A14.7 – NM Rothschild Bank (Ground Investigation) (Norwest Holst Soil Engineering Ltd)

REPORT QUALITY ASSURANCE SHEET

Title:

REPORT ON A GROUND INVESTIGATION AT NM ROTHSCHILD BANK LONDON EC4N

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1.0 INTRODUCTION

In August 2007 Norwest Holst Limited - Soil Engineering Division (NHSED) were instructed by Arup Geotechnics (The Engineer) acting for and on behalf of Stanhope Plc (The Employer) to carry out a ground investigation at N. M. Rothschild and Sons (NMR) Bank, in the City of London for the proposed development of the site. It is understood that it is proposed to replace the existing buildings with a fifteen storey building with two basement levels which are to be deeper than the existing ones below the present site. The investigation comprised the formation of one cable percussion borehole together with one trial pit.

This factual report represents the results of the fieldwork and laboratory testing undertaken together with information on the ground and groundwater conditions encountered. The fieldwork was carried out in two phases; the first between 25th and 27th August 2007, and the second on 15th October 2007.

2.0 PURPOSE, SCOPE AND REPORT FORMAT

2.1 Purpose

The purpose of this investigation was to determine the subsurface ground and groundwater conditions at the site of the proposed re-development. This information was to be obtained from a combination of intrusive investigation techniques and laboratory testing.

2.2 Scope of Work

The brief for this factual report comprised the following items:

1. To form one exploratory hole on site.
2. To log and sample one trial pit on site.
3. To install gas and ground water monitoring instruments.
4. To monitor on site installations.
5. To undertake laboratory tests on samples recovered from exploratory holes.

The sources of information used in the compilation of this report are detailed in the list of references on page 10.

2.3 Report Format

This report is presented in the following format:

Factual information comprising: -

- Description of fieldwork
- Exploratory hole logs
- Laboratory test results
- Maps and plans
- Photographs of the trial pit

3.0 DESK STUDY INFORMATION

3.1 Scope of Study

A formal comprehensive desk study was not requested by the Engineer for this investigation. The following sections however provide general details of site location and description and site geology as ascertained from published maps.

3.2 Site Location and Description

The site is located at New Court and Nos 1 to 10 St Swithin's Lane, City of London, EC4N, (approximate National Grid Reference TQ 327 810). The existing building is currently owned and occupied by the investment bank, N. M. Rothschild and Sons.

At the time of the investigation the NMR Bank was bounded by The Wallbrook development to the south of the site (under construction at the time of the investigation); by 8-10 Mansion House Place, adjacent to the northern and western site boundary, (used by the British Arab Commercial Bank at the time of the investigation); by The Wallbrook Club, adjacent to the western boundary of New Court and by St. Swithin's Lane, adjacent to the eastern site boundary.

Ground levels varied around the perimeter of the site between approximately 14.0m OD at St Swithin's Lane to 10.0m OD at Bond Court, with a slight downward gradient proceeding eastwards from the corner of Mansion House Place and St Swithin's Lane. The area of open space between New Court and St Stephen's Church was generally level.

The location of the site is indicated on Figure 1 in Section D of this report.

3.3 Geology

From the available information on the 1:50,000 scale Geological Survey map of the area (Sheet 256: 1993, Solid and Drift edition for North London) the site is shown to be underlain by River Terrace Deposits of Taplow Gravel and locally by alluvial drift deposits. These in turn overlie the London Clay Formation of Eocene age and at greater depth the Lambeth Group of Palaeocene age.

4.0 FIELDWORK

4.1 Scope of Fieldwork

The scope of the fieldwork was specified by the Engineer and was undertaken in general accordance with BS 5930: 1999. In accordance with the specification and drawings provided by the Engineer, NHSED were required to survey the exploratory hole and to undertake the testing and sampling regime. One cable percussion borehole was formed by NHSED to a depth of 52.30m together with one trial pit formed by McGees (acting as subcontractors to Arup Geotechnics) to a depth of 2.03m. The exploratory hole locations are shown on the site plan presented in Section D of this report.

4.2 Enabling Works

Prior to the first phase of the work, i.e. cable percussion borehole, McGees were responsible for locating the borehole position in the basement and coring upwards between the beams of the concrete waffle ground slab. McGees then cored the basement slab vertically below

the first hole and installed props below the beams of the concrete waffle slab. McGees were also responsible for the reinstatement of the cored hole in the concrete waffle slab on completion of the borehole.

Prior to the second phase of the works, i.e. sampling from the trial pit, McGees were responsible for excavating the trial pit located in the basement. McGees formed the pit by "stitch drilling" around the perimeter using a concrete coring rig, followed by breaking out the concrete and then hand excavation of the underlying River Terrace Deposits. Following logging and sampling by a NHSED Engineering Geologist the pit was backfilled and reinstated by McGees.

4.3 Cable Percussion Boreholes

One borehole designated BH01 was formed to a depth of 52.3m below existing road level (i.e. to -37.91m OD) using conventional light cable percussion techniques utilising 200mm diameter temporary steel casings. The borehole was formed in order to obtain samples for laboratory testing, to provide geotechnical information for foundation design and to locate the base of the London Clay. The borehole was also used for the installation of a standpipe piezometer.

102mm nominal diameter open tube samples (U100) 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 Leeds laboratory of NHSED.

In the River Terrace Deposits and alternating with the open tube samples, Standard Penetration Tests were carried out using either a split spoon sampler or a solid 60° cone. The results of these tests are given as a Standard Penetration "N" value or as a blow count for a given penetration at the appropriate position on the borehole logs, where the use of either the sampler or cone is also recorded.

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

The samples recovered from the borehole were described by an Engineering Geologist, in accordance with the terminology presented in Section A of this report. A detailed description of all strata encountered, groundwater conditions and the position and type of samples taken are included on the borehole log presented in Section B of this report.

4.5 Trial Pits

As described in Section 4.2 a single trial pit, designated TP03, was excavated by hand by McGees to a depth of 2.03m. This trial pit was located in the basement to provide a reasonable indication of base of the existing foundation and the depth to the top of the River Terrace Deposits.

The trial pit was shored by McGees and was logged by a NHSED Engineering Geologist. The Engineering Geologist provided a detailed description of the ground conditions encountered in the pit and also obtained soil samples for geotechnical and contamination analysis. The strata encountered in the trial pit are described on the trial pit log presented in Section B of this report and the location of the trial pit is indicated on the site plan presented in Section D.

4.6 Survey

The coordinates and elevation of the borehole were determined by Wellden Land Surveys, acting as sub-contractors to NHSED. The coordinates and elevation were established using Leica Total Station Equipment and are based on survey stations indicated on plans supplied by Plowman Craven & Associates. The coordinates and elevation are given on the borehole log.

4.7 Installations / Instrumentation

A slotted 50mm diameter UPVC tube was installed in borehole BH01 at the base of the River Terrace Deposits, at an elevation of 4.69m OD. This tubing was slotted from the base up to an elevation of 7.69m OD with the slotted section being surrounded by pea gravel and the upper 0.50m being surrounded by a bentonite seal. A metal stopcock cover was concreted into place at basement level and a plastic cap with a gas valve was placed onto the tube to facilitate long-term groundwater and gas monitoring. A schematic of the installation is shown on the borehole log.

4.8 Gas and Groundwater Monitoring

In accordance with the Engineer's instruction monitoring of gas concentrations and groundwater levels in BH01 was carried out at weekly intervals for four weeks after completion of the site works. Monitoring for methane, carbon dioxide, and oxygen gases was carried out using a Geotechnical Instruments GA2000 gas analyser. The results are presented in Section B of this report.

5.0 LABORATORY TESTING

5.1 Scope of Testing

All geotechnical (soils) and chemical (contamination) testing was scheduled by the Engineer. The scope of the testing was required to enable comments regarding foundation design to be made and for potential site contamination levels to be established.

5.2 Geotechnical Soils Testing

The programme of laboratory testing was carried out in accordance with BS1377 (1990). The following testing was carried out at the Leeds laboratory of NHSED, which is registered as UKAS Testing laboratory No 1265.

The tests listed below were carried out and the results are given on the summary sheets with individual test plots presented in Section C of this report.

B.S. CLAUSE No	DESCRIPTION
Part 2: 3	Moisture Content
Part 2: 4 & 5	Atterberg Limits
Part 2: 9	Particle Size Distribution
Part 7: 8	Undrained Triaxial Compression with single stage Loading

In addition chemical (sulfate and pH) testing was undertaken by ECõS Environmental of Bradford which is registered as UKAS testing laboratory 0618. Testing was undertaken in order to assess concrete requirements from BRE Special Digest No 1. Samples were prepared in general accordance with BS 1377, although final analysis of total sulfate was performed

using ICP and aqueous extract using Ion Chromatography.

5.3 Contamination Testing

A programme of contamination testing was scheduled by the Engineer. A total of two soil samples were sent to ECõS Environmental of Bradford, which is registered as UKAS Testing laboratory No. 0618.

The results of the contamination testing are presented in Section C of this report.

METALS AND SEMI METALS	ORGANICS AND OTHERS
Arsenic Beryllium Cadmium Chromium (total) Copper Lead Mercury Nickel Selenium Vanadium Zinc	Acidity Asbestos BTEX (by GCMS) Cyanide (total) PAH (16 speciated) PCB Phenols (total) Total Organic Carbon TPH

In addition one soil sample was tested according to BSEN 12457-3:2000, using one stage preparation batch test at 10l/kg, to screen the material for compliance with waste acceptance criteria.

6.0 RESULTS OF THE INVESTIGATION

6.1 Scope of Commentary

The results of this investigation appear to broadly concur with the published geology summarised in Section 3.3 of this report. The following sections are only intended to provide a summary of the ground conditions encountered during this investigation whilst the logs presented in Section B of this report give a detailed account of all the strata observed.

6.2 Made Ground

In the borehole, BH01, concrete was present from road level to the top of the basement car park at an elevation of 13.89m OD. The floor of the basement slab of the car park was encountered at 11.09m OD and extended to an elevation of 8.89m OD. The basement is shown as a void on the borehole log. In the trial pit (TP03) reinforced concrete with 30mm and 15mm reinforcing bar extended to a depth of 1.66m.

6.3 River Terrace Deposits

Underlying the concrete of the basement floor slab, River Terrace Deposits (RTD) were encountered to an elevation of 4.84m OD. This deposit comprised very dense, very sandy flint gravel. In the trial pit, TP03, RTD were encountered beneath the reinforced concrete and proven to the base of the pit at 2.03m.

6.4 London Clay Formation

Underlying the River Terrace Deposits, London Clay was encountered in BH01 to an elevation of -36.11m OD. This deposit comprised firm becoming very stiff with depth, brownish grey clay, which was locally sandy. Pockets of selenite crystals and claystone bands were also noted.

6.5 Lambeth Group

Below the London Clay Formation soils of the Lambeth Group were encountered. This deposit comprised bands of multicoloured sandy clay and greyish brown fine sand, which were proven to the base of the borehole at -37.91m OD.

6.6 Groundwater

Groundwater was encountered in BH01 at an elevation of -36.61m OD. A summary of groundwater inflows into the borehole is given in Table 1 in Section B, whilst the log presented in Section B of this report provides full details of groundwater information.

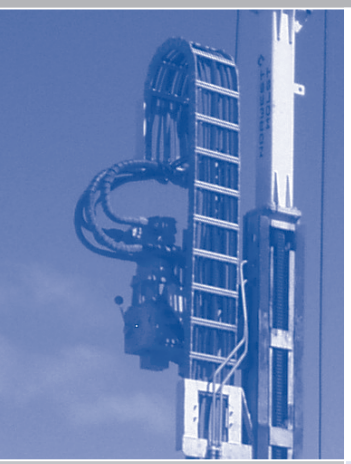
For and on behalf of
Norwest Holst Limited - Soil Engineering Division

H. Sydney
Assistant Reports Engineer

J. T. Williams
Principal Geotechnical Engineer

REPORT REFERENCES

- BRE Special Digest 1: (2005): Concrete in Aggressive Ground. BRE Construction Division.
- BGS Sheet 256: (1993): 1:50,000 scale Solid and Drift edition for North London. British Geological Survey.
- BS 5930: (1999): Code of Practice for Site Investigation. British Standards Institution.
- BS 1377: (1990): Parts 1 to 9: Methods of Test for Soils For Civil Engineering Purposes. British Standards Institution.



SUPPORTING FACTUAL DATA

SECTION A
Notes on Fieldwork, Logging and Laboratory Testing

FIELDWORK PROCEDURES

NORWEST HOLST
SOIL ENGINEERING

1.0 CABLE PERCUSSION BORING TECHNIQUES

Unless otherwise stated the light cable percussion technique of 'soft ground' boring has been employed in the formation of boreholes for this contract. In cohesive soils a clay cutter has been used to advance the boreholes whilst in granular deposits a shell has been employed. The combination of clay cutter and shell bring up disturbed material which is generally sufficiently representative to permit identification of the strata. Whilst these particular techniques allow 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.

2.0 DYNAMIC SAMPLING

As an alternative to cable percussion boring, NHSED employs a number of techniques for the sampling of soils. The most common alternative techniques comprise some form of dynamic sampler system which involves sampling tubes being driven into the ground by means of a sliding weight.

'Window sampling' techniques form the most common type of dynamic sampling and typically comprises 1.0m long steel cylinders with elongated windows. These are driven to the required depth by the use of a percussive hammer. In the 'windowless' mode a plastic liner can be placed in the steel cylinders such that effectively continuous sampling can be undertaken. This method of sampling only produces class 2 or 3 samples which are generally not suitable for any form of laboratory machine testing.

3.0 ROUTINE SAMPLING

In the UK "undisturbed" samples of predominantly cohesive soils are generally obtained in a 102mm diameter open drive sampler as defined in the British Standard Code of Practice BS 5930 (1999) (ref 01). The British Standard notes however that conventional and lined open drive samplers do not produce Class 1 samples for laboratory testing and for this reason NHSED has incorporated a taper into the cutting shoe of all its lined open drive samplers. This taper significantly reduces sample disturbance and for the majority of cohesive soils allows samples to be recovered which are suitable for laboratory machine testing. However it should be appreciated that no sample can be truly undisturbed when sampled in this manner and the effects of disturbance can best be seen in laminated clays in which the laminations may be turned downward on the margins of the sample due to the driving effects of the sampler. Where it is necessary to minimise the effects of sample disturbance e.g in 'sensitive' clays and silts, alternative sampling techniques may be specified and where used, are described in the report text.

In granular deposits and mixed cohesive-granular deposits where it is not possible to recover undisturbed samples, either large or small disturbed samples are normally obtained. The size of these samples are in accordance with the requirements of B.S. 5930 (1999) whilst the frequency of sampling is unique to this contract.

It is important to note that the number of blows taken to drive any kind of sampling tube is not necessarily indicative of the strength of the material being sampled. For this reason NHSED recommends that no attempt is made to correlate such blows with the consistency of cohesive strata.

4.0 ROTARY DRILLING

Where rotary open hole drilling techniques have been employed it is important to note that descriptions of the strata encountered are generally solely based on the foreman drillers observations of cuttings and drill flush returns. Whilst such techniques can provide useful information in certain ground conditions it should be recognised that an accurate determination of subsurface rock strata can only be obtained by rotary coring techniques.

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

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. When appropriate the Fracture Index (FI) or fracture spacing (If) is also given on the logs and represents respectively the number of natural fractures per metre run of core for core that has a similar intensity of fracturing, or the minimum, average and maximum spacing of such natural fractures over an arbitrary length of core of similar intensity of fracturing.

The symbols and abbreviations used on the rotary borehole logs are explained on the exploratory hole legend and notation sheet that precedes the exploratory hole records. 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. 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.

Where significant core loss (>300mm) has occurred, it is NHSED general policy to insert a separate 'stratum' on the log to coincide with the inferred zone of core loss. Unless there is good evidence as to the rock (or soil) type that has been lost, the legend column is left blank. For zones of inferred mine workings, an appropriate legend is used and this together with all the legends used on the logs is shown on the log notation sheet that precedes the exploratory logs in the report.

A summary of logging methodology for rock strata and core measurements is given in Section A: Terminology used in the description and classification of rocks.

5.0 IN SITU DYNAMIC PENETRATION TESTS

Standard or Cone Penetration Testing is generally employed where undisturbed samples cannot be obtained e.g in granular soils, fill and rock etc, in order to obtain an indication of the in situ density, compaction or hardness. Inherent difficulties are present in obtaining true S.P.T or C.P.T "N" values in water bearing fine grained granular deposits and careful consideration of the test technique and groundwater conditions are necessary before test results are used for design purposes.

The full procedure for carrying out the Standard Penetration Test (SPT) is given in BS 1377: 1990, Test 9:3.3 (ref 02). Essentially the test consists of driving a 50mm external diameter split barrel sampler into the soil using a 63.5kg hammer dropping 760mm. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows for the 300mm test drive penetration is recorded on the borehole logs as the "N" value. A full record of the number of blows required to drive the sampler at 75mm intervals throughout the total 450mm drive is also tabulated along with the groundwater level at the time of test. It is important to distinguish how the blow count relates to the penetration of the sampler and this may be achieved in the following manner:

(i) Where the test drive is terminated at 50 blows the number of blows for the partial test drive (usually 50) and the penetration of the sampler within the test drive are recorded. An approximate "N" value may be obtained by linear extrapolation of the number of blows recorded for the partial test drive.

(ii) If the total penetration is equal to or less than the 150mm seating drive then the number of blows (usually 25) and the depth of penetration within the initial seating penetration are recorded on the borehole logs.

The "N" value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels in accordance with Clause 41.3.2 of BS 5930: 1999, as follows:

TABEL 1: **DETERMINATION OF RELATIVE DENSITY FROM PENETRATION TESTS**

Term	SPT N-Value: Blows/300mm Penetration
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Standard Penetration Testing may also be performed in very stiff/hard clays in which it would be difficult to obtain undisturbed samples. In such cases the S.P.T "N" values may be used for design purposes based on correlations between "N" value and various soil parameters such as those proposed by Stroud and Butler (ref 03).

6.0 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 should also be noted 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 such fluctuations.

More accurate information on groundwater conditions can be obtained from exploratory hole installations such as piezometers and standpipes. Normally three or four monitoring visits are required at the site to provide this information.

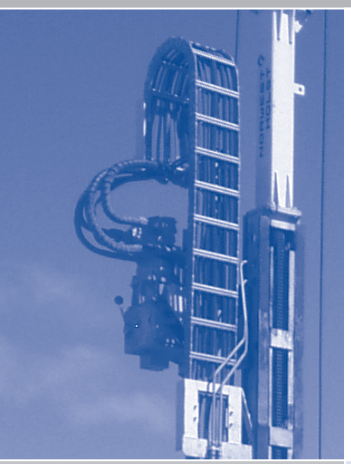
References

01) BS 5930:1999 Code of Practice for Site Investigation. British Standards Institution.

02) BS 1377: Part 9: Test 9.3.3 1990 Methods of Tests for Soils for Civil Engineering Purposes. British Standards Institution.

03) Stroud, M.A, Butler, F.G ' The Standard Penetration Test and the Engineering Properties of Glacial Materials' from the Engineering Behaviour of Glacial Materials Proc. of Symp. April 1975.

04) NHSED, Manual on the Sampling and Logging of Soil and Rock (SALOSAR). 2005, 3rd Ed.



SUPPORTING FACTUAL DATA

SECTION A
Notes on Fieldwork, Logging and Laboratory Testing

SOIL DESCRIPTION TERMINOLOGY

NORWEST HOLST
SOIL ENGINEERING

1.0 GENERAL PROCEDURES

Soil descriptions contained in this report have been produced in accordance with the procedure and principles given in BS 5930 (1999) (ref 01). The SALOSAR document produced by NHSED provides amplification on all aspects of the descriptive terminology given in the British Standard, (ref 02).

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**
comprising state and structure
1a Density and Field Strength
1b Discontinuities
1c Bedding

2 **Material Characteristics**
comprising nature and state
2a Colour
2b Composite Soil Types: particle grading and composition, shape and size
2c Principal Soil Type, name in capitals eg CLAY

3 **Stratum Name (optional)**
3a Geological Formation

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 may be broadly summarised as follows, with categories i to iii covered by these notes and category iv and v by separate notes.

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

(ii) Coarse soils: 0.06mm 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 strength guide given in Table 1 on the following page shall be used. Unless specified for individual contracts no subdivision of material strength categories is used.

TABLE 1: **STRENGTH SCALE GUIDE FOR COHESIVE MATERIAL**

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.

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 BS 1377:1990) (ref 03).

TABLE 2: **ASSESSMENT OF RELATIVE DENSITY FOR GRANULAR SOILS**

Term	Field Identification (generally in trial pits)	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 be treated 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 Table 3. 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 3.

TABLE 3: **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
N.B: Spacing terms are also used for describing the distance between partings, isolated beds, laminae or roots etc.		N.B: 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 include 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 three colours the term multicoloured should be used. The term mottled should be applied to soils which exhibit two colours, one of which is subordinate to the other.

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 Soil Types (Including Composite Soils)

3.2.1 Very Coarse Soils (Boulders and Cobbles)

Where the soil sample is considered large enough to be representative, material is described as follows:-

TABLE 4: **DESCRIPTORS FOR VERY COARSE SOILS**

Main Name	Estimated Boulder/Cobble Content of Very Coarse Fraction
BOULDERS	Over 50% is of boulder size (>200mm)
COBBLES	Over 50% is of cobble size (200mm to 60mm)

Mixtures of very coarse and finer materials are described by combining terms for the very coarse constituents with those for the finer constituents as follows:-

TABLE 5: **DESCRIPTORS FOR MIXTURES OF VERY COARSE AND FINER SOILS**

Term	Composition (Approx %)
BOULDERS (or COBBLES) with a little finer material (1)	Up to 5% finer material
BOULDERS (or COBBLES) with some finer material (1)	5% to 20% finer material
BOULDERS (or COBBLES) with much finer material (1)	20% to 50% finer material
FINER MATERIAL with many boulders (or cobbles)	50% to 20% boulders (or cobbles)
FINER MATERIAL with some boulders (or cobbles)	20% to 5% boulders (or cobbles)
FINER MATERIAL with occasional boulders (or cobbles)	Up to 5% boulders (or cobbles)

(1) The description of "finer material" is made in accordance with BS 5930 41.4.2 to 41.4.6 ignoring the very coarse fraction; the principal soil type name of the finer material may also be given in capital letters, e.g. sandy GRAVEL with occasional boulders; COBBLES with some sandy CLAY.

3.2.2 Coarse Soils (Gravel and Sand)

A coarse soil (omitting any cobbles and boulders) contains 65% or more of SAND or GRAVEL. The following terms may be used to describe the coarse fraction:-

TABLE 6: **DESCRIPTORS FOR MIXTURES OF VERY COARSE AND FINER SOILS**

Term	Principal Soil Type	Approximate Proportion of Secondary Constituent
Slightly sandy or gravelly	SAND	Up to 5%
Sandy or gravelly	or	5% to 20%
Very sandy or gravelly	GRAVEL	Over 20%
-	SAND and GRAVEL	About equal proportions

3.2.3 Fine Soils and Mixtures of Fine and Coarse Soils

Fine soil should be described as either a SILT or a CLAY. The use of silty CLAY or clayey SILT is not permitted.

For deposits that contain a mixture of soil types the descriptors given in Table 7 are used. The dominant secondary fraction is placed immediately before the principal soil type. It should also be noted that the terms silty and clayey are mutually exclusive in a coarse soil. The use of the terms sandy and gravelly are however permitted.

TABLE 7: **DESCRIPTORS FOR FINE SOILS AND COMPOSITE SOIL TYPES**

Term	Principal Soil Type	Approximate Proportion of Secondary Constituent Coarse Soil	Coarse and/or Fine Soil
Slightly clayey or silty and/or sandy or gravelly	SAND and/or GRAVEL		>5%
Clayey or silty and/or sandy or gravelly			5% - 20% *
Very clayey or silty and/or sandy or gravelly			>20% *
Very sandy or gravelly	SILT or CLAY	>65% +	
Sandy and/or gravelly		35% - 65%	
Slightly sandy and/or gravelly		<35%	

* or described as fine soil depending on assessed engineering behaviour
+ or described as coarse soil depending on assessed engineering behaviour

3.3 Particle Shape and Grading

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

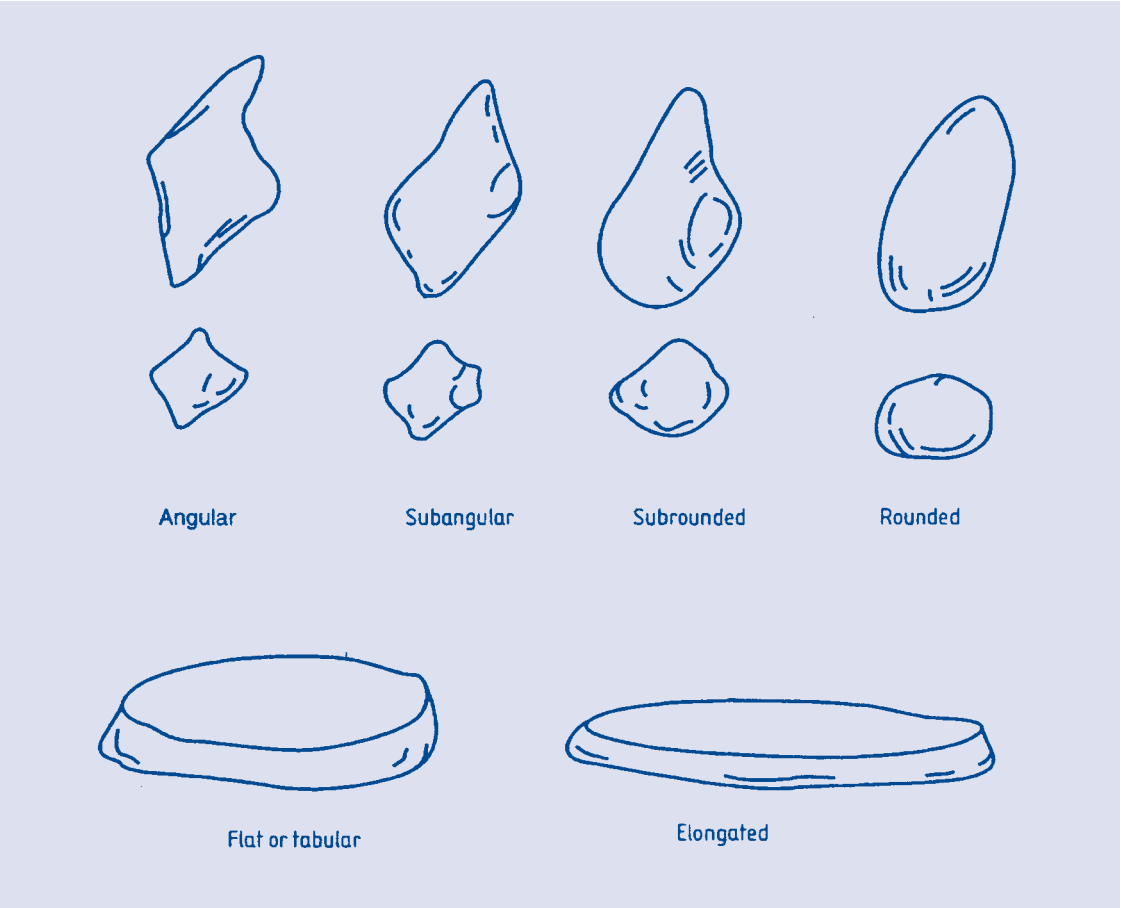
TABLE 8: **DESCRIPTORS FOR PARTICLE SHAPE**

Angularity	Form	Surface Texture
Angular	Flat	Rough
Subangular	Elongated	Smooth
Subrounded		
Rounded		

Notes: Form and surface textural descriptors are optional.

The distribution of particle sizes within sands and gravels should be described stating the predominant size fraction present eg fine to medium SAND.

FIGURE 1: **PARTICLE ANGULARITY AND FORM TERMS**

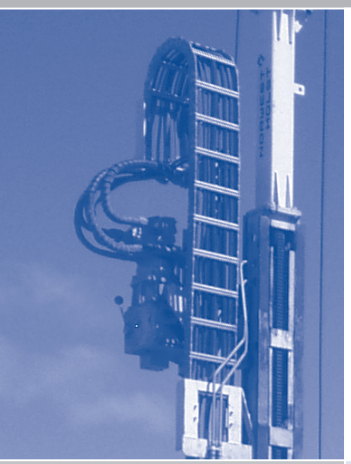


References

01) BS 5930: (1999) Code of Practice for Site Investigation. British Standards Institution.

02) NHSED, Manual on the Sampling and Logging of Soil and Rock (SALOSAR), 2005, 3rd Ed.

03) BS 1377: 1990 Methods of Test for Soils for Civil Engineering Purposes. Part 9 British Standards Institution.



SUPPORTING FACTUAL DATA

SECTION A
Notes on Fieldwork, Logging and Laboratory Testing

MADE GROUND DESCRIPTION TERMINOLOGY

NORWEST HOLST
SOIL ENGINEERING

SECTION A 3: TERMINOLOGY USED IN THE DESCRIPTION OF MADE GROUND

1.0 GENERAL DEFINITIONS

Man made soils may be defined as those materials that have not been laid down by geomorphological processes. Under the heading of 'man made soils' two distinct material types can be identified as follows:-

TABLE 1: **DEFINITIONS FOR MAN MADE SOILS**

NATURAL SOILS (Reworked)	Use normal BS5930 approach and terminology as outlined previously. Usually not too much of a problem. Can be tested in accordance with BS1377.
MAN MADE MATERIALS	Can frequently also be described using normal approach and terminology as above, and tested geotechnically. Includes materials that defy description in any standard manner and includes a range of exotic materials and artefacts. Often not testable in the field or in the laboratory. For example cannot measure strength of a bicycle frame or liquid limit of plastic.

There is also a distinction between the terms "Fill" and "Made Ground" as follows:

FILL = Material placed under engineering control
MADE GROUND = Material placed without any kind of control, ie non engineered

2.0 IDENTIFICATION OF MAN MADE SOILS

Some common examples of man made soils are given in Table 2 on the following page. The table illustrates that the heading of 'man made' soils can cover a wide variety of materials, some of which may not readily appear to be anything other than natural.

Natural soils re-laid by man may be difficult to identify as such but look for evidence in the form of artefacts or relic structure in the material.

For example as few as one or two artefacts may be diagnostic (rare brick fragments or car body at base of trial pit). Lenses or pockets of clay that are laminated etc help to indicate natural material that has been relaid. However be aware of the following:

- Contamination by driller (Clinker from around rig, green grass from 15m...).
- Contamination during trial pitting (brick rubble can fall from the upper layers in a pit and then get pushed in to natural deposits by the action of the excavator bucket).

TABLE 2: **EXAMPLES OF COMMONLY FOUND MAN MADE SOIL**

CATEGORY	EXAMPLE
Natural Soils re-laid by man	Embankment Fill Colliery Spoil (Coarse Discard) Drainage Layer e.g Gravel
Man Made Materials that can be described and which are testable geotechnically	Abutment backfill e.g Crushed rock Colliery Spoil (Fine Discard) Mine Tailings from non-coal mines Crushed Concrete Pulverised Fuel Ash (PFA) Chalk whiting (slurry from cement manufacture)
Man Made Materials that are NOT readily describable and which are not testable geotechnically	Landfill Demolition rubble (including frames, slates etc) Fly tipped materials Burgy (glass work waste)

3.0 DESCRIPTION OF MAN MADE SOILS

Information that needs to be reported includes the following:-

- Origin of materials, if known from desk study.
- Layers and their inclination to inform on mode of tipping, whether ponded, end tipped, spread of stockpiled.
- Large objects, obstructions such as concrete, masonry walls, old cars.
- Presence of hollow objects, compressible/collapsible objects or voids such as oil drums, cellars, tanks.
- Chemical wastes and dangerous or hazardous substances such as creosote, hospital wastes, unlabelled drums, asbestos.
- Decomposable materials with note on degree of decomposition such as garden waste, paper.
- Smell such as organic, phenolic, sulphurous, petrol.
- Striking colours
- Any dating possible such as on bottle types, newspapers, papers.
- Signs of heat or combustion such as steam, smoke, burnt shale.

NOTES

- In general do not attempt to assign strength or in situ density descriptors to made ground. Where describing fill as opposed to made ground it may be possible to use the descriptors that are used for natural soils.

- Large or hollow objects cannot be sampled so the description is the sole information on condition and character of the features.
- Group together under the above categories, give volumetric percentages where possible.

Granular made ground may be given a particle size, although the following description methodology should be employed.

MADE GROUND: Grey fine to coarse gravel sized fragments of brick and concrete.

OR

MADE GROUND: Grey gravely clay with occasional subangular cobble sized fragments of brick. Gravel sized fragments are angular to subangular, fine, medium and coarse of brick.

In these two examples, note the use of term 'sized fragments' to describe the granular content. Because the material is man made we do not use the terms sand, gravel or cobbles etc in the same context as for natural soils. In other words it would be incorrect to use the following:

MADE GROUND: Grey gravelly clay with occasional cobbles. Gravel is angular coarse of brick, cobbles are rounded of brick.

The use of sand, gravel or cobble prior to 'sized fragments' is only intended to define a size range to the granular made ground material.

Similar grain size indicators can also be used to describe the size of other man made materials such as concrete, bituminous road surfacing etc. In addition the terms can also be used to describe natural material that has been modified by man, such as wood that may be present in the form of railway sleepers etc. Where whole man made items are identified they should be described as follows:

'with numerous wooden railway sleepers'

For such materials it is necessary to add size measurements, since no other quantifying terms are used.

4.0 DEFINITIONS OF SOME MAN MADE SOILS

There is generally a lack of national guidance on the meaning of common terms used in made ground. This applies particularly to man made materials. For this reason it is vital to provide as much information as possible on the material being logged, whilst staying within the guidance provided in these notes.

For some sites it is advisable to determine a set of definitions for the likely range of made ground to be encountered at the start of the project. This will allow all those responsible for the description of materials to provide unified logs for the site.

Some suggestions for one group of commonly encountered made ground are given below.

COMBUSTION PRODUCTS, often physically unstable and usually containing concentrations of metals and poly aromatic hydrocarbons. The definitions below are workable compromises.

ASH: Sand or silt size by definition, so do not need but can use "ash sand", and cannot have "gravel size ash" although cinders can be gravel size but readily crush down. Can include unburnt coal.

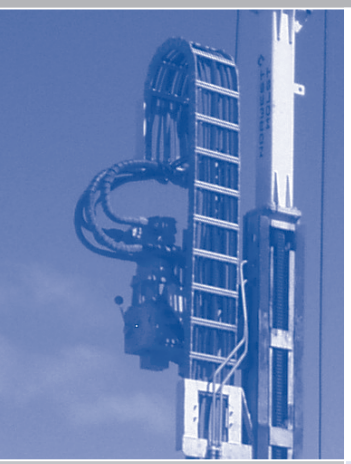
CLINKER: Gravel size or larger by definition so do not need but can use "clinker gravel", and cannot have "sand size clinker".

SLAG: Materials fused or poured as liquid or scum or froth, of any size or shape, and will be at least strong. If in blocks or layers, can present difficulties for borehole or trial pit penetration. Slag is often pelletised, expanded or crushed for reuse in construction.

References

01) BS 5930 (1999) Code of Practice for Site Investigation. British Standards Institution.

02) NHSED, Manual on the Sampling and Logging of Soil and Rock, (SALOSAR) 2005, 3rd Ed.



SUPPORTING FACTUAL DATA

SECTION A
Notes on Fieldwork, Logging and Laboratory Testing

AGGRESSIVE GROUND AND GROUNDWATER CONDITIONS

NORWEST HOLST
SOIL ENGINEERING

SECTION A 6: ASSESSMENT OF AGGRESSIVE GROUND AND GROUNDWATER CONDITIONS

Certain ground and groundwater conditions may be described as aggressive depending on their chemical composition which is related to previous industrial use. Where foundations are proposed to be constructed on industrial sites or on landfill sites in which the ground or groundwater may be contaminated with chemical waste, detailed consideration needs to be given to both the method of investigation and the severity of ground and groundwater conditions with respect to construction materials. For such sites it will usually be necessary to undertake a full chemical analysis in order to identify the potentially aggressive compounds.

On sites where new concrete foundations are to be constructed in natural ground it is usually only necessary to examine the sulfate content and pH level of the ground. The sulfate content of soils varies widely and can range from being virtually absent to extremely high concentrations in crystals such as gypsum. In between these two extremes sulfate may be disseminated throughout a soil or may be present in discrete bands or lenses. Because of this wide variation in the sulfate content of soils, the most reliable indication of possible aggressive conditions can be obtained by testing representative samples of groundwater. In order to take account of natural variations in the distribution of sulfates in the ground, samples should be taken at a number of locations that are well spaced across the site and at different depths.

The methods for the determination of total sulfate of soil and the sulfate content of groundwater and 2:1 aqueous soil extracts are given in various specifications including BS 1377: 1990: Part 3: Section 5 (ref 01). The results of tests performed in accordance with BS 1377 yield results which are expressed as percentage of dry weight retained or grammes/litre SO3. Tests performed in accordance with other specifications however, tend to express results as SO4.

The classification of natural sulfate conditions is based on BRE Special Digest 1 (2005) (ref 02). This digest makes most use of sulfate values expressed as milligrammes/litre SO4. In order to convert the results expressed as SO3 (BS 1377) to SO4 (BRE Digest) it is necessary to apply a multiplication factor of 1.2. In the following discussion of sulfate conditions values given in the tables are expressed in terms of SO4.

The current approach to the classification of aggressive ground conditions is based on the aggressive chemical environment for concrete or ACEC. This takes into account the type of site, sulfate concentration and ground water acidity and mobility. Different site assessment procedures are used for natural ground, for brownfield sites that contain industrial waste and pyritic ground. The reactions of sulfates in the presence of other ions, notably carbonate and magnesium are also taken into account.

As with the previous Special Digest 1, there are five design sulfate classes (designated DS1 to DS5) for the site, although in the current digest natural ground and brownfield sites are now covered by separate tables. More subdivision of ACEC Class is given in the table for brownfield locations and this reflects the complexity of conditions that often apply.

In general when the results of sulfate determinations are assessed emphasis must be given to the samples which fall in the higher classes. Therefore if eight out of ten samples are found to be non aggressive and fall within Class DS1 and the remainder fall within Class DS2 it will be necessary to adopt the precautions appropriate to Class DS2 conditions for the whole site. The current digest differentiates between ‘natural ground locations’ and brownfield locations’.

Table 1 on page 2 is reproduced from the digest and deals with natural ground locations.

TABLE 1: AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) CLASSIFICATION FOR NATURAL GROUND LOCATIONS (a)

SULFATE				GROUNDWATER		
DESIGN SULFATE CLASS FOR LOCATION	2:1 WATER/SOIL EXTRACT (b)	GROUNDWATER	TOTAL POTENTIAL SULFATE (c)	STATIC WATER	MOBILE WATER	ACEC CLASS FOR LOCATION
1	2 (SO_4 mg/l)	3 (SO_4 mg/l)	4 (SO_4 %)	5 (pH)	6 (pH)	7
DS-1	<500	<400	<0.24	>2.5	>5.5 (d) 2.5-5.5	AC-1s AC-1 (d) AC-2z
DS-2	500-1500	400-1400	0.24-0.6	>3.5 2.5-3.5	>5.5 2.5-5.5	AC-1s AC-2 AC-2s AC-3z
DS-3	1600-3000	1500-3000	0.7-1.2	>3.5 2.5-3.5	>5.5 2.5-5.5	AC-2s AC-3 AC-3s AC-4
DS-4	3100-6000	3100-6000	1.3-2.4	>3.5 2.5-3.5	>5.5 2.5-5.5	AC-3s AC-4 AC-4s AC-5
DS-5	>6000	>6000	>2.4	>3.5 2.5-3.5	>2.5	AC-4s AC-5

NOTES

a) Applies to locations on sites that comprise either undisturbed ground that is in its natural state or clean fill derived from such ground.

b) The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous digests.

c) Applies only to locations where concrete will be exposed to sulphate ions (SO4) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance.

d) For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15mg/l, increase the ACEC Class to AC-2z.

Explanation of suffix symbols to ACEC Class

Suffix 's' indicates that the water has been classified as static

Concrete place in a ACEC Classes that include the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements listed in Table D2 in the Digest.

Additional testing is required for those natural sites that contain pyrite. In particular it is essential to take account of the total potential sulfate content which might result from oxidation following ground disturbance. On such sites it is necessary to determine total sulfate content (AS% S04), total sulfur (TS%). The total potential sulfate is then determined from TPS%SO4=3.0 x TS%S. Finally the amount of oxidisable sulfides (OS as %SO4) is determined by subtracting the acid soluble sulfates(AS%S04) from the total potential sulfate content: OS%SO4 = TPS%SO4 – AS%S04. It is important to note that this testing is in addition to and not instead of the standard sulfate determination testing.

Unless the site can be demonstrated to comprise natural ground, Table 2 for brownfield locations must be used in all assessments for the design of concrete. It should be noted that the effects of the magnesium ion become relevant to concrete design for certain Design Sulfate Classes.

TABLE 2: AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) CLASSIFICATION FOR BROWNFIELD LOCATIONS (a)

SULFATE AND MAGNESIUM						GROUNDWATER		
DESIGN SULFATE CLASS FOR LOCATION	2:1 WATER/SOIL EXTRACT (b)		GROUNDWATER		TOTAL POTENTIAL SULFATE (c)	STATIC WATER	MOBILE WATER	ACEC CLASS FOR LOCATION
1	2 (SO_4 mg/l)	3 (Mg mg/l)	4 (SO_4 mg/l)	5 (Mg mg/l)	6 (SO_4 %)	7 (pH) (d)	8 (pH) (d)	9
DS-1	<500	-	<400	-	<0.24	>2.5		AC-1s
							>6.5 (d)	AC-1
							5.5-6.5	AC-2z
							4.5-5.5	AC-3z
							2.5-4.5	AC-4z
DS-2	500-1500	-	400-1400	-	0.24-0.6	>5.5		AC-1s
							>6.5	AC-2
						2.5-3.5		AC-2s
							5.5-6.5	AC-3z
							4.5-5.5	AC-4z
							2.5-4.5	AC-5z
DS-3	1600-3000	-	1500-3000	-	0.7-1.2	>5.5		AC-2s
							>6.5	AC-3
						2.5-5.5		AC-3s
							5.5-6.5	AC-4
							2.5-5.5	AC-5
DS-4	3100-6000	<1200	3100-6000	<1000	1.3-2.4	>5.5		AC-3s
							>6.5	AC-4
						2.5-3.5		AC-4s
							2.5-6.5	AC-5
DS-4m	3100-6000	>1200 (e)	3100-6000	>1000 (e)	1.3-2.4	>5.5		AC-3s
							>6.5	AC-4m
						2.5-5.5		AC-4ms
							2.5-6.5	AC-5m
DS-5	>6000	<1200	>6000	<1000	>2.4	>5.5		AC-4s
						2.5-3.5	>2.5	AC-5
DS-5m	>6000	>1200 (e)	>6000	>1000 (e)	>2.4	>5.5		AC-4ms
						2.5-5.5	>2.5	AC-5m

NOTES

a) Brownfield locations are those sites or parts of sites that might contain chemical residues produced by industrial processes.

b) The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous digests.

c) Applies only to locations where concrete will be exposed to sulfate ions (SO4) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance.

d) An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content

e) The limit on water soluble magnesium does not apply to brackish groundwater (chloride content between 12000mg/l and 17000mg/l). This allows 'm' to be omitted from the relevant ACEC classification. Sea water (chloride about 18000mg/l) and stronger brines are not covered by this table.

Explanation of suffix symbols to ACEC Class

Suffix 's' indicates that the water has been classified as static

Concrete placed in ACEC Classes that include the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements listed in Table D2 in the Digest.

Suffix 'm' relates to the higher levels of magnesium in Design Sulfate Classes 4 and 5.

The pH value of groundwater provides a crude measure of the potential aggressiveness due to the presence of organic acids. The standard procedure for measuring the acidity of soils and groundwater is the electrometric method using a pH meter and is described in BS 1377 (1990): Part 3: Section 5. The pH value of pure water is 7.0 and the presence of acid substances will yield results with values less than 7. It should be noted however that the pH of most natural waters depends mainly on the dissolved carbon dioxide content and therefore lies between pH values of 6.5 and 8.5. It is generally accepted that soils or groundwater with pH values in the range 6 to 9 may be classified as near neutral. It should be noted that the pH value of soil and groundwater can change with time and it is therefore necessary to carry out testing on fresh samples of soil or water.

The pH value of the soil or groundwater also needs to be taken into consideration when the recorded sulfate content is borderline between two classes or approaches the upper limit of a given class. In these circumstances both the pH value and the mobility of the groundwater needs to be assessed and where doubt exists, the sample should be placed in the more severe class of the sulfate classification. This general approach may be justified on the grounds that the acids present will tend to break down the concrete surface and therefore make it more susceptible to sulfate attack. This will be especially so if the sample contains large amounts of sulfides since these can be converted to sulfuric acid.

Organic acids are often found in peaty or marshy soils in which the pH value is below 6.0. In such soils it will be necessary to take specific precautions to protect any concrete which would be exposed to organic acids. The recommended precautionary measures outlined in Tomlinson (2001) (ref 03) could be followed. In all cases where mineral acids are present the groundwater is likely to be aggressive with regard to foundation concrete and in these circumstances the recommendations given in BRE Special Digest Part C will need to be followed.

Apart form acid groundwater, the effects of static and mobile ground water tables are taken into account in the digest in 'Box C9' and the incremental rules in this table need to be viewed in relation to Tables C1 and C2 in the Digest.

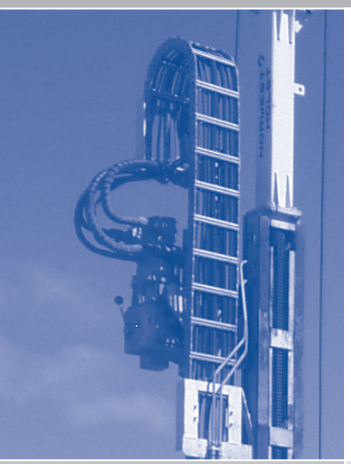
Alkaline groundwater is not generally considered aggressive to concrete unless present in high concentrations. Unless the aggregate used in foundation concrete is of a reactive type, pH values of groundwater up to pH = 14 need not be considered as problematic.

References

01) BS 1377: 1990 Methods of Test for Soils for Civil Engineering Purposes. Part 3: Chemical and Electrochemical Tests, British Standards Institution.

02) Building Research Establishment: 2005: Concrete in Aggressive Ground. BRE Special Digest 1. Building Research Station, Garston

03) Tomlinson M.J: 2001: Foundation Design and Construction. 7th Edition, Pearson, Prentice Hall.



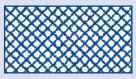
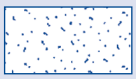
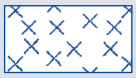
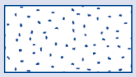
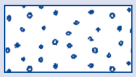
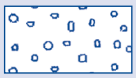
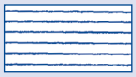
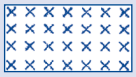
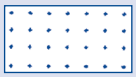
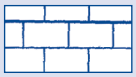
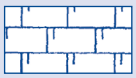
SUPPORTING FACTUAL DATA

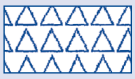
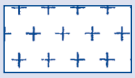
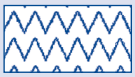
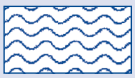
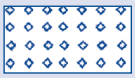
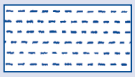
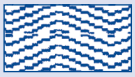
SECTION B
Exploratory Hole Records and Field Data

EXPLORATORY HOLE LEGEND AND NOTATION SHEET

NORWEST HOLST
SOIL ENGINEERING

EXPORATORY HOLE LOG LEGENDS

CODE	DESCRIPTION	LEGEND
101	Topsoil	
102	Made Ground	
104	Concrete	
201	Clay	
301	Silt	
401	Sand	
501	Gravel	
601	Peat	
701	Cobbles	
730	Boulders	
801	Mudstone	
802	Siltstone	
803	Sandstone	
804	Limestone	
805	Chalk	

CODE	DESCRIPTION	LEGEND
806	Coal	
807	Breccia	
808	Conglomerate	
809	Fine Grained Igneous	
810	Medium Grained Igneous	
811	Coarse Grained Igneous	
812	Fine Grained Metamorphic	
813	Coarse / Medium Grained Metamorphic	
EVT	Evaporite	
MWS	Mine Workings	
904	Grout	
905	Arising	
BLK	Zone of No Recovery	
WTR	Water	

Note: Most soils types comprise a mixture of particle sizes. These soil types are represented graphically on the exploratory hole logs by combining the legends shown on this sheet.

NORWEST HOLST
SOIL ENGINEERING

NOTATION USED ON EXPORATORY HOLE LOGS

SAMPLING NOTATION

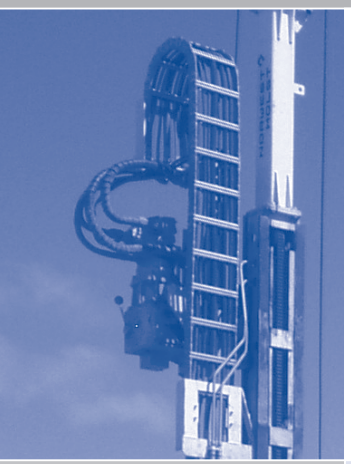
U	Undisturbed U100 or U38 sample (not differentiated)
P	Piston Sample
BLK	Block Sample
M	Mazier Sample
TW	Thin Walled Sample
L	Liner Sample obtained from windowless sampler
D	Small Disturbed Sample
B	Bulk Disturbed Sample
LB	Large Bulk Disturbed Sample
C	Core Sample
ES	Environmental Soil Sample
EW	Environmental Water Sample
W	Water Sample
UF	No Recovery in U Sample
PF	No Recovery in P Sample
TWF	No Recovery in TW Sample

IN SITU TEST NOTATION

S	Standard Penetration Test
C	Cone Penetration Test
NP	No Penetration for S or C
V	Vane Test
HV	Hand Vane
HP	Hand Penetrometer
K	Permeability Test (test type not differentiated)
Pr	Pressuremeter Test

OTHER NOTATION

TCR	Total Core Recovery
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FI	Fracture Index
If	Fracture Spacing
NI	Non Intact
NA	Data Not Applicable
NR	Data Not Recorded



SUPPORTING FACTUAL DATA

SECTION B
Exploratory Hole Records and Field Data

CABLE PERCUSSION AND ROTARY DRILLING RECORDS

NORWEST HOLST
SOIL ENGINEERING

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID.
BH01
Header

Contract No.	F15001	Method	Cable Percussion	Coordinates	5832703.82 E
Project	NM Rothschild Bank				180999.52 N
		Drilling Rig	Dando 2000	Ground Level	14.39m OD
Client	Stanhope plc	Driller	MH	Orientation	Vertical
		Logged by	IM	Date Started	25/08/2007
Consultant	Arup Geotechnics			Date Completed	26/08/2007

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
25/08/2007	0800	5.50	0.00	DRY	Start of Boring
25/08/2007	1700	28.95	9.70	DRY	End of Shift
26/08/2007	0800	28.95	9.70	DRY	Start of Shift
26/08/2007	1700	52.30	9.70	DRY	End of Boring
27/08/2007	0800	52.00	0.00	32.00	Installation

BORING DETAILS

Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks

CASING

Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
200	52.30	200	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
26/08/2007		51.00	44.00	20	Fast	9.70	NR

GENERAL NOTES

1. All measurements during drilling taken fom street level.
2. Concrete at road level (0.5m) and car park basement floor slab (2.8m) drilled out by McGee's.
3. Groundwater encountered at 51.0m, fast inflow rate.
4. 50mm standpipe installed to base of River Terrace Deposits (9.70m) with a 3.0m slotted section at base of pipe.
5. Flush cover installed in concrete at basement level car park.
6. Backfill details: grout to 9.7m, gravel to 6.8m, bentonite seal to 3.8m, concrete to basement level at 3.3m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration	Casing	Water Depth
5.90	C	50/160mm (3,4,13,31,6/10mm)	5.90	DRY
7.50	C	50/180mm (4,9,16,22,12/30mm)	7.50	DRY
9.00	C	N=39 (3,8,9,12,10,8)	9.00	DRY
10.50	S	N=24 (2,3,3,7,7,7)	9.70	DRY
12.50	S	N=24 (3,3,5,5,6,8)	9.70	DRY
14.50	S	N=25 (3,3,4,7,7,7)	9.70	DRY
16.50	S	N=31 (3,4,6,8,8,9)	9.70	DRY
18.50	S	N=33 (4,4,7,8,9,9)	9.70	DRY
20.50	S	N=37 (4,5,7,9,10,11)	9.70	DRY
22.50	S	N=38 (4,6,7,10,10,11)	9.70	DRY
24.50	S	N=40 (5,6,8,10,11,11)	9.70	DRY
26.50	S	N=42 (5,7,10,10,10,12)	9.70	DRY
28.50	S	N=44 (6,8,10,10,11,13)	9.70	DRY
30.50	S	N=45 (6,8,10,11,12,12)	9.70	DRY
32.50	S	N=48 (6,8,10,12,13,13)	9.70	DRY
34.50	S	N=50 (7,8,11,12,13,14)	9.70	DRY
36.50	S	50/285mm (6,9,13,14,14,9/60mm)	9.70	DRY
38.50	S	50/255mm (7,10,13,14,16,7/30mm)	9.70	DRY
40.50	S	55/255mm (6,10,14,15,16,10/30mm)	9.70	DRY
42.50	S	50/230mm (7,10,14,15,18,3/5mm)	9.70	DRY
44.50	S	50/255mm (7,8,11,14,15,10/30mm)	9.70	DRY
46.50	S	50/235mm (8,10,12,14,18,6/10mm)	9.70	DRY
48.90	S	62/245mm (9,11,14,14,20,14/20mm)	9.70	DRY
51.40	S	50/125mm (5,20,23,27/50mm)	9.70	DRY
52.30	S	57/160mm (10,15,22,25,10/10mm)	9.70	DRY

* Seating blows only.

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

Form	ARIAL CP HEADER
Version	3.04
Revised	15/08/2007

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID.
BH01
Sheet 1 of 6

Contract No.	F15001	Method	Cable Percussion	Coordinates	5832703.82 E
Project	NM Rothschild Bank				180999.52 N
		Drilling Rig	Dando 2000	Ground Level	14.39m OD
Client	Stanhope plc	Driller	MH	Orientation	Vertical
		Logged by	IM	Date Started	25/08/2007
Consultant	Arup Geotechnics			Date Completed	26/08/2007

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
MADE GROUND: Concrete (road level)									
		0.50	13.89						
VOID: Basement car park.									
		3.30	11.09						
MADE GROUND: Basement floor slab.									
		5.50	8.89	B1	5.50 - 5.90				
Very dense brown, white, grey and black very sandy angular to subrounded fine to coarse flint GRAVEL. Sand is fine to coarse. (RIVER TERRACE DEPOSITS)				B2	5.90 - 6.35	C50/160mm	C	5.90	6.21
				B3	7.50 - 7.95	C50/180mm	C	7.50	7.83
--- From 9.0m: Sand becoming predominantly coarse.				B4	9.00 - 9.45	C39	C	9.00	9.45
		9.55	4.84	D5	9.55	(30)			
Stiff brownish grey slightly sandy CLAY with				U6	9.60 - 10.00				
		9.80	4.59						

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

Form	ARIAL CP LOG
Version	3.08
Revised	29/03/2006

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID. BH01
Sheet 2 of 6

Contract No.	F15001	Method	Cable Percussion	Coordinates	5832703.82 E
Project	NM Rothschild Bank				180999.52 N
		Drilling Rig	Dando 2000	Ground Level	14.39m OD
Client	Stanhope plc	Driller	MH	Orientation	Vertical
		Logged by	IM	Date Started	25/08/2007
Consultant	Arup Geotechnics			Date Completed	26/08/2007

Description of Strata	Depth Below G.L.	Datum Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
			D7	10.00				
9.55m - 9.80m : occasional subrounded medium flint gravel and rare fine black silty sandy pockets. (LONDON CLAY FORMATION)	10.50	3.89	D8	10.50 - 10.96	S24	S	10.50 10.95	
9.80m - 10.50m : Firm grey slightly sandy CLAY with rare subrounded fine siliceous gravel. (LONDON CLAY FORMATION)								
Firm greyish brown CLAY. (LONDON CLAY FORMATION)			U9	11.50 - 11.95	(30)			
			D10	11.95				
--- At 12.50m: With localised fine sandy pockets.			D11	12.50 - 12.95	S24	S	12.50 12.95	
			U12	13.50 - 13.95	(35)			
--- At 13.95m: With localised pockets of fine greyish black sand (0.02 x 0.01m)			D13	13.95				
			D14	14.50 - 14.95	S25	S	14.50 14.95	
			U15	15.50 - 15.95	(35)			
--- From 15.95m: Becoming sandy.			D16	15.95				
--- At 16.50m: With fine gravel size white selenite crystals.			D17	16.50 - 16.95	S31	S	16.50 16.95	
			U18	17.50 - 17.95	(40)			
--- From 17.95m: Becoming less sandy.			D19	17.95				
			D20	18.50 - 18.95	S33	S	18.50 18.95	
			U21	19.50 - 19.95	(45)			
	19.95	-5.56	D22	19.95				

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

Form	ARIAL CP LOG
Version	3.08
Revised	29/03/2006

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID. BH01
Sheet 3 of 6

Contract No.	F15001	Method	Cable Percussion	Coordinates	5832703.82 E
Project	NM Rothschild Bank				180999.52 N
		Drilling Rig	Dando 2000	Ground Level	14.39m OD
Client	Stanhope plc	Driller	MH	Orientation	Vertical
		Logged by	IM	Date Started	25/08/2007
Consultant	Arup Geotechnics			Date Completed	26/08/2007

Description of Strata	Depth Below G.L.	Datum Level	Sampling		SPT N & (U blows)	SPT type & depth	Install-ation
Stiff grey CLAY. (LONDON CLAY FORMATION)							
--- From 20.50m: Becoming slightly sandy with fine gravel size white selenite crystals.			D23	20.50 - 20.95	S37	S 20.50 20.95	
			U24	21.50 - 21.85	(50)		
			D25	21.85			
--- From 22.50m: Becoming increasingly sandy with rare fine gravel size selenite crystals.			D26	22.50 - 22.95	S38	S 22.50 22.95	
			U27	23.50 - 23.95	(55)		
			D28	23.95			
--- From 24.50m: Becoming very stiff.			D29	24.50 - 24.95	S40	S 24.50 24.95	
			U30	25.50 - 25.95	(65)		
			D31	25.95			
--- From 25.95m: With occasional pockets of fine sand (0.1 x 0.2m) and sand partings.							
--- From 26.50m: Becoming less sandy.			D32	26.50 - 26.95	S42	S 26.50 26.95	
			U33	27.50 - 27.95	(70)		
--- From 27.85m: With increasing partings of fine sand.			D34	27.95			
--- At 28.00m: Grey claystone recovered as angular to subangular fine to coarse sand and gravel size fragments.			D35	28.00			
			D36	28.50 - 28.95	S44	S 28.50 28.95	
	28.80	-14.41					
Very stiff grey very sandy CLAY with white angular fine to coarse gravel size selenite crystals. (LONDON CLAY FORMATION)							
			U37	29.50 - 29.85	(70)		
			D38	29.85			

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

Form	ARIAL CP LOG
Version	3.08
Revised	29/03/2006

NORWEST HOLST

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID.
BH01
Sheet 4 of 6

Contract No.	F15001	Method	Cable Percussion	Coordinates	5832703.82 E
Project	NM Rothschild Bank				180999.52 N
		Drilling Rig	Dando 2000	Ground Level	14.39m OD
Client	Stanhope plc	Driller	MH	Orientation	Vertical
		Logged by	IM	Date Started	25/08/2007
Consultant	Arup Geotechnics			Date Completed	26/08/2007

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		SPT N & (U blows)	SPT type & depth	Install-ation
Remaining Detail : 29.85m - 29.85m : --- From 29.85m: Becoming slightly sandy.								
--- From 30.50m: Selenite crystals becoming fine gravel size.				D39	30.50 - 30.95	S45	S 30.50 30.95	
				U40	31.50 - 31.90	(75)		
--- From 31.90m: With greyish brown pockets of fine sand (0.1 x 0.05m)				D41	31.90			
				D42	32.50 - 32.95	S48	S 32.50 32.95	
				U43	33.50 - 33.95	(80)		
				D44	33.95			
Very stiff grey CLAY with white fine gravel size selenite crystals. (LONDON CLAY FORMATION)		34.50	-20.11	D45	34.50 - 34.95	S50	S 34.50 34.95	
				U46	35.50 - 35.90	(85)		
--- From 35.90m: With partings of fine brown sand.				D47	35.90			
--- From 36.50m: With occasional angular coarse gravel of claystone.				D48	36.50 - 36.92	S50/285mm	S 36.50 36.94	
				U49	37.50 - 37.80	(85)		
				D50	37.80			
Very stiff grey CLAY. (LONDON CLAY FORMATION)		38.50	-24.11	D51	38.50 - 38.91	S50/255mm	S 38.50 38.91	
				U52	39.50 - 39.90	(95)		
				D53	39.90			

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

Form	ARIAL CP LOG
Version	3.08
Revised	29/03/2006

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID. BH01
Sheet 5 of 6

Contract No.	F15001	Method	Cable Percussion	Coordinates	5832703.82 E
Project	NM Rothschild Bank				180999.52 N
		Drilling Rig	Dando 2000	Ground Level	14.39m OD
Client	Stanhope plc	Driller	MH	Orientation	Vertical
		Logged by	IM	Date Started	25/08/2007
Consultant	Arup Geotechnics			Date Completed	26/08/2007

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
Remaining Detail : 39.90m - 39.90m : --- From 39.90m: With partings of light grey fine sand.									
		40.50	-26.11	D54	40.50 - 40.90	S55/255mm	S	40.50 40.91	
Very stiff grey CLAY with abundant pockets of fine sand and sand partings and frequent white fine gravel size selenite crystals. (LONDON CLAY FORMATION)									
				U55	41.50 - 41.85	(100)			
		41.85	-27.46	D56	41.85				
Very stiff grey sandy CLAY. (LONDON CLAY FORMATION)									
				D57	42.50 - 42.85	S50/230mm	S	42.50 42.88	
--- From 42.50m: Becoming increasingly sandy.									
				U58	43.50 - 43.95	(110)			
				D59	43.95				
				D60	44.50 - 44.90	S50/255mm	S	44.50 44.91	
				U61	45.50 - 45.85	(110)			
--- At 45.5m: Becoming hard.									
		45.85	-31.46	D62	45.85				
Very stiff grey CLAY with pockets of fine sand (0.1 x 0.05m) and sandy partings. (LONDON CLAY FORMATION)									
				D63	46.50 - 46.88	S50/235mm	S	46.50 46.89	
--- From 46.50m: Becoming less sandy.									
				U64	47.50 - 47.90	(120)			
				D65	47.90				
--- From 47.90m: Becoming increasingly sandy.									
				D66	48.90 - 49.50	S62/245mm	S	48.90 49.30	

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

Form	ARIAL CP LOG
Version	3.08
Revised	29/03/2006

NORWEST HOLST

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

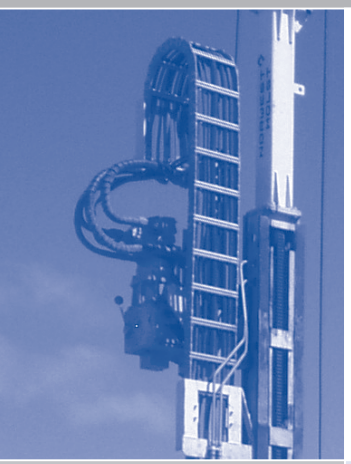
Hole ID.
BH01
Sheet 6 of 6

Contract No.	F15001	Method	Cable Percussion	Coordinates	5832703.82 E
Project	NM Rothschild Bank				180999.52 N
		Drilling Rig	Dando 2000	Ground Level	14.39m OD
Client	Stanhope plc	Driller	MH	Orientation	Vertical
		Logged by	IM	Date Started	25/08/2007
Consultant	Arup Geotechnics			Date Completed	26/08/2007

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
Very stiff grey CLAY with pockets of fine sand (0.1 x 0.05m) and sandy partings. (LONDON CLAY FORMATION)									
		50.50	-36.11	D67	50.50				
Very stiff grey, greenish grey, brown, blueish green, friable sandy CLAY. (LAMBETH GROUP)				U68	50.70 - 51.05	(100)			
		51.00	-36.61						
Very dense greyish brown fine SAND. (LAMBETH GROUP - SAND CHANNEL)				D69	51.40	S50/125mm	S	51.40 51.68	
		51.70	-37.31						
Very stiff brownish grey, blue, green very sandy CLAY. (LAMBETH GROUP)				UF	52.00				
		52.30	-37.91	D70	52.30	S57/160mm	S	52.30 52.61	
Cable Percussion boring complete at 52.30 m.									

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

Form	ARIAL CP LOG
Version	3.08
Revised	29/03/2006



SUPPORTING FACTUAL DATA

SECTION B
Exploratory Hole Records and Field Data

INSPECTION PIT / TRIAL PIT / TRIAL TRENCH RECORDS

NORWEST HOLST
SOIL ENGINEERING

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

Hole ID.
TP03
Sheet 1 of 1

Contract No.	F15001	Method	Hand Excavated	Coordinates	-
Project	NM Rothschild Bank				-
		Equipment	Breaker	Ground Level	-
Client	Stanhope plc			Date Started	15/10/2007
		Logged by	IM	Date Completed	15/10/2007
Consultant	Arup Geotechnics				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		Remarks
CONCRETE: Reinforced concrete with 30mm and 15mm re-bar.						
--- At 0.92m: Re-bar.						
SAND and GRAVEL (RIVER TERRACE DEPOSITS)		1.66				
Trial pit complete at 2.03 m.		2.03		ES1 ES2	2.00 2.00	

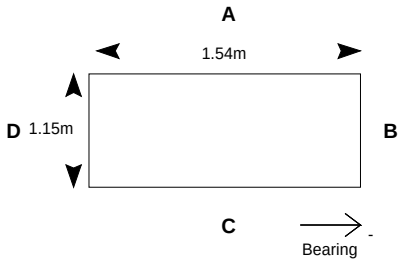
Stability: Good

Shoring:

Groundwater: Standing at 1.5m

Remarks:
1. Trial pit located in basement, in old archive office.
2. All depth measurements relative to basement floor level.
3. Trial pit excavated by McGees.
4. 2 x Environmental Samples taken at 2.0m (A & B) consists of 1x plastic tub, 1x vial and 1 x 250ml glass jar.

Sketch Plan of Trial Pit

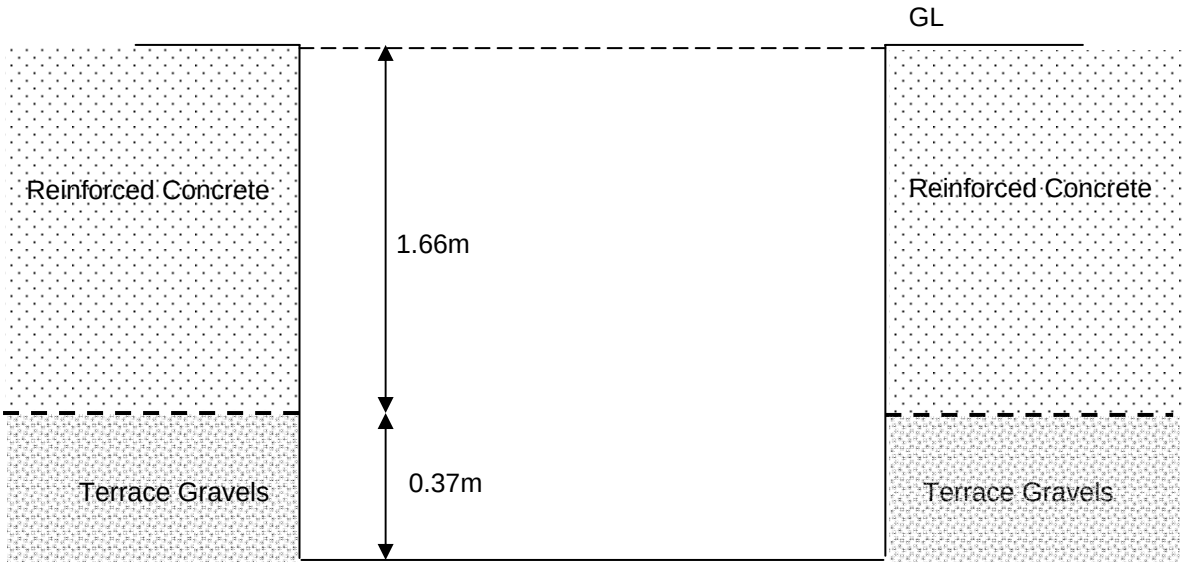


NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

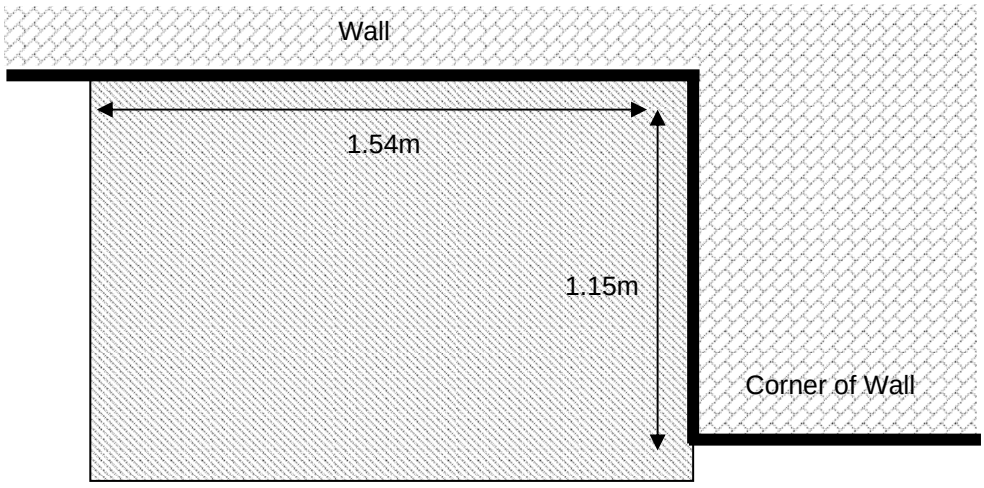
Form	ARIAL TP LOG
Version	3.05
Revised	15/02/2006

Project Name	NMR BANK	**Trial Pit Sketch Plan & Section (Sheet 1 of 1)**	Hole ID TP03
Project No.	F15001		Fig no.
Engineer	Arup Geotechnics		
Client	Stanhope PLC		
Ground Level		Coordinates	

SECTION



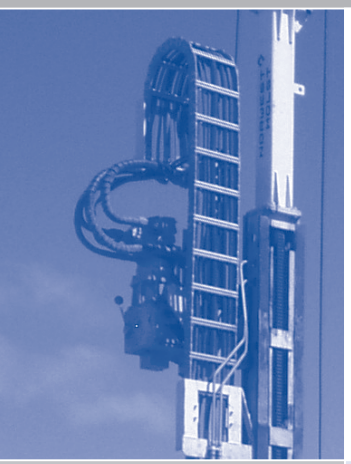
PLAN:



REMARKS - All dimensions in meters unless stated

Plotted by Hannah Sydney	Checked by	Approved by
Date	Date	Date
Form No. SI IPSFSA4	Revision No. 1.01	Issue Date 20/11/2006

NORWEST HOLST SOIL ENGINEERING



SUPPORTING FACTUAL DATA

SECTION B
Exploratory Hole Records and Field Data

GROUNDWATER / GAS MONITORING / SAMPLING RESULTS

NORWEST HOLST
SOIL ENGINEERING

Project Name NM Rothschild Bank Project No. F15001 Engineer Arup Geotechnics Client Stanhope Plc		**Groundwater Inflows Recorded In Exploratory Holes**	Table no. 01

NOTES:

Exploratory Hole ID	Depth of Inflow (m)	Rate of Inflow	Level After 20mins (m)	Type of Stratum	Comments/Observations
BH01	51.00	Fast	44.00	London Clay	

Project Name	NM ROTHSCHILD BANK	**Groundwater Readings For Installations**	
Project No.	F15001		
Engineer	ARUP GEOTECHNICS		Fig no.
Client	STANHOPE PLC		02

NOTES: PZ=Piezometer, SP=Standpipe
For multiple installations, record piezometer 1 as PZ1, piezometer 2 as PZ2 etc.
For piezometers installation depth = tip depth. For standpipes = base of pipe

COMMENTS
Depths are recorded as metres below Lower Ground Floor Slab Surface

Exploratory Hole ID	Installation Type	Installation Depth (m)	Recorded Water Level (m)				
			Date 31/08/2007	Date 07/09/2007	Date 17/09/2007	Date 18/10/2007	Date 15/11/2007
BH01	SP	6.00	4.79	4.77	4.77	4.83	4.69

Recorded by:	Checked by:	Approved by:
Date:	Date:	Date:

NORWEST HOLST SOIL ENGINEERING

Project Name	NM ROTHSCHILD BANK	**Record Of Gas Monitoring**	Hole ID
Project No.	F15001		BH01
Engineer	ARUP GEOTECHNICS		Fig no.
Client	STANHOPE PLC		03

Notes Type of Sampling Point: OB = Open Borehole, GW = Gas Well, HS = Head Space Analysis
SP = Standpipe, PZ = Piezometer, S = Spike Hole
Measured Gas State: P=Peak Value, SS=Steady State Value, CF=Circulated Flow Value, NR = Not Recorded
For double gas valves, record upper valve (UV) and lower valve (LV) values separately

Well Type				SP / 50mm				
Depth to base of installation			mbgl	6.0m				
Measured Parameter	Units	Detection Limit	Ambient Level					
Monitoring round no.	N/A	N/A	N/A	1	2	3	4	5
Date	dd/mm/yyyy	N/A	N/A	31/08/2007	07/09/2007	17/09/2007	18/10/2007	15/11/2007
Time of initial reading	hh:mm	N/A	N/A	13:25	14:00	15:30	11:30	09:40
Water Level	mbgl	0.01	N/A	4.79	4.77	4.77	4.83	4.69
Measured Gas State	N/A	N/A	N/A	SS	SS	SS	SS	SS
Atmospheric pressure	mb	1		1017	1026	1007	1029	1018
Relative pressure	mb	1		0	0	0	0	0
CH_4: (LEL) Steady State	%	1		0	0	0	0	0
CH_4: (LEL) Peak	%	1		0	0	0	0	0
CH_4: Steady Sate	% v/v	0.1		0.0	0.0	0.0	0.0	0.0
CH_4: Peak	% v/v	0.1		0.0	0.0	0.0	0.0	0.0
CO_2: Steady State	% v/v	0.1		0.0	0.0	0.0	0.0	0.0
CO_2: Peak	% v/v	0.1		0.0	0.0	0.0	0.1	0.2
O_2: Steady State	% v/v	0.1		20.4	20.3	20.3	19.6	20.0
O_2: Peak	% v/v	0.1		20.5	20.3	20.4	20.0	20.0
CO: Steady State	ppm	1		0	0	0	0	0
CO: Peak	ppm	1		1	0	0	0	0
H_2S: Steady State	ppm	1		0	0	0	0	0
H_2S: Peak	ppm	1		0	0	0	0	0
Gas Flow	l/hr	0.1		0.0	0.0	0.0	0.0	0.0
PID	ppm	1		NR	NR	NR	NR	NR
FID	ppm	1		NR	NR	NR	NR	NR

Weather Conditions: DRY

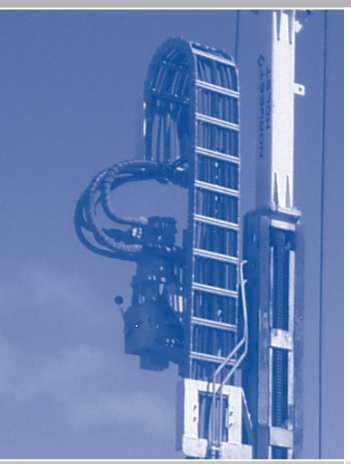
Equipment Used (list): GA2000

Equipment Last Calibrated (respective to list above):

Comments

Monitored By: JD		
Date:		

NORWEST HOLST SOIL ENGINEERING



SUPPORTING FACTUAL DATA

SECTION C
Laboratory Testing

KEY TO LABORATORY TEST RESULTS

NORWEST HOLST
SOIL ENGINEERING

KEY TO LABORATORY SUMMARY SHEETS

COMMON TO ALL SUMMARIES

Sample Type	U	Undisturbed sample	AMAL	Amalgamated sample
	P	Piston sample	B	Bulk disturbed sample
	TW	Thin walled sample	BLK	Block sample
	L	Liner sample	C	Rock core
	D	Small disturbed sample		
Test status	Any result in *italics* indicates a test that is not within the scope of the UKAS accreditation for this laboratory.			

SUMMARY OF LABORATORY SOIL TESTS: INDEX / CLASSIFICATION TESTS

Particle density	p	Small pyknometer method	g	Gas jar method
Plastic index	N/P	Non plastic, although liquid limit will have been determined if requested		
Particle size (PSD)	[1]	Following value in silt column denotes combined clay and silt fraction		
	p	Folowing value in clay column denotes sedimentation by pipette, else sedimentation is by hydrometer.		

SUMMARY OF LABORATORY SOIL TESTS: STRENGTH AND PERMEABILITY TESTS

Triaxial	UU	Single stage unconsolidated quick undrained		
	UUM	Multi stage unconsolidated quick undrained		
	UU3	Set of 3 unconsolidated quick undrained		
	CU	Single stage consolidated undrained		
	CUM	Multi stage consolidated undrained		
	CU3	Set of 3 consolidated undrained		
	CD	Single stage consolidated drained		
	CDM	Multi stage consolidated drained		
	CD3	Set of 3 consolidated drained		
	Note that single stage tests are reported assuming phi = 0 for total stress and c' = 0 for effective stress			
Consol	Oed	One-dimensional oedometer	Hyd	Hydraulic cell consolidation
	m_v	Coefficient of compressibility quoted for p0 to p0 + 100kPa, where determined		
Permeability	C	Constant head permeability	T	Triaxial permeability
Shearbox	SSB	Small shear box	LSB	Large shear box
	P	Peak value	r	Residual value
	RS	Ring shear		

NORWEST HOLST
SOIL ENGINEERING

KEY TO LABORATORY SUMMARY SHEETS

SUMMARY OF LABORATORY SOIL RE-USE TEST

MCV	s	MCV value at natural or specified moisture content
	int	Intercept of calibration line in MCV calibration

SUMMARY OF LABORATORY ROCK STRENGTH TESTS

Point Load	Type (Combination of)	D	Diametral	A	Axial
		I	Irregular lump	B	Block
		L	Test performed parallel to planes of weakness		
		P	Test performed perpendicular to planes of weakness		
		X	Invalid failure of point load (not broken between points of load application)		

SUMMARY OF LABORATORY ROCK MATERIALS TESTS

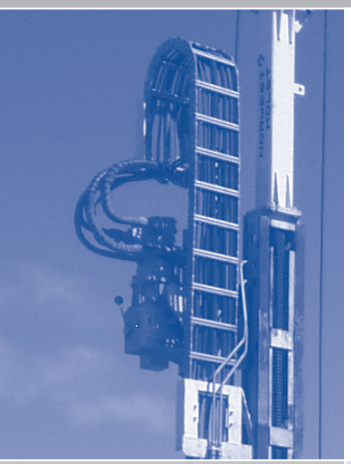
Ten% fines		w	Soaked test	d	Dry test

POINT LOAD INDEX RESULT

Point Load	Type (Combination of)	D	Diametral	A	Axial
		I	Irregular lump	B	Block
		L	Test performed parallel to planes of weakness		
		P	Test performed perpendicular to planes of weakness		
		X	Invalid failure of point load (not broken between points of load application)		
Dimensions		W	Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump		
		D	Distance between platens when just in contact with specimen		
		D'	Distance between platens at point of failure		
		De	Equivalent core diameter	Is	P/De^2
		Is(50)	F x Is	F	$(De/50)^{0.45}$

Is(50) point load strength index corrected for a diametral test of core diameter 50mm
For Axial/Lump tests $De^2 = (4/Pi) \times (W \times D')$
For Diametral tests $De^2 = D \times D'$

Important note:
summary sheets are provided for convenience and in no way replace individual test result sheets which shall, without exception, be regarded as the definitive result.



SUPPORTING FACTUAL DATA

SECTION C
Laboratory Testing

LABORATORY SOIL TEST SUMMARY SHEETS

NORWEST HOLST
SOIL ENGINEERING

Project Name NM Rothschild Bank

Project No. F15001

Engineer Arup Geotechnics

Client Stanhope plc

Classification Tests Summary

Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Moisture Content	Bulk Density	Dry Density	Particle Density	Liquid Limit	Plastic Limit	Plastic Index	Passing 425µm	Linear Shrinkage	Particle size				
															Clay	Silt	Sand	Gravel	Cobbles
						%	Mg/m³			%	%		%	%	%	%	%	%	%
BH01	5.90	002	B	2.90	01											0[1]	39	61	0
BH01	9.00	004	B	9.00	01											1[1]	32	67	0
BH01	9.55	005	D	9.55	01	28				70	25	45	88						
BH01	10.00	007	D	10.00	01										61	36	3	0	0
BH01	11.95	010	D	11.95	01	28				76	24	52	100						
BH01	15.95	016	D	15.95	01	26				72	23	49	100						
BH01	17.95	019	D	17.95	01										61	38	1	0	0
BH01	21.85	025	D	21.85	01										49	35	2	14	0
BH01	23.95	028	D	23.95	01	21				80	29	51	100						
BH01	25.95	031	D	25.95	01										49	46	5	0	0
BH01	28.00	035	D	28.00	01											6[1]	2	92	0
BH01	29.85	038	D	29.85	01	22				62	24	38	100						
BH01	33.95	044	D	33.95	01	25				68	28	40	100						
BH01	35.90	047	D	35.90	01										62	37	1	0	0
BH01	37.80	050	D	37.80	01	24				74	25	49	100						
BH01	41.85	056	D	41.85	01	23				71	27	44	100						
BH01	43.95	059	D	43.95	01										41	28	30	0	0
BH01	45.85	062	D	45.85	01	25				72	25	47	100						
BH01	47.90	065	D	47.90	01										39	32	29	0	0
BH01	50.50	067	D	50.50	01	14				38	15	23	100						

Approved by:
Stuart Kirk

Leeds Laboratory

Print date 03/10/2007

Revision No. 2.01 Issue Date 17/07/2006

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank
Project No.	F15001
Engineer	Arup Geotechnics
Client	Stanhope plc

Classification Tests Summary

Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Moisture Content	Bulk Density	Dry Density	Particle Density	Liquid Limit	Plastic Limit	Plastic Index	Passing 425µm	Linear Shrinkage	Particle size				
															Clay	Silt	Sand	Gravel	Cobbles
						%	Mg/m³			%	%		%	%	%	%	%	%	%
BH01	52.30	070	D	52.30	01										36	50	15	0	0
							End												

Approved by:	Leeds Laboratory		
Stuart Kirk		Print date	03/10/2007
	Revision No. 2.01	Issue Date	17/07/2006

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank
Project No.	F15001
Engineer	Arup Geotechnics
Client	Stanhope plc

Strength and Permeability Summary

								Triaxial			Consol		Permeability		Shearbox		
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Moisture Content	Bulk Density	Type	c	Ø	Type	m_v	Type	K	Type	c	Ø
						%	Mg/m³		kPa	°		m²/MN		m/s		kPa	°
BH01	9.60	006	U	9.70	1	29	1.98	UU	121	0							
BH01	11.50	009	U	11.50	1	29	3.65	UU	88	0							
BH01	13.50	012	U	13.52	1	27	2.00	UU	101	0							
BH01	15.50	015	U	15.55	1	27	2.04	UU	109	0							
BH01	17.50	018	U	17.51	1	28	2.01	UU	132	0							
BH01	19.50	021	U	19.55	1	28	1.93	UU	127	0							
BH01	21.50	024	U	21.61	1	28	2.00	UU	91	0							
BH01	23.50	027	U	23.53	1	29	1.98	UU	123	0							
BH01	25.50	030	U	25.55	1	28	1.99	UU	142	0							
BH01	27.50	033	U	27.52	1	23	2.11	UU	266	0							
BH01	29.50	037	U	29.65	1	23	2.10	UU	249	0							
BH01	31.50	040	U	31.58	1	20	2.03	UU	282	0							
BH01	33.50	043	U	33.55	1	26	2.03	UU	221	0							
BH01	35.50	046	U	35.57	1	26	2.00	UU	155	0							
BH01	37.50	049	U	37.70	1	27	1.95	UU	256	0							
BH01	39.50	052	U	39.63	1	25	2.00	UU	169	0							
BH01	41.50	055	U	41.62	1	25	1.97	UU	183	0							
BH01	43.50	058	U	43.55	1	25	1.96	UU	243	0							
BH01	45.50	061	U	45.61	1	24	1.97	UU	341	0							
								End									

Approved by:
Stuart Kirk

Leeds Laboratory

Print date 03/10/2007

Revision No. 2.01 Issue Date 08/08/2006

NORWEST HOLST
SOIL ENGINEERING

CHEMICAL ANALYSIS

ECOS

Project: NM Rothschild Bank — Contract no. F15001

KEY TO ABBREVIATIONS AND NOMENCLATURE

SO_4	w	Water soluble sulfate content	NO3		Nitrate content
SO_4	g	Ground water sulfate content	pH		Determination of pH value
Note:		SO_4 derived by multiplying SO_3 by 1.2	Cl	w	Water soluble chloride content
ORG		Organic Matter content	Cl	g	Ground water chloride content

Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Description	SO_4 (g/l) w	SO_4 (g/l) g	ORG (%)	NO_3 (g/l)	pH	Cl (g/l) w	Cl (mg/l) g	< 2mm (%)
BH01	13.95	13	D			Greyish CLAY	0.46				7.9			97
BH01	19.95	22	D			Brown CLAY	0.34				8.1			98
BH01	27.95	34	D			Greyish CLAY			1.7					99
BH01	31.90	41	D			Greyish CLAY	0.49				7.8			99
BH01	39.90	53	D			Greyish CLAY	1.08				7.6			96

ECoS Environmental Limited
Low Moor Business Park, Common Road, Bradford, BD12 0NB
Tel. 01274 691122 Fax. 01274 608100 e-mail: info@ecos.co.uk

Approved:

CHEMICAL ANALYSIS

ECOS

Project: NM Rothschild Bank

Contract no. F15001

KEY TO ABBREVIATIONS AND NOMENCLATURE

SO_4	w	Water soluble sulfate content	NO3		Nitrate content
SO_4	g	Ground water sulfate content	pH		Determination of pH value
Note:		SO_4 derived by multiplying SO_3 by 1.2	Cl	w	Water soluble chloride content
ORG		Organic Matter content	Cl	g	Ground water chloride content

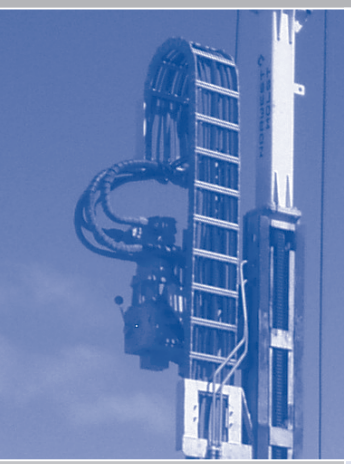
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Description	SO_4 (g/l) w	SO_4 (g/l) g	ORG (%)	NO_3 (g/l)	pH	Cl (g/l) w	Cl (mg/l) g	< 2mm (%)
BH01	5.50 - 5.90	01	B			Brown SAND			<0.1					52
BH01	7.50 - 7.95	03	B			Gravelly SAND	<0.1				8.1			10

ECoS Environmental Limited

Low Moor Business Park, Common Road, Bradford, BD12 0NB

Tel. 01274 691122 Fax. 01274 608100 e-mail: info@ecos.co.uk

Approved:



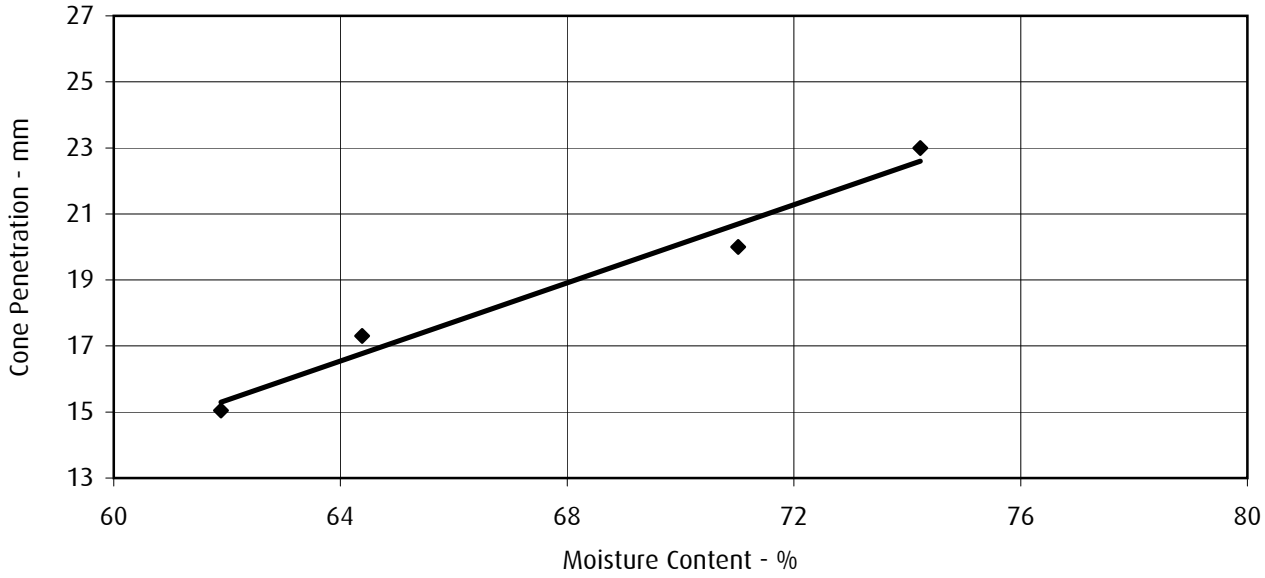
SUPPORTING FACTUAL DATA

SECTION C
Laboratory Testing

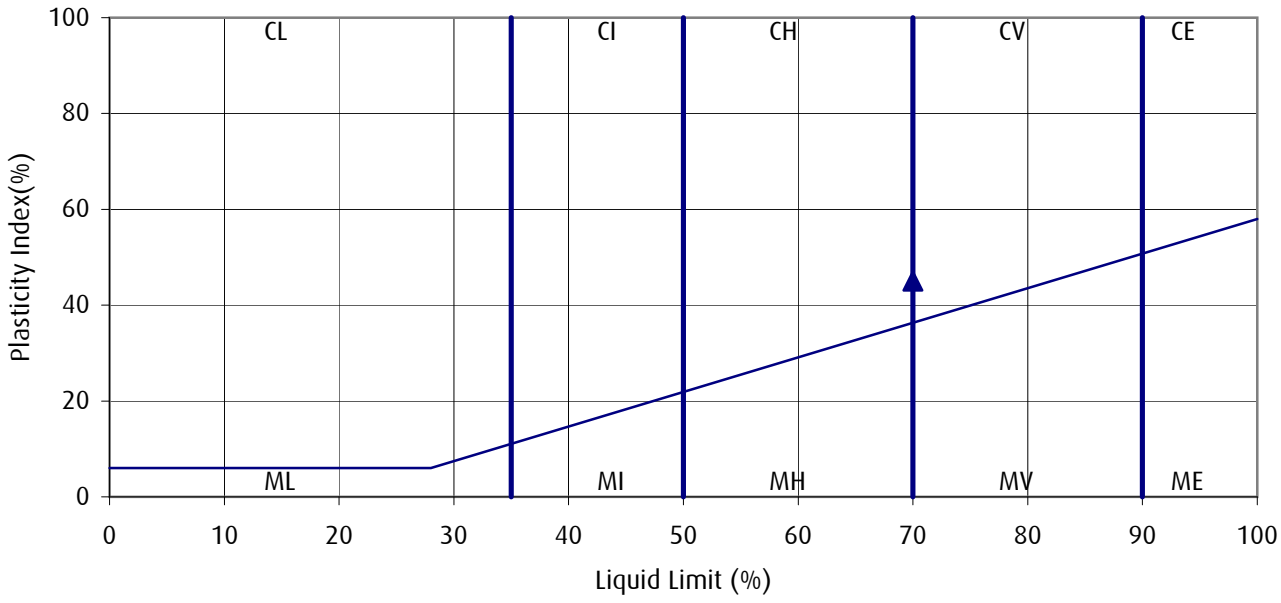
LABORATORY SOIL TEST DATA SHEETS

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Liquid And Plastic Limit Test**	Hole ID BH01
Project No.	F15001		Sample Depth 9.55m
Engineer	Arup Geotechnics		Sample Number 005
Client	Stanhope plc	Test Method: BS1377: Part 2: 1990: Clause 4.3 and 5	Sample Type D
Description	Brown slightly gravelly CLAY.		Specimen Depth 9.55m
			Specimen Number 1



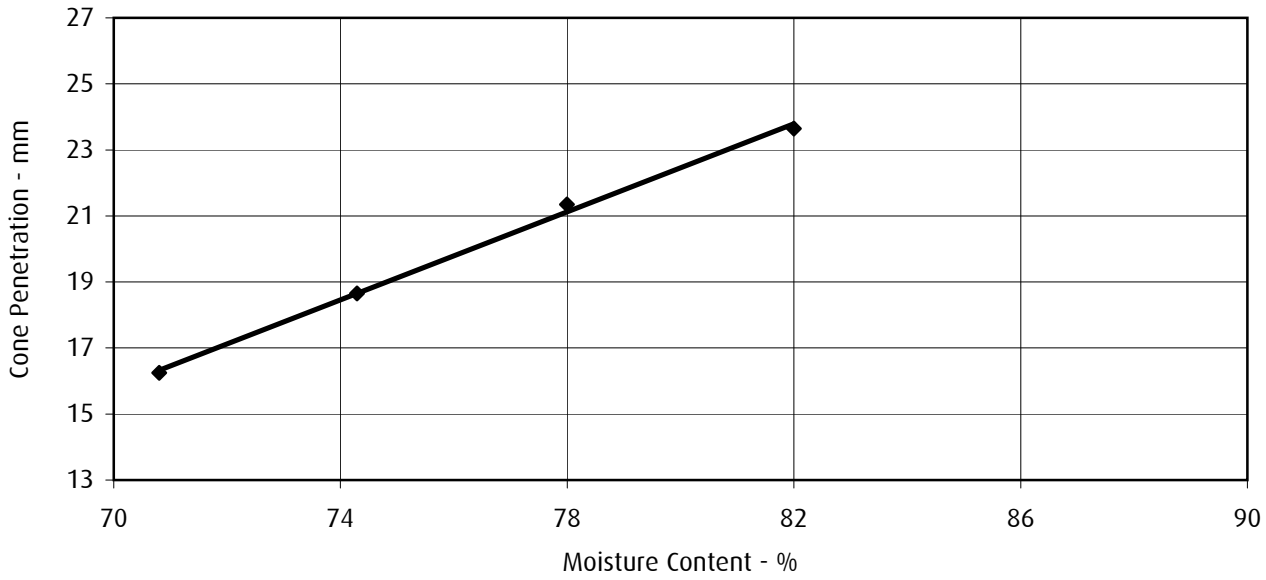
Natural moisture content:	28%	Estimated percentage retained on 425µm sieve:	12%
Liquid limit:	70%	Preparation of sample: Natural	
Plastic limit:	25%	Remarks:	
Plasticity index:	45		
Moisture content of soil passing 425µm	32%		
Liquidity index:	0.16		



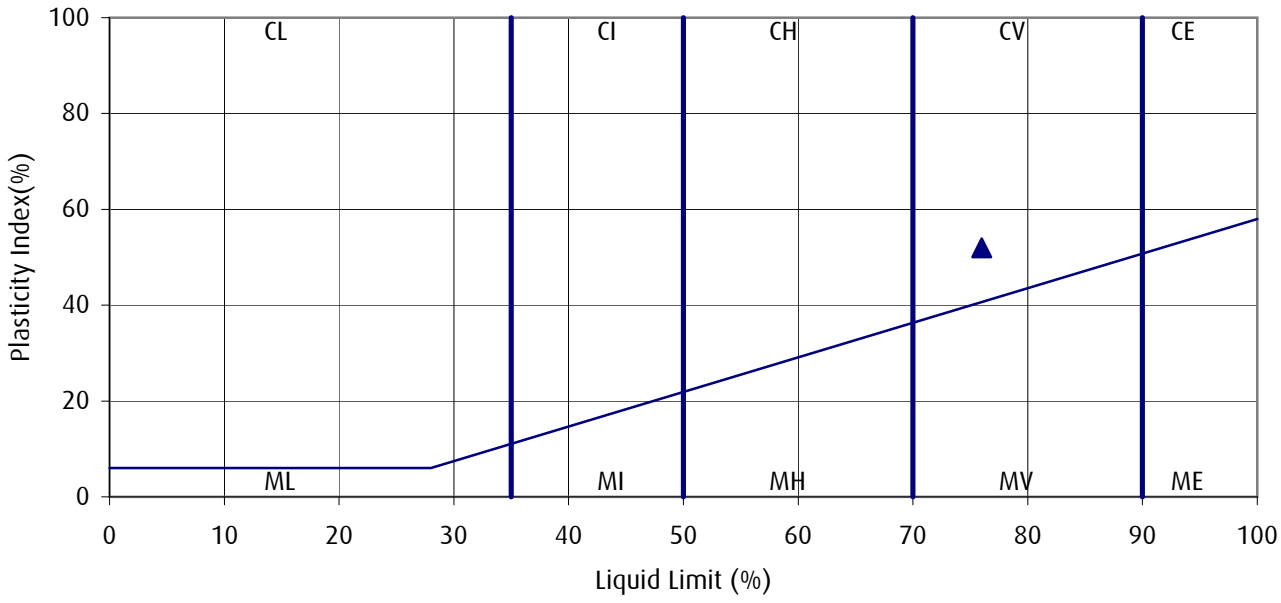
Approved by:	Leeds Laboratory		
Sushil Sharda		Print date	03/10/2007
	Revision No. 2.02	Issue Date	19/06/2007

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Liquid And Plastic Limit Test**	Hole ID BH01
Project No.	F15001		Sample Depth 11.95m
Engineer	Arup Geotechnics		Sample Number 010
Client	Stanhope plc	Test Method: BS1377: Part 2: 1990: Clause 4.3 and 5	Sample Type D
Description	Brown CLAY.		Specimen Depth 11.95m
			Specimen Number 1



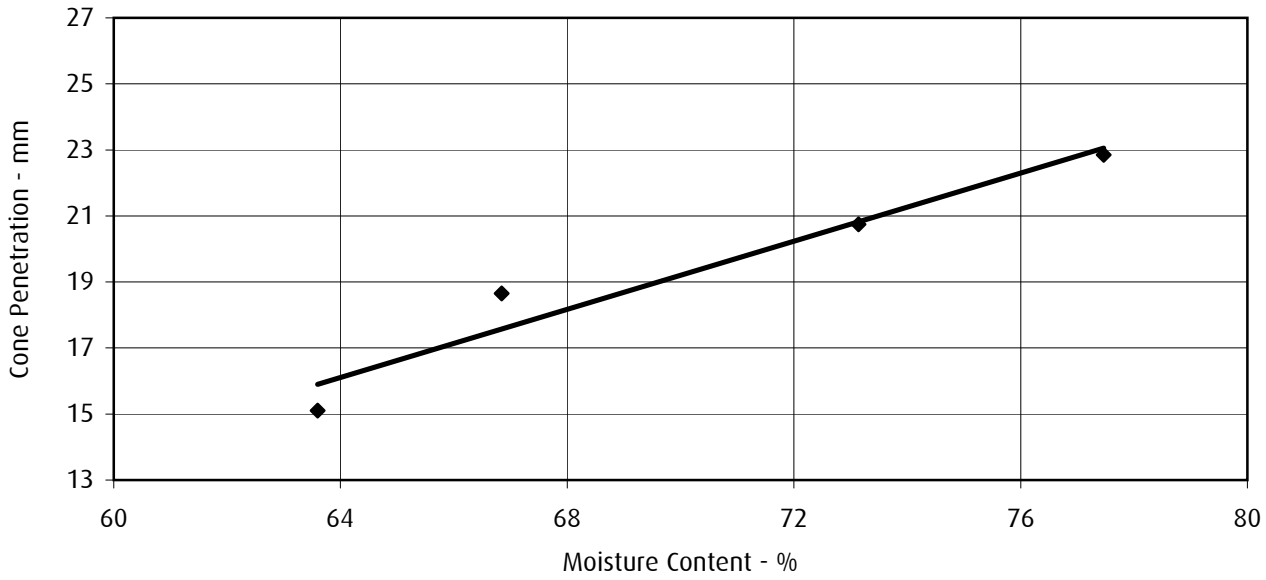
Natural moisture content:	28%	Estimated percentage retained on 425µm sieve:	0%
Liquid limit:	76%	Preparation of sample: Natural	
Plastic limit:	24%	Remarks:	
Plasticity index:	52		
Moisture content of soil passing 425µm	28%		
Liquidity index:	0.08		



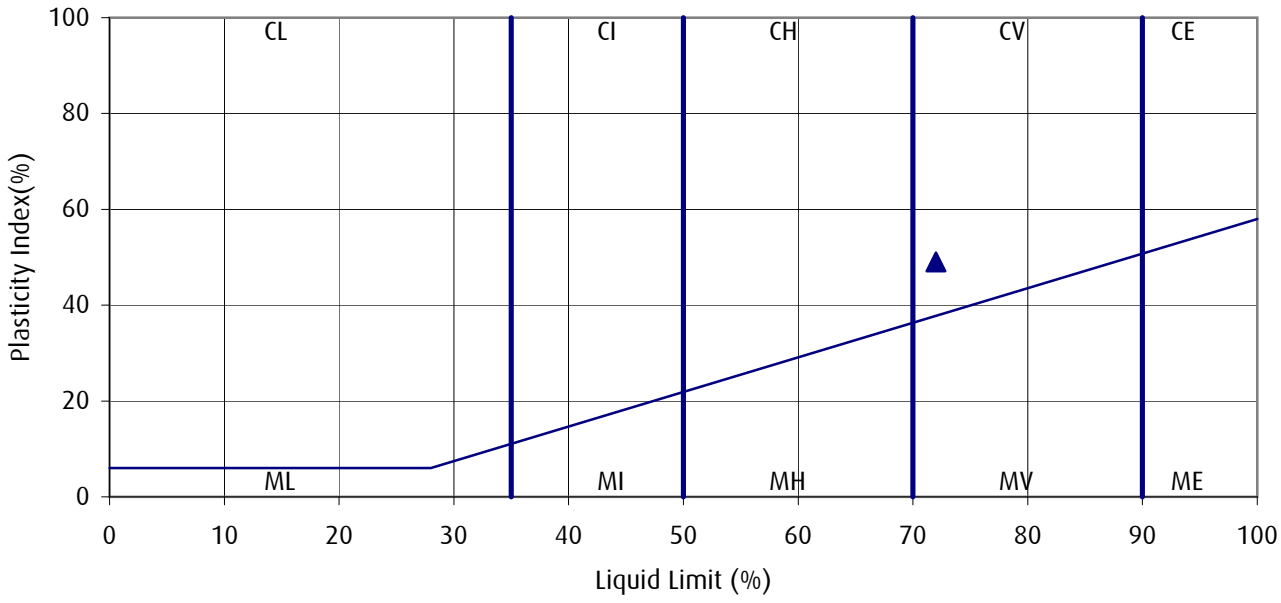
Approved by:	Leeds Laboratory		
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 19/06/2007	

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Liquid And Plastic Limit Test**	Hole ID BH01
Project No.	F15001		Sample Depth 15.95m
Engineer	Arup Geotechnics		Sample Number 016
Client	Stanhope plc	Test Method: BS1377: Part 2: 1990: Clause 4.3 and 5	Sample Type D
Description	Brown CLAY.		Specimen Depth 15.95m
			Specimen Number 1



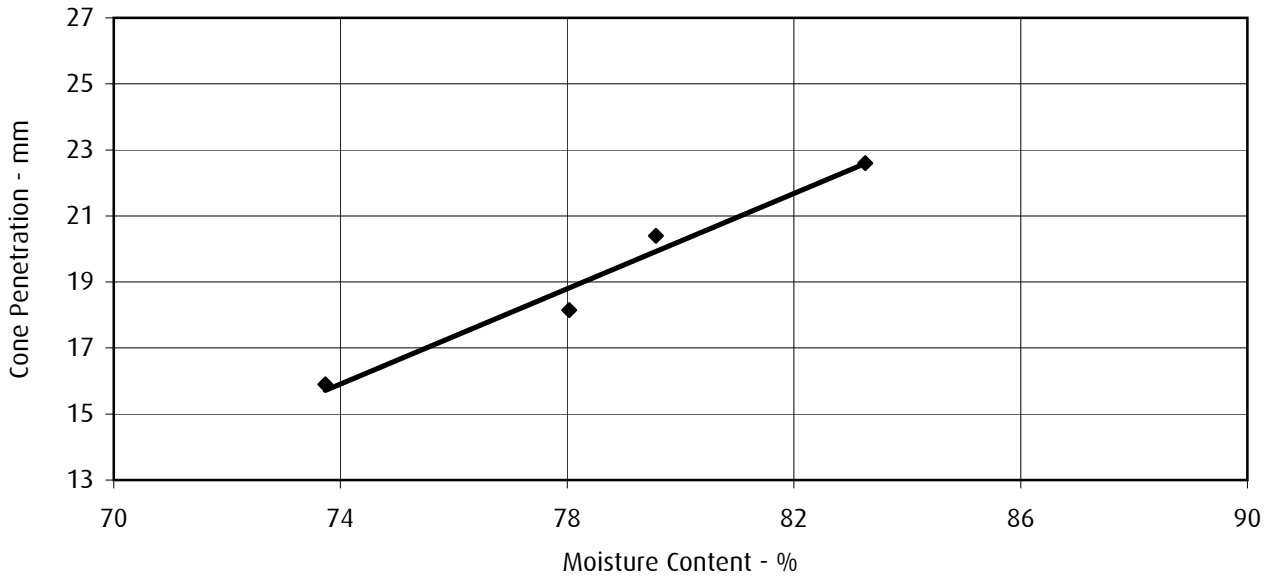
Natural moisture content:	26%	Estimated percentage retained on 425µm sieve:	0%
Liquid limit:	72%	Preparation of sample: Natural	
Plastic limit:	23%	Remarks:	
Plasticity index:	49		
Moisture content of soil passing 425µm	26%		
Liquidity index:	0.06		



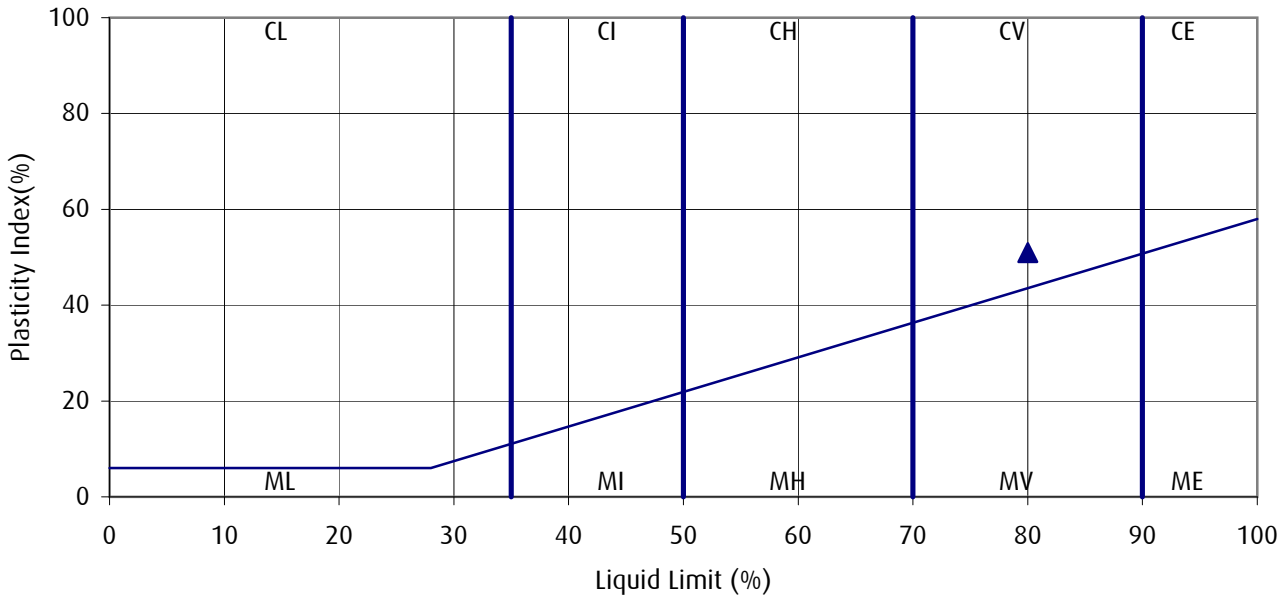
Approved by:	Leeds Laboratory		
Sushil Sharda		Print date	03/10/2007
	Revision No. 2.02	Issue Date	19/06/2007

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Liquid And Plastic Limit Test**	Hole ID BH01
Project No.	F15001		Sample Depth 23.95m
Engineer	Arup Geotechnics		Sample Number 028
Client	Stanhope plc	Test Method: BS1377: Part 2: 1990: Clause 4.3 and 5	Sample Type D
Description	Brown slightly gravelly CLAY.		Specimen Depth 23.95m
			Specimen Number 1



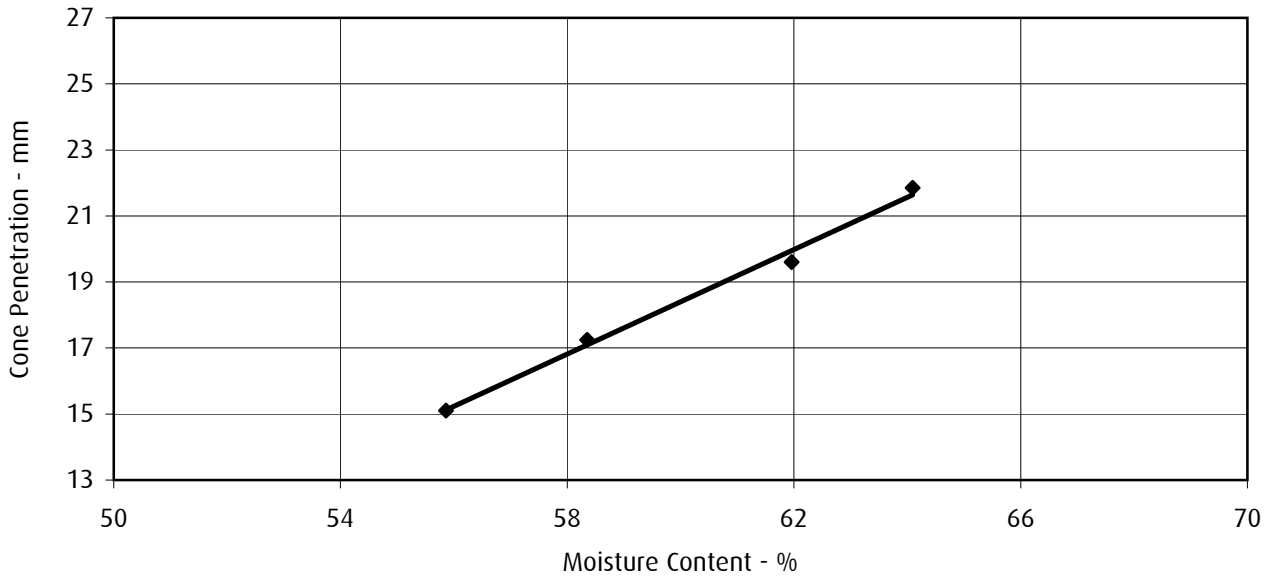
Natural moisture content:	21%	Estimated percentage retained on 425µm sieve:	0%
Liquid limit:	80%	Preparation of sample: Natural	
Plastic limit:	29%	Remarks:	
Plasticity index:	51		
Moisture content of soil passing 425µm	21%		
Liquidity index:	-0.16		



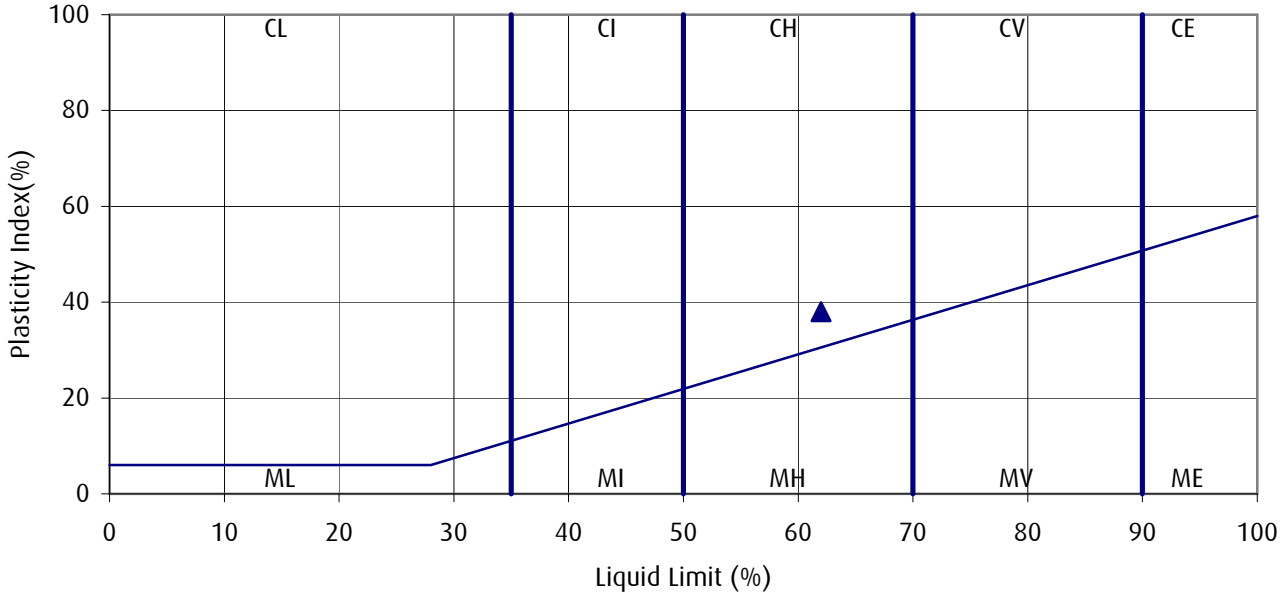
Approved by:	Leeds Laboratory		
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 19/06/2007	

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Liquid And Plastic Limit Test**	Hole ID BH01
Project No.	F15001		Sample Depth 29.85m
Engineer	Arup Geotechnics		Sample Number 038
Client	Stanhope plc	Test Method: BS1377: Part 2: 1990: Clause 4.3 and 5	Sample Type D
Description	Brown CLAY.		Specimen Depth 29.85m
			Specimen Number 1



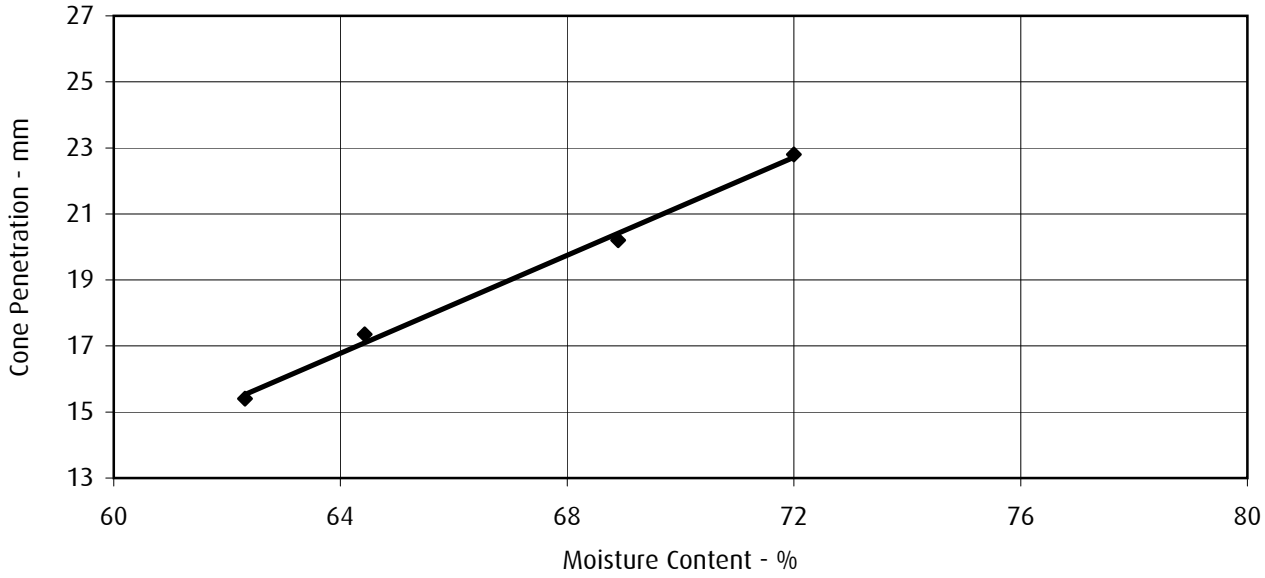
Natural moisture content:	22%	Estimated percentage retained on 425µm sieve:	0%
Liquid limit:	62%	Preparation of sample: Natural	
Plastic limit:	24%	Remarks:	
Plasticity index:	38		
Moisture content of soil passing 425µm	22%		
Liquidity index:	-0.05		



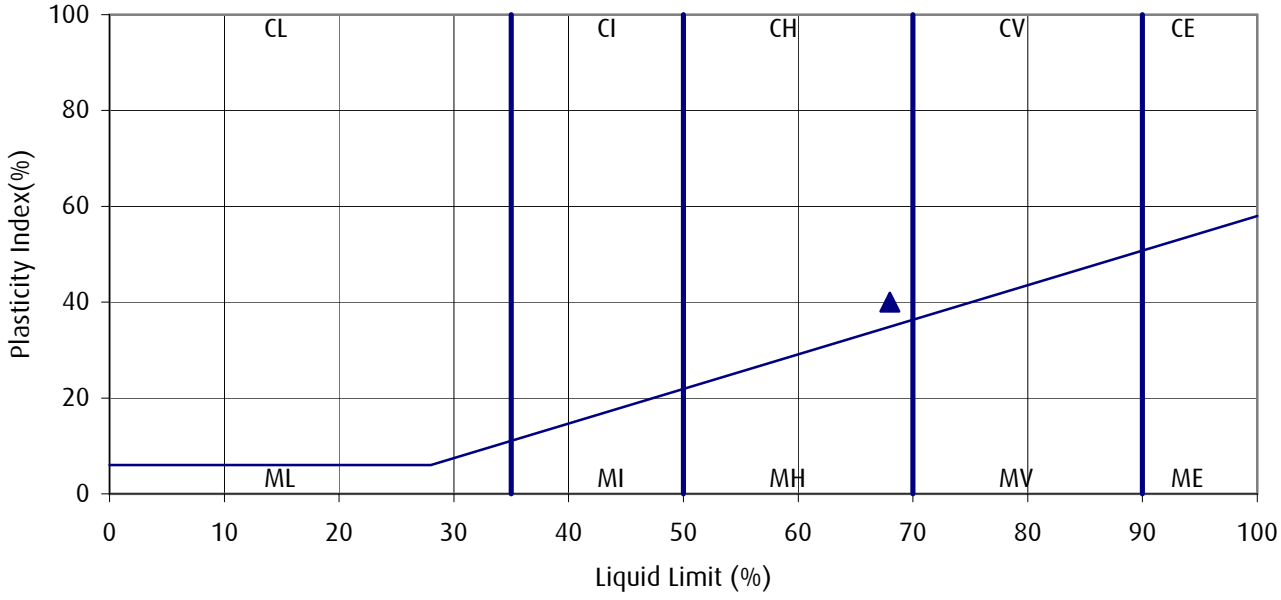
Approved by:	Leeds Laboratory		
Sushil Sharda		Print date	03/10/2007
	Revision No. 2.02	Issue Date	19/06/2007

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Liquid And Plastic Limit Test**	Hole ID BH01
Project No.	F15001		Sample Depth 33.95m
Engineer	Arup Geotechnics		Sample Number 044
Client	Stanhope plc	Test Method: BS1377: Part 2: 1990: Clause 4.3 and 5	Sample Type D
Description	Brown CLAY.		Specimen Depth 33.95m
			Specimen Number 1



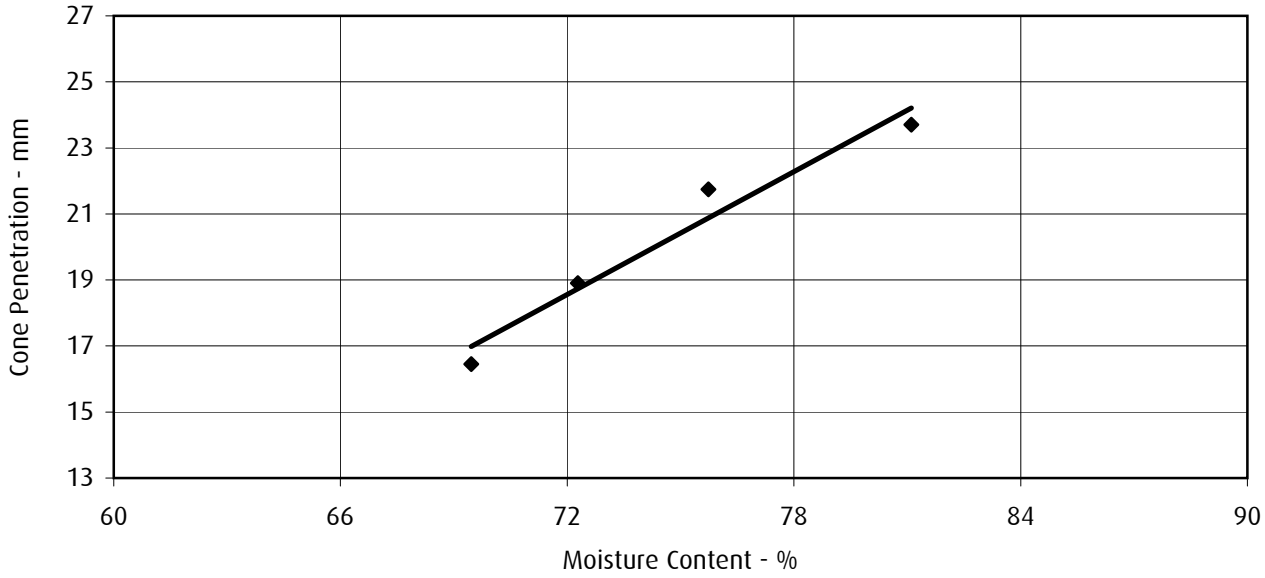
Natural moisture content:	25%	Estimated percentage retained on 425µm sieve:	0%
Liquid limit:	68%	Preparation of sample: Natural	
Plastic limit:	28%	Remarks:	
Plasticity index:	40		
Moisture content of soil passing 425µm	25%		
Liquidity index:	-0.08		



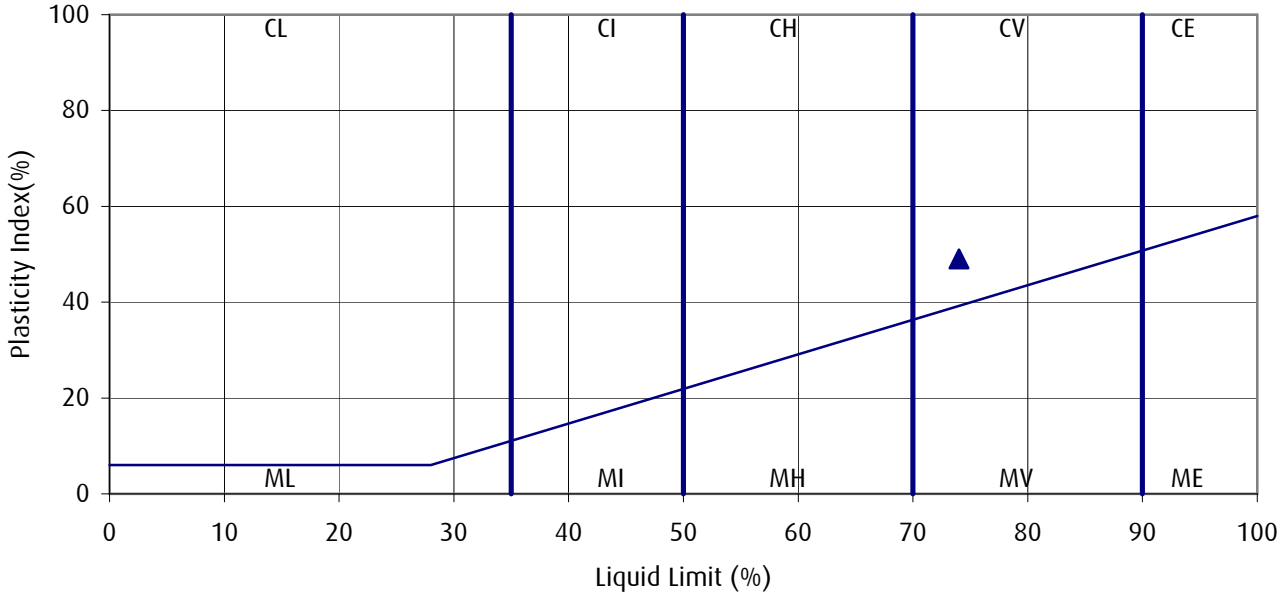
Approved by:	Leeds Laboratory		
Sushil Sharda		Print date	03/10/2007
	Revision No. 2.02	Issue Date	19/06/2007

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Liquid And Plastic Limit Test**	Hole ID BH01
Project No.	F15001		Sample Depth 37.80m
Engineer	Arup Geotechnics		Sample Number 050
Client	Stanhope plc	Test Method: BS1377: Part 2: 1990: Clause 4.3 and 5	Sample Type D
Description	Brown CLAY.		Specimen Depth 37.80m
			Specimen Number 1



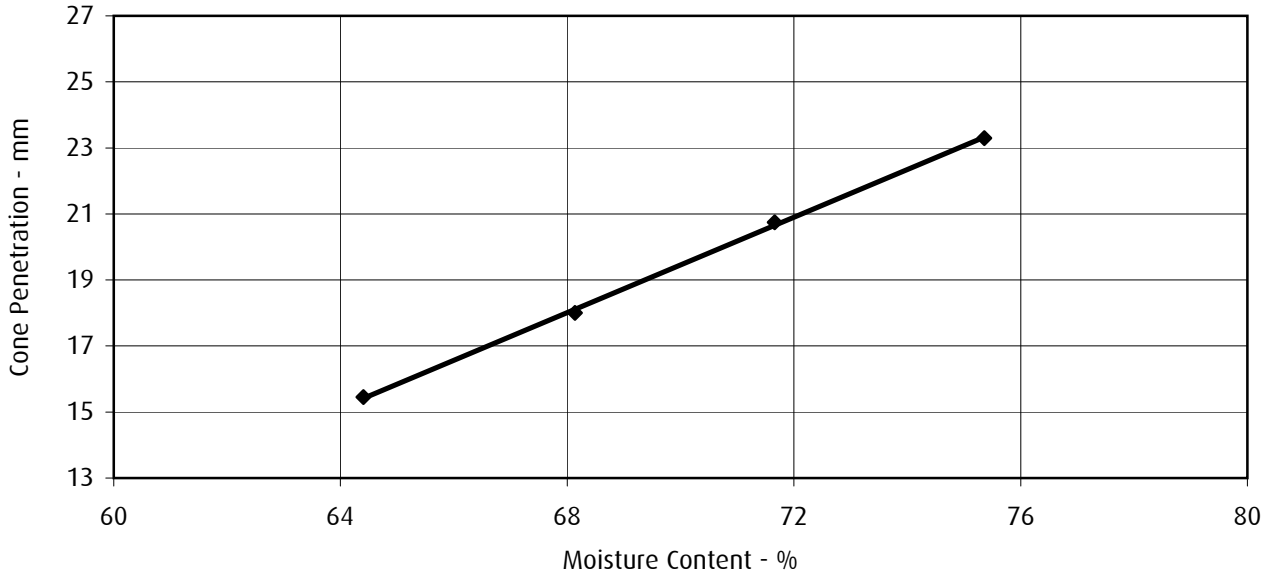
Natural moisture content:	24%	Estimated percentage retained on 425µm sieve:	0%
Liquid limit:	74%	Preparation of sample: Natural	
Plastic limit:	25%	Remarks: Unable to obtain repeatable plastic limit test results.	
Plasticity index:	49	Value recorded is outside the BS test limits.	
Moisture content of soil passing 425µm	24%		
Liquidity index:	-0.02		



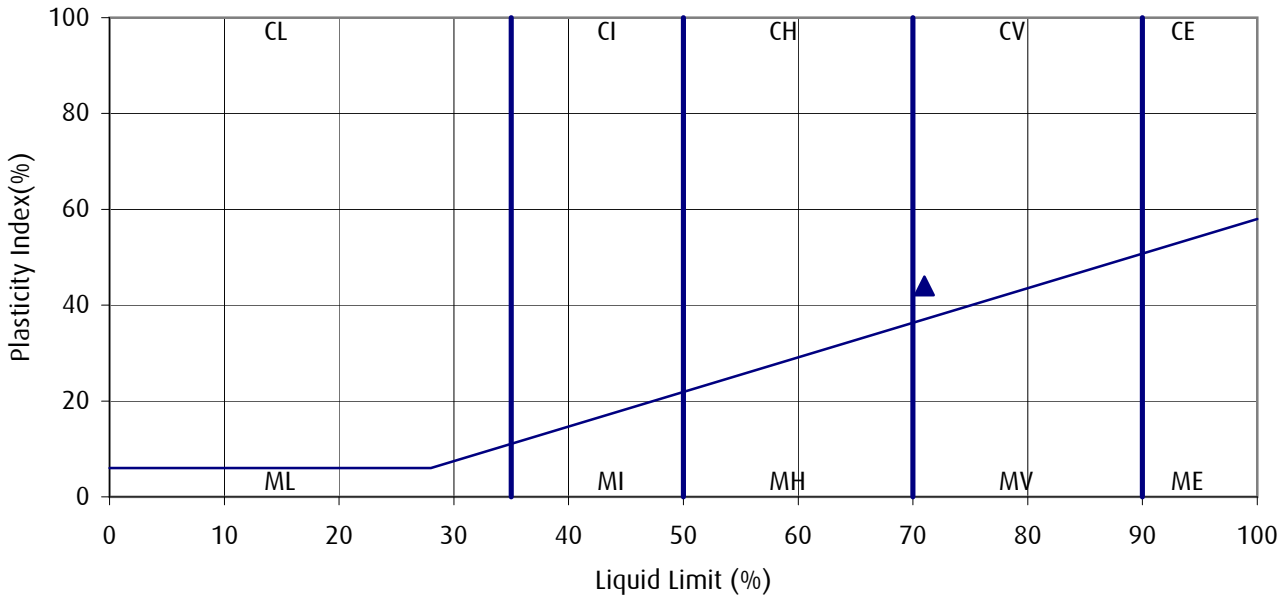
Approved by:	Leeds Laboratory		
Stuart Kirk		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 19/06/2007	

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Liquid And Plastic Limit Test**	Hole ID BH01
Project No.	F15001		Sample Depth 41.85m
Engineer	Arup Geotechnics		Sample Number 056
Client	Stanhope plc	Test Method: BS1377: Part 2: 1990: Clause 4.3 and 5	Sample Type D
Description	Brown CLAY.		Specimen Depth 41.85m
			Specimen Number 1



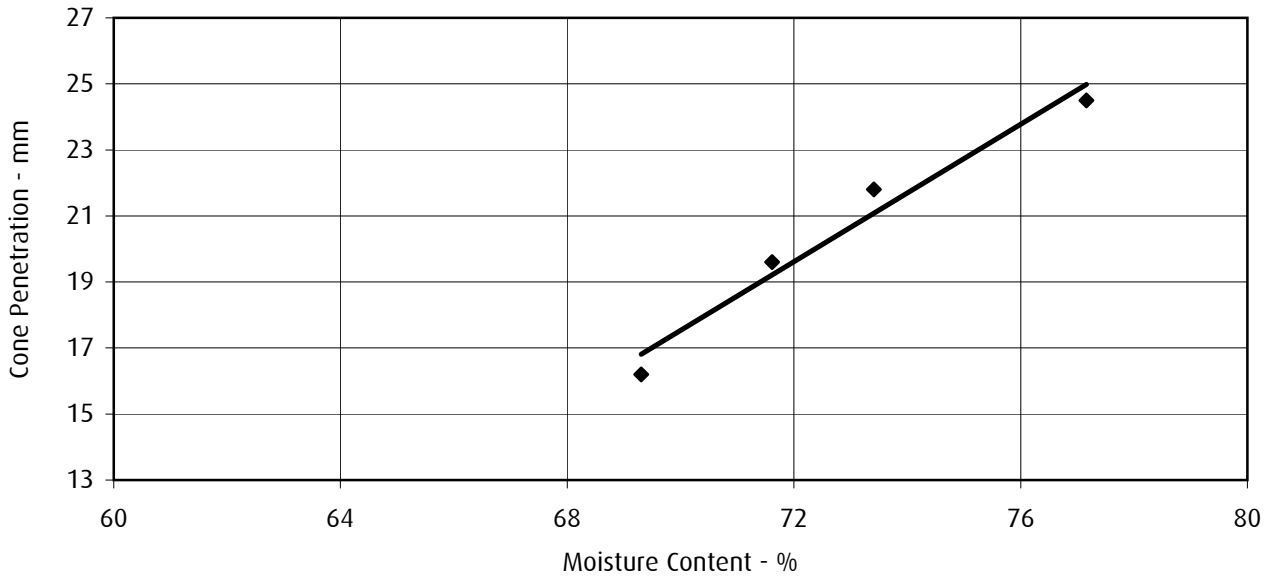
Natural moisture content:	23%	Estimated percentage retained on 425µm sieve:	0%
Liquid limit:	71%	Preparation of sample: Natural	
Plastic limit:	27%	Remarks:	
Plasticity index:	44		
Moisture content of soil passing 425µm	23%		
Liquidity index:	-0.09		



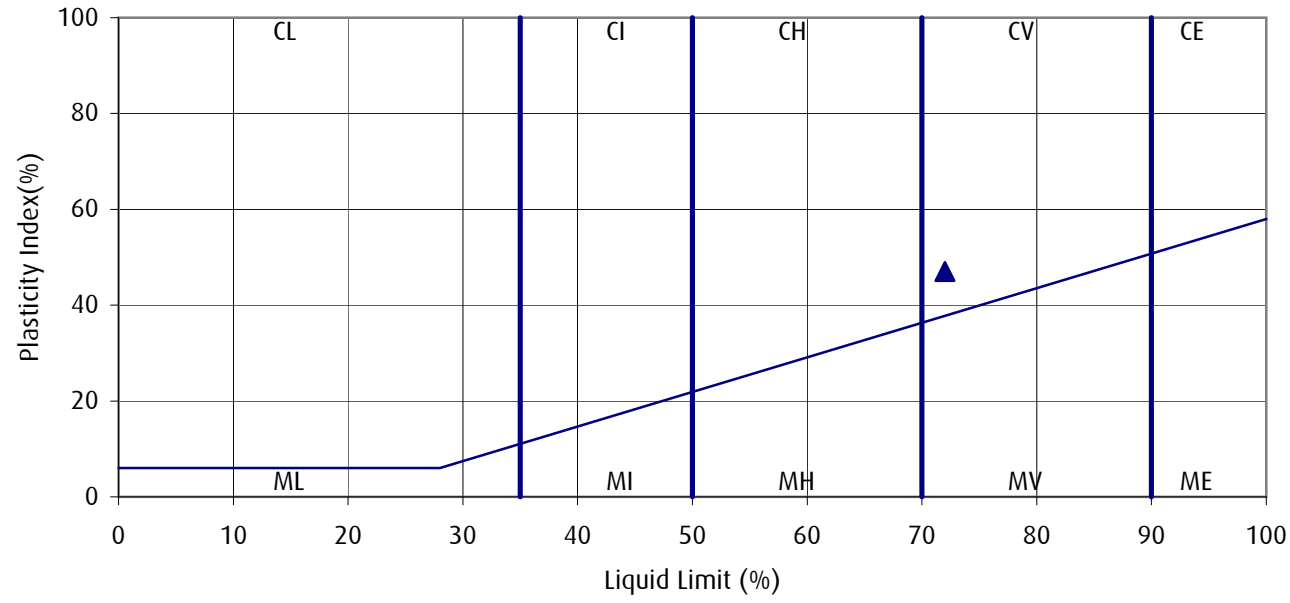
Approved by:	Leeds Laboratory		
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 19/06/2007	

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Liquid And Plastic Limit Test**	Hole ID BH01
Project No.	F15001		Sample Depth 45.85m
Engineer	Arup Geotechnics		Sample Number 062
Client	Stanhope plc	Test Method: BS1377: Part 2: 1990: Clause 4.3 and 5	Sample Type D
Description	Brown CLAY.		Specimen Depth 45.85m
			Specimen Number 1



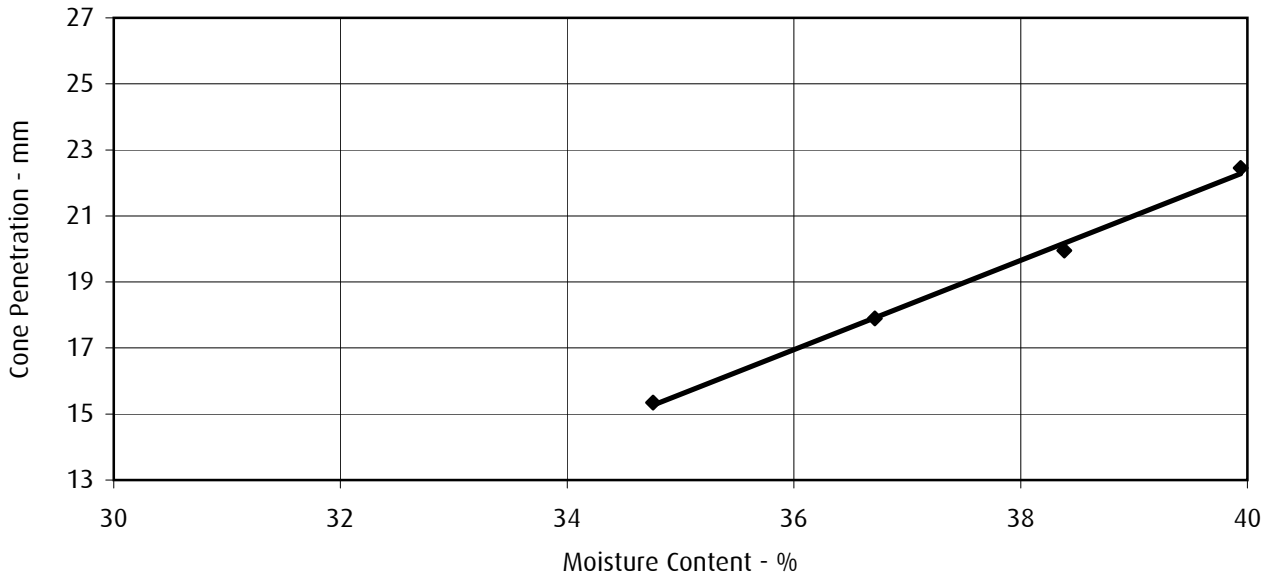
Natural moisture content:	25%	Estimated percentage retained on 425µm sieve:	0%
Liquid limit:	72%	Preparation of sample: Natural	
Plastic limit:	25%	Remarks:	
Plasticity index:	47		
Moisture content of soil passing 425µm	25%		
Liquidity index:	0.00		



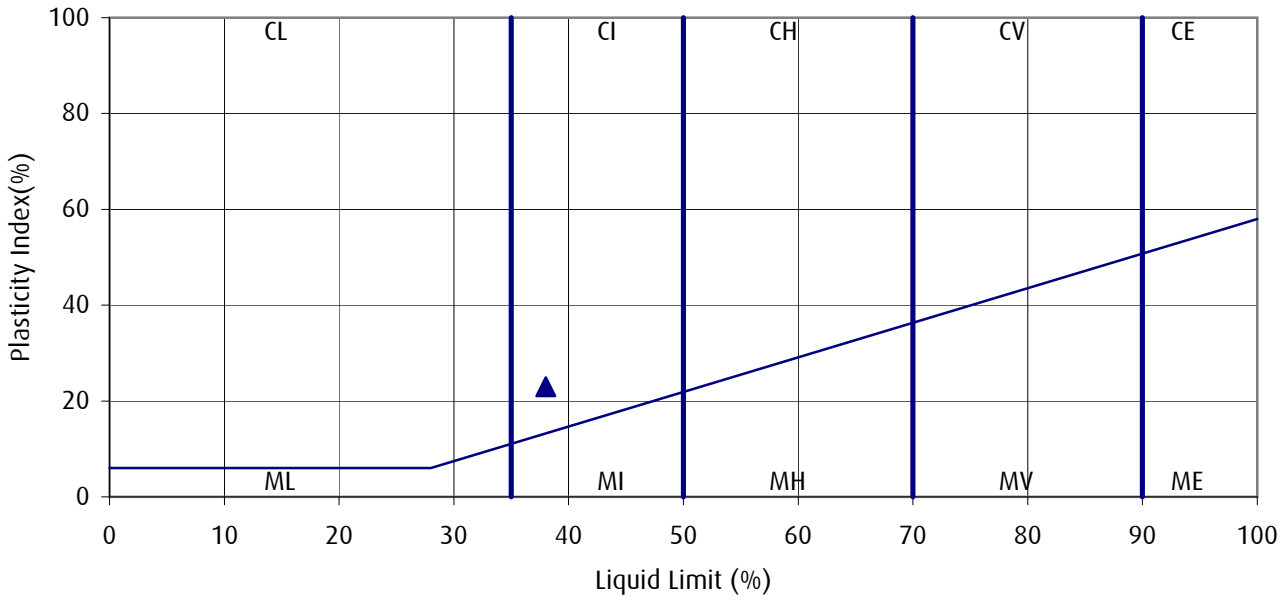
Approved by:	Leeds Laboratory		
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 19/06/2007	

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Liquid And Plastic Limit Test**	Hole ID BH01
Project No.	F15001		Sample Depth 50.50m
Engineer	Arup Geotechnics		Sample Number 067
Client	Stanhope plc	Test Method: BS1377: Part 2: 1990: Clause 4.3 and 5	Sample Type D
Description	Light grey sandy CLAY.		Specimen Depth 50.50m
			Specimen Number 1



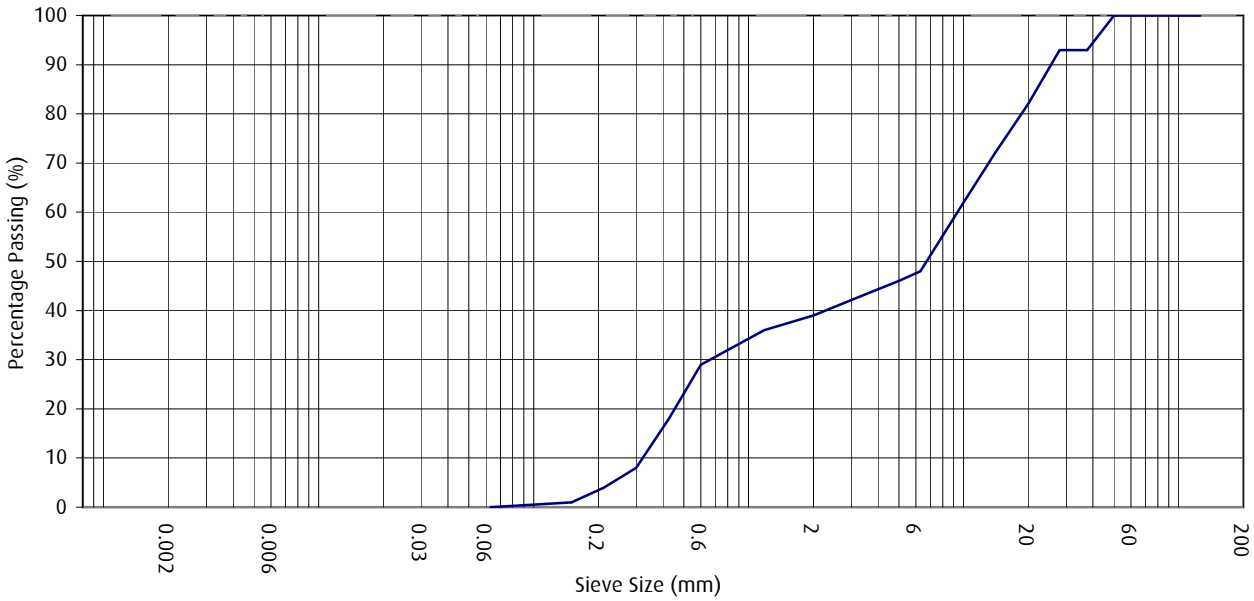
Natural moisture content:	14%	Estimated percentage retained on 425µm sieve:	0%
Liquid limit:	38%	Preparation of sample: Natural	
Plastic limit:	15%	Remarks:	
Plasticity index:	23		
Moisture content of soil passing 425µm	14%		
Liquidity index:	-0.04		



Approved by:	Leeds Laboratory		
Sushil Sharda		Print date	03/10/2007
	Revision No. 2.02	Issue Date	19/06/2007

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 5.90m
Engineer	Arup Geotechnics		Sample Number 002
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2	Sample type B
Description	Brown sandy GRAVEL.		Specimen Depth 2.90m
			Specimen No. 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

PARTICLE SIZE	%
Silt and clay:	0
Sand:	39
Gravel:	61
Cobbles:	0

General remarks

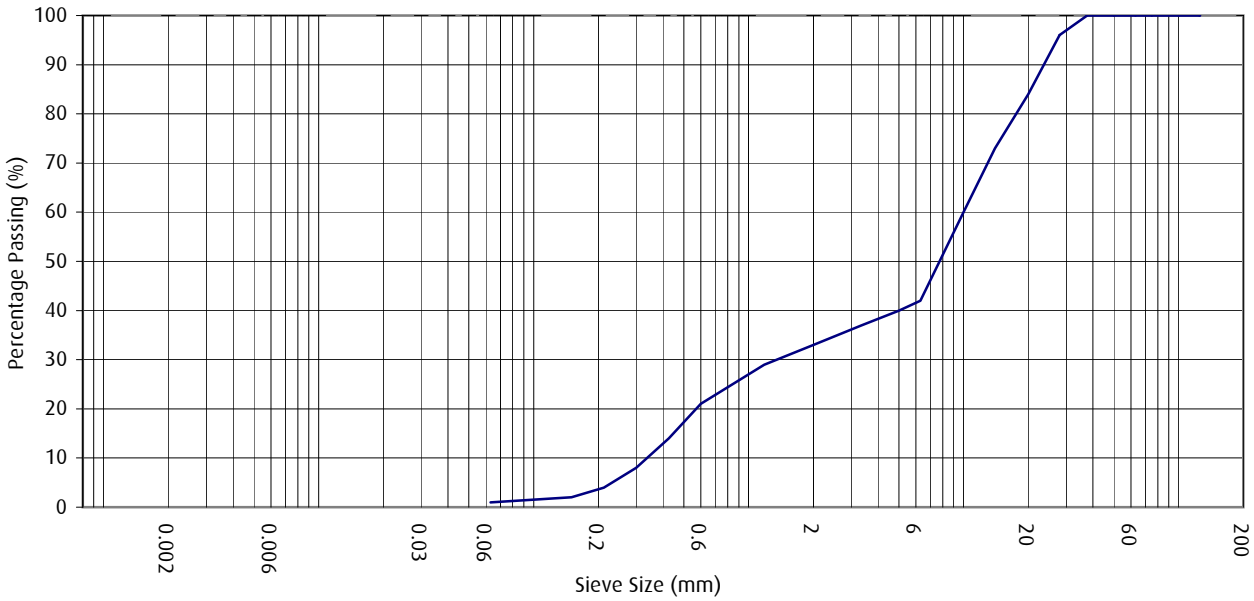
WET SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
		14.0	72
		10.0	62
		6.3	48
125.0	100	5.0	46
100.0	100	3.35	43
75.0	100	2.00	39
63.0	100	1.18	36
50.0	100	0.600	29
37.5	93	0.425	18
28.0	93	0.300	8
20.0	82	0.212	4
		0.150	1
		0.063	0

Approved by:	Leeds Laboratory		
Sushil Sharda		Print date	03/10/2007
	Revision No. 3.01	Issue Date	28/04/2006

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 9.00m
Engineer	Arup Geotechnics		Sample Number 004
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2	Sample type B
Description	Brown sandy GRAVEL.		Specimen Depth 9.00m
			Specimen No. 1



PARTICLE SIZE	%
Silt and clay:	1
Sand:	32
Gravel:	67
Cobbles:	0

General remarks

WET SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
		14.0	73
		10.0	60
		6.3	42
125.0	100	5.0	40
100.0	100	3.35	37
75.0	100	2.00	33
63.0	100	1.18	29
50.0	100	0.600	21
37.5	100	0.425	14
28.0	96	0.300	8
20.0	84	0.212	4
		0.150	2
		0.063	1

Approved by:
Sushil Sharda

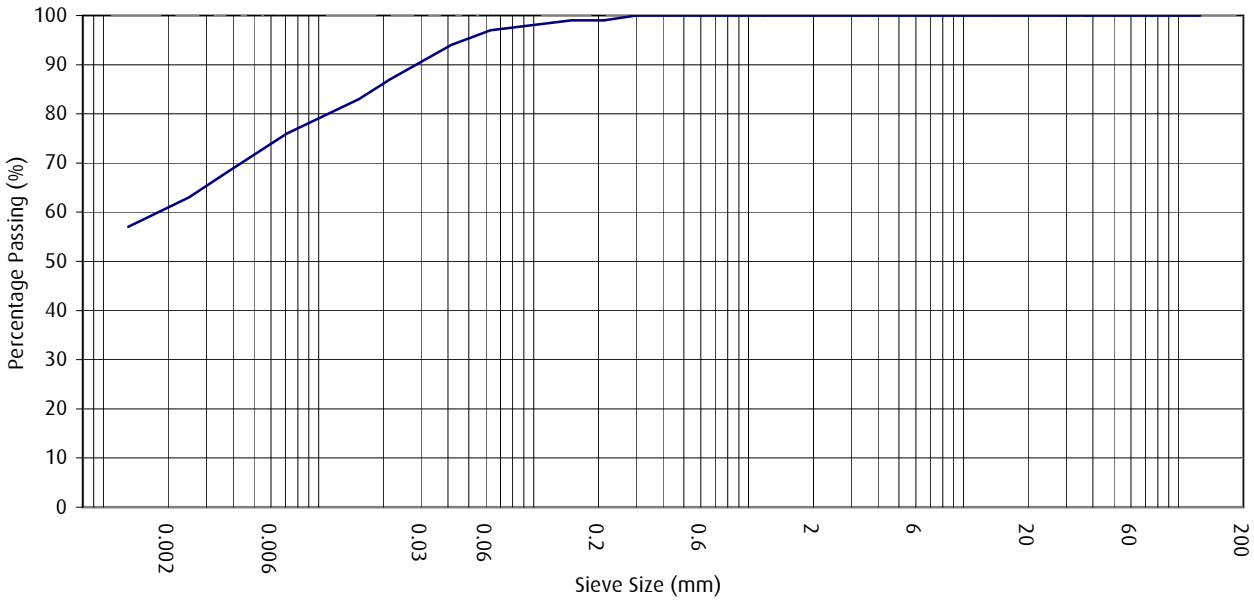
Leeds Laboratory

Print date 03/10/2007

Revision No. 3.01 Issue Date 28/04/2006

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 10.00m
Engineer	Arup Geotechnics		Sample Number 007
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2, 9.5	Sample type D
Description	Brown CLAY.		Specimen Depth 10.00m
			Specimen No. 1



PARTICLE SIZE	%
Clay:	61
Silt:	36
Sand:	3
Gravel:	0
Cobbles:	0

General remarks

Particle density: 2.65Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	100		
		10.0	100	0.0413	94
		6.3	100	0.0214	87
125.0	100	5.0	100	0.0154	83
100.0	100	3.35	100	0.0071	76
75.0	100	2.00	100	0.0037	68
63.0	100	1.18	100	0.0025	63
50.0	100	0.600	100	0.0013	57
37.5	100	0.425	100		
28.0	100	0.300	100		
20.0	100	0.212	99		
		0.150	99		
		0.063	97		

Approved by:
Sushil Sharda

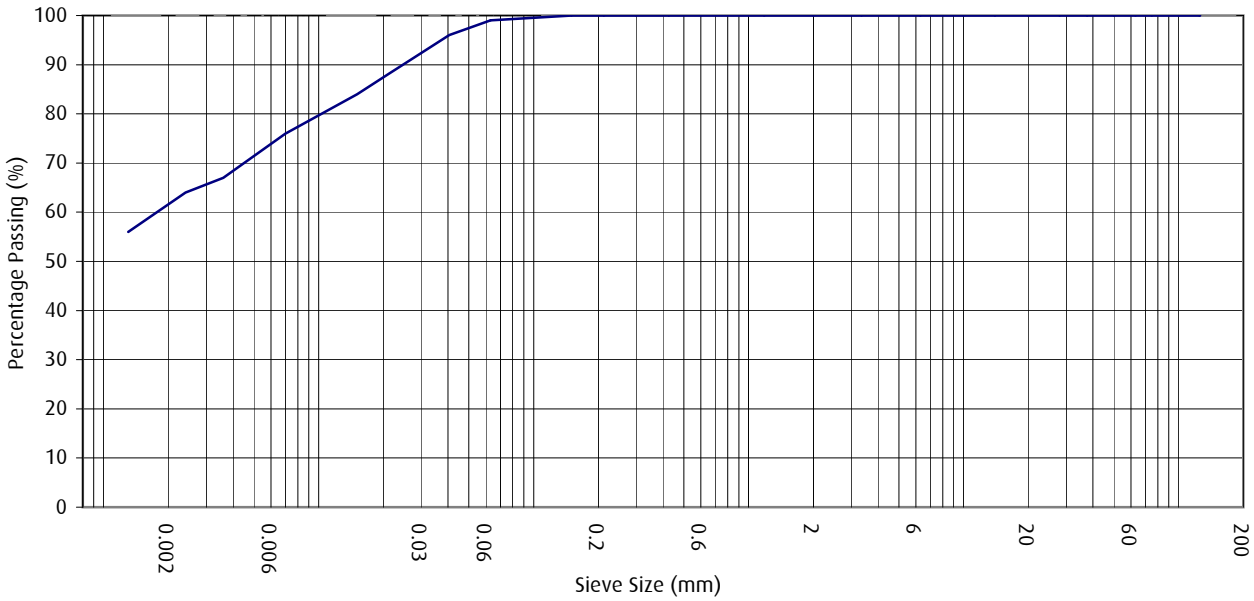
Leeds Laboratory

Print date 03/10/2007

Revision No. 3.01 Issue Date 28/04/2006

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 17.95m
Engineer	Arup Geotechnics		Sample Number 019
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2, 9.5	Sample type D
Description	Brown CLAY.		Specimen Depth 17.95m
			Specimen No. 1



PARTICLE SIZE	%
Clay:	61
Silt:	38
Sand:	1
Gravel:	0
Cobbles:	0

General remarks

Particle density: 2.65Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	100		
		10.0	100	0.0405	96
		6.3	100	0.0210	88
125.0	100	5.0	100	0.0151	84
100.0	100	3.35	100	0.0070	76
75.0	100	2.00	100	0.0036	67
63.0	100	1.18	100	0.0024	64
50.0	100	0.600	100	0.0013	56
37.5	100	0.425	100		
28.0	100	0.300	100		
20.0	100	0.212	100		
		0.150	100		
		0.063	99		

Approved by:
Sushil Sharda

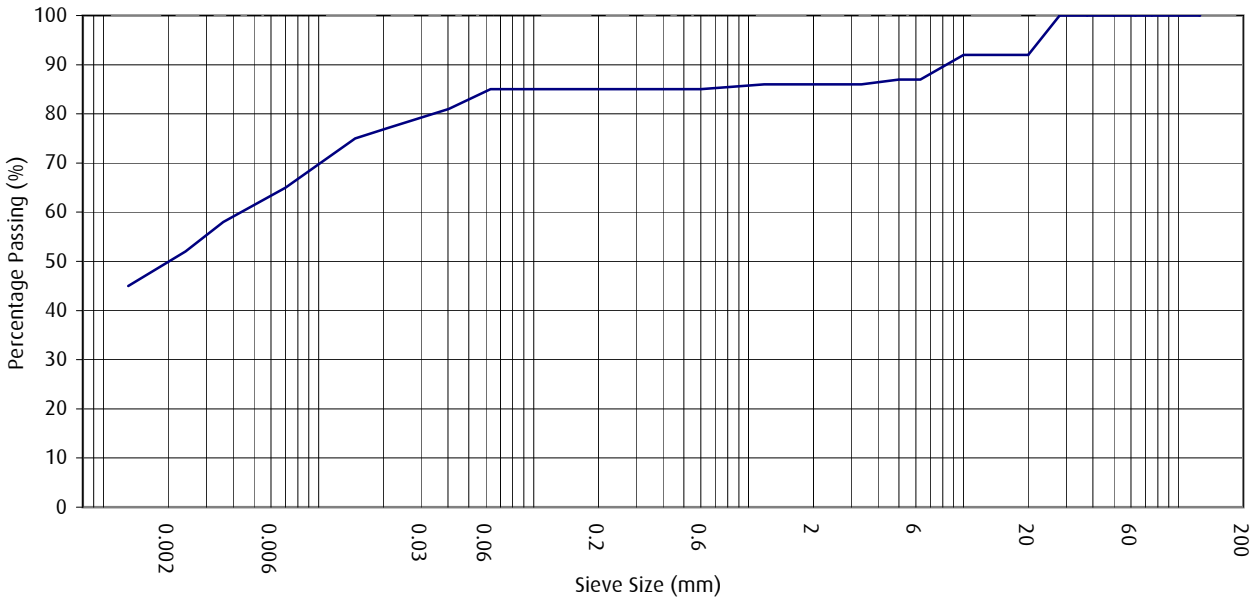
Leeds Laboratory

Print date 03/10/2007

Revision No. 3.01 Issue Date 28/04/2006

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 21.85m
Engineer	Arup Geotechnics		Sample Number 025
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2, 9.5	Sample type D
Description	Brown slightly gravelly CLAY.		Specimen Depth 21.85m
			Specimen No. 1



PARTICLE SIZE	%
Clay:	49
Silt:	35
Sand:	2
Gravel:	14
Cobbles:	0

General remarks

Particle density: 2.65Mg/m³ Assumed

WET SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
		14.0	92
		10.0	92
		6.3	87
125.0	100	5.0	87
100.0	100	3.35	86
75.0	100	2.00	86
63.0	100	1.18	86
50.0	100	0.600	85
37.5	100	0.425	85
28.0	100	0.300	85
20.0	92	0.212	85
		0.150	85
		0.063	85

SEDIMENTATION DATA

Equivalent particle diameter	Cumulative % passing
0.0402	81
0.0206	77
0.0148	75
0.0070	65
0.0036	58
0.0024	52
0.0013	45

Approved by: Stuart Kirk

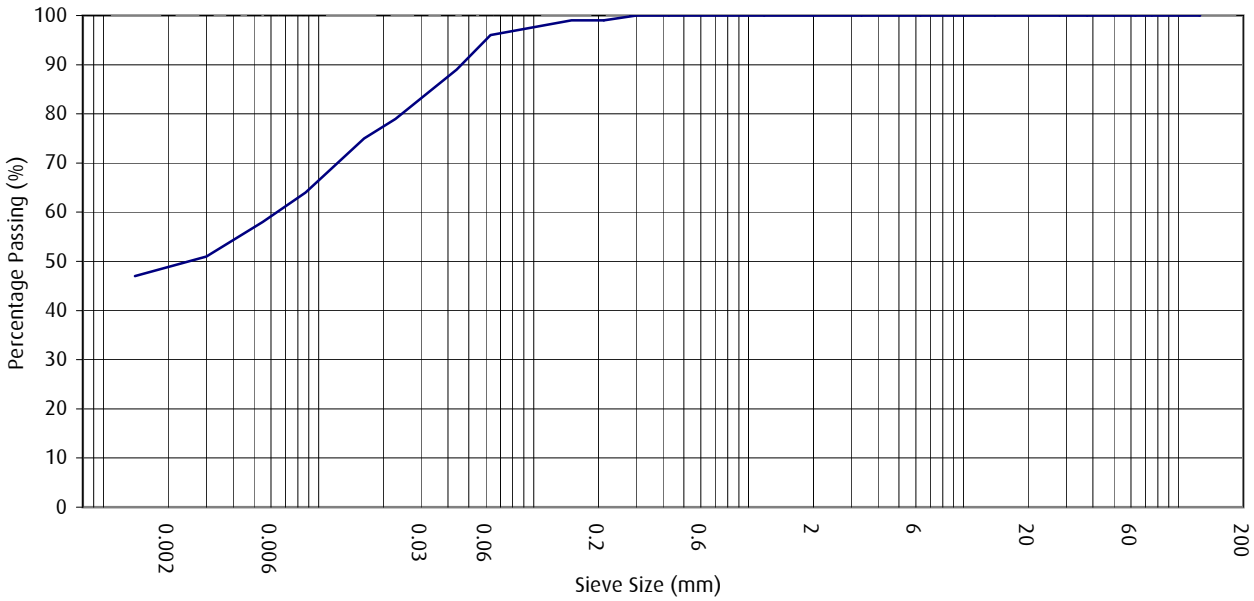
Leeds Laboratory

Print date 03/10/2007

Revision No. 3.01 Issue Date 28/04/2006

NORWEST HOLST SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 25.95m
Engineer	Arup Geotechnics		Sample Number 031
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2, 9.5	Sample type D
Description	Brown CLAY.		Specimen Depth 25.95m
			Specimen No. 1



PARTICLE SIZE	%
Clay:	49
Silt:	46
Sand:	5
Gravel:	0
Cobbles:	0

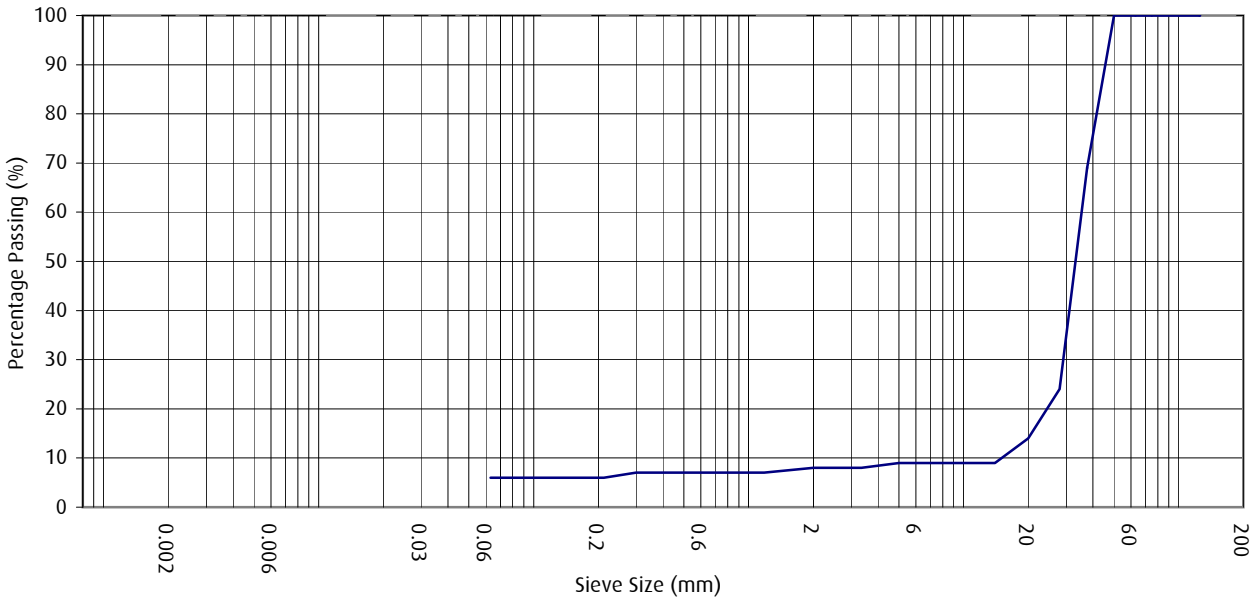
General remarks

Particle density: 2.65Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	100		
		10.0	100	0.0439	89
		6.3	100	0.0228	79
125.0	100	5.0	100	0.0163	75
100.0	100	3.35	100	0.0087	64
75.0	100	2.00	100	0.0055	58
63.0	100	1.18	100	0.0030	51
50.0	100	0.600	100	0.0014	47
37.5	100	0.425	100		
28.0	100	0.300	100		
20.0	100	0.212	99		
		0.150	99		
		0.063	96		

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Stuart Kirk		Print date 03/10/2007	
	Revision No. 3.01	Issue Date 28/04/2006	

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 28.00m
Engineer	Arup Geotechnics		Sample Number 035
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2	Sample type D
Description	Brown slightly sandy GRAVEL.		Specimen Depth 28.00m
			Specimen No. 1



PARTICLE SIZE	%
Silt and clay:	6
Sand:	2
Gravel:	92
Cobbles:	0

General remarks
Sample size was insufficient to be representative of particle size

WET SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
		14.0	9
		10.0	9
		6.3	9
125.0	100	5.0	9
100.0	100	3.35	8
75.0	100	2.00	8
63.0	100	1.18	7
50.0	100	0.600	7
37.5	69	0.425	7
28.0	24	0.300	7
20.0	14	0.212	6
		0.150	6
		0.063	6

Approved by:
Sushil Sharda

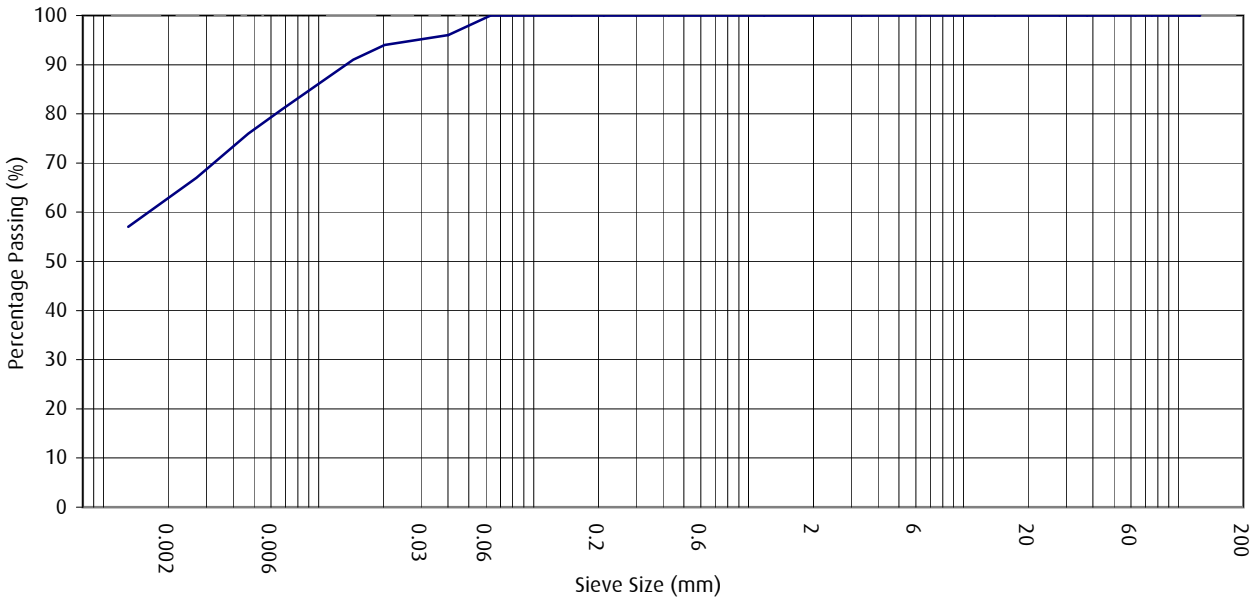
Leeds Laboratory

Print date 03/10/2007

Revision No. 3.01 Issue Date 28/04/2006

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 35.90m
Engineer	Arup Geotechnics		Sample Number 047
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2, 9.5	Sample type D
Description	Brown CLAY.		Specimen Depth 35.90m
			Specimen No. 1



PARTICLE SIZE	%
Clay:	62
Silt:	37
Sand:	1
Gravel:	0
Cobbles:	0

General remarks

Particle density: 2.65Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	100		
		10.0	100	0.0401	96
		6.3	100	0.0203	94
125.0	100	5.0	100	0.0145	91
100.0	100	3.35	100	0.0068	81
75.0	100	2.00	100	0.0047	76
63.0	100	1.18	100	0.0027	67
50.0	100	0.600	100	0.0013	57
37.5	100	0.425	100		
28.0	100	0.300	100		
20.0	100	0.212	100		
		0.150	100		
		0.063	100		

Approved by:
Sushil Sharda

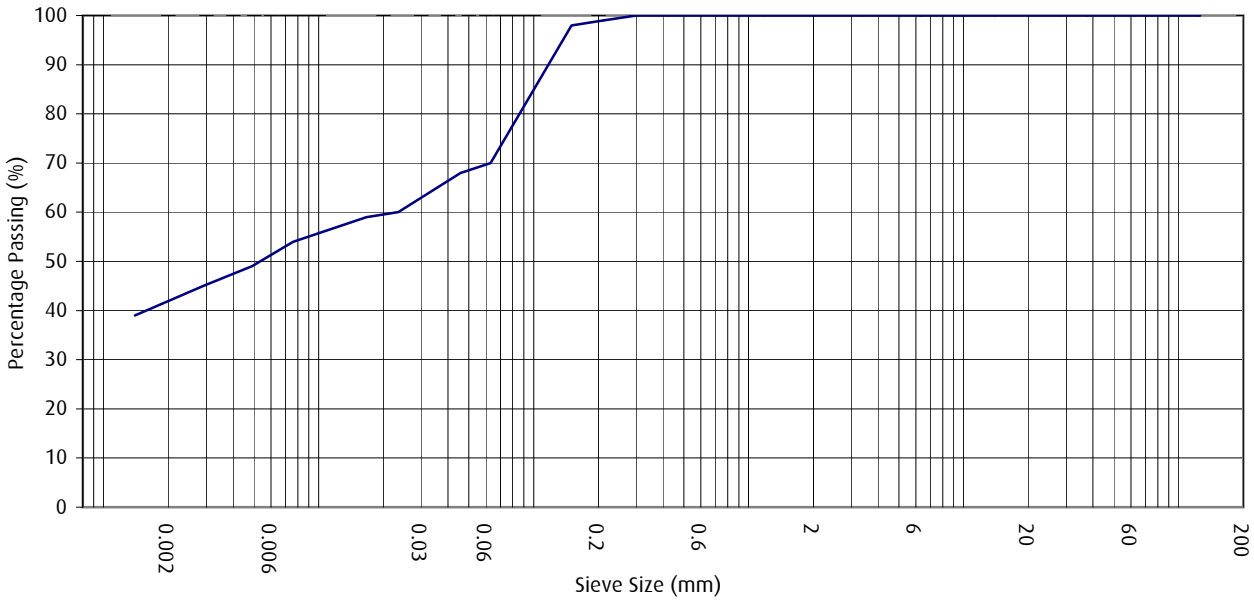
Leeds Laboratory

Print date 03/10/2007

Revision No. 3.01 Issue Date 28/04/2006

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 43.95m
Engineer	Arup Geotechnics		Sample Number 059
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2, 9.5	Sample type D
Description	Brown slightly sandy CLAY.		Specimen Depth 43.95m
			Specimen No. 1



PARTICLE SIZE	%
Clay:	41
Silt:	28
Sand:	30
Gravel:	0
Cobbles:	0

General remarks

Particle density: 2.65Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	100		
		10.0	100	0.0457	68
		6.3	100	0.0235	60
125.0	100	5.0	100	0.0167	59
100.0	100	3.35	100	0.0076	54
75.0	100	2.00	100	0.0049	49
63.0	100	1.18	100	0.0029	45
50.0	100	0.600	100	0.0014	39
37.5	100	0.425	100		
28.0	100	0.300	100		
20.0	100	0.212	99		
		0.150	98		
		0.063	70		

Approved by:
Sushil Sharda

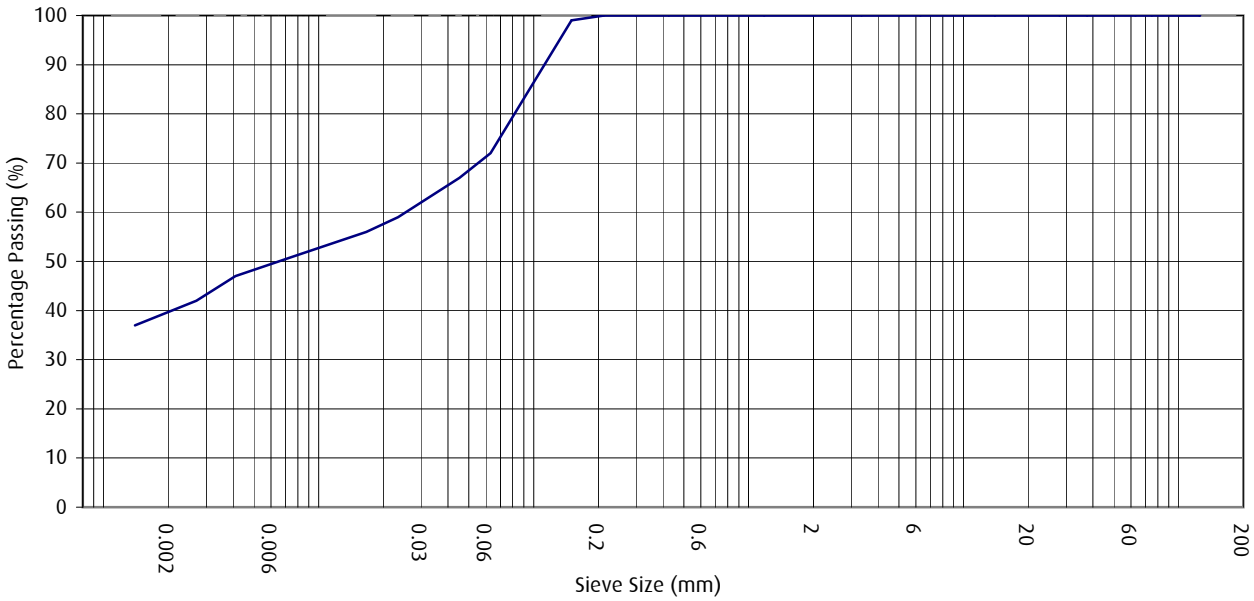
Leeds Laboratory

Print date 03/10/2007

Revision No. 3.01 Issue Date 28/04/2006

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 47.90m
Engineer	Arup Geotechnics		Sample Number 065
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2, 9.5	Sample type D
Description	Brown CLAY.		Specimen Depth 47.90m
			Specimen No. 1



PARTICLE SIZE	%
Clay:	39
Silt:	32
Sand:	29
Gravel:	0
Cobbles:	0

General remarks

Particle density: 2.65Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	100		
		10.0	100	0.0452	67
		6.3	100	0.0234	59
125.0	100	5.0	100	0.0167	56
100.0	100	3.35	100	0.0076	51
75.0	100	2.00	100	0.0041	47
63.0	100	1.18	100	0.0027	42
50.0	100	0.600	100	0.0014	37
37.5	100	0.425	100		
28.0	100	0.300	100		
20.0	100	0.212	100		
		0.150	99		
		0.063	72		

Approved by:
Sushil Sharda

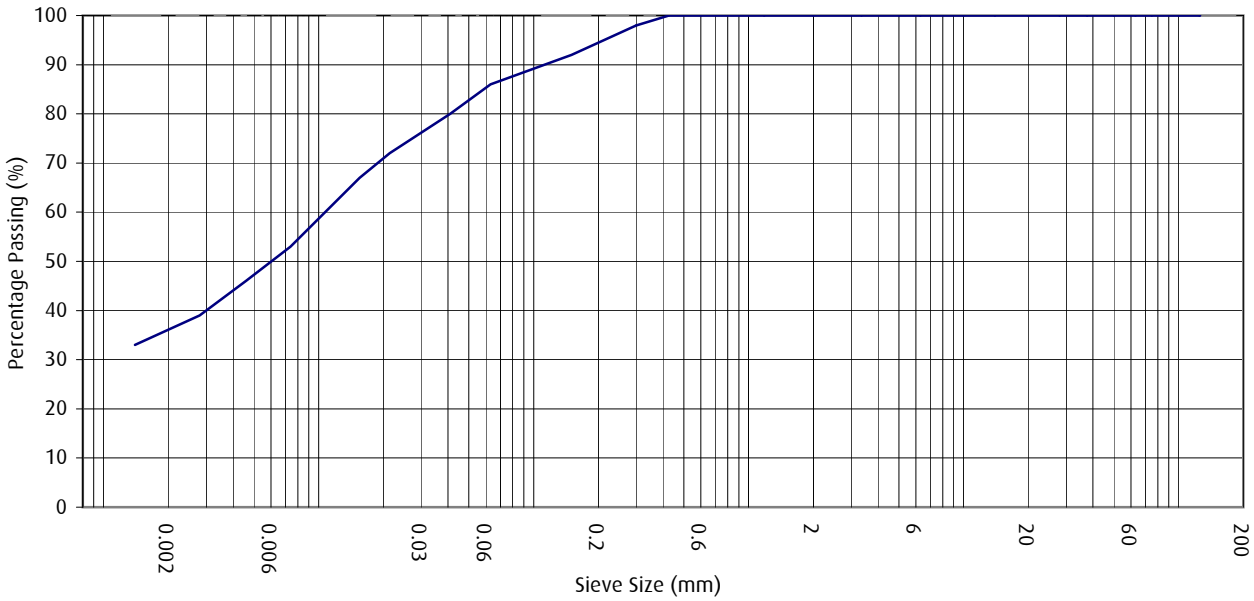
Leeds Laboratory

Print date 03/10/2007

Revision No. 3.01 Issue Date 28/04/2006

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Particle Size Distribution**	Hole ID BH01
Project No.	F15001		Sample Depth 52.30m
Engineer	Arup Geotechnics		Sample Number 070
Client	Stanhope plc	BS 1377: Part 2: 1990: 9.2, 9.5	Sample type D
Description	Brown mottled slightly sandy CLAY.		Specimen Depth 52.30m
			Specimen No. 1



PARTICLE SIZE	%
Clay:	36
Silt:	50
Sand:	15
Gravel:	0
Cobbles:	0

General remarks

Particle density: 2.65Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	100		
		10.0	100	0.0409	80
		6.3	100	0.0214	72
125.0	100	5.0	100	0.0155	67
100.0	100	3.35	100	0.0074	53
75.0	100	2.00	100	0.0046	46
63.0	100	1.18	100	0.0028	39
50.0	100	0.600	100	0.0014	33
37.5	100	0.425	100		
28.0	100	0.300	98		
20.0	100	0.212	95		
		0.150	92		
		0.063	86		

Approved by:
Sushil Sharda

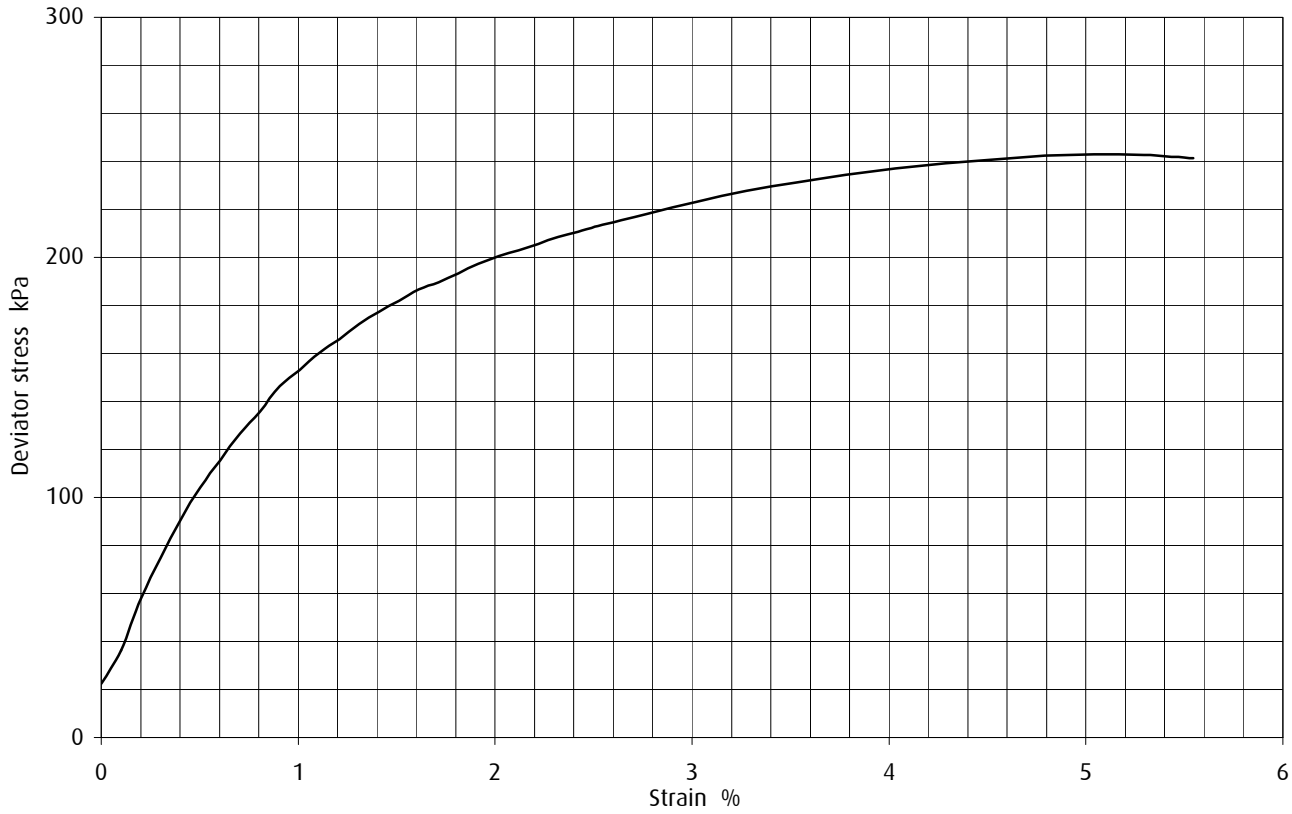
Leeds Laboratory

Print date 03/10/2007

Revision No. 3.01 Issue Date 28/04/2006

NORWEST HOLST
SOIL ENGINEERING

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 9.60m
Engineer	Arup Geotechnics		Sample Number 006
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Brown slightly gravelly CLAY.		Specimen Depth 9.70m
			Specimen Number 1



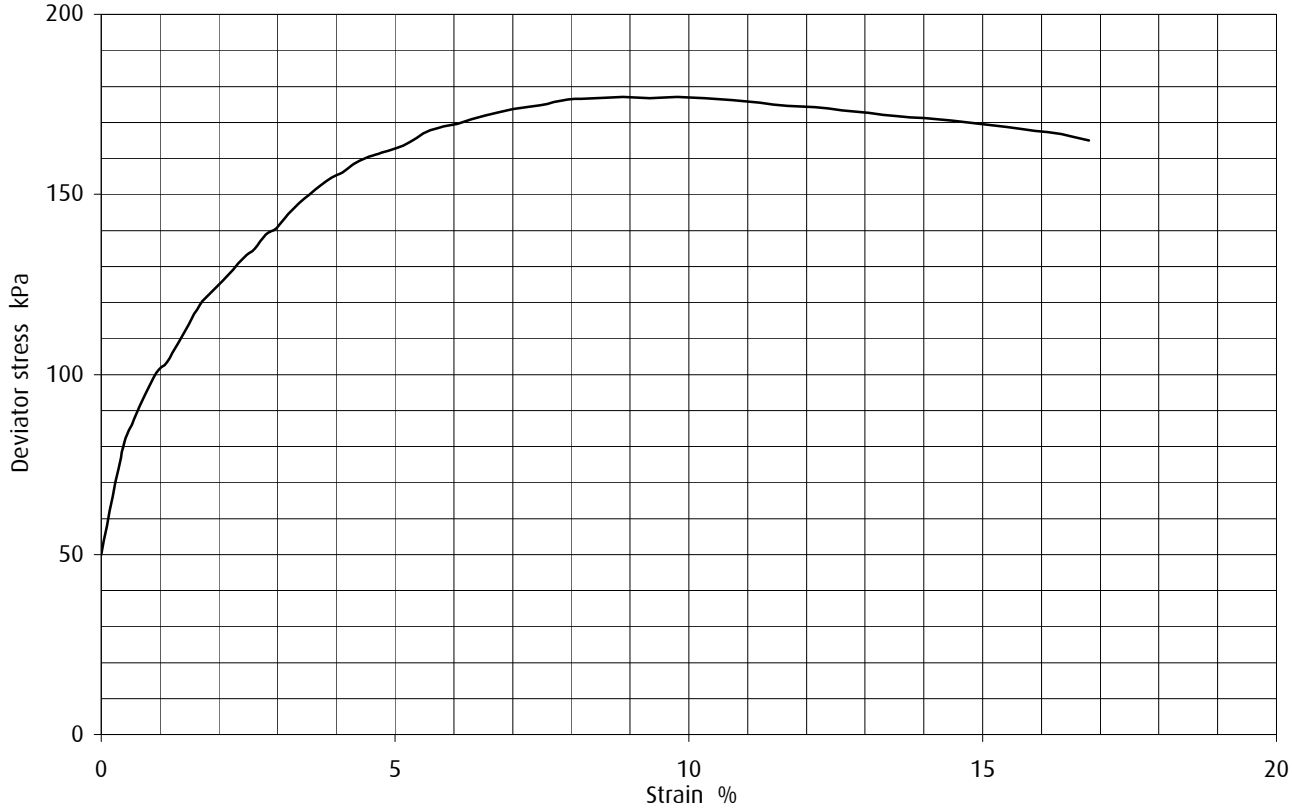
Shear strength parameters c 121 kPa ϕ 0.0 ° Apparent c 121 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	120		
Deviator stress	kPa	242.84		
Corrected deviator stress	kPa	242		
Membrane correction	kPa	0.56		
Membrane thickness	mm	0.449		
Moisture content	%	29		
Bulk density	Mg/m^3	1.98		
Dry density	Mg/m^3	1.53		
Diameter	mm	104.65		
Length	mm	198.33		
Failure strain	%	5.0		
Cu	kPa	121		
Rate of strain	%/min	1.51		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 11.50m
Engineer	Arup Geotechnics		Sample Number 009
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured brown CLAY.		Specimen Depth 11.50m
			Specimen Number 1



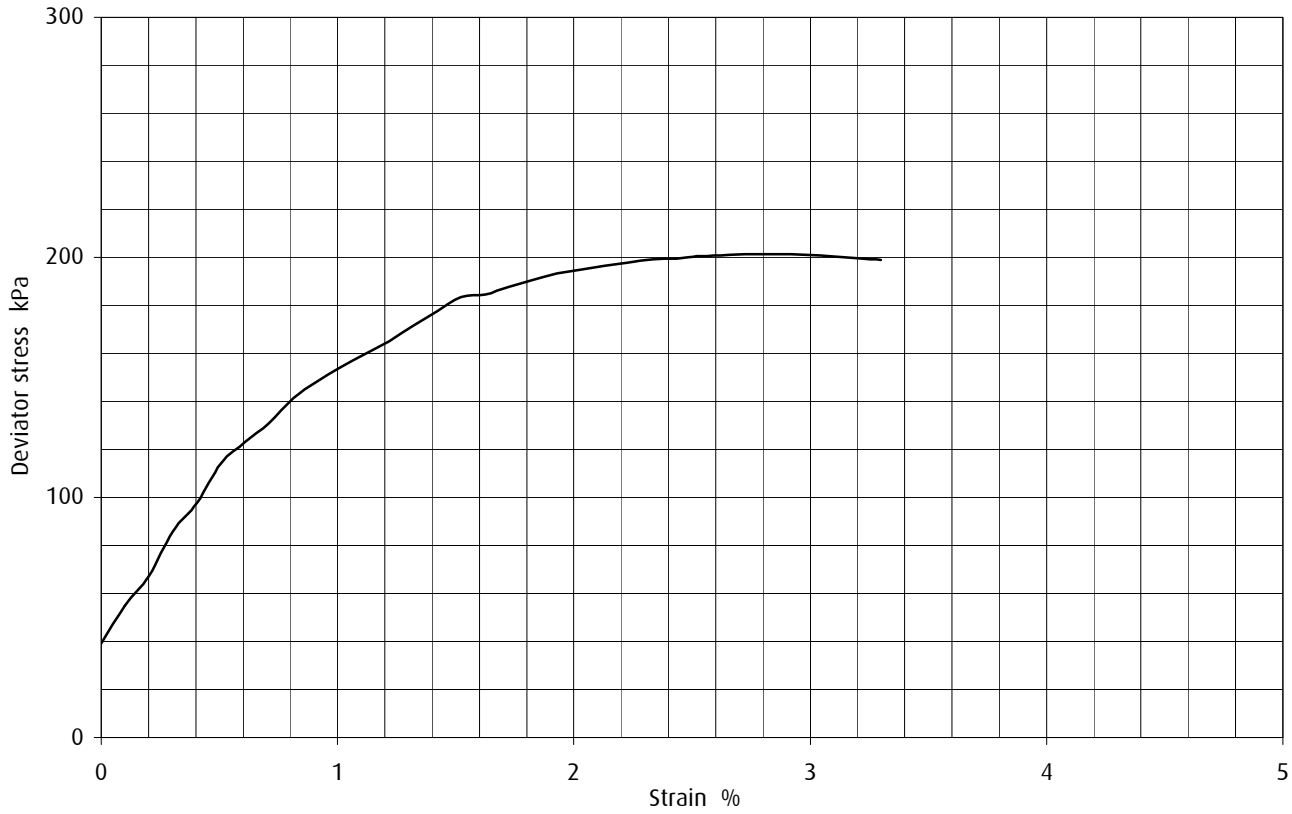
Shear strength parameters c 88 kPa ϕ 0.0 ° Apparent c 88 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	200		
Deviator stress	kPa	177.05		
Corrected deviator stress	kPa	176		
Membrane correction	kPa	0.96		
Membrane thickness	mm	0.449		
Moisture content	%	29		
Bulk density	Mg/m^3	3.65		
Dry density	Mg/m^3	2.84		
Diameter	mm	104.72		
Length	mm	107.07		
Failure strain	%	9.8		
Cu	kPa	88		
Rate of strain	%/min	2.80		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID: BH01
Project No.	F15001		Sample Depth: 13.50m
Engineer	Arup Geotechnics		Sample Number: 012
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type: U
Description	Fissured brownish grey CLAY.		Specimen Depth: 13.52m
			Specimen Number: 1



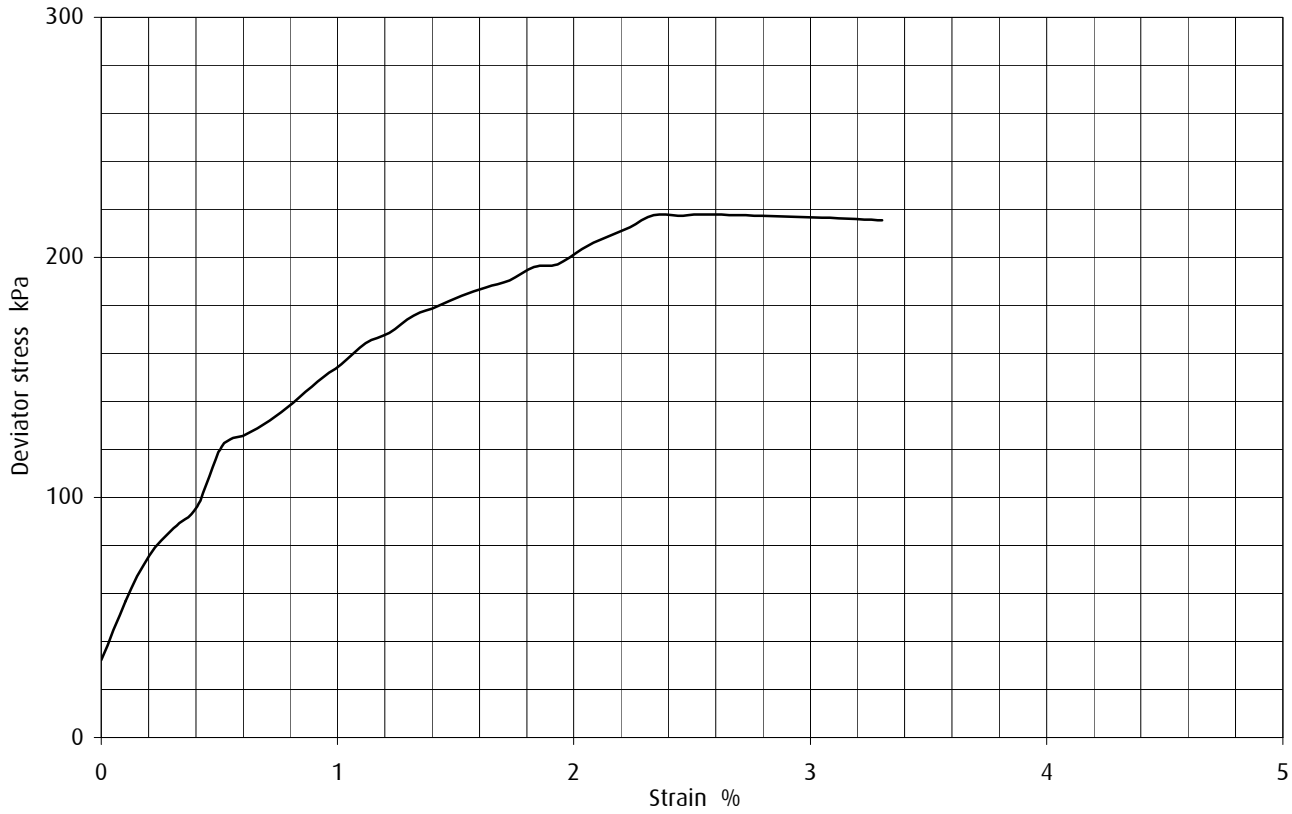
Shear strength parameters c 101 kPa ϕ 0.0 ° Apparent c 101 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	280		
Deviator stress	kPa	201.42		
Corrected deviator stress	kPa	201		
Membrane correction	kPa	0.33		
Membrane thickness	mm	0.449		
Moisture content	%	27		
Bulk density	Mg/m^3	2.00		
Dry density	Mg/m^3	1.57		
Diameter	mm	104.83		
Length	mm	197.03		
Failure strain	%	2.8		
Cu	kPa	101		
Rate of strain	%/min	1.52		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 15.50m
Engineer	Arup Geotechnics		Sample Number 015
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured grey CLAY with silt lenses.		Specimen Depth 15.55m
			Specimen Number 1



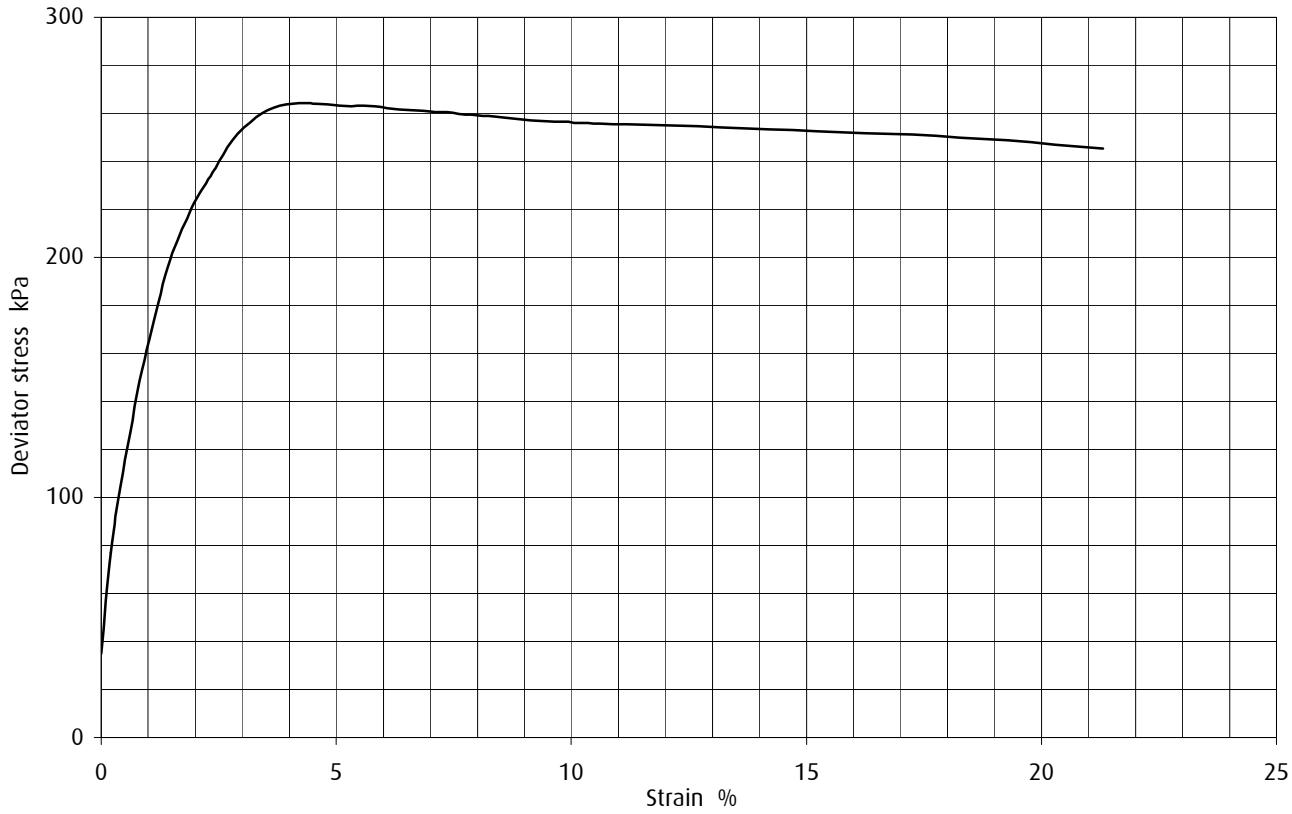
Shear strength parameters c 109 kPa ϕ 0.0 ° Apparent c 109 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	350		
Deviator stress	kPa	217.79		
Corrected deviator stress	kPa	218		
Membrane correction	kPa	0.20		
Membrane thickness	mm	0.302		
Moisture content	%	27		
Bulk density	Mg/m^3	2.04		
Dry density	Mg/m^3	1.61		
Diameter	mm	104.47		
Length	mm	196.70		
Failure strain	%	2.5		
Cu	kPa	109		
Rate of strain	%/min	2.03		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 17.50m
Engineer	Arup Geotechnics		Sample Number 018
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured brownish grey CLAY.		Specimen Depth 17.51m
			Specimen Number 1



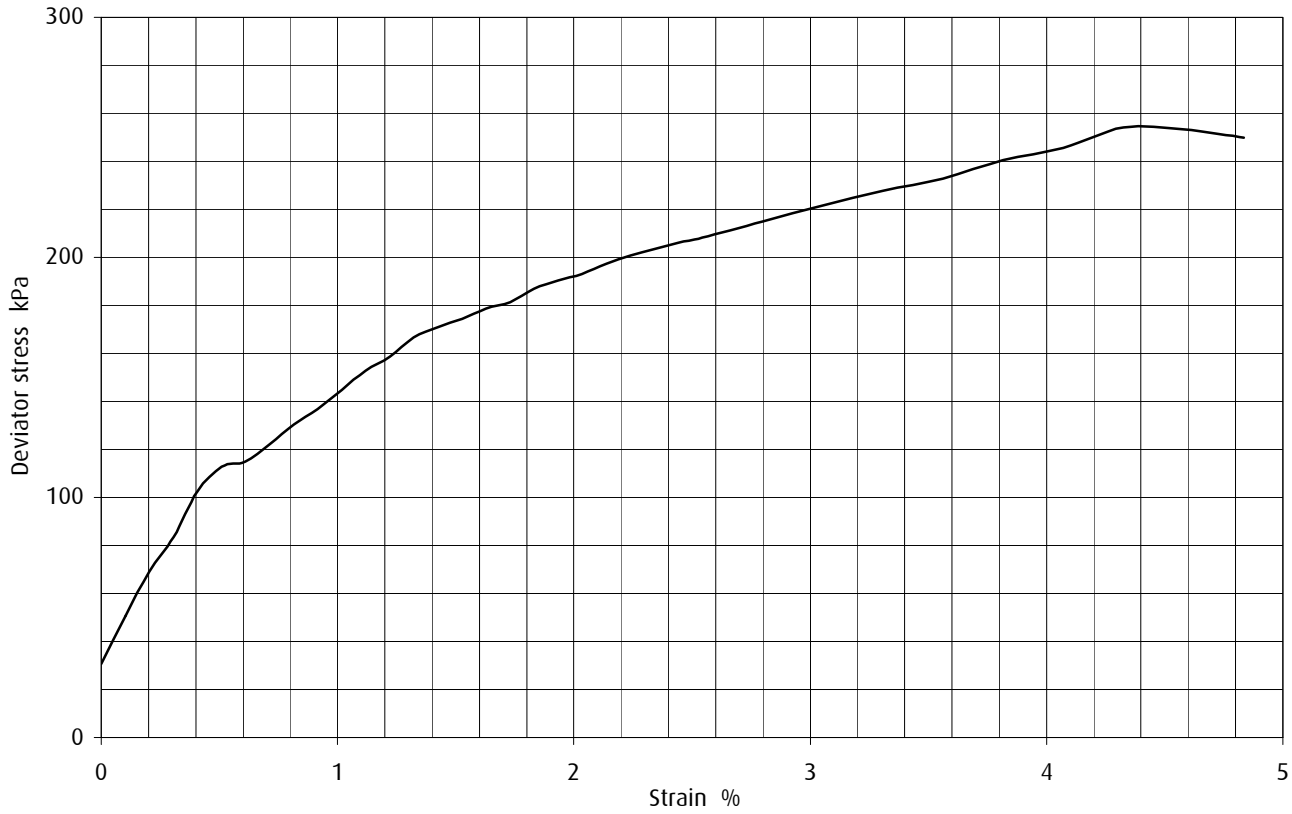
Shear strength parameters c 132 kPa ϕ 0.0 ° Apparent c 132 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	400		
Deviator stress	kPa	264.38		
Corrected deviator stress	kPa	264		
Membrane correction	kPa	0.49		
Membrane thickness	mm	0.449		
Moisture content	%	28		
Bulk density	Mg/m^3	2.01		
Dry density	Mg/m^3	1.57		
Diameter	mm	104.68		
Length	mm	197.10		
Failure strain	%	4.3		
Cu	kPa	132		
Rate of strain	%/min	1.52		
Mode of failure		Compound		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 19.50m
Engineer	Arup Geotechnics		Sample Number 021
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured brown CLAY with silt lenses.		Specimen Depth 19.55m
			Specimen Number 1



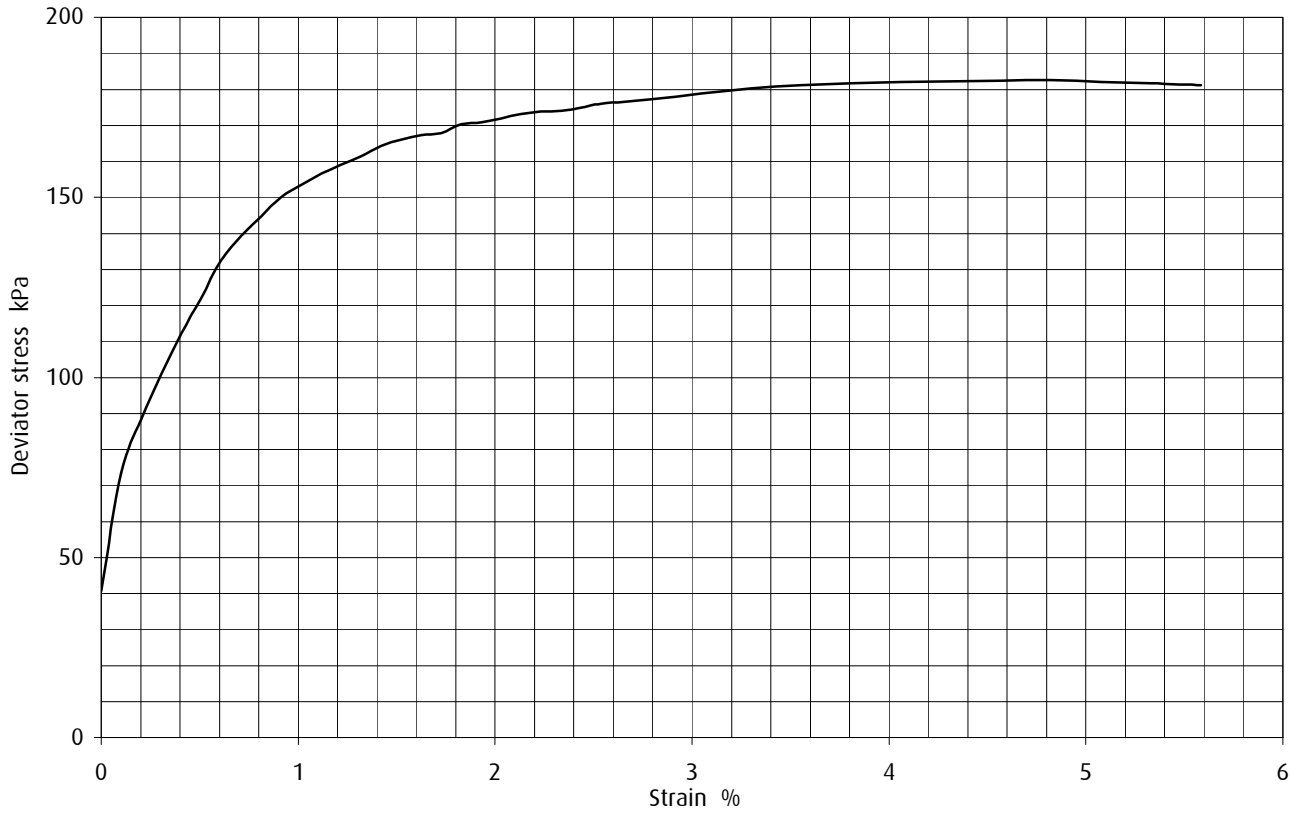
Shear strength parameters c 127 kPa ϕ 0.0 ° Apparent c 127 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	460		
Deviator stress	kPa	254.03		
Corrected deviator stress	kPa	254		
Membrane correction	kPa	0.49		
Membrane thickness	mm	0.449		
Moisture content	%	28		
Bulk density	Mg/m^3	1.93		
Dry density	Mg/m^3	1.51		
Diameter	mm	104.47		
Length	mm	196.53		
Failure strain	%	4.3		
Cu	kPa	127		
Rate of strain	%/min	1.53		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 21.50m
Engineer	Arup Geotechnics		Sample Number 024
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured brownish grey CLAY.		Specimen Depth 21.61m
			Specimen Number 1



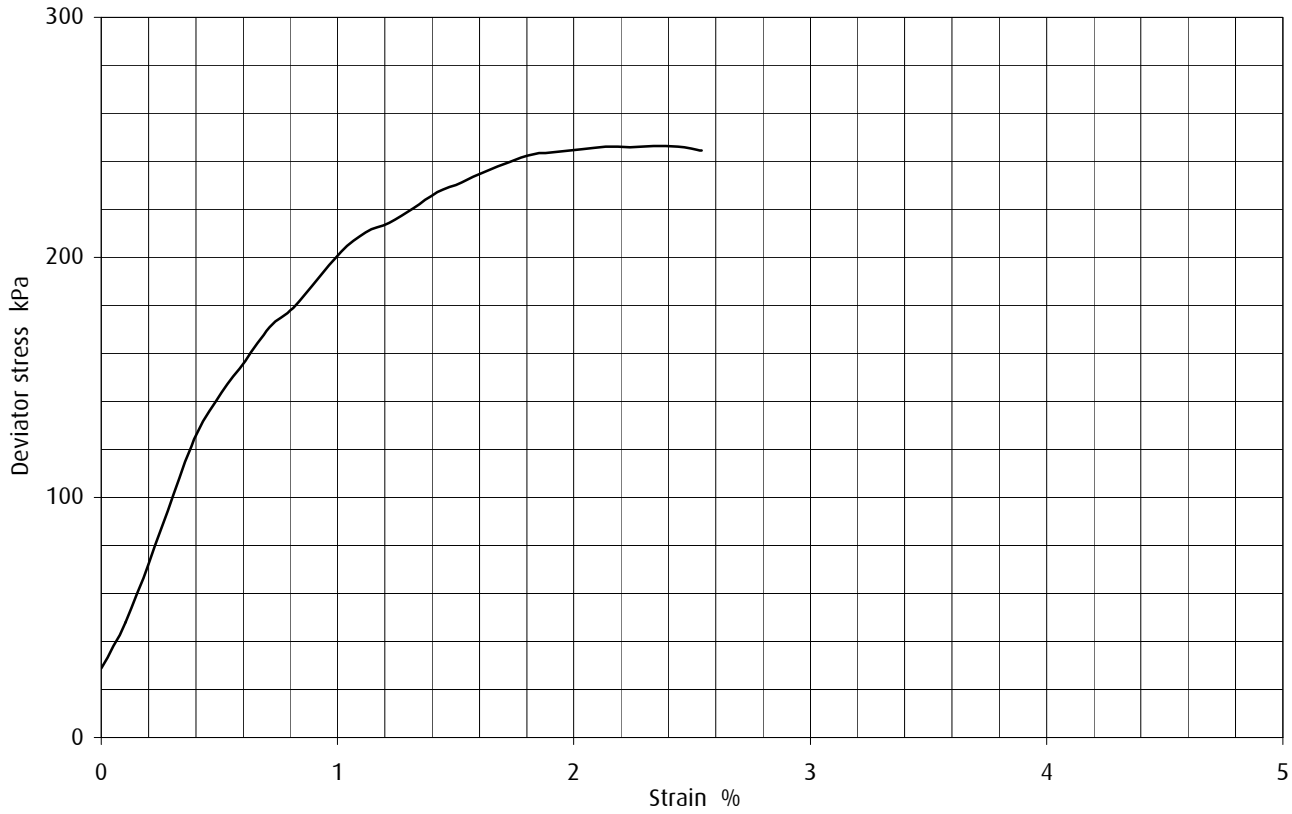
Shear strength parameters c 91 kPa ϕ 0.0 ° Apparent c 91 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	510		
Deviator stress	kPa	182.59		
Corrected deviator stress	kPa	182		
Membrane correction	kPa	0.54		
Membrane thickness	mm	0.449		
Moisture content	%	28		
Bulk density	Mg/m^3	2.00		
Dry density	Mg/m^3	1.57		
Diameter	mm	104.82		
Length	mm	196.97		
Failure strain	%	4.8		
Cu	kPa	91		
Rate of strain	%/min	1.52		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 23.50m
Engineer	Arup Geotechnics		Sample Number 027
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured greyish brown CLAY.		Specimen Depth 23.53m
			Specimen Number 1



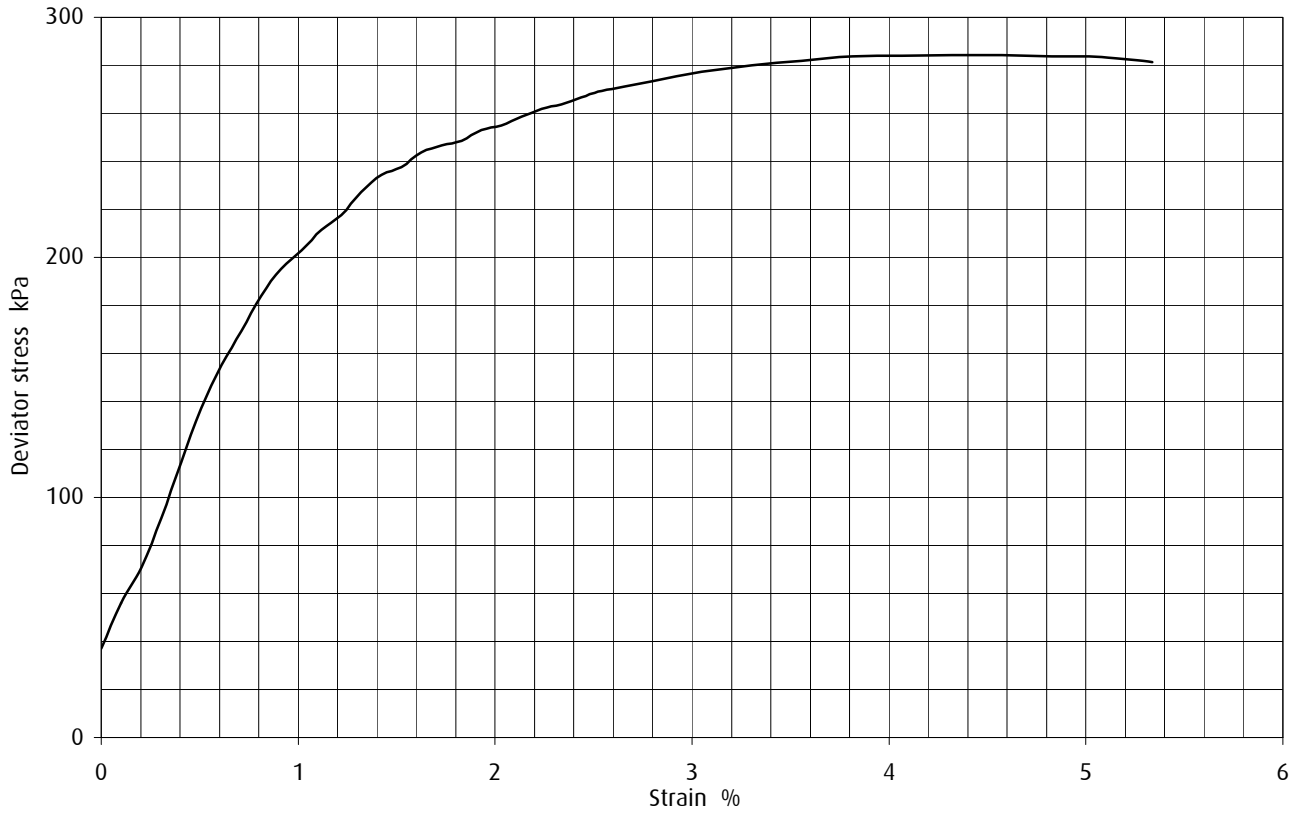
Shear strength parameters c 123 kPa ϕ 0.0 ° Apparent c 123 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	560		
Deviator stress	kPa	246.42		
Corrected deviator stress	kPa	246		
Membrane correction	kPa	0.28		
Membrane thickness	mm	0.449		
Moisture content	%	29		
Bulk density	Mg/m^3	1.98		
Dry density	Mg/m^3	1.53		
Diameter	mm	104.55		
Length	mm	196.77		
Failure strain	%	2.3		
Cu	kPa	123		
Rate of strain	%/min	1.52		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 25.50m
Engineer	Arup Geotechnics		Sample Number 030
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured brown CLAY.		Specimen Depth 25.55m
			Specimen Number 1



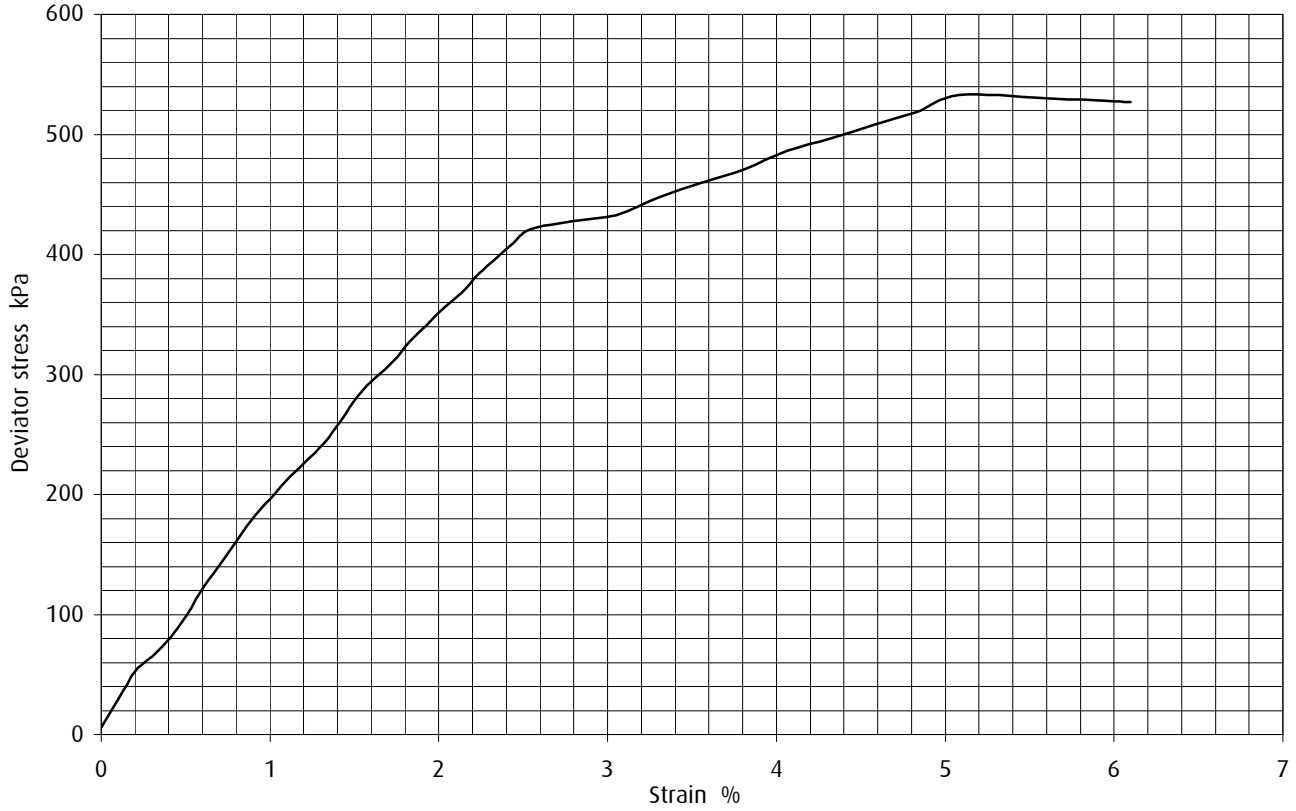
Shear strength parameters c 142 kPa ϕ 0.0 ° Apparent c 142 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	610		
Deviator stress	kPa	284.33		
Corrected deviator stress	kPa	284		
Membrane correction	kPa	0.49		
Membrane thickness	mm	0.449		
Moisture content	%	28		
Bulk density	Mg/m^3	1.99		
Dry density	Mg/m^3	1.55		
Diameter	mm	104.95		
Length	mm	196.80		
Failure strain	%	4.3		
Cu	kPa	142		
Rate of strain	%/min	2.03		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 27.50m
Engineer	Arup Geotechnics		Sample Number 033
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured grey CLAY with silt lenses.		Specimen Depth 27.52m
			Specimen Number 1



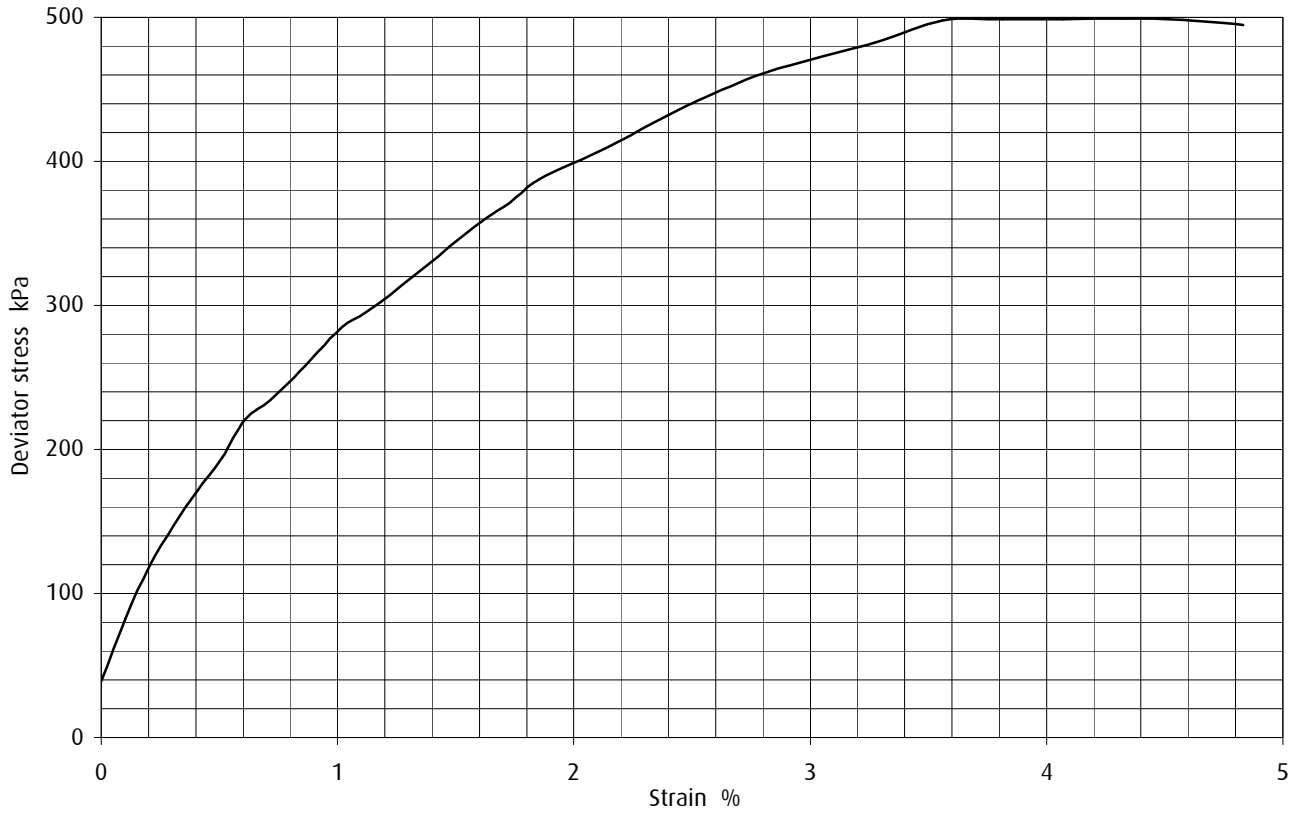
Shear strength parameters c 266 kPa ϕ 0.0 ° Apparent c 266 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	670		
Deviator stress	kPa	532.76		
Corrected deviator stress	kPa	532		
Membrane correction	kPa	0.57		
Membrane thickness	mm	0.449		
Moisture content	%	23		
Bulk density	Mg/m^3	2.11		
Dry density	Mg/m^3	1.71		
Diameter	mm	102.85		
Length	mm	196.77		
Failure strain	%	5.1		
Cu	kPa	266		
Rate of strain	%/min	1.52		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Stuart Kirk		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 29.50m
Engineer	Arup Geotechnics		Sample Number 037
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured grey CLAY with silt lenses.		Specimen Depth 29.65m
			Specimen Number 1



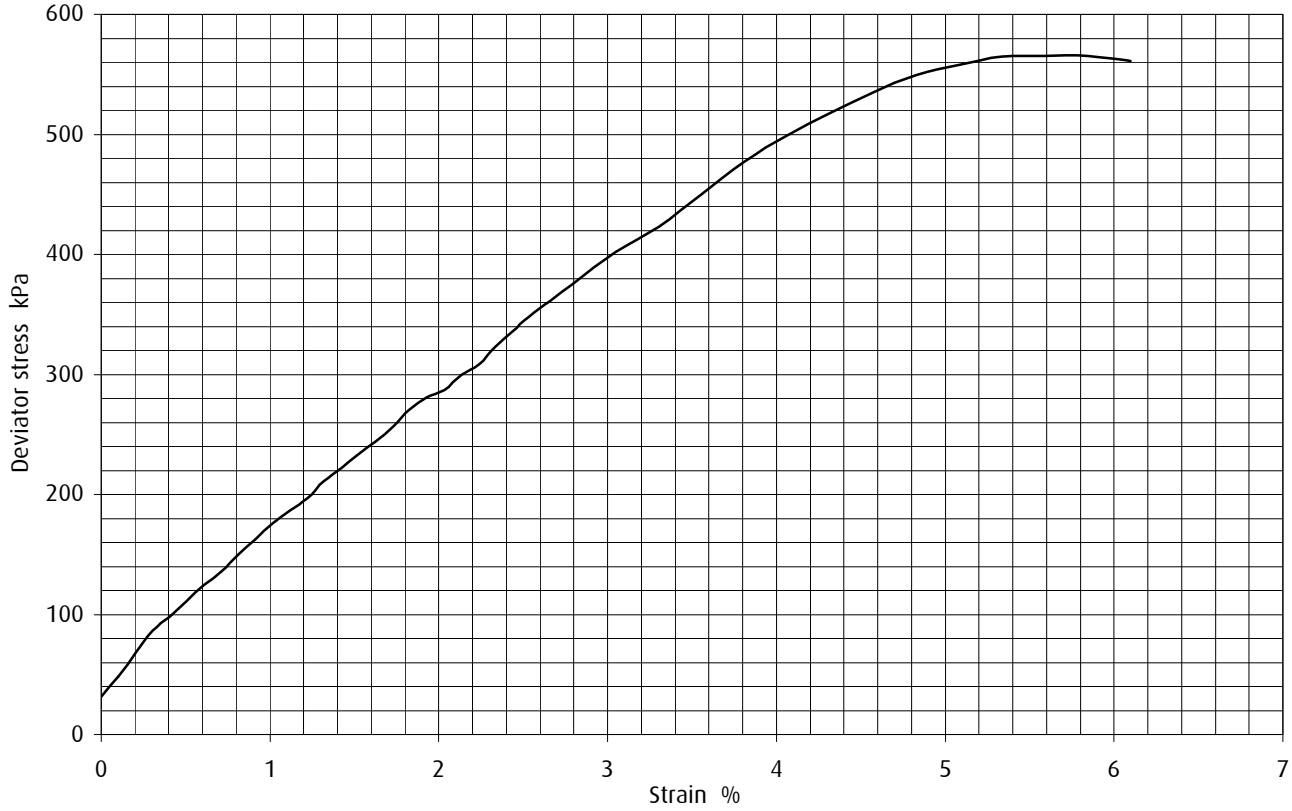
Shear strength parameters c 249 kPa ϕ 0.0 ° Apparent c 249 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	720		
Deviator stress	kPa	499.10		
Corrected deviator stress	kPa	499		
Membrane correction	kPa	0.49		
Membrane thickness	mm	0.449		
Moisture content	%	23		
Bulk density	Mg/m^3	2.10		
Dry density	Mg/m^3	1.71		
Diameter	mm	103.87		
Length	mm	196.63		
Failure strain	%	4.3		
Cu	kPa	249		
Rate of strain	%/min	1.53		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 31.50m
Engineer	Arup Geotechnics		Sample Number 040
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured brown sandy CLAY.		Specimen Depth 31.58m
			Specimen Number 1



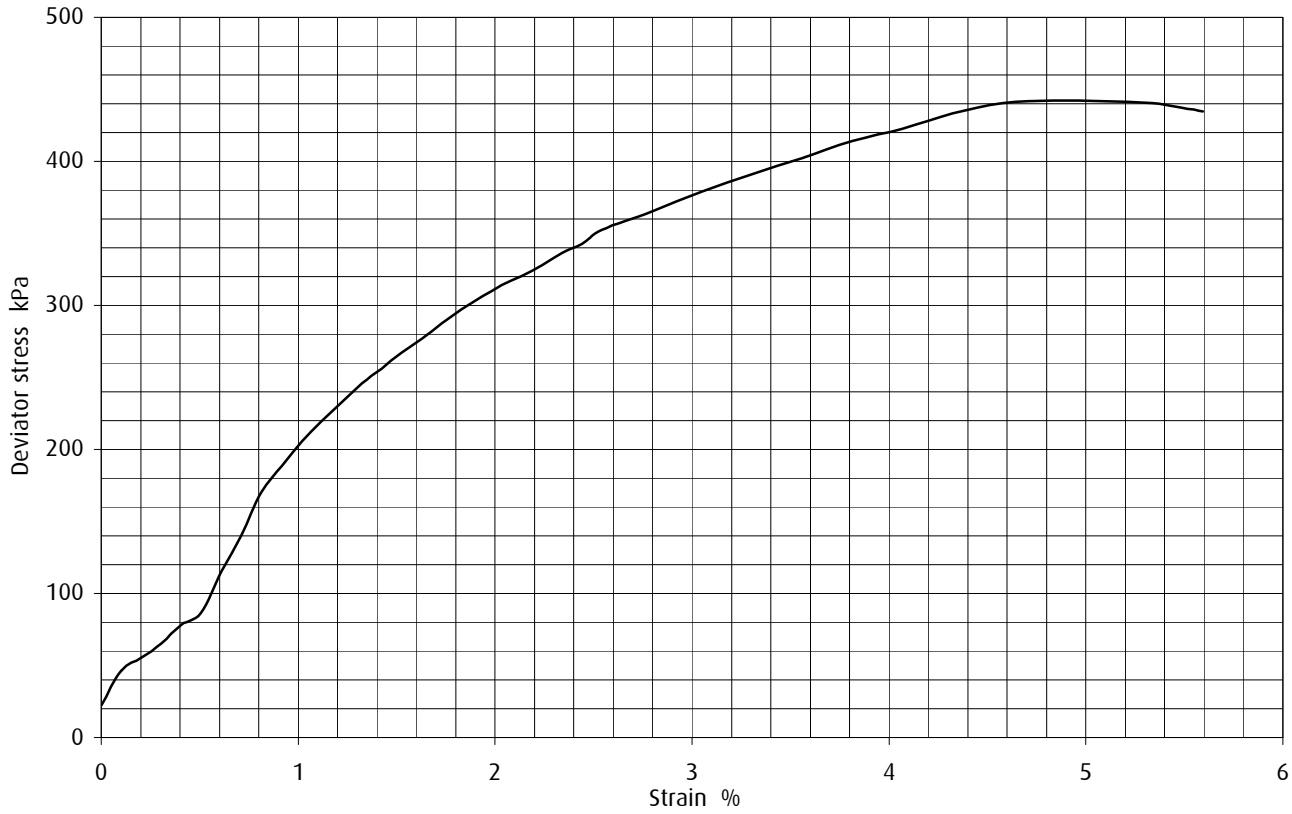
Shear strength parameters c 282 kPa ϕ 0.0 ° Apparent c 282 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	760		
Deviator stress	kPa	565.53		
Corrected deviator stress	kPa	565		
Membrane correction	kPa	0.61		
Membrane thickness	mm	0.449		
Moisture content	%	20		
Bulk density	Mg/m^3	2.03		
Dry density	Mg/m^3	1.69		
Diameter	mm	104.90		
Length	mm	196.80		
Failure strain	%	5.6		
Cu	kPa	282		
Rate of strain	%/min	1.52		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 33.50m
Engineer	Arup Geotechnics		Sample Number 043
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured grey CLAY with silt lenses.		Specimen Depth 33.55m
			Specimen Number 1



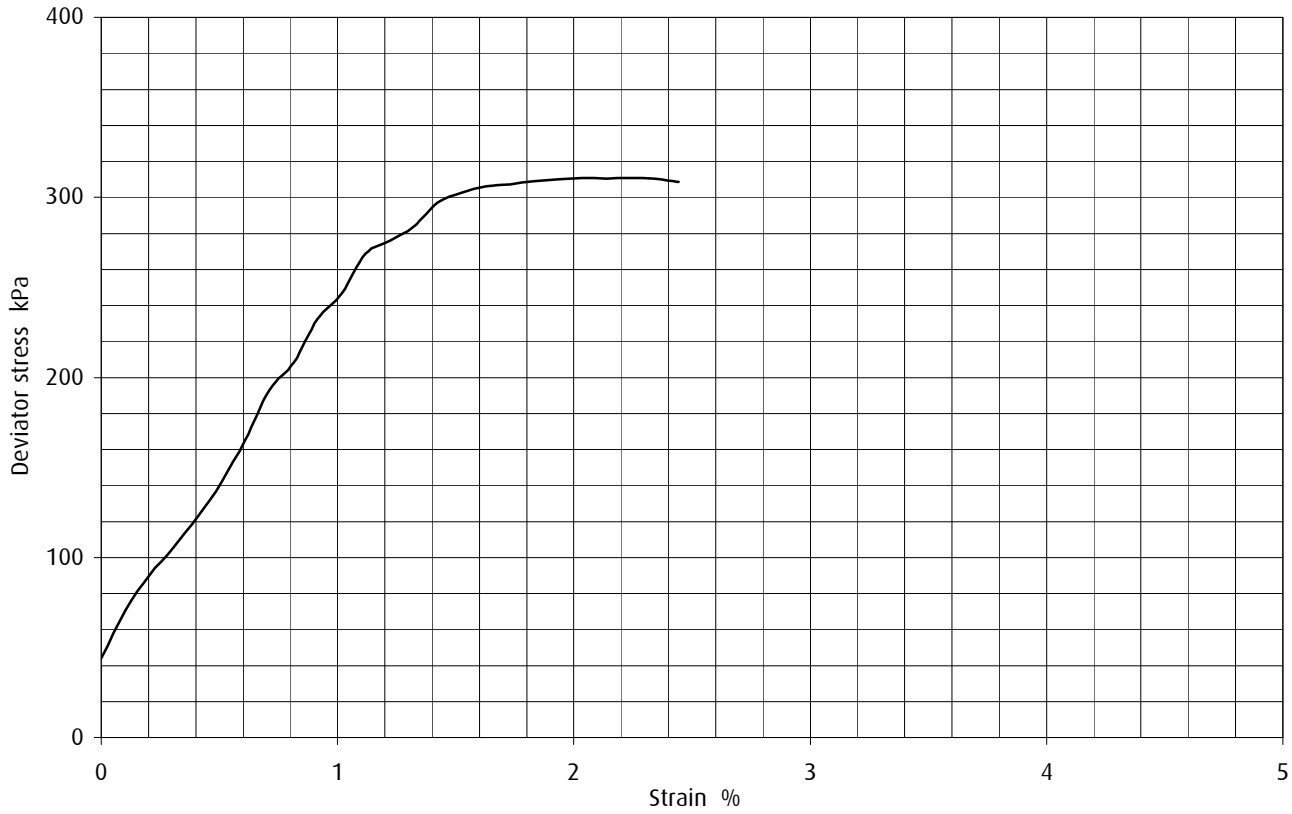
Shear strength parameters c 221 kPa ϕ 0.0 ° Apparent c 221 kPa

Test type		Undisturbed		
Test number		1		
Cell pressure	kPa	810		
Deviator stress	kPa	442.10		
Corrected deviator stress	kPa	442		
Membrane correction	kPa	0.54		
Membrane thickness	mm	0.449		
Moisture content	%	26		
Bulk density	Mg/m^3	2.03		
Dry density	Mg/m^3	1.61		
Diameter	mm	104.17		
Length	mm	196.60		
Failure strain	%	4.8		
Cu	kPa	221		
Rate of strain	%/min	1.53		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Stuart Kirk		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 35.50m
Engineer	Arup Geotechnics		Sample Number 046
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured brown CLAY.		Specimen Depth 35.57m
			Specimen Number 1



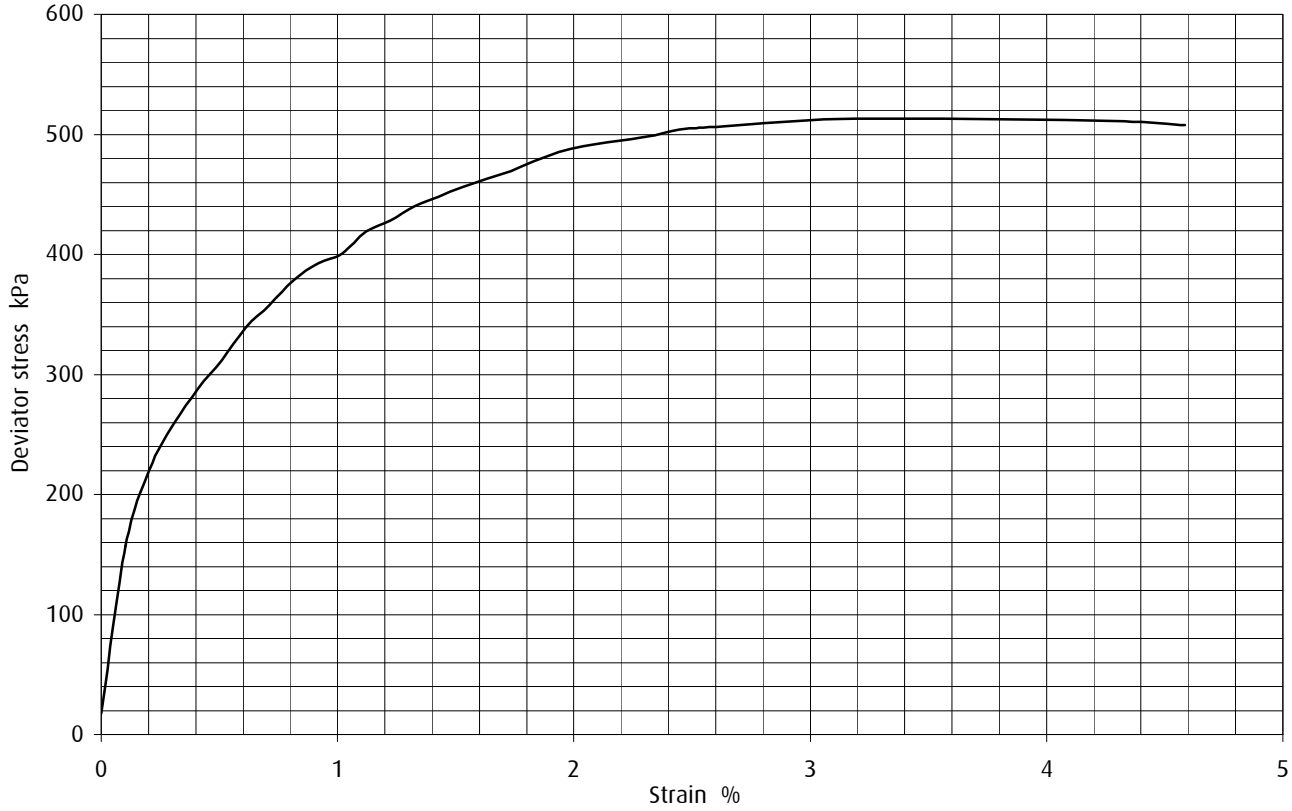
Shear strength parameters c 155 kPa ϕ 0.0 ° Apparent c 155 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	860		
Deviator stress	kPa	310.67		
Corrected deviator stress	kPa	310		
Membrane correction	kPa	0.27		
Membrane thickness	mm	0.449		
Moisture content	%	26		
Bulk density	Mg/m^3	2.00		
Dry density	Mg/m^3	1.59		
Diameter	mm	104.98		
Length	mm	196.57		
Failure strain	%	2.2		
Cu	kPa	155		
Rate of strain	%/min	1.02		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 37.50m
Engineer	Arup Geotechnics		Sample Number 049
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured brownish grey CLAY.		Specimen Depth 37.70m
			Specimen Number 1



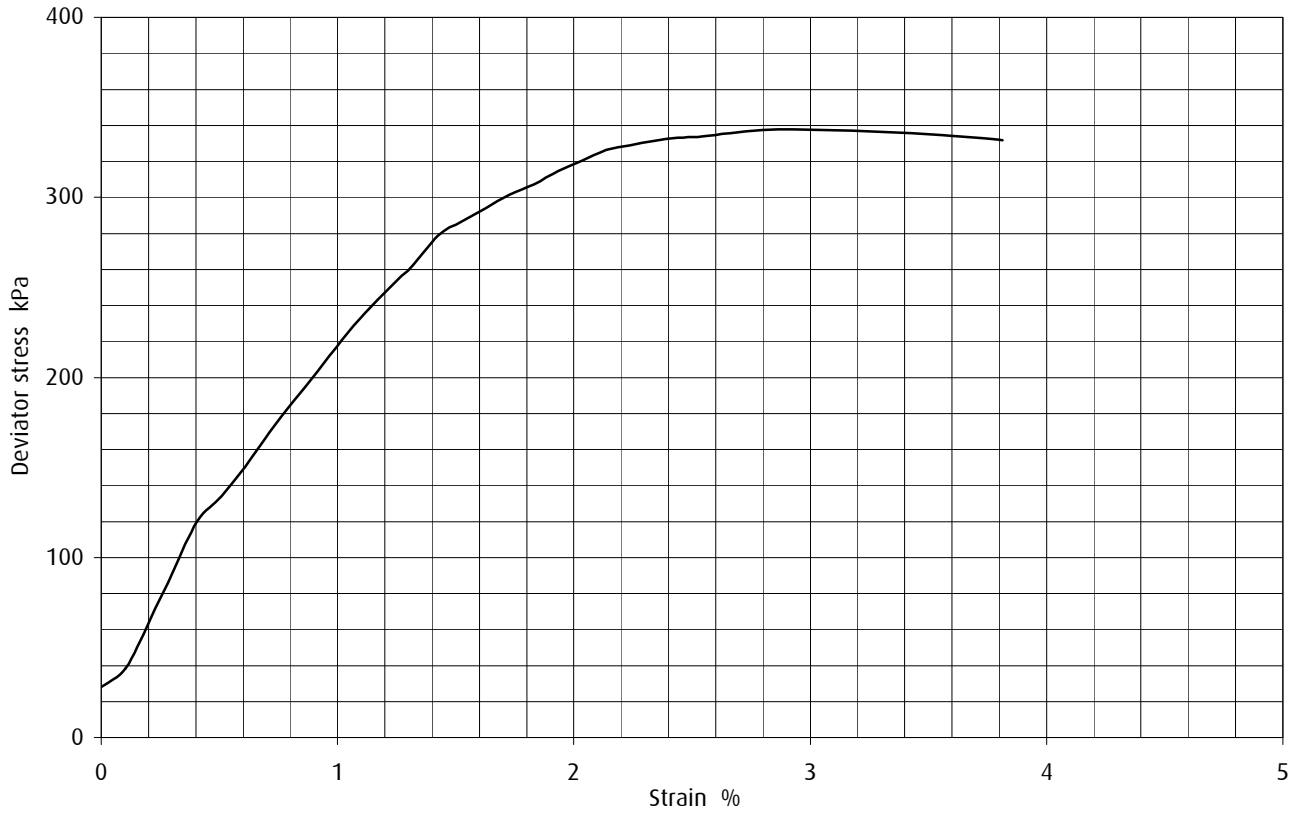
Shear strength parameters c 256 kPa ϕ 0.0 ° Apparent c 256 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	900		
Deviator stress	kPa	513.20		
Corrected deviator stress	kPa	513		
Membrane correction	kPa	0.39		
Membrane thickness	mm	0.449		
Moisture content	%	27		
Bulk density	Mg/m^3	1.95		
Dry density	Mg/m^3	1.54		
Diameter	mm	104.12		
Length	mm	196.23		
Failure strain	%	3.3		
Cu	kPa	256		
Rate of strain	%/min	1.53		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 39.50m
Engineer	Arup Geotechnics		Sample Number 052
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured grey CLAY with silt lenses.		Specimen Depth 39.63m
			Specimen Number 1



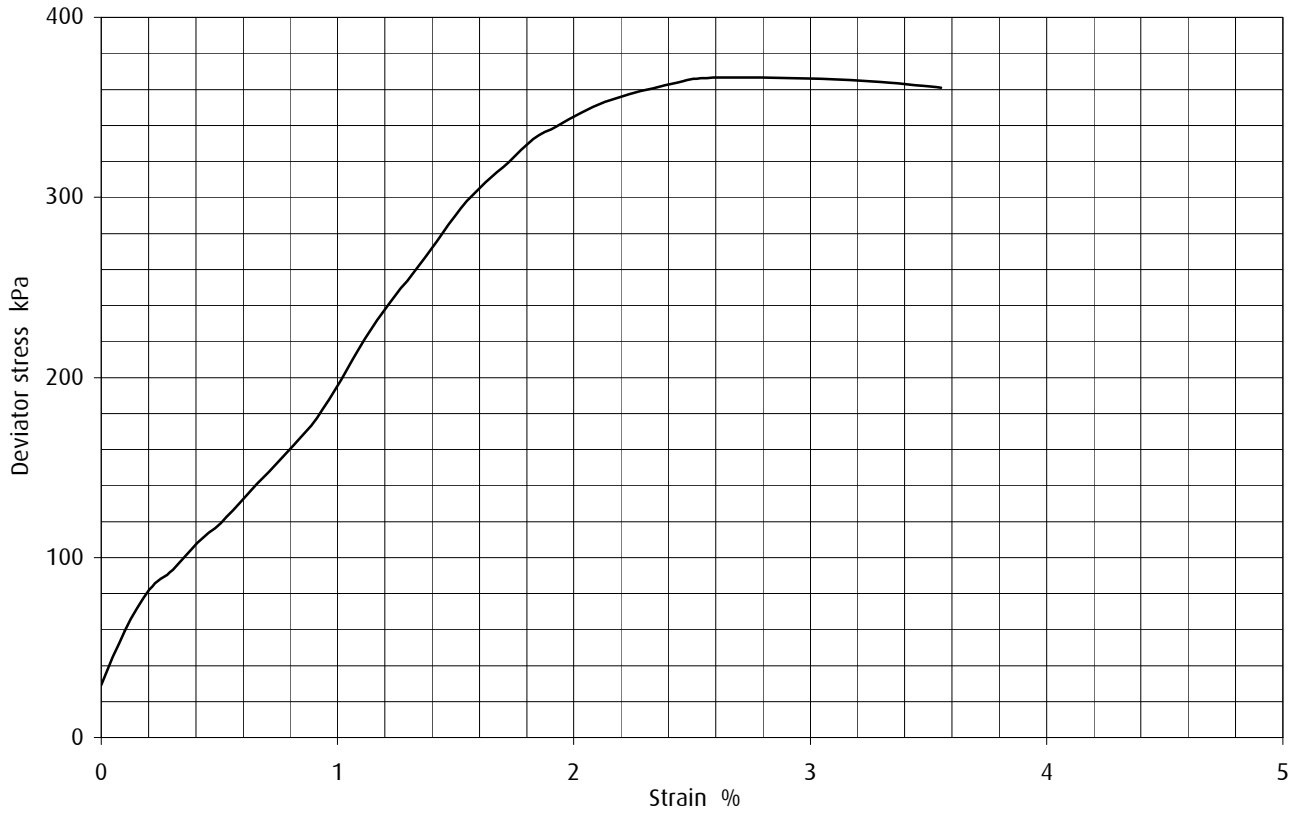
Shear strength parameters c 169 kPa ϕ 0.0 ° Apparent c 169 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	940		
Deviator stress	kPa	337.41		
Corrected deviator stress	kPa	337		
Membrane correction	kPa	0.24		
Membrane thickness	mm	0.302		
Moisture content	%	25		
Bulk density	Mg/m^3	2.00		
Dry density	Mg/m^3	1.60		
Diameter	mm	104.12		
Length	mm	196.63		
Failure strain	%	3.1		
Cu	kPa	169		
Rate of strain	%/min	1.02		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 41.50m
Engineer	Arup Geotechnics		Sample Number 055
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured grey CLAY with silt lenses.		Specimen Depth 41.62m
			Specimen Number 1



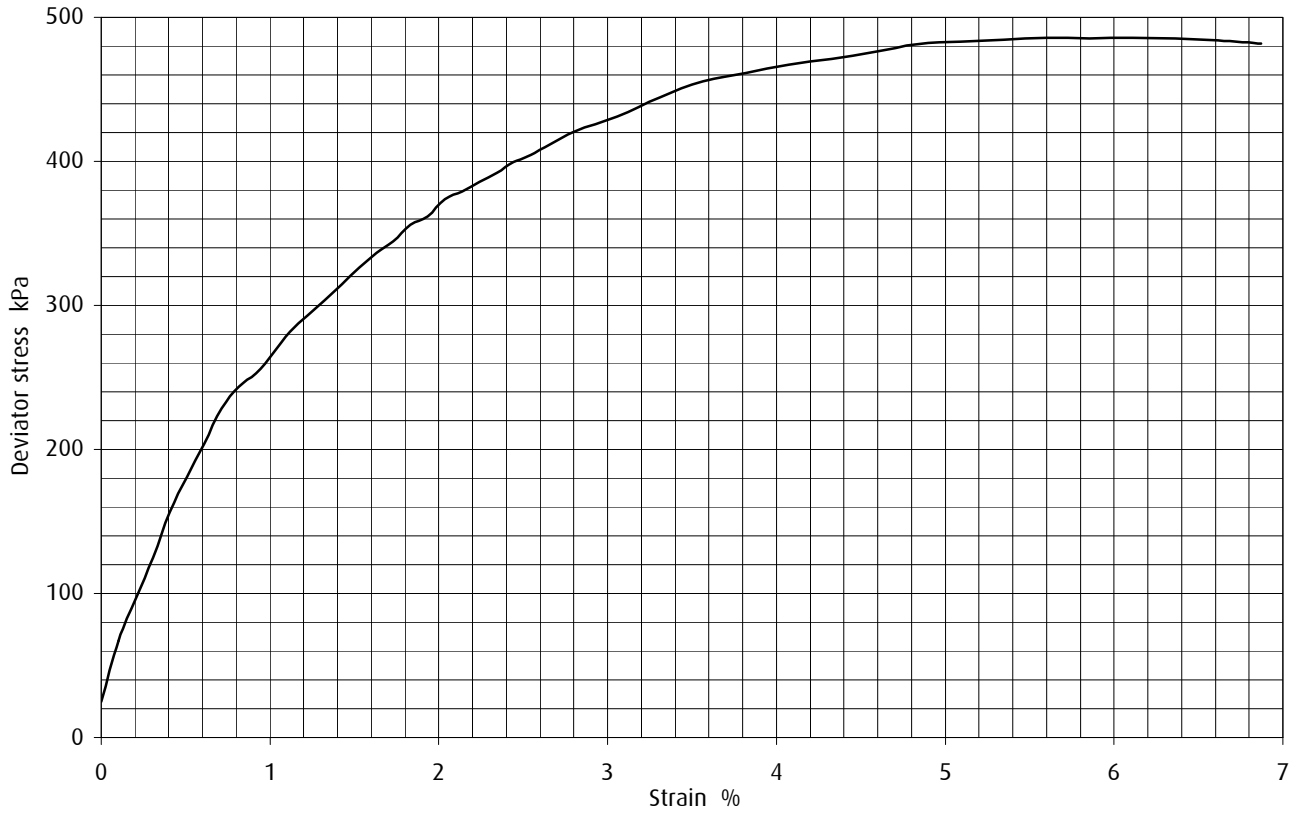
Shear strength parameters c 183 kPa ϕ 0.0 ° Apparent c 183 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	990		
Deviator stress	kPa	366.68		
Corrected deviator stress	kPa	366		
Membrane correction	kPa	0.33		
Membrane thickness	mm	0.449		
Moisture content	%	25		
Bulk density	Mg/m^3	1.97		
Dry density	Mg/m^3	1.58		
Diameter	mm	104.83		
Length	mm	196.97		
Failure strain	%	2.8		
Cu	kPa	183		
Rate of strain	%/min	2.03		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 43.50m
Engineer	Arup Geotechnics		Sample Number 058
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured brown sandy CLAY.		Specimen Depth 43.55m
			Specimen Number 1



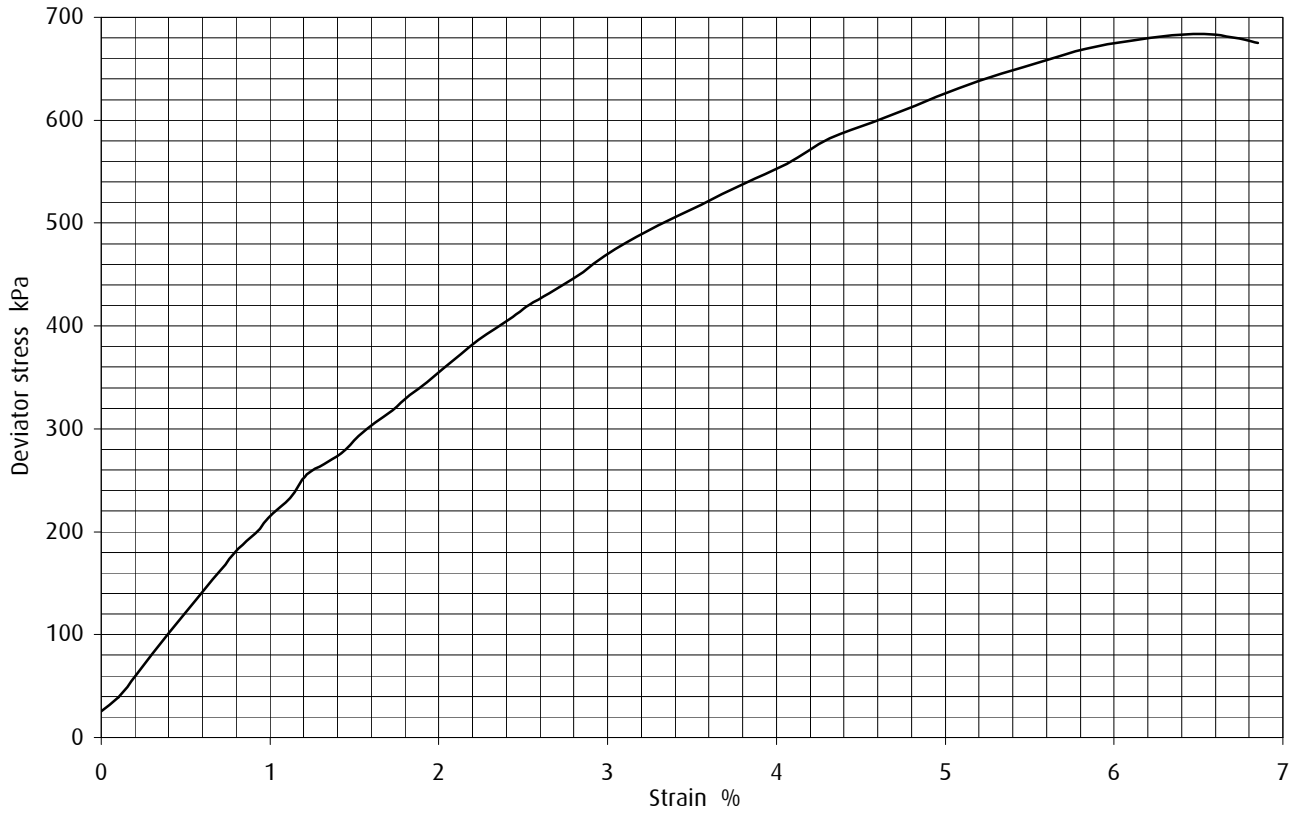
Shear strength parameters c 243 kPa ϕ 0.0 ° Apparent c 243 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	1030		
Deviator stress	kPa	485.80		
Corrected deviator stress	kPa	485		
Membrane correction	kPa	0.65		
Membrane thickness	mm	0.449		
Moisture content	%	25		
Bulk density	Mg/m^3	1.96		
Dry density	Mg/m^3	1.57		
Diameter	mm	105.38		
Length	mm	196.43		
Failure strain	%	6.1		
Cu	kPa	243		
Rate of strain	%/min	1.02		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Project Name	NM Rothschild Bank	**Undrained Triaxial Compression Without Measurement Of Pore Pressure (Definitive Method)**	Hole ID BH01
Project No.	F15001		Sample Depth 45.50m
Engineer	Arup Geotechnics		Sample Number 061
Client	Stanhope plc	BS1377: Part 7: 1990: 8	Sample Type U
Description	Fissured greyish brown CLAY.		Specimen Depth 45.61m
			Specimen Number 1



Shear strength parameters c 341 kPa ϕ 0.0 ° Apparent c 341 kPa

Test type		Undisturbed	Single stage	
Test number		1		
Cell pressure	kPa	1080		
Deviator stress	kPa	683.05		
Corrected deviator stress	kPa	682		
Membrane correction	kPa	0.70		
Membrane thickness	mm	0.449		
Moisture content	%	24		
Bulk density	Mg/m^3	1.97		
Dry density	Mg/m^3	1.59		
Diameter	mm	104.97		
Length	mm	197.00		
Failure strain	%	6.6		
Cu	kPa	341		
Rate of strain	%/min	1.02		
Mode of failure		Brittle		

High density rubber latex membrane used
Remarks

Approved by:	Leeds Laboratory		NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Print date 03/10/2007	
	Revision No. 2.02	Issue Date 18/05/2006	

Client: **Norwest Holst Ltd - Soil Engineering Div**
Parkside Lane
Dewsbury Road
LEEDS
West Yorkshire
LS11 5SX

FAO: Mr S Kirk

Test Report Number: R07/8447

Client Project Name:	**NM Rothschild Bank**
Client Project Number:	**F15001**
Your Order Number:	**F15001**
Order Receipt Date:	**17/09/07**
Reporting Date:	**Friday 5 October 2007**

If you have any queries regarding this report please contact our Customer Services Section

ECõS Environmental Limited
Low Moor Business Park, Common Road, Bradford BD12 0NB
Tel: 01274 691122 Fax: 01274 608100

Client Project Name: NM Rothschild Bank

Project Number: F15001

Client: Norwest Holst Ltd - Soil Engineering Div

Reporting Date: Friday 5 October 2007

Comments

All analyses are carried out using the laboratory's standard methods unless otherwise agreed.

The test results in this report refer only to the actual samples on which testing has been performed.

Any opinions and/or interpretations expressed herein are outside the scope of the testing laboratory's UKAS accreditation.

The test report shall not be reproduced, except in full, without the testing laboratory's written approval.

This testing laboratory cannot be held responsible for the condition or suitability of samples submitted for testing by a third party or for the competency of personnel other than its own staff.

This testing laboratory cannot be held responsible for the accuracy of test sample locations or descriptions when supplied by a third party.

Soil Samples

Results are expressed on a dried mass basis. Assisted drying carried out @ 40°C.

See key in Notes section for explanation of numerical categories for asbestos results, if applicable.

Stones (for example inert flints and inorganic minerals) >10mm are removed prior to analysis. Results have not been corrected for this loss.

Samples submitted for leachate determination were prepared using agreed procedures and analysed using UKAS accredited methodology where appropriate.

Results are expressed without correction for recovery factors.

Sample Pretreatment (as listed in method statement)

AD = Assisted drying @ 40°C R = As Received

Sample Type

B = Bulk disturbed sample
C = Core Sample
D = Small disturbed sample
ES = Environmental Soil Sample
P = Piston sample
U = Undisturbed sample - open drive
W = Water Sample
EW = Environmental Water Sample

Sample Results

Analysis not requested
*** Test not completed. Please see notes on last page

Signed: _____

For and on behalf of ECõS Environmental Limited

Approved signatories:

Name	Position
J R Brown	Business Development Manager
L Dewell	Production Manager
P Richardson	Section Head
J Stoddart	Technical Manager

Client Project Name: NM Rothschild Bank

Project Number: F15001

Client: Norwest Holst Ltd - Soil Engineering Div

Reporting Date: Friday 5 October 2007

Soil Samples

Method Statement

Determinand	Method of Detection	Sample Pretreatment	Limit of Detection	UKAS Accreditation	Sub-Contracted	Result Date
Sulphate (water soluble)	HPLC-IC	AD	0.001 g/l SO4	Yes	No	28/09/07
pH	pH-meter	AD	N/A	Yes	No	28/09/07
Organic Matter	Titration	AD	0.1 %	No	No	26/09/07
Material >2mm	Gravimetry	AD	0.1 %	No	No	28/09/07

Client Project Name: NM Rothschild Bank

Project Number: F15001

Client: Norwest Holst Ltd - Soil Engineering Div

Reporting Date: Friday 5 October 2007

Sample Location / Identification		BH01	BH01	BH01	BH01	BH01
Top Depth / m		13.95	19.95	27.95	31.90	39.90
Bottom Depth / m						
Sample No.		013	022	034	041	053
Sample Type		D	D	D	D	D
Date Sampled						
Receipt Date		17/09/07	17/09/07	17/09/07	17/09/07	17/09/07
ECõS Sample ID		S0783353	S0783354	S0783355	S0783356	S0783357
Matrix Type		Soil	Soil	Soil	Soil	Soil
Determinand	**Units**					
pH	N/A	7.9	8.1	#	7.8	7.6
Sulphate (water soluble)	g/l SO4	0.461	0.336	#	0.485	1.075
Material >2mm	%	3.1	2.1	1.2	1.2	4.1
Organic Matter	%	#	#	1.7	#	#

Notes and Preservation Details

None.

End of Test Report

Client: **Norwest Holst Ltd - Soil Engineering Div**
Parkside Lane
Dewsbury Road
LEEDS
West Yorkshire
LS11 5SX

FAO: Mr S Kirk

Test Report Number: R07/8497

Client Project Name:	**NM Rothschild Bank**
Client Project Number:	**F15001**
Your Order Number:	**F15001**
Order Receipt Date:	**26/09/07**
Reporting Date:	**Wednesday 10 October 2007**

If you have any queries regarding this report please contact our Customer Services Section

ECõS Environmental Limited
Low Moor Business Park, Common Road, Bradford BD12 0NB
Tel: 01274 691122 Fax: 01274 608100

Client Project Name: NM Rothschild Bank

Project Number: F15001

Client: Norwest Holst Ltd - Soil Engineering Div

Reporting Date: Wednesday 10 October 2007

Comments

All analyses are carried out using the laboratory's standard methods unless otherwise agreed.

The test results in this report refer only to the actual samples on which testing has been performed.

Any opinions and/or interpretations expressed herein are outside the scope of the testing laboratory's UKAS accreditation.

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This testing laboratory cannot be held responsible for the accuracy of test sample locations or descriptions when supplied by a third party.

Soil Samples

Results are expressed on a dried mass basis. Assisted drying carried out @ 40°C.

See key in Notes section for explanation of numerical categories for asbestos results, if applicable.

Stones (for example inert flints and inorganic minerals) >10mm are removed prior to analysis. Results have not been corrected for this loss.

Samples submitted for leachate determination were prepared using agreed procedures and analysed using UKAS accredited methodology where appropriate.

Results are expressed without correction for recovery factors.

Sample Pretreatment (as listed in method statement)

AD = Assisted drying @ 40°C

R = As Received

Sample Type

B = Bulk disturbed sample
C = Core Sample
D = Small disturbed sample
ES = Environmental Soil Sample
P = Piston sample
U = Undisturbed sample - open drive
W = Water Sample
EW = Environmental Water Sample

Sample Results

Analysis not requested
*** Test not completed. Please see notes on last page

Signed:

For and on behalf of ECõS Environmental Limited

Approved signatories:

Name	Position
J R Brown	Business Development Manager
L Dewell	Production Manager
P Richardson	Section Head
J Stoddart	Technical Manager

Client Project Name: NM Rothschild Bank

Project Number: F15001

Client: Norwest Holst Ltd - Soil Engineering Div

Reporting Date: Wednesday 10 October 2007

Soil Samples

Method Statement

Determinand	Method of Detection	Sample Pretreatment	Limit of Detection	UKAS Accreditation	Sub-Contracted	Result Date
Sulphate (water soluble)	HPLC-IC	AD	0.001 g/l SO4	Yes	No	08/10/07
pH	pH-meter	AD	N/A	Yes	No	08/10/07
Material >2mm	Gravimetry	AD	0.1 %	No	No	09/10/07
Organic Matter	Titration	AD	0.1 %	No	No	03/10/07

Client Project Name: NM Rothschild Bank

Project Number: F15001

Client: Norwest Holst Ltd - Soil Engineering Div

Reporting Date: Wednesday 10 October 2007

Sample Location / Identification		BH01	BH01
Top Depth / m		5.50	7.50
Bottom Depth / m		5.90	7.95
Sample No.		001	003
Sample Type		B	B
Date Sampled			
Receipt Date		26/09/07	26/09/07
ECõS Sample ID		S0783696	S0783697
Matrix Type		Soil	Soil
Determinand	**Units**		
Organic Matter	%	<0.1	#
Material >2mm	%	48.2	89.7
pH	N/A	#	8.1
Sulphate (water soluble)	g/l SO4	#	0.004

Client Project Name: NM Rothschild Bank

Project Number: F15001

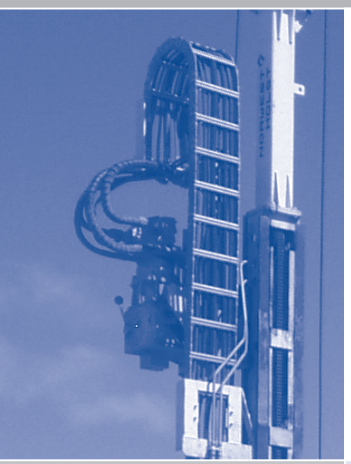
Client: Norwest Holst Ltd - Soil Engineering Div

Reporting Date: Wednesday 10 October 2007

Notes and Preservation Details

None.

End of Test Report



SUPPORTING FACTUAL DATA

SECTION C
Laboratory Testing

CONTAMINATION TEST RESULTS

NORWEST HOLST
SOIL ENGINEERING

ALcontrol Technichem

Heron Drive,
Langley,
Slough SL3 8XP
tel: 01753 212500
fax: 01753 212501
email: langley@alcontrol.co.uk

Hannah Sydney
Norwest Holst Soil Engineering Ltd
Southern Regional Office
Astral House
Imperial Way
Watford
Hertfordshire
WD24 4WW

01 November 2007

TEST REPORT

Our Report Number: 07-40346

Your Order Reference: STC/4516

2 soil samples submitted for analysis on 18/10/2007

Project Name: NMR Bank

Project Code: F15001

Laboratory analysis started on 18/10/2007
All laboratory analysis completed by 01 November 2007

Rexona Rahman
Analytical Reporting Manager
ALCONTROL TECHNICHEM

Sharon Googh
Project Co-Ordinator
ALCONTROL TECHNICHEM

Test methods are documented in house procedures or where appropriate standard methods. Non accredited tests (if applicable) are identified on each page. Procedures for sampling are outside the scope of the laboratory UKAS accreditation. Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation. All samples connected with this report , including any 'on hold', will be stored and disposed of according to company policy. A copy of this policy is available on request.

ALcontrol Technichem
Sample Description

Job Number: 07-40346
Client: Norwest Holst Soil Engineering Ltd
Project Code: F15001

Matrix: Soil
Project Name: NMR Bank

Laboratory Reference No	Sample Reference	Sample Depth (m)	Date Sampled	Sample Description
269991	TP03A	2.00m	15/10/07	Orange sand with gravel
269992	TP03B	2.00m	15/10/07	Orange sand with gravel

ALcontrol Technichem
Table Of Results

Job Number : 07-40346
Matrix : Soil
Project Code: F15001

Project Name: NMR Bank
Client : Norwest Holst Soil Engineering Ltd

Sample Reference	TP03A	TP03B				Method No	Units	LOD
Sample Depth (m)	2.00m	2.00m						
Date Sampled	15/10/07	15/10/07						
Date Scheduled	18/10/07	18/10/07						
Laboratory Reference No	269991	269992						
Analysis								
Moisture Content (Dry Weight)	2.6	4.3					%	0.1
Moisture Content (Wet Weight)	2.5	4.1					%	0.1
Asbestos (Screen)	Absent	Absent				001a		
Arsenic	14	18				069S[IM]	mg/kg	3
Beryllium	0.7	0.8				069S[IM]	mg/kg	0.5
Cadmium	< 0.5	< 0.5				069S[IM]	mg/kg	0.5
Chromium	22	49				069S[IM]	mg/kg	10
Copper	15	16				069S[IM]	mg/kg	5
Lead	23	20				069S[IM]	mg/kg	10
Mercury	< 0.6	< 0.6				069S[IM]	mg/kg	0.6
Nickel	28	59				069S[IM]	mg/kg	4
Selenium	< 2.5	< 2.5				069S[IM]	mg/kg	2.5
Vanadium	35	45				069S[IM]	mg/kg	3
Zinc	37	52				069S[IM]	mg/kg	10
Total Cyanide	< 1	< 1				061S[IM]	mg/kg	1
Organic Carbon	0.12	< 0.1				092[IM]	%	0.1
pH	8.6	8.3				084S[IM]	pH Units	1
* * EPH SUITE * *								
EPH (C10-C40)	13	13				070S[IM]	mg/kg	5
* * PCB SUITE * *								
PCB Congener 28	< 0.002	< 0.002				039S[IM]	mg/kg	0.002
PCB Congener 52	< 0.002	< 0.002				039S[IM]	mg/kg	0.002
PCB Congener 101	< 0.002	< 0.002				039S[IM]	mg/kg	0.002
PCB Congener 118	< 0.002	< 0.002				039S[IM]	mg/kg	0.002
PCB Congener 138	< 0.002	< 0.002				039S[IM]	mg/kg	0.002
PCB Congener 153	< 0.002	< 0.002				039S[IM]	mg/kg	0.002
PCB Congener 180	< 0.002	< 0.002				039S[IM]	mg/kg	0.002
PCB's (Sum of ICES Congeners)	ND	ND				039S[I]	mg/kg	0.002
* * PHENOLS SUITE * *								
Phenol	< 0.1	< 0.1				020S[IM]	mg/kg	0.1
Total Monohydric Phenols	< 1	< 1				020S[I]	mg/kg	1

[I] ISO 17025 accredited.
[M] MCERTS accredited for sand, loam and clay.

ALcontrol Technichem
Table Of Results

Job Number : 07-40346
Matrix : Soil
Project Code: F15001

Project Name: NMR Bank
Client : Norwest Holst Soil Engineering Ltd

Sample Reference	TP03A	TP03B				Method No	Units	LOD
Sample Depth (m)	2.00m	2.00m						
Date Sampled	15/10/07	15/10/07						
Date Scheduled	18/10/07	18/10/07						
Laboratory Reference No	269991	269992						
Analysis								
* * PAH SUITE * *								
Naphthalene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Acenaphthylene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Acenaphthene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Fluorene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Phenanthrene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Anthracene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Fluoranthene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Pyrene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Benzo(a)anthracene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Chrysene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Benzo(b)fluoranthene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Benzo(k)fluoranthene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Benzo(a)pyrene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Indeno(1,2,3-cd)pyrene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Dibenzo(a,h)anthracene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
Benzo(g,h,i)perylene	< 0.1	< 0.1				022S[IM]	mg/kg	0.1
PAH (Sum of EPA 16)	ND	ND				022S[I]	mg/kg	1.6

[I] ISO 17025 accredited.
[M] MCERTS accredited for sand, loam and clay.

ALcontrol Technichem
Table Of Results

Job Number : 07-40346
Matrix : Soil
Project Code: F15001

Project Name: NMR Bank
Client : Norwest Holst Soil Engineering Ltd

Sample Reference	TP03A	TP03B				Method No	Units	LOD
Sample Depth (m)	2.00m	2.00m						
Date Sampled	15/10/07	15/10/07						
Date Scheduled	18/10/07	18/10/07						
Laboratory Reference No	269991	269992						
Analysis								
* * VOC SUITE * *								
MTBE	< 0.025	< 0.025				071S[I]	mg/kg	0.025
Benzene	< 0.025	< 0.025				071S[I]	mg/kg	0.025
Toluene	< 0.025	< 0.025				071S[I]	mg/kg	0.025
Ethylbenzene	< 0.025	< 0.025				071S[I]	mg/kg	0.025
m,p-Xylenes	< 0.05	< 0.05				071S[I]	mg/kg	0.05
o-Xylene	< 0.025	< 0.025				071S[I]	mg/kg	0.025
1,3,5-Trimethylbenzene	< 0.025	< 0.025				071S[I]	mg/kg	0.025
1,2,4-Trimethylbenzene	< 0.025	< 0.025				071S[I]	mg/kg	0.025

[I] ISO 17025 accredited.
[M] MCERTS accredited for sand, loam and clay.

ALcontrol Technichem
EPH Description

Job Number: 07-40346
Client: Norwest Holst Soil Engineering Ltd
Project Code: F15001

Matrix: Soils
Project Name: NMR Bank

Laboratory Reference No	Sample Reference	Sample Depth (m)	Date Sampled	EPH Description
269991	TP03A	2.00m	15/10/07	The sample chromatogram exhibits a hump of unresolved complex material eluting from C16 to C34.
269992	TP03B	2.00m	15/10/07	The sample chromatogram exhibits a hump of unresolved complex material eluting from C16 to C34.

ALcontrol Technichem
Table Of Results - Appendix

Job Number : 07-40346

Project Code: F15001

Project Name: NMR Bank
Client : Norwest Holst Soil Engineering Ltd

Summary of methods contained within report :

Method No.	Reference	Description	Wet/Dry Analysis
070S	In-house method	Determination of hexane/acetone extractable hydrocarbons in soil by gas chromatography with flame ionisation detection. Note: UKAS accreditation only applies to C10-C40 and excludes other carbon banding.	W
061S	In-house method based on Method 4500-CN, "Standard Methods for the Examination of Water and Waste Water", APHA AWWA WEF, Edition 18, 1992	Determination of cyanides and thiocyanate in soil samples by continuous flow colorimetry (Skalar)	W
039S	In-house method	Determination of PCB congeners in soil samples by hexane/acetone extraction followed by GC-MS determination	W
022S	In-house method	Determination of PAH compounds in soil samples by hexane / acetone extraction followed by GC-MS detection	W
020S	In-house method based on Second Site Property: Environmental Assessment Guidance Version 3: March 2003	Determination of methanol/water based mobile phase extractable phenols in soil samples by HPLC with electrochemical detection	W
071S	In-house method	Determination of volatile organic compounds in soil samples by headspace GC-MS analysis	W
092	In-house method	Determination of organic content and organic carbon in soil samples by combustion analyser	D
084S	In-house method referencing BS1377: Part 3: 1990 and Second Site Property: Environmental Assessment Guidance Version 3: March 2003	Determination of pH by addition of water followed by electrometric measurement	D
069S	In-house method based on MEWAM "Methods for the Determination of Metals in Soil", HMSO, 1986	Determination of metals in soil samples by aqua-regia digestion followed by ICP-OES detection	D

ALcontrol Technichem
Table Of Results - Appendix

Job Number : 07-40346

Project Code: F15001

Project Name: NMR Bank
Client : Norwest Holst Soil Engineering Ltd

Summary of methods contained within report :

Method No.	Reference	Description	Wet/Dry Analysis
001a	In-house method based on HSG 248	Visual screening of soil samples for fibrous material requiring further identification according to method 001 (note for samples > approximately 1kg it may be necessary to sub-sample prior to screening)	

Soil results are expressed on a dry weight basis. Where the test uses as-received sample, a moisture correction factor is applied to the wet weight result. This factor is determined gravimetrically using weight loss on drying at 30° (+/-5) C.

ALcontrol Technichem

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Norwest Holst Soil Engineering Ltd
Southern Regional Office
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Watford
Hertfordshire
WD24 4WW

01 November 2007

TEST REPORT

Our Report Number: 07-40346a

Your Order Reference: STC/4516

1 soil samples submitted for analysis on 18/10/2007

Project Name: NMR Bank

Project Code: F15001

Laboratory analysis started on 18/10/2007
All laboratory analysis completed by 01 November 2007

Rexona Rahman
Analytical Reporting Manager
ALCONTROL TECHNICHEM

Sharon Googh
Project Co-Ordinator
ALCONTROL TECHNICHEM

Test methods are documented in house procedures or where appropriate standard methods. Non accredited tests are identified in the appendix. Procedures for sampling are outside the scope of the laboratory UKAS accreditation. Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation. All samples connected with this report , including any 'on hold', will be stored and disposed of according to company policy. A copy of this policy is available on request.

UKAS TESTING
1141

TEST REPORT

WAC ANALYTICAL RESULTS

Our Report No: 07-40346a

Your Order No: STC/4516

CLIENT: Norwest Holst Soil Engineering Ltd

1 soil samples submitted for analysis on 17 October 2007

DATE OF ISSUE: 01 November 2007

Project Name: NMR Bank

Project Code: F15001

Lab Reference	**269991**				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	**15/10/2007**				**Inert Waste Landfill**	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID	**TP03A**						
Sample Depth (m)	**2.00m**						
Eluate Analysis	**2:1**	**8:1**	**2:1**	**Cumulative 10:1**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
	mg/l		**mg/kg**				
080 Arsenic	< 0.005	< 0.005	< 0.010	**< 0.050**	0.5	2	25
080 Barium	< 0.005	< 0.005	< 0.010	**< 0.050**	20	100	300
080 Cadmium	< 0.001	< 0.001	< 0.002	**< 0.010**	0.04	1	5
080 Chromium	< 0.005	< 0.005	< 0.010	**< 0.050**	0.5	10	70
080 Copper	< 0.005	< 0.005	< 0.010	**< 0.050**	2	50	100
080 Mercury	< 0.00005	< 0.00005	< 0.00010	**< 0.00050**	0.01	0.2	2
080 Molybdenum	< 0.005	< 0.005	< 0.010	**< 0.050**	0.5	10	30
080 Nickel	< 0.005	< 0.005	< 0.010	**< 0.050**	0.4	10	40
080 Lead	< 0.005	< 0.005	< 0.010	**< 0.050**	0.5	10	50
080 Antimony	< 0.001	< 0.001	< 0.002	**< 0.010**	0.06	0.7	5
080 Selenium	< 0.005	< 0.005	< 0.010	**< 0.050**	0.1	0.5	7
080 Zinc	< 0.005	< 0.005	< 0.010	**< 0.050**	4	50	200
086 Chloride	13	< 10	25	**< 100**	800	15000	25000
086 Fluoride	0.55	0.14	1.1	**1.8**	10	150	500
086 Sulphate as SO_4	39	< 10	77	**< 100**	1000	20000	50000
029 Total Dissolved Solids	-	-	-	-	4000	60000	100000
020 Phenol Index	< 0.01	< 0.01	< 0.02	**< 0.1**	1	-	-
010 Dissolved Organic Carbon	< 5	< 5	< 10	**< 50**	500	800	1000
Leach Test Information							
084 pH (pH Units)	7.6	7.4					
084 Conductivity (µS/cm)	209	79					
078 Temperature (°C)	17.0	17.0					
021 Mass Sample (kg)	0.150						
021 Dry Matter (kg)	0.15						
021 Moisture (% Dry Weight)	2.6						
Stage 1							
078 Volume Leachant, L_2 (l)	0.289						
078 Filtered Eluate Volume, VE_1 (l)	0.135						
Stage 2							
078 Volume Leachant, L_8 (l)	1.170						

Results are expressed on a dry weight basis, after correction for moisture content where applicable

Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepencies with current legislation

Waste Acceptance Method Appendix

Our Report No: 07-40346a

Your Order No: STC/4516

CLIENT: Norwest Holst Soil Engineering Ltd

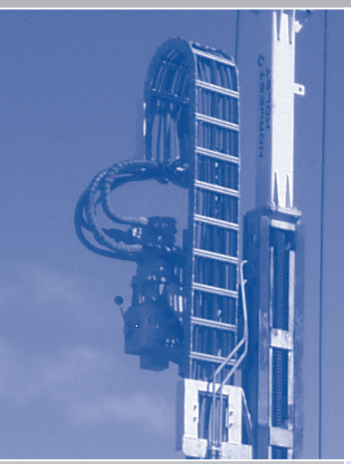
DATE OF ISSUE: 01 November 2007

Project Name: NMR Bank

Project Code: F15001

Method Reference / Parameter	Extraction Summary	Detection Technique	ISO17025 Accredited?
Solid Waste Analysis			
092 Total Organic Carbon		Carbon Analyser	✓
019 Loss on Ignition	Oven heated at 450°C	Gravimetry	✓
071 Sum of BTEX	Headspace	GC-MS	
Benzene			✓
Toluene			✓
Ethylbenzene			✓
m,p-Xylenes			✓
o-Xylene			✓
039 Sum of 7 PCBs	Hexane / acetone	GC-MS	
PCB Congener 28			✓
PCB Congener 52			✓
PCB Congener 101			✓
PCB Congener 118			✓
PCB Congener 138			✓
PCB Congener 153			✓
PCB Congener 180			✓
065 Mineral Oil (C_{8}-C_{40})	Hexane / acetone with silica / alumina clean-up	GC-FID	✗
022 PAH (Sum of 17 listed)	Hexane / acetone	GC-MS	
Naphthalene			✓
Acenaphthylene			✓
Acenaphthene			✓
Fluorene			✓
Phenanthrene			✓
Anthracene			✓
Fluoranthene			✓
Pyrene			✓
Benzo (a) anthracene			✓
Chrysene			✓
Benzo (b) fluoranthene			✓
Benzo (k) fluoranthene			✓
Benzo (a) pyrene			✓
Indeno (1,2,3-cd) pyrene			✓
Dibenzo (a,h) anthracene			✓
Benzo (g,h,i) perylene			✓
Coronene			✓
084 pH	Water addition	Potentiometric	✓
085 Acid Neutralisation Capacity (ANC)	Water addition	Titration	✗
021 Moisture Content	Dried at 105 (+/-5) °C	Gravimetry	✓
Leachate Analysis†			
078 Leachate Preparation	In accordance with BS EN 12457-3	-	✗
080 Metals	Nitric acidification	ICP-MS	✓
086 Chloride	-	Ion chromatography	✓
086 Fluoride	-	Ion chromatography	✓
086 Sulphate	-	Ion chromatography	✓
029 Total Dissolved Solids	Evaporation	Gravimetry	✓
020 Monohydric Phenols (Phenol Index)	-	HPLC - electrochemical detection	✓
010 Dissolved Organic Carbon	Persulphate oxidation	Infra-red detection	✓
084 pH	-	pH meter	✓
084 Conductivity	-	Conductivity meter	✓

†Note: ISO17025 accreditation does not cover leachate analysis as the preparation stage is not accredited



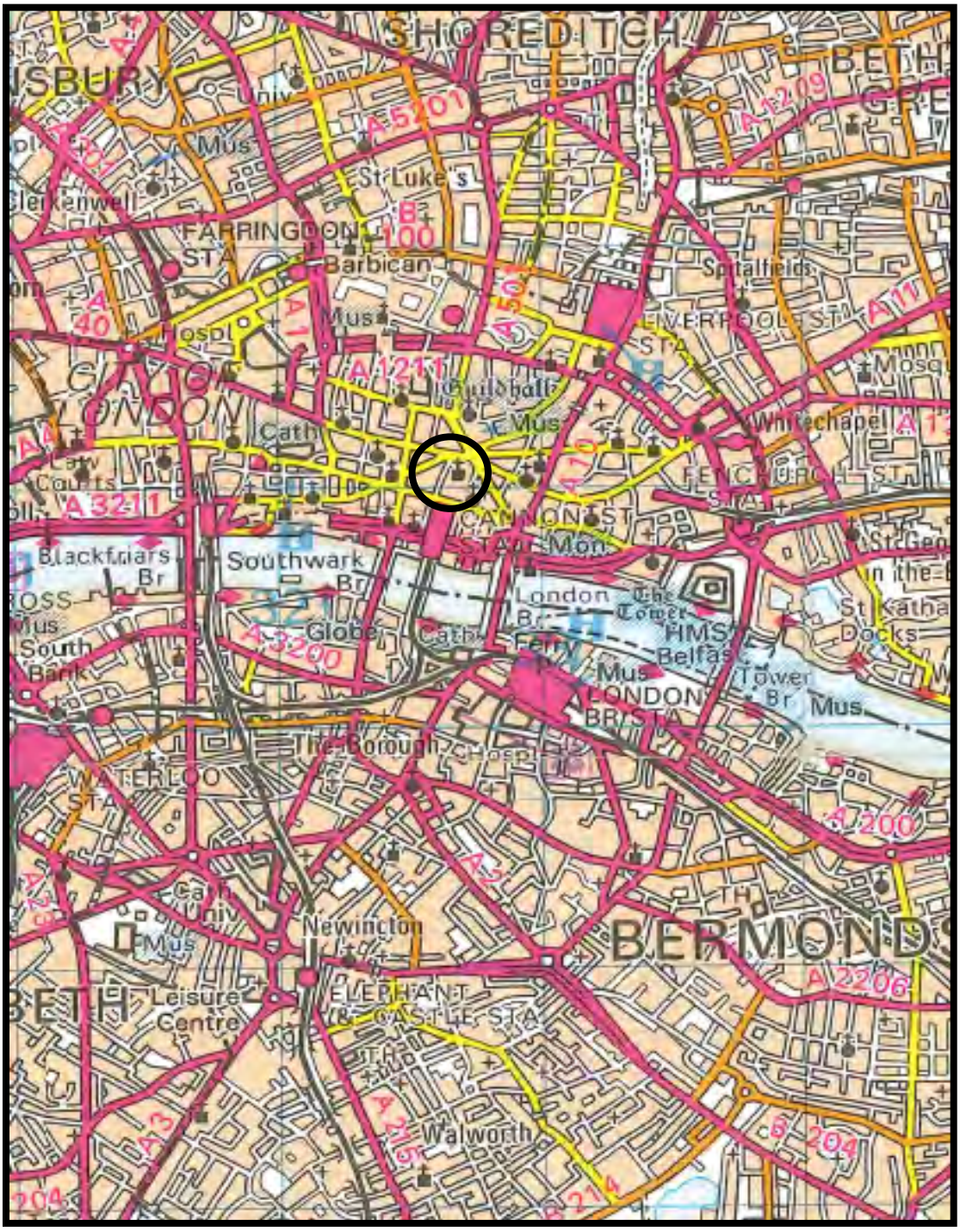
SUPPORTING FACTUAL DATA

SECTION D
Site Plans

SITE LOCATION PLAN

NORWEST HOLST
SOIL ENGINEERING

Project Name	NMR BANK	**Site Location Plan**	Scale
Project No.	F15001		1:50,000
Engineer	Arup Geotechnics		Fig no.
Client	Stanhope Plc		01



Denotes Site Location

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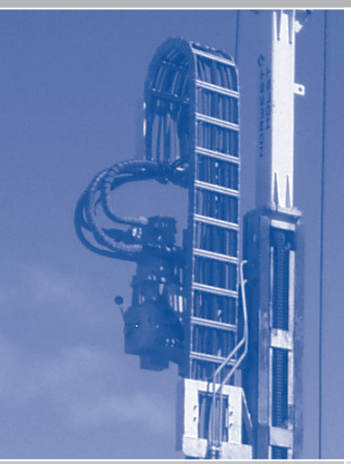
Date		
13/11/2007		

Form No. SI SLP Revision No. 2.01 Issue Date 16/03/2006

NORWEST HOLST SOIL ENGINEERING



SUPPORTING FACTUAL DATA

SECTION D
Site Plans

EXPLORATORY HOLE LOCATION PLAN

NORWEST HOLST
SOIL ENGINEERING

Project Name NMR ROTHSCHILD BANK, LONDON EC4N

Project No. F15001

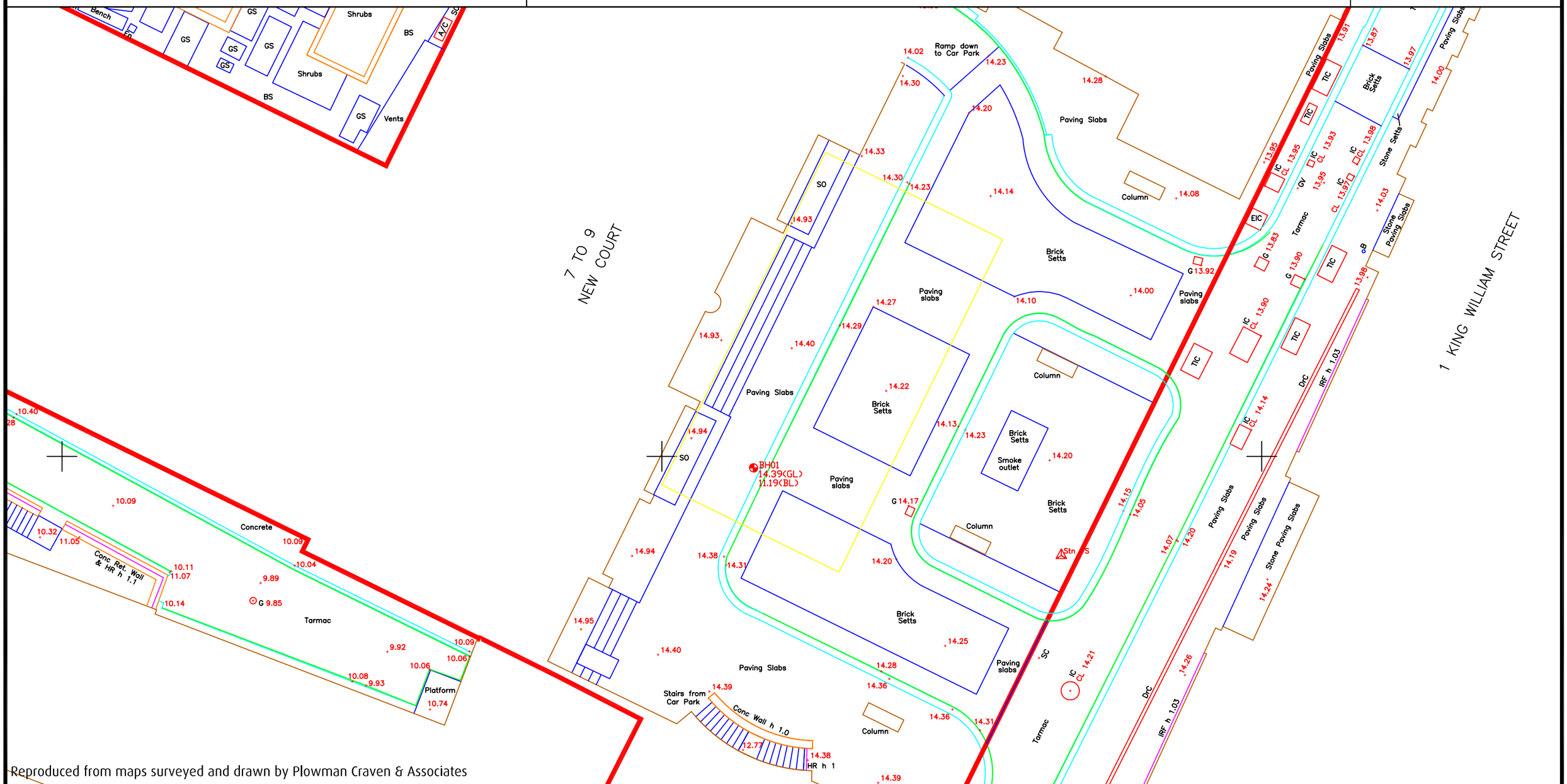
Engineer ARUP GEOTECHNICS

Client STANHOPE PLC

Exploratory Hole Location Plan

Scale
NTS

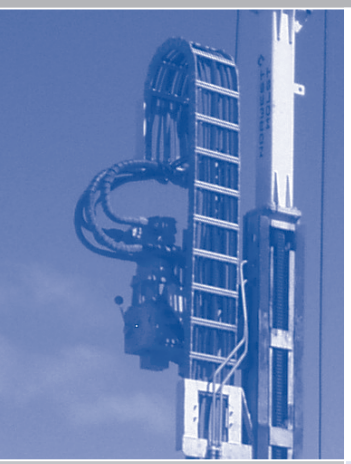
Fig no.
02



Date 21/11/2007

Form No. SI EHLP Revison No. 2.01 Issue Date 16/03/2006

NORWEST HOLST
SOIL ENGINEERING



SUPPORTING FACTUAL DATA

SECTION E
Photographs

INSPECTION PIT / TRIAL PIT / TRIAL TRENCH PHOTOGRAPHS

NORWEST HOLST
SOIL ENGINEERING

Project Name NMR BANK Project No. F15001 Engineer Arup Geotechnics Client Stanhope Plc	**Photographic Record**	Hole ID TP03 Fig no. E01

TP03 GL - 2.2m

TP03 GL - 2.2m

Photographed by	Date photographed	Filename 1 TP03A	NORWEST HOLST SOIL ENGINEERING
IM	15/10/2007	Filename 2 TP03B	
Form No. SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007	

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