Geotechnical Interpretative Report

Site | 36 Princedale Road
     | London
     | W11 4NJ

Client | Christopher Courage
Date   | 6th November 2015

Our Ref | GEO/5499
CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION

2.0 SUMMARY OF FIELDWORK EXECUTED

3.0 GEOLOGICAL SETTING

4.0 SUMMARY OF GROUND CONDITIONS

5.0 LABORATORY TESTING

6.0 GEOTECHNICAL ASSESSMENT

APPENDICES

- Borehole Record Sheet (BH1)
- Trial Pit Record Sheets (TP1-TP3)
- Laboratory Test Results
- Sketch Fieldwork Location Plans
- Proposed Development Plans (15041/GA/100 & 101, 15041/MS/120, 15041/SE/200)
# EXECUTIVE SUMMARY

## 36 Princedale Road, London, W11 4NJ

<table>
<thead>
<tr>
<th>Ground Conditions</th>
<th>The current work encountered Made Ground to a maximum depth of 3.9m below existing ground level (bgl). Within borehole BH1 the Made Ground was underlain by Weathered London Clay to a depth of 7.4mbgl which in turn was underlain by un-weathered London Clay Formation. Langley Silt Member was encountered in Trial Pt 3 below the underside of the footing of the property.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater</td>
<td>Groundwater was not encountered at the time of the investigation.</td>
</tr>
<tr>
<td>Roots</td>
<td>Roots were not encountered at the time of the investigation.</td>
</tr>
<tr>
<td>Foundations</td>
<td>From the Pilcon Vane test a count of 108 and 110 at a depth of 4.0m was recorded in BH1 and can be adopted for design purposes. Whilst Pilcon Vane tests do not directly measure shear strength, using accepted empirical correlations (Bjerrum, 1972) with a measured PI (plasticity index) for the clay of around 52%, the clay at this depth is estimated to have an undrained shear strength (Cu) of around 85 kPa. Based on the estimated shear strength, the maximum bearing capacity of the Clay at a depth of 4.0m below existing ground level is 435kPa. Applying a global factor of safety of 3 it is recommended that an allowable bearing pressure not exceeding 145kPa is adopted for foundation design, at which settlements are expected to be within normal acceptable tolerances.</td>
</tr>
<tr>
<td>Buried Concrete</td>
<td>Chemical testing has been carried out to determine the nature of the soils in the context of the durability of buried concrete. Based on the available test data the soluble sulphate content of the soils is noted to be variable and ranges between 260 and 2400 mg/l (measured as soluble SO4) with a pH of 6.6 to 8.0. Taking the worst case data, the soils are classified as DS-3 in accordance with BRE guidance (Ref 5) with a corresponding ACEC class of AC-3.</td>
</tr>
<tr>
<td>Swelling/Shrinking</td>
<td>The Weathered London Clay and London Clay have been confirmed to possess ‘high’ volume change potential in accordance with the National House Building Councils (NHBC) classification system given in Part 4 of their Standards (Ref 4). The granular Head deposits will be classed as non-shrinkable.</td>
</tr>
<tr>
<td>Shallow Excavations</td>
<td>Shallow excavations within the site will most likely be within Made Ground deposits and short term support is likely to be required to maintain the excavations. The London Clay will by contrast be self-supporting and as such excavations below Made Ground may not require support in the short term. All excavations will be subject to normal health and safety considerations.</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

1.1 This report has been prepared by Chelmer Site Investigation Laboratories Limited (CSI) to the instructions of the Structural Engineer, Axiom Structures Ltd, on behalf of the Client.

1.2 The Client for the project was Christopher Courage.

1.3 The site address is 36 Princedale Road, London, W11 4NJ and is located at approximate Ordnance Survey grid reference (OSNGR) 524375E, 180295N. At the time of the investigation No. 36 Princedale Road was found to comprise of a three storey terraced house with lower ground floor level (basement). The property was occupied at the time of the investigation. No.36 looks onto Princedale Road situated within the London Borough of South Kensington. A small courtyard, backing onto Pottery Lane, is present to the rear of the property.

1.4 It is understood that the proposed scheme is for the extension of the current single storey basement. The proposed basement extension will extend out from the current basement structure (beneath the footprint of the existing property) beneath the existing courtyard. Proposed Development Plans (15041/GA/100 & 101, 15041/MS/120, 15041/SE/200) are appended to this report.

1.5 A Phase I Desk Top Study was not requested by the client.

1.6 This Intrusive site investigation has been commissioned to provide information on the sub-soil conditions of the site in order to support foundation design and assessment of other relevant geotechnical and ground engineering aspects of the proposed development.

1.7 This report presents a summary of the site investigation work carried out and discusses the findings.
2.0 SUMMARY OF FIELDWORK EXECUTED

2.1 All fieldwork was executed in general accordance with applicable British Standards and accepted industry good practice (Ref 1).

2.2 The borehole locations were chosen by the Structural Engineer and are indicated on the appended Sketch Fieldwork Location Plans.

2.3 Fieldwork was undertaken on 25th June 2015 and comprised the following elements:

   C.f.a. Borehole

2.4 A single c.f.a. borehole (BH1) was undertaken at the location indicated on the Sketch Fieldwork Location Plan. BH1 was advanced to a depth of 10.00m below existing ground level. Upon completion of borehole BH1 a standpipe was installed to a depth of 6.00m below existing ground level.

2.5 Discrete disturbed samples were taken from the boreholes at regular depth intervals as the boreholes were advanced, within each stratum and when a change of stratum was encountered.

2.6 Pilcon Vane tests were undertaken on samples at regular depth intervals as the borehole was advanced in order to provide additional information on the in-situ consistency of the material encountered.

2.7 Full details of the borehole findings are given on the appended borehole record sheets.

   Hand Excavated Trial Pit Excavation

2.8 Three trial pits were excavated within the property. Trial pits TP1 and TP2 were excavated within the confines of the properties courtyard on opposing walls. They were excavated to examine the current foundations of the property and to inspect the depth and condition of the neighbouring party walls. Trial pit TP3 was excavated within the current basements utility cupboard below the staircase.

2.9 Discrete disturbed samples were taken from the underside of the footings from each of the trial pits.

2.10 Pilcon Vane were also undertaken on the material under the footings of the property. This will provide additional information on the consistency and strength of the material the current building is founded on.

2.11 Full details of the trial pit findings are given on the appended trial pit log sheets.
3.0 GEOLOGICAL SETTING

3.1 According to information published by the British Geological Survey (England and Wales, 1:50,000 Sheet E270; South London and BGS online resources) the underlying geology at this site is shown as Langley Silt Member overlying the London Clay Formation.

3.2 Langley Silt Member

Langley Head Deposits represents a superficial deposit which formed during the Quaternary Period. The unit varies between silt and clay layers which are commonly yellow-brown in colour. The unit is usually found to rest on sand and gravel deposits belonging to River Terrace Deposits which also formed during the Quaternary Period.

3.3 London Clay

It is inferred that the London Clay Formation was deposited during a period of sea inundation in the area up to 200m in depth. The London Clay can be up to 150m thick beneath south Essex thinning across London to about 90m near Reading. The formation consists of mainly dark blue-grey to brown-grey clay containing variable amounts of fine-grained sand and silt. London Clay generally weathers to an orange-brown colour with pockets of silty fine sand. The formation is particularly susceptible to swelling and shrinking when subjected to moisture content changes and is commonly intensely fissured. In addition, gypsum (selenite) crystals and pyrite nodules are commonly found throughout the formation.

When exposed to the weathering process the upper regions of the London Clay oxidise to brown in colour. It usually contains selenite crystals, often grouped in bands or layers, which are thought to have originated from the decomposition of shell fragments. London Clay contains clay minerals in the form of illite, kaolinite and smectite. The presence of smectite renders the London Clay particularly susceptible to changes in moisture content and is prone to shrinkage and swelling (settlement and heave) caused by alternate wetting and drying near the surface. In addition, weathering and possible slight transportation of semi-frozen material “en-masse” in glacial or peri-glacial regions is believed to have occurred. This action often completely destroys the structure of the material and can involve a serious loss of strength. As the soil composition is derived mostly from materials local to the point of deposition, the lithology can be variable and reflects that of the parent strata.
### 4.0 SUMMARY OF GROUND CONDITIONS

**4.1** Full details of the ground conditions encountered are presented on the borehole and trial pit records appended to this report and can be summarised as follows:

<table>
<thead>
<tr>
<th>Depth to top of stratum from GL (m bgl)</th>
<th>Depth to base of stratum from GL (m bgl)</th>
<th>Stratum</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>0.125</td>
<td>CONCRETE</td>
</tr>
<tr>
<td>0.125</td>
<td>0.90</td>
<td>MADE GROUND: medium compact, brown, very sandy fine to coarse gravel with brick, concrete and slate</td>
</tr>
<tr>
<td>0.50</td>
<td>0.90</td>
<td>LANGLEY SILT MEMBER: stiff, brown, sandy silty CLAY</td>
</tr>
<tr>
<td>0.90</td>
<td>1.60</td>
<td>MADE GROUND: firm, brown, slightly sandy silty clay with occasional brick and concrete fragments</td>
</tr>
<tr>
<td>1.60</td>
<td>3.90</td>
<td>MADE GROUND: stiff, brown, silty clay with occasional brick fragments</td>
</tr>
<tr>
<td>3.90</td>
<td>7.40</td>
<td>WEATHERED LONDON CLAY: stiff, brown/orange, silty CLAY</td>
</tr>
<tr>
<td>7.40</td>
<td>10.00</td>
<td>LONDON CLAY: very stiff, dark grey, silty CLAY</td>
</tr>
</tbody>
</table>

**4.2** It should be noted that the MADE GROUND depths recorded above are those encountered within the boreholes undertaken during the current work. Owing to the variable nature and unknown provenance of MADE GROUND it is possible that deeper or more extensive areas of MADE GROUND may exist at this site which have not been revealed by the current work.

**4.3** The Pilcon Vane results showed values of 86 within the Langley Silt Member deposits found beneath the underside of the footing from TP3. This indicates that the material is ‘stiff’.

**4.4** The Pilcon Vane results showed values of 108 in the shallowest section of the Weathered London Clay indicating that the material is ‘stiff’. Values increased with depth with Vane results exceeding 140 within the un-weathered London Clay indicating that the material is ‘very stiff’.

**4.5** Groundwater was not encountered in the trial pits or within the borehole at the time of the investigation.

**4.6** No roots were observed in the trial pits or borehole at the time of the investigation.
5.0 LABORATORY TESTING

5.1 The following geotechnical laboratory testing has been carried out on samples recovered from the trial pits and borehole undertaken at this site.

5.2 Unless otherwise stated, the geotechnical testing has generally been carried out in accordance with applicable British Standard (Ref 2)

5.3 Atterberg Limits and Moisture Content Tests

The Atterberg Limits and moisture contents have been determined for a total of five samples from the site; one sample from the Made Ground, One from the Langley Silt Member and four samples of London Clay.

The Atterberg Limits from the sample collected from the Made Ground could not be determined due to the granular composition of the sample.

Langley Silt Member

The sample tested from the underside of the footing from TP3 showed a liquid limit (LL) of 40%, plastic limit (PL) of 16%, plasticity index of 25% and a modified plasticity index of 25%. The moisture content of the sample was 21%.

These results indicate that the sample tested would be classified as Clay of ‘intermediate’ (CV) plasticity in accordance with the Casagrande Geotechnical classification system.

London Clay

For the samples tested the liquid limit (LL) was found to range between 73% and 76%, the plastic limit (PL) between 23% and 25%, the plasticity index between 48% and 52% and modified plasticity index between 48% and 52%. The moisture content of these samples was found to range between 28% and 29%.

These results indicate that the samples tested would be classified as Clay of ‘very high’ (CV) plasticity in accordance with the Casagrande Geotechnical classification system.

5.4 pH and Sulphate Tests

The pH and sulphate content has been determined for two samples recovered from the site.

The pH value was found to range between 6.6 and 8.0. The water soluble sulphate content ranged from 260 to 2400mg/l and a range of 0.06 to 0.18% for Total Sulphur.
6.0 GEOTECHNICAL ASSESSMENT

SUMMARY OF PROPOSED DEVELOPMENT

6.1 It is understood that the proposed scheme is for the extension of the current single storey basement. The proposed basement extension will extend out from the current basement structure (beneath the footprint of the existing property) beneath the existing courtyard. Proposed Development Plans (15041/GA/100 & 101, 15041/MS/120, 15041/SE/200) are appended to this report.

6.2 Full details of the proposed construction are not yet developed and it is assumed that they will be subject to the findings of this investigation. As a consequence the foundation design discussed below is, by necessity, general in nature and is subject to confirmation following the results of this investigation and further design.

6.3 Should ground conditions during construction be found to differ significantly from those described in our report Chelmer Site Investigation Laboratories Limited should be contacted immediately and that the below noted allowable bearing pressures or recommended foundation type may need to be altered accordingly.

FOUNDATIONS

6.4 The current investigation revealed that the site is underlain Made Ground with a thickness up to 3.9m in places. Made Ground is by its nature heterogeneous in composition and therefore its engineering properties are likely to be variable both laterally and vertically across the site. Therefore it is recommended that in all cases new foundations are taken below the Made Ground and set within the underlying natural soils.

6.5 It is assumed that the basement will be set at a depth of approximately 3.0-4.0m below ground level. At this depth the new basement floor slab and foundations will be set below the Made Ground which is present across the site and recorded at a depth of 3.90m in BH1. At this depth the basement floor slab and the proposed underpins and retaining wall foundations should be set within the ‘stiff’ Weathered London Clay Formation. The soil at this depth is considered to present adequate founding conditions subject to appropriate foundation design.

6.6 From the Pilcon Vane test a count of 108 and 110 at a depth of 4.0m was recorded in BH1 and can be adopted for design purposes. Whilst Pilcon Vane tests do not directly measure shear strength, using accepted empirical correlations (Bjerrum, 1972) with a measured PI (plasticity index) for the clay of around 52%, the clay at this depth is estimated to have an undrained shear strength (Cu) of around 85 kPa.

6.7 Based on the estimated shear strength, the maximum bearing capacity of the Clay at a depth of 4.0m below existing ground level is 435 kPa. Applying a global factor of safety of 3 it is recommended that an allowable bearing pressure not exceeding 145
kPa is adopted for foundation design, at which settlements are expected to be within normal acceptable tolerances.

**RETAINING WALL CONSTRUCTION**

6.8 It is possible that some retaining wall structured may be required at the site. The full design of temporary and permanent retaining structures is beyond the scope of this investigation. Retaining structures should be designed in accordance with accepted good practice such as that set out within CIRIA guidance C580 (Ref 3) or similar. The calculation of permanent lateral pressures against the sides should relate to long-term (effective) stress analysis.

6.9 Based on the findings of the site investigation undertaken the following soil parameters are recommended for use in the retaining wall design:

<table>
<thead>
<tr>
<th>Made Ground</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk unit weight, $\gamma_b$</td>
<td>18 kN/m$^3$</td>
</tr>
<tr>
<td>Earth pressure coefficient at rest, $K_0$</td>
<td>0.3-0.4</td>
</tr>
<tr>
<td>Undrained shear strength, $S_u$</td>
<td>0</td>
</tr>
<tr>
<td>Effective shear strength, $c'$</td>
<td>0</td>
</tr>
<tr>
<td>Effective angle of internal friction, $\phi'$</td>
<td>20$^\circ$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Langley Silt Member</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk unit weight, $\gamma_b$</td>
<td>19 kN/m$^3$</td>
</tr>
<tr>
<td>Earth pressure coefficient at rest, $K_0$</td>
<td>0.5-0.6</td>
</tr>
<tr>
<td>Effective shear strength, $c'$</td>
<td>75</td>
</tr>
<tr>
<td>Effective angle of internal friction, $\phi'$</td>
<td>25$^\circ$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>London Clay</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk unit weight, $\gamma_b$</td>
<td>20 kN/m$^3$</td>
</tr>
<tr>
<td>Earth pressure coefficient at rest, $K_0$</td>
<td>2.5-2.5</td>
</tr>
<tr>
<td>Undrained shear strength, $S_u$</td>
<td>85-120 kN/m$^2$ (based on in situ testing)</td>
</tr>
<tr>
<td>Effective shear strength, $c'$</td>
<td>85 kN/m$^2$</td>
</tr>
<tr>
<td>Effective angle of internal friction, $\phi'$</td>
<td>18-22$^\circ$</td>
</tr>
</tbody>
</table>

6.10 Although groundwater was not encountered at the time of the investigation, design of the retaining walls should include allowance for groundwater in accordance with accepted good design practice and allowance for hydrostatic forces to both the ground bearing floor slab and retaining walls should be based on site specific hydrological and hydrogeological assessment.

**ANTICIPATED GROUND MOVEMENTS**

6.11 During excavation of the basement the stress conditions within the soil will be modified and this stress release or ‘relaxation’ in the ground will inevitably result in ground movement. Lateral stress release in the ground surrounding the excavation by
both foundation construction and excavation in front of the retaining structure will manifest itself in lateral and associated vertical ground movement at the edge of excavation and line of foundations/retaining structure and extending back from the edge of the excavation/line of basement wall. The magnitude of lateral and vertical movement and the limit of its extent beyond the excavation will depend on the nature of the soils, the foundation system, and the construction methodology. There is published empirical data available to predict the degree of movement that can be expected (CIRCA C580) (Ref.4).

6.12 It is important to ensure that the construction sequence and construction method statement (CMS) is developed based on the specific development system proposed and with full recognition of anticipated ground movements as assessed from site specific Ground Movement Analysis (GMA). It is implicit within this that good standards of workmanship will be maintained throughout so as to minimise and otherwise ameliorate the effects of ground movement associated with basement construction. This may include, inter alia, control on underpin installation, sequencing of installation to minimise ground movement, use of necessary temporary support, and adequate control of groundwater.

FOUNDATION AND SERVICE EXCAVATIONS

6.13 Shallow excavations within the site will most likely be within Made Ground deposits and short term support is likely to be required to maintain the excavations. The London Clay will by contrast be self-supporting and as such excavations below the Made Ground material may not require support in the short term. All excavations will be subject to normal health and safety considerations.

6.14 Groundwater/surface water should be prevented from accumulating at the base of foundation excavations. It is important that the base of foundation excavations is kept dry and the exposed formation is protected to prevent softening by exposure to surface water. In the event that the formation is exposed, the material should be inspected immediately prior to floor slab construction and any soft spots are excavated and materials replaced and compacted prior to pouring foundation concrete. Alternatively ‘blinding’ concrete may be used to preserve the formation prior to foundation being constructed.

SWELLING AND SHRINKAGE

6.15 The Weathered London Clay and London Clay have been confirmed to possess ‘high’ volume change potential in accordance with the National House Building Councils (NHBC) classification system given in Part 4 of their Standards (Ref 4). As such appropriate consideration should be given to NHBC guidance for shallow foundations set within the London Clay.
BURIED CONCRETE

6.16 Chemical testing has been carried out to determine the nature of the soils in the context of the durability of buried concrete. Based on the available test data the soluble sulphate content of the soils is noted to be variable and ranges between 260 and 2400 mg/l (measured as soluble SO₄) with a pH of 6.6 to 8.0. Taking the worst case data, the soils are classified as DS-3 in accordance with BRE guidance (Ref 5) with a corresponding ACEC class of AC-3.

RECOMMENDATIONS FOR FURTHER WORK

6.17 Prior to or as part of the final design stage it is recommended that a full Ground Movement Analysis for the project be undertaken in order to assess the impact of the proposed new development on the adjacent properties during both temporary and permanent works, together with recommending in detail on heave protection measures related to the anticipated stress changes. A Basement Impact Assessment should also be considered in order to fully understand the hydrogeological regime at the site and the impact that basement construction may have. Any planning requirements of London Borough of South Kensington will need to be followed regarding basement construction.
References


End of report
a) This report has been prepared for the purpose of providing advice to the client pursuant to its appointment of Chelmer Site Investigation Laboratories Limited (CSI) to act as a consultant.
b) Save for the client no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out.
c) All work carried out in preparing this report has used, and is based upon, our professional knowledge and understanding of the current relevant English and European Community standards, approved codes of practice, technology and legislation.
d) Changes in the above may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, CSI has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, we will have no obligation to advise the client of any such changes, or of their repercussions.
e) CSI acknowledges that it is being retained, in part, because of its knowledge and experience with respect to environmental matters. CSI will consider and analyse all information provided to it in the context of our knowledge and experience and all other relevant information known to us. To the extent that the information provided to us is not inconsistent or incompatible therewith, CSI shall be entitled to rely upon and assume, without independent verification, the accuracy and completeness of such information.
f) The content of this report represents the professional opinion of experienced environmental consultants. CSI does not provide specialist legal advice and the advice of lawyers may be required.
g) In the Summary and Recommendations sections of this report,CSI has set out our key findings and provided a summary and overview of our advice, opinions and recommendations. However, other parts of this report will often indicate the limitations of the information obtained by CSI and therefore any advice, opinions or recommendations set out in the Executive Summary, Summary and Recommendations sections ought not to be relied upon unless they are considered in the context of the whole report.
h) The assessments made in this report are based on the ground conditions as revealed by walkover survey and/or intrusive investigations, together with the results of any field or laboratory testing or chemical analysis undertaken and other relevant data, which may have been obtained including previous site investigations. In any event, ground contamination often exists as small discrete areas of contamination (hot spots) and there can be no certainty that any or all such areas have been located and/or sampled.
i) There may be special conditions appertaining to the site, which have not been taken into account in the report. The assessment may be subject to amendment in light of additional information becoming available.
j) Where any data supplied by the client or from other sources, including that from previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by CSI for inaccuracies within the data supplied by other parties.
k) Whilst the report may express an opinion on possible ground conditions between or beyond trial pit or borehole locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy thereof.
l) Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. Groundwater conditions may vary due to seasonal or other effects.
m) This report is prepared and written in the context of the agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a reinterpretation of the report in whole or part after its original submission.
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p) This report is issued on the condition that CSI will under no circumstances be liable for any loss arising directly or indirectly from subsequent information arising but not presented or discussed within the current Report.
q) In addition CSI will not be liable for any loss whatsoever arising directly or indirectly from any opinion within this report.
No roots observed.

MADE GROUND: medium compact, brown, very sandy fine to coarse gravel with brick, concrete and slate.

MADE GROUND: firm, brown, slightly sandy silty clay with occasional brick and concrete fragments.

MADE GROUND: stiff, brown, silty clay with occasional brick fragments.

Stiff, brown/orange, silty CLAY.

Very stiff, dark grey, silty CLAY.

Borehole dry and open on completion. Standpipe installed to 6.0m.
Ground breaking Services
Christopher Courage
36 Princedale Road, London, W11 4NJ

Scale: N.T.S.  Sheet No: 1 of 2  Date: 25.06.15
Location: 36 Princedale Road, London, W11 4NJ  Job No: 5499  Trial Pit No: 1  Weather: Overcast

Remarks:
Made Ground: medium compact, moist, dark brown, gravelly silty clay with brick and concrete fragments.
No roots observed.
Firm, brown, slightly sandy silty clay with occasional brick and concrete fragments.
No roots observed.

TP1 SECTION A ENDS AT 1100mm

Key:
D Small disturbed sample
B Bulk disturbed sample
U Undisturbed sample (U100)
N Standard Penetration Test Blow Count
J Jar sample
V Pilcon Vane (kPa)
M Mackintosh Probe
W Water Sample
Client: Christopher Courage  Scale: N.T.S.  Sheet No: 2 of 2  Date: 25.06.15
Location: 36 Princedale Road, London, W11 4NJ  Job No: 5499  Trial Pit No: 1  Weather: Overcast

SECTION B

CONCRETE

WINDOW

G.L.
50

PAVING SLAB

SOIL AND ROOTS AS TP1 SECTION
A SHEET 1 OF 2

TP1 SECTION B ENDS AT 600mm

Remarks:

Key:
D Small disturbed sample
B Bulk disturbed sample
U Undisturbed sample (U100)
N Standard Penetration Test Blow Count
J Jar sample
V Pilcon Vane (kPa)
M Mackintosh Probe
W Water Sample
Remarks:

- **Made Ground**: medium compact, dark brown, gravelly sandy silty clay with brick fragments and pieces. No roots observed.

**SECTION A**

- **TP2 SECTION A ENDS AT 1500mm - UNABLE TO DETERMINE UNDERSIDE FOUNDATION**

**Key:**
- D Small disturbed sample
- B Bulk disturbed sample
- U Undisturbed sample (U100)
- N Standard Penetration Test Blow Count
- J Jar sample
- V Pilcon Vane (kPa)
- M Mackintosh Probe
- W Water Sample
SECTION B

SOIL AND ROOTS AS TP2 SECTION A SHEET 1 OF 2

TP2 SECTION B ABANDONED AT 400mm DUE TO ELECTRIC CABLES OBSTRUCTING ACCESS

Remarks:

Key:
- D: Small disturbed sample
- B: Bulk disturbed sample
- U: Undisturbed sample (U100)
- N: Standard Penetration Test Blow Count
- J: Jar sample
- V: Pilcon Vane (kPa)
- M: Mackintosh Probe
- W: Water Sample
Remarks:

Key:

- D: Small disturbed sample
- B: Bulk disturbed sample
- U: Undisturbed sample (U100)
- N: Standard Penetration Test Blow Count
- J: Jar sample
- V: Pilcon Vane (kPa)
- M: Mackintosh Probe
- W: Water Sample

CONCRETE

MADE GROUND: medium compact, dark brown, clayey gravelly silt with brick and concrete fragments.
No roots observed.

Stiff, brown, slightly sandy silt CLAY.
No roots observed.

CONCRETE

TP3 ENDS AT 900mm
Laboratory Report

Site 44 Princesdale Road, W11

Client Christopher Courage

Date 14-Jul-15

Our Ref CSI5499

CGL Ref CGL5499
Content Summary

This report contains all test results as indicated on the test instruction/summary.

CGL Reference : CGL5499
Client Reference : CSI5499
For the attention of : Christopher Courage

This report comprises of the following:
1 Cover Page
   1 Inside Cover/Contents Page
2 Pages of Results
   1 Moisture/Shear Strength Chart
   1 Plasticity Chart
   1 Particle Size Distribution - Sieve & Sedimentation Chart
4 Pages of BRE SD1 Results
1 Limitations of Report Page

Notes:

General
Please refer to report summary notes for details pertaining to methods undertaken and their subsequent accreditations
Samples were supplied by Chelmer Site Investigations
All tests performed in-house unless otherwise stated

Deviant Samples
Samples were received in suitable containers Yes
A date and time of sampling was provided Yes
Arrived damaged and/or denatured No
## Laboratory Testing Results

**BS 1377 : 1990**

### Details
- **Job Number:** CGL5499
- **Client:** Christopher Courage
- **Site Name:** 44 Princesdale Road, W11

### Results
<table>
<thead>
<tr>
<th>Sample Ref</th>
<th>Depth (m)</th>
<th>Sample Type</th>
<th>*Moisture Content (%)</th>
<th>*Soil Faction &gt; 0.425mm (%)</th>
<th>*Plastic Limit (%)</th>
<th>*Plasticity Index (%)</th>
<th>*Liquidity Index (%)</th>
<th>*Soil Class</th>
<th>Filter Paper Contact Time (h)</th>
<th>*Modified Plasticity Index (%)</th>
<th>*Soil Sample Suction (kPa)</th>
<th>Indus Shear Vane Strength (kPa)</th>
<th>Organic Content (%)</th>
<th>pH Value</th>
<th>*Sulphate Content (g/l)</th>
<th><strong>Key</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>TP3</td>
<td>0.7</td>
<td>D</td>
<td>21</td>
<td>&lt;5</td>
<td>40</td>
<td>16</td>
<td>25</td>
<td>0.19</td>
<td>25</td>
<td>CI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes
- *UKAS Accredited Tests*
  - [1] BS 1377 : Part 2 : 1990, Test No 3.2
  - [2] Estimated if <5%, otherwise measured
  - [5] Values of shear strength were determined in situ by Chelmer Site Investigations using a Pilcon hand vane or Geonor vane (GV).
  - [8] BS 1377 : Part 3 : 1990, Test No 5.4

### Key
- [0] - Disturbed sample
- [B] - Bulk sample
- [D] - Undisturbed sample
- [W] - Water sample
- [ENP] - Essentially Non-Plastic
- [U] - U100 (undisturbed sample)
- [B] - Bulk sample
- [D] - Disturbed sample
- [W] - Water sample
- [U] - U100 (undisturbed sample)
- [ENP] - Essentially Non-Plastic

### Technical Details
- **Notes:**
  - *UKAS Accredited Tests*
  - [1] BS 1377 : Part 2 : 1990, Test No 3.2
  - [2] Estimated if <5%, otherwise measured
  - [5] Values of shear strength were determined in situ by Chelmer Site Investigations using a Pilcon hand vane or Geonor vane (GV).
  - [8] BS 1377 : Part 3 : 1990, Test No 5.4

### Comments
- **Technician:** HS
- **Checked By:** MC

---

**Chelmer Site Investigations 2014**
### Laboratory Testing Results

**BS 1377 : 1990**

**Job Number :** CGL5499  
**Client :** Christopher Courage  
**Client Reference :** CGL5499  
**Site Name :** 44 Princesdale Road, W11

---

<table>
<thead>
<tr>
<th>Sample Ref</th>
<th>Sample Type</th>
<th>Moisture Content (%)</th>
<th>Soil Fraction &gt; 0.425mm (%)</th>
<th>UCS Limit (%)</th>
<th>Plastic Limit (%)</th>
<th>Plasticity Index (%)</th>
<th>Liquidity Index (%)</th>
<th>Modified Plasticity Index (%)</th>
<th>Soil Class</th>
<th>Filter Paper Contact Time (h)</th>
<th><em>S</em> Sample Vicoh Shear Strength (kPa)</th>
<th>Organic Content (%)</th>
<th>pH Value</th>
<th>Sulphate Content (g/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH1</td>
<td></td>
<td>&lt;5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BH1</td>
<td></td>
<td>29</td>
<td>&gt;0.425mm</td>
<td>76</td>
<td>24</td>
<td>52</td>
<td>0.10</td>
<td>52</td>
<td>CV</td>
<td>0</td>
<td></td>
<td></td>
<td>7.8</td>
<td>0.16  0.19 DS-1</td>
</tr>
<tr>
<td>BH1</td>
<td></td>
<td>29</td>
<td>&gt;0.425mm</td>
<td>74</td>
<td>23</td>
<td>51</td>
<td>0.12</td>
<td>51</td>
<td>CV</td>
<td>8</td>
<td></td>
<td></td>
<td>8.2</td>
<td>0.80  0.96 DS-1</td>
</tr>
<tr>
<td>BH1</td>
<td></td>
<td>28</td>
<td>&gt;0.425mm</td>
<td>73</td>
<td>25</td>
<td>48</td>
<td>0.07</td>
<td>48</td>
<td>CV</td>
<td>0</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

---

**Notes:**
- BS 1377 : Part 2 : 1990, Test No 3.2
- BS 1377 : Part 3 : 1990, Test No 4.4
- BS 1377 : Part 3 : 1990, Test No 5.3
- BS 1377 : Part 3 : 1990, Test No 5.4
- BS 1377 : Part 2 : 1990, Test No 4
- BS 1377 : Part 2 : 1990, Test No 5.6
- BS 1377 : Part 2 : 1990, Test No 9
- BS 1377 : Part 2 : 1990, Test No 5.6
- BS 1377 : Part 3 : 1990, Test No 5.6

**Key:**
- B - Disturbed sample
- S - Sub sample
- U - U100 (undisturbed sample)
- W - Water sample
- EM - Essentially Non-Plastic
- US - Undersite Foundation

---

**Chelmer Geotechnical, CM3 8AB**

---

**Date Received :** 01/07/2015  
**Date Testing Started :** 06/07/2015  
**Date Testing Completed :** 14/07/2015  
**Laboratory Used :** Chelmer Geotechnical, CM3 8AB

---

**Technical :** HS  
**Checked By :** MC  
**Date Checked :** 14-Jul-15

---

**Client Reference :** CSI5499  
**Client :** Christopher Courage  
**Site Name :** 44 Princesdale Road, W11
Laboratory Testing Results

Notes:

1. If the Soil Fraction > 0.425mm exceeds 5% the Equivalent Moisture Content of the remainder (calculated in accordance with BS 1377: Part 2: 1990, cl.3.2.4 note 1) is also plotted and the alternative profile additionally shown as an appropriately coloured broken line.

2. If plotted, 0.4 LL and PL+2 (after Driscoll, 1983) should only be applied to London Clay (and similarly over consolidated clays) at shallow depths.

Unless otherwise stated, values of Shear Strength were determined in situ by Chelmer Site Investigations using a Pilcon Hand Vane the calibration of which is limited to a maximum reading of 140 kPa. (Not UKAS accredited)

Checked By: MC
Date Checked: 14-Jul-15
Laboratory Testing Results

Plasticity Chart for the classification of fine soils and the finer part of coarse soils
In Compliance with BS5930 : 1999

Job Number : COL5499
Client : Christopher Courage
Client Reference : CSI5499
Site Name : 44 Princesdale Road, W11

Notes :-
- Key :-
  - TP3
  - BH1

Comments :-
- SILT (M-SOIL), M, plots below A-Line
- CLAY, C, plots above A-Line JM and C may be combined as FINE SOIL, F.

Checked By :- MC
Date Checked :- 14-Jul-15
PARTICLE SIZE DISTRIBUTION
BS 1377-2:1990

Job Number: CGL5499
Site Name: 44 Princedale Road
Sample Number: TP3
Soil Description: Orange/brown, slightly sandy slightly gravelly silty CLAY with occasional fine crystals.

Type of Sieving: Hydrometer
Date: 10-Jul-15
Tested By: LE
Laboratory: Chelmer Geotechnical CM3 8AB

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.0</td>
<td>100.0</td>
</tr>
<tr>
<td>75.0</td>
<td>100.0</td>
</tr>
<tr>
<td>63.0</td>
<td>100.0</td>
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<tr>
<td>50.0</td>
<td>100.0</td>
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<tr>
<td>37.5</td>
<td>100.0</td>
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<tr>
<td>28.0</td>
<td>100.0</td>
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<tr>
<td>20.0</td>
<td>100.0</td>
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<td>14.0</td>
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<td>10.0</td>
<td>96.5</td>
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<td>6.3</td>
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<tr>
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<td>81.0</td>
</tr>
<tr>
<td>0.212</td>
<td>77.4</td>
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<tr>
<td>0.150</td>
<td>71.0</td>
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<td>0.063</td>
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<td>0.045</td>
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<td>0.008</td>
<td>26.3</td>
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<tr>
<td>0.004</td>
<td>25.7</td>
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<tr>
<td>0.003</td>
<td>25.0</td>
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<tr>
<td>0.002</td>
<td>23.2</td>
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<tr>
<td>0.001</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Calculations:
f = \frac{(M_1 - M_2) \times P}{M_1} 
\text{t = Percentage of fines passing 0.063mm}

Comments:
- Checks by: MC
- Checked: 31-Jul-15
- Date Checked: 31-Jul-15
Chelmer Site Investigations
Unit 15
East Manningfield Industrial Estate
CM3 8AB

RT - Summary Report Format, Issued by JG 07.05.15 Authorised by MS
Page 1 of 4

Analytical Test Report: L15/j292/c5/j001

Your Project Reference: CS15499  Samples Received on: 03.07.2015
Your Order Number: 4696  Testing Instruction Received: 03.07.2015
Report Issue Number: 1  Sample Tested: 03 to 10.07.2015
Samples Analysed: 2 Soils  Report issued: 10.07.2015

Signed

James Gane
Manager - Data Logistics
Nicholls Colton Analytical

Notes:

General
Please refer to Methodology tab for details pertaining to the analytical methods undertaken.
Samples will be returned for 14 days after issue of this report unless otherwise requested.
Moisture Content was determined in accordance with BCA method statement MS - GL - Sample Prep, oven dried at 105oC.
Moisture Content is reported as a percentage of the dry mass of soil. This calculation is in accordance with BS1377, Part 2, 1990, Clause 3.1
Stone Content was determined in accordance with BCA method statement MS - GL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.
With the exception of Sulphate and Sulphur, which have crushed over the 2mm test sieve, concentrations are reported as a percentage mass of the dry soil passing the 10mm BS test sieve.
Samples were supplied by customer.

Deviant Samples
Samples were received in suitable containers  Yes
A date and time of sampling was provided  Yes
Some sample handling times were exceeded prior to analysis of determinants  Yes

When samples do not meet one or more of the above criteria they will be classed as deviant, this means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.


Accreditation Key
UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited
L15/1292/CSI/001

Project Reference - CSI5499

Analytical Test Results - BRE Suite

<table>
<thead>
<tr>
<th>NCA Reference</th>
<th>15-17889</th>
<th>15-17890</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client Sample Reference</td>
<td>64103 / BH1</td>
<td>64106 / BH1</td>
</tr>
<tr>
<td>Client Sample Location</td>
<td>64103 / BH1</td>
<td>64106 / BH1</td>
</tr>
<tr>
<td>Depth (m)</td>
<td>1.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Date of Sampling</td>
<td>25.06.2015</td>
<td>25.06.2015</td>
</tr>
<tr>
<td>Time of Sampling</td>
<td>AM</td>
<td>AM</td>
</tr>
<tr>
<td>Sample Matrix</td>
<td>Clay</td>
<td>Clay</td>
</tr>
<tr>
<td>Determinant</td>
<td>Units</td>
<td>Accreditation</td>
</tr>
<tr>
<td>Water soluble sulphate</td>
<td>(mg/l)</td>
<td>u</td>
</tr>
<tr>
<td>Acid Soluble Sulphate</td>
<td>(%)</td>
<td>u</td>
</tr>
<tr>
<td>Total Sulphur</td>
<td>(%)</td>
<td>u</td>
</tr>
<tr>
<td>pH Value</td>
<td>pH Units</td>
<td>MCERTS</td>
</tr>
</tbody>
</table>
L15/1292/CSI/001

Project Reference - CSI5499

Sample Descriptions

<table>
<thead>
<tr>
<th>NCA Reference</th>
<th>Client Sample Reference</th>
<th>Sample Depth (m)</th>
<th>Description</th>
<th>% Passing 2mm BS test sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-17889</td>
<td>64103 / BH1</td>
<td>1.00</td>
<td>Light brown slightly sandy slightly gravelly clay with brick fragments and carbonaceous material. (Fill)</td>
<td>88</td>
</tr>
<tr>
<td>15-17890</td>
<td>64106 / BH1</td>
<td>5.00</td>
<td>Brown slightly sandy clay.</td>
<td>100</td>
</tr>
</tbody>
</table>
**Analysis Methodologies**

<table>
<thead>
<tr>
<th>Matrix</th>
<th>Determinant</th>
<th>Sample condition for analysis</th>
<th>Test Method used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>pH</td>
<td>As Received</td>
<td>In house method statement - MS - Cl - pH (Soil)</td>
</tr>
<tr>
<td>Soil</td>
<td>Sulphate</td>
<td>Air Dried</td>
<td>In house method statement - MS - Cl - Anions (Aquakem)</td>
</tr>
<tr>
<td>Soil</td>
<td>Acid Sulphate</td>
<td>Air Dried</td>
<td>In house method statement - MS - Cl - BRE</td>
</tr>
<tr>
<td>Soil</td>
<td>Total Sulphur</td>
<td>Air Dried</td>
<td>In house method statement - MS - Cl - BRE</td>
</tr>
</tbody>
</table>
Any samples that are deemed to be subject to deviation will be recorded as such within the test summary.

This report is personal to the client, confidential and non assignable. It is issued with no admission of liability to any third party.

This report shall not be reproduced, except in full, without the written approval of Chelmer Site Investigations Laboratories Ltd.

Where our involvement consists exclusively of testing samples, the results and comments (if provided) relate only to the samples tested.
On site tree identification for guidance only. Not authenticated.
Upper Ground Floor (existing)
Notes: On site tree identification for guidance only. Not authenticated.
First Floor (existing)
Notes: On site tree identification for guidance only. Not authenticated.
Upper Ground Floor (existing)

Key:
- Tree/Shrub
- Borehole
- Trial Pit
- Gully
- Tree Stump
- Rain Water/Soil Pipe
- Manhole
On site tree identification for guidance only. Not authenticated.

Lower Ground Floor (existing)
PLAN ON TW01 PROPS

TW01 - Typical horizontal shores using RMD propping at low level, subject to detail design by the contractor

Typical fully shored shaft excavation as per details

# - Excavate near corners first to expose existing party wall footings and confirm assumptions.

PLAN ON U/PINS SHAFTS

PLAN ON LATERAL RESTRANIT TO BOUNDARY WALLS (GROUND AND FIRST FLOOR)

Permanent Ground floor steels

Temporary RMD braced with scaffold tubing to laterally restrain perimeter walls before bulk excavation commence

3. Underpin wall and place back prop on completion

5. Reduce central earth install ground floor steelwork to maintain lateral restraint to party walls

4. TW01 - Install in localised trenches

TYPICAL SECTION

6 & 7. Excavate to formation level, blind and construct basement slab.

READ IN CONJUNCTION WITH 5.0 METHOD STATEMENT