



GEOTECHNICAL INVESTIGATION REPORT

CONTRACT: 38-44 London Road
Purbrook
Waterlooville
Hampshire
PO7 5LJ

ORDER NO: 326806

CLIENT: McCarthy & Stone Retirement
Lifestyles Ltd
Southern House
1 Embankment Way
Ringwood
Hampshire
BH24 1EU

FAO: Mr T Beckett

REPORT NO: 17-82110/BG/GIR

PREPARED BY:



B. Graham BSc (Hons) MSc FGS

APPROVED BY:



R. J. Holloway BSc (Hons) MSc FGS CEnv MCIWEM C.WEM

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ACS Testing Ltd. Unit 14 Blackhill Road West, Holton Heath Trading Park, Poole, Dorset, BH16 6LE.
Ph 01202 622858 – Fax 01202 625045 – Email geo@acstesting.co.uk – www.acstesting.co.uk

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EXECUTIVE SUMMARY

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

Instructions / Brief	Conduct and document an intrusive investigation, in situ and laboratory testing to provide geotechnical data to assist with pile design.
Proposal / Planning	Planning Application No. APP/15/00896 was granted permission by Havant Borough Council on appeal on 25/08/16 for the 'Demolition of existing buildings and redevelopment to form 42No. retirement apartments for older persons including communal facilities, parking provision and associated landscaping, and 2No. commercial / retail units.'
Previous Reports	Crossfield Consulting – Site Investigation Report – CCI02684.BY070 – May 2015.
Exploration & Laboratory Testing	Three shell and auger boreholes sunk to depths between 11.40m and 19.10m. Standard Penetration Testing at regular intervals within each borehole. Eleven samples were tested for index properties comprising natural moisture content, liquid limit and plastic limit. Six samples were tested for pH and water soluble sulphate. Six samples scheduled for quick undrained unconsolidated triaxial testing to determine the shear strength of cohesive soils. WAC testing was carried out on two samples to assist with waste classification.
Findings	The intrusive ground investigation has revealed three different geological units underlying the site. Made Ground was identified in all boreholes proven to a maximum depth of 1.20m. The Made Ground typically comprised dark brown very sandy very gravelly SILT or light grey mottled brown / brown very silty very sandy GRAVEL. Wittering Formation units were revealed underlying the Made Ground proven to depths between 3.30m and 5.30m and typically comprised a very soft to soft grey / brown mottled yellow silty slightly sandy CLAY or slightly clayey slightly sandy slightly gravelly SILT. The basal unit revealed was the London Clay Formation which typically comprised grey soft clayey slightly sandy SILT overlying a firm becoming very stiff grey silty slightly sandy CLAY. Groundwater was struck within two of the three boreholes with resting levels recorded between 4.80m and 12.20m with reduced levels between 38.22mAOD and 31.94mAOD. Groundwater was however recorded at 1.00m within all the Crossfield boreholes. SPT[N] testing revealed N values of N=0-12 within the Wittering Formation and N=8->50 for all tests conducted in the London Clay Formation. The London Clay Formation revealed a clear trend with N values increasing with depth.

Findings cont'd	Testing of the Wittering Formation and London Clay Formation have revealed the samples to have a high volume change potential. pH and water soluble sulphate tests classify the site as having an aggressive environment for concrete as Design Sulphate Class DS-2, and Aggressive Chemical Environment for Concrete AC-3z. Quick undrained triaxial testing carried out on cohesive soils revealed shear strengths between 38-245kPa with a clear increase in strength with depth. WAC testing classified the Made Ground as Non-Hazardous Waste and the Wittering Formation as Inert Waste.
Recommendations	It is recommended that this report is sent to Piling Contractors to assist with pile design. Consideration should be given into crushing and re-using demolition materials for use as a piling mat for the proposed building. Due to the presence of cohesive materials, heave precautions for a pile and ground-beam solution should be taken into consideration for high volume change potential soils as outlined in NHBC 4.2. Due to the cohesive shallows soils it is considered that soakaways will not be suitable for surface water drainage. Preliminary CBR values between 2.5% and 3% for the Wittering Formation are recommended based on plasticity index results, however Plate Bearing Tests should be undertaken at formation level following site clearance.

1.0 INTRODUCTION

1.1 Instructions

- 1.1.1 ACS Testing Ltd. (ACS) were instructed by Mr T Beckett of McCarthy & Stone Retirement Lifestyles Ltd. (McC&S) to carry out an intrusive investigation for the proposed redevelopment of 38-44 London Road, Purbrook, Waterloooville.
- 1.1.2 The term site within this report is defined as the area outlined in red on the Site Location Plan included as Appendix A.

1.2 Objectives

- 1.2.1 The objectives of this report are to document the intrusive investigation, in-situ testing and laboratory testing to provide geotechnical data to assist with pile design.

1.3 Proposed Development

- 1.3.1 The Client submitted a planning application to Havant Borough Council on 14/08/15. Planning application APP/15/00896 was approved by Havant Borough Council on appeal on 25/08/16 for the following proposal:

Demolition of existing buildings and redevelopment to form 42No. retirement apartments for older persons including communal facilities, parking provision and associated landscaping; and 2No. commercial / retail units.

1.4 Previous Reports

- 1.4.1 A report has previously been produced for the site by Crossfield Consulting Ltd (Crossfield) in 2015 commissioned by McC&S. The report produced documents both a desk study and site investigation.
- 1.4.2 A review of the pertinent geotechnical aspects from the previous Crossfield report is included in Section 2.0 of this report.

1.5 Report Limitations

- 1.5.1 This report has been prepared in accordance with the instructions received from McCarthy & Stone Retirement Lifestyles Ltd. and includes the findings of a ground investigation carried out by ACS.
- 1.5.2 The report is based upon the findings of an intrusive ground investigation which includes soil sampling, site testing, and laboratory testing for physical and chemical parameters. It should be appreciated that there may be areas of the site that have not been investigated where concentrations or ground conditions may vary from those encountered. It should also be appreciated that the concentrations or sub-surface features revealed may be more widespread than identified by the works carried out.

- 1.5.3 The information contained in this report is intended for the use of McCarthy & Stone Retirement Lifestyles Ltd. pursuant to the development described above. The recommendations contained herein may not be appropriate to other development proposals.
- 1.5.4 The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of samples tested. No liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the Client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by ACS Testing Ltd.

1.6 **References**

BS EN ISO 14688-1:2002. *Geotechnical Investigation and Testing. Identification and Classification of Soil*. BSI 2002.

BS 5930:2015. *Code of Practice for Site Investigations*. BSI 2015.

BRE Special Digest 1:2005 (2005). *Concrete in aggressive ground*. BRE Press.

Department of Communities and Local Government (2012). *National Planning Policy Framework*.

NHBC (2016). *NHBC Standards, Part 4 Foundations*. NHBC

2.0 REVIEW OF PREVIOUS REPORTS

- 2.0.1 This section provides a summary of the Crossfield Site Investigation Report: Report No. CCI02684.BY07. This section only reviews the pertinent geotechnical aspects of the report.

2.1 Crossfield Site Investigation

- 2.1.1 Six windowless boreholes were drilled by Dynamic Sampling UK limited on 06/05/15 to depths between 4.00m and 5.00m.
- 2.1.2 Standard Penetration Tests (SPT) were carried out in each borehole at regular intervals. In-situ hand shear vane tests were undertaken in every borehole where appropriate.
- 2.1.3 Four samples were tested for natural moisture content, liquid limit and plastic limit.
- 2.1.4 Four samples were tested for pH and water soluble sulphate testing.

2.2 Ground Conditions

- 2.2.1 Crossfield interpreted three different units to be underlying the site:

Made Ground

A cover of Made Ground was present across the site and typically comprised concrete surfacing over a sand and gravel sub-base. Beneath the sub-base a layer of reworked natural strata with rare ashy deposits and brick fragments was recorded. Made Ground was identified between depths of 1.00m and 2.00m.

Wittering Formation

Below the Made Ground, a layer of soft to firm greenish grey mottled orange sandy silty clay was revealed to depths between 3.00m and 4.00m.

London Clay Formation

Dark grey clayey silt or silty clay of the London Clay Formation was underlying the Wittering Formation proven to 5.00m, the maximum depth of the investigation.

- 2.2. Groundwater was encountered within all boreholes at approximately 1.00m. However this was interpreted as perched water within the Made Ground or sandier horizons of the Wittering Formation. Desk Study information revealed groundwater is likely to be at depths below 5.00m.

2.3 Recommendations

- 2.3.1 Based on the pH and water soluble sulphate results content the DC Class of concrete for buried structures and foundations should be suitable for an ACEC site classification of AC-2.
- 2.3.2 N values recorded were variable within the shallow soils. It was considered that this could be due to perched water causing the tests to underestimate soil density / strength. It was recommended that a supplementary ground investigation was undertaken at the site to enable a better assessment of the shallow soils.
- 2.3.3 The underlying cohesive soils revealed a high volume change potential, therefore it was recommended that the influence of trees would need to be taken into consideration at the design stage.
- 2.3.4 Due to the thickness of Made Ground at the site it was recommended that an allowance was made for suspended ground floor slabs.
- 2.3.5 It was considered that an equilibrium design California Bearing Ratio (CBR) value of 3% was applicable for the shallow soils.

3.0 ACS EXPLORATION & TESTING

- 3.0.1 An intrusive investigation was undertaken by ACS in March 2017. Exploratory hole locations were selected by ACS to give good coverage of the site to provide geotechnical information to aid future foundation design.
- 3.0.2 Utility plans supplied to ACS by the Client were assessed prior to the intrusive works. A Cable Avoidance Tool (CAT) was used to confirm the location of services prior to drilling at each exploratory hole location. Hand dug pits were excavated to 1.20m as a precaution against unidentified buried services before drilling commenced.
- 3.0.3 Exploratory Hole Location Plans showing the current and previous ACS investigations are included as Appendix B.

3.1 *Shell & Auger Boreholes*

- 3.1.1 Three shell and auger boreholes were drilled used a Pilcon 1 Tonne cable percussion drilling rig between 06/03/17 and 08/03/17. Samples were collected from the boreholes to allow logging and sub-sampling for laboratory testing. It was intended for all three boreholes to be sunk to 20.00m however refusal was met in each of the boreholes prior to this depth being achieved. The shell and auger boreholes reached the following depths:
- CP01 – 19.10m, CP02 – 15.60m, CP03 – 11.40m
- 3.1.2 Shell and Auger borehole logs are included as Appendix C.

3.2 *Geotechnical Testing*

- 3.2.1 Standard Penetration Tests (SPT) were carried out in each borehole at regular vertical intervals. The results of the tests are shown on the borehole logs and Figures 1 and 2 in Section 4.0 of this report.
- 3.2.2 Eleven samples were tested for natural moisture content, liquid limit and plastic limit. From these tests the plasticity indices can be calculated which can be used to determine the volume change potential of cohesive soils.
- 3.2.3 Six samples were tested for pH and water soluble sulphate in order to provide information for the specification of future buried concrete.
- 3.2.4 Six samples were scheduled for quick undrained unconsolidated triaxial testing to determine the shear strength of the underlying cohesive soils.
- 3.2.5 Laboratory test result certificates are included within Appendix D.

3.3 *Chemical Testing*

- 3.3.1 Waste Acceptance Criteria (WAC) testing was carried out on two samples to assist with waste classification for materials which may be necessary to dispose off-site.
- 3.3.2 Laboratory test result certificates are included within Appendix D.

4.0 GROUND CONDITIONS

4.1 General Strata Encountered

4.1.1 Summarised ground conditions are outlined below. Full details are shown on the borehole logs included as Appendix C.

Strata	Exploratory Holes Encountered in	Top of Stratum Depth (mbgl)	Thickness (m)
Made Ground	All	Ground Level	0.40 – 1.20
Wittering Formation	All	0.40 – 1.20	2.50 – 4.90
London Clay Formation	All	3.30 – 5.30	Proven to 19.10

Table 1: Summary of strata revealed from the intrusive investigation

4.1.2 Made Ground

Made Ground was revealed in all three boreholes proven to depths between 0.40m and 1.20m. The Made Ground comprised concrete surfacing overlying a single unit in each of the locations. CP01 revealed a dark brown very sandy very gravelly SILT and CP02 and CP03 revealed a light grey mottled brown / brown very silty very sandy GRAVEL.

4.1.3 Wittering Formation

The Made Ground was revealed to be overlying deposits of the Wittering Formation in every borehole location. The Wittering Formation was proven to depths of 3.30m and 5.30m. The unit was typically described as a very soft to soft grey mottled brown / grey mottled yellow / brown mottled yellow silty slightly sandy CLAY / slightly clayey slightly sandy slightly gravelly SILT.

4.1.4 London Clay Formation

The London Clay Formation was revealed to be underlying the Wittering Formation in all three boreholes proven to the maximum depth achieved in the investigation of 19.10m. The unit typically comprised a soft grey clayey slightly sandy SILT underlain by a firm becoming very stiff grey silty slightly sandy CLAY.

Each borehole refused at depths between 11.40m and 19.10m due to competent strata being encountered. Chiselling was undertaken within CP01 at 19.10m for 90 minutes; 60 minutes at 15.50m in CP02 and 60 minutes within CP03 and 11.40m.

No samples were able to be recovered from this stratum however the drillers described it as Limestone. It is considered that this unit is most likely to be cemented sections of the London Clay Formation.

4.2 Groundwater

- 4.2.1 Groundwater strikes were only recorded in two of the three boreholes. A summary of these strikes and subsequent resting levels are shown in Table 2 below.

Client Reference	Groundwater Strike		Resting level (after 20 minutes)	
	m	mAOD	m	mAOD
CP01	12.50	31.64	12.20	31.94
CP02	5.00	38.02	4.80	38.22

Table 2: Summary of groundwater strikes recorded within the shell and auger boreholes

- 4.2.2 Within the Crossfield investigation groundwater was encountered within all holes at approximately 1.00m. It was summarised that this is likely to be perched water within Made Ground or the sandier horizons of the Wittering Formation. Crossfield concluding that based on desk study information groundwater was likely to be at depths below 5m, but possibly less than 10m.

4.3 SPT[N] Results

4.3.1 Figures 1 & 2, below, show the results of the in-situ SPT testing for CP01-03. Testing was terminated at N = 50 therefore values of N = 50 may not represent the true N value which could be higher.

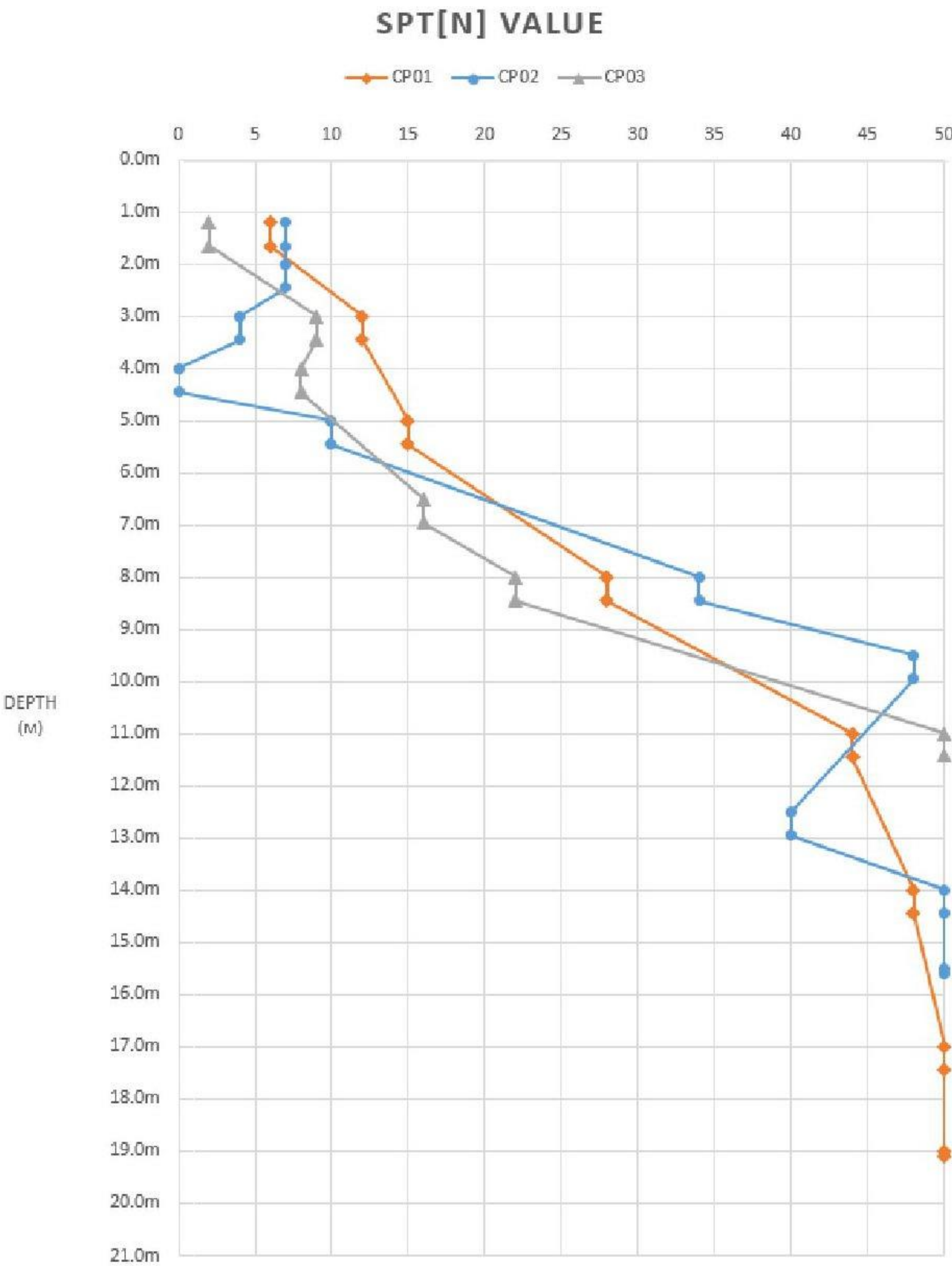


Figure 1: SPT[N] values against ground level.

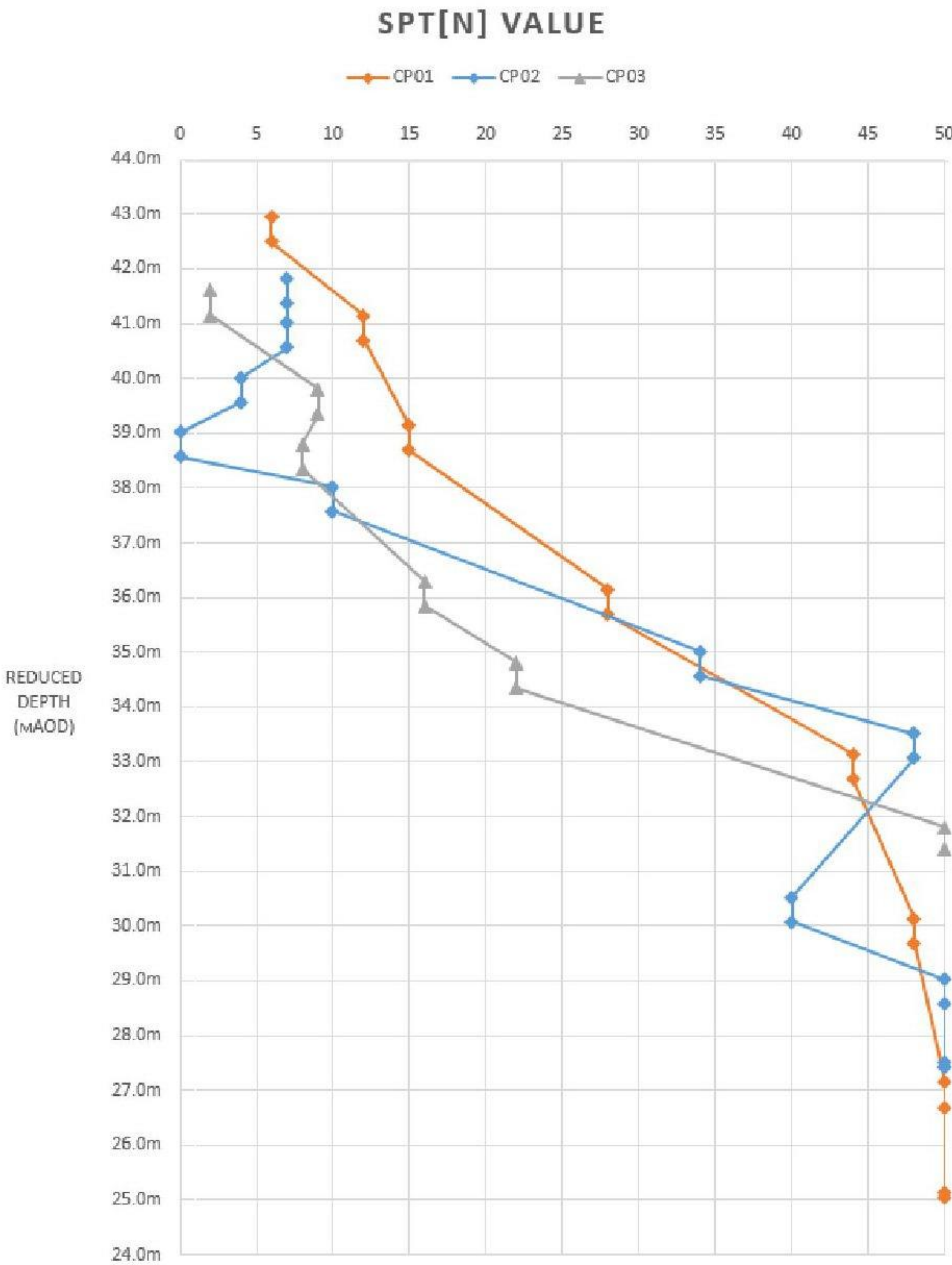


Figure 2: SPT[N] values against reduced level

5.0 GEOTECHNICAL & CHEMICAL RESULTS

5.1 Index Properties - Moisture Content and Atterberg Limit testing (LL/PL/PI)

- 5.1.1 In accordance with NHBC 4.2, shrinkable soils are those containing more than 35% fine particles (60µm) and have a Modified Plasticity Index of 10% or greater. The Modified Plasticity Index is calculated as the Plasticity Index of the soil multiplied by the percentage of particles less than 425µm.
- 5.1.2 The Modified Plasticity Index can be used to determine the volume change potential of the underlying soil. The Table below summarises the volume change potential of a soils based on the Modified Plasticity Index.

Modified Plasticity Index	Volume Change Potential
40% and greater	High
20% to less than 40%	Medium
10% to less than 20%	Low
Less than 10%	Non-Shrinkable

Table 3: Modified Plasticity Index relating to Volume Change Potential.

- 5.1.3 The results of the laboratory testing undertaken on the cohesive units from both the Wittering Formation and London Clay Formation are shown in Table 3 below.

Reference (Depth m)	Stratum	Moisture Content %	Percentage passing 425µm sieve (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Modified Plasticity Index (%)
CP01 (2.70)	WF	34	100	18	58	40	40
CP01 (4.70)	LCF	27	100	20	41	21	21
CP01 (7.50)	LCF	23	100	16	48	32	32
CP01 (13.60)	LCF	50	100	19	46	27	27
CP02 (0.60)	WF	16	63	15	27	12	7.56
CP02 (2.70)	WF	29	100	Non Plastic			N/S
CP02 (6.00)	LCF	30	100	19	61	42	42
CP02 (15.00)	LCF	26	100	18	64	46	46
CP03 (3.70)	WF	26	100	23	42	19	19
CP03 (4.70)	LCF	27	100	21	41	20	20
CP03 (9.00)	LCF	28	100	17	55	38	38
Minimum							7.56
Maximum							46

Table 4: Moisture content and Atterberg Limit testing results. N/S = Non-Shrinkable. WF = Wittering Formation. LCF = London Clay Formation

5.1.4 Figure 3 below shows the results of the Atterberg Limit testing plotted on an A-Chart.

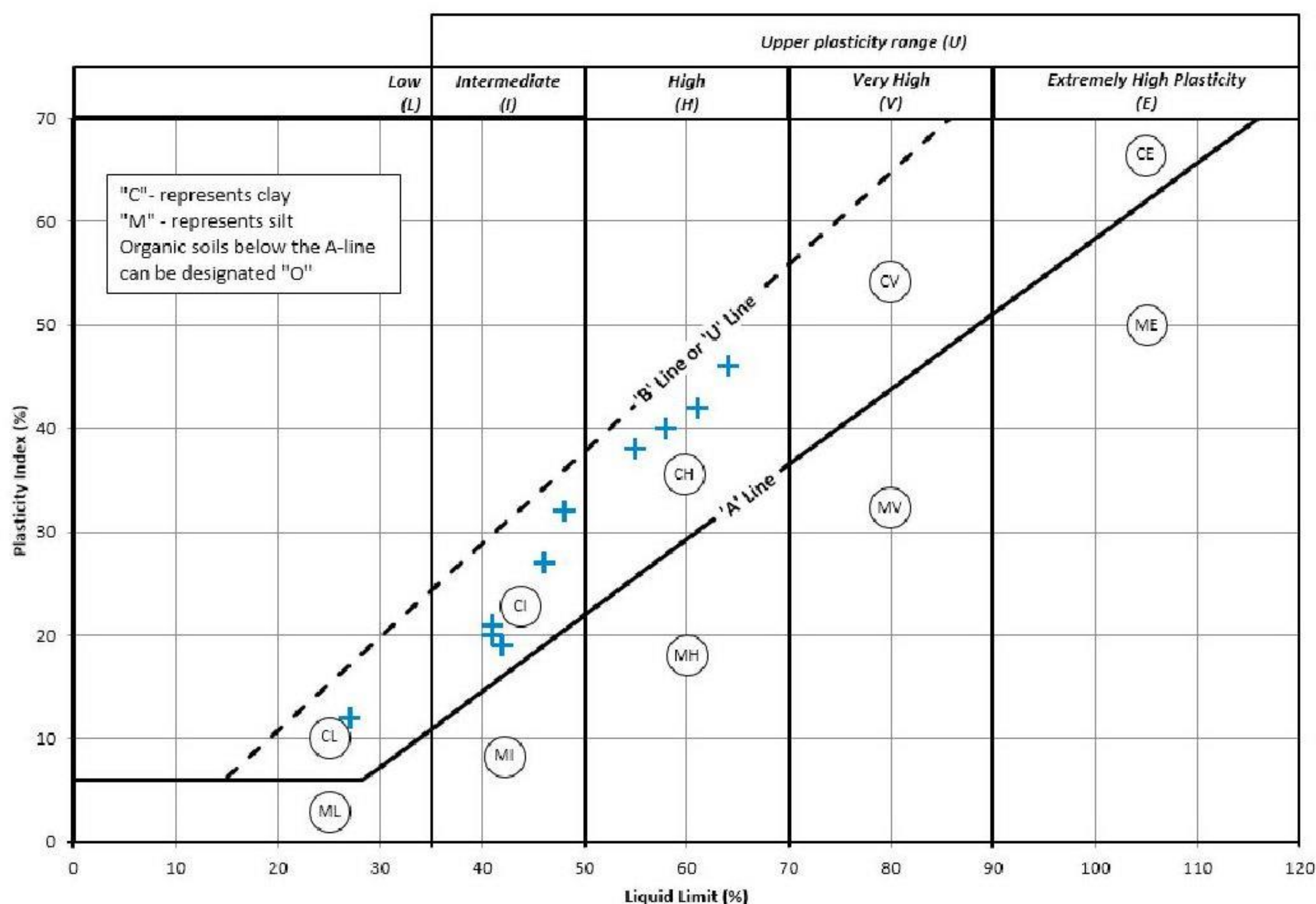


Figure 3. A-Chart plotting the results of Atterberg Limit testing

5.2 Aggressive Ground Chemical Suite

5.2.1 Naturally occurring sulphates and acids in the soil and groundwater are agents that can attack concrete. The effects can result in expansion and softening of the concrete. Therefore it is best practice for the concrete to be installed into the ground to be designed to be resistant to this attack.

5.2.2 Given the potentially industrial usage at the site it is considered that site should be classified as a brownfield location. A brownfield location is defined by BRE Special Digest 1:2005 as:

A site of part of a site that has been subjected to industrial development, storage of chemicals (including for agricultural use) or deposition of waste, and which may contain aggressive chemicals in residual surface materials or in ground penetrated by leachates. Where the history of a site is not known, it should be treated as a brownfield site until there is evidence to classify it as natural.

5.2.3 The results of pH and water soluble sulphate testing are shown in Table 4 below.

Client Reference	Stratum	Depth (m)	pH	Water Soluble Sulphate mg/l
CP01	Wittering Formation	1.80	8.8	5.64
CP01	London Clay Formation	16.50	8.0	909
CP02	Wittering Formation	1.70	8.4	29.0
CP02	London Clay Formation	7.50	6.5	125
CP03	Wittering Formation	2.70	6.8	30.8
CP03	London Clay Formation	6.00	6.7	72.9
Minimum pH / Maximum Sulphate			6.5	909

Table 5: Aggressive ground chemical testing results

5.3 Triaxial Testing

5.3.1 The results of the quick undrained unconsolidated triaxial testing undertaken on the cohesive units revealed during the intrusive investigation are summarised in Table 6 below.

Client Reference	Stratum	Depth (m) Unit	Bulk Density (mg/m³)	Cell Pressure (kPa)	Undrained Shear Strength (kPa)
CP01	London Clay Formation	4.00-4.45	2.01	80	41
CP01	London Clay Formation	15.50-15.95	2.05	310	245
CP02	London Clay Formation	6.50-6.95	1.93	130	62
CP02	London Clay Formation	11.00-11.45	2.04	220	144
CP03	Wittering Formation	2.00-2.45	1.98	40	38
CP03	London Clay Formation	9.50-9.95	2.05	190	109

Table 6: Summary of triaxial testing results

5.3.2 The results of the triaxial testing have been plotted against depth on figure 4 below.

UNDRAINED SHEAR STRENGTH

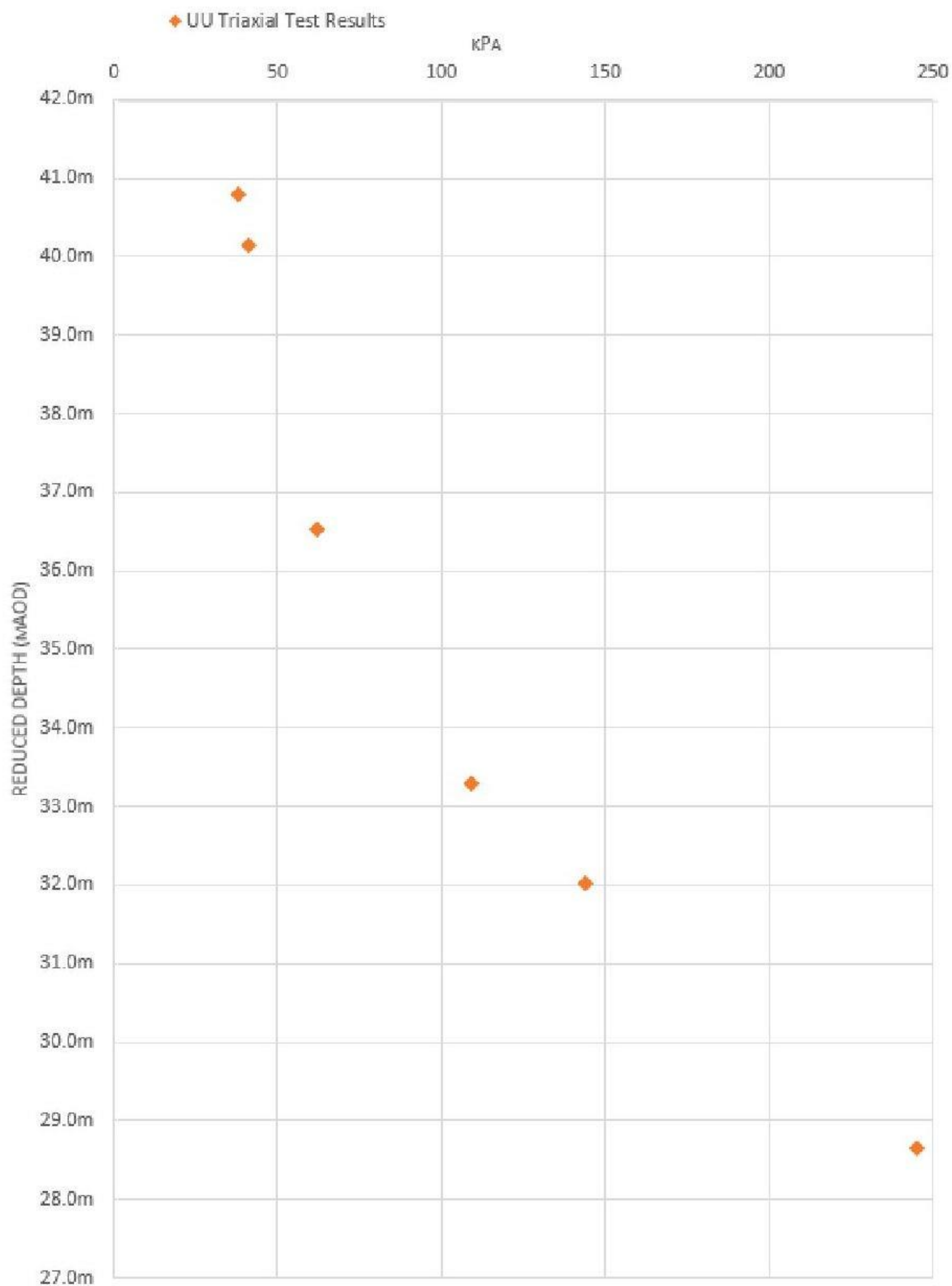


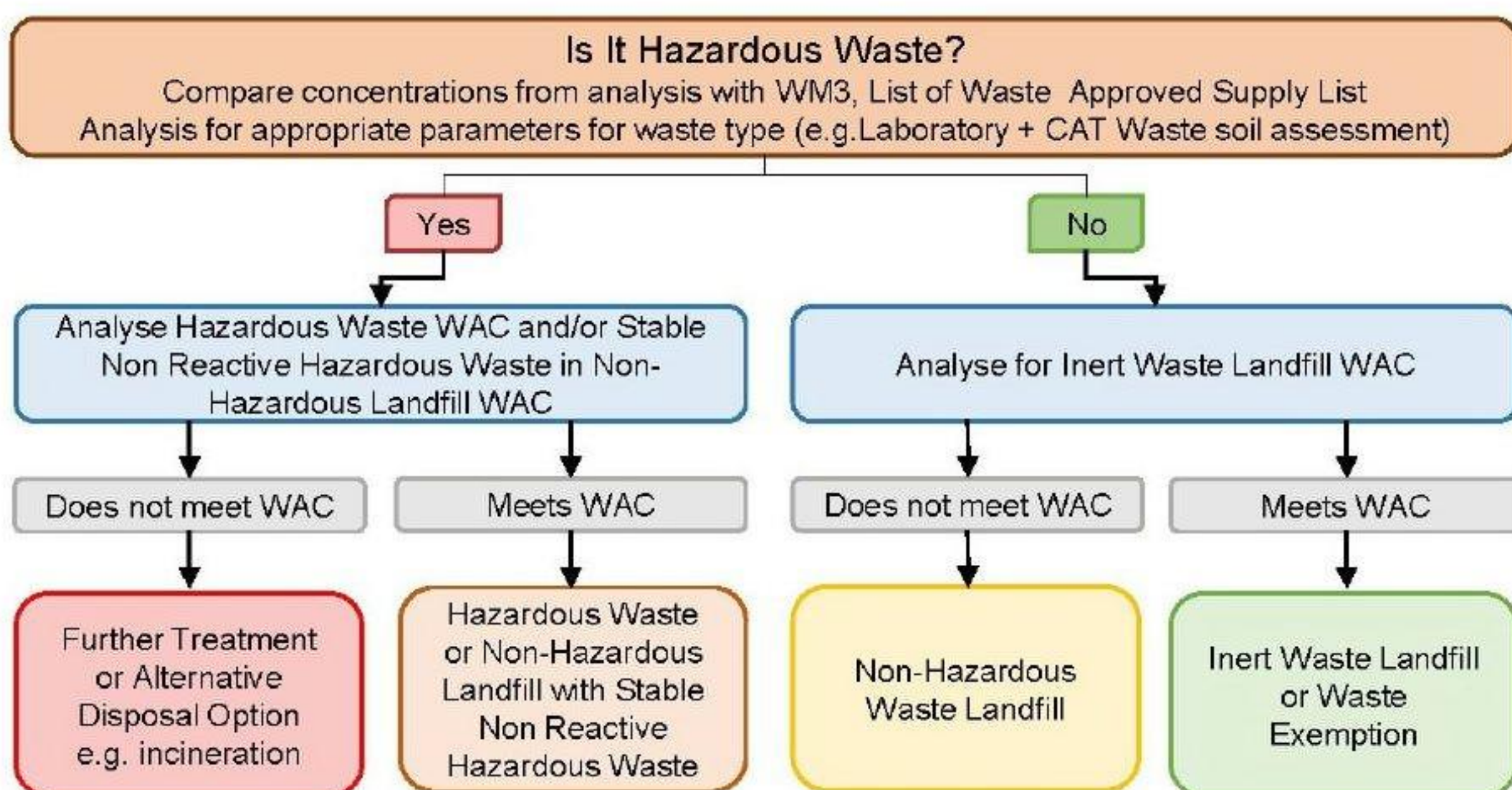
Figure 4: Plot of triaxial tests vs depth

5.4 Waste Classification

5.4.1 Two samples were tested for Waste Acceptance Criteria to classify materials that may require removal from site as waste. WAC testing comprises two parts:

- I. Testing of the solid soil fraction to determine if the sample has hazardous properties using CAT Waste assessment software.
- II. Preparation and testing of a leachate (+ solid component) for comparison against published WAC Criteria.

5.4.2 The flow diagram below outlines the process of waste classification.



5.4.3 Laboratory Results

The two samples scheduled for WAC were:

- CP01 – 0.90m – Wittering Formation – Grey mottled brown silty slightly sandy CLAY
- CP03 – 0.50m – Made Ground – Brown very silty very sandy GRAVEL

The results from the contamination testing on both the Wittering Formation and Made Ground were entered into the CatWasteSoil software. Both samples do not exhibit Hazardous Properties. The results of the WAC tests shows no concentrations above the acceptance criteria for inert waste for the Wittering Formation, however the Made Ground revealed elevated concentrations of Total Organic Carbon above the inert waste threshold. Therefore the Wittering Formation would be classified as Inert Waste and the Made Ground as Non-Hazardous Waste.

A copy of the CatWasteSoil Output sheet has been included as Appendix D.

6.0 GEOTECHNICAL ASSESSMENT

6.1 Ground Conditions

6.1.1 The ACS investigation has revealed three geological units during the intrusive works. The units found are generally consistent with those shown on online geological maps and the previous site investigation works carried out. A description of the units revealed and their associated geotechnical parameters are discussed below.

6.1.2 Made Ground

Made Ground was revealed in all three boreholes to a maximum depth of 1.20m. The unit comprise concrete overlying either a dark brown very sandy very gravelly SILT or a light grey mottled brown / brown very silty very sandy GRAVEL.

6.1.3 Wittering Formation

Underlying the Made Ground were units from the Wittering Formation proven to a maximum depth of 5.30m, comprising grey / brown mottled yellow SILT or CLAY dominant layers.

SPT N values have revealed results between 0 and 12 showing that the unit is fairly variable. The N values reported indicate that the Wittering Formation is not a suitable bearing stratum for traditional foundations for the proposed building.

Atterberg Limit test results have shown the unit to be variable with the samples ranging from being non-plastic to have a modified plasticity index of 40%. This indicates that the Wittering Formation has non-shrinkable soils as well as soils with a high volume change potential. For a conservative approach it is recommended that the worst case scenario, high volume change potential, is used for design purposes.

Testing to assist with the design of buried concrete has revealed a minimum pH of 6.8 and a maximum water soluble sulphate of 30.8mg/l.

A summary of the Wittering Formation parameters is shown in Table 7 below.

Parameter	Minimum	Maximum
Moisture Content %	16	34
Plastic Limit %	Non-Plastic	23
Liquid Limit %		58
Plasticity Index %		40
Modified Plasticity Index %		40
Volume Change Potential	Non-Shrinkable	High
Undrained Shear Strength kPa		38
SPT[N] Value	0	12
pH	6.8	8.8
Water Soluble Sulphate mg/l	5.64	30.8

Table 7: Summary of Weathered Kellaway Formation parameters obtained from entire ACS investigation

6.1.4 London Clay Formation

The basal unit revealed was the London Clay which typically comprised a soft grey clayey slightly sandy SILT overlying a firm becoming very stiff grey silty slightly sandy CLAY. It is considered that competent units of the London Clay Formation caused the borehole refusals.

SPT N values were recorded in the London Clay Formation between 8 and >50 with N values typically increasing with depth. Undrained shear strengths were also shown to increase with depth with values between 41kPa and 245kPa recorded from undrained unconsolidated triaxial testing.

Atterberg Limit tests results have revealed the London Clay Formation to have a Modified Plasticity Index between 20% and 46% resulting in a medium to high volume change potential, resulting in the requirement for protection measures.

Buried concrete design testing revealed a minimum pH of 6.5 and a maximum water soluble sulphate of 909mg/l. As a pH of 6.5 has been recorded the aggressive chemical environment for concrete (ACEC) is elevated to resist acid conditions.

A summary of the London Clay Formation parameters is shown in Table 8 below.

Parameter	Minimum	Maximum
Moisture Content %	23	50
Plastic Limit %	16	21
Liquid Limit %	41	64
Plasticity Index %	20	46
Modified Plasticity Index %	20	46
Volume Change Potential	Medium	High
Undrained Shear Strength kPa	41	245
SPT[N] Value	8	>50
pH	6.5	8.0
Water Soluble Sulphate mg/l	72.9	909

Table 8: Summary of the Kellaway Formation parameters

6.2 Groundwater

- 6.2.1 Groundwater was struck within two of the three boreholes with resting levels recorded at 12.20m and 4.80m with reduced levels between 38.22mAOD and 31.94mAOD. Groundwater was also recorded at shallow levels within the Crossfield investigation. Water which was interpreted as perched was encountered at 1.00m within all the Crossfield exploratory holes.
- 6.2.2 Therefore considered that there is the potential for perched water to be present at shallow depths which may result in the need for localised pumping within shallow excavations during construction.
- 6.2.3 Although groundwater depths were found to be varied, based on the information obtained by Crossfield it is expected that groundwater will be encountered between depths of 5.00m to 10.00m, and should be expected to be encountered during piling.

6.3 Volume Change Potential

- 6.3.1 The samples that have been tested to determine index properties including Atterberg Limits have shown the soils to be highly variable. However Modified Plasticity Index results from both the Wittering Formation and London Clay Formation have exhibited a high volume change potential, in accordance with "NHBC 4.2 Building Near Trees".
- 6.3.2 Shrinkable soils are subject to change in volume as their moisture content is altered. Soil moisture contents vary seasonally and are influenced by a number of factors including the action of tree roots. The resulting shrinkage or swelling of the soil can cause subsidence or heave damage to foundations, the structures they support and services. It will be required that all floor slabs are suspended to allow for the ground to heave. Heave protection will also be required beneath and beside ground-beams, if a piled foundation solution is used.

6.4 Specification of Buried Concrete

- 6.4.1 Results from soil samples have determined a minimum pH of 6.5 and a maximum water soluble sulphate value of 909mg/l. It is considered that groundwater was encountered during the ACS therefore groundwater has been classed as mobile. In accordance with BRE Special Digest 1:2005 (Concrete in aggressive ground), the pH and water sulphate results for the site would classify the aggressive environment for concrete Design Sulphate Class DS-2, and Aggressive Chemical Environment for Concrete AC-3z.

7.0 CONSIDERATIONS & RECOMMENDATIONS

7.1 Foundation Design Recommendations

7.1.1 The selection and design of foundations and ground-floor slab construction is beyond the scope of current instructions and is the responsibility of the designers of the proposed building. The following recommendations, deriving from observations made during the investigation and testing are provided to assist the design process.

7.1.2 Due to the poor shallow ground revealed it has been decided by the Client that a piled foundation solution is to be progressed for the site. Based on the results of the investigation some preliminary guide pile lengths are included in the table below, however it is recommended that this report is submitted to Piling Contractors to enable a full design.

Pile Diameter (mm)	Pile Load (kN)		
	250	450	650
300	14.00	19.00	24.50
450	10.50	15.00	17.50
600	8.50	11.50	15.00

Table 9: Preliminary pile lengths

7.1.3 It is recommended that consideration is given to crushing demolition materials and re-using as a piling mat for the new building. The piling mat will need to be designed in accordance with current guidelines and best practice.

7.2 Ground Floor Construction

7.2.1 Due to the presence of shrinkable clay, it will be necessary for suspended / suspendable ground floor slabs to be utilised within the proposed building. Any organic material should be removed from beneath the proposed buildings.

7.2.2 Heave can take place in a shrinkable soil when it takes up moisture and swells after the felling or removal of trees and hedgerows. Heave precautions for a pile and beam solution should be taken into consideration which for high volume change potential should include the following;

- ▶ Void former capable of collapsing to form a 35mm void on the internal face of all external ground beams
- ▶ Void former capable of collapsing to form a 150mm void under all ground beams
- ▶ 300mm void under precast concrete floors

7.2.3 Trees / shrubs should be planted in accordance with NHBC 4.2 or similar guidance due to the presence of shrinkable soils.

7.3 Specification for Buried Concrete

7.3.1 All buried concrete for the site should comply with Design Sulphate Class DS-2, and Aggressive Chemical Environment for Concrete AC-3z.

7.4 Drainage

- 7.4.1 The intrusive investigation has revealed the shallow soils to comprise cohesive silt and clay indicating that soakaways are unlikely to be suitable for surface water drainage. Enquires should be made regarding the possibility of connecting surface water to the public sewer system.
- 7.4.2 Much of the existing site is covered with structures and hardstanding which appears to effectively drain. It will be necessary for the existing drainage networks to be assessed prior to demolition. Subject to the necessary authorisations it may be possible to re-use some of the existing drainage for future surface water disposal.

7.5 Pavement Design

- 7.5.1 If the proposed formation level is to be on the Wittering Formation it is considered that a California Bearing Ratio (CBR) between 2.5% and 3% should be suitable, based on the plasticity index results.
- 7.5.2 Following site clearance it is recommended that Plate Bearing Tests are undertaken at formation level to accurately determine CBR values.

8.0 QUALITY STATEMENT

- 8.1 We confirm that in preparing this report we have exercised reasonable skill and care in order to produce accurate details.
- 8.2 We confirm that testing has been conducted in accordance with relevant Standards, as requested by the Client, with reference to the Organisation's Quality Manual Procedures.
- 8.3 The results and contents of this report are based upon in-situ analysis and/or the laboratory testing of specimens or sample material submitted to the laboratory.
- 8.4 Consequently, comments contained herein are derived from the determination of the results from the analysed material and that of any additional information, drawings, plans or similar such data as supplied by the Client.
- 8.5 ACS Testing warrants only the accuracy of the test result and information contracted to be supplied to the Client but will accept no liability in respect of the use to which the Client puts such information or the purpose for which such information was requested.
- 8.6 Unless specifically assigned and confirmed in writing within the terms of the Agreement/Written Order the Organisation asserts and retains all Copyright and other Intellectual Property rights, in and over the report and its contents.

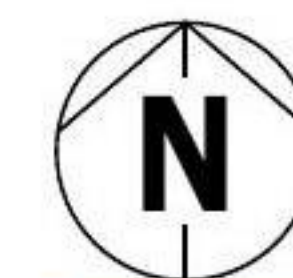
APPENDIX A

SITE LOCATION PLAN – 17-82110/01



Notes:

Key:



DO NOT SCALE

Drawing:
Site Location Plan

Client:
McCarthy & Stone Retirement Lifestyles Ltd

Project:	Project No:
38-44 London Road	17-82110
Purbeck	Drawing No:
Waterlooville	17-82110/01
PO7 5LJ	Revision:

Drawn By:	Date:
BG	27/04/2017

Checked By:	Date:
RJH	27/04/2017



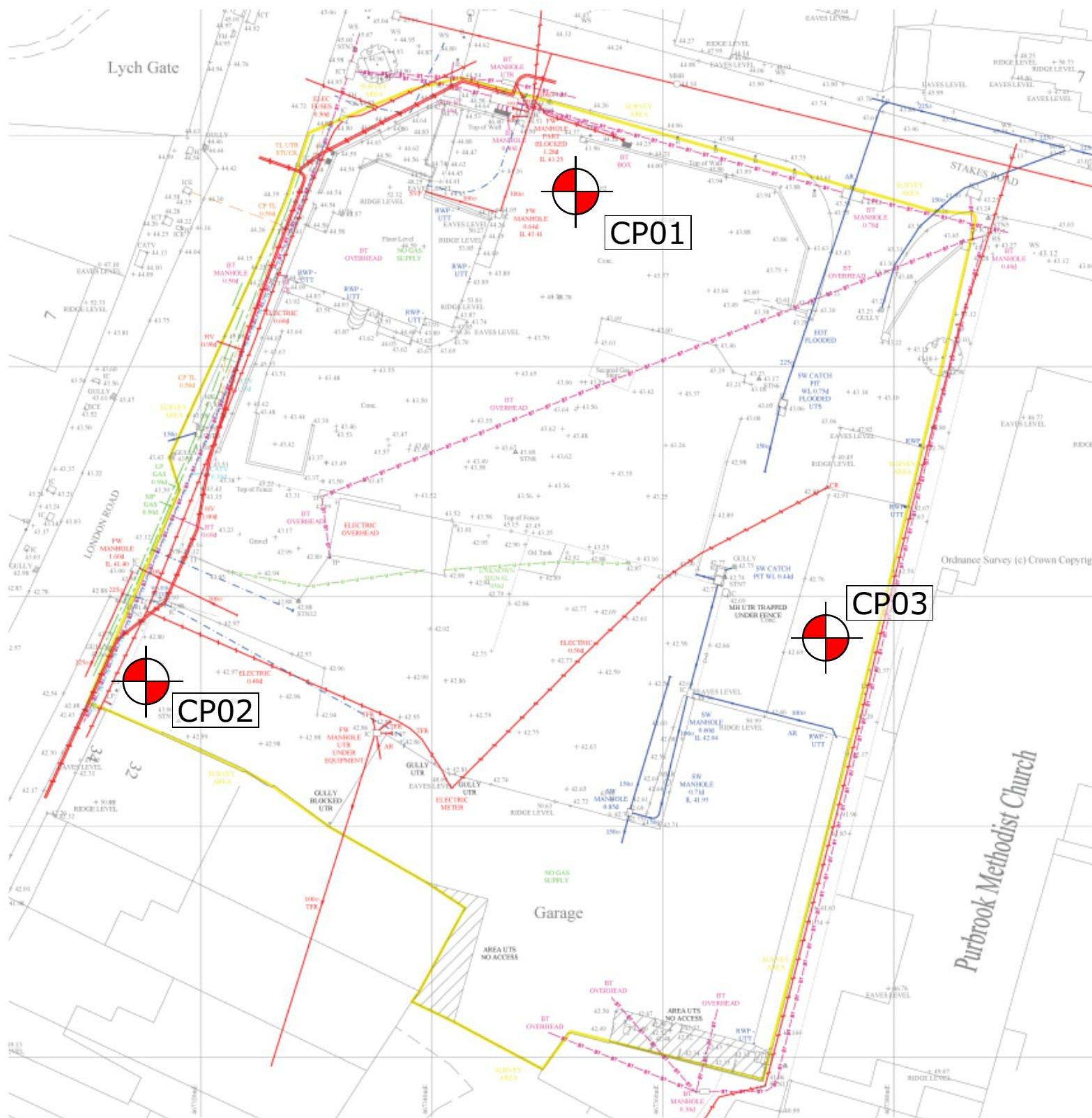
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Unit 14 Blackhill Road West
Holton Heath Trading Park
Poole, BH16 6LE
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APPENDIX B

EXPLORATORY HOLE LOCATION PLAN

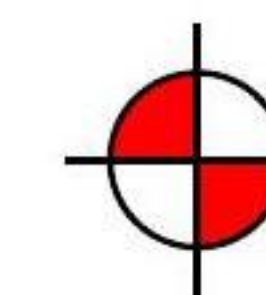
Current Plan – 17-82110/02
Proposed Plan – 17-8211/03





Notes:

Key:



Shell & Auger Borehole



DO NOT SCALE

Drawing:
Exploratory Hole Location Plan - Current Plan

Client:
McCarthy & Stone Retirement Lifestyles Ltd

Project: 38-44 London Road	Project No: 17-82110
Purbrook	Drawing No: 17-82110/02
Waterlooville	Revision:
PO7 5LJ	

Drawn By: BG	Date: 27/04/2017
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Checked By: RJH	Date: 27/04/2017
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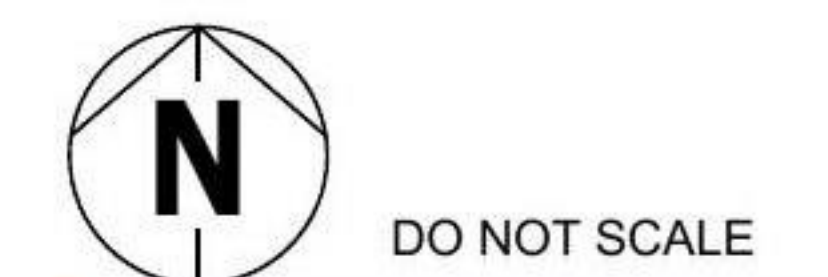


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Notes:

Key:



Drawing:
Exploratory Hole Location Plan - Proposed Plan

Client:
McCarthy & Stone Retirement Lifestyles Ltd

Project: 38-44 London Road Purbrook Waterlooville PO7 5LJ	Project No: 17-82110 Drawing No: 17-82110/03 Revision:
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Drawn By: BG	Date: 27/04/2017
-----------------	---------------------

Checked By: RJH	Date: 27/04/2017
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Unit 14 Blackhill Road West
Holton Heath Trading Park
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APPENDIX C

BOREHOLE LOGS – CP01-03



 ACS Testing Ltd Tel: 01202 622858 Fax: 01202 625045 Email: testing@acstesting.co.uk www.acstesting.co.uk		BOREHOLE LOG CABLE PERCUSSION				Borehole No. CP01 Sheet 1 of 2	
Client: McCarthy & Stone Retirement Lifestyles Ltd		Lab. Ref: 17-80954				Hole Type WLS	
Contract: 38-44 London Road		Drilling Equipment: Pilcon 1 Ton Shell & Auger Rig				Scale 1:55	
Location: Purbrook, Waterlooville						Logged By LF	
Ground Level (mAOD): 44.14		Co-ords: DNS		Date(s): 06/03/2017 - 07/03/2017			

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Backfill	Water Strike Depth	Casing Depth	Sample (Type) Depth	In Situ Testing		
									Depth	Type	Results
	CONCRETE.	0.10 (44.04)									
	MADE GROUND. Soft dark brown very sandy very gravelly SILT. Gravel comprises fine, medium and coarse; angular to sub-rounded concrete brick and flint.		(0.70)								
1	Very soft to soft grey mottled brown silty slightly sandy CLAY. Unit becomes increasingly silty and mottled yellow with depth. (WITTERING FORMATION)	0.80 (43.34)	(0.90)						1.20	SPT(S)	N=6 (1,1/1,1,2,2)
2	Very soft becoming firm grey mottled yellow silty slightly sandy CLAY. Unit becomes mottled red and orange with depth. (WITTERING FORMATION)	1.70 (42.44)						2.00 (U)			U100 Blows = 32 U100 Rec = 100%
			(1.60)					2.45			
3									3.00	SPT(S)	N=12 (1,2/3,2,3,4)
	Firm grey slightly clayey slightly sandy SILT. (LONDON CLAY FORMATION)	3.30 (40.84)									
4								4.00 (U)			U100 Blows = 40 U100 Rec = 100%
			(2.70)					4.45			
5									5.00	SPT(S)	N=15 (2,2/3,3,4,5)
6	Firm becoming stiff grey silty slightly sandy CLAY. (LONDON CLAY FORMATION)	6.00 (38.14)									
								6.50 (U)			U100 Blows = 50 U100 Rec = 40%
7								6.95			
8									8.00	SPT(S)	N=28 (4,5/6,7,7,8)
			(6.50)								
9								9.50 (U)			U100 Blows = 58 U100 Rec = 70%
								9.95			
10											

Remarks: Borehole terminated at 19.10m due to refusal in bedrock. Ground level inferred from topographical survey.	Chiselling		Groundwater Observations:					
	Depth	Time	Date	Strike	Casing	Time Elapsed	Standing	Remarks
	19.00-19.10m	01:15	06-03-2017	12.50m	10.50m	20mins	12.20m	
Technical Notes (where applicable): Fine grained soil consistencies and rock strengths have been determined by hand worked field tests as described in BS5930:2015. Coarse grained soil densities are described based on SPT[N] values where available. Chalk is described in accordance with CIRIA C574.								



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Tel: 01202 622858
Fax: 01202 625045
Email: testing@acstesting.co.uk
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BOREHOLE LOG

CABLE PERCUSSION

Borehole No.

CP01

Sheet 2 of 2

Client: McCarthy & Stone Retirement Lifestyles Ltd

Contract: 38-44 London Road

Location: Purbrook, Waterlooville

Lab. Ref: 17-80954

Drilling Equipment: Pilcon 1 Ton Shell & Auger Rig

Hole Type: WLS

Scale: 1:55

Logged By: LF

Ground Level (mAOD): 44.14

Co-ords: DNS

Date(s): 06/03/2017 - 07/03/2017

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Backfill	Water Strike Depth	Casing Depth	Sample (Type) Depth	In Situ Testing		
									Depth	Type	Results
11	Firm becoming stiff grey silty slightly sandy CLAY. (LONDON CLAY FORMATION)								11.00	SPT(S)	N=44 (6,7/8,10,12,14)
12	Firm becoming very stiff grey silty slightly sandy CLAY. (LONDON CLAY FORMATION)	12.50 (31.64)				12.50	10.50	12.50 (U)			U100 Blows = 150 U100 Rec = 90%
								12.95			
13											
14											
15											
16								15.50 (U)			U100 Blows = 150 U100 Rec = 70%
								15.95			
17											
18											
19	LIMESTONE ROCK. Drillers description. End of Borehole at 19.100m	19.00 (25.14)									
		19.10 (25.04)									
20											

Remarks:

Borehole terminated at 19.10m due to refusal in bedrock. Ground level inferred from topographical survey.

Chiselling

Depth	Time
19.00-19.10m	01:15

Groundwater Observations:

Date	Strike	Casing	Time Elapsed	Standing	Remarks
06-03-2017	12.50m	10.50m	20mins	12.20m	

Technical Notes (where applicable):

Fine grained soil consistencies and rock strengths have been determined by hand worked field tests as described in BS5930:2015. Coarse grained soil densities are described based on SPT[N] values where available. Chalk is described in accordance with CIRIA C574.



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Tel: 01202 622858
Fax: 01202 625045
Email: testing@acstesting.co.uk
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BOREHOLE LOG

CABLE PERCUSSION

Borehole No.

CP02

Sheet 1 of 2

Client: McCarthy & Stone Retirement Lifestyles Ltd

Contract: 38-44 London Road

Location: Purbrook, Waterlooville

Lab. Ref: 17-80954

Drilling Equipment: Pilcon 1 Ton Shell & Auger Rig

Hole Type: WLS

Scale: 1:55

Logged By: LF

Ground Level (mAOD): 43.02

Co-ords: DNS

Date(s): 07/03/2017 - 08/03/2017

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Backfill	Water Strike Depth	Casing Depth	Sample (Type) Depth	In Situ Testing		
									Depth	Type	Results
	CONCRETE	0.10 (42.92)									
	MADE GROUND. Light grey mottled brown very silty very sandy GRAVEL. Gravel comprises fine, medium and coarse; angular to sub-rounded flint and brick. Numerous angular cobble bricks noted.	0.40 (42.62)									
1	Soft to firm light brown mottled yellow slightly clayey slightly gravelly SILT. Gravel comprises fine, medium and coarse; sub-angular to sub-rounded flint. (WITTERING FORMATION)	1.20 (41.82)	(0.80)						1.20	SPT(S)	N=7 (1,1/2,2,1,2)
2	Soft grey mottled yellow slightly clayey slightly sandy slightly gravelly SILT. Gravel comprises fine to medium; sub-angular to sub-rounded flint. Unit is mottled orange in places and gravel is less frequent at depth. (WITTERING FORMATION)								2.00	SPT(S)	N=7 (1,1/1,2,2,2)
3									3.00	SPT(S)	N=4 (1,1/1,1,1,1)
4			(4.10)						4.00	SPT(S)	N=0 (1,0/0,0,0,0)
5						5.00	5.00		5.00	SPT(S)	N=10 (2,2/2,2,3,3)
	Firm becoming stiff grey silty slightly sandy CLAY. (LONDON CLAY FORMATION)	5.30 (37.72)									
6								6.50 (U)			U100 Blows = 32 U100 Rec = 100%
7								6.95			
8									8.00	SPT(S)	N=34 (5,6/7,8,9,10)
9											
									9.50	SPT(S)	N=48 (6,9/9,11,13,15)
10											

Remarks:

Borehole terminated at 15.60m due to refusal in bedrock. Ground level inferred from topographical survey.

Chiselling

Depth	Time
15.50-15.60m	01:00

Groundwater Observations:

Date	Strike	Casing	Time Elapsed	Standing	Remarks
07-03-2017	5.00m	5.00m	20mins	4.80m	

Technical Notes (where applicable):

Fine grained soil consistencies and rock strengths have been determined by hand worked field tests as described in BS5930:2015. Coarse grained soil densities are described based on SPT[N] values where available. Chalk is described in accordance with CIRIA C574.

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Client: McCarthy & Stone Retirement Lifestyles Ltd				Lab. Ref: 17-80954				Hole Type WLS		
Contract: 38-44 London Road				Drilling Equipment: Pilcon 1 Ton Shell & Auger Rig				Scale 1:55		
Location: Purbrook, Waterlooville								Logged By LF		
Ground Level (mAOD): 43.02		Co-ords: DNS		Date(s): 07/03/2017 - 08/03/2017						
All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Backfill	Water Strike Depth	Casing Depth	Sample (Type) Depth	In Situ Testing	
									Depth	Type
11	Firm becoming stiff grey silty slightly sandy CLAY. (LONDON CLAY FORMATION)		(10.20)					11.00 (U) 11.45		U100 Blows = 120 U100 Rec = 100%
12								12.50	SPT(S)	N=40 (6,7/10,10,10,10)
13								14.00	SPT(S)	N=54 (10,11/13,13,13,15)
14								15.50	SPT(S)	100 (25 for 10mm/100 for 10mm)
15	LIMESTONE ROCK. Drillers description. End of Borehole at 15.600m	15.50 (27.52) 15.60 (27.42)						15.60	SPT(S)	100 (25 for 10mm/100 for 10mm)
16										
17										
18										
19										
20										
Remarks: Borehole terminated at 15.60m due to refusal in bedrock. Ground level inferred from topographical survey.		Chiselling		Groundwater Observations:						
		Depth	Time	Date	Strike	Casing	Time Elapsed	Standing	Remarks	
		15.50-15.60m	01:00	07-03-2017	5.00m	5.00m	20mins	4.80m		
		Technical Notes (where applicable): Fine grained soil consistencies and rock strengths have been determined by hand worked field tests as described in BS5930:2015. Coarse grained soil densities are described based on SPT[N] values where available. Chalk is described in accordance with CIRIA C574.								



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Fax: 01202 625045
Email: testing@acstesting.co.uk
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BOREHOLE LOG

CABLE PERCUSSION

Borehole No.
CP03
Sheet 1 of 2

Client: McCarthy & Stone Retirement Lifestyles Ltd

Contract: 38-44 London Road

Location: Purbrook, Waterlooville

Lab. Ref: 17-80954

Drilling Equipment: Pilcon 1 Ton Shell & Auger Rig

Hole Type: WLS

Scale: 1:55

Logged By: LF

Ground Level (mAOD): 42.80

Co-ords: DNS

Date(s): 08/03/2017

All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Backfill	Water Strike Depth	Casing Depth	Sample (Type) Depth	In Situ Testing		
									Depth	Type	Results
	CONCRETE.										
	MADE GROUND. Brown very silty very sandy GRAVEL. Gravel comprises fine, medium and coarse; sub-angular to sub-rounded flint, concrete and brick.	0.25 (42.55)	(0.95)								
1											
	Soft grey mottled brown very silty slightly sandy CLAY. Unit becomes dominantly brown with depth and has mottled orange areas throughout. (WITTERING FORMATION)	1.20 (41.60)	(2.80)						1.20	SPT(S)	N=2 (1,0/1,0,1,0)
2								2.00 (U)			U100 Blows = 25 U100 Rec = 80%
								2.45			
3									3.00	SPT(S)	N=9 (1,1/1,2,3,3)
4	Soft grey clayey slightly sandy SILT. (LONDON CLAY FORMATION)	4.00 (38.80)	(1.10)						4.00	SPT(S)	N=8 (1,1/2,2,2,2)
5											
	Firm grey silty slightly sandy CLAY. (LONDON CLAY FORMATION)	5.10 (37.70)	(6.10)					5.00 (U)			U100 Blows = 53 U100 Rec = 100%
								5.45			
6											
									6.50	SPT(S)	N=16 (2,2/3,3,5,5)
7											
8									8.00	SPT(S)	N=22 (3,3/4,5,6,7)
9											
								9.50 (U)			U100 Blows = 75 U100 Rec = 100%
								9.95			
10											

Remarks:

Borehole terminated at 11.40m due to refusal in bedrock. Groundwater not encountered. Ground level inferred from topographical survey.

Chiselling

Depth	Time
11.20-11.40m	01:00

Groundwater Observations:

Date	Strike	Casing	Time Elapsed	Standing	Remarks

Technical Notes (where applicable):

Fine grained soil consistencies and rock strengths have been determined by hand worked field tests as described in BS5930:2015. Coarse grained soil densities are described based on SPT[N] values where available. Chalk is described in accordance with CIRIA C574.

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Client: McCarthy & Stone Retirement Lifestyles Ltd				Lab. Ref: 17-80954				Hole Type WLS			
Contract: 38-44 London Road				Drilling Equipment: Pilcon 1 Ton Shell & Auger Rig				Scale 1:55			
Location: Purbrook, Waterlooville								Logged By LF			
Ground Level (mAOD): 42.80		Co-ords: DNS		Date(s): 08/03/2017							
All units = (m)	Stratum Description	Depth (Level)	Thickness	Legend	Backfill	Water Strike Depth	Casing Depth	Sample (Type) Depth	In Situ Testing		
									Depth	Type	Results
11	Firm grey silty slightly sandy CLAY. (LONDON CLAY FORMATION)								11.00	SPT(S)	50 (25,40/50 for 70mm)
	LIMESTONE ROCK. Drillers description.	11.20 (31.60)							11.40	SPT(S)	100 (25 for 10mm/100 for 10mm)
	End of Borehole at 11.400m	11.40 (31.40)									
12											
13											
14											
15											
16											
17											
18											
19											
20											
Remarks:		Chiselling		Groundwater Observations:							
Borehole terminated at 11.40m due to refusal in bedrock. Groundwater not encountered. Ground level inferred from topographical survey.		Depth	Time	Date	Strike	Casing	Time Elapsed	Standing	Remarks		
		11.20-11.40m	01:00								
		Technical Notes (where applicable): Fine grained soil consistencies and rock strengths have been determined by hand worked field tests as described in BS5930:2015. Coarse grained soil densities are described based on SPT[N] values where available. Chalk is described in accordance with CIRIA C574.									

APPENDIX D

LABORATORY TEST CERTIFICATES

17-80954

17-06607-01

17-11334-01

CatWasteSoil Output Sheet



CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327114	Head Office Certificate No : 327114-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	In-Situ	
Client reference/data :	CP01	
Location of sample on site :	2.70m	
Borehole/pit no / depth :	N/A @ N/A m	
Date sampled :	06/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Grey mottled yellow silty slightly sandy CLAY	
Total mass received :	0.80 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

The test specimen was oven dried at : **108** °C

Moisture content : **34** %

Remarks : **None**

Tested by : **LTMMJKSAS** Date tested : **23.03.2017** Approved :  **Andy Bates Laboratory Manager** Date : **28/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

Any statement of compliance with a given specification relates only to the test covered by this certificate.

Opinions and interpretations, if stated, are not within the scope of our UKAS accreditation

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Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office

Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Testing Limited
Registered in England and
Wales No. 4639658



*Quality Testing & Materials Consultancy
to the
Construction Industry*



**CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0**

Laboratory reference no(s) : **17-80954 - 327114** Head Office Certificate No : **327114-17-80954-S4**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
 Certificate address : **4th Floor, 100 Holdenhurst Road
 Bournemouth
 Dorset
 BH8 8AQ**

Contract : **Purbrook - London Road**
 Source of material (as indicated by client) : **in-situ**
 Client reference/data : **CP01**
 Location of sample on site : **2.70m**
 Borehole/pit no / depth : **N/A @ N/A m**
 Date sampled : **06/03/2017**
 Sampled by : **ODA**
 Date received : **01/03/2017**
 Material description : **Grey mottled yellow silty slightly sandy CLAY**
 Total mass received : **0.80 kg**
 Method of preparation : **BS 1377 : Part 1 & Part 2**
 Variation from test procedure : **None**
 Location & orientation of test specimen within original sample : **N/A**

Sampling certificate : **No - None Submitted**
 Client's indicated specification(s) : **n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	0	%
Proportion of material passing 425 µm test sieve	:	100	%
Plastic limit	:	18	%
Liquid limit	:	58	%
Plasticity index	:	40	%
Liquidity index	:	0.400	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : **DHLTM** Date tested : **28.03.2017** Approved :  Date : **31/03/2017**
 Andy Bates Laboratory Manager

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
 Any statement of compliance with a given specification relates only to the test covered by this certificate.
 Opinions and interpretations, if stated, are not within the scope of our UKAS accreditation
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Head Office

Unit 14
 Blackhill Road West
 Holton Heath Trading Park
 Poole
 Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office

Unit 14
 Blackhill Road West
 Holton Heath Trading Park
 Poole
 Dorset BH16 6LE
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**CERTIFICATE OF TEST - DETERMINATION OF THE UNDRAINED SHEAR STRENGTH
IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)
TESTED IN ACCORDANCE WITH BS 1377 : PART 7 : 1990 : CLAUSE 8**

Laboratory reference no(s) : **17-80954 - 327115** Head Office Certificate No : **327115-17-80954-S42-U100 x1**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
Certificate address : **4th Floor, 100 Holdenhurst Road
Bournemouth
Dorset
BH8 8AQ**

Contract : **Purbrook - London Road**
Source of material (as indicated by client) : **in-situ**
Client reference/data : **CP01**
Location of sample on site : **4.00-4.45m**
Borehole/pit no /depth : **N/A @ N/A m**
Date sampled : **06/03/2017**
Sampled by : **ODA**
Date received : **01/03/2017**
Material description : **Grey slightly clayey slightly sandy SILT**
Total mass received : **7.74 kg**
Method of preparation : **BS 1377 : Part 1**
Variation from test procedure : **None**
Location & orientation of test specimen within original sample : **N/A**
Sampling certificate : **No - None Submitted**
Client's indicated specification(s) : **n/a**

Specimen details	Sample A
Specimen condition :	Remoulded
Length (mm) :	203.4
Diameter (mm) :	102.7
Moisture content (%) :	24.4
Bulk Density (Mg/m ³) :	2.01
Dry Density (Mg/m ³) :	1.62
Test Details	Sample A
Type of membrane :	Latex
Membrane thickness (mm) :	0.3
Correction applied (kPa) :	1.0
Rate of strain (%/min) :	1.0
Cell Pressure (kPa) :	80
Strain at failure (%) :	18.2
Maximum deviator stress (kPa) :	83
Shear strength (kPa) :	41
Mode of failure :	

Remarks : **This sample tested was within UKAS accredited force load range.**

Tested by : **MW** Date tested : **03.04.2017** Approved :  Laboratory Manager Date : **05/04/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327116	Head Office Certificate No : 327116-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	In-Situ	
Client reference/data :	CP01	
Location of sample on site :	4.70m	
Borehole/pit no / depth :	N/A @ N/A m	
Date sampled :	06/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Grey slightly clayey slightly sandy SILT	
Total mass received :	0.77 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

The test specimen was oven dried at : **108** °C

Moisture content : **27** %

Remarks : **None**

Tested by : **LTMMJKSAS** Date tested : **23.03.2017** Approved :  Laboratory Manager Date : **28/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) : **17-80954 - 327116** Head Office Certificate No : **327116-17-80954-S4**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
 Certificate address : **4th Floor, 100 Holdenhurst Road
 Bournemouth
 Dorset
 BH8 8AQ**

Contract : **Purbrook - London Road**
 Source of material (as indicated by client) : **In-Situ**
 Client reference/data : **CP01**
 Location of sample on site : **4.70m**
 Borehole/pit no / depth : **N/A @ N/A m**
 Date sampled : **06/03/2017**
 Sampled by : **ODA**
 Date received : **01/03/2017**
 Material description : **Grey slightly clayey slightly sandy SILT**
 Total mass received : **0.77 kg**
 Method of preparation : **BS 1377 : Part 1 & Part 2**
 Variation from test procedure : **None**
 Location & orientation of test specimen within original sample : **N/A**

Sampling certificate : **No - None Submitted**
 Client's indicated specification(s) : **n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	0	%
Proportion of material passing 425 µm test sieve	:	100	%
Plastic limit	:	20	%
Liquid limit	:	41	%
Plasticity index	:	21	%
Liquidity index	:	0.333	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : **DHLTMMEW** Date tested : **27.03.2017** Approved : **Andy Bates Laboratory Manager** Date : **28/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327117	Head Office Certificate No : 327117-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	In-Situ	
Client reference/data :	CP01	
Location of sample on site :	7.50m	
Borehole/pit no / depth :	N/A @ N/A m	
Date sampled :	06/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Grey silty slightly sandy CLAY	
Total mass received :	0.61 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

The test specimen was oven dried at : **108** °C

Moisture content : **23** %

Remarks : **None**

Tested by : **LTMMJKSAS** Date tested : **23.03.2017** Approved :  ry Manager Date : **28/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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**CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0**

Laboratory reference no(s) : **17-80954 - 327117** Head Office Certificate No : **327117-17-80954-S4**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
 Certificate address : **4th Floor, 100 Holdenhurst Road
 Bournemouth
 Dorset
 BH8 8AQ**

Contract : **Purbrook - London Road**
 Source of material (as indicated by client) : **in-situ**
 Client reference/data : **CP01**
 Location of sample on site : **7.50m**
 Borehole/pit no / depth : **N/A @ N/A m**
 Date sampled : **06/03/2017**
 Sampled by : **ODA**
 Date received : **01/03/2017**
 Material description : **Grey silty slightly sandy CLAY**
 Total mass received : **0.61 kg**
 Method of preparation : **BS 1377 : Part 1 & Part 2**
 Variation from test procedure : **None**
 Location & orientation of test specimen within original sample : **N/A**

Sampling certificate : **No - None Submitted**
 Client's indicated specification(s) : **n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	0	%
Proportion of material passing 425 µm test sieve	:	100	%
Plastic limit	:	16	%
Liquid limit	:	48	%
Plasticity index	:	32	%
Liquidity index	:	0.219	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : **DHLTM** Date tested : **28.03.2017** Approved : **Andy Bates Laboratory Manager** Date : **31/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327118	Head Office Certificate No : 327118-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	in-situ	
Client reference/data :	CP01	
Location of sample on site :	13.60m	
Borehole/pit no / depth :	N/A @ N/A m	
Date sampled :	06/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Grey silty slightly sandy CLAY	
Total mass received :	0.74 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

The test specimen was oven dried at : **108** °C

Moisture content : **50** %

Remarks : **None**

Tested by : **DHLTMMJKSAS** Date tested : **23.03.2017** Approved :  Manager Date : **31/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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**CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0**

Laboratory reference no(s) : **17-80954 - 327118** Head Office Certificate No : **327118-17-80954-S4**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
 Certificate address : **4th Floor, 100 Holdenhurst Road
 Bournemouth
 Dorset
 BH8 8AQ**

Contract : **Purbrook - London Road**
 Source of material (as indicated by client) : **in-situ**
 Client reference/data : **CP01**
 Location of sample on site : **13.60m**
 Borehole/pit no / depth : **N/A @ N/A m**
 Date sampled : **06/03/2017**
 Sampled by : **ODA**
 Date received : **01/03/2017**
 Material description : **Grey silty slightly sandy CLAY**
 Total mass received : **0.74 kg**
 Method of preparation : **BS 1377 : Part 1 & Part 2**
 Variation from test procedure : **None**
 Location & orientation of test specimen within original sample : **N/A**

Sampling certificate : **No - None Submitted**
 Client's indicated specification(s) : **n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	0	%
Proportion of material passing 425 µm test sieve	:	100	%
Plastic limit	:	19	%
Liquid limit	:	46	%
Plasticity index	:	27	%
Liquidity index	:	1.148	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : **DHLTM** Date tested : **29.03.2017** Approved :  **Andy Bates Laboratory Manager** Date : **31/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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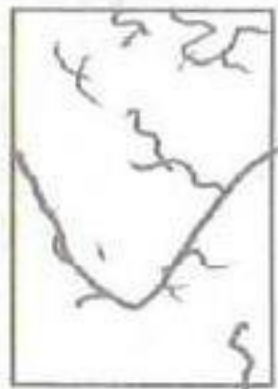


**CERTIFICATE OF TEST - DETERMINATION OF THE UNDRAINED SHEAR STRENGTH
IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)
TESTED IN ACCORDANCE WITH BS 1377 : PART 7 : 1990 : CLAUSE 8**

Laboratory reference no(s) : **17-80954 - 327119** Head Office Certificate No : **327119-17-80954-S42-U100 x1**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
Certificate address : **4th Floor, 100 Holdenhurst Road
Bournemouth
Dorset
BH8 8AQ**

Contract : **Purbrook - London Road**
Source of material (as indicated by client) : **in-situ**
Client reference/data : **CP01**
Location of sample on site : **15.50-15.95m**
Borehole/pit no /depth : **N/A @ N/A m**
Date sampled : **06/03/2017**
Sampled by : **ODA**
Date received : **01/03/2017**
Material description : **Grey silty slightly sandy CLAY**
Total mass received : **5.88 kg**
Method of preparation : **BS 1377 : Part 1**
Variation from test procedure : **None**
Location & orientation of test specimen within original sample : **N/A**
Sampling certificate : **No - None Submitted**
Client's indicated specification(s) : **n/a**

Specimen details	Sample A
Specimen condition :	Remoulded
Length (mm) :	204.1
Diameter (mm) :	103.3
Moisture content (%) :	19.5
Bulk Density (Mg/m ³) :	2.05
Dry Density (Mg/m ³) :	1.72
Test Details	Sample A
Type of membrane :	Latex
Membrane thickness (mm) :	0.3
Correction applied (kPa) :	0.7
Rate of strain (%/min) :	1.0
Cell Pressure (kPa) :	310
Strain at failure (%) :	11.3
Maximum deviator stress (kPa) :	491
Shear strength (kPa) :	245
Mode of failure :	

Remarks : **This sample tested was within UKAS accredited force load range.**

Tested by : **MW** Date tested : **03.04.2017** Approved :  **Quality Manager** Date : **05/04/2017**

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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327121	Head Office Certificate No : 327121-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	In-Situ	
Client reference/data :	CP02	
Location of sample on site :	0.60m	
Borehole/pit no / depth :	N/A @ N/A m	
Date sampled :	07/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Brown slightly clayey slightly gravelly SILT	
Total mass received :	1.01 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

The test specimen was oven dried at : **108** °C

Moisture content : **16** %

Remarks : **None**

Tested by : **LTMMJKSAS** Date tested : **23.03.2017** Approved :  Laboratory Manager Date : **28/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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**CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0**

Laboratory reference no(s) :	17-80954 - 327121	Head Office Certificate No : 327121-17-80954-S4
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth Dorset BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	In-Situ	
Client reference/data :	CP02	
Location of sample on site :	0.60m	
Borehole/pit no / depth	N/A @ N/A m	
Date sampled :	07/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Brown slightly clayey slightly gravelly SILT	
Total mass received :	1.01 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

Soil washed through 425 µm test sieve (B.S. 1377 : Part 2 : 1990 Clause 4.2.4)

Proportion of material retained on 425 µm test sieve	:	37	%
Proportion of material passing 425 µm test sieve	:	63	%
Plastic limit	:	15	%
Liquid limit	:	27	%
Plasticity index	:	12	%
Liquidity index	:	0.866	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : DHLTMMEW	Date tested : 24.03.2017	Approved :  Quality Manager	Date : 28/03/2017
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Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327123	Head Office Certificate No :	327123-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited		
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ		
Contract :	Purbrook - London Road		
Source of material (as indicated by client) :	in-situ		
Client reference/data :	CP02		
Location of sample on site :	2.70m		
Borehole/pit no / depth :	N/A @ N/A m		
Date sampled :	07/03/2017		
Sampled by :	ODA		
Date received :	01/03/2017		
Material description :	Grey clayey slightly sandy slightly gravelly SILT		
Total mass received :	0.90 kg		
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990		
Variation from test procedure :	None		
Location & orientation of test specimen within original sample :	N/A		
Sampling certificate :	No - None Submitted		
Client's indicated specification(s) :	n/a		

The test specimen was oven dried at : **108** °C

Moisture content : **29** %

Remarks : **None**

Tested by : **LTMMJKSAS** Date tested : **23.03.2017** Approved :  Date : **31/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0

Laboratory reference no(s) : **17-80954 - 327123** Head Office Certificate No : **327123-17-80954-S4**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
 Certificate address : **4th Floor, 100 Holdenhurst Road
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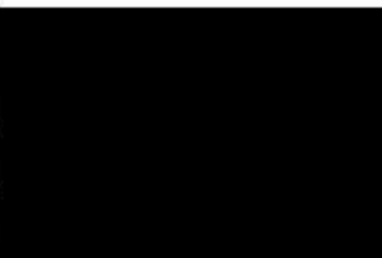
Contract : **Purbrook - London Road**
 Source of material (as indicated by client) : **in-situ**
 Client reference/data : **CP02**
 Location of sample on site : **2.70m**
 Borehole/pit no / depth : **N/A @ N/A m**
 Date sampled : **07/03/2017**
 Sampled by : **ODA**
 Date received : **01/03/2017**
 Material description : **Grey clayey slightly sandy slightly gravelly SILT**
 Total mass received : **0.90 kg**
 Method of preparation : **BS 1377 : Part 1 & Part 2**
 Variation from test procedure : **None**
 Location & orientation of test specimen within original sample : **N/A**

Sampling certificate : **No - None Submitted**
 Client's indicated specification(s) : **n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	0	%
Proportion of material passing 425 µm test sieve	:	100	%
Plastic limit	:	NON PLASTIC	%
Liquid limit	:	N/A	%
Plasticity index	:	N/A	%
Liquidity index	:	N/A	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : **DHLTM** Date tested : **28.03.2017** Approved :  Manager Date : **31/03/2017**

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 Dorset BH16 6LE

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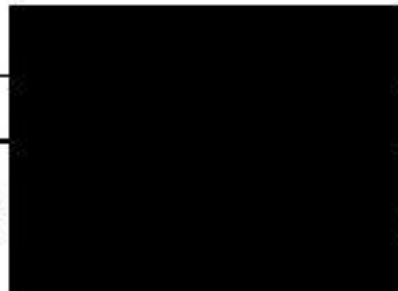
CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327124	Head Office Certificate No :	327124-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited		
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ		
Contract :	Purbrook - London Road		
Source of material (as indicated by client) :	In-Situ		
Client reference/data :	CP02		
Location of sample on site :	6.00m		
Borehole/pit no / depth :	N/A @ N/A m		
Date sampled :	07/03/2017		
Sampled by :	ODA		
Date received :	01/03/2017		
Material description :	Grey silty slightly sandy CLAY		
Total mass received :	0.61 kg		
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990		
Variation from test procedure :	None		
Location & orientation of test specimen within original sample :	N/A		
Sampling certificate :	No - None Submitted		
Client's indicated specification(s) :	n/a		

The test specimen was oven dried at : **108** °C

Moisture content : **30** %

Remarks : **None**

Tested by : **LTMMJKSAS** Date tested : **23.03.2017** Approved :  Manager Date : **28/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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**CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0**

Laboratory reference no(s) : **17-80954 - 327124** Head Office Certificate No : **327124-17-80954-S4**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
 Certificate address : **4th Floor, 100 Holdenhurst Road
 Bournemouth
 Dorset
 BH8 8AQ**

Contract : **Purbrook - London Road**
 Source of material (as indicated by client) : **in-situ**
 Client reference/data : **CP02**
 Location of sample on site : **6.00m**
 Borehole/pit no / depth : **N/A @ N/A m**
 Date sampled : **07/03/2017**
 Sampled by : **ODA**
 Date received : **01/03/2017**
 Material description : **Grey silty slightly sandy CLAY**
 Total mass received : **0.61 kg**
 Method of preparation : **BS 1377 : Part 1 & Part 2**
 Variation from test procedure : **None**
 Location & orientation of test specimen within original sample : **N/A**

Sampling certificate : **No - None Submitted**
 Client's indicated specification(s) : **n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	0	%
Proportion of material passing 425 µm test sieve	:	100	%
Plastic limit	:	19	%
Liquid limit	:	61	%
Plasticity index	:	42	%
Liquidity index	:	0.262	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : **DHLTM** Date tested : **29.03.2017** Approved :  Date : **31/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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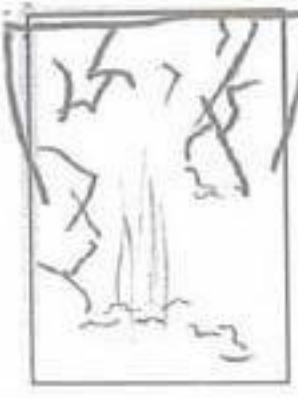


**CERTIFICATE OF TEST - DETERMINATION OF THE UNDRAINED SHEAR STRENGTH
IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)
TESTED IN ACCORDANCE WITH BS 1377 : PART 7 : 1990 : CLAUSE 8**

Laboratory reference no(s) : **17-80954 - 327125** Head Office Certificate No : **327125-17-80954-S42-U100 x1**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
Certificate address : **4th Floor, 100 Holdenhurst Road
Bournemouth
Dorset
BH8 8AQ**

Contract : **Purbrook - London Road**
Source of material (as indicated by client) : **in-situ**
Client reference/data : **CP02**
Location of sample on site : **6.50-6.95m**
Borehole/pit no /depth : **N/A @ N/A m**
Date sampled : **07/03/2017**
Sampled by : **ODA**
Date received : **01/03/2017**
Material description : **Grey silty slightly sandy CLAY**
Total mass received : **6.97 kg**
Method of preparation : **BS 1377 : Part 1**
Variation from test procedure : **None**
Location & orientation of test specimen within original sample : **N/A**
Sampling certificate : **No - None Submitted**
Client's indicated specification(s) : **n/a**

Specimen details	Sample A
Specimen condition :	Remoulded
Length (mm) :	204.0
Diameter (mm) :	102.6
Moisture content (%) :	26.6
Bulk Density (Mg/m ³) :	1.93
Dry Density (Mg/m ³) :	1.52
Test Details	Sample A
Type of membrane :	Latex
Membrane thickness (mm) :	0.3
Correction applied (kPa) :	1.1
Rate of strain (%/min) :	1.0
Cell Pressure (kPa) :	130
Strain at failure (%) :	19.6
Maximum deviator stress (kPa) :	124
Shear strength (kPa) :	62
Mode of failure :	

Remarks : **This sample tested was within UKAS accredited force load range.**

Tested by : **MW** Date tested : **27.03.2017** Approved :  Laboratory Manager Date : **05/04/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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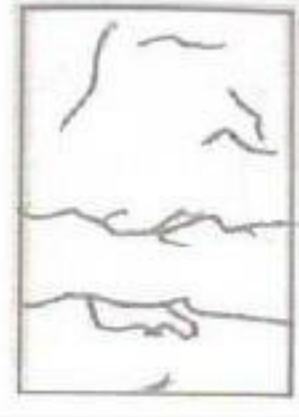


**CERTIFICATE OF TEST - DETERMINATION OF THE UNDRAINED SHEAR STRENGTH
IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)
TESTED IN ACCORDANCE WITH BS 1377 : PART 7 : 1990 : CLAUSE 8**

Laboratory reference no(s) : **17-80954 - 327127** Head Office Certificate No : **327127-17-80954-S42-U100 x1**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
Certificate address : **4th Floor, 100 Holdenhurst Road
Bournemouth
Dorset
BH8 8AQ**

Contract : **Purbrook - London Road**
Source of material (as indicated by client) : **in-situ**
Client reference/data : **CP02**
Location of sample on site : **11.00-11.45m**
Borehole/pit no /depth : **N/A @ N/A m**
Date sampled : **07/03/2017**
Sampled by : **ODA**
Date received : **01/03/2017**
Material description : **Grey silty slightly sandy CLAY**
Total mass received : **7.90 kg**
Method of preparation : **BS 1377 : Part 1**
Variation from test procedure : **None**
Location & orientation of test specimen within original sample : **N/A**
Sampling certificate : **No - None Submitted**
Client's indicated specification(s) : **n/a**

Specimen details	Sample A
Specimen condition :	Remoulded
Length (mm) :	204.4
Diameter (mm) :	103.1
Moisture content (%) :	22.2
Bulk Density (Mg/m ³) :	2.04
Dry Density (Mg/m ³) :	1.67
Test Details	Sample A
Type of membrane :	Latex
Membrane thickness (mm) :	0.3
Correction applied (kPa) :	0.9
Rate of strain (%/min) :	1.0
Cell Pressure (kPa) :	220
Strain at failure (%) :	14.2
Maximum deviator stress (kPa) :	288
Shear strength (kPa) :	144
Mode of failure :	

Remarks : **This sample tested was within UKAS accredited force load range.**

Tested by : **MW** Date tested : **03.04.2017** Approved :  **dry Manager** Date : **05/04/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327128	Head Office Certificate No : 327128-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	In-Situ	
Client reference/data :	CP02	
Location of sample on site :	15.00m	
Borehole/pit no / depth :	N/A @ N/A m	
Date sampled :	08/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Grey silty slightly sandy CLAY	
Total mass received :	0.49 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

The test specimen was oven dried at : **108** °C

Moisture content : **26** %

Remarks : **None**

Tested by : **LTMMJKSAS** Date tested : **23.03.2017** Approved :  Laboratory Manager Date : **28/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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**CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0**

Laboratory reference no(s) : **17-80954 - 327128** Head Office Certificate No : **327128-17-80954-S4**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
 Certificate address : **4th Floor, 100 Holdenhurst Road
 Bournemouth
 Dorset
 BH8 8AQ**

Contract : **Purbrook - London Road**
 Source of material (as indicated by client) : **in-situ**
 Client reference/data : **CP02**
 Location of sample on site : **15.00m**
 Borehole/pit no / depth : **N/A @ N/A m**
 Date sampled : **08/03/2017**
 Sampled by : **ODA**
 Date received : **01/03/2017**
 Material description : **Grey silty slightly sandy CLAY**
 Total mass received : **0.49 kg**
 Method of preparation : **BS 1377 : Part 1 & Part 2**
 Variation from test procedure : **None**
 Location & orientation of test specimen within original sample : **N/A**

Sampling certificate : **No - None Submitted**
 Client's indicated specification(s) : **n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	0	%
Proportion of material passing 425 µm test sieve	:	100	%
Plastic limit	:	18	%
Liquid limit	:	64	%
Plasticity index	:	46	%
Liquidity index	:	0.174	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : **DHLTM** Date tested : **28.03.2017** Approved :  Laboratory Manager Date : **31/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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**CERTIFICATE OF TEST - DETERMINATION OF THE UNDRAINED SHEAR STRENGTH
IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)
TESTED IN ACCORDANCE WITH BS 1377 : PART 7 : 1990 : CLAUSE 8**

Laboratory reference no(s) : **17-80954 - 327130** Head Office Certificate No : **327130-17-80954-S42-U100 x1**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
Certificate address : **4th Floor, 100 Holdenhurst Road
Bournemouth
Dorset
BH8 8AQ**

Contract : **Purbrook - London Road**
Source of material (as indicated by client) : **in-situ**
Client reference/data : **CP03**
Location of sample on site : **2.00-2.45m**
Borehole/pit no /depth : **N/A @ N/A m**
Date sampled : **08/03/2017**
Sampled by : **ODA**
Date received : **01/03/2017**
Material description : **Grey very silty slightly sandy CLAY**
Total mass received : **5.24 kg**
Method of preparation : **BS 1377 : Part 1**
Variation from test procedure : **None**
Location & orientation of test specimen within original sample : **N/A**
Sampling certificate : **No - None Submitted**
Client's indicated specification(s) : **n/a**

Specimen details	Sample A
Specimen condition :	Remoulded
Length (mm) :	203.0
Diameter (mm) :	100.9
Moisture content (%) :	32.0
Bulk Density (Mg/m ³) :	1.98
Dry Density (Mg/m ³) :	1.50
Test Details	Sample A
Type of membrane :	Latex
Membrane thickness (mm) :	0.3
Correction applied (kPa) :	1.1
Rate of strain (%/min) :	1.0
Cell Pressure (kPa) :	40
Strain at failure (%) :	19.2
Maximum deviator stress (kPa) :	77
Shear strength (kPa) :	38
Mode of failure :	

Remarks : **This sample tested was within UKAS accredited force load range.**

Tested by : **MW** Date tested : **27.03.2017** Approved :  Laboratory Manager Date : **06/04/2017**

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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327132	Head Office Certificate No : 327132-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	In-Situ	
Client reference/data :	CP03	
Location of sample on site :	3.70m	
Borehole/pit no / depth :	N/A @ N/A m	
Date sampled :	08/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Grey very silty slightly sandy CLAY	
Total mass received :	0.64 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

The test specimen was oven dried at : **108** °C

Moisture content : **26** %

Remarks : **None**

Tested by : **DHLTMMJKSAS** Date tested : **23.03.2017** Approved :  **Andy Bates Laboratory Manager** Date : **28/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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**CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0**

Laboratory reference no(s) :	17-80954 - 327132	Head Office Certificate No : 327132-17-80954-S4
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth Dorset BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	In-Situ	
Client reference/data :	CP03	
Location of sample on site :	3.70m	
Borehole/pit no / depth	N/A @ N/A m	
Date sampled :	08/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Grey very silty slightly sandy CLAY	
Total mass received :	0.64 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	0	%
Proportion of material passing 425 µm test sieve	:	100	%
Plastic limit	:	23	%
Liquid limit	:	42	%
Plasticity index	:	19	%
Liquidity index	:	0.158	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : DHLTMMEW	Date tested : 27.03.2017	Approved :  Andy Bates Laboratory Manager	Date : 28/03/2017
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Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327133	Head Office Certificate No : 327133-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	In-Situ	
Client reference/data :	CP03	
Location of sample on site :	4.70m	
Borehole/pit no / depth :	N/A @ N/A m	
Date sampled :	08/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Grey clayey slightly sandy SILT	
Total mass received :	0.69 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

The test specimen was oven dried at : **108** °C

Moisture content : **27** %

Remarks : **None**

Tested by : **LTMMJKSAS** Date tested : **23.03.2017** Approved : **Andy Bates Laboratory Manager** Date : **28/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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**CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0**

Laboratory reference no(s) : **17-80954 - 327133** Head Office Certificate No : **327133-17-80954-S4**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
 Certificate address : **4th Floor, 100 Holdenhurst Road
 Bournemouth
 Dorset
 BH8 8AQ**

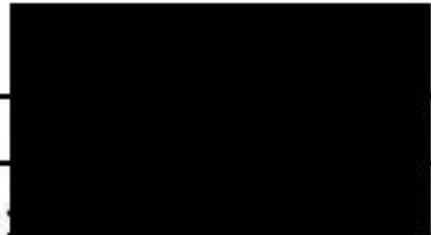
Contract : **Purbrook - London Road**
 Source of material (as indicated by client) : **in-situ**
 Client reference/data : **CP03**
 Location of sample on site : **4.70m**
 Borehole/pit no / depth : **N/A @ N/A m**
 Date sampled : **08/03/2017**
 Sampled by : **ODA**
 Date received : **01/03/2017**
 Material description : **Grey clayey slightly sandy SILT**
 Total mass received : **0.69 kg**
 Method of preparation : **BS 1377 : Part 1 & Part 2**
 Variation from test procedure : **None**
 Location & orientation of test specimen within original sample : **N/A**

Sampling certificate : **No - None Submitted**
 Client's indicated specification(s) : **n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	0	%
Proportion of material passing 425 µm test sieve	:	100	%
Plastic limit	:	21	%
Liquid limit	:	41	%
Plasticity index	:	20	%
Liquidity index	:	0.300	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : **DHLTM** Date tested : **28.03.2017** Approved :  Manager Date : **31/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
 Any statement of compliance with a given specification relates only to the test covered by this certificate.
 Opinions and interpretations, if stated, are not within the scope of our UKAS accreditation
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Head Office

Unit 14
 Blackhill Road West
 Holton Heath Trading Park
 Poole
 Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office

Unit 14
 Blackhill Road West
 Holton Heath Trading Park
 Poole
 Dorset BH16 6LE
 ACS Testing Limited
 Registered in England and
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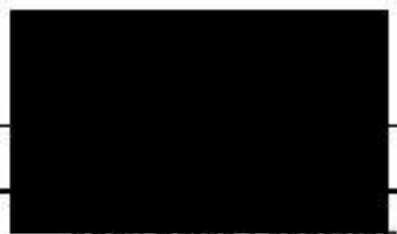
CERTIFICATE OF TEST - DETERMINATION OF MOISTURE CONTENT
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CL 3.2.3.1

Laboratory reference no(s) :	17-80954 - 327135	Head Office Certificate No : 327135-17-80954-S2
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth, Dorset, BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	In-Situ	
Client reference/data :	CP03	
Location of sample on site :	9.00m	
Borehole/pit no / depth :	N/A @ N/A m	
Date sampled :	08/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Grey silty slightly sandy CLAY	
Total mass received :	0.58 kg	
Method of preparation :	BS 1377 : Part 1 & Part 2 : 1990	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

The test specimen was oven dried at : **108** °C

Moisture content : **28** %

Remarks : **None**

Tested by : **LTMMJKSAS** Date tested : **23.03.2017** Approved :  **Andy Bates Laboratory Manager** Date : **28/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention

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Head Office

Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office

Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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**CERTIFICATE OF TEST - DETERMINATION OF LIQUID/PLASTIC LIMIT, PLASTICITY/LIQUIDITY INDEX
TESTED IN ACCORDANCE WITH B.S. 1377 : PART 2 : 1990 : CLAUSE 4.3 & 5.0**

Laboratory reference no(s) : **17-80954 - 327135** Head Office Certificate No : **327135-17-80954-S4**

Client : **McCarthy & Stone Retirement Lifestyles Limited**
 Certificate address : **4th Floor, 100 Holdenhurst Road
 Bournemouth
 Dorset
 BH8 8AQ**

Contract : **Purbrook - London Road**
 Source of material (as indicated by client) : **in-situ**
 Client reference/data : **CP03**
 Location of sample on site : **9.00m**
 Borehole/pit no / depth : **N/A @ N/A m**
 Date sampled : **08/03/2017**
 Sampled by : **ODA**
 Date received : **01/03/2017**
 Material description : **Grey silty slightly sandy CLAY**
 Total mass received : **0.58 kg**
 Method of preparation : **BS 1377 : Part 1 & Part 2**
 Variation from test procedure : **None**
 Location & orientation of test specimen within original sample : **N/A**

Sampling certificate : **No - None Submitted**
 Client's indicated specification(s) : **n/a**

Soil tested in natural condition (BS 1377:Part 2:1990 Clause 4.2.3)

Proportion of material retained on 425 µm test sieve	:	0	%
Proportion of material passing 425 µm test sieve	:	100	%
Plastic limit	:	17	%
Liquid limit	:	55	%
Plasticity index	:	38	%
Liquidity index	:	0.289	

Remarks : **No compliance statement given as no client's indicated specification details submitted.**

Tested by : **DHLTM** Date tested : **29.03.2017** Approved :  Manager Date : **31/03/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
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Head Office

Unit 14
 Blackhill Road West
 Holton Heath Trading Park
 Poole
 Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office

Unit 14
 Blackhill Road West
 Holton Heath Trading Park
 Poole
 Dorset BH16 6LE
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**CERTIFICATE OF TEST - DETERMINATION OF THE UNDRAINED SHEAR STRENGTH
IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)
TESTED IN ACCORDANCE WITH BS 1377 : PART 7 : 1990 : CLAUSE 8**

Laboratory reference no(s) :	17-80954 - 327136	Head Office Certificate No : 327136-17-80954-S42-U100 x1
Client :	McCarthy & Stone Retirement Lifestyles Limited	
Certificate address :	4th Floor, 100 Holdenhurst Road Bournemouth Dorset BH8 8AQ	
Contract :	Purbrook - London Road	
Source of material (as indicated by client) :	in-situ	
Client reference/data :	CP03	
Location of sample on site :	9.50-9.95m	
Borehole/pit no /depth :	N/A @ N/A m	
Date sampled :	08/03/2017	
Sampled by :	ODA	
Date received :	01/03/2017	
Material description :	Grey silty slightly sandy CLAY	
Total mass received :	7.46 kg	
Method of preparation :	BS 1377 : Part 1	
Variation from test procedure :	None	
Location & orientation of test specimen within original sample :	N/A	
Sampling certificate :	No - None Submitted	
Client's indicated specification(s) :	n/a	

Specimen details	Sample A
Specimen condition :	Remoulded
Length (mm) :	204.0
Diameter (mm) :	101.6
Moisture content (%) :	23.5
Bulk Density (Mg/m ³) :	2.05
Dry Density (Mg/m ³) :	1.66
Test Details	Sample A
Type of membrane :	Latex
Membrane thickness (mm) :	0.3
Correction applied (kPa) :	0.7
Rate of strain (%/min) :	1.0
Cell Pressure (kPa) :	190
Strain at failure (%) :	10.8
Maximum deviator stress (kPa) :	219
Shear strength (kPa) :	109
Mode of failure :	

Remarks : **This sample tested was within UKAS accredited force load range.**

Tested by : **MW** Date tested : **27.03.2017** Approved :  Date : **06/04/2017**

Bulk samples will be retained for a minimum of 21 days from date of receipt unless a written instruction is received within 14 days of receipt requesting sample retention
Any statement of compliance with a given specification relates only to the test covered by this certificate. Opinions and interpretations, if stated, are not within the scope of our UKAS accreditation

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Head Office

Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 622858
Fax 01202 626046

Registered Office

Unit 14
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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Certificate of Analysis

Certificate Number : 17-06607-Issue 1-Page: 1

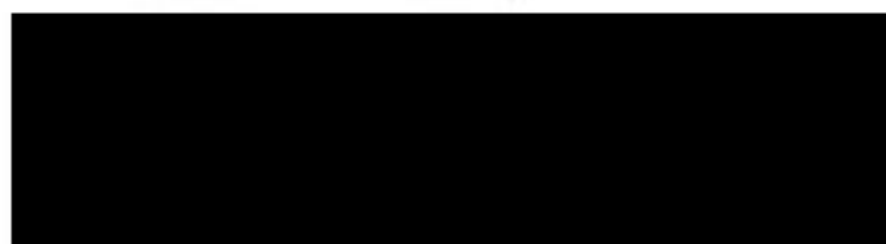
Report For: GEO RESULTS
Site Address: Purbrook - London Road
Client Order No: 17-80954
Date of Sampling: 06/03/2017
Date Received: 22/03/2017
Report Date: 29/03/2017

Please find your certificates of test attached for your samples received in the laboratory on 22/03/2017 under our laboratory reference 17-06607.

Remarks:

None

Results reviewed by:



David Redfern Technical Supervisor

Test Certificates approved by:



Mark Rowley Laboratory Manager

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This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.
Excel copies of reports are valid only when accompanied by this PDF certificate.
Client's Sample Description / ACS Material Description are noted for reference only.*

Head Office

Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628642

Registered Office

Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
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Certificate No. 17-06607-Issue 1-Page: 2
 Site Address Purbrook - London Road



ACSE Sample Number Sample ID	28155 327113 - 17-80954	28156 327120 - 17-80954	28157 327122 - 17-80954
Clients Sample Ref.	CP01	CP01	CP02
Location / Sample Depth (m)	1.80m	16.50m	1.70m
Date Sampled Time Sampled	06/03/2017	06/03/2017	07/03/2017
Sample deviating codes Client's Sample Description	fg	fg	fg
ACS Testing Material Description Principal Matrix (as received)	Grey mottled yellow silty slightly sandy CLAY CLAY	Grey silty slightly sandy CLAY CLAY	Grey clayey slightly sandy slightly gravelly SILT CLAY

Determination	Units	Method		Result	AS	Result	AS	Result	AS
Anions									
Water Soluble Sulphate	mg/l	MT/ACSE/204	AD	5.64	*fg	909	*fg	29.0	*fg
pH and Conductivity									
pH (@ 20 °C)	units	MT/ACSE/301	AD	8.8	*fg	8.0	*fg	8.4	*fg

Head Office
 Unit 14B
 Blackhill Road West
 Holton Heath Trading Park
 Poole
 Dorset BH16 6LE
 Tel 01202 628680
 Fax 01202 628680

Registered Office
 Unit 14B
 Blackhill Road West
 Holton Heath Trading Park
 Poole
 Dorset BH16 6LE
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Certificate No. 17-06607-Issue 1-Page: 3
 Site Address Purbrook - London Road



ACSE Sample Number	28158	28159	28160
Sample ID	327126 - 17-80954	327131 - 17-80954	327134 - 17-80954
Clients Sample Ref.	CP02	CP03	CP03
Location / Sample Depth (m)	7.50m	2.70m	6.00m
Date Sampled	07/03/2017	08/03/2017	08/03/2017
Time Sampled			
Sample deviating codes	fg	fg	fg
Client's Sample Description			
ACS Testing Material Description	Grey silty slightly sandy CLAY	Grey very silty slightly sandy CLAY	Grey silty slightly sandy CLAY
Principal Matrix (as received)	CLAY	CLAY	CLAY

Determination	Units	Method	Result	AS	Result	AS	Result	AS
Anions								
Water Soluble Sulphate	mg/l	MT/ACSE/204 AD	125	*fg	30.8	*g	72.9	*g
pH and Conductivity								
pH (@ 20 °C)	units	MT/ACSE/301 AD	6.5	*fg	6.8	*fg	6.7	*fg

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 Unit 14B
 Blackhill Road West
 Holton Heath Trading Park
 Poole
 Dorset BH16 6LE
 Tel 01202 628680
 Fax 01202 628680

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 Unit 14B
 Blackhill Road West
 Holton Heath Trading Park
 Poole
 Dorset BH16 6LE
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Technical Information for Analytical Results

Analysis

* - denotes analysis covered by our UKAS accreditation
- denotes analysis covered by our MCERTS certification
AD = Sample tested in air dried condition.
AR = Sample tested in as-received condition.
D = Sample tested in dry condition.
L = Laboratory prepared leachate
SC = sub contracted

Where results are less than the limit of detection, the value of 0 is used in calculations.

Deviating Codes

Deviating Samples

The use of any of the following symbols indicates that the sample was deviating and it is possible therefore that the results provided may not be representative of the sample taken.

- a – The date and/or time of sampling has not been provided, therefore it is not known if the time lapse between sampling and analysis has exceeded the acceptable holding time(s). It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
- b – No sampling time given (waters only) unable to confirm if samples are within acceptable holding times.
- c – This Test Item was received in an inappropriate container; it is possible that sample and/or analyte integrity has not been maintained and that the results are non-representative of the original sample taken.
- d – On receipt, the temperature of the sample received was found to fall outside the recommendations of EN ISO 18512:2007 Soils & Granular Wastes.
- e – The sample was received in a container that had been filled incorrectly which may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
- f – The delay between Sampling and Sample Receipt is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.
- g – The delay between Sampling and Analysis is greater than the recommended holding time for the analyte of interest in this matrix. It is possible that some deterioration may have compromised sample and/or analyte integrity, rendering the results non-representative of the original sample taken.

The following Additional Deviating Sample Codes may also be used.

- I/S – Insufficient sample mass/volume received for accurate quantification of this analyte.
- U/S – The sample received was deemed unsuitable for accurate determination of this analyte using the Test Methods available.

Deviating Methods

- Z – A minor deviation from the Test Method was necessary but this is deemed to have had no impact on the Test Result, the legitimacy of the method validation or the Accreditation Status of the Test Method.
- Y – A significant deviation from the Test Method was necessary which is deemed to have had no impact on the Test Result, however, due to a lack of sufficient supporting validation, the Accreditation Status of the Method has been removed.
- W – The normal LOD of the instrument/method could not be attained, thus an elevated LOD or LOQ has been applied to the Test Data, however, the data reported meets the requirements of the Client and does not affect compliance with the specification limit (where applicable).
- V – One of the QA/QC parameters failed, however, the increased implied Uncertainty associated with the Test Result meets the requirements of the Client and does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.2.9).
- U – The precision acceptance criteria associated with the Test Method could not be met but the Test Result fulfils the Client's objectives and the elevated Uncertainty does not affect compliance with the specification limit (where applicable) (Quality Manual, Section 18.8.10).
- T – The Test Method used was supplied by the Client and involved a simple modification of a Test Method for which ACSE holds accreditation (Quality Manual, Section 18.3.8).

Head Office

Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Tel 01202 628680
Fax 01202 628680

Registered Office

Unit 14B
Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE
ACS Environmental Testing Limited
Registered in England and
Wales No. 6000065

**Quality Testing & Materials Consultancy
to the
Construction Industry**



Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY

Telephone: (01424) 718618
Facsimile: (01424) 729911
info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 17-11334

Issue: 1

Date of Issue: 29/03/2017

Contact: Brent Graham

Customer Details: ACS Testing Ltd
Unit 14 Blackhill Road West
Holton Heath Trading Park
Poole
Dorset BH16 6LE

Quotation No: Q17-00780

Order No: G-2017-0108

Customer Reference: 17-80954

Date Received: 24/03/2017

Date Approved: 29/03/2017

Details: Purbrook London Road

Approved by:

John Wilson, Operations M

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)



Sample Summary

Report No.: 17-11334

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
94159	CP01 327112 0.90	06/03/2017	24/03/2017	Clayey loam	fg
94160	CP03 327129 0.50	08/03/2017	24/03/2017	Loamy sand + stones	fg

Results Summary

Report No.: 17-11334

ELAB Reference	94159	94160
Customer Reference	327112	327129
Sample ID		
Sample Type	SOIL	SOIL
Sample Location	CP01	CP03
Sample Depth (m)	0.90	0.50
Sampling Date	06/03/2017	08/03/2017

Determinand	Codes	Units	LOD		
Metals					
Arsenic	M	mg/kg	1	4.1	^ 9.3
Cadmium	M	mg/kg	0.5	< 0.5	^ < 0.5
Chromium	M	mg/kg	5	33.7	^ 13.3
Copper	M	mg/kg	5	10.4	^ 23.1
Lead	M	mg/kg	5	18.8	^ 36.1
Mercury	M	mg/kg	0.5	< 0.5	^ < 0.5
Nickel	M	mg/kg	5	8.4	^ 20.5
Selenium	M	mg/kg	1	< 1.0	^ < 1.0
Zinc	M	mg/kg	5	39.4	^ 51.2
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8
Miscellaneous					
Acid Neutralisation Capacity	N	mol/kg	0.1	< 0.1	< 0.1
Fraction of Organic Carbon	N		0.0001	0.0027	0.0370
Loss On Ignition (450°C)	M	%	0.01	3.04	^ 1.40
pH	M	pH units	0.1	7.2	^ 8.5
Soil Organic Matter	U	%	0.1	0.9	1.3
Total Organic Carbon	N	%	0.01	0.27	3.7
Polyaromatic hydrocarbons					
Naphthalene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Acenaphthylene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Acenaphthene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Fluorene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Phenanthrene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Anthracene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Fluoranthene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Pyrene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Benzo(a)anthracene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Chrysene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Benzo (b) fluoranthene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Benzo(k)fluoranthene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Benzo (a) pyrene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Indeno (1,2,3-cd) pyrene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Dibenzo(a,h)anthracene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Benzo[g,h,i]perylene	M	mg/kg	0.1	f < 0.1	f^ < 0.1
Total PAH(16)	M	mg/kg	0.4	f < 0.4	f^ < 0.4
Total PAH (Including Coronene)	N	mg/kg	2	f < 2	f < 2
BTEX					
Benzene	M	ug/kg	10	fg < 10.0	fg^ < 10.0
Toluene	M	ug/kg	10	fg < 10.0	fg^ < 10.0
Ethylbenzene	M	ug/kg	10	fg < 10.0	fg^ < 10.0
Xylenes	M	ug/kg	10	fg < 10.0	fg^ < 10.0
MTBE	N	ug/kg	10	fg < 10.0	fg < 10.0
Total BTEX	M	mg/kg	0.01	fg < 0.01	fg^ < 0.01

Results Summary

Report No.: 17-11334

ELAB Reference	94159	94160
Customer Reference	327112	327129
Sample ID		
Sample Type	SOIL	SOIL
Sample Location	CP01	CP03
Sample Depth (m)	0.90	0.50
Sampling Date	06/03/2017	08/03/2017

Determinand	Codes	Units	LOD		
TPH CWG					
>C5-C6 Aliphatic	N	mg/kg	0.01	fg < 0.01	fg < 0.01
>C6-C8 Aliphatic	N	mg/kg	0.01	fg < 0.01	fg < 0.01
>C8-C10 Aliphatic	N	mg/kg	1	fg < 1.0	fg < 1.0
>C10-C12 Aliphatic	N	mg/kg	1	fg < 1.0	fg < 1.0
>C12-C16 Aliphatic	N	mg/kg	1	fg < 1.0	fg < 1.0
>C16-C21 Aliphatic	N	mg/kg	1	fg < 1.0	fg < 1.0
>C21-C35 Aliphatic	N	mg/kg	1	fg < 1.0	fg < 1.0
>C35-C40 Aliphatic	N	mg/kg	1	fg < 1.0	fg < 1.0
>C5-C7 Aromatic	N	mg/kg	0.01	fg < 0.01	fg < 0.01
>C7-C8 Aromatic	N	mg/kg	0.01	fg < 0.01	fg < 0.01
>C8-C10 Aromatic	N	mg/kg	1	fg < 1.0	fg < 1.0
>C10-C12 Aromatic	N	mg/kg	1	fg < 1.0	fg < 1.0
>C12-C16 Aromatic	N	mg/kg	1	fg < 1.0	fg < 1.0
>C16-C21 Aromatic	N	mg/kg	1	fg < 1.0	fg < 1.0
>C21-C35 Aromatic	N	mg/kg	1	fg 1.3	fg < 1.0
>C35-C40 Aromatic	N	mg/kg	1	fg < 1.0	fg < 1.0
Total (>C5-C40) Ali/Aro	N	mg/kg	1	fg 1.3	fg < 1.0
Total Petroleum Hydrocarbons					
Mineral Oil	U	mg/kg	5	fg < 5	fg 7
PCB (ICES 7 congeners)					
PCB (Total of 7 Congeners)	M	mg/kg	0.03	< 0.03	^ < 0.03



Results Summary

Report No.: 17-11334

ELAB Reference	94159	94160
Customer Reference	327112	327129
Sample ID		
Sample Type	SOIL	SOIL
Sample Location	CP01	CP03
Sample Depth (m)	0.90	0.50
Sampling Date	06/03/2017	08/03/2017

Determinand	Codes	Units	LOD		
VOC					
Heptane	N	ug/kg	10	fg < 10.0	fg < 10.0
Octane	N	ug/kg	10	fg < 10.0	fg < 10.0

Results Summary

Report No.: 17-11334

WAC Analysis

Elab Ref:	94160					Landfill Waste Acceptance Criteria Limits		
Sample Date:	08/03/2017					Inert Waste Landfill	Stable Non-reactive Hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:	CP03 327129							
Depth (m)	0.5							
Site:	Purbrook London Road							
Determinand		Code	Units					
Total Organic Carbon		N	%		3.70	3	5	6
Loss on Ignition		M	%		1.4	--	--	10
Total BTEX		M	mg/kg		< 0.01	6	--	--
Total PCBs (7 congeners)		M	mg/kg		< 0.03	1	--	--
TPH Total WAC		M	mg/kg		7	500	--	--
Total (of 17) PAHs		N	mg/kg		< 2	100	--	--
pH		M			8.5	--	>6	--
Acid Neutralisation Capacity		N	mol/kg		< 0.1	--	To evaluate	To evaluate

Eluate Analysis

			10:1		10:1	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg		
			mg/l		mg/kg			
Arsenic		N	< 0.005		< 0.05	0.5	2	25
Barium		N	0.011		0.11	20	100	300
Cadmium		N	< 0.001		< 0.01	0.04	1	5
Chromium		N	< 0.005		< 0.05	0.5	10	70
Copper		N	< 0.005		< 0.05	2	50	100
Mercury		N	< 0.005		< 0.01	0.01	0.2	2
Molybdenum		N	< 0.005		< 0.05	0.5	10	30
Nickel		N	< 0.001		< 0.05	0.4	10	40
Lead		N	< 0.001		< 0.05	0.5	10	50
Antimony		N	< 0.005		< 0.05	0.06	0.7	5
Selenium		N	< 0.005		< 0.05	0.1	0.5	7
Zinc		N	< 0.005		< 0.05	4	50	200
Chloride		N	7		66.00	800	15000	25000
Fluoride		N	< 5		< 10	10	150	500
Sulphate		N	14		137.00	1000	20000	50000
Total Dissolved Solids		N	160		1600.00	4000	60000	100000
Phenol Index		N	< 0.01		< 0.10	1	-	-
Dissolved Organic Carbon		N	8.550		86.00	500	800	1000

Leach Test Information

pH		N	8.0					
Conductivity (uS/cm)		N	129					
Dry mass of test portion (g)			100.000					
Dry Matter (%)			86					
Moisture (%)			17					
Eluent Volume (ml)			958					

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

Stated limits are for guidance only and ELAB cannot be held responsible for any discrepancies with current legislation

Results Summary

Report No.: 17-11334

WAC Analysis								
Elab Ref:	94159					Landfill Waste Acceptance Criteria Limits		
Sample Date:	06/03/2017					Inert Waste Landfill	Stable Non-reactive Hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:	CP01 327112							
Depth (m)	0.9							
Site:	Purbrook London Road							
Determinand		Code	Units					
Total Organic Carbon		N	%		0.27	3	5	6
Loss on Ignition		M	%		3.0	--	--	10
Total BTEX		M	mg/kg		< 0.01	6	--	--
Total PCBs (7 congeners)		M	mg/kg		< 0.03	1	--	--
TPH Total WAC		M	mg/kg		< 5	500	--	--
Total (of 17) PAHs		N	mg/kg		< 2	100	--	--
pH		M			7.2	--	>6	--
Acid Neutralisation Capacity		N	mol/kg		< 0.1	--	To evaluate	To evaluate
Eluate Analysis			10:1		10:1	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg		
			mg/l		mg/kg			
Arsenic		N	< 0.005		< 0.05	0.5	2	25
Barium		N	< 0.005		< 0.05	20	100	300
Cadmium		N	< 0.001		< 0.01	0.04	1	5
Chromium		N	< 0.005		< 0.05	0.5	10	70
Copper		N	< 0.005		< 0.05	2	50	100
Mercury		N	< 0.005		< 0.01	0.01	0.2	2
Molybdenum		N	< 0.005		< 0.05	0.5	10	30
Nickel		N	< 0.001		< 0.05	0.4	10	40
Lead		N	< 0.001		< 0.05	0.5	10	50
Antimony		N	< 0.005		< 0.05	0.06	0.7	5
Selenium		N	< 0.005		< 0.05	0.1	0.5	7
Zinc		N	< 0.005		< 0.05	4	50	200
Chloride		N	< 5		< 50	800	15000	25000
Fluoride		N	< 5		< 10	10	150	500
Sulphate		N	4		42.00	1000	20000	50000
Total Dissolved Solids		N	< 10		< 100	4000	60000	100000
Phenol Index		N	< 0.01		< 0.10	1	-	-
Dissolved Organic Carbon		N	12.400		124.00	500	800	1000
Leach Test Information								
pH		N	7.7					
Conductivity (uS/cm)		N	48					
Dry mass of test portion (g)			101.000					
Dry Matter (%)			80					
Moisture (%)			25					
Eluent Volume (ml)			935					

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

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Method Summary

Report No.: 17-11334

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	27/03/2017	110	Colorimetry
Aqua regia extractable metals	M	Air dried sample	28/03/2017	118	ICPMS
PAH (GC-FID)	M	As submitted sample	27/03/2017	133	GC-FID
VOC in solids	N	As submitted sample	27/03/2017	181	GC-MS
Aliphatic hydrocarbons in soil	N	As submitted sample	27/03/2017	214	GC-FID
Aliphatic/Aromatic hydrocarbons in soil	N	As submitted sample	29/03/2017	214	GC-FID
Aromatic hydrocarbons in soil	N	As submitted sample	27/03/2017	214	GC-FID
Low range Aliphatic hydrocarbons soil	N	As submitted sample	28/03/2017	214	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	28/03/2017	214	GC-MS
Soil organic matter	U	Air dried sample	28/03/2017	BS1377:P3	Titrimetry
Leachate					
Arsenic*	N		29/03/2017	101	ICPMS
Cadmium*	N		29/03/2017	101	ICPMS
Chromium*	N		29/03/2017	101	ICPMS
Lead*	N		29/03/2017	101	ICPMS
Nickel*	N		29/03/2017	101	ICPMS
Copper*	N		29/03/2017	101	ICPMS
Zinc*	N		29/03/2017	101	ICPMS
Mercury*	N		29/03/2017	101	ICPMS
Selenium*	N		29/03/2017	101	ICPMS
Antimony	N		29/03/2017	101	ICPMS
Barium*	N		29/03/2017	101	ICPMS
Molybdenum*	N		29/03/2017	101	ICPMS
pH Value*	N		29/03/2017	113	Electrometric
Electrical Conductivity*	N		29/03/2017	136	Probe
Dissolved Organic Carbon	N		29/03/2017	102	TOC analyser
Chloride*	N		29/03/2017	131	Ion Chromatography
Fluoride*	N		29/03/2017	131	Ion Chromatography
Sulphate*	N		29/03/2017	131	Ion Chromatography
Total Dissolved Solids	N		29/03/2017	144	Gravimetric
Phenol index	N		29/03/2017	121	HPLC
WAC Solids analysis	N				
pH Value**	M	Air dried sample	28/03/2017	113	Electrometric
Total Organic Carbon	N	Air dried sample	29/03/2017	210	IR
Loss on Ignition**	M	Air dried sample	28/03/2017	129	Gravimetric
Acid Neutralization Capacity to pH 7	N	Air dried sample	28/03/2017	NEN 737	Electrometric
Total BTEX**	M	As submitted sample	28/03/2017	181	GCMS
Mineral Oil**	U	As submitted sample	27/03/2017	117	GCFID
Total PCBs (7 congeners)	M	Air dried sample	28/03/2017	120	GCMS
Total PAH (17)**	N	As submitted sample	28/03/2017	133	GCFID

Tests marked N are not UKAS accredited

Report Information

Report No.: 17-11334

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

-
- | | |
|---|--|
| a | No date of sampling supplied |
| b | No time of sampling supplied (Waters Only) |
| c | Sample not received in appropriate containers |
| d | Sample not received in cooled condition |
| e | The container has been incorrectly filled |
| f | Sample age exceeds stability time (sampling to receipt) |
| g | Sample age exceeds stability time (sampling to analysis) |

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage

Site Name	London Road
Location	Purbrook
Site ID	
Job Number	17-80954
Date	03/05/2017
User Name	morag.wilson@atkinsglobal.com
Company Name	admin

[illegible]

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