

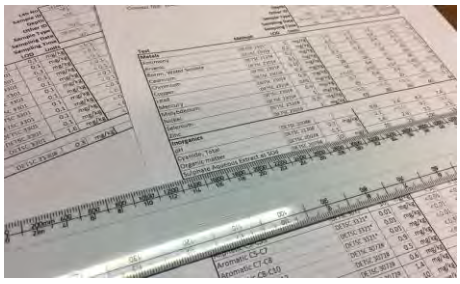

# Phase 2: Site Investigation

## Hotel Felix, Cambridge

## Cassel Hotels (Cambridge) Ltd

## S201112/SI

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# PHASE 2 SITE INVESTIGATION REPORT

# HOTEL FELIX, CAMBRIDGE

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# 1 EXECUTIVE SUMMARY

| | |
|---|---|
| **Site Address** | Hotel Felix, Huntingdon Road, Girton, Cambridge, CB3 0LX. |
| **Proposed Development** | The proposed development is outlined to be demolition of the existing building and construction of a two and three storey care home with associated external access road, parking and soft landscaping. |
| **Fieldwork** | • 5no. small percussive boreholes drilled to a maximum of 5.00mbgl.<br>• 3no. cable percussive boreholes drilled to a maximum of 20.00mbgl.<br>• 8no. machine excavated trial pits to a maximum depth of 3.20mbgl.<br>• 2no. soakaway tests were undertaken in TP1 and TP8<br>• 5no gas pipes installed into (WS1, WS2, WS3, WS4 and WS5). |
| **Ground Conditions** | • Made ground encountered to depths of between 0.40mbgl (TP3 and TP4) and 1.80mbgl (BH2). Generally comprising topsoil or clayey granular fill over sandy gravelly clay fill or clay fill from ground surface. Locally, in the formal garden areas, topsoil was proven over dolomite fill and sandy gravelly clay fill. To the east granular fill surfacing of brick, chalk, dolomite and flint generally overlying sandy gravelly clay fill was proven.<br>• The shallow natural deposits comprised firm and firm to stiff consistency locally slightly sandy slightly gravelly medium to high strength silty clay to depths of between 1.10 and 1.50mbgl and locally to 3.60mbgl and 2.50mbgl in BH2 and BH3 respectively. In TP1 yellowish brown sandy gravel was proven between 1.20mbgl and 1.80mbgl.<br>• Below these depths stiff to very stiff consistency slightly gravelly high to very high strength clay was encountered distinguished by their blueish grey colour. In the deeper boreholes the clay continued at depth, however the gravel fraction was absent from 6.00mbgl and 7.50mbgl onwards.<br>• No groundwater was encountered in the trial pits or boreholes during this investigation other than a seepage in TP1 at 1.40mbgl. |
| **Contamination Testing Results** | • 8no. samples were subject to a suite of metals, semi-metals, non-metals and inorganic determinants.<br>• 8no. samples selected for suites of organic testing comprising speciated PAH and 2no for TPHCWG.<br>• 8no. samples were screened for asbestos; no fibres were present.<br>• Levels of metals, semi-metals and non-metals were recorded below the relevant thresholds for long term risk to human health. Localised raised speciated PAH contaminants were proven locally in the shallow granular and clay fill made ground. |
| **Contamination Analysis** | • Based on the contamination levels recorded to date, there is a general minimal risk existing to end users of the site. However, the shallow PAH impacted material should be delineated and removed from site to appropriate landfill facility.<br>• In proposed soft landscaped areas the topsoil should be stockpiled for reuse as a suitable growing medium, minimum 300mm in thickness after screening of deleterious material such as brick rubble if encountered. If insufficient on site then clean topsoil should be imported from a reputable source.<br>• The PAH impacted topsoil around TP3 should be delineated and then removed from site to an appropriate tip.<br>• PPE must be incorporated for workers. Damping down of site during dry windy conditions.<br>• With respect to utilities, levels of pH preclude the use of copper pipes and TPHCWG PE pipes.<br>• Sub surface concrete should be designed to DS-2 ACEC (Class AC-2).<br>• Low risk to controlled waters. |
| **Geotechnical Testing Results** | • Laboratory testing indicate shear strengths of 67 and 191kPa (medium to high strength clay).<br>• Insitu hand vanes (0.90-5.00mbgl) ranged from 65kPa to 120kPa (medium to high strength clay).<br>• Insitu SPT results within cohesive materials at 7.00mbgl indicate medium to very high strength conditions.<br>• Moisture levels were between 22% and 33%.<br>• The cohesive material can be assessed as generally having a high shrinkage.<br>• Raised soluble sulphates and slightly alkaline to alkaline pH conditions.<br>• Soil infiltration rates of between 0.169-3.04 x $10^{-6}$m/s.<br>• CBRs assumed >5.00%. |
| **Preliminary Geotechnical Analysis & Foundation Recommendations** | • A safe bearing capacity of 150kN/m² has been determined for strip foundations.<br>• Providing the safe bearing capacity is not exceeded settlements have been calculated to be less than 25mm.<br>• Prior to placing foundation concrete, obvious soft or loose spots should be removed and replaced with suitably recompacted hardcore or lean mix concrete. In addition, all excavations should be inspected to ensure that they fully penetrate areas of disturbed ground.<br>• Normal earthwork plant although after demolition of the existing buildings, relict foundations may still be present which will require breaking out. |

# 2 INTRODUCTION

## 2.1 Authorisation

Solmek were instructed by Cassel Hotels (Cambridge) Ltd to undertake a site investigation at Hotel Felix, Huntingdon Road, Girton, Cambridge, CB3 0LX.

Sources of information, including previous works undertaken at the site are detailed below:

- *Solmek Phase One Desk Study – S201112 (December 2020)*

Reference should be made to the above report for details of the site's history and environmental setting.

## 2.2 Scope of Works

The proposed development is outlined to be demolition of the existing building and construction of a two and three storey care home with associated external access road, parking and soft landscaping.

A drawing showing the position of the site is included in Appendix A (Figure 1).

A site investigation comprising geotechnical and contamination testing and analysis was undertaken. A ground gas risk assessment was also requested.

The fieldwork and testing was generally carried out according to the recommendations of BS5930: 2015 "Code of Practice for Ground Investigations" and where applicable BS EN 1997-2:2007 with soil descriptions to BS EN 14688-1:2013 where applicable. The information provided in this report is based on the investigation fieldwork and is subject to the comments and approval of the various regulatory authorities.

There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Solmek reserve the right to alter conclusions and recommendations should further information be available or provided. Any schematic representation or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

# 3 SITE DESCRIPTION AND FIELDWORK

The centre of the site is located at OS Grid Ref 543140, 260550 and covers an area of approximately 1.41Ha. The area is located at Hotel Felix, Huntingdon Road, Girton, Cambridge, CB3 0LX.

The site is located on a parcel of land northwest of Whitehouse Lane and is approximately rectangular in shape with a mostly flat and even topography. The site is currently occupied by a hotel and restaurant with landscaped outdoor areas surrounding the buildings.

The main building on the site is a large two and three storey hotel and restaurant located in the centre of the site with an enclosed courtyard to the north east. The remainder of the site is surfaced with a combination of soft landscaping, asphalt roadways and paved/gravel footpaths. The southeast of the site is currently occupied by a hard surfaced car parking area.

The site perimeter to the north, west and south is lined with fencing and trees while the eastern edge of the site has a publicly accessible road with bushes along the boundary. The land use immediately to the northwest of the site is residential in nature with large fields located to the south and northeast. Whitehouse Lane forms the eastern site boundary with residential flats and commercial offices located across the road.

## 3.1 Fieldwork

The fieldwork was carried out commencing on 30th November 2020 and comprised:

- 5no. small percussive boreholes (WS1 to WS5 inclusive) drilled to a maximum depth of 5.00m below ground level (bgl).

  - The borehole locations were spread across the whole area to give a general site coverage and to target the proposed building footprints.
  - To determine shallow to medium ground conditions and obtain samples for geotechnical testing.
- Installation of ground gas wells in 5no boreholes (WS1, WS2, WS3, WS4 and WS5).
  - Installations evenly spaced around the site (25-50m distance) to capture potential ground gas from the areas of made ground.
- 3no. cable percussive boreholes (BH1 to BH3 inclusive) drilled to depths of 20.00mbgl.
  - The borehole locations were placed in order to target the proposed building footprints.
  - Boreholes drilled to determine deeper ground conditions.
  - To obtain samples for geotechnical testing.
- 8no. machine excavated trial pits (TP1 to TP8 inclusive) to depths of between 3.00 and 3.20mbgl.
  - The trial pits were located around the site and to obtain samples for environmental samples for contamination testing.
  - 2no. soakaway tests were undertaken in TP1 and TP8 to obtain local soil infiltration rates.

In-situ standard penetration tests (SPT) were undertaken in the cable percussive boreholes. Undisturbed (U100) samples were also undertaken within the cable percussive boreholes. In-situ hand shear vane tests were carried out in the small percussive boreholes and the trial pits.

Descriptions of the strata encountered in the trial pits and boreholes together with details of testing, sampling and groundwater are presented in Appendix B of this report. Photographs of the trial pits are presented in Appendix A (Plates 1 to 8). A plan showing the location of all the exploratory positions undertaken can be found in Appendix A, Figure 2.

## 4 GROUND CONDITIONS

A summary of the ground conditions encountered is given below in Tables 1, 2 and 3.

### 4.1 Made Ground

Made ground was encountered across the site to depths of between 0.40mbgl (TP3 and TP4) and 1.80mbgl (BH2). The made ground varied across the site and generally comprised topsoil or clayey granular fill over sandy gravelly clay fill or clay fill from ground surface. Locally, in the formal garden areas, topsoil was proven over dolomite fill and sandy gravelly clay fill. To the eastern areas the made ground consisted of granular fill surfacing of brick, chalk, dolomite and flint generally overlying sandy gravelly clay fill.

The made ground comprised the following stratum units.

**TABLE 1: MADE GROUND GEOLOGY**

| Stratum | Top Depth | Base Depth | Details |
|---|---|---|---|
| **Topsoil** | 0.00mbgl | 0.60mbgl | Generally brown clayey silty slightly gravelly sandy topsoil with brick, chalk and flint. Located in BH1, BH2, TP1-TP4 inclusive, TP6 and TP8. |
| **Granular fill** | 0.00-0.30mbgl | 0.40-0.70mbgl | Comprising clayey silty sandy gravel. Gravel fraction comprised brick, chalk, flint and locally dolomite. In BH3 crushed brick and concrete fill was found under the granular fill. Located in TP5, TP7, WS3, BH1 (below topsoil) and BH3. |
| **Clay fill** | 0.00-0.70mbgl | 0.50-1.80mbgl | Described as firm consistency sandy gravelly silty clay. The gravel component comprised brick, concrete, cinder blocks, charcoal, pottery, flint and chalk. Locally plastic material was found in TP7. Located from the surface in WS1, WS2, WS4 and WS5, and under the topsoil/granular fill in TP1, TP2, TP6, TP5, TP7, BH2 and BH3. |

## 4.2 Natural Deposits

The shallow natural deposits varied between firm and firm to stiff consistency locally slightly sandy slightly gravelly medium to high strength silty clay. These units were predominant to depths of between 1.10 and 1.50mbgl although locally they deepened to 3.60mbgl and 2.50mbgl in BH2 and BH3 respectively. The gravel component was flint and chalk.

In TP1 a layer of yellowish brown sandy gravel of chalk and flint was proven between 1.20mbgl and 1.80mbgl.

Below these depths the soil profile comprised stiff to very stiff consistency slightly gravelly high to very high strength clay which were distinguished only by their blueish grey colour. The gravel component was flint and chalk.

In the deeper boreholes the clay continued at depth, however the gravel fraction was absent from 6.00mbgl and 7.50mbgl onwards.

The natural ground comprised the following stratum units.

**TABLE 2: NATURAL GROUND GEOLOGY**

| Stratum | Top Depth | Base Depth | Details |
|---|---|---|---|
| **GRAVEL** | 1.20mbgl | 1.80mbgl | Yellowish brown sandy gravel of chalk and flint, TP1 only. |
| **Upper brownish CLAY** | 0.40-0.60mbgl | 1.10-3.60mbgl | Firm consistency slightly sandy slightly gravelly medium to high strength clay. Gravel fractions mostly flint and chalk. |
| **Upper bluish grey CLAY** | 1.10-3.60mbgl | 6.00-7.50mbgl | Stiff to very stiff consistency slightly gravelly high to very high strength clay. Gravel fractions mostly flint and chalk. |
| **Lower bluish grey CLAY** | 6.00-7.50mbgl | 20.00mbgl | Stiff to very stiff consistency slightly sandy to sandy high to very high strength clay. |

## 4.3 Solid Geology

Solid geology was not encountered during this investigation.

## 4.4 Groundwater

No groundwater was generally encountered in the trial pits or boreholes during this investigation. A slight seepage was noted in TP1 at the interface between the made ground and granular natural ground.

It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities.

# 5 CONTAMINATION TESTING RESULTS

The proposed development is outlined to be demolition of the existing building and construction of a two and three storey care home with associated external access road, parking and soft landscaping. The chemical test results are presented in Appendix C.

## 5.1 Contamination Testing and Rationale

To provide information upon the possibility of ground contamination eight samples were selected for shallow contamination testing.

A very low to moderate overall contamination risk was highlighted in the Phase 1 Desk Study due to site's former use as a private house, college and hotel. Coupled with the end use being Residential without Home

Grown Produce and given the size of the site the following samples selected are considered appropriate for testing:

- TP1, 0.40-0.60m (Clay fill)
- TP2, 0.30-0.50m (Clay fill)
- TP3, 0.20-0.40m (Topsoil)
- TP4, 0.10-0.30m (Topsoil)
- TP5, 0.50-0.70m (Clay fill)
- TP6, 0.10-0.30m (Topsoil)
- TP7, 0.40-0.60m (Clay fill)
- TP8, 0.20-0.40m (Topsoil)

The samples selected are considered to provide a range of coverage of the types of made ground encountered during the site investigation and are likely to be encountered during future site development ground works.

The scope of testing included:

- 8no. Metals, semi-metals, non-metals, inorganic determinands
- 8no. Asbestos identification screenings
- 8no. Speciated Polyaromatic Hydrocarbons (PAHs)
- 2no. Total Petroleum Hydrocarbons Criteria Working Group (TPHCWG)

TPHCWG testing was not considered necessary for the entire site due to the lack of visual or olfactory evidence of fuel and oil sources from the recovered samples and given the nature of the previous development. A selection of 2no. samples was therefore scheduled for TPHCWG.

## 5.2 Test Results

Based on the proposed development at the site, the test results have been compared to a series of Land Quality Management (LQM) Suitable for Use Levels (S4UL) based on a Residential without Home Grown Produce (HGP) land use.

These are the most up to date thresholds published in December 2014.

Where S4ULs are absent the EA CLEA model has been used to generate Residential without HGP land use thresholds for cyanide. The value for lead has been compared with the Category 4 Screening Level (March 2014) developed by Contaminated Land: Applications In Real Environments (CL:AIRE).

The test results are presented in Appendix C, and a summary is provided below in Tables 3 and 4 with values above the threshold highlighted.

### TABLE 3: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS (RES W/O HGP)

| Determinand | Units | Number of Samples above Level of Detection | Minimum Level | Maximum Level | Residential without HGP Value | Number of Results Exceeding Threshold Value |
|---|---|---|---|---|---|---|
| **Metals** | | | | | | |
| Cadmium | mg/kg | 8 | 0.10 | 0.26 | 85 | 0 |
| Chromium | mg/kg | 8 | 17 | 23 | 910 | 0 |
| Copper | mg/kg | 8 | 16 | 32 | 7100 | 0 |
| Mercury | mg/kg | 7 | <0.10 | 0.20 | 56 | 0 |
| Nickel | mg/kg | 8 | 22 | 29 | 180 | 0 |
| Lead | mg/kg | 8 | 58 | 220 | 310* | 0 |
| Zinc | mg/kg | 8 | 42 | 110 | 40000 | 0 |
| **Semi metals and non metals** | | | | | | |
| Arsenic | mg/kg | 8 | 11 | 35 | 40 | 0 |
| Boron | mg/kg | 8 | 0.70 | 2.20 | 11000 | 0 |
| Selenium | mg/kg | 5 | <0.20 | 0.30 | 430 | 0 |
| **Inorganic chemicals** | | | | | | |
| Cyanide, Total | mg/kg | 0 | <0.50 | - | 73.8** | 0 |
| W.S. Sulphate | mg/l | 3 | <10 | 320 | 2000^ | 0 |

| Other | | | | | | |
|---|---|---|---|---|---|---|
| pH | pH | 8 | 8.4 | 10.4 | 5.5^ | 0 |

* Category 4 Screening Levels, March 2014
** CLEA Software Version 1.06 (pH7 and 1%SOM)
^ EA Threshold Values
HGP Home Grown Produce

## 5.3 Metals, Semi Metals and Non-Metals

From the eight samples tested, concentrations of metals, semi-metal or non-metals were below the relevant thresholds for long term risk to human health.

## 5.4 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were generally recorded below 10mg/l and a maximum of 320mg/l.

None of the samples were elevated above levels affecting human health or the BRE Special Digest 1 500mg/l limit for the sulphate classification of concrete.

The results of the pH testing were between 8.4 and 10.4. These pH levels are consistent with alkaline to highly alkaline conditions.

## 5.5 Organic Chemicals

The organic thresholds vary depending on the levels of soil organic matter (SOM). The average SOM across the site was 2.98%, therefore a SOM of 2.50% has been used to determine the S4UL thresholds. Table 5, below, summarises the results.

### TABLE 4: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS (RES W/O HGP)

| Determinand | Units | Number of Samples above LOD | Minimum Level | Maximum Level | S4UL 1% SOM | S4UL 2.5% SOM | S4UL 6% SOM | Number of Results Exceeding Threshold Value |
|---|---|---|---|---|---|---|---|---|
| **TPH Aromatic Fractions (2no. Samples)** | | | | | | | | |
| C5-7 (Benzene) | mg/kg | 0 | <0.10 | - | 370 | **690** | 1400 | 0 |
| C7-8 (Toluene) | mg/kg | 0 | <0.10 | - | 860 | **1800** | 3900 | 0 |
| C8-10 | mg/kg | 0 | <0.10 | - | 47 | **110** | 270 | 0 |
| C10-12 | mg/kg | 0 | <0.10 | - | 250 | **590** | 1200 | 0 |
| C12-16 | mg/kg | 0 | <0.10 | - | 1800 | **2300** | 2500 | 0 |
| C16-21 | mg/kg | 1 | <0.10 | 16 | 1900 | **1900** | 1900 | 0 |
| C21-35 | mg/kg | 1 | <0.10 | 88 | 1900 | **1900** | 1900 | 0 |
| **TPH Aliphatic Fractions (2no. Samples)** | | | | | | | | |
| C5-6 | mg/kg | 0 | <0.10 | - | 42 | **78** | 160 | 0 |
| C6-8 | mg/kg | 0 | <0.10 | - | 100 | **230** | 530 | 0 |
| C8-10 | mg/kg | 0 | <0.10 | - | 27 | **65** | 150 | 0 |
| C10-12 | mg/kg | 0 | <0.10 | - | 130 | **330** | 770 | 0 |
| C12-16 | mg/kg | 0 | <0.10 | - | 1100 | **2400** | 4400 | 0 |
| C16-35 | mg/kg | 1 | <0.10 | 13 | 65000 | **92000** | 110000 | 0 |
| **Speciated PAH** | | | | | | | | |
| Naphthalene | mg/kg | 3 | <0.10 | 0.13 | 2.3 | **5.6** | 13 | 0 |
| Acenaphthylene | mg/kg | 3 | <0.10 | 0.60 | 2900 | **4600** | 6000 | 0 |
| Acenaphthene | mg/kg | 3 | <0.10 | 3.00 | 3000 | **4700** | 6000 | 0 |
| Fluorene | mg/kg | 3 | <0.10 | 3.30 | 2800 | **3800** | 4500 | 0 |
| Phenanthrene | mg/kg | 7 | <0.10 | 27 | 1300 | **1500** | 1500 | 0 |
| Anthracene | mg/kg | 7 | <0.10 | 8.9 | 31000 | **35000** | 37000 | 0 |
| Fluoranthene | mg/kg | 8 | 0.22 | 33 | 1500 | **1600** | 1600 | 0 |
| Pyrene | mg/kg | 8 | 0.21 | 31 | 3700 | **3800** | 3800 | 0 |
| Benz' (a)anth' ene | mg/kg | 6 | <0.10 | 13 | 11 | **14** | 15 | 0 |
| Chrysene | mg/kg | 6 | <0.10 | 13 | 30 | **31** | 32 | 0 |
| Benz' (b)fluor' ene | mg/kg | 6 | <0.10 | 13 | 3.9 | **4.0** | 4.0 | 3 |
| Benz' (k)fluor' ene | mg/kg | 6 | <0.10 | 5.3 | 110 | **110** | 110 | 0 |
| Benz' (a)pyrene | mg/kg | 6 | <0.10 | 10 | 3.2 | **3.2** | 3.2 | 2 |
| Id' (123cd)pyrene | mg/kg | 5 | <0.10 | 7.1 | 45 | **46** | 46 | 0 |
| Diben(ah)anth'ene | mg/kg | 5 | <0.10 | 2.4 | 0.31 | **0.32** | 0.32 | 4 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Benz (ghi)per' ene | mg/kg | 5 | <0.10 | 5.5 | 360 | **360** | 360 | 0 |
| Total PAH | mg/kg | 7 | <2.00 | 180 | 50* | **50*** | 50* | 3 |
| **Other** | | | | | | | | |
| Phenol | mg/kg | 0 | <0.30 | - | 750 | **1300** | 2300 | 0 |
| * *EA Threshold Values* | | | | | | | | |

Three speciated PAH determinands were elevated as were total PAH locally where brick gravel was found within the clay and topsoil fill. TPHCWG levels were below LQM/CIEH S4UL threshold values; indeed, most were below detection limits. All phenols were below the limits of detection.

### 5.6 Asbestos

Eight samples were selected for asbestos screening. No asbestos fibres were detected in the samples tested to date.

### 5.7 Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.
The main objectives of the Part 2A regime are to "identify and remove unacceptable risks to human health and the environment" and to "seek to ensure that contaminated land is made suitable for its current use".

Part 2A uses a risk based approach to defining contaminated land whereby the "risk" is interpreted as "the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land" and by "the scale and seriousness of such harm or pollution if it did occur".

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *"for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters."*

A conceptual model is used to develop and communicate the risks associated with a particular site.

To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include "land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health."

Categories 3 and 4 "encompass land which is not capable of being determined on such grounds".

See Appendix E for additional notes on contamination guidelines.

## 6 CONCEPTUAL MODEL AND CONTAMINATION ANALYSIS

The contamination conceptual model in Table 5 identifies the potential pollution linkages present on site based on source – pathway – receptor relationships. The Conceptual Model has been undertaken in accordance with CIRIA C552 and is based on Source, Pathway and Receptor analysis relating to EPA1990 (Part 2A, 2012).

The Conceptual Model assesses the consequence and the likelihood of a risk being realised to provide a risk classification for each receptor.

Full details of the tables used to assess consequence, likelihood and risk classification are presented in Appendix E.

## TABLE 5: CONCEPTUAL MODEL

| Source | Pathway | Receptor | Risk Rating | Comments |
|---|---|---|---|---|
| **Asphyxiating or explosive ground gases**<br>• Generally shallow made ground<br>• Not in radon affected area | **Ground gas migration**<br>• Migration through permeable soils<br>• Inhalation | **Future site users**<br>• Adult and possibly infants | **Low** | Gas monitoring in progress, source risk rating subject to change. No radon precautions required in new buildings. |
| | | **Users during development**<br>• Construction workers | **Low** | |
| **Areas of contamination hazardous to human health (Residential Without Homegrown Produce Thresholds)**<br>• Localised raised speciated PAH contaminants in made ground<br>• No asbestos proven | • Inhalation<br>• Direct Contact<br>• Dust Ingestion | **Future site users**<br>• Adult and possibly infants | **Low** | Mitigated by proposed structure hard standing, roads and service yards. Reuse clean topsoil (after compliance testing) and subsoil as suitable growing medium in proposed soft landscaped areas. |
| | | **Users during development**<br>• Construction workers | **Low** | Mitigation measures required during construction (PPE provision) |
| | | **Users of surrounding sites Adults and Infants** | **Low** | Potential low risk during construction from dust generation, damping down during dry conditions. |
| | | **Soft landscaping as communal gardens** | **Low** | Reuse topsoil (after compliance testing) and subsoil as suitable growing medium in proposed soft landscaped areas. |
| **Areas of contamination hazardous to human health (Residential Without Homegrown Produce Thresholds)**<br>• Generally low contamination profile<br>• Localised raised speciated PAH contaminants in made ground<br>• No groundwater encountered | • Leaching of mobilised contaminants<br>• Drainage<br>• Lateral migration<br>• Accumulation of contaminated sediment | **Solid geology**<br>• Unproductive Strata | **Low** | Low sensitivity aquifer beneath extensive low permeable clays with limited availability of contaminants in soil analysis. |
| | | **Drift geology**<br>• None recorded | **Low** | Low permeability clays across site. Generally no groundwater encountered during fieldwork. |
| | | **Surface water features**<br>• Stream/drain 185m northwest | **Low** | Limited availability of contaminants in soil analysis. Control of surface water run off through suitable drainage systems once construction complete. |
| **Areas of water-soluble sulphates elevated above BRE Special Digest 1 threshold (>500mg/l)**<br>• Raised within natural clay<br>• Alkaline to highly alkaline pH | • Direct contact | **Construction Materials**<br>• Concrete | **Low to Moderate** | A slightly higher level of sulphate resistant concrete to be adopted into Class DS-2, ACEC (Class AC-2). |
| **Areas of contamination above service fabric thresholds:**<br>• Alkaline to highly alkaline pH<br>• TPHCWG locally raised | • Direct contact | **Construction Materials**<br>• Service Fabric | **Low to Moderate** | Copper and PE piping to be avoided and prudent to lay any service within clean bedding. |

The majority of receptors are considered to be a low risk with construction materials being a moderate to low risk.

Mitigation measures to reduce the risks identified for reach receptor are discussed in the following sections.

## 6.1 Users of the Site Once Development is Complete

The users of the site, particularly construction workers, are unlikely to be exposed to contaminants present in the soils beneath the site during redevelopment work. However, **potential** exposure pathways may include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion.

To establish if the levels of contaminants present on site may pose a risk to the health of the future users of the site the results of the contamination testing have been compared to a series of LQM S4UL and C4SL thresholds based on a residential without home grown produce land use.

The levels of metals, semi-metals and non-metals were recorded below the relevant thresholds for long term risk to human health. Localised raised speciated PAH contaminants were proven locally in the shallow topsoil and clay fill made ground. However, the pollutant linkage will be severed as long as all contaminated areas are covered either by buildings, hardstanding, or a clean cover system. Alternatively, the shallow PAH impacted material can be delineated and removed from site to appropriate landfill facility. In addition, no asbestos fibres were detected within the samples tested to date.

During the initial site strip, if any zones of odorous, brightly coloured or suspected contaminated ground are encountered then work should cease in that area until the material has been tested. The results of the tests will determine whether or not remediation will be required.

The current legislation on waste involves the categorization of materials into inert waste, non-reactive hazardous wastes and hazardous wastes. The determination of the category depends on DEFRA landfill directive waste acceptance criteria (WAC) testing. Material taken off site may be subject to WAC by the appropriate waste disposal company.

## 6.2 Construction Workers and Users of Surrounding Sites

Short term human exposure to contaminants present in soils can occur via several pathways during the construction and ground works phase of the development. These include dermal absorption after contact with contaminated ground, inhalation of soil or dust (including windblown dust), inhalation of volatised compounds, inadvertent soil ingestion and contact with contaminated groundwater.

Although asbestos was not detected from the soil samples subjected to testing within this investigation, the possibility exists that asbestos containing materials may still be present on site and currently lie undetected. It is therefore advised that a ‘watching brief’ is undertaken during the initial site strip and any excavation works and advice sought if asbestos is found or suspected. All works should be undertaken in accordance with the Control of Asbestos Regulations 2012.

As good practice, PPE must be employed in accordance with HSE guidance and safeguards should be taken to limit dust during ground works, and access to the public should be restricted. Construction workers should use gloves as a precaution when handling any soils. Provision of suitable hygiene facilities are needed for site workers. Wheel washers should be provided and used for any vehicle entering or leaving site to prevent cross contamination, excessive road contamination and dust migration.

During dry weather, any excavations may require clean water to be sprinkled at shallow depth to prevent excess dust escaping to offsite receptors. Monitoring of dust concentrations during construction should be given careful consideration to ensure occupational exposure levels are not exceeded.

## 6.3 Vegetation

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, nickel, and zinc.

With the exception of the topsoil around TP3, in the northern part of the site, the topsoil can be stripped and stockpiled for reuse as a suitable growing medium, minimum 300mm in thickness after screening of deleterious material such as brick rubble if encountered.

The PAH impacted topsoil around TP3 should be delineated and then removed from site to an appropriate tip.

If there is insufficient clean topsoil then it should be imported from a reputable source. The topsoil should be placed over the natural clay in all proposed areas of soft landscaping.

## 6.4 Ground and Surface Water

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology.

The solid geology beneath the site is classified as a Low Sensitivity Aquifer. The site is not located in a Source Protection Zone.

No groundwater was encountered in the trial pits or boreholes during this investigation apart from a slight seepage at 1.40mbgl in TP1.

Generally low soil contamination results were recorded.

Given the relatively shallow made ground, general lack of groundwater and the fact that extensive clays underlie the site, which will have a low permeability and thus acting as an effective aquiclude, the risk of ground and surface water contamination appears to be low.

## 6.5 Construction Materials

Materials at risk from potential soil contamination include inorganic matrices such as cement and concrete and also organic material, e.g. plastics and rubbers. Acid ground conditions and elevated levels of sulphates can accelerate the corrosion of building materials. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum-based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

### *6.5.1 Concrete Classification*

BRE Special Digest One: *"Concrete in Aggressive Ground"*: 2005 3rd Edition has been used to assess the risks posed to underground concrete and to establish the design measures required to mitigate the risks. The results of the pH and sulphate tests in the natural deposits fall into Class DS-2, ACEC (Class AC-2) requirements for concrete protection assuming mobile groundwater conditions.

### *6.5.2 Water Supply Pipes Material Selection*

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication "Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites" (January 2011). A Brownfield Site is defined in the document as "Land or premises that have previously been used or developed that may be vacant or derelict". It should be noted that Brownfield Sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer.

The concentrations of the selected determinands should be compared to the pipe material selection table in Appendix E and consultation with the appropriate utility supply company is required to identify the most suitable service fabric. However, the pH levels preclude the use of copper pipes and the raised TPHCWG PE pipes.

# 7 GROUND GAS ASSESSMENT

Ground gas monitoring is currently underway and these will be reported as an addendum to this report.

# 8 GEOTECHNICAL TESTING AND ANALYSIS

Samples taken from the boreholes underwent a series of geotechnical tests (BS 1377:1990) to aid foundation design and soil description. In-situ hand shear vanes were undertaken within the small percussive boreholes and trial pits. Disturbed and undisturbed samples were retrieved for laboratory testing. The geotechnical results are presented in Appendix D.

## 8.1 Strength and Density

Ten cohesive samples have been subjected to remoulded U38 or U100 undrained triaxial testing. The depths of the samples were between 1.00mbgl and 10.50mbgl. The results were generally between 67kPa and 191kPa indicating medium to high strength conditions.

SPT's within the deeper clay deposits greater than 7.00mbgl ranged from 15 to 41, when using the rule of thumb that five times the N value equate to a shear strength values of between 75 and 205kPa can be assumed, which relates to medium to very high strength conditions.

Insitu hand shear vane readings at depths of between 0.90mbgl and 5.00mbgl in the natural clay ranged from 65kPa to 120kPa which is indicative of medium to high strength conditions.

## 8.2 Moisture Contents

Ten samples recovered from the boreholes have been subject to moisture content tests to determine the moisture profile at depths of between 1.00 and 10.95mbgl. Moisture levels were between 22% and 33%.

## 8.3 Atterberg Limit Determinations

Seven Atterberg Limit Determination tests were carried out on samples of cohesive material to classify the fine-grained soils. The results were compared to the Casagrande Chart published in BS5930 and showed the samples to be generally clay of high to very high plasticity.

The Plasticity Indices ranged between 36 and 47 with equivalent moisture contents recorded generally above and one result below the corresponding plastic limits. The cohesive material across the site can be assessed as having a **high** shrinkage potential in relation to NHBC Guidance Chapter 4.2.

## 8.4 pH and Sulphate Results

Six samples of soil from the boreholes were tested for acidity and soluble sulphate content to assess whether the material may be potentially aggressive to building fabric. The results of the testing for pH ranged from 7.8 to 8.4 indicating slightly alkaline to alkaline conditions. Soluble sulphates were recorded at 63mg/l to 1300mg/l.

## 8.5 Percolation Trials

Soakaway testing was undertaken within two of the trial pits and was generally carried out in accordance with BRE Digest 365: Soakaway Design. The result sheets are presented in Appendix D. The trial pits were excavated to a maximum depth of 3.00mbgl using an excavator with a 0.60m wide bucket. The strata were then logged and water was poured into the pit. Table 6 below gives a summary of the related infiltration rates.

**TABLE 6: PERCOLATION TRIAL RESULTS**

| Pit Number | Infiltration Rate ($x10^{-6}$ m/s) | | | | Description of Base Stratum |
|---|---|---|---|---|---|
| | Test 1 | Test 2 | Test 3 | Mean | |
| TP1 | 3.04 | - | - | - | Slightly gravelly CLAY |
| TP8 | 0.169 | - | - | - | Slightly gravelly CLAY |

## 8.5 CBR Results

Insitu hand shear vane tests were undertaken within the small percussive boreholes and trial pits from at 0.90mbgl within the natural clay. The results ranged from 65kPa to 120kPa. This equates to equilibrium CBR values >5% (after Black et al). Where made ground is encountered at formation level, a CBR value of 2% should be taken.

The formation level of any proposed access roads or parking areas should first be proof rolled prior to placing the sub base. Followed by compacting the material in layers to Series 600 “Specification of Earthworks”. Further confirmatory CBR testing may then be undertaken to ensure that suitable compaction has taken place.

## 8.6 Foundations

The site comprises relatively shallow natural cohesive deposits which are suitable for traditional shallow foundations.

### 8.6.1 Care Home – BH1, BH2, WS1, WS2, WS3 and WS4

The made ground generally ranged from 0.40mbgl up to 1.30mbgl. This is underlain with medium to high strength clay encountered in the western and central part of the site where the proposed main building is to be located.

Based on plasticity index results, all cohesive soils at the site should be regarded as being of high volume change potential. Foundations should therefore be placed at a minimum depth of 1.00m below original or finished ground level, whichever is the lower. Locally the made ground on this part of the site is slightly deeper and therefore foundations will have to be deepened and stepped down accordingly.

Based on the laboratory and insitu testing results a conservative undrained shear strength of 67kN/m² a safe bearing capacity of 150kN/m² has been determined for strip foundations 0.60m wide founding on the natural medium strength clay at depths of around 1.00mbgl.

Providing the safe bearing capacity is not exceeded settlements have been calculated to be less than 25mm.

### 8.6.2 General

Foundations near existing or proposed trees should be deepened and provided with appropriate heave precautions in accordance with NHBC Standards Chapter 4.2 current guidance. Over deepened foundations should be stepped in accordance with NHBC Standards, Chapter 4.4.

Prior to placing foundation concrete, obvious soft or loose spots should be removed and replaced with suitably recompacted hardcore or lean mix concrete. In addition, all excavations should be inspected to ensure that they fully penetrate areas of disturbed ground.

The results of the pH and sulphate tests generally fall into Class DS-2, ACEC (Class AC-2) requirements for concrete protection assuming mobile groundwater conditions.

Further advice should be sought from Solmek if unexpected ground conditions are encountered during redevelopment.

## 8.7 Excavation

Based on the nature of the ground conditions encountered, excavations should be within the capacity of normal earthworks plant, although after demolition of the existing buildings, relict foundations may still be present which will require breaking out.

Stability of excavations will be poor in the shallow made ground but should improve in the natural clay underlying the site. Excavation sides should be designed, constructed and supported in accordance with the recommendations given in CIRIA Report No. 97: “Trenching Practice”.

## 8.8 Groundwater

No groundwater was generally encountered in the trial pits or boreholes during this investigation. A slight seepage was noted in TP1 at the interface between the made ground and granular natural ground.

It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities.

**SOLMEK**

# APPENDIX A


SOLMEK

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**Figure Title**

Site Location Plan

**Project Number**

S201112

**Project Name**

Felix Hotel, Cambridge

**Client**

Cassel Hotels (Cambridge) Ltd

**Date**

January 2021

**DRG Number**

Figure 1

**Scale**

1:5000 @ A4 [DO NOT SCALE]

Legend Key

Project Bounds - Project Bounds


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**Figure Title**

BH/TP Location Plan

**Project Number**

S201112

**Project Name**

Felix Hotel, Cambridge

**Client**

Cassel Hotels (Cambridge) Ltd

**Date**

January 2021

**DRG Number**

Figure 2

**Scale**

1:1250 @ A4 [DO NOT SCALE]

Legend Key

- Locations By Type - Empty
- Locations By Type - BH
- Locations By Type - CP
- Locations By Type - TP
- Project Bounds - Project Bounds

# APPENDIX B

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# Cable Percussive Log

Scale 1:50 Sheet 1 of 2

## BH1

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Dando 2000 |
| | | | | **Started:** | 04/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 04/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 04/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543112 |
| **Northing:** | 260566 |
| **Logged:** | MB |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Dark brown clayey silty slightly gravelly sandy topsoil. Gravel is sub angular fine to coarse of brick, chalk and flint. Common roots. | 0.00 - 0.10 | B | |
| | | 0.30 | | MADE GROUND: Yellowish brown sandy sub rounded fine to coarse gravel of dolomite and flint. | 0.40 - 0.50 | B | |
| | | 0.60 | | Firm consistency light greenish brown mottled grey slightly sandy slightly gravelly low to medium strength silty CLAY of very high plasticity. Gravel is sub angular to sub rounded fine to coarse of chalk and flint. | 0.80 - 0.90 | B | |
| | | | | | 1.20 - 1.65 | UT | 71 blows [450mm] |
| | | | | | 1.65 - 1.70 | B | |
| | | | | | 2.00 - 2.45 | SPT (S) | N=7 (2,1/2,2,1,2) |
| | | | | | 2.00 - 2.45 | B | |
| | | | | | 2.00 - 2.45 | D | |
| | | 3.00 | | Stiff consistency bluish grey slightly gravelly medium to high strength silty CLAY. Gravel is sub angular to sub rounded fine to medium of flint and chalk. | 3.00 - 3.45 | UT | 91 blows [450mm] |
| | | | | | 3.45 - 3.50 | B | |
| | | | | | 4.00 - 4.45 | SPT (S) | N=9 (1,2/2,2,3,2) |
| | | | | | 4.00 - 4.45 | B | |
| | | | | | 4.00 - 4.45 | D | |
| | | | | | 5.00 - 5.45 | UT | 112 blows [450mm] |
| | | | | | 5.45 - 5.50 | B | |
| | | | | | 6.00 - 6.45 | SPT (S) | N=9 (2,2/2,2,2,3) |
| | | | | | 6.00 - 6.45 | B | |
| | | | | | 6.00 - 6.45 | D | |
| | | 7.20 | | Stiff to very stiff consistency bluish grey to grey slightly sandy high strength silty CLAY. | 7.50 - 7.95 | UT | 115 blows [450mm] |
| | | | | | 7.95 - 8.00 | B | |
| | | | | | 9.00 - 9.45 | SPT (S) | N=23 (2,4/4,6,6,7) |
| | | | | | 9.00 - 9.45 | B | |
| | | | | | 9.00 - 9.45 | D | |

**Hole Diameter**

| Depth Base (m) | Diameter (mm) |
|---|---|
| 20.00 | 150 |

**Casing Depths**

| Depth Base (m) | Diameter (mm) |
|---|---|
| 6.00 | 150 |

**General Remarks**

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.
3. Borehole backfilled on completion.

**Chiselling**

| From (m) | To (m) | Time (hr) |
|---|---|---|
| | | |

**Ground Water**

| Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
|---|---|---|---|---|
| | | | | |

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# Cable Percussive Log

Scale 1:50 Sheet 2 of 2

## BH1

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Dando 2000 |
| | | | | **Started:** | 04/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 04/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 04/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543112 |
| **Northing:** | 260566 |
| **Logged:** | MB |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | Stiff to very stiff consistency bluish grey to grey slightly sandy high strength silty CLAY. | | | |
| | | | | | 10.50 - 10.95 | UT | 157 blows [450mm] |
| | | | | | 10.95 - 11.00 | B | |
| | | | | | 12.00 - 12.45 | SPT (S) | N=17 (3,3/2,3,6,6) |
| | | | | | 12.00 - 12.45 | B | |
| | | | | | 12.00 - 12.45 | D | |
| | | | | | 13.50 - 13.95 | UT | 169 blows [450mm] |
| | | | | | 13.95 - 14.00 | B | |
| | | 15.00 | | Very stiff consistency bluish grey to grey slightly sandy very high strength silty CLAY. | 15.00 - 15.45 | SPT (S) | N=30 (4,4/5,7,9,9) |
| | | | | | 15.00 - 15.45 | B | |
| | | | | | 15.00 - 15.45 | D | |
| | | | | | 16.50 - 16.95 | UT | 188 blows [450mm] |
| | | | | | 16.95 - 17.00 | B | |
| | | | | | 18.00 - 18.45 | SPT (S) | N=39 (4,6/6,9,11,13) |
| | | | | | 18.00 - 18.45 | B | |
| | | | | | 18.00 - 18.45 | D | |
| | | | | | 19.50 - 19.95 | UT | 191 blows [400mm] |
| | | 20.00 | | | 19.95 - 20.00 | B | |
| | | | | End of Borehole at 20.000m | | | |

| Hole Diameter | | Casing Depths | | General Remarks | Chiselling | | | Ground Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | | From (m) | To (m) | Time (hr) | Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| 20.00 | 150 | 6.00 | 150 | 1. Hand dug inspection pit to 1.20m.<br>2. No groundwater encountered.<br>3. Borehole backfilled on completion. | | | | | | | | |

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# Cable Percussive Log

Scale 1:50 Sheet 1 of 2

## BH2

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Dando 2000 |
| | | | | **Started:** | 07/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 07/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 07/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543157 |
| **Northing:** | 260539 |
| **Logged:** | MB |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing: Depth (m) | Type | Results |
|---|---|---|---|---|---|---|---|
| | | | | MADE GROUND: Dark brown clayey silty slightly gravelly sandy topsoil. Gravel is sub angular fine to coarse of brick, chalk and flint. Common roots. | 0.10 - 0.20 | B | |
| | | 0.30 | | MADE GROUND: Firm consistency brown slightly sandy gravelly silty clay. Gravel is sub angular fine to coarse of brick, pottery, chalk and flint. | 0.70 - 0.80 | B | |
| | | | | | 1.20 - 1.65 | U | 51 blows [450mm] |
| | | | | | 1.65 - 1.70 | B | |
| | | 1.80 | | | 1.80 - 1.90 | B | |
| | | | | Firm to stiff consistency grey slightly sandy slightly gravelly medium strength silty CLAY. Gravel is sub angular to sub rounded fine to medium of flint and chalk. | 2.00 - 2.45 | SPT (S) | N=9 (2,2/2,3,2,2) |
| | | | | | 2.00 - 2.45 | B | |
| | | | | | 2.00 - 2.45 | D | |
| | | | | | 3.00 - 3.45 | U | 62 blows [450mm] |
| | | 3.60 | | Stiff consistency bluish grey slightly gravelly medium to high strength silty CLAY. Gravel is sub angular to sub rounded fine to medium of flint and chalk. | 3.60 - 3.70 | B | |
| | | | | | 4.00 - 4.45 | SPT (S) | N=12 (1,2/2,3,3,4) |
| | | | | | 4.00 - 4.45 | B | |
| | | | | | 4.00 - 4.45 | D | |
| | | | | | 5.00 - 5.45 | U | 72 blows [450mm] |
| | | | | | 6.00 - 6.45 | SPT (S) | N=12 (2,2/3,2,3,4) |
| | | | | | 6.00 - 6.45 | D | |
| | | 7.50 | | Stiff to very stiff consistency grey to bluish grey sandy high to very high strength silty CLAY of very high plasticity. | 7.50 - 7.95 | U | 74 blows [450mm] |
| | | | | | 7.95 - 8.00 | B | |
| | | | | | 9.00 - 9.45 | SPT (S) | N=16 (3,2/3,4,4,5) |
| | | | | | 9.00 - 9.45 | B | |
| | | | | | 9.00 - 9.45 | D | |

**Hole Diameter**

| Depth Base (m) | Diameter (mm) |
|---|---|
| 20.00 | 150 |

**Casing Depths**

| Depth Base (m) | Diameter (mm) |
|---|---|
| 6.00 | 150 |

**General Remarks**

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.
3. Borehole backfilled on completion.

**Chiselling**

| From (m) | To (m) | Time (hr) |
|---|---|---|
| | | |

**Ground Water**

| Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
|---|---|---|---|---|
| | | | | |

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# Cable Percussive Log

Scale 1:50 Sheet 2 of 2

## BH2

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Dando 2000 |
| | | | | **Started:** | 07/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 07/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 07/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543157 |
| **Northing:** | 260539 |
| **Logged:** | MB |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | Stiff to very stiff consistency grey to bluish grey sandy high to very high strength silty CLAY of very high plasticity. | | | |
| | | | | | 10.50 - 10.95 | U | 102 blows [450mm] |
| | | | | | 10.95 - 11.00 | B | |
| | | | | | 12.00 - 12.45 | SPT (S) | N=20 (4,4/5,4,5,6) |
| | | | | | 12.00 - 12.45 | B | |
| | | | | | 12.00 - 12.45 | D | |
| | | | | | 13.50 - 13.95 | U | 112 blows [450mm] |
| | | | | | 13.95 - 14.00 | B | |
| | | | | | 15.00 - 15.45 | SPT (S) | N=27 (3,4/5,5,8,9) |
| | | | | | 15.00 - 15.45 | B | |
| | | | | | 15.00 - 15.45 | D | |
| | | | | | 16.50 - 16.95 | U | 124 blows [450mm] |
| | | | | | 16.95 - 17.00 | B | |
| | | 18.00 | | Very stiff consistency bluish grey to grey slightly sandy very high strength silty CLAY. | 18.00 - 18.45 | SPT (S) | N=40 (4,5/9,9,10,12) |
| | | | | | 18.00 - 18.45 | B | |
| | | | | | 18.00 - 18.45 | D | |
| | | | | | 19.50 - 19.95 | U | 131 blows [450mm] |
| | | 20.00 | | End of Borehole at 20.000m | 19.95 - 20.00 | B | |

| Hole Diameter | | Casing Depths | | General Remarks |
|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | |
| 20.00 | 150 | 6.00 | 150 | 1. Hand dug inspection pit to 1.20m.<br>2. No groundwater encountered.<br>3. Borehole backfilled on completion. |

| Chiselling | | |
|---|---|---|
| From (m) | To (m) | Time (hr) |
| | | |

| Ground Water | | | | |
|---|---|---|---|---|
| Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | |

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# Cable Percussive Log

Scale 1:50 Sheet 1 of 2

## BH3

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Dando 2000 |
| | | | | **Started:** | 07/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 08/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 08/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543212 |
| **Northing:** | 260527 |
| **Logged:** | MB |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Yellowish brown sandy sub rounded fine to coarse gravel of dolomite and flint. | 0.20 - 0.30 | B | |
| | | 0.30 | | MADE GROUND: Grey sandy angular fine to coarse gravel of brick and concrete. Occasional half bricks and small cobbles of concrete. | | | |
| | | 0.70 | | MADE GROUND: Firm consistency dark brown sandy gravelly silty clay. Gravel is angular to sub angular fine to coarse of brick, cinder block, flint and chalk. | 0.80 - 0.90 | B | |
| | | | | | 1.20 - 1.65 | SPT (S) | N=7 (3,3/2,2,1,2) |
| | | | | | 1.20 - 1.65 | D | |
| | | 1.70 | | Firm to stiff consistency light greenish brown mottled grey slightly gravelly high strength CLAY. Gravel is angular to sub rounded fine to medium of chalk and flint. | 1.70 - 1.80 | B | |
| | | | | | 2.00 - 2.45 | U | 54 blows [450mm] |
| | | 2.50 | | Stiff consistency bluish grey slightly gravelly medium strength silty CLAY of very high plasticity. Gravel is sub angular to sub rounded fine to medium of flint and chalk. | 2.45 - 2.50 | B | |
| | | | | | 2.50 - 2.60 | B | |
| | | | | | 3.00 - 3.45 | SPT (S) | N=10 (2,2/2,2,3,3) |
| | | | | | 3.00 - 3.45 | B | |
| | | | | | 3.00 - 3.45 | D | |
| | | | | | 4.00 - 4.45 | U | 61 blows [450mm] |
| | | | | | 4.45 - 4.50 | B | |
| | | | | | 5.00 - 5.45 | SPT (S) | N=14 (2,3/3,4,3,4) |
| | | | | | 5.00 - 5.45 | B | |
| | | | | | 5.00 - 5.45 | D | |
| | | 6.00 | | Stiff to very stiff consistency grey to bluish grey sandy high strength silty CLAY. | 6.00 - 6.45 | U | 72 blows [450mm] |
| | | | | | 6.45 - 6.50 | B | |
| | | | | | 7.10 - 7.20 | B | |
| | | | | | 7.50 - 7.95 | SPT (S) | N=22 (4,4/4,5,6,7) |
| | | | | | 7.50 - 7.95 | B | |
| | | | | | 7.50 - 7.95 | D | |
| | | | | | 9.00 - 9.45 | U | 78 blows [450mm] |
| | | | | | 9.45 - 9.50 | B | |

| Hole Diameter | | Casing Depths | | General Remarks |
|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | |
| 20.00 | 150 | 6.00 | 150 | 1. Hand dug inspection pit to 1.20m.<br>2. No groundwater encountered.<br>3. Borehole backfilled on completion. |

| Chiselling | | |
|---|---|---|
| From (m) | To (m) | Time (hr) |
| | | |

| Ground Water | | | | |
|---|---|---|---|---|
| Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | |

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# Cable Percussive Log

Scale 1:50 Sheet 2 of 2

## BH3

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Dando 2000 |
| | | | | **Started:** | 07/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 08/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 08/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543212 |
| **Northing:** | 260527 |
| **Logged:** | MB |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | Stiff to very stiff consistency grey to bluish grey sandy high strength silty CLAY. | 10.50 - 10.95 | SPT (S) | N=26 (4,5/5,6,7,8) |
| | | | | | 10.50 - 10.95 | B | |
| | | | | | 10.50 - 10.95 | D | |
| | | | | | 12.00 - 12.45 | U | 112 blows [400mm] |
| | | | | | 12.45 - 12.50 | B | |
| | | 13.50 | | Very stiff consistency bluish grey to grey slightly sandy very high strength silty CLAY. | 13.50 - 13.95 | SPT (S) | N=31 (4,6/6,7,8,10) |
| | | | | | 13.50 - 13.95 | B | |
| | | | | | 13.50 - 13.95 | D | |
| | | | | | 15.00 - 15.45 | U | 145 blows [450mm] |
| | | | | | 15.45 - 15.50 | B | |
| | | | | | 16.50 - 16.95 | SPT (S) | N=39 (6,6/7,9,11,12) |
| | | | | | 16.50 - 16.95 | B | |
| | | | | | 16.50 - 16.95 | D | |
| | | | | | 18.00 - 18.45 | U | 181 blows [450mm] |
| | | | | | 18.45 - 18.50 | B | |
| | | | | | 19.50 - 19.95 | SPT (S) | N=41 (5,7/9,9,10,13) |
| | | | | | 19.50 - 19.95 | B | |
| | | | | | 19.50 - 19.95 | D | |
| | | 20.00 | | End of Borehole at 20.000m | | | |

| Hole Diameter | | Casing Depths | | General Remarks |
|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | |
| 20.00 | 150 | 6.00 | 150 | 1. Hand dug inspection pit to 1.20m.<br>2. No groundwater encountered.<br>3. Borehole backfilled on completion. |

| Chiselling | | |
|---|---|---|
| From (m) | To (m) | Time (hr) |
| | | |

| Ground Water | | | | |
|---|---|---|---|---|
| Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | |

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## WS1

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 07/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 07/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 07/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543103 |
| **Northing:** | 260585 |
| **Logged:** | CG |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Firm consistency dark brown sandy gravelly silty clay. Gravel is angular to sub angular fine to coarse of brick, cinder block, flint and chalk. Occasional cobbles of brick. | 0.20 - 0.40 | ES | |
| | | 0.50 | | Firm consistency light brown sandy slightly gravelly high strength silty CLAY. Gravel is sub angular to sub rounded fine to coarse of chalk and flint. Occasional roots. | 0.80 - 1.00 | B | |
| | | | | | 1.00 | HV | 120kPa |
| | | 1.20 | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular to sub rounded fine to medium of flint and chalk. Rare roots noted. | 1.80 - 2.00 | B | |
| | | | | | 2.00 | HV | 120kPa |
| | | | | | 2.80 - 3.00 | B | |
| | | | | | 3.00 | HV | 120kPa |
| | | | | | 3.80 - 4.00 | B | |
| | | | | | 4.00 | HV | 120kPa |
| | | | | | 4.80 - 5.00 | B | |
| G | | 5.00 | | End of Borehole at 5.000m | 5.00 | HV | 120kPa |

| Hole Diameter | | Casing Depths | | General Remarks | Chiselling | | | Ground Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | | From (m) | To (m) | Time (hr) | Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| 5.00 | 100 | | | 1. Hand dug inspection pit to 1.20m.<br>2. No groundwater encountered.<br>3. Gas standpipe installed on completion. | | | | | | | | |

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## WS2

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 07/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 07/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 07/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543142 |
| **Northing:** | 260580 |
| **Logged:** | CG |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Firm consistency dark grey sandy gravelly silty clay. Gravel is angular to sub angular fine to coarse of brick, dolomite, asphalt, slate and charcoal. | 0.40 - 0.60 | ES | |
| | | 0.60 | | Firm consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular to sub rounded fine to medium of chalk and flint. Occasional roots. | 1.00 | HV | 120kPa |
| | | 1.20 | | Stiff consistency bluish grey slightly gravelly high to very high strength silty CLAY of very high plasticity. Gravel is sub angular to sub rounded fine to medium of flint and chalk. Occasional roots noted. | 1.40 - 1.60 | B | |
| | | | | | 2.00 | HV | 120kPa |
| | | | | | 2.40 - 2.60 | B | |
| | | | | | 3.00 | HV | 120kPa |
| | | | | | 3.40 - 3.60 | B | |
| | | | | | 4.00 | HV | 120kPa |
| | | | | | 4.40 - 4.60 | B | |
| G | | 5.00 | | End of Borehole at 5.000m | 5.00 | HV | 120kPa |

| Hole Diameter | | Casing Depths | | General Remarks | Chiselling | | | Ground Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | | From (m) | To (m) | Time (hr) | Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| 5.00 | 100 | | | 1. Hand dug inspection pit to 1.20m.<br>2. No groundwater encountered.<br>3. Gas standpipe installed on completion. | | | | | | | | |

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## WS3

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 07/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 07/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 07/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543144 |
| **Northing:** | 260550 |
| **Logged:** | CG |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Light brown slightly clayey sandy angular to sub rounded fine to coarse gravel of brick, dolomite, pottery, chalk and flint. | 0.40 - 0.60 | ES | |
| | | 0.60 | | Firm consistency bluish grey slightly sandy slightly gravelly high strength silty CLAY. Gravel is sub angular to sub rounded fine to coarse of chalk and flint. Occasional roots noted. | 0.60 - 0.80 | B | |
| | | | | | 1.00 | HV | 90kPa |
| | | 1.30 | | Stiff consistency bluish grey slightly gravelly high to very high strength silty CLAY of high plasticity. Gravel is sub angular to sub rounded fine to medium of flint and chalk. Occasional roots noted. | 1.60 - 1.80 | B | |
| | | | | | 2.00 | HV | 120kPa |
| | | | | | 2.60 - 2.80 | B | |
| | | | | | 3.00 | HV | 120kPa |
| | | | | | 3.60 - 3.80 | B | |
| | | | | | 4.00 | HV | 120kPa |
| | | | | | 4.60 - 4.80 | B | |
| G | | 5.00 | | End of Borehole at 5.000m | 5.00 | HV | 120kPa |

| Hole Diameter | | Casing Depths | | General Remarks | Chiselling | | | Ground Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | | From (m) | To (m) | Time (hr) | Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| 5.00 | 100 | | | 1. Hand dug inspection pit to 1.20m.<br>2. No groundwater encountered.<br>3. Gas standpipe installed on completion. | | | | | | | | |

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## WS4

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 07/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 07/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 07/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543173 |
| **Northing:** | 260534 |
| **Logged:** | CG |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Firm consistency dark brown sandy gravelly silty clay. Gravel is angular to sub angular fine to coarse of brick, dolomite and charcoal. | 0.60 - 0.80 | ES | |
| | | | | | 1.00 | HV | 110kPa |
| | | 1.20 | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY of high plasticity. Gravel is sub angular to sub rounded fine to medium of chalk and flint. Occasional roots noted. | 1.20 - 1.40 | B | |
| | | | | | 2.00 | HV | 120kPa |
| | | | | | 2.20 - 2.40 | B | |
| | | | | | 3.00 | HV | 120kPa |
| | | | | | 3.20 - 3.40 | B | |
| | | | | | 4.00 | HV | 120kPa |
| | | | | | 4.20 - 4.40 | B | |
| G | | 5.00 | | End of Borehole at 5.000m | 5.00 | HV | 120kPa |

| Hole Diameter | | Casing Depths | | General Remarks |
|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | |
| 5.00 | 100 | | | 1. Hand dug inspection pit to 1.20m.<br>2. No groundwater encountered.<br>3. Gas standpipe installed on completion. |

| Chiselling | | |
|---|---|---|
| From (m) | To (m) | Time (hr) |
| | | |

| Ground Water | | | | |
|---|---|---|---|---|
| Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | |

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## WS5

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S201112 | **Site:** | Felix Hotel, Cambridge | **Driller:** | BBL |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 07/12/2020 |
| **Client:** | Cassel Hotels (Cambridge) Ltd | | | **Ended:** | 07/12/2020 |
| **Method:** | Mini Percussive Rig | | | **Backfilled:** | 07/12/2020 |

| | |
|---|---|
| **GL (AOD):** | |
| **Easting:** | 543221 |
| **Northing:** | 260536 |
| **Logged:** | CG |
| **Status:** | FINAL |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Firm consistency dark brown sandy gravelly silty clay. Gravel is angular to sub angular fine to coarse of brick, dolomite and charcoal. | 0.10 - 0.30 | ES | |
| | | 0.50 | | Firm to stiff consistency light brown slightly sandy slightly gravelly high strength silty CLAY. Gravel is sub angular to sub rounded fine to coarse of chalk and flint. Occasional roots. | 1.00 | HV | 115kPa |
| | | | | | 1.00 - 1.20 | B | |
| | | 1.30 | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular to sub rounded fine to medium of chalk and flint. Occasional roots noted. | 2.00 | HV | 120kPa |
| | | | | | 2.00 - 2.20 | B | |
| | | | | | 3.00 | HV | 120kPa |
| | | | | | 3.00 - 3.20 | B | |
| | | | | | 4.00 | HV | 120kPa |
| | | | | | 4.00 - 4.20 | B | |
| G | | 5.00 | | End of Borehole at 5.000m | 5.00 | HV | 120kPa |

| Hole Diameter | | Casing Depths | | General Remarks |
|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | |
| 5.00 | 100 | | | 1. Hand dug inspection pit to 1.20m.<br>2. No groundwater encountered.<br>3. Gas standpipe installed on completion. |

| Chiselling | | |
|---|---|---|
| From (m) | To (m) | Time (hr) |
| | | |

| Ground Water | | | | |
|---|---|---|---|---|
| Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | |

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# Trial Pit Log

TrialPit No: TP1
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Felix Hotel, Cambridge | Project No. S201112 | Co-ords: 543073E - 260604N<br>Level: |
| Plant Used: | JCB 3CX | Dimensions (m): Depth 3.00 | 1.90 × 0.60 |
| Client: | Cassel Hotels (Cambridge) Ltd | | |

Date: 30/11/2020
Scale: 1:26
Logged: CG

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 0.20 | | | MADE GROUND: Dark brown clayey silty slightly gravelly sandy topsoil. Gravel is sub angular fine to coarse of brick, chalk and flint. Common roots. |
| | 0.40 - 0.60 | ES | | | | | MADE GROUND: Firm to stiff consistency light brown to bluish grey sandy gravelly silty clay. Gravel is sub angular fine to coarse of brick, pottery, chalk and flint. |
| ▼ | 1.20 - 1.40 | ES | | 1.20 | | | Yellowish brown sandy sub angular fine to coarse GRAVEL of flint and occasional chalk. |
| | 2.00 | HV | 100kPa | 1.80 | | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. |
| | 3.00 | HV | 110kPa | 3.00 | | | End of Pit at 3.000m |

Remarks: 1. Slight groundwater seepage encountered at 1.40m.

Stability: All sides stable.

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# Trial Pit Log

TrialPit No
TP2
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Felix Hotel, Cambridge | Project No. S201112 | Co-ords: 543068E - 260578N<br>Level: |
| Plant Used: | JCB 3CX | Dimensions (m): Depth 3.20 | 1.90 × 0.60 |
| Client: | Cassel Hotels (Cambridge) Ltd | | Scale 1:26<br>Logged CG |

Date 30/11/2020

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.30 - 0.50 | ES | | 0.20 | | | MADE GROUND: Dark brown clayey silty slightly gravelly sandy topsoil. Gravel is sub angular fine to coarse of brick, chalk and flint. Common roots. |
| | | | | | | | MADE GROUND: Firm to stiff consistency light brown sandy gravelly silty clay. Gravel is sub angular fine to coarse of brick, pottery, chalk and flint. Occasional roots. |
| | 1.00 - 1.20<br>1.00 | ES<br>HV | 70kPa | 0.80 | | | Firm consistency light brown slightly sandy slightly gravelly medium strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. Occasional roots. |
| | | | | 1.20 | | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. |
| | 2.00 | HV | 120kPa | | | | |
| | 3.00 | HV | 90kPa | | | | |
| | | | | 3.20 | | | End of Pit at 3.200m |

1 2 3 4 5

Remarks: 1. No groundwater encountered.

Stability: All sides stable.

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# Trial Pit Log

TrialPit No
TP3
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Felix Hotel, Cambridge | Project No. S201112 | Co-ords: 543093E - 260611N<br>Level: |
| Plant Used: | JCB 3CX | Dimensions (m): Depth 3.00 | 1.90 × 0.60 |
| Client: | Cassel Hotels (Cambridge) Ltd | | |

Date: 30/11/2020
Scale: 1:26
Logged: CG

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.20 - 0.40 | ES | | 0.40 | | | MADE GROUND: Dark brown clayey silty slightly gravelly sandy topsoil. Gravel is sub angular fine to coarse of brick, chalk and flint. Common roots. |
| | 0.60 - 0.80 | ES | | | | | Firm consistency light brown slightly sandy slightly gravelly medium strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. Occasional roots. Sandy gravel flint pocket at 0.90-1.10m. |
| | 1.00 | HV | 70kPa | 1.10 | | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. |
| | 1.80 - 2.00 | B | | | | | |
| | 2.00 | HV | 100kPa | | | | |
| | 2.80 | HV | 120kPa | 3.00 | | | End of Pit at 3.000m |

1
2
3
4
5

Remarks: 1. No groundwater encountered.

Stability: All sides stable.

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# Trial Pit Log

TrialPit No
TP4
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Felix Hotel, Cambridge | Project No. S201112 | Co-ords: 543104E - 260543N<br>Level: |
| Plant Used: | JCB 3CX | Dimensions (m): Depth 3.00 | 1.90 × 0.60 |
| Client: | Cassel Hotels (Cambridge) Ltd | | |

Date: 30/11/2020
Scale: 1:26
Logged: CG

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.10 - 0.30 | ES | | 0.40 | | | MADE GROUND: Dark brown clayey silty slightly gravelly sandy topsoil. Gravel is sub angular fine to coarse of brick, chalk and flint. Common roots. |
| | 0.60 - 0.80 | ES | | | | | Firm consistency light brown slightly sandy slightly gravelly medium strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. Occasional roots. |
| | 0.90 | HV | 65kPa | 1.10 | | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. Occasional roots. |
| | 1.50 | HV | 100kPa | | | | |
| | 2.50 | HV | 100kPa | 3.00 | | | End of Pit at 3.000m |

1
2
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4
5

Remarks: 1. No groundwater encountered.

Stability: All sides stable.

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TS18 3NA
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# Trial Pit Log

TrialPit No: TP5
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Felix Hotel, Cambridge | Project No. S201112 | Co-ords: 543201E - 260542N<br>Level: |
| Plant Used: | JCB 3CX | Dimensions (m): Depth 3.00 | 1.90 × 0.60 |
| Client: | Cassel Hotels (Cambridge) Ltd | | |

Date: 30/11/2020
Scale: 1:26
Logged: CG

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 0.30 | | | MADE GROUND: Yellowish brown sandy sub rounded fine to coarse gravel of dolomite and flint. |
| | 0.50 - 0.70 | ES | | 0.50 | | | MADE GROUND: Reddish brown sandy angular fine to coarse gravel of brick, concrete and asphalt. Frequent cobble sized fragments of brick noted. |
| | | | | 0.70 | | | MADE GROUND: Firm to stiff consistency bluish grey sandy gravelly silty clay. Gravel is sub angular fine to coarse of brick, pottery, chalk and flint. Occasional black staining noted. |
| | 1.00 - 1.20<br>1.00 | ES<br>HV | 95kPa | | | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. |
| | 2.00 | HV | 110kPa | | | | |
| | | | | 3.00 | | | End of Pit at 3.000m |

1
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5

Remarks: 1. No groundwater encountered.

Stability: All sides stable.

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# Trial Pit Log

TrialPit No
TP6
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Felix Hotel, Cambridge | Project No. S201112 | Co-ords: 543166E - 260525N<br>Level: |
| Plant Used: | JCB 3CX | Dimensions (m): Depth 3.00 | 1.90 × 0.60 |
| Client: | Cassel Hotels (Cambridge) Ltd | | |

Date: 30/11/2020
Scale: 1:26
Logged: CG

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.10 - 0.30 | ES | | 0.30 | | | MADE GROUND: Dark brown clayey silty slightly gravelly sandy topsoil. Gravel is sub angular fine to coarse of brick, chalk and flint. Common roots. |
| | 0.60 - 0.80 | ES | | | | | MADE GROUND: Firm to stiff consistency light brown slightly sandy gravelly silty clay. Gravel is sub angular fine to coarse of brick, pottery, chalk and flint. Occasional roots. |
| | 1.40 - 1.60 | ES | | 1.30 | | | Firm consistency light brown slightly sandy slightly gravelly medium strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. Occasional roots. |
| | 1.50 | HV | 70kPa | | | | |
| | 2.50 | HV | 120kPa | 1.80 | | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. |
| | 2.60 - 2.80 | B | | | | | |
| | | | | 3.00 | | | End of Pit at 3.000m |

Remarks: 1. No groundwater encountered.

Stability: All sides stable.

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# Trial Pit Log

TrialPit No
TP7
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Felix Hotel, Cambridge | Project No. S201112 | Co-ords: 543182E - 260500N<br>Level: |
| Date | 30/11/2020 | | |
| Plant Used: | JCB 3CX | Dimensions (m): Depth 3.20 | 1.90 × 0.60 |
| Scale | 1:26 | | |
| Client: | Cassel Hotels (Cambridge) Ltd | | |
| Logged | CG | | |

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | MADE GROUND: Yellowish brown sandy sub rounded fine to coarse gravel of dolomite and flint. |
| | 0.40 - 0.60 | ES | | 0.40 | | | |
| | | | | | | | MADE GROUND: Firm to stiff consistency bluish grey sandy gravelly silty clay. Gravel is sub angular fine to coarse of brick, plastic, pottery, chalk and flint. |
| | 0.80 - 1.00 | ES | | 0.80 | | | |
| | 1.00 | HV | 65kPa | | | | Firm consistency light brown slightly sandy slightly gravelly medium strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. Occasional roots. |
| | | | | 1.20 | | | |
| | | | | | | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. |
| | 2.00 | HV | 110kPa | | | | |
| | 3.00 | HV | 120kPa | | | | |
| | | | | 3.20 | | | End of Pit at 3.200m |

1
2
3
4
5

Remarks: 1. No groundwater encountered.

Stability: All sides stable.

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# Trial Pit Log

TrialPit No
TP8
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Felix Hotel, Cambridge | Project No. S201112 | Co-ords: 543131E - 260511N<br>Level: |
| Plant Used: | JCB 3CX | Dimensions (m): Depth 3.00 | 1.90 × 0.60 |
| Client: | Cassel Hotels (Cambridge) Ltd | | Scale 1:26<br>Logged CG |
| | | | Date 30/11/2020 |

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.20 - 0.40 | ES | | | | | MADE GROUND: Dark brown clayey silty slightly gravelly sandy topsoil. Gravel is sub angular fine to coarse of brick, chalk and flint. Common roots. |
| | | | | 0.60 | | | |
| | 0.80 - 1.00 | ES | | | | | Firm consistency light brown slightly sandy slightly gravelly medium strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. Occasional roots. |
| | 1.00 | HV | 70kPa | | | | |
| | | | | 1.10 | | | Stiff consistency bluish grey slightly gravelly high strength silty CLAY. Gravel is sub angular fine to medium of chalk and flint. Occasional roots. |
| | 2.00 | HV | 120kPa | | | | |
| | | | | 3.00 | | | End of Pit at 3.000m |

Remarks: 1. No groundwater encountered.

Stability: All sides stable.

Photo 1: View of TP1 faces.

Photo 2: View of TP1 spoil.

| **Title** | **Date** |
|---|---|
| Trial Pit Photos | January 2021 |
| **Project** | |
| Hotel Felix, Cambridge | |
| **Client** | |
| Cassel Hotels (Cambridge) Ltd | |

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Photo 3: View of TP2 faces.

Photo 4: View of TP2 spoil.

| **Title** | **Date** |
|---|---|
| Trial Pit Photos | January 2021 |
| **Project** | |
| Hotel Felix, Cambridge | |
| **Client** | |
| Cassel Hotels (Cambridge) Ltd | |
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Photo 5: View of TP3 faces.

Photo 6: View of TP3 spoil.

| **Title** | **Date** |
|---|---|
| Trial Pit Photos | January 2021 |
| **Project** | |
| Hotel Felix, Cambridge | |
| **Client** | |
| Cassel Hotels (Cambridge) Ltd | |
| | |
| | |

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Photo 7: View of TP4 faces.

Photo 8: View of TP4 spoil.

| **Title** | **Date** |
|---|---|
| Trial Pit Photos | January 2021 |
| **Project** | |
| Hotel Felix, Cambridge | |
| **Client** | |
| Cassel Hotels (Cambridge) Ltd | |

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Photo 9: View of TP5 faces.

Photo 10: View of TP5 spoil.

| **Title** | **Date** |
|---|---|
| Trial Pit Photos | January 2021 |
| **Project** | |
| Hotel Felix, Cambridge | |
| **Client** | |
| Cassel Hotels (Cambridge) Ltd | |
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Photo 11: View of TP6 faces.

Photo 12: View of TP6 spoil.

| **Title** | **Date** |
|---|---|
| Trial Pit Photos | January 2021 |
| **Project** | |
| Hotel Felix, Cambridge | |
| **Client** | |
| Cassel Hotels (Cambridge) Ltd | |

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Photo 13: View of TP7 faces.

Photo 14: View of TP7 spoil.

| **Title** | **Date** |
|---|---|
| Trial Pit Photos | January 2021 |
| **Project** | |
| Hotel Felix, Cambridge | |
| **Client** | |
| Cassel Hotels (Cambridge) Ltd | |
| | |
| | |

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Photo 15: View of TP8 faces.

Photo 16: View of TP8 spoil.

| **Title** | **Date** |
|---|---|
| Trial Pit Photos | January 2021 |
| **Project** | |
| Hotel Felix, Cambridge | |
| **Client** | |
| Cassel Hotels (Cambridge) Ltd | |
| | |
| | |

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# APPENDIX C

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

# Final Report

| | |
|---|---|
| **Report No.:** | 20-34757-1 |
| **Initial Date of Issue:** | 23-Dec-2020 |
| **Client** | Solmek Ltd |
| **Client Address:** | 12 Yarm Road<br>Stockton-on-Tees<br>TS18 3NA |
| **Contact(s):** | Adrian Cutts<br>Office |
| **Project** | S201112 Felix Hotel, Cambridge |
| **Quotation No.:** | |
| **Order No.:** | SOL4553 |
| **No. of Samples:** | 8 |
| **Turnaround (Wkdays):** | 5 |
| **Date Approved:** | 23-Dec-2020 |
| **Approved By:** | |
| **Details:** | Glynn Harvey, Technical Manager |

| | |
|---|---|
| **Date Received:** | 17-Dec-2020 |
| **Date Instructed:** | 17-Dec-2020 |
| **Results Due:** | 23-Dec-2020 |

# Results - Soil

**Project: S201112 Felix Hotel, Cambridge**

| **Client: Solmek Ltd** | | **Chemtest Job No.:** | | | 20-34757 | 20-34757 | 20-34757 | 20-34757 | 20-34757 | 20-34757 | 20-34757 | 20-34757 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: | | **Chemtest Sample ID.:** | | | 1115567 | 1115568 | 1115569 | 1115570 | 1115571 | 1115572 | 1115573 | 1115574 |
| | | Sample Location: | | | TP1 | TP2 | TP3 | TP4 | TP5 | TP6 | TP7 | TP8 |
| | | Sample Type: | | | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | Top Depth (m): | | | 0.4 | 0.3 | 0.2 | 0.1 | 0.5 | 0.1 | 0.4 | 0.2 |
| | | Bottom Depth (m): | | | 0.6 | 0.5 | 0.4 | 0.3 | 0.7 | 0.3 | 0.6 | 0.4 |
| | | Date Sampled: | | | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 |
| | | Asbestos Lab: | | | COVENTRY | COVENTRY | COVENTRY | DURHAM | DURHAM | DURHAM | DURHAM | DURHAM |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - | - | - | - | - |
| Asbestos Identification | U | 2192 | | N/A | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| ACM Detection Stage | U | 2192 | | N/A | - | - | - | - | - | - | - | - |
| Moisture | N | 2030 | % | 0.020 | 14 | 14 | 11 | 15 | 18 | 16 | 17 | 13 |
| Soil Colour | N | 2040 | | N/A | Brown | Brown | Brown | Brown | Brown | Brown | Brown | Brown |
| Other Material | N | 2040 | | N/A | Stones | Stones | Stones | Stones | Stones | Stones and Wood | Stones | Stones |
| Soil Texture | N | 2040 | | N/A | Clay | Clay | Sand | Sand | Clay | Sand | Clay | Sand |
| pH | M | 2010 | | 4.0 | 10.4 | 9.0 | 8.8 | 8.7 | 8.5 | 8.7 | 8.4 | 8.6 |
| Boron (Hot Water Soluble) | M | 2120 | mg/kg | 0.40 | 0.70 | 0.99 | 1.1 | 0.98 | 2.2 | 1.2 | 1.6 | 1.6 |
| Sulphate (2:1 Water Soluble) as SO4 | M | 2120 | mg/l | 10 | 320 | < 10 | < 10 | < 10 | 140 | < 10 | 130 | < 10 |
| Cyanide (Total) | M | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Arsenic | M | 2450 | mg/kg | 1.0 | 16 | 35 | 23 | 26 | 17 | 23 | 14 | 11 |
| Cadmium | M | 2450 | mg/kg | 0.10 | 0.17 | 0.12 | 0.26 | 0.25 | 0.17 | 0.22 | 0.10 | 0.13 |
| Chromium | M | 2450 | mg/kg | 1.0 | 21 | 17 | 22 | 21 | 21 | 23 | 17 | 22 |
| Copper | M | 2450 | mg/kg | 0.50 | 18 | 17 | 28 | 32 | 22 | 29 | 16 | 19 |
| Mercury | M | 2450 | mg/kg | 0.10 | 0.12 | 0.12 | 0.16 | 0.20 | 0.14 | 0.20 | < 0.10 | 0.18 |
| Nickel | M | 2450 | mg/kg | 0.50 | 22 | 24 | 27 | 27 | 24 | 29 | 25 | 26 |
| Lead | M | 2450 | mg/kg | 0.50 | 79 | 59 | 210 | 220 | 83 | 160 | 70 | 58 |
| Selenium | M | 2450 | mg/kg | 0.20 | < 0.20 | < 0.20 | 0.25 | 0.24 | 0.26 | 0.22 | < 0.20 | 0.30 |
| Zinc | M | 2450 | mg/kg | 0.50 | 67 | 42 | 95 | 110 | 67 | 91 | 45 | 48 |
| Organic Matter | M | 2625 | % | 0.40 | 2.2 | 1.2 | 3.3 | 4.5 | 5.2 | 3.1 | 1.2 | 3.1 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aliphatic TPH >C8-C10 | M | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aliphatic TPH >C10-C12 | M | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aliphatic TPH >C12-C16 | M | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aliphatic TPH >C16-C21 | M | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aliphatic TPH >C21-C35 | M | 2680 | mg/kg | 1.0 | | | 13 | | < 1.0 | | | |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 5.0 | | | 13 | | < 5.0 | | | |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aromatic TPH >C8-C10 | M | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aromatic TPH >C10-C12 | M | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aromatic TPH >C12-C16 | M | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Aromatic TPH >C16-C21 | U | 2680 | mg/kg | 1.0 | | | 16 | | < 1.0 | | | |

# Results - Soil

**Project: S201112 Felix Hotel, Cambridge**

| **Client: Solmek Ltd** | | | **Chemtest Job No.:** | | 20-34757 | 20-34757 | 20-34757 | 20-34757 | 20-34757 | 20-34757 | 20-34757 | 20-34757 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: | | | **Chemtest Sample ID.:** | | 1115567 | 1115568 | 1115569 | 1115570 | 1115571 | 1115572 | 1115573 | 1115574 |
| | | | Sample Location: | | TP1 | TP2 | TP3 | TP4 | TP5 | TP6 | TP7 | TP8 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 0.4 | 0.3 | 0.2 | 0.1 | 0.5 | 0.1 | 0.4 | 0.2 |
| | | | Bottom Depth (m): | | 0.6 | 0.5 | 0.4 | 0.3 | 0.7 | 0.3 | 0.6 | 0.4 |
| | | | Date Sampled: | | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 | 08-Dec-2020 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY | COVENTRY | DURHAM | DURHAM | DURHAM | DURHAM | DURHAM |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Aromatic TPH >C21-C35 | M | 2680 | mg/kg | 1.0 | | | 88 | | < 1.0 | | | |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 1.0 | | | < 1.0 | | < 1.0 | | | |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 5.0 | | | 100 | | < 5.0 | | | |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 10.0 | | | 120 | | < 10 | | | |
| Naphthalene | M | 2700 | mg/kg | 0.10 | < 0.10 | 0.11 | 0.13 | 0.13 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Acenaphthylene | M | 2700 | mg/kg | 0.10 | < 0.10 | 0.33 | 0.60 | 0.18 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Acenaphthene | M | 2700 | mg/kg | 0.10 | < 0.10 | 1.1 | 3.0 | 0.63 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Fluorene | M | 2700 | mg/kg | 0.10 | < 0.10 | 1.1 | 3.3 | 0.53 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Phenanthrene | M | 2700 | mg/kg | 0.10 | 0.59 | 8.1 | 27 | 5.3 | 0.44 | 1.0 | 1.3 | < 0.10 |
| Anthracene | M | 2700 | mg/kg | 0.10 | 0.18 | 1.6 | 8.9 | 1.6 | 0.19 | 0.28 | 0.45 | < 0.10 |
| Fluoranthene | M | 2700 | mg/kg | 0.10 | 1.9 | 10 | 33 | 11 | 0.80 | 2.4 | 3.3 | 0.22 |
| Pyrene | M | 2700 | mg/kg | 0.10 | 2.2 | 9.6 | 31 | 11 | 0.80 | 2.6 | 3.4 | 0.21 |
| Benzo[a]anthracene | M | 2700 | mg/kg | 0.10 | 0.95 | 4.0 | 13 | 5.1 | < 0.10 | 1.3 | 1.9 | < 0.10 |
| Chrysene | M | 2700 | mg/kg | 0.10 | 0.98 | 4.2 | 13 | 5.2 | < 0.10 | 1.4 | 1.9 | < 0.10 |
| Benzo[b]fluoranthene | M | 2700 | mg/kg | 0.10 | 1.1 | 4.2 | 13 | 4.7 | < 0.10 | 1.6 | 2.0 | < 0.10 |
| Benzo[k]fluoranthene | M | 2700 | mg/kg | 0.10 | 0.51 | 1.7 | 5.3 | 2.0 | < 0.10 | 0.69 | 0.87 | < 0.10 |
| Benzo[a]pyrene | M | 2700 | mg/kg | 0.10 | 0.82 | 2.9 | 10 | 3.5 | < 0.10 | 1.1 | 1.4 | < 0.10 |
| Indeno(1,2,3-c,d)Pyrene | M | 2700 | mg/kg | 0.10 | < 0.10 | 2.3 | 7.1 | 2.0 | < 0.10 | 0.81 | 1.2 | < 0.10 |
| Dibenz(a,h)Anthracene | M | 2700 | mg/kg | 0.10 | < 0.10 | 0.66 | 2.4 | 0.48 | < 0.10 | 0.21 | 0.43 | < 0.10 |
| Benzo[g,h,i]perylene | M | 2700 | mg/kg | 0.10 | < 0.10 | 2.3 | 5.5 | 2.2 | < 0.10 | 0.67 | 1.0 | < 0.10 |
| Total Of 16 PAH's | M | 2700 | mg/kg | 2.0 | 9.2 | 54 | 180 | 56 | 2.2 | 14 | 19 | < 2.0 |
| Total Phenols | M | 2920 | mg/kg | 0.30 | < 0.30 | < 0.30 | < 0.30 | < 0.30 | < 0.30 | < 0.30 | < 0.30 | < 0.30 |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 2010 | pH Value of Soils | pH | pH Meter |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2040 | Soil Description(Requirement of MCERTS) | Soil description | As received soil is described based upon BS5930 |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES |
| 2192 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry |
| 2300 | Cyanides & Thiocyanate in Soils | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser. |
| 2450 | Acid Soluble Metals in Soils | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc | Acid digestion followed by determination of metals in extract by ICP-MS. |
| 2625 | Total Organic Carbon in Soils | Total organic Carbon (TOC) | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser. |
| 2680 | TPH A/A Split | Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Dichloromethane extraction / GCxGC FID detection |
| 2700 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID | Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene | Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds) |
| 2920 | Phenols in Soils by HPLC | Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded. | 60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection. |

## Report Information

**Key**

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

**Sample Deviation Codes**

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

**Sample Retention and Disposal**

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

# APPENDIX D

# Laboratory Report Front Sheet

| Site name | Job number |
|---|---|
| Felix Hotel, Cambridge | S201112 |

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING
7607

**Client details:**

| | |
|---|---|
| Reference: | S201112 |
| Name: | Solmek |
| Address: | 12 Yarm Road,<br>Stockton-on-tees,<br>TS18 3NA |
| Telephone: | 01642 607083 |
| Email: | acutts@solmek.com |
| FAO: | A Cutts |

**Date commenced:** 15/12/2020

**Date reported:** 06/01/2021

## Observations and interpretations are outside of the UKAS Accreditiation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Samples will be held at the laboratory for a period of 4 weeks after the report date. After the all samples will be disposed of. Should further testing be required then the office should be informed before the above date.

| Signature: | Approved Signitories: |
|---|---|
| K Watkin | ☑ K Watkin (Lab Manager)<br>☐ U Mazhar (Assistant Lab Manager)<br>☐ |

# Summary of Classification Tests

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING
7607

| Site name | Job number |
|---|---|
| Felix Hotel, Cambridge | S201112 |

| Hole | Depth Top m | Depth Base m | Type | w % | Oven temp. oc | wa % | Pa % | Pr % | wL % | wP % | IP % | IL | Plasticity class | Preparation method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BH1 | 1.20 | 1.65 | U | 31 | 105 | 31 | 100 | 0 | 70-s | 28 | 42 | 0.071 | CV | Tested after >425µm removed by hand |
| BH1 | 3.00 | 3.45 | U | 33 | 105 | | | | | | | | | |
| BH2 | 5.00 | 5.45 | U | 32 | 105 | | | | | | | | | |
| BH2 | 10.50 | 10.95 | U | 29 | 105 | 29 | 100 | 0 | 71-s | 25 | 46 | 0.087 | CV | Tested in natural condition |
| BH3 | 2.00 | 2.45 | U | 29 | 105 | | | | | | | | | |
| BH3 | 6.00 | 6.45 | U | 30 | 105 | 30 | 100 | 0 | 72-s | 26 | 46 | 0.087 | CV | Tested in natural condition |
| WS2 | 2.40 | 2.60 | B | 26 | 105 | 26 | 99 | 1 | 74-s | 27 | 47 | -0.021 | CV | Tested after >425µm removed by hand |
| WS3 | 1.60 | 1.80 | B | 28 | 105 | 28 | 99 | 1 | 65-s | 26 | 39 | 0.051 | CH | Tested after >425µm removed by hand |
| WS4 | 1.20 | 1.40 | B | 22 | 105 | 27 | 82 | 18 | 58-s | 22 | 36 | 0.139 | CH | Tested after >425µm removed by hand |
| WS5 | 1.00 | 1.20 | B | 27 | 105 | 27 | 99 | 1 | 67-s | 25 | 42 | 0.048 | CH | Tested after >425µm removed by hand |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

All tests found in Solmek UKAS Schedule of Accreditation are tested to standard unless otherwise indicated

| Key | Description | | Category | BS Test Code |
|---|---|---|---|---|
| *w* | Moisture content | | | BS 1377:1990 Part 2 Clause 3.2 |
| wa | Equivalent moisture content passing 425µm sieve | | | BS 1377:1990 Part 2 Clause 3.2 |
| wL | Liquid limit | Single point | -s | BS 1377:1990 Part 2 Clause 4.4 |
| | | Four point | -f | BS 1377:1990 Part 2 Clause 4.3 |
| wP | Plastic limit | | | BS 1377:1990 Part 2 Clause 5.2 |
| Pa | Percentage passing 425um sieve | | | |
| Pr | Percentage retained 425um sieve | | | |
| IP | Plasticity index | | | BS 1377:1990 Part 2 Clause 5.4 |
| IL | Liquidity index | | | BS 1377:1990 Part 2 Clause 5.4 |
| | Suffix indicating test is "Not UKAS Accredited" | | * | |

| | |
|---|---|
| Approved by | KW |
| Approval date | 05/01/2021 13:52 |
| Date report generated | |
| Report Number | |

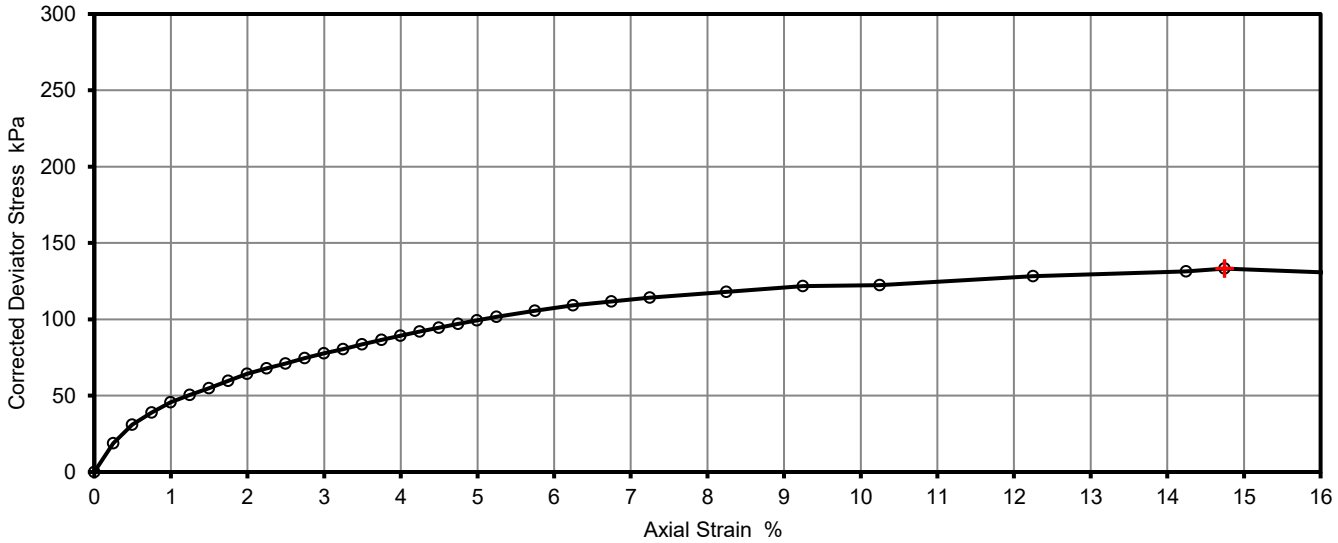
| | Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen | | | Job Ref | S201112 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH1 |
| Site Name | Felix Hotel, Cambridge | | | Sample No. | |
| Soil Description | | | | Depth | 1.20 |
| Specimen Reference | | Specimen Depth | m | Sample Type | U |
| Specimen Description | Firm, brown, Medium Strength CLAY | | | KeyLAB ID | SLMK202012150 |
| Test Method | BS1377 : Part 7 : 1990, clause 8, single specimen | | | Date of test | 18/12/2020 |

| | | | |
|---|---|---|---|
| Test Number | | 1 | |
| Length | | 202.0 | mm |
| Diameter | | 103.0 | mm |
| Bulk Density | | 1.91 | Mg/m3 |
| Moisture Content | | 30.9 | % |
| Dry Density | | 1.46 | Mg/m3 |
| Rate of Strain | | 1.0 | %/min |
| Cell Pressure | | 24 | kPa |
| At failure | Axial Strain | 14.7 | % |
| | Deviator Stress, ( σ1 - σ3 )f | 133 | kPa |
| | Undrained Shear Strength, cu | 67 | kPa ½( σ1 - σ3 )f |
| | Mode of Failure | Compound | |

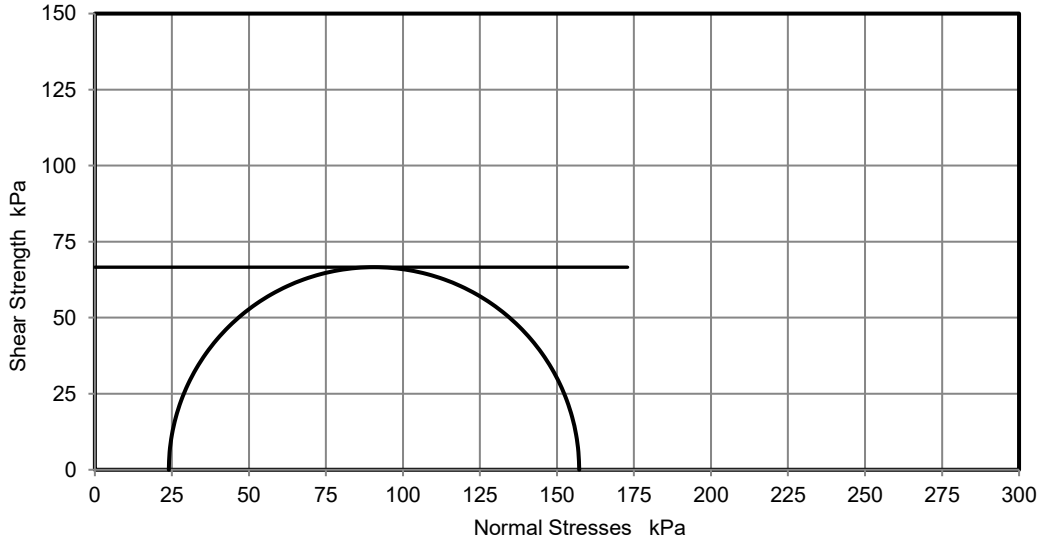
**Tracable Equipment Record**

| | |
|---|---|
| Test Frame | TRI 004 |
| Load Ring | LOAD CELL 003 |
| Pressure Gauge | PRE 006 |
| Digital Caliper | CAL-005 |
| Balance | BAL-001 |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

| No of membranes used |
|---|
| 1 |
| Total thickness (mm) |
| 0.35 |

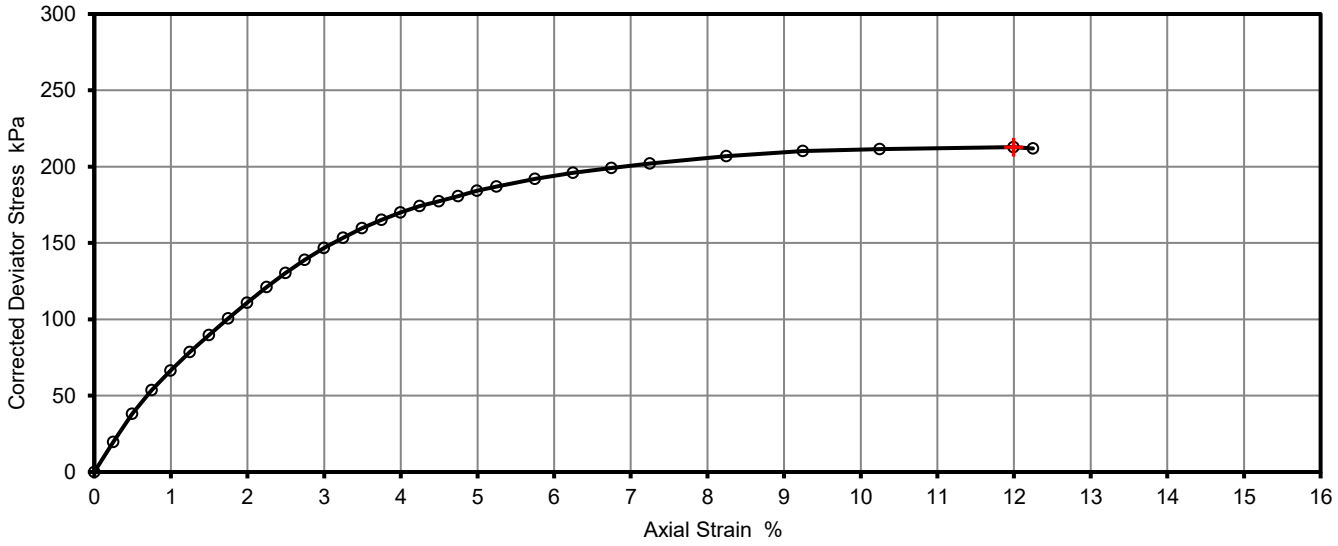
| | Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen | | | Job Ref | S201112 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH1 |
| Site Name | Felix Hotel, Cambridge | | | Sample No. | |
| Soil Description | | | | Depth | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | U |
| Specimen Description | Firm to stiff, brown, High Strength CLAY | | | KeyLAB ID | SLMK202012151 |
| Test Method | BS1377 : Part 7 : 1990, clause 8, single specimen | | | Date of test | 23/12/2020 |

| | | | |
|---|---|---|---|
| Test Number | | 1 | |
| Length | | 202.0 | mm |
| Diameter | | 103.0 | mm |
| Bulk Density | | 1.94 | Mg/m3 |
| Moisture Content | | 32.7 | % |
| Dry Density | | 1.46 | Mg/m3 |
| Rate of Strain | | 1.0 | %/min |
| Cell Pressure | | 60 | kPa |
| At failure | Axial Strain | 12.0 | % |
| | Deviator Stress, ( σ1 - σ3 )f | 213 | kPa |
| | Undrained Shear Strength, cu | 106 | kPa ½( σ1 - σ3 )f |
| | Mode of Failure | Compound | |

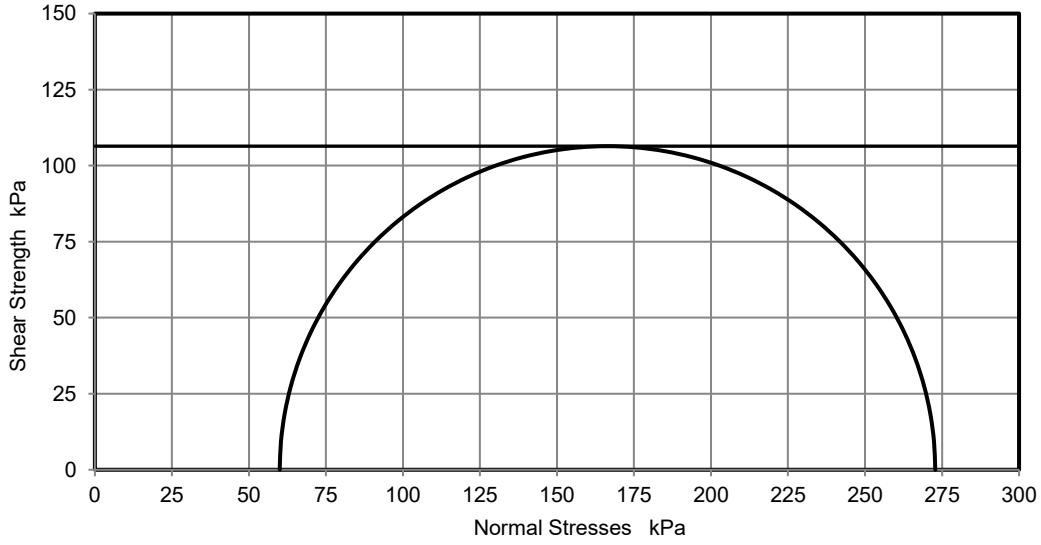
**Tracable Equipment Record**

| | |
|---|---|
| Test Frame | TRI 004 |
| Load Ring | LOAD CELL 003 |
| Pressure Gauge | PRE 006 |
| Digital Caliper | CAL-005 |
| Balance | BAL-001 |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

| No of membranes used |
|---|
| 1 |
| Total thickness (mm) |
| 0.35 |

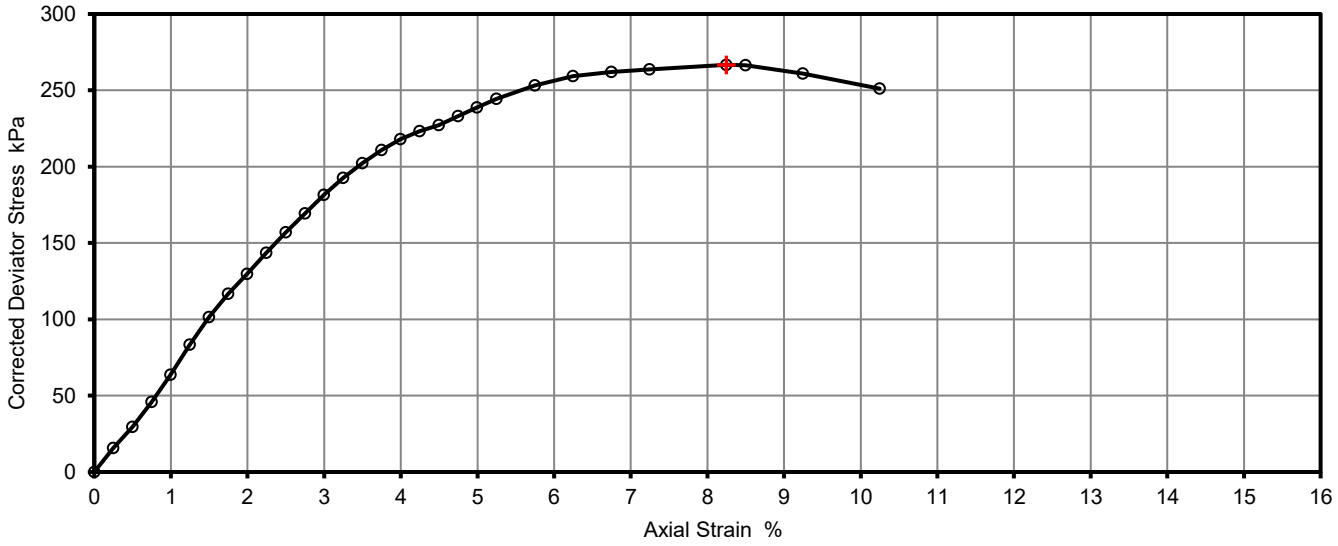
| | Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen | | | Job Ref | S201112 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH2 |
| Site Name | Felix Hotel, Cambridge | | | Sample No. | |
| Soil Description | | | | Depth | 5.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | U |
| Specimen Description | Stiff, greyish brown, High Strength CLAY | | | KeyLAB ID | SLMK202012152 |
| Test Method | BS1377 : Part 7 : 1990, clause 8, single specimen | | | Date of test | 04/01/2021 |

| | | | |
|---|---|---|---|
| Test Number | | 1 | |
| Length | | 203.0 | mm |
| Diameter | | 103.0 | mm |
| Bulk Density | | 1.92 | Mg/m3 |
| Moisture Content | | 31.7 | % |
| Dry Density | | 1.46 | Mg/m3 |
| Rate of Strain | | 1.0 | %/min |
| Cell Pressure | | 100 | kPa |
| At failure | Axial Strain | 8.2 | % |
| | Deviator Stress, ( σ1 - σ3 )f | 267 | kPa |
| | Undrained Shear Strength, cu | 133 | kPa ½( σ1 - σ3 )f |
| | Mode of Failure | Compound | |

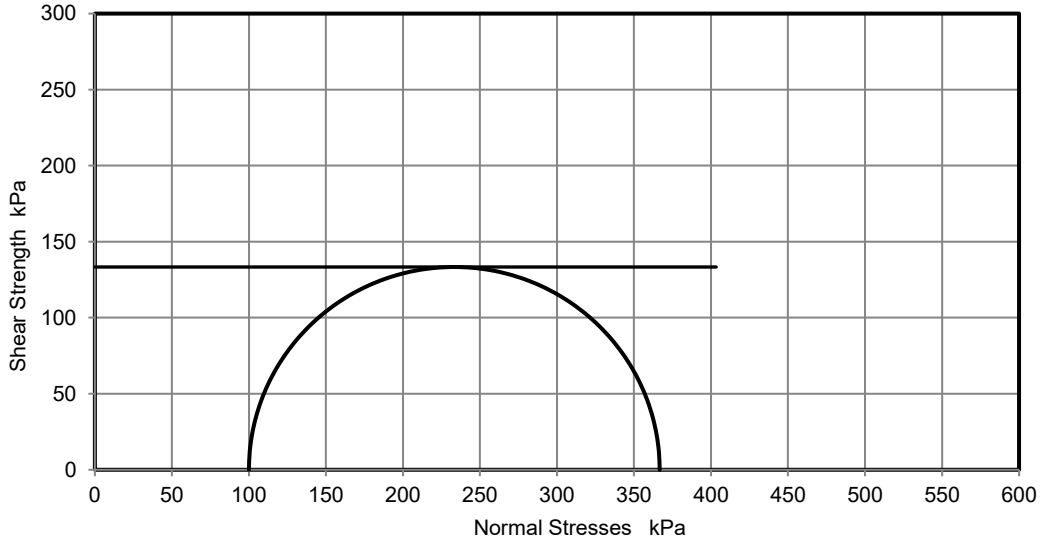
**Tracable Equipment Record**

| | |
|---|---|
| Test Frame | TRI 004 |
| Load Ring | LOAD CELL 003 |
| Pressure Gauge | PRE 006 |
| Digital Caliper | CAL-005 |
| Balance | BAL-001 |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

| No of membranes used |
|---|
| 1 |
| Total thickness (mm) |
| 0.35 |

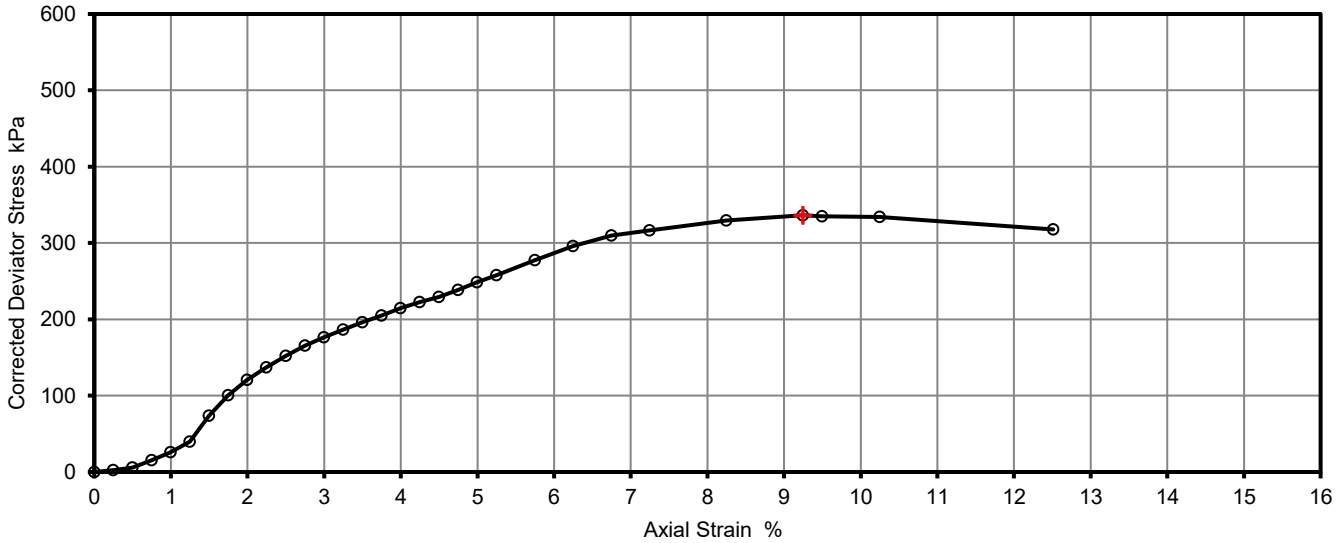
| | Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen | | | Job Ref | S201112 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH2 |
| Site Name | Felix Hotel, Cambridge | | | Sample No. | |
| Soil Description | | | | Depth | 10.50 |
| Specimen Reference | | Specimen Depth | m | Sample Type | U |
| Specimen Description | Stiff, greyish brown, Very High Strength CLAY | | | KeyLAB ID | SLMK202012153 |
| Test Method | BS1377 : Part 7 : 1990, clause 8, single specimen | | | Date of test | 04/01/2021 |

| | | | |
|---|---|---|---|
| Test Number | | 1 | |
| Length | | 203.0 | mm |
| Diameter | | 102.0 | mm |
| Bulk Density | | 1.99 | Mg/m3 |
| Moisture Content | | 29.3 | % |
| Dry Density | | 1.54 | Mg/m3 |
| Rate of Strain | | 1.0 | %/min |
| Cell Pressure | | 210 | kPa |
| At failure | Axial Strain | 9.2 | % |
| | Deviator Stress, ( σ1 - σ3 )f | 336 | kPa |
| | Undrained Shear Strength, cu | 168 | kPa ½( σ1 - σ3 )f |
| | Mode of Failure | Compound | |

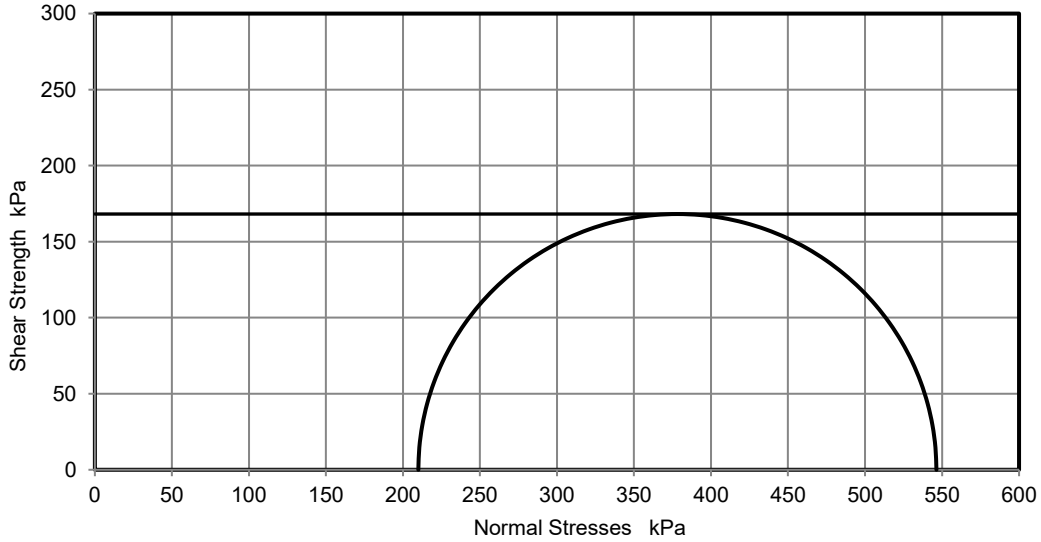
**Tracable Equipment Record**

| | |
|---|---|
| Test Frame | TRI 004 |
| Load Ring | LOAD CELL 003 |
| Pressure Gauge | PRE 006 |
| Digital Caliper | CAL-005 |
| Balance | BAL-001 |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

| No of membranes used |
|---|
| 1 |
| Total thickness (mm) |
| 0.35 |

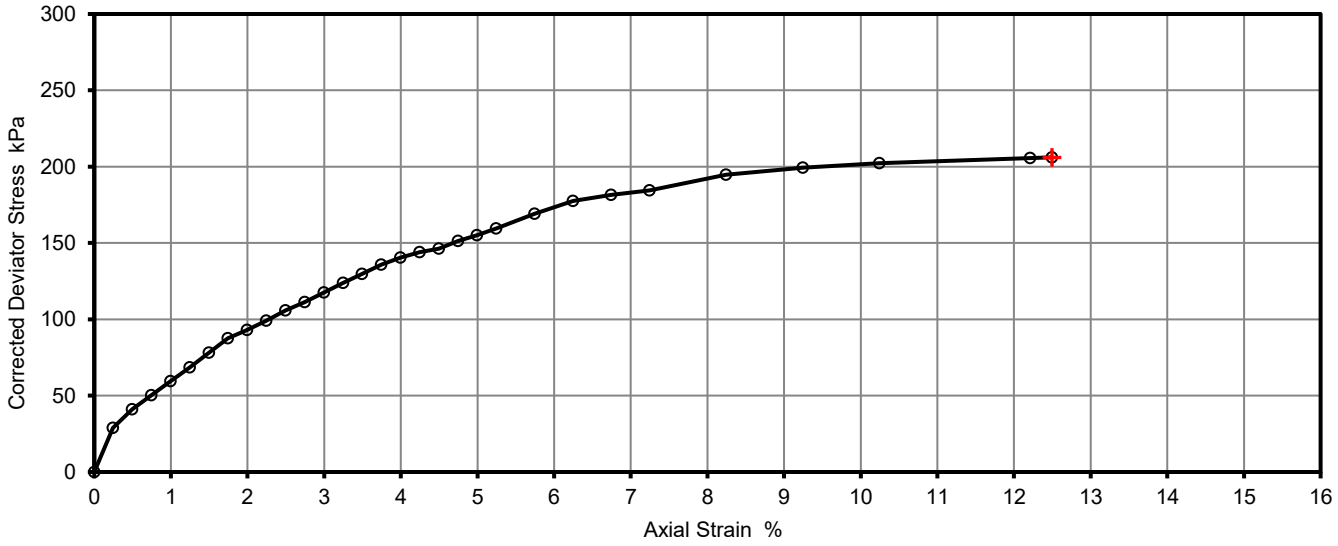
| | Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen | | | Job Ref | S201112 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH3 |
| Site Name | Felix Hotel, Cambridge | | | Sample No. | |
| Soil Description | | | | Depth | 2.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | U |
| Specimen Description | Firm to stiff, brownish grey, High Strength CLAY | | | KeyLAB ID | SLMK202012154 |
| Test Method | BS1377 : Part 7 : 1990, clause 8, single specimen | | | Date of test | 04/01/2021 |

| | | | |
|---|---|---|---|
| Test Number | | 1 | |
| Length | | 204.0 | mm |
| Diameter | | 103.0 | mm |
| Bulk Density | | 1.94 | Mg/m3 |
| Moisture Content | | 29.3 | % |
| Dry Density | | 1.50 | Mg/m3 |
| Rate of Strain | | 1.0 | %/min |
| Cell Pressure | | 40 | kPa |
| At failure | Axial Strain | 12.5 | % |
| | Deviator Stress, ( σ1 - σ3 )f | 206 | kPa |
| | Undrained Shear Strength, cu | 103 | kPa ½( σ1 - σ3 )f |
| | Mode of Failure | Compound | |

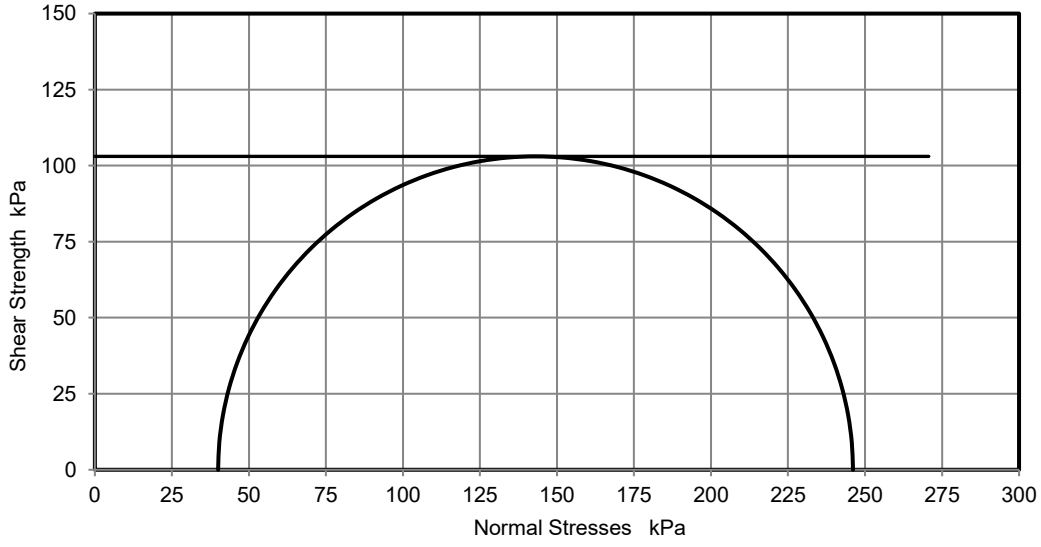
**Tracable Equipment Record**

| | |
|---|---|
| Test Frame | TRI 004 |
| Load Ring | LOAD CELL 003 |
| Pressure Gauge | PRE 006 |
| Digital Caliper | CAL-005 |
| Balance | BAL-001 |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

| No of membranes used |
|---|
| 1 |
| Total thickness (mm) |
| 0.35 |

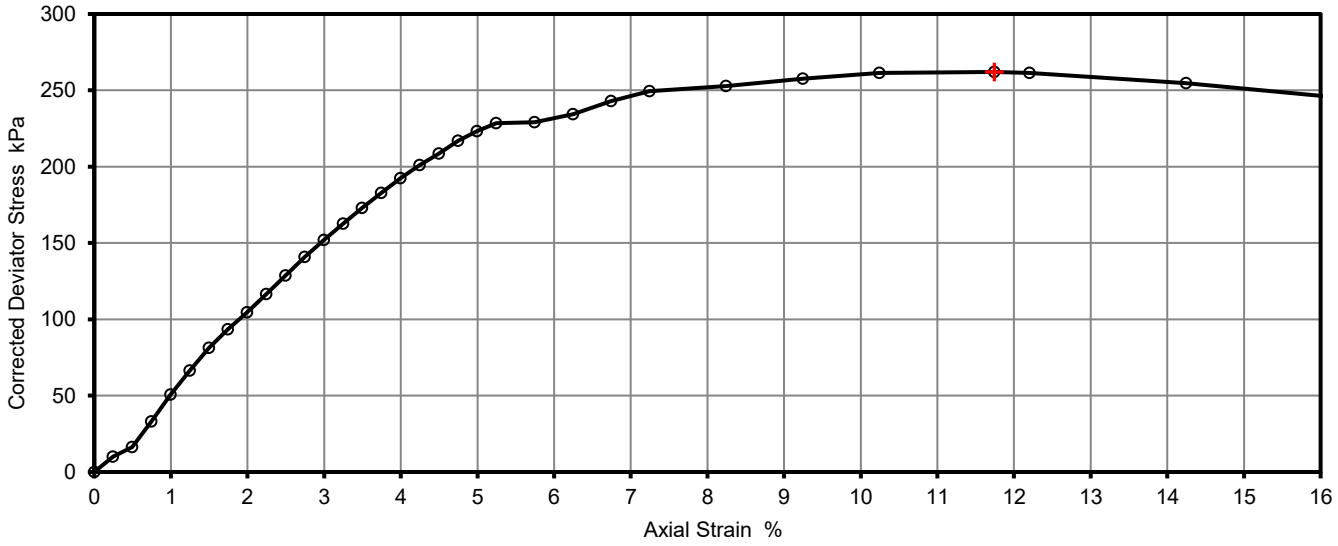
| | Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen | | | Job Ref | S201112 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH3 |
| Site Name | Felix Hotel, Cambridge | | | Sample No. | |
| Soil Description | | | | Depth | 6.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | U |
| Specimen Description | Stiff, greyish brown, High Strength CLAY | | | KeyLAB ID | SLMK202012155 |
| Test Method | BS1377 : Part 7 : 1990, clause 8, single specimen | | | Date of test | 04/01/2021 |

| | | | |
|---|---|---|---|
| Test Number | | 1 | |
| Length | | 204.0 | mm |
| Diameter | | 103.0 | mm |
| Bulk Density | | 1.94 | Mg/m3 |
| Moisture Content | | 29.6 | % |
| Dry Density | | 1.49 | Mg/m3 |
| Rate of Strain | | 1.0 | %/min |
| Cell Pressure | | 120 | kPa |
| At failure | Axial Strain | 11.7 | % |
| | Deviator Stress, ( σ1 - σ3 )f | 262 | kPa |
| | Undrained Shear Strength, cu | 131 | kPa ½( σ1 - σ3 )f |
| | Mode of Failure | Compound | |

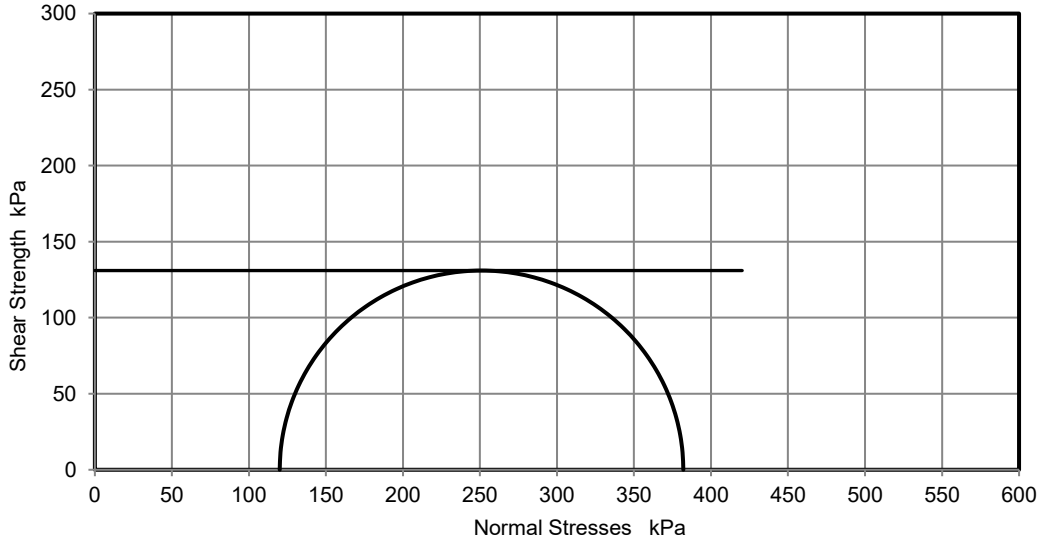
**Tracable Equipment Record**

| | |
|---|---|
| Test Frame | TRI 004 |
| Load Ring | LOAD CELL 003 |
| Pressure Gauge | PRE 006 |
| Digital Caliper | CAL-005 |
| Balance | BAL-001 |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

| No of membranes used |
|---|
| 1 |
| Total thickness (mm) |
| 0.35 |

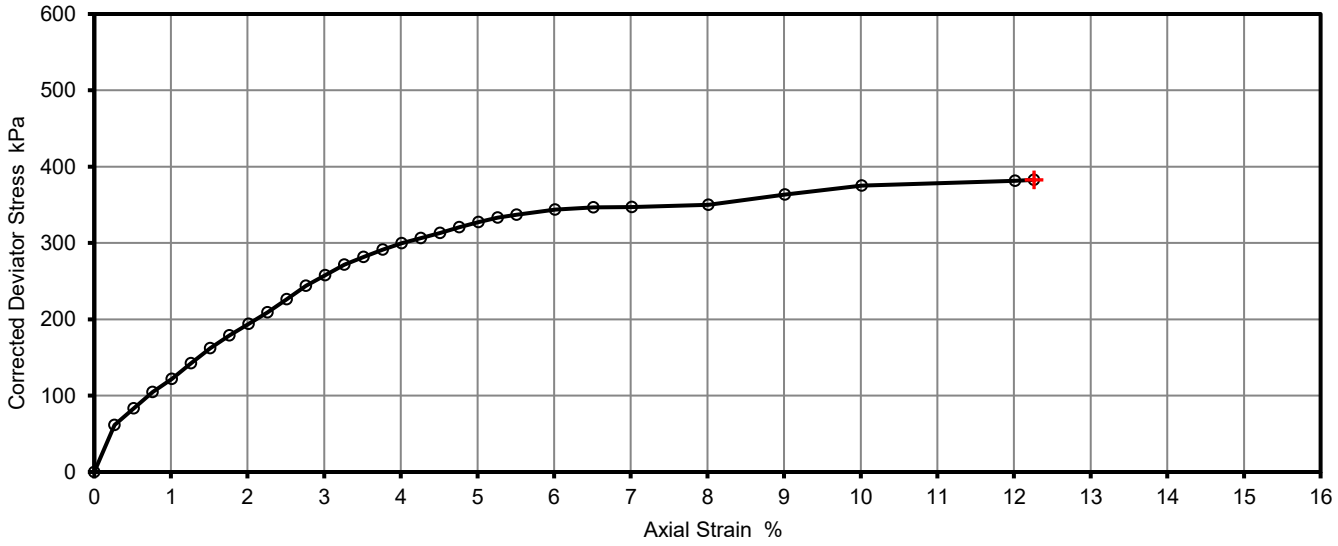
| | Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen | | | Job Ref | S201112 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | WS2 |
| Site Name | Felix Hotel, Cambridge | | | Sample No. | |
| Soil Description | | | | Depth | 2.40 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Specimen Description | Stiff, brownish grey, slightly gravelly, Very High Strength CLAY | | | KeyLAB ID | SLMK202012156 |
| Test Method | BS1377 : Part 7 : 1990, clause 8, single specimen | | | Date of test | 22/12/2020 |

| | | | |
|---|---|---|---|
| Test Number | | 1 | |
| Length | | 76.0 | mm |
| Diameter | | 38.0 | mm |
| Bulk Density | | 1.93 | Mg/m3 |
| Moisture Content | | 26.0 | % |
| Dry Density | | 1.53 | Mg/m3 |
| Rate of Strain | | 1.0 | %/min |
| Cell Pressure | | 48 | kPa |
| At failure | Axial Strain | 12.3 | % |
| | Deviator Stress, ( σ1 - σ3 )f | 383 | kPa |
| | Undrained Shear Strength, cu | 191 | kPa ½( σ1 - σ3 )f |
| | Mode of Failure | Compound | |

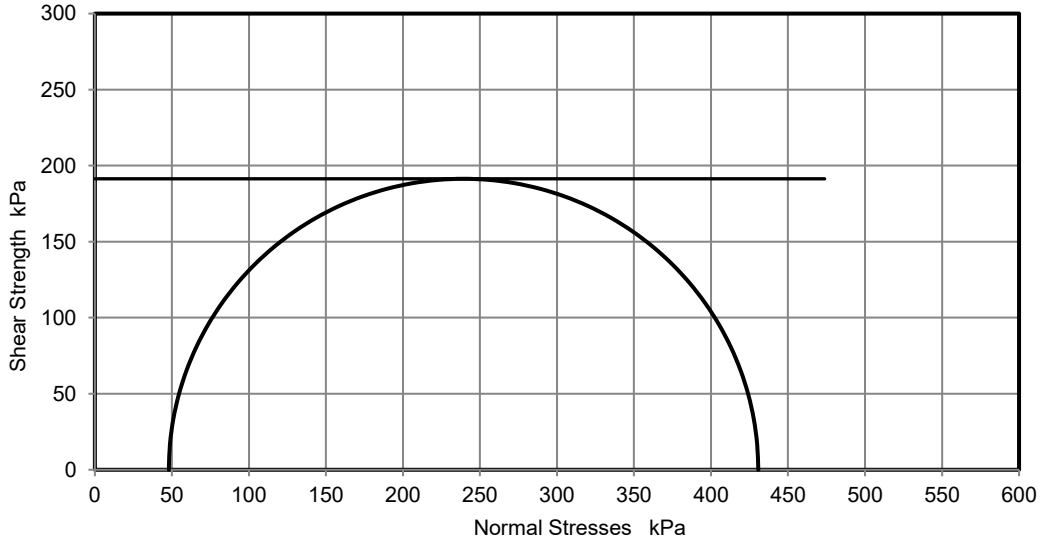
**Tracable Equipment Record**

| | |
|---|---|
| Test Frame | TRI 004 |
| Load Ring | LOAD CELL 003 |
| Pressure Gauge | PRE 006 |
| Digital Caliper | CAL-005 |
| Balance | BAL-001 |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

| No of membranes used |
|---|
| 1 |
| Total thickness (mm) |
| 0.26 |

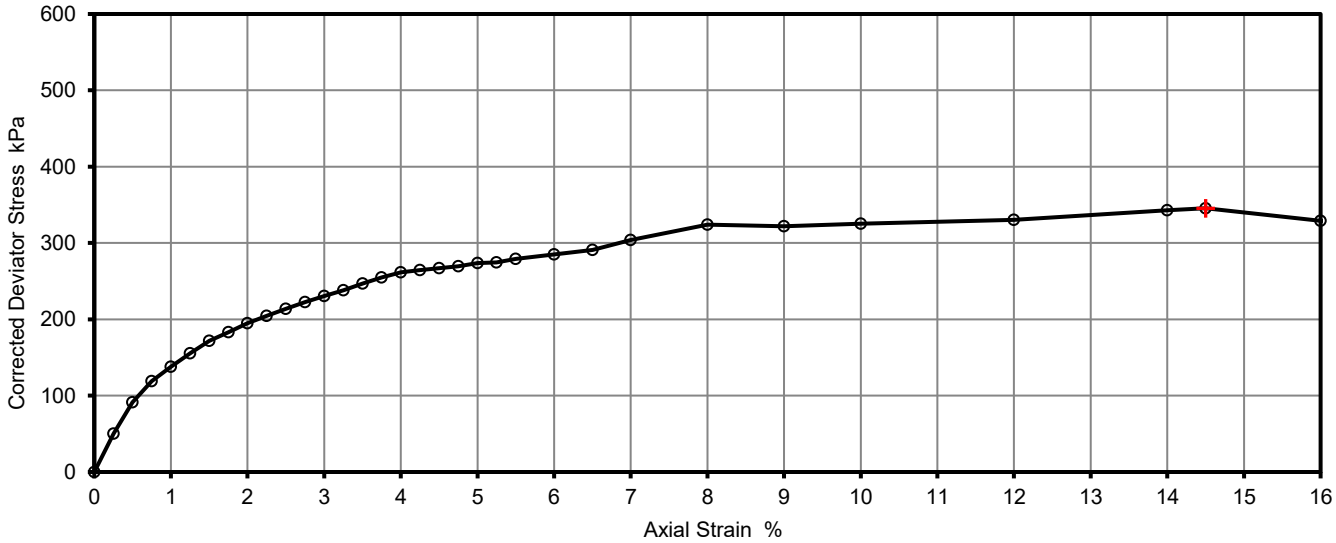
| | Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen | | | Job Ref | S201112 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | WS3 |
| Site Name | Felix Hotel, Cambridge | | | Sample No. | |
| Soil Description | | | | Depth | 1.60 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Specimen Description | Stiff, brownish grey, Very High Strength CLAY | | | KeyLAB ID | SLMK202012157 |
| Test Method | BS1377 : Part 7 : 1990, clause 8, single specimen | | | Date of test | 22/12/2020 |

| | | | |
|---|---|---|---|
| Test Number | | 1 | |
| Length | | 76.0 | mm |
| Diameter | | 38.0 | mm |
| Bulk Density | | 1.94 | Mg/m3 |
| Moisture Content | | 28.2 | % |
| Dry Density | | 1.52 | Mg/m3 |
| Rate of Strain | | 1.0 | %/min |
| Cell Pressure | | 32 | kPa |
| At failure | Axial Strain | 14.5 | % |
| | Deviator Stress, ( σ1 - σ3 )f | 346 | kPa |
| | Undrained Shear Strength, cu | 173 | kPa ½( σ1 - σ3 )f |
| | Mode of Failure | Compound | |

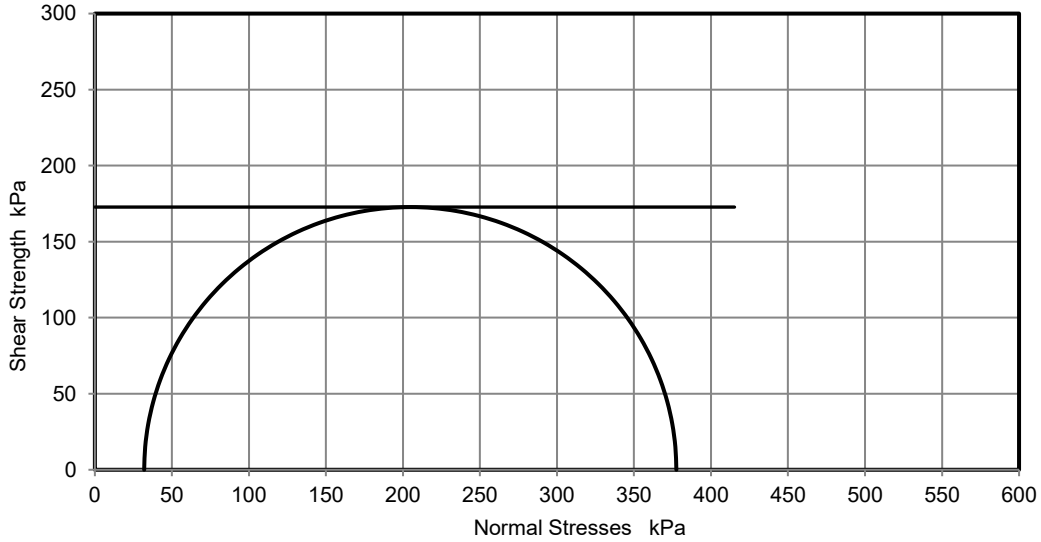
**Tracable Equipment Record**

| | |
|---|---|
| Test Frame | TRI 004 |
| Load Ring | LOAD CELL 003 |
| Pressure Gauge | PRE 006 |
| Digital Caliper | CAL-005 |
| Balance | BAL-001 |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

| No of membranes used |
|---|
| 1 |
| Total thickness (mm) |
| 0.26 |

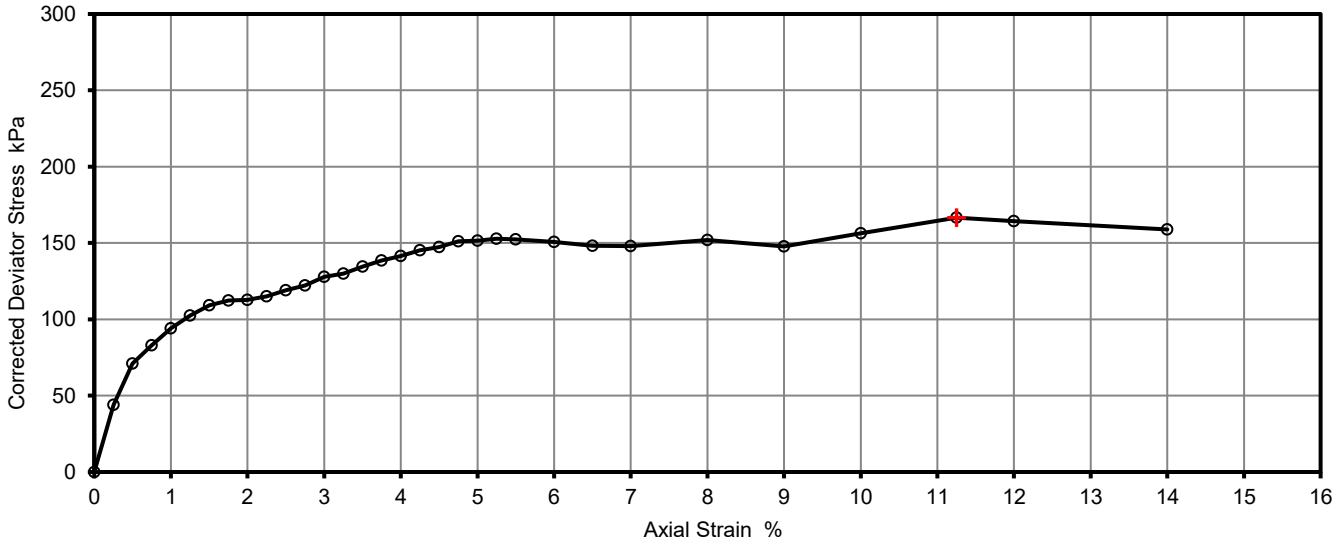
| | Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen | | | Job Ref | S201112 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | WS4 |
| Site Name | Felix Hotel, Cambridge | | | Sample No. | |
| Soil Description | | | | Depth | 1.20 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Specimen Description | Firm, greyish brown, slightly gravelly, slightly sandy High Strength CLAY | | | KeyLAB ID | SLMK202012158 |
| Test Method | BS1377 : Part 7 : 1990, clause 8, single specimen | | | Date of test | 22/12/2020 |

| | | | |
|---|---|---|---|
| Test Number | | 1 | |
| Length | | 76.0 | mm |
| Diameter | | 38.0 | mm |
| Bulk Density | | 2.00 | Mg/m3 |
| Moisture Content | | 22.1 | % |
| Dry Density | | 1.64 | Mg/m3 |
| Rate of Strain | | 1.0 | %/min |
| Cell Pressure | | 24 | kPa |
| At failure | Axial Strain | 11.3 | % |
| | Deviator Stress, ( σ1 - σ3 )f | 167 | kPa |
| | Undrained Shear Strength, cu | 83 | kPa ½( σ1 - σ3 )f |
| | Mode of Failure | Plastic | |

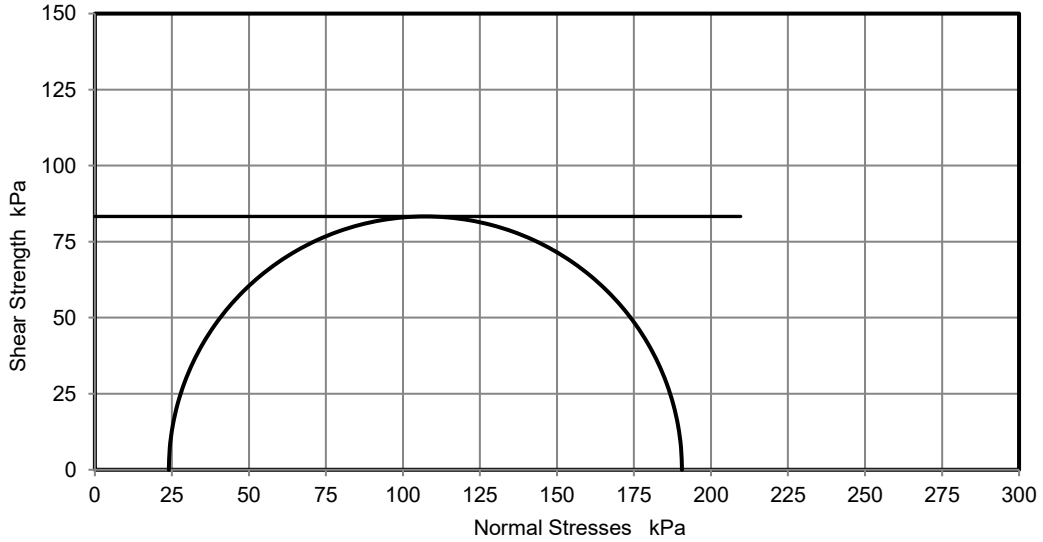
**Tracable Equipment Record**

| | |
|---|---|
| Test Frame | TRI 004 |
| Load Ring | LOAD CELL 003 |
| Pressure Gauge | PRE 006 |
| Digital Caliper | CAL-005 |
| Balance | BAL-001 |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

| No of membranes used |
|---|
| 1 |
| Total thickness (mm) |
| 0.26 |

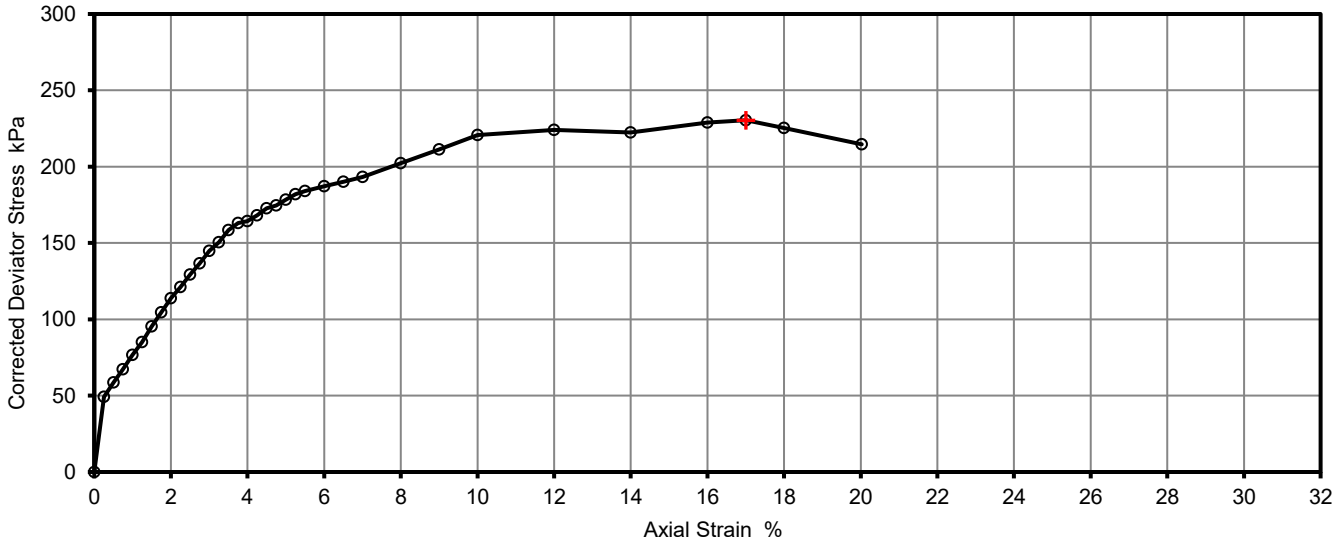
| | Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen | | | Job Ref | S201112 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | WS5 |
| Site Name | Felix Hotel, Cambridge | | | Sample No. | |
| Soil Description | | | | Depth | 1.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Specimen Description | Firm, brown, mottled grey, High Strength CLAY | | | KeyLAB ID | SLMK202012159 |
| Test Method | BS1377 : Part 7 : 1990, clause 8, single specimen | | | Date of test | 22/12/2020 |

| | | | |
|---|---|---|---|
| Test Number | | 1 | |
| Length | | 76.0 | mm |
| Diameter | | 38.0 | mm |
| Bulk Density | | 1.94 | Mg/m3 |
| Moisture Content | | 27.1 | % |
| Dry Density | | 1.53 | Mg/m3 |
| Rate of Strain | | 1.0 | %/min |
| Cell Pressure | | 20 | kPa |
| At failure | Axial Strain | 17.0 | % |
| | Deviator Stress, ( σ1 - σ3 )f | 230 | kPa |
| | Undrained Shear Strength, cu | 115 | kPa ½( σ1 - σ3 )f |
| | Mode of Failure | Plastic | |

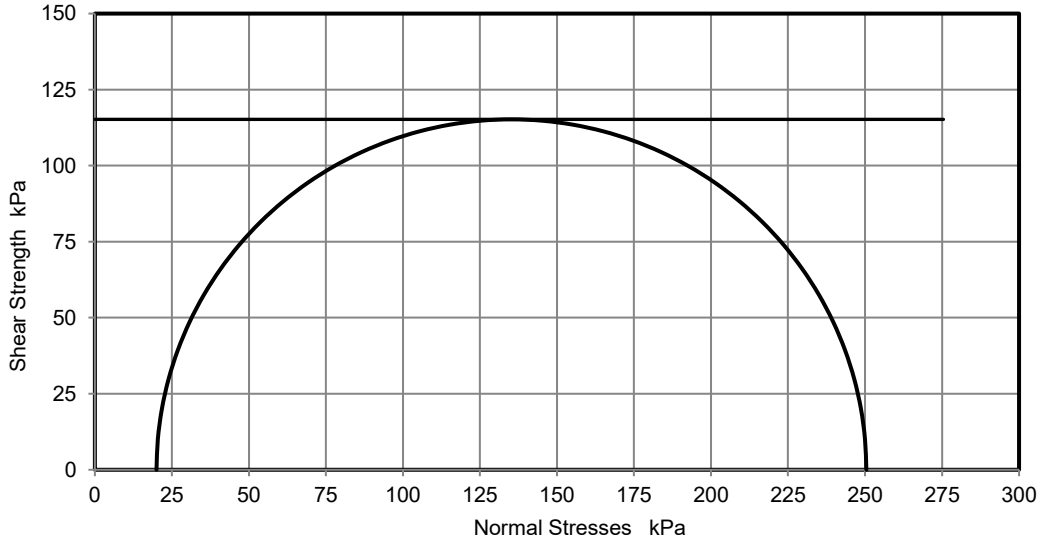
**Tracable Equipment Record**

| | |
|---|---|
| Test Frame | TRI 004 |
| Load Ring | LOAD CELL 003 |
| Pressure Gauge | PRE 006 |
| Digital Caliper | CAL-005 |
| Balance | BAL-001 |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

| No of membranes used |
|---|
| 1 |
| Total thickness (mm) |
| 0.26 |

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

2183

# Final Report

| | | | |
|---|---|---|---|
| **Report No.:** | 20-34744-1 | | |
| **Initial Date of Issue:** | 22-Dec-2020 | | |
| **Client** | Solmek Ltd | | |
| **Client Address:** | 12 Yarm Road<br>Stockton-on-Tees<br>TS18 3NA | | |
| **Contact(s):** | Adrian Cutts<br>Kathryn Watkin<br>Office | | |
| **Project** | S201112 Felix Hotel, Cambridge | | |
| **Quotation No.:** | | **Date Received:** | 17-Dec-2020 |
| **Order No.:** | LAB691 | **Date Instructed:** | 17-Dec-2020 |
| **No. of Samples:** | 6 | | |
| **Turnaround (Wkdays):** | 5 | **Results Due:** | 23-Dec-2020 |
| **Date Approved:** | 22-Dec-2020 | | |
| **Approved By:** | | | |
| **Details:** | Glynn Harvey, Technical Manager | | |

# Results - Soil

**Project: S201112 Felix Hotel, Cambridge**

| **Client: Solmek Ltd** | | | **Chemtest Job No.:** | | 20-34744 | 20-34744 | 20-34744 | 20-34744 | 20-34744 | 20-34744 |
|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: | | | **Chemtest Sample ID.:** | | 1115514 | 1115515 | 1115516 | 1115517 | 1115518 | 1115519 |
| | | | Sample Location: | | BH1 | BH1 | BH3 | WS2 | WS3 | WS5 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 3.0 | 10.5 | 6.0 | 2.4 | 1.6 | 1.0 |
| | | | Bottom Depth (m): | | 3.45 | 10.95 | 6.45 | 2.6 | 1.8 | 1.2 |
| | | | Date Sampled: | | 14-Dec-2020 | 14-Dec-2020 | 14-Dec-2020 | 14-Dec-2020 | 14-Dec-2020 | 14-Dec-2020 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | |
| Moisture | N | 2030 | % | 0.020 | 11 | 13 | 17 | 10 | 13 | 7.4 |
| pH | U | 2010 | | 4.0 | 8.3 | 8.3 | 7.8 | 8.0 | 8.4 | 8.3 |
| Sulphate (2:1 Water Soluble) as SO4 | U | 2120 | mg/l | 10 | 140 | 220 | 1200 | 1300 | 63 | 100 |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 2010 | pH Value of Soils | pH | pH Meter |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2040 | Soil Description(Requirement of MCERTS) | Soil description | As received soil is described based upon BS5930 |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES |

## Report Information

**Key**

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

**Sample Deviation Codes**

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

**Sample Retention and Disposal**

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

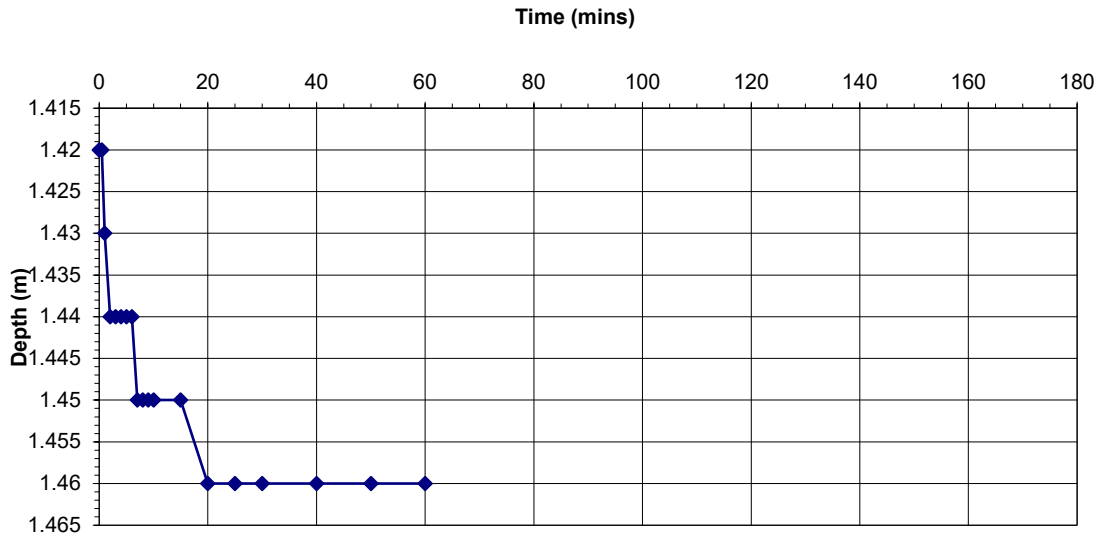
## SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | **Cassel Hotels (Cambridge) Ltd** | | | | |
| **Site:** | **Hotel Felix, Cambridge** | | | | |
| **Job No:** | **S201112** | | | | |
| **Pit No:** | **TP1** | | **Test No:** | **1** | |

## CALCULATION OF SOIL INFILTRATION RATE

| Time (min) | Depth (m) |
|---|---|
| 0 | 1.42 |
| 0.5 | 1.42 |
| 1 | 1.43 |
| 2 | 1.44 |
| 3 | 1.44 |
| 4 | 1.44 |
| 5 | 1.44 |
| 6 | 1.44 |
| 7 | 1.45 |
| 8 | 1.45 |
| 9 | 1.45 |
| 10 | 1.45 |
| 15 | 1.45 |
| 20 | 1.46 |
| 25 | 1.46 |
| 30 | 1.46 |
| 40 | 1.46 |
| 50 | 1.46 |
| 60 | 1.46 |
| 90 | |
| 120 | |
| 180 | |

| | |
|---|---|
| **Pit Dimensions** | |
| Length (m) = | 1.90 |
| Width (m) = | 0.60 |
| Depth (m) = | 3.00 |
| **Depth at start of test (m) =** | 1.420 |
| **Depth at end of test (m)=** | 1.460 |
| **75% level (m)=** | 1.430 |
| **50% Effective Depth** | 1.560 |
| **25% level (m)=** | 1.450 |
| **Base area of pit ($m^2$) =** | 1.140 |
| **$Vp_{75-25}$ ($m^3$) =** | 0.023 |
| **$a_{p50}$ ($m^2$) =** | 8.940 |
| **From the graph:** | |
| **tp 75 (min) =** | 1 |
| **tp 25 (min) =** | 15 |
| **Soil infiltration rate, f, (m/s) =** | **3.04E-06** **normal test** |
| **Input by:** | **CG** **Date:** **30/11/2020** |
| **Checked by:** | **RW** **Date:** **30/11/2020** |



## SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

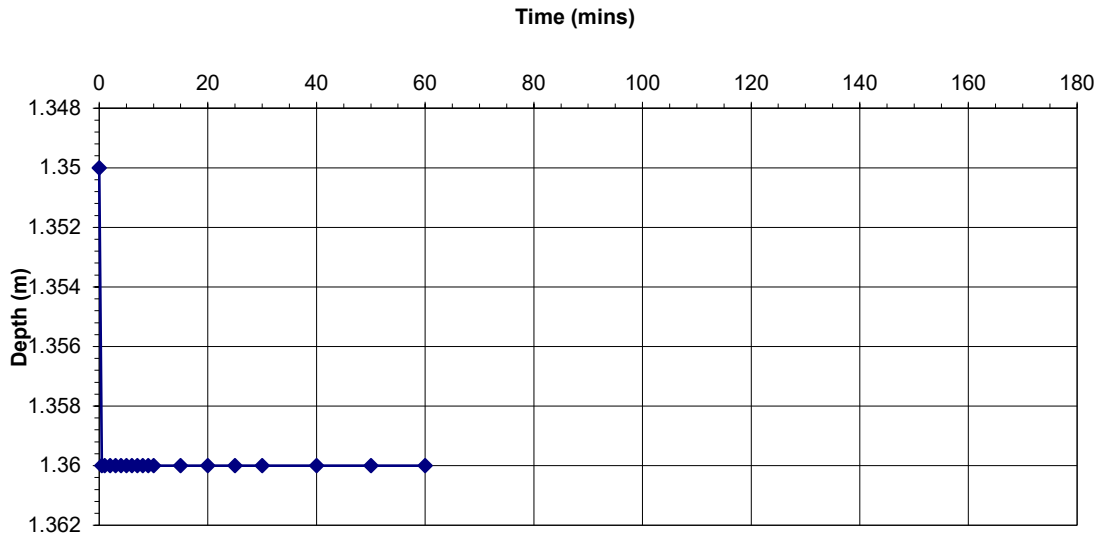
| | | | | | |
|---|---|---|---|---|---|
| **Client:** | **Cassel Hotels (Cambridge) Ltd** | | | | |
| **Site:** | **Hotel Felix, Cambridge** | | | | |
| **Job No:** | **S201112** | | | | |
| **Pit No:** | **TP8** | | **Test No:** | **1** | |

## CALCULATION OF SOIL INFILTRATION RATE

| Time (min) | Depth (m) |
|---|---|
| 0 | 1.35 |
| 0.5 | 1.36 |
| 1 | 1.36 |
| 2 | 1.36 |
| 3 | 1.36 |
| 4 | 1.36 |
| 5 | 1.36 |
| 6 | 1.36 |
| 7 | 1.36 |
| 8 | 1.36 |
| 9 | 1.36 |
| 10 | 1.36 |
| 15 | 1.36 |
| 20 | 1.36 |
| 25 | 1.36 |
| 30 | 1.36 |
| 40 | 1.36 |
| 50 | 1.36 |
| 60 | 1.36 |
| 90 | |
| 120 | |
| 180 | |

| | |
|---|---|
| **Pit Dimensions** | |
| Length (m) = | 1.90 |
| Width (m) = | 0.60 |
| Depth (m) = | 3.00 |
| **Depth at start of test (m) =** | 1.350 |
| **Depth at end of test (m)=** | 1.360 |
| **75% level (m)=** | 1.353 |
| **50% Effective Depth** | 1.645 |
| **25% level (m)=** | 1.358 |
| **Base area of pit ($m^2$) =** | 1.140 |
| **$Vp_{75-25}$ ($m^3$) =** | 0.006 |
| **$a_{p50}$ ($m^2$) =** | 9.365 |
| **From the graph:** | |
| **tp 75 (min) =** | 0 |
| **tp 25 (min) =** | 60 |

| | | | |
|---|---|---|---|
| **Soil infiltration rate, f, (m/s) =** | **1.69E-07** | **normal test** | |
| **Input by:** | **CG** | **Date:** | **30/11/2020** |
| **Checked by:** | **RW** | **Date:** | **30/11/2020** |



# APPENDIX E

# SOLMEK NOTES ON CONTAMINATION GUIDANCE (REF: VERSION 1/2021)

UK BACKGROUND

**Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)**

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.

The main objectives of the Part 2A regime are to *"identify and remove unacceptable risks to human health and the environment" and* to *"seek to ensure that contaminated land is made suitable for its current use".*

Part 2A uses a risk based approach to defining contaminated land whereby the "risk" is interpreted as *"the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land"* and by *"the scale and seriousness of such harm or pollution if it did occur".*

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *"for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters."*

A conceptual model is used to develop and communicate the risks associated with a particular site.

To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include *"land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health."*

Categories 3 and 4 *"encompass land which is not capable of being determined on such grounds".*

**PRELIMINARY CONCEPTUAL MODEL**

Preliminary Conceptual Models are undertaken in accordance with CIRIA C552. The Preliminary Conceptual Model assesses the consequence and the likelihood of a risk being realised to provide a risk classification, using the tables detailed below.

**CONSEQUENCE OF RISK BEING REALISED (Based on C552 CIRIA, 2001)**

| Classification | Definition | Example |
|---|---|---|
| **Severe** | Short-term (acute) risk to human health, the environment, an element of the development or other aspect with is likely to result in *significant harm*, damage or both. | High concentrations of cyanide on the surface of an informal recreational area. Major spills of contaminants from site into controlled water. High concentrations of explosive gas in the subsurface environment that have a clear unobstructed pathway into buildings. |
| **Moderate** | Chronic damage to human health, a plausible chance that an event will occur, although the timeline is not immediate to be in the short-term. | Appreciable concentration of contamination that over the longer-term will cause significant harm i.e. high lead concentration in topsoil. Shallow mine workings that are potentially unstable but may remain in a satisfactory or stable conditions for a number of years. |
| **Mild** | Low level pollution of non-sensitive water, a feasible hazardous scenario although the timeline of such occurring can probably be considered in 10's of years. | The effect of high sulphate concentrations on structural concrete. Pollution of non-classified groundwater. |
| **Minor** | Harm, although not necessarily significant to human health, or with respect to other aspects of the development, which are considered implausible in terms of occurrence, or will have little consequential impact. | The presence of contaminants at such low concentrations that protective equipment is required during site works. Any damage to structures is minimal and will not be structural in characteristics. |

**PROBABILITY OF RISK BEING REALISED (C552 CIRIA, 2001)**

| Classification | Definition |
|---|---|
| High Likelihood | There is a viable pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence that the receptor has been harmed or polluted. |
| Likely | There is a viable pollutant linkage and all elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term. |
| Low Likelihood | There is a viable pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term. |
| Unlikely | There is a viable pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long term. |

**RISK CLASSIFICATION MATRIX (C552 CIRIA, 2001)**

| Risk = Probability x Consequence | | Consequence | | | |
|---|---|---|---|---|---|
| | | **Severe** | **Moderate** | **Mild** | **Minor** |
| **Probability** | **High likelihood** | Very high risk | High risk | Moderate risk | Moderate/low risk |
| | **Likely** | High risk | Moderate risk | Moderate/low risk | Low risk |
| | **Low likelihood** | Moderate risk | Moderate/low risk | Low risk | Very low risk |
| | **Unlikely** | Moderate/low risk | Low risk | Very low risk | Very low risk |

**HUMAN RECEPTORS**

Human exposure to contaminants present in soils can occur via several pathways. Direct exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion (or deliberate soil ingestion in the case of some children). Other indirect pathways include human ingestion of plants grown in contaminated soil or contaminated ground or surface water. Contaminants associated with wind blown dust can affect humans on surrounding sites.

**VEGETATION**

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, lead, nickel, and zinc.

To establish if the levels of contaminants present on a site may pose a risk to vegetation the results of the contamination testing are compared to a series of threshold values published in 'Code of Good Agricultural Practice for the Protection of Soil'.

**GROUNDWATER AND SURFACE WATER RECEPTORS**

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology. Surface watercourses may also accumulate contamination as contaminated sediments are deposited within the water body.

Where the site investigated overlies major/principal aquifers (and in some cases minor/secondary aquifers depending on certain conditions), groundwater Source Protection Zones and areas in close proximity to groundwater abstractions, contamination test results have been compared with the Water Supply (Water Quality) Regulations 1989 and The Water Supply (Water Quality) Regulations 2000.

Should a surface water receptor, such as a fresh water environment (river, canal, stream, lake etc), or marine environment be considered sensitive in relation to a site, then test results are compared with DEFRA & SEPA Environmental Quality Standards (2004). Many of the Environmental Quality Standards are hardness ($CaCO_3$) depended. Where no hardness values are available, Solmek assume conservative values (of between 0 and 50mg/l).

In the absence of vulnerable ground and surface water environments, Solmek may compare any test results with the Environment Agency Leachate Quality Threshold Values.

**DETAILED QUANTITATIVE RISK ASSESSMENT (DQRA)**

In line with CLR 11- Model Procedures, a DQRA for groundwater/human health may be required following a Phase 2 investigation and before the preparation of a Phase 3 Remediation Strategy. For human health DQRA, a site specific assessment criteria is undertaken using CLEA Software Version 1.06. For groundwater DQRA, the Environment Agency Remedial Targets Worksheet Version 3.1 is used.

**WASTE ACCEPTANCE CRITERIA**

The WAC testing relates to materials that are to be exported from a site/development to landfill, and do not directly relate to human health specifically. The WAC test categorises materials as either inert waste, non-reactive hazardous waste, and hazardous waste.

The testing results are generally presented as certificates which can be used by site owners/contractors etc, which should be presented to the accepting waste facility or waste contractor.

**CONSTRUCTION MATERIALS**

Materials at risk from possible soil contaminants include inorganic matrices such as cement and concrete and also organic material such as plastics and rubbers. Acid ground conditions and high levels of sulphates can accelerate the corrosion of building materials. Where pH and soluble sulphate analysis has been undertaken, Solmek compare the test results with the guidelines presented within BRE Special Digest 1, 2005 (3rd Edition) 'Concrete in Aggressive Ground'. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication "Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites" (January 2011). A Brownfield Site is defined in the document as "Land or premises that have not previously been used or developed that may be vacant or derelict". It should be noted that Brownfield sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer. The table below outlines the pipe material selection threshold concentrations.

| | **Pipe Material (Threshold concentrations in mg/kg)** | | | | | |
|---|---|---|---|---|---|---|
| **Parameter group** | **PE** | **PVC** | **Barrier pipe (PE-AL-PE)** | **Wrapped Steel** | **Wrapped Ductile Iron** | **Copper** |
| Extended VOC suite by purge and trap or head space and GC-MS with TIC | 0.5 | 0.125 | Pass | Pass | Pass | Pass |
| + BTEX + MTBE | 0.1 | 0.03 | Pass | Pass | Pass | Pass |
| SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C5-C10) | 2 | 1.4 | Pass | Pass | Pass | Pass |
| + Phenols | 2 | 0.4 | Pass | Pass | Pass | Pass |
| + Cresols and chlorinated phenols | 2 | 0.04 | Pass | Pass | Pass | Pass |
| Mineral oil C11-C20 | 10 | Pass | Pass | Pass | Pass | Pass |
| Mineral oil C21-C40 | 500 | Pass | Pass | Pass | Pass | Pass |
| Corrosive (Conductivity, Redox and pH) | Pass | Pass | Pass | Corrosive if pH <7 and conductivity >400µS/cm | Corrosive if pH <5, Eh not neutral and conductivity >400µS/cm | Corrosive if pH <5 or >8 and Eh positive |
| **Specific suite identified as relevant following site investigation** | | | | | | |
| Ethers | 0.5 | 1 | Pass | Pass | Pass | Pass |
| Nitrobenzene | 0.5 | 0.4 | Pass | Pass | Pass | Pass |
| Ketones | 0.5 | 0.02 | Pass | Pass | Pass | Pass |
| Aldehydes | 0.5 | 0.02 | Pass | Pass | Pass | Pass |
| Amines | Fail | Pass | Pass | Pass | Pass | Pass |

**REQUIREMENTS OF PARTIES WITHIN THE DEVELOPMENT PROCESS**

Interested parties involved in the development process may use the data in different ways and there may be varying views and interpretation of the factual data. Local Authority staff may have a view on contamination and human health and the wider environment. The Environment Agency are concerned principally with the protection of Controlled waters. Building insurers, funders and purchasers may be primarily concerned with issues of potential commercial blight. Purchasers are also not always fully informed, and perceptions on issues associated with risk can affect the decision to purchase. Developers and construction organisations will focus on financial aspects of dealing with the contamination in the context of the development and construction programme.

**RISKS & LIABILITIES FROM CONTAMINATION**

In simple terms, risks associated with contamination may be considered in terms of 1) statutory risks and 2) development related risks. If contamination is severe or forms a potential hazard based on its potential to affect groundwater, surface water or human health, a statutory risk may be present, and as such, if the risk is not reduced, criminal proceedings may be instigated by a government body or local authority.

If the contamination is less severe or not considered to be mobile, it may be considered a commercial liability which could, in theory remain untreated, but which may at a later date affect the value of the property, or, with changing legislation, become a statutory risk. Commercial liabilities could give rise to civil proceedings by third parties if there are grounds for action.

**♣Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2021)**

These conditions accompany our tender and supercede any previous conditions issued. Solmek will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3rd parties. The report, its content and format and associated data are copyright, and the property of Solmek. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from Solmek. A charge may be levied against such approval, the same to be made at the discretion of Solmek.

Solmek cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. Solmek are not responsible for the action negligent of otherwise of subcontractors or third parties.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, ground gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Solmek cannot be held liable for any unrecorded or unforeseen obstructions between exploratory boreholes and trial pits. This includes instances where previous structures on the site (buried man made structures) or the presence of boulder clay (cobbles and/or boulder obstructions) have been anticipated. All types of piling operations should make allowance for obstructions within the construction budget to accommodate this. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2011 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, Solmek cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by Solmek in the course of investigation is the property of Solmek, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. Solmek reserve the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter months. If Japanese Knotweed or other invasive species are suspect, it should be confirmed by an ecologist. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning Solmek you understand and accept that you/your agent have a contractual relationship with Solmek & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Solmek are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete, and Solmek has not allowed for this. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming Solmek agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. Solmek are exempt from the CIS Scheme. Solmek offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. Solmek are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by Solmek. Solmek give notice that consequential loss as a direct or indirect result of Solmek's activities or omission of the same are excluded.