUN : 0 STATUS :

Hole ID	Depth	TYPE	Point Load Testing Is	Is(50)	Type	UCS	Elastic Modulus	Poissons Ratio	Tensile Strength (Braz)	Slake Durability	Rock Porosity	Nat M/C	Bulk & Dry Density	Soundness Test	Shore Hardness	P-Wave Velocity	S-Wave Velocity	Elastic & Shear Modulus	Sample description
	m		MN/m²			MN/m²	MN/m²		MN/m²	%	%	%	Mg/m³	%		m/s		GPa	
BHP9	1.80	C	5.944	7.385	D							0.3							Brown limestone
			5.852	7.478	A														
BHP9	3.20	C	5.668	5.741	L							0.0							Grey limestone
			4.959	5.522	L														
BHP9	5.90	C	6.535	8.249	D							0.7							Grey limestone
			4.910	6.113	A														
BHP9	8.00	C	10.204	11.872	D							0.5							Grey limestone
			5.205	6.305	A														

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	VC%
BHA3	5.50	Light greyish pink fine to coarse grained closely to medium thickly spaced subhorizontally bedded moderately weathered SANDSTONE moderately strong	D	106.30	104.70	3.35	104.70	0.306	1.395	0.426	9.376	1.2
BHA3	5.50	Light greyish pink fine to coarse grained closely to medium thickly spaced subhorizontally bedded moderately weathered SANDSTONE moderately strong	A	106.30	67.00	4.70	95.23	0.518	1.336	0.693	15.237	
BHA3	11.50	Reddish brown mottled greyish green slightly to moderately weathered sandy MUDSTONE moderatelt strong to strong	D	106.40	94.20	33.00	94.20	3.719	1.330	4.945	108.798	1.4
BHA3	11.50	Reddish brown mottled greyish green slightly to moderately weathered sandy MUDSTONE moderatelt strong to strong	A	106.40	91.00	26.50	111.03	2.150	1.432	3.078	67.716	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB1	8.50	Reddish brown slightly weathered micaceous SANDSTONE moderately strong	A	106.60	52.50	36.00	84.41	5.052	1.266	6.395	140.685	1.4
BHB1	8.50	Reddish brown slightly weathered micaceous SANDSTONE moderately strong	D	106.60	105.90	13.00	105.90	1.159	1.402	1.625	35.747	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB2	9.60	Purplish to reddish brown mottled green moderately weathered very sandy MUDSTONE moderately weak to strong	A	106.30	45.90	4.40	78.82	0.708	1.227	0.869	19.123	2.1
BHB2	9.60	Purplish to reddish brown mottled green moderately weathered very sandy MUDSTONE moderately weak to strong	D	106.30	105.50	4.10	105.50	0.368	1.399	0.515	11.340	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB2	11.60	Reddish brown mottled green medium subhorizontally bedded slightly weathered very sandy MUDSTONE moderately strong	D	107.20	105.00	0.15	105.00	0.014	1.396	0.019	0.418	5.1
BHB2	11.60	Reddish brown mottled green medium subhorizontally bedded slightly weathered very sandy MUDSTONE moderately strong	A	107.20	78.50	0.20	103.51	0.019	1.387	0.026	0.570	
BHB2	13.60	Reddish brown mottled green medium subhorizontally bedded slightly weathered very sandy MUDSTONE moderately strong	D	106.90	100.20	2.70	100.20	0.269	1.367	0.368	8.089	4.8
BHB2	13.60	Reddish brown mottled green medium subhorizontally bedded slightly weathered very sandy MUDSTONE moderately strong	A	106.90	48.30	2.30	81.08	0.350	1.243	0.435	9.567	
BHB2	15.70	Reddish brown thinly inclined bedding slightly to moderately weathered sandy MUDSTONE moderately strong	D	107.00	104.20	0.50	104.20	0.046	1.392	0.064	1.410	6.1
BHB2	15.70	Reddish brown thinly inclined bedding slightly to moderately weathered sandy MUDSTONE moderately strong	A	107.00	74.30	0.80	100.61	0.079	1.370	0.108	2.382	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB2	19.85	Reddish brown thinly inclined bedding slightly to moderately weathered sandy MUDSTONE moderately strong	D	108.40	102.20	0.70	102.20	0.067	1.379	0.092	2.034	4.8
BHB2	19.85	Reddish brown thinly inclined bedding slightly to moderately weathered sandy MUDSTONE moderately strong	A	108.40	55.00	0.30	87.13	0.040	1.284	0.051	1.116	
BHB2	22.20	Purplish brown mottled green thinly to medium subhorizontally bedded slightly to moderately weathered silty MUDSTONE moderately weak	D	107.20	102.20	1.80	102.20	0.172	1.379	0.238	5.230	3.9
BHB2	22.20	Purplish brown mottled green thinly to medium subhorizontally bedded slightly to moderately weathered silty MUDSTONE moderately weak	A	107.20	68.40	3.20	96.62	0.343	1.345	0.461	10.143	
BHB2	24.20	Reddish brown mottled green medium subhorizontally bedded slightly to moderately weathered silty MUDSTONE moderately weak	D	107.10	101.10	2.40	101.10	0.235	1.373	0.322	7.091	3.1
BHB2	24.20	Reddish brown mottled green medium subhorizontally bedded slightly to moderately weathered silty MUDSTONE moderately weak	A	107.10	62.50	2.60	92.32	0.305	1.318	0.402	8.844	

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB3	6.35	Pink to greyish green fine to coarse grained moderately weathered SANDSTONE moderately strong	A	105.80	52.00	23.50	83.70	3.355	1.261	4.230	93.061	2.1
BHB3	6.35	Pink to greyish green fine to coarse grained moderately weathered SANDSTONE moderately strong	D	105.80	105.00	1.40	105.00	0.127	1.396	0.177	3.901	
BHB3	9.20	Pink to greyish green fine to coarse grained fresh to slightly weathered SANDSTONE strong	D	106.00	102.50	11.00	102.50	1.047	1.381	1.446	31.817	1.0
BHB3	9.20	Pink to greyish green fine to coarse grained fresh to slightly weathered SANDSTONE strong	A	106.00	43.60	45.00	76.71	7.647	1.212	9.272	203.976	
BHB3	10.50	Reddish brown mottled greyish green slightly to moderately weathered very sandy micaceous MUDSTONE moderately weak	D	106.10	104.40	1.70	104.40	0.156	1.393	0.217	4.779	1.3
BHB3	10.50	Reddish brown mottled greyish green slightly to moderately weathered very sandy micaceous MUDSTONE moderately weak	A	106.10	60.00	20.00	90.03	2.467	1.303	3.215	70.732	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 07 Jan 98 02:18:52 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB4	9.50	Reddish brown fine to medium grained thinly to medium subhorizontally bedded cross laminated slightly weathered micaceous SANDSTONE strong	A	106.30	60.00	33.00	90.12	4.064	1.304	5.297	116.537	1.7
BHB4	9.50	Reddish brown fine to medium grained thinly to medium subhorizontally bedded cross laminated slightly weathered micaceous SANDSTONE strong	D	106.30	99.50	30.00	99.50	3.030	1.363	4.130	90.862	
BHB4	11.70	Reddish brown thinly to medium subhorizontally bedded thinly and thickly cross laminated slightly weathered very sandy micaceous MUDSTONE strong	D	106.20	99.20	4.10	99.20	0.417	1.361	0.567	12.476	3.6
BHB4	11.70	Reddish brown thinly to medium subhorizontally bedded thinly and thickly cross laminated slightly weathered very sandy micaceous MUDSTONE strong	A	106.20	71.50	4.90	98.33	0.507	1.356	0.687	15.116	
BHB4	16.40	Reddish brown occasionally mottled greyish green thinly to medium sub-horizontally bedded slightly sandy MUDSTONE strong	A	105.90	70.00	5.50	97.15	0.583	1.348	0.786	17.286	2.3

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB4	12.80	Light grey to pink fine to medium grained medium subhorizontally bedded thinly thickly and cross laminated fresh to slightly weathered SANDSTONE strong to very strong	A	106.20	57.30	13.00	88.02	1.678	1.290	2.164	47.611	1.6
BHB4	12.80	Light grey to pink fine to medium grained medium subhorizontally bedded thinly thickly and cross laminated fresh to slightly weathered SANDSTONE strong to very strong	D	106.20	103.80	4.30	103.80	0.399	1.389	0.554	12.197	

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 07 Jan 98 02:18:52 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB4	16.40	Reddish brown occasionally mottled greyish green thinly to medium sub-horizontally bedded slightly sandy MUDSTONE strong	D	105.90	101.80	4.60	101.80	0.444	1.377	0.611	13.447	2.3

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD * Contract Number : F10895 * Process Date : 06 Jan 98 11:14:31 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB4	14.60	Purple and white fine to coarse grained medium subhorizontally bedded slightly sandy slightly weathered MUDSTONE strong	A	106.20	73.00	11.50	99.35	1.165	1.362	1.587	34.911	1.2
BHB4	14.60	Purple and white fine to coarse grained medium subhorizontally bedded slightly sandy slightly weathered MUDSTONE strong	D	106.20	103.10	23.50	103.10	2.211	1.385	3.062	67.360	

U - Unsuitable Sample
I - Invalid Failure
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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB5	4.80	Light grey to pink medium subhorizontally bedded thinly to thickly laminated slightly weathered micaceous SANDSTONE strong	A	106.20	79.00	52.00	103.35	4.868	1.386	6.749	148.483	1.2
BHB5	4.80	Light grey to pink medium subhorizontally bedded thinly to thickly laminated slightly weathered micaceous SANDSTONE strong	D	106.20	93.70	43.00	93.70	4.898	1.327	6.497	142.941	
BHB5	7.10	Reddish brown fine to medium grained thinly to thickly laminated slightly weathered micaceous SANDSTONE strong	A	106.20	72.00	22.00	98.67	2.260	1.358	3.068	67.503	1.5
BHB5	7.10	Reddish brown fine to medium grained thinly to thickly laminated slightly weathered micaceous SANDSTONE strong	D	106.20	105.10	3.20	105.10	0.290	1.397	0.405	8.903	
BHB5	8.20	Light greyish pink fine to medium grained medium to thickly subhorizontally bedded fresh to slightly weathered micaceous SANDSTONE strong	A	106.30	54.40	39.00	85.81	5.297	1.275	6.754	148.591	1.3
BHB5	8.20	Light greyish pink fine to medium grained medium to thickly subhorizontally bedded fresh to slightly weathered micaceous SANDSTONE strong	D	106.30	103.40	26.00	103.40	2.432	1.387	3.372	74.191	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB5	10.45	Reddish brown thickly bedded slightly weathered sandy slightly micaceous MUDSTONE moderately strong	A	106.30	78.00	2.20	102.75	0.208	1.383	0.288	6.340	2.2
BHB5	10.45	Reddish brown thickly bedded slightly weathered sandy slightly micaceous MUDSTONE moderately strong	D	106.30	103.50	1.45	103.50	0.135	1.387	0.188	4.131	
BHB5	12.60	Reddish brown mottled greyish green thinly and medium subhorizontally bedded slightly weathered very sandy MUDSTONE strong	D	106.30	104.00	4.90	104.00	0.453	1.390	0.630	13.857	2.1
BHB5	12.60	Reddish brown mottled greyish green thinly and medium subhorizontally bedded slightly weathered very sandy MUDSTONE strong	A	106.30	85.00	3.80	107.26	0.330	1.410	0.466	10.245	
BHB5	15.20	Reddish brown mottled greyish green closely to medium subhorizontally bedded fresh to slightly weathered very sandy MUDSTONE strong	D	106.40	102.70	2.40	102.70	0.228	1.383	0.315	6.921	2.9
BHB5	15.20	Reddish brown mottled greyish green closely to medium subhorizontally bedded fresh to slightly weathered very sandy MUDSTONE strong	A	106.40	59.00	2.00	89.40	0.250	1.299	0.325	7.150	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB5	18.90	Reddish brown mottled greyish green medium to thickly subhorizontally bedded fresh to slightly weathered silty MUDSTONE moderately strong	A	105.40	76.20	14.00	101.12	1.369	1.373	1.880	41.352	2.0
BHB5	18.90	Reddish brown mottled greyish green medium to thickly subhorizontally bedded fresh to slightly weathered silty MUDSTONE moderately strong	D	105.40	94.60	19.00	94.60	2.123	1.332	2.829	62.231	

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I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB6	10.40	Purplish grey brown fine to medium grained thinly to medium bedded thinly laminated slightly weathered micaceous SANDSTONE very strong	D	106.20	104.40	14.50	104.40	1.330	1.393	1.853	40.763	5.3
BHB6	10.40	Purplish grey brown fine to medium grained thinly to medium bedded thinly laminated slightly weathered micaceous SANDSTONE very strong	A	106.20	42.20	13.50	75.54	2.366	1.204	2.849	62.669	1.5
BHB6	12.90	Purplish grey brown fine to medium grained thinly to medium bedded thinly laminated slightly weathered micaceous SANDSTONE very strong	A	106.10	50.40	13.50	82.51	1.983	1.253	2.484	54.651	2.8
BHB6	12.90	Purplish grey brown fine to medium grained thinly to medium bedded thinly laminated slightly weathered micaceous SANDSTONE very strong	D	106.10	104.70	4.50	104.70	0.411	1.395	0.572	12.595	
BHB6	13.70	Purplish grey brown fine to medium grained thinly to medium bedded thinly laminated slightly weathered micaceous SANDSTONE very strong	D	106.20	102.00	15.00	102.00	1.442	1.378	1.987	43.717	2.4
BHB6	13.70	Purplish grey brown fine to medium grained thinly to medium bedded thinly laminated slightly weathered micaceous SANDSTONE very strong	A	106.20	73.40	30.00	99.62	3.023	1.364	4.122	90.686	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB7	6.40	Reddish brown mottled greyish green thinly to medium bedded highly to moderately weathered MUDSTONE moderately strongly	A	104.00	54.20	0.10	84.72	0.014	1.268	0.018	0.389	9.4
BHB7	6.40	Reddish brown mottled greyish green thinly to medium bedded highly to moderately weathered MUDSTONE moderately strongly	D	104.00	90.20	0.05	90.20	0.006	1.304	0.008	0.176	
BHB7	8.20	Purplish grey mottled greyish green fine to medium grained moderately weathered micaceous SANDSTONE strong	A	106.30	62.00	28.50	91.60	3.396	1.313	4.460	98.120	2.8
BHB7	8.20	Purplish grey mottled greyish green fine to medium grained moderately weathered micaceous SANDSTONE strong	D	106.30	88.00	31.00	88.00	4.003	1.290	5.163	113.579	
BHB7	10.20	Purplish grey mottled pale greyish green thinly to medium bedded slightly weathered calcitic sandy CONGLOMERATE	D	106.10	101.40	13.00	101.40	1.264	1.375	1.738	38.236	1.9
BHB7	10.20	Purplish grey mottled pale greyish green thinly to medium bedded slightly weathered calcitic sandy CONGLOMERATE	A	106.10	49.00	20.00	81.36	3.021	1.245	3.761	82.752	
BHB7	12.50	Purplish grey mottled pale greyish green thinly to medium bedded slightly weathered calcitic sandy CONGLOMERATE	D	106.20	94.40	28.00	94.40	3.142	1.331	4.182	92.011	2.0

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB7	12.50	Purplish grey mottled pale greyish green thinly to medium bedded slightly weathered calcitic sandy CONGLOMERATE	A	106.20	54.00	26.00	85.45	3.561	1.273	4.532	99.702	2.0
BHB7	19.80	Reddish brown occasionally mottled greyish green medium bedded slightly to moderately weathered MUDSTONE	D	106.30	98.70	6.20	98.70	0.636	1.358	0.864	19.015	3.6
BHB7	19.80	Reddish brown occasionally mottled greyish green medium bedded slightly to moderately weathered MUDSTONE	A	106.30	57.00	6.00	87.83	0.778	1.289	1.002	22.048	
BHB7	31.70	Light grey to dark grey fine to medium grained thinly to medium bedded thinly thickly and cross laminated fresh to slightly weathered micaceous SANDSTONE strong	D	106.30	105.20	13.00	105.20	1.175	1.398	1.642	36.116	1.8
BHB7	31.70	Light grey to dark grey fine to medium grained thinly to medium bedded thinly thickly and cross laminated fresh to slightly weathered micaceous SANDSTONE strong	A	106.30	50.80	33.50	82.92	4.872	1.256	6.118	134.592	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB7	13.80	Pale greyish green fine to medium grained medium to thickly subhorizontally bedded slightly weathered SANDSTONE very strong	D	106.20	103.70	11.50	103.70	1.069	1.389	1.485	32.668	1.5
BHB7	13.80	Pale greyish green fine to medium grained medium to thickly subhorizontally bedded slightly weathered SANDSTONE very strong	A	106.20	51.60	26.00	83.53	3.726	1.260	4.694	103.277	
BHB7	14.60	Pale greyish green fine to medium grained medium to thickly subhorizontal -ly bedded thinly and cross laminated fresh to slightly weathered micaceous SANDSTONE very strong	A	106.30	48.40	12.50	80.94	1.908	1.242	2.370	52.140	1.6
BHB7	14.60	Pale greyish green fine to medium grained medium to thickly subhorizontal -ly bedded thinly and cross laminated fresh to slightly weathered micaceous SANDSTONE very strong	D	106.30	102.80	12.50	102.80	1.183	1.383	1.636	35.992	
BHB7	16.80	Pinkish grey fine to medium grained medium to thickly subhorizontally bedded slightly weathered micaceous SANDSTONE strong to very strong	D	106.20	102.70	11.50	102.70	1.090	1.383	1.507	33.163	1.8

U - Unsuitable Sample
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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB7	16.80	Pinkish grey fine to medium grained medium to thickly subhorizontally bedded slightly weathered micaceous SANDSTONE strong to very strong	A	106.20	45.10	24.00	78.09	3.936	1.222	4.810	105.818	1.8
BHB7	28.80	Greyish pink fine to coarse grained medium to thickly bedded occasionally cross laminated fresh to slightly weathered micaceous SANDSTONE strong	A	106.30	53.30	26.00	84.93	3.604	1.269	4.575	100.642	1.9
BHB7	28.80	Greyish pink fine to coarse grained medium to thickly bedded occasionally cross laminated fresh to slightly weathered micaceous SANDSTONE strong	D	106.30	103.00	11.50	103.00	1.084	1.384	1.501	33.013	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB7	23.30	Reddish brown mottled greyish green slightly to moderately weathered silty MUDSTONE moderately weak to moderately strong	A	87.60	47.10	0.45	72.48	0.086	1.182	0.101	2.227	9.3
BHB7	23.30	Reddish brown mottled greyish green slightly to moderately weathered silty MUDSTONE moderately weak to moderately strong	D	87.60	85.60	0.25	85.60	0.034	1.274	0.043	0.956	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD * Contract Number : F10895 * Process Date : 06 Jan 98 11:14:31 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB7	26.40	Reddish brown occasionaly mottled greyish green medium bedded slightly to moderately weathered silty MUDSTONE moderately weak to moderately strong	D	106.80	104.70	0.20	104.70	0.018	1.395	0.025	0.560	3.6
BHB7	26.40	Reddish brown occasionaly mottled greyish green medium bedded slightly to moderately weathered silty MUDSTONE moderately weak to moderately strong	A	106.80	49.30	1.50	81.88	0.224	1.248	0.279	6.146	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB8	10.60	Reddish brown fine to medium grained silty SANDSTONE moderately strong to strong	A	106.30	51.70	19.00	83.65	2.715	1.261	3.423	75.304	2.3
BHB8	10.60	Reddish brown fine to medium grained silty SANDSTONE moderately strong to strong	D	106.30	103.70	13.00	103.70	1.209	1.389	1.679	36.929	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:58 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB8	12.30	Greenish grey to pink fine to coarse grained closely to medium subhorizontally bedded thickly cross laminated slightly weathered micaceous SANDSTONE, strong.	D	106.20	101.50	33.00	101.50	3.203	1.375	4.405	96.912	1.9
BHB8	12.30	Greenish grey to pink fine to coarse grained closely to medium subhorizontally bedded thickly cross laminated slightly weathered micaceous SANDSTONE, strong.	A	106.20	44.00	26.00	77.13	4.370	1.215	5.311	116.851	
BHB8	14.00	Reddish brown occasionally mottled grayish green thinly subhorizontally bedded sandy MUDSTONE, moderately weak.	D	106.20	102.50	0.30	102.50	0.029	1.381	0.039	0.868	4.2
BHB8	14.00	Reddish brown occasionally mottled grayish green thinly subhorizontally bedded sandy MUDSTONE, moderately weak.	A	106.20	60.00	0.90	90.07	0.111	1.303	0.145	3.181	
BHB8	15.80	Pinkish grey coarse to fine grained medium subhorizontally bedded cross laminated slightly weathered micaceous SANDSTONE, strong.	D	106.40	105.40	21.00	105.40	1.890	1.399	2.644	58.170	1.2
BHB8	15.80	Pinkish grey coarse to fine grained medium subhorizontally bedded cross laminated slightly weathered micaceous SANDSTONE, strong.	A	106.40	44.00	31.00	77.21	5.201	1.216	6.324	139.119	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:58 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB8	19.70	Reddish brown occasionally mottled greyish green medium subhorizontally bedded slightly weathered sandy MUDSTONE, moderately weak.	D	106.00	96.00	10.00	96.00	1.085	1.341	1.455	32.016	2.4
BHB8	19.70	Reddish brown occasionally mottled greyish green medium subhorizontally bedded slightly weathered sandy MUDSTONE, moderately weak.	A	106.00	59.00	13.00	89.23	1.633	1.298	2.119	46.612	
BHB8	24.90	Purplish brown occasionally mottled green medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE, moderately weak.	D	106.10	104.00	0.50	104.00	0.046	1.390	0.064	1.414	2.4
BHB8	24.90	Purplish brown occasionally mottled green medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE, moderately weak.	A	106.10	46.00	7.00	78.83	1.126	1.227	1.383	30.417	
BHB8	28.00	Purplish brown occasionally mottled green medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE, moderately weak.	D	106.30	102.00	8.50	102.00	0.817	1.378	1.126	24.773	1.7
BHB8	28.00	Purplish brown occasionally mottled green medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE, moderately weak.	A	106.30	53.50	21.00	85.09	2.900	1.270	3.684	81.052	

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D(e) = Equivalent core diameter
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De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD * Contract Number : F10895 * Process Date : 06 Jan 98 11:14:31 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB10	5.00	Reddish brown occasionaly mottled greyish green thinly bedded moderately weathered silty MUDSTONE moderately weak to moderately strong	A	108.80	50.00	0.00	83.23	0.000	1.258	0.000	0.000	8.3
BHB10	5.00	Reddish brown occasionaly mottled greyish green thinly bedded moderately weathered silty MUDSTONE moderately weak to moderately strong	D	108.80	105.90	0.00	105.90	0.000	1.402	0.000	0.000	
BHB10	8.60	Reddish brown occasionaly mottled greyish green thinly bedded moderately weathered silty MUDSTONE moderately weak to moderately strong	A	106.40	51.90	2.85	83.85	0.405	1.262	0.512	11.254	1.8
BHB10	8.60	Reddish brown occasionaly mottled greyish green thinly bedded moderately weathered silty MUDSTONE moderately weak to moderately strong	D	106.40	96.90	13.00	96.90	1.385	1.347	1.865	41.023	
BHB10	11.30	Reddish brown occasionaly mottled greyish green thinly bedded moderately weathered silty MUDSTONE moderately weak to moderately strong	D	107.10	104.20	1.60	104.20	0.147	1.392	0.205	4.511	4.9
BHB10	11.30	Reddish brown occasionaly mottled greyish green thinly bedded moderately weathered silty MUDSTONE moderately weak to moderately strong	A	107.10	41.70	0.70	75.41	0.123	1.203	0.148	3.258	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB10	7.30	Reddish brown occasionally greyish green thinly bedded moderately weathered silty MUDSTONE	A	106.60	74.50	0.20	100.56	0.020	1.369	0.027	0.596	6
BHB10	7.30	Reddish brown occasionally greyish green thinly bedded moderately weathered silty MUDSTONE	D	106.60	103.10	0.15	103.10	0.014	1.385	0.020	0.430	
BHB10	15.20	Greyish green to pink fine to coarse grained medium bedded fresh to slightly weathered micaceous SANDSTONE	A	106.60	28.80	11.50	62.52	2.942	1.106	3.253	71.571	1.5
BHB10	15.20	Greyish green to pink fine to coarse grained medium bedded fresh to slightly weathered micaceous SANDSTONE	D	106.60	103.60	11.00	103.60	1.025	1.388	1.422	31.295	
BHB10	18.20	Greyish green thinly subhorizontally bedded slightly to moderately weathered silty MUDSTONE	A	106.60	67.00	1.35	95.36	0.148	1.337	0.199	4.367	3.7
BHB10	18.20	Greyish green thinly subhorizontally bedded slightly to moderately weathered silty MUDSTONE	D	106.60	104.00	0.50	104.00	0.046	1.390	0.064	1.414	
BHB10	20.00	Reddish brown occasionally mottled greyish green medium subhorizontally bedded moderately weathered MUDSTONE moderately weak	A	106.70	67.20	2.70	95.55	0.296	1.338	0.396	8.708	3.2

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB10	20.00	Reddish brown occasionally mottled greyish green medium subhorizontally bedded moderately weathered MUDSTONE moderately weak	D	106.70	102.20	2.50	102.20	0.239	1.379	0.330	7.264	3.2
BHB10	25.10	Purplish brown mottled greyish green medium bedded moderately weathered MUDSTONE	A	106.50	85.50	10.50	107.67	0.906	1.412	1.279	28.138	2.7
BHB10	25.10	Purplish brown mottled greyish green medium bedded moderately weathered MUDSTONE	D	106.50	103.50	7.00	103.50	0.653	1.387	0.907	19.945	
BHB10	27.30	Purplish brown mottled greyish green medium bedded moderately weathered MUDSTONE	A	106.50	48.30	8.50	80.93	1.298	1.242	1.612	35.460	4.0
BHB10	27.30	Purplish brown mottled greyish green medium bedded moderately weathered MUDSTONE	D	106.50	104.40	4.40	104.40	0.404	1.393	0.562	12.370	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD * Contract Number : F10895 * Process Date : 06 Jan 98 11:14:31 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB10	22.60	Purplish brown mottled greyish green medium bedded slightly to moderately silty MUDSTONE moderately strong with closely spaced undulating thin laminations of calcite	L	47.80	44.00	2.15	51.75	0.803	1.016	0.815	17.939	1.6
BHB10	22.60	Purplish brown mottled greyish green medium bedded slightly to moderately silty MUDSTONE moderately strong with closely spaced undulating thin laminations of calcite	D	106.60	105.40	1.00	105.40	0.090	1.399	0.126	2.770	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB11	4.10	Reddish brown fine to medium grained thinly bedded fresh to slightly weathered slightly micaceous SANDSTONE strong	A	106.20	70.40	40.00	97.57	4.202	1.351	5.677	124.889	2.1
BHB11	4.10	Reddish brown fine to medium grained thinly bedded fresh to slightly weathered slightly micaceous SANDSTONE strong	D	106.20	91.00	50.00	91.00	6.038	1.309	7.905	173.917	
BHB11	6.40	Reddish brown fine to medium grained thinly bedded fresh to slightly weathered slightly micaceous SANDSTONE strong	D	106.20	102.60	30.00	102.60	2.850	1.382	3.938	86.642	1.7
BHB11	6.40	Reddish brown fine to medium grained thinly bedded fresh to slightly weathered slightly micaceous SANDSTONE strong	A	106.20	45.00	36.00	78.01	5.916	1.222	7.227	159.000	
BHB11	10.40	Reddish brown mottled greyish green thinly to medium subhorizontally bedded moderately to highly weathered MUDSTONE weak	D	106.70	98.80	0.10	98.80	0.010	1.359	0.014	0.306	7.1
BHB11	10.40	Reddish brown mottled greyish green thinly to medium subhorizontally bedded moderately to highly weathered MUDSTONE weak	A	106.70	55.00	0.60	86.44	0.080	1.279	0.103	2.260	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB11	13.20	Reddish brown mottled greyish green fine to medium grained slightly weathered silty SANDSTONE strong	D	106.30	96.20	31.50	96.20	3.404	1.342	4.569	100.525	1.9
BHB11	13.20	Reddish brown mottled greyish green fine to medium grained slightly weathered silty SANDSTONE strong	A	106.30	62.00	28.50	91.60	3.396	1.313	4.460	98.120	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:57 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB12	1.50	Firm reddish brown CLAY with some fine to medium angular mudstone gravel.	A	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	20
BHB12	1.50	Firm reddish brown CLAY with some fine to medium angular mudstone gravel.	D	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	
BHB12	5.20	Reddish brown thinly to medium bedded moderately weathered silty MUDSTONE, moderately weak.	A	108.20	88.00	0.10	110.11	0.008	1.427	0.012	0.259	8.1
BHB12	5.20	Reddish brown thinly to medium bedded moderately weathered silty MUDSTONE, moderately weak.	D	108.20	102.00	0.10	102.00	0.010	1.378	0.013	0.291	
BHB12	8.00	Reddish brown thinly to medium bedded slightly weathered silty MUDSTONE, moderately strong.	A	106.20	57.00	3.30	87.79	0.428	1.288	0.552	12.135	3.8
BHB12	8.00	Reddish brown thinly to medium bedded slightly weathered silty MUDSTONE, moderately strong.	D	106.20	105.00	1.40	105.00	0.127	1.396	0.177	3.901	
BHB12	9.80	Reddish brown thinly to medium bedded slightly weathered silty MUDSTONE, moderately strong.	A	106.80	44.00	0.70	77.35	0.117	1.217	0.142	3.132	5.9
BHB12	9.80	Reddish brown thinly to medium bedded slightly weathered silty MUDSTONE, moderately strong.	D	106.80	102.20	0.40	102.20	0.038	1.379	0.053	1.162	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:57 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB12	11.80	Reddish brown occasionally mottled green thinly subhorizontal to inclined bedded slightly weathered MUDSTONE, moderately weak.	A	107.30	77.00	0.30	102.57	0.029	1.382	0.039	0.867	7.9
BHB12	11.80	Reddish brown occasionally mottled green thinly subhorizontal to inclined bedded slightly weathered MUDSTONE, moderately weak.	D	107.30	104.00	0.20	104.00	0.018	1.390	0.026	0.566	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB13	19.40	Reddish brown slightly to moderately weathered slightly sandy MUDSTONE modertely weak to moderately strong	A	106.30	55.00	2.00	86.28	0.269	1.278	0.343	7.556	1.8
BHB13	19.40	Reddish brown slightly to moderately weathered slightly sandy MUDSTONE modertely weak to moderately strong	D	106.30	102.90	3.75	102.90	0.354	1.384	0.490	10.781	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:57 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB13	8.80	Greenish grey to pink fine to coarse grained medium subhorizontally to inclined bedded thickly and cross laminated fresh to slightly weathered micaceous SANDSTONE.	D	106.30	101.50	5.20	101.50	0.505	1.375	0.694	15.271	11
BHB13	8.80	Greenish grey to pink fine to coarse grained medium subhorizontally to inclined bedded thickly and cross laminated fresh to slightly weathered micaceous SANDSTONE.	A	106.30	73.00	5.00	99.40	0.506	1.362	0.689	15.167	
BHB13	10.00	Reddish brown fine to medium grained thinly to medium subhorizontally bedded slightly weathered SANDSTONE, moderately strong.	D	106.50	100.20	0.40	100.20	0.040	1.367	0.054	1.198	4.7
BHB13	10.00	Reddish brown fine to medium grained thinly to medium subhorizontally bedded slightly weathered SANDSTONE, moderately strong.	A	106.50	73.00	0.55	99.49	0.056	1.363	0.076	1.666	
BHB13	29.80	Greyish pink occasionally mottled greyish green fine to medium grained medium bedded thinly and cross laminated silty micaceous SANDSTONE, strong.	D	106.50	101.50	2.70	101.50	0.262	1.375	0.360	7.929	1.9

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB13	6.60	Greyish grey to pink fine to coarse grained medium subhorizontally to inclined bedded thickly and cross laminated fresh to slightly weathered micaceous SANDSTONE	D	106.00	103.50	47.00	103.50	4.388	1.387	6.087	133.914	1.9
BHB13	6.60	Greyish grey to pink fine to coarse grained medium subhorizontally to inclined bedded thickly and cross laminated fresh to slightly weathered micaceous SANDSTONE	A	106.00	42.00	8.00	75.29	1.411	1.202	1.697	37.329	
BHB13	11.60	Light greyish pink fine to medium grained thickly bedded thinly and cross laminated fresh SANDSTONE strong	D	106.60	104.90	18.00	104.90	1.636	1.396	2.283	50.229	1.6
BHB13	11.60	Light greyish pink fine to medium grained thickly bedded thinly and cross laminated fresh SANDSTONE strong	A	106.60	68.60	37.50	96.49	4.028	1.344	5.414	119.110	
BHB13	17.30	Reddish brown thinly subhorizontally bedded slightly to moderately weathered slightly sandy MUDSTONE moderately weak	D	106.50	103.80	1.20	103.80	0.111	1.389	0.155	3.404	4.7

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB13	17.30	Reddish brown thinly subhorizontally bedded slightly to moderately weathered slightly sandy MUDSTONE moderately weak	A	106.50	86.40	1.10	108.24	0.094	1.416	0.133	2.924	4.7
BHB13	21.50	Purplish brown occasionally mottled greyish green thinly to medium bedded slightly weathered very silty MUDSTONE moderately strong	D	106.20	104.40	0.60	104.40	0.055	1.393	0.077	1.687	2.9
BHB13	21.50	Purplish brown occasionally mottled greyish green thinly to medium bedded slightly weathered very silty MUDSTONE moderately strong	A	106.20	61.00	14.00	90.82	1.697	1.308	2.220	48.846	
BHB13	25.40	Reddish brown occasionally mottled greyish green thinly to medium bedded slightly weathered slightly sandy MUDSTONE moderately strong	D	106.40	103.50	1.20	103.50	0.112	1.387	0.155	3.419	4.7
BHB13	25.40	Reddish brown occasionally mottled greyish green thinly to medium bedded slightly weathered slightly sandy MUDSTONE moderately strong	A	106.40	84.00	3.20	106.68	0.281	1.406	0.395	8.700	
BHB13	27.60	Reddish brown occasionally mottled greyish green thinly to medium bedded slightly weathered slightly sandy MUDSTONE moderately strong	D	106.40	103.00	0.50	103.00	0.047	1.384	0.065	1.435	5.4

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB13	27.60	Reddish brown occasionally mottled greyish green thinly to medium bedded slightly weathered slightly sandy MUDSTONE moderately strong	A	106.40	65.50	0.85	94.20	0.096	1.330	0.127	2.802	5.4
BHB13	31.60	Reddish brown to purplish brown mottled greyish green medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE moderately strong	A	106.40	66.00	0.90	94.56	0.101	1.332	0.134	2.950	2.9
BHB13	31.60	Reddish brown to purplish brown mottled greyish green medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE moderately strong	D	106.40	103.70	0.80	103.70	0.074	1.389	0.103	2.273	

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:57 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB13	29.80	Greyish pink occasionally mottled greyish green fine to medium grained medium bedded thinly and cross laminated silty micaceous SANDSTONE, strong.	A	106.50	60.00	1.70	90.20	0.209	1.304	0.272	5.995	1.9

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A - Axial
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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:57 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB14	6.20	Reddish brown mottled greenish grey thinly to medium subhorizontally bedded slightly bedded slightly strong moderately weathered sandy MUDSTONE.	A	105.60	53.00	1.60	84.42	0.225	1.266	0.284	6.252	3.3
BHB14	6.20	Reddish brown mottled greenish grey thinly to medium subhorizontally bedded slightly bedded slightly strong moderately weathered sandy MUDSTONE.	D	105.60	101.70	0.60	101.70	0.058	1.376	0.080	1.757	
BHB14	18.35	Light greyish pink occasionally mottled greyish green fine to medium grained subhorizontally bedded fresh micaceous SANDSTONE, very strong.	A	106.10	58.40	16.50	88.82	2.091	1.295	2.709	59.589	1.3
BHB14	18.35	Light greyish pink occasionally mottled greyish green fine to medium grained subhorizontally bedded fresh micaceous SANDSTONE, very strong.	D	106.10	91.00	31.00	91.00	3.744	1.309	4.901	107.829	
BHB14	22.20	Reddish brown occasional mottled greyish green medium subhorizontally bedded slightly weathered sandy MUDSTONE, strong.	A	106.20	58.00	8.00	88.56	1.020	1.293	1.319	29.025	2.7
BHB14	22.20	Reddish brown occasional mottled greyish green medium subhorizontally bedded slightly weathered sandy MUDSTONE, strong.	D	106.20	105.40	5.00	105.40	0.450	1.399	0.630	13.850	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB14	12.30	Reddish brown mottled greyish green thinly to medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE moderately strong	A	106.60	56.20	0.20	87.34	0.026	1.285	0.034	0.741	5.3
BHB14	12.30	Reddish brown mottled greyish green thinly to medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE moderately strong	D	106.60	102.50	0.30	102.50	0.029	1.381	0.039	0.868	
BHB14	14.70	Reddish brown medium to thickly subhorizontally bedded fresh to slightly weathered very sandy slightly micaceous MUDSTONE very strong	A	106.70	61.20	6.00	91.18	0.722	1.310	0.946	20.805	2.7
BHB14	14.70	Reddish brown medium to thickly subhorizontally bedded fresh to slightly weathered very sandy slightly micaceous MUDSTONE very strong	D	106.70	104.00	3.20	104.00	0.296	1.390	0.411	9.050	
BHB14	25.20	Purplish brown fine to medium grained medium to very thickly subhorizontally bedded fresh argillaceous micaceous SANDSTONE very strong	A	106.50	51.40	35.00	83.49	5.022	1.259	6.325	139.141	3.7

U - Unsuitable Sample
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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 07 Jan 98 02:18:52 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB14	16.70	Light greyish pink fine to medium grained medium to thick subhorizontal bedding thinly to thickly laminated fresh to slightly weathered micaceous SANDSTONE very strong	D	55.80	52.70	13.00	52.70	4.681	1.024	4.793	105.444	1.5
BHB14	16.70	Light greyish pink fine to medium grained medium to thick subhorizontal bedding thinly to thickly laminated fresh to slightly weathered micaceous SANDSTONE very strong	A	55.80	34.00	16.00	34.00	13.841	0.841	11.636	255.985	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB14	25.20	Purplish brown fine to medium grained medium to very thickly subhorizontally bedded fresh argillaceous micaceous SANDSTONE very strong	D	106.50	101.80	14.00	101.80	1.351	1.377	1.860	40.927	3.7

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I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB15	6.20	Reddish brown medium to thickly bedded moderately weathered slightly sandy silty MUDSTONE weak to moderately weak	D	107.00	105.80	0.60	105.80	0.054	1.401	0.075	1.652	4.1
BHB15	6.20	Reddish brown medium to thickly bedded moderately weathered slightly sandy silty MUDSTONE weak to moderately weak	A	107.00	64.00	0.50	93.38	0.057	1.325	0.076	1.671	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB15	13.20	Reddish brown fine to medium grained slightly weathered silty SANDSTONE strong	A	106.40	46.40	13.00	79.28	2.068	1.231	2.545	55.988	2.25
BHB15	13.20	Reddish brown fine to medium grained slightly weathered silty SANDSTONE strong	D	106.40	104.80	2.20	104.80	0.200	1.395	0.279	6.148	
BHB15	16.20	Reddish brown occasionally mottled greyish green slightly weathered sandy MUDSTONE moderately strong to strong	D	106.20	106.10	2.30	106.10	0.204	1.403	0.287	6.306	3.5
BHB15	16.20	Reddish brown occasionally mottled greyish green slightly weathered sandy MUDSTONE moderately strong to strong	A	106.20	47.60	1.10	80.23	0.171	1.237	0.211	4.651	

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I - Invalid Failure
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 07 Jan 98 02:18:52 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB15	9.00	Purplish brown mottled greyish green thinly to medium subhorizontally bedded slightly to moderately weathered silty MUDSTONE moderately weak to moderately strong	A	106.20	77.70	4.50	102.50	0.428	1.381	0.592	13.016	2
BHB15	9.00	Purplish brown mottled greyish green thinly to medium subhorizontally bedded slightly to moderately weathered silty MUDSTONE moderately weak to moderately strong	D	106.20	101.00	10.00	101.00	0.980	1.372	1.345	29.593	
BHB15	14.90	Reddish brown fine to medium grained thinly bedded slightly weathered silty SANDSTONE strong	D	106.40	101.20	13.50	101.20	1.318	1.373	1.810	39.828	2
BHB15	14.90	Reddish brown fine to medium grained thinly bedded slightly weathered silty SANDSTONE strong	A	106.40	34.20	11.00	68.07	2.374	1.149	2.728	60.010	
BHB15	18.50	Reddish brown occasionally mottled greyish green thinly to medium bedded slightly weathered sandy MUDSTONE moderately strong	D	106.30	0.00	1.00	0.00	0.000	0.000	0.000	0.000	4.8
BHB15	18.50	Reddish brown occasionally mottled greyish green thinly to medium bedded slightly weathered sandy MUDSTONE moderately strong	L	54.00	46.20	3.10	56.36	0.976	1.055	1.030	22.659	

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB16	8.95	Reddish brown occasionally green mottled moderately weathered MUDSTONE	A	106.50	59.00	2.20	89.44	0.275	1.299	0.357	7.860	3.1
BHB16	8.95	Reddish brown occasionally green mottled moderately weathered MUDSTONE	D	106.50	104.00	3.70	104.00	0.342	1.390	0.476	10.464	
BHB16	13.70	Reddish brown mottled green slightly weathered micaceous MUDSTONE	A	106.50	70.00	15.00	97.43	1.580	1.350	2.134	46.938	2.0
BHB16	13.70	Reddish brown mottled green slightly weathered micaceous MUDSTONE	D	106.50	103.20	13.00	103.20	1.221	1.386	1.691	37.207	
BHB16	15.50	Reddish brown green mottled moderately weathered MUDSTONE	A	106.70	79.00	5.30	103.60	0.494	1.388	0.685	15.079	3.3
BHB16	15.50	Reddish brown green mottled moderately weathered MUDSTONE	D	106.70	98.00	1.10	98.00	0.115	1.354	0.155	3.411	
BHB16	17.60	Reddish brown green mottled moderately weathered MUDSTONE	D	106.40	102.00	3.10	102.00	0.298	1.378	0.411	9.035	3.1
BHB16	17.60	Reddish brown green mottled moderately weathered MUDSTONE	A	106.40	64.00	3.90	93.11	0.450	1.323	0.595	13.091	
BHB16	19.70	Reddish brown green mottled moderately weathered MUDSTONE	D	106.60	101.50	0.80	101.50	0.078	1.375	0.107	2.349	4.4
BHB16	19.70	Reddish brown green mottled moderately weathered MUDSTONE	A	106.60	50.00	3.80	82.38	0.560	1.252	0.701	15.422	
BHB16	22.30	Reddish brown green mottled moderately weathered MUDSTONE	D	106.30	105.00	0.45	105.00	0.041	1.396	0.057	1.254	5.1

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB16	22.30	Reddish brown green mottled moderately weathered MUDSTONE	A	106.30	66.30	0.30	94.73	0.033	1.333	0.045	0.981	5.1

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:58 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB17	4.35	Reddish brown mottled greyish green medium to thickly horizontally bedded moderately weathered silty MUDSTONE, moderately weak.	D	107.10	104.20	0.20	104.20	0.018	1.392	0.026	0.564	5.8
BHB17	4.35	Reddish brown mottled greyish green medium to thickly horizontally bedded moderately weathered silty MUDSTONE, moderately weak.	A	107.10	85.00	0.20	107.66	0.017	1.412	0.024	0.536	
BHB17	5.80	Reddish brown thinly to medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE, moderately weak.	A	106.80	77.00	7.00	102.33	0.669	1.380	0.923	20.300	3.1
BHB17	5.80	Reddish brown thinly to medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE	D	106.20	106.10	0.35	106.10	0.031	1.403	0.044	0.960	
BHB17	5.80	Reddish brown thinly to medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE	A	106.20	42.60	1.30	75.90	0.226	1.207	0.272	5.991	3.1
BHB17	5.80	Reddish brown thinly to medium subhorizontally bedded slightly to moderately weathered sandy MUDSTONE, moderately weak.	D	106.80	102.00	3.20	102.00	0.308	1.378	0.424	9.326	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:58 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB17	7.60	Light greyish pink fine to coarse grained medium to thickly subhorizontally bedded thinly and thickly cross laminated micaceous SANDSTONE, very strong.	A	106.30	55.00	53.00	86.28	7.120	1.278	9.101	200.222	1.3
BHB17	7.60	Light greyish pink fine to coarse grained medium to thickly subhorizontally bedded thinly and thickly cross laminated micaceous SANDSTONE, very strong.	D	106.30	99.00	28.00	99.00	2.857	1.360	3.885	85.469	
BHB17	9.35	Light greyish pink fine to coarse grained medium to thickly subhorizontally bedded thinly and thickly cross laminated micaceous SANDSTONE.	D	106.40	104.00	11.50	104.00	1.063	1.390	1.478	32.522	1.3
BHB17	9.35	Light greyish pink fine to coarse grained medium to thickly subhorizontally bedded thinly and thickly cross laminated micaceous SANDSTONE.	A	106.40	60.40	34.50	90.46	4.216	1.306	5.505	121.120	
BHB17	10.30	Light greyish pink fine to coarse grained medium to thickly subhorizontally bedded thinly and thickly cross laminated micaceous SANDSTONE, very strong.	A	106.40	36.30	11.00	70.13	2.237	1.164	2.605	57.302	1.4

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB17	13.50	Green thinly to medium subhorizontally bedded slightly to moderately weathered silty MUIDSTONE moderately strong	D	105.90	95.60	3.20	95.60	0.350	1.339	0.469	10.312	4.7
BHB17	13.50	Green thinly to medium subhorizontally bedded slightly to moderately weathered silty MUIDSTONE moderately strong	A	105.90	68.00	4.50	95.75	0.491	1.340	0.657	14.465	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:58 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB17	10.30	Light greyish pink fine to coarse grained medium to thickly subhorizontally bedded thinly and thickly cross laminated micaceous SANDSTONE, very strong.	D	106.40	104.30	15.00	104.30	1.379	1.392	1.920	42.232	1.4
BHB17	12.20	White to light grey fine to coarse grained thickly subhorizontally bedded fresh silicaceous CONGLOMERATE.	D	106.40	97.30	47.00	97.30	4.964	1.349	6.699	147.370	0.9
BHB17	12.20	White to light grey fine to coarse grained thickly subhorizontally bedded fresh silicaceous CONGLOMERATE.	A	106.40	69.00	32.00	96.68	3.423	1.345	4.606	101.331	
BHB17	15.90	Reddish brown occasionally mottled grayish green fine to medium grained closely to medium subhorizontally bedded slightely weathered slightly micaceous SANDSTONE.IRREGULAR LUMP TEST	D	106.30	102.50	12.00	102.50	1.142	1.381	1.578	34.709	1.4
BHB17	15.90	Reddish brown occasionally mottled grayish green fine to medium grained closely to medium subhorizontally bedded slightely weathered slightly micaceous SANDSTONE.IRREGULAR LUMP TEST	A	106.30	52.00	28.00	83.89	3.978	1.262	5.022	110.477	

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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB18	2.20	Reddish brown mottled green moderate to highly weathered MUDSTONE	D	106.70	96.00	0.25	96.00	0.027	1.341	0.036	0.800	11
BHB18	2.20	Reddish brown mottled green moderate to highly weathered MUDSTONE	A	106.70	82.50	0.10	105.87	0.009	1.402	0.013	0.275	
BHB18	4.60	Reddish brown mottled green moderate to highly weathered MUDSTONE	A	106.70	67.70	0.10	95.90	0.011	1.341	0.015	0.321	8.8
BHB18	4.60	Reddish brown mottled green moderate to highly weathered MUDSTONE	D	106.70	100.30	0.10	100.30	0.010	1.368	0.014	0.299	
BHB18	7.70	Reddish brown mottled green moderately weathered MUDSTONE	D	106.70	102.10	1.70	102.10	0.163	1.379	0.225	4.947	4.9
BHB18	7.70	Reddish brown mottled green moderately weathered MUDSTONE	A	106.70	74.00	0.75	100.27	0.075	1.368	0.102	2.245	
BHB18	9.10	Reddish brown mottled green moderately weathered MUDSTONE	D	106.50	103.60	5.50	103.60	0.512	1.388	0.711	15.647	2.1
BHB18	9.10	Reddish brown mottled green moderately weathered MUDSTONE	A	106.50	67.20	23.00	95.46	2.524	1.338	3.377	74.285	
BHB18	11.40	Reddish brown mottled green moderately to highly weathered MUDSTONE	D	106.50	101.10	0.20	101.10	0.020	1.373	0.027	0.591	5.9
BHB18	11.40	Reddish brown mottled green moderately to highly weathered MUDSTONE	A	106.50	73.00	0.30	99.49	0.030	1.363	0.041	0.909	

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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHB19A	16.30	Reddish brown occasionally greenish grey mottled highly to completely weathered MUDSTONE	A	105.80	49.20	0.10	81.41	0.015	1.245	0.019	0.413	9.6
BHB19A	16.30	Reddish brown occasionally greenish grey mottled highly to completely weathered MUDSTONE	D	105.80	100.20	0.20	100.20	0.020	1.367	0.027	0.599	
BHB19A	18.20	Reddish brown occasionally greyish green mottled moderately weathered MUDSTONE	A	106.40	73.50	1.90	99.79	0.191	1.365	0.260	5.729	5
BHB19A	18.20	Reddish brown occasionally greyish green mottled moderately weathered MUDSTONE	D	106.40	101.00	3.10	101.00	0.304	1.372	0.417	9.174	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHC5	6.70	Reddish brown occasionally mottled green medium to thickly bedded silty MUDSTONE moderately weak	D	88.30	86.00	0.05	86.00	0.007	1.276	0.009	0.190	21
BHC5	6.70	Reddish brown occasionally mottled green medium to thickly bedded silty MUDSTONE moderately weak	A	88.30	79.80	0.15	94.72	0.017	1.333	0.022	0.490	
BHC5	9.30	Reddish brown occasionally mottled green medium to thickly bedded silty MUDSTONE moderately weak	A	88.90	72.20	0.10	90.40	0.012	1.305	0.016	0.351	23
BHC5	9.30	Reddish brown occasionally mottled green medium to thickly bedded silty MUDSTONE moderately weak	D	88.90	81.00	0.50	81.00	0.076	1.242	0.095	2.083	
BHC5	11.70	Reddish brown occasionally mottled green medium to thickly bedded silty MUDSTONE moderately weak	A	88.30	72.70	0.10	90.41	0.012	1.305	0.016	0.351	19
BHC5	11.70	Reddish brown occasionally mottled green medium to thickly bedded silty MUDSTONE moderately weak	D	88.30	85.50	0.05	85.50	0.007	1.273	0.009	0.192	
BHC5	13.30	Reddish brown occasionally mottled green medium to thickly bedded silty MUDSTONE moderately weak	A	87.80	67.70	0.05	87.00	0.007	1.283	0.008	0.186	21

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHC5	13.30	Reddish brown occasionally mottled green medium to thickly bedded silty MUDSTONE moderately weak	D	87.80	85.10	0.05	85.10	0.007	1.270	0.009	0.193	21

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHD4	15.70	Reddish brown occasionally mottled green medium to thickly subhorizontally bedded moderately weathered silty MUDSTONE moderately weak	D	87.20	82.50	0.00	82.50	0.000	1.253	0.000	0.000	17
BHD4	15.70	Reddish brown occasionally mottled green medium to thickly subhorizontally bedded moderately weathered silty MUDSTONE moderately weak	A	87.20	67.30	0.50	86.44	0.067	1.279	0.086	1.883	
BHD4	27.70	Reddish brown very thinly to thinly subhorizontally bedded slightly to moderately weathered very sandy MUDSTONE moderately weak	D	87.60	76.00	4.00	76.00	0.693	1.207	0.836	18.394	6.6
BHD4	27.70	Reddish brown very thinly to thinly subhorizontally bedded slightly to moderately weathered very sandy MUDSTONE moderately weak	A	87.60	69.90	5.40	88.30	0.693	1.292	0.895	19.682	
BHD4	30.60	Reddish brown occasionally mottled green medium to thickly subhorizontally bedded slightly to moderately weathered silty MUDSTONE	A	87.10	69.90	0.10	88.04	0.013	1.290	0.017	0.366	13
BHD4	30.60	Reddish brown occasionally mottled green medium to thickly subhorizontally bedded slightly to moderately weathered silty MUDSTONE	D	87.10	69.90	0.00	69.90	0.000	1.163	0.000	0.000	

U - Unsuitable Sample
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHD4	32.90	Reddish brown occasionally mottled green medium to thickly subhorizontally bedded slightly to moderately weathered silty MUDSTONE	D	87.30	83.80	0.85	83.80	0.121	1.262	0.153	3.360	12
BHD4	32.90	Reddish brown occasionally mottled green medium to thickly subhorizontally bedded slightly to moderately weathered silty MUDSTONE	A	87.30	67.40	1.45	86.56	0.194	1.280	0.248	5.451	
BHD4	33.80	Reddish brown occasionally mottled green medium to thickly subhorizontally bedded slightly to moderately weathered silty MUDSTONE	A	86.90	41.00	0.80	67.35	0.176	1.143	0.202	4.436	9.9
BHD4	33.80	Reddish brown occasionally mottled green medium to thickly subhorizontally bedded slightly to moderately weathered silty MUDSTONE	D	86.90	83.30	0.45	83.30	0.065	1.258	0.082	1.795	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHD5	17.00	Reddish brown occasionally mottled green moderately weathered silty MUDSTONE moderately weak	D	88.50	86.20	0.00	86.20	0.000	1.278	0.000	0.000	20
BHD5	17.00	Reddish brown occasionally mottled green moderately weathered silty MUDSTONE moderately weak	A	88.50	75.50	0.05	92.24	0.006	1.317	0.008	0.170	
BHD5	25.40	Reddish brown occasionally mottled green thinly to medium horizontally to subhorizontally bedded moderately weathered silty MUDSTONE moderately weak	A	87.80	78.40	0.00	93.62	0.000	1.326	0.000	0.000	16
BHD5	25.40	Reddish brown occasionally mottled green thinly to medium horizontally to subhorizontally bedded moderately weathered silty MUDSTONE moderately weak	D	87.80	84.50	0.00	84.50	0.000	1.266	0.000	0.000	
BHD5	26.80	Reddish brown occasionally mottled green thinly to medium horizontally to subhorizontally bedded moderately weathered silty MUDSTONE moderately weak	A	87.80	77.70	0.20	93.20	0.023	1.323	0.030	0.670	14

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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 09 Feb 98 12:30:36 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHD5	19.50	Reddish brown occasionally mottled green medium to thickly horizontally bedded moderately weathered silty MUDSTONE, moderately weak.	D	87.20	86.00	0.00	86.00	0.000	1.276	0.000	0.000	16
BHD5	19.50	Reddish brown occasionally mottled green medium to thickly horizontally bedded moderately weathered silty MUDSTONE, moderately weak.	A	87.20	55.00	0.05	78.14	0.008	1.223	0.010	0.220	
BHD5	23.80	Reddish brown occasionally mottled green thinly to medium horizontal to subhorizontally bedded moderately weathered silty MUDSTONE, moderately weak.	D	87.10	86.40	0.00	86.40	0.000	1.279	0.000	0.000	14
BHD5	23.80	Reddish brown mottled green thinly to medium horizontal to subhorizontally bedded moderately weathered silty MUDSTONE moderately weak	A	87.10	62.50	0.05	83.25	0.007	1.258	0.009	0.200	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHD5	26.80	Reddish brown occasionally mottled green thinly to medium horizontally to subhorizontally bedded moderately weathered silty MUDSTONE moderately weak	D	87.80	86.50	0.00	86.50	0.000	1.280	0.000	0.000	14

U - Unsuitable Sample
I - Invalid Failure
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:59 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHD7	16.00	Reddish brown mottled greyish green occasionally thinly laminated highly to completely weathered MUDSTONE, very weak.	D	89.20	77.00	0.15	77.00	0.025	1.214	0.031	0.676	22
BHD7	16.00	Reddish brown mottled greyish green occasionally thinly laminated highly to completely weathered MUDSTONE, very weak.	A	89.20	55.00	0.10	79.03	0.016	1.229	0.020	0.433	
BHD7	21.10	Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, moderately weak.	D	88.00	84.30	0.05	84.30	0.007	1.265	0.009	0.196	15
BHD7	21.10	Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, moderately weak.	A	88.00	62.00	0.05	83.35	0.007	1.259	0.009	0.199	
BHD7	22.60	Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, moderately weak.	D	8.10	85.50	0.00	85.50	0.000	1.273	0.000	0.000	15
BHD7	22.60	Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE, moderately weak.	A	88.10	76.50	0.05	92.63	0.006	1.320	0.008	0.169	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:59 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHD7	25.75	Reddish brown occasionally mottled green medium bedded moderately weathered silty MUDSTONE, moderately weak.	D	88.10	86.00	0.00	86.00	0.000	1.276	0.000	0.000	18
BHD7	25.75	Reddish brown occasionally mottled green medium bedded moderately weathered silty MUDSTONE, moderately weak.	A	88.10	82.00	0.05	95.91	0.005	1.341	0.007	0.160	
BHD7	29.40	Reddish brown mottled green thinly to medium bedded highly weathered silty sandy MUDSTONE.	D	89.00	86.50	0.10	86.50	0.013	1.280	0.017	0.376	11
BHD7	29.40	Reddish brown mottled green thinly to medium bedded highly weathered silty sandy MUDSTONE.	A	89.00	74.50	0.50	91.88	0.059	1.315	0.078	1.713	
BHD7	34.80	Reddish brown thinly to medium bedded moderately weathered silty MUDSTONE, moderately weak.	D	88.80	86.50	0.05	86.50	0.007	1.280	0.009	0.188	14
BHD7	34.80	Reddish brown thinly to medium bedded moderately weathered silty MUDSTONE, moderately weak.	A	88.80	65.00	0.70	85.73	0.095	1.275	0.121	2.671	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:59 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHE3A	16.20	Reddish brown occasionally mottled greenish grey medium to thickly subhorizontally bedded thinly laminated highly to completely weathered MUDSTONE, very weak.	A	87.40	74.00	0.05	90.75	0.006	1.308	0.008	0.175	27
BHE3A	16.20	Reddish brown occasionally mottled greenish grey medium to thickly subhorizontally bedded thinly laminated highly to completely weathered MUDSTONE, very weak.	D	87.40	84.00	0.00	84.00	0.000	1.263	0.000	0.000	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHE3A	18.70	Reddish brown occasionally mottled greyish green thinly laminated highly to completely weathered MUDSTONE	A	86.10	63.00	0.20	83.10	0.029	1.257	0.036	0.801	17
BHE3A	18.70	Reddish brown occasionally mottled greyish green thinly laminated highly to completely weathered MUDSTONE	D	86.10	85.50	0.20	85.50	0.027	1.273	0.035	0.766	
BHE3A	20.30	Reddish brown occasionally mottled greyish green thinly laminated highly to completely weathered MUDSTONE	D	87.20	86.50	0.20	86.50	0.027	1.280	0.034	0.753	20
BHE3A	20.30	Reddish brown occasionally mottled greyish green thinly laminated highly to completely weathered MUDSTONE	A	87.20	75.40	0.20	91.50	0.024	1.312	0.031	0.690	
BHE3A	22.50	Reddish brown occasionally mottled greyish green thinly laminated highly to completely weathered MUDSTONE	A	88.00	62.20	0.10	83.48	0.014	1.259	0.018	0.398	22
BHE3A	22.50	Reddish brown occasionally mottled greyish green thinly laminated highly to completely weathered MUDSTONE	D	88.00	87.30	0.10	87.30	0.013	1.285	0.017	0.371	
BHE3A	24.20	Reddish brown occasionally mottled greyish green thinly laminated highly to completely weathered MUDSTONE	A	86.80	58.00	0.20	80.06	0.031	1.236	0.039	0.848	19

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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHE3A	24.20	Reddish brown occasionally mottled greyish green thinly laminated highly to completely weathered MUDSTONE	D	86.80	85.20	0.40	85.20	0.055	1.271	0.070	1.541	19
BHE3A	26.50	Reddish brown occasionally mottled greyish green thinly laminated highly to completely weathered MUDSTONE	A	88.00	67.50	0.10	86.97	0.013	1.283	0.017	0.373	18
BHE3A	26.50	Reddish brown occasionally mottled greyish green thinly laminated highly to completely weathered MUDSTONE	D	88.00	87.10	0.20	87.10	0.026	1.284	0.034	0.745	

U - Unsuitable Sample
I - Invalid Failure
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHF1	14.80	Reddish brown mottled green highly weathered MUDSTONE	A	89.10	55.50	0.05	79.35	0.008	1.231	0.010	0.215	14
BHF1	14.80	Reddish brown mottled green highly weathered MUDSTONE	D	89.10	82.00	0.05	82.00	0.007	1.249	0.009	0.204	
BHF1	24.50	Reddish brown mottled green highly weathered MUDSTONE	D	89.00	84.40	0.05	84.40	0.007	1.266	0.009	0.195	21
BHF1	24.50	Reddish brown mottled green highly weathered MUDSTONE	A	89.00	65.80	0.05	86.35	0.007	1.279	0.009	0.189	
BHF1	25.40	Reddish brown mottled green highly weathered MUDSTONE	A	88.80	71.70	0.05	90.04	0.006	1.303	0.008	0.177	24
BHF1	25.40	Reddish brown mottled green highly weathered MUDSTONE	D	88.80	82.00	0.00	82.00	0.000	1.249	0.000	0.000	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHF1	37.10	Reddish brown moderately weathered MUDSTONE moderately weak	D	88.70	84.50	0.10	84.50	0.014	1.266	0.018	0.390	14
BHF1	37.10	Reddish brown moderately weathered MUDSTONE moderately weak	A	88.70	24.60	0.20	52.71	0.072	1.024	0.074	1.622	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	mc %
BHF2	30.70	Reddish brown moderately weathered silty MUDSTONE moderately weak	L	57.00	32.50	0.20	48.57	0.085	0.987	0.084	1.841	31
BHF2	30.70	Reddish brown moderately weathered silty MUDSTONE moderately weak	L	50.20	21.30	0.40	36.90	0.294	0.872	0.256	5.638	

U - Unsuitable Sample
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHF2	32.10	Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE moderately weak	A	88.60	56.30	2.00	79.69	0.315	1.233	0.388	8.545	31
BHF2	32.10	Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE moderately weak	D	88.60	88.20	1.00	88.20	0.129	1.291	0.166	3.651	
BHF2	33.10	Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE moderately weak	D	88.80	84.00	0.50	84.00	0.071	1.263	0.089	1.969	27
BHF2	33.10	Reddish brown occasionally mottled green medium to thickly bedded moderately weathered silty MUDSTONE moderately weak	A	88.80	72.00	1.00	90.23	0.123	1.304	0.160	3.525	

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I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHF3	33.10	Reddish brown occasionally mottled greyish green moderately weathered silty MUDSTONE moderately strong	D	106.30	104.60	0.70	104.60	0.064	1.394	0.089	1.962	3.7
BHF3	33.10	Reddish brown occasionally mottled greyish green moderately weathered silty MUDSTONE moderately strong	A	106.30	46.70	0.30	79.50	0.047	1.232	0.058	1.287	

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I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:59 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHF4	20.90	Reddish brown highly to completely weathered MUDSTONE CLAYLIKE PLASTIC CONSISTENCY.	A	89.80	68.00	0.05	88.18	0.006	1.291	0.008	0.183	21
BHF4	20.90	Reddish brown highly to completely weathered MUDSTONE CLAYLIKE PLASTIC CONSISTENCY.	D	89.80	75.50	0.05	75.50	0.009	1.204	0.011	0.232	
BHF4	26.80	Reddish brown moderately to highly weathered MUDSTONE.	D	87.60	58.00	0.30	58.00	0.089	1.069	0.095	2.097	14
BHF4	26.80	Reddish brown moderately to highly weathered MUDSTONE.	A	87.60	57.00	0.75	79.73	0.118	1.234	0.146	3.202	
BHF4	33.80	Reddish brown highly weathered MUDSTONE.	D	88.20	84.70	0.00	84.70	0.000	1.268	0.000	0.000	15
BHF4	33.80	Reddish brown highly weathered MUDSTONE.	A	88.20	64.50	0.05	85.11	0.007	1.270	0.009	0.193	
BHF4	38.40	Reddish brown moderately to highly weathered MUDSTONE.	D	86.00	85.00	0.70	85.00	0.097	1.270	0.123	2.706	7.0
BHF4	38.40	Reddish brown moderately to highly weathered MUDSTONE.	A	86.00	69.20	2.50	87.05	0.330	1.283	0.423	9.315	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 29 Jan 98 03:44:04 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHF5	24.30	Reddish brown moderately to highly weathered MUDSTONE	A	86.70	70.30	0.20	88.09	0.026	1.290	0.033	0.732	10
BHF5	24.30	Reddish brown moderately to highly weathered MUDSTONE	D	86.70	85.80	0.00	85.80	0.000	1.275	0.000	0.000	
BHF5	38.20	Reddish brown moderately to highly weathered MUDSTONE	A	87.00	58.00	0.05	80.15	0.008	1.237	0.010	0.212	16
BHF5	38.20	Reddish brown moderately to highly weathered MUDSTONE	D	87.00	84.50	0.00	84.50	0.000	1.266	0.000	0.000	
BHF5	40.80	Reddish brown moderately to highly weathered MUDSTONE	A	87.00	57.00	0.05	79.46	0.008	1.232	0.010	0.215	12
BHF5	40.80	Reddish brown moderately to highly weathered MUDSTONE	D	87.00	84.00	0.00	84.00	0.000	1.263	0.000	0.000	
BHF5	42.60	Reddish brown moderately to highly weathered MUDSTONE	D	86.80	83.80	0.00	83.80	0.000	1.262	0.000	0.000	16
BHF5	42.60	Reddish brown moderately to highly weathered MUDSTONE	A	86.80	72.00	0.05	89.20	0.006	1.298	0.008	0.179	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHF6	23.60	Reddish brown moderately weathered MUDSTONE moderately weak	A	88.00	61.20	2.00	82.81	0.292	1.255	0.366	8.052	9.5
BHF6	23.60	Reddish brown moderately weathered MUDSTONE moderately weak	D	88.00	84.80	0.35	84.80	0.049	1.268	0.062	1.358	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:22:59 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHF6	28.00	Reddish brown occasionally green mottled highly weathered MUDSTONE.	D	88.10	86.20	0.00	86.20	0.000	1.278	0.000	0.000	19
BHF6	28.00	Reddish brown occasionally green mottled highly weathered MUDSTONE.	A	88.10	73.70	0.05	90.92	0.006	1.309	0.008	0.174	
BHF6	32.50	Reddish brown occasionally green mottled highly weathered MUDSTONE.	D	87.80	84.20	0.05	84.20	0.007	1.264	0.009	0.196	19
BHF6	32.50	Reddish brown occasionally green mottled highly weathered MUDSTONE.	A	87.80	63.30	0.35	84.12	0.049	1.264	0.063	1.375	
BHF6	37.00	Reddish brown occasionally green mottled highly weathered MUDSTONE.	D	88.10	87.20	0.10	87.20	0.013	1.284	0.017	0.372	16
BHF6	37.00	Reddish brown occasionally green mottled highly weathered MUDSTONE.	A	88.10	54.00	0.15	77.83	0.025	1.220	0.030	0.665	
BHF6	39.10	Reddish brown mottled greyish green highley weathered MUDSTONE.	A	87.50	67.00	0.15	86.40	0.020	1.279	0.026	0.565	
BHF6	39.10	Reddish brown mottled greyish green highley weathered MUDSTONE.	D	87.50	82.20	0.05	82.20	0.007	1.251	0.009	0.204	
BHF6	41.80	Reddish brown occasionally green mottled highly weathered MUDSTONE.	D	88.10	86.00	0.00	86.00	0.000	1.276	0.000	0.000	21
BHF6	41.80	Reddish brown occasionally green mottled highly weathered MUDSTONE.	A	88.10	67.70	0.10	87.14	0.013	1.284	0.017	0.372	
BHF6	47.50	Reddish brown highly weathered MUDSTONE	A	87.90	41.50	0.70	68.15	0.151	1.150	0.173	3.812	14

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I - Invalid Failure
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:23:00 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHF6	47.50	Reddish brown highly weathered MUDSTONE	D	87.90	87.00	0.15	87.00	0.020	1.283	0.025	0.559	14
BHF6	50.30	Reddish brown highly weathered MUDSTONE	A	88.60	71.00	0.20	89.50	0.025	1.299	0.032	0.714	18
BHF6	50.30	Reddish brown highly weathered MUDSTONE	D	88.60	85.20	0.05	85.20	0.007	1.271	0.009	0.193	
BHF6	51.50	Reddish brown moderately weathered MUDSTONE	A	88.70	76.20	0.40	92.77	0.046	1.321	0.061	1.350	15
BHF6	51.50	Reddish brown moderately weathered MUDSTONE	D	88.70	86.20	0.10	86.20	0.013	1.278	0.017	0.378	
BHF6	51.80	Reddish brown moderately weathered MUDSTONE	A	88.80	72.00	0.50	90.23	0.061	1.304	0.080	1.762	9.7
BHF6	51.80	Reddish brown moderately weathered MUDSTONE	D	88.80	86.00	0.20	86.00	0.027	1.276	0.035	0.759	
BHF6	54.10	Reddish brown/green mottled moderately weathered MUDSTONE	A	87.40	46.00	0.70	71.55	0.137	1.175	0.161	3.535	13
BHF6	54.10	Reddish brown/green mottled moderately weathered MUDSTONE	D	87.40	86.20	0.40	86.20	0.054	1.278	0.069	1.513	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:23:00 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHG2	29.50	Reddish brown occasionally mottled greyish green highly weathered MUDSTONE	D	87.20	86.40	0.00	86.40	0.000	1.279	0.000	0.000	15
BHG2	29.50	Reddish brown occasionally mottled greyish green highly weathered MUDSTONE	A	87.20	74.50	0.05	90.95	0.006	1.309	0.008	0.174	
BHG2	32.40	Reddish brown occasionally mottled greyish green highly weathered MUDSTONE	D	87.30	85.00	0.00	85.00	0.000	1.270	0.000	0.000	17
BHG2	32.40	Reddish brown occasionally mottled greyish green highly weathered MUDSTONE	A	87.30	68.50	0.10	87.26	0.013	1.285	0.017	0.371	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHG3	23.30	Reddish brown mottled greyish green thinly to medium subhorizontally bedded moderately to highly weathered MUDSTONE	D	86.20	77.40	1.00	77.40	0.167	1.217	0.203	4.470	15
BHG3	23.30	Reddish brown mottled greyish green thinly to medium subhorizontally bedded moderately to highly weathered MUDSTONE	A	86.20	63.00	0.60	83.15	0.087	1.257	0.109	2.400	
BHG3	23.80	Reddish brown mottled greyish green thinly to medium subhorizontally bedded moderately to highly weathered MUDSTONE	A	86.80	74.00	0.20	90.43	0.024	1.306	0.032	0.702	17
BHG3	23.80	Reddish brown mottled greyish green thinly to medium subhorizontally bedded moderately to highly weathered MUDSTONE	D	86.80	84.20	0.20	84.20	0.028	1.264	0.036	0.785	
BHG3	38.50	Reddish brown thinly subhorizontally bedded slightly weathered silty MUDSTONE moderately strong	D	86.80	83.60	0.10	83.60	0.014	1.260	0.018	0.397	15
BHG3	38.50	Reddish brown thinly subhorizontally bedded slightly weathered silty MUDSTONE moderately strong	A	86.80	48.50	0.55	73.21	0.103	1.187	0.122	2.680	

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHG4	14.70	Greyish green moderately weathered silty MUDSTONE moderately weak	A	87.60	38.00	0.10	65.10	0.024	1.126	0.027	0.585	1.9
BHG4	14.70	Greyish green moderately weathered silty MUDSTONE moderately weak	D	87.60	84.20	0.10	84.20	0.014	1.264	0.018	0.392	
BHG4	31.70	Reddish brown occasionally mottled greyish green moderately weathered silty MUDSTONE moderately strong	D	107.00	100.10	2.90	100.10	0.289	1.367	0.396	8.702	2.6
BHG4	31.70	Reddish brown occasionally mottled greyish green moderately weathered silty MUDSTONE moderately strong	A	107.00	53.30	1.40	85.21	0.193	1.271	0.245	5.392	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 20 Jan 98 08:56:50 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHG6	25.90	Reddish brown occasionally mottled greyish green highly weathered MUDSTONE	A	85.90	70.50	1.00	87.81	0.130	1.288	0.167	3.676	16
BHG6	25.90	Reddish brown occasionally mottled greyish green highly weathered MUDSTONE	D	86.00	84.20	0.30	84.20	0.042	1.264	0.053	1.177	
BHG6	28.00	Reddish brown occasionally mottled greyish green highly weathered MUDSTONE	A	86.00	66.00	0.20	85.01	0.028	1.270	0.035	0.773	15
BHG6	28.00	Reddish brown occasionally mottled greyish green highly weathered MUDSTONE	D	86.00	84.20	0.30	84.20	0.042	1.264	0.053	1.177	
BHG6	29.80	Reddish brown occasionally mottled greyish green completely weathered MUDSTONE	A	86.20	58.00	0.05	79.79	0.008	1.234	0.010	0.213	23
BHG6	29.80	Reddish brown occasionally mottled greyish green completely weathered MUDSTONE	D	86.20	84.50	0.10	84.50	0.014	1.266	0.018	0.390	
BHG6	31.90	Reddish brown occasionally mottled greyish green completely weathered MUDSTONE	A	86.20	76.50	0.05	91.63	0.006	1.313	0.008	0.172	16
BHG6	31.90	Reddish brown occasionally mottled greyish green completely weathered MUDSTONE	D	86.20	85.10	0.05	85.10	0.007	1.270	0.009	0.193	
BHG6	34.50	Reddish brown occasionally mottled greyish green completely weathered MUDSTONE	A	86.10	60.00	0.25	81.10	0.038	1.243	0.047	1.040	14

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:23:00 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHG6	32.30	Reddish brown moderately weathered sandy MUDSTONE.	D	87.20	85.00	0.05	85.00	0.007	1.270	0.009	0.193	19
BHG6	32.30	Reddish brown moderately weathered sandy MUDSTONE.	A	87.20	37.00	0.15	64.09	0.037	1.118	0.041	0.898	

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 20 Jan 98 08:56:50 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHG6	34.50	Reddish brown occasionally mottled greyish green completely weathered MUDSTONE	D	86.10	84.80	0.10	84.80	0.014	1.268	0.018	0.388	14

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:23:00 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHJ2	15.40	Reddish brown thinly subhorizontally bedded moderately weathered silty MUDSTONE, moderately weak.	A	85.50	62.00	3.20	82.15	0.474	1.250	0.593	13.042	8.6
BHJ2	15.40	Reddish brown thinly subhorizontally bedded moderately weathered silty MUDSTONE, moderately weak.	D	85.50	82.50	3.30	82.50	0.485	1.253	0.607	13.363	
BHJ2	19.20	Reddish brown thinly subhorizontally bedded moderately weathered silty MUDSTONE, moderately weak.	A	85.40	26.50	0.50	53.68	0.174	1.032	0.179	3.941	10
BHJ2	19.20	Reddish brown thinly subhorizontally bedded moderately weathered silty MUDSTONE, moderately weak.	D	85.40	83.00	0.05	83.00	0.007	1.256	0.009	0.201	
BHJ2	26.20	Reddish brown mudstone completely weathered to soft to firm CLAY.	A	87.20	60.50	0.00	81.96	0.000	1.249	0.000	0.000	23
BHJ2	26.20	Reddish brown mudstone completely weathered to soft to firm CLAY.	D	87.20	75.00	0.00	75.00	0.000	1.200	0.000	0.000	

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHL3	13.90	Reddish brown thinly to medium subhorizontally bedded moderately to slightly weathered MUDSTONE moderately strong	D	85.80	81.50	1.20	81.50	0.181	1.246	0.225	4.952	8
BHL3	13.90	Reddish brown thinly to medium subhorizontally bedded moderately to slightly weathered MUDSTONE moderately strong	A	85.80	52.30	1.60	75.59	0.280	1.204	0.337	7.420	
BHL3	20.00	Reddish brown thinly to medium subhorizontally bedded moderately to slightly weathered MUDSTONE moderately strong	A	85.00	57.70	6.50	79.02	1.041	1.229	1.279	28.137	8
BHL3	20.00	Reddish brown thinly to medium subhorizontally bedded moderately to slightly weathered MUDSTONE moderately strong	D	85.00	79.60	1.10	79.60	0.174	1.233	0.214	4.708	

U - Unsuitable Sample
I - Invalid Failure
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 09 Feb 98 03:23:29 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN2	5.00	Reddish brown to yellowish brown thinly to medium subhorizontally bedded slightly to moderately weathered slightly dolomitic sandy MUDSTONE,M.S.	A	88.00	51.00	0.15	75.59	0.026	1.204	0.032	0.696	16
BHN2	5.00	Reddish brown to yellowish brown thinly to medium subhorizontally bedded slightly to moderately weathered slightly dolomitic sandy MUDSTONE,M.S.	D	88.00	81.20	0.10	81.20	0.015	1.244	0.019	0.415	
BHN2	6.25	Light brown subhorizontally bedded fresh DOLOMITE, strong.	A	86.50	75.00	24.00	90.89	2.906	1.309	3.802	83.643	3.3
BHN2	6.25	Light brown subhorizontally bedded fresh DOLOMITE, strong.	D	86.50	81.00	12.00	81.00	1.829	1.242	2.272	49.994	
BHN2	8.70	Light brown to reddish brown thinly subhorizontally to inclined bedded occasionally thinly and thickly laminated slightly to moderately weathered silty DOLOMITE, strong.	A	86.50	64.00	34.50	83.96	4.895	1.263	6.180	135.964	4.8
BHN2	8.70	Light brown to reddish brown thinly subhorizontally to inclined bedded occasionally thinly and thickly laminated slightly to moderately weathered silty DOLOMITE, strong.	D	86.50	75.00	32.00	75.00	5.689	1.200	6.828	150.207	

U - Unsuitable Sample
I - Invalid Failure
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 09 Feb 98 03:23:29 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN2	10.60	Reddish to yellowish brown thinly to medium subhorizontally bedded fresh to slightly weathered silty dolomite SANDSTONE, strong. weathered silty DOLOMITE, strong.	A	86.70	50.50	1.25	74.66	0.224	1.198	0.269	5.908	8.1
BHN2	10.60	Reddish to yellowish brown thinly to medium subhorizontally bedded fresh to slightly weathered silty dolomite SANDSTONE, strong. weathered silty DOLOMITE, strong.	D	86.70	84.60	0.70	84.60	0.098	1.267	0.124	2.726	
BHN2	11.40	Reddish to yellowish brown thinly to medium subhorizontally bedded fresh to slightly weathered silty dolomite SANDSTONE, strong. weathered silty DOLOMITE, strong.	A	86.50	63.00	1.00	83.30	0.144	1.258	0.181	3.989	4.9
BHN2	11.40	Reddish to yellowish brown thinly to medium subhorizontally bedded fresh to slightly weathered silty dolomite SANDSTONE, strong. weathered silty DOLOMITE, strong.	D	86.50	84.50	1.20	84.50	0.168	1.266	0.213	4.682	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN3	8.25	Reddish brown mottled yellowish green medium to thinly subhorizontally bedded slightly to moderately weathered sandy DOLOMITE moderately strong	A	86.20	66.30	24.50	85.30	3.367	1.272	4.282	94.201	4.3
BHN3	8.25	Reddish brown mottled yellowish green medium to thinly subhorizontally bedded slightly to moderately weathered sandy DOLOMITE moderately strong	D	86.20	79.60	11.50	79.60	1.815	1.233	2.237	49.223	
BHN3	8.60	Reddish brown fine to medium grained medium to thinly subhorizontally bedded slightly weathered silty SANDSTONE	D	86.20	83.40	11.50	83.40	1.653	1.259	2.081	45.791	4.5
BHN3	8.60	Reddish brown fine to medium grained medium to thinly subhorizontally bedded slightly weathered silty SANDSTONE	A	86.20	50.30	14.00	74.30	2.536	1.195	3.031	66.677	
BHN3	9.60	Reddish brown fine to medium grained thinly to medium subhorizontally bedded slightly weathered silty SANDSTONE	A	86.20	58.30	26.50	79.99	4.142	1.235	5.117	112.568	1.9
BHN3	9.60	Reddish brown fine to medium grained thinly to medium subhorizontally bedded slightly weathered silty SANDSTONE	D	86.20	80.90	34.50	80.90	5.271	1.242	6.546	144.007	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN3	10.60	Yellowish to reddish brown thinly subhorizontally bedded slightly weathered silty very sandy DOLOMITE strong	A	86.30	38.70	9.00	65.21	2.116	1.127	2.385	52.473	9
BHN3	10.60	Yellowish to reddish brown thinly subhorizontally bedded slightly weathered silty very sandy DOLOMITE strong	D	86.30	79.40	7.50	79.40	1.190	1.231	1.465	32.227	
BHN3	12.30	Reddish brown fine to medium grained thinly to medium subhorizontally bedded slightly weathered silty SANDSTONE	D	86.60	81.70	30.50	81.70	4.569	1.247	5.699	125.384	1.6
BHN3	12.30	Reddish brown fine to medium grained thinly to medium subhorizontally bedded slightly weathered silty SANDSTONE	A	86.60	45.60	34.00	70.91	6.762	1.170	7.913	174.095	

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I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN4	2.60	Reddish brown mottled greyish green thinly to medium subhorizontally bedded highly to completely weathered MUDSTONE moderately weak	A	88.20	58.60	0.10	81.12	0.015	1.243	0.019	0.416	23
BHN4	2.60	Reddish brown mottled greyish green thinly to medium subhorizontally bedded highly to completely weathered MUDSTONE moderately weak	D	88.20	87.00	0.10	87.00	0.013	1.283	0.017	0.373	
BHN4	4.10	Reddish brown mottled greyish green thinly to medium subhorizontally bedded highly to completely weathered MUDSTONE moderately weak	D	88.10	76.20	0.20	76.20	0.034	1.209	0.042	0.916	16
BHN4	4.10	Reddish brown mottled greyish green thinly to medium subhorizontally bedded highly to completely weathered MUDSTONE moderately weak	A	88.10	61.00	0.30	82.72	0.044	1.254	0.055	1.210	
BHN4	6.60	Reddish brown mottled greyish green thinly to medium subhorizontally bedded highly to moderately weathered slightly dolomitic sandy MUDSTONE moderately strong	D	88.20	79.90	0.15	79.90	0.023	1.235	0.029	0.638	12

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN4	6.60	Reddish brown mottled greyish green thinly to medium subhorizontally bedded highly to moderately weathered slightly dolomitic sandy MUDSTONE moderately strong	A	88.20	51.50	0.30	76.05	0.052	1.208	0.063	1.378	12
BHN4	8.60	Reddish brown mottled greyish green thinly to medium subhorizontally bedded slightly to moderately weathered very sandy MUDSTONE strong	D	86.30	82.20	5.00	82.20	0.740	1.251	0.926	20.361	5.6
BHN4	8.60	Reddish brown mottled greyish green thinly to medium subhorizontally bedded slightly to moderately weathered very sandy MUDSTONE strong	A	86.30	59.30	47.50	80.72	7.290	1.241	9.043	198.952	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 09 Jan 98 09:39:20 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN5	4.40	Yellowish brown thin to medium bedding slightly weathered DOLOMITE strong	D	86.50	83.90	10.00	83.90	1.421	1.262	1.793	39.451	3.0
BHN5	4.40	Yellowish brown thin to medium bedding slightly weathered DOLOMITE strong	A	86.50	55.00	10.00	77.83	1.651	1.220	2.015	44.321	
BHN5	6.10	Yellowish brown occasionally fine to medium gravel sized vugs thinly to medium subhorizontally bedded slightly weathered DOLOMITE weak	A	86.60	48.00	0.40	72.75	0.076	1.184	0.089	1.968	6.3
BHN5	6.10	Yellowish brown occasionally fine to medium gravel sized vugs thinly to medium subhorizontally bedded slightly weathered DOLOMITE weak	D	86.60	84.20	1.20	84.20	0.169	1.264	0.214	4.708	
BHN5	7.90	Yellowish brown to reddish brown thinly bedded slightly weathered very silty slightly sandy DOLOMITE strong	D	86.30	83.60	9.00	83.60	1.288	1.260	1.623	35.703	2.9
BHN5	7.90	Yellowish brown to reddish brown thinly bedded slightly weathered very silty slightly sandy DOLOMITE strong	A	86.30	63.80	11.00	83.73	1.569	1.261	1.979	43.534	
BHN5	15.60	Yellowish brown to reddish brown moderately weathered very silty slightly sandy DOLOMITE moderately strong	D	86.20	84.20	4.40	84.20	0.621	1.264	0.785	17.263	4.4

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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 09 Jan 98 09:39:20 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN5	15.60	Yellowish brown to reddish brown moderately weathered very silty slightly sandy DOLOMITE moderately strong	A	86.20	61.70	7.00	82.29	1.034	1.251	1.294	28.457	4.4
BHN5	17.30	Yellow to pinkish brown fine to medium grained medium to thickly subhorizontal to inclined bedded fresh to slightly weathered silty dolomitic SANDSTONE strong to very strong	A	86.60	44.20	24.50	69.81	5.027	1.162	5.842	128.519	1.9
BHN5	17.30	Yellow to pinkish brown fine to medium grained medium to thickly subhorizontal to inclined bedded fresh to slightly weathered silty dolomitic SANDSTONE strong to very strong	D	86.60	72.40	34.00	72.40	6.486	1.181	7.662	168.566	

U - Unsuitable Sample
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L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD * Contract Number : F10895 * Process Date : 06 Jan 98 11:14:31 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	mc%
BHN5	6.10	Yellowish brown sub-horizontally bedded slightly to moderately weathered very silty slightly sandy DOLOMITE moderately strong	D	86.40	84.10	2.15	84.10	0.304	1.264	0.384	8.451	6.3
BHN5	6.10	Yellowish brown sub-horizontally bedded slightly to moderately weathered very silty slightly sandy DOLOMITE moderately strong	A	86.40	55.60	2.70	78.21	0.441	1.223	0.540	11.877	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN5	9.60	Yellowish brown to reddish brown slightly weathered very silty slightly sandy DOLOMITE strong	A	55.80	35.40	2.80	50.15	1.113	1.001	1.115	24.526	4.0
BHN5	9.60	Yellowish brown to reddish brown slightly weathered very silty slightly sandy DOLOMITE strong	D	55.80	54.70	3.65	54.70	1.220	1.041	1.270	27.945	

U - Unsuitable Sample
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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN7	4.10	Yellowish brown with occasional fine to medium gravel sized vugs thinly to medium subhorizontally bedded slightly to moderately weathered DOLOMITE strong	A	86.20	76.40	13.00	91.57	1.550	1.313	2.036	44.783	2.8
BHN7	4.10	Yellowish brown with occasional fine to medium gravel sized vugs thinly to medium subhorizontally bedded slightly to moderately weathered DOLOMITE strong	D	86.20	84.40	9.50	84.40	1.334	1.266	1.688	37.135	
BHN7	6.40	Yellowish brown with occasional fine to medium gravel sized vugs thinly to medium subhorizontally bedded slightly to moderately weathered DOLOMITE strong	D	86.20	81.80	1.40	81.80	0.209	1.248	0.261	5.744	3.9
BHN7	6.40	Yellowish brown with occasional fine to medium gravel sized vugs thinly to medium subhorizontally bedded slightly to moderately weathered DOLOMITE strong	A	86.20	48.00	4.20	72.58	0.797	1.183	0.943	20.742	
BHN7	8.20	Yellowish brown with occasional fine to medium gravel sized vugs thinly to medium subhorizontally bedded slightly to moderately weathered DOLOMITE strong	D	86.30	83.00	15.00	83.00	2.177	1.256	2.735	60.174	3.2
BHN7	8.20	Yellowish brown with occasional fine to medium gravel sized vugs thinly to medium subhorizontally bedded slightly to moderately weathered DOLOMITE strong	A	86.30	66.00	18.00	85.16	2.482	1.271	3.154	69.390	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN7	10.30	Yellowish brown thinly subhorizontally bedded slightly to moderately weathered DOLOMITE strong	D	85.90	82.40	3.90	82.40	0.574	1.252	0.719	15.822	5
BHN7	10.30	Yellowish brown thinly subhorizontally bedded slightly to moderately weathered DOLOMITE strong	A	85.90	54.00	2.80	76.85	0.474	1.213	0.575	12.656	
BHN7	11.90	Yellowish brown occasionally fine to y medium gravel sized vugs thinly to medium subhorizontally bedded slightly weathered very sandy DOLOMITE strong	D	86.10	81.00	5.10	81.00	0.777	1.242	0.966	21.247	3.2
BHN7	11.90	Yellowish brown occasionally fine to y medium gravel sized vugs thinly to medium subhorizontally bedded slightly weathered very sandy DOLOMITE strong	A	86.10	65.20	12.00	84.54	1.679	1.267	2.127	46.784	
BHN7	13.50	Yellowish brown occasionally fine to y medium gravel sized vugs thinly to medium subhorizontally bedded slightly weathered very sandy DOLOMITE strong	D	86.30	82.40	13.50	82.40	1.988	1.252	2.489	54.769	4.3
BHN7	13.50	Yellowish brown occasionally fine to y medium gravel sized vugs thinly to medium subhorizontally bedded slightly weathered very sandy DOLOMITE strong	A	86.30	67.80	13.50	86.31	1.812	1.278	2.317	50.969	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN7	16.20	Yellowish brown occasionally fine to y medium gravel sized vugs thinly to medium subhorizontally bedded slightly weathered very sandy DOLOMITE strong	D	86.30	75.00	22.50	75.00	4.000	1.200	4.801	105.615	2.6
BHN7	16.20	Yellowish brown occasionally fine to y medium gravel sized vugs thinly to medium subhorizontally bedded slightly weathered very sandy DOLOMITE strong	A	86.30	71.00	22.50	88.33	2.884	1.292	3.726	81.965	
BHN7	17.20	Yellowish brown with occasional fine to medium gravel sized vugs thinly to medium subhorizontally bedded slightly to moderately weathered very sandy DOLOMITE strong	A	86.40	66.00	32.50	85.21	4.476	1.271	5.690	125.176	1.7
BHN7	17.20	Yellowish brown with occasional fine to medium gravel sized vugs thinly to medium subhorizontally bedded slightly to moderately weathered very sandy DOLOMITE strong	D	86.40	82.20	16.50	82.20	2.442	1.251	3.054	67.192	

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 07 Jan 98 02:18:53 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN8	5.40	Yellowish brown thinly subhorizontally bedded moderately weathered sandy DOLOMITE strong	D	86.30	83.20	7.00	83.20	1.011	1.258	1.272	27.976	3.9
BHN8	5.40	Yellowish brown thinly subhorizontally bedded moderately weathered sandy DOLOMITE strong	A	86.30	32.30	4.80	59.57	1.352	1.082	1.463	32.195	
BHN8	7.20	Reddish brown fine to coarse grained thinly to medium subhorizontally bedded moderately weathered dolomite sandstone CONGLOMERATE strong	D	86.40	83.80	4.90	83.80	0.698	1.262	0.880	19.367	7.20
BHN8	7.20	Reddish brown fine to coarse grained thinly to medium subhorizontally bedded moderately weathered dolomite sandstone CONGLOMERATE strong	A	86.40	56.50	4.30	78.84	0.692	1.227	0.849	18.682	
BHN8	8.60	Reddish brown fine to coarse grained thinly to medium subhorizontally bedded moderately weathered dolomite sandstone CONGLOMERATE strong	D	86.40	83.50	21.50	83.50	3.084	1.260	3.884	85.450	3.1
BHN8	8.60	Reddish brown fine to coarse grained thinly to medium subhorizontally bedded moderately weathered dolomite sandstone CONGLOMERATE strong	A	86.40	76.00	16.00	91.44	1.914	1.312	2.511	55.242	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN8	6.30	Yellowish brown moderately weathered sandy DOLOMITE strong	A	86.50	35.10	5.20	62.18	1.345	1.103	1.484	32.643	.27
BHN8	6.30	Yellowish brown moderately weathered sandy DOLOMITE strong	D	86.50	85.90	15.50	85.90	2.101	1.276	2.680	58.956	

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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN9	8.40	Reddish brown thinly to medium subhorizontally bedded slightly to moderately weathered slightly dolomitic silty sandy CONGLOMERATE strong	A	86.30	81.00	35.00	94.34	3.932	1.331	5.233	115.124	2.8
BHN9	8.40	Reddish brown thinly to medium subhorizontally bedded slightly to moderately weathered slightly dolomitic silty sandy CONGLOMERATE strong	D	86.30	78.20	33.50	78.20	5.478	1.223	6.699	147.387	
BHN9	11.00	Reddish brown thinly to medium subhorizontally bedded slightly to moderately weathered slightly dolomitic silty sandy CONGLOMERATE strong	A	86.40	68.30	24.00	86.68	3.194	1.281	4.092	90.016	1.9
BHN9	11.00	Reddish brown thinly to medium subhorizontally bedded slightly to moderately weathered slightly dolomitic silty sandy CONGLOMERATE strong	D	86.40	81.50	25.00	81.50	3.764	1.246	4.689	103.165	

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:41 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN10B	7.40	Yellowish brown very thinly to thinly subhorizontally bedded slightly to moderately weathered DOLOMITE strong	A	86.30	67.00	18.50	85.80	2.513	1.275	3.204	70.491	0.8
BHN10B	7.40	Yellowish brown very thinly to thinly subhorizontally bedded slightly to moderately weathered DOLOMITE strong	D	86.30	82.00	17.00	82.00	2.528	1.249	3.159	69.490	
BHN10B	9.20	Reddish brown fine to medium grained thinly to medium subhorizontally bedded slightly weathered dolomitic SANDSTONE strong	A	86.30	43.50	13.50	69.14	2.824	1.157	3.268	71.891	1.5
BHN10B	9.20	Reddish brown fine to medium grained thinly to medium subhorizontally bedded slightly weathered dolomitic SANDSTONE strong	D	86.30	80.20	24.50	80.20	3.809	1.237	4.712	103.653	
BHN10B	13.00	Reddish brown moderately weathered sandy MUDSTONE moderately weak	D	88.90	82.30	0.40	82.30	0.059	1.251	0.074	1.626	12
BHN10B	13.00	Reddish brown moderately weathered sandy MUDSTONE moderately weak	A	88.90	58.00	0.40	81.03	0.061	1.243	0.076	1.666	
BHN10B	13.70	Reddish brown moderately weathered sandy MUDSTONE moderately weak	A	88.30	68.00	0.40	87.44	0.052	1.286	0.067	1.480	10
BHN10B	13.70	Reddish brown moderately weathered sandy MUDSTONE moderately weak	D	88.30	85.00	0.10	85.00	0.014	1.270	0.018	0.387	

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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN10B	10.60	Reddish brown moderately weathered sandy MUDSTONE moderately weak to moderately strong	A	106.30	53.70	1.90	85.25	0.261	1.271	0.332	7.312	2.9
BHN10B	10.60	Reddish brown moderately weathered sandy MUDSTONE moderately weak to moderately strong	D	106.30	102.60	0.70	102.60	0.066	1.382	0.092	2.022	

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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 07 Jan 98 02:18:52 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN11	1.10	Light to yellowish brown thinly subhorizontally bedded slightly to moderately weathered slightly dolomitic LIMESTONE strong	A	85.70	52.70	4.00	75.83	0.696	1.206	0.839	18.458	1.7
BHN11	1.10	Light to yellowish brown thinly subhorizontally bedded slightly to moderately weathered slightly dolomitic LIMESTONE strong	D	85.70	81.70	3.20	81.70	0.479	1.247	0.598	13.155	
BHN11	3.60	Light to yellowish brown thinly subhorizontally bedded slightly to moderately weathered slightly dolomitic LIMESTONE strong	D	86.50	84.00	41.00	84.00	5.811	1.263	7.339	161.450	0.3
BHN11	3.60	Light to yellowish brown thinly subhorizontally bedded slightly to moderately weathered slightly dolomitic LIMESTONE strong	A	86.50	54.00	44.50	77.12	7.482	1.215	9.093	200.054	
BHN11	7.70	Yellowish brown with many fine to medium gravel sized vugs weathered dolomitic CONGLOMERATE strong	D	86.30	81.60	22.00	81.60	3.304	1.247	4.119	90.613	1.8
BHN11	7.70	Yellowish brown with many fine to medium gravel sized vugs weathered dolomitic CONGLOMERATE strong	A	86.30	51.90	14.00	75.52	2.455	1.204	2.955	65.020	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 07 Jan 98 02:18:53 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN11	9.70	Yellowish brown with many fine to medium gravel sized vugs weathered dolomitic CONGLOMERATE strong	D	86.40	77.20	24.00	77.20	4.027	1.216	4.896	107.719	1.5
BHN11	9.70	Yellowish brown with many fine to medium gravel sized vugs weathered dolomitic CONGLOMERATE strong	A	86.40	65.40	20.00	84.82	2.780	1.268	3.526	77.578	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN12	0.30	Yellowish brown moderately weathered LIMESTONE strong	D	83.90	79.90	21.00	79.90	3.289	1.235	4.062	89.363	1.34
BHN12	0.30	Yellowish brown moderately weathered LIMESTONE strong	A	83.90	52.10	19.50	74.60	3.504	1.197	4.195	92.289	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:23:00 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHN12	7.90	Grey to light grey medium to thickly subhorizontally bedded fresh to slightly weathered LIMESTONE, very strong.	D	86.30	81.20	31.00	81.20	4.702	1.244	5.848	128.658	0.9
BHN12	7.90	Grey to light grey medium to thickly subhorizontally bedded fresh to slightly weathered LIMESTONE, very strong.	A	86.30	42.70	32.00	68.50	6.820	1.152	7.858	172.878	
BHN12	8.20	Grey to light grey medium to thickly subhorizontally bedded fresh to slightly weathered LIMESTONE, very strong.	D	86.40	83.90	44.00	83.90	6.251	1.262	7.890	173.583	0.6
BHN12	8.20	Grey to light grey medium to thickly subhorizontally bedded fresh to slightly weathered LIMESTONE, very strong.	A	86.40	52.30	37.00	75.85	6.431	1.206	7.758	170.665	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD * Contract Number : F10895 * Process Date : 06 Jan 98 11:14:31 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP1	1.20	Light grey yellowish brown with some fine to coarse gravel sized vugs thickly bedded slightly weathered DOLOMITE strong	D	85.50	78.30	19.00	78.30	3.099	1.224	3.792	83.427	
BHP1	1.20	Light grey yellowish brown with some fine to coarse gravel sized vugs thickly bedded slightly weathered DOLOMITE strong	A	85.50	71.20	26.00	88.04	3.354	1.290	4.327	95.194	
BHP1	6.90	Light grey to grey medium to thickly bedded weathered slightly shelly LIMESTONE strong	D	84.60	79.00	22.00	79.00	3.525	1.229	4.331	95.277	0.4
BHP1	6.90	Light grey to grey medium to thickly bedded weathered slightly shelly LIMESTONE strong	A	84.60	73.10	29.00	88.74	3.683	1.295	4.768	104.889	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:23:01 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP1	2.80	Light greyish yellow with occasional fine to medium gravel size vugs thinly bedded slightly to moderately weathered DOLOMITE, strong.	D	86.00	83.00	23.00	83.00	3.339	1.256	4.194	92.266	0.4
BHP1	2.80	Light greyish yellow with occasional fine to medium gravel size vugs thinly bedded slightly to moderately weathered DOLOMITE, strong.	A	86.00	57.00	19.00	79.00	3.044	1.229	3.740	82.280	
BHP1	4.20	Light greyish yellow with occasional fine to medium gravel size vugs thinly bedded slightly to moderately weathered DOLOMITE, strong.	D	84.80	82.20	47.00	82.20	6.956	1.251	8.700	191.396	0.5
BHP1	4.20	Light greyish yellow with occasional fine to medium gravel size vugs thinly bedded slightly to moderately weathered DOLOMITE, strong.	A	84.80	58.00	33.00	79.13	5.270	1.230	6.479	142.538	
BHP1	9.90	Light grey to grey medium to thickly bedded slightly weathered slightly shelly LIMESTONE, strong to very strong	D	84.60	78.00	34.00	78.00	5.588	1.222	6.826	150.182	0.3
BHP1	9.90	Light grey to grey medium to thickly bedded slightly weathered slightly shelly LIMESTONE, strong to very strong	A	84.60	49.00	30.00	72.65	5.684	1.183	6.725	147.941	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 07 Jan 98 02:18:53 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP1	5.90	Greyish yellow with occasional fine to medium gravel size vugs medium to thickly bedded slightly weathered slightly shelly dolomitic LIMESTONE strong to very strong	D	84.40	81.10	33.00	81.10	5.017	1.243	6.237	137.220	0.6
BHP1	5.90	Greyish yellow with occasional fine to medium gravel size vugs medium to thickly bedded slightly weathered slightly shelly dolomitic LIMESTONE strong to very strong	A	84.40	33.90	20.50	60.36	5.627	1.088	6.125	134.746	

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D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD NEWPORT * Contract Number : F10895 * Process Date : 09 Jan 98 09:39:20 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP2	3.20	Yellow brown fine to coarse grained medium to thickly bedded slightly weathered very sandy CONGLOMERATE moderately strong	D	86.30	84.00	8.00	84.00	1.134	1.263	1.432	31.502	3.9
BHP2	3.20	Yellow brown fine to coarse grained medium to thickly bedded slightly weathered very sandy CONGLOMERATE moderately strong	A	86.30	68.60	11.50	86.82	1.526	1.282	1.956	43.025	
BHP2	5.20	Yellow brown fine to coarse grained medium to thickly bedded slightly weathered very sandy CONGLOMERATE moderately strong	D	86.30	81.80	7.00	81.80	1.046	1.248	1.306	28.722	4.1
BHP2	5.20	Yellow brown fine to coarse grained medium to thickly bedded slightly weathered very sandy CONGLOMERATE moderately strong	A	86.30	56.30	7.00	78.65	1.132	1.226	1.387	30.523	

U - Unsuitable Sample
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP3	4.30	Light grey thinly to medium subhorizontally bedded slightly weathered slightly dolomitic LIMESTONE very strong	A	86.50	48.00	29.00	72.71	5.486	1.184	6.492	142.833	0.3
BHP3	4.30	Light grey thinly to medium subhorizontally bedded slightly weathered slightly dolomitic LIMESTONE very strong	D	86.50	83.00	39.00	83.00	5.661	1.256	7.111	156.452	

U - Unsuitable Sample
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 17 Dec 97 10:45:18 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP11	7.00	Yellowish brown with occasional fine to medium size vugs medium sub-horizontally bedded slightly weathered dolomitic CONGLOMERATE	A	84.90	27.20	2.30	54.22	0.782	1.037	0.811	17.849	3.8
BHP3	1.50	Light brown yellow thinly bedded slightly to moderately weathered dolomitic LIMESTONE strong	L	55.10	51.40	24.00	60.05	6.656	1.086	7.227	159.002	0.9
BHP3	1.50	Light brown yellow thinly bedded slightly to moderately weathered dolomitic LIMESTONE strong	L	29.90	30.10	14.00	33.85	12.217	0.839	10.251	225.515	
BHP3	3.50	Light brown yellow thinly bedded slightly to moderately weathered dolomitic LIMESTONE strong	A	86.80	38.80	15.50	65.48	3.615	1.129	4.081	89.787	1.8
BHP3	6.20	Light grey thinly to medium sub-horizontally bedded slightly weathered slightly dolomitic LIMESTONE strong	D	86.50	78.10	50.00	78.10	8.197	1.222	10.019	220.418	0.6
BHP3	6.20	Light grey thinly to medium sub-horizontally bedded slightly weathered slightly dolomitic LIMESTONE strong	A	86.50	39.40	35.00	65.87	8.066	1.132	9.131	200.887	

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP7	7.50	Light grey and yellowish brown - moderately to highly weathered dolomitic CONGLOMERATE strong	D	86.50	86.20	21.00	86.20	2.826	1.278	3.611	79.445	
BHP7	7.50	Light grey and yellowish brown moderately to highly weathered dolomitic CONGLOMERATE strong	A	86.50	41.70	21.00	67.77	4.573	1.147	5.243	115.347	

U - Unsuitable Sample
I - Invalid Failure
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A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 17 Dec 97 10:45:18 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP7	2.60	Light greyish brown with many fine to medium gravel sized vugs thinly to medium sub-horizontally bedded moderate to highly weathered dolomitic CONGLOMERATE strong	A	85.80	52.80	3.60	75.95	0.624	1.207	0.753	16.573	5.2
BHP7	2.60	Light greyish brown with many fine to medium gravel sized vugs thinly to medium sub-horizontally bedded moderate to highly weathered dolomitic CONGLOMERATE strong	D	85.80	81.70	5.50	81.70	0.824	1.247	1.028	22.610	
BHP7	3.30	Light greyish brown with many fine to medium gravel sized vugs thinly to medium sub-horizontally bedded moderate to highly weathered dolomitic CONGLOMERATE strong	A	85.90	51.20	3.40	74.83	0.607	1.199	0.728	16.015	5.3
BHP7	3.30	Light greyish brown with many fine to medium gravel sized vugs thinly to medium sub-horizontally bedded moderate to highly weathered dolomitic CONGLOMERATE strong	D	85.90	80.00	3.80	80.00	0.594	1.236	0.734	16.139	
BHP8	4.10	Yellowish brown with occasional fine to medium size vugs thinly to medium sub-horizontally bedded slightly weathered argillaceous DOLOMITE strong	A	86.50	51.10	1.80	75.02	0.320	1.200	0.384	8.446	1.27

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D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP8	2.60	Reddish brown with many fine to coarse sgravel sized vugs thin subhorizontal beds slightly to moderately weathered dolomitic CONGLOMERATE strong	D	86.10	83.20	2.60	83.20	0.376	1.258	0.472	10.391	6.9
BHP8	2.60	Reddish brown with many fine to coarse sgravel sized vugs thin subhorizontal beds slightly to moderately weathered dolomitic CONGLOMERATE strong	A	86.10	58.00	3.30	79.74	0.519	1.234	0.640	14.087	
BHP8	7.10	Reddish brown medium to thick sub-horizontal beds fresh to slightly weathered very sandy micaceous MUDSTONE moderately strong	D	85.70	85.00	1.00	85.00	0.138	1.270	0.176	3.866	5.1
BHP8	7.10	Reddish brown medium to thick sub-horizontal beds fresh to slightly weathered very sandy micaceous MUDSTONE moderately strong	A	85.70	56.40	3.45	78.45	0.561	1.225	0.687	15.104	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 17 Dec 97 10:45:18 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP8	4.10	Yellowish brown with occasional fine to medium size vugs thinly to medium sub-horizontally bedded slightly weathered argillaceous DOLOMITE strong	D	86.50	84.80	1.70	84.80	0.236	1.268	0.300	6.597	9.2
BHP9	1.80	Light grey to yellow brown thinly to medium sub-horizontally bedded slightly dolomitic LIMESTONE strong	D	85.10	81.00	39.00	81.00	5.944	1.242	7.385	162.480	0.3
BHP9	1.80	Light grey to yellow brown thinly to medium sub-horizontally bedded slightly dolomitic LIMESTONE strong	A	85.10	68.60	43.50	86.21	5.852	1.278	7.478	164.522	
BHP9	5.90	Yellowish brown thinly bedded slightly to moderately weathered DOLOMITE strong	d	85.50	83.90	46.00	83.90	6.535	1.262	8.249	181.473	0.7
BHP9	5.90	Yellowish brown thinly bedded slightly to moderately weathered DOLOMITE strong	A	85.50	60.80	32.50	81.36	4.910	1.245	6.113	134.482	
BHP9	8.00	Light grey thickly sub-horizontally bedded fresh LIMESTONE very strong	D	84.60	70.00	50.00	70.00	10.204	1.163	11.872	261.189	0.5
BHP9	8.00	Light grey thickly sub-horizontally bedded fresh LIMESTONE very strong	A	84.60	54.40	30.50	76.55	5.205	1.211	6.305	138.701	

U - Unsuitable Sample
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L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 16 Feb 98 04:18:55 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP9	3.20	Grey slightly weathered dolomitic LIMESTONE strong	L	44.70	46.50	15.00	51.44	5.668	1.013	5.741	126.301	.08
BHP9	3.20	Grey slightly weathered dolomitic LIMESTONE strong	L	75.60	41.90	20.00	63.51	4.959	1.114	5.522	121.490	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD * Contract Number : F10895 * Process Date : 06 Jan 98 11:14:31 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP10	6.10	Light greyish yellow brown medium to thickly bedded slightly weathered oolitic LIMESTONE strong to very strong	A	83.90	72.00	40.00	87.70	5.201	1.288	6.697	147.330	0.2
BHP10	6.10	Light greyish yellow brown medium to thickly bedded slightly weathered oolitic LIMESTONE strong to very strong	D	83.90	80.00	35.00	80.00	5.469	1.236	6.757	148.650	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP10	4.40	Light greyish yellow brown with occasional gravel sized vugs slightly weathered slightly dolomitic SANDSTONE strong to very strong	D	83.20	79.00	29.00	79.00	4.647	1.229	5.709	125.592	0.4
BHP10	4.40	Light greyish yellow brown with occasional gravel sized vugs slightly weathered slightly dolomitic SANDSTONE strong to very strong	A	83.20	73.00	32.50	87.94	4.203	1.289	5.418	119.205	
BHP10	7.00	Light greyish yellow brown medium to thickly bedded slightly weathered oolitic LIMESTONE strong to very strong	A	83.50	42.00	45.00	66.82	10.078	1.139	11.483	252.620	0.2
BHP10	7.00	Light greyish yellow brown medium to thickly bedded slightly weathered oolitic LIMESTONE strong to very strong	D	83.50	70.40	51.00	70.40	10.290	1.166	12.003	264.070	
BHP10	9.20	Light greyish yellow brown medium to thickly bedded slightly weathered oolitic LIMESTONE strong to very strong	A	84.00	48.00	26.50	71.65	5.162	1.176	6.069	133.521	1.6
BHP10	9.20	Light greyish yellow brown medium to thickly bedded slightly weathered oolitic LIMESTONE strong to very strong	D	84.00	80.10	38.00	80.10	5.923	1.236	7.322	161.079	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP11	5.20	Yellowish brown occasionally fine to gravel sized vugs slightly weathered DOLOMITE strong	A	86.10	55.20	1.60	77.79	0.264	1.220	0.323	7.097	6.3
BHP11	5.20	Yellowish brown occasionally fine to gravel sized vugs slightly weathered DOLOMITE strong	D	86.10	84.00	2.40	84.00	0.340	1.263	0.430	9.451	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 17 Dec 97 10:45:18 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHM5	13.80	Yellowish brown sub-horizontally bedded moderately weathered DOLOMITE strong	D	85.70	82.50	11.00	82.50	1.616	1.253	2.025	44.543	1.7
BHM5	13.80	Yellowish brown sub-horizontally bedded moderately weathered DOLOMITE strong	A	85.70	39.80	6.00	65.90	1.382	1.132	1.564	34.416	
BHP11	1.70	Yellowish brown thinly to medium sub-horizontally bedded slightly to moderately weathered dolomitic CONGLOMERATE	D	86.30	62.80	50.00	62.80	12.678	1.108	14.047	309.043	1.1
BHP11	1.70	Yellowish brown thinly to medium sub-horizontally bedded slightly to moderately weathered dolomitic CONGLOMERATE	A	86.30	37.40	27.00	64.11	6.570	1.118	7.347	161.644	
BHP11	3.80	Reddish brown thinly to medium sub-horizontally bedded moderately weathered sandy MUDSTONE moderately weak	D	86.40	86.10	0.50	86.10	0.067	1.277	0.086	1.895	8.0
BHP11	3.80	Reddish brown thinly to medium sub-horizontally bedded moderately weathered sandy MUDSTONE moderately weak	A	86.40	32.00	0.75	59.33	0.213	1.080	0.230	5.062	
BHP11	7.00	Yellowish brown with occasional fine to medium size vugs medium sub-horizontally bedded slightly weathered dolomitic CONGLOMERATE	D	84.90	80.40	8.00	80.40	1.238	1.238	1.533	33.715	3.8

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT * Contract Number : F10895 * Process Date : 19 Jan 98 04:34:42 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP12	2.20	Reddish brown mottled orange and green thinly to medium bedded highly to moderately weathered slightly sandy calcereous MUDSTONE weak to moderately weak	D	86.60	83.90	0.40	83.90	0.057	1.262	0.072	1.578	14
BHP12	2.20	Reddish brown mottled orange and green thinly to medium bedded highly to moderately weathered slightly sandy calcereous MUDSTONE weak to moderately weak	A	86.60	56.00	0.50	78.58	0.081	1.226	0.099	2.183	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD, NEWPORT. * Contract Number : F10895 * Process Date : 05 Feb 98 12:23:01 pm * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP12	8.95	Light grey to pink medium horizontally to subhorizontally bedded slightly weathered argillaceous LIMESTONE, strong.	D	85.30	84.00	1.20	84.00	0.170	1.263	0.215	4.725	2.6
BHP12	8.95	Light grey to pink medium horizontally to subhorizontally bedded slightly weathered argillaceous LIMESTONE, strong.	A	85.30	66.50	11.00	84.98	1.523	1.270	1.934	42.540	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

NORWEST HOLST SOIL ENGINEERING LIMITED

POINT LOAD INDEX TEST RESULTS

Test method: ISRM 1985 : Suggested Method

Location : M4 RELIEF ROAD * Contract Number : F10895 * Process Date : 06 Jan 98 11:14:31 am * Program Version 2.0

Borehole	Depth m	Description	Type	Width mm	Diameter mm	P kN	De mm	Is MN/m2	F	Is(50) MN/m2	Co MN/m2	MC%
BHP12	12.10	Light grey to pink medium horizontally bedded slightly weathered calcareous MUDSTONE very strong	A	84.00	55.40	22.50	76.97	3.797	1.214	4.611	101.444	1.4
BHP12	12.10	Light grey to pink medium horizontally bedded slightly weathered calcareous MUDSTONE very strong	D	84.00	73.00	28.50	73.00	5.348	1.186	6.341	139.502	

U - Unsuitable Sample
I - Invalid Failure
L - Lump
A - Axial
D - Diametral

D(e) = Equivalent core diameter
Is(50) = F x Is
De = SQR(4WD/Pi)
Is = P/(De)^2
F = (De/50)^.45

Is(50) Point load strength index corrected for a diametral test of core diameter 50mm
Co Compreseive strength 22 x Is(50)

CHEMICAL CONTAMINATION

NAMAS
TESTING
No. 0618

What's so special about a NAMAS report or certificate?
- NAMAS is the acronym for National Accreditation of Measurement and Sampling.
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- Measurements are traceable to national and international standards.

Comments:
Tests marked † in this report are not included in the NAMAS Accreditation Schedule for the testing laboratory. However, with the continuing development of our QC protocols, these tests will be included in the near future.
Any opinions and interpretations expressed herein are outside the scope of the testing laboratory's NAMAS Accreditation.
Coefficient of Variation (CV_T) is better than 15%

Date submitted for analysis : 19/12/97

Your Job/Order Number : F10895

Analyst(s) : CAT ELS NH ZN RLG JS RDB CBA GE

Approved signatories: J R Brown, C Barlow

Signature : R. Brown

Report date : 28 January 1998

QA APPROVED
Signed A Smith
Date 28/1/98

SOIL

ANALYTE	METHOD OF DETECTION	LIMIT OF DETECTION
Arsenic	ICP-Hydride	1.0 mg/kg
Boron (available)	ICP	0.2 mg/kg
Cadmium	ICP	0.2 mg/kg
Chromium (total)	ICP	0.2 mg/kg
Copper	ICP	0.2 mg/kg
Cyanide (total)	Colorimetry	0.1 mg/kg
Ferro/ferricyanide	Colorimetry	10 mg/kg
Cyanide (free)	Colorimetry	0.1 mg/kg
Thiocyanate	Colorimetry	1.0 mg/kg
Lead	ICP	0.5 mg/kg
Mercury	ICP-Hydride	0.1 mg/kg
Mineral Oils	Infra-red	1 mg/kg
Nickel	ICP	0.2 mg/kg
pH	pH-meter	N/A
Phenols (total)	HPLC-UV	1.0 mg/kg
Phenols (monohydric)	Colorimetry	1.0 mg/kg
PAH	GC-FID	0.1 mg/kg
Selenium	ICP-Hydride	0.1 mg/kg
Sulphate (total)	ICP	1 mg/kg
Sulphide	Colorimetry	2.0 mg/kg
Sulphur (free)	GC-ECD	20 mg/kg
TEM	Gravimetry	100 mg/kg
Zinc	ICP	0.2 mg/kg
Pentachlorophenol	GC-ECD	0.1 mg/kg
PCBs	GC-ECD	0.1 mg/kg
VOC (screen)	GC-FID	0.1 mg/kg

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH C4 (0.30m)	BH D7 (0.20m)	BH D7 (1.75m)	BH F2 (0.20m)	BH F3 (0.50m)	BH F4 (1.75m)	BH G3 (0.20m)	BH G5 (0.40m)	BH G6 (0.30m)	BH G6 (0.60m)	BH G6 (12.50--12.95m)	BH G6 (17.10--17.55m)	
		S9717757	S9717758	S9717759	S9717760	S9717761	S9717762	S9717763	S9717764	S9717766	S9717767	S9717768	S9717769	
Arsenic	mg/kg	9.7	13.5	10.8	11.9	20.1	25.3	13.3	21.9	11.2	18.5	5.4	7.8	†
Boron (available)	mg/kg	0.2	0.3	1.2	6.1	9.4	3.1	35.3	3.3	1.1	1.5	1.5	3.9	†
Cadmium	mg/kg	<0.2	0.8	0.6	1.0	0.8	0.3	10.6	0.3	0.9	<0.2	<0.2	0.3	
Chromium (total)	mg/kg	69.6	41.9	44.1	34.4	39.4	49.1	1137.9	93.7	35.8	65.2	35.7	43.6	
Copper	mg/kg	16.1	32.3	27.8	29.1	49.6	87.8	228.4	27.3	17.5	15.7	26.9	42.2	
Cyanide (total)	mg/kg	<0.1	0.2	<0.1	0.2	<0.1	<0.1	0.3	<0.1	0.2	<0.1	<0.1	<0.1	†
Ferro/ferricyanide	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	†
Cyanide (free)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	†
Thiocyanate	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	†
Lead	mg/kg	45.2	91.3	97.6	117.5	126.6	119.8	449.9	60.6	50.9	47.2	21.4	31.1	
Mercury	mg/kg	<0.1	0.2	<0.1	0.5	0.2	1.5	0.5	<0.1	0.5	<0.1	<0.1	0.1	†
Nickel	mg/kg	31.1	29.6	27.2	17.0	26.6	43.3	81.5	40.1	17.9	35.9	23.3	31.6	
pH	N/A	7.0	8.0	8.3	9.6	10.2	8.3	11.5	8.1	8.1	7.8	8.3	8.6	
Phenols (total)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	†
Phenols (monohydric)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	†
Selenium	mg/kg	0.4	0.3	0.5	0.9	1.0	1.2	1.2	0.3	0.6	0.3	0.1	<0.1	†
Sulphate (total)	mg/kg	492	2022	1113	26797	5410	1074	3456	603	1709	490	706	649	†
Zinc	mg/kg	61.1	135.7	124.7	437.5	174.0	188.5	1368.1	136.6	191.5	146.7	45.4	112.6	
Mineral Oils	mg/kg	#	351	22	1715	73	29	53	<1	29	<1	<1	<1	†
PAH	mg/kg	#	16.4	7.6	8.1	49.3	13.3	9.3	1.7	<0.1	9.5	<0.1	<0.1	†

Results for soil samples expressed as dry weight
: Analyte not requested

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH C4 (0.30m)	BH D7 (0.20m)	BH D7 (1.75m)	BH F2 (0.20m)	BH F3 (0.50m)	BH F4 (1.75m)	BH G3 (0.20m)	BH G5 (0.40m)	BH G6 (0.30m)	BH G6 (0.60m)	BH G6 (12.50--12.95m)	BH G6 (17.10--17.55m)	
		S9717757	S9717758	S9717759	S9717760	S9717761	S9717762	S9717763	S9717764	S9717766	S9717767	S9717768	S9717769	
TEM	mg/kg	#	370	390	6800	1670	550	1440	450	580	<100	260	280	†
Sulphide	mg/kg	#	#	#	#	#	#	#	<2.0	4.2	3.4	15.7	<2.0	†
Sulphur (free)	mg/kg	#	#	#	#	#	#	#	<20	<20	<20	<20	<20	†
Pentachlorophenol	mg/kg	#	#	#	#	#	#	#	<0.1	<0.1	<0.1	<0.1	<0.1	†
PCBs	mg/kg	#	#	#	#	#	#	#	<0.1	4.6	<0.1	<0.1	<0.1	
VOC (screen)	mg/kg	#	#	#	#	#	#	#	<0.1	<0.1	<0.1	<0.1	<0.1	

Results for soil samples expressed as dry weight
: Analyte not requested

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH H1 (0.20m)	BH H1 (1.85m)	BH G5 (2.80m)	BH G5 (12.70--13.15m)	BH G5 (17.20--17.25m)	BH H2 (0.30m)	BH K2 (0.30m)	BH N3 (1.00m)	BH F1 (0.40m)	BH F5 (0.20m)	BH F6 (0.50m)	BH G2 (1.00m)	
		S9717770	S9717771	S9717772	S9717773	S9717774	S9717775	S9717776	S9717777	S9717778	S9717779	S9717780	S9717781	
Arsenic	mg/kg	9.6	11.0	8.1	4.2	3.9	13.8	15.4	11.3	12.5	36.9	124.2	20.9	†
Boron (available)	mg/kg	0.9	1.0	1.4	2.1	1.4	1.0	0.8	<0.2	12.1	2.2	0.2	2.9	†
Cadmium	mg/kg	1.2	1.0	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	1.5	0.5	0.3	<0.2	
Chromium (total)	mg/kg	39.2	41.1	54.1	28.7	34.0	63.9	87.2	57.3	526.2	51.4	59.8	67.5	
Copper	mg/kg	33.8	37.0	13.4	7.7	29.2	12.1	18.2	34.5	87.8	181.7	181.1	26.0	
Cyanide (total)	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	0.2	0.1	0.1	<0.1	†
Ferro/ferricyanide	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	†
Cyanide (free)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	†
Thiocyanate	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	†
Lead	mg/kg	74.8	73.5	41.3	15.7	19.5	44.5	105.1	36.6	130.2	165.0	171.4	59.5	
Mercury	mg/kg	30.9	4.8	0.4	0.2	<0.1	0.4	0.4	<0.1	<0.1	1.1	0.8	<0.1	†
Mineral Oils	mg/kg	1557	1630	<1	<1	<1	12	<1	#	25	273	22	<1	†
Nickel	mg/kg	31.9	221.7	35.9	16.0	21.1	33.6	37.4	33.9	49.9	35.3	43.1	39.3	
pH	N/A	11.2	11.2	8.3	9.3	8.8	8.1	6.8	7.6	11.2	8.4	8.2	8.3	
Phenols (total)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	†
Phenols (monohydric)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	†
PAH	mg/kg	155.3	142.6	17.6	<0.1	<0.1	<0.1	2.4	#	29.8	23.8	52.7	<0.1	†
Selenium	mg/kg	0.3	0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.5	1.2	0.8	0.3	†
Sulphate (total)	mg/kg	2487	2525	731	317	557	435	403	328	2022	1696	1816	777	†
Sulphide	mg/kg	22.1	30.4	3.4	12.9	2.1	<2.0	<2.0	#	24.9	50.2	24.6	10.8	†

Results for soil samples expressed as dry weight
: Analyte not requested

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH H1 (0.20m)	BH H1 (1.85m)	BH G5 (2.80m)	BH G5 (12.70--13.15m)	BH G5 (17.20--17.25m)	BH H2 (0.30m)	BH K2 (0.30m)	BH N3 (1.00m)	BH F1 (0.40m)	BH F5 (0.20m)	BH F6 (0.50m)	BH G2 (1.00m)	
		S9717770	S9717771	S9717772	S9717773	S9717774	S9717775	S9717776	S9717777	S9717778	S9717779	S9717780	S9717781	
Sulphur (free)	mg/kg	<20	<20	<20	<20	<20	<20	<20	#	<20	<20	<20	<20	†
TEM	mg/kg	11310	19820	5570	370	<100	150	<100	#	930	2770	1170	360	†
Zinc	mg/kg	188.9	178.4	95.1	33.2	68.3	92.6	254.3	68.1	402.1	195.6	222.8	136.7	
Pentachlorophenol	mg/kg	6.2	0.2	<0.1	<0.1	<0.1	<0.1	#	#	#	#	#	#	†
PCBs	mg/kg	538.0	418.2	<0.1	<0.1	<0.1	<0.1	#	#	#	#	#	#	
VOC (screen)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	#	#	#	#	#	#	

Results for soil samples expressed as dry weight
: Analyte not requested

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH H1 (0.90m)											
		S9717782											
Arsenic	mg/kg	13.4	#	#	#	#	#	#	#	#	#	#	# †
Boron (available)	mg/kg	0.5	#	#	#	#	#	#	#	#	#	#	# †
Cadmium	mg/kg	2.0	#	#	#	#	#	#	#	#	#	#	#
Chromium (total)	mg/kg	55.1	#	#	#	#	#	#	#	#	#	#	#
Copper	mg/kg	44.1	#	#	#	#	#	#	#	#	#	#	#
Cyanide (total)	mg/kg	<0.1	#	#	#	#	#	#	#	#	#	#	# †
Ferro/ferricyanide	mg/kg	<10	#	#	#	#	#	#	#	#	#	#	# †
Cyanide (free)	mg/kg	<0.1	#	#	#	#	#	#	#	#	#	#	# †
Thiocyanate	mg/kg	<1.0	#	#	#	#	#	#	#	#	#	#	# †
Lead	mg/kg	71.1	#	#	#	#	#	#	#	#	#	#	#
Mercury	mg/kg	24.8	#	#	#	#	#	#	#	#	#	#	# †
Mineral Oils	mg/kg	452	#	#	#	#	#	#	#	#	#	#	# †
Nickel	mg/kg	40.5	#	#	#	#	#	#	#	#	#	#	#
pH	N/A	8.4	#	#	#	#	#	#	#	#	#	#	#
Phenols (total)	mg/kg	<1.0	#	#	#	#	#	#	#	#	#	#	# †
Phenols (monohydric)	mg/kg	<1.0	#	#	#	#	#	#	#	#	#	#	# †
PAH	mg/kg	62.5	#	#	#	#	#	#	#	#	#	#	# †
Selenium	mg/kg	0.2	#	#	#	#	#	#	#	#	#	#	# †
Sulphate (total)	mg/kg	1218	#	#	#	#	#	#	#	#	#	#	# †
Sulphide	mg/kg	18.4	#	#	#	#	#	#	#	#	#	#	# †

Results for soil samples expressed as dry weight
: Analyte not requested

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH H1 (0.90m)											
		S9717782											
Sulphur (free)	mg/kg	<20	#	#	#	#	#	#	#	#	#	#	# †
TEM	mg/kg	9650	#	#	#	#	#	#	#	#	#	#	# †
Zinc	mg/kg	225.6	#	#	#	#	#	#	#	#	#	#	#
Pentachlorophenol	mg/kg	0.1	#	#	#	#	#	#	#	#	#	#	# †
PCBs	mg/kg	1691.2	#	#	#	#	#	#	#	#	#	#	#
VOC (screen)	mg/kg	<0.1	#	#	#	#	#	#	#	#	#	#	#

Results for soil samples expressed as dry weight
: Analyte not requested

NAMAS
TESTING
No. 0618

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Coefficient of Variation (CV_T) is better than 15%

Date submitted for analysis : 19/12/97

Your Job/Order Number : F10895

Analyst(s) : CAT NH CBA ZN RLG RDB

Approved signatories: J R Brown, C Barlow

Signature : R. Brown

Report date : 21 January 1998

QA APPROVED
Signed A Smith
Date 21/1/98

WATER

ANALYTE	METHOD OF DETECTION	LIMIT OF DETECTION
Arsenic	ICP	0.5 µg/l
Boron	ICP	0.01 mg/l
Cadmium	ICP	0.005 mg/l
Copper	ICP	0.01 mg/l
Cyanide (total)	Colorimetry	0.01 mg/l
Ferro/Ferricyanate	Colorimetry	1.0 mg/l
Cyanide (free)	Colorimetry	0.01 mg/l
Thiocyanate	Colorimetry	0.1 mg/l
Lead	ICP	0.03 mg/l
Mercury	ICP	0.1 µg/l
Mineral Oils	Infra-red	0.01 mg/l
Nickel	ICP	0.001 mg/l
pH	pH-meter	N/A
Sulphate	HPLC-IC	1 mg/l
Sulphur (free)	GC-ECD	0.01 mg/l
Zinc	ICP	0.005 mg/l

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH F2 (0.50m)	BH G5 (9.70m)	BH G6 (6.60m)	BH H1 (1.00m)								
		S9717785	S9717787	S9717788	S9717789								
Arsenic	µg/l	1.3	0.6	<0.5	3.3	#	#	#	#	#	#	#	# †
Boron	mg/l	3.26	1.55	0.37	0.32	#	#	#	#	#	#	#	#
Cadmium	mg/l	<0.005	<0.005	<0.005	<0.005	#	#	#	#	#	#	#	# †
Copper	mg/l	<0.01	<0.01	<0.01	<0.01	#	#	#	#	#	#	#	#
Cyanide (total)	mg/l	<0.01	<0.01	<0.01	0.02	#	#	#	#	#	#	#	# †
Ferro/Ferricyanate	mg/l	<1.0	<1.0	<1.0	<1.0	#	#	#	#	#	#	#	# †
Cyanide (free)	mg/l	<0.01	<0.01	<0.01	0.01	#	#	#	#	#	#	#	# †
Thiocyanate	mg/l	1.0	0.7	0.2	<0.1	#	#	#	#	#	#	#	# †
Lead	mg/l	<0.03	<0.03	<0.03	<0.03	#	#	#	#	#	#	#	#
Mercury	µg/l	<0.1	<0.1	8.0	<0.1	#	#	#	#	#	#	#	# †
Mineral Oils	mg/l	<0.01	<0.01	21.31	2715.8	#	#	#	#	#	#	#	# †
Nickel	mg/l	<0.001	<0.001	<0.001	0.017	#	#	#	#	#	#	#	# †
pH	N/A	7.6	7.5	7.8	8.2	#	#	#	#	#	#	#	#
Sulphate	mg/l	452	202	64	236	#	#	#	#	#	#	#	#
Sulphur (free)	mg/l	<0.01	<0.01	<0.01	<0.01	#	#	#	#	#	#	#	# †
Zinc	mg/l	0.523	0.068	0.012	0.081	#	#	#	#	#	#	#	# †

Water samples analysed as received
: Analyte not requested

NAMAS
TESTING
No. 0618

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Coefficient of Variation (CV_T) is better than 15%

Date submitted for analysis : 19/01/98

Your Job/Order Number : F10895

Analyst(s) : CAT NH ELS RG JS

Approved signatories: J R Brown, C Barlow

Signature : R. Brown

Report date : 5 February 1998

QA APPROVED
Signed A. Smith
Date 5/2/98

SOIL

ANALYTE	METHOD OF DETECTION	LIMIT OF DETECTION
Arsenic	ICP-Hydride	1.0 mg/kg
Boron (available)	ICP	0.2 mg/kg
Cadmium	ICP	0.2 mg/kg
Chromium (total)	ICP	0.2 mg/kg
Copper	ICP	0.2 mg/kg
Cyanide (total)	Colorimetry	0.1 mg/kg
Ferro/ferricyanide	Colorimetry	10 mg/kg
Cyanide (free)	Colorimetry	0.1 mg/kg
Thiocyanate	Colorimetry	1.0 mg/kg
Lead	ICP	0.5 mg/kg
Mercury	ICP-Hydride	0.1 mg/kg
Nickel	ICP	0.2 mg/kg
pH	pH-meter	N/A
Phenols (total)	HPLC-EC	1.0 mg/kg
Phenols (monohydric)	Colorimetry	1.0 mg/kg
Selenium	ICP-Hydride	0.1 mg/kg
Sulphate (total)	ICP	1 mg/kg
Zinc	ICP	0.2 mg/kg

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH D6 (0.25m)	BH G4 (0.40m)											
		S9800508	S9800510											
Arsenic	mg/kg	15.8	15.2	#	#	#	#	#	#	#	#	#	#	†
Boron (available)	mg/kg	4.0	1.6	#	#	#	#	#	#	#	#	#	#	†
Cadmium	mg/kg	0.7	0.6	#	#	#	#	#	#	#	#	#	#	
Chromium (total)	mg/kg	82.9	60.3	#	#	#	#	#	#	#	#	#	#	
Copper	mg/kg	21.7	15.5	#	#	#	#	#	#	#	#	#	#	
Cyanide (total)	mg/kg	<0.1	<0.1	#	#	#	#	#	#	#	#	#	#	†
Ferro/ferricyanide	mg/kg	<10	<10	#	#	#	#	#	#	#	#	#	#	†
Cyanide (free)	mg/kg	<0.1	<0.1	#	#	#	#	#	#	#	#	#	#	†
Thiocyanate	mg/kg	1.1	<1.0	#	#	#	#	#	#	#	#	#	#	†
Lead	mg/kg	70.5	41.6	#	#	#	#	#	#	#	#	#	#	
Mercury	mg/kg	<0.1	<0.1	#	#	#	#	#	#	#	#	#	#	†
Nickel	mg/kg	49.2	38.6	#	#	#	#	#	#	#	#	#	#	
pH	N/A	7.1	7.8	#	#	#	#	#	#	#	#	#	#	
Phenols (total)	mg/kg	<1.0	<1.0	#	#	#	#	#	#	#	#	#	#	†
Phenols (monohydric)	mg/kg	<1.0	<1.0	#	#	#	#	#	#	#	#	#	#	†
Selenium	mg/kg	0.1	0.1	#	#	#	#	#	#	#	#	#	#	†
Sulphate (total)	mg/kg	493	575	#	#	#	#	#	#	#	#	#	#	†
Zinc	mg/kg	131.6	95.3	#	#	#	#	#	#	#	#	#	#	

Results for soil samples expressed as dry weight
: Analyte not requested

NAMAS
TESTING
No. 0618

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Date submitted for analysis : 22/12/97

Your Job/Order Number : F10895

Analyst(s) : CAT NH ELS ZN RLG JS RDB

Approved signatories: J R Brown, C Barlow

Signature : R. Brown

Report date : 5 February 1998

QA APPROVED
Signed A Smith
Date 5/2/98

SOIL

ANALYTE	METHOD OF DETECTION	LIMIT OF DETECTION
Arsenic	ICP-Hydride	1.0 mg/kg
Boron (available)	ICP	0.2 mg/kg
Cadmium	ICP	0.2 mg/kg
Chromium (total)	ICP	0.2 mg/kg
Copper	ICP	0.2 mg/kg
Cyanide (total)	Colorimetry	0.1 mg/kg
Ferro/ferricyanide	Colorimetry	10 mg/kg
Cyanide (free)	Colorimetry	0.1 mg/kg
Thiocyanate	Colorimetry	1.0 mg/kg
Lead	ICP	0.5 mg/kg
Mercury	ICP-Hydride	0.1 mg/kg
Nickel	ICP	0.2 mg/kg
pH	pH-meter	N/A
Phenols (total)	HPLC-UV	1.0 mg/kg
Phenols (monohydric)	Colorimetry	1.0 mg/kg
PAH	GC-FID	0.1 mg/kg
Selenium	ICP-Hydride	0.1 mg/kg
Sulphate (total)	ICP	1 mg/kg
Sulphide	Colorimetry	2.0 mg/kg
Sulphur (free)	GC-ECD	20 mg/kg
TEM	Gravimetry	100 mg/kg
Zinc	ICP	0.2 mg/kg

WATER

ANALYTE	METHOD OF DETECTION	LIMIT OF DETECTION
Arsenic	ICP	0.5 µg/l
Boron	ICP	0.01 mg/l
Cadmium	ICP	0.005 mg/l
Copper	ICP	0.01 mg/l
Cyanide (total)	Colorimetry	0.01 mg/l
Ferro/ferricyanide	Colorimetry	1.0 mg/l
Cyanide (free)	Colorimetry	0.01 mg/l
Thiocyanate	Colorimetry	0.1 mg/l
Lead	ICP	0.03 mg/l
Mercury	ICP	0.1 µg/l
Nickel	ICP	0.001 mg/l
pH	pH-meter	N/A
Sulphur (free)	GC-ECD	0.01 mg/l
Zinc	ICP	0.005 mg/l
Sulphate	ICP	0.1 mg/l

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH K3 (0.00m GL)	BH K3 (1.00m)	BH K4 (1.00-1-.25m)	BH K4 (2.00-2-.30m)	BH H6 (0.00m GL)	BH H7 (0.00m GL)	BH H7 (0.80m)						
		S9717829	S9717830	S9717831	S9717832	S9717833	S9717835	S9717836						
Arsenic	mg/kg	11.7	12.2	3.6	4.2	15.4	17.5	18.1	#	#	#	#	#	†
Boron (available)	mg/kg	<0.2	<0.2	1.5	0.9	1.4	0.8	0.9	#	#	#	#	#	†
Cadmium	mg/kg	0.8	0.7	8.0	8.6	2.0	0.6	0.4	#	#	#	#	#	
Chromium (total)	mg/kg	46.7	51.5	561.4	504.3	117.1	76.9	77.6	#	#	#	#	#	
Copper	mg/kg	32.9	26.1	21.6	18.1	36.5	42.5	43.3	#	#	#	#	#	
Cyanide (total)	mg/kg	0.2	0.2	0.2	0.1	0.5	0.2	<0.1	#	#	#	#	#	†
Ferro/ferricyanide	mg/kg	<10	<10	<10	<10	<10	<10	<10	#	#	#	#	#	†
Cyanide (free)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	#	#	#	#	#	†
Thiocyanate	mg/kg	<1.0	<1.0	<1.0	2.7	3.3	1.1	1.1	#	#	#	#	#	†
Lead	mg/kg	46.7	43.0	60.9	54.9	119.4	76.1	72.7	#	#	#	#	#	
Mercury	mg/kg	0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	#	#	#	#	#	†
Nickel	mg/kg	43.1	51.1	40.2	38.8	43.3	73.0	76.5	#	#	#	#	#	
pH	N/A	7.8	8.1	11.5	12.1	10.5	8.5	8.2	#	#	#	#	#	
Phenols (total)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	#	#	#	#	#	†
Phenols (monohydric)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	#	#	#	#	#	†
Selenium	mg/kg	0.3	0.2	0.1	<0.1	1.3	0.5	0.5	#	#	#	#	#	†
Sulphate (total)	mg/kg	650	297	828	1146	3781	1002	998	#	#	#	#	#	†
Sulphide	mg/kg	2.3	3.1	27.4	21.8	575.6	67.5	27.0	#	#	#	#	#	†
Sulphur (free)	mg/kg	<20	<20	<20	<20	<20	<20	<20	#	#	#	#	#	†
Zinc	mg/kg	115.2	99.6	85.9	80.8	345.4	116.4	116.9	#	#	#	#	#	

Results for soil samples expressed as dry weight
: Analyte not requested

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH K3 (0.00m GL)	BH K3 (1.00m)	BH K4 (1.00-1-.25m)	BH K4 (2.00-2-.30m)	BH H6 (0.00m GL)	BH H7 (0.00m GL)	BH H7 (0.80m)					
		S9717829	S9717830	S9717831	S9717832	S9717833	S9717835	S9717836					
PAH	mg/kg	#	#	#	#	<0.1	<0.1	<0.1	#	#	#	#	# †
TEM	mg/kg	#	#	#	#	700	260	220	#	#	#	#	# †

Results for soil samples expressed as dry weight
: Analyte not requested

Summary Of Results
Norwest Holst Soil Engineering Limited - M4 Relief Road, Newport

ANALYTES	UNITS	BH K4 (1.00m)											
		S9717839											
Arsenic	ug/l	2.9	#	#	#	#	#	#	#	#	#	#	# †
Boron	mg/l	<0.01	#	#	#	#	#	#	#	#	#	#	#
Cadmium	mg/l	<0.005	#	#	#	#	#	#	#	#	#	#	# †
Copper	mg/l	0.07	#	#	#	#	#	#	#	#	#	#	#
Cyanide (total)	mg/l	0.02	#	#	#	#	#	#	#	#	#	#	# †
Ferro/ferricyanide	mg/l	<1.0	#	#	#	#	#	#	#	#	#	#	# †
Cyanide (free)	mg/l	0.02	#	#	#	#	#	#	#	#	#	#	# †
Thiocyanate	mg/l	17.5	#	#	#	#	#	#	#	#	#	#	# †
Lead	mg/l	0.09	#	#	#	#	#	#	#	#	#	#	#
Mercury	ug/l	22.6	#	#	#	#	#	#	#	#	#	#	# †
Nickel	mg/l	0.018	#	#	#	#	#	#	#	#	#	#	# †
pH	N/A	12.3	#	#	#	#	#	#	#	#	#	#	#
Sulphur (free)	mg/l	<0.01	#	#	#	#	#	#	#	#	#	#	# †
Zinc	mg/l	<0.005	#	#	#	#	#	#	#	#	#	#	# †
Sulphate	mg/l	13.1	#	#	#	#	#	#	#	#	#	#	# †

Water samples analysed as received
: Analyte not requested

Ground Investigation Report

NR/SR/F10895 APRIL 1998

GROUND INVESTIGATION

M4 RELIEF ROAD

FOR

THE WELSH OFFICE

Consulting Engineer
Ove Arup and Partners

VOLUME 2

Norwest Holst Soil Engineering Ltd

SGE GROUPE

NORWEST HOLST SOIL ENGINEERING LIMITED - Parkside Lane, Dewsbury Road,
Leeds LS11 5SX Tel: (0113) 271 1111 Fax: (0113) 276 0472
E-mail: NHSEL_LEEDS@compuserve.com

NR/SR/F10895 APRIL 1998

GROUND INVESTIGATION

M4 RELIEF ROAD

FOR

THE WELSH OFFICE

Consulting Engineer
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VOLUME 2

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VOLUME 1	TEXT APPENDIX ONE : EXPLORATORY HOLE LOGS Borehole Records 'A' to 'L' Holes
VOLUME 2	APPENDIX ONE : EXPLORATORY HOLE LOGS Borehole Records 'M' to 'P' Holes Trial Pit Records APPENDIX TWO : INSITU TEST RESULTS Borehole Vane Results Permeability Test Results Groundwater Monitoring Records Geophysics report
VOLUME 3	APPENDIX THREE : LABORATARY TEST RESULTS SOIL SUMMARIES Laboratory Vane Results Shear Strength Plots- undrained triaxials effective triaxials ring shear Particle Size Distribution Graphs Compaction Graphs
VOLUME 4	APPENDIX THREE : LABORATORY TEST RESULTS MCV Plots CBR Plots Oedometer Plots ROCK SUMMARIES Point Load Test Results CHEMICAL CONTAMINATION RESULTS
VOLUME 5	APPENDIX FOUR : DRAWINGS Plans Sections

APPENDIX ONE
EXPLORATION HOLE LOGS

APPENDIX 1.2:
TERMINOLOGY USED IN SOIL DESCRIPTIONS

1.0 GENERAL PROCEDURES

Soil descriptions contained in this report have been produced in accordance with the procedure and principles given in B.S. 5930 (1981) Section 8 (ref 01). However in some instances a modified or extended approach has been adopted based on the work of Norbury, Child and Spink (ref 02) and this is indicated at appropriate points in the following text.

For a soil description the main soil characteristics should be given in a standard word order although the word order can be adjusted to enhance and clarify if appropriate. The main soil characteristics can be divided as follows:-

(1)	Mass Characteristics	(2)	Material Characteristics
1a)	Field Strength or density	2a)	Colour
1b)	Discontinuities	2b)	Particle shape, grading & composition
1c)	Bedding	2c)	Soil name in capital eg (CLAY)

(3) Geological Formations, age and type of deposit
(4) Classification Soil Group (optional)

For descriptions used in this report the soil colour is placed after the field strength or density ie stiff grey CLAY. Other word order is as described previously.

The basic soil categories covered by the following notes may be broadly summarised as:

(i) Very coarse soils: greater than 60mm in diameter, ie cobbles and boulders.

(ii) Coarse soils: 0.06m to 60mm in diameter, ie sands and gravels.

(iii) Fine soils: less than 0.06mm in diameter, ie clays and silts.

(iv) Organic soils.

(v) Man made "soils".

2.0 MASS CHARACTERISTICS OF SOILS

2.1 Cohesive Soils

For cohesive material the following strength scale is used.

Term	Field Identification	Undrained Shear Strength kN/m²
Very Soft	Can be squeezed through fingers	20
Soft	Easily remoulded by hand	20-40
Firm	Hard to remould by hand	40-75
Stiff	Indented slightly by thumb	75-150
Very Stiff	Indented by thumb nail	150-300
Hard	Can be scratched	>300
N.B Clays with undrained strengths greater than 300 kN/m² can be described as hard clays or as very weak mudstones as suggested by Spink and Norbury.		

2.2 Granular Soils

For granular deposits relative density may only be determined by the standard penetration test (S.P.T). The following table provides a scale of terms related to S.P.T 'N' values (see B.S. 1377:1990).

Term	Field Identification	S.P.T 'N' Values (blows for 300mm penetration)
Very loose	Can be excavated with a spade	0-4
Loose	and 50mm wooden peg can be easily driven	4-10
Medium dense	-	10-30
Dense	Requires pick for excavation	30-50
Very dense	and 50mm wooden peg is hard to drive	over 50
N.B. The field identification terms for very loose/loose material and dense/very dense material are very general and should only be used with caution.		

2.3 Discontinuities

The type of discontinuity should be described eg fissures, faults and shear planes together with their spacing as given in the following table. Discontinuity openness, and surface texture eg rough, smooth, polished, striated should be recorded although this need not always be added to the borehole log if the required level of detail is low.

2.4 Bedding

Bedding spacing is assessed using the thickness terms given in Table One.

TABLE ONE: DESCRIPTIONS FOR DISCONTINUITIES AND BEDDING

DISCONTINUITIES		BEDDING	
Scale of Spacing Term	**Mean Spacing mm**	**Scale of Bedding Term**	**Mean Thickness mm**
Very widely	>2000	Very thickly bedded	>2000
Widely	2000-600	Thickly bedded	2000-600
Medium	600-200	Medium bedded	600-200
Closely	200-60	Thinly bedded	200-60
Very closely	60-20	Very thinly bedded	60-20
Extremely closely	<20	Thickly laminated	20-6
		Thinly laminated	<6
Note: Spacing terms are also used for describing the distance between partings, isolated beds, laminae or roots etc.		Note: Interbedded/interlaminated: alternating layers of different material type. These terms must be given a thickness if material is present in equal proportions. Otherwise the thickness of and spacing between subordinate layers must be defined.	

3.0 MATERIAL CHARACTERISTICS OF SOIL

An examination of insitu soil deposits, disturbed or undisturbed samples allows the material characteristics to be recorded. These characteristics included colour, particle shape, particle grading and particle composition.

3.1 Colour

The recorded colour should be based on the logger's general impression of the overall colour. For material with more than one colour the terms mottled or multicoloured should be used.

White, cream, grey, black, yellow, orange, red, brown, green and blue etc may be used but supplemented as necessary with: light, dark, mottled and reddish brownish etc. All coloration associated with chemical changes should be noted ie grey gleying on fissures.

3.2 Particle Shape

For coarser granular deposits (gravel and cobbles) the particle shape should be described as follows:-

Angularity	Form	Surface Texture
Angular Subangular Subrounded Rounded	Flat Elongated	Rough Smooth
Notes: Form and surface textural descriptors are optional.		

3.3 Principle Soil Type and Secondary Constituents

The main ambiguities in BS 5930 (1981) Section 8 relate to the description of composite soil types. In order to overcome these ambiguities the modifications to BS 5930 proposed by Norbury, Child and Spink (1986) have been adopted as follows:-

3.3.1 Predominantly Coarse Soils

BS 5930 Section 8 recommends that the secondary constituents of coarse soil should in the soil description, precede the main soil type, eg (slightly/-/very) sandy gravel. This can become ambiguous if qualifying adjectives also form part of the description. Norbury et al overcome this by proposing that the secondary constituent may be placed after the main soil type, eg GRAVEL (with a little/some/much) sand as shown in Table Two.

3.3.2 Mixtures of Coarse and Fine Soils

Section 41.3.2.1 of BS 5930 states that mixtures of coarse and fine soils with more than 35% of fine soil (Silt and Clay) shall be described as a clay or silt (fine soil) or they should be described as sand or gravel (coarse soil) ! This could lead to misleading descriptions if strictly adhered to since a material that in engineering terms behaves as a clay may have a clay content as low as 10%. The above approach is therefore not adopted where it would lead to a description which would not reflect the engineering behaviour of the material. For such cases the 35% limit is relaxed.

TABLE TWO: DESCRIPTORS FOR SECONDARY CONSTITUENTS IN COARSE SOILS

Term Before	Principal Term	Term After	Secondary Constituent (Approx %)
Slightly (sandy*)		with a little (sand*) or occasional (cobbles*)	<5
(Sandy*)	SAND, GRAVEL COBBLES OR BOULDERS	with some (sand*) or some (cobbles*)	5-20
Very (Sandy*)		with much (sand) or many (cobbles+) and (sand*) or and (cobbles+)	20-40 50
Notes: Terms may be placed before or after the principal constituents as appropriate. * Fine or coarse soil type as appropriate + Very coarse soil type as appropriate x or described as fine soil depending on mass behaviour			

3.3.3 **Predominantly Fine Soils**

Mixtures of clay and silt are fine soils and BS 5930 suggests that they are classified as either clay or silt based on plasticity. When fine soils present as a secondary constituent have an appreciable influence on mass behaviour the terms 'very silty' and 'very clayey' are exclusively used. As for predominantly coarse soils, secondary constituents may be included after the main soil type in accordance with following table:

TABLE THREE: DESCRIPTORS FOR SECONDARY CONSTITUENTS IN FINE SOILS

Term Before	Principal Term	Term After	Secondary Constituent (Approx %)
Slightly (sandy*)		with a little (sand*)	<35
(Sandy*)	CLAY OR SILT	with some (sand*)	35-65
Very (Sandy*)		with much (sand*)	65+
Notes: Terms may be placed before or after the principal constituents as appropriate. * Coarse soil type as appropriate + or described as coarse soil depending on mass behaviour			

APPENDIX 1.3:
TERMINOLOGY USED IN THE DESCRIPTION AND CLASSIFICATION OF ROCKS

1.0 GENERAL PROCEDURES

Rock descriptions contained in this report have been produced in accordance with the procedure and principles given in BS 5930 (1981) Section 8 (ref 01), with the exception of the description of the weathered state for which the scheme outlined in QJEG (1972) (ref 03) and recommended by Norbury et al (1984) (ref 02) is used.

For rock descriptions the main rock characteristics should be given in a standard word order. The descriptions and classification is therefore based on the following:-

(1) Material Characteristics
1a) Colour
1b) Grain size
1c) Texture
1d) Structure
1e) State of weathering
1f) Rock name (in capitals eg SANDSTONE)
1g) Strength
1h) Other characteristics
(2) Geological Formation
(3) Mass Characteristics
3a) State of weathering
3b) Fracture state
3c) Discontinuities

2.0 MATERIAL CHARACTERISTICS OF ROCK

2.1 Colour

Colour is described according to the scheme for soils (see Appendix 2 and also BS 5930 Section 41.3.2.2).

2.2 Grain Size

The descriptive scheme given in Table 9 of BS 5930 is used together with the accompanying notes in section 44.2.2.

2.3 Texture

A description of rock texture is not normally required but when used refers to the arrangement of individual grains in the rock. Terms which may be used include: porphyritic, crystalline, amorphous and glass. For further guidance refer to BS 5930 section 44.2.3.

2.4 Structure

The descriptive terms for structure cove the inter-relationship of lithology and textural features in the rock. Terms include: bedding, laminated, foliated and banded. The thicknesses of these structures are described by the following terms which also apply to the spacing of Discontinuities (see 4.3).

TABLE ONE: DESCRIPTIVE TERMS FOR STRUCTURE AND DISCONTINUITY SPACING

Structure (eg Bedding, Cleavage)	Discontinuity (eg Joint, Fissure)	Spacing
Very thickly	Very widely (jointed)	> 2m
Thickly (bedded)	Widely (jointed)	0.6m-2m
Medium (bedded)	Medium (jointed)	0.2m-0.6m
Thinly (bedded)	Closely (jointed)	60mm-200mm
Very thinly (bedded)	Very closely (jointed)	200mm-60mm
Laminated	Extremely closely (jointed)	6mm-20mm
Thinly laminated	-	< 6mm

2.5 State of Weathering

The descriptors given in the following table which are based on the scheme given in QJEG (1972) are used for weathering in rock.

TABLE TWO: DESCRIPTORS FOR WEATHERING IN ROCK CORES

Term	Description
Fresh	Parent rock showing no discolouration, loss of strength or any other weathering effect
Slightly weathered	Rock may be slightly discoloured, particularly adjacent to discontinuities, which may be open and will have slightly discoloured surfaces; the intact rock is not noticeably weaker than the fresh rock
Moderately weathered	Rock is discoloured; discontinuities may be open and will have discoloured surfaces with alteration starting to penetrate inwards; intact rock is noticeably weaker, as determined in the field, than the fresh rock. (The ratio of original rock to weathered rock is estimated where possible)
Highly weathered	Rock is discoloured: discontinuities may be open and will have discoloured surfaces and the original fabric of the rock may be altered. Alteration penetrates deeply inwards, but corestones are still present. (The ratio of original rock to weathered rock is estimated where possible)
Completely weathered	Rock is discoloured and changed to a soil but original fabric is mainly preserved. There may be occasional small corestones. The property of the soil depends in part on the nature of the parent rock.
Residual soil	Rock is discoloured and completely changed to a soil in which the original rock fabric is completely destroyed.

2.6 Rock Name

An aid to the identification of rock type is given in Table 9 of BS 5930.

2.7 Strength

The descriptors given in the following table are used to assess rock strength.

TABLE THREE: DESCRIPTORS AND FIELD IDENTIFICATION FOR ROCK STRENGTH

Term	Field Identification	Uniaxial Compressive Strength Range (MN/m^2)
Very weak	Gravel size lumps crushed between finger and thumb	1.25
Weak	Gravel size lumps broken in half by heavy hand pressure	1.25-5
Moderately weak	Thin slabs/corner broken off with heavy hand pressure	5-12.5
Moderately strong	Rock broken by hammer blow when held in hand	12.5-50
Strong	Rock broken by hammer blow when resting on solid surface	50-100
Very strong	Rock chipped by heavy hammer blows	100-200
Extremely strong	Rock rings on hammer blow. Only broken by sledge hammer	200

2.8 Other Characteristics

In formation can include minor constituents as for soils (see Appendix 2) and can included abnormal mineralogy, presence of vugs etc.

3.0 GEOLOGICAL FORMATION

The geological formation, age and type of deposit are only given where this can be done with confidence and where no conjecture is involved.

The names of geological units referred to have been derived from an assessment of the strata descriptions and regional geology. At some locations the geological formation is complex and description of different geological units are similar. No responsibility is accepted for the geological units being inaccurate.

4.0 MASS CHARACTERISTICS

4.1 Weathering Classification for Rock Mass

A draft revision of BS 5930 (1992), Section 8 recognises the original 1981 BS mass weathering classification is unworkable and should be changed as for rock material description. Although the distribution of weathering grades of rock material may be recorded for borehole cores, the distribution of weathering grades of the rock mass from which the cores were obtained has to be inferred. For further guidance see the Draft BS 5930 (1992) Section 44.3.2.

4.2 Fracture State

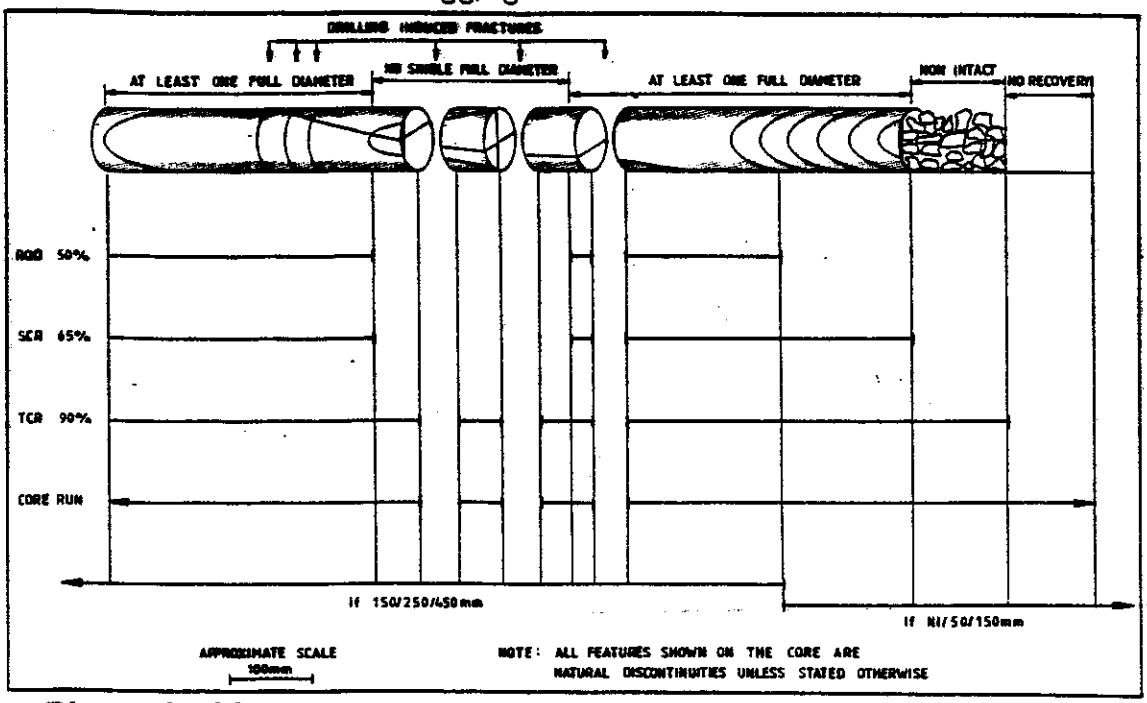
Fracture state is recorded in accordance with the terms detailed in BS 5930 (1981) and is further clarified using the definition of solid core given by Norbury et al (1984) as follows:

Solid core - Core with at least one full diameter (but not necessarily a full circumference) between two natural fractures. By this definition core that has a single set of inclined fractures would have a core recovery of 100%. Where there are two or more sets of non parallel fractures only sections of the core in which the fractures actually intersect are excluded from the solid core.

Based on these definitions the following terms are defined:

Term	Abbreviation	Definition
Total Core Recovery	TCR (%)	The percentage ratio of core recovered (both solid and non-intact) to the total length of core run
Solid Core Recovery	SCR (%)	The percentage of solid core recovered to total length of core run
Rock Quality Designation	RQD(%)	The total length of solid core pieces greater than 100mm between natural fractures expressed as a percentage of total length of core run
Fracture Index	F.I	The number of natural fractures contained within a metre of core of reasonably uniform characteristics. This need not correspond to core runs. (NI) is used to denote non intact fragmented core.

The terms on the previous page may be related to the definitions given in the following schematic illustration of fracture logging terms:



4.3 Discontinuities

Discontinuities are described in terms of type, i.e joint, fissure, fault, vein etc and the spacing detailed in Table One is recorded. The presence or absence of infill material is recorded together with joint roughness as detailed in the following table:

TABLE FOUR: DESCRIPTORS FOR DISCONTINUITY INFILL AND ROUGHNESS

Infill Description	Definition
Clean	No fracture infill material
Stained	Colouration on rock only. No recognisable infill material
Filled or partially filled	Fracture filled with recognisable infill material (which should be described, eg clay, gypsum etc)
Roughness Description	**Definition**
Smooth	Appears smooth and is essentially smooth to the touch. May be slickensided
Slightly rough	Asperities on the fracture surfaces are visible and may be distinctly felt
Medium rough	Asperities on the fracture surfaces are visible and fracture surface abrasive
Rough	Large angular asperities can be seen. Some ridge and high side angle steps evident
Very rough	Near vertical steps can occur on the fracture surfaces

5.0 Geological Formational Weathering Zones

An accurate assessment of the individual stratum's weathering zones within the Mercia Mudstone Group could be not be successfully ascertained since much of the data used to categorise individual zones conflicted with other data available. Consequently, the exploratory hole logs do not show separate weathering zones for the Mercia Mudstone Group.

References:

(01) Code of Practice for Site Investigation, BS 5930. British Standards Institution (Revision Section 8; 1992).

(02) Norbury, D.R, Child, G.H and Spink, T.W 'A Critical Review of Section 8 (BS 5930) - Soil and Rock Description'. Geological Society, Engineering Geology Special Publication No 2, 1986.

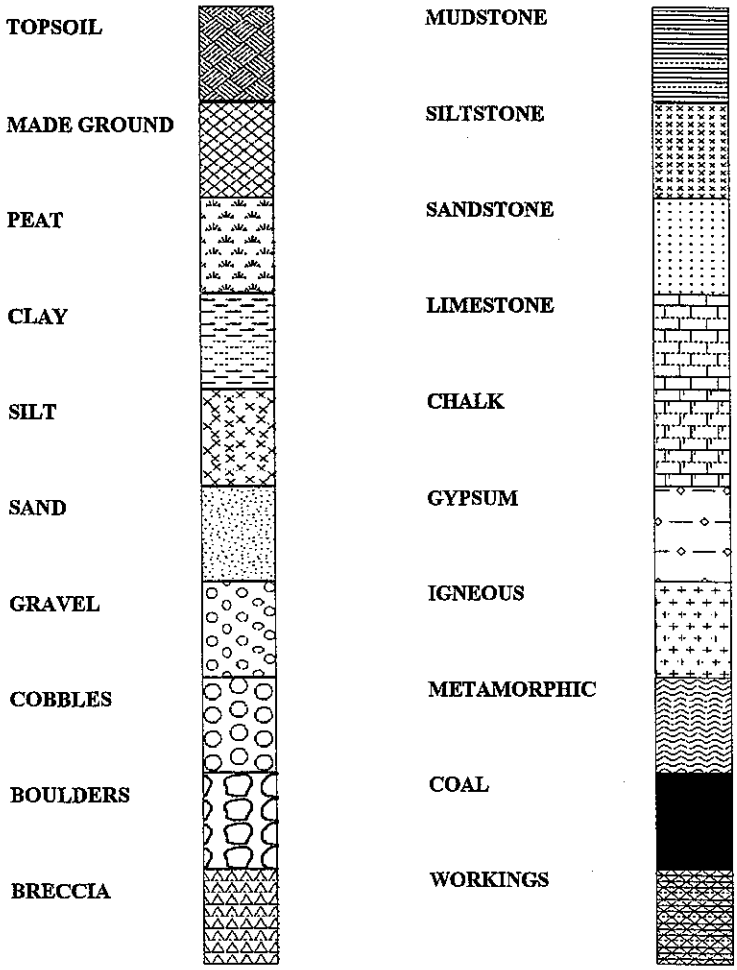
(03) Anon (1970): The logging of cores for engineering purposes. Q. Journ. Engng. Geol. 3, pp 1-24.

BOREHOLE RECORDS

Norwest Holst Soil Engineering Ltd.

EXPLORATION HOLE LOG LEGEND AND NOTATION SHEET

SOIL AND ROCK LEGEND CODES



Where a strata consists of material of more than one soil or rock type the legends are appropriately combined.

LOG NOTATION

U -- Undisturbed U100 Sample
P - Piston Sample
BL - Block Sample
M - Mazier Sample
D -- Disturbed Sample
B -- Bulk Disturbed Sample
W -- Water Sample
V - Vane Test
K - Permeability Test
Pr - Pressuremeter Test
S -- Standard Penetration Test
C -- Cone Penetration Test

NR -- No Recovery
NP -- No Penetration
TCR -- Total Core Recovery
SCR -- Solid Core Recovery
RQD -- Rock Quality Designation
F.I. - Fracture Index
N.A. - Not Applicable
N.I. - Not Intact

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHM1** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	341017.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				186296.1 N
		Drilling Rig	Pilcon	Ground Level	5.10m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	T.R	Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	15/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
14/10/1997	1800	9.00	9.00	Dry	
15/10/1997	0800	9.00	9.00	1.80	
15/10/1997	1200	12.00	9.00	10.10	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	12.00	150	9.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
14/10/1997	0000	2.40	0.60	20.0	medium	1.50	3.00
14/10/1997	0000	8.40	6.30	20.0	medium	8.00	9.00

GENERAL NOTES

1. Borehole complete to 12.00m.
2. Backfilled with cement/bentonite grout to ground level.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
7.50	S	1/450mm*
8.50	S	N=11 (2,2,2,3,3,3)
11.00	S	53/150mm (4,6,15,38)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHM1** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	341017.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		186296.1 N
		Driller	I.D	Ground Level	5.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	15/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.30	4.80				
Soft to firm brown mottled grey slightly sandy CLAY with occasional rootlets. (Estuarine Alluvium)			U 0.50 - 1.00	(10)		
			D 1.20			
			U 1.50 - 2.00	(7)		
---at 2.20m soft			D 2.20			
			U 2.50 - 3.00	(4)		
	2.70	2.40				
Very soft dark brown slightly clayey fibrous PEAT. (Peat)			D 3.20			
			U 3.50 - 4.00	(3)		
			D 4.20			
			U 4.50 - 5.00	(2)		
	5.00	0.10				
Very soft grey sandy CLAY. (Estuarine Alluvium)			D 5.20			
---from 5.20 to 6.70m with occasional slighlty decomposed fine to medium gravel sized organic fragments			D 5.70			
			U 6.00 - 6.50	(2)		
---at 6.70m very soft slightly sandy			D 6.70			
			B 7.50 - 8.00	S1/450mm*	S 7.50	
			D 7.50		7.95	
	8.00	-2.90				
Firm brown mottled grey sandy CLAY with occasional to some fine to coarse angular to subrounded mudstone and sandstone gravel. (Estuarine Alluvium)			D 8.20			
	8.40	-3.30	B 8.50 - 9.00	S11	S 8.50	
					8.95	
Medium dense greyish brown sandy fine to coarse subangular to rounded silicious GRAVEL. (Fluvial Alluvium)	8.90	-3.80				
			D 9.20			
Reddish brown highly to completely weathered silty MUDSTONE, very weak to weak. (Mercia Mudstone Group)			U 9.50 - 10.00	(61)		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHM1** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	341017.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		186296.1 N
		Driller	I.D	Ground Level	5.10m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
				Date Started	14/10/1997
Consultant	Ove Arup and Partners			Date Completed	15/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Reddish brown highly to completely weathered silty MUDSTONE, very weak to weak. (Mercia Mudstone Group)				D 10.20			
---from 10.20 to 10.70m moderately weathered, weak				D 10.70			
---from 11.00m moderately weathered, weak				D 11.00	S53/150mm	S 11.00 – 11.30	
				D 11.70			
		12.00	-6.90				
Cable Percussion boring complete at 12.00 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM2** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341180.1 E 186398.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	4.70m AOD
Client	Welsh Office	Drillers	I.D/E.D	Orientation	Vertical
		Logged by	C.D/T.R/M.B	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	16/10/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
15/10/1997	1800	12.50	9.00	Dry	.
16/10/1997	1000	12.50	10.50	1.30	Inflow overnight
16/10/1997	1250	12.50	4.30	Dry	
16/10/1997	1530	20.30	12.50	4.21	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
11.80	12.30	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	12.50	150	10.50
121	20.30	121	12.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
15/10/1997	0000	3.50	2.70	20	medium	3.00	6.00
15/10/1997	0000	7.30	4.90	20	medium	7.00	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
12.50	20.30	air & mist	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
0.50	S	1/450mm*
2.50	S	1/450mm*
4.50	S	N=1 (1,0,0,0,0,1)
8.50	S	N=22 (2,2,3,5,6,8)
10.00	S	N=67 (8,13,15,15,17,20)
11.50	S	73/150mm (12,18,32,41)
12.30	S	75/150mm*

* Seating blows only.

GENERAL NOTES

1. Cable Percussion boring complete at 12.50m, PW casing installed.
2. Borehole complete at 20.30m, standpipe piezometer installed at 8.30m.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM2** Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341180.1 E 186398.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	4.70 m AOD
Client	Welsh Office	Drillers	I.D/E.D	Orientation	Vertical
		Logged by	C.D/T.R/M.B	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	16/10/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
MADE GROUND: Hardcore			B 0.50 - 1.00		S1/450mm* 0.50	
	0.60	4.10	D 0.50		0.95	
Very soft brown mottled grey brown fine sandy CLAY with occasional fine and medium sandstone and mudstone gravel and occasional pockets of black brown firm fibrous peat. (Estuarine Alluvium)						
	1.20	3.50	D 1.20			
			U 1.50 - 2.00	(2)		
Black mottled black brown spongy fibrous slightly clayey PEAT with very occasional subangular medium and coarse sandstone gravel at 2.20m. (Peat)			D 2.20			
			B 2.50 - 3.00		S1/450mm* 2.50	
			D 2.50		2.95	
			D 3.20			
---at 3.20m predominantly black becoming slightly plastic			U 3.50 - 4.00	(1)		
			B 3.60 - 4.00			
---at 3.50m spongy to plastic occasionally woody	4.00	0.70				
			D 4.20			
Very soft grey occasionally slightly fine sandy CLAY with occasional medium gravel sized pockets of black fibrous woody peat.(Estuarine Alluvium)			B 4.50 - 5.00		S1 4.50	
			D 4.50		4.95	
			D 5.50			
	6.00	-1.30	U 6.00 - 6.50	(2)		
Black spongy fibrous PEAT occasionally brown and woody. (Peat)						
			D 6.70			
	6.80	-2.10	D 6.90			
Firm brown fine sandy CLAY with occasional subangular and subrounded fine gravel of sandstone and mudstone. (Estuarine Alluvium)			U 7.00 - 7.50	(21)		
	7.30	-2.60				
Medium dense light greyish brown with white speckling slightly clayey silty fine SAND with occasional gravel. (Fluvial Alluvium)			D 7.70			
			B 7.80 - 8.30			
			B 8.50 - 9.00		S22 8.50	
	8.70	-4.00	D 8.50		8.95	
Light reddish brown completely weathered MUDSTONE, weak.(Mercia Mudstone Group)						
			D 9.50			
			D 10.00		S67 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM2** Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341180.1 E 186398.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	4.70 m AOD
Client	Welsh Office	Drillers	I.D/E.D	Orientation	Vertical
		Logged by	C.D/T.R/M.B	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	16/10/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Light reddish brown completely weathered MUDSTONE, weak.(Mercia Mudstone Group)			D 10.00						S67 10.00 10.45	
---at 11.00m occasionally speckled greyish green			D 11.00							
			D 11.50						S73/150mm 11.50 11.80	
---at 12.10m occasionally thinly laminated			D 12.10							
---at 12.30m thinly laminated	12.50	-7.80	D 12.30						S75/150mm*12.30 12.45	
Reddish brown medium to thickly horizontally bedded moderately weathered silty MUDSTONE moderately weak with closely to medium spaced horizontal fractures irregular rough tight. (Mercia Mudstone Group)			12.50 - 13.90		93	71	71	0 NI 2 3 NI 0		
---from 12.50 to 12.72m highly weathered very weak completely fractured										
---from 13.00 to 13.26m highly weathered very weak completely fractured			13.90 - 15.50		100	76	76	NI 2		
---from 14.00 to 14.60m highly weathered very weak completely fractured										
---from 16.25 to 16.40m highly weathered very weak completely fractured			15.50 - 17.00		100	49	49	4 NI NI		
---from 16.40 to 17.30m occasional mottled grey green										
---from 16.40 to 17.00m highly weathered very weak completely fractured			17.00 - 18.50		100	64	64	NI 1 NI 1 NI 1 1		
---from 17.00 to 17.40m highly weathered very weak completely fractured										
---from 17.71 to 17.85m highly weathered very weak completely fractured										
---from 18.00 to 18.17m highly weathered very weak completely fractured			18.50 - 19.60		97	39	30	NI 0 0 NI		
---from 18.50 to 19.10m highly weathered very weak completely fractured										
			19.60 - 20.30		103	17	17	NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM2** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341180.1 E 186398.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	4.70 m AOD
Client	Welsh Office	Driller	I.D/E.D	Orientation	Vertical
		Logged by	C.D/T.R/M.B	Date Started	15/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	16/10/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown medium to thickly horizontally bedded moderately weathered silty MUDSTONE moderately weak with closely to medium spaced horizontal fractures irregular rough tight. (Mercia Mudstone Group)		20.30	-15.60					0 NI		
Borehole complete at 20.30 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHM3** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	341234.3 E
Project	M4 Relief Road Magor to Castleton Stage 2				186549.7 N
		Drilling Rig	Pilcon	Ground Level	4.50m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	C.D	Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
16/10/1997	1800	9.50	9.50	4.40	
17/10/1997	0800	9.50	9.50	0.20	
17/10/1997	1000	11.00	11.00	1.70	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
9.30	9.50	0.50	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	11.00	150	11.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
16/10/1997	0000	0.40	0.10	20.0	fast	0.00	0.00

GENERAL NOTES

1. Vane tests at 2.00m and 5.00m.
2. Borehole grouted to ground level.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	1/450mm*
4.00	S	1/450mm*
8.00	S	1/450mm*
9.50	S	N=39 (12,6,8,8,10,13)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHM3** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	341234.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		186549.7 N
		Driller	I.D	Ground Level	4.50m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
MADE GROUND: Hardcore			W 0.20 W 0.20			
			B 1.00 - 1.50	S1/450mm*	S 1.00	
---from 1.00 to 1.50m with some hardcore gravel	1.20	3.30			1.45	
Very soft black mottled brown spongy to plastic fibrous woody PEAT with occasional subangular fine medium and coarse sandstone and mudstone gravel and cobbles. (Peat)			D 1.70 B 2.20 - 2.70 U 3.00 - 3.50 D 3.70	(2)		
	4.00	0.50	B 4.00 - 4.50	S1/450mm*	S 4.00	
Very soft blackish brown spongy fibrous woody clayey PEAT with occasional cobble sized pockets of soft grey organic clay. (Peat)			D 4.70 B 5.20 - 5.70 D 6.20 U 6.50 - 7.00 D 7.20	(2)	4.45	
---at 7.20m with much soft grey organic clay	7.40	-2.90				
Loose light brown speckled white slightly clayey silty fine SAND. (Fluvial Alluvium)			D 7.70 B 8.00 - 8.50	S1/450mm*	S 8.00	
---from 8.00 to 9.00m with very occasional black fine gravel sized coal			D 9.00		8.45	
			B 9.50 - 10.00 D 9.50	S39	S 9.50	
					9.95	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHM3** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	341234.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		186549.7 N
		Driller	I.D	Ground Level	4.50m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	16/10/1997
Consultant	Ove Arup and Partners			Date Completed	17/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Loose light brown speckled white slightly clayey silty fine SAND. (Fluvial Alluvium)				B 10.50 - 11.00			
		11.00	-6.50				
Cable Percussion boring complete at 11.00 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHM3A
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	341235.6 E
Project	M4 Relief Road Magor to Castleton Stage 2				186554.2 N
		Drilling Rig	Pilcon	Ground Level	4.50m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	C.D	Date Started	10/11/1997
Consultant	Ove Arup and Partners			Date Completed	10/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
10/11/1997	1800	12.00	10.30	1.40	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	12.00	150	11.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
10/11/1997	0000	0.70	0.20	20.0	fast	0.50	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
11.50	S	N=28 (2,3,5,7,7,9)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHM3A** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	341235.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		186554.2 N
		Driller	I.D	Ground Level	4.50m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	10/11/1997
Consultant	Ove Arup and Partners			Date Completed	10/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
MADE GROUND; Hard core (drillers description).		1.20	3.30				
Brown woody PEAT with bands of greyish silty clay (drillers description). (Peat)		7.40	-2.90				
Loose light brown fine grained SAND (drillers description). (Fluvial Alluvium)		9.20	-4.70				
Dense light brown SAND and small to large gravel (drillers description). (Fluvial Alluvium)							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHM3A** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	341235.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		186554.2 N
		Driller	I.D	Ground Level	4.50m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	10/11/1997
Consultant	Ove Arup and Partners			Date Completed	10/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Dense light brown SAND and small to large gravel (drillers description). (Fluvial Alluvium)							
		11.30	-6.80	D 11.40			
Reddish brown mottled greyish green thinly laminated highly to completely weathered MUDSTONE, weak. (Mercia Mudstone Group)				B 11.50 - 12.00 D 11.50	S28	S 11.50 11.95	
		12.00	-7.50				
Cable Percussion boring complete at 12.00 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM4** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341379.2 E 186615.8 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	4.60m AOD
Client	Welsh Office	Drillers	C.A/D.D	Orientation	Vertical
		Logged by	C.D/D.D	Date Started	19/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	30/10/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
19/10/1997	1600	8.00	8.00	1.00	
28/10/1997	1800	11.00	8.00	Dry	
29/10/1997	0800	11.00	8.00	Dry	
29/10/1997	1800	21.70	9.80	Dry	
30/10/1997	0800	21.70	9.80	Dry	
30/10/1997	1200	22.45	9.80	Dry	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
7.30	8.00	1.50	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	8.00	150	8.00
120	22.45	140	9.80

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
19/10/1997	0000	1.06	0.80	20	slow	0.00	0.00
19/10/1997	0000	7.70	1.00	20	fast□□	7.30	NR

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
8.00	22.45	mist	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	1/450mm*
2.00	S	1/450mm*
3.00	S	1/450mm*
4.00	S	1/450mm*
5.50	C	N=50 (8,9,12,12,13,13)
7.50	S	81/170mm (6,10,17,34,30/50mm)

* Seating blows only.

GENERAL NOTES

1. Cable Percussion boring complete at 8.00m.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM4** Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341379.2 E 186615.8 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	4.60 m AOD
Client	Welsh Office	Drillers	C.A/D.D	Orientation	Vertical
		Logged by	C.D/D.D	Date Started	19/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	30/10/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Very soft black brown spongy fibrous woody PEAT. (Peat)				D 0.50			
				B 1.00 - 1.45		S1/450mm* 1.00	
				W 1.00		1.45	
				W 1.00			
				D 1.75			
				D 2.00		S1/450mm* 2.00	
						2.45	
				D 2.75			
				B 3.00 - 3.45		S1/450mm* 3.00	
---from 3.00m spongy to plastic				D 3.00		3.45	
				D 3.75			
				B 4.00 - 4.45		S1/450mm* 4.00	
---at 4.00m with occasional fine to medium gravel sized pockets of soft grey clay				D 4.00		4.45	
		4.50	0.10	D 4.50			
Soft greyish brown occasionally organic very silty fine sandy CLAY, locally fine and medium sandy. (Estuarine Alluvium)				U 4.60 - 5.05	(4)		
		5.15	-0.55	D 5.10			
				D 5.20			
				D 5.40			
Very stiff greyish brown mottled brown occasional organic CLAY with occasional sub-angular fine, medium and coarse gravel and cobbles of sandstone and mudstone. (Estuarine Alluvium)				B 5.50 - 5.95		C50 5.50	
		5.70	-1.10			5.95	
				D 6.25			
Reddish brown occasionally thinly laminated completely to highly weathered MUDSTONE, moderately weak. (Mercia Mudstone Group)				U 6.50 - 6.95	(89)		
				D 7.00			
---at 7.00m mottled greyish green				D 7.25			
				B 7.50 - 8.00		S81/170mm 7.50	
---from 7.25m moderately weathered, moderately strong to strong				D 7.50		7.85	
				W 7.70			
---from 7.50m, thinly laminated				W 7.70			
		8.00	-3.40		TCR SCR RQD FI		
Purplish grey to greenish grey fine to coarse grained medium sub-horizontal to inclined bedded fresh to slightly weathered SANDSTONE, very strong with medium spaced inclined discontinuities planar rough tight. (Tintern Sandstone)				8.00 - 9.50	27 25 19 2		
					4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM4** Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341379.2 E 186615.8 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	4.60 m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/D.D	Date Started	19/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	30/10/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purplish grey to greenish grey fine to coarse grained medium sub-horizontal to inclined bedded fresh to slightly weathered SANDSTONE, very strong with medium spaced inclined discontinuities planar rough tight. (Tintern Sandstone)				9.50 - 11.00	100	95	63	15		
		11.00	-6.40							
---from 10.22 to 10.49m light greenish grey				11.00 - 11.45	96	93	67	3		
---from 10.49 to 10.72m extremely closely to very closely spaced inclined bedding moderately strong				11.45 - 12.95	80	73	69	7		
---from 10.72m very thin to thinly spaced inclined bedding		12.25	-7.65					2		
Greyish green fine to coarse grained thinly sub-horizontally bedded slightly weathered SANDSTONE, with closely spaced sub-horizontal discontinuities planar rough tight. (Tintern Sandstone)		12.95	-8.35	12.95 - 14.25	98	92	83	5		
Pinkish red purple fine to coarse grained medium sub-horizontally bedded fresh to slightly weathered very sandy quartz CONGLOMERATE, strong with medium spaced sub-horizontal discontinuities planar rough slightly open. (Tintern Sandstone)		14.62	-10.02	14.25 - 15.65	97	93	38	3 9 0		
Greyish green mottled purple fine to coarse grained medium to thickly sub-horizontally bedded fresh SANDSTONE, very strong with medium spaced sub-horizontal discontinuities planar rough tight. (Tintern Sandstone)		15.57	-10.97							
Pinkish red to purple fine to coarse grained medium sub-horizontally bedded fresh to slightly weathered very sandy quartz CONGLOMERATE, strong medium spaced very thin beds of greyish green fine to coarse grained sandstone sub-horizontal discontinuities planar rough slightly open. (Tintern Sandstone)				15.65 - 17.00	100	100	88	6		
Greyish green mottled purple fine to coarse grained medium to thickly sub-horizontally bedded fresh SANDSTONE, very strong with medium spaced sub-horizontal discontinuities planar rough tight. (Tintern Sandstone)				17.00 - 18.25	100	100	70	8		
				18.25 - 19.80	100	95	67	8		
								4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM4** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341379.2 E 186615.8 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	4.60 m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/D.D	Date Started	19/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	30/10/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Greyish green mottled purple fine to coarse grained medium to thickly sub-horizontally bedded fresh SANDSTONE, very strong with medium spaced sub-horizontal discontinuities planar rough tight. (Tintern Sandstone)		20.60	-16.00					NI 2 4		
				21.00 - 21.00	60	28	8			
Greyish green mottled purple fine to coarse grained thinly to medium sub-horizontally bedded slightly weathered micaceous SANDSTONE, strong with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (Tintern Sandstone)				21.00 - 21.70	79	73	0	8		
				21.70 - 22.45	100	60	60	4		
		22.45	-17.85							
Borehole complete at 22.45 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM5** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341460.9 E 186817.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hans England	Ground Level	4.80m AOD
Client	Welsh Office	Drillers	I.D	Orientation	Vertical
		Logged by	M.B/T.R	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	28/10/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
17/10/1997	1700	7.50	7.30	4.50	
20/10/1997	1000	7.50	7.30	4.50	
20/10/1997	1400	13.20	12.00	4.70	
28/10/1997	1800	17.00	12.00	Dry	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
7.80	8.00	0.50	
9.10	9.40	0.75	
12.70	12.90	0.50	
12.90	13.20	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	13.20	150	12.00
120	17.00	139	13.20

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
17/10/1997	0000	2.40	2.00	20	medium	2.20	2.20

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
13.20	17.00	mist	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
0.50	S	N=1 (1,0,0,1,0,0)
2.50	S	1/450mm*
4.50	S	N=25 (3,4,6,6,6,7)
6.00	S	N=26 (2,3,5,7,7,7)
7.50	S	59/150mm (6,10,17,42)
9.00	S	56/75mm*
10.50	S	N=40 (3,5,7,9,11,13)
12.00	S	N=47 (4,7,7,10,12,18)
12.90	S	50/60mm*
13.20	S	50/40mm*

* Seating blows only.

GENERAL NOTES

1. Cable Percussion boring complete at 13.20m.
2. Borehole complete at 17.00m.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM5** Sheet 1 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341460.9 E 186817.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	4.80 m AOD
Client	Welsh Office	Drillers	I.D	Orientation	Vertical
		Logged by	M.B/T.R	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	28/10/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
TOPSOIL				B 0.50 - 1.00 D 0.50		S1 0.50	
		0.60	4.20			0.95	
Spongy black slightly sandy, clayey, fibrous PEAT. (Peat)				D 1.20			
				U 1.50 - 2.00	(2)		
				D 2.20			
—at 2.50m occasional fine to medium sub-angular gravel				B 2.50 - 3.00 D 2.50		S1/450mm* 2.50	
						2.95	
		3.10	1.70				
Soft to firm brown mottled grey very sandy CLAY with occasional fine gravel. (Estuarine Alluvium)				D 3.20			
				U 3.50 - 4.00	(23)		
		4.00	0.80				
Reddish brown completely to highly weathered very sandy MUDSTONE, very weak and weak. (Mercia Mudstone Group)				D 4.20			
—from 4.20 to 7.00m occasional coarse gravel sized pockets of calcite							
—at 4.50m becoming reddish brown mottled grey highly weathered, weak				B 4.50 - 5.00 D 4.50 W 4.50		S25 4.50	
						4.95	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM5** Sheet 2 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341460.9 E 186817.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	4.80 m AOD
Client	Welsh Office	Drillers	I.D	Orientation	Vertical
		Logged by	M.B/T.R	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	28/10/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Reddish brown completely to highly weathered very sandy MUDSTONE, very weak and weak. (Mercia Mudstone Group)				D 5.50			
				B 6.00 - 6.50 D 6.00		S26 6.00	
						6.45	
---at 7.00m becoming clayey				D 7.00			
				B 7.50 - 7.80 D 7.50		S59/150mm 7.50	
						7.80	
---at 8.50m becoming brown sandy very clayey, very weak				D 8.50			
				B 9.00 - 9.10 D 9.00		S56/75mm* 9.00	
						9.08	
				D 10.00			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM5** Sheet 3 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341460.9 E 186817.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	4.80 m AOD
Client	Welsh Office	Drillers	I.D	Orientation	Vertical
		Logged by	M.B/T.R	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	28/10/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Reddish brown completely to highly weathered very sandy MUDSTONE, very weak and weak. (Mercia Mudstone Group)				D 10.00			
				B 10.50 - 11.00		S40 10.50	
---at 10.50m becoming reddish brown mottled grey highly weathered slightly sandy, very weak to weak				D 10.50		10.95	
				D 11.50			
				B 12.00 - 12.50		S47 12.00	
---at 12.00m occasional fine gravel sized pockets of calcite				D 12.00		12.45	
				D 12.90		S50/60mm* 12.90	
				D 13.10		12.96	
		13.20	-8.40	D 13.20		S50/40mm* 13.20	
Greyish green fine to coarse grained thinly sub-horizontally bedded slightly weathered SANDSTONE, moderately strong to strong with closely spaced very thin beds of reddish brown very sandy mudstone with very closely spaced sub-horizontal discontinuities planar rough tight. (Probably Marginal Facies of Mercia Mudstone Group)				13.20 - 13.80	TCR 88 SCR 75 RQD 17 FI 7	13.24	
---from 13.65m with occasional gravel size vugs, dolomitic		13.80	-9.00				
Yellowish brown thinly sub-horizontally bedded slightly to moderately weathered DOLOMITE, strong with many gravel size vugs and closely spaced very thin to thin beds of reddish brown fine to medium grained dolomitic sandstone with very closely to closely spaced sub-horizontal discontinuities planar rough slightly open. (Probably Marginal Facies of Mercia Mudstone Group)						FI NI	
---from 13.80 to 14.00m completely fractured						6	
---from 14.45 to 14.67m completely fractured				13.80 - 15.30	58 13 7	NI	
						NI	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHM5** Sheet 4 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341460.9 E 186817.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	4.80 m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	M.B/T.R	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	28/10/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Yellowish brown thinly sub-horizontally bedded slightly to moderately weathered DOLOMITE, strong with many gravel size vugs and closely spaced very thin to thin beds of reddish brown fine to medium grained dolomitic sandstone with very closely to closely spaced sub-horizontal discontinuities planar rough slightly open. (Probably Marginal Facies of Mercia Mudstone Group)										
				15.30 - 16.00	71	21	0	6		
				16.00 - 16.60	100	62	53	7		
				16.60 - 17.00	80	40	0	4		
		17.00	-12.20							
Borehole complete at 17.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHM6** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	341586.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187014.0 N
		Driller	E.D	Ground Level	11.10m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	11/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
11/11/1997	1800	10.00	2.50	4.21	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	2.00	mist	100%	0*
2.00	10.00	mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	10.00	140	2.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
11/11/1997	0000	6.50	0.00	0		2.50	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=25 (5,5,9,8,5,3)
2.00	C	50/15mm (13,12,50)
3.00	C	51/231mm (1,1,11,2,8,30)
5.60	C	50/75mm*

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHM6** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	341586.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187014.0 N
		Driller	E.D	Ground Level	11.10m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	11/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL		0.10	11.00							
Brown sandstone cobbles in CLAY (drillers description). (Head Deposits)		0.61	10.49							
Weathered SANDSTONE clayey (drillers description). (Tintern Sandstone)									25 1.00 1.45	
				C50/15mm 2.00 – 2.17					C50/15mm 2.00 2.17	
		2.50	8.60	2.00 2.50	40	0	0	NI		
Greyish green fine to coarse grained thinly to medium sub-horizontally bedded occasionally thinly and thickly laminated SANDSTONE, strong completely fractured. (Tintern Sandstone)				2.50 3.00	36	0	0	NI		
				C51/231mm 3.00 – 3.38					C51/231mm 3.00 3.38	
				3.00 3.50	40	0	0	NI		
		3.50	7.60							
Reddish brown fine to coarse grained medium sub-horizontally bedded slightly to moderately weathered micaceous SANDSTONE, strong with medium spaced very thin beds of fine gravelly sandstone and closely to medium spaced inclined discontinuities planar rough tight. (Tintern Sandstone)				3.50 4.00	46	10	0	NI		
				4.00 4.60	92	83	28	4		
---from 3.50 to 4.00m completely fractured										
---from 4.60 to 4.75m completely fractured				4.60 5.60	10	0	0	NI		
				C50/75mm* 5.60 – 5.68					C50/75mm* 5.60 5.68	
---from 5.60 to 5.75m completely fractured				5.60 6.00	25	0	0	NI		
---from 6.00 to 6.50m sub-vertical fracture (075°) planar rough tight				6.00 6.50	100	96	0	5		
---from 6.50 to 6.75m moderately weathered		6.50	4.60							
Reddish brown to greyish green fine to medium grained thinly to medium sub-horizontally bedded slightly to moderately weathered micaceous SANDSTONE, moderately strong to strong with closely spaced very thin interbedding of reddish brown mottled grey mudstone with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Tintern Sandstone)				6.50 8.00	100	93	21	12 6		
---from 7.00 to 7.25m sub-vertical fracture (065°) planar rough tight										
---from 7.35 to 7.60m sub-vertical fracture (065°) planar rough tight										
		8.00	3.10							
SANDSTONE As Sheet 2				8.00 9.50	100	97	79	11		
				9.50 10.00	90	80	0	5		
Rotary drilling complete at 10.00 m.		10.00	1.10							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHM6** Extra Sheet

Contract No.	F10895	Method	Rotary Coring	Coordinates	341586.8 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187014.0 N
		Driller	E.D	Ground Level	11.10m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	11/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Purple occasionally mottled greyish green fine to coarse grained thinly to medium horizontally bedded fresh to slightly weathered micaceous SANDSTONE, strong with closely to medium spaced discontinuities planar rough tight. (Tintern Sandstone)		10.00	1.10							
Rotary drilling complete at 10.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHM7** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	341704.6 E
Project	M4 Relief Road Magor to Castleton Stage 2				187170.2 N
		Drilling Rig	Pilcon	Ground Level	23.80m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	C.D	Date Started	21/10/1997
Consultant	Ove Arup and Partners			Date Completed	21/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
21/10/1997	0000	2.60	1.50	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
2.30	2.60	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	2.60	150	1.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.50	S	N=73 (5,7,13,15,19,26)
2.30	S	50/50mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHM7** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	341704.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		187170.2 N
		Driller	I.D	Ground Level	23.80m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	21/10/1997
Consultant	Ove Arup and Partners			Date Completed	21/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.40	23.40				
Stiff brown sandy CLAY (drillers description). (River Terrace)	0.60	23.20	U 0.50 - 1.00	(62)		
Yellowish brown mottled light reddish brown occasionally thinly laminated micaceous silty clayey fine and medium SAND. (River Terrace)	1.50	22.30	D 1.20 B 1.50 - 2.00 D 1.50	S73	S 1.50 - 1.95	
Light yellowish grey brown fine and medium grained thinly laminated highly to completely weathered micaceous silty SANDSTONE, very weak to weak with occasional orange iron staining along discontinuities. (Tintern Sandstone)	2.60	21.20	D 2.20 D 2.30	S50/50mm*	S 2.30 - 2.35	
---from 2.20m weak						
Cable Percussion boring complete at 2.60 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHN1** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	341718.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				187310.6 N
		Drilling Rig	Pilcon	Ground Level	27.90m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	C.D	Date Started	21/10/1997
Consultant	Ove Arup and Partners			Date Completed	21/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
21/10/1997	0000	4.60	1.50	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
4.20	4.50	0.66	
4.50	4.60	0.30	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	4.60	150	1.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
0.50	S	N=13 (2,2,3,3,3,4)
2.50	S	N=21 (3,4,4,5,6,6)
4.50	S	50/0mm*

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

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BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHN1** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	341718.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		187310.6 N
		Driller	I.D	Ground Level	27.90m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	21/10/1997
Consultant	Ove Arup and Partners			Date Completed	21/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL						
	0.60	27.30	B 0.50 - 1.00 D 0.50	S13	S 0.50 0.95	
Firm reddish brown sandy to very sandy CLAY with occasional sub-angular to sub-rounded gravel, locally sandy silt with gravel. (River Terrace)			D 1.20 U 1.50 - 2.00	(26)		
	2.10	25.80	D 2.20			
Reddish brown completely weathered slightly sandy MUDSTONE, weak. (Tintern Sandstone) ---from 2.50 to 3.00m red to yellowish brown sandy with extremely closely spaced partings to thin laminations of yellowish brown fine sand ---from 3.20m reddish brown mottled greyish green slightly sandy ---from 4.00m with very closely to closely spaced very thin beds of yellowish brown to light grey fine to coarse grained moderately to highly weathered sandstone			B 2.50 - 3.00 D 2.50 D 3.20 U 3.50 - 4.00 D 4.20	S21 (106)	S 2.50 2.95	
	4.60	23.30	D 4.50	S50/0mm*	S 4.50 4.50	
Cable Percussion boring complete at 4.60 m.						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN1A** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	341718.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187309.1 N
		Driller	E.D.	Ground Level	27.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	12/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	12/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
12/11/1997	1800	7.00	3.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	4.00	air & mist	100%	0*
4.00	7.00	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	7.00	140	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole open holed to 4.00m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN1A** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	341718.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187309.1 N
		Driller	E.D.	Ground Level	27.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	12/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	12/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL	0.10	27.80							
Light brown sandy CLAY (drillers description). (River Terrace)	1.35	26.55							
Reddish brown sandy CLAY (drillers description). (River Terrace)	1.47	26.43							
Reddish brown weathered MUDSTONE (drillers description). (Tintern Sandstone)	2.73	25.17							
Grey sandy MUDSTONE (drillers description). (Tintern Sandstone)	3.11	24.79							
Grey SANDSTONE and MUDSTONE (drillers description). (Tintern Sandstone)	4.00	23.90					3		
Greyish green mottled reddish brown fine grained thinly to medium sub-horizontally bedded slightly to moderately weathered silty micaceous SANDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal and sub-vertical fractures planar, rough tight. (Tintern Sandstone)	4.10	23.80					0		
	4.53	23.37					5		
	4.77	23.13	4.00 5.50	100	97	53	2		
	5.05	22.85					7		
Greyish green mottled reddish brown very thinly to thinly horizontal to sub-horizontally bedded moderately weathered MUDSTONE, weak to moderately weak. (Tintern Sandstone)							10		
Greyish green mottled grey fine to medium grained thinly horizontal to sub-horizontally bedded thinly to thickly laminated and cross laminated fresh to slightly weathered micaceous SANDSTONE, strong to very strong with closely to medium spaced sub-horizontal to inclined fractures, planar, rough tight. (Tintern Sandstone)			5.50 7.00	100	80	21	2		
	7.00	20.90					8		
Greyish green mottled reddish brown medium horizontal to sub-horizontally bedded moderately weathered MUDSTONE, weak to moderately weak. (Tintern Sandstone)									
---from 4.90m micaceous, sandy									
Greyish green fine to medium grained medium horizontal to sub-horizontally bedded fresh to slightly weathered SANDSTONE, very strong with medium to closely spaced sub-horizontal fractures, planar, rough tight. (Tintern Sandstone)									
---from 5.05 to 5.25m sub-vertical fracture, planar, rough tight									
---from 5.32 to 5.61m sub-vertical fracture,									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Rotary drilling complete at 7.00 m.

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHN2** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341850.8 E
Project	M4 Relief Road Magor to Castleton Stage 2				187422.1 N
		Drilling Rig	Pilcon/Knebel 77	Ground Level	28.10m AOD
Client	Welsh Office	Drillers	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	04/11/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
21/10/1997	1800	4.30	3.70	Dry	
04/11/1997	1800	12.00	4.00	Dry	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
4.00	4.30	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	4.30	150	3.70
120	12.00	140	4.40

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
4.40	12.00	air & mist	none	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=19 (2,3,3,5,5,6)
3.70	S	89/245mm (2,2,6,7,28,48)
4.30	S	50/20mm*

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHN2**
Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341850.8 E 187422.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	28.10 m AOD
Client	Welsh Office	Drillers	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	04/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth
TOPSOIL	0.30	27.80			
Firm reddish brown speckled blackish brown sandy CLAY with occasional to some sub-rounded to rounded fine and medium siliceous gravel. (River Terrace)			D 0.50 U 1.00 - 1.45	(89)	
---from 1.75m very sandy			D 1.50 D 1.75 B 2.00 - 2.45		S19 2.00 2.45
Firm to stiff reddish brown mottled greyish green and blackish brown thinly laminated CLAY. (Marginal Facies of Mercia Mudstone Group)	2.10	26.00	D 2.00 D 2.50 U 2.70 - 3.05	(140)	
Stiff to very stiff purplish grey mottled greyish green and reddish brown thinly laminated CLAY. (Marginal Facies of Mercia Mudstone Group)	2.60	25.50	D 3.10 D 3.20 B 3.70 - 4.15 D 3.70		S89/245mm 3.70 4.10
---from 3.70m very stiff greyish green mottled reddish brown	4.00	24.10			
Mustard CONGLOMERATE (drillers description). (Marginal Facies of Mercia Mudstone Group)	4.30	23.80			S50/20mm* 4.30 4.32
Reddish brown to yellowish brown thinly to medium sub-horizontally bedded slightly to moderately weathered slightly dolomitic sandy MUDSTONE, moderately strong with medium spaced thin beds of yellow to greenish brown very silty dolomite with closely to medium spaced horizontal to sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)			4.40 - 6.00	TCR 99, SCR 94, RQD 64, FI 7	
---from 4.40 to 4.65m highly to completely weathered ---at 5.00m weak ---from 5.90 to 6.00m greenish grey moderately weathered ---from 6.00 to 6.15m greenish grey highly weathered	6.27	21.83	6.00 - 7.10	81, 67, 54, NI 0, 3	
Light brown sub-horizontally bedded fresh DOLOMITE strong to very strong with medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	8.50	19.60	7.10 - 8.60	98, 97, 91, 4, 0	
---from 6.35 to 6.70m with occasional fine to medium gravel size vugs occasionally thickly laminated			8.60 - 10.10	100, 72, 40, 8, 0	
LIMESTONE As Sheet 2	9.80	18.30			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHN2** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	341850.8 E 187422.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	28.10 m AOD
Client	Welsh Office	Driller	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	04/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Light brown to reddish brown thinly sub-horizontally to inclined bedded occasionally thinly and thickly laminated slightly to moderately weathered silty DOLOMITE strong with closely to medium spaced sub-horizontal to inclined greenish brown highly weathered slightly dolomitic mudstone with closely to medium spaced inclined discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)								NI		
		10.54	17.56	10.10 - 11.60	99	57	39	7		
(9.80-10.54) Reddish brown medium sub-horizontally bedded moderately weathered slightly sandy MUDSTONE, moderately weak to moderately strong. (Margianl Facies of Mercia Mudstone Group) Detail:---from 10.10 to 10.54m highly weathered Detail:very weak completely fractured ---from 10.10 to 10.54m highly weathered very weak completely fractured				11.60 - 12.00	25	0	0	NI NI		
		12.00	16.10							
Reddish to yellowish brown thinly to medium sub-horizontally bedded fresh to slightly weathered silty dolomitic SANDSTONE, weak to strong with medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group) ---from 11.60m very silty completely fractured										
Borehole complete at 12.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHN3
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	341825.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187581.5 N
		Driller	E.D	Ground Level	26.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	04/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
06/11/1997	1800	9.50	5.15	Dry	
07/11/1997	0800	9.50	5.15	Dry	
07/11/1997	1800	12.30	5.15	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	5.00	water & mist	100%	NR
5.00	6.50	water & mist	100%	92
6.50	8.00	water & mist	0%	92
8.00	12.30	water & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	12.30	140	5.15

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. 100mm diameter plastic pipe grouted to 11.70m on completion.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=11 (2,1,2,2,3,4)
2.00	S	N=19 (2,2,4,4,5,6)
3.00	S	N=8 (2,1,2,2,2,2)
4.00	S	N=40 (4,5,7,7,11,15)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN3** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	341825.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187581.5 N
		Driller	E.D	Ground Level	26.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
MADE GROUND: Concrete slab (drillers description).		0.20	26.40							
		0.40	26.20							
MADE GROUND: Hard core fill (drillers description).										
MADE GROUND: Clayey marl fill (drillers descriptions).									S11 1.00 1.45	
									S19 2.00 2.45	
		2.70	23.90							
TOPSOIL (drillers description).		3.00	23.60						S8 3.00 3.45	
Reddish brown CLAY (drillers description). (Marginal Facies of Mercia Mudstone Group)		3.55	23.05							
Soft reddish brown weathered marl MUDSTONE (drillers description). (Marginal Facies of Mercia Mudstone Group)		4.15	22.45						S40 4.00 4.45	
Greyish brown green marl (drillers description). (Marginal Facies of Mercia Mudstone Group)		5.00	21.60							
Reddish brown mottled greyish green medium to thinly sub-horizontally bedded moderately to highly weathered slightly sandy MUDSTONE, moderately weak to moderately strong with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				5.00 6.50	100	72	28	4 NI 5		
---from 5.38m greyish brown completely to highly weathered moderately weak to weak		6.30	20.30					2		
---from 5.56 to 5.79m completely fractured				6.50 7.50	43	34	12	6		
Reddish brown mottled green fine grained medium to thinly sub-horizontally bedded moderately to slightly weathered very silty SANDSTONE, moderately strong to moderately weak with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		8.00	18.60	7.50 8.00	96	92	74	3		
Reddish brown mottled yellowish green medium to thinly sub-horizontally bedded thinly laminated slightly to moderately weathered sandy DOLOMITE, moderately strong to strong with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		8.65	17.95	8.00 9.50	100	97	79	8		
---from 8.20 to 8.35m fine to medium gravel sized vugs		9.89	16.71					3		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN3** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	341825.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187581.5 N
		Driller	E.D	Ground Level	26.60m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded slightly weathered silty SANDSTONE, strong with very closely spaced thin laminations to very thin beds of yellowish brown sandy dolomite and closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		10.29	16.31	9.50 11.00	100	97	71	2 5		
(9.89-10.29) Yellowish brown medium sub-horizontally bedded fresh to slightly weathered slightly silty very sandy DOLOMITE, strong to very strong with occasional fine gravel sized vugs and undulating thin to thick laminations of calcite. (Marginal Facies of Mercia Mudstone Group)		11.00 11.53	15.60 15.07	11.00 12.30	100	95	46	4 4		
Yellowish to reddish brown thinly sub-horizontally bedded slightly weathered silty very sandy DOLOMITE, strong closely spaced thick laminations to thin beds of reddish brown mottled green moderately weathered sandy mudstone moderately weak very closely to closely spaced discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group) ---from 10.40 to 10.63m very closely spaced undulating thin laminations of calcite		12.30	14.30					4		
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded slightly weathered silty dolomitic SANDSTONE, strong with occasional fine gravel size vugs and closely spaced thick laminations to very thin beds of reddish brown mottled greyish green moderately to highly weathered sandy mudstone with very closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group) ---from 11.30 to 11.45m sub-vertical undulating thin laminations of calcite										
Reddish brown occasionally mottled greyish green thinly to medium sub-horizontally bedded moderately weathered sandy MUDSTONE, moderately weak to moderately strong with closely spaced sub-horizontal discontinuities planar rough to smooth tight. (Marginal Facies of Mercia Mudstone Group) ---from 12.00 to 12.30m slightly to moderately weathered slightly sandy, very strong										
Rotary drilling complete at 12.30 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No.
BHN3A
Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	341826.7 E
Project	M4 Relief Road Magor to Castleton Stage 2				187583.7 N
		Drilling Rig	Pilcon	Ground Level	26.60m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	20/11/1997
Consultant	Ove Arup and Partners			Date Completed	20/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
20/11/1997	1030	4.90	3.20	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
4.50	4.75	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	4.90	150	3.20

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=11 (1,4,2,3,3,3)
4.75	S	50/75mm (25,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHN3A** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	341826.7 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		187583.7 N
		Driller	I.M	Ground Level	26.60m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	20/11/1997
Consultant	Ove Arup and Partners			Date Completed	20/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
CONCRETE		0.30	26.30	D 0.35 - 1.00 B 0.40			
MADE GROUND: Orangish brown silty clay with occasional sub-rounded siliceous gravel and gravel size pockets of sub-angular brick and rubble fragments to 2.00m.				U 1.00 - 1.45	(17)		
				D 1.45 D 1.70 D 2.00	S11	S 2.00 - 2.45	
				B 2.45 - 3.00			
		3.20	23.40	U 3.00 - 3.45	(41)		
Reddish brown mottled greyish green thinly laminated moderately to highly weathered MUDSTONE, very weak to weak with occasional thin laminations of yellowish brown fine to medium sand. (Marginal Facies of Mercia Mudstone Group)				D 3.45 D 3.80 D 4.00			
---from 4.00m purplish brown mottled greyish green							
---from 4.50m weak to moderately weak				D 4.75	S50/75mm	S 4.75 - 4.90	
		4.90	21.70				
Cable Percussion boring complete at 4.90 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN4** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	341993.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187571.0 N
		Driller	E.D	Ground Level	21.38m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	04/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
04/11/1997	1800	10.10	2.50	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	10.10	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	10.10	140	2.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
04/11/1997	0000	9.40	0.00	0	slow	2.50	0.00

GENERAL NOTES

1. Piezometer installed on completion.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=16 (3,4,4,4,3,5)
2.00	S	50/72mm*

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN4** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	341993.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187571.0 N
		Driller	E.D	Ground Level	21.38m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	04/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
TOPSOIL	0.20	21.18							
Reddish brown sandy CLAY (drillers description). (Head Deposits)								S16 1.00 1.45	
Brownish red mottled greyish green thinly to medium sub-horizontally bedded highly to completely weathered MUDSTONE, very weak to weak with very closely to closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	1.40	19.98						S50/72mm* 2.00 2.07	
							6		
---from 2.88 to 3.14m completely weathered very silty weak							NI		
---from 3.14m sandy slightly dolomitic			2.50 4.10	97	82	16	6		
							3		
			4.10 5.50	99	93	9	19		
---from 5.80 to 5.90m moderately weathered strong	5.90	15.48					5		
	6.00	15.38					0		
Grey thinly sub-horizontally bedded fresh to slightly weathered LIMESTONE, strong to very strong. (Marginal Facies of Mercia Mudstone Group)			5.50 7.10	100	94	50	10		
	6.85	14.53					0		
	6.93	14.45					3		
Brownish red mottled greyish green thinly to medium sub-horizontally bedded highly to moderately weathered slightly dolomitic sandy MUDSTONE, weak to moderately strong with sub-horizontal discontinuities rough tight. (Marginal Facies of Mercia Mudstone Group)							8		
	7.85	13.53	7.10 8.60	100	90	37			
---from 6.80 to 6.85m dolomite							6		
Grey thinly sub-horizontally bedded fresh to slightly weathered LIMESTONE, strong to very strong. (Marginal Facies of Mercia Mudstone Group)									
MUDSTONE As Sheet 2							9		
			8.60 10.10	100	93	44			
	9.72	11.66					2		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN4** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	341993.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187571.0 N
		Driller	E.D	Ground Level	21.38m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	04/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	04/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Brownish red mottled greyish green thinly to medium sub-horizontally bedded highly to moderately weathered slightly dolomitic sandy MUDSTONE, moderately strong to strong with sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		10.10	11.28							
(7.85-9.72) Reddish brown mottled greyish green thinly to medium sub-horizontally bedded slightly to moderately weathered very sandy MUDSTONE, strong with closely to medium spaced planar discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group) Detail:---from 7.85 to 8.60m slightly dolomitic Detail:---from 8.90 to 9.72m moderately to highly Detail:weathered moderately strong										
(9.72-10.10) Reddish brown fine to medium grained thinly to medium sub-horizontally bedded thinly and cross laminated fresh to slightly weathered silty SANDSTONE, very strong to strong with closely to medium spaced planar rough tight. (Marginal Facies of Mercia Mudstone Group) Detail:---from 9.86 to 10.00m very closely spaced thin Detail:irregular laminations of calcite										
Rotary drilling complete at 10.10 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN5** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	342064.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187781.9 N
		Driller	E.D	Ground Level	24.30m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	05/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	06/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
05/11/1997	1800	15.50	2.50	Dry	
06/11/1997	0800	15.50	2.50	Dry	
06/11/1997	1800	20.00	2.50	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	2.50	air & mist	100%	0*
2.50	20.00	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	20.00	140	2.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole open holed from ground level to 2.50m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=8 (4,3,3,2,2,1)
2.00	S	50/61mm (12,13,50)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN5** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	342064.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187781.9 N
		Driller	E.D	Ground Level	24.30m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	05/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	06/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
TOPSOIL	0.10	24.20							
Brown stoney sandy CLAY (drillers description). (Head Deposits)								S8 1.00 1.45	
Yellowish brown thinly to medium bedded (01°) slightly weathered DOLOMITE, strong with occasional fine to coarse gravel size vugs with medium to widely spaced very thin beds of grey limestone and closely spaced gravel size limestone fragments with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	1.60	22.70						S50/61mm 2.00 2.21	
			2.50 3.90	100	99	91	6		
---from 3.70m with some fine to medium gravel size vugs									
---at 4.40m moderately strong							6		
	4.70	19.60	3.90 5.50	97	88	67			
Yellowish brown sub-horizontally bedded slightly to moderately weathered very silty slightly sandy DOLOMITE, moderately strong with occasional fine to medium gravel size vugs and very closely to closely spaced very thin to thin beds of greenish to yellow brown moderately weathered dolomitic mudstone with widely spaced thin beds of grey dolomitic limestone with very closely to closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)							4		
---at 6.10m weak to moderately weak			5.50 7.00	62	47	21	5		
	7.12	17.18							
Yellowish brown to reddish brown with very thinly bedded (15°) slightly weathered very silty slightly sandy DOLOMITE, moderately weak to strong with occasional fine to medium gravel size vugs and closely to medium spaced discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)			7.00 8.30	100	83	52	9		
							2		
---from 7.00 to 7.15m with extremely closely spaced thin to thick undulating laminations of calcite									
---from 7.80m thinly to medium sub-horizontally bedded fresh to slightly weathered			8.30 9.80	100	95	68	6		
---from 9.10 to 9.50m with some to many fine to medium gravel size vugs									
							1		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN5** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	342064.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187781.9 N
		Driller	E.D	Ground Level	24.30m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	05/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	06/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Yellowish brown to reddish brown with very thinly bedded (15°) slightly weathered very silty slightly sandy DOLOMITE, moderately weak to strong with occasional fine to medium gravel size vugs and closely to medium spaced discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	10.02	14.28					4		
			9.80 11.40	85	64	37	5		
Reddish to yellowish brown slightly to moderately weathered very silty slightly sandy DOLOMITE, strong with occasional to some gravel size vugs and medium to widely spaced very thin beds (0°) of reddish brown dolomite mudstone with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)			11.40 12.80	100	96	83	6		
---from 10.30 to 12.30m with very closely to medium spaced thin laminations of calcite			12.80 14.30	100	77	48	7		
	13.65	10.65					6		
Reddish brown thinly to medium sub-horizontally bedded moderately weathered dolomitic MUDSTONE, strong with occasional fine to coarse gravel size vugs and medium spaced thin beds of yellowish brown moderately to highly weathered silty dolomite moderately strong with closely sub-horizontal to inclined discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)			14.30 15.50	120	67	18	7		
---from 15.15 to 15.50m mottled greyish green completely fractured	15.50	8.80					NI		
Reddish brown to yellowish brown medium bedded (18°)? moderately weathered very silty slightly sandy DOLOMITE, moderately strong with closely to medium spaced thick laminations to very thin beds of reddish brown dolomitic sandy mudstone and many fine to medium gravel size vugs with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)			15.50 17.00	100	83	83	6		
---from 16.80 to 17.00m completely fractured	17.00	7.30							
Yellow to pinkish brown fine to medium grained medium to thickly sub-horizontal to inclined bedded fresh to slightly weathered silty dolomitic SANDSTONE, strong to very strong with occasional fine gravel size vugs and widely spaced inclined discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)			17.00 18.50	94	92	83	4		
---from 18.50m with occasional to some fine to medium gravel size vugs slightly weathered			18.50 20.00	100	96	96	1		
---from 18.70m with medium spaced sub-horizontal to inclined thin laminations of calcite	19.65	4.65							
							0		
Rotary drilling complete at 20.00 m.	20.00	4.30					NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHN5
Extra Sheet

Contract No.	F10895	Method	Rotary Coring	Coordinates	342064.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187781.9 N
		Driller	E.D	Ground Level	24.30m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	05/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	06/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown medium sub-horizontally bedded moderately weathered sandy slightly dolomitic MUDSTONE, moderately weak to moderately strong with medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		20.00	4.30							
Rotary drilling complete at 20.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHN6
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	342190.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187771.5 N
		Driller	E.D	Ground Level	18.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	03/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
02/11/1997	1600	6.00	2.00	Dry	
03/11/1997	0800	6.00	2.50	Dry	
03/11/1997	1800	20.30	2.50	14.21	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
2.50	20.30	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	20.30	140	2.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
03/11/1997	0000	15.20	NR	0	fast	2.50	0.00

GENERAL NOTES

1. 100mm plastic casing installed on completion of borehole.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	48/225m*
2.00	S	50/75mm*

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN6** Sheet 1 of 3

Contract No.	F10895	Method	Rotary Coring	Coordinates	342190.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187771.5 N
		Driller	E.D	Ground Level	18.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	03/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
TOPSOIL	0.10	18.80							
Dark brown sandy CLAY (drillers description). (Head Deposits)								S48/225m* 1.00 1.38 S50/75mm* 2.00 2.08	
Yellowish brown with some fine to medium gravel size vugs thinly to medium sub-horizontally bedded slightly to moderately weathered LIMESTONE, strong with medium spaced very thin beds of grey dolomitic limestone with closely to medium spaced discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	2.50	16.40	2.50 3.90	81	74	56	8		
---from 3.65 to 3.77m moderately to highly weathered weak completely fractured							NI NI		
---3.90 to 4.20m moderately to highly weathered weak completely fractured			3.90 4.50	50	0	0	NI NI		
			4.50 6.00	100	93	57	2 5		
---from 5.82m yellowish to red brown silty sandy	5.87	13.03					0 NI		
Yellowish brown occasionally fine to medium gravel size vugs thinly and medium sub-horizontally bedded slightly to moderately weathered silty DOLOMITE, strong with closely spaced very thin to thin beds of reddish brown to yellowish green dolomitic mudstone with medium spaced horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	6.48	12.42	6.00 7.60	98	98	93	6		
Reddish brown thinly sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, moderately weak to moderately strong with widely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	8.59	10.31	7.60 9.20	100	71	67	1 3 0		
Yellowish brown occasional fine to medium gravel size vugs thinly to medium sub-horizontally bedded slightly weathered DOLOMITE, strong with closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)							NI NI 8 NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHN6** Sheet 2 of 3

Contract No.	F10895	Method	Rotary Coring	Coordinates	342190.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187771.5 N
		Driller	E.D	Ground Level	18.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	03/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Yellowish brown occasional fine to medium gravel size vugs thinly to medium sub-horizontally bedded slightly weathered DOLOMITE, strong with closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				~~9.20 11.00~~	~~100~~	~~48~~	~~19~~	13		
---from 11.25m silty								6		
		11.60	7.30							
Reddish brown thinly to medium sub-horizontally bedded occasionally thinly laminated slightly sandy MUDSTONE, moderately weak to moderately strong closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				11.00 12.80	100	84	43	6		
		12.26	6.64					5		
---from 11.95m very sandy slightly dolomitic										
Pink to yellow with thinly to medium sub-horizontally bedded slightly weathered sandy silty DOLOMITE, moderately strong with occasional fine to medium gravel size vugs and medium spaced very thin beds of slightly sandy dolomitic mudstone with very closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				12.80 14.40	100	78	52	13		
		14.95	3.95							
Reddish brown thinly to medium sub-horizontally bedded slightly to moderately weathered very silty sandy DOLOMITE, moderately strong with occasional fine to medium gravel size vugs and closely spaced very thin to thin beds of reddish brown slightly sandy mudstone with very closely to closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				14.40 15.80	94	89	81	7		
---from 16.40 to 16.50m completely fractured				15.80 17.30	100	89	85	2 ~~NI~~ 4 ~~3~~		
		17.15	1.75							
Reddish brown very thinly to medium sub-horizontally bedded slightly weathered slightly sandy MUDSTONE, moderately weak to moderately strong with closely to medium spaced very thin to thin beds of yellowish brown with occasional fine to medium vugs of silty dolomite with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				17.30 18.80	100	99	86	7		
		18.80	0.10							
LIMESTONE As Sheet 3				18.80 20.30	100	97	90	8		
		20.00	-1.10							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN6** Sheet 3 of 3

Contract No.	F10895	Method	Rotary Coring	Coordinates	342190.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187771.5 N
		Driller	E.D	Ground Level	18.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	02/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	03/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly to medium sub-horizontally bedded slightly to moderately weathered very silty sandy DOLOMITE with closely spaced very thin beds of sandy slightly dolomitic mudstone and occasional fine to medium gravel size vugs with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		20.00	-1.10							
Reddish brown to grey medium sub-horizontally bedded slightly to moderately weathered slightly sandy MUDSTONE, moderately weak to moderately to moderately strong. (Marginal Facies of Mercia Mudstone Group)		20.30	-1.40							
Rotary drilling complete at 20.30 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHN7
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	342203.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187870.0 N
		Driller	E.D	Ground Level	18.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	01/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
31/10/1997	1300	15.70	5.15	12.10	
01/11/1997	0800	15.70	5.15	12.51	
01/11/1997	1600	20.20	5.15	12.27	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
3.00	20.20	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	20.20	140	5.15

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
31/10/1997	0000	12.10	0.00	0	slow	5.15	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=4 (1,1,1,1,1,1)
2.00	S	N=5 (1,0,1,0,1,3)
3.00	S	N=52 (4,5,12,15,15,10)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN7** Sheet 1 of 3

Contract No.	F10895	Method	Rotary Coring	Coordinates	342203.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187870.0 N
		Driller	E.D	Ground Level	18.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	01/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Soft reddish brown sandy CLAY (drillers description). (Head Deposits)								S4 1.00 1.45 S5 2.00 2.45	
	3.00	15.00					NI	S52 3.00 3.45	
Yellowish brown with occasional fine to medium gravel size vugs thinly to medium sub-horizontally bedded slightly to moderately weathered DOLOMITE moderately strong to strong with medium spaced very thin to thin beds of grey dolomitic limestone with closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)			3.00 4.30	45	23	11	0 NI 0 NI NI		
---from 3.00 to 3.10m completely fractured ---from 3.20 to 3.32m completely fractured ---from 3.45 to 3.59m completely fractured ---from 4.30 to 4.42m completely fractured			4.30 5.90	98	81	58	6		
---from 4.30m medium spaced thin beds of reddish yellow very sandy dolomite ---from 5.90 to 6.30m completely fractured			5.90 6.30	78	0	0	NI		
---from 6.94 to 7.30m moderately to highly weathered			6.30 7.80	98	84	47	5		
---from 7.30m slightly weathered							1		
			7.80 8.20	100	95	68	2		
			8.20 9.70	40	39	33	8		
	9.26	8.74							
LIMESTONE As Sheet 2							0 NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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BOREHOLE LOG - ROTARY

Borehole No. **BHN7** Sheet 2 of 3

Contract No.	F10895	Method	Rotary Coring	Coordinates	342203.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187870.0 N
		Driller	E.D	Ground Level	18.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	01/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Yellowish brown thinly sub-horizontally bedded slightly to moderately weathered sandy DOLOMITE strong with occasional fine to medium gravel size vugs with medium spaced very thin to thin beds of reddish brown fine to medium grained silty dolomitic sandstone with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		10.40	7.60	9.70 10.40	99	76	41	3		
				10.40 11.10	90	30	26	NI		
		11.10	6.90					1		
Yellowish brown thinly to medium sub-horizontally bedded slightly to moderately weathered DOLOMITE strong with occasional fine to medium gravel size vugs and medium spaced very thin to thin beds of grey dolomitic limestone with closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				11.10 12.00	97	59	32	6		
								NI		
								2		
---from 10.40 to 10.80m completely fractured								2		
				12.00 13.50	100	75	48	NI		
								5		
Yellowish brown occasional fine to medium gravel size vugs thinly to medium sub-horizontally bedded slightly to moderately weathered very sandy DOLOMITE moderately strong to very strong with medium spaced thin beds of reddish brown fine to medium grained dolomitic sandstone and medium to widely spaced thin beds of reddish brown fine to coarse grained dolomitic sandstone conglomerate with closely to medium spaced sub-horizontal discontinuities planar rough tight to slightly open. (Marginal Facies of Mercia Mudstone Group)								2		
				13.50 14.30	100	84	60	4		
---from 11.43 to 11.63m completely fractured				14.30 15.70	100	86	27	19		
---from 12.27 to 12.37m completely fractured										
---from 14.45m very closely to closely spaced sub-horizontal discontinuities planar rough tight										
---from 14.80m moderately weathered										
				15.70 17.20	99	71	21	15		
								NI		
---at 17.20m very strong								3		
				17.20 18.70	31	26	7	7		
		17.89	0.11					3		
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded slightly weathered dolomitic silty SANDSTONE strong with widely spaced thin beds of dolomitic sandstone conglomerate and greyish pink to coarse grained sandstone with closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)								7		
				18.70 20.20	95	92	45	9		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN7** Sheet 3 of 3

Contract No.	F10895	Method	Rotary Coring	Coordinates	342203.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187870.0 N
		Driller	E.D	Ground Level	18.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	31/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	01/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded slightly weathered dolomitic silty SANDSTONE strong with widely spaced thin beds of dolomitic sandstone conglomerate and greyish pink to coarse grained sandstone with closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		20.20	-2.20							
Rotary drilling complete at 20.20 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHN8
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	342293.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187853.0 N
		Driller	E.D	Ground Level	12.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	02/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
01/11/1997	1600	10.00	4.15	Dry	
02/11/1997	0800	10.00	4.15	5.20	
02/11/1997	1600	15.00	4.15	5.69	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
4.00	7.50	air & mist	good	92
7.50	15.00	air & mist	lost	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	15.00	140	5.15

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	50/31mm (1,1,50)
2.00	S	N=19 (4,5,5,4,5,5)
3.00	S	25/10mm (12,13,25)
4.00	C	45/150mm (12,13,25,20)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN8** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	342293.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187853.0 N
		Driller	E.D	Ground Level	12.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	02/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
Brown sandy CLAY with cobbles (drillers description). (Head Deposits)								S50/31mm 1.00 1.18	
Reddish brown very sandy CLAY (drillers description). (Head Deposits)	1.53	10.67							
Weathered SANDSTONE (drillers description).	2.05	10.15						S19 2.00 2.45 S25/10mm 3.00 3.16	
Yellowish brown thinly sub-horizontally bedded slightly to moderately weathered sandy DOLOMITE moderately strong to strong with occasional fine to medium gravel size vugs and closely spaced very thin to thin beds of reddish brown fine to medium grained dolomitic sandstone and medium spaced thin beds of grey dolomitic limestone with very closely to closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	4.00	8.20	4.00 5.50	100	75	25	15	C45/150mm 4.00 4.17	
			5.50 6.50	91	81	77	4		
Reddish brown fine to coarse grained thinly to medium sub-horizontally bedded slightly to moderately weathered dolomitic sandstone CONGLOMERATE moderately strong to strong with occasional fine to medium gravel size vugs and medium spaced very thin to thin beds of grey dolomitic limestone and reddish brown fine to coarse grained dolomitic sandstone and yellowish brown dolomite with closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group) ---from 6.50 to 6.75m completely fractured ---from 8.50 to 8.75m completely fractured ---from 9.10 to 9.20m completely fractured	6.50	5.70	6.50 7.00	100	60	60	NI 2		
			7.00 8.50	99	83	51	9		
			8.50 10.00	66	37	25	NI 3 NI 3 NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN8** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	342293.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187853.0 N
		Driller	E.D	Ground Level	12.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	01/11/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	02/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to coarse grained thinly to medium sub-horizontally bedded slightly to moderately weathered dolomitic sandstone CONGLOMERATE moderately strong to strong with occasional fine to medium gravel size vugs and medium spaced very thin to thin beds of grey dolomitic limestone and reddish brown fine to coarse grained dolomitic sandstone and yellowish brown dolomite with closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		10.20	2.00	10.00 10.60	88	65	48	0 4 ~~NI~~ 0		
Reddish brown thickly sub-horizontally bedded slightly weathered dolomitic sandstone CONGLOMERATE, strong with occasional gravel size vugs and medium sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group) ---from 10.60 to 10.75m completely fractured		11.25	0.95	10.60 11.90	76	63	63	0		
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded slightly to moderately weathered dolomitic SANDSTONE, strong with occasional fine to medium gravel size vugs and closely spaced thin to medium beds of grey dolomitic limestone, yellowish brown dolomite and sandstone dolomite conglomerate with medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		13.50	-1.30	11.90 13.50	88	87	78	7		
Reddish brown medium sub-horizontally bedded moderately to highly weathered slightly sandy MUDSTONE, weak to moderately weak with widely spaced very thin beds of yellowish brown silty sandy dolomite with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group) ---from 14.10 to 14.50m highly weathered very weak completely fractured		15.00	-2.80	13.50 14.40	100	61	34	4 NI		
				14.40 15.00	83	55	55	1		
Rotary drilling complete at 15.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHN9
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	342425.3 E 187955.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	10.20m AOD
Client	Welsh Office	Drillers	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	29/10/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
29/10/1997	1200	5.60	5.50	Dry	
29/10/1997	1800	15.00	8.50	Dry	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
5.50	5.60	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	5.60	150	5.60
120	15.00	140	8.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
29/10/1997	0000	3.90	3.60	20	slow	2.90	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
5.60	15.00	mist	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=2 (1,0,1,0,1,0)
3.00	C	N=4 (1,0,1,1,1,1)
4.00	C	N=13 (1,2,2,3,3,5)
5.00	S	N=43 (4,6,8,8,7,20)
5.60	C	50/20mm*
6.50	C	50/63mm (12,12,50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHN9** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	342425.3 E 187955.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	10.20 m AOD
Client	Welsh Office	Drillers	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	29/10/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Installation
TOPSOIL		0.10	10.10				
Firm brown thinly laminated CLAY with occasional rootlets. (Fluvial Alluvium)				D 0.50			
		1.00	9.20	U 1.00 - 1.45	(12)		
Soft brown mottled grey occasionally thinly laminated CLAY. (Fluvial Alluvium)				D 1.50 D 1.75			
		2.00	8.20	B 2.00 - 2.45 D 2.00		S2 2.00 2.45	
Very soft to soft becoming firm brown sandy CLAY. (Fluvial Alluvium)							
---at 2.75m brown mottled grey				D 2.75 D 2.90			
---at 2.90m very medium sandy with some sub-rounded siliceous gravel				B 3.00 - 3.45		C4 3.00 3.45	
---at 3.00m very soft to soft				D 3.75			
---at 3.75m thinly laminated				B 4.00 - 4.45 W 4.00 W 4.00		C13 4.00 4.45	
---from 4.00m firm greyish brown very sandy with some sub-rounded siliceous gravel				D 4.75			
---from 5.00m stiff				B 5.00 - 5.45		S43 5.00 5.45	
		5.60	4.60			C50/20mm* 5.60 5.62	
Yellowish brown thinly to thinly bedded slightly to moderately weathered DOLOMITE strong completely fractured with occasional fine to medium gravel size vugs. (Marginal Facies of Mercia Mudstone Group)				5.60 - 6.50	TCR 13, SCR 0, RQD 0, FI NI	C50/63mm 6.50 6.71	
---at 5.60m with much sub-angular to sub-rounded siliceous gravel				6.50 - 7.50	TCR 18, SCR 0, RQD 0, FI NI		
				7.50 - 7.70	TCR 100, SCR 45, RQD 0, FI NI 1		
---from 7.60m closely spaced horizontal discontinuities planar rough tight		7.70	2.50				
Reddish brown thinly to medium sub-horizontally bedded slightly to moderately weathered dolomitic silty sandy CONGLOMERATE strong locally very strong with closely spaced sub-horizontal very thin beds of yellowish brown slightly weathered dolomite and occasional to many fine to medium gravel sized vugs with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				7.70 - 9.20	TCR 95, SCR 83, RQD 44, FI 8 NI 2		
				9.20 - 10.80	TCR 96, SCR 90, RQD 68, FI 9		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHN9** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	342425.3 E 187955.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	10.20 m AOD
Client	Welsh Office	Driller	C.A/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	29/10/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly to medium sub-horizontally bedded slightly to moderately weathered dolomitic silty sandy CONGLOMERATE strong locally very strong with closely spaced sub-horizontal very thin beds of yellowish brown slightly weathered dolomite and occasional to many fine to medium gravel sized vugs with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				9.20 - 10.80	96	90	68	9		
---from10.90 to 11.20m with very closely spaced gravel size pockets of calcite				10.80 - 11.75	100	89	61	6		
---from 11.75m thin to medium beds of grey limestone				11.75 - 12.85	100	88	75	1 NI 3		
				12.85 - 13.50	92	77	43	2 6		
				13.50 - 15.00	100	89	69	13		
		15.00	-4.80							
Borehole complete at 15.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHN10A** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	342422.2 E
Project	M4 Relief Road Magor to Castleton Stage 2				188027.6 N
		Drilling Rig	Pilcon	Ground Level	10.90m AOD
Client	Welsh Office	Driller	I.D	Orientation	Vertical
		Logged by	C.D	Date Started	22/10/1997
Consultant	Ove Arup and Partners			Date Completed	22/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
22/10/1997	1800	7.00	7.00	5.20	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	7.00	150	7.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
22/10/1997	0000	4.50	4.30	20.0	slow	4.50	0.00

GENERAL NOTES

1. Borehole abandoned at 7.00m due to obstruction.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
0.50	S	N=5 (1,1,1,1,1,2)
2.50	S	N=1 (1,0,0,1,0,0)
4.50	S	N=11 (8,5,3,3,3,2)
5.50	S	N=23 (4,4,6,5,5,7)
7.00	S	50/0mm

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHN10A** Sheet 1 of 1

Contract No.	F10895	Method	Cable Percussion	Coordinates	342422.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		188027.6 N
		Driller	I.D	Ground Level	10.90m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	22/10/1997
Consultant	Ove Arup and Partners			Date Completed	22/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL		0.30	10.60				
Soft reddish brown occasionally thinly laminated slightly fine sandy CLAY with occasional rootlets. (Fluvial Alluvium)				B 0.50 - 1.00	S5	S 0.50 - 0.95	
				D 1.20			
				U 1.50 - 2.00	(12)		
		2.00	8.90				
Very soft reddish brown very fine and medium sandy CLAY with occasional to some fine medium subangular and subrounded siliceous gravel. (Fluvial Alluvium)				D 2.20			
				B 2.50 - 3.00	S1	S 2.50 - 2.95	
---at 2.20m with occasional medium gravel sized pockets of reddish brown silty clay				D 3.20			
				U 3.50 - 4.00	(11)		
				D 4.20			
		4.50	6.40	B 4.50 - 5.00	S11	S 4.50 - 4.95	
Soft to firm reddish brown fine sandy CLAY with some to much subangular and subrounded fine medium and coarse gravel and cobbles of hard grey sandstone. (Fluvial Alluvium)				D 5.20			
				B 5.50 - 6.00	S23	S 5.50 - 5.95	
				B 6.30 - 6.80			
		7.00	3.90		S50/0mm	S 7.00 - 7.00	
Cable Percussion boring complete at 7.00 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHN10B
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	342487.3 E 187905.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/ Knebel 77	Ground Level	10.80m AOD
Client	Welsh Office	Drillers	I.D/E.D	Orientation	Vertical
		Logged by	M.B/T.R	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	29/10/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
23/10/1997	1800	6.90	6.90	4.30	
29/10/1997	1800	15.00	9.10	Dry	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	6.90	150	6.90
120	15.00	140	9.10

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
23/10/1997	0000	4.70	0.00	0	seepage	4.50	0.00
23/10/1997	0000	6.40	5.30	20	slow	6.40	0.00
29/10/1997	1200	9.60	0.00	0	fast	9.10	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
6.90	15.00	mist	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
0.50	S	N=4 (1,1,1,1,1,1)
2.50	S	N=4 (1,1,1,1,1,1)
4.50	S	N=20 (3,3,4,5,5,6)
5.50	S	N=23 (4,5,5,6,5,7)
6.90	S	50/0mm*

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHN10B** Sheet 1 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	342487.3 E 187905.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/ Knebel 77	Ground Level	10.80 m AOD
Client	Welsh Office	Drillers	I.D/E.D	Orientation	Vertical
		Logged by	M.B/T.R	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	29/10/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
TOPSOIL							
		0.30	10.50				
Soft reddish brown very sandy CLAY with occasional rootlets and fine gravel. (Fluvial Alluvium)				B 0.50 - 1.00 D 0.50		S4 0.50 0.95	
				D 1.20			
				U 1.50 - 2.00	(12)		
		1.80	9.00				
Soft brown mottled grey sandy CLAY with occasional medium to coarse sub-angular gravel. (Fluvial Alluvium)				D 2.20			
				B 2.50 - 3.00 D 2.50		S4 2.50 2.95	
				D 3.20			
				U 3.50 - 4.00	(15)		
		3.80	7.00				
Firm to stiff brown very sandy CLAY with much fine to medium sub-rounded gravel. (Fluvial Alluvium)				D 4.20 W 4.30			
				B 4.50 - 5.00 D 4.50		S20 4.50 4.95	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHN10B**
Sheet 2 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	342487.3 E 187905.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/ Knebel 77	Ground Level	10.80 m AOD
Client	Welsh Office	Drillers	I.D/E.D	Orientation	Vertical
		Logged by	M.B/T.R	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	29/10/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Firm to stiff brown very sandy CLAY with much fine to medium sub-rounded gravel. (Fluvial Alluvium)				D 5.20			
		5.50	5.30	B 5.50 - 6.00		S23 5.50	
Medium dense brown slightly clayey silty sandy GRAVEL. (Fluvial Alluvium)				D 5.50		5.95	
---from 5.50m becoming very gravelly with many cobbles of limestone				B 6.20 - 6.70			
		6.90	3.90	D 6.90		S50/0mm* 6.90	
Yellowish brown very thinly to thinly sub-horizontally bedded slightly to moderately weathered DOLOMITE, strong with occasional fine to medium gravel size vugs with medium spaced very thin beds of grey dolomitic limestone with very closely spaced sub-horizontal discontinuities planar rough slightly open. (Marginal Facies of Mercia Mudstone Group)				6.90 - 7.10	TCR 20 / SCR 20 / RQD / NI	6.90	
---from 6.90 to 7.10m completely fractured				7.10 - 7.60	66 / 28 / 0 / NI / 2		
---from 7.10 to 7.27m completely fractured					NI		
---from 7.60 to 7.73m completely fractured					4		
		8.04	2.76				
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded slightly weathered dolomitic SANDSTONE, strong with some fine to medium gravel size vugs and very closely spaced gravel size pockets and very thin beds of grey limestone with closely spaced to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				7.60 - 8.70	75 / 36 / 24 / 5		
				8.70 - 9.70	87 / 80 / 76 / 4		
---from 9.60m silty							
---from 9.60 to 9.80m moderately to highly weathered					0		
		10.00	0.80				

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHN10B** Sheet 3 of 3

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	342487.3 E 187905.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/ Knebel 77	Ground Level	10.80 m AOD
Client	Welsh Office	Driller	I.D/E.D	Orientation	Vertical
		Logged by	M.B/T.R	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	29/10/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown fine to medium grained thinly to medium sub-horizontally bedded slightly weathered dolomitic SANDSTONE, strong with some fine to medium gravel size vugs and very closely spaced gravel size pockets and very thin beds of grey limestone with closely spaced to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		10.00	0.80					0		
Reddish brown medium to thickly sub-horizontally bedded moderately weathered sandy MUDSTONE, moderately weak to moderately strong with medium to widely spaced sub-horizontally bedded discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				9.70 - 11.30	100	100	64	0		
								3		
---from 11.65 to 12.11m highly weathered very weak completely fractured				11.30 - 12.80	100	67	46	0		
								NI		
---from 12.11m very closely to closely spaced sub-horizontal discontinuities planar smooth tight								6		
								7		
---from 13.05 to 13.40m highly weathered very weak completely fractured								NI		
---from 13.40m with medium spaced thick laminations to very thin beds of pinkish grey fine to medium grained silty sandstone moderately strong				12.80 - 14.25	91	72	38	7		
				14.25 - 15.00	73	45	20	6		
Borehole complete at 15.00 m.		15.00	-4.20							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN11** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	342517.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187973.1 N
		Driller	E.D	Ground Level	15.20m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	P	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	29/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
29/10/1997	1800	10.05	4.10	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
5.20	10.05	mist	good	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	10.05	140	4.10

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
3.00	S	50/70mm (1,2,50)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN11** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	342517.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187973.1 N
		Driller	E.D	Ground Level	15.20m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	P	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	29/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL		0.10	15.10							
Sandy CLAY (drillers description).		1.00	14.20							
Light to yellowish brown thinly sub-horizontally bedded slightly to moderately weathered slightly dolomitic LIMESTONE, strong with closely to medium spaced very thin sub-horizontal to inclined beds of yellowish brown dolomite with many fine to medium gravel size vugs and very closely to closely spaced sub- horizontal to inclined discontinuities planar rough slightly open. (Marginal Facies of Mercia Mudstone Group)				1.00 1.40	100	38	30	NI 0 NI		
				1.40 3.00	34	22	6	8		
---from 1.00 to 1.14m completely fractured										
---from 1.26 to 1.40m completely fractured									S50/70mm 3.00	
---from 3.00 to 3.50m completely fractured				3.00 3.50	86	20	0	NI	3.22	
				3.50 4.10	93	65	20	7		
				4.10 5.80	88	68	68	4		
Yellowish brown with many fine to medium gravel size vugs thinly to medium sub-horizontally bedded weathered dolomitic CONGLOMERATE, strong with closely spaced very thin to thin beds of light grey limestone with closely spaced sub-horizontal discontinuities planar rough slightly open. (Marginal Facies of Mercia Mudstone Group)		5.20	10.00	5.80 6.15	100	77	77	2		
---from 6.15m medium sub-horizontally bedded slightly weathered with medium spaced sub-horizontal discontinuities				6.15 7.30	100	87	59	10		
---from 6.15 to 6.95m occasional fine to medium gravel size vugs										
---from 7.90m occasional to some fine to medium gravel size vugs medium to thickly sub-horizontally bedded fresh to slightly weathered with thickly spaced sub-horizontal discontinuities				7.30 8.80	100	99	94	4		
				8.80 10.05	100	99	97	2		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN11** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	342517.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187973.1 N
		Driller	E.D	Ground Level	15.20m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	P	Date Started	29/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	29/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Yellowish brown with many fine to medium gravel size vugs thinly to medium sub-horizontally bedded weathered dolomitic CONGLOMERATE, strong with closely spaced very thin to thin beds of light grey limestone with closely spaced sub-horizontal discontinuities planar rough slightly open. (Marginal Facies of Mercia Mudstone Group)		10.05	5.15							
Rotary drilling complete at 10.05 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHN12
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	342781.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188015.2 N
		Driller	E.D	Ground Level	34.40m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	P	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	28/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
28/10/1997	1800	10.00	2.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	0.30	air & mist	100%	0*
0.30	10.00	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	10.00	92	2.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole open holed from ground level to 0.30m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHN12** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	342781.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188015.2 N
		Driller	E.D	Ground Level	34.40m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	P	Date Started	28/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	28/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL		0.30	34.10							
Yellowish brown very thinly to thinly sub-horizontal beds slightly to moderately weathered LIMESTONE, strong with some fine to medium gravel size vugs and with closely to medium spaced very thin to thin beds of light grey dolomitic limestone with very closely to closely spaced sub-horizontal discontinuities planar rough slightly open. (Carboniferous Limestone Group, Lower Dolomite)				0.30 1.05	100	80	41	9		
				1.05 1.40	46	14	0	4		
				1.40 1.90	112	40	0	11		
---from 1.40 to 1.80m vertical fracture planar rough tight		1.80	32.60							
				1.90 2.10	125	50	0	7		
Yellowish brown very thin sub-horizontally bedded slightly to moderately weathered LIMESTONE, strong with occasional gravel size vugs and with very closely to closely spaced sub-horizontal discontinuities planar rough tight. (Carboniferous Limestone Group, Lower Dolomite)				2.10 3.60	100	69	35	17		
		3.60	30.80							
Light grey to yellowish brown medium to thickly sub-horizontally bedded slightly weathered dolomitic LIMESTONE, very strong with closely to medium spaced very thin beds of yellowish brown sandstone with many fine to medium gravel size vugs, dolomite with medium to widely spaced sub-horizontal discontinuities planar rough tight. (Carboniferous Limestone Group, Lower Dolomite)				3.60 4.00	100	95	53	5		
				4.00 5.50	98	97	91	5		
		5.60	28.80							
Grey to light grey medium to thickly sub-horizontally bedded fresh to slightly weathered LIMESTONE, very strong with medium to widely spaced sub-horizontal discontinuities planar rough tight. (Carboniferous Limestone Group, Lower Dolomite)				5.50 7.10	96	94	94	6		
---from 7.10 to 8.00m with medium spaced very thin beds of dolomitic limestone				7.10 8.50	98	96	92	4		
				8.50 10.00	100	99	99	4		
---from 9.50 to 10.00m with medium spaced very thin beds of dolomitic limestone		10.00	24.40							

Rotary drilling complete at 10.00 m

NB All depths in metres, all diameters in millimetres.

See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP1** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	343033.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188040.5 N
		Driller	E.D	Ground Level	41.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	18/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
18/10/1997	1800	10.00	3.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
3.00	4.35	mist	good	92
4.35	4.80	mist	good	92
4.80	10.00	mist	total loss	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	10.00	140	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Piezometer installed, tip at 8.00m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP1** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	343033.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188040.5 N
		Driller	E.D	Ground Level	41.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	18/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
TOPSOIL	0.10	41.60							
Brown sandy CLAY (drillers description). (Head Deposits)	0.50	41.20	0.50 0.70	100	40	0	NI 4		
Light grey yellow brown with some fine to coarse gravel sized vugs thinly to medium bedded moderately weathered DOLOMITE, strong with very closely spaced vertical to horizontal discontinuities planar rough slightly open. (Carboniferous Limestone Group, Lower Dolomite)			0.70 1.20	94	33	0	9		
	1.59	40.11					2		
---from 0.50 to 0.62m completely fractured ---from 0.92 to 1.20m horizontal to sub-horizontal discontinuities planar rough slightly open (clay limestone infill)			1.20 2.40	100	94	20	13		
Light greyish yellow with occasional fine to medium gravel size vugs thickly bedded slightly weathered DOLOMITE, strong with very closely spaced sub-horizontal discontinuities planar rough tight (10°), (10°). (Carboniferous Limestone Group, Lower Dolomite)			2.40 3.90	94	90	63	12		
---from 2.09 to 2.30m some fine to medium gravel size vugs							2		
	4.35	37.35	3.90 4.80	73	60	60	2 NI		
---from 2.40 to 3.70m closely spaced subhorizontal to horizontal discontinuities irregular rough tight	4.80	36.90					NI		
---from 3.70m medium spaced sub-horizontal discontinuities (20°) ---from 4.07 to 4.35m slightly shelly							4		
			4.80 6.30	96	79	57	4		
White yellowish grey with occasional fine to medium gravel size vugs thinly bedded slightly to moderately weathered DOLOMITE, strong with closely spaced very thin to thin beds of soft brown clay with some to much angular to sub-angular limestone and dolomite gravel with very closely to closely spaced horizontal discontinuities. (Carboniferous Limestone Group, Lower Dolomite)	6.62	35.08							
---from 4.50 to 4.60m completely fractured ---from 4.60 to 4.80m void			6.30 7.50	108	104	92	5		
Greyish yellow occasionally with fine to medium gravel size vugs medium to thickly bedded slightly weathered slightly shelly dolomtic LIMESTONE, strong to very strong with closely spaced horizontal to sub-vertical discontinuities irregular rough slightly open. (Carboniferous Limestone Group, Lower Dolomite)			7.50 8.90	111	107	93	7		
---from 5.30 to 6.62m medium spaced horizontal discontinuities irregular rough slightly open			8.90 10.00	85	80	77	4		
Rotary drilling complete at 10.00 m.	10.00	31.70							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHP1
Extra Sheet

Contract No.	F10895	Method	Rotary Coring	Coordinates	343033.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188040.5 N
		Driller	E.D	Ground Level	41.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	18/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	18/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Light grey to grey medium to thickly bedded slightly weathered slightly shelly LIMESTONE, strong to very strong with closely to medium spaced horizontal to sub-horizontal discontinuities (20°). (Carboniferous Limestone Group, Lower Dolomite)		10.00	31.70							
Rotary drilling complete at 10.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHP2
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	343307.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188003.9 N
		Driller	E.D	Ground Level	37.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core bit	DST	Date Completed	17/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
17/10/1997	1800	7.00	3.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	3.00	mist	good	110
3.00	7.00	mist	good	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	7.00	150	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole open holed to 3.00m.
2. Borehole complete at 7.00m.
3. 100mm diameter pipe installed from GL to 7.00m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP2** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	343307.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188003.9 N
		Driller	E.D	Ground Level	37.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	17/10/1997
Consultant	Ove Arup and Partners	Core bit	DST	Date Completed	17/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Open holed to 3.00m. Brown sandy CLAY (drillers description). (Head Deposits)									
	3.00	34.00							
Yellow brown fine to coarse grained medium to thickly bedded slightly weathered very sandy CONGLOMERATE, moderately strong to strong with very closely to closely spaced horizontal fractures planar rough tight. (Marginal Faices of Mercia Mudstone Group)			3.00 3.60	92	37	18	NI 5		
			3.60 4.30	31	29	0	2 NI		
---from 3.00 to 3.23m completely weathered									
---from 4.47 to 4.56m completely weathered			4.30 5.00	50	37	33	1 NI 0 NI		
			5.00 5.80	106	71	44	6 NI		
---from 5.64 to 5.76m completely weathered	5.80	31.20							
Light greyish brown fine to coarse grained thinly bedded moderately to highly weathered silty SANDSTONE moderately weak to moderately strong with very closely to closely spaced undulating thick laminations of light greyish green sandy siltstone with very closely spaced horizontal to sub-vertical fractures planar rough tight. (Marginal Facies of Mercia Mudstone Group)			5.80 7.00	100	58	8	NI 1 NI 5 NI 1		
---from 5.80 to 6.02m highly weathered weak completely fractured									
---from 6.14 to 6.23m highly weathered weak completely fractured									
---from 6.47 to 6.57m highly weathered weak completely fractured									
	7.00	30.00							
Rotary drilling complete at 7.00 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP3** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	343525.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188092.6 N
		Driller	E.D	Ground Level	35.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	23/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
23/10/1997	1800	7.00	2.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	1.00	-	-	NR
1.00	7.00	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	7.00	140	2.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole open holed from ground level to 1.00m.
2. Borehole grouted to ground level.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP3** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	343525.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188092.6 N
		Driller	E.D	Ground Level	35.40m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	23/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL		0.10	35.30							
Brown clayey weathered LIMESTONE. (Driller's description)		1.00	34.40							
Light brown yellow brown thinly bedded slightly to moderately weathered dolomitic LIMESTONE, strong with gravel size pockets of dolomite, completely fractured. (Carboniferous Limestone, Lower Dolomite)				1.00 1.40	55	0	0	NI		
---from 1.40m occasional gravel size vugs				1.40 2.00	100	30	0	NI		
---at 1.50m very strong				2.00 2.90	100	42	0	NI 5		
---from 2.50m slightly weathered with very closely to closely spaced sub-horizontal to inclined discontinuities, planar rough tight				2.90 4.00	116	75	44	2 NI 6 NI		
---from 3.06 to 3.16m completely fractured										
---from 3.22 to 3.50m thinly to medium sub-horizontal discontinuities planar, rough, tight										
---from 3.80 to 4.00m completely fractured		4.30	31.10	4.00 4.30	100	83	0	3		
Light grey thinly to medium sub-horizontally bedded slightly weathered slightly dolomitic LIMESTONE, very strong with thinly to medium sub-horizontal discontinuities planar rough tight. (Carboniferous Limestone Group, Lower Dolomite)				4.30 4.50	100	70	70	4		
				4.50 4.90	95	80	40	4		
---from 4.90 to 5.36m very closely to closely spaced horizontal to subvertical discontinuities, planar rough tight				4.90 6.30	100	93	53	8 6		
---from 6.75m dolomitic		7.00	28.40	6.30 7.00	70	66	37	2 NI 5		
---from 6.75 to 6.85m completely fractured										
Rotary drilling complete at 7.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP4** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	343514.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187970.1 N
		Driller	E.D.	Ground Level	25.50m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
		Core barrel	P	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	23/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
23/10/1997	0000	8.00	2.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	1.00	-	-	NR
1.00	8.00	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	8.00	140	2.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole open holed from ground level to 1.40m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	50/150mm (1,1,8,42)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP4** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	343514.6 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187970.1 N
		Driller	E.D.	Ground Level	25.50m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
		Core barrel	P	Date Started	23/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	23/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
TOPSOIL	0.15	25.35							
Firm brown sandy CLAY (drillers description). (Head Deposits)								S50/150mm 1.00 1.30	
	1.35	24.15							
Brown SANDSTONE (drillers description).	1.40	24.10							
Yellowish brown with many fine to medium gravel size vugs thinly to medium sub-horizontally bedded slightly weathered dolomitic CONGLOMERATE, strong to very strong with closely to medium spaced thin to very thin beds of grey limestone with closely to medium spaced sub-horizontal to inclined discontinuities planar irregular rough tight. (Marginal Facies of Mercia Mudstone Group)			1.40 2.80	99	86	82	7		
			2.80 4.40	100	94	89	5		
							1		
Yellowish brown with some fine to medium gravel size vugs medium sub-horizontally bedded fresh to slightly weathered dolomitic CONGLOMERATE, strong to very strong with closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	4.40	21.10	4.40 5.90	100	83	136	2		
	5.30	20.20					NI		
Yellowish brown with occasional fine to medium gravel size vugs thinly to medium sub-horizontally bedded fresh to slightly weathered dolomitic CONGLOMERATE, strong to very strong with closely spaced sub-horizontal and inclined discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	5.90	19.60					3		
---from 5.30 to 5.52m moderately weathered moderately strong to strong completely fractured			5.90 7.30	100	93	89	6		
Grey thinly to medium sub-horizontally bedded fresh LIMESTONE, very strong with closely to medium spaced sub-horizontal and inclined discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)			7.30 8.00	110	100	79	3		
	8.00	17.50							
Rotary drilling complete at 8.00 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHP5
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	343650.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188062.0 N
		Driller	E.D	Ground Level	26.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	27/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	27/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
27/10/1997	1800	8.05	2.10	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	2.00	.	.	NR
2.00	8.05	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	8.05	140	2.10

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Borehole open holed from ground level to 2.00m.
2. Piezometer installed, tip at 7.00m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=17 (1,2,4,4,4,5)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP5** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	343650.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188062.0 N
		Driller	E.D	Ground Level	26.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	27/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	27/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Sandy CLAY (drillers description). (Head Deposits)									S17 1.00 1.45	
---at 1.00m firm to stiff		2.00	24.90							
Yellowish brown thinly to medium sub-horizontally bedded moderately weathered dolomitic CONGLOMERATE strong with medium spaced sub-horizontal discontinuities planar rough slightly open to tight and many gravel size vugs. (Marginal Facies of Mercia Mudstone Group)				2.00 3.60	100	66	58	NI 4		
---from 2.00 to 2.45m highly weathered very weak completely fractured										
---from 3.00 to 4.10m with some fine to medium gravel size vugs				3.60 4.10	100	30	28	3		
---from 4.10m very thinly to thinly sub-horizontally bedded moderately to highly weathered								4		
Yellowish brown thinly sub-horizontally bedded slightly weathered DOLOMITE strong and with occasional fine gravel size vugs closely to medium spaced thick laminations to very thin beds of yellowish grey dolomitic limestone with closely spaced sub-horizontal discontinuities planar rough tight. (Margina Facies of Mercia Mudstone Group)		4.83	22.07	4.10 5.60	90	65	37	5		
---from 4.83 to 5.10m yellowish green		5.90	21.00					2		
Grey medium to thickly sub-horizontally bedded fresh to slightly weathered LIMESTONE very strong with medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				5.60 7.20	97	94	80	3		
				7.20 8.00	94	88	88	3		
Rotary drilling complete at 8.05 m.		8.05	18.85							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHP6
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	343647.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187872.0 N
		Driller	E.D	Ground Level	20.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	24/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	24/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
24/10/1997	1800	8.00	3.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	2.50	.	.	NR
2.50	8.00	mist	good	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	8.00	139	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=4 (1,1,1,1,1,1)
2.00	S	N=2 (1,1,0,1,1,0)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP6** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	343647.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187872.0 N
		Driller	E.D	Ground Level	20.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	24/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	24/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
Soft brown very sandy CLAY with occasional dolomitic gravel. (Head Deposits)								S4 1.00, 1.45	
---from 2.00m becoming very soft								S2 2.00, 2.45	
							NI		
Yellowish brown very thinly sub-horizontally bedded slightly to moderately weathered DOLOMITE, moderately strong with closely spaced thick laminations to very thin beds of reddish brown dolomitic mudstone with very closely spaced sub-horizontal discontinuities planar rough tight to slightly open. (Marginal Facies of Mercia Mudstone Group)	2.90	17.10	2.50 4.00	80	43	13	14		
---from 4.00m very thinly to thinly sub-horizontally bedded							7		
---from 4.20 to 4.40m moderately to highly weathered	4.50 4.86	15.50 15.14	4.00 5.50	98	90	60	2		
Yellowish brown with some fine to coarse gravel size vugs medium sub-horizontally bedded slightly weathered DOLOMITE, strong with closely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	5.50	14.50	5.50 7.00	100	97	83	9		
Yellowish brown with many fine to coarse gravel size vugs medium sub-horizontally bedded slightly weathered dolomitic CONGLOMERATE, strong with medium spaced sub-horizontal discontinuities, planar rough tight. (Marginal Facies of Mercia Mudstone Group)	6.75	13.25	7.00 8.00	100	100	100	2		
Yellowish brown thinly sub-horizontally bedded slightly weathered DOLOMITE, strong with very closely to closely spaced very thin to thin beds of reddish brown dolomitic mudstone with thinly spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	8.00	12.00							
Yellowish brown with occasional fine to medium gravel size vugs medium to thickly sub-horizontally bedded slightly weathered DOLOMITE, strong with medium to widely spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)									
Rotary drilling complete at 8.00 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHP7
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	343851.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188129.1 N
		Driller	E.D	Ground Level	22.30m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	P	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	20/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
20/10/1997	1800	8.00	0.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	8.00	mist	good	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	8.00	120	0.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP7** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	343851.3 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188129.1 N
		Driller	E.D	Ground Level	22.30m AOD
Client	Welsh Office	Logged by	T.R	Orientation	Vertical
		Core barrel	P	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	20/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL		0.10	22.20							
Brown sandy CLAY (drillers description). (Head Deposits)		0.50	21.80							
Light greyish yellow brown with many fine to medium gravel sized vugs thinly to medium sub-horizontally bedded moderate to highly weathered dolomitic CONGLOMERATE, moderately weak to very strong completely fractured. (Marginal Facies of Mercia Mudstone Group)				0.50 1.00	92	0	0	NI		
				1.00 1.50	82	10	0	NI		
---from 1.80m slightly weathered strong to very strong with widely spaced very thin to thin beds of light grey dolomitic limestone and closely spaced horizontal to sub-horizontal discontinuities planar, rough, tight				1.50 3.00	103	78	38	NI 8 5		
---at 2.60m moderately strong										
---at 3.30m moderately weak										
---from 3.36m medium to widely space sub-horizontal fractures planar, rough, tight				3.00 4.50	100	93	85	4 1		
				4.50 6.00	102	102	102	3		
---from 6.33m very close to closely spaced sub-horizontal fractures planar, rough, tight				6.00 7.50	96	92	56	11		
---from 7.50m very strong with closely spaced thin to medium horizontal beds of reddish brown fine to medium grained slightly argillaceous sandstone with very closely spaced horizontal fractures planar, rough open (sandy clayey infill)		8.00	14.30	7.50 8.00	100	84	44	5		
Rotary drilling complete at 8.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHP8
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	343827.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187994.9 N
		Driller	E.D	Ground Level	17.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	22/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	22/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
22/10/1997	1800	8.00	2.00	8.00	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	1.00	.	.	NR
1.00	8.00	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
87	8.00	87	2.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
22/10/1997	0000	8.00	7.80	20	slow	2.00	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP8** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	343827.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187994.9 N
		Driller	E.D	Ground Level	17.70m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	22/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	22/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
TOPSOIL	0.15	17.55							
Firm brown CLAY (drillers description). (Head Deposits)	0.51	17.19							
Yellowish brown with many fine to coarse gravel size vugs thinly sub-horizontally bedded slightly to moderately weathered dolomitic CONGLOMERATE, moderately strong to strong with very closely spaced sub-horizontal discontinuities, planar, rough tight. (Marginal Facies of Mercia Mudstone Group)			1.00 2.60	102	75	33	NI 13		
---from 1.00 to 1.18m completely fractured							3		
---from 2.00m slightly weathered thinly to medium sub-horizontally bedded	2.86	14.84					1		
---at 2.60m moderately strong			2.60 3.90	88	86	51	7		
Yellowish brown with occasional fine to medium gravel size vugs medium sub-horizontally bedded slightly weathered DOLOMITE, very strong with medium spaced very thin beds of dolomitic conglomerate. (Marginal Facies of Mercia Mudstone Group)	4.00	13.70	3.90 4.00	100	100	100	0		
Yellowish brown with occasional fine to medium size vugs thinly to medium sub-horizontally bedded slightly weathered argillaceous DOLOMITE, moderately weak to strong with extremely to very closely spaced thin laminations to very thin beds of reddish brown slightly dolomitic mudstone with closely to medium spaced sub-horizontal discontinuities, planar, rough tight. (Marginal Facies of Mercia Mudstone Group)			4.00 5.50	95	78	51	6 NI 3		
---from 4.70 to 4.98m reddish brown mottled greyish green highly weathered mudstone, weak, completely fractured	5.94	11.76					NI 4		
---at 4.10m moderately weak			5.50 7.00	100	89	25	7		
---from 4.98m medium spaced very thin beds of reddish brown to yellowish brown dolomitic mudstone									
---from 5.50 to 5.63m highly weathered, weak, completely fractured			7.00 8.00	100	98	90	4		
Reddish brown medium to thickly sub-horizontally bedded fresh to slightly weathered very sandy slightly micaceous MUDSTONE, moderately strong with closely spaced thick laminations to very thin beds of yellow brown dolomite with closely to medium spaced sub-horizontal discontinuities, planar, smooth tight. (Marginal Facies of Mercia Mudstone Group)	8.00	9.70							
Rotary drilling complete at 8.00 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHP9
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	343827.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187835.1 N
		Driller	E.D	Ground Level	22.30m AOD
Client	Welsh Office	Logged by	C.D/T.R	Orientation	Vertical
		Core barrel	P	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	21/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
21/10/1997	1800	8.00	3.00	7.32	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	1.00	-	-	NR
1.00	8.00	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
140	8.00	140	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

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Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP9** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	343827.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187835.1 N
		Driller	E.D	Ground Level	22.30m AOD
Client	Welsh Office	Logged by	C.D/T.R	Orientation	Vertical
		Core barrel	P	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	21/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
TOPSOIL	0.17	22.13							
Limestone cobbles clayey layers (drillers description). (Head Deposits)	1.00	21.30							
Light grey to yellow brown thinly to medium sub-horizontally bedded slightly weathered slightly dolomitic LIMESTONE, strong to very strong with closely spaced sub-horizontal discontinuities, planar, rough tight. (Carboniferous Limestone Group, Crease Limestone)			1.00 1.80	100	50	0	NI 10		
---from 1.00 to 1.20m completely fractured			1.80 2.60	100	56	20	2 NI		
---from 2.05 to 2.60m completely fractured	2.60	19.70							
Grey thinly to medium sub-horizontally bedded slightly weathered dolomitic LIMESTONE, strong to very strong with closely to medium spaced sub-horizontal discontinuities, planar, rough, tight. (Carboniferous Limestone Group, Crease Limestone)			2.60 4.00	100	96	0	11		
			4.00 4.30	100	95	95	1		
			4.30 5.80	95	90	87	5		
---from 6.30 to 6.57m light grey to pink							2		
	6.57	15.73	5.80 7.30	96	87	47	5		
Yellowish brown with occasional fine to medium gravel sized vugs medium sub-horizontally bedded moderately weathered DOLOMITE, moderately strong with closely spaced gravel to cobble size dolomitic limestone with very closely to closely spaced sub-horizontal discontinuities, irregular, rough tight. (Carboniferous Limestone Group, Crease Limestone)	7.07	15.23					NI		
			7.30 8.00	97	97	50	1		
	8.00	14.30							
Light grey thickly sub-horizontally bedded fresh LIMESTONE, very strong with moderately to widely spaced discontinuities, planar, rough tight. (Carboniferous Limestone Group, Crease Limestone)									
---from 7.07 to 7.30m slightly to moderately weathered, strong completely fractured									
---from 7.30 to 7.63m vertical fracture, planar, rough tight									
Rotary drilling complete at 8.00 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP10** Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	344072.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188127.7 N
		Driller	E.D	Ground Level	29.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw tooth	Date Completed	20/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
20/10/1997	0000	10.00	3.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
2.60	7.20	mist	100%	92
7.20	7.35	mist	none	92
7.35	8.50	mist	70%	92
8.50	10.00	mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	10.00	140	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Standpipe installed borehole backfilled with grout.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=19 (2,2,4,4,5,6)
2.00	S	N=13 (1,2,3,3,2,5)

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP10** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	344072.4 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188127.7 N
		Driller	E.D	Ground Level	29.90m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	20/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw tooth	Date Completed	20/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL		0.10	29.80							
		0.25	29.65							
Firm brown CLAY (drillers description). (Head Deposits)										
Light brown grey CLAY (drillers description). (Head Deposits)									S19 1.00 1.45	
		2.10	27.80						SI3 2.00 2.45	
Dark brown CLAY (drillers description). (Head Deposits)										
		2.60	27.30							
Light greyish yellow brown occasionally to some fine to medium gravel size vugs medium to thickly bedded fresh to slightly weathered slightly dolomitic SANDSTONE, strong to very strong with medium to widely spaced horizontal to sub-horizontal discontinuities, planar, rough, tight. (Carboniferous Limestone Group, Whitehead Limestone)				2.60 4.10	103	98	89	4		
				4.10 5.50	76	97	97	1		
		5.03	24.87							
Light grey medium to thickly bedded slightly weathered LIMESTONE, strong to very strong with medium to widely spaced horizontal to sub-horizontal discontinuities planar, rough, tight. (Carboniferous Limestone Group, Crease Limestone)		5.50	24.40					1		
Light greyish yellow brown medium to thickly bedded slightly weathered oolitic LIMESTONE, strong to extremely strong with medium to widely spaced horizontal to sub-horizontal discontinuities planar, rough, tight. (Carboniferous Limestone Group, Crease Limestone)				5.50 7.00	87	87	87	3		
				7.00 8.50	105	100	97	3		
—from 8.50m with occasional fine gravel sized vugs slightly dolomitic				8.50 10.00	100	93	93	4		
Rotary drilling complete at 10.00 m.		10.00	19.90							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
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Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHP11
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	344056.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187832.4 N
		Driller	E.D	Ground Level	19.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	21/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
21/10/1997	1800	8.00	3.00	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
0.00	1.00	.	.	NR
1.00	4.80	air & mist	100%	92
4.80	5.10	air & mist	0%	92
5.10	8.00	air & mist	100%	92

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
140	8.00	140	3.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
6.40	S	50/70mm*

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP11** Sheet 1 of 1

Contract No.	F10895	Method	Rotary Coring	Coordinates	344056.2 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		187832.4 N
		Driller	E.D	Ground Level	19.20m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	21/10/1997
Consultant	Ove Arup and Partners	Core bit	Saw Tooth	Date Completed	21/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Installation
TOPSOIL	0.20	19.00							
Firm brown CLAY (drillers description). (Head Deposits)	0.51	18.69							
Weathered LIMESTONE (drillers description). (Marginal Facies of Mercia Mudstone Group)	1.00	18.20	1.00 1.30	83	33	0	4		
			1.30 1.80	68	24	24	NI 1		
Yellowish brown thinly to medium sub-horizontally bedded slightly to moderately weathered dolomitic CONGLOMERATE, strong to very strong with medium spaced sub-horizontal thin beds of grey dolomitic limestone strong with very closely to closely spaced sub-horizontal discontinuities, planar rough. (Marginal Facies of Mercia Mudstone Group)							5		
---from 1.30 to 1.53m completely fractured	2.40	16.80	1.80 3.30	100	80	17	8		
---from 1.53m with occasional fine to medium gravel size vugs							NI		
Reddish brown thinly to medium sub-horizontally bedded moderately weathered sandy MUDSTONE, moderately weak with closely to medium spaced very thin to thin beds of yellowish brown dolomite with very closely to closely spaced sub-horizontal discontinuities, planar, rough tight. (Marginal Facies of Mercia Mudstone Group)							3		
							NI		
---from 3.30 to 3.43m moderately to highly weathered completely fractured			3.30 4.80	100	62	42	5		
---from 3.67 to 3.87m moderately to highly weathered completely fractured	4.30	14.90					3		
							4		
							NI		
Yellowish brown occasionally fine to medium gravel sized vugs thinly to medium sub-horizontally bedded slightly weathered DOLOMITE, moderately weak to strong with closely to medium spaced thin to medium sub-horizontal beds of highly weathered dolomitic mudstone with closely to medium spaced sub-horizontal discontinuities, planar, rough tight. (Marginal Facies of Mercia Mudstone Group)							3		
			4.80 6.40	71	31	18	NI		
---from 5.00 to 5.12m highly weathered, very weak, completely fractured							0		
---at 5.20m moderately weak	6.40	12.80						S50/70mm* 6.40 6.47	
---from 5.46 to 5.80m highly weathered, very weak, completely fractured			6.40 7.00	88	83	83	2		
Yellowish brown with occasional fine to medium gravel size vugs medium sub-horizontally bedded slightly weathered dolomitic CONGLOMERATE, strong with medium spaced sub-horizontal discontinuities, planar, rough, tight. (Marginal Facies of Mercia Mudstone Group)			7.00 8.00	92	87	87	3		
Rotary drilling complete at 8.00 m.	8.00	11.20							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No.
BHP12
Header

Contract No.	F10895	Method	Rotary Coring	Coordinates	344247.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188066.5 N
		Driller	E.D	Ground Level	36.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	19/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	19/10/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
19/10/1997	1800	15.00	3.10	Dry	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
1.00	15.00	mist	100%	87

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
120	15.00	92	3.10

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

1. Bedding dips and dip direction on separate sheet.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes.

Form	ROTARY HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP12** Sheet 1 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	344247.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188066.5 N
		Driller	E.D	Ground Level	36.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	19/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	19/10/1997

Description of Strata	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
TOPSOIL	0.10	35.90							
Grey brown weathered MUDSTONE (drillers description). (Marginal Facies of Mercia Mudstone Group)	1.00	35.00					NI		
Reddish brown mottled orange and green thinly to medium bedded highly to moderately weathered slightly sandy calcareous MUDSTONE, weak to moderately weak with widely spaced thin beds of light grey limestone completely fractured. (Marginal Facies of Mercia Mudstone Group)			1.00 1.50	100	0	0			
---from 1.50 to 2.70m with extremely closely to closely spaced horizontal to vertical discontinuities irregular ,smooth tight			1.50 2.70	100	70	50	3 0 4 0		
Light grey medium to thickly bedded slightly weathered LIMESTONE, very strong with closely to medium spaced horizontal to sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	2.70	33.30	2.70 2.80	100	90	0	6 1 1 NI 3		
---from 3.30m widely spaced undulating thin laminations of calcite			2.80 3.30	114	75	0			
---from 4.90m light grey to pale slightly argillaceous to argillaceous			3.30 4.90	94	88	69	9		
---from 5.50 to 6.00m with extremely closely spaced undulating thin to thick laminations of reddish brown calcareous mudstone			4.90 5.50	102	92	88	5		
Light grey to pink medium horizontally to inclined bedded slightly weathered argillaceous LIMESTONE, strong with medium to widely spaced very thin to thin beds of greyish green highly weathered calcareous mudstone and closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)	7.10	28.90	5.50 7.10	91	88	84			
---from 8.70m thinly and thickly laminated			7.10 8.70	92	91	80	3 2		
---at 8.95m moderately strong									
---from 9.30 to 10.20m closely to closely spaced very thin to thin beds of reddish brown			8.70 10.00	102	69	42	4 NI 2 NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - ROTARY

Borehole No. **BHP12** Sheet 2 of 2

Contract No.	F10895	Method	Rotary Coring	Coordinates	344247.9 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Knebel 77		188066.5 N
		Driller	E.D	Ground Level	36.00m AOD
Client	Welsh Office	Logged by	T.R/C.D	Orientation	Vertical
		Core barrel	P	Date Started	19/10/1997
Consultant	Ove Arup and Partners	Core bit	D.S.T	Date Completed	19/10/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Coring and Sampling	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Light grey to pink medium horizontally to inclined bedded slightly weathered argillaceous LIMESTONE, strong with medium to widely spaced very thin to thin beds of greyish green highly weathered calcareous mudstone and closely to medium spaced sub-horizontal discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)		10.20	25.80	10.00 10.20	80	30	0	NI		
				10.20 11.15	100	95	82	8		
Light grey to pink medium inclined bedded slightly weathered calcareous MUDSTONE, very strong with closely spaced undulating thin laminations of calcite with closely spaced horizontal to inclined discontinuities planar rough tight. (Marginal Facies of Mercia Mudstone Group)				11.15 12.70	100	100	100	4		
---from 10.20 to 14.30m with widely spaced very thin beds of purplish brown moderately weathered mudstone and light grey to pink slightly weathered limestone				12.70 14.30	50	44	43	4		
				14.30 15.00	80	79	54	5		
Rotary drilling complete at 15.00 m.		15.00	21.00							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH ROTARY LOG
Version	1.00
Revised	16/09/96

TRIAL PIT RECORDS

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

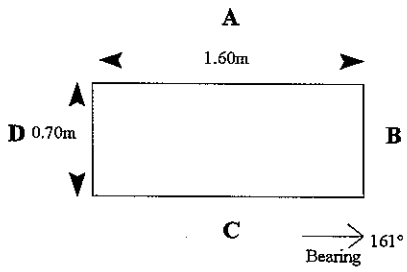
Trial Pit No.
TPB100
Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	325707.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		184395.0 N
		Logged by	M.B	Ground Level	100.90m AOD
Client	Welsh Office			Date Started	21/11/1997
				Date Completed	21/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL		0.25	100.65			
Soft to firm brown very sandy CLAY with occasional fine to coarse sub-angular gravel of sandstone. (Morainic Drift)				B D D	0.50- 1.00 0.50 0.60	
---from 0.50m with medium spaced thin beds (187°/11°) of fine to medium grained moderately weathered micaceous sandstone moderately strong to strong		1.36 1.60	99.54 99.30	B D	1.50 1.50	
Dark grey fine to medium grained thinly sub-horizontally bedded and cross laminated moderately to slightly weathered micaceous SANDSTONE, moderately strong. (St. Maughans Group)				B D	2.00 2.00	
Soft dark greyish brown very sandy CLAY with closely to medium spaced thin sub-horizontal beds of fine to medium grained moderately to slightly weathered micaceous SANDSTONE, moderately strong. (St. Maughans Group)		2.50 2.70	98.40 98.20	B D B D	2.50 2.50 2.70 2.70	
Dark grey fine to medium grained thinly to medium bedded slightly weathered to fresh micaceous SANDSTONE, strong. (St. Maughans Group)						
Trial pit complete at 2.70 m.						

Stability	Sides stable
Shoring	None
Groundwater	None encountered during excavation.
Remarks	From 0.60m material unsuitable for hand vane.

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.61	49.0	28.0	
0.62	31.0	27.0	
0.63	43.0	29.0	

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

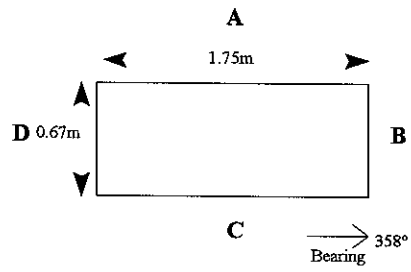
Trial Pit No.
TPB101
Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	325735.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		184294.0 N
		Logged by	M.B	Ground Level	87.80m AOD
Client	Welsh Office			Date Started	20/11/1997
				Date Completed	20/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL		0.27	87.53			
Soft to firm brown sandy CLAY with some fine to coarse sub-rounded to sub-angular gravel and rootlets with occasional cobbles. (Morainic Drift)				B D	0.50 0.50	
				B D	1.00 1.00	
---at 1.20m becoming very sandy with much fine to coarse gravel and some cobbles of greyish green medium to coarse grained sandstone				D	1.50	
		1.86	85.94			
Reddish brown mottled greyish green highly weathered sandy MUDSTONE, weak to very weak with thin laminations of greyish green siltstone. (St. Maughans Group)		2.10	85.70	B D	2.00 2.00	
				B D	2.50 2.50	
Dark greyish green fine to medium grained moderately to slightly weathered micaceous SANDSTONE, moderately weak to moderately strong. (St. Maughans Group)		2.86	84.94			
Trial pit complete at 2.86 m.						

Stability	Sides stable
Shoring	None
Groundwater	None encountered during excavation.
Remarks	From 1.20m too much gravel for hand vane test.

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
1.00	43.0	27.0	
1.10	22.0	16.0	
1.20	22.0	11.0	

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

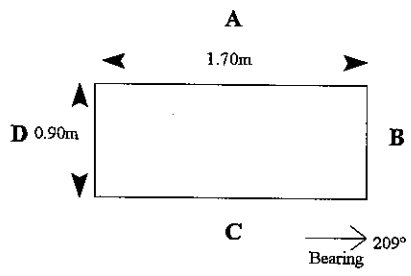
Trial Pit No.
TPB102
Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	325923.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		184413.0 N
		Logged by	M.B	Ground Level	95.80m AOD
Client	Welsh Office			Date Started	21/11/1997
				Date Completed	21/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL		0.40	95.40			
Soft to firm reddish brown very sandy CLAY with some fine to medium sub-angular to sub-rounded gravel. (Morainic Drift)		0.70	95.10	B D	0.50 0.50	
Reddish brown mottled greyish green moderately to highly weathered sandy MUDSTONE, weak to moderately weak with occasional thin laminations of greyish green silt. (St Maughans Group)				B D	1.00 1.00	
				D	1.50	
---from 0.80 to 1.00m with very thin beds of highly weathered greyish green siltstone, weak		2.25	93.55	B D	2.00 2.00	
---at 1.30m becoming slightly sandy moderately weathered moderately strong						
Trial pit complete at 2.25 m.						

Stability	Sides stable
Shoring	None
Groundwater	None encountered during excavation.
Remarks	

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.50	40.0	27.0	
0.51	51.0	42.0	
0.52	47.0	42.0	

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

Trial Pit No. **TPB103** Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	325936.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		184304.0 N
		Logged by	M.B	Ground Level	75.70m AOD
Client	Welsh Office			Date Started	20/11/1997
				Date Completed	20/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL		0.30	75.40			
Soft to firm dark reddish brown sandy CLAY with much fine to medium sub-rounded to sub-angular gravel and occasional cobbles. (Morainic Drift)		0.61	75.09	B D	0.50 0.50	
				B D	1.00 1.00	
Reddish brown mottled greyish green thinly bedded (180°/07°) highly weathered MUDSTONE, weak to very weak with thin laminations of greyish green silt. . Fractures (220°/04°), (323°/07°), (020°/07°), (200°/05°). (St. Maughans Group)		1.40	74.30	D	1.40	
Trial pit complete at 1.40 m.						

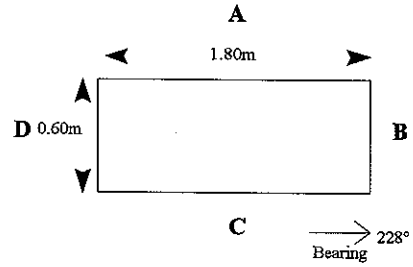
Stability: Sides stable

Shoring: None

Groundwater: None encountered during excavation.

Remarks:

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.50	42.0	31.0	
0.51	48.0	32.0	
0.52	44.0	32.0	

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

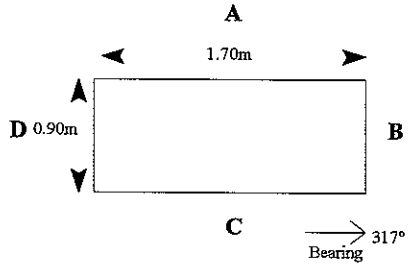
Trial Pit No.
TPB105
Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	326141.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		184307.0 N
		Logged by	M.B	Ground Level	91.70m AOD
Client	Welsh Office			Date Started	20/11/1997
				Date Completed	20/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL						
		0.42	91.28	B	0.50	
Soft to firm reddish brown sandy CLAY with occasional fine to medium sub-angular and sub-rounded gravel. (Morainic Drift)				D	0.50	
		0.80	90.90			
---from 0.75 to 0.95m thin to thick laminations of greyish green silt				B	1.00	
				D	1.00	
		1.42	90.28			
Reddish brown mottled greyish green thinly horizontally bedded moderately to highly weathered sandy MUDSTONE, weak to very weak. (St. Maughans Group)						
Trial pit complete at 1.42 m.						

Stability	Sides stable
Shoring	None
Groundwater	None encountered during excavation.
Remarks	

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.50	58.0	42.0	
0.51	52.0	38.0	
0.52	61.0	42.0	

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

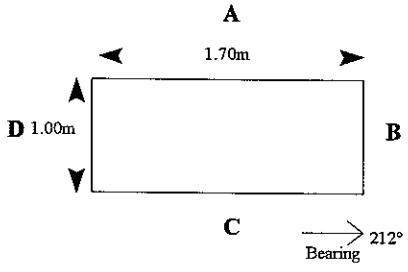
Trial Pit No.
TPN100
Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	341810.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		187350.0 N
		Logged by	M.B	Ground Level	27.90m AOD
Client	Welsh Office			Date Started	19/11/1997
				Date Completed	19/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL		0.30	27.60			
Soft reddish brown sandy CLAY with some to much fine to medium grained sub-angular to sub-rounded gravel with cobbles locally clayey silty sand. (River Terrace)				B D	0.50 0.50	
---from 0.85m to 1.50m very sandy				B D	1.00 1.00	
				D	1.50	
---from 1.80m occasional medium to coarse gravel size pockets of dark fibrous peat				B D	2.00- 2.50 2.00	
		2.40	25.50			
Light grey mottled reddish brown interlaminated sub-horizontally bedded highly weathered SILTSTONE and MUDSTONE, weak. (Tintern Sandstone)		2.50	25.40			
Trial pit complete at 2.50 m.						

Stability	Sides stable
Shoring	None
Groundwater	None encountered during excavation.
Remarks	Too much gravel for hand vane.

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

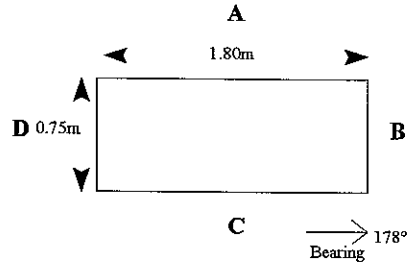
Trial Pit No.
TPN101
Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	341823.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		187488.0 N
		Logged by	M.B	Ground Level	26.80m AOD
Client	Welsh Office			Date Started	19/11/1997
				Date Completed	19/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL		0.24	26.56			
Soft to firm brown sandy CLAY with much fine to coarse sub-rounded gravel and occasional cobbles and rootlets locally very silty. (River Terrace)				B D	0.50- 1.00 0.50	
---from 0.95m becoming very sandy				D	1.00	
				D	1.50	
---from 2.00m locally becomes a clayey sand				B D B	2.00- 2.20 2.00 2.20- 2.50	
Brown clayey silty SAND with much fine to coarse sub-rounded gravel and occasional cobbles. (River Terrace)		2.20	24.60			
---at 2.50m lenses of soft to firm pale yellowish brown thinly laminated clay				D	3.00	
Purplish red fine to medium grained thinly to very thinly sub-horizontally bedded micaceous SANDSTONE, moderately weak to moderately strong with interlaminations of soft pale yellowish brown thinly laminated slightly sandy clay. (Marginal Facies of Mercia Mudstone Group)		3.30 3.50	23.50 23.30	D	3.40	
Greyish green interlaminated highly weathered siltstone and MUDSTONE, very weak. (Marginal Facies of Mercia Mudstone Group)		3.80	23.00			
Trial pit complete at 3.80 m.						

Stability	Sides stable
Shoring	None
Groundwater	None encountered during excavation.
Remarks	From 1.50m too much gravel for hand vane test.

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
1.00	42.0	15.0	
1.10	49.0	31.0	
1.20	33.0	21.0	

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

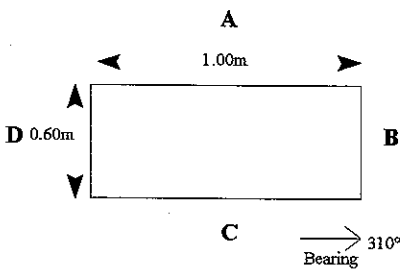
Trial Pit No.
TPN102
Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	342126.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		187724.0 N
		Logged by	M.B	Ground Level	21.30m AOD
Client	Welsh Office			Date Started	19/11/1997
				Date Completed	19/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL		0.25	21.05			
Firm brown very sandy CLAY with some sub-rounded gravel and occasional cobbles and rootlets. (Head Deposits)		0.80	20.50	B D	0.50 0.50	
---from 0.50m becoming sandy		1.20	20.10	D B	1.00 1.20	
Light brown thinly bedded (120°/19°) slightly weathered LIMESTONE, moderately strong to strong. (Marginal Facies of Mercia Mudstone Group)						
Trial pit complete at 1.20 m.						

Stability	Sides stable
Shoring	None
Groundwater	None encountered during excavation.
Remarks	

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.50	51.0	32.0	
0.51	63.0	24.0	
0.52	50.0	38.0	

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

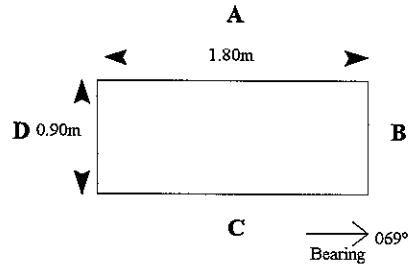
Trial Pit No.
TPN103
Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	342653.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		187936.0 N
		Logged by	M.B	Ground Level	29.90m AOD
Client	Welsh Office			Date Started	19/11/1997
				Date Completed	19/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL		0.14	29.76			
Firm to stiff reddish brown very sandy CLAY with much fine to coarse sub-rounded gravel and occasional cobbles and rootlets. (Head Deposits)				B D	0.50 0.50	
				D	1.00	
---from 0.55m becoming sandy with occasional fine to medium sub-angular to sub-rounded gravel		1.42	28.48	B D	1.40 1.40	
Pale yellowish brown thickly bedded slightly to moderately weathered LIMESTONE, moderately strong to strong. (Carboniferous Limestone Group, Lower Dolomite)		1.87	28.03			
Trial pit complete at 1.87 m.						

Stability	Sides stable
Shoring	None
Groundwater	None encountered during excavation.
Remarks	

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
1.10	61.0	29.0	
1.20	79.0	41.0	
1.30	58.0	42.0	

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

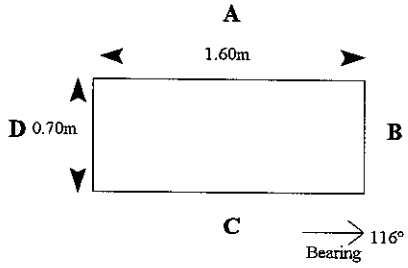
Trial Pit No.
TPP100
Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	343026.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		187975.0 N
		Logged by	M.B	Ground Level	38.90m AOD
Client	Welsh Office			Date Started	20/11/1997
				Date Completed	20/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL		0.20	38.70			
Soft to firm reddish brown sandy CLAY with some fine to coarse sub-rounded to sub-angular gravel and occasional cobbles of dolomite. (Head Deposits)		0.50	38.40	B D	0.50 0.50	
Grey thinly bedded (162°/03°) slightly to moderately weathered DOLOMITE, strong. (Carboniferous Limestone Group, Lower Dolomite)		0.80	38.10	B D	0.80 0.80	
Trial pit complete at 0.80 m.						

Stability	Sides stable
Shoring	None
Groundwater	None encountered during excavation.
Remarks	

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.40	61.0	40.0	
0.41	50.0	38.0	
0.42	59.0	32.0	

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

Trial Pit No. **TPP101** Sheet 1 of 1

Contract No.	F10895	Method	Machine Excavated	Coordinates	344165.0 E
Project	M4 Relief Road Magor to Castleton Stage 2	Equipment	JCB 3CX		188054.0 N
		Logged by	M.B	Ground Level	31.00m AOD
Client	Welsh Office			Date Started	20/11/1997
				Date Completed	20/11/1997
Consultant	Ove Arup and Partners				

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		Notes
TOPSOIL		0.20	30.80			
Soft to firm brown sandy CLAY with occasional fine to coarse gravel. (Head Deposits)				B D	0.50 0.50	
		0.80	30.20			
---at 0.70m becoming very sandy				B D	1.00 1.00	
				D	1.50	
Pale yellow highly weathered thinly laminated horizontally bedded MUDSTONE, very weak to weak. (Marginal Facies of Mercia Mudstone Group)		1.80	29.20			
				B D	2.00 2.00	
Reddish brown highly to moderately weathered sandy horizontally bedded MUDSTONE, very weak to weak. (Marginal Facies of Mercia Mudstone Group)		2.70	28.30			
Trial pit complete at 2.70 m.						

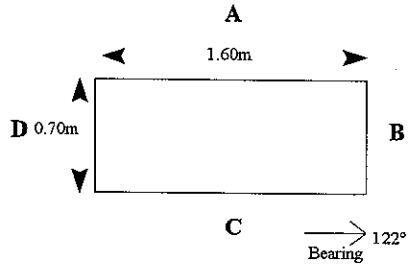
Stability: Sides stable

Shoring: None

Groundwater: None encountered during excavation.

Remarks:

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.50	60.0	39.0	
0.51	43.0	34.0	
0.52	39.0	18.0	

REMARKS - All depths in metres, all soil strengths in KPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic north

Form	TP LOG
Version	2.00
Revised	07/07/1997

APPENDIX TWO
IN-SITU TEST RESULTS

IN-SITU BOREHOLE VANE TEST RESULTS

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT	Job ref. F10895
	Borehole/ Test no. D2/1
	Sheet no. ONE
Test method BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m; Weather: FINE
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. IV2; Date 20/11/97
Vane constant, K: 1.544 mm^3	Depth to ground water level: DRY

Test record — Rate of loading ..20.... ~~radians/min~~ or degrees/min*

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
3.00	3.25	140		30			Soft grey silty CLAY.
		340	1	00			
		538	2	00			
		558	2	30			
		520	3	00			
		320	4	00			
		388	4	30	18.53	12.00	
		305	5	00	14.40	9.30	

*Delete as appropriate

	Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT	Job ref. F10895
	Borehole/ Test no. D2/2
	Sheet no. ONE
Test method BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m; Weather: FINE
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. IV2; Date 20/11/97
Vane constant, K: 1.544 mm^3	Depth to ground water level: DRY

Test record — Rate of loading ..20.... ~~radians/min~~ or degrees/min*

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
5.00	5.50	20		30			
		28	1	00			
		30	1	30			
		100	2	00			
		110	2	20			
		150	2	40			
		170	3	00			
		220	3	30			
		230	4	00			
		152	4	20	10.65	6.9	
		118	6	00	5.06	3.3	

*Delete as appropriate

Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT		Job ref.	F10985
		Borehole/ Test no.	E3
		Sheet no.	ONE
Test method: BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m	Weather:	FINE
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. ..IV2.....	Date	5/11/98
Vane constant, K: 1.544 mm^3	Depth to ground water level:		

Test record — Rate of loading .....radians/min or degrees/min*

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
5.00	5.50	0	0	0			
		30	1	0			
		160	2	0			
		395	3	0			
		740	4	0	36.10	23.38	
		450	5	0			
		210	10	0	9.65	6.25	

*Delete as appropriate

	Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT	Job ref.: F10895
	Borehole/ Test no.: E6V1
	Sheet no.: ONE
Test method: BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m; Weather: FINE
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. ....IV2..... Date 1/11/97
Vane constant, K: 1.544 mm^3	Depth to ground water level:
Test record	Rate of loading ..20.....~~radians/min~~ or degrees/min*

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
5.00	5.50	0		0			Very soft grey mottled brown
		80		20			slightly sandy CLAY.
		157		40			
		162	1	0			
		178	1	2			
		191	1	4			
		196	2	0			
		209	2	20			
		227	2	40			
5.00	5.50	237	2	50	10.998	7.123	
residual	3.50	125	3	50	5.410	3.609	

*Delete as appropriate

Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT	Job ref. F10895
	Borehole/ Test no. H4-V1
	Sheet no. ONE
Test method BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m; Weather: FINE
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. IV2; Date 29/10/97
Vane constant, K: 1.544 mm^3	Depth to ground water level:
Test record	Rate of loading ..20.... ~~radians/min~~ or degrees/min*

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
3.00	3.50	0		0			Very soft grey mottled
		27		20			black slightly sandy CLAY.
		65		40			
		120	1	00			
		167	1	20			
		191	1	40			
		231	2	00			
		252	2	20			
		293	2	40			
3.00	3.50	294	2	53	13.843	8.965	
residual		121	4	10	5.210	3.374	

*Delete as appropriate

	Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT		Job ref.	F10895
		Borehole/ Test no.	H4-V2
		Sheet no.	TWO
Test method: BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m	Weather:	FINE
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. ..IV2.....	Date	29/10/97
Vane constant, K: 1.544 mm^3	Depth to ground water level:		
Test record	Rate of loading ...20... ~~radians/min~~ or degrees/min*		

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
8.00	8.50	12		20			Soft grey slightly organic CLAY
		20		40			with occasional gravel sized
		26	1	00			pockets of black fibrous peat.
		43	1	20			
		81	1	40			
		139	2	00			
		188	2	20			
		238	2	40			
		309	3	00			
		391	3	20			
		481	3	40			
		594	4	00			
		689	4	20			
		706	4	40			
8.00	8.50	749	5	00	36.471	23.670	
residual		694	4	40	33.803	21.893	

*Delete as appropriate

Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT	Job ref. F10895
	Borehole/ Test no. J1-V1
	Sheet no. ONE
Test method BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) ■
	Weather: FINE
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. IV2
	Date 19/10/97
Vane constant, K: 1.544 mm³	Depth to ground water level:
Test record	Rate of loading ..20.... ~~radians/min~~ or degrees/min*

Depth of borehole below ground level ■	Depth of vane tip ■	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
3.00	3.50	0		0			Soft grey mottled brown
		101		20			slightly sandy CLAY.
		306		40			
		562	1	00			
		725	1	20			
		832	1	40			
3.00	3.50	863	2	00	42.236	27.355	
residual		240	4	40	11.148	7.220	

*Delete as appropriate

Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location	M4 RELIEF ROAD, NEWPORT	Job ref.	F10895
		Borehole/ Test no.	J2-V2
		Sheet no.	TWO
Test method	BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m	Weather: FINE
Vane dimensions: height 150 mm; Dia. 75 mm		Instrument no. JV2.....	Date 19/10/97
Vane constant, K: 1.544 mm^3		Depth to ground water level:	
Test record		Rate of loading ..20.....~~radians/min~~ or degrees/min*	

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
7.00	7.50	0		0			Very soft grey mottled brown
		21		20			slightly sandy organic CLAY.
		45		40			
		72	1	00			
		114	1	20			
		133	1	40			
		158	2	00			
		177	2	20			
		188	2	40			
		202	3	00			
		209	3	20			
		212	3	40			
		221	4	00			
		236	4	20			
7.00	7.50	239	4	23	11.098	7.189	
residual		121	5	30	5.210	3.374	

*Delete as appropriate

	Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT	Job ref. F10895
	Borehole/ Test no. K3-V1
	Sheet no. ONE
Test method BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m; Weather: FINE
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. IV2; Date 17/10/97
Vane constant, K: 1.544 mm^3	Depth to ground water level:

Test record — Rate of loading ..20.... ~~radians/min~~ or degrees/min*

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
3.00	3.50	0		0			Soft dark brown mottled grey
		80		20			slightly sandy CLAY with occasiona
		173		40			rootlets.
		303	1	00			
		607	1	20			
		650	1	40			
3.00	3.50	665	1	50	32.356	20.956	
residual		256	3	50	11.046	7.737	

*Delete as appropriate

Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT	Job ref. F10895
	Borehole/ Test no. L3-V1
	Sheet no. ONE
Test method BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m / Weather: FINE
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. IV2 / Date 17/10/97
Vane constant, K: 1.544 mm^3	Depth to ground water level: DRY
Test record	Rate of loading ..20.... ~~radians/min~~ or degrees/min*

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
1.00	1.50	0		0			Very soft grey mottled brown
		21		20			CLAY with occasional rootlets.
		43		40			
		67	1	00			
		82	1	20			
		107	1	40			
		123	2	00			
		137	2	20			
		168	2	40			
		189	3	00			
1.00	1.50	202	3	20	9.252	5.992	
residual		117	3	40	5.010	3.245	

*Delete as appropriate

Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location	M4 RELIEF ROAD, NEWPORT	Job ref.	F10895
		Borehole/ Test no.	L3-V2
		Sheet no.	TWO
Test method	BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m	Weather:
Vane dimensions:height	150 mm;Dia. 75 mm	Instrument no. ..IV2.....	Date 17/10/97
Vane constant,K:	1.544 mm^3	Depth to ground water level:	
Test record		Rate of loading .20.....~~radians/min~~ or degrees/min*	

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque,M N.m	Shear strength M/K kPa	Remarks(soil description at test levels, etc.)
4.00	4.50	0		0			Very soft grey CLAY with occasional
		30		20			fine to medium gravel sized pockets
		60		40			of fibrous peat.
		106	1	00			
		167	1	20			
		248	1	40			
		286	2	00			
4.00	4.50	286	2	00	13.443	8.707	
residual		177	4	20	8.004	5.184	

*Delete as appropriate

Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT	Job ref. F10895
	Borehole/ Test no. L3-V3
	Sheet no. THREE
Test method BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m; Weather:
Vane dimensions: height 200 mm; Dia. 100 mm	Instrument no. IV2; Date 18/10/97
Vane constant, K: 3.66 mm^3	Depth to ground water level:
Test record	Rate of loading 20 ~~radians/min~~ or degrees/min*

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
8.00	8.50	0		0			Very soft dark grey CLAY with
		8		20			occasional medium gravel sized
		47		40			pockets of black fibrous peat.
		111	1	00			
		119	1	20			
		149	1	40			
		162	2	00			
8.00	8.50	169	2	07	7.605	2.078	
residual		139	4	10	6.108	1.669	

*Delete as appropriate

Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT	Job ref. F10895
	Borehole/ Test no. M3-V1
	Sheet no. ONE
Test method BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m; Weather: FINE
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. IV2; Date 16/10/97
Vane constant, K: 1.544 mm^3	Depth to ground water level:

Test record — Rate of loading ..20.... ~~radians/min~~ or degrees/min*

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
2.00	2.50	0		0			Very soft dark grey slightly sandy
		21		20			CLAY with occasional gravel sized
		43		40			pockets of black fibrous peat.
		77	1	00			
		101	1	20			
		112	1	40			
		130	2	00			
		158	2	20			
		172	2	40			
		207	3	00			
		247	3	20			
		289	3	40			
		323	4	00			
		344	4	20			
2.00	2.50	362	4	28	17.236	11.163	
residual		211	4	20	9.701	6.283	

*Delete as appropriate

Operator	Calculations	Checked	Approved

Norwest Holst Soil Engineering Ltd. **LABORATORY TESTING SHEET** Ref.No. 63A

In-Situ vane shear strength test.

Location: M4 RELIEF ROAD, NEWPORT		Job ref.	F10895
		Borehole/ Test no.	M3-V2
		Sheet no.	TWO
Test method: BS 1377:Part 9:1990:4.4	Ground level: (Ordnance datum) m	Weather:	
Vane dimensions: height 150 mm; Dia. 75 mm	Instrument no. IV2	Date 16/10/97	
Vane constant, K: 1.544 mm^3	Depth to ground water level: 2.40m		
Test record	Rate of loading ....20....~~radians/min~~ or degrees/min*		

Depth of borehole below ground level m	Depth of vane tip m	Max. force applied and time to failure: Dial gauge Reading Divs.	min	s.	Torque, M N.m	Shear strength M/K kPa	Remarks (soil description at test levels, etc.)
5.00	5.50	0		0			Very soft grey CLAY with occasional
		20		20			medium to coarse gravel sized
		67		40			pockets of black fibrous peat.
		102	1	00			
		173	1	20			
		189	1	40			
		197	2	00			
		227	2	20			
		251	2	40			
5.00	5.50	267	2	58	12.495	8.093	
residual		203	4	20	9.302	6.024	

*Delete as appropriate

	Operator	Calculations	Checked	Approved

VARIABLE HEAD PERMEABILITY TEST RESULTS

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK

Contract F10895
Hole ID BHB3
Ground level 0.00 m AOD
Test depth 10.33m BGL
Test date 13.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	1.81 m	Top of filter material	5.28 m
Length of test section	5500.00 mm	Bottom of filter material	10.78 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.28 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	1.21 m	Centre of piezometer tip	10.18 m

Time (Mins)	Depth to Water level	H	H/Ho
0.50	0.87	0.94	1.000
1.00	0.94	0.87	0.926
2.00	1.11	0.70	0.745
3.00	1.15	0.66	0.702
4.00	1.17	0.64	0.681
5.00	1.17	0.64	0.681
10.00	1.18	0.63	0.670
15.00	1.21	0.60	0.638
20.00	1.21	0.60	0.638
30.00	1.21	0.60	0.638
40.00	1.21	0.60	0.638
50.00	1.21	0.60	0.638
60.00	1.21	0.60	0.638

Ho = 0.94 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 120.0 seconds

t2 = 240.0 seconds

H1 = 0.70 metres

H2 = 0.64 metres

F = 9.180 metres

A = 2.84×10^{-4} metres^2

$k = 2.31 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 9.40
Finish : 10.40

NORWEST HOLST SOIL ENGINEERING LIMITED

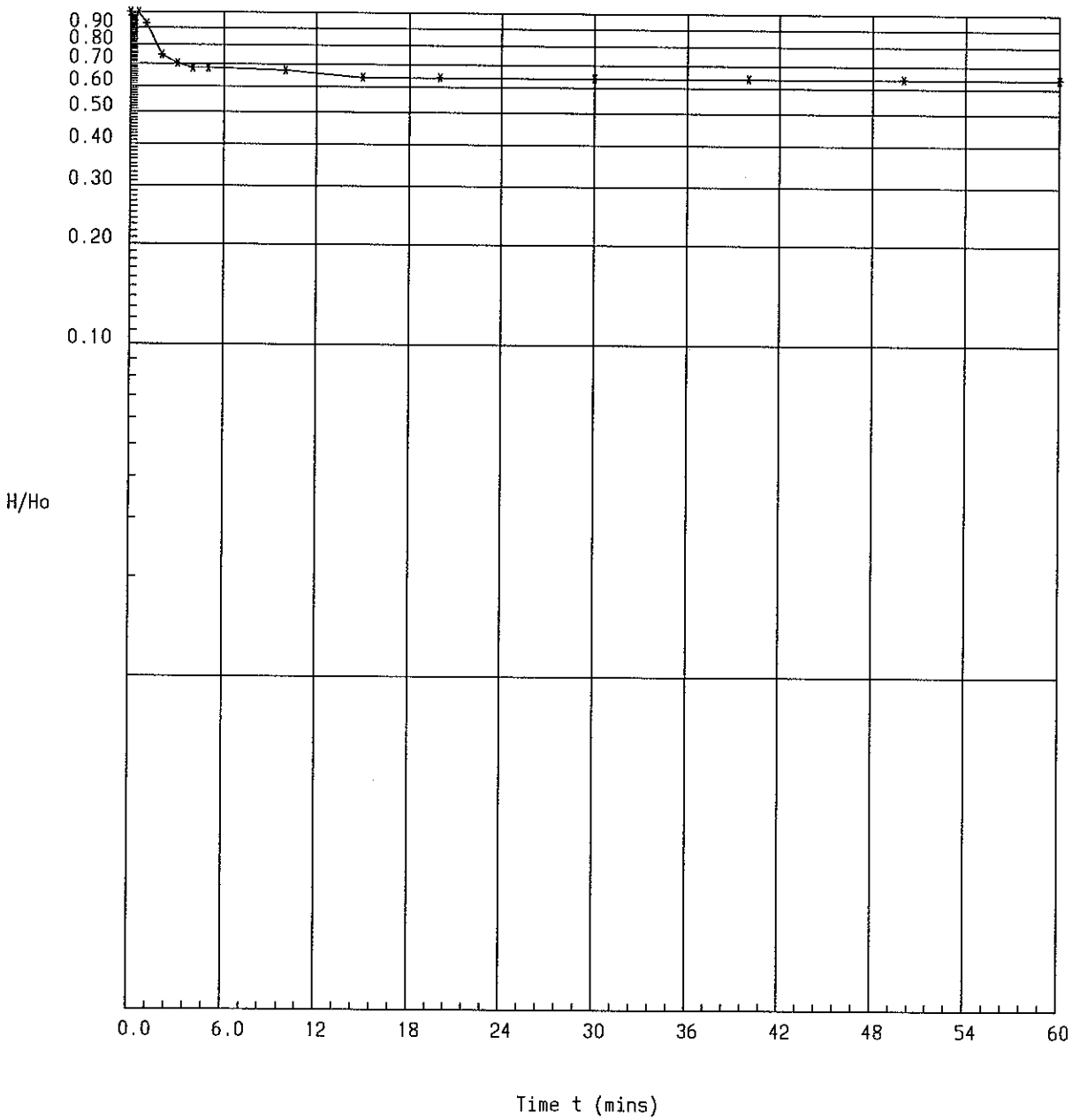
FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK

Contract	F10895
Hole ID	BHB3
Ground level	0.00 m AOD
Test depth	10.33m BGL
Test date	13.12.97



Calculation: General Approach

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK

Contract F10895
Hole ID BHB3
Ground level 0.00 m AOD
Test depth 10.33m BGL
Test date 17.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	2.97 m	Top of filter material	5.28 m
Length of test section	5500.00 mm	Bottom of filter material	10.78 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.28 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	2.86 m	Centre of piezometer tip	10.18 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	0.00	2.97	1.000
0.50	0.82	2.15	0.724
1.00	1.63	1.34	0.451
2.00	2.15	0.82	0.276
3.00	2.43	0.54	0.182
4.00	2.68	0.29	0.098
5.00	2.79	0.18	0.061
10.00	2.83	0.14	0.047
15.00	2.83	0.14	0.047
20.00	2.84	0.13	0.044
20.00	2.84	0.13	0.044
30.00	2.84	0.13	0.044
40.00	2.86	0.11	0.037
50.00	2.86	0.11	0.037
60.00	2.86	0.11	0.037

Ho = 2.97 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds
t2 = 600.0 seconds
H1 = 0.19 metres
H2 = 0.13 metres

F = 9.180 metres
A = 2.84×10^{-4} metres^2

$k = 3.26 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 10.40
Finish : 11.40

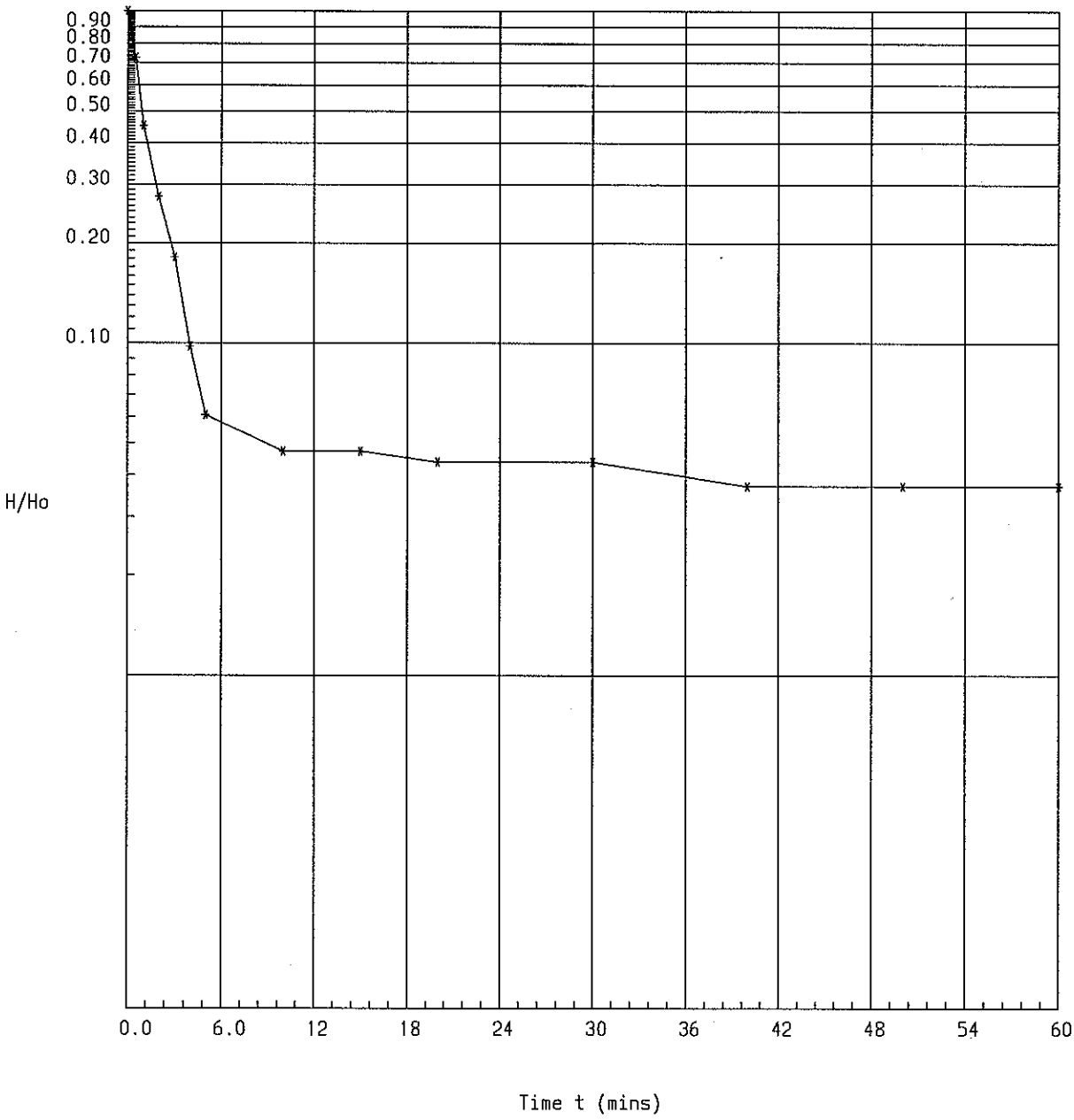
Q.A. Ref: /097-12/M4B3F2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB3
Description	REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK	Ground level	0.00 m AOD
		Test depth	10.33m BGL
		Test date	17.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B3F2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK

Contract F10895
Hole ID BHB3
Ground level 0.00 m AOD
Test depth 10.33m BGL
Test date 19.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	3.49 m	Top of filter material	5.28 m
Length of test section	5500.00 mm	Bottom of filter material	10.78 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.28 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	3.39 m	Centre of piezometer tip	10.18 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	0.00	3.49	1.000
0.50	1.35	2.14	0.613
1.00	2.48	1.01	0.289
2.00	3.09	0.40	0.115
3.00	3.25	0.24	0.069
4.00	3.30	0.19	0.054
5.00	3.33	0.16	0.046
10.00	3.36	0.13	0.037
15.00	3.37	0.12	0.034
20.00	3.37	0.12	0.034
30.00	3.38	0.11	0.032
40.00	3.38	0.11	0.032
50.00	3.39	0.10	0.029
60.00	3.39	0.10	0.029

Ho = 3.49 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds
t2 = 600.0 seconds
H1 = 0.19 metres
H2 = 0.13 metres

F = 9.180 metres
A = 2.84×10^{-4} metres^2

$k = 3.26 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 15.00
Finish : 16.00

NORWEST HOLST SOIL ENGINEERING LIMITED

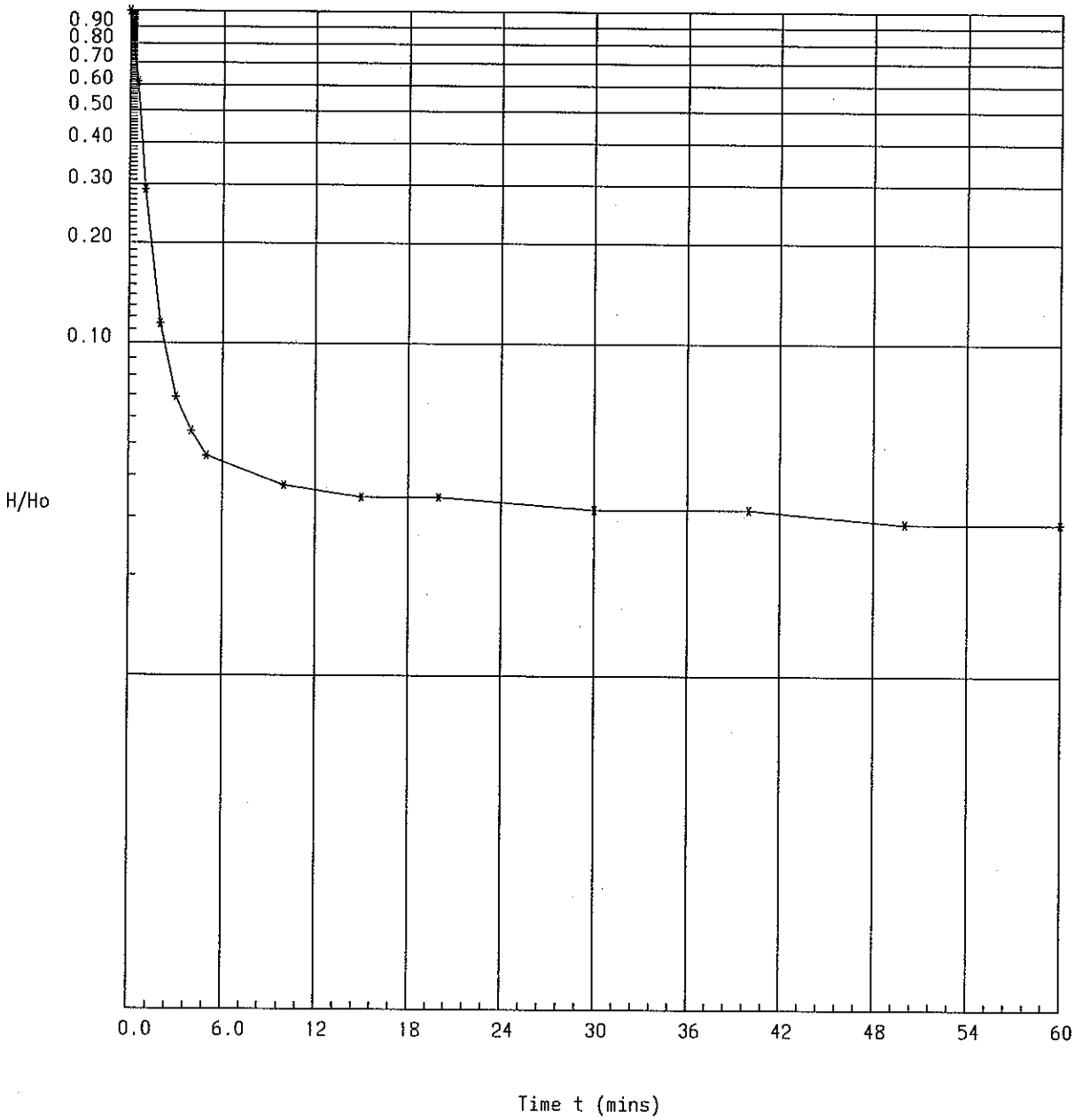
FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK

Contract	F10895
Hole ID	BHB3
Ground level	0.00 m AOD
Test depth	10.33m BGL
Test date	19.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B3F3.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK

Contract F10895
Hole ID BH83
Ground level 0.00 m AOD
Test depth 10.33m BGL
Test date 15.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	2.65 m	Top of filter material	5.28 m
Length of test section	5500.00 mm	Bottom of filter material	10.78 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.28 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	2.67 m	Centre of piezometer tip	10.18 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	5.02	2.37	1.000
0.50	3.77	1.12	0.473
1.00	2.93	0.28	0.118
2.00	2.74	0.09	0.038
3.00	2.70	0.05	0.021
4.00	2.69	0.04	0.017
5.00	2.69	0.04	0.017
10.00	2.68	0.03	0.013
15.00	2.68	0.03	0.013
20.00	2.68	0.03	0.013
30.00	2.68	0.03	0.013
40.00	2.67	0.02	0.008
50.00	2.67	0.02	0.008
60.00	2.67	0.02	0.008

Ho = 2.37 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds
t2 = 240.0 seconds
H1 = 0.05 metres
H2 = 0.04 metres

F = 9.180 metres
A = 2.84×10^{-4} metres^2

$k = 1.15 \times 10^{-7}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)\hat{}2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 9.40
Finish : 10.40

NORWEST HOLST SOIL ENGINEERING LIMITED

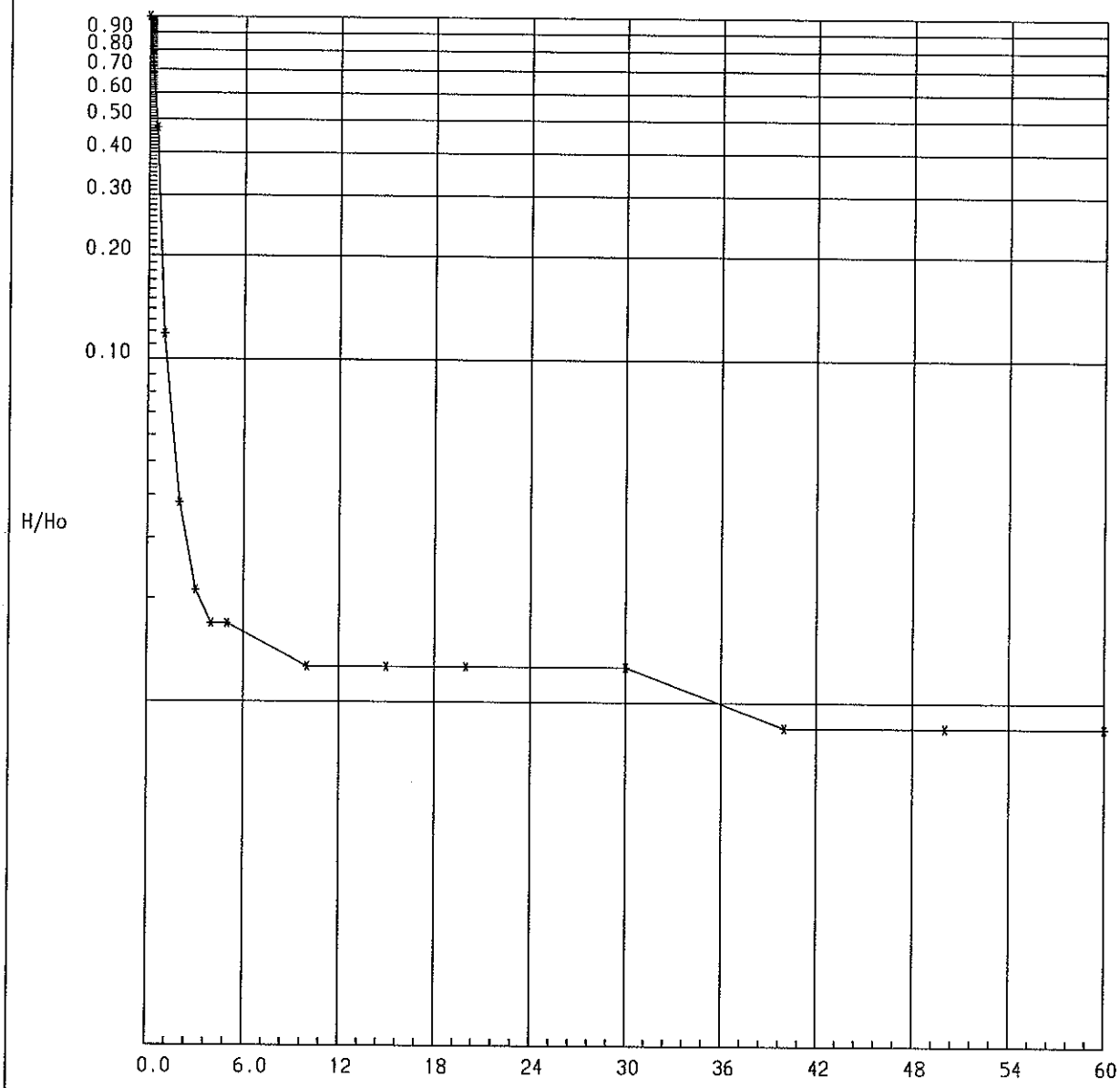
RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK

Contract	F10895
Hole ID	BHB3
Ground level	0.00 m AOD
Test depth	10.33m BGL
Test date	15.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B3R1.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK

Contract F10895
Hole ID BHB3
Ground level 0.00 m AOD
Test depth 10.33m BGL
Test date 20.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	1.91 m	Top of filter material	5.28 m
Length of test section	5500.00 mm	Bottom of filter material	10.78 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.28 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	2.03 m	Centre of piezometer tip	10.18 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	2.67	0.76	1.000
0.50	2.48	0.57	0.750
1.00	2.27	0.36	0.474
2.00	2.11	0.20	0.263
3.00	2.10	0.19	0.250
4.00	2.08	0.17	0.224
5.00	2.08	0.17	0.224
10.00	2.07	0.16	0.211
15.00	2.07	0.16	0.211
20.00	2.06	0.15	0.197
30.00	2.04	0.13	0.171
40.00	2.04	0.13	0.171
50.00	2.03	0.12	0.158
60.00	2.03	0.12	0.158

Ho = 0.76 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 120.0 seconds
t2 = 180.0 seconds
H1 = 0.20 metres
H2 = 0.19 metres

F = 9.180 metres
A = 2.84×10^{-4} metres^2

$k = 2.64 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(\pi.(L/D))}{\ln(1.1.(L/D)+\sqrt{(1+(1.1.(L/D)^2))})}$$

COMMENTS

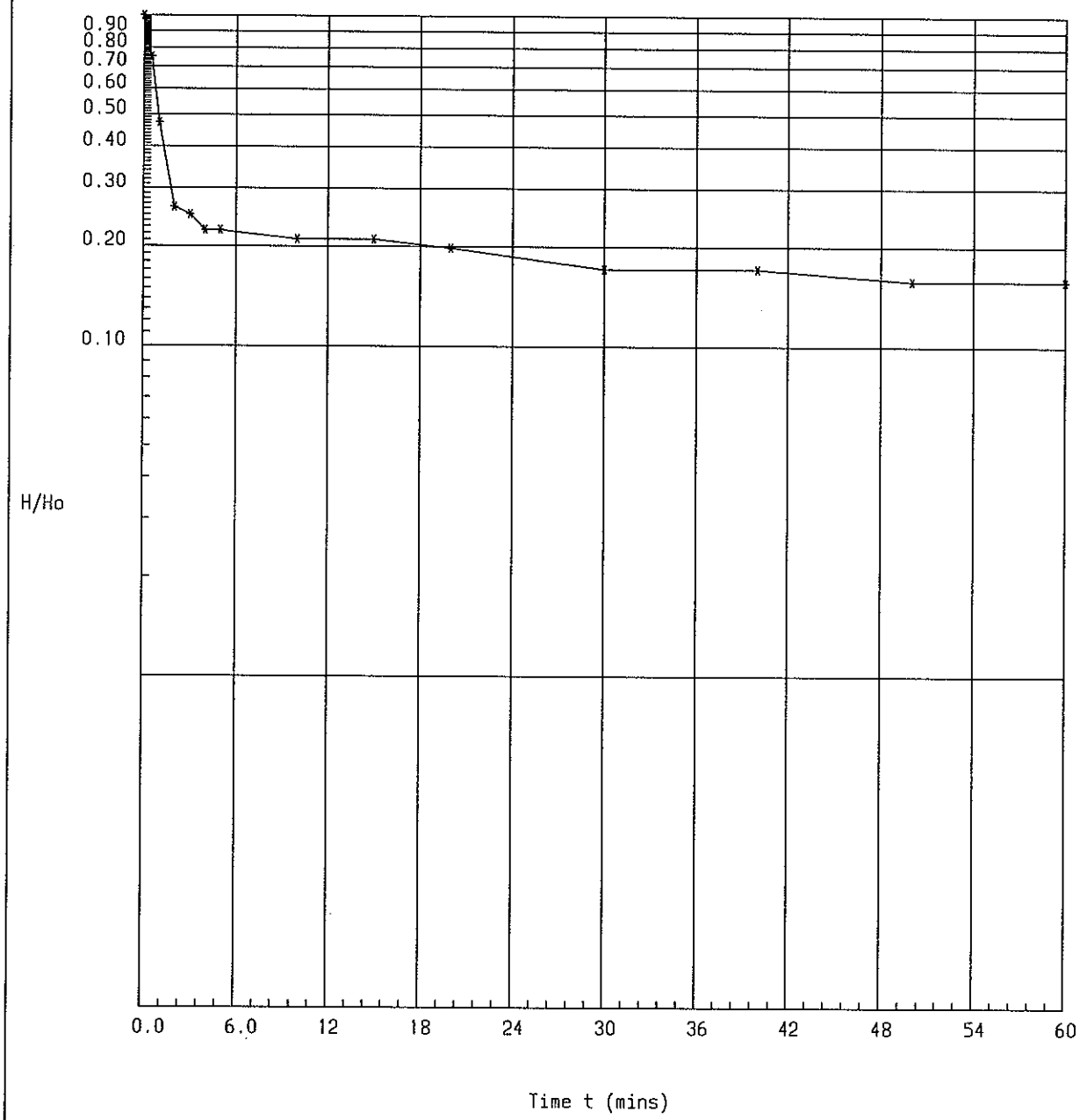
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : DRIZLLING
Crew/Operator : MB
Time Start : 10.50
Finish : 11.50

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB3
Description	REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK	Ground level	0.00 m AOD
		Test depth	10.33m BGL
		Test date	20.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B3R2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK

Contract F10895
Hole ID BHB3
Ground level 0.00 m AOD
Test depth 10.33m BGL
Test date 21.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	2.04 m	Top of filter material	5.28 m
Length of test section	5500.00 mm	Bottom of filter material	10.78 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.28 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	2.07 m	Centre of piezometer tip	10.18 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	2.83	0.79	1.000
0.50	2.53	0.49	0.620
1.00	2.29	0.25	0.316
2.00	2.16	0.12	0.152
3.00	2.13	0.09	0.114
4.00	2.11	0.07	0.089
5.00	2.10	0.06	0.076
10.00	2.09	0.05	0.063
15.00	2.09	0.05	0.063
20.00	2.09	0.05	0.063
30.00	2.07	0.03	0.038
40.00	2.07	0.03	0.038
50.00	2.07	0.03	0.038
60.00	2.07	0.03	0.038

Ho = 0.79 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds
t2 = 600.0 seconds
H1 = 0.19 metres
H2 = 0.13 metres

F = 9.180 metres
A = 2.84×10^{-4} metres^2

$k = 3.26 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(\pi.(L/D))}{\ln(1.1.(L/D)+\sqrt{(1+(1.1.(L/D)^2)})}$$

COMMENTS

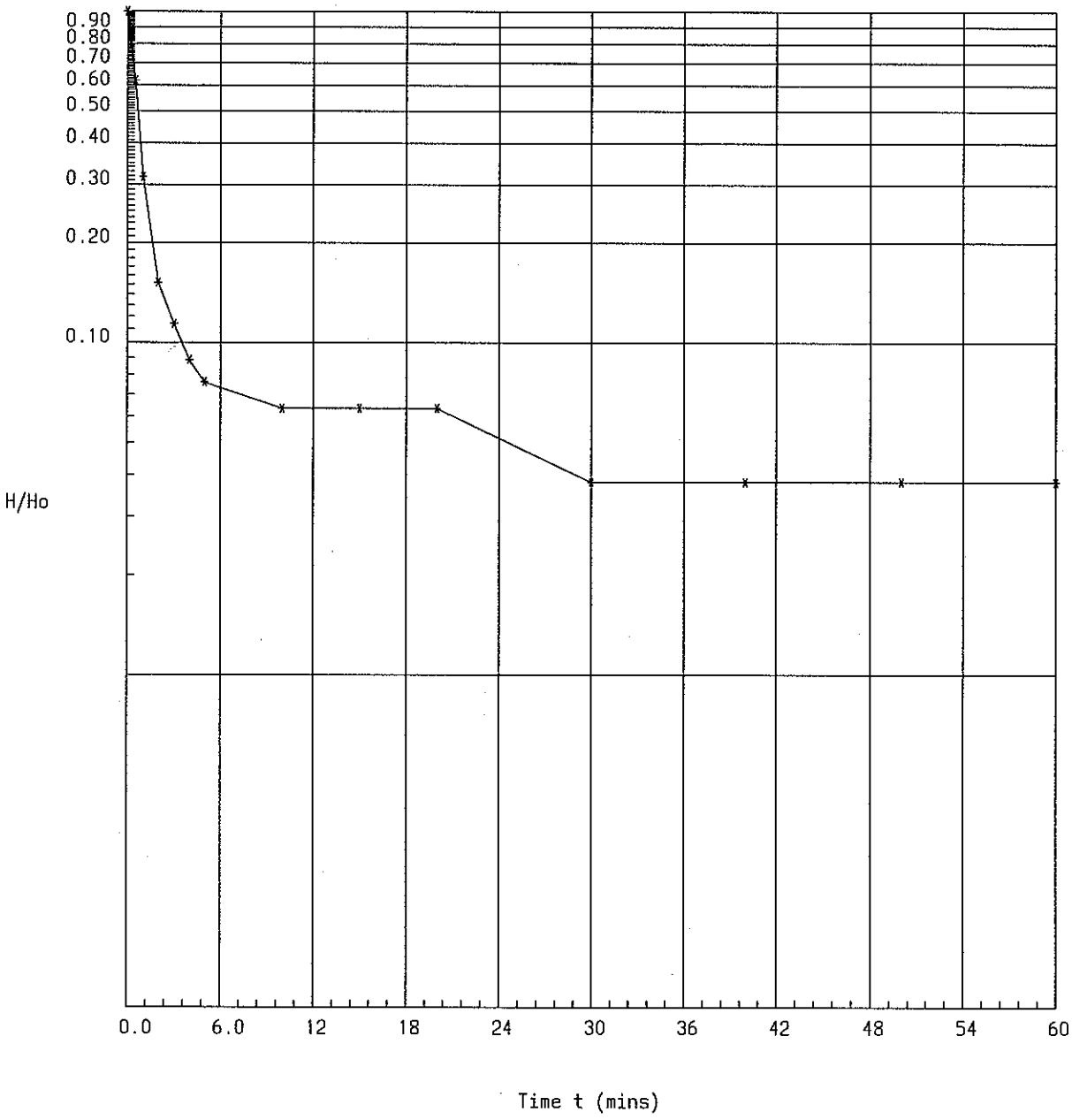
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : DRIZZLING
Crew/Operator : MB
Time Start : 13.35
Finish : 14.35

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB3
Description	REDDISH BROWN SLIGHTLY TO MODERATELY WEATHERED SILTY VERY SANDY MUDSTONE MODERATELY STRONG TO MODERATELY WEAK	Ground level	0.00 m AOD
		Test depth	10.33m BGL
		Test date	21.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B3R3.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE

Contract F10895
Hole ID BHB4
Ground level 0.00 m AOD
Test depth 14.89m BGL
Test date 13.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	11.59 m	Top of filter material	10.38 m
Length of test section	5000.00 mm	Bottom of filter material	15.38 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.38 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	11.07 m	Centre of piezometer tip	10.23 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	4.30	7.29	1.000
0.50	7.57	4.02	0.551
1.00	8.98	2.61	0.358
2.00	9.73	1.86	0.255
3.00	10.44	1.15	0.158
4.00	10.78	0.81	0.111
5.00	10.94	0.65	0.089
10.00	11.00	0.59	0.081
15.00	11.04	0.55	0.075
20.00	11.06	0.53	0.073
30.00	11.07	0.52	0.071
40.00	11.07	0.52	0.071
50.00	11.07	0.52	0.071
60.00	11.07	0.52	0.071

Ho = 7.29 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 300.0 seconds
t2 = 600.0 seconds
H1 = 0.65 metres
H2 = 0.59 metres

F = 8.531 metres
A = 2.84×10^{-4} metres^2

$k = 1.07 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(\pi.(L/D))}{\ln(1.1.(L/D)+\sqrt{(1+(1.1.(L/D)^2))})}$$

COMMENTS

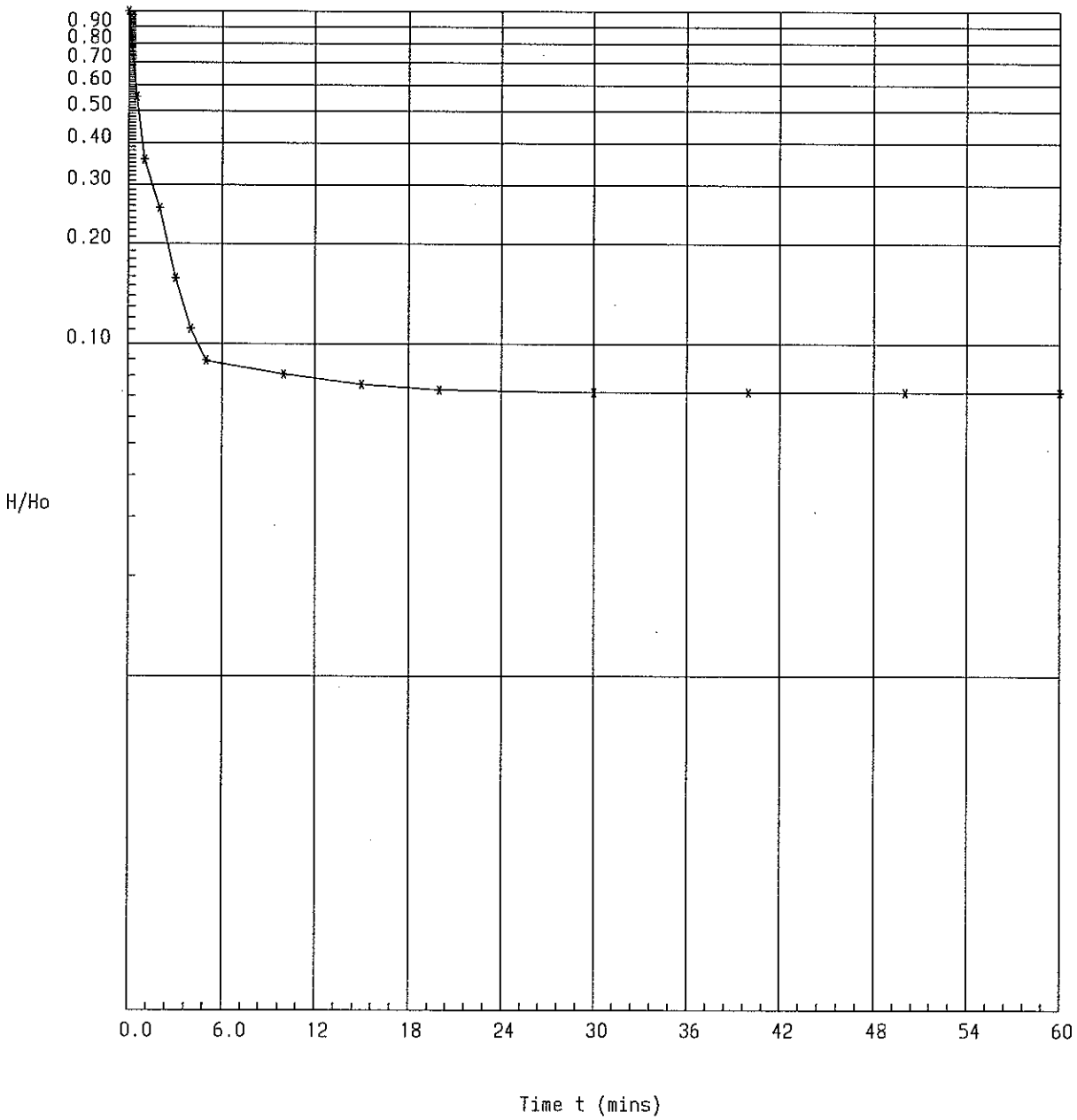
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 10.00
Finish : 11.00

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB4
Description	REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE	Ground level	0.00 m AOD
		Test depth	14.89m BGL
		Test date	13.12.97



Calculation: General Approach

Q.A. Ref: /097-11/M4B4F1.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB4
Description	REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE	Ground level	0.00 m AOD
		Test depth	14.89m BGL
		Test date	15.12.97

Type of test : Piezometer/Standpipe

ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	11.32 m	Top of filter material	10.38 m
Length of test section	5000.00 mm	Bottom of filter material	15.38 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.38 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	11.48 m	Centre of piezometer tip	10.23 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	13.12	1.80	1.000
0.50	12.49	1.17	0.650
1.00	11.87	0.55	0.306
2.00	11.63	0.31	0.172
3.00	11.56	0.24	0.133
4.00	11.54	0.22	0.122
5.00	11.54	0.22	0.122
10.00	11.52	0.20	0.111
15.00	11.51	0.19	0.106
20.00	11.51	0.19	0.106
30.00	11.51	0.19	0.106
40.00	11.49	0.17	0.094
50.00	11.48	0.16	0.089
60.00	11.48	0.16	0.089

Ho = 1.80 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 120.0 seconds

t2 = 180.0 seconds

H1 = 0.31 metres

H2 = 0.24 metres

F = 8.531 metres

A = 2.84×10^{-4} metres ^{2}

$k = 1.42 \times 10^{-7}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)\hat{}2)))}$$

COMMENTS **Test not valid.**

Piezometer type : CASAGRANDE

Quality of water used : CLEAN AND FRESH

Weather : FINE

Crew/Operator : MB

Time Start : 10.00

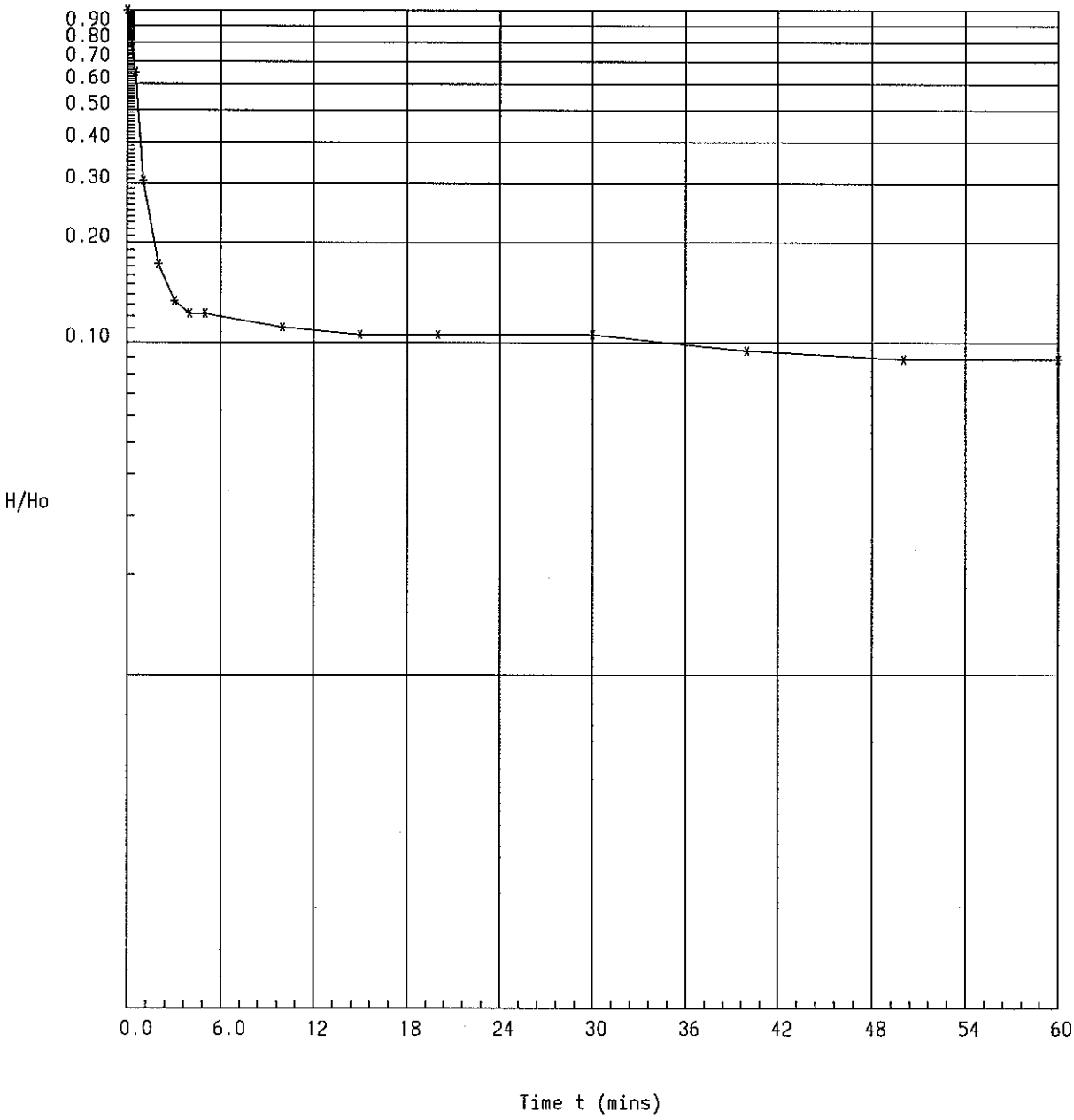
Finish : 11.00

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB4
Description	REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE	Ground level	0.00 m AOD
		Test depth	14.89m BGL
		Test date	15.12.97



Calculation: General Approach

Q.A. Ref: /097-11/M4B4R1.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BH84
Description	REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE	Ground level	0.00 m AOD
		Test depth	14.89m BGL
		Test date	17.12.97

Type of test Piezometer/Standpipe

ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	11.45 m	Top of filter material	10.38 m
Length of test section	5000.00 mm	Bottom of filter material	15.38 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.38 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	10.77 m	Centre of piezometer tip	10.23 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	7.20	4.25	1.000
0.50	8.97	2.48	0.584
1.00	9.84	1.61	0.379
2.00	10.37	1.08	0.254
3.00	10.64	0.81	0.191
4.00	10.68	0.77	0.181
5.00	10.71	0.74	0.174
10.00	10.75	0.70	0.165
15.00	10.76	0.69	0.162
20.00	10.76	0.69	0.162
30.00	10.76	0.69	0.162
40.00	10.77	0.68	0.160
50.00	10.77	0.68	0.160
60.00	10.77	0.68	0.160

Ho = 4.25 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds

t2 = 300.0 seconds

H1 = 0.81 metres

H2 = 0.74 metres

F = 8.531 metres

A = 2.84×10^{-4} metres^2

$k = 2.50 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE

Quality of water used : CLEAN AND FRESH

Weather : FINE

Crew/Operator : MB

Time Start : 11.00

Finish : 12.00

NORWEST HOLST SOIL ENGINEERING LIMITED

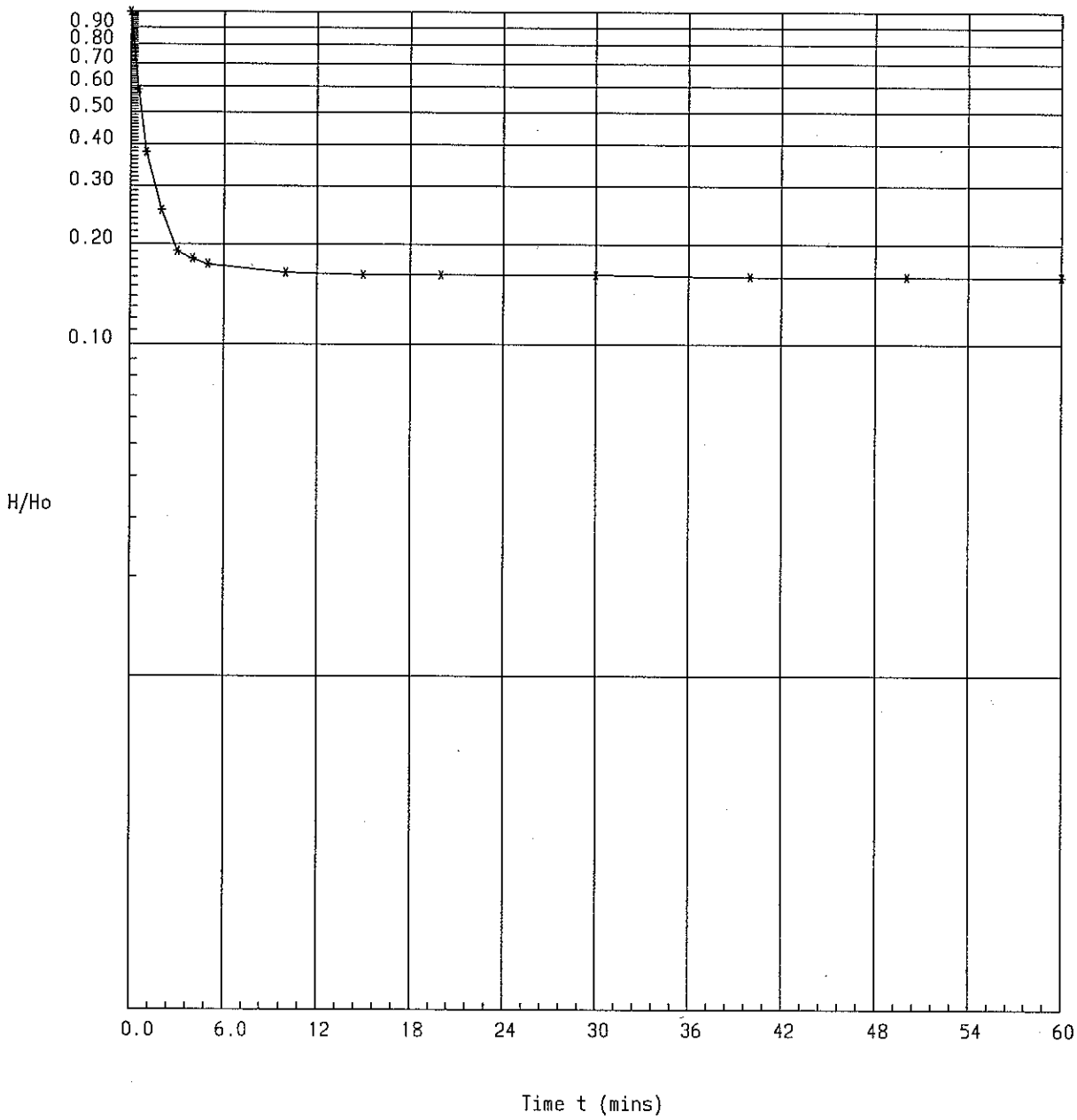
FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE

Contract F10895
Hole ID BHB4
Ground level 0.00 m AOD
Test depth 14.89m BGL
Test date 17.12.97



Calculation: General Approach

Q.A. Ref: /097-11/M4B4F2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE

Contract F10895
Hole ID BHB4
Ground level 0.00 m AOD
Test depth 14.89m BGL
Test date 19.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	11.50 m	Top of filter material	10.38 m
Length of test section	5000.00 mm	Bottom of filter material	15.38 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.38 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	11.37 m	Centre of piezometer tip	10.23 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	7.68	3.82	1.000
0.50	9.18	2.32	0.607
1.00	9.90	1.60	0.419
2.00	10.70	0.80	0.209
3.00	10.98	0.52	0.136
4.00	11.04	0.46	0.120
5.00	11.11	0.39	0.102
10.00	11.19	0.31	0.081
15.00	11.24	0.26	0.068
20.00	11.28	0.22	0.058
30.00	11.34	0.16	0.042
40.00	11.37	0.13	0.034
50.00	11.37	0.13	0.034
60.00	11.37	0.13	0.034

Ho = 3.82 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds
t2 = 1200.0 seconds
H1 = 0.46 metres
H2 = 0.22 metres

F = 8.531 metres
A = 2.84×10^{-4} metres^2

$k = 2.55 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

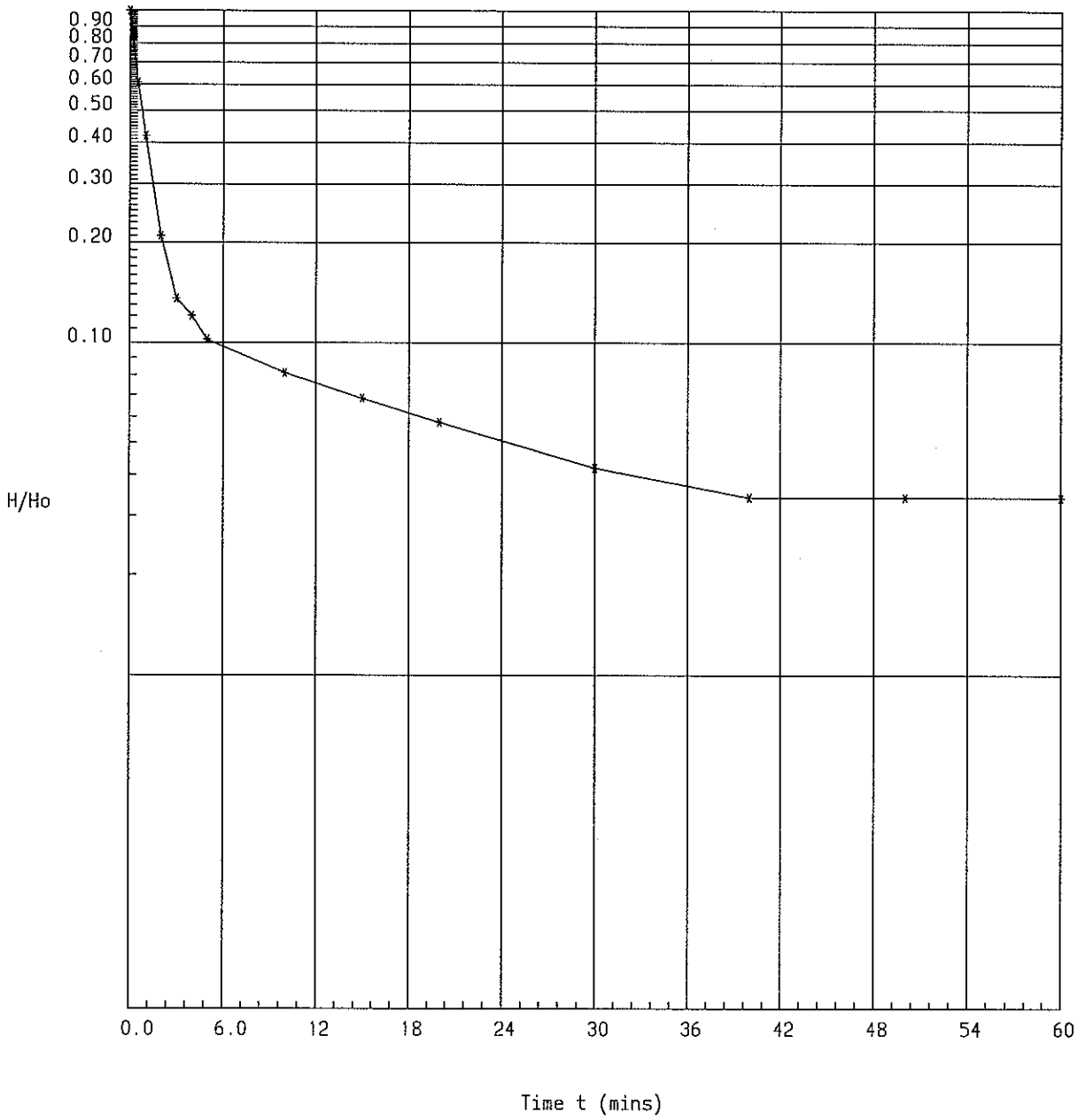
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 15.20
Finish : 16.20

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB4
Description	REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE	Ground level	0.00 m AOD
		Test depth	14.89m BGL
		Test date	19.12.97



Calculation: General Approach

Q.A. Ref: /097-11/M4B4F3.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB4
Description	REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE	Ground level	0.00 m AOD
		Test depth	14.89m BGL
		Test date	20.12.97

Type of test: Piezometer/Standpipe

ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	11.39 m	Top of filter material	10.38 m
Length of test section	5000.00 mm	Bottom of filter material	15.38 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.38 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	11.55 m	Centre of piezometer tip	10.23 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	12.62	1.23	1.000
0.50	12.37	0.98	0.797
1.00	12.12	0.73	0.593
2.00	11.92	0.53	0.431
3.00	11.84	0.45	0.366
4.00	11.76	0.37	0.301
5.00	11.70	0.31	0.252
10.00	11.63	0.24	0.195
15.00	11.60	0.21	0.171
20.00	11.59	0.20	0.163
30.00	11.56	0.17	0.138
40.00	11.56	0.17	0.138
50.00	11.55	0.16	0.130
60.00	11.55	0.16	0.130

Ho = 1.23 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds

t2 = 300.0 seconds

H1 = 0.45 metres

H2 = 0.31 metres

F = 8.531 metres

A = 2.84×10^{-4} metres ^{2}

$k = 1.03 \times 10^{-7}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(\pi.(L/D))}{\ln(1.1.(L/D)+\sqrt{(1+(1.1.(L/D)^2)})}$$

COMMENTS **Test not valid.**

Piezometer type : CASAGRANDE

Quality of water used : CLEAN AND FRESH

Weather : DRIZZLING

Crew/Operator : MB

Time Start : 11.10

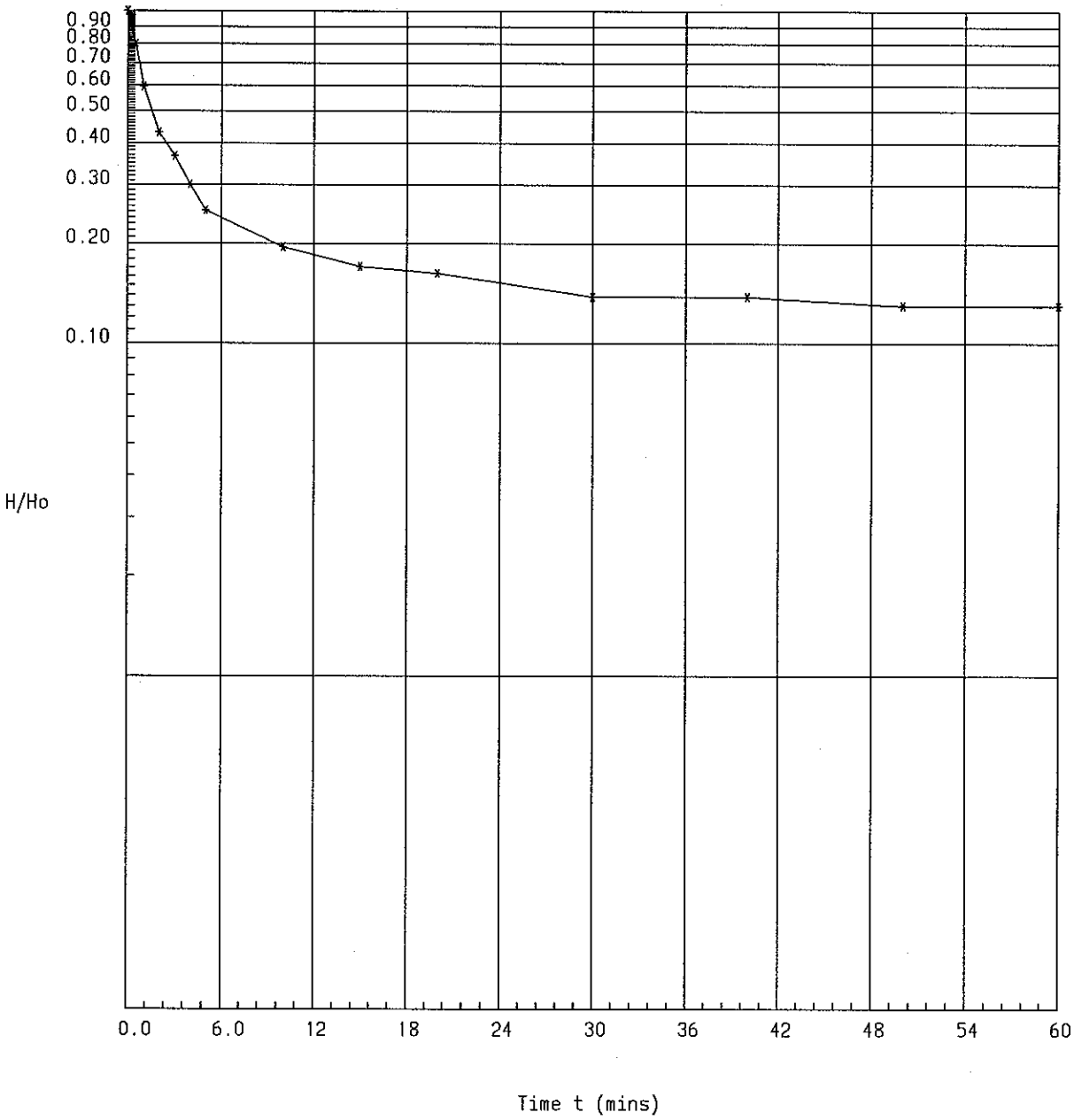
Finish : 12.10

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB4
Description	REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE	Ground level	0.00 m AOD
		Test depth	14.89m BGL
		Test date	20.12.97



Calculation: General Approach

Q.A. Ref: /097-11/M4B4R2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB4
Description	REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE	Ground level	0.00 m AOD
		Test depth	14.89m BGL
		Test date	21.12.97

Type of test: Piezometer/Standpipe

ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	11.42 m	Top of filter material	10.38 m
Length of test section	5000.00 mm	Bottom of filter material	15.38 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.38 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	11.74 m	Centre of piezometer tip	10.23 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	12.97	1.55	1.000
0.50	12.53	1.11	0.716
1.00	12.21	0.79	0.510
2.00	12.14	0.72	0.465
3.00	12.02	0.60	0.387
4.00	11.92	0.50	0.323
5.00	11.85	0.43	0.277
10.00	11.81	0.39	0.252
15.00	11.79	0.37	0.239
20.00	11.79	0.37	0.239
30.00	11.78	0.36	0.232
40.00	11.77	0.35	0.226
50.00	11.75	0.33	0.213
60.00	11.74	0.32	0.206

Ho = 1.55 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 300.0 seconds

t2 = 600.0 seconds

H1 = 0.43 metres

H2 = 0.39 metres

F = 8.531 metres

A = 2.84×10^{-4} metres^2

$k = 1.08 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS **Test not valid.**

Piezometer type : CASAGRANDE

Quality of water used : CLEAN AND FRESH

Weather : DRIZZLING

Crew/Operator : MB

Time Start : 14.55

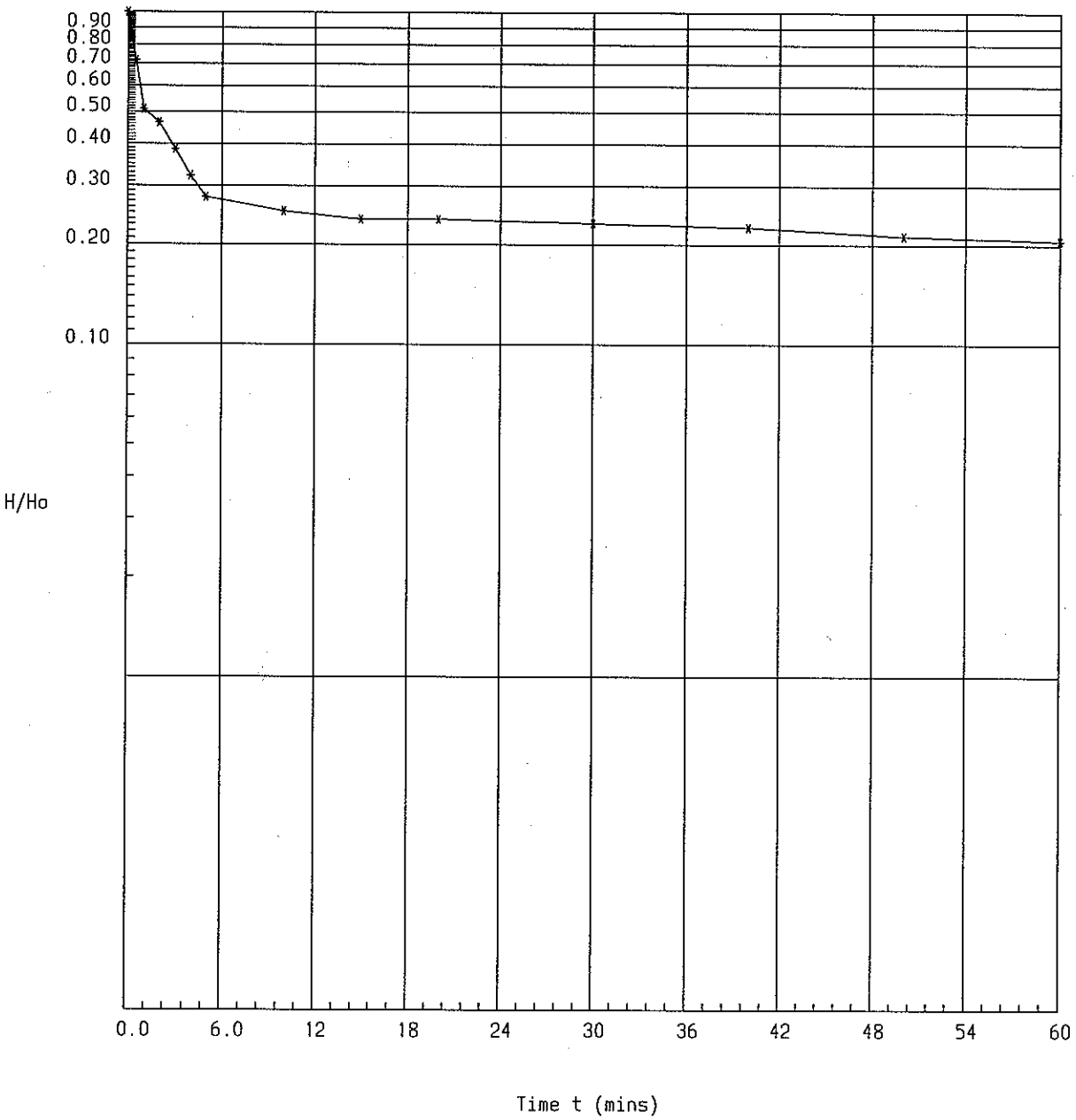
Finish : 15.55

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB4
Description	REDDISH BROWN SLIGHTLY WEATHERED VERY SANDY MICACEOUS MUDSTONE	Ground level	0.00 m AOD
		Test depth	14.89m BGL
		Test date	21.12.97



Calculation: General Approach

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SANDY MARL AND SANDSTONE

Contract F10895
Hole ID BHB7A
Ground level 0.00 m AOD
Test depth 28.48m BGL
Test date 13.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	26.03 m	Top of filter material	13.51 m
Length of test section	15480.00 mm	Bottom of filter material	28.99 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.51 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	25.42 m	Centre of piezometer tip	28.35 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	14.30	11.73	1.000
0.50	17.57	8.46	0.721
1.00	20.41	5.62	0.479
2.00	22.63	3.40	0.290
3.00	23.87	2.16	0.184
4.00	24.52	1.51	0.129
5.00	25.07	0.96	0.082
10.00	25.23	0.80	0.068
15.00	25.33	0.70	0.060
20.00	25.39	0.64	0.055
30.00	25.41	0.62	0.053
40.00	25.42	0.61	0.052
50.00	25.42	0.61	0.052
60.00	25.42	0.61	0.052

Ho = 11.73 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds
t2 = 600.0 seconds
H1 = 1.51 metres
H2 = 0.80 metres

F = %20.887 metres
A = 2.84×10^{-4} metres ^{2}

$k = 2.40 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS **Test not valid.**

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 14.40
Finish : 15.40

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB11A
DATE 10/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.48
0.5	+0.32
1	+0.20
2	+0.15
3	+0.15
4	+0.13
5	+0.10
10	G.L
15	0.03
20	0.11
30	0.18

TIP DEPTH: 8.01m

INITIAL WATER LEVEL: 0.50m

AMOUNT OF WATER ADDED: 1 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.52m

HEIGHT OF PIPE A.B.G.L: 0.48m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB12A
DATE 13/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.29
0.5	0.09
1	0.59
2	0.63
3	0.64
4	0.66
5	0.69
10	0.73
15	0.77
20	0.81
30	0.83

TIP DEPTH: 10.20m

INITIAL WATER LEVEL: 1.80m

AMOUNT OF WATER ADDED: 1 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.31m

HEIGHT OF PIPE A.B.G.L: 0.29m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB13A
DATE 04/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.26
0.5	1.90
1	3.30
2	3.42
3	3.48
4	3.48
5	3.48
10	3.51
15	3.52
20	3.52
30	3.52

TIP DEPTH: 23.10m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 3.82m

HEIGHT OF COVER A.B.G.L: 0.29m

AMOUNT OF WATER ADDED: 3 gal.

HEIGHT OF PIPE A.B.G.L: 0.26m

COMMENTS:

MEASURED FROM:G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB14A
DATE 30/10/97

TIME(mins)	WATER LEVEL(m)
0	+0.17
0.5	/
1	5.10
2	8.20
3	10.40
4	13.16
5	13.87
10	14.84
15	15.68
20	16.11
30	16.69

TIP DEPTH: 21.30m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: DRY

HEIGHT OF COVER A.B.G.L: 0.23m

AMOUNT OF WATER ADDED: 10 gal.

HEIGHT OF PIPE A.B.G.L: 0.17m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB15A
DATE 10/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.22
0.5	0.08
1	0.18
2	0.18
3	0.18
4	0.18
5	0.18
10	0.18
15	0.18
20	/
30	/

TIP DEPTH: 10.40m

INITIAL WATER LEVEL: 0.18m

AMOUNT OF WATER ADDED: 1 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.40m

HEIGHT OF PIPE A.B.G.L: 0.22m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB16B
DATE 01/12/97

TIME(mins)	WATER LEVEL(m)
0	15.20
0.5	18.20
1	18.31
2	18.42
3	18.58
4	18.75
5	18.96
10	18.96
15	18.97
20	18.97
30	18.98

TIP DEPTH: 19.85m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: DRY

HEIGHT OF COVER A.B.G.L: 0.41m

AMOUNT OF WATER ADDED: 10 gal.

HEIGHT OF PIPE A.B.G.L: 0.30m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB18
DATE 26/11/97

TIME(mins)	WATER LEVEL(m)
0	9.02
0.5	9.70
1	9.72
2	DRY
3	DRY
4	
5	
10	
15	
20	
30	

TIP DEPTH: 10.20m

INITIAL WATER LEVEL: DRY

AMOUNT OF WATER ADDED: 8 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.36m

HEIGHT OF PIPE A.B.G.L: 0.27m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED

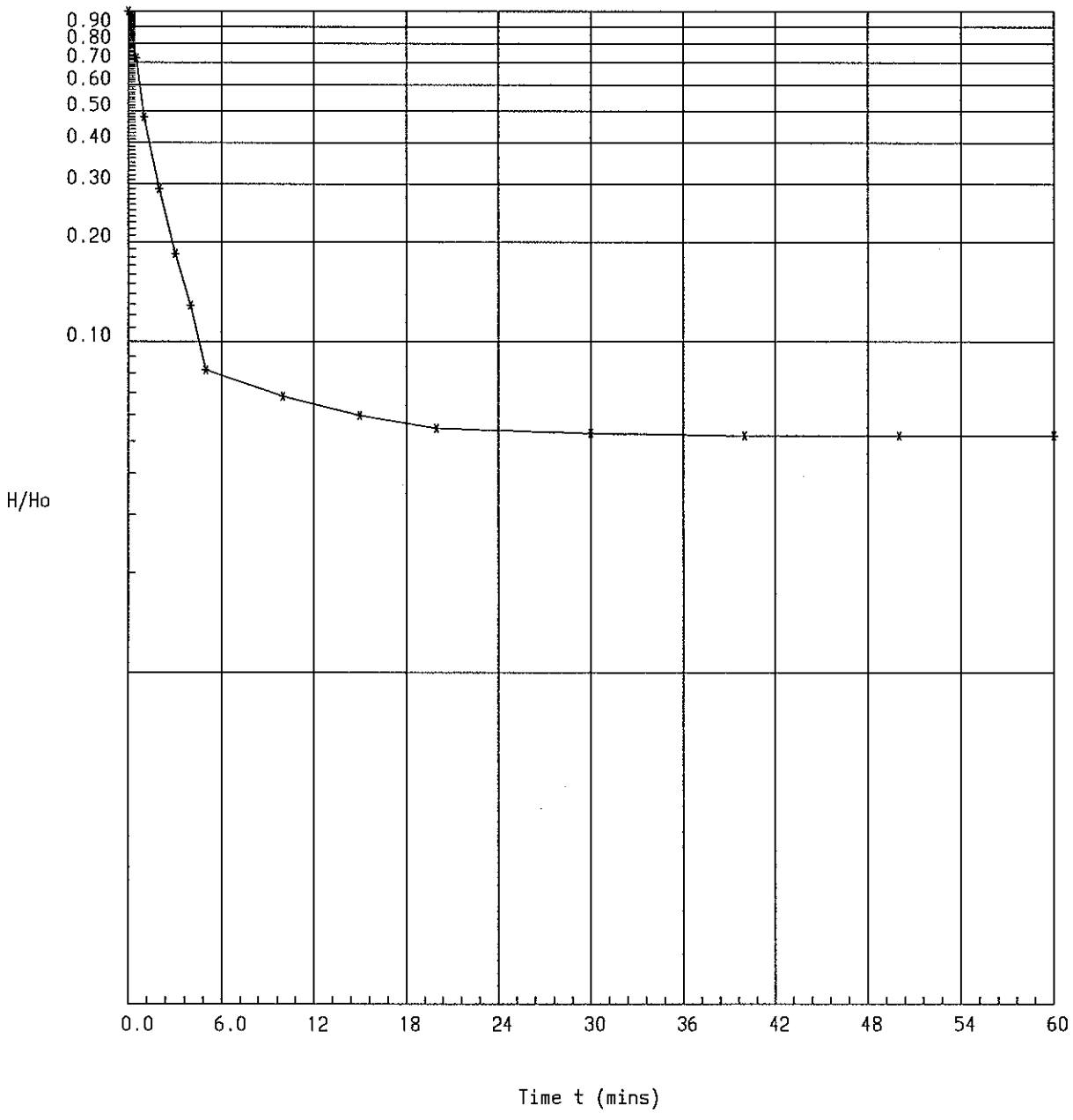
FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SANDY MARL AND SANDSTONE

Contract	F10895
Hole ID	BHB7A
Ground level	0.00 m AOD
Test depth	28.48m BGL
Test date	13.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B7F1.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SANDY MARL AND SANDSTONE

Contract F10895
Hole ID BHB7A
Ground level 0.00 m AOD
Test depth 28.48m BGL
Test date 17.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	26.52 m	Top of filter material	13.51 m
Length of test section	15490.00 mm	Bottom of filter material	29.00 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.51 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	25.23 m	Centre of piezometer tip	28.35 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	15.02	11.50	1.000
0.50	18.73	7.79	0.677
1.00	22.47	4.05	0.352
2.00	25.03	1.49	0.130
3.00	25.11	1.41	0.123
4.00	25.14	1.38	0.120
5.00	25.14	1.38	0.120
10.00	25.17	1.35	0.117
15.00	25.19	1.33	0.116
20.00	25.20	1.32	0.115
30.00	25.22	1.30	0.113
40.00	25.22	1.30	0.113
50.00	25.22	1.30	0.113
60.00	25.23	1.29	0.112

Ho = 11.50 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds
t2 = 600.0 seconds
H1 = 0.19 metres
H2 = 0.13 metres

F = 9.180 metres
A = 2.84×10^{-4} metres^2

$k = 3.26 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS **Test not valid.**

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 9.20
Finish : 10.20

Q.A. Ref: /097-12/M4B7F2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

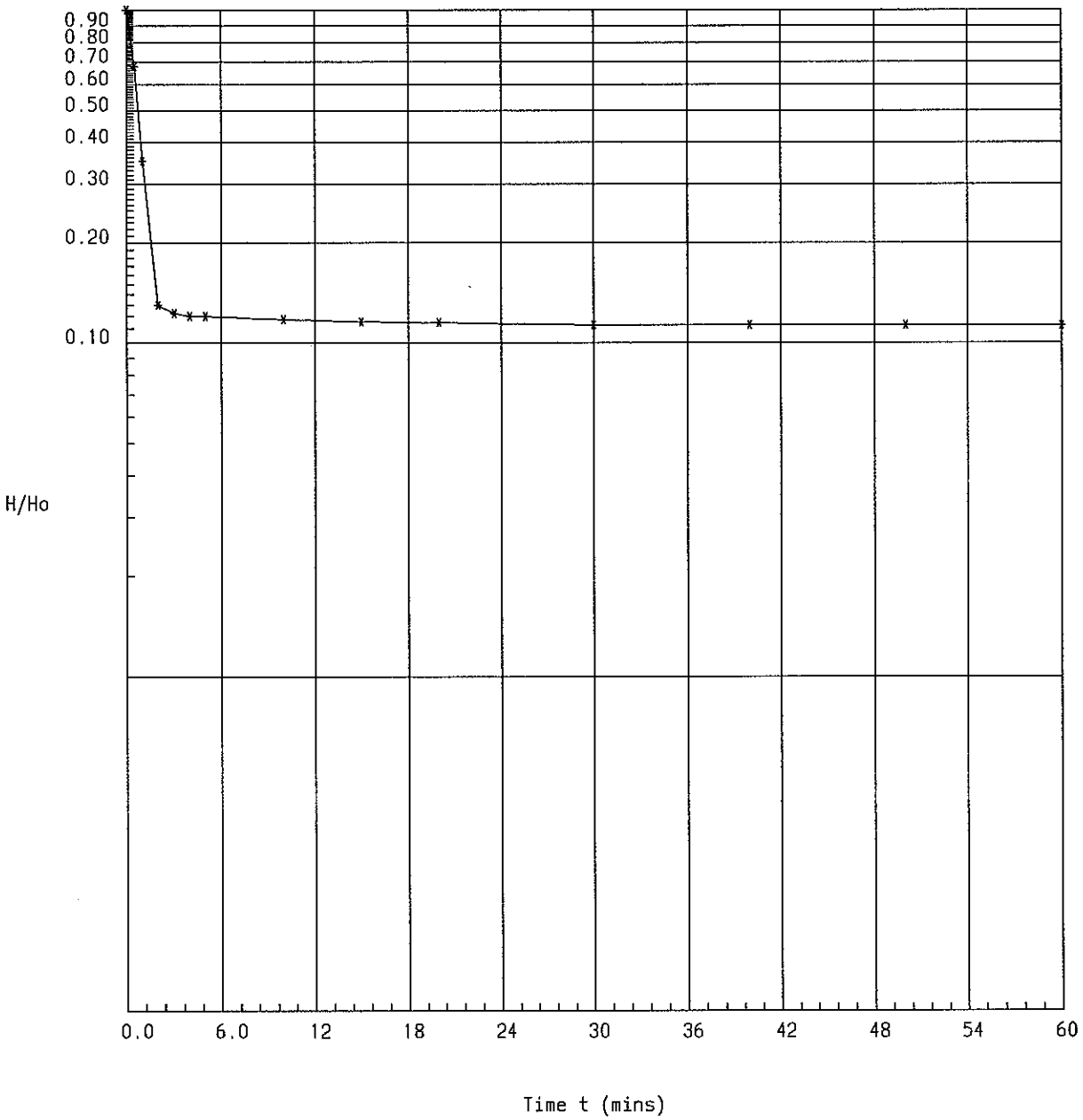
FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SANDY MARL AND SANDSTONE

Contract	F10895
Hole ID	BHB7A
Ground level	0.00 m AOD
Test depth	28.48m BGL
Test date	17.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B7F2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SANDY MARL AND SANDSTONE

Contract F10895
Hole ID BHB7A
Ground level 0.00 m AOD
Test depth 28.48m BGL
Test date 19.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	24.56 m	Top of filter material	13.51 m
Length of test section	15490.00 mm	Bottom of filter material	29.00 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.51 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	24.54 m	Centre of piezometer tip	28.35 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	9.11	15.45	1.000
0.50	13.78	10.78	0.698
1.00	17.31	7.25	0.469
2.00	18.83	5.73	0.371
3.00	20.71	3.85	0.249
4.00	22.71	1.85	0.120
5.00	23.82	0.74	0.048
10.00	24.29	0.27	0.017
15.00	24.34	0.22	0.014
20.00	24.39	0.17	0.011
30.00	24.52	0.04	0.003
40.00	24.53	0.03	0.002
50.00	24.54	0.02	0.001
60.00	24.54	0.02	0.001

Ho = 15.45 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 300.0 seconds
t2 = 600.0 seconds
H1 = 0.74 metres
H2 = 0.27 metres

F = %20.898 metres
A = 2.84×10^{-4} metres^2

$k = 4.56 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS **Test not valid.**

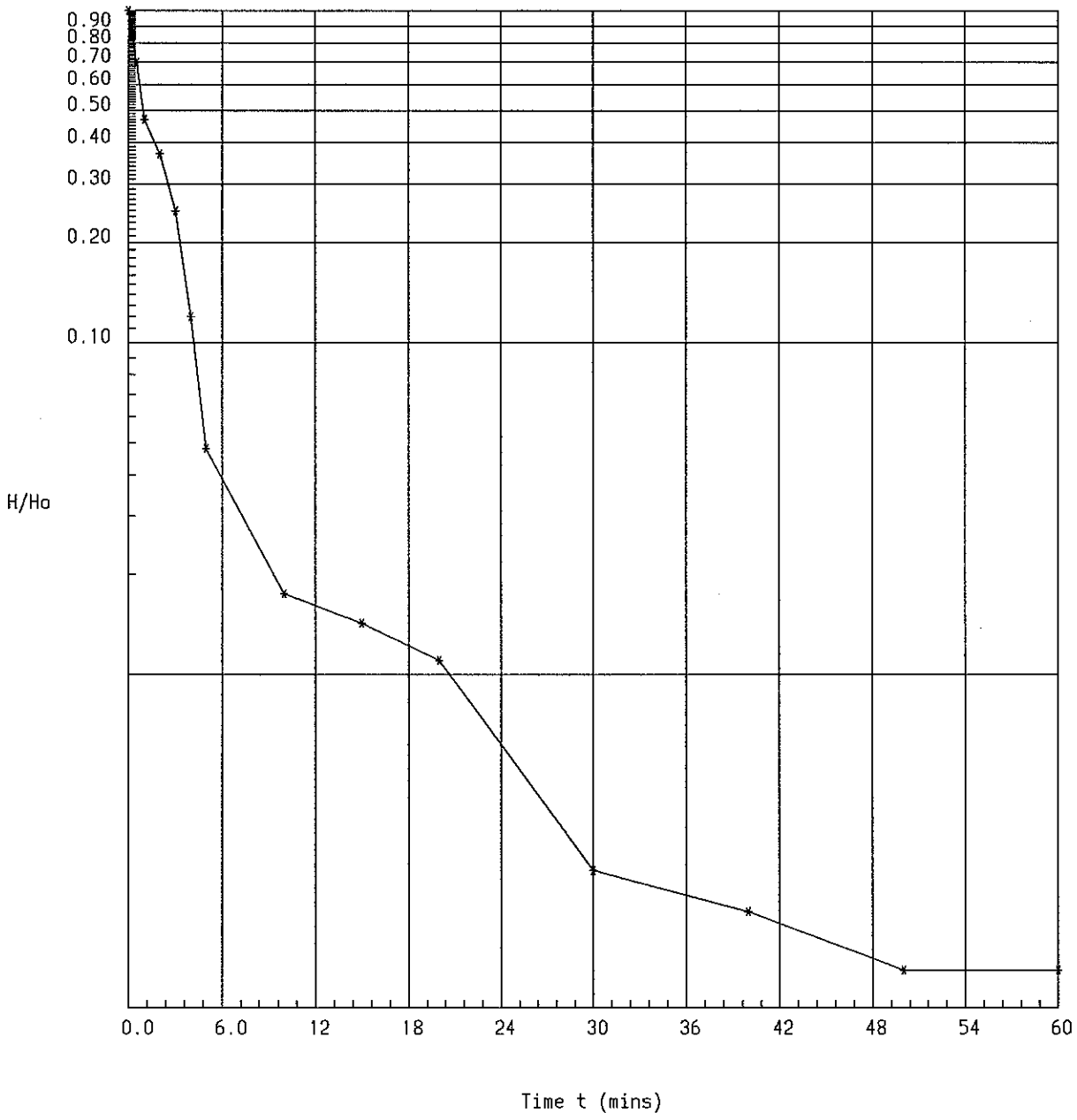
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 14.00
Finish : 15.00

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB7A
Description	REDDISH BROWN SANDY MARL AND SANDSTONE	Ground level	0.00 m AOD
		Test depth	28.48m BGL
		Test date	19.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B7F3.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SANDY MARL AND SANDSTONE

Contract F10895
Hole ID BHB7A
Ground level 0.00 m AOD
Test depth 28.48m BGL
Test date 15.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	25.47 m	Top of filter material	13.51 m
Length of test section	%15480.00 mm	Bottom of filter material	28.99 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.51 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	25.50 m	Centre of piezometer tip	28.35 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	27.03	1.56	1.000
0.50	26.37	0.90	0.577
1.00	25.97	0.50	0.321
2.00	25.63	0.16	0.103
3.00	25.56	0.09	0.058
4.00	25.55	0.08	0.051
5.00	25.55	0.08	0.051
10.00	25.53	0.06	0.038
15.00	25.52	0.05	0.032
20.00	25.51	0.04	0.026
30.00	25.50	0.03	0.019
40.00	25.50	0.03	0.019
50.00	25.50	0.03	0.019
60.00	25.50	0.03	0.019

Ho = 1.56 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds
t2 = 300.0 seconds
H1 = 10.25 metres
H2 = 9.50 metres

F = %10.449 metres
A = 2.84×10^{-4} metres^2

$k = 1.72 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS **Test not valid.**

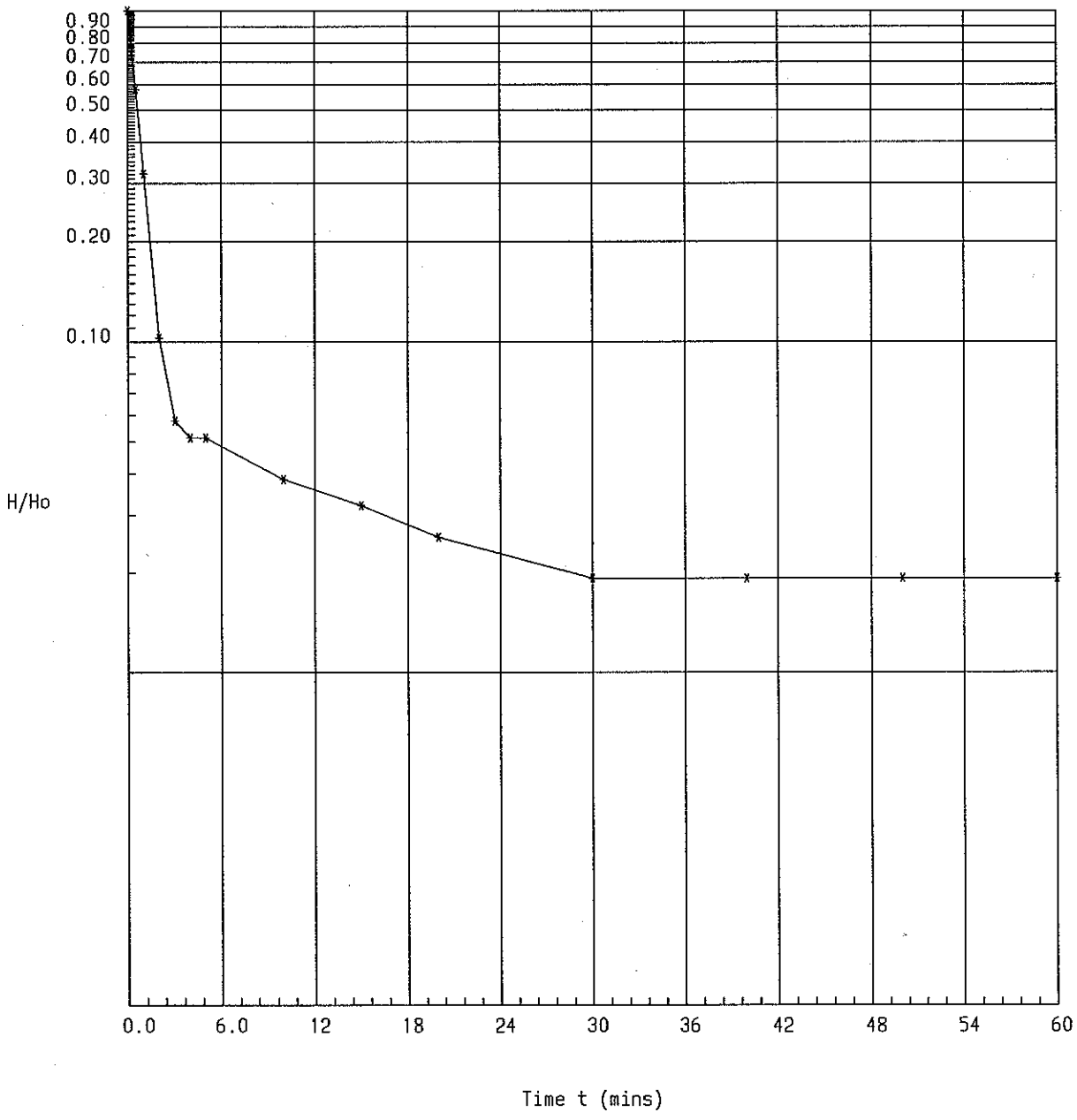
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 14.40
Finish : 15.40

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB7A
Description	REDDISH BROWN SANDY MARL AND SANDSTONE	Ground level	0.00 m AOD
		Test depth	28.48m BGL
		Test date	15.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B7R1.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SANDY MARL AND SANDSTONE

Contract F10895
Hole ID BHB7A
Ground level 0.00 m AOD
Test depth 28.48m BGL
Test date 20.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	24.02 m	Top of filter material	13.51 m
Length of test section	15480.00 mm	Bottom of filter material	28.99 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.51 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	24.34 m	Centre of piezometer tip	28.35 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	26.93	2.91	1.000
0.50	25.82	1.80	0.619
1.00	25.07	1.05	0.361
2.00	24.74	0.72	0.247
3.00	24.44	0.42	0.144
4.00	24.40	0.38	0.131
5.00	24.39	0.37	0.127
10.00	24.37	0.35	0.120
15.00	24.35	0.33	0.113
20.00	24.35	0.33	0.113
30.00	24.35	0.33	0.113
40.00	24.35	0.33	0.113
50.00	24.35	0.33	0.113
60.00	24.34	0.32	0.110

Ho = 2.91 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds
t2 = 300.0 seconds
H1 = 0.42 metres
H2 = 0.37 metres

F = %20.887 metres
A = 2.84×10^{-4} metres^2

$k = 1.43 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS **Test not valid.**

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : DRIZZLING
Crew/Operator : MB
Time Start : 9.30
Finish : 10.30

NORWEST HOLST SOIL ENGINEERING LIMITED

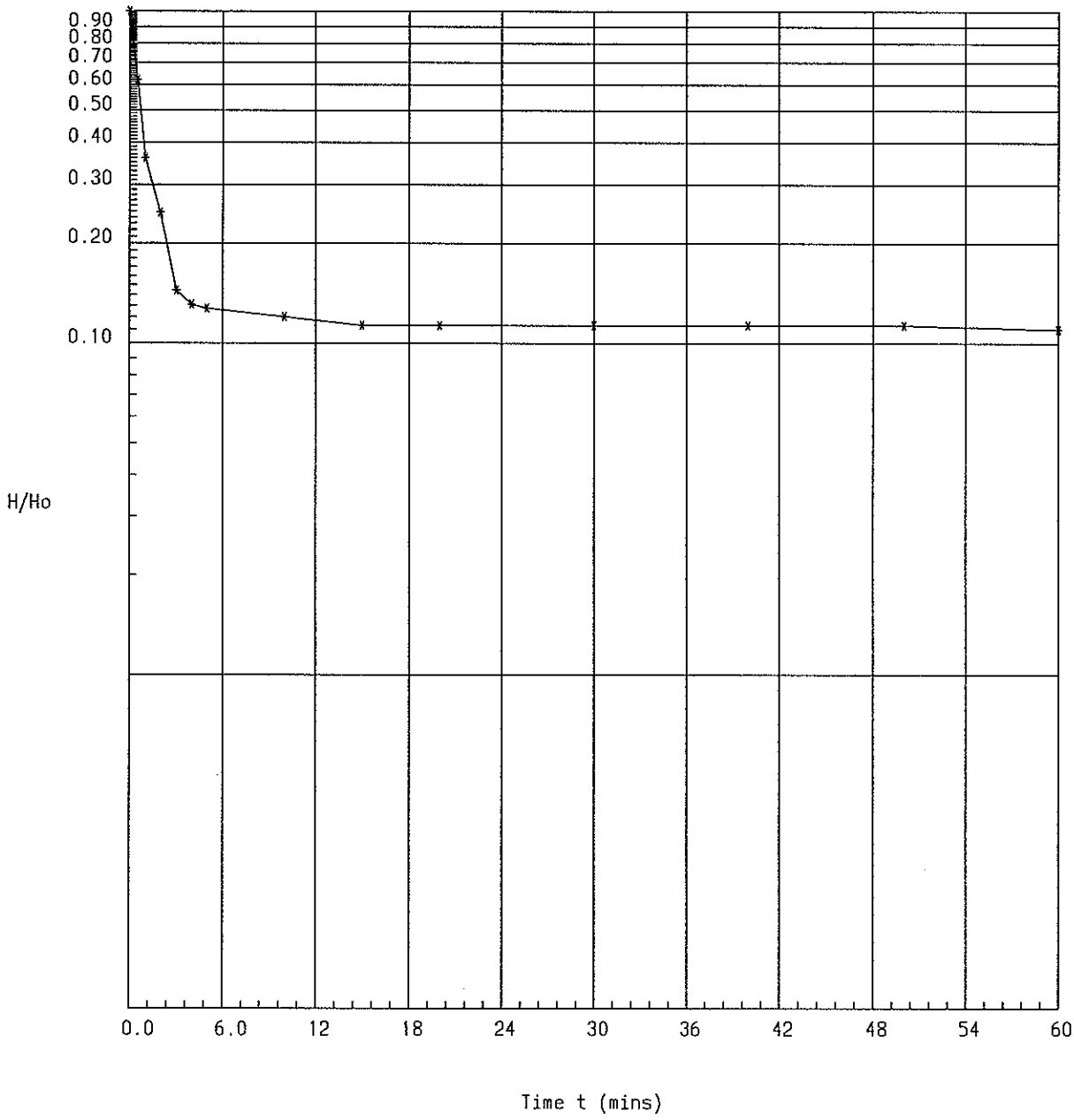
RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SANDY MARL AND SANDSTONE

Contract	F10895
Hole ID	BHB7A
Ground level	0.00 m AOD
Test depth	28.48m BGL
Test date	20.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B7R2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SANDY MARL AND SANDSTONE

Contract F10895
Hole ID BHB7A
Ground level 0.00 m AOD
Test depth 28.48m BGL
Test date 21.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	25.13 m	Top of filter material	13.51 m
Length of test section	15480.00 mm	Bottom of filter material	28.99 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.51 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	25.20 m	Centre of piezometer tip	28.35 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	26.89	1.76	1.000
0.50	26.03	0.90	0.511
1.00	25.62	0.49	0.278
2.00	25.39	0.26	0.148
3.00	25.29	0.16	0.091
4.00	25.25	0.12	0.068
5.00	25.24	0.11	0.063
10.00	25.23	0.10	0.057
15.00	25.23	0.10	0.057
20.00	25.22	0.09	0.051
30.00	25.22	0.09	0.051
40.00	25.20	0.07	0.040
50.00	25.20	0.07	0.040
60.00	25.20	0.07	0.040

Ho = 1.76 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds

t2 = 300.0 seconds

H1 = 0.12 metres

H2 = 0.11 metres

F = %20.887 metres

A = 2.84×10^{-4} metres^2

$k = 1.97 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS **Test not valid.**

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : DRIZZLING
Crew/Operator : MB
Time Start : 11.35
Finish : 12.35

NORWEST HOLST SOIL ENGINEERING LIMITED

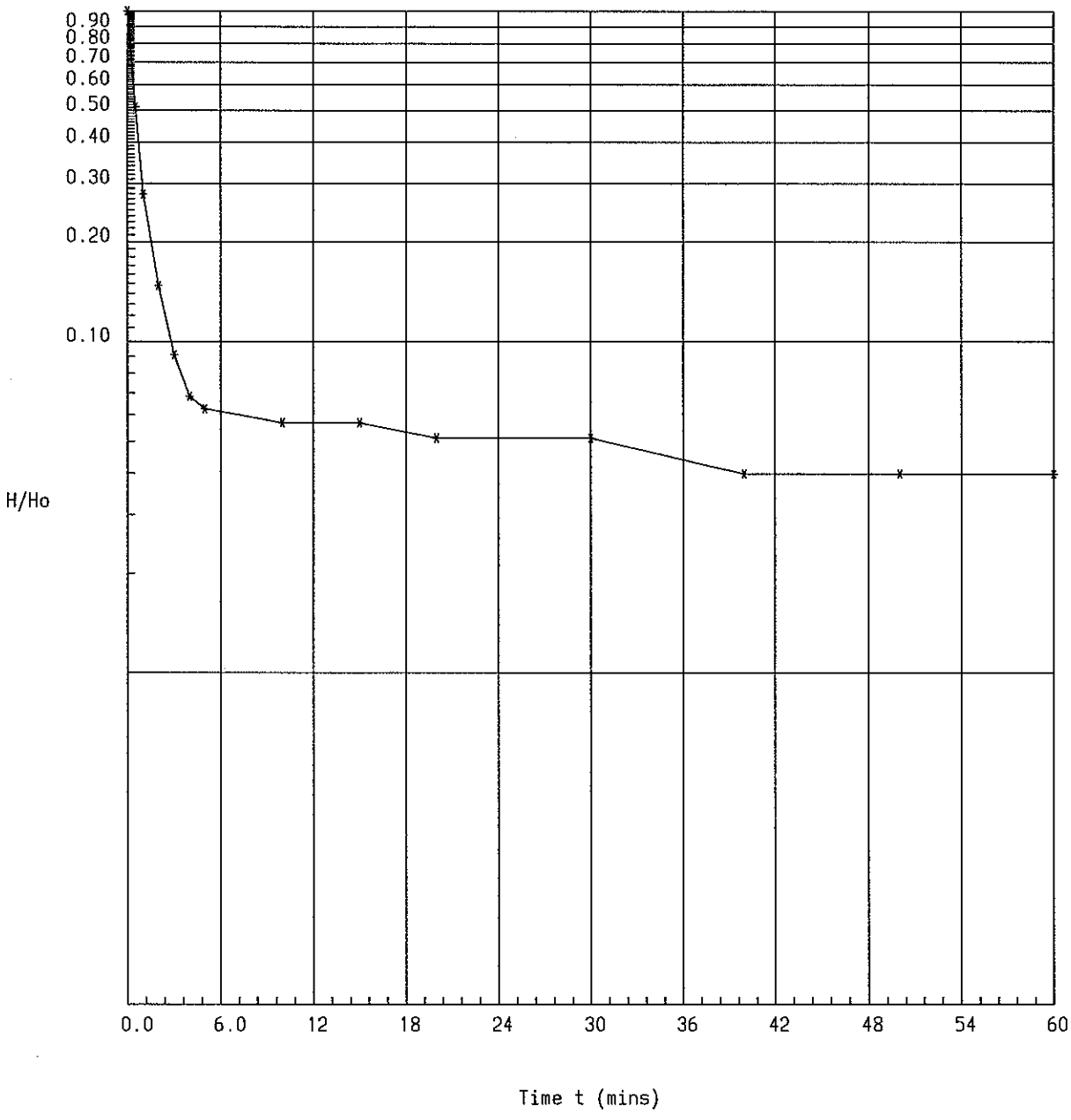
RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description REDDISH BROWN SANDY MARL AND SANDSTONE

Contract	F10895
Hole ID	BHB7A
Ground level	0.00 m AOD
Test depth	28.48m BGL
Test date	21.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B7R3.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description SOFT BANDS OF SILSTONE

Contract F10895
Hole ID BHB9A
Ground level 0.00 m AOD
Test depth 4.33m BGL
Test date 21.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	1.58 m	Top of filter material	2.95 m
Length of test section	1550.00 mm	Bottom of filter material	4.50 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.45 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	1.67 m	Centre of piezometer tip	2.80 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	3.20	1.62	1.000
0.50	2.52	0.94	0.580
1.00	2.14	0.56	0.346
2.00	1.90	0.32	0.198
3.00	1.84	0.26	0.160
4.00	1.79	0.21	0.130
5.00	1.74	0.16	0.099
10.00	1.71	0.13	0.080
15.00	1.69	0.11	0.068
20.00	1.68	0.10	0.062
30.00	1.67	0.09	0.056
40.00	1.67	0.09	0.056
50.00	1.67	0.09	0.056
60.00	1.67	0.09	0.056

Ho = 1.62 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds
t2 = 240.0 seconds
H1 = 0.26 metres
H2 = 0.21 metres

F = 3.641 metres
A = 2.84×10^{-4} metres^2

$k = 2.77 \times 10^{-7}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : DRIZZLING
Crew/Operator : MB
Time Start : 10.05
Finish : 11.05

Q.A. Ref: /097-12/M4B9AR3.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

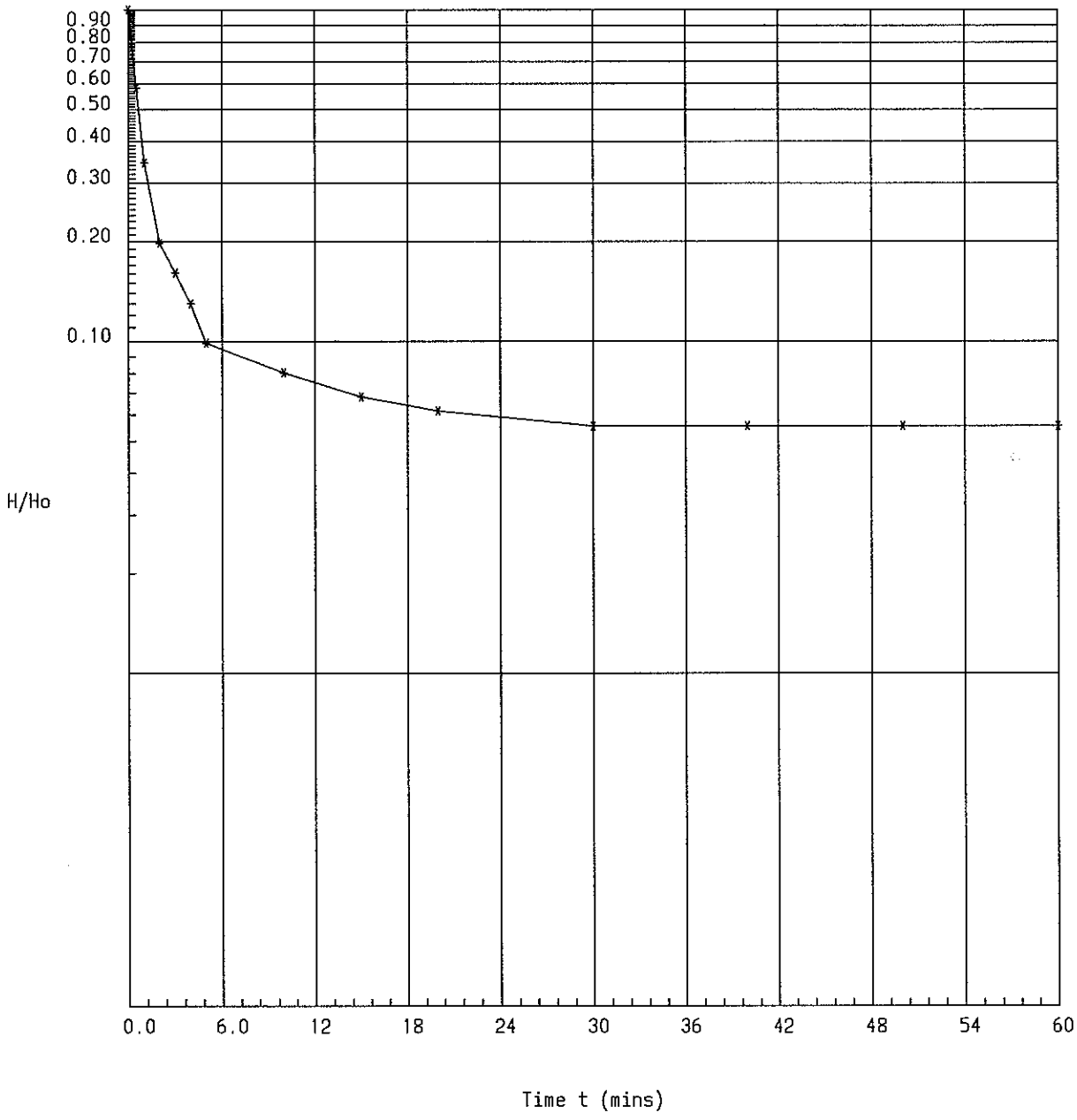
RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description SOFT BANDS OF SILSTONE

Contract F10895
Hole ID BHB9A
Ground level 0.00 m AOD
Test depth 4.33m BGL
Test date 21.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B9AR3.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description SOFT BANDS OF SILSTONE

Contract F10895
Hole ID BHB9A
Ground level 0.00 m AOD
Test depth 4.33m BGL
Test date 13.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	1.47 m	Top of filter material	2.95 m
Length of test section	1550.00 mm	Bottom of filter material	4.50 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.45 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	0.96 m	Centre of piezometer tip	2.80 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	0.00	1.47	1.000
0.30	0.31	1.16	0.789
1.00	0.49	0.98	0.667
2.00	0.59	0.88	0.599
3.00	0.67	0.80	0.544
4.00	0.74	0.73	0.497
5.00	0.82	0.65	0.442
10.00	0.85	0.62	0.422
15.00	0.87	0.60	0.408
20.00	0.88	0.59	0.401
30.00	0.90	0.57	0.388
40.00	0.93	0.54	0.367
50.00	0.95	0.52	0.354
60.00	0.96	0.51	0.347

Ho = 1.47 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds
t2 = 300.0 seconds
H1 = 0.80 metres
H2 = 0.65 metres

F = 3.641 metres
A = 2.84×10^{-4} metres^2

$k = 1.35 \times 10^{-7}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(\pi.(L/D))}{\ln(1.1.(L/D)+\sqrt{(1+(1.1.(L/D)^2))})}$$

COMMENTS

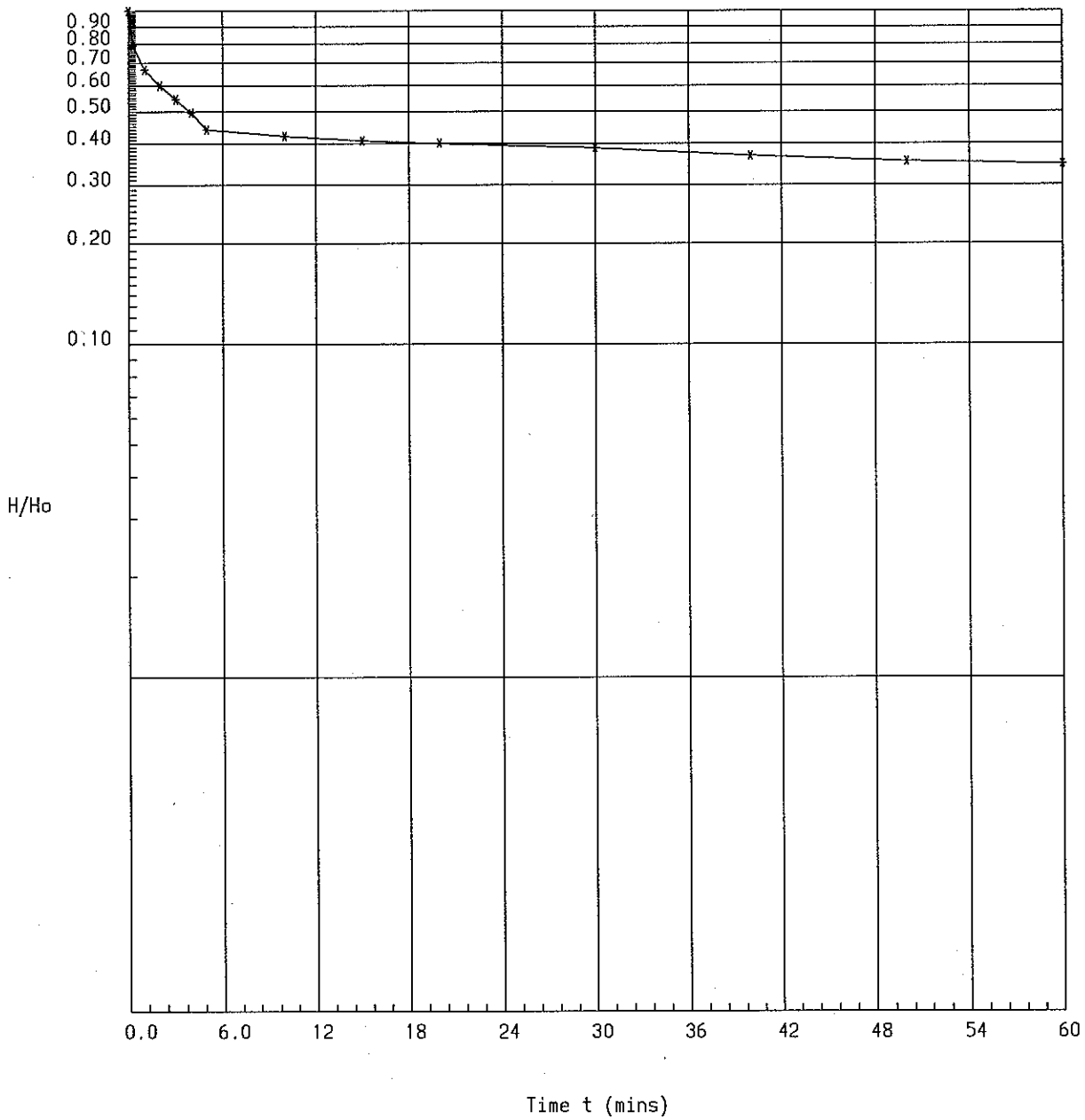
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 13.20
Finish : 14.20

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB9A
Description	SOFT BANDS OF SILSTONE ([illegible]DL)	Ground level	0.00 m AOD
		Test depth	4.33m BGL
		Test date	13.12.97



Calculation: General Approach

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description SOFT BANDS OF SILSTONE

Contract F10895
Hole ID BHB9A
Ground level 0.00 m AOD
Test depth 4.33m BGL
Test date 16.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	1.42 m	Top of filter material	2.95 m
Length of test section	1550.00 mm	Bottom of filter material	4.50 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.45 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	1.23 m	Centre of piezometer tip	2.80 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	0.00	1.42	1.000
0.50	0.22	1.20	0.845
1.00	0.52	0.90	0.634
2.00	0.72	0.70	0.493
3.00	0.82	0.60	0.423
4.00	0.86	0.56	0.394
5.00	0.86	0.56	0.394
10.00	0.97	0.45	0.317
15.00	1.03	0.39	0.275
20.00	1.08	0.34	0.239
30.00	1.13	0.29	0.204
40.00	1.17	0.25	0.176
50.00	1.20	0.22	0.155
60.00	1.23	0.19	0.134

Ho = 1.42 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds

t2 = 600.0 seconds

H1 = 0.19 metres

H2 = 0.13 metres

F = 9.180 metres

A = 2.84×10^{-4} metres^2

$k = 3.26 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 15.20
Finish : 16.20

NORWEST HOLST SOIL ENGINEERING LIMITED

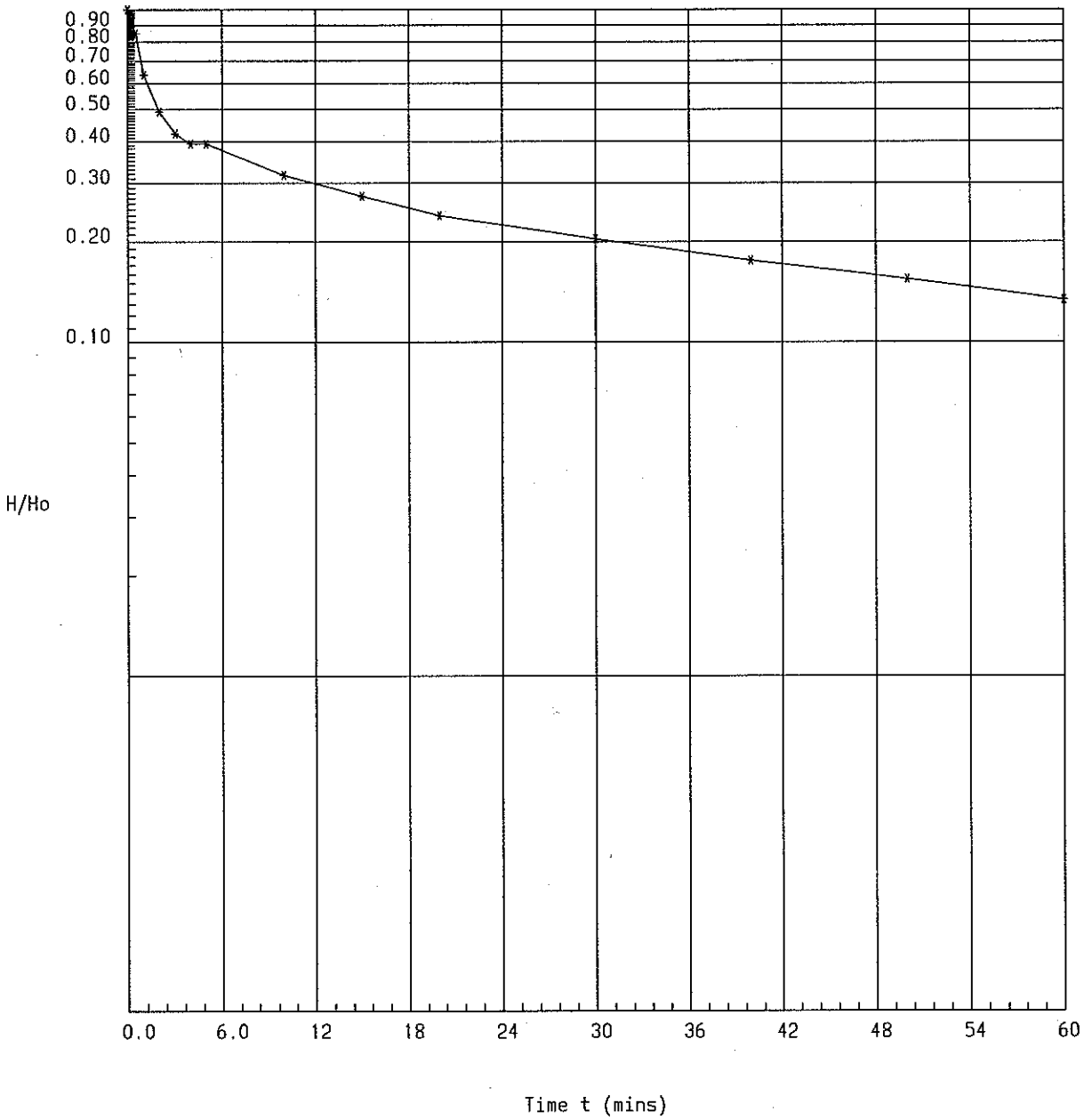
FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description SOFT BANDS OF SILSTONE (

Contract F10895
Hole ID BHB9A
Ground level 0.00 m AOD
Test depth 4.33m BGL
Test date 16.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B9AF2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description SOFT BANDS OF SILSTONE ([illegible])

Contract F10895
Hole ID BHB9A
Ground level 0.00 m AOD
Test depth 4.33m BGL
Test date 15.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	1.47 m	Top of filter material	2.95 m
Length of test section	1550.00 mm	Bottom of filter material	4.50 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.45 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	1.67 m	Centre of piezometer tip	2.80 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	2.37	0.90	1.000
0.50	2.05	0.58	0.644
1.00	1.82	0.35	0.389
2.00	1.79	0.32	0.356
3.00	1.73	0.26	0.289
4.00	1.72	0.25	0.278
5.00	1.70	0.23	0.256
10.00	1.69	0.22	0.244
15.00	1.68	0.21	0.233
20.00	1.68	0.21	0.233
30.00	1.68	0.21	0.233
40.00	1.67	0.20	0.222
50.00	1.67	0.20	0.222
60.00	1.67	0.20	0.222

Ho = 0.90 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 120.0 seconds

t2 = 240.0 seconds

H1 = 0.32 metres

H2 = 0.25 metres

F = 3.641 metres

A = 2.84×10^{-4} metres ^{2}

$k = 1.60 \times 10^{-7}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 13.20
Finish : 14.20

NORWEST HOLST SOIL ENGINEERING LIMITED

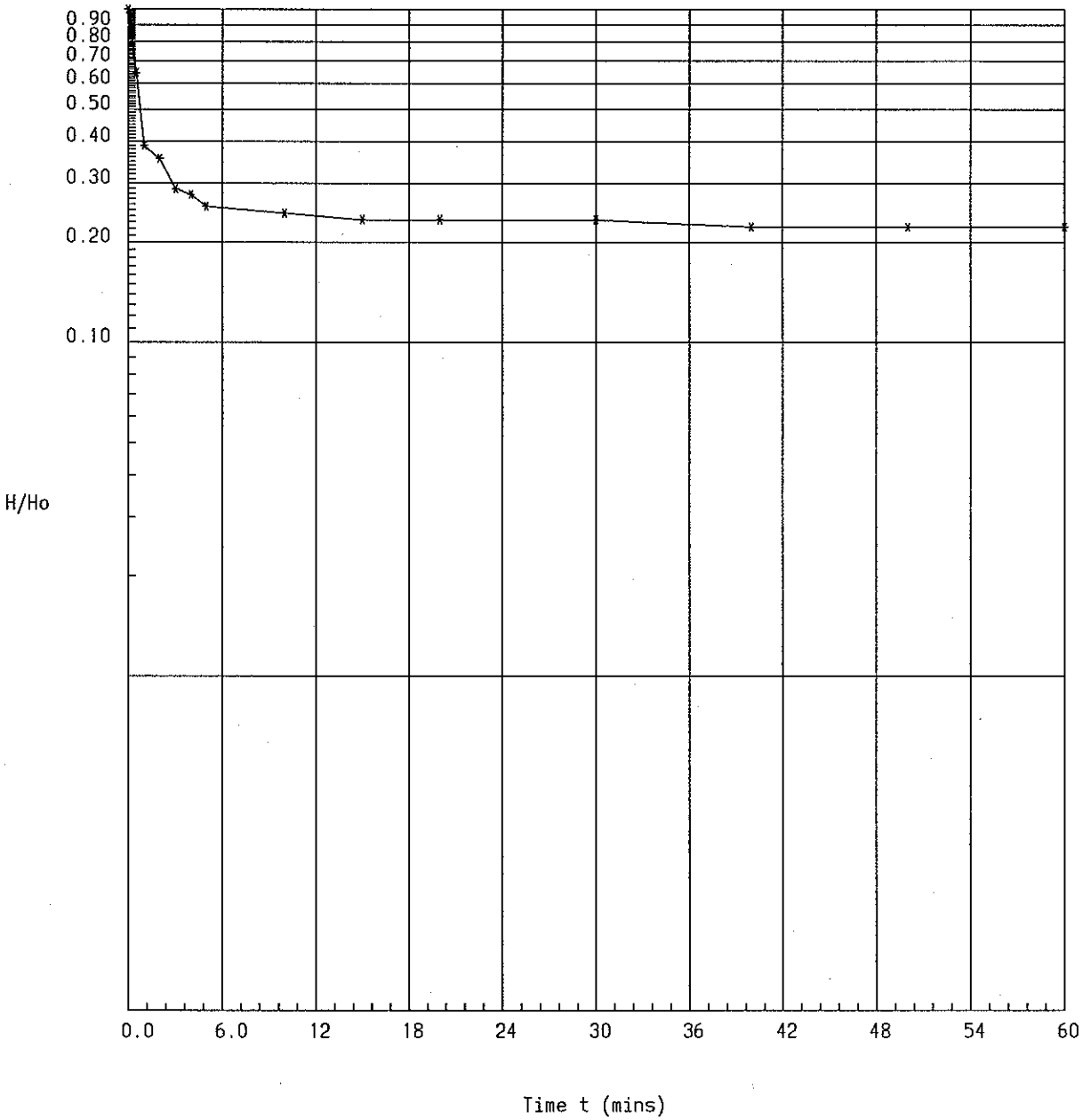
RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description SOFT BANDS OF SILSTONE)

Contract F10895
Hole ID BHB9A
Ground level 0.00 m AOD
Test depth 4.33m BGL
Test date 15.12.97



Calculation: General Approach

Q.A. Ref: /097-11/M4B9AR1.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description SOFT BANDS OF SILSTONE ( )

Contract F10895
Hole ID BHB9A
Ground level 0.00 m AOD
Test depth 4.33m BGL
Test date 20.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	2.20 m	Top of filter material	2.95 m
Length of test section	1550.00 mm	Bottom of filter material	4.50 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.45 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	2.24 m	Centre of piezometer tip	2.80 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	4.04	1.84	1.000
0.50	3.32	1.12	0.609
1.00	2.61	0.41	0.223
2.00	2.42	0.22	0.120
3.00	2.36	0.16	0.087
4.00	2.32	0.12	0.065
5.00	2.29	0.09	0.049
10.00	2.27	0.07	0.038
15.00	2.26	0.06	0.033
20.00	2.25	0.05	0.027
30.00	2.24	0.04	0.022
40.00	2.24	0.04	0.022
50.00	2.24	0.04	0.022
60.00	2.24	0.04	0.022

Ho = 1.84 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 120.0 seconds

t2 = 240.0 seconds

H1 = 0.22 metres

H2 = 0.12 metres

F = 3.641 metres

A = 2.84×10^{-4} metres ^{2}

$k = 3.93 \times 10^{-7}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : DRIZZLING
Crew/Operator : MB
Time Start : 15.30
Finish : 16.30

Q.A. Ref: /097-12/M4B9AR2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

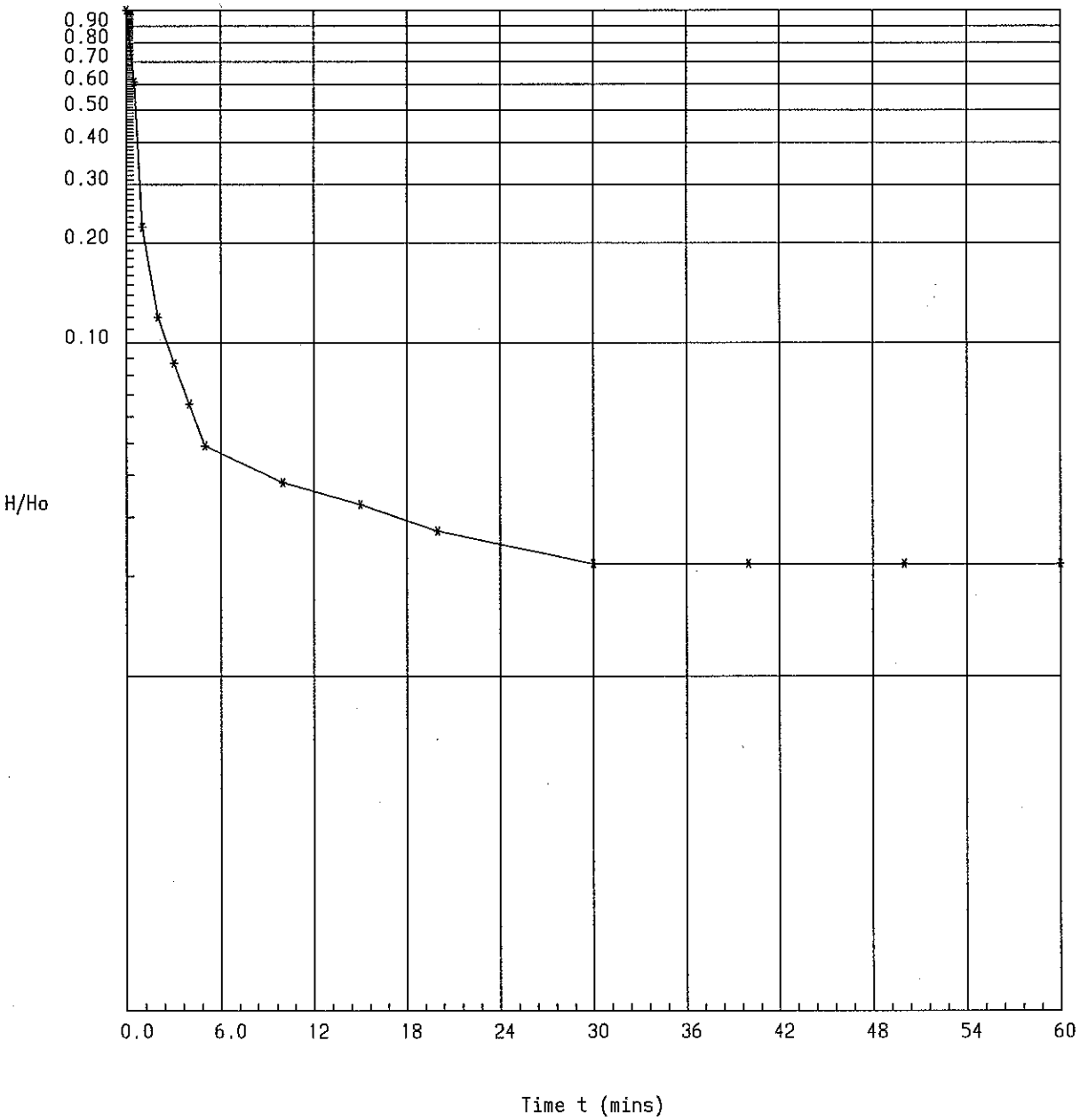
RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description SOFT BANDS OF SILSTONE ( )

Contract F10895
Hole ID BHB9A
Ground level 0.00 m AOD
Test depth 4.33m BGL
Test date 20.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B9AR2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description SOFT BANDS OF SILSTONE

Contract F10895
Hole ID BHB9A
Ground level 0.00 m AOD
Test depth 4.33m BGL
Test date 21.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	1.58 m	Top of filter material	2.95 m
Length of test section	1550.00 mm	Bottom of filter material	4.50 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.45 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	1.67 m	Centre of piezometer tip	2.80 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	3.20	1.62	1.000
0.50	2.52	0.94	0.580
1.00	2.14	0.56	0.346
2.00	1.90	0.32	0.198
3.00	1.84	0.26	0.160
4.00	1.79	0.21	0.130
5.00	1.74	0.16	0.099
10.00	1.71	0.13	0.080
15.00	1.69	0.11	0.068
20.00	1.68	0.10	0.062
30.00	1.67	0.09	0.056
40.00	1.67	0.09	0.056
50.00	1.67	0.09	0.056
60.00	1.67	0.09	0.056

Ho = 1.62 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds
t2 = 300.0 seconds
H1 = 0.21 metres
H2 = 0.16 metres

F = 3.641 metres
A = 2.84×10^{-4} metres^2

$k = 3.53 \times 10^{-7}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

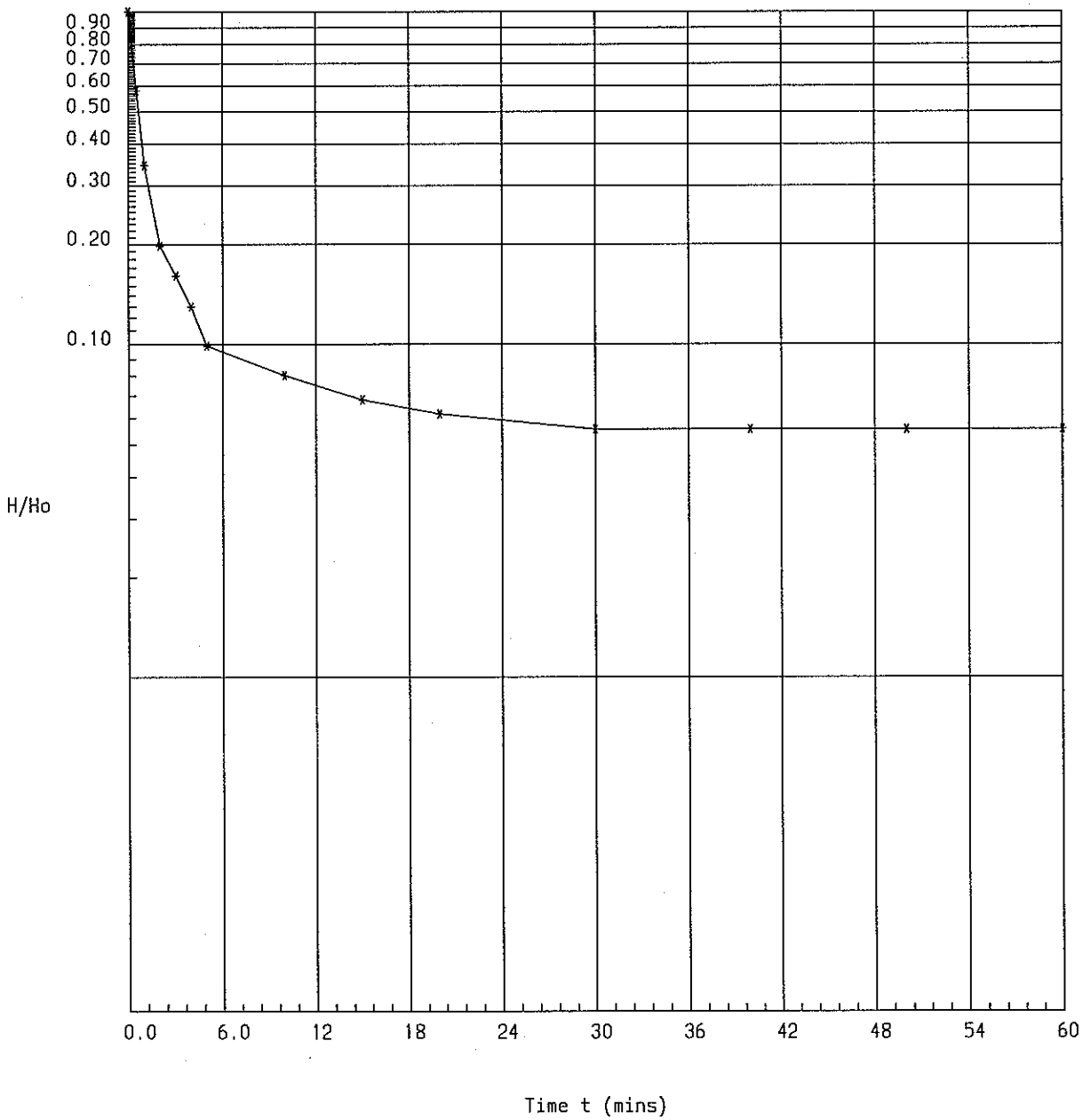
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : DRIZZLING
Crew/Operator : MB
Time Start : 10.05
Finish : 11.05

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB9A
Description	SOFT BANDS OF SILSTONE	Ground level	0.00 m AOD
		Test depth	4.33m BGL
		Test date	21.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B9AR3.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB10A
		Ground level	0.00 m AOD
Description	PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE	Test depth	25.51m BGL
		Test date	13.12.97

Type of test: Piezometer/Standpipe

ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	1.40 m	Top of filter material	21.37 m
Length of test section	5000.00 mm	Bottom of filter material	26.37 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.39 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	1.10 m	Centre of piezometer tip	25.36 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	0.00	1.40	1.000
0.50	0.38	1.02	0.729
1.00	0.67	0.73	0.521
2.00	0.89	0.51	0.364
3.00	0.89	0.51	0.364
4.00	0.92	0.48	0.343
5.00	0.93	0.47	0.336
10.00	0.95	0.45	0.321
15.00	0.99	0.41	0.293
20.00	1.04	0.36	0.257
30.00	1.07	0.33	0.236
40.00	1.07	0.33	0.236
50.00	1.09	0.31	0.221
60.00	1.10	0.30	0.214

Ho = 1.40 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds

t2 = 300.0 seconds

H1 = 0.51 metres

H2 = 0.47 metres

F = 8.531 metres

A = 2.84×10^{-4} metres^2

$k = 2.26 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

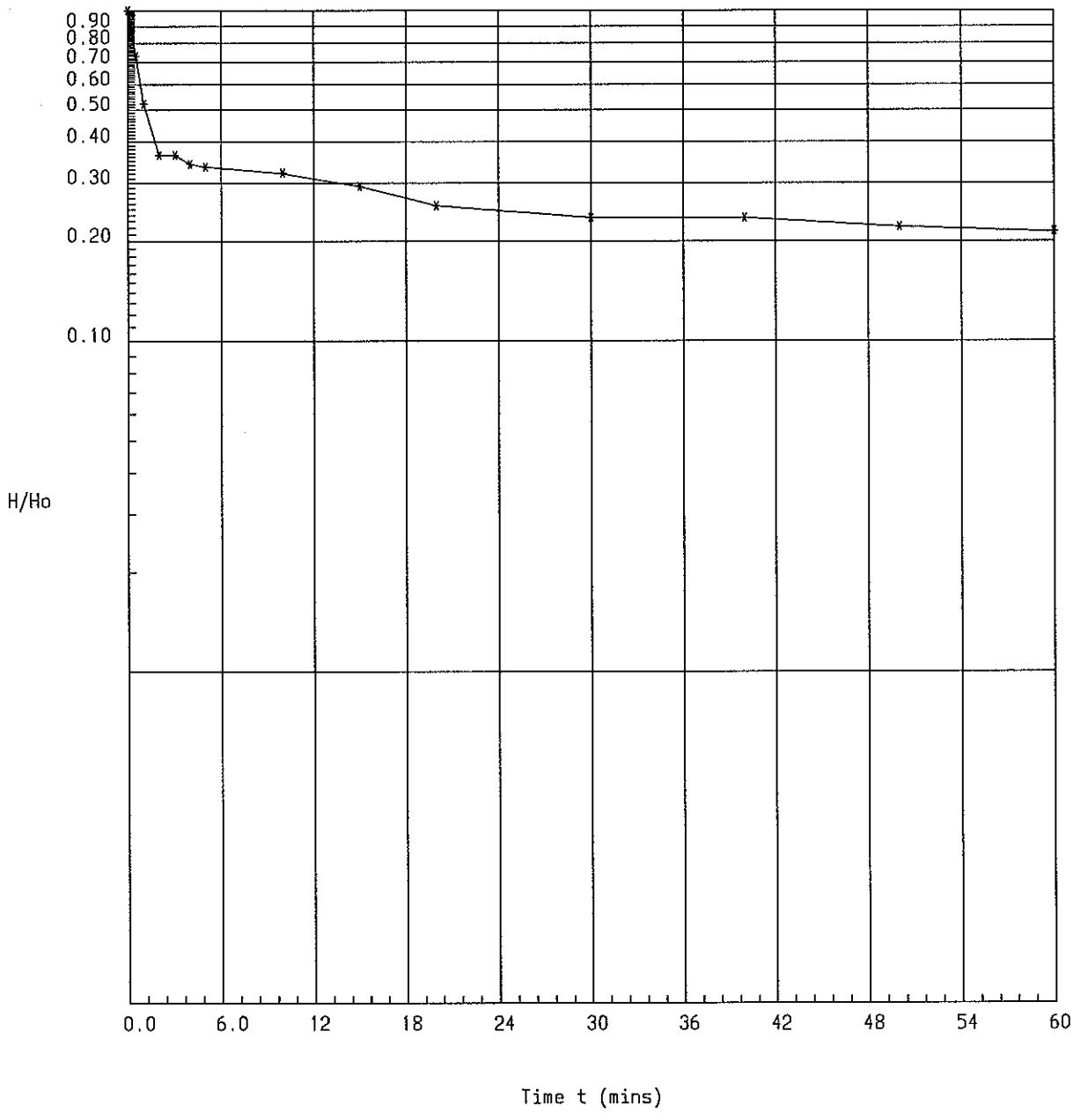
Piezometer type	:CASAGRANDE
Quality of water used	: CLEAN AND FRESH
Weather	: FINE
Crew/Operator	: MB
Time Start	: 13.00
Finish	: 14.00

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB10A
Description	PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE	Ground level	0.00 m AOD
		Test depth	25.51m BGL
		Test date	13.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B10AF1.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE

Contract F10895
Hole ID BHB10A
Ground level 0.00 m AOD
Test depth 25.51m BGL
Test date 16.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	0.83 m	Top of filter material	21.37 m
Length of test section	5000.00 mm	Bottom of filter material	26.37 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.39 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	0.55 m	Centre of piezometer tip	25.36 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	0.00	0.83	1.000
0.50	0.17	0.66	0.795
1.00	0.31	0.52	0.627
2.00	0.42	0.41	0.494
3.00	0.46	0.37	0.446
4.00	0.48	0.35	0.422
5.00	0.48	0.35	0.422
10.00	0.51	0.32	0.386
15.00	0.51	0.32	0.386
20.00	0.52	0.31	0.373
30.00	0.53	0.30	0.361
40.00	0.54	0.29	0.349
50.00	0.54	0.29	0.349
60.00	0.55	0.28	0.337

Ho = 0.83 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds

t2 = 600.0 seconds

H1 = 0.19 metres

H2 = 0.13 metres

F = 9.180 metres

A = 2.84×10^{-4} metres^2

$k = 3.26 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 15.00
Finish : 16.00

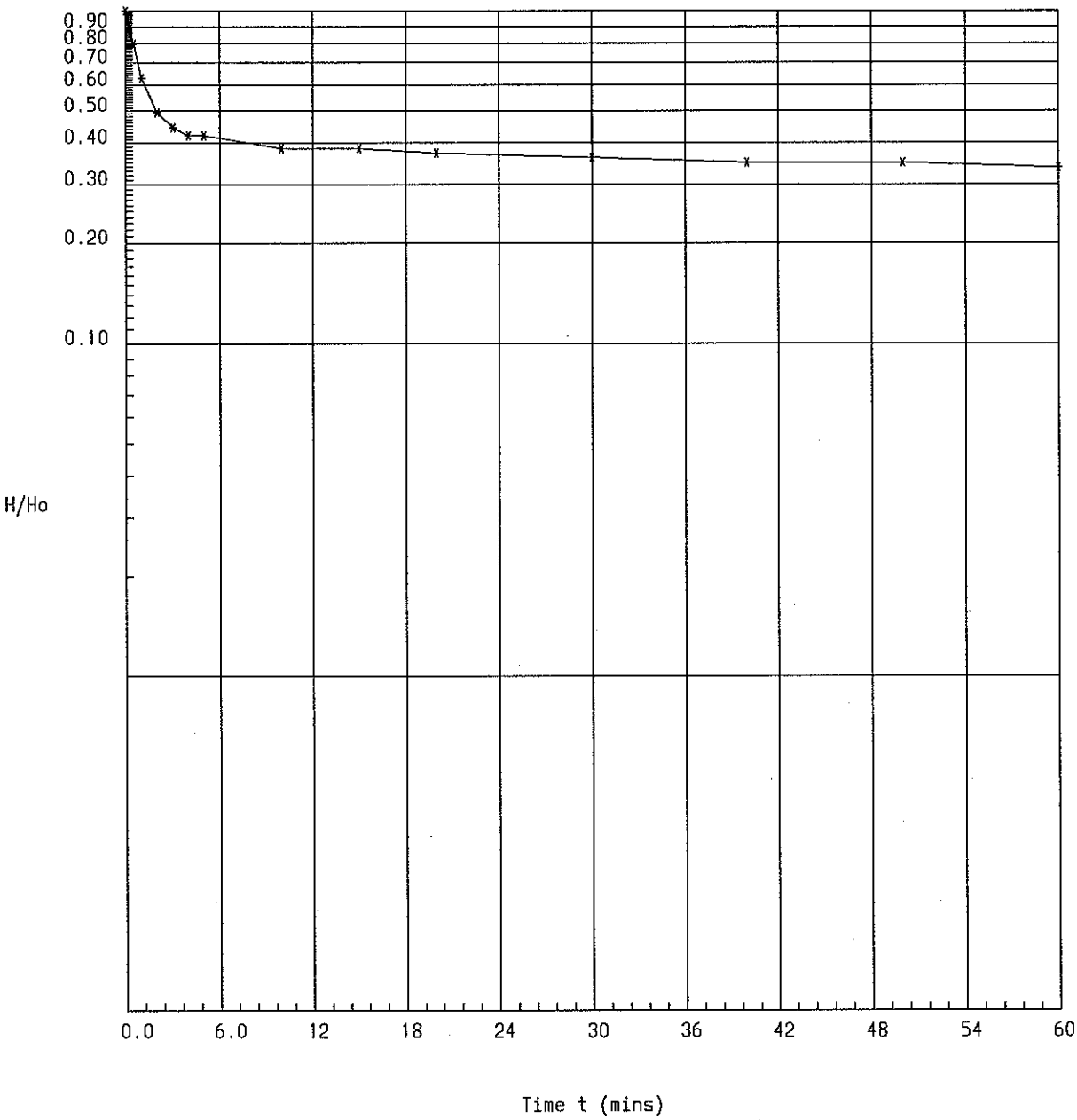
Q.A. Ref: /097-12/M4B10F2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB10A
Description	PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE	Ground level	0.00 m AOD
		Test depth	25.51m BGL
		Test date	16.12.97



Calculation: General Approach

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE

Contract F10895
Hole ID BHB10A
Ground level 0.00 m AOD
Test depth 25.51m BGL
Test date 15.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	1.48 m	Top of filter material	21.37 m
Length of test section	5000.00 mm	Bottom of filter material	26.37 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.39 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	2.53 m	Centre of piezometer tip	25.36 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	3.57	2.09	1.000
0.50	3.34	1.86	0.890
1.00	3.27	1.79	0.856
2.00	3.16	1.68	0.804
3.00	2.97	1.49	0.713
4.00	2.88	1.40	0.670
5.00	2.81	1.33	0.636
10.00	2.76	1.28	0.612
15.00	2.70	1.22	0.584
20.00	2.64	1.16	0.555
30.00	2.58	1.10	0.526
40.00	2.55	1.07	0.512
50.00	2.53	1.05	0.502
60.00	2.53	1.05	0.502

Ho = 2.09 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds

t2 = 300.0 seconds

H1 = 1.49 metres

H2 = 1.33 metres

F = 8.531 metres

A = 2.84×10^{-4} metres^2

$k = 3.15 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(\pi.(L/D))}{\ln(1.1.(L/D)+\sqrt{(1+(1.1.(L/D)^2))})}$$

COMMENTS

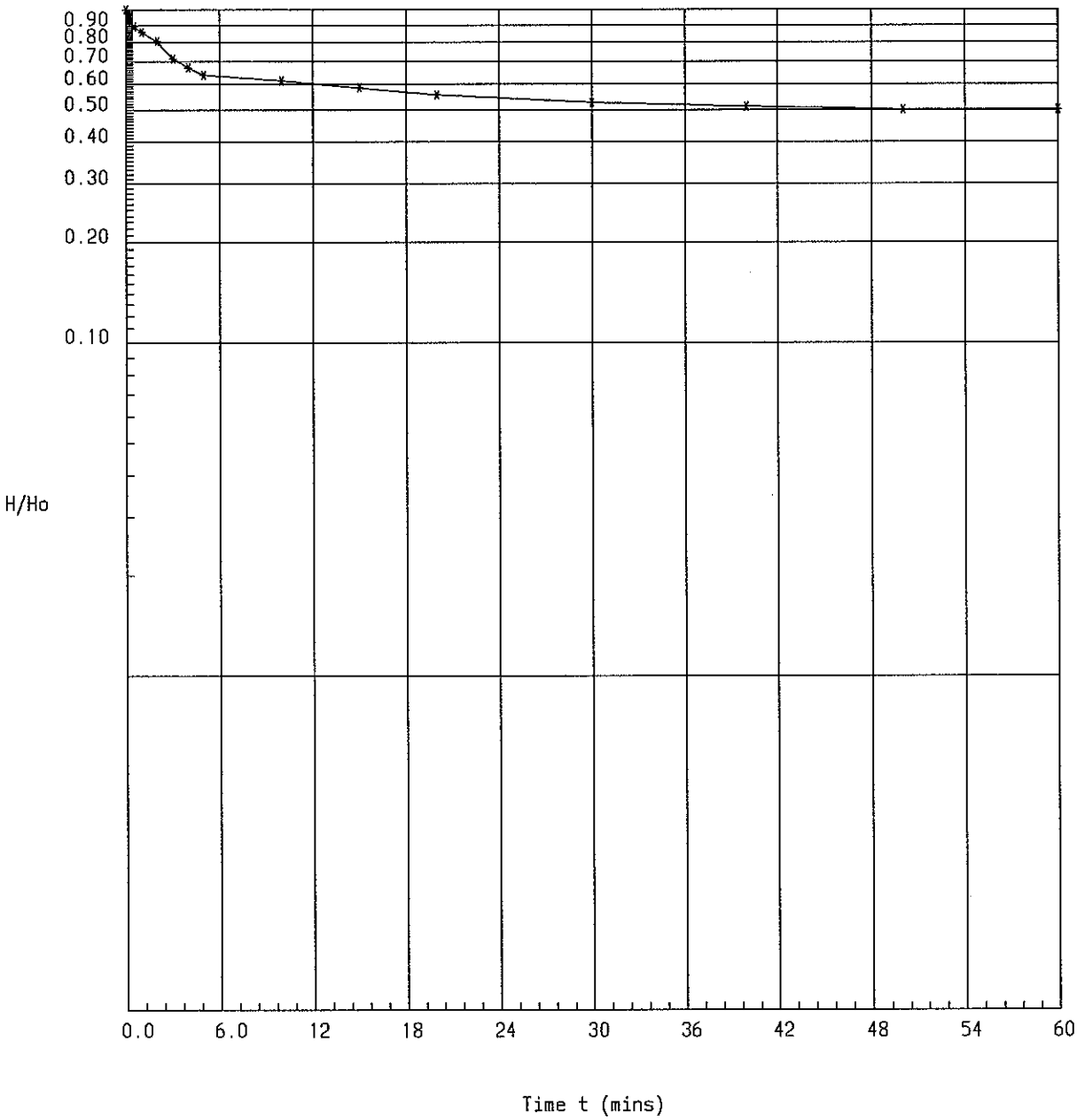
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 13.00
Finish : 14.00

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB10A
Description	PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE	Ground level	0.00 m AOD
		Test depth	25.51m BGL
		Test date	15.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B10AR1.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE

Contract F10895
Hole ID BHB10A
Ground level 0.00 m AOD
Test depth 25.51m BGL
Test date 19.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	0.11 m	Top of filter material	21.37 m
Length of test section	5000.00 mm	Bottom of filter material	26.37 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.39 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	0.05 m	Centre of piezometer tip	25.36 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	0.00	0.11	1.000
0.50	0.00	0.11	1.000
1.00	0.00	0.11	1.000
2.00	0.00	0.11	1.000
3.00	0.01	0.10	0.909
4.00	0.01	0.10	0.909
5.00	0.02	0.09	0.818
10.00	0.02	0.09	0.818
15.00	0.02	0.09	0.818
20.00	0.02	0.09	0.818
30.00	0.03	0.08	0.727
40.00	0.04	0.07	0.636
50.00	0.05	0.06	0.545
60.00	0.05	0.06	0.545

Ho = 0.11 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds

t2 = 300.0 seconds

H1 = 0.10 metres

H2 = 0.09 metres

F = 8.531 metres

A = 2.84×10^{-4} metres^2

$k = 2.92 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 12.10
Finish : 13.10

NORWEST HOLST SOIL ENGINEERING LIMITED

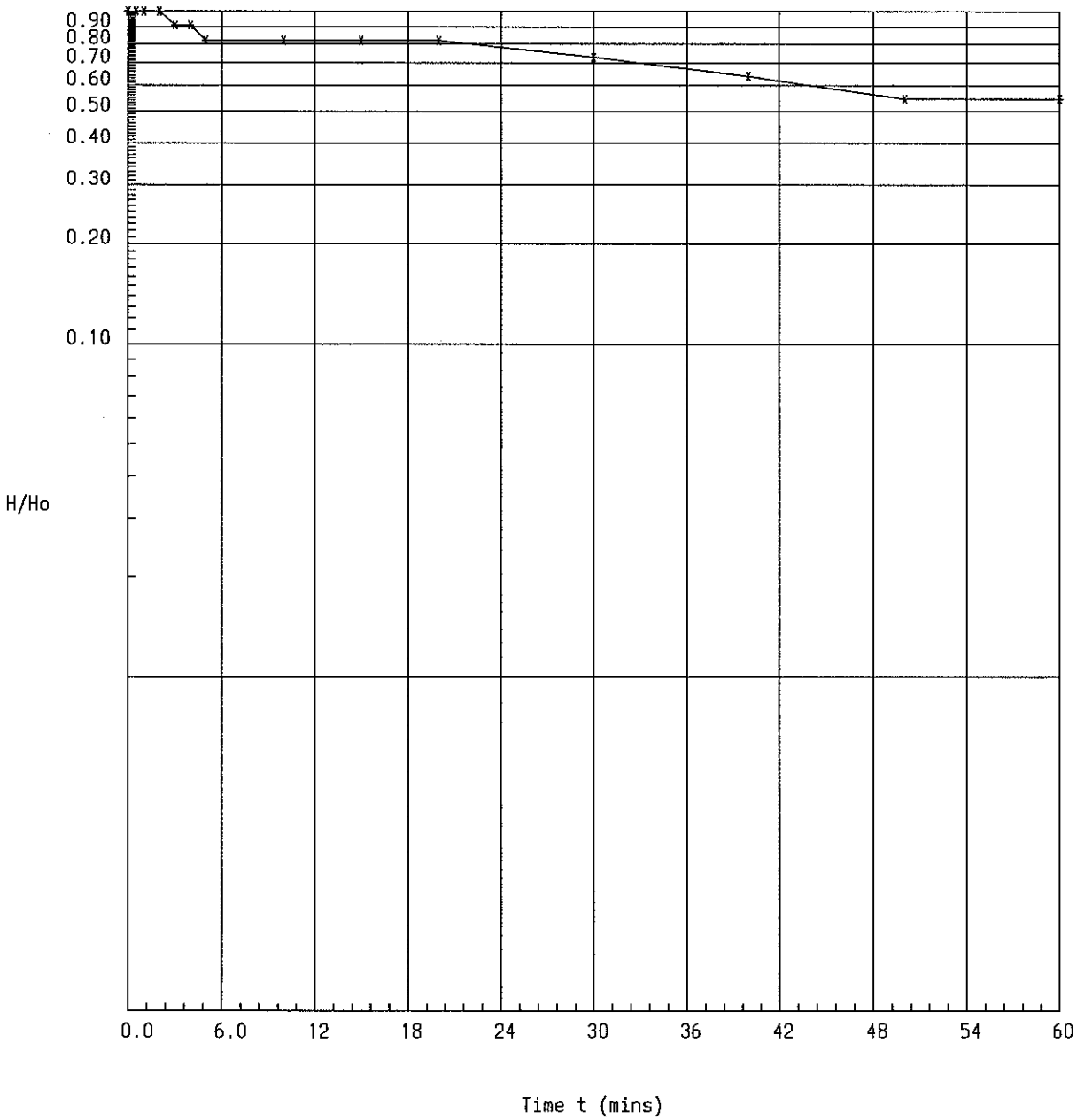
FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE

Contract	F10895
Hole ID	BHB10A
Ground level	0.00 m AOD
Test depth	25.51m BGL
Test date	19.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B10F3.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE

Contract F10895
Hole ID BHB10A
Ground level 0.00 m AOD
Test depth 25.51m BGL
Test date 20.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	1.05 m	Top of filter material	21.37 m
Length of test section	5000.00 mm	Bottom of filter material	26.37 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.39 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	1.45 m	Centre of piezometer tip	25.36 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	2.45	1.40	1.000
0.50	2.27	1.22	0.871
1.00	2.09	1.04	0.743
2.00	1.94	0.89	0.636
3.00	1.86	0.81	0.579
4.00	1.73	0.68	0.486
5.00	1.66	0.61	0.436
10.00	1.54	0.49	0.350
15.00	1.49	0.44	0.314
20.00	1.47	0.42	0.300
30.00	1.46	0.41	0.293
40.00	1.44	0.39	0.279
50.00	1.44	0.39	0.279
60.00	1.45	0.40	0.286

Ho = 1.40 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds

t2 = 600.0 seconds

H1 = 0.68 metres

H2 = 0.49 metres

F = 8.531 metres

A = 2.84×10^{-4} metres^2

$k = 3.03 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : DRIZZLING
Crew/Operator : MB
Time Start : 15.10
Finish : 16.10

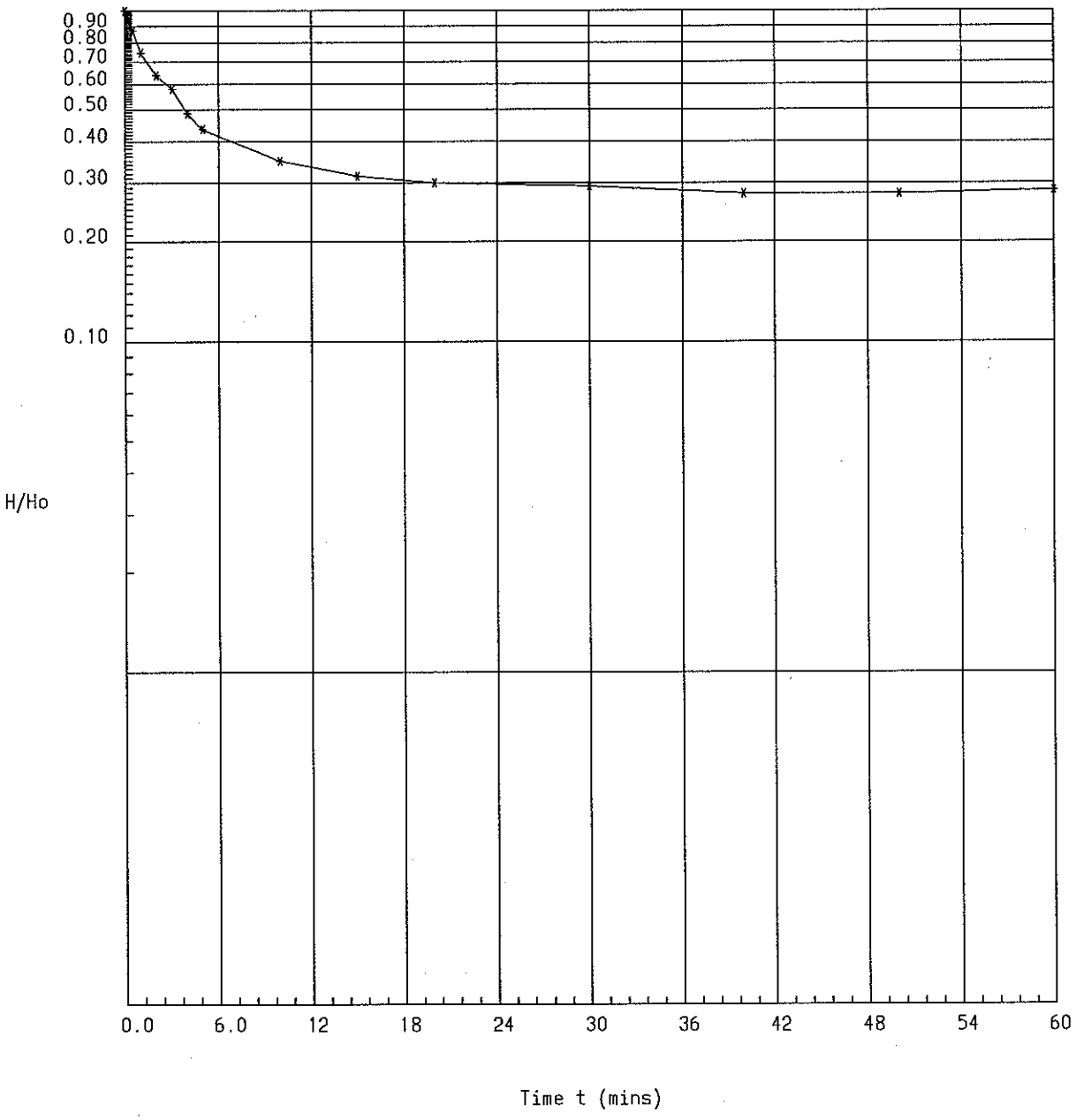
Q.A. Ref: /097-12/M4B10AR2.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB10A
Description	PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE	Ground level	0.00 m AOD
		Test depth	25.51m BGL
		Test date	20.12.97



Calculation: General Approach

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE

Contract F10895
Hole ID BHB10A
Ground level 0.00 m AOD
Test depth 25.51m BGL
Test date 21.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	0.79 m	Top of filter material	21.37 m
Length of test section	5000.00 mm	Bottom of filter material	26.37 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.39 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	0.93 m	Centre of piezometer tip	25.36 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	1.62	0.83	1.000
0.50	1.43	0.64	0.771
1.00	1.27	0.48	0.578
2.00	1.15	0.36	0.434
3.00	1.07	0.28	0.337
4.00	1.00	0.21	0.253
5.00	0.97	0.18	0.217
10.00	0.96	0.17	0.205
15.00	0.95	0.16	0.193
20.00	0.94	0.15	0.181
30.00	0.94	0.15	0.181
40.00	0.94	0.15	0.181
50.00	0.93	0.14	0.169
60.00	0.93	0.14	0.169

Ho = 0.83 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds
t2 = 300.0 seconds
H1 = 0.12 metres
H2 = 0.11 metres

F = %21.458 metres
A = 2.84×10^{-4} metres ^{2}

$k = 1.92 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS

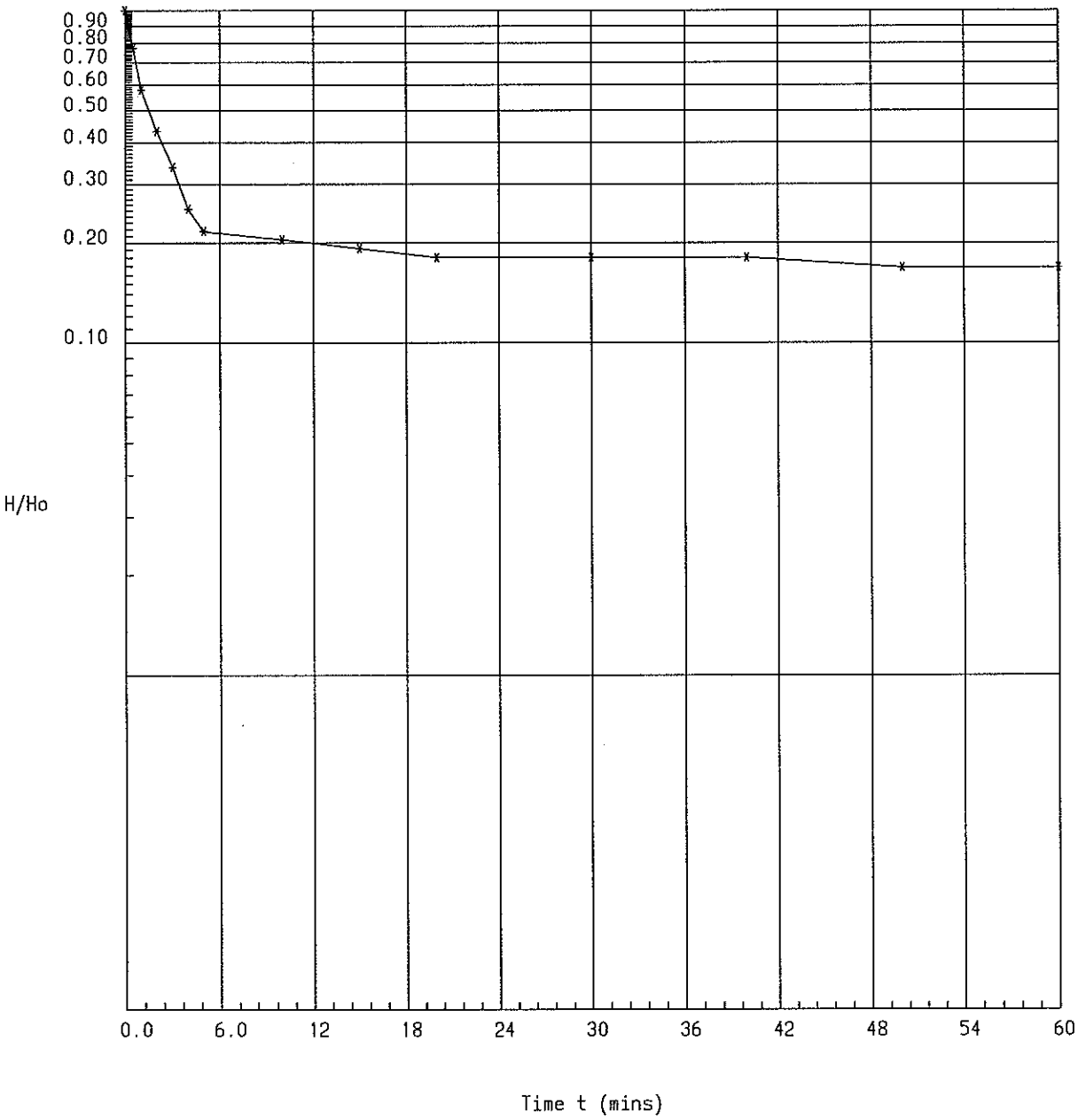
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : DRIZZLING
Crew/Operator : MB
Time Start : 9.45
Finish : 10.45

NORWEST HOLST SOIL ENGINEERING LIMITED

RISING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB10A
Description	PURPLISH BROWN MOTTLED GREYISH GREEN SLIGHTLY TO MODERATELY SILTY MUDSTONE	Ground level	0.00 m AOD
		Test depth	25.51m BGL
		Test date	21.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B10AR3.IP2 2.02

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB14
Description	GREYISH PINK FINE TO MEDIUM GRAINED FRESH TO SLIGHTLY WEATHERED MICACEOUS SANDSTONE	Ground level	0.00 m AOD
		Test depth	21.47m BGL
		Test date	13.12.97

Type of test Piezometer/Standpipe

ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	22.67 m	Top of filter material	15.17 m
Length of test section	6500.00 mm	Bottom of filter material	21.67 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.17 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	15.46 m	Centre of piezometer tip	21.32 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	0.00	22.67	1.000
0.50	4.40	18.27	0.806
1.00	7.23	15.44	0.681
2.00	9.58	13.09	0.577
3.00	11.47	11.20	0.494
4.00	12.90	9.77	0.431
5.00	13.53	9.14	0.403
10.00	14.12	8.55	0.377
15.00	14.83	7.84	0.346
20.00	15.02	7.65	0.337
30.00	15.31	7.36	0.325
40.00	15.37	7.30	0.322
50.00	15.42	7.25	0.320
60.00	15.46	7.21	0.318

Ho = 22.67 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds

t2 = 300.0 seconds

H1 = 0.51 metres

H2 = 0.47 metres

F = 8.531 metres

A = 2.84×10^{-4} metres^2

$k = 2.26 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS **Test not valid.**

ASSUMED INITIAL GROUND WATER LEVEL.

Piezometer type :CASAGRANDE

Quality of water used : CLEAN AND FRESH

Weather : FINE

Crew/Operator : MB

Time Start : 11.20

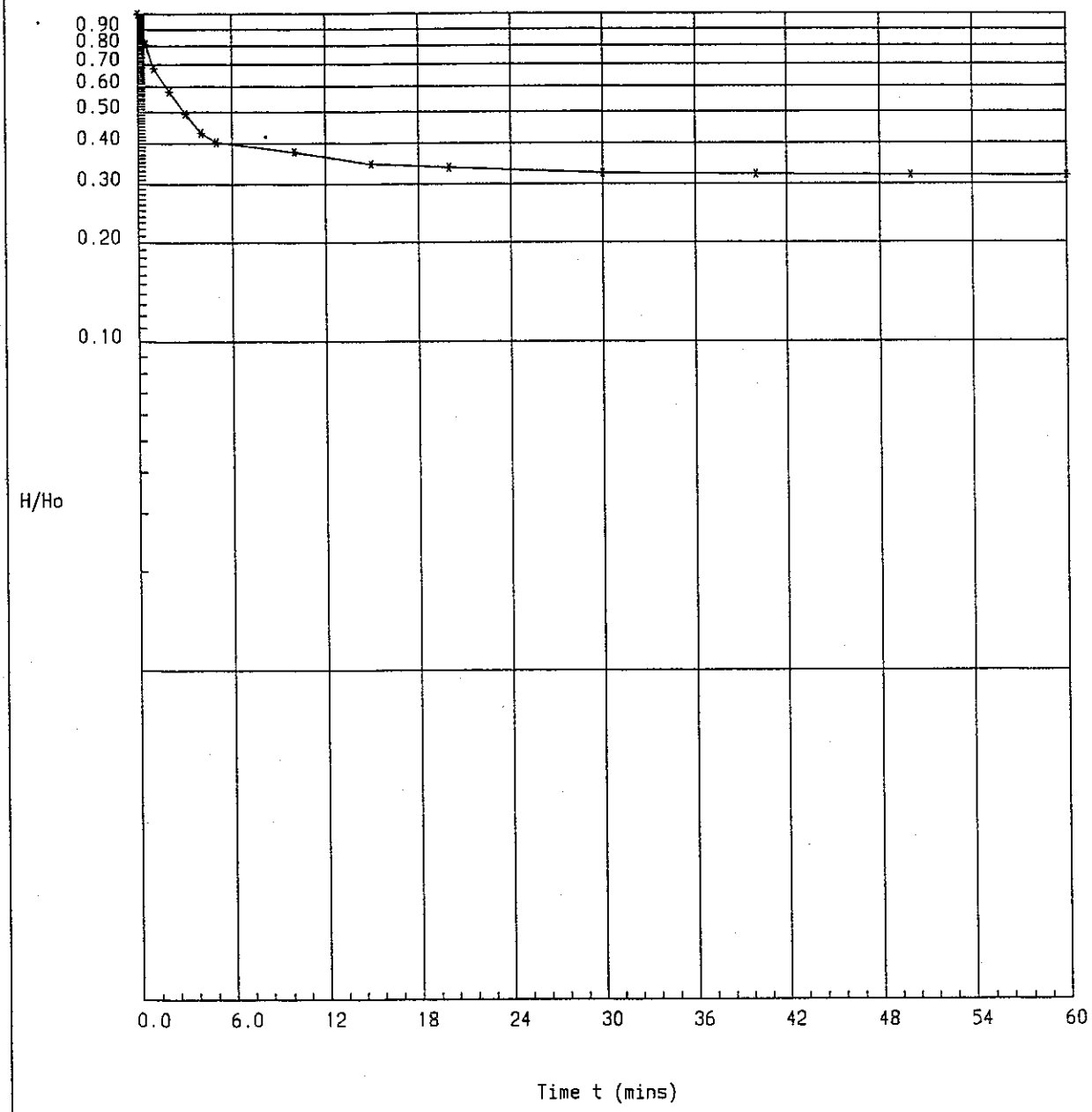
Finish : 12.20

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB14
Description	GREYISH PINK FINE TO MEDIUM GRAINED FRESH TO SLIGHTLY WEATHERED MICACEOUS SANDSTONE	Ground level	0.00 m AOD
		Test depth	21.47m BGL
		Test date	13.12.97



Calculation: General Approach

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description GREYISH PINK FINE TO MEDIUM GRAINED FRESH TO SLIGHTLY WEATHERED MICACEOUS SANDSTONE

Contract F10895
Hole ID BHB14
Ground level 0.00 m AOD
Test depth 21.47m BGL
Test date 16.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	22.67 m	Top of filter material	15.17 m
Length of test section	6500.00 mm	Bottom of filter material	21.67 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.17 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	15.97 m	Centre of piezometer tip	21.32 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	0.00	22.67	1.000
0.50	4.72	17.95	0.792
1.00	8.33	14.34	0.633
2.00	10.43	12.24	0.540
3.00	12.42	10.25	0.452
4.00	12.87	9.80	0.432
5.00	13.17	9.50	0.419
10.00	13.62	9.05	0.399
15.00	14.43	8.24	0.363
20.00	14.93	7.74	0.341
30.00	15.17	7.50	0.331
40.00	15.31	7.36	0.325
50.00	15.81	6.86	0.303
60.00	15.97	6.70	0.296

Ho = 22.67 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 180.0 seconds
t2 = 300.0 seconds
H1 = 10.25 metres
H2 = 9.50 metres

F = %10.449 metres
A = 2.84×10^{-4} metres^2

$k = 1.72 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS Test not valid.

ASSUMED INITIAL GROUND WATER LEVEL.

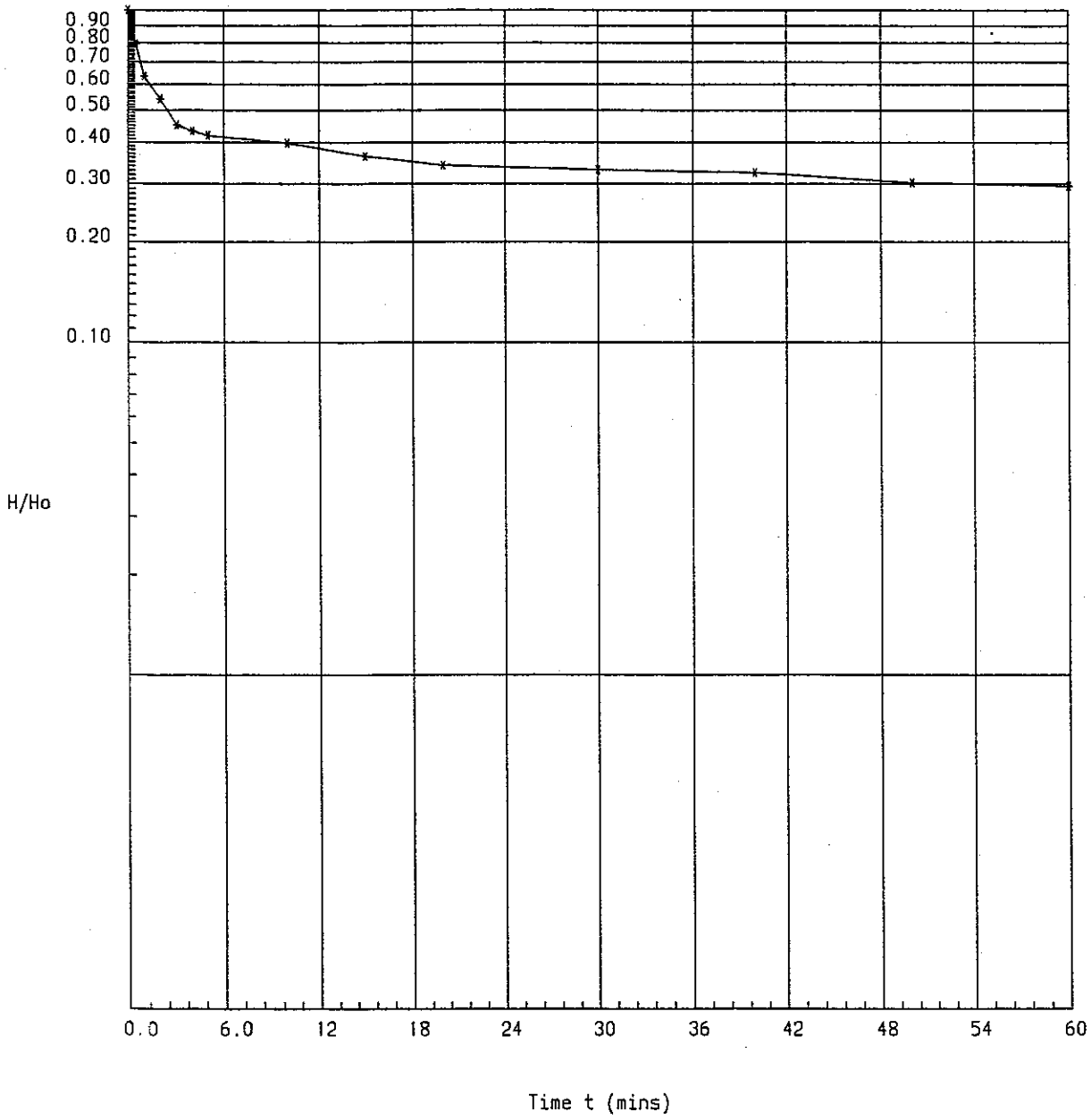
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 13.20
Finish : 14.20

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB14
		Ground level	0.00 m AOD
Description	GREYISH PINK FINE TO MEDIUM GRAINED FRESH TO SLIGHTLY WEATHERED MICACEOUS SANDSTONE	Test depth	21.47m BGL
		Test date	16.12.97



Calculation: General Approach

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST RESULTS

Test method: BS 5930: Pages 34-38: 1981

Location M4 RELIEF ROAD STAGE 2

Description GREYISH PINK FINE TO MEDIUM GRAINED FRESH TO SLIGHTLY WEATHERED MICACEOUS SANDSTONE

Contract F10895
Hole ID BHB14
Ground level 0.00 m AOD
Test depth 21.47m BGL
Test date 19.12.97

Type of test Piezometer/Standpipe
ALL MEASUREMENTS BELOW CASING/STANDPIPE

Inital ground water level	22.67 m	Top of filter material	15.17 m
Length of test section	6500.00 mm	Bottom of filter material	21.67 m
Diameter of test section	150.00 mm		
Height of casing/standpipe above surface	0.17 m	Diameter of piezometer tube	19.00 mm
Water level at end of test	16.42 m	Centre of piezometer tip	21.32 m

Time (Mins)	Depth to Water level	H	H/Ho
0.00	0.00	22.67	1.000
0.50	5.11	17.56	0.775
1.00	8.62	14.05	0.620
2.00	10.42	12.25	0.540
3.00	12.43	10.24	0.452
4.00	13.13	9.54	0.421
5.00	13.52	9.15	0.404
10.00	14.53	8.14	0.359
15.00	15.09	7.58	0.334
20.00	15.35	7.32	0.323
30.00	15.50	7.17	0.316
40.00	15.92	6.75	0.298
50.00	16.20	6.47	0.285
60.00	16.42	6.25	0.276

Ho = 22.67 m

Using $k = A/(F(t2-t1)).\ln H1/H2$

t1 = 240.0 seconds
t2 = 300.0 seconds
H1 = 0.12 metres
H2 = 0.11 metres

F = %21.458 metres
A = 2.84×10^{-4} metres ^{2}

$k = 1.92 \times 10^{-8}$ metres/second

Intake Factor: Piezometer with top and bottom seal.

$$\frac{F}{D} = \frac{2.32.(pi.(L/D))}{\ln(1.1.(L/D)+sqr(1+(1.1.(L/D)^2)))}$$

COMMENTS Test not valid.

ASSUMED INITIAL GROUND WATER LEVEL.

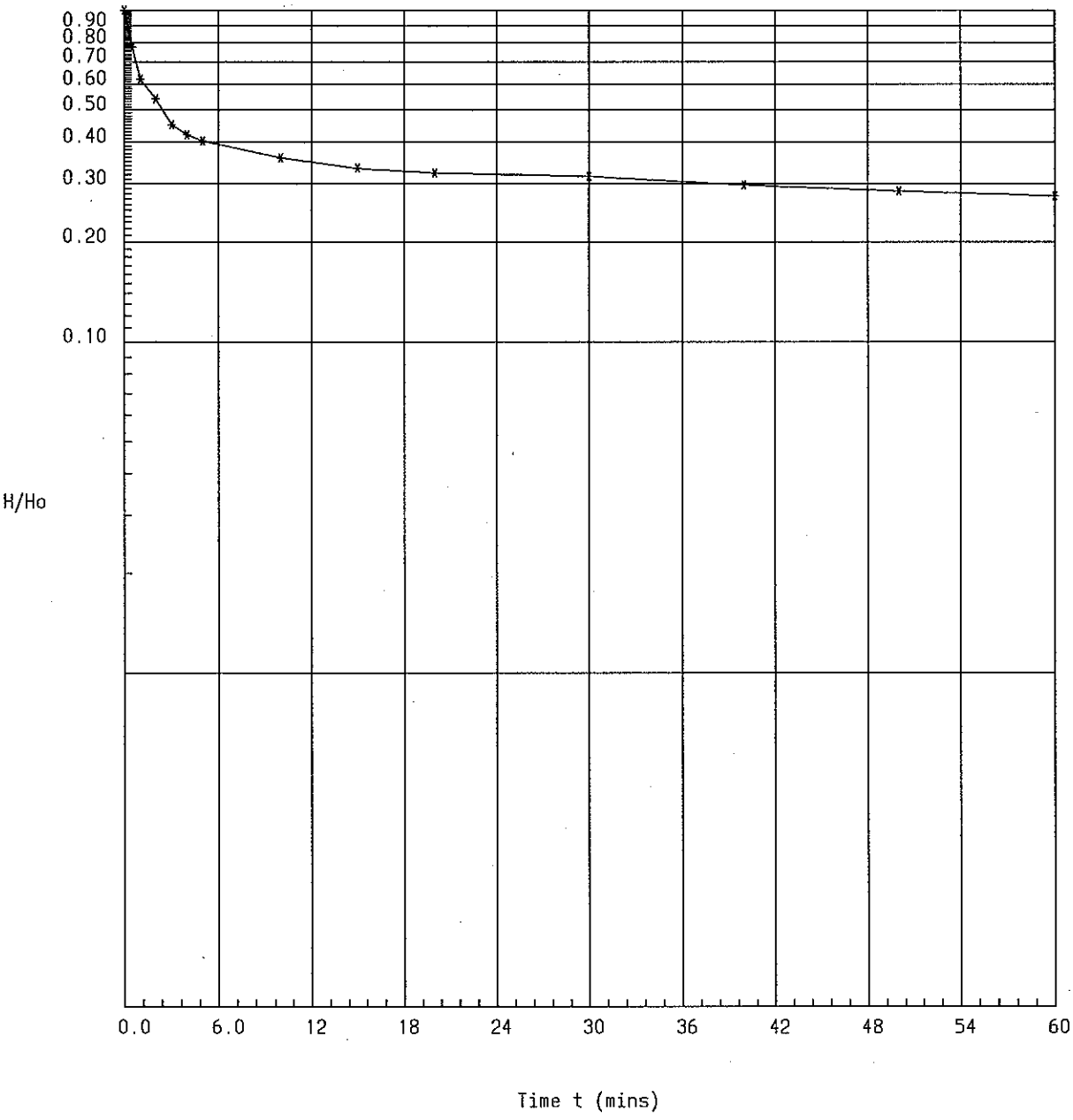
Piezometer type :CASAGRANDE
Quality of water used : CLEAN AND FRESH
Weather : FINE
Crew/Operator : MB
Time Start : 10.30
Finish : 11.30

NORWEST HOLST SOIL ENGINEERING LIMITED

FALLING HEAD PERMEABILITY TEST GRAPH

Test method: BS 5930: Pages 34-38: 1981

Location	M4 RELIEF ROAD STAGE 2	Contract	F10895
		Hole ID	BHB14
Description	GREYISH PINK FINE TO MEDIUM GRAINED FRESH TO SLIGHTLY WEATHERED MICACEOUS SANDSTONE	Ground level	0.00 m AOD
		Test depth	21.47m BGL
		Test date	19.12.97



Calculation: General Approach

Q.A. Ref: /097-12/M4B14F3.IP2 2.02

GROUNDWATER MONITORING RECORDS

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB3
DATE 04/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.28
0.5	1.72
1	2.43
2	3.90
3	4.82
4	5.92
5	6.11
10	6.20
15	6.25
20	6.25
30	6.25

TIP DEPTH:10.05m

INITIAL WATER LEVEL: 6.52m

AMOUNT OF WATER ADDED: 5 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L:0.38m

HEIGHT OF PIPE A.B.G.L:0.28m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB4A
DATE 11/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.38
0.5	3.20
1	5.10
2	10.32
3	10.71
4	10.81
5	10.87
10	10.95
15	10.97
20	10.98
30	10.98

TIP DEPTH: 14.51m

INITIAL WATER LEVEL: 12.40m

AMOUNT OF WATER ADDED: 4gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L:0.52m

HEIGHT OF PIPE A.B.G.L:0.38m

MEASURED FROM:G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB6A
DATE 11/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.31
0.5	0.11
1	0.92
2	1.16
3	1.32
4	1.56
5	1.70
10	2.10
15	2.38
20	2.55
30	2.56

TIP DEPTH: 13.13m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 3.40m

HEIGHT OF COVER A.B.G.L:0.62m

AMOUNT OF WATER ADDED: 4 gal.

HEIGHT OF PIPE A.B.G.L: 0.31m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB7A
DATE 11/11/97

TIME(mins)	WATER LEVEL(m)
0	16.51
0.5	19.20
1	22.63
2	25.52
3	25.52
4	25.52
5	25.54
10	25.55
15	25.58
20	25.60
30	25.60

TIP DEPTH: 28.48m

INITIAL WATER LEVEL: 26.20m

AMOUNT OF WATER ADDED: 8 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.62m

HEIGHT OF PIPE A.B.G.L: 0.51m

MEASURED FROM:G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB7B
DATE 01/12/97

TIME(mins)	WATER LEVEL(m)
0	+0.34
0.5	+0.32
1	+0.32
2	+0.31
3	+0.31
4	+0.31
5	+0.30
10	+0.28
15	+0.28
20	+0.28
30	+0.26

TIP DEPTH: 18.50m

INITIAL WATER LEVEL: 3.82m

AMOUNT OF WATER ADDED: 1 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.40m

HEIGHT OF PIPE A.B.G.L: 0.34m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB8A
DATE 11/11/97

TIME(mins)	WATER LEVEL(m)
0	-0.16
0.5	9.17
1	13.20
2	16.60
3	17.80
4	17.82
5	17.97
10	17.97
15	18.03
20	18.03
30	18.09

TIP DEPTH: 20.65m

INITIAL WATER LEVEL: 18.98m

AMOUNT OF WATER ADDED: 10 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.44m

HEIGHT OF PIPE A.B.G.L: 0.16m

MEASURED FROM: G

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB9A
DATE 30/10/97

TIME(mins)	WATER LEVEL(m)
0	+0.31
0.5	0.16
1	0.31
2	0.49
3	0.76
4	0.90
5	1.03
10	1.21
15	1.36
20	1.72
30	1.72

TIP DEPTH: 3.88m

INITIAL WATER LEVEL: 2.10m

AMOUNT OF WATER ADDED: 5 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.40m

HEIGHT OF PIPE A.B.G.L:0.31m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB9B
DATE 01/12/97

TIME(mins)	WATER LEVEL(m)
0	
0.5	
1	
2	
3	
4	
5	
10	
15	
20	
30	

TIP DEPTH: 15.50m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL:

HEIGHT OF COVER A.B.G.L: 0.52m

AMOUNT OF WATER ADDED:

HEIGHT OF PIPE A.B.G.L: 0.45m

COMMENTS:Artesian

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB10A
DATE 05/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.39
0.5	+0.12
1	0.41
2	0.41
3	0.44
4	0.49
5	0.49
10	0.72
15	0.76
20	0.76
30	0.91

TIP DEPTH: 25.51m

INITIAL WATER LEVEL: 6.71m

AMOUNT OF WATER ADDED: 2 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L:0.51m

HEIGHT OF PIPE A.B.G.L:0.39m

MEASURED FROM:G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB11A
DATE 10/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.48
0.5	+0.32
1	+0.20
2	+0.15
3	+0.15
4	+0.13
5	+0.10
10	0
15	0.03
20	0.11
30	0.18

TIP DEPTH: 8.01m

TYPE OF COVER:BARREL

INITIAL WATER LEVEL:0.50m

HEIGHT OF COVER A.B.G.L: 0.52m

AMOUNT OF WATER ADDED: 1 gal.

HEIGHT OF PIPE A.B.G.L: 0.48m

COMMENTS:

MEASURED FROM:GL

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB12A
DATE 13/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.26
0.5	1.90
1	3.30
2	3.42
3	3.48
4	3.48
5	3.48
10	3.51
15	3.52
20	3.52
30	3.52

TIP DEPTH: 9.00m

INITIAL WATER LEVEL:
1.80m

AMOUNT OF WATER ADDED: 1 gal.

COMMENTS:

TYPEOFCOVER:BARREL

HEIGHT OF COVER A.B.G.L: 0.31m

HEIGHT OF PIPE A.B.G.L: 0.29m

MEASURED FROM: GL

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB13A
DATE 04/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.26
0.5	1.9
1	3.3
2	3.42
3	3.48
4	3.48
5	3.48
10	3.51
15	3.52
20	3.52
30	3.52

TIP DEPTH: 23.00m

INITIAL WATER LEVEL:3.82m

AMOUNT OF WATER ADDED: 3 gal.

COMMENTS:

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L: 0.29m

HEIGHT OF PIPE A.B.G.L:0.26m

MEASURED FROM: GL

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB14A
DATE 30/10/97

TIME(mins)	WATER LEVEL(m)
0	+0.17
0.5	
1	5.10
2	8.20
3	10.40
4	13.16
5	13.87
10	14.84
15	15.68
20	16.11
30	16.69

TIP DEPTH: 21.00m

INITIAL WATER LEVEL: Dry

AMOUNT OF WATER ADDED: 10 gal.

COMMENTS: No PZ cap / cover

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L: 0.23m

HEIGHT OF PIPE A.B.G.L:

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB15A
DATE 10/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.22
0.5	0.08
1	0.18
2	0.18
3	0.18
4	0.18
5	0.18
10	0.18
15	0.18
20	-
30	-

TIP DEPTH: 10.00m

TYPE OF COVER:BARREL

INITIAL WATER LEVEL: 0.18m

HEIGHT OF COVER A.B.G.L: 0.40m

AMOUNT OF WATER ADDED: 1 gal.

HEIGHT OF PIPE A.B.G.L: 0.22m

COMMENTS:

MEASURED FROM:GL

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB16B
DATE 01/12/97

TIME(mins)	WATER LEVEL(m)
0	15.20
0.5	18.20
1	18.31
2	18.42
3	18.58
4	18.75
5	18.96
10	18.96
15	18.97
20	18.97
30	18.98

TIP DEPTH: 19.50m

TYPE OF COVER:BARREL

INITIAL WATER LEVEL: Dry

HEIGHT OF COVER A.B.G.L: 0.41m

AMOUNT OF WATER ADDED: 10 gal.

HEIGHT OF PIPE A.B.G.L: 0.30m

COMMENTS:

MEASURED FROM: GL

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB18
DATE 26/11/97

TIME(mins)	WATER LEVEL(m)
0	9.02
0.5	9.70
1	9.72
2	Dry
3	Dry
4	
5	
10	
15	
20	
30	

TIP DEPTH: 10.20m

INITIAL WATER LEVEL: Dry

AMOUNT OF WATER ADDED: 8 gal.

COMMENTS:

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L: 0.36m

HEIGHT OF PIPE A.B.G.L: 0.27m

MEASURED FROM:GL

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHB19A
DATE 06/12/97

TIME(mins)	WATER LEVEL(m)
0	-0.05
0.5	1.02
1	1.60
2	1.97
3	2.17
4	2.32
5	2.32
10	2.38
15	2.48
20	2.49
30	2.53

TIP DEPTH: 19.00m

INITIAL WATER LEVEL: 9.30m

AMOUNT OF WATER ADDED: 3 gal.

COMMENTS:

TYPE OF COVER:STOPCOCK

HEIGHT OF COVER A.B.G.L: 0m

HEIGHT OF PIPE A.B.G.L: -0.05m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHC5
DATE 15/11/97

TIME(mins)	WATER LEVEL(m)
0	0.32
0.5	0.09
1	0.72
2	1.39
3	1.76
4	2.07
5	2.21
10	2.52
15	2.62
20	2.72
30	2.73

TIP DEPTH: 7.40m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 2.75m

HEIGHT OF COVER A.B.G.L: 0.36m

AMOUNT OF WATER ADDED: 2 gal.

HEIGHT OF PIPE A.B.G.L: 0.32m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHC5A
DATE 25/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.28
0.5	0.00
1	0.20
2	0.35
3	0.50
4	0.67
5	0.70
10	0.70

TIP DEPTH: 7.30m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 0.77m

HEIGHT OF COVER A.B.G.L: 0.30m

AMOUNT OF WATER ADDED: 1 gal.

HEIGHT OF PIPE A.B.G.L: 0.23m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHD3
DATE 28/11/97

TIME(mins)	WATER LEVEL(m)
0	0.11
0.5	1.12
1	1.32
2	1.38
3	1.38
4	1.39
5	1.39
10	1.42
15	1.42
20	1.43
30	1.43

TIP DEPTH: 11.00m

INITIAL WATER LEVEL: 1.53m

AMOUNT OF WATER ADDED: 1 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L:0.24m

HEIGHT OF PIPE A.B.G.L:0.11m

MEASURED FROM:G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHD5
DATE 15/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.36
0.5	1.08
1	1.29
2	1.39
3	1.42
4	1.48
5	1.48
10	1.48
15	1.48
20	1.48
30	1.48

TIP DEPTH: 12.72m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 1.52m

HEIGHT OF COVER A.B.G.L: 0.43m

AMOUNT OF WATER ADDED: 2 gal.

HEIGHT OF PIPE A.B.G.L: 0.36m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHD6
DATE 15/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.16
0.5	0.45
1	1.18
2	1.38
3	1.40
4	1.41
5	1.42
10	1.42
15	1.42
20	1.45
30	1.45

TIP DEPTH: 18.40m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 1.50m

HEIGHT OF COVER A.B.G.L: 0.20m

AMOUNT OF WATER ADDED: 2 gal.

HEIGHT OF PIPE A.B.G.L: 0.16m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHE3A
DATE 15/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.31
0.5	0.30
1	3.31
2	3.48
3	3.48
4	3.48
5	3.49
10	3.49
15	3.49
20	3.49
30	3.49

TIP DEPTH: 28.85m

INITIAL WATER LEVEL: 3.61m

AMOUNT OF WATER ADDED: 3 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.40m

HEIGHT OF PIPE A.B.G.L: 0.31m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHE4
DATE 13/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.40
0.5	+0.03
1	+0.17
2	+0.59
3	0.86
4	0.97
5	1.17
10	1.29
15	1.48
20	1.55
30	1.75

TIP DEPTH: 12.14m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 3.16m

HEIGHT OF COVER A.B.G.L: 0.53m

AMOUNT OF WATER ADDED: /

HEIGHT OF PIPE A.B.G.L: 0.40m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHF1
DATE 28/11/97

TIME(mins)	WATER LEVEL(m)
0	
0.5	
1	
2	
3	
4	
5	
10	
15	
20	
30	

TIP DEPTH: 18.00m

INITIAL WATER LEVEL: G.L

AMOUNT OF WATER ADDED: none

COMMENTS:

TYPE OF COVER: STOP COCK

HEIGHT OF COVER A.B.G.L: G.L

HEIGHT OF PIPE A.B.G.L: -0.04m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHF2
DATE 15/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.39
0.5	7.12
1	7.22
2	7.25
3	7.25
4	7.25
5	7.26
10	7.35
15	7.35
20	7.36
30	7.36

TIP DEPTH: 17.01m

INITIAL WATER LEVEL: 7.62m

AMOUNT OF WATER ADDED: 3 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.48m

HEIGHT OF PIPE A.B.G.L: 0.39m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHF4
DATE 27/11/97

TIME(mins)	WATER LEVEL(m)
0	-0.02
0.5	4.20
1	6.40
2	6.72
3	6.79
4	6.79
5	6.82
10	6.82
15	6.83
20	6.83
30	6.83

TIP DEPTH: 31.50m

INITIAL WATER LEVEL: 6.97m

AMOUNT OF WATER ADDED: 2 gal.

COMMENTS:

TYPE OF COVER: STOPCOCK

HEIGHT OF COVER A.B.G.L: 0

HEIGHT OF PIPE A.B.G.L: -0.02m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHF5
DATE 27/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.19
0.5	4.32
1	6.64
2	6.72
3	6.75
4	6.78
5	6.78
10	6.78
15	6.78
20	6.78
30	6.78

TIP DEPTH: 17.00m

INITIAL WATER LEVEL: 6.81m

AMOUNT OF WATER ADDED: 2 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.26m

HEIGHT OF PIPE A.B.G.L: 0.19m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHF6
DATE 28/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.31
0.5	1.02
1	1.99
2	2.06
3	2.20
4	2.29
5	2.31
10	2.73
15	2.84
20	2.96
30	3.12

TIP DEPTH: 29.60m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 7.30m

HEIGHT OF COVER A.B.G.L: 0.41m

AMOUNT OF WATER ADDED: 2 gal.

HEIGHT OF PIPE A.B.G.L: 0.31m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHG1
DATE 27/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.36
0.5	2.52
1	3.92
2	5.06
3	5.52
4	5.78
5	5.78
10	5.82
15	5.87
20	5.92
30	5.94

TIP DEPTH: 36.00m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 6.05m

HEIGHT OF COVER A.B.G.L: 0.43m

AMOUNT OF WATER ADDED: 2 gal.

HEIGHT OF PIPE A.B.G.L: 0.36m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHG2
DATE 26/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.22
0.5	0.29
1	0.53
2	0.74
3	0.82
4	0.86
5	0.94
10	0.98
15	1.12
20	1.12
30	1.14

TIP DEPTH: 13.72m

INITIAL WATER LEVEL: 5.72m

AMOUNT OF WATER ADDED: 2 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.29m

HEIGHT OF PIPE A.B.G.L: 0.22m

MEASURED FROM:G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHG3
DATE 15/11/97

TIME(mins)	WATER LEVEL(m)
0	G.L
0.5	2.40
1	3.52
2	4.20
3	4.82
4	5.07
5	5.09
10	5.09
15	5.09
20	5.11
30	5.13

TIP DEPTH: 19.50m

INITIAL WATER LEVEL: 5.21m

AMOUNT OF WATER ADDED: 2 gal.

COMMENTS:

TYPE OF COVER: STOPCOCK

HEIGHT OF COVER A.B.G.L: 0

HEIGHT OF PIPE A.B.G.L:0

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHG6
DATE 27/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.09
0.5	1.01
1	2.07
2	2.98
3	3.62
4	4.08
5	4.12
10	4.16
15	4.16
20	4.18
30	4.22

TIP DEPTH: 16.00m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 4.72m

HEIGHT OF COVER A.B.G.L: 0.11m

AMOUNT OF WATER ADDED: 1 gal.

HEIGHT OF PIPE A.B.G.L:0.09m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHH7
DATE 15/11/97

TIME(mins)	WATER LEVEL(m)
0	-0.09
0.5	-0.09
1	0.09
2	0.09
3	0.09
4	0.09
5	0.09
10	0.09
15	0.09
20	0.09
30	0.09

TIP DEPTH: 14.43m

INITIAL WATER LEVEL: 3.30m

AMOUNT OF WATER ADDED: 2 gal.

COMMENTS:

TYPE OF COVER: STOPCOCK

HEIGHT OF COVER A.B.G.L: 0

HEIGHT OF PIPE A.B.G.L: -0.09m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHJ2
DATE 13/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.14
0.5	+0.14
1	+0.14
2	+0.14
3	+0.14
4	+0.14
5	+0.14
10	+0.14
15	+0.14
20	+0.14
30	+0.14

TIP DEPTH: 13.30m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 0.73m

HEIGHT OF COVER A.B.G.L: 0.21m

AMOUNT OF WATER ADDED: 1 gal.

HEIGHT OF PIPE A.B.G.L: 0.14m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHL3
DATE 13/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.20
0.5	0.09
1	0.91
2	1.14
3	1.19
4	1.23
5	1.24
10	1.24
15	1.27
20	1.28
30	1.28

TIP DEPTH: 13.50m

INITIAL WATER LEVEL: 1.31m

AMOUNT OF WATER ADDED: 1 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.24m

HEIGHT OF PIPE A.B.G.L: 0.20m

MEASURED FROM:G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHM2
DATE 22/10/97

TIME(mins)	WATER LEVEL(m)
0	+0.12
0.5	+0.12
1	+0.12
2	+0.12
3	+0.12
4	+0.12
5	+0.12
10	+0.12
15	+0.12
20	+0.07
30	+0.07

TIP DEPTH: 8.02m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 0.56m

HEIGHT OF COVER A.B.G.L:0.19m

AMOUNT OF WATER ADDED: 4 gal.

HEIGHT OF PIPE A.B.G.L: 0.12m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHM4
DATE 15/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.19
0.5	+0.13
1	+0.13
2	+0.10
3	+0.10
4	+0.90
5	+0.80
10	+0.80
15	+0.80
20	+0.80
30	+0.80

TIP DEPTH: 7.84m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: 0.04m

HEIGHT OF COVER A.B.G.L: 0.20m

AMOUNT OF WATER ADDED: 0.5 gal.

HEIGHT OF PIPE A.B.G.L: 0.19m

COMMENTS:

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHM6
DATE 15/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.14
0.5	2.87
1	3.23
2	3.32
3	3.39
4	3.40
5	3.44
10	3.45
15	3.49
20	3.49
30	3.49

TIP DEPTH: 6.53m

INITIAL WATER LEVEL: 3.52m

AMOUNT OF WATER ADDED: 3 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.22m

HEIGHT OF PIPE A.B.G.L: 0.14m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHN2
DATE 11/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.27
0.5	1.70
1	3.10
2	5.41
3	7.61
4	7.90
5	8.07
10	8.06
15	8.11
20	8.16
30	8.18

TIP DEPTH: 9.30m

INITIAL WATER LEVEL: 8.23m

AMOUNT OF WATER ADDED: 4 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.33m

HEIGHT OF PIPE A.B.G.L: 0.27m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHN4
DATE 11/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.13
0.5	1.80
1	2.48
2	3.12
3	3.26
4	3.32
5	3.42
10	3.43
15	3.43
20	3.46
30	3.48

TIP DEPTH: 5.45m

INITIAL WATER LEVEL: 3.49

AMOUNT OF WATER ADDED: 2 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.20m

HEIGHT OF PIPE A.B.G.L: 0.13m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHN5
DATE 15/11/97

TIME(mins)	WATER LEVEL(m)
0	
0.5	
1	
2	
3	
4	
5	
10	
15	
20	
30	

TIP DEPTH: 14.47m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: DRY

HEIGHT OF COVER A.B.G.L:0.23m

AMOUNT OF WATER ADDED: 15gal.

HEIGHT OF PIPE A.B.G.L: 0.17m

COMMENTS:

MEASURED FROM: G.L

Still dry after 15 gal.

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHN8
DATE 11/11/97

TIME(mins)	WATER LEVEL(m)
0	-4.80
0.5	5.20
1	5.59
2	5.59
3	5.59
4	5.59
5	5.59
10	5.59
15	5.60
20	5.60
30	5.60

TIP DEPTH: 8.90m

INITIAL WATER LEVEL: 5.64m

AMOUNT OF WATER ADDED: 10 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.29m

HEIGHT OF PIPE A.B.G.L: 0.25m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHN9
DATE 11/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.21
0.5	1.72
1	2.75
2	3.32
3	3.33
4	3.34
5	3.34
10	3.36
15	3.36
20	3.36
30	3.36

TIP DEPTH: 9.17m

INITIAL WATER LEVEL: 3.50m

AMOUNT OF WATER ADDED: 6 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.27m

HEIGHT OF PIPE A.B.G.L: 0.21m

MEASURED FROM:G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHN10B
DATE 11/11/97

TIME(mins)	WATER LEVEL(m)
0	+0.27
0.5	1.46
1	2.60
2	3.50
3	4.08
4	4.16
5	4.07
10	4.09
15	4.09
20	4.09
30	4.09

TIP DEPTH: 6.48m

INITIAL WATER LEVEL: 4.17m

AMOUNT OF WATER ADDED: 6 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.32m

HEIGHT OF PIPE A.B.G.L:0.27m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHP1
DATE 23/10/97

TIME(mins)	WATER LEVEL(m)
0	+0.41
0.5	1.90
1	4.47
2	4.87
3	4.88
4	5.01
5	5.01
10	5.12
15	5.31
20	5.31
30	5.32

TIP DEPTH: 7.90m

INITIAL WATER LEVEL: DRY

AMOUNT OF WATER ADDED: 20 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.48m

HEIGHT OF PIPE A.B.G.L:0.41m

MEASURED FROM:G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHP4
DATE 30/10/97

TIME(mins)	WATER LEVEL(m)
0	
0.5	
1	
2	
3	
4	
5	
10	
15	
20	
30	

TIP DEPTH: 7.40m

TYPE OF COVER: BARREL

INITIAL WATER LEVEL: DRY

HEIGHT OF COVER A.B.G.L: 0.31m

AMOUNT OF WATER ADDED: 20 gal.

HEIGHT OF PIPE A.B.G.L: .0.26m

COMMENTS:

MEASURED FROM: G.L

Still dry after 20 gal.

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHP5
DATE 30/10/97

TIME(mins)	WATER LEVEL(m)
0	G.L
0.5	1.17
1	2.80
2	4.08
3	4.11
4	4.11
5	4.18
10	4.32
15	4.45
20	4.45
30	4.70

TIP DEPTH: 7.10m

INITIAL WATER LEVEL: DRY

AMOUNT OF WATER ADDED: 15 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.33m

HEIGHT OF PIPE A.B.G.L: 0.28m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LIMITED.
M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

COMMISSIONING RECORD BHP12
DATE 23/10/97

TIME(mins)	WATER LEVEL(m)
0	+0.14
0.5	5.20
1	5.98
2	6.30
3	6.55
4	6.82
5	6.91
10	7.31
15	7.49
20	7.71
30	7.73

TIP DEPTH: 10.40m

INITIAL WATER LEVEL: 8.10m

AMOUNT OF WATER ADDED: 10 gal.

COMMENTS:

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L:0.29m

HEIGHT OF PIPE A.B.G.L: 0.14m

MEASURED FROM: G.L

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB3

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
04/11/97	13:10	6.52	48.19
05/11/97	16:20	7.82	46.89
14/11/97	15:30	3.02	51.69
25/11/97	11:35	2.61	52.10
02/12/97	16:00	1.42	53.29
09/12/97	13:00	2.57	52.14
13/12/97	09:40	1.53	53.18
15/12/97	09:40	2.37	52.34
17/12/97	10:40	2.97	51.74
18/12/97	11:40	2.87	51.84
19/12/97	15:00	3.21	51.50
20/12/97	10:50	1.63	53.08
21/12/97	13:35	1.76	52.95

TIP DEPTH: 10.05m

TYPE OF COVER: BARREL

HEIGHT OF COVER A.B.G.L: 0.38m

HEIGHT OF PIPE A.B.G.L: 0.28m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB4A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
05/11/97	16:00	13.03	68.96
11/11/97	13:00	12.40	69.59
14/11/97	15:20	9.02	72.97
25/11/97	11:25	11.10	70.89
02/12/97	15:45	10.94	71.05
09/12/97	15:50	11.05	70.94
13/12/97	10:00	11.21	70.78
15/12/97	10:00	10.94	71.05
17/12/97	11:00	11.07	70.92
18/12/97	11:30	11.17	70.82
19/12/97	15:20	11.12	70.87
20/12/97	11:10	11.01	70.98
21/12/97	14:55	11.04	70.95

TIP DEPTH:14.51m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.52m

HEIGHT OF PIPE A.B.G.L:0.38m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB6A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/5/97	15:50	5.03	99.17
11/11/97	12:10	3.40	100.80
11/14/97	15:15	3.60	100.60
11/25/97	11:10	3.59	100.61
12/2/97	15:20	3.61	100.59
12/9/97	15:40	3.60	100.60
12/18/97	12:40	3.56	100.64

TIP DEPTH:13.13m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.62m

HEIGHT OF PIPE A.B.G.L:0.31m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB7A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/11/97	12:50	26.20	71.16
14/11/97	15:10	25.02	72.34
25/11/97	11.05	23.79	73.57
02/12/97	15:25	23.97	73.39
09/12/97	12:40	23.82	73.54
13/12/97	14:40	25.52	71.84
15/12/97	14:40	24.96	72.40
17/12/97	09:20	26.01	71.35
18/12/97	12:45	24.72	72.64
19/12/97	14:00	24.05	73.31
20/12/97	09:30	23.51	73.85
21/12/97	11:35	24.62	72.74

TIP DEPTH:28.48m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.62m

HEIGHT OF PIPE A.B.G.L:0.51m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB7B

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
12/1/97	10:30	3.82	93.58
12/9/97	12:40	4.70	92.70
12/18/97	12:45	4.87	92.53

TIP DEPTH: 18.50m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.40m

HEIGHT OF PIPE A.B.G.L:0.34m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB8A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/5/97	15:40	5.58	76.46
11/11/97	12:30	18.98	63.06
11/14/97	14:35	18.53	63.51
11/25/97	10:15	15.17	66.87
12/9/97	15:30	16.02	66.02
12/18/97	12:30	14.63	67.41

TIP DEPTH:20.65m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.44m

HEIGHT OF PIPE A.B.G.L:0.16m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB9A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
30/10/97	13:10	2.10	99.63
05/11/97	17:00	2.38	99.35
14/11/97	15:00	1.23	100.50
25/11/97	10:55	0.98	100.75
01/12/97	09:25	0.91	100.82
09/12/97	16:50	0.94	100.79
13/12/97	13:20	1.02	100.71
15/12/97	13:20	1.02	100.71
16/12/97	15:20	0.97	100.76
19/12/97	12:30	1.12	100.61
20/12/97	15:30	1.75	99.98
21/12/97	10:05	1.13	100.60

TIP DEPTH:4.18m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.40m

HEIGHT OF PIPE A.B.G.L:0.31m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB9B

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
12/16/97		+0.82m	102.62

TIP DEPTH:15.50m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.52m

HEIGHT OF PIPE A.B.G.L:0.45m

COMMENTS:

Piezometer increased in height by 1 metre.
Head of water measured at 0.82m above G.L.

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB10A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
05/11/97	16:05	6.71	79.19
14/11/97	14:40	1.50	84.40
25/11/97	10:25	0.77	85.13
01/12/97	10:35	0.16	85.74
12/12/97	14:05	1.42	84.48
13/12/97	13:00	1.01	84.89
15/12/97	13:00	1.09	84.81
16/12/97	15:00	0.44	85.46
18/12/97	12:25	0.40	85.50
19/12/97	12:10	0.11	85.79
20/12/97	15:10	0.68	85.22
21/12/97	09:45	0.42	85.48

TIP DEPTH:25.51m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.57m

HEIGHT OF PIPE A.B.G.L:0.39m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB10B

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
12/1/97	10:00	2.70	83.22
12/12/97	14:05	3.02	82.90
12/18/97	12:25	3.02	82.90

TIP DEPTH: 17.50m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.45m

HEIGHT OF PIPE A.B.G.L:0.37m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB11A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/5/97	15:10	5.58	59.32
11/10/97	12:15	0.50	64.40
11/14/97	14:30	0.92	63.98
11/25/97	10:10	1.10	63.80
12/2/97	16:15	0.02	64.88
12/12/97	13:35	1.04	63.86
12/18/97	12:55	0.92	63.98

TIP DEPTH:8.01m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.52m

HEIGHT OF PIPE A.B.G.L:0.48m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB12A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/13/97	16:40	1.80	92.45
11/14/97	14:00	0.87	93.38
11/25/97	10:45	1.53	92.72
12/2/97	15:05	0.92	93.33
12/12/97	14:55	1.63	92.62
12/18/97	13:15	1.72	92.53

TIP DEPTH:10.20m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.31m

HEIGHT OF PIPE A.B.G.L:0.29m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB13

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
04/11/97	13:15	3.82	85.54
05/11/94	15:30	3.84	85.52
14/11/97	14:10	+0.07	93.18
25/11/97	10:40	+0.21	93.20
02/12/97	15:00	+0.26	89.43
12/12/97	14:55	+0.08	89.57
18/12/97	13:15	+0.07	89.62

TIP DEPTH:23.10m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.29m

HEIGHT OF PIPE A.B.G.L:0.26m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB14A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
30/10/97	14:30	21.30	55.30
05/11/97	15:35	20.52	56.08
14/11/97	14:20	20.82	55.78
25/11/97	10:00	20.90	55.70
02/12/97	14:55	DRY	-
12/12/97	13:55	DRY	-
13/12/97	11:20	DRY	-
15/12/97	11:20	DRY	-
16/12/97	13:20	DRY	-
18/12/97	12:15	20.70	55.90
19/12/97	10:30	DRY	-
20/12/97	13:30	DRY	-
21/12/97	12:05	DRY	-

TIP DEPTH:21.30m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.23m

HEIGHT OF PIPE A.B.G.L:0.17m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB15A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/5/97	15:20	1.21	78.35
11/10/97	12:10	0.18	79.38
11/14/97	14:15	+0.13	80.77
11/25/97	9:50	+0.20	79.74
12/2/97	14:50	0.22	78.35
12/12/97	13:45	0.20	79.38
12/18/97	12:05	0.21	79.43

TIP DEPTH:10.40m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.40m

HEIGHT OF PIPE A.B.G.L:0.22m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB16

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
01/12/97	09:30	DRY	/
09/12/97	13:50	DRY	/
18/12/97	12:10	DRY	/

TIP DEPTH:19.85m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.41m

HEIGHT OF PIPE A.B.G.L:0.30m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB18

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
26/11/97	10:00	9.90	38.32
02/12/97	14:45	DRY	-
12/12/97	13:40	DRY	-
18/12/97	12:00	DRY	-

TIP DEPTH:10.20m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.36m

HEIGHT OF PIPE A.B.G.L:0.27m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHB19A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
12/6/97	12:30	9.30	18.13
12/9/97	13:25	9.62	17.81
12/18/97	11:45	9.51	17.92

TIP DEPTH:19.00m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.00m

HEIGHT OF PIPE A.B.G.L:-0.05m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHC5

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
15/11/97	09:20	2.75	8.36
26/11/97	10:50	2.85	8.4
02/12/97	17:00	2.05	11.11
12/12/97	15:10	2.65	8.36
18/12/97	13:30	2.71	11.11

TIP DEPTH:7.42m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.35m

HEIGHT OF PIPE A.B.G.L:0.28m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHC5A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
25/11/97	12:10	0.77	10.34
02/12/97	17:05	0.62	10.49
12/12/97	15:10	0.83	10.28
18/12/97	13:30	0.73	10.38

TIP DEPTH:2.30

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.30m

HEIGHT OF PIPE A.B.G.L:0.23m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHD3

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/28/97	9:00	1.53	4.35
12/3/97	12:00	1.52	4.36
12/12/97	15:20	1.42	4.46
12/18/97	13:40	1.42	4.46

TIP DEPTH:11.00m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.24m

HEIGHT OF PIPE A.B.G.L:0.11m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHD5

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
15/11/97	10:00	1.52	4.51
25/11/97	12:35	1.44	4.59
03/12/97	12:10	1.52	4.51
12/12/97	15:30	1.54	4.49
18/12/97	13:50	1.68	4.35

TIP DEPTH:12.72m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.43m

HEIGHT OF PIPE A.B.G.L:0.36m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHD6

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
15/11/97	10:40	1.50	4.41
25/11/97	12:41	0.72	5.19
03/12/97	12:15	1.33	4.58
12/12/97	15:45	1.64	4.27
18/12/97	14:05	1.73	4.18

TIP DEPTH:18.40m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.20m

HEIGHT OF PIPE A.B.G.L:0.16m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHE3A

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
15/11/97	11:40	3.61	2.80
25/11/97	12:50	3.49	2.92
03/12/97	11:30	3.52	2.89
12/12/97	15:55	3.51	2.90
18/12/97	14:15	3.42	2.99

TIP DEPTH:28.85m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.40m

HEIGHT OF PIPE A.B.G.L:0.31m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHE4

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
05/11/97	16:40	1.80	4.74
13/11/97	16:20	3.16	3.38
14/11/97	14:00	2.33	4.21
25/11/97	13:00	2.62	3.92
03/12/97	11:40	3.27	3.27
12/12/97	16:00	2.89	3.65
18/12/97	14:20	2.71	3.83

TIP DEPTH:12.14m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.53m

HEIGHT OF PIPE A.B.G.L:0.40m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHF1

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/28/97	10:30	GL	/
12/3/97	10:20	GL	/
12/11/97	14:40	GL	/
12/17/97	13:40	GL	/

TIP DEPTH:18.00m

TYPE OF COVER:FLUSH COVER

HEIGHT OF COVER A.B.G.L:0.00m

HEIGHT OF PIPE A.B.G.L:-0.04m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHF2

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
15/11/97	08:30	7.62	1.15
25/11/97	14:05	7.81	0.96
03/12/97	10:45	6.92	1.85
11/12/97	14:30	7.42	1.35
17/12/97	13:20	7.37	1.40

TIP DEPTH:17.01m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.48m

HEIGHT OF PIPE A.B.G.L:0.39m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHF4

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/27/97	13:30	6.97	2.34
12/3/97	10:50	6.83	2.48
12/11/97	14:20	6.32	2.99
12/17/97	13:10	6.64	2.67

TIP DEPTH:31.50m

TYPE OF COVER:FLUSH COVER

HEIGHT OF COVER A.B.G.L:0.00m

HEIGHT OF PIPE A.B.G.L:-0.02m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHF5

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/27/97	14:15	6.81	2.95
12/3/97	10:55	6.72	3.04
12/11/97	14:00	7.16	2.60
12/17/97	13:00	7.32	2.44

TIP DEPTH:17.00m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.26m

HEIGHT OF PIPE A.B.G.L:0.19m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHF6

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
28/11/97	11:00	7.30	1.50
03/12/97	11:05	5.93	2.87
11/12/97	13:50	8.32	0.48
17/12/97	12.37	8.60	0.20

TIP DEPTH:29.60m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.41m

HEIGHT OF PIPE A.B.G.L:0.31m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHG1

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/27/97	10:45	6.05	0.15
12/3/97	8:30	3.72	2.48
12/11/97	13:25	3.81	2.39
12/17/97	12:15	4.02	2.18

TIP DEPTH:36.00m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.43m

HEIGHT OF PIPE A.B.G.L:0.36m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHG2

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
27/11/97	11:30	5.72	2.32
03/12/97	08:50	4.20	3.84
11/12/97	13:20	3.98	4.06
17/12/97	12:10	4.12	3.92

TIP DEPTH:13.72m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.29m

HEIGHT OF PIPE A.B.G.L:0.22m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHG3

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/15/97	12:15	5.21	2.77
11/25/97	14:10	3.52	4.46
12/3/97	9:00	3.12	4.86
12/11/97	13:10	3.62	4.36
12/17/97	12:00	3.70	4.28

TIP DEPTH:19.50m

TYPE OF COVER:FLUSH COVER

HEIGHT OF COVER A.B.G.L:0.00m

HEIGHT OF PIPE A.B.G.L:0.00m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHG6

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/27/97	9:30	4.72	2.28
12/3/97	9:05	4.03	2.97
12/11/97	13:00	4.52	2.48
12/17/97	11:55	4.68	2.32

TIP DEPTH:16.00m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.11m

HEIGHT OF PIPE A.B.G.L:0.09m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHH7

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/15/97	16:10	3.30	3.72
11/25/97	14:15	1.32	5.70
12/11/97	12:40	1.43	5.59
12/17/97	11:30	1.62	5.40

TIP DEPTH:14.43m

TYPE OF COVER:FLUSH COVER

HEIGHT OF COVER A.B.G.L:0.00m

HEIGHT OF PIPE A.B.G.L:-0.09m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHJ2

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
13/11/97	15:00	0.73	4.33
14/11/97	12:00	1.22	3.84
25/11/97	12:25	0.31	4.75
10/12/97	15:10	0.47	4.59
16/12/97	16:15	0.62	4.44

TIP DEPTH:13.30m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.21m

HEIGHT OF PIPE A.B.G.L:0.14m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHL3

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/13/97	14:20	1.31	3.87
11/14/97	11:30	1.22	3.96
11/25/97	14:35	1.21	3.97
12/10/97	14:50	1.10	4.08
12/16/97	15:55	1.15	4.03

TIP DEPTH:13.50m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.24m

HEIGHT OF PIPE A.B.G.L:0.20m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHM2

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
22/10/97	12:00	0.56	4.11
14/11/97	11:10	+0.18	4.49
25/11/97	15:15	0.06	4.61
01/12/97	16:30	+0.04	4.63
10/12/97	14:10	0.03	4.64
16/12/97	15:46	0.03	4.64

TIP DEPTH:8.00m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.19m

HEIGHT OF PIPE A.B.G.L:0.12m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHM4

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
15/11/97	13:30	+0.04	4.61
25/11/97	15:20	+0.02	4.59
01/12/97	16:35	+0.02	4.59
10/12/97	14:00	+0.04	4.61
16/12/97	15:35	+0.04	4.61

TIP DEPTH:7.84m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.20m

HEIGHT OF PIPE A.B.G.L:0.19m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHM6

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
15/11/97	14:00	3.52	7.53
25/11/97	15:25	3.17	7.88
02/12/97	11:00	1.67	9.38
10/12/97	14:30	1.86	9.19
16/12/97	15:35	1.93	9.12

TIP DEPTH:6.53m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.22m

HEIGHT OF PIPE A.B.G.L:0.14m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHN2

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/11/97	14:00	8.23	19.87
14/11/97	10:40	7.90	20.20
24/11/97	17:00	4.15	23.95
01/12/97	16:00	7.32	20.78
10/12/97	14:20	7.92	20.18
16/12/97	15:25	8.03	20.07

TIP DEPTH:9.30m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.33m

HEIGHT OF PIPE A.B.G.L:0.27m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHN4

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/11/97	14:20	3.49	17.89
14/11/97	10:35	3.78	17.60
24/11/97	16:55	3.94	17.44
01/12/97	16:05	3.59	17.79
10/12/97	14:25	3.87	17.51
16/12/97	15:30	3.92	17.46

TIP DEPTH:5.45m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.20m

HEIGHT OF PIPE A.B.G.L:0.13m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHN5

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
15/11/97	15:00	DRY	/
24/11/97	16:48	DRY	/
01/12/97	15:50	DRY	/
10/12/97	14:55	DRY	/
16/12/97	15:00	DRY	/

TIP DEPTH:14.47m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.23m

HEIGHT OF PIPE A.B.G.L:0.17m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHN8

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/11/97	14:30	5.64	6.56
14/11/97	10:20	5.50	6.70
24/11/97	15:50	4.07	8.13
01/12/97	15:25	4.59	7.61
10/12/97	14:00	4.70	7.50
16/12/97	15:05	4.87	7.33

TIP DEPTH:8.90m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.29m

HEIGHT OF PIPE A.B.G.L:0.25m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHN9

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/11/97	14:40	3.50	6.67
14/11/97	10:00	3.29	6.88
24/11/97	15:35	2.70	7.47
01/12/97	15:30	2.28	7.89
10/12/97	13:55	2.67	7.50
16/12/97	15:00	2.70	7.47

TIP DEPTH:9.17m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.27m

HEIGHT OF PIPE A.B.G.L:0.21m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHN10B

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/11/97	14:50	4.17	6.63
11/14/97	10:25	3.98	6.82
11/24/97	15:40	3.22	7.58
12/1/97	15:35	3.12	7.68
12/10/97	13:50	3.87	6.93
12/16/97	14:55	3.93	6.87

TIP DEPTH:6.48m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.32m

HEIGHT OF PIPE A.B.G.L:0.27m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHP1

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
23/10/97	14:20	DRY	/
14/11/97	12:55	6.80	34.90
24/11/97	16:05	6.52	35.18
01/12/97	11:55	8.82	32.88
10/12/97	13:45	6.87	34.83
16/12/97	14:50	6.91	34.79

TIP DEPTH:7.90m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.48m

HEIGHT OF PIPE A.B.G.L:0.41m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHP4

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LAVEL mOD
30/10/97	12:20	DRY	/
14/11/97	12:45	DRY	/
24/11/97	16:15	DRY	/
01/12/97	11:50	DRY	/
10/12/97	13:25	DRY	/
16/12/97	14:30	DRY	/

TIP DEPTH:7.40m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.31m

HEIGHT OF PIPE A.B.G.L:0.26m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHP5

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
30/10/97	11:30	DRY	/
14/11/97	12:50	6.01	20.89
24/11/97	16:13	6.22	20.68
01/12/97	11:40	6.06	20.84
10/12/97	13:35	6.18	20.72
16/12/97	14:40	6.21	20.69

TIP DEPTH:7.10m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.33m

HEIGHT OF PIPE A.B.G.L:0.28m

COMMENTS:

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHP12

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
23/10/97	15:00	8.10	27.85
14/11/97	12:30	6.62	29.33
24/11/97	16:00	6.82	29.13
01/12/97	11:00	5.77	30.18
10/12/97	13:20	6.82	29.13
16/12/97	14:25	7.01	28.94

TIP DEPTH:10.40m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.29m

HEIGHT OF PIPE A.B.G.L:0.14m

COMMENTS:

GEOPHYSICS (TERRADAT) REPORT

REPORT

GEOPHYSICAL SURVEY

M4 CASTLETON TO MAGOR RELIEF ROAD

STAGE 2 GROUND INVESTIGATIONS

Prepared for:

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APPENDIX A - Understanding Microgravity Anomalies

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1. INTRODUCTION

A geophysical survey has been carried out under subcontract to Norwest Holst Ltd. as part of the Stage 2 M4 Relief Road Preliminary Ground Investigation. The geophysical work targeted solution features and geological structure at the proposed interchanges near Magor and Castleton, respectively. Downhole seismic surveys were carried out at both sites to provide bedrock velocity information.

2. SURVEY DESCRIPTION

2.1 Magor Survey (Microgravity)

2.1.1 Introduction

The density contrast between different Earth materials provides a useful means for mapping subsurface structures through measurement of associated localised variation in the Earth's gravitational field. The presence of an anomalously high (or low) density body in the subsurface causes a localised high (or low) anomaly in the measured gravitational field. The gravity effects described are extremely small, however, modern instrumentation and exhaustive data processing techniques enable detection of geological and artificial structures relevant to the engineering and groundwater industries.

Increase in both the size of a body and the density contrast with its host material, proportionally increases its detectability using gravitational methods. However, there is a reduction in both spatial resolution and detectability with increased depth of burial. Typical targets for a microgravity survey include location of buried channels, solution features, vertical structures, geological lineations and groundwater movement through monitoring with time. The principal limitation on the use of gravity is the time required for careful acquisition and data processing.

2.1.2 Survey Description

A microgravity survey has been carried out to target possible solution features in the local Limestone at Magor. The survey was carried out over two areas, B and C/D, totalling about 20,000m^2 and 10,000 m^2 respectively, as indicated on the site plans in Figures T1 & T4. Readings were recorded at 5m spaced grid nodes to cover the areas at relatively high resolution in order to locate potentially small solution features. The data acquisition was carried out over a period of 22 days.

The survey was designed to map areas of localised mass deficiency in the shallow subsurface that may be indicative of underlying solution features. Since void space (0g/cm3), ground water (1g/cm3) and unconsolidated sediments (~1.9g/cm3) are all significantly less dense than limestone bedrock (~2.6g/cm3) (Telford et al., 1990) the presence of solution features and rockhead depressions can be readily located through high precision measurement of variation in the local gravitational field. In order to record gravity data of sufficient precision to detect small cavities, it is essential to use an instrument capable of measuring to 1 microgal. TerraDat used a Scintrex CG3M instrument for the survey which is a semi-automated system with a 1 microgal precision. The main advantage of a semi-automated system is that it enables statistical averaging of readings taken every second over a fixed period of time (typically 2-3 minutes) thereby significantly reducing low level noise from nearby roadways such as the M4.

The gravity readings were processed to remove effects due to earth tides, latitude, elevation, instrument drift and regional terrain using proprietary software. The elevation of the gravity instrument was recorded to a 1mm precision at each survey station to facilitate accurate elevation correction. Errors of 1cm or greater in measured elevation create spurious anomalous gravity readings.

2.2 Castleton Survey (Ground Conductivity & Resistivity Tomography)

2.2.1 Introduction

The planned format for the geophysical work at Castleton was a seismic reflection survey linking the borehole network. Initial tests (Appendix B) indicated that sufficient resolution can not be achieved in the required 0 to 40m depth range due to a thin weathering layer that severely attenuates the necessary high frequency seismic signal. Trials carried out using resistivity tomography and ground conductivity methods indicated that essential information about bedrock structure could be derived using a combination of these electrical methods. The ground conductivity survey was required to provide bedrock outcrop information across the site to aid structural interpretation and to enable optimal positioning of the resistivity tomography lines which provide cross sectional data.

Resistivity tomography and ground conductivity surveys both rely on accurate measurement of electrical properties which are among the most useful geophysical parameters for characterising the subsurface. Variations in electrical resistivity (or conductivity) typically correlate with variations in lithology, water saturation, fluid conductivity, porosity and permeability. Depending on the particular site, these variations may be used to map stratigraphic units, geological structure, sinkholes, fractures, and groundwater. At Castleton the surveys were designed to exploit the contrast between low

resistivity clay-rich materials and more resistive coarser grained materials to enable structural modelling.

2.2.2 Ground Conductivity Background

There are a variety of ground conductivity (electromagnetic (EM)) methods that measure subsurface electrical properties. A Geonics EM31 system was used for this survey which measures apparent ground conductivity to a depth of 6m below surface. Ground conductivity instruments function by inducing eddy currents into the ground via an electromagnetic transmitter coil and measuring the resultant secondary electromagnetic field produced by conductive Earth materials via a receiver coil. The presence of metals, ions, or clays increases the ground conductivity. Conductivity readings are recorded in milliSiemens/metre. Metal detector readings are also recorded in parts per thousand of the total field but are not relevant in this instance other than for distinguishing high conductivity anomalies due to buried metal or true geological sources.

The main features that influence a ground conductivity dataset are lateral variations in shallow bedrock lithology, sediment thickness, sediment type, presence of groundwater, fracture/fault zones and artificial objects.

Following field acquisition, ground conductivity data are downloaded to a dedicated processing package (GEOSOFT) for analysis and final presentation as colour plans of lateral variation in ground conductivity. These maps may be used for identifying the position of features requiring further investigation, interpretation of structural trends or general ground characterisation depending on the survey site and objectives.

2.2.3 Ground Conductivity Survey Description

An EM31 instrument was selected for the ground conductivity survey because it provides high lateral resolution and a depth range of investigation certain to map bedrock that is known to reside at shallow depth in most areas. A grid spacing of 6 x 2 metres was adopted, with the increased detail in a direction perpendicular to the prevailing geological trends at the site. The traverse lines were spaced 6m apart with readings acquired at 2m spaced increments along each line, the boom width of the survey instrument (EM31) covers much of the ground between survey lines.

2.2.4 Resistivity Tomography Background

Acquisition of resistivity tomography data involves deployment of an array of regularly-spaced

electrodes along a survey line which are connected to a central control unit via multi-core cables. Resistivity data are then recorded via complex combinations of current and potential electrode pairs to build up a pseudo cross-section of apparent resistivity beneath the survey line. The depth of investigation depends on the electrode separation and geometry, with greater electrode separations yielding bulk resistivity measurements to greater depths.

Measured *apparent resistivity* data are plotted initially as a 'pseudo-section' image based on the current and potential electrode separations or "n" level and horizontal position of the centre of the active electrodes. This term 'pseudo-section' means that the measured values are only *apparent* in terms of magnitude, location and depth. The modelled true subsurface resistivity image is then derived from finite-difference forward modelling via RES2DINV software.

Data processing is based on an iterative routine involving determination of a two-dimensional (2D) simulated model of the subsurface which is then compared to the observed data and revised. Convergence between theoretical and observed data is achieved by non-linear least squares optimisation. The procedure is smoothness constrained to improve stability in the iterative process, the degree of smoothness being determined by a user-specified damping factor. The extent to which the observed and calculated theoretical models agree is an indication of the validity of the true resistivity model (indicated by the final root-mean-squared (RMS) error).

The true resistivity models are presented as colour-scaled contour plots of changes in subsurface resistivity with depth. The 2D method of presenting resistivity data is limited when irregular or complex geological features are present where the simple cross-section may not be indicative of the true geometry.

Geological materials have characteristic resistivity values that enable identification of boundaries between distinct lithologies on resistivity cross-sections. At some sites, however, there are overlaps between the ranges of possible resistivity values associated with sediments of variable composition, e.g., tills and fluvial sediments. The distinction of two geological units depends on percentage differences in the content of high resistivity coarse grained material and low resistivity clays and water. Borehole, seismic or other geophysical surveys can provide useful data to assist with the interpretation of resistivity cross-sections where complex lithologies are encountered.

2.2.5 Resistivity Tomography Survey Description

A total of 21 separate resistivity tomography survey lines were acquired to investigate the geological structure at the Castleton site. The survey lines vary in length between 100m and 300m depending on site obstructions such as roadways and hedges. An electrode spacing of 3.5m was adopted for nearly all of the survey lines as an optimal compromise between resolution, depth of penetration and rate of acquisition. The surveys were configured to exploit the contrast in electrical properties between clay-rich and coarser grained lithologies known to exist within the depth of interest from borehole information. An electrode configuration termed Dipole-Dipole was adopted for the survey because of its proven superiority in spatial resolution at depth. The main disadvantage of using the Dipole-Dipole configuration is the significantly longer time it takes to acquire data over any given length of survey line when compared to more widely use configurations.

The survey lines were positioned to best intersect the main features identified from the ground conductivity survey in order to record the maximum dip where possible. In any given area of the site not all of the survey lines were positioned parallel to each other and perpendicular to the interpreted strike. This approach enables early confirmation of whether inferred dip directions are correct. Measuring a range of apparent dips along different azimuths facilitates calculation of true dip through stereographic projection.

3. RESULTS

3.1 Magor Area

The results of the microgravity survey over designated areas B and C/D are shown in Figures T1, T2 & T3 and Figures T4, T5 & T6 respectively. The data are shown in relation to geographical features in Figures T1 & T4 and in closer detail in Figures T2 & T5 correlated with local topography. Perspective views of the data overlain with topographic contours (red) are shown in Figures T3 & T6. The location of subsurface mass deficiencies (suspected solution features) are revealed by the mapped anomalous 'gravity lows' and indicate the presence of sub-rockhead cavities or localised rockhead depression. The relative amplitude of the 'gravity lows' vary between about -20 microgals and -50 microgals in both of the survey areas. There is a possible system of interconnection between the gravity 'lows' in Area B which may be indicative of a linked karstic system or filled surface drainage network. The notable elongated 'low' zone in the north western part of the area shows correlation with a topographic low zone.

Three main anomalous 'low' zones have been identified at locations (344090,188125),

(344140,188105) and (344205,199090) in survey area C/D, Figure T5. There is a small topographic low zone coincident with the central gravity low. Other small gravity lows are evident within the survey area which also warrant investigation.

The recommended approach for further investigation of the identified gravity anomalies is to carry out resistivity tomography surveys to identify the cross-sectional geometry and depth of the mass deficient zones followed by invasive ground truthing where necessary. This follow-up approach would enable differentiation of sinkhole structures and rockhead channels from sub-rockhead cavities. APPENDIX A offers an explanation of possible ambiguities encountered when interpreting gravity data, and illustrates how similar anomalies can arise from different geological sources.

3.2 Castleton Area

3.2.1 Ground Conductivity

The results of the ground conductivity survey over the site at Castleton are shown in Figure T7. The main structures are evident through the mapped outcrop of contrasting high conductivity clay-rich bedrock (yellow) and low resistivity coarse-grained bedrock. The outcropping beds are most clearly evident where steeper dips are apparent or faulting has caused abrupt lateral contrast between lithologies close to surface. Where beds are dipping gently in relation to the surface topography it is difficult to identify apparent strike direction and to establish lateral continuity between observed conductivity lineations. The identified conductivity lineations reveal the apparent strike direction with respect to surface topography and facilitated optimal design of a resistivity tomography survey with most lines intersecting main features at a close to perpendicular angle to maximise measured dips.

The conductivity survey provides independent structural evidence that correlates with the expected structure from locally measured dips (Geological Survey Sheet ST 28 SE, 1979; Lawrence et al., 1981) as shown on the plans in Figures T7 & T8. There is an apparent abrupt change in measured dip direction in the vicinity of (326300, 184250) which is also suggested by the abrupt change in apparent strike direction either side of a suspected discontinuity aligned approximately parallel and ~50m to the East of the access lane between B14 and B16. The eastern half of the survey area contains the vast majority of measured dips greater than 15 degrees and as would be expected also contains the clearest conductivity lineations from mapped bedding outcrop. The part of the site crossed by Lines L & O shows gently varying ground conductivity which would suggest only small difference between the geological and topographic dip in this area. West of B4 and B5 it is also very difficult to identify any significant regular lineations. There is a notable complex area between B4 and B11 where the measured dip and ground conductivity evidence suggests the presence of folding. The three measured

dips to the immediate Southeast of B8 are aligned in contrasting directions and the presence of a mapped outcrop that curves in the opposite direction to topographic contours ~30m to the west of B7 both suggest folding. In addition, the smoothly discontinuous nature of some of the identified lineations, in particular those between B4 and B8, also suggest possible undulation of the local bedding (also evident on resistivity section Line U).

The presence of most services at shallow depth are readily detectable using ground conductivity methods, however, they do adversely affect the ability to map geological features in their immediate vicinity. Two areas of the site at Castleton are crossed by underground services and have been noted on the conductivity plan in Figure T7.

3.2.2 Resistivity Tomography

The structural symbols shown on each of the resistivity line locations (Figure T8) are derived from the cross-sectional evidence provided by the resistivity tomography sections. A simple classification has been adopted for reference to the sections where the most significant structures have been identified. The positioning of the symbols on the traverse lines do not indicate the exact position of the identified features which should be derived from the resistivity tomography sections shown in Figures T9 to T18.

There is very good correlation between the inferred structures from the ground conductivity plan and the mapped features identified from the resistivity sections. Where clear lineations are observed on the conductivity plan, steeper dipping beds or faults have been identified on the resistivity sections. Where smoothly discontinuous and broader lineations are observed on the conductivity plan, gentler dipping or folded structures have been identified on the resistivity sections.

The resistivity data suggests that near planar bedding has been mapped in places along several of the survey lines including A, B, E, G, J and L. The presence of abrupt discontinuities of distinctive high or low resistivity units suggests the presence of faults crossing some of the survey lines including B, C, F, K, Q, T and possibly I, other faults may be present where complex structures or poor data have been identified. The interpreted faults have been indicated as vertical lines on the resistivity sections because the deviation of the faults from vertical cannot be derived from the resistivity data. Significant apparent folding has been mapped along several of the survey lines including Lines M, N, R, S, U & V which are notably on the western side of the site. The main evident folding on the eastern side of the site, e.g., Lines O, K, & G, appears to be primarily related to the interpreted faulting in the area.
Limitations that affect the interpretation of the survey data include (i) the acquisition of unreliable data due to locally adverse ground conditions, (ii) the presence of a variable water table that reduces the

contrast between the more resistive coarser grained lithologies and adjacent low resistivity clay-rich lithologies, (iii) the inherent reduction in resolution with increased depth of burial that affects most non-invasive ground investigation methods. An example of limitation (i) can be seen on Line Q where although a suspected fault zone has been mapped, the r.m.s. error of the model is 15% (indicated above y axis) which indicates an inability to solve the resistivity structure with a realistic earth model. The relatively poor data has produced potentially erroneous dips either side of the interpreted fault. An example of limitation (ii) can be seen clearly on Line A at about 15m chainage where a spring line was observed on site at the time of the survey. Evidence from both the resistivity data and the boreholes suggest that while the high resistivity (red) coarser-grained lithologies continue at a steeper dip than the surface topography there is a significant reduction in contrast with the underlying more clay-rich lithologies where the groundwater is present within the coarser-grained material. This factor apparently affects the ability to clearly resolve bedding at depth along some of the survey lines and possibly in places where fractures cause localised concentrations of groundwater. An example of limitation (iii) can be seen on Line G where a high resistivity unit continues to depth at the start of the line but the contours broaden with depth due to a proportional reduction in spatial resolution which diminishes the accuracy in identifying the boundary between lithologies.

It should be noted that data acquired along Line D are of insufficient quality for presentation despite two site visits. The reasons are thought to be that the line crosses services, hedge rows and an area of complex geology at an oblique angle resulting in an unstable resistivity model. In order to provide the required information in the area around the northern part of Line D a further Line V was acquired along a more favourable azimuth to avoid the services and to better intersect the apparent strike.

3.3 Downhole surveys (Castleton and Magor)

The results of the downhole surveys are presented in the form of velocity curves (surface to depth) and travel time curves (surface to depth) plotted against depth below ground level on the same graph (Figures T19 to T38). The velocity data have been corrected for the lateral offset of the shot point from the top of the borehole. It should be noted that measured velocities are calculated from surface to depth travel-times (time) and depth below ground level (distance), therefore the velocities shown on the graphs at a particular depth are an average through the material to the surface which incorporates the weathering and soil layers. In order to calculate the velocity of subsurface materials over a small depth range at depth it is necessary to use the difference in observed travel times to the top and bottom of the zone of interest, i.e., the travel time through the zone of interest, and the thickness of the zone of interest for the calculation. Care should be taken if considering small thicknesses of material for the above calculation because of the increased percentage error in considering small time intervals. The

geometrical influence on distances due to the lateral offset of the shot from the borehole should also be accounted for in any calculation where depth ranges close to surface are considered.

4. CONCLUSIONS

1. Electromagnetic ground conductivity mapping has been used to identify variations in the geo-electrical properties of the shallow bedrock geology. These lateral variations are associated with bedrock outcrop and fault/fissure zones. The observation of lineations on the ground conductivity plan facilitated initial structural interpretation and optimal design of a resistivity tomography survey targeting structures and true dip. The presence of buried services is clearly evident in two areas of the site where high amplitude noise masks any geological signal.

2. Electrical resistivity tomography has enabled identification of apparent geological structure beneath the survey area based on observed geo-electrical contrasts. The dipole-dipole electrode configuration, adopted for the survey, proved better for resolving the local geological structure than other more commonly used arrays. In overall terms, the best sections were to the East of the survey area where strongly contrasting lithologies have been mapped and simple apparently faulted structures have been identified. The resistivity data was poor in a minority of places due to difficult near-surface ground conditions affecting current flow, suspected complex structures and/or irregular hydrology in places. In other areas the presence of a shallow water table reduced the geo-electrical contrast between targeted lithologies thereby reducing the ability to resolve the targeted bedrock boundaries.

3. High resolution microgravity data were collected over two areas in the Magor section of the proposed route. Areas of lower apparent density (mass deficiency) within the shallow subsurface have been identified and attributed either to voids within the Carboniferous Limestone, or local deepening in the elevation of bedrock which maybe associated with solution features. Recommendations for further geophysical investigation in the form of resistivity tomography to differentiate between the two possible sources low density anomaly have been made.

4. Downhole vertical P-Wave seismic profiles were acquired at boreholes along the relief road route which facilitates rock rippability and strength calculations. High quality data was acquired at all locations and are presented as graphs of depth versus velocity.

5. It should be noted that any interpretations included in this report that imply geological structure and stratigraphy are based purely on geophysical measurements and unless stated otherwise are intended as

a qualitative reference to assist in the overall interpretation of the boreholes and the local geological model.

Recommendations

1. Complex geological structure can be mapped by geophysical methods within ~20m of the surface at Castleton. Further measurements along optimally located traverse lines using longer arrays and more powerful electrical current sources could enable increased understanding of the local structure, and also improve information in areas where existing data proved unreliable.

2. Buried voids can be mapped and modelled using microgravity measurements at Magor. The source of a gravity anomaly can be more fully understood if further geophysical data is integrated with the interpretation. This would include bedrock profiling with resistivity tomography or seismic refraction. Use of resistivity tomography would also enable differentiation of air-filled voids form those containing sediment infill which are less resistive. Ground conductivity mapping may also be carried out over the gravity survey grids in order to map lateral variations in overburden thickness and to possibly identify buried voids by virtue of a variation in measured values with different selected penetration depths.

3. Depth of overburden and local bedrock topography may have hydrological significance. These can be mapped using shallow seismic refraction. A systematic seismic refraction programme would complement data collected from trial pits leading to a comprehensive overburden ispachyte map.

M4 RELIEF ROAD
MAGOR TO CASTLETON: STAGE 2

PRELIMINARY GROUND INVESTIGATION

GEOPHYSICAL SURVEY

APPENDICES

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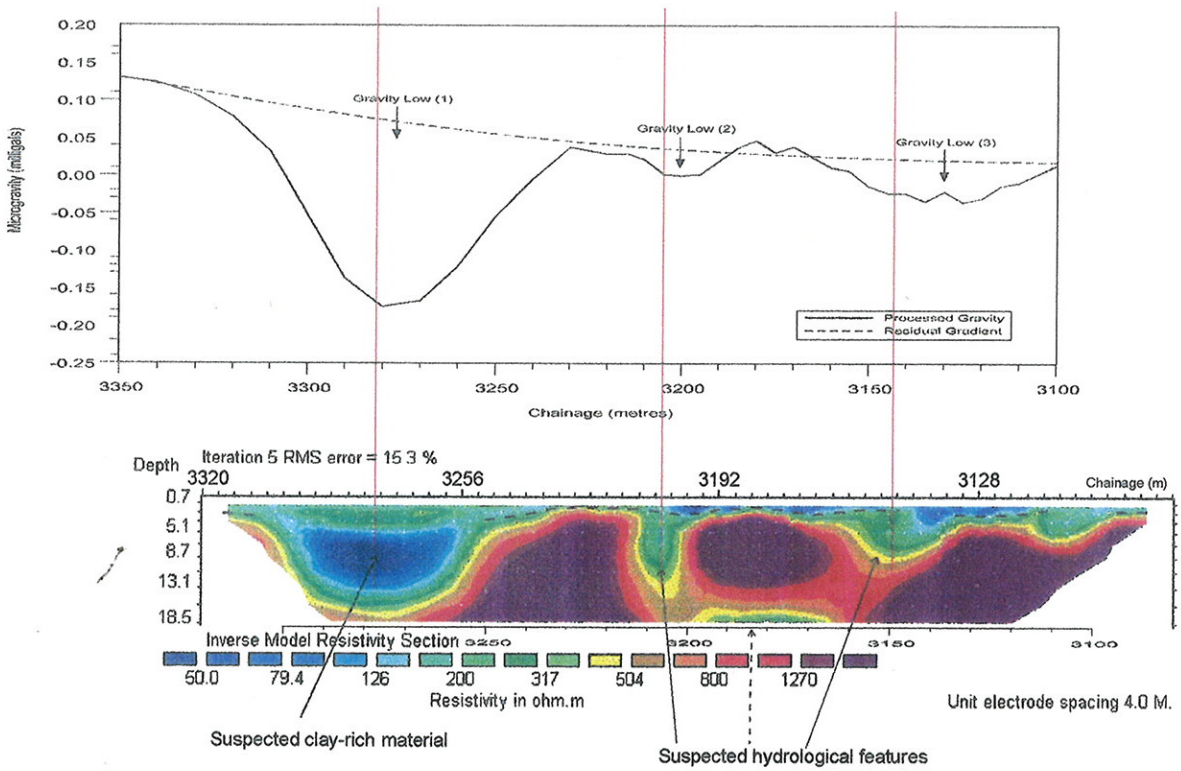
APPENDIX A
Understanding microgravity anomalies

The microgravity survey has mapped suspected solution features beneath the two survey areas by mapping localised decrease in the Earth's gravitational field. While it is possible to produce a theoretical model for the geometry of a solution cavity, in reality there are a large number of iterations of depth, size, water/air/sediment infill and density contrast that can be inferred to fit a measured anomaly. Similar anomalies can also arise from features such as a bedrock channel that is infilled with drift or linear zones of karstic erosion along fractures (see example below).

Based on gravity data alone it is difficult to distinguish between a cavity and a depression in rockhead at a similar depth although both may be caused by solution of limestone. However, solution features are often localised and less likely to exhibit laterally continuous 'gravity low' trends such as those typically recorded over a bedrock channel. The results of a complimentary geophysical technique such as seismic refraction or resistivity tomography can be used to further characterise the geology and refine the gravity model. Most commonly, a follow-up phase of invasive probing is carried out using the prioritised gravity anomalies as targets in order to conclude whether the anomaly is due to irregular rockhead or a cavity.



Results from a combined microgravity and resistivity tomography survey in Central Eire illustrating that both fracture zones and filled cavities can be located and characterised when both methods are used.

APPENDIX B
Seismic Reflection Trials

Basic Background

Seismic reflection surveying is a survey method based on the observation of seismic shock wave signal that has been generated at the surface and been reflected at geological boundaries in the subsurface. Boundaries between geological layers of contrasting density and/or velocity will reflect the incident seismic signal. By recording signal from each shot via a linear array of equally spaced geophone detectors, data can be acquired in a format that enables calculation of seismic velocities down to the main reflecting boundaries. Combination of observed travel-times and measured velocities enables depth estimates to be calculated for observed reflection events.

Carrying out a seismic reflection survey involves firing and recording shots at regular closely-spaced intervals along the survey line. The acquired data are then input to a computer to be processed with a series of data-sorting, filtering and analysis algorithms. The final output of a seismic reflection survey is a processed seismic section displaying observed reflection signal (and noise) which can be interpreted geologically.

Survey Equipment

Seismic data were acquired using the following modern acquisition equipment:

Recording instrument - Bison 9024 24 channel (Floating Point Digital Seismograph)

Sensors - 100Hz and 15Hz Geophones & 2m spaced cables

Seismic source - Buffalo Gun (firing 12, 10, 8 gauge blanks)
Sledgehammer and plate
Tractor driven Post Rammer (optional for deep penetration)

Instrument trigger - Electrical contact and inertia trigger

Seismic Tests

Seismic source tests were carried out at two locations on site at Castleton. The objective of the test was to enable assessment of two key factors that affect the selection of a suitable source and the outcome of a reflection survey, namely, (i) the depth of penetration and (ii) the dominant frequency of transmitted signal (resolution).

In order to achieve the required data quality and resolution necessary to investigate the bedrock structure within 40m of ground level it is essential to record signal to sufficient time-depth (>40ms)

with high frequency (>200Hz) for a resolution of ~2.5m. A range of sources of varying power and output signal frequency were brought to site. As a general rule, sources of low power output, e.g., a sledge hammer or a 12 gauge blank gun cartridge produce the required high frequency signal and should be used where they can be shown to provide sufficient depth of penetration. Where greater depth of penetration is required it may be necessary to use 10 gauge, 8 gauge, Post Hammer or explosive sources to provide more power but with some loss of resolution.

Seismic reflection data can be successfully acquired at most survey sites, however, the near-surface conditions will primarily determine the *depth range* over which reflection data can be observed. Two examples of data that we have been acquired at other sites are shown in Figures Tb1 & Tb2. An example of data acquired on a water-logged site is shown in Figure Tb1, the presence of shallow water facilitates transmission of *high frequency* signal which results in *high resolution* of sediment boundaries with 40m of ground level. The example shown in Figure Tb2 is from a site where dry weak materials are present at surface which prevents transmission of high frequency signal and therefore results in low resolution and no data within 40m of ground level, however, the requirement was for information in the 50 - 100m depth range where high quality data is observed. The relevance of these examples to the site in Castleton is to illustrate that good ground conditions are required to image geological boundaries within 40m of ground level and poor conditions restrict the zone of information to greater depths.

Shot records from three different sites including Castleton are compared in Figure Tb3. The comparison is drawn to further illustrate the relatively low resolution achievable at Castleton and to show the detrimental guided wave noise that is a result of the thin low velocity soil and weathered rock layer.

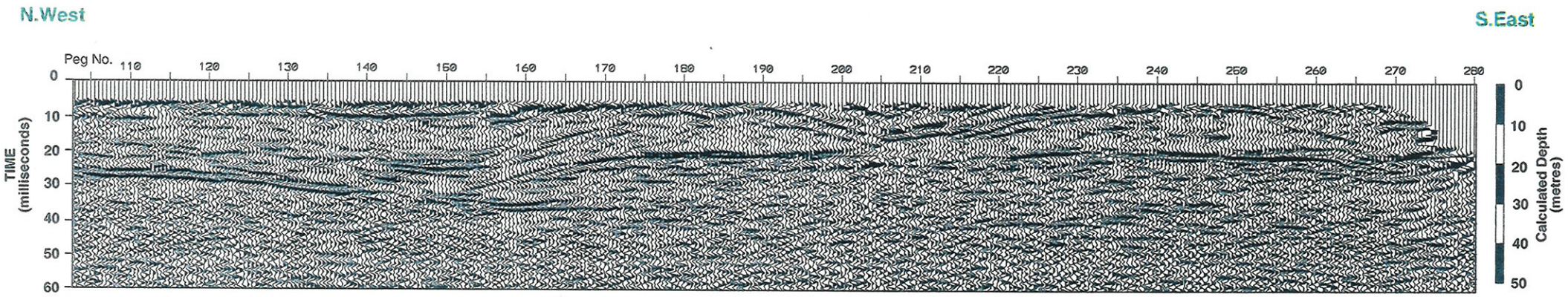
At Castleton it appears at first that the near surface ground conditions comprise compact wet clays which would typically enable acquisition of high resolution reflection data. However, following initial source tests which involved some auguring to shallow depth it became apparent that there is only a very thin crust of wet clay at surface and the shallow materials predominantly comprise weak dry clay and weathered mudstone. Material of this type severely attenuates high frequency seismic signal (similar to the way a thin pillow muffles sound) and prevents acquisition of high resolution reflection data within the required depth range.

The initial tests revealed that the required high frequency signal could not be recorded using any system but it is possible to achieve the required depth of penetration using all of the tested sources. To avoid the possibility of the test areas being unrepresentative of the site it was decided to carry out a trial survey line using survey parameters configured to investigate depths to 50m assuming that suitable signal may be recorded. The data acquired for the trial survey line has confirmed that poor ground conditions for shallow seismic work are widespread on site.

In summary, the following factors have lead to our advice that a seismic reflection survey is not carried out under the present brief :

1. The dry weak nature of the shallow ground materials prevents acquisition of high frequency data necessary for resolving boundaries within 40m of ground level.
2. The presence of a sharp near surface P-wave velocity contrast between the shallow bedrock and overburden materials causes generation of 'guided' waves which affect the quality of high resolution reflection data and can be mis-interpreted as shallow reflections.
3. The detrimental effect of relatively high seismic velocities in addition to low seismic frequency further reduces resolution to unacceptable levels for the survey design.

Seismic Section



Stratigraphic Interpretation

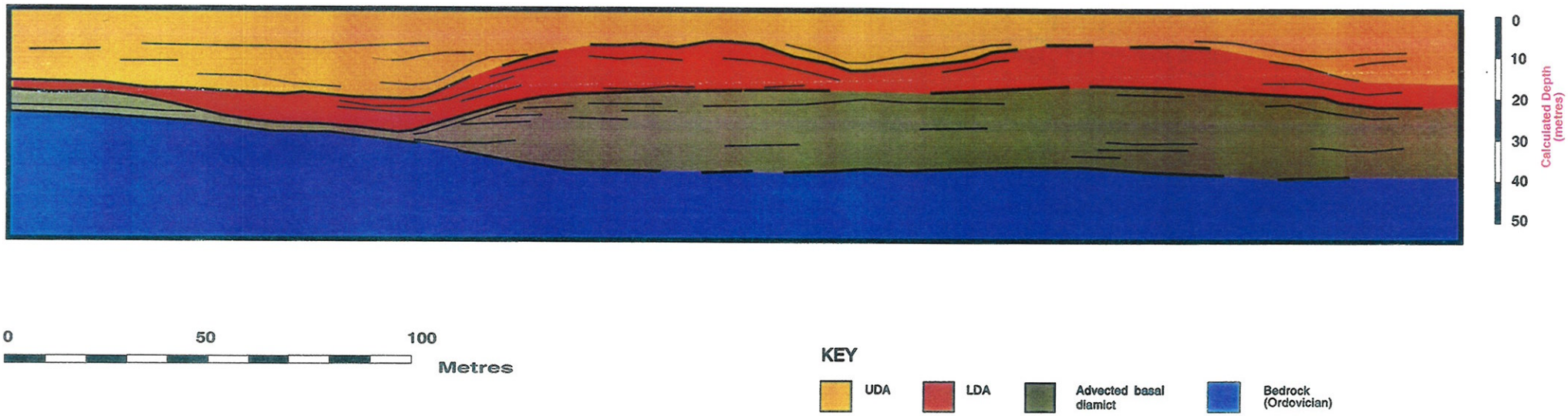
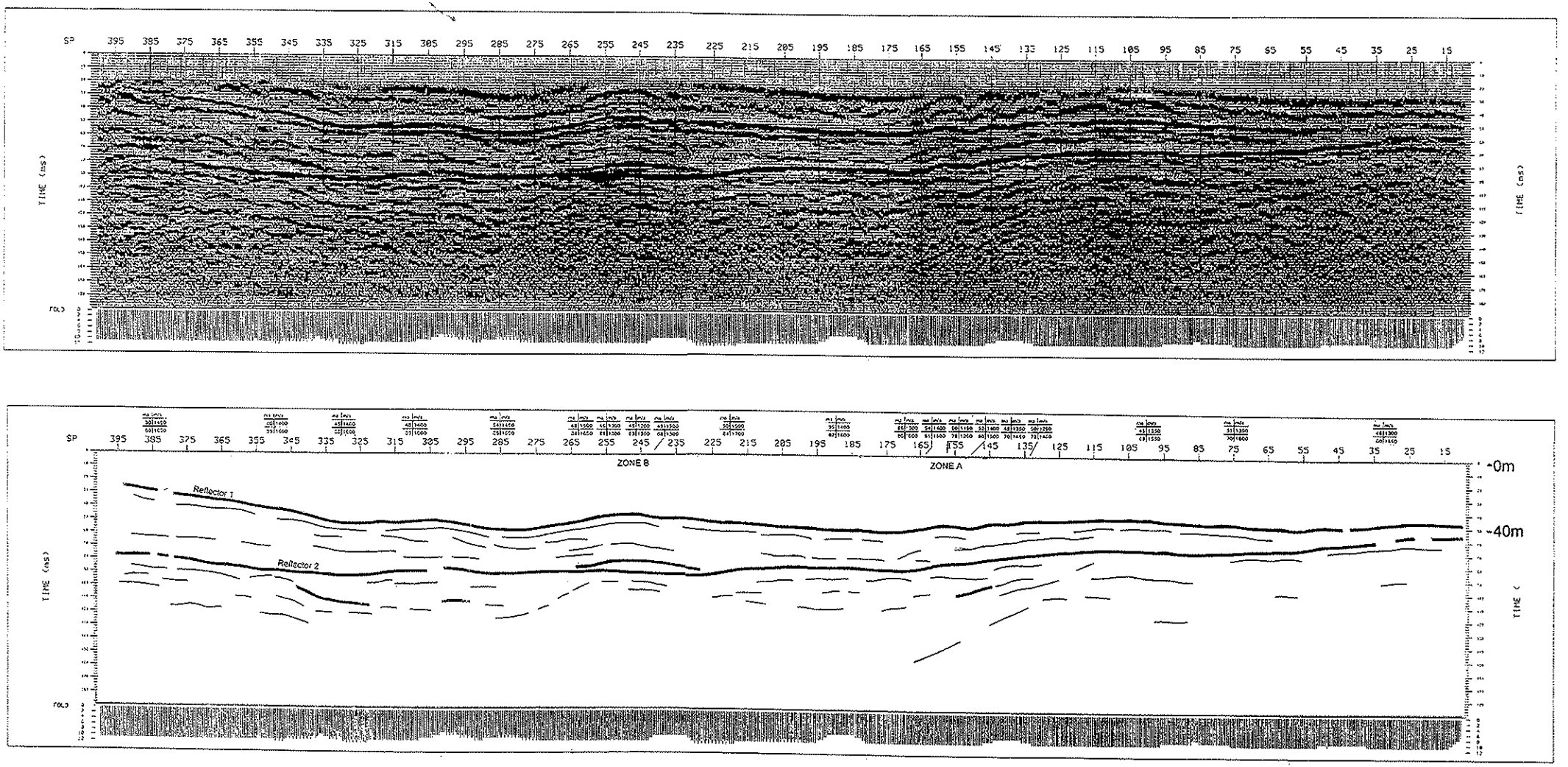


Figure Tb1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TIME (ms)
FOLD

SP
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ZONE B
ZONE A
Reflector 1
Reflector 2
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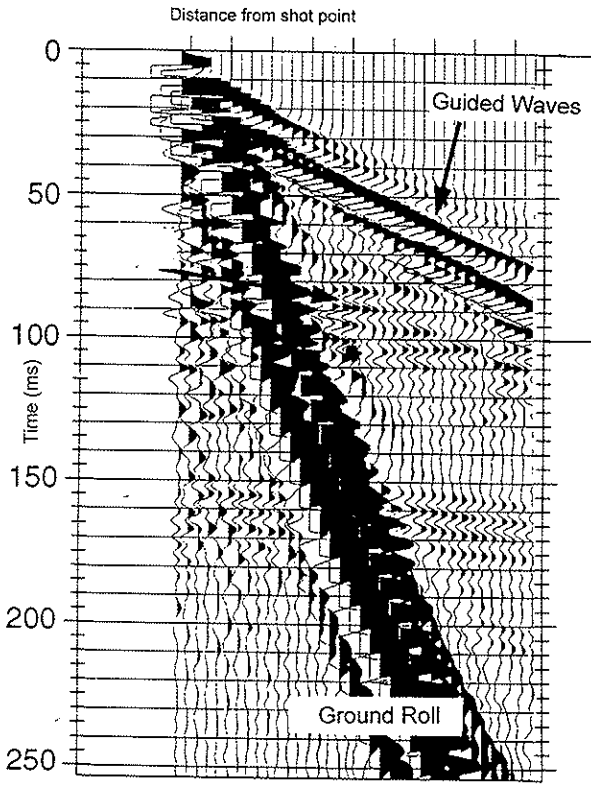
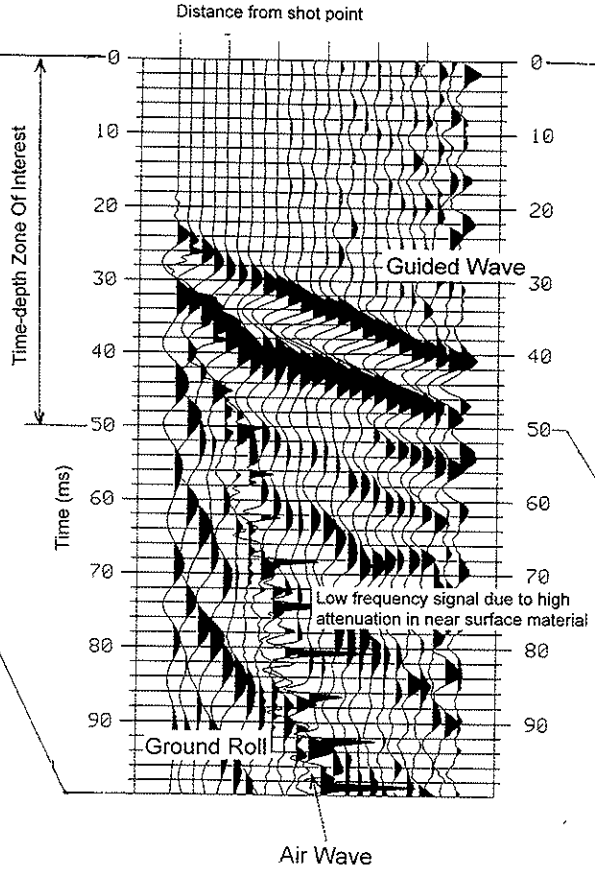
~40m
TIME (ms)
FOLD

Figure Tb2

Seismic shot record (Robertsson et al., 1996)
Low frequency data and guided wave noise



Seismic shot record (Castleton, M4 Survey)
Low frequency data and guided wave noise



Seismic shot record (McDonald et al., 1992)
High frequency data required for shallow investigation

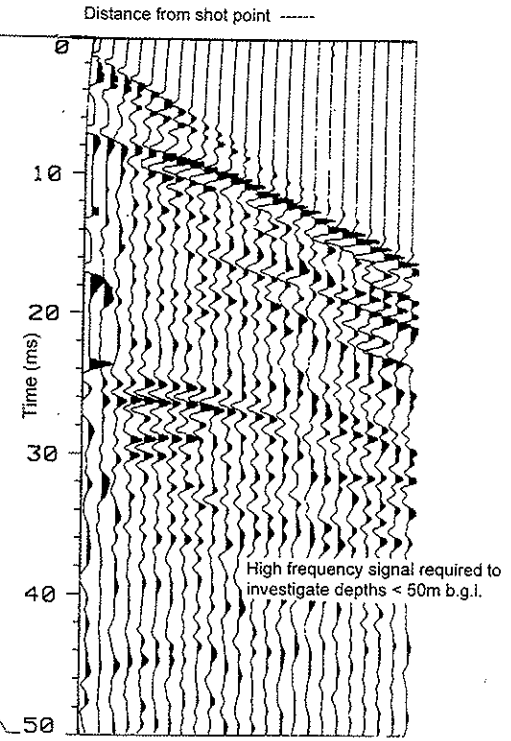


Figure Tb3

M4 RELIEF ROAD
MAGOR TO CASTLETON: STAGE 2

PRELIMINARY GROUND INVESTIGATION

GEOPHYSICAL SURVEY

MICROGRAVITY SURVEY
AREA B

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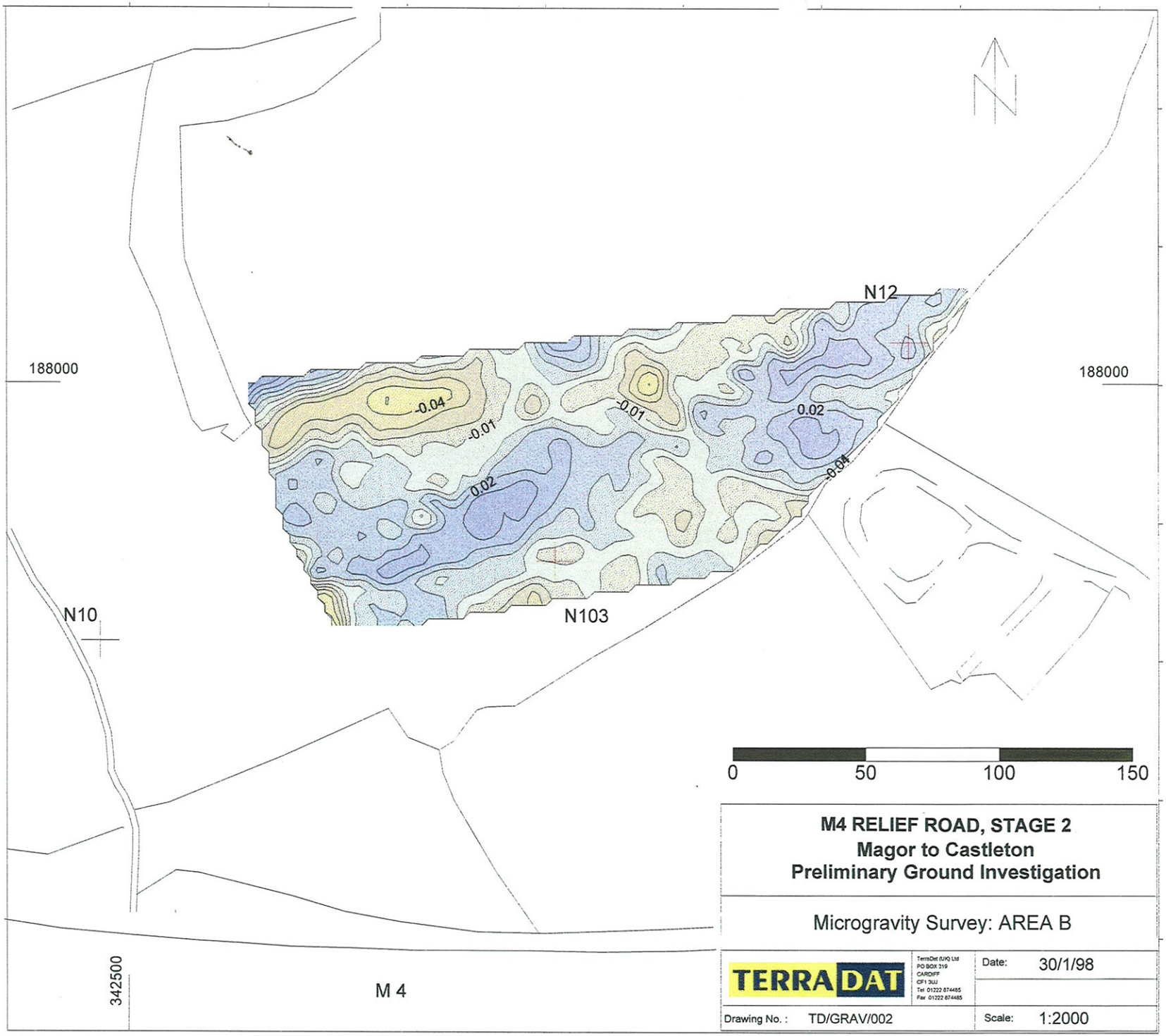

M4 RELIEF ROAD, STAGE 2
Magor to Castleton
Preliminary Ground Investigation

Microgravity Survey: AREA B

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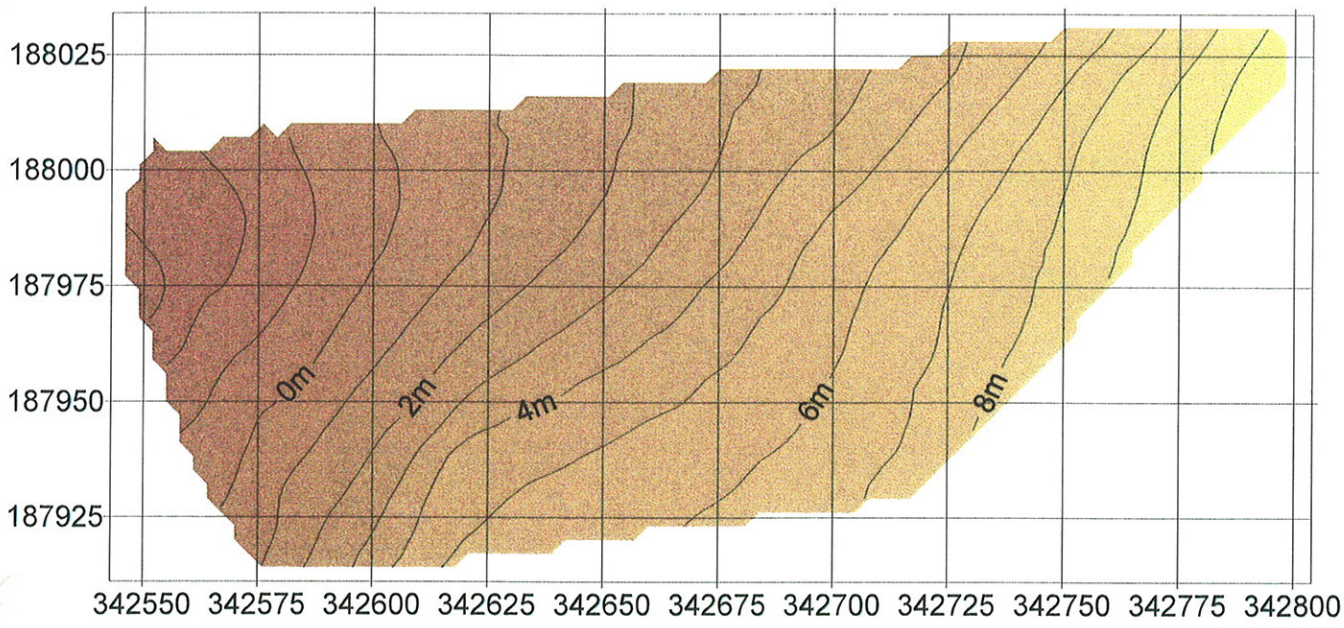
Date: 30/1/98

Drawing No. : TD/GRAV/002

Scale: 1:2000

TERRA DAT

TOPOGRAPHY



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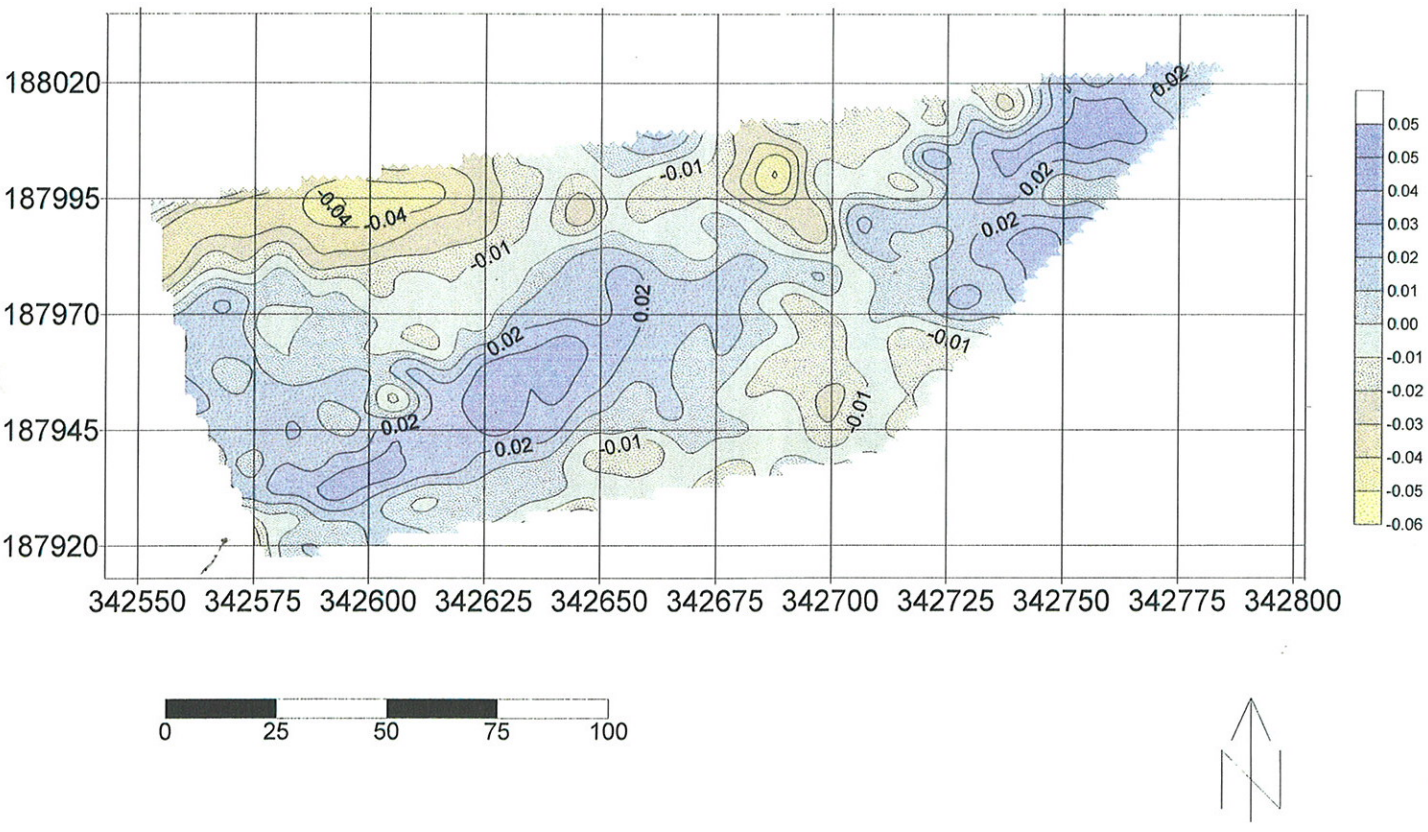

M4 RELIEF ROAD, STAGE 2

GEOPHYSICAL SURVEY, AREA B

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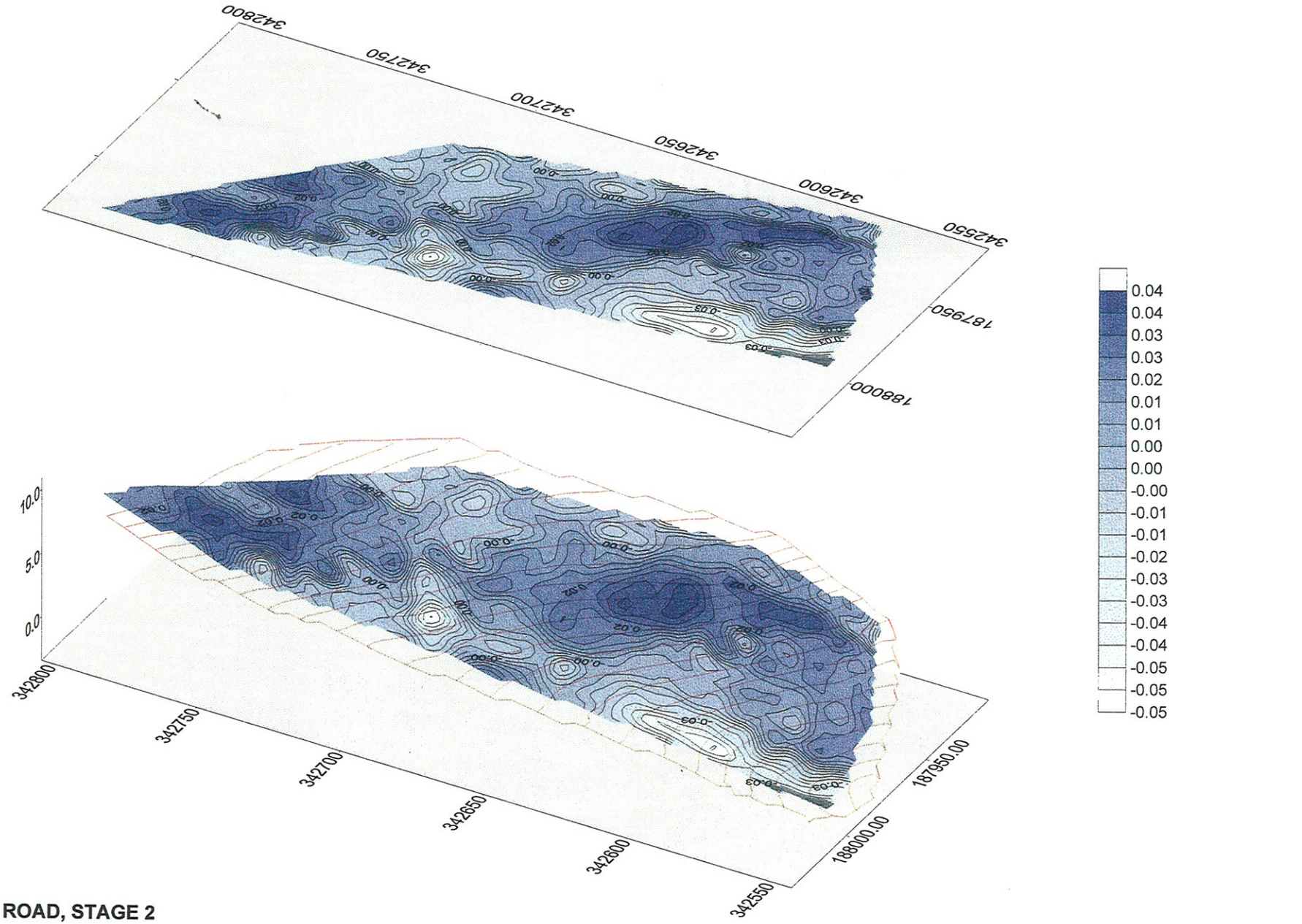

M4 RELIEF ROAD, STAGE 2

Microgravity data on topography
Area B

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M4 RELIEF ROAD
MAGOR TO CASTLETON: STAGE 2

PRELIMINARY GROUND INVESTIGATION

GEOPHYSICAL SURVEY

MICROGRAVITY SURVEY
AREA C & D

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M4 RELIEF ROAD, STAGE 2
Magor to Castleton
Preliminary Ground Investigation

Microgravity Survey: AREAS C and D

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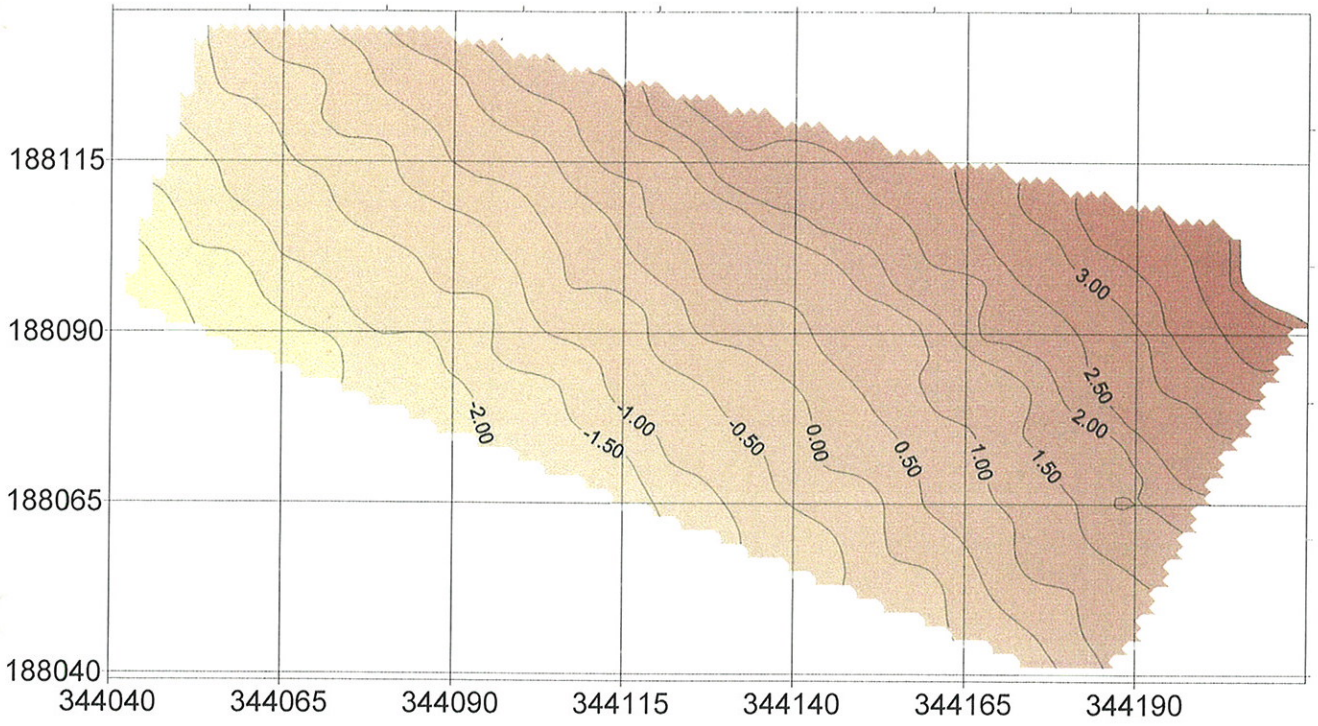
TOPOGRAPHY



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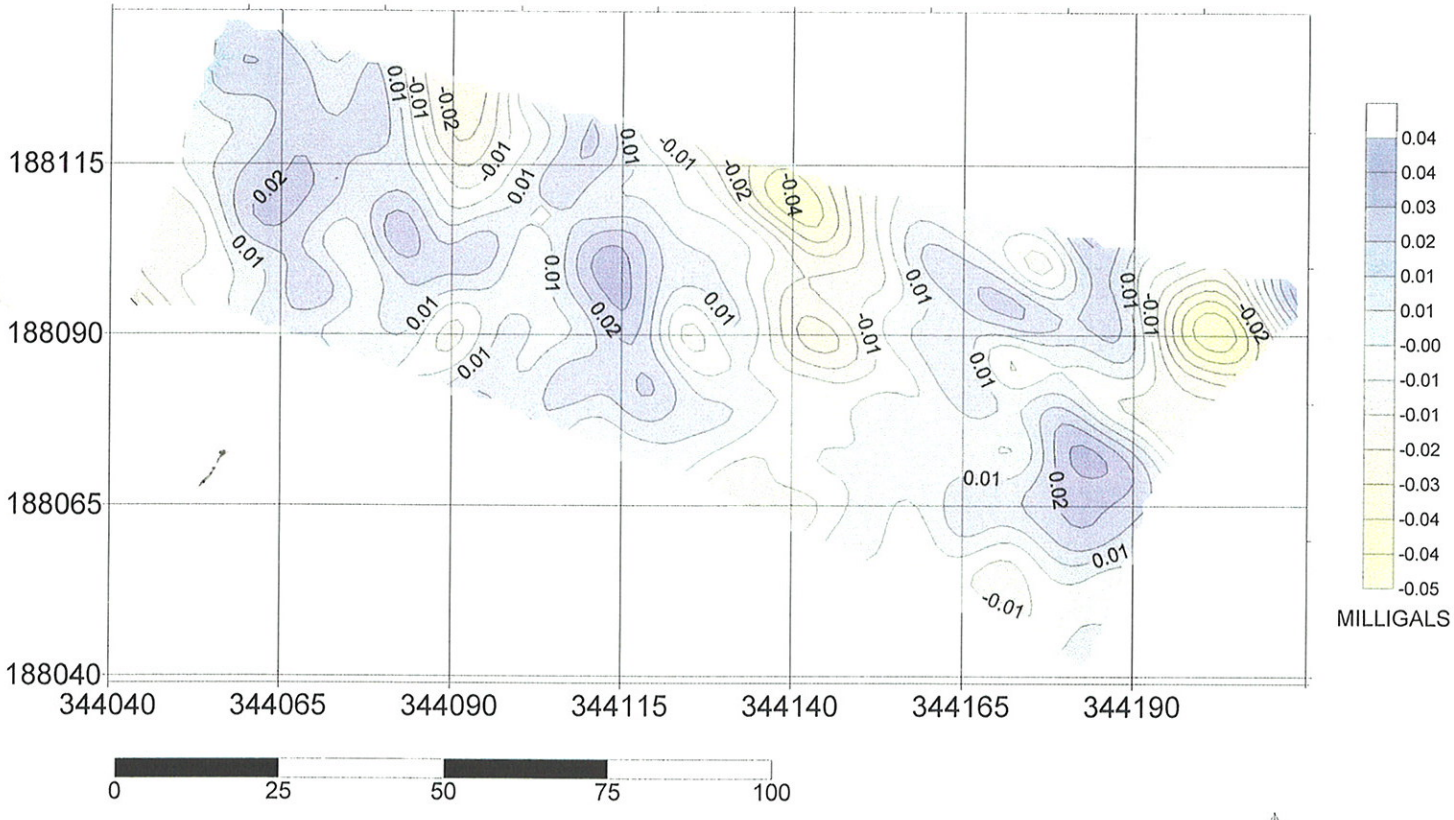

M4 RELIEF ROAD, STAGE 2

GEOPHYSICAL SURVEY, AREAS C / D

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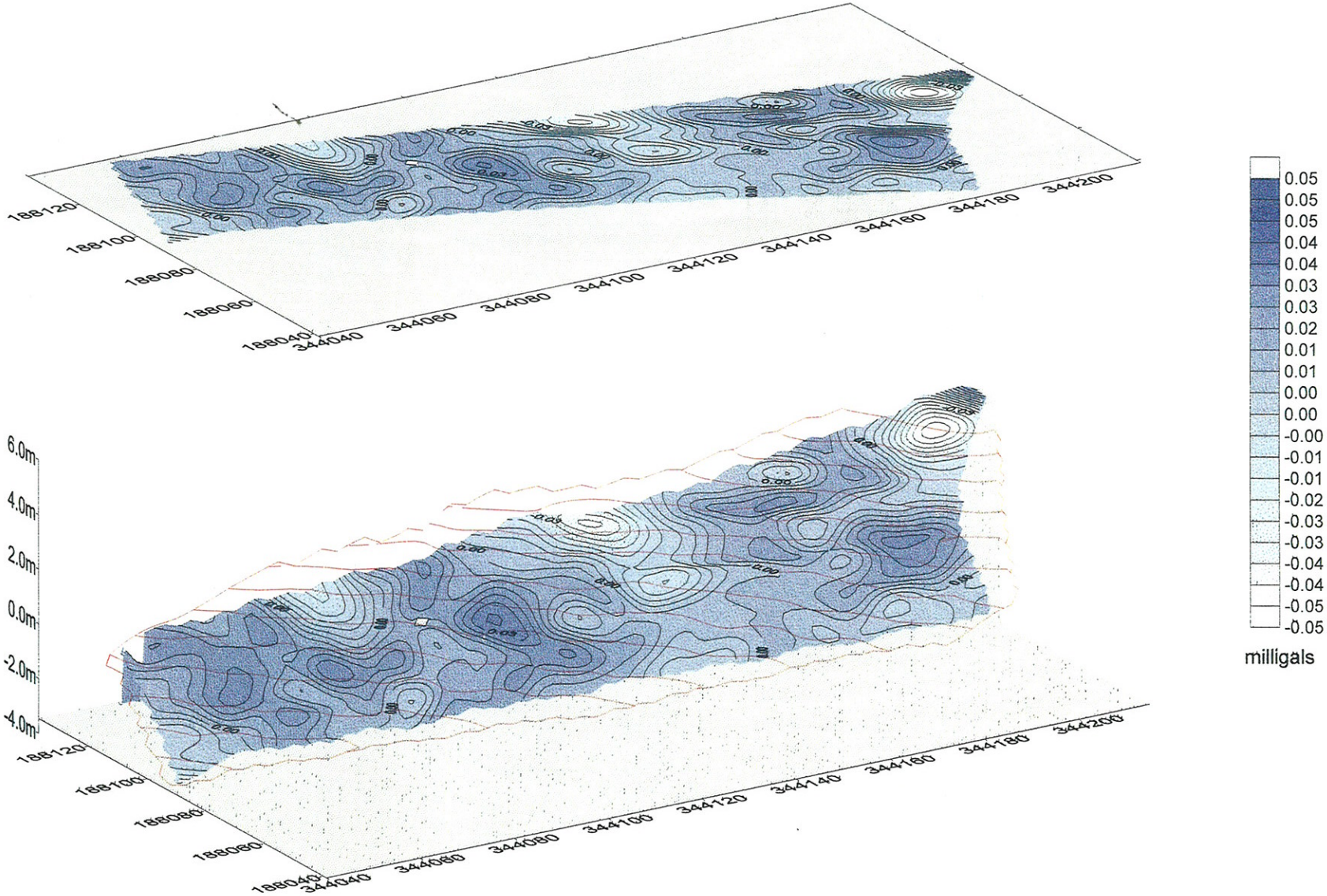

M4 RELIEF ROAD, STAGE 2

Microgravity data on topography

Area C/D

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Cardiff, UK
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M4 RELIEF ROAD
MAGOR TO CASTLETON: STAGE 2

PRELIMINARY GROUND INVESTIGATION

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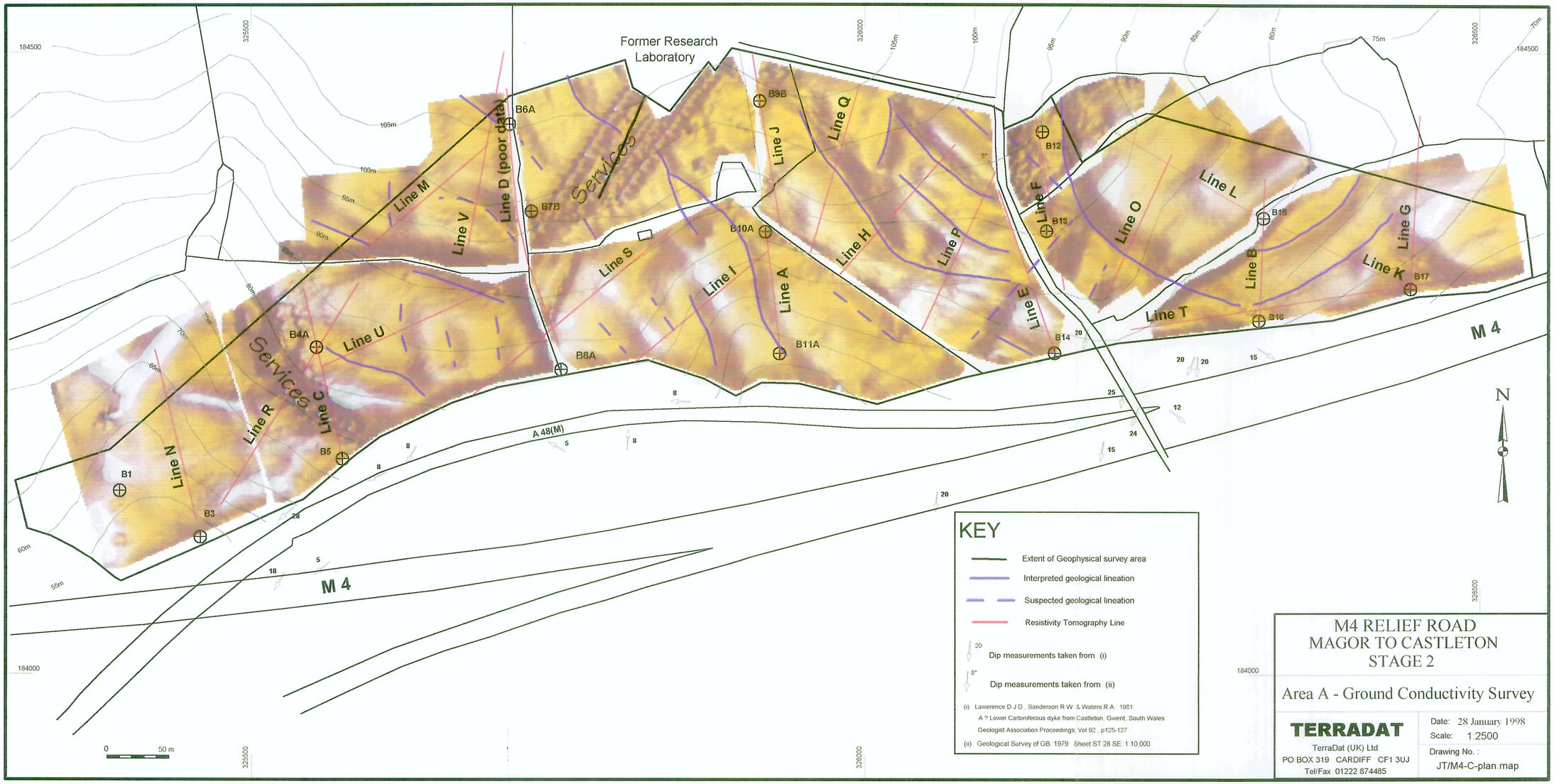
Former Research Laboratory
Line D (poor data)
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B9B
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B12
B13
B14
B15
B16
B17
A 48(M)
M 4
M 4
N
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KEY
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Interpreted geological lineation
Suspected geological lineation
Resistivity Tomography Line
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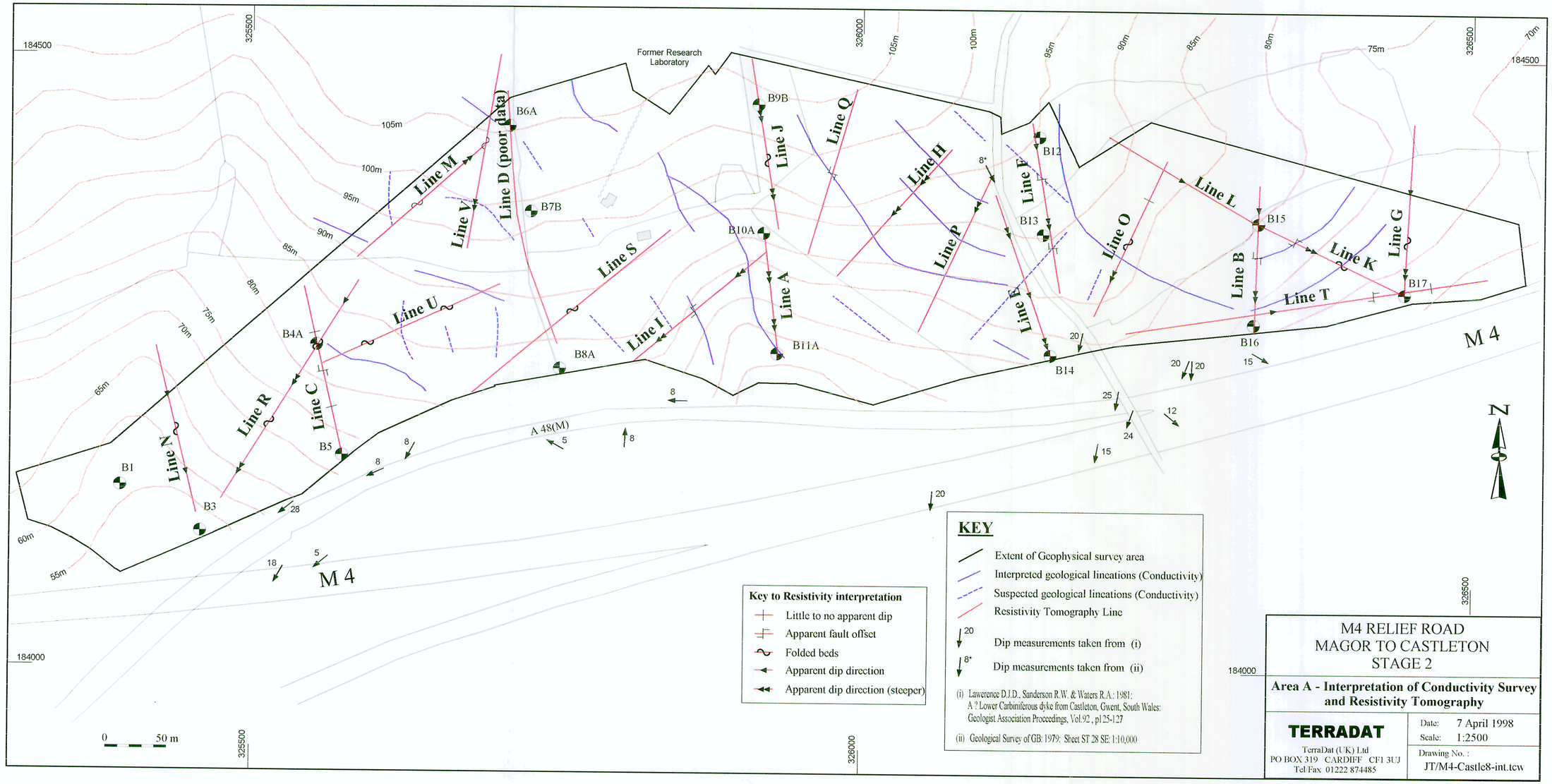
Dip measurements taken from (ii)
(i) Lawerence D J D , Sanderson R W & Waters R A 1981
A ? Lower Carbiniferous dyke from Castleton, Gwent, South Wales
Geologist Association Proceedings, Vol 92 , p125-127
(ii) Geological Survey of GB 1979 Sheet ST 28 SE 1:10,000
M4 RELIEF ROAD
MAGOR TO CASTLETON
STAGE 2
Area A - Ground Conductivity Survey
TERRADAT
TerraDat (UK) Ltd
PO BOX 319 CARDIFF CF1 3UJ
Tel/Fax 01222 874485
Date: 28 January 1998
Scale: 1:2500
Drawing No. :
JT/M4-C-plan.map


184500
326000
326500
Former Research Laboratory
105m
100m
95m
90m
85m
80m
75m
70m
65m
60m
55m
Line M
Line D (poor data)
Line V
Line J
Line Q
Line H
Line P
Line F
Line E
Line O
Line L
Line B
Line K
Line G
Line T
Line S
Line U
Line I
Line A
Line R
Line C
Line N
B1
B3
B4A
B5
B6A
B7B
B8A
B9B
B10A
B11A
B12
B13
B14
B15
B16
B17
A 48(M)
M 4
N
0
50 m
Key to Resistivity interpretation
Little to no apparent dip
Apparent fault offset
Folded beds
Apparent dip direction
Apparent dip direction (steeper)
KEY
Extent of Geophysical survey area
Interpreted geological lineations (Conductivity)
Suspected geological lineations (Conductivity)
Resistivity Tomography Line
Dip measurements taken from (i)
Dip measurements taken from (ii)
(i) Lawerence D.J.D., Sanderson R.W. & Waters R.A.: 1981: A ? Lower Carbiniferous dyke from Castleton, Gwent, South Wales: Geologist Association Proceedings, Vol.92 , p125-127
(ii) Geological Survey of GB: 1979: Sheet ST 28 SE: 1:10,000
M4 RELIEF ROAD
MAGOR TO CASTLETON
STAGE 2
Area A - Interpretation of Conductivity Survey and Resistivity Tomography
TERRADAT
TerraDat (UK) Ltd
PO BOX 319 CARDIFF CF1 3UJ
Tel/Fax 01222 874485
Date: 7 April 1998
Scale: 1:2500
Drawing No. :
JT/M4-Castle8-int.tcw

M4 RELIEF ROAD
MAGOR TO CASTLETON: STAGE 2

PRELIMINARY GROUND INVESTIGATION

GEOPHYSICAL SURVEY

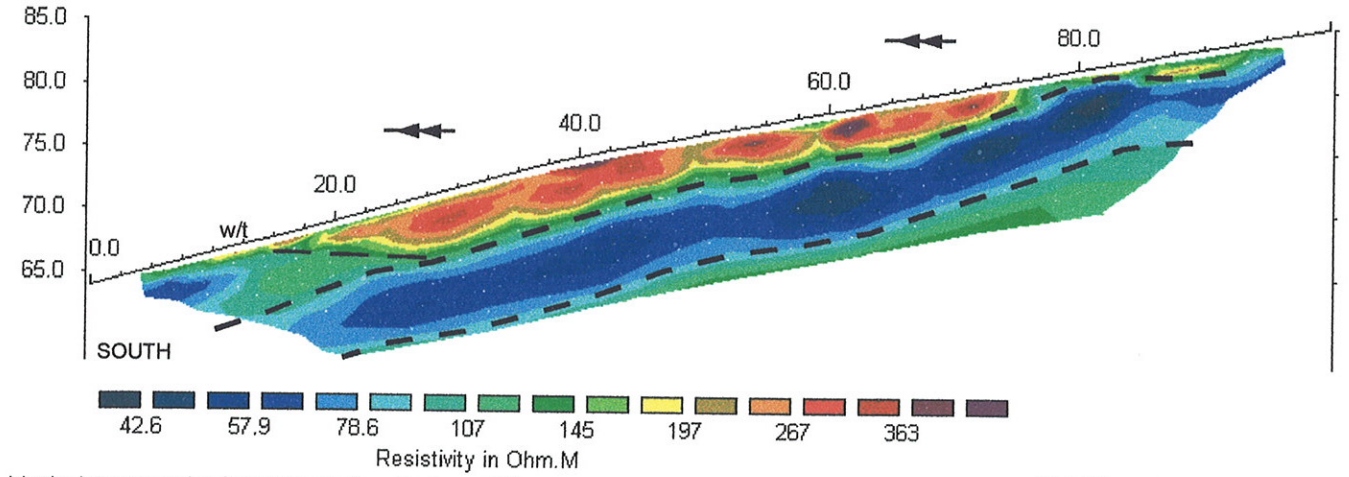
RESISTIVITY SECTIONS

TERRADAT
CONSULTING & CONTRACTING GEOPHYSICISTS

TERRADAT (UK) LTD
PO BOX 319
CARDIFF
CF1 3YE
Tel: 01222 874485
Fax: 01222 874485
terradat@compuserve.com

LINE A

Model resistivity with topography
Iteration 4 RMS error = 7.3

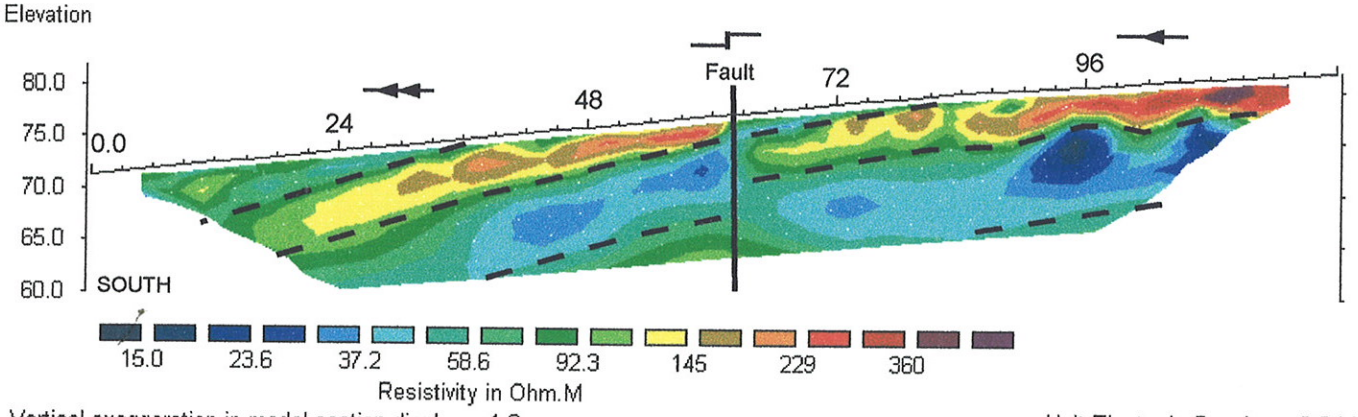


Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 100.0 M.

Unit Electrode Spacing = 2.5 M.

LINE B

Model resistivity with topography
Iteration 5 RMS error = 4.9



Vertical exaggeration in model section display = 1.0
First electrode is located at 40.0 M.
Last electrode is located at 160.0 M.

Unit Electrode Spacing = 3.0 M.

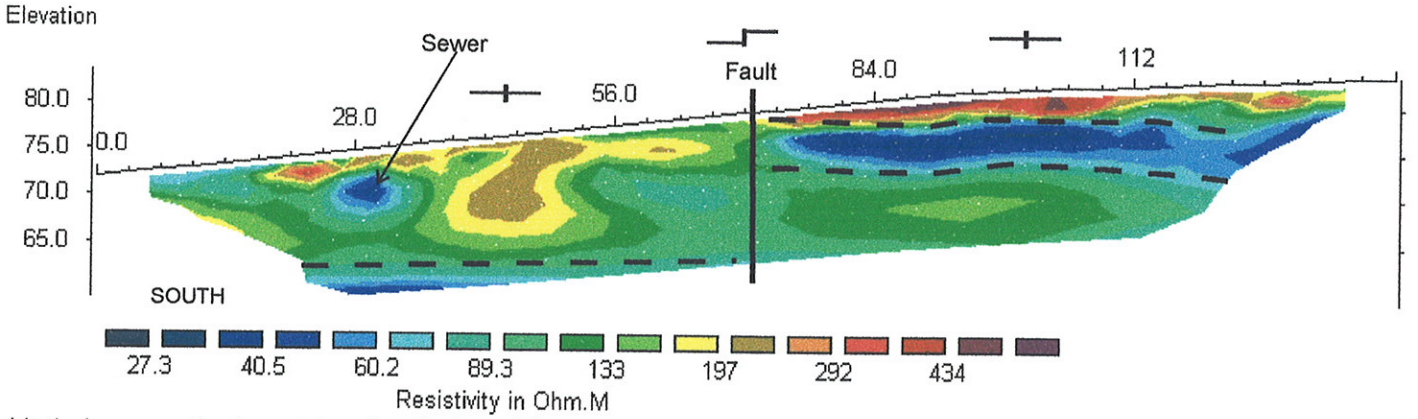
Key:

- Little to no apparent dip
- Apparent fault offset
- Folded beds
- Apparent dip direction
- Apparent dip direction (steeper)

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2		
Resistivity Tomography Lines		
TERRADAT	Terradat (UK) Ltd PO BOX 315 CARDIFF CF1 3UJ Tel 01222 874445 Fax 01222 874445	Date: 28 January 1998
Drawing No.: RM/M4Res1		Scale: Horiz = Vert

LINE C

Model resistivity with topography
Iteration 5 RMS error = 3.5



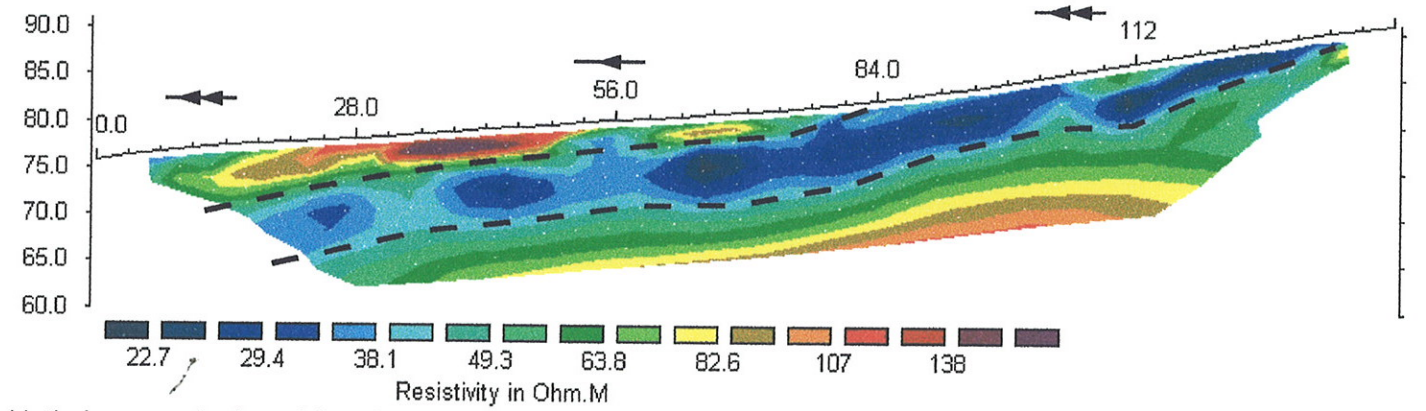
Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

NOTE : LINE D is of insufficient quality and is replaced with LINE V

LINE E

Model resistivity with topography
Iteration 5 RMS error = 4.3



Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

Key:

- Little to no apparent dip
- Apparent fault offset
- Folded beds
- Apparent dip direction
- Apparent dip direction (steeper)

M4 RELIEF ROAD
MAGOR TO CASTLETON
STAGE 2

Resistivity Tomography Lines

TERRADAT

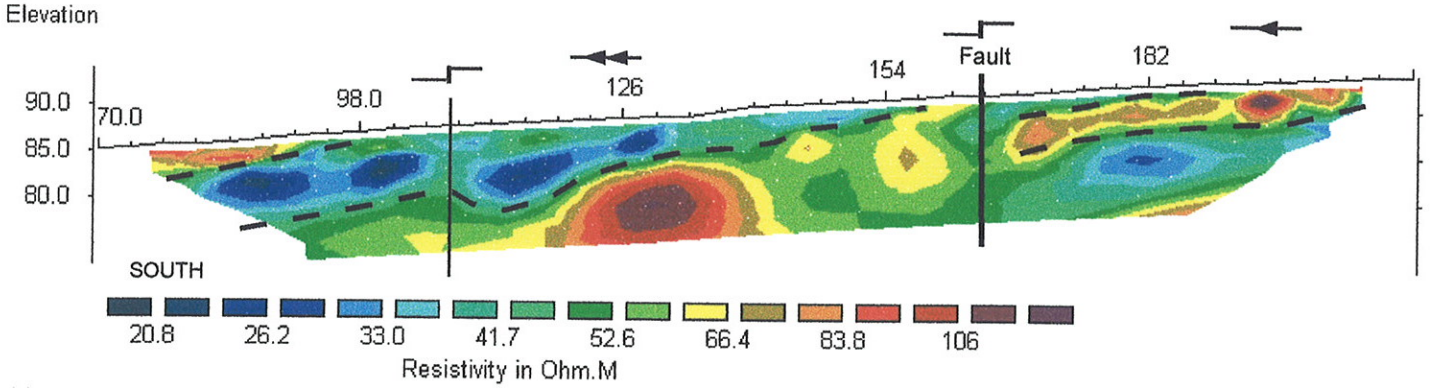
Date: 28 January 1998

Drawing No.: RM/M4Res2

Scale: Horiz = Vert

LINE F

Model resistivity with topography
Iteration 5 RMS error = 5.8

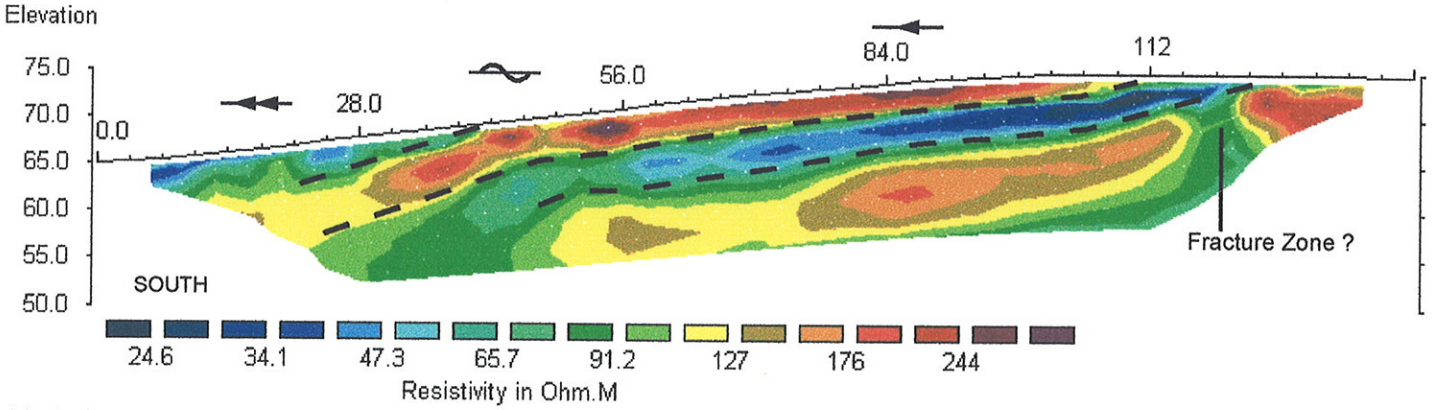


Vertical exaggeration in model section display = 1.0
First electrode is located at 70.0 M.
Last electrode is located at 210.0 M.

Unit Electrode Spacing = 3.5 M.

LINE G

Model resistivity with topography
Iteration 5 RMS error = 3.3



Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

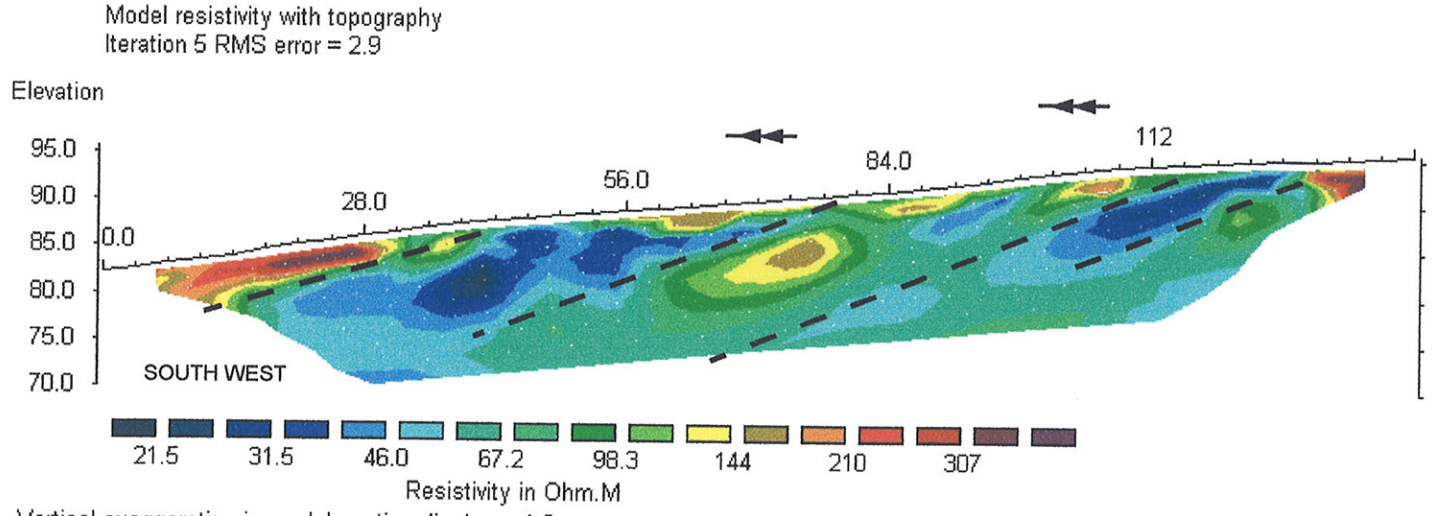
Unit Electrode Spacing = 3.5 M.

Key:

- Little to no apparent dip
- Apparent fault offset
- Folded beds
- Apparent dip direction
- Apparent dip direction (steeper)

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2	
Resistivity Tomography Lines	
TERRADAT	Date: 28 January 1998
Drawing No.: RM/M4Res3	Scale: Horiz = Vert

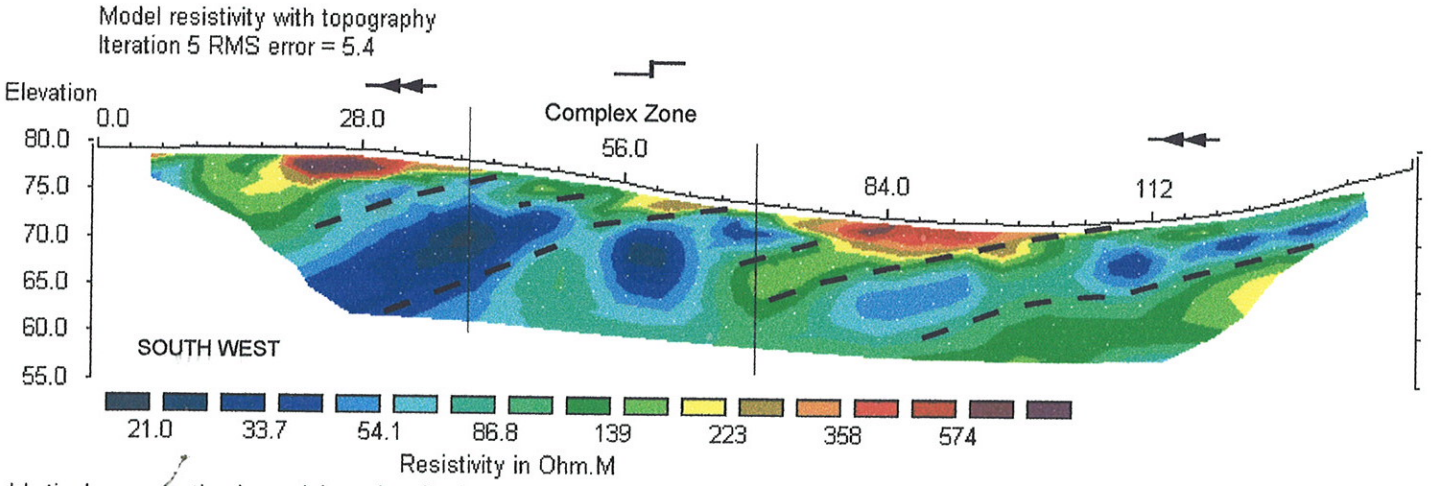
LINE H



Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

LINE I



Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

Key:

- Little to no apparent dip
- Apparent fault offset
- Folded beds
- Apparent dip direction
- Apparent dip direction (steeper)

M4 RELIEF ROAD
MAGOR TO CASTLETON
STAGE 2

Resistivity Tomography Lines

TERRADAT

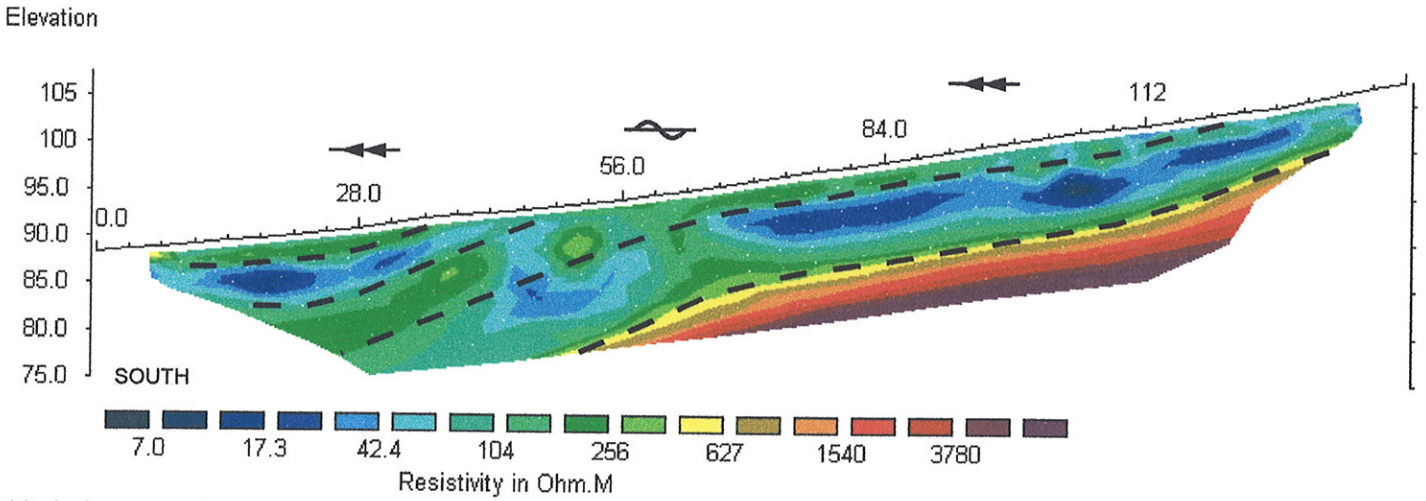
Date: 28 January 1998

Drawing No.: RM/M4Res4

Scale: Horiz = Vert

LINE J

Model resistivity with topography
Iteration 4 RMS error = 35.3

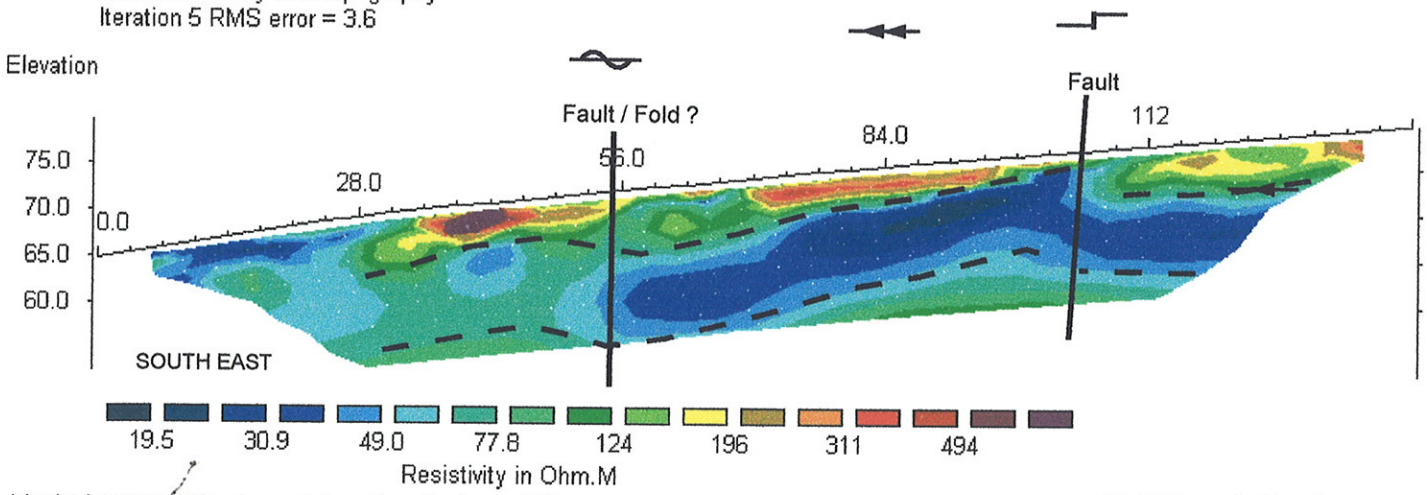


Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

LINE K

Model resistivity with topography
Iteration 5 RMS error = 3.6



Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

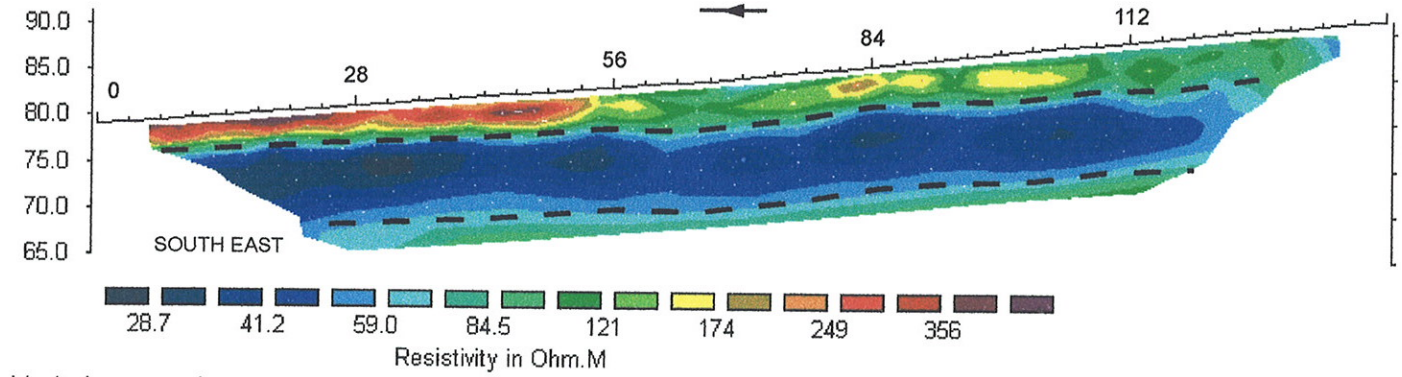
Key:

- Little to no apparent dip
- Apparent fault offset
- Folded beds
- Apparent dip direction
- Apparent dip direction (steeper)

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2	
Resistivity Tomography Lines	
TERRADAT	Date: 28 January 1998
Drawing No.: RM/M4Res5	Scale: Horiz = Vert

LINE L

Model resistivity with topography
Iteration 5 RMS error = 2.6

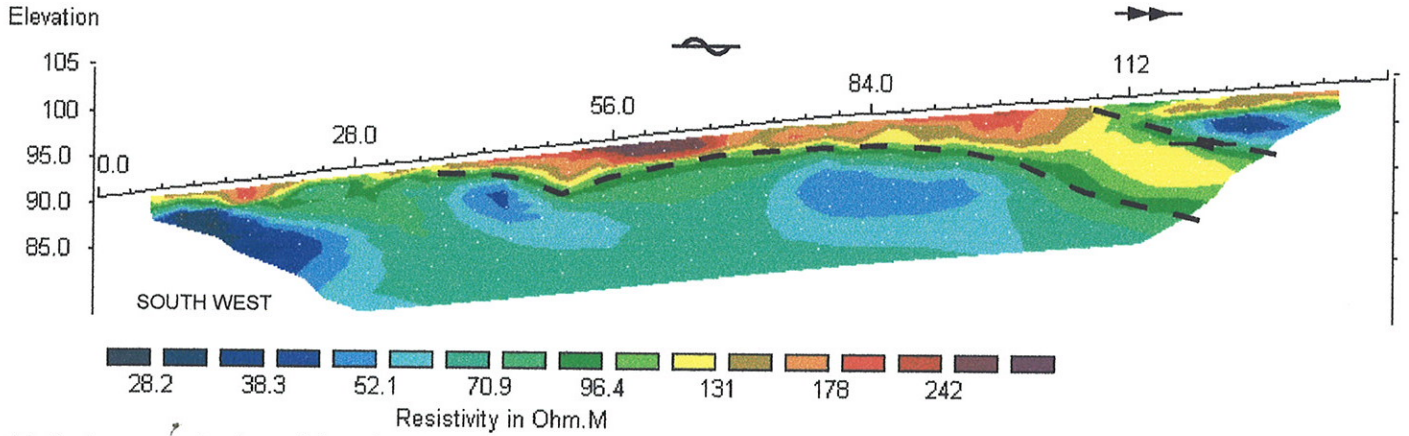


Vertical exaggeration in model section display = 1.0
First electrode is located at 140.0 M.
Last electrode is located at 280.0 M.

Unit Electrode Spacing = 3.5 M.

LINE M

Model resistivity with topography
Iteration 5 RMS error = 3.7



Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

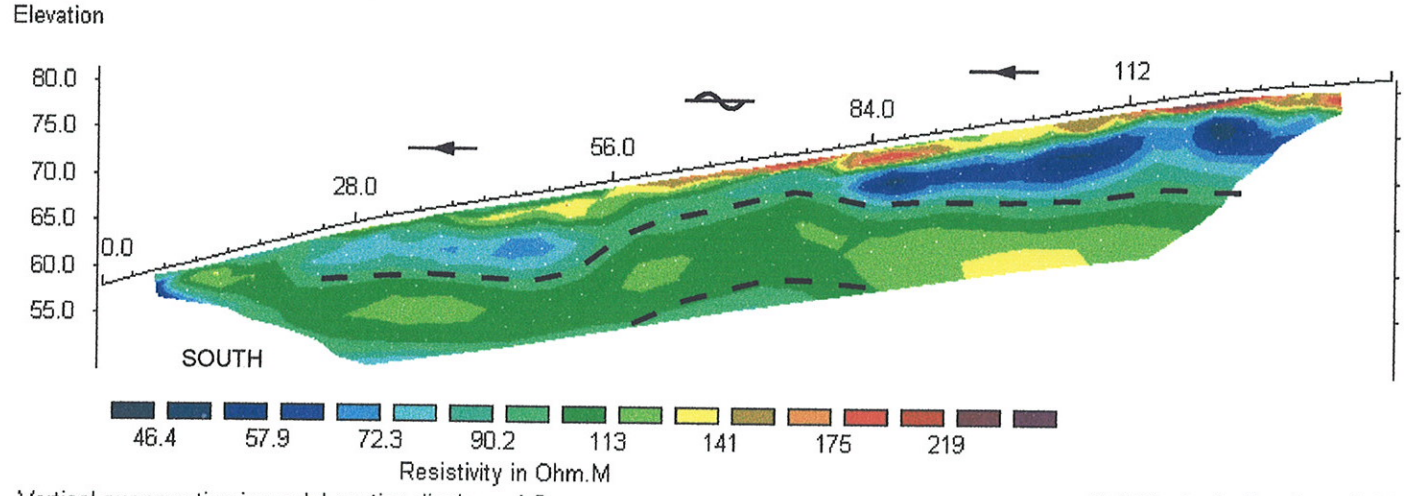
Key:

- Little to no apparent dip
- Apparent fault offset
- Folded beds
- Apparent dip direction
- Apparent dip direction (steeper)

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2		
Resistivity Tomography Lines		
TERRADAT	Terradat (UK) Ltd PO BOX 319 CARDIFF CF1 3UT Tel 01222 874483 Fax 01222 874483	Date: 28 January 1998
Drawing No.: RM/M4Res6		Scale: Horiz = Vert

LINE N

Model resistivity with topography
Iteration 5 RMS error = 2.7

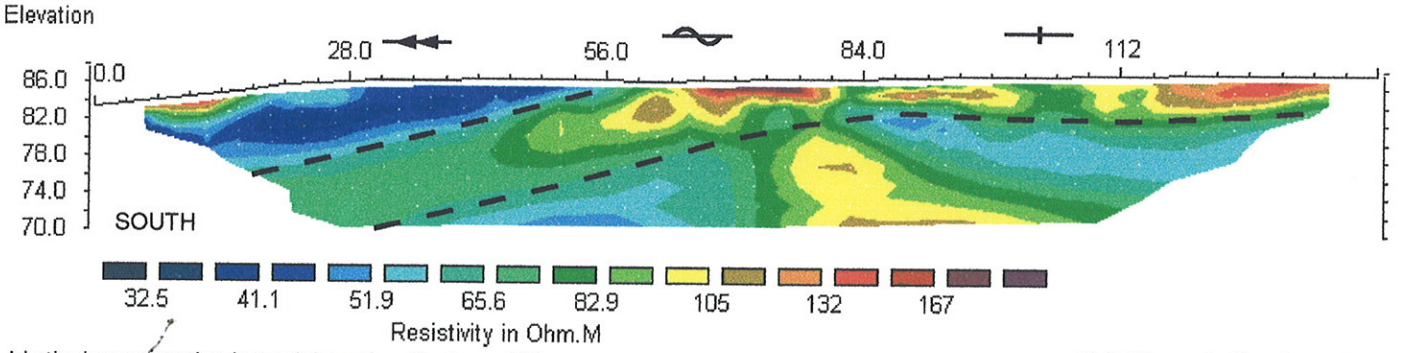


Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

LINE O

Model resistivity with topography
Iteration 3 RMS error = 12.4



Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

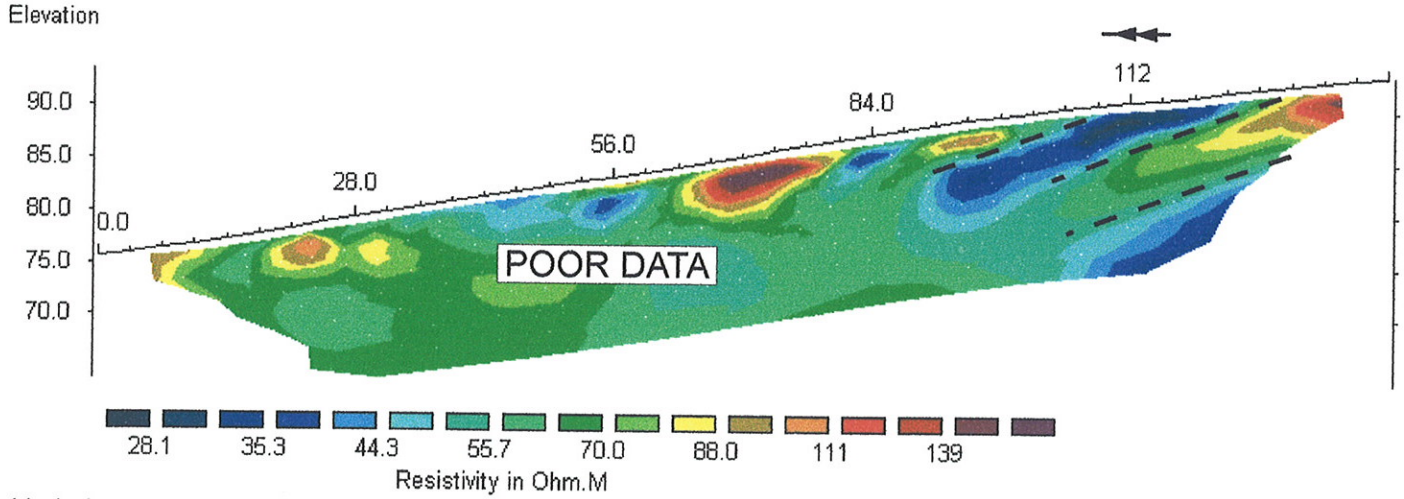
Key:

- Little to no apparent dip
- Apparent fault offset
- Folded beds
- Apparent dip direction
- Apparent dip direction (steeper)

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2	
Resistivity Tomography Lines	
TERRADAT	Date: 28 January 1998
Drawing No.: RM/M4Res7	Scale: Horiz = Vert

LINE P

Model resistivity with topography
Iteration 4 RMS error = 5.1

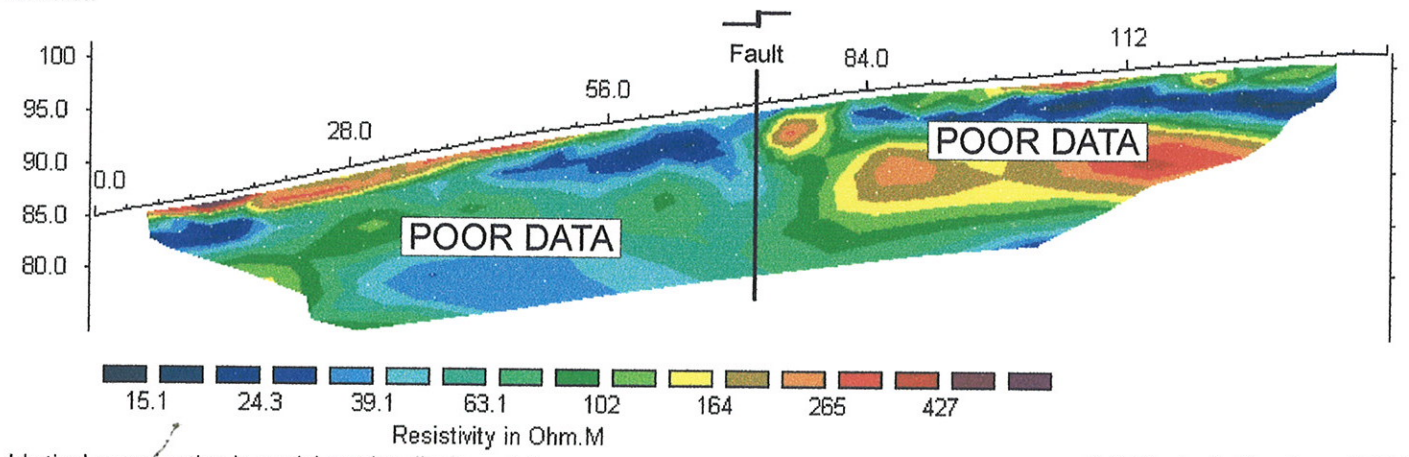


Vertical exaggeration in model section display = 1.1
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

LINE Q

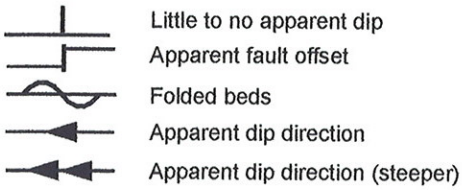
Model resistivity with topography
Iteration 4 RMS error = 15.0



Vertical exaggeration in model section display = 1.1
First electrode is located at 0.0 M.
Last electrode is located at 140.0 M.

Unit Electrode Spacing = 3.5 M.

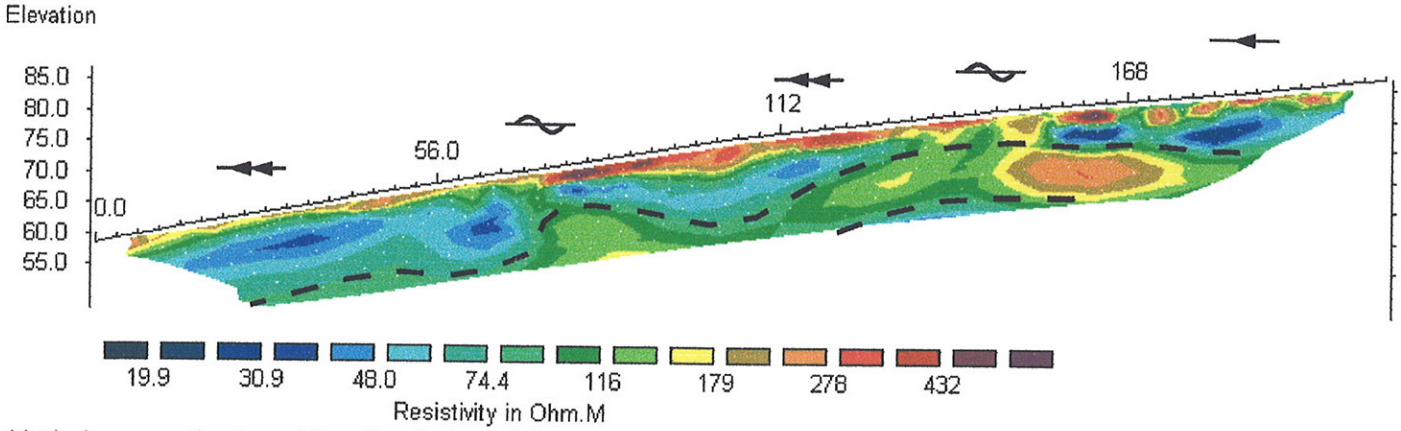
Key:



M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2	
Resistivity Tomography Lines	
TERRADAT	Date: 28 January 1998
Drawing No.: RM/M4Res8	Scale: Horiz = Vert

LINE R

Model resistivity with topography
Iteration 5 RMS error = 9.6

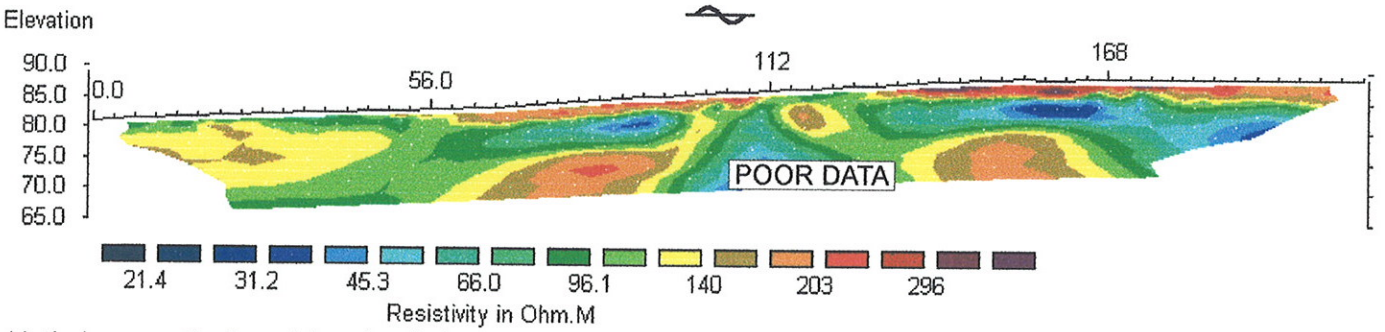


Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 210.0 M.

Unit Electrode Spacing = 3.5 M.

LINE S

Model resistivity with topography
Iteration 3 RMS error = 7.9



Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 210.0 M.

Unit Electrode Spacing = 3.5 M.

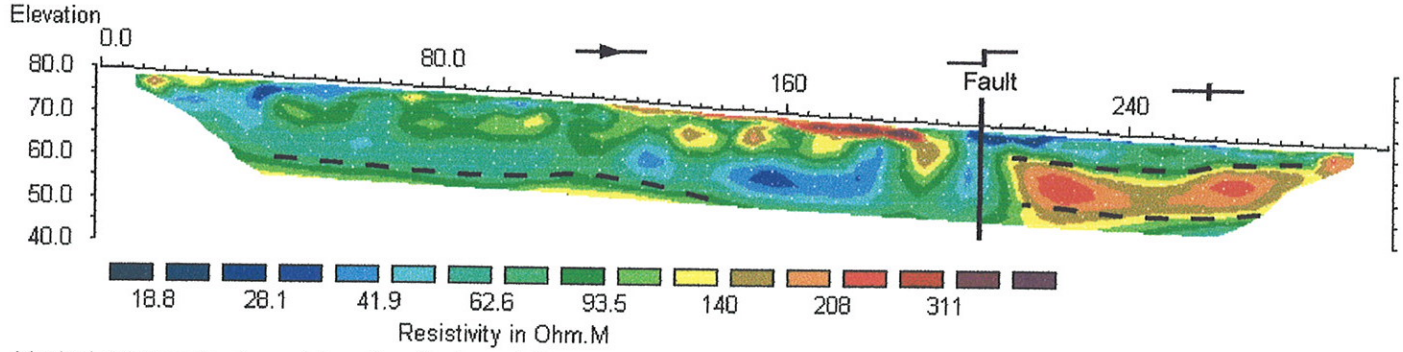
Key:

- Little to no apparent dip
- Apparent fault offset
- Folded beds
- Apparent dip direction
- Apparent dip direction (steeper)

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2		
Resistivity Tomography Lines		
TERRADAT	Terradat UK Ltd PO BOX 319 CARDIFF CF1 3UJ Tel 01222 874483 Fax 01222 874483	Date: 28 January 1998
Drawing No. : RM/M4Res9		Scale: Horiz = Vert

LINE T

Model resistivity with topography
Iteration 4 RMS error = 8.1

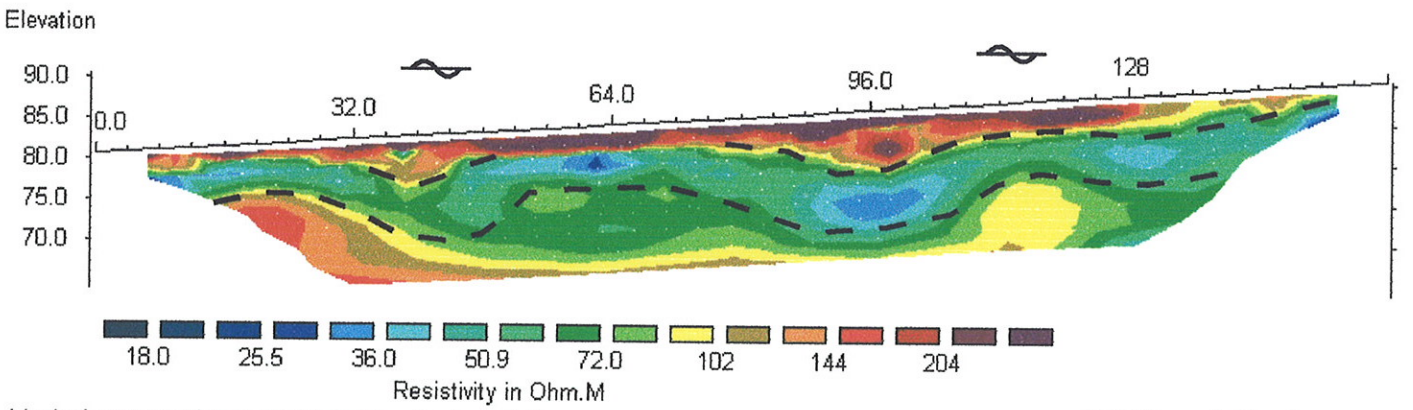


Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 300.0 M.

Unit Electrode Spacing = 5.0 M.

LINE U

Model resistivity with topography
Iteration 5 RMS error = 8.3



Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 160.0 M.

Unit Electrode Spacing = 4.0 M.

Key:

- Little to no apparent dip
- Apparent fault offset
- Folded beds
- Apparent dip direction
- Apparent dip direction (steeper)

M4 RELIEF ROAD

MAGOR TO CASTLETON
STAGE 2

Resistivity Tomography Lines

TERRADAT

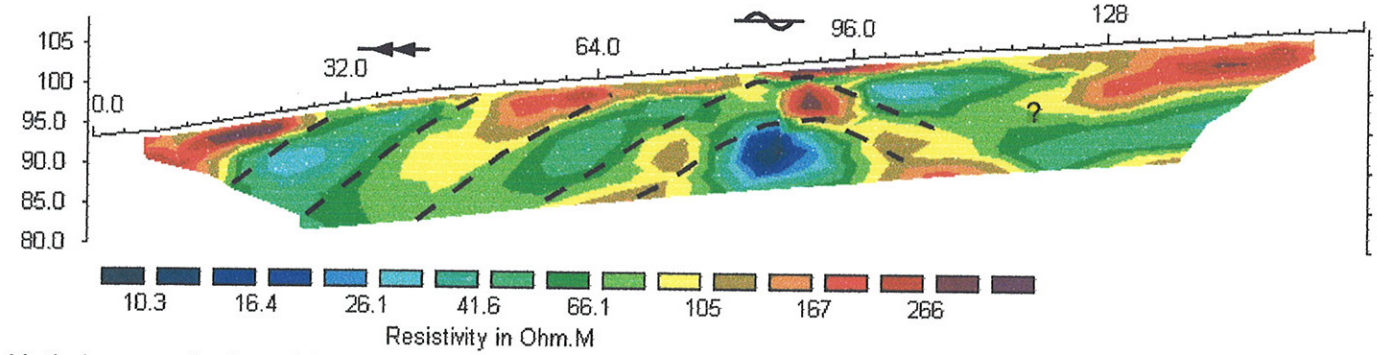
Date: 28 January 1998

Drawing No.: RM/M4Res10

Scale: Horiz = Vert

LINE V

Model resistivity with topography
Iteration 7 RMS error = 3.9



Vertical exaggeration in model section display = 1.0
First electrode is located at 0.0 M.
Last electrode is located at 160.0 M.

Unit Electrode Spacing = 4.0 M.

Key:

- Little to no apparent dip
- Apparent fault offset
- Folded beds
- Apparent dip direction
- Apparent dip direction (steeper)

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2		
Resistivity Tomography Lines		
TERRADAT	Terradat (UK) Ltd P.O. BOX 310 CARDIFF CF1 3 UJ Tel: 01222 874483 Fax: 01222 874485	Date: 28 January 1998
Drawing No. : RM/M4Res11		Scale: Horiz = Vert

M4 RELIEF ROAD
MAGOR TO CASTLETON: STAGE 2

PRELIMINARY GROUND INVESTIGATION

GEOPHYSICAL SURVEY

VERTICAL SEISMIC PROFILES

TERRADAT
CONSULTING & CONTRACTING GEOPHYSICISTS

TERRADAT (UK) LTD
PO BOX 319
CARDIFF
CF1 3YE
Tel: 01222 874485
Fax: 01222 874485
terradat@compuserve.com

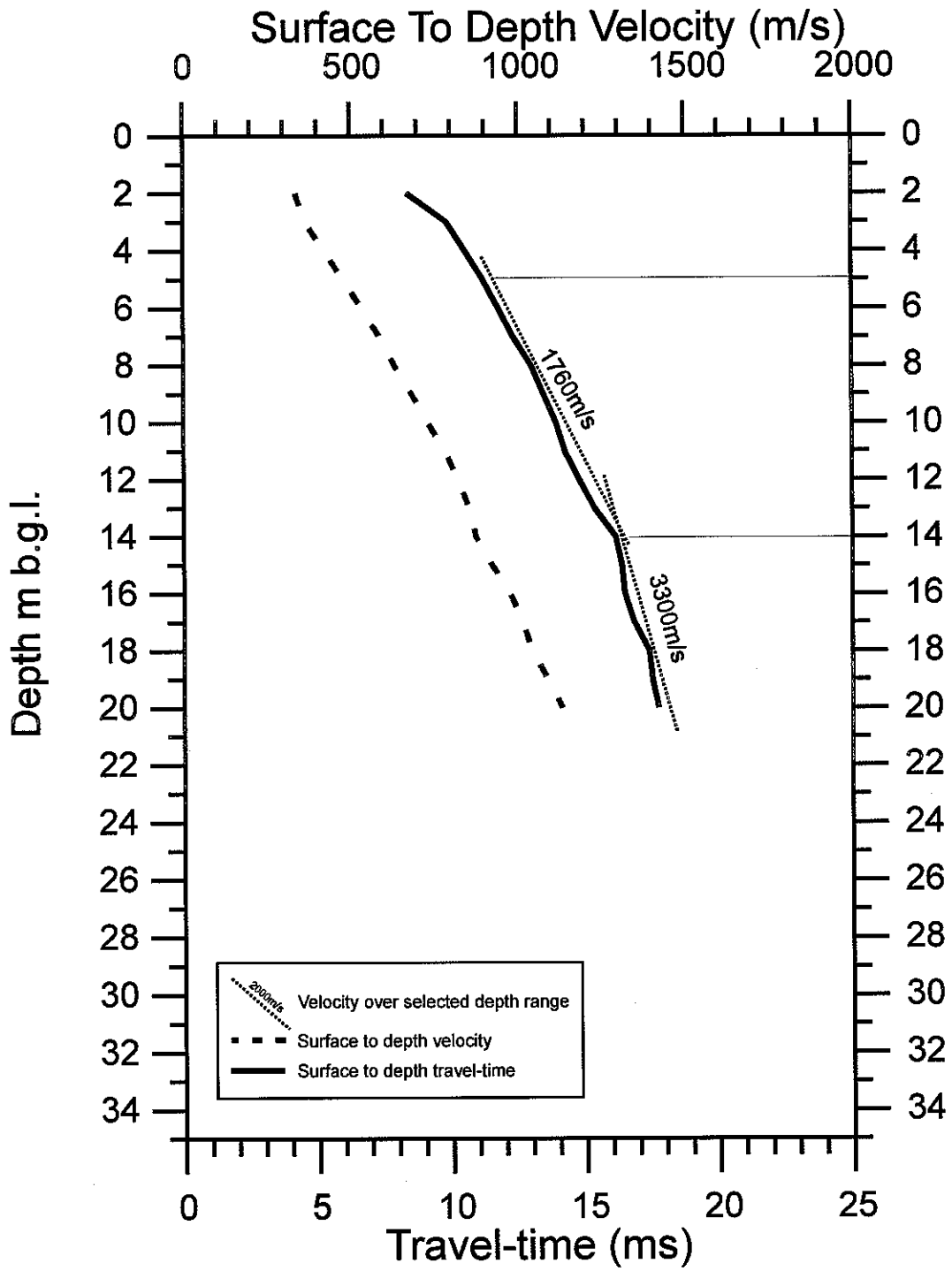
TERRADAT

VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 325553.6, 184267.0
Ground Level: 82.0m OD
Date: January 1998

Borehole No
B4
Sheet 1 of 1



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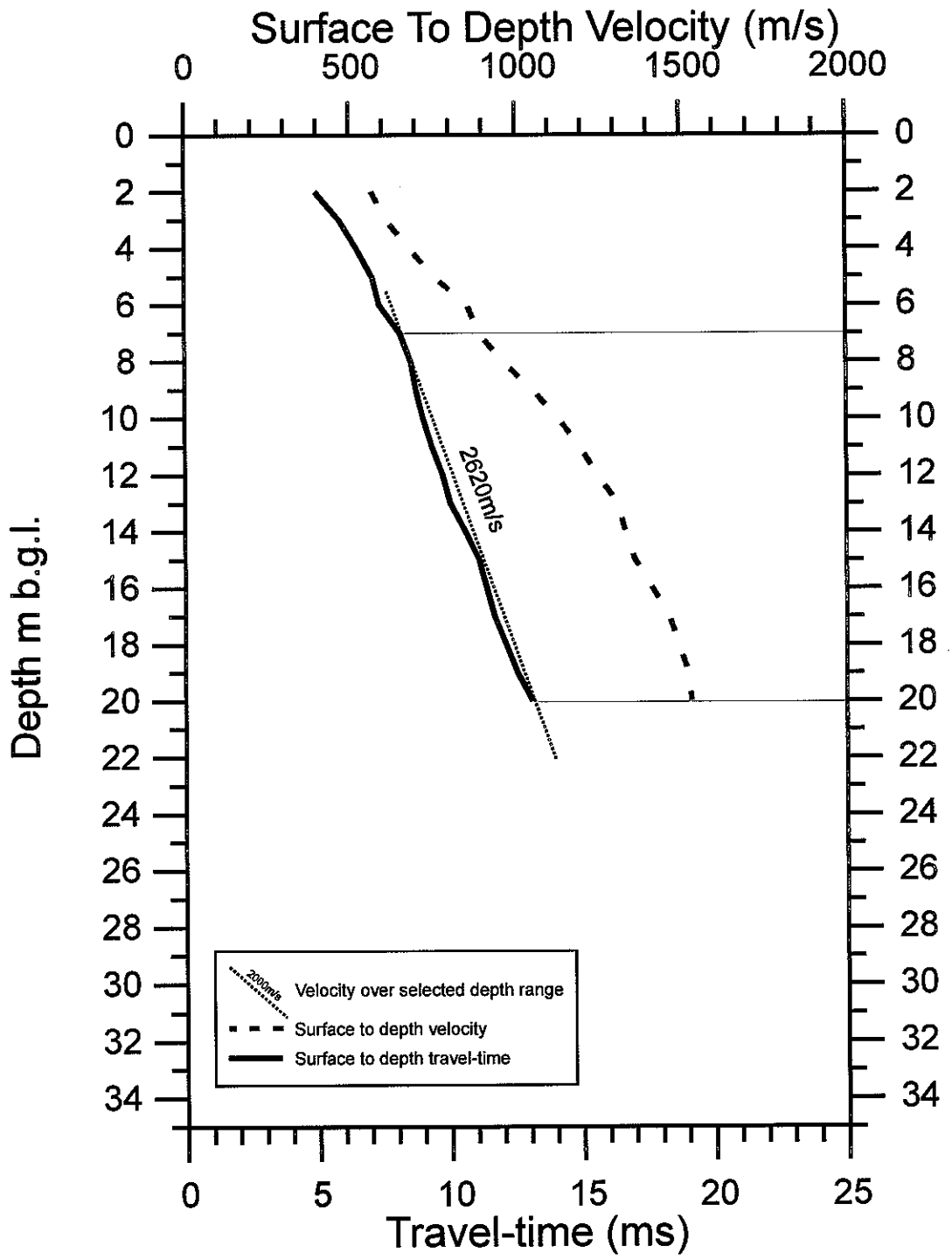
Tel/Fax 01222 874485

TERRADAT

VERTICAL SEISMIC PROFILE

M4 Relief Road Magor to Castleton Stage 2	Method: Down-hole P-wave Coordinates: 325574.4, 184173.6 Ground Level: 72.4m OD Date: January 1998	Borehole No B5 Sheet 1 of 1



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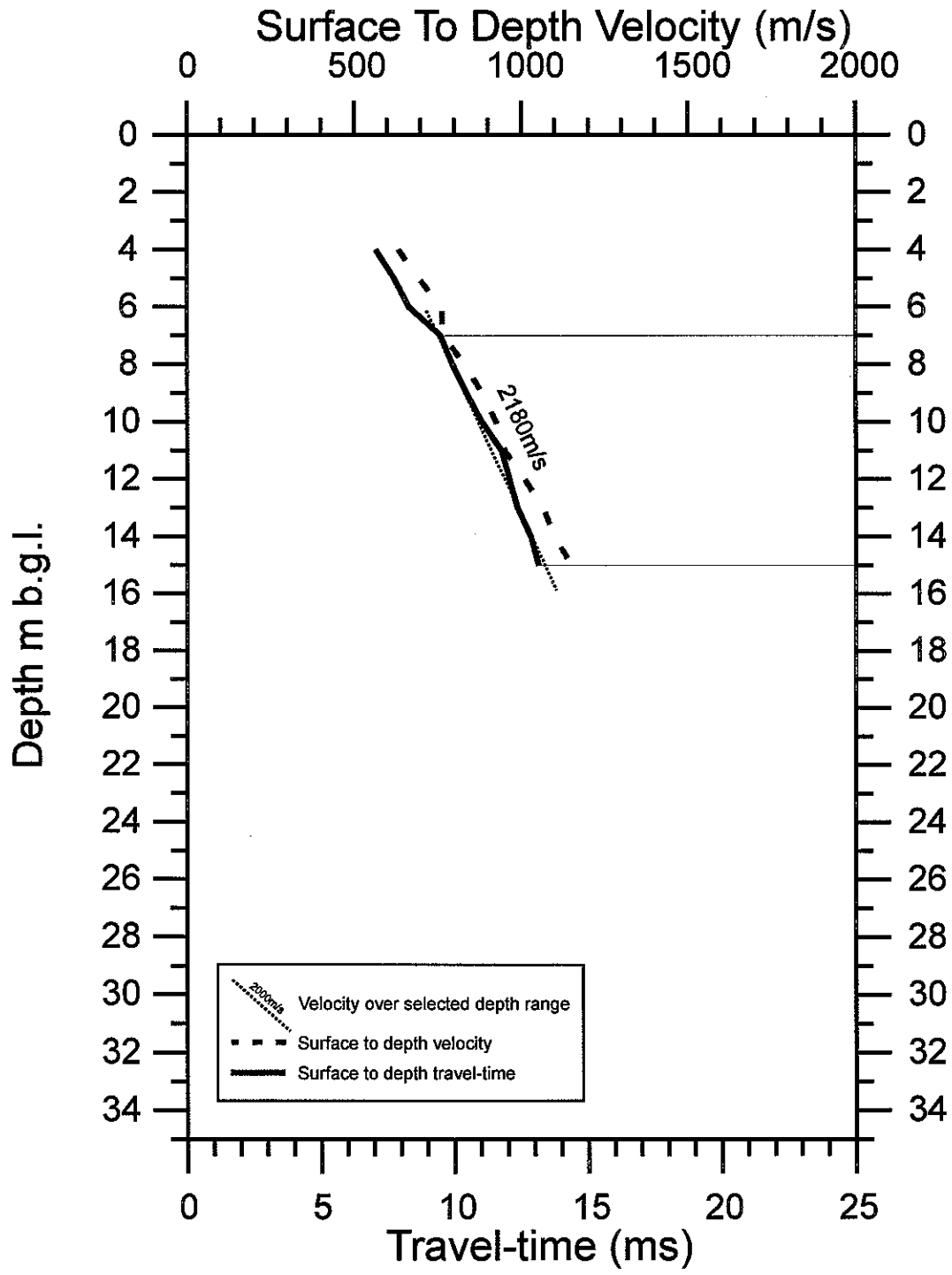
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 325709.0, 184437.0
Ground Level: 104.2m OD
Date: January 1998

Borehole No
B6
Sheet 1 of 1



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Tel/Fax 01222 874485

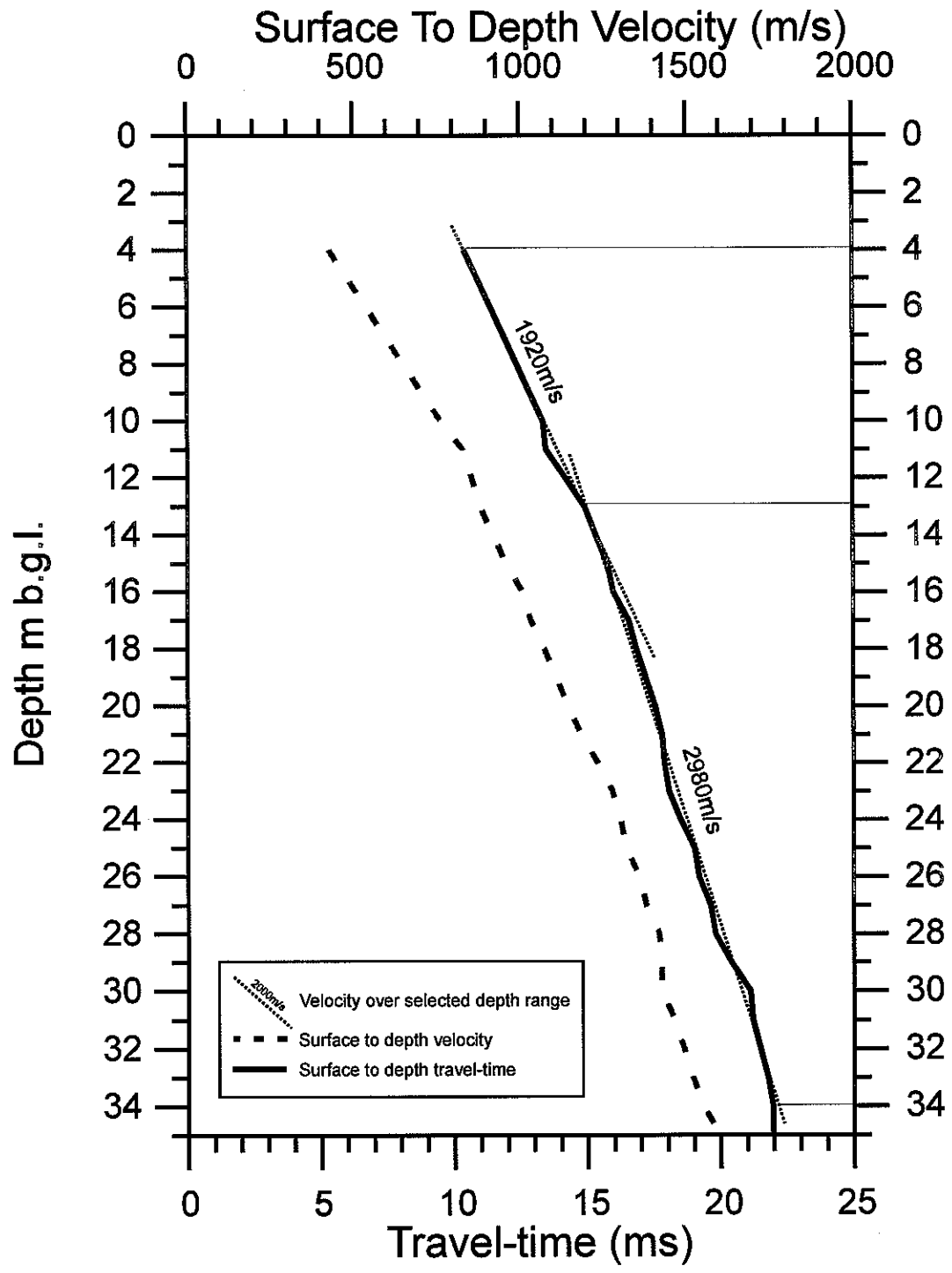
TERRADAT

VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 325729.2, 184364.8
Ground Level: 96.6m OD
Date: January 1998

Borehole No
B7
Sheet 1 of 1



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Tel/Fax 01222 874485

TERRADAT

VERTICAL SEISMIC PROFILE

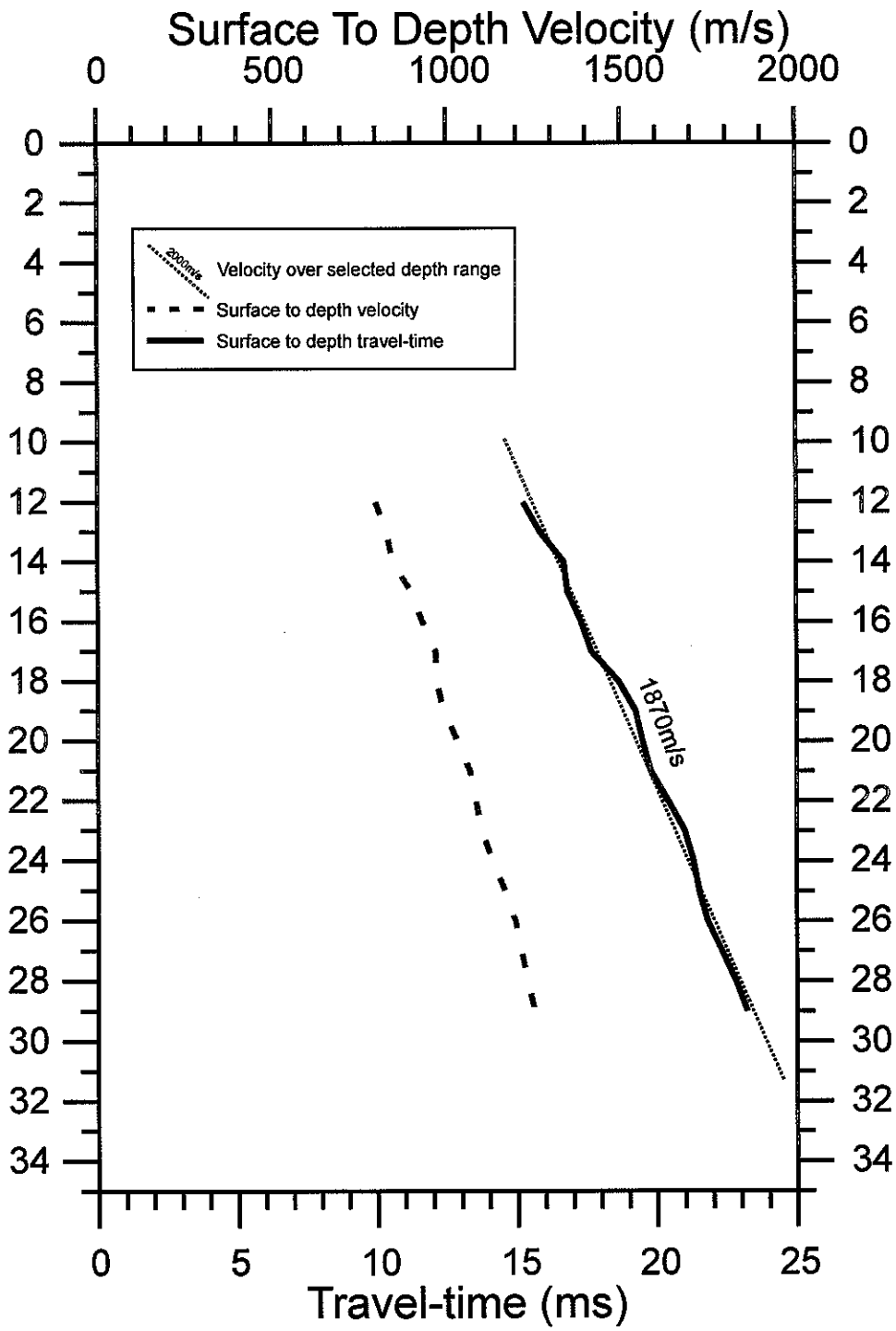
M4 Relief Road
Magor to Castleton
Stage 2

Method:	Down-hole P-wave
Coordinates:	325758.4, 184246.1
Ground Level:	82.1m OD
Date:	January 1998

Borehole No

B8

Sheet 1 of 1



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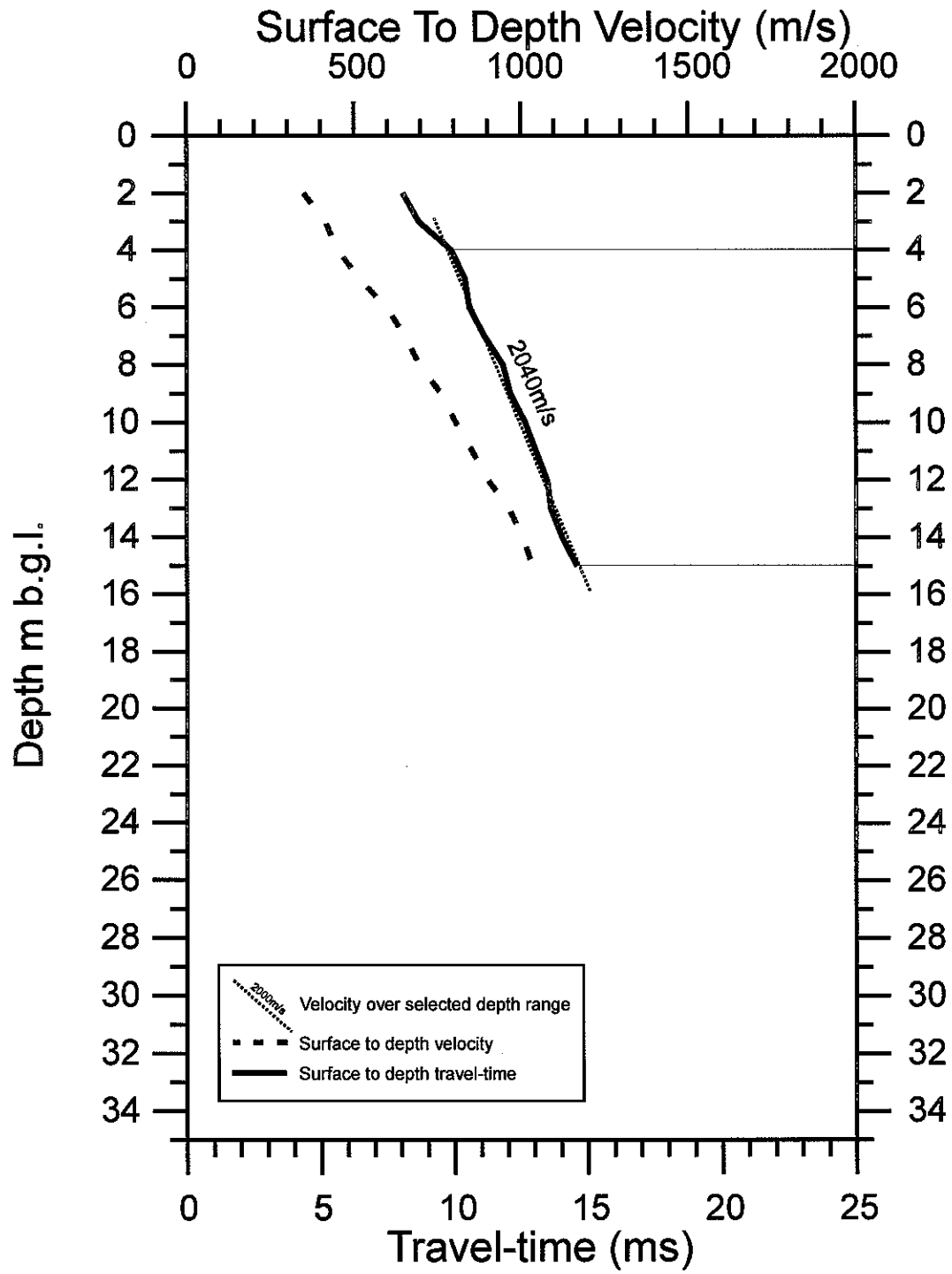
TERRADAT

VERTICAL SEISMIC PROFILE

M4 Relief Road Magor to Castleton Stage 2	Method: Down-hole P-wave Coordinates: 325915.0, 184457.8 Ground Level: 101.6m OD Date: January 1998	Borehole No B9 Sheet 1 of 1



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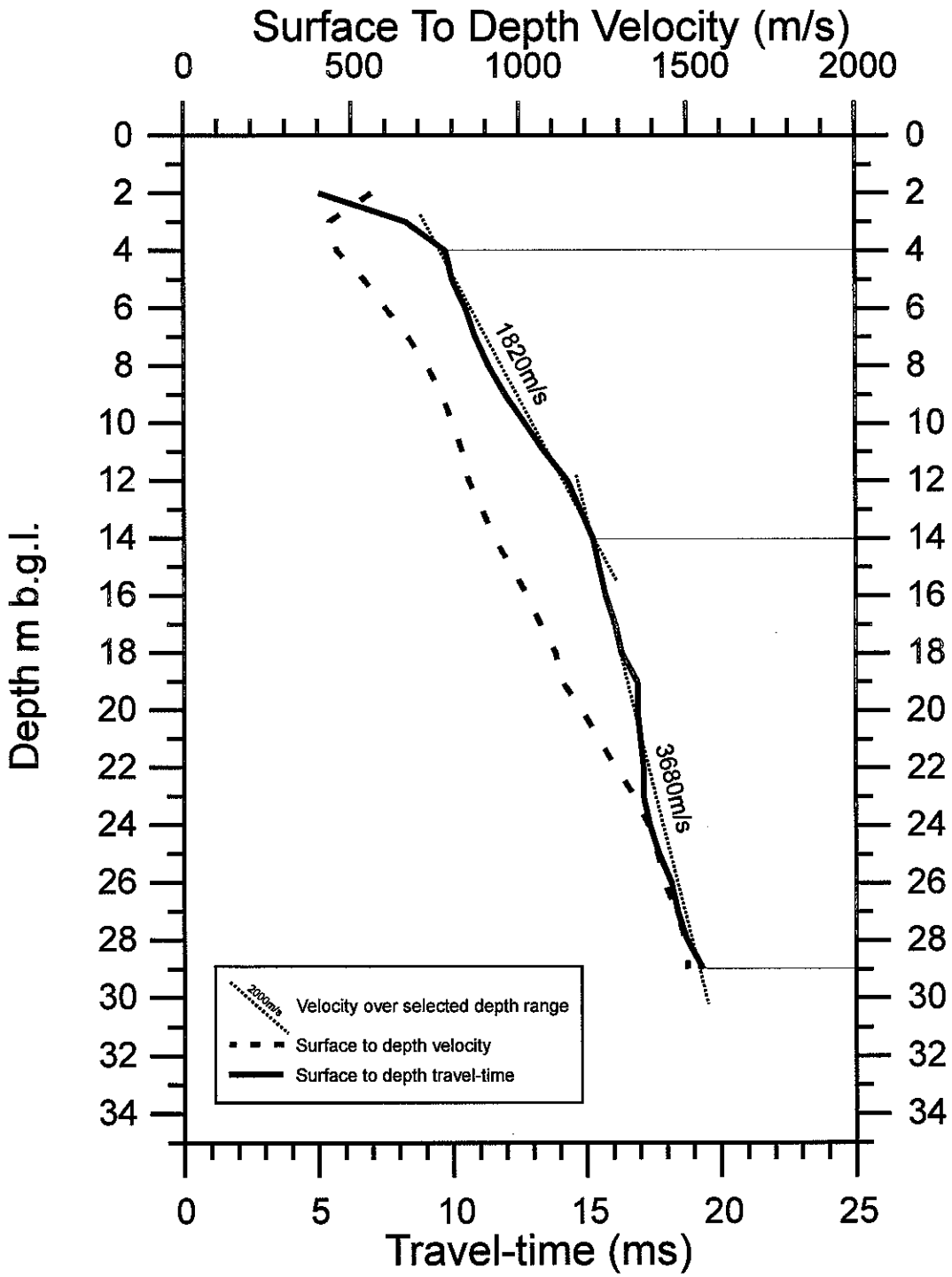
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 325926.9, 184351.9
Ground Level: 85.7m OD
Date: January 1998

Borehole No
B10
Sheet 1 of 1



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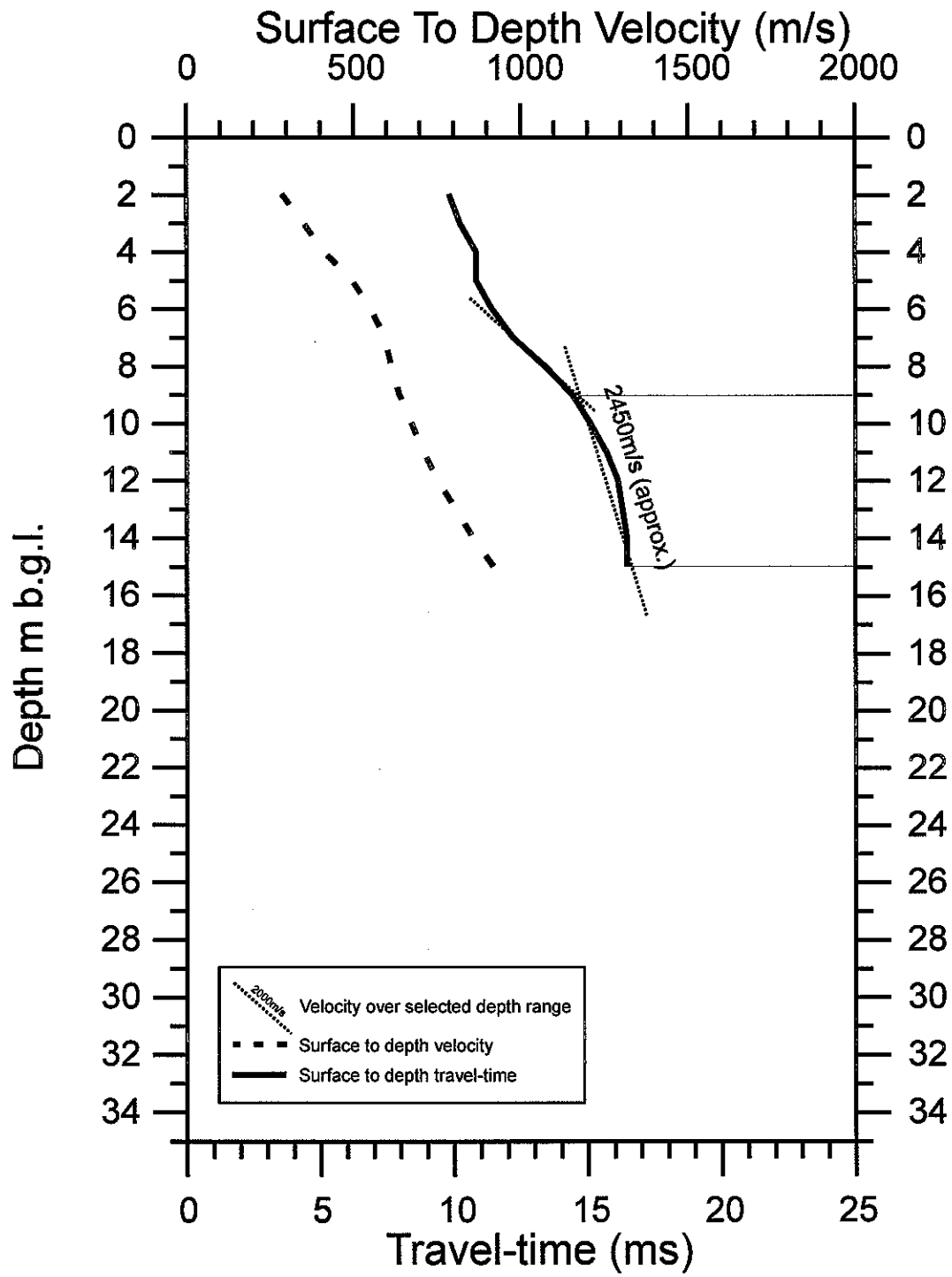
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 325942.0, 184256.9
Ground Level: 64.5m OD
Date: January 1998

Borehole No
B11
Sheet 1 of 1



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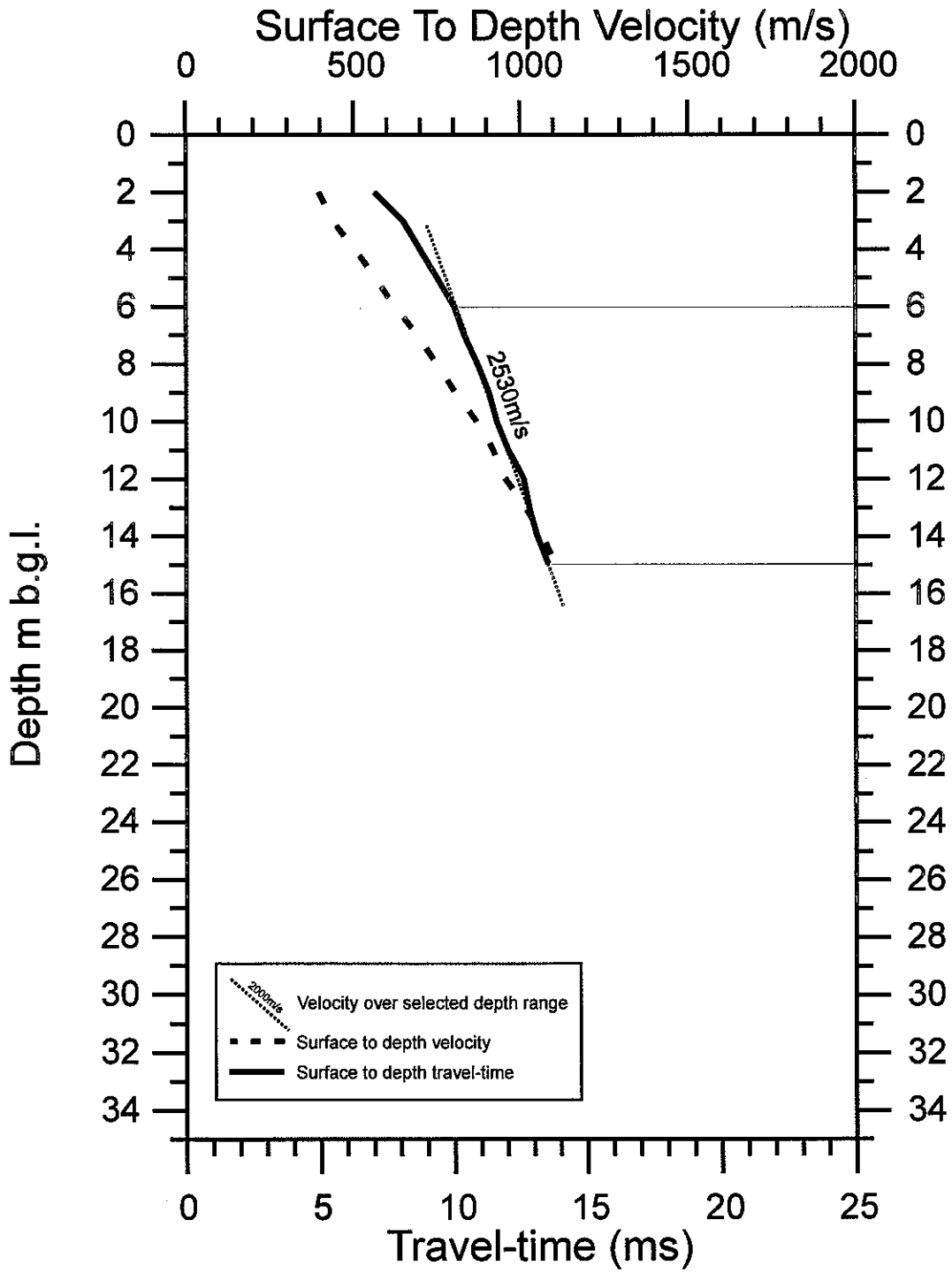
VERTICAL SEISMIC PROFILE

M4 Relief Road Magor to Castleton Stage 2	Method: Down-hole P-wave Coordinates: 326144.0, 184436.0 Ground Level: 94.3m OD Date: January 1998	Borehole No B12 Sheet 1 of 1



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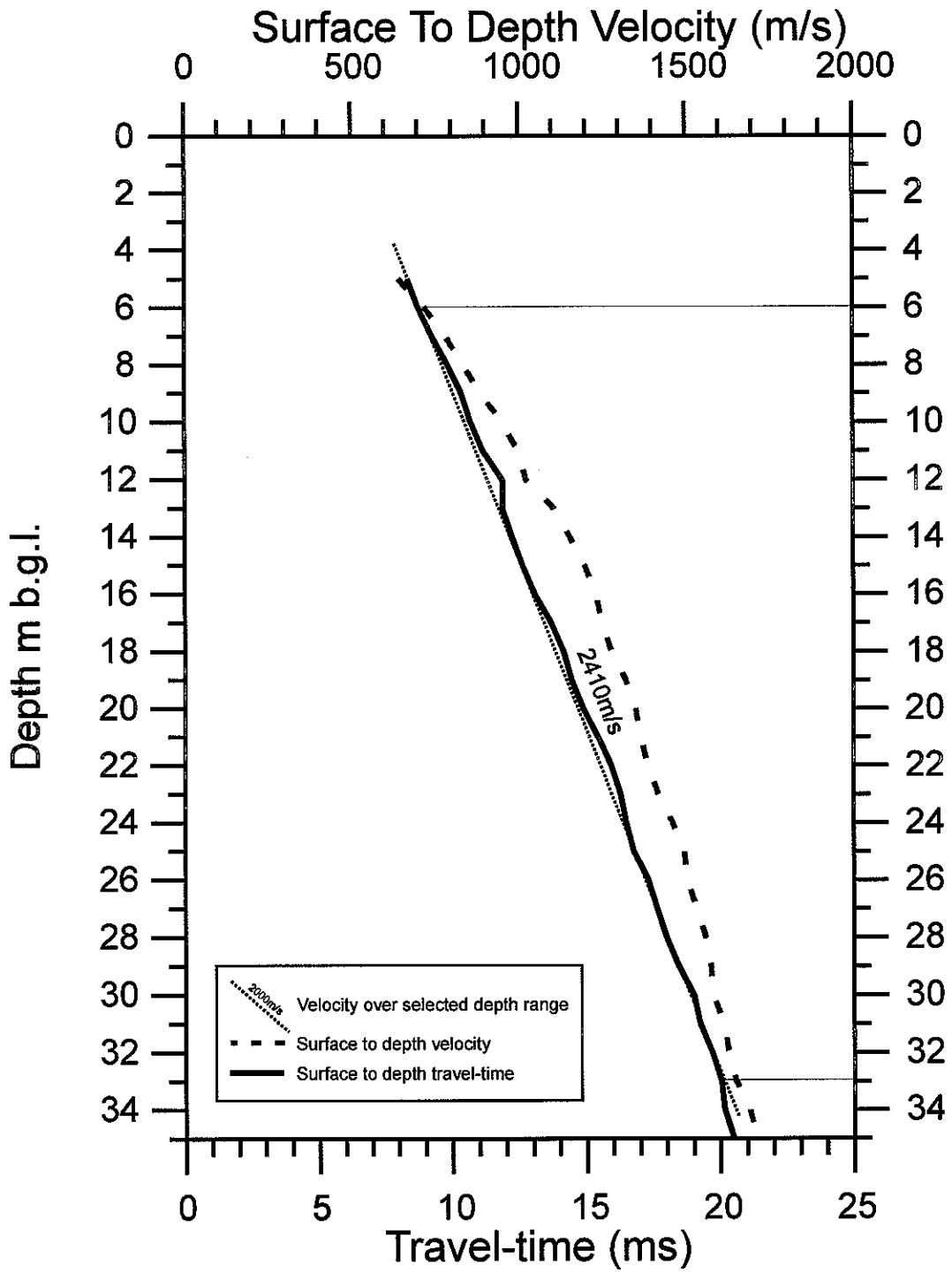
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 326147.0, 184356.7
Ground Level: 89.4m OD
Date: January 1998

Borehole No
B13
Sheet 1 of 1



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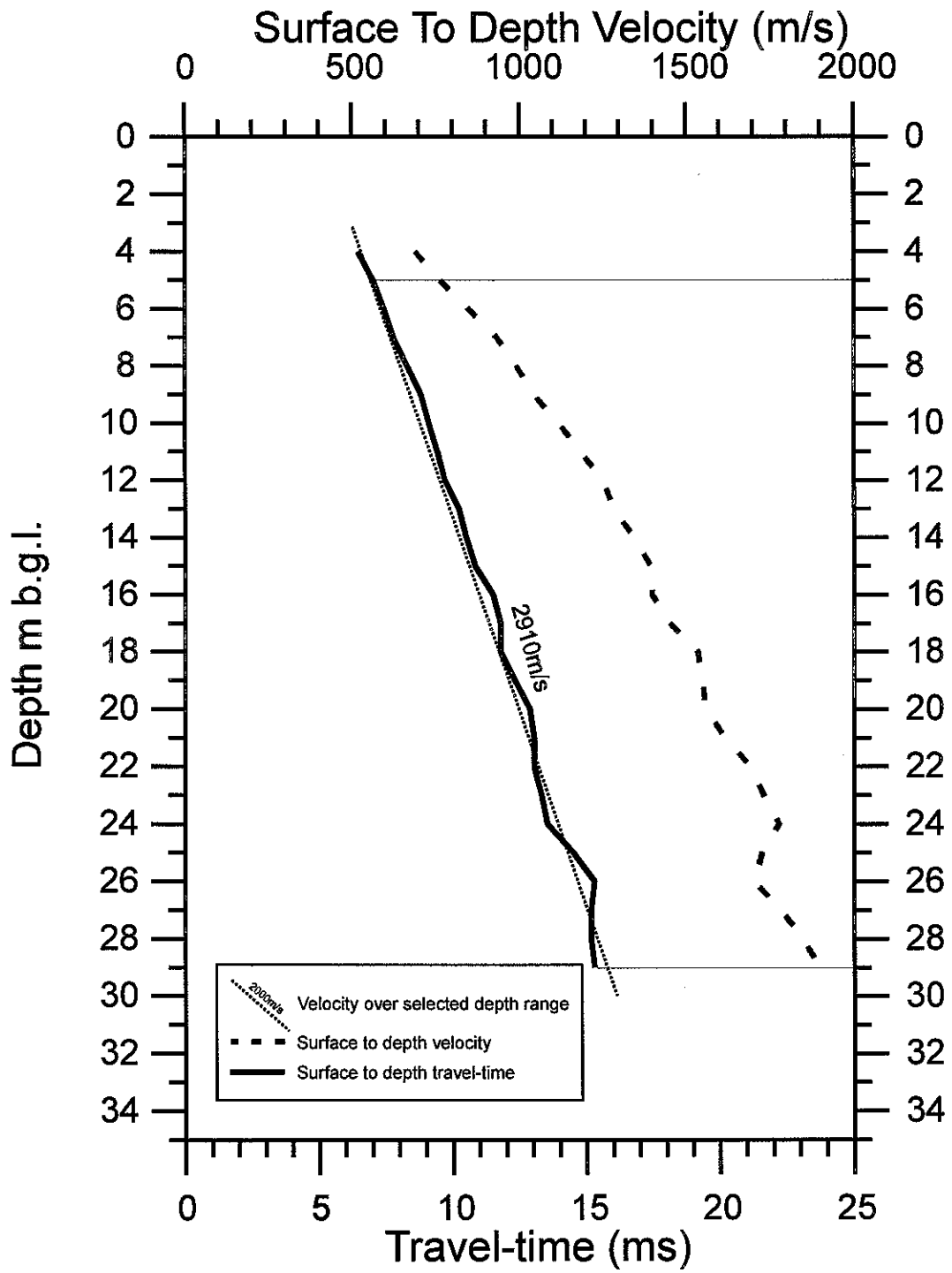
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 326154.1, 184258.5
Ground Level: 76.5m OD
Date: January 1998

Borehole No
B14
Sheet 1 of 1



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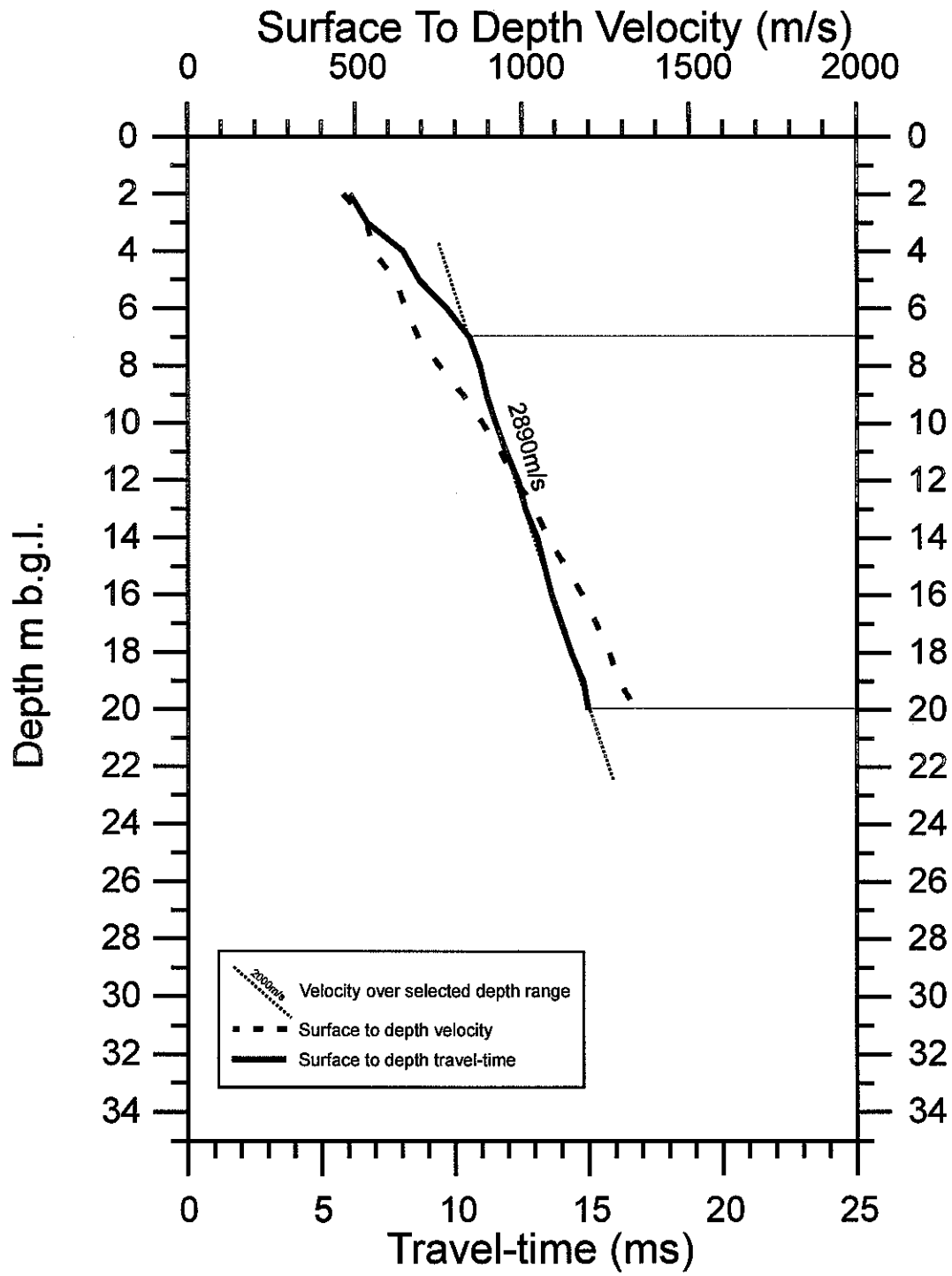
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method:	Down-hole P-wave
Coordinates:	326323.7, 184367.1
Ground Level:	79.6m OD
Date:	January 1998

Borehole No
B15
Sheet 1 of 1



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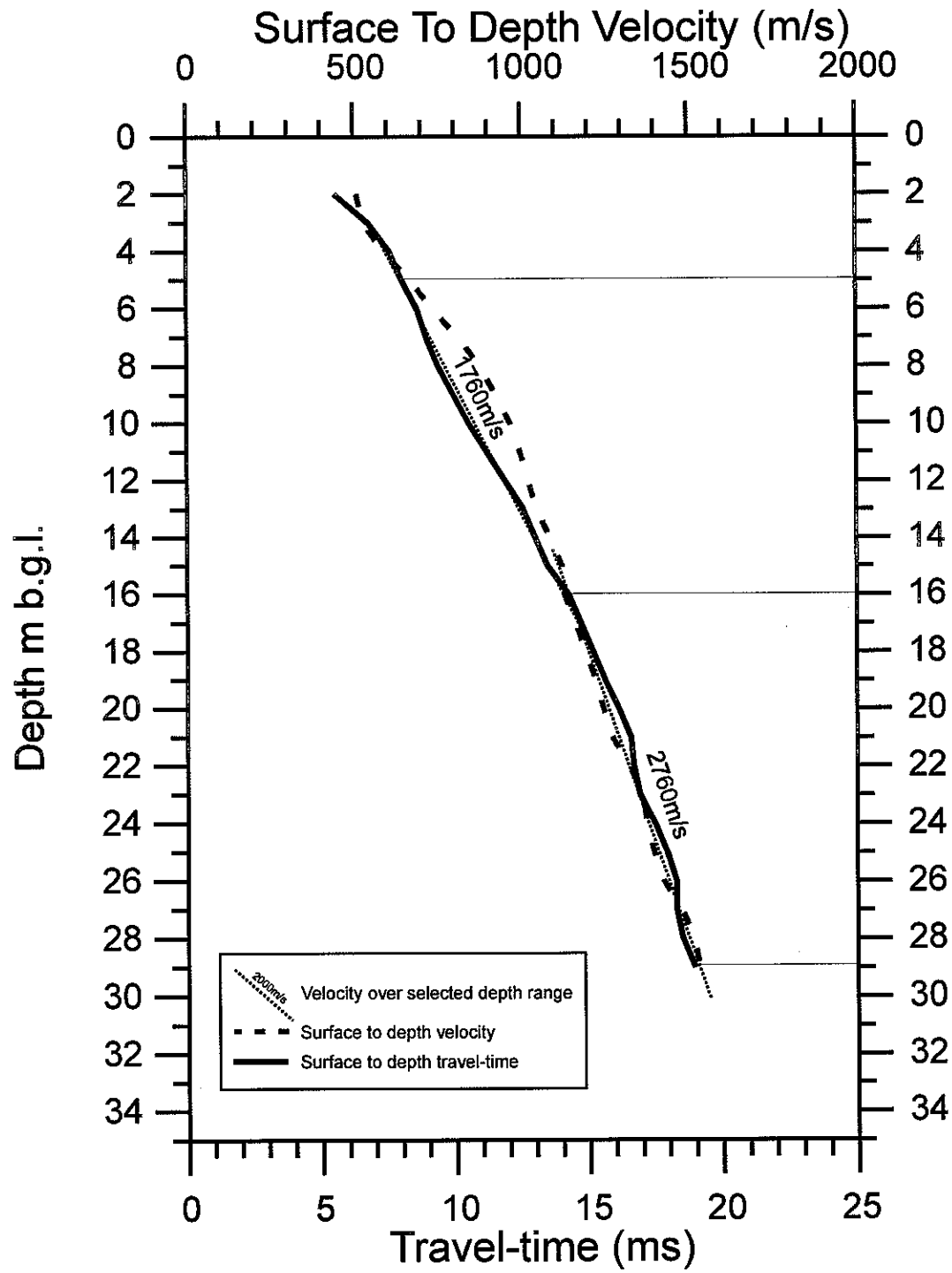
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 326323.0, 184285.5
Ground Level: 71.4m OD
Date: January 1998

Borehole No
B16A
Sheet 1 of 1



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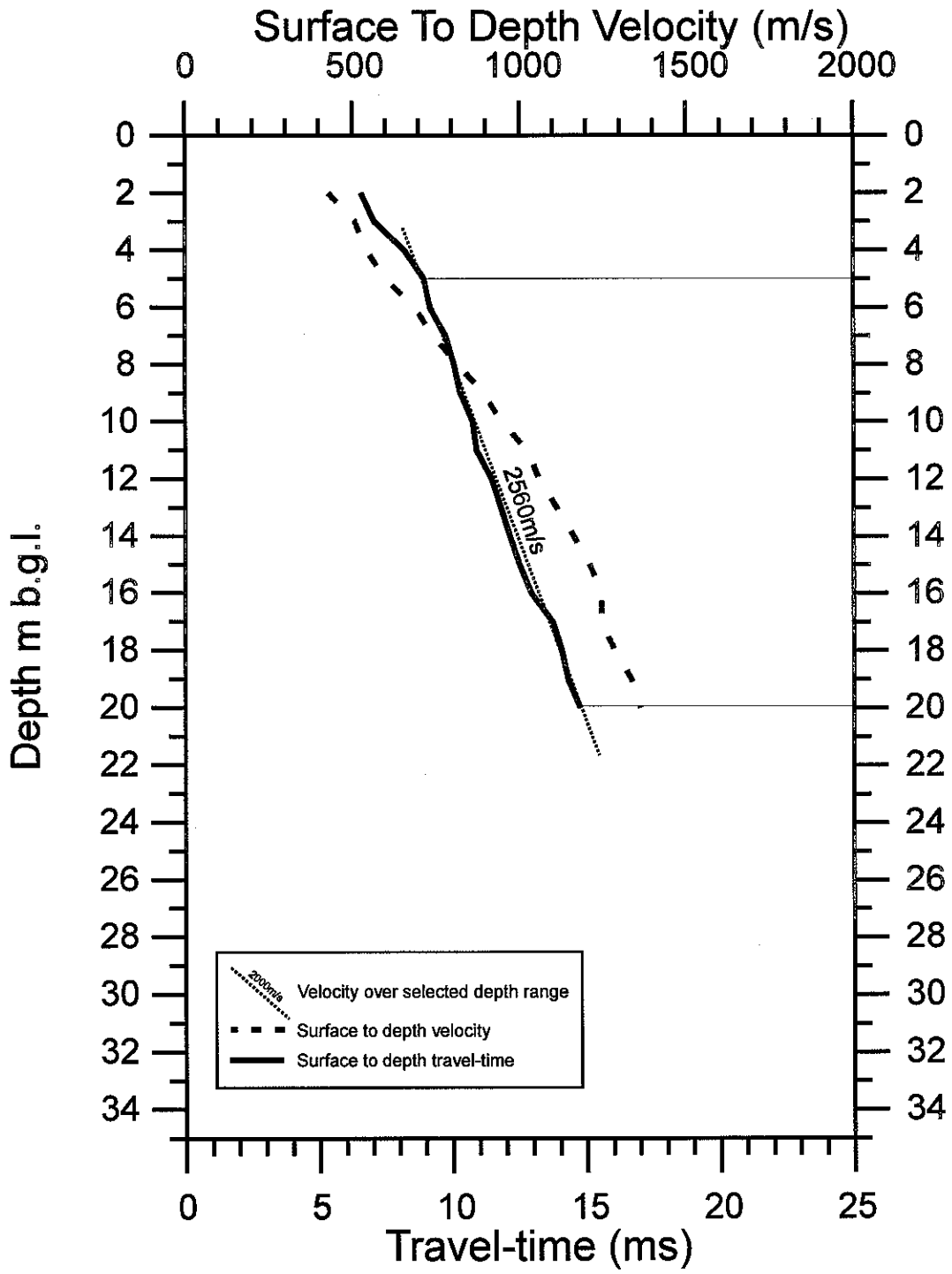
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 326443.0, 184310.3
Ground Level: 65.3m OD
Date: January 1998

Borehole No
B17
Sheet 1 of 1



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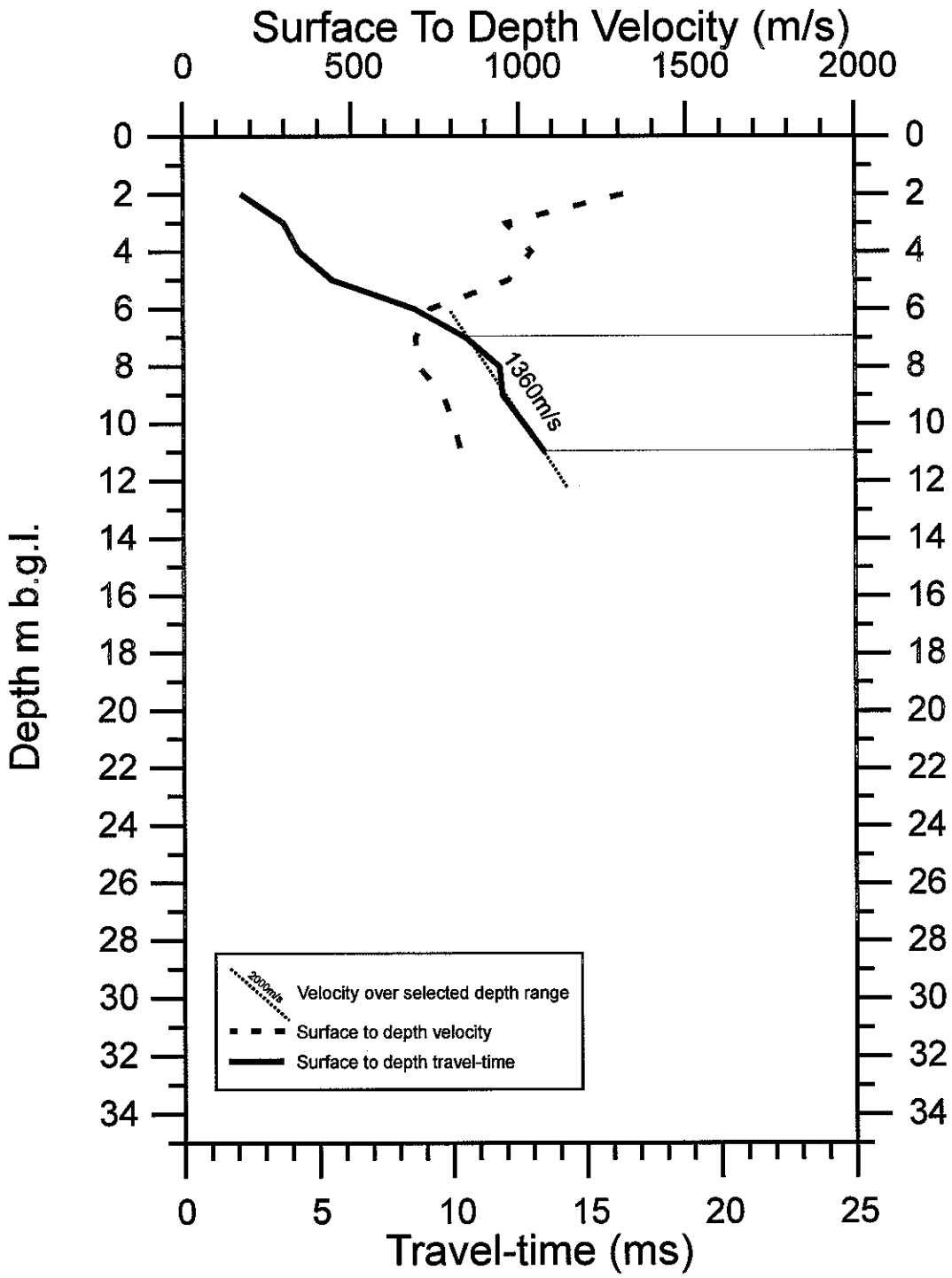
VERTICAL SEISMIC PROFILE

M4 Relief Road Magor to Castleton Stage 2	Method: Down-hole P-wave Coordinates: 341825.7, 187581.5 Ground Level: 26.6m OD Date: January 1998	Borehole No N3 Sheet 1 of 1



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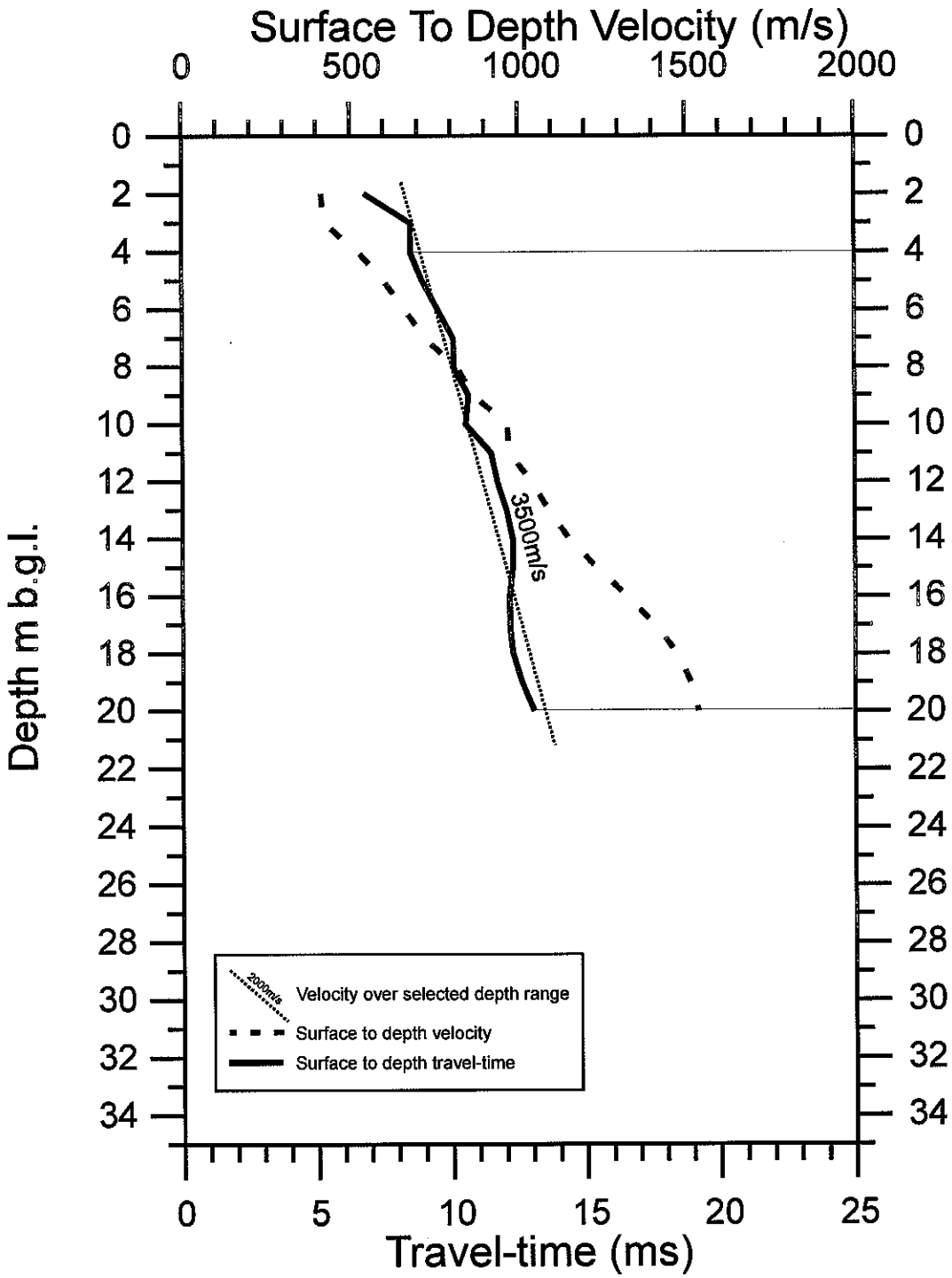
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 342190.3, 187771.5
Ground Level: 18.0m OD
Date: January 1998

Borehole No
N6
Sheet 1 of 1



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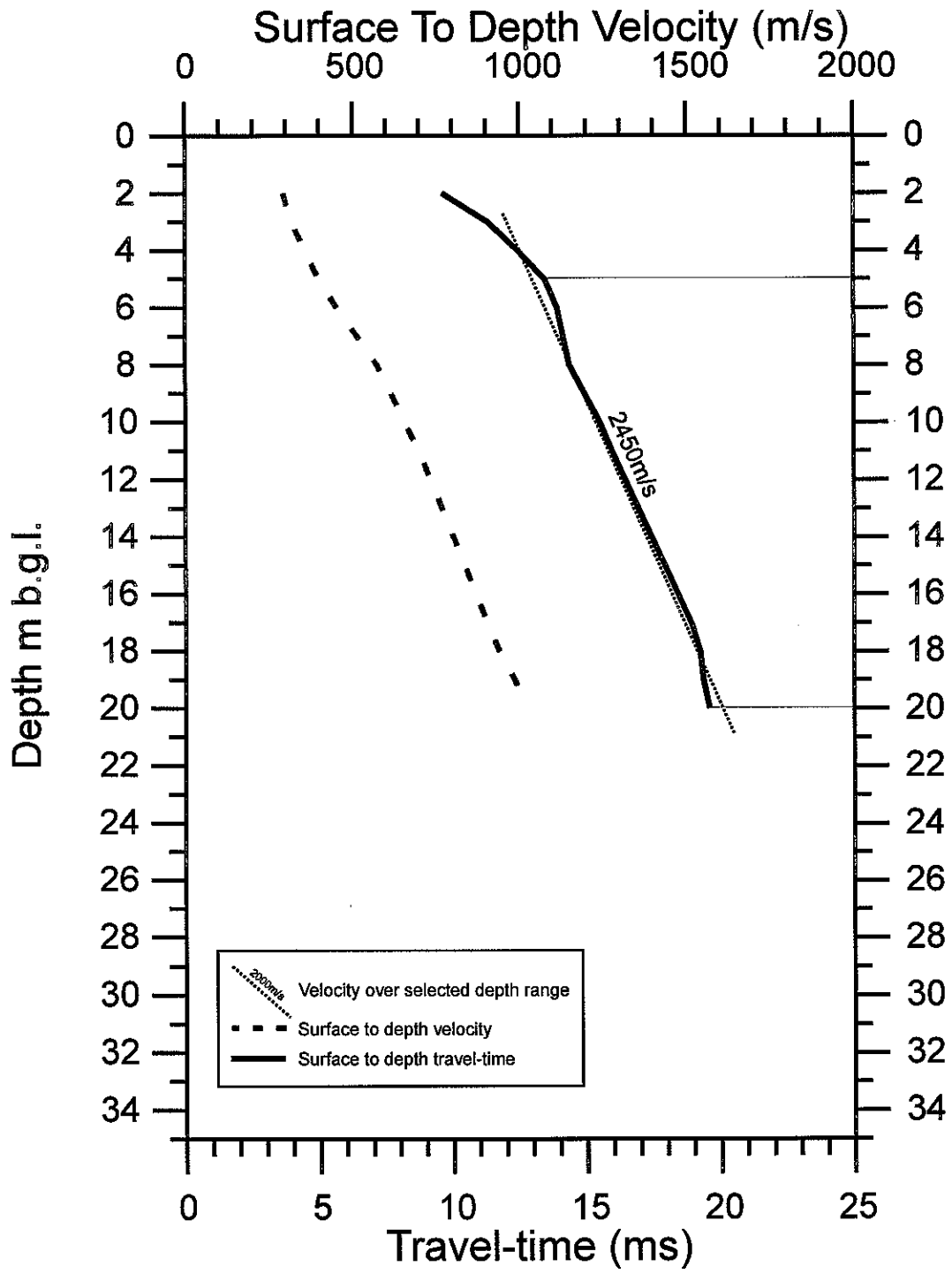
VERTICAL SEISMIC PROFILE

M4 Relief Road Magor to Castleton Stage 2	Method: Down-hole P-wave Coordinates: 342203.2, 187870.0 Ground Level: 18.0m OD Date: January 1998	Borehole No N7 Sheet 1 of 1



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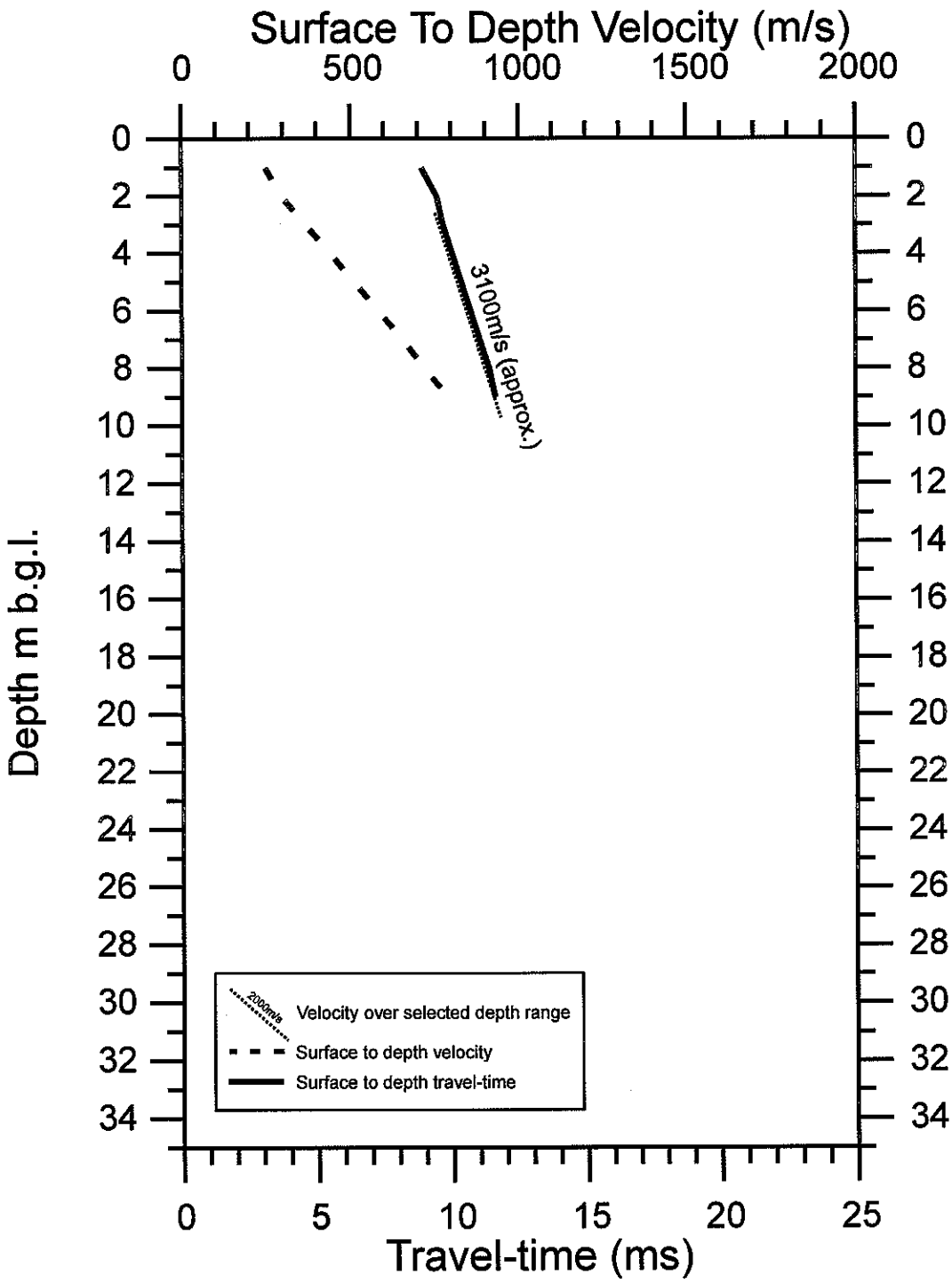
VERTICAL SEISMIC PROFILE

M4 Relief Road Magor to Castleton Stage 2	Method: Down-hole P-wave Coordinates: 342781.2, 188015.2 Ground Level: 34.4m OD Date: January 1998	Borehole No N12 Sheet 1 of 1



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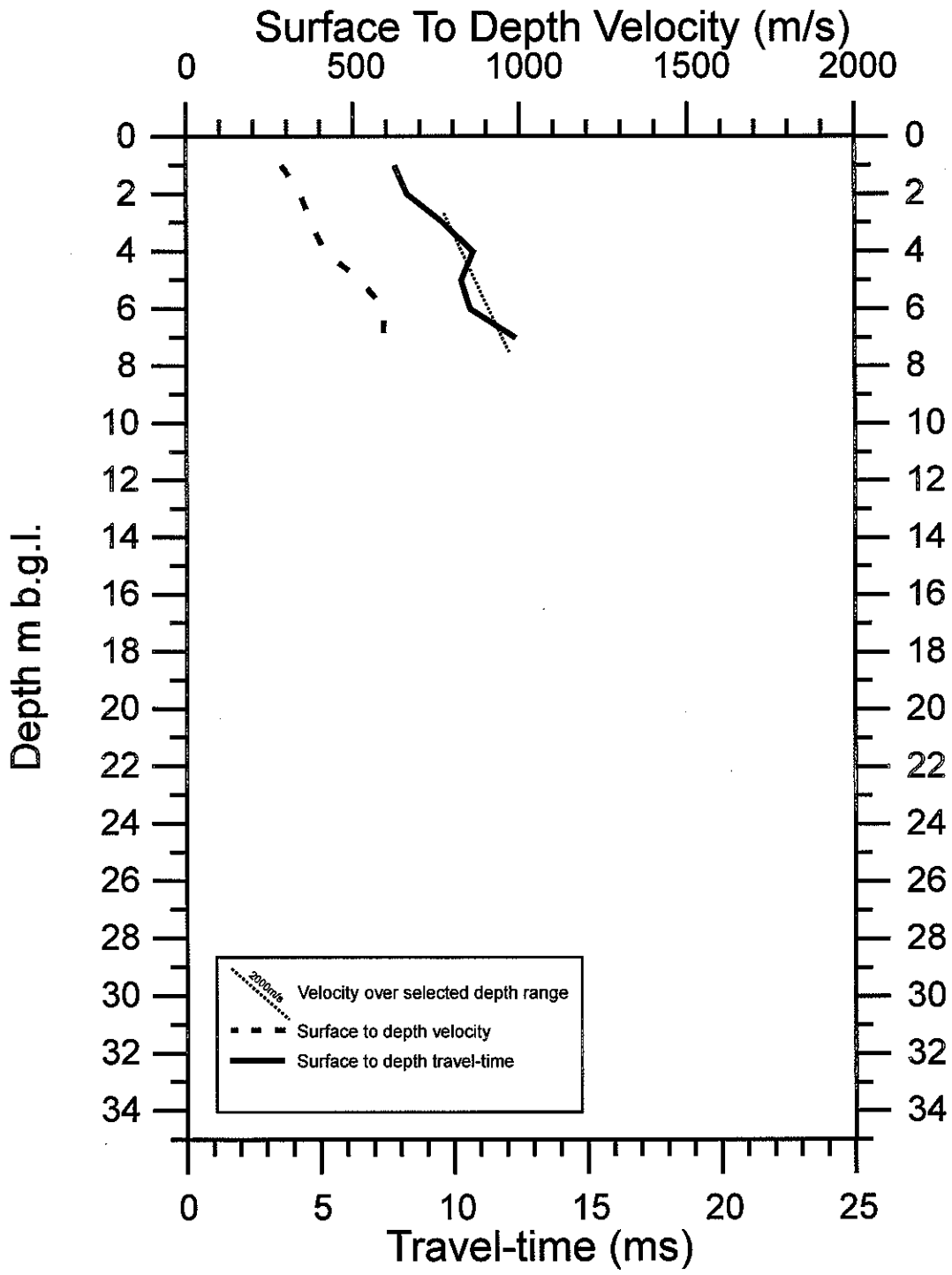
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 343307.0, 188003.9
Ground Level: 37.0m OD
Date: January 1998

Borehole No
P2
Sheet 1 of 1



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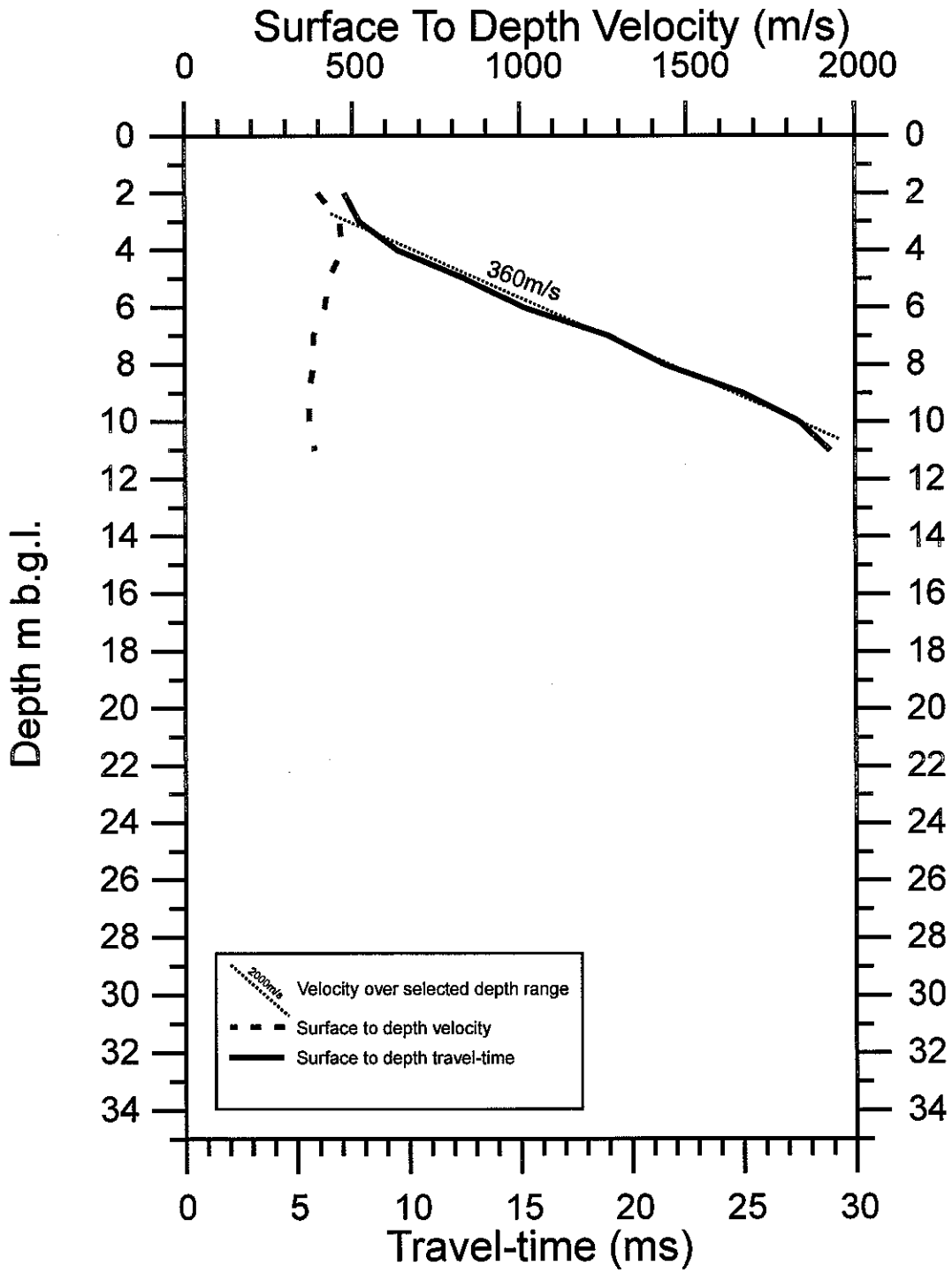
VERTICAL SEISMIC PROFILE

M4 Relief Road
Magor to Castleton
Stage 2

Method: Down-hole P-wave
Coordinates: 344072.4, 188127.7
Ground Level: 29.9m OD
Date: January 1998

Borehole No
P10
Sheet 1 of 1



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