



## **Main Investigation Report**

at

**Proposed Hotel Extension, Heathrow Point West, 234 Bath Road,  
Harlington, Hayes, Greater London UB3 5AP**

for

**RDP Architects Limited**

**Reference: I7898/MIR\_R27  
November 2019**

## Control Document

### Project

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This is not a valid document for use in the design of the project unless it is titled Final in the document status box.

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

## **Commission**

Soils Limited was commissioned by RDP Architects Limited to undertake an intrusive ground investigation and to prepare a Main Investigation Report on a site known as land at Proposed Hotel Extension, Heathrow Point West, 234 Bath Road, Harlington, Hayes, Greater London UB3 5AP. The scope of the investigation was outlined in the Soils Limited quotation reference Q21769/Rev1.01 dated 9<sup>th</sup> September 2019.

This document comprises the Main Investigation Report and incorporates the results, discussion and conclusions to this intrusive works.

This Main Investigation Report must be read in conjunction with the Preliminary Investigation Report undertaken by Soils Limited for the area comprising the site and the land to the immediate south and south-west, Report ref: 16149/DS, dated April 2017, as shown on an aerial plan on Figure 2. Due caution as to reliance on the whole of the above-noted report should be taken as this report only references those parts and sections of the report relevant to this portion of the site as a whole.

## **Standards**

The site works, soil descriptions and geotechnical testing was undertaken in accordance with the following standards:

- BS 5930:2015 and BS EN ISO 22476-2&3:2005+A1:2011 for WS/DP + BH
- BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design
- BS EN ISO 14688-1:2002+A1:2013 - Geotechnical investigation and testing - Identification and description
- BS EN ISO 14688-2:2004+A1:2013 - Geotechnical investigation and testing - Principles for a classification
- BS 10175:2011+A1:2013 - Investigation of potentially contaminated sites

The geotechnical laboratory testing was performed by GEO Site & Testing Services Ltd (GSTL) in accordance with the methods given in BS 1377:1990 Parts 1 to 8 and their UKAS accredited test methods.

For the preparation of this report, the relevant BS code of practice was adopted for the geotechnical laboratory testing technical specifications, in the absence of the relevant Eurocode specifications (ref: ISO TS 17892).

The chemical analyses were undertaken by i2 analytical Ltd in accordance with their UKAS and MCERTS accredited test methods or their documented in-house testing procedures. This investigation did not comprise an environmental audit of the site or its environs.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sample borehole implies the specific technique used to

produce a trial hole.

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## **Section I      Introduction**

### **I.1      Objective of Investigation**

Soils Limited was commissioned by RDP Architects Limited undertake an intrusive ground investigation and to prepare a Main Investigation Report to supply the client with information regarding ground conditions, to assist in preparing a foundation scheme for development that was appropriate to the settings present on the site.

The investigation was to be undertaken to provide comment on appropriate foundation options for the proposed development. The investigation was to be made by means of in-situ testing and geotechnical laboratory testing undertaken on soil samples taken from the trial holes.

Soil samples were taken for chemical laboratory testing to enable recommendations for the safe redevelopment of the site and the protection of site workers, end-users and the public from any contamination identified.

Two wells (2no.) were installed in the boreholes (BH1 and BH3), to allow groundwater/soil-gas monitoring on three (3No.) occasions, following liaison and agreement with the client.

### **I.2      Location**

The site was located at the Proposed Hotel Extension, Heathrow Point West, 234 Bath Road, Harlington, Hayes, Greater London UB3 5AP and had an approximate O.S Land Ranger Grid Reference of TQ 080 769.

**The site location plan is given in**

Figure 1. An aerial photograph has been included in Figure 2.

### **I.3      Proposed Development**

The proposal comprised the erection of a 4 storey hotel extension building to accommodate 108 rooms with a covered link bridge connecting the existing hotel building, with associated ancillary works. The proposed development is to include limited areas of soft landscaping comprising communal open space.

In compiling this report reliance was placed on drawing number 890/RDP/P02, by RDP Architects Limited, dated 10/03/2016 that was supplied to Soils Limited by the client. Any

change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

Development plans provided by the client are presented in Appendix E.

#### **1.4 Anticipated Geology**

The 1:50,000 BGS Geology map showed the site to be situated on bedrock of the London Clay Formation with the superficial deposits of Langley Silt Member and Taplow Gravel Formation.

##### **1.4.1 Langley Silt Member**

The Langley Silt Member, formerly known as Brickearth, comprises a geologically recent deposit of brown structureless sandy clay of limited thickness that is usually associated with the underlying Taplow Gravel Formation. Its previous name is derived from its former use in the manufacture of bricks.

The name Langley Silt Member has been applied to sandy superficially deposited soils of differing origins covering soliflucted deposits, stratified estuarine deposits and colluvial sediments. The name Langley Silt has been applied to the deposits that are thought to be in their original position.

##### **1.4.2 Taplow Gravel Member**

The rivers of the south-east of England, including the River Thames and its tributaries, have been subject to at least three changes of level since Pleistocene times. One result has been the formation of a complex series of River Terrace Gravels. These terraces represent ancient floodplain deposits that became isolated as the river cut downwards to lower levels. The Taplow Gravel is found at an elevation that approximates to the present floodplain gravel

The composition of the River Terrace Gravel varies greatly, depending on the source material available in the river's catchment. Deposits generally consist of sands and gravels of roughly bedded flint or chert gravels commonly in a matrix of silts and clays.

##### **1.4.3 London Clay Formation**

The London Clay Formation comprises stiff grey fissured clay, weathering to brown near surface. Concretions of argillaceous limestone in nodular form (Claystones) occur throughout the formation. Crystals of gypsum (Selenite) are often found within the weathered part of the London Clay, and precautions against sulphate attack to concrete are sometimes required.

The upper boundary member of the London Clay Formation is known as the Claygate Member and marks the transition between the deep water, predominantly clay environment and succeeding shallow-water, sand environment of the Bagshot Formation.

The lower boundary is generally marked by a thin bed of well-rounded flint gravel and/or a glauconitic horizon. The formation overlies the Harwich Formation or where the Harwich Formation is absent the Lambeth Group.

### **1.5 Limitations and Disclaimers**

This Main Investigation Report relates to the site located at the Proposed Hotel Extension, Heathrow Point West, 234 Bath Road, Harlington, Hayes, Greater London UB3 5AP and was prepared for the sole benefit of RDP Architects Limited (The "Client"). The report was prepared solely for the brief described in Section 1.1 of this report.

Soils Limited disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report has been prepared by Soils Limited, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Conditions of Contract of Business and taking into account the resources devoted to us by agreement with the Client.

The report is personal and confidential to the Client and Soils Limited accept no responsibility of whatever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report wholly at its own risk.

The Client may not assign the benefit of the report or any part to any third party without the written consent of Soils Limited.

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot by plot basis prior to the construction of foundations. Supplied site surveys may not include substantial shrubs or bushes and is also unlikely to have data on any trees, bushes or shrubs removed prior to or following the site survey.

Where trees are mentioned in the text this means existing trees, substantial bushes or shrubs, recently removed trees (approximately 20 years to full recovery on cohesive soils) and those planned as part of the site landscaping).

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. "Contaminated Land" is defined in Section 57 of the Environment Act 1995 as:

*"Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being, or is likely to be caused".*

The investigation, analysis or recommendations in respect of contamination are made solely in respect of the prevention of harm to vulnerable receptors, using where possible best practice at the date of preparation of the report. The investigation and report do not address, define or make recommendations in respect of environmental liabilities. A separate environmental audit and liaison with statutory authorities is required to address these issues.

Ownership of copyright of all printed material including reports, laboratory test results, trial pit and borehole log sheets, including drillers log sheets remains with Soils Limited. License is for the sole use of the client and may not be assigned, transferred or given to a third party.

## Section 2      Site Works

### 2.1      Proposed Project Works

The proposed intrusive investigation was designed to provide information on the ground conditions and to aid the design of foundations and to recover contamination samples for an environmental assessment for the proposed development. The intended investigation, as outlined within the Soils Limited quotation (Q21769/Rev1.01 dated 9<sup>th</sup> September 2019), was to comprise the following items:

- A series of windowless sampler boreholes and dynamic probes (DPSH);
- 2No. cable percussion boreholes to 20.00 metres and 1no. cable percussion borehole to 15.00 metres below existing ground level (bgl);
- Installation of wells in two (2No.) of the cable percussion boreholes, to allow groundwater/soil-gas monitoring on three (3No.) occasions, following liaison and agreement with the client;
- Geotechnical laboratory testing;
- Chemical laboratory testing.

#### 2.1.1      Actual Project Works

The actual project works were undertaken between 9<sup>th</sup> and 11<sup>th</sup> October 2019 and comprised:

- 4No. windowless sampler boreholes (WS1-WS4);
- 4No. dynamic probes (DPSH) (DP1-DP4) adjacent and prior to the drilling of the relevant windowless sampler boreholes;
- 2No. cable percussion boreholes to 20.00 metres and 1no. cable percussion borehole to 15.00 metres bgl;
- Installation of wells in two (2No.) of the cable percussion boreholes (BH1 and BH3) to allow groundwater/soil-gas monitoring on three (3No.) occasions, following liaison and agreement with the client;
- Geotechnical laboratory testing;
- Chemical laboratory testing.

Two cable percussive boreholes (BH1 and BH3) were backfilled with gravel and bentonite following the installation of monitoring wells; the remaining boreholes were backfilled with gravel.

The cable percussive borehole installation details are as follows:

- Ground level to 1.0m bgl – plain 63mm pipework/bentonite backfill;
- From 1.0m bgl to a depth of 5.00m perforated 63mm pipework/gravel backfill with bentonite seal at depth.

All trial hole locations have been presented in Figure 3.

Following completion of site works, soil cores from the windowless sampler boreholes were logged and sub sampled so that samples could be sent to the laboratory for both contamination and geotechnical testing.

## 2.2 Ground Conditions

On the 9<sup>th</sup> October 2019 four (4No.) windowless sampler boreholes (WS1-WS4) were drilled, using a Premier Compact Series 110 rig, to a maximum depth of 2.70m bgl. It must be mentioned that drilled depth in the windowless sampler boreholes was limited due to dense soils encountered that could not be penetrated with the equipment available.

Four (4No.) dynamic probes, using the Premier Compact 110 Series super heavy rig, (DP1-DP4) were driven prior and adjacent to their corresponding windowless sampler borehole to a maximum depth of 6.00m bgl. It must be mentioned that the depth of DP3-DP4 was limited to 1.6m and 2.9m bgl respectively due to dense soils encountered that could not be penetrated with the equipment available.

Between 9<sup>th</sup> and 11<sup>th</sup> October 2019, one cable percussion borehole (BH2) was drilled, to a depth of 15.00m bgl and two cable percussion boreholes (BH1 and BH3) were drilled to 20.00m bgl.

Two wells (2no.) were installed to a depth of 5.00m bgl in two of the cable percussive boreholes (BH1 and BH3), to allow groundwater/soil-gas monitoring on three (3No.) occasions, following liaison and agreement with the client.

The maximum depths of trial holes have been included in Table 2.1.

**Table 2.1 Final Depth of Trial Holes**

| <b>Trial Hole</b> | <b>Depth (m bgl)</b> | <b>Probe Hole</b> | <b>Depth (m bgl)</b> |
|-------------------|----------------------|-------------------|----------------------|
| WS1               | 2.70 <sup>1</sup>    | DP1               | 6.00                 |
| WS2               | 2.00 <sup>1</sup>    | DP2               | 6.00                 |
| WS3               | 1.30 <sup>1</sup>    | DP3               | 1.60 <sup>1</sup>    |
| WS4               | 1.50 <sup>1</sup>    | DP4               | 2.90 <sup>1</sup>    |
| BH1 (w)           | 20.00                | -                 | -                    |
| BH2               | 15.00                | -                 | -                    |
| BH3 (w)           | 20.00                | -                 | -                    |

**Notes:** w - well installation <sup>1</sup> = limited due to dense soils encountered at this depth that could not be safely penetrated with the equipment available

The soil conditions encountered were recorded and soil sampling commensurate with the purposes of the investigation was carried out. The depths given on the trial hole logs and quoted in this report were measured from ground level.

The soils encountered from immediately below ground surface have been described in the following manner. Where the soil incorporated an organic content such as either decomposing leaf litter or roots or has been identified as part of the in-situ weathering profile, it has been described as Topsoil both on the logs and within this report. Where man has clearly either placed the soil, or the composition altered, with say greater than an estimated 5% of a non-natural constituent, it has been referred to as Made Ground both on the log and within this report.

For more complete information about the soils encountered within the general area of the site reference should be made to the detailed records given within Appendix A, but for the purposes of discussion, the succession of conditions encountered in the trial holes in descending order can be summarised as:

**Made Ground (MG)**  
**Langley Silt Member (LASI)**  
**Taplow Gravel Member (TPGR)**  
**London Clay Formation (LC)**

The ground conditions encountered in the trial holes are summarised in Table 2.2.

**Table 2.2 Ground Conditions**

| Strata | Epoch        | Depth Encountered<br>(m bgl) |                                                                            | Typical<br>Thickness<br>(m) | Typical Description                                                                                                                                      |
|--------|--------------|------------------------------|----------------------------------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |              | Top                          | Bottom                                                                     |                             |                                                                                                                                                          |
| MG     | Anthropocene | G.L.                         | 0.50 – 1.00                                                                | 0.85                        | Block/brick paving over sand/roadstone sub-base to 0.30m bgl, underlain by soft, grey, gravelly, sandy CLAY/sandy GRAVEL with brick, tarmac and concrete |
| LASI   | Quaternary   | 0.50 – 1.00                  | 1.00                                                                       | 0.35                        | Firm to stiff, orangey brown, gravelly, silty CLAY                                                                                                       |
| TPGR   | Quaternary   | 0.80 - 1.00                  | 4.00–6.40<br>(inferred to 4.80 <sup>1</sup> )                              | 3.80                        | Orangey brown slightly clayey, sandy fine to coarse angular flint GRAVEL                                                                                 |
| LC     | Paleocene    | 4.00 – 6.40                  | 15.00 <sup>2</sup> –20.00 <sup>2</sup><br>(inferred to 6.00 <sup>1</sup> ) | Not proved                  | Firm to stiff with depth brown grey CLAY                                                                                                                 |

**Notes:** <sup>1</sup> Maximum depth of dynamic probes <sup>2</sup> Final depth of cable percussion boreholes

## 2.3 Ground Conditions Encountered in Trial Holes

The ground conditions encountered in trial holes have been described below in descending order. The engineering logs are presented in Appendix A.1.

### 2.3.1 Made Ground

Made Ground was encountered in each of the trial holes from surface to a maximum proved depth of 1.00m in BH1-BH3.

The Made Ground generally comprised block/brick paving over sand/roadstone sub-base to 0.30m bgl, underlain by soft, grey, gravelly, sandy CLAY/sandy GRAVEL. Sand is fine. Gravel is fine to coarse, angular to sub-rounded, flint, brick, tarmac and concrete.

The depths of Made Ground have been included in Table 2.3.

**Table 2.3 Final Depth of Made Ground**

| <b>Trial Hole</b> | <b>Depth (m bgl)</b> |
|-------------------|----------------------|
| WS1               | 0.80                 |
| WS2               | 0.80                 |
| WS3               | 0.50                 |
| WS4               | 0.80                 |
| BH1               | 1.00                 |
| BH2               | 1.00                 |
| BH3               | 1.00                 |

### **2.3.2 Langley Silt Member**

The soils of the Langley Silt Member were only found in WS3-WS4, directly beneath the Made Ground to a proved depth of 1.00m bgl and comprised firm to stiff, orangey brown, gravelly, silty, friable CLAY. Gravel is fine to medium sub-angular flint. Rare fine roots.

The depth of Langley Silt Member has been included in Table 2.4.

**Table 2.4 Final Depth of Langley Silt Member**

| <b>Trial Hole</b> | <b>Depth (m bgl)</b> |
|-------------------|----------------------|
| WS1               | Not encountered      |
| WS2               | Not encountered      |
| WS3               | 1.00                 |
| WS4               | 1.00                 |
| BH1               | Not encountered      |
| BH2               | Not encountered      |
| BH3               | Not encountered      |

### **2.3.3 Taplow Gravel Member**

The soils of the Taplow Gravel Member were found in each of the boreholes, directly beneath the Made Ground or the Langley Silt Member in WS3-WS4, to a maximum proved depth of 6.40m bgl in BH3 and for the full depth of the windowless sampler boreholes to a maximum of 2.70m bgl in WS1 and inferred in the DPs to a maximum depth of 4.80m bgl in DP2.

The soils of the Taplow Gravel Member comprised orangey brown slightly clayey, sandy fine to coarse angular flint GRAVEL. Sand is fine to medium.

The depth of Taplow Gravel Member has been included in Table 2.5.

**Table 2.5 Final Depth of Taplow Gravel Member**

| <b>Trial Hole</b> | <b>Depth (m bgl)</b>                               |
|-------------------|----------------------------------------------------|
| WS1/DP1           | 2.70 <sup>1</sup> /Inferred to 4.50 <sup>1</sup>   |
| WS2/DP2           | 2.00 <sup>1</sup> /Inferred to 4.80 <sup>1</sup>   |
| WS3/DP3           | 1.30 <sup>12</sup> /Inferred to 1.60 <sup>12</sup> |
| WS4/DP4           | 1.50 <sup>12</sup> /Inferred to 2.90 <sup>12</sup> |
| BH1               | 4.00                                               |
| BH2               | 4.20                                               |
| BH3               | 6.40                                               |

**Note:** <sup>1</sup> Final depth of trial hole. <sup>2</sup> Depth limited due to refusals

### 2.3.4 London Clay Formation

The soils of the London Clay Formation were only found in BH1-BH3, directly beneath the Taplow Gravel Member for the full depth of the boreholes to a maximum of 20.00m bgl in BH1 and BH3 and inferred in DP1-DP2 only for their full depth to a maximum of 6.00m bgl.

The soils of the London Clay Formation comprised firm to stiff with depth brown grey CLAY.

The depth of London Clay Formation has been included in Table 2.6.

**Table 2.6 Final Depth of London Clay Formation**

| <b>Trial Hole</b> | <b>Depth (m bgl)</b>              |
|-------------------|-----------------------------------|
| WS1/DP1           | Not encountered/6.00 <sup>1</sup> |
| WS2/DP2           | Not encountered/6.00 <sup>1</sup> |
| WS3/DP3           | Not encountered/Not inferred      |
| WS4/DP4           | Not encountered/Not inferred      |
| BH1               | 20.00 <sup>1</sup>                |
| BH2               | 15.00 <sup>1</sup>                |
| BH3               | 20.00 <sup>1</sup>                |

**Note:** <sup>1</sup> Final depth of trial hole.

## 2.4 Roots

Roots were encountered in 2no. out of the 7no. trial holes at a depth of 1.00m bgl.

The depths of root penetration have been included in Table 2.7.

**Table 2.7 Depth of Root Penetration**

| <b>Trial Hole</b> | <b>Depth (m bgl)</b> |
|-------------------|----------------------|
| WS1               | Not encountered      |
| WS2               | Not encountered      |
| WS3               | 1.00                 |
| WS4               | 1.00                 |
| BH1               | Not encountered      |
| BH2               | Not encountered      |
| BH3               | Not encountered      |

As discussed in Preliminary Investigation Report undertaken on the above site by Soils Limited, Report ref: 16149/DS, dated April 2017, mature and semi-mature trees were noted along the site's perimeter.

Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

It must be emphasised that the probability of determining the maximum depth of roots from a narrow diameter borehole is low. A direct observation such as from within a trial pit is necessary to gain a better indication of the maximum root depth.

In order to establish if the soils are likely to be desiccated due to the presence of roots historic maps must be checked to see when trees, shrubs or bushes were present or had been present within approximately the last 20 years.

## **2.5 Groundwater**

Groundwater equilibrium conditions may only be conclusively established if a series of observations are made via groundwater monitoring wells.

Wells were installed in two boreholes (BH1 and BH3), to allow groundwater/soil-gas monitoring on three (3No.) occasions, following liaison and agreement with the client.

No groundwater was encountered during drilling of the boreholes; it must be mentioned that the speed of drilling and the addition of water to facilitate drilling through the granular soils of the Taplow Gravel Member may have masked any groundwater strikes.

Groundwater records taken during the groundwater monitoring to date, are shown in Table 2.8.

**Table 2.8 Groundwater Records and Monitoring Data (to date)**

| <b>Trial Hole</b> | <b>Well Depth (m bgl)</b> | <b>Depth to Water (m bgl)</b> |                 |                 |                 |
|-------------------|---------------------------|-------------------------------|-----------------|-----------------|-----------------|
|                   |                           | <b>09.11.10.19</b>            | <b>16.10.19</b> | <b>23.10.19</b> | <b>28.10.19</b> |
| WS1               | -                         | Not encountered               | -               | -               | -               |
| WS2               | -                         | Not encountered               | -               | -               | -               |

| Trial Hole | Well Depth (m bgl) | Depth to Water (m bgl) |          |          |          |
|------------|--------------------|------------------------|----------|----------|----------|
|            |                    | 09-11.10.19            | 16.10.19 | 23.10.19 | 28.10.19 |
| VS3        | -                  | Not encountered        | -        | -        | -        |
| VS4        | -                  | Not encountered        | -        | -        | -        |
| BH1        | 5.00               | Not encountered        | 3.32     | 3.47     | *        |
| BH2        | -                  | Not encountered        | -        | -        | -        |
| BH3        | 5.00               | Not encountered        | 3.24     | 3.20     | 3.20     |

**Note:** \* Car parked at BH1 location, no water records could be taken

Changes in groundwater level occur for reasons including seasonal effects and variations in drainage.

The investigation and groundwater monitoring were conducted in October 2019, when groundwater levels should be at or near their annual minimum (i.e. lowest elevation typically in September). Groundwater levels should be at their annual maximum (highest) in March.

## Section 3 Discussion of Geotechnical In-Situ and Laboratory Testing

### 3.1 Standard Penetration Tests

Standard Penetration Tests (SPTs) were undertaken in BH1-BH3. The results were interpreted based on the classifications outlined in Appendix B.1. The SPT trip hammer efficiency was 60%, therefore  $1.00 \times \text{SPT } N = \text{SPT } N_{60}$ .

It should be noted that SPT ' $N_{60}$ ' values used within the foundation design, are corrected values in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc. Raw field data is archived within the Soils Limited project file and can be provided on request.

Based on the SPT tests, the granular beds of the Taplow Gravel Member recorded SPT " $N_{60}$ " values between 14 and 50 classifying them as **medium dense to very dense**; no specific pattern of relative density fluctuations with depth could be established.

Based on the SPT tests, the cohesive beds of the London Clay Formation recorded SPT " $N_{60}$ " values between 10 and 32 and thus were classified as **medium to very high strength** with inferred undrained cohesive strengths ranging between 50kPa and 160kPa and generally increasing with depth.

A full interpretation of the SPT results are outlined in Appendix B.2, Table B.2.1.

### 3.2 Dynamic Probe Tests

Four (4No.) dynamic probes, using the Premier Compact 110 Series super heavy rig, (DP1-DP4) were driven prior and adjacent to their corresponding windowless sampler borehole to a maximum depth of 6.00m bgl.

The results were converted to equivalent SPT " $N_{60}$ " values based on dynamic energy using commercial computer software (Geostru). The results were then interpreted based on the classifications outlined in Appendix B.1, Table B.1.1. The energy ratio efficiency was 79%, therefore  $1.33 \times \text{equivalent SPT } N = \text{SPT } N_{60}$ .

The SPT " $N_{60}$ " values presented have been corrected in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc. Further correction of the ' $N$ ' values should therefore not be necessary. Raw field data is archived within the Soils Limited project file and can be provided on request.

Based on the DP tests, the cohesive beds of the Langley Silt Member recorded equivalent SPT " $N_{60}$ " values between 23 and 126 classifying them as **high to extremely high strength** with inferred undrained cohesive strengths of 115kPa and >300kPa; the relatively high blow counts were attributed to possible gravel bands.

Based on the DP tests, the granular beds of the Taplow Gravel Member recorded

equivalent SPT “N<sub>60</sub>” values generally between 27 and greater than 50 classifying them as **medium dense to very dense** with relative density generally increasing with depth. In DP1 between 3.20m and 3.40m bgl, a marked decrease in blow counts was noted with equivalent SPT “N<sub>60</sub>” values between 11 and 15 classifying them as **medium dense** relative density.

Based on the DP tests, the cohesive beds of the inferred London Clay Formation recorded equivalent SPT “N<sub>60</sub>” values between 4 and 27 and thus were classified as **very low to high strength** with inferred undrained cohesive strengths of 20kPa and 135kPa respectively and generally increasing with depth; no specific pattern of undrained cohesive strength with depth could be established.

A full interpretation of the DPSH tests are outlined in Appendix B.2.

### 3.3 Quick Unconsolidated Undrained Triaxial Compression Tests

Quick Unconsolidated Undrained Triaxial Compression Tests (QUU) were performed on twelve (12no.) cohesive samples from the London Clay Formation.

The QUU testing indicated the soils of the London Clay Formation to be of a **medium to very high strength** with undrained cohesions of between 62kPa and 217kPa.

A full interpretation of the QUU tests are outlined in Appendix B.2 and the laboratory report in Appendix B.3.

### 3.4 Atterberg Limit Tests

Atterberg Limit tests were performed on three (3no.) cohesive samples from the London Clay Formation. The results were classified in accordance with BRE Digest 240.

The London Clay Formation was classified as **high** volume change potential in accordance with BRE Digest 240.

A full interpretation of the Atterberg Limit tests is outlined in Appendix B.2 and the laboratory report in Appendix B.3.

### 3.5 Particle Size Distribution Tests

Particle Size Distribution (PSD) tests were performed on four (4no.) granular samples from the Taplow Gravel Member.

The PSD tests classified the granular soils of the Taplow Gravel Member as having **no volume change** potential in accordance with BRE Digest 240.

A full interpretation of the SMC tests are outlined in Appendix B.2 and the laboratory report in Appendix B.3.

### **3.6 Sulphate and pH Tests**

Six samples from the Made Ground (WS1:0.70m, WS2:0.80m, BH1:0.20m, BH2:0.50m, BH3:0.50m and BH3:1.0m bgl), four (4no.) from the Taplow Gravel Member (BH1:2.00, BH2:2.00m, BH3:2.00 and BH3:5.00m bgl), four (4no.) samples from the London Clay Formation (BH1:9.00m, BH2:7.50m, BH2:13.5m and BH3:19.50m bgl) were taken for water soluble sulphate (2:1) and pH testing in accordance with Building Research Establishment Special Digest 1, 2005, 'Concrete in Aggressive Ground'.

The tests recorded water soluble sulphate between 15mg/l and 72mg/l with pH values of 8.1 to 10.0.

The significance of the sulphate and pH Test results are discussed in Appendix B.2 and the laboratory report in Appendix B.3.

## Section 4 Foundation Design

### 4.1 General

An engineering appraisal of the soil types encountered during the site investigation and likely to be encountered during the redevelopment of this site is presented. Soil descriptions are based on analysis of disturbed samples taken from the trial holes.

#### 4.1.1 Made Ground and Topsoil

The terms *Fill* and *Made Ground (non-engineered fill)* are used to describe material, which has been placed by man either for a particular purpose e.g. to form an embankment, or to dispose of unwanted material. For the former use, the Fill and/or Made Ground may well have been selected for the purpose and placed and compacted in a controlled manner. With the latter, great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material.

The BSI Code of Practice for Foundations, BS 8004:2015, Clause 4.1.2.2 states, *'Spread foundations should not be placed on non-engineered fill unless such use can be justified on the basis of a thorough ground investigation and detailed design.'*

Made Ground was encountered in each of the trial holes from surface to a maximum proved depth of 1.00m in BH1-BH3. Made Ground generally comprised block/brick paving over sand/roadstone sub-base to 0.30m bgl, underlain by soft, grey, gravelly, sandy CLAY/sandy GRAVEL. Sand is fine. Gravel is fine to coarse, angular to sub-rounded, flint, brick, tarmac and concrete.

A result of the inherent variability, particularly of uncontrolled Topsoil, Fill and/or Made Ground is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should, therefore, be taken through any Topsoil and/or Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

#### 4.1.2 Langley Silt Member

The soils of the Langley Silt Member were only found in WS3-WS4, directly beneath the Made Ground to a proved depth of 1.00m bgl and comprised firm to stiff, orangey brown, gravelly, silty, friable CLAY. Gravel is fine to medium sub-angular flint. Rare fine roots.

Based on the DP tests, the cohesive beds of the Langley Silt Member recorded equivalent SPT "N<sub>60</sub>" values between 23 and 126 classifying them as **high to extremely high strength** with inferred undrained cohesive strengths of 115kPa and >300kPa; the relatively high blow counts were attributed to possible gravel bands.

The consistency of the cohesive soils of the Langley Silt Member was indicated to be **firm to stiff** in accordance with the BS 5930:1999+A2:2010, based on the field description of disturbed soil samples as presented on the borehole logs.

The soils of the Langley Silt Member are generally poorly sorted normally consolidated soils; therefore, and considering their lack of consistency as were only found in WS3-WS4 with a limited thickness of 0.35m, they were **not** considered suitable for the proposed development.

#### 4.1.3 Taplow Gravel Member

The soils of the Taplow Gravel Member were found in each of the boreholes, directly beneath the Made Ground or the Langley Silt Member in WS3-WS4, to a maximum proved depth of 6.40m bgl in BH3 and for the full depth of the windowless sampler boreholes to a maximum of 2.70m bgl in WS1 and inferred in the DPs to a maximum depth of 4.80m bgl in DP2. The soils of the Taplow Gravel Member comprised orangey brown slightly clayey, sandy fine to coarse angular flint GRAVEL. Sand is fine to medium.

Based on the SPT tests, the granular beds of the Taplow Gravel Member recorded SPT “N<sub>60</sub>” values between 14 and 50 classifying them as **medium dense to very dense** relative density; no specific pattern of relative density fluctuations with depth could be established.

Based on the DP tests, the granular beds of the Taplow Gravel Member recorded equivalent SPT “N<sub>60</sub>” values generally between 27 and greater than 50 classifying them as **medium dense to very dense** with relative density generally increasing with depth. In DP1 between 3.20m and 3.40m bgl, a marked decrease in blow counts was noted with equivalent SPT “N<sub>60</sub>” values between 11 and 15 classifying them as **medium dense** relative density.

The PSD tests classified the granular soils of the Taplow Gravel Member as having **no volume change** potential in accordance with BRE Digest 240.

The soils of the Taplow Gravel Member are generally granular soils and are expected to high moderate bearing capacities and low settlement characteristics and are considered to be suitable as a bearing stratum for the proposed redevelopment using strip foundations.

#### 4.1.4 London Clay Formation

The soils of the London Clay Formation were only found in BH1-BH3, directly beneath the Taplow Gravel Member for the full depth of the boreholes to a maximum of 20.00m bgl in BH1 and BH3 and inferred in DP1-DP2 only for their full depth to a maximum of 6.00m bgl. The soils of the London Clay Formation comprised firm to stiff with depth brown grey CLAY.

Based on the SPT tests, the cohesive beds of the London Clay Formation recorded

SPT “N<sub>60</sub>” values between 10 and 32 and thus were classified as **medium to very high strength** with inferred undrained cohesive strengths ranging between 50kPa and 165kPa and generally increasing with depth.

Based on the DP tests, the cohesive beds of the inferred London Clay Formation recorded equivalent SPT “N<sub>60</sub>” values between 4 and 27 and thus were classified as **very low to high strength** with inferred undrained cohesive strengths of 20kPa and 135kPa respectively and generally increasing with depth; no specific pattern of undrained cohesive strength with depth could be established.

The QUU testing indicated the soils of the London Clay Formation to be of a medium to very high strength with undrained cohesions of between 62kPa and 217kPa.

The London Clay Formation was classified as **high** volume change potential in accordance with BRE Digest 240.

The consistency of the cohesive soils of the London Clay Formation was indicated to be **firm to stiff with depth** in accordance with the BS 5930:1999+A2:2010, based on the field description of disturbed soil samples as presented on the borehole logs.

The soils of the London Clay Formation are cohesive overconsolidated to heavily overconsolidated soils and are expected to display moderate bearing capacities and moderate settlement characteristics and are considered to be suitable as a bearing stratum for the proposed redevelopment using piled foundations.

## 4.2 Foundation Scheme General

The proposal comprised the erection of a 4 storey hotel extension building to accommodate 108 rooms with a covered link bridge connecting the existing hotel building, with associated ancillary works. The proposed development is to include limited areas of soft landscaping comprising communal open space.

In compiling this report reliance was placed on drawing number 890/RDP/P02, by RDP Architects Limited, dated 10/03/2016 that was supplied to Soils Limited by the client. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

Development plans provided by the client are presented in Appendix E.

### 4.2.1 Guidance on Shrinkable Soils

The Building Research Establishment (BRE) Digests 240, 241 and 242 provide guidance on ‘best practice’ for the design and construction of foundations on shrinkable soils.

The PSD tests classified the granular soils of the Taplow Gravel Member as having **no volume change** potential in accordance with BRE Digest 240.

The London Clay Formation was classified as **high** volume change potential in accordance with BRE Digest 240.

The BRE Digest 241 states: *“An increasingly common, potentially damaging situation is where trees or hedges have been cut down prior to building. The subsequent long-term swelling of the zone of clay desiccated by the roots, as moisture slowly returns to the ground, can be substantial. The rate at which the ground recovers is very difficult to predict and if there is any doubt that recovery is complete then bored pile foundations with suspended beams and floors should be used”.*

The BRE Digest 240 suggests: *“Two courses of action are open:*

*Estimate the potential for swelling or shrinkage and try to avoid large changes in the water content, for example by not planting trees near the foundations.*

*Accept that swelling or shrinkage will occur and take account of it. The foundations can be designed to resist resulting ground movements or the superstructure can be designed to accommodate movement without damage.”*

The design of foundations suitable to withstand movements is presented in BRE Digest 241 “Low-rise buildings on shrinkable clay soils: Part 2”.

Any ground beams, foundations or slabs passing through the **granular** bands of the Taplow Gravel Member must be designed in accordance with the BRE Digest 240 **no volume change potential**. Due to the thickness of the granular soils of the Taplow Gravel Member reaching an average of ~4.0m, the impact of the underlying cohesive soils of the London Clay Formation due to volume change potential was considered to be negligible, provided that proposed foundation depth is limited within 1.5m bgl.

#### 4.3 Foundation Scheme

Foundations **must not** be constructed within any Made Ground or Langley Silt Member due to the likely variability and potential for large load induced settlements both total and differential.

Roots were encountered in 2no. out of the 7no. trial holes at a depth of 1.00m bgl. As discussed in Preliminary Investigation Report undertaken on the above site by Soils Limited, Report ref: 16149/DS, dated April 2017, mature and semi-mature trees were noted along the site's perimeter.

If roots are encountered during the construction phase foundations must not be placed within any live root penetrated or desiccated cohesive soils or those with a volume change potential. Should the foundation excavations reveal such materials, the excavations must be extended to greater depth in order to bypass these unsuitable soils. Excavations must be checked by a suitable person prior to concrete being poured.

A strip foundation solution was considered, with the foundations taken into or into the granular soils of the Taplow Gravel Member below any live root zone, below any Made Ground, Langley Silt Member and/or “soft spots” or desiccated soils, such that adequate bearing capacity was achieved.

#### **4.3.1 Strip Foundations into the Taplow Gravel Member**

Based on a 5.00m long by 0.75m wide strip foundation into the granular soils of the Taplow Gravel Member, using commercial software, Table 4.1 shows the calculated bearing values and anticipated settlement characteristics.

**Table 4.1 Bearing Capacities Strip Footings In The Taplow Gravel Member**

| <b>Depth (m bgl)</b> | <b>Size (m)</b> | <b>Bearing Capacity (kPa)</b> | <b>Anticipated Settlement (mm)</b> |
|----------------------|-----------------|-------------------------------|------------------------------------|
| 1.20                 | 5.00x0.75       | 450                           | 25                                 |

For the bearing value given, settlements should not exceed the presented value, provided that excavation bases are carefully bottomed out and blinded or concreted as soon after excavation as possible and kept dry.

Anticipated settlements may be taken as proportional to the bearing capacity adopted (for the same configuration of foundation), therefore if the bearing value is halved the anticipated settlement will halve.

Foundations must not be constructed over former structures and other hard spots.

The anticipated settlement includes both elastic settlement and long-term drained settlement.

Any soft spots must be removed from the base of the excavations, these excavations then being either concreted or blinded as soon after excavation as possible. Failure to do so could results in increased settlements.

#### **4.3.2 Groundwater**

No groundwater was encountered during drilling of the boreholes; it must be mentioned that the speed of drilling and the addition of water to facilitate drilling through the granular soils of the Taplow Gravel Member may have masked any groundwater strikes. Groundwater records taken during the groundwater monitoring to date, established the groundwater level at a minimum depth of 3.20m bgl in BH3 on 23.10.19.

The investigation and groundwater monitoring were conducted in October 2019, when groundwater levels should be at or near their annual minimum (i.e. lowest elevation typically in September). Groundwater levels should be at their annual maximum (highest) in March.

Therefore, and subject to the finalised foundation depth, **it is likely that groundwater levels may be higher therefore subject to the finalised foundation depth, both support and dewatering of excavations may be required.**

#### 4.3.3 Ground Floor Slab

Although the NHBC is not strictly applicable to non-residential structures, the relevant guidance was considered appropriate for the proposed development.

NHBC Standards 2018, Chapter 5.2, Suspended Ground Floors, states:

- *“Ground floors should be constructed as suspended floors where the depth of fill exceeds 600mm”.*
- *“Suspended slabs should be adopted where the foundation depth dictated by the NHBC Standards 2018, Chapter 4.2, Appendix 4.2-C would exceed 1.5m bgl.”*

Due to the soils of the Taplow Gravel Member not having volume change potential and given the relatively limited depth of Made Ground (1.0m bgl), **ground bearing slabs** could be considered for the proposed redevelopment subject to reduction of existing site elevation that would potentially result in thickness of Made Ground equal or less than 600mm.

#### 4.3.4 Piled Foundations

Alternatively, a piled foundation scheme could be considered for the proposed development, with the foundations taken through any Made Ground and Langley Silt Member, Taplow Gravel Member and into the underlying London Clay Formation.

The construction of a piled foundation is a specialist job with the actual pile working load depending on the particular type pile and installation method. Prior to finalising the foundation design the advice from a reputable contractor who is familiar with the ground and groundwater conditions present at the site should be sought.

The vertical load capacities are provided for varying diameters and lengths of bored piles taken into the London Clay Formation, based on:

- the SPT “N<sub>60</sub>” values recorded during the cable percussion drilling in the soils of the London Clay Formation;
- the results of the QUU laboratory testing that derived Undrained Strength values in the soils of the London Clay Formation.

It must only be used for preliminary design purposes.

The SPT trip hammer efficiency was 60%, therefore  $1.00 \times \text{equivalent SPT } N = \text{SPT } N_{60}$ . It should be noted that SPT 'N<sub>60</sub>' values used within the pile design in this report, are corrected values in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc.

An adhesion value ( $\alpha$ ) of 0.50 was used to calculate the skin friction and a bearing capacity factor ( $N_c$ ) of 9 was adopted for the cohesive bands of the London Clay Formation. The skin friction values are pile type and installation sensitive and the adoption of CFA piles may well result in an increased adhesion value and consequential increase in capacity of the pile.

A factor of safety of 3.0 was applied to both the shaft and base and depicted by the design line outlined in Appendix C.

The bearing values given in Appendix C, are applicable to single piles. Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

From ground level the upper 6.0m of the pile shaft has been ignored in the preliminary pile design given.

The skin friction of the granular bands of the Taplow Gravel Member was considered and was added into the skin friction of the underlying granular bands of the London Clay Formation.

To prevent necking of the green concrete, temporary casing may be required where the pile passes through the Made Ground, Langley Silt Member, Taplow Gravel Member and into the underlying London Clay Formation and below the groundwater table.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter. The bearing values may be limited by the maximum permissible stress allowable on a concrete pile.

Guidance on the design of a working platform for piling rigs can be provided by Soils Limited in accordance with the BRE "Working platform for tracked plant, 2004" documentation.

Void formers and/or compressible layers to ground beam and ground floor slabs as well as pile sleeves and tensile reinforcement should be adopted to accommodate heave/swelling due to **high** volume change potential of the London Clay Formation in accordance with the BRE 250.

#### 4.4 Subsurface Concrete

The sulphate concentrations measured in 2:1 water/soil extracts fell into Class **DS-1** of the BRE Special Digest 1 2005, '*Concrete in Aggressive Ground*'. Table C2 of the Digest indicated ACEC (Aggressive Chemical Environment for Concrete) site classifications of **AC-1**. The pH of the soils tested ranged between 8.1 to 10.0. The classification given was determined using the "mobile" groundwater case, in the view of groundwater being encountered. The laboratory results are presented in Appendix B.3 and the contamination analysis results in Appendix D.1.

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1 2005, '*Concrete in Aggressive Ground*' considering any possible exposure of potentially pyrite bearing natural ground and the pH of the soils.

#### 4.5 Excavations

Shallow excavations in the Made Ground, Langley Silt Member or Taplow Gravel Member are likely to be unstable, depending on the thickness of overlying Made Ground and the groundwater level.

Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions must therefore be taken to ensure that such earth faces are adequately supported or battered back to a safe angle of repose before excavations are entered by personnel and dewatering of excavations would likely be required considering the potentially high groundwater table, especially in winter months.

#### 4.6 Pavements

CBR values within the Made Ground are expected to be highly variable due to changes in moisture content and marked variations within ground conditions, therefore **in-situ testing must be undertaken** immediately prior to the installation of pavements/roads. Indicative CBR estimates were noted to range between 1.5% and 3.5% for thin (300mm) and thick (1200mm) proposed pavements for "poor construction conditions" and "high water table", i.e. worst case. (Source: Table C1, TRRL LR1132, 1984).

Any soft spots at formation level, within the Made Ground must be dug out and replaced with a suitably compacted granular fill. Prior to construction the formation level should be proof rolled. The designer should consider the use of a geogrid to reinforce the formation and prevent punching into the underlying Langley Silt Member (if encountered).

The percentage of material passing the 75um BS test sieve within the granular soils of the Taplow Gravel Member was noted to be less than 10%, therefore and in accordance with the Road Research Laboratory LR90, the Taplow Gravel Member is generally expected to be non-frost susceptible.

## Section 5 Determination of Chemical Analysis

### 5.1 Site Characterisation

The Main Investigation Report established the presence of Made Ground underlying the superficial deposits of the Langley Silt Member (Unproductive Strata) and the Taplow Gravel Member (Principal Aquifer) underlain by the bedrock of the London Clay Formation (Unproductive Strata).

Furthermore, groundwater was encountered during monitoring, established at a minimum depth of 3.20m bgl in BH3 on 23.10.19.

### 5.2 Soil Sampling

A non-targeted sampling strategy is appropriate when there is:

- No adequate information available regarding the likely locations of contamination;
- No sensitive areas where there is a need for a high degree of confidence.

A targeted sampling strategy is appropriate when there is:

- Adequate information available regarding the likely locations of contamination
- Sensitive areas where there is a need for a high degree of confidence.

A combination of targeted and non-targeted sampling pattern was adopted, with contamination sampling locations selected by Soils Limited.

Table 5.1 outlines the sampling undertaken.

**Table 5.1 Sampling Strategy**

| Sample Location | Strategy    | Proposed Use              |
|-----------------|-------------|---------------------------|
| WS1:0.70m bgl   | Made Ground | Beneath proposed building |
| WS2:0.80m bgl   | Made Ground | Beneath proposed building |
| BH1:0.20m bgl   | Made Ground | Beneath proposed building |
| BH2:0.50m bgl   | Made Ground | Beneath proposed building |
| BH3:0.50m bgl   | Made Ground | Beneath proposed building |
| BH3:1.00m bgl   | Made Ground | Beneath proposed building |

### 5.3 Determination of Chemical Analysis

The driver for determination of the analysis suite was derived following liaison with the client and based on the Preliminary Investigation Report undertaken by Soils Limited (report ref: 16149/DS, dated April 2017) and the findings of the Main Investigation Report intrusive investigation.

Table 5.2 outlines the specification for each sample tested.

**Table 5.2 Chemical Analysis Specification**

| <b>Substance</b> | <b>Locations: Depths (m bgl)</b> |                 |                 |                 |                 |                 |
|------------------|----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                  | <b>WS1:0.70</b>                  | <b>WS2:0.80</b> | <b>BH1:0.20</b> | <b>BH2:0.50</b> | <b>BH3:0.50</b> | <b>BH1:1.00</b> |
| Asbestos Screen  | ✓                                | ✓               | ✓               | ✓               | ✓               | ✓               |
| Total Phenols    | ✓                                | ✓               | ✓               | ✓               | ✓               | ✓               |
| Total Cyanide    | ✓                                |                 | ✓               | ✓               | ✓               |                 |
| Organic Matter   | ✓                                | ✓               | ✓               | ✓               | ✓               | ✓               |
| pH               | ✓                                | ✓               | ✓               | ✓               | ✓               | ✓               |
| Metals           | ✓                                | ✓               | ✓               | ✓               | ✓               | ✓               |
| Metalloids       | ✓                                | ✓               | ✓               | ✓               | ✓               | ✓               |
| Organics         | ✓                                | ✓               | ✓               | ✓               | ✓               | ✓               |
| PAHs             | ✓                                | ✓               | ✓               | ✓               | ✓               | ✓               |
| TPH-CWG          |                                  |                 | ✓               | ✓               | ✓               |                 |
| BTEX             |                                  |                 | ✓               | ✓               | ✓               |                 |
| OCP              |                                  |                 |                 | ✓               |                 |                 |

**Notes:** **Metals:** Cd, Cr, Pb, Hg, Ni, Se, CN, S, Cu, Zn, Bo, V. **metalloids:** As. **organics:** USEPA 16 speciated PAH, **TPH-CWG** (speciated TPH), **BTEX** (benzene, toluene, ethylbenzene, xylene,) **Asbestos screening** was undertaken in accordance with HSG 248. **OCP** (Organochlorine Pesticides)

## Section 6 Qualitative Risk Assessment

### 6.1 Assessment Criteria

The assessment criteria used to determine risks to human health are derived and explained within Appendix D.2.

### 6.2 Representative Contamination Criteria - Soil

The proposal comprised the erection of a 4 storey hotel extension building to accommodate 108 rooms with a covered link bridge connecting the existing hotel building, with associated ancillary works. The proposed development is to include limited areas of soft landscaping comprising communal open space.

In compiling this report reliance was placed on drawing number 890/RDP/P02, by RDP Architects Limited, dated 10/03/2016 that was supplied to Soils Limited by the client. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

Based on the proposed development, the results of the chemical analysis have been compared against generic guidance values for a 'Residential without home grown produce' end use, (a conservative approach for the proposed land-use) as presented in SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination December 2014 (C4SL), derived for the protection of human health. Where this document has not published generic screening values for determinants, screening values derived for the same end use have been adopted from the following published guidance; DEFRA Soil Guideline Values (SGV) and LQM/CIEH/Suitable 4 Use Level (S4UL).

Table 6.1 outlines the samples that have exceeded their relevant assessment criteria.

**Table 6.1 Summary of Chemical Analysis of Soils Sample Exceedance**

| Substance                                          | Sample locations where SGV, C4SL or S4UL adopted were exceeded for the 'Residential without plant uptake' land-use scenario |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| None                                               | None                                                                                                                        |
| <b>Asbestos (Note non-threshold only presence)</b> |                                                                                                                             |
| None                                               |                                                                                                                             |

The full laboratory report is presented in Appendix D.1.

The guideline values are assessed against the "Residential without plant uptake" land-use scenario, which is considered a **conservative** land-use scenario, given the type of the proposed redevelopment (commercial).

To assess the potential toxicity to the human health receptor from the concentrations of

organic compounds tested for, Soil Organic Matter (SOM) tests were undertaken on the samples submitted for chemical testing, which revealed SOM values of between 0.1% and 1.1%. For each soil sample tested, the Soil Organic Matter recorded was used to derive the appropriate guideline value for organic determinants.

### 6.3 Tier I Quantitative Risk Assessment

Quantitative risk assessments are undertaken for the soil, groundwater and soil gas. The full laboratory chemical report is presented in Appendix D.1.

#### 6.3.1 Soils

In summary, no asbestos was recorded and none of the substances tested recorded concentrations above the residential end-use screening values in any of the 6no. soil samples of the Made Ground tested.

The Tier 1 Quantitative risk assessment therefore established that there was **no risk to the human health receptors** of construction workers or future end-users.

#### 6.3.2 Groundwater

In the absence of any elevated concentrations within the Made Ground and due to the lack of any additional on-site sources of contamination established on site from the intrusive investigation, it was considered **there was no risk** to the groundwater receptor.

#### 6.3.3 Soil Gas

Wells were installed in two boreholes (BH1 and BH3), to allow groundwater/soil-gas monitoring on three (3No.) occasions, following liaison and agreement with the client.

The head-works comprised two gas taps, one of which was connected to an internal tube to draw gas from a point approximately one metre below ground level and the other tap to an internal tube terminating at a nominal depth of 300mm below ground level. The taps were connected to the flow and return ports on the gas analyser to enable measurements of soil gas concentrations in the well to be taken without venting to the atmosphere.

Concentrations of Volatile Organic Compounds (VOCs) within the monitoring wells were measured using a Photo-Ionisation Detector (PID).

The soil-gas monitoring results are provided within Table 6.3.

**Table 6.2 Soil-Gas Records (3no. monitoring visits)**

| Date<br>(BaroTrend)     | BH  | CH <sub>4</sub><br>(%) | CO <sub>2</sub><br>(%) | O <sub>2</sub><br>(%) | H <sub>2</sub> S<br>(ppm) | CO<br>(ppm) | LEL<br>(%) | aP<br>(mb) | Flow<br>(l/h) | VOC<br>(ppm) | H <sub>2</sub> O<br>(m bgl) | Base<br>of hole |
|-------------------------|-----|------------------------|------------------------|-----------------------|---------------------------|-------------|------------|------------|---------------|--------------|-----------------------------|-----------------|
| 16/10/2019<br>(Falling) | ATM | 0.0                    | 0.0                    | 21.2                  | 0.0                       | 0.0         | 0.0        | 1000       | 0.0           | 0.0          | N/a                         | N/a             |
|                         | BH1 | 0.0                    | 4.3                    | 15.3                  | 0.0                       | 0.0         | 0.0        | 1000       | 0.0           | 0.0          | 3.32                        | 5.00            |

| Date<br>(BaroTrend)     | BH  | CH <sub>4</sub><br>(%)                              | CO <sub>2</sub><br>(%) | O <sub>2</sub><br>(%) | H <sub>2</sub> S<br>(ppm) | CO<br>(ppm) | LEL<br>(%) | aP<br>(mb) | Flow<br>(l/h) | VOC<br>(ppm) | H <sub>2</sub> O<br>(m bgl) | Base<br>of hole |
|-------------------------|-----|-----------------------------------------------------|------------------------|-----------------------|---------------------------|-------------|------------|------------|---------------|--------------|-----------------------------|-----------------|
|                         | BH3 | 0.0                                                 | 3.8                    | 16.3                  | 0.0                       | 0.0         | 0.0        | 1000       | 0.0           | 0.0          | 3.24                        | 5.00            |
| 23/10/2019<br>(Falling) | ATM | 0.0                                                 | 0.0                    | 21.0                  | 0.0                       | 0.0         | 0.0        | 1010       | 0.0           | 0.0          | N/a                         | N/a             |
|                         | BH1 | 0.0                                                 | 2.2                    | 18.6                  | 0.0                       | 0.0         | 0.0        | 1010       | 0.0           | 0.0          | 3.47                        | 5.00            |
|                         | BH3 | 0.0                                                 | <b>4.9</b>             | <b>14.8</b>           | 0.0                       | 0.0         | 0.0        | 1010       | 0.0           | 0.0          | 3.20                        | 5.00            |
| 28/10/2019<br>(Falling) | ATM | 0.0                                                 | 0.0                    | 21.2                  | 0.0                       | 0.0         | 0.0        | 1025       | 0.0           | 0.0          | N/a                         | N/a             |
|                         | BH1 | Unable to gain access at location due to parked car |                        |                       |                           |             |            |            |               |              |                             |                 |
|                         | BH3 | 0.0                                                 | 2.7                    | 18.7                  | 0.0                       | 0.0         | 0.0        | 1025       | 0.0           | 0.0          | 3.20                        | 5.00            |

**Notes:** Zero reading = below the equipment detection limit. Published barometric pressure trend data were obtained for each monitoring visit (data from Weather Station at West Drayton, The Green. ID: IWESTDRA2)

Concentrations of methane (CH<sub>4</sub>) either total or LEL were noted to be below the instrument detection limit.

Maximum concentration of carbon dioxide (CO<sub>2</sub>) was recorded at 4.9% on 23/10/2019 in BH3.

No concentrations of hydrogen sulphide (H<sub>2</sub>S) were recorded above instrument detection limit to date.

The carbon monoxide (CO) concentrations were noted to be below the instrument detection limit.

The oxygen concentrations were generally noted to be close to their normal atmospheric values; however, on 23/10/2019 they were noted to be slightly depleted at 14.8% in BH3.

Concentrations of Volatile Organic Compounds (VOCs) within the monitoring wells were measured using a Photo-Ionisation Detector (PID) and were below the instrument detection limit.

No positive flow rates were recorded above the instrument detection limit.

## 6.4 Remedial Objective

This report is not a design document. The purpose of this section is to describe a framework for the treatment of contamination that can be developed by the designers of the development to give the most practical and cost-effective treatment for the proposed scheme.

According to the way in which the design of the project is conceived it may be possible to develop alternative strategies to those discussed. For example, the treatment systems described in this report are based upon the assumptions that finished ground levels for the development will be the same as those that currently exist. Increases in ground level could result in less onerous requirements to remove soil from the site.

The advice and recommendations presented are made on the basis of the chemical analyses results obtained to date.

#### **6.4.1 Soil**

The Tier 1 Quantitative risk assessment therefore established that there was no risk to the human health receptors of construction workers and future end-users, therefore there was **no merit in any remediation actions to be taken for their protection.**

#### **6.4.2 Groundwater**

As discussed in Section 6.3.2, there was no risk to the groundwater receptor underlying the site. Furthermore, as discussed in the Preliminary Investigation Report undertaken by Soils Limited (report ref: 16149/DS, dated April 2017), there were no potable abstraction points or Groundwater Source Protection Zones within 2000m radius from the area comprising the site and the land to the immediate south and south-west, therefore there was **no merit in any remediation actions to be taken for its protection.**

#### **6.4.3 Soil-Gas**

A very low to low soil-gas risk was identified in the Preliminary Investigation Report undertaken by Soils Limited (report ref: 16149/DS, dated April 2017) for the area comprising the site and the land to the immediate south and south-west; the soil-gas/VOC monitoring to date has not established any elevated concentrations of soil-gas, any VOC above the instrument detection limit, or any additional potential sources of soil-gas/VOC.

Furthermore, a Phase II Contamination Assessment Report (ref: 16367/GIR, dated October 2017) previously undertaken by Soils Limited for a site that comprised the eastern extension of the existing hotel to the immediate south of the site, included a soil-gas risk assessment of 6no. monitoring visits between July and October 2017, which concluded that the site in question fell into a Characteristic Gas Situation 1 (CS1), for which no special precautions are required as given in the "Guidance on methane and carbon dioxide, NHBC 2007" (refer to Tables 11.1 and 11.2).

Consequently, the risk of soil-gas impacting the site was considered to be negligible.

### **6.5 Duty of Care**

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust

is generated as a result of construction activities. The site should be securely fenced at all times to prevent unauthorised access.

Washing facilities should be provided and eating restricted to mess huts.

## **6.6 Excavated Material**

Excavated material as waste must be defined or classified prior to any disposal, transport, recycling or re-use at or by an appropriately licensed or exempt carrier and/or off-site disposal facility. The requirements inherent in both Duty of Care and Health and Safety must also be complied with. In order to determine what is to happen, what is suitable, appropriate and most effective in the disposal of wastes, especially those subject to CDM waste management plan requirements, several factors must be considered and competent advice should always be sought.

The amount, type and nature of the material to be removed will in part determine the amount and type of analysis that may be required to comply with current waste guidance, and thereby allow a competent person to suitably classify the material. Often this data is uncertain or unavailable, especially in the early stages of a project, and therefore further investigation, testing and analysis may be required as additional information regarding the development becomes available.

Wastes must be classified and defined by their solid characteristics to comply with current waste guidance. Existing information and analysis derived for environmental purposes may therefore be suitable for use in this context. Waste Acceptance Criteria (WAC) report the leachability of materials and therefore cannot be used to classify, characterise or define wastes. The only purpose of a WAC analysis is to determine the suitability of a given material for acceptance at one of the three different types of available licenced landfills (inert, stable non-reactive hazardous or hazardous).

Other options are available that may lead to significant savings against disposal to landfill and expert advice should always be sought from a competent person to advise on their relative costs or benefits and advise on any additional analysis, sampling or investigation that may be required to reduce remaining uncertainties and comply with current guidance. Further consideration of results using HazWasteOnline™ can be undertaken on request to give an indication of potentially hazardous properties in the materials analysed.

## **6.7 Re-use of Excavated Material On-site**

The re-use of on-site soils may be undertaken either under the Environmental Permitting Regulations 2007 (EPR), in which case soils other than uncontaminated soils are classed as waste, or under the CL:AIRE Voluntary Code of Practice (CoP) which was published in September 2008 and is accepted as an alternative regime to the EPR. Under the EPR, material that is contaminated but otherwise suitable for re-use is also classified as waste and its re-use should be in accordance with the Environmental

Permitting Regulations 2007 (EPR). Environmental Permit Exemptions (EPE) are for the re-use of non-hazardous or inert waste only; hazardous waste cannot be re-used under a permit exemption. EPE apply only to imported inert waste materials; inert material arising on site and recovered on site is not classified as waste and does not require an exemption. It is possible that materials arising on-site will be classified as inert and would not need an exemption.

Environmental Permit Exemptions are only allowed for certain activities, placing controls on the quantities that can be stored and re-used. The re-use of waste shall be within areas and levels defined in planning applications and permissions for the development. An EPE requires a site-specific risk assessment for the receptor site to demonstrate that the materials are suitable for use, i.e. that they will not give rise to harm to human health or pollution of the environment.

Under the CL:AIRE voluntary code of practice (CoP) materials excavated on-site are not deemed contaminated if suitable for re-use at specified locations or generally within the site.

Material that may have been classified as hazardous waste under the EPR may be re-used. The CoP regime requires that a 'Qualified Person' as defined under the CoP reviews the development of the Materials Management Plan, including review of Risk Assessments and Remediation Strategy/Design Statement together with documentation relating to Planning and Regulatory issues, and signs a Declaration which is forwarded to the Environment Agency and which confirms compliance with the CoP.

Should it be necessary to import materials from another site where materials are excavated and which is not material from a quarry or produced under a WRAP protocol, then an EPE would be necessary for the imported material whether the work was managed under the CoP or the EPR.

## **6.8 Imported Material**

Any soil, which is to be imported onto the site, must undergo chemical analysis to permit classification prior to its importation and placement in order to ascertain its status with specific regard to contamination, i.e. to prove that it is suitable for the purpose for which it is intended.

## **6.9 Discovery Strategy**

There may be areas of contamination not identified during the course of the investigation. Such occurrences may also be discovered during the demolition and construction phases for the redevelopment of the site.

Care should be taken during excavation works especially to investigate any soils, which appear by eye (e.g. such as fibrous materials, large amounts of ash and unusual discolouration), odour (e.g. fuel, oil and chemical type odours or unusual odours such as sweet odours or fishy odours) or wellbeing (e.g. light headedness and/or nausea,

burning of nasal passages and blistering or reddening of skin due to contact with soil) to be contaminated or of unusual and/or different character to standard soils or those analysed.

In the event of any discovery of potentially contaminated soils or materials, this discovery should be quarantined and reported to the most senior member of site staff or the designated responsible person at the site for action. The location, type and quantity must be recorded and the Local Authority, and a competent and appropriate third party Engineer/Environmental consultant notified immediately. An approval from the Local authority must be sought prior to implementing any proposed mitigation action.

The discovery strategy must remain on site at all times and must demonstrate a clear allocation of responsibility for reporting and dealing with contamination. A copy of the strategy must be placed on the health and safety notice board and /or displayed in a prominent area where all site staff are able to take note of and consult the document at any time. Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination and the discovery strategy.

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**Figure 1 – Site Location Map**

**Job Number**  
17898

**Client**  
RDP Architects Limited

**Project**

Proposed Hotel Extension, Heathrow Point West,  
234 Bath Road, Harlington, Hayes, Greater London  
UB3 5AP

**Date**

November 2019

**Figure 2 – Aerial Photograph**

**Project**

Proposed Hotel Extension,  
Heathrow Point West, 234 Bath  
Road, Harlington, Hayes, Greater  
London UB3 5AP

**Client**

RDP Architects Limited

**Date**

November 2019

**Job Number**

17898

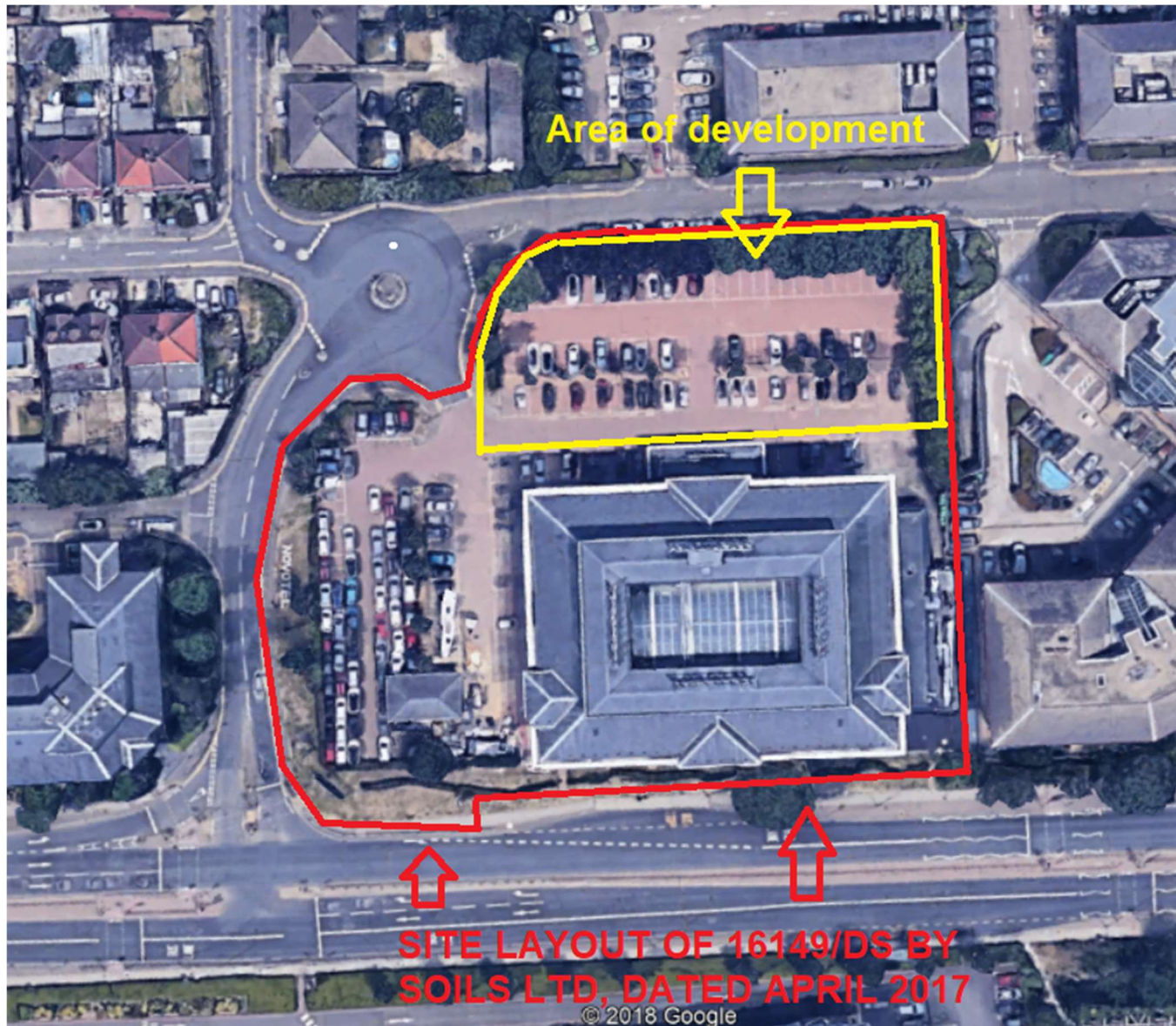
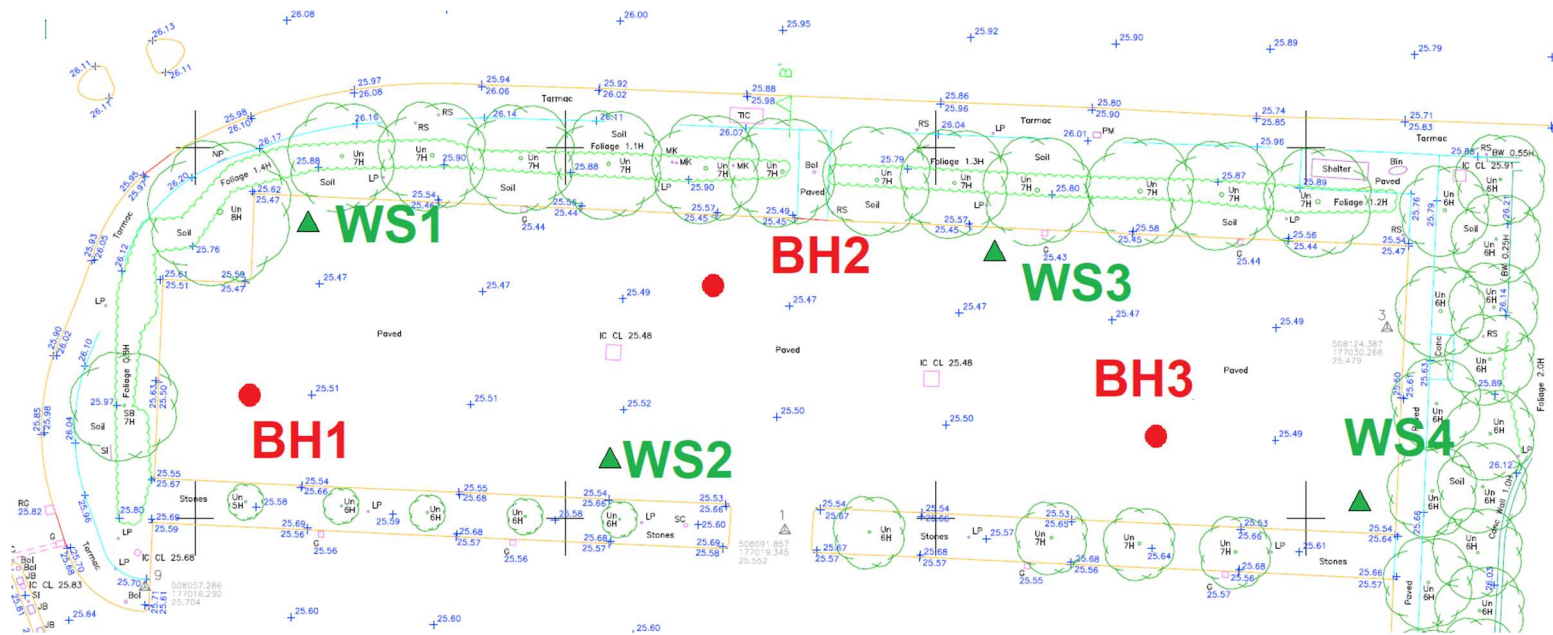


Figure 3 – Trial Hole Plan

**Project**

Proposed Hotel Extension,  
Heathrow Point West, 234 Bath  
Road, Harlington, Hayes, Greater  
London UB3 5AP

**Client**

RDP Architects Limited

**Date**

November 2019

**Job Number**

17898

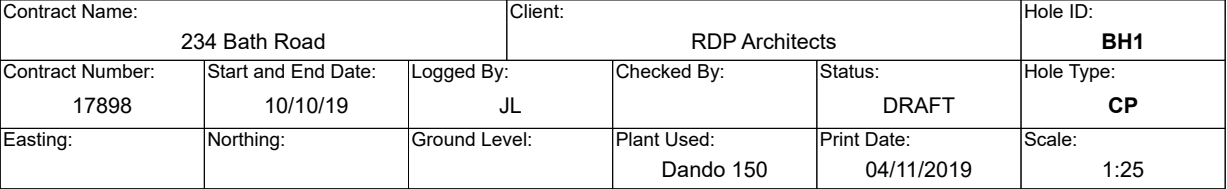


## **Appendix A    Field Work**

### **Appendix A.1   Engineers Logs**

|                                                                                 |                                 |                               |                                 |                       |                                                                                     |                                                                                                                                  |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |
|---------------------------------------------------------------------------------|---------------------------------|-------------------------------|---------------------------------|-----------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------------|----------------------------------------------------------------------------|--|------------------|---------------|-----------------------|------------|-------------|-------------|---------|
|  | Contract Name:<br>234 Bath Road |                               |                                 |                       | Client:<br>RDP Architects                                                           |                                                                                                                                  |                          |                                    | Hole ID:<br>BH1                                                            |  |                  |               |                       |            |             |             |         |
|                                                                                 | Contract Number:<br>17898       |                               | Start and End Date:<br>10/10/19 |                       | Logged By:<br>JL                                                                    |                                                                                                                                  | Checked By:              |                                    | Status:<br>DRAFT                                                           |  | Hole Type:<br>CP |               |                       |            |             |             |         |
|                                                                                 | Easting:                        |                               | Northing:                       |                       | Ground Level:                                                                       |                                                                                                                                  | Plant Used:<br>Dando 150 |                                    | Print Date:<br>04/11/2019                                                  |  | Scale:<br>1:25   |               |                       |            |             |             |         |
| Weather:                                                                        |                                 |                               | Termination:                    |                       |                                                                                     |                                                                                                                                  |                          | SPT Hammer: N/R, Energy Ratio: N/R |                                                                            |  |                  | Sheet 1 of 4  |                       |            |             |             |         |
| Samples & In Situ Testing                                                       |                                 |                               |                                 |                       | Strata Details                                                                      |                                                                                                                                  |                          |                                    |                                                                            |  |                  |               | Groundwater           |            |             |             |         |
| Depth                                                                           | Type                            | Results                       | Level (mAOD)                    | Depth (m) (Thickness) | Legend                                                                              | Strata Description                                                                                                               |                          |                                    |                                                                            |  |                  | Water Strike  | Backfill/Installation |            |             |             |         |
| 0.20                                                                            | D ES                            |                               |                                 | 0.10                  |    | Block Paving. MADE GROUND                                                                                                        |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |
|                                                                                 |                                 |                               |                                 | (0.40)                |    | Sub-base roadstone. MADE GROUND                                                                                                  |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |
| 0.50<br>0.50 - 1.00                                                             | ES<br>B                         |                               |                                 | 0.50                  |    | Reddish grey, sandy, fine to coarse sub-angular to angular flint, brick and concrete GRAVEL. Sand is fine to coarse. MADE GROUND |                          |                                    |                                                                            |  |                  | 1             |                       |            |             |             |         |
| 1.00                                                                            | D ES                            |                               |                                 | (0.50)                |    |                                                                                                                                  |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |
|                                                                                 |                                 |                               |                                 | 1.00                  |    | Dense orangey brown slightly clayey, sandy fine to coarse angular flint GRAVEL. Sand is fine to medium. TAPLOW GRAVEL MEMBER     |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |
| 1.50<br>1.50 - 2.00                                                             | SPT<br>B                        | 50 (25 for 100mm/50 for 77mm) |                                 | (2.00)                |    |                                                                                                                                  |                          |                                    |                                                                            |  |                  | 2             |                       |            |             |             |         |
| 2.00                                                                            | D                               |                               |                                 |                       |                                                                                     |                                                                                                                                  |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |
| 2.50<br>2.50 - 3.00                                                             | SPT<br>B                        | N=50 (7,8/50 for 285mm)       |                                 |                       |                                                                                     |                                                                                                                                  |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |
| 3.00                                                                            | D                               |                               |                                 | 3.00                  |  | Multicoloured, sandy, fine to coarse angular to sub-angular flint GRAVEL. Sand is fine to coarse. TAPLOW GRAVEL MEMBER           |                          |                                    |                                                                            |  |                  | 3             |                       |            |             |             |         |
| 3.50<br>3.50 - 4.00                                                             | SPT<br>B                        | N=22 (3,4/5,5,6,6)            |                                 | (1.00)                |  |                                                                                                                                  |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |
| 4.00<br>4.00 - 4.50                                                             | D<br>B                          |                               |                                 | 4.00                  |  | Brown weathered CLAY. LONDON CLAY FORMATION                                                                                      |                          |                                    |                                                                            |  |                  | 4             |                       |            |             |             |         |
| 4.50                                                                            | SPT                             | N=17 (3,3/3,4,5,5)            |                                 | (0.50)                |  |                                                                                                                                  |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |
|                                                                                 |                                 |                               |                                 | 4.50                  |  | Firm grey silty CLAY. LONDON CLAY FORMATION                                                                                      |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |
| 5.00                                                                            | D                               |                               |                                 |                       |                                                                                     |                                                                                                                                  |                          |                                    |                                                                            |  |                  | 5             |                       |            |             |             |         |
| Start & End of Shift Observations                                               |                                 |                               |                                 | Borehole Diameter     |                                                                                     | Casing Diameter                                                                                                                  |                          | Remarks:                           |                                                                            |  |                  |               |                       |            |             |             |         |
| Date                                                                            | Time                            | Depth (m)                     | Casing (m)                      | Water (m)             | Depth (m)                                                                           | Dia (mm)                                                                                                                         | Depth (m)                | Dia (mm)                           | Water added throughout drilling of gravelly layers, no roots were observed |  |                  |               |                       |            |             |             |         |
|                                                                                 |                                 |                               |                                 |                       |                                                                                     |                                                                                                                                  | 4.50                     | 150                                |                                                                            |  |                  |               |                       |            |             |             |         |
|                                                                                 |                                 |                               |                                 |                       |                                                                                     |                                                                                                                                  |                          |                                    |                                                                            |  |                  | Water Strikes |                       |            |             |             |         |
| Chiselling                                                                      |                                 |                               |                                 |                       |                                                                                     | Installation                                                                                                                     |                          |                                    |                                                                            |  |                  | Strike (m)    | Casing (m)            | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
| From (m)                                                                        | To (m)                          | Duration                      | Remarks                         |                       |                                                                                     | Top (m)                                                                                                                          | Base (m)                 | Type                               | Dia (mm)                                                                   |  |                  |               |                       |            |             |             |         |
|                                                                                 |                                 |                               |                                 |                       |                                                                                     | 0.00                                                                                                                             | 1.00                     | PLAIN                              | 50                                                                         |  |                  |               |                       |            |             |             |         |
|                                                                                 |                                 |                               |                                 |                       |                                                                                     | 1.00                                                                                                                             | 5.00                     | SLOTTED                            | 50                                                                         |  |                  |               |                       |            |             |             |         |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.    |                                 |                               |                                 |                       |                                                                                     |                                                                                                                                  |                          |                                    |                                                                            |  |                  |               |                       |            |             |             |         |

|                                                                                 |                              |                    |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      |         |   |
|---------------------------------------------------------------------------------|------------------------------|--------------------|------------------------------|-----------------------|------------------------------------------------------------------------------------|---------------------------------------------|------------------------------------|----------|-------------------------------------------------------------------------------------|------------|---------------|--------------|--------------------------------------------------------------------------------------|---------|---|
|  | Contract Name: 234 Bath Road |                    |                              |                       | Client: RDP Architects                                                             |                                             |                                    |          | Hole ID: BH1                                                                        |            |               |              |                                                                                      |         |   |
|                                                                                 | Contract Number: 17898       |                    | Start and End Date: 10/10/19 |                       | Logged By: JL                                                                      |                                             | Checked By:                        |          | Status: DRAFT                                                                       |            | Hole Type: CP |              |                                                                                      |         |   |
|                                                                                 | Easting:                     |                    | Northing:                    |                       | Ground Level:                                                                      |                                             | Plant Used: Dando 150              |          | Print Date: 04/11/2019                                                              |            | Scale: 1:25   |              |                                                                                      |         |   |
| Weather:                                                                        |                              |                    | Termination:                 |                       |                                                                                    |                                             | SPT Hammer: N/R, Energy Ratio: N/R |          |                                                                                     |            | Sheet 2 of 4  |              |                                                                                      |         |   |
| Samples & In Situ Testing                                                       |                              |                    |                              |                       | Strata Details                                                                     |                                             |                                    |          |                                                                                     |            |               | Groundwater  |                                                                                      |         |   |
| Depth                                                                           | Type                         | Results            | Level (mAOD)                 | Depth (m) (Thickness) | Legend                                                                             | Strata Description                          |                                    |          |                                                                                     |            |               | Water Strike | Backfill/ Installation                                                               |         |   |
| 5.50                                                                            | D                            | Ublow = 53         |                              | (10.50)               |  | Firm grey silty CLAY. LONDON CLAY FORMATION |                                    |          |                                                                                     |            |               | 6            |  |         |   |
| 6.00 - 6.45                                                                     | U                            |                    |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      |         |   |
| 6.50                                                                            | D                            |                    |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      |         |   |
| 7.00                                                                            | D                            |                    |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      |         |   |
| 7.50                                                                            | SPT                          | N=17 (2,2/3,4,5,5) |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      | 7       |   |
| 8.00                                                                            | D                            |                    |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      |         |   |
| 8.50                                                                            | D                            |                    |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      |         |   |
| 9.00 - 9.45                                                                     | U                            | Ublow = 100        |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      |         | 8 |
| 9.50                                                                            | D                            |                    |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      |         |   |
| 10.00                                                                           | D                            |                    |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      |         |   |
| Start & End of Shift Observations                                               |                              |                    |                              |                       | Borehole Diameter                                                                  |                                             | Casing Diameter                    |          | Remarks: Water added throughout drilling of gravelly layers, no roots were observed |            |               |              |                                                                                      |         |   |
| Date                                                                            | Time                         | Depth (m)          | Casing (m)                   | Water (m)             | Depth (m)                                                                          | Dia (mm)                                    | Depth (m)                          | Dia (mm) |                                                                                     |            |               |              |                                                                                      |         |   |
|                                                                                 |                              |                    |                              |                       |                                                                                    |                                             | 4.50                               | 150      |                                                                                     |            |               |              |                                                                                      |         |   |
| Chiselling                                                                      |                              |                    |                              |                       | Installation                                                                       |                                             |                                    |          | Water Strikes                                                                       |            |               |              |                                                                                      |         |   |
| From (m)                                                                        | To (m)                       | Duration           | Remarks                      |                       | Top (m)                                                                            | Base (m)                                    | Type                               | Dia (mm) | Strike (m)                                                                          | Casing (m) | Sealed (m)    | Time (mins)  | Rose to (m)                                                                          | Remarks |   |
|                                                                                 |                              |                    |                              |                       | 0.00                                                                               | 1.00                                        | PLAIN                              | 50       |                                                                                     |            |               |              |                                                                                      |         |   |
|                                                                                 |                              |                    |                              |                       | 1.00                                                                               | 5.00                                        | SLOTTED                            | 50       |                                                                                     |            |               |              |                                                                                      |         |   |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.    |                              |                    |                              |                       |                                                                                    |                                             |                                    |          |                                                                                     |            |               |              |                                                                                      |         |   |



| Samples & In Situ Testing |      |         | Strata Details |                       |        |                    | Groundwater  |                        |
|---------------------------|------|---------|----------------|-----------------------|--------|--------------------|--------------|------------------------|
| Depth                     | Type | Results | Level (mAOD)   | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |

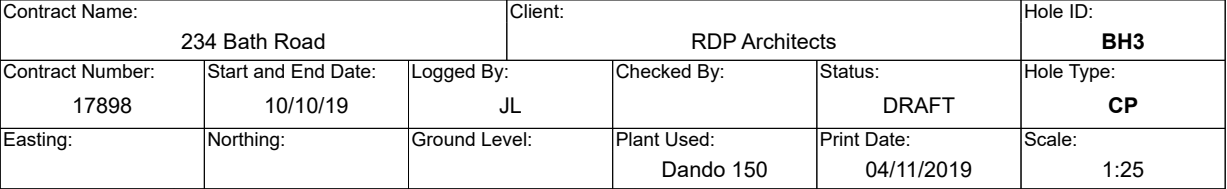
| Start & End of Shift Observations                                            |        |           |            |           | Borehole Diameter |          | Casing Diameter |          | Remarks:                                                                   |            |            |             |             |         |
|------------------------------------------------------------------------------|--------|-----------|------------|-----------|-------------------|----------|-----------------|----------|----------------------------------------------------------------------------|------------|------------|-------------|-------------|---------|
| Date                                                                         | Time   | Depth (m) | Casing (m) | Water (m) | Depth (m)         | Dia (mm) | Depth (m)       | Dia (mm) |                                                                            |            |            |             |             |         |
|                                                                              |        |           |            |           |                   |          | 4.50            | 150      |                                                                            |            |            |             |             |         |
|                                                                              |        |           |            |           |                   |          |                 |          |                                                                            |            |            |             |             |         |
|                                                                              |        |           |            |           |                   |          |                 |          | Water added throughout drilling of gravelly layers, no roots were observed |            |            |             |             |         |
|                                                                              |        |           |            |           |                   |          |                 |          |                                                                            |            |            |             |             |         |
| Chiselling                                                                   |        |           |            |           | Installation      |          |                 |          | Water Strikes                                                              |            |            |             |             |         |
| From (m)                                                                     | To (m) | Duration  | Remarks    |           | Top (m)           | Base (m) | Type            | Dia (mm) | Strike (m)                                                                 | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|                                                                              |        |           |            |           | 0.00              | 1.00     | PLAIN           | 50       |                                                                            |            |            |             |             |         |
|                                                                              |        |           |            |           | 1.00              | 5.00     | SLOTTED         | 50       |                                                                            |            |            |             |             |         |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm. |        |           |            |           |                   |          |                 |          |                                                                            |            |            |             |             |         |

|                                                                                 |                                 |                     |                                 |                       |                           |                                                      |                                    |          |                                                                            |            |                  |              |                       |         |
|---------------------------------------------------------------------------------|---------------------------------|---------------------|---------------------------------|-----------------------|---------------------------|------------------------------------------------------|------------------------------------|----------|----------------------------------------------------------------------------|------------|------------------|--------------|-----------------------|---------|
|  | Contract Name:<br>234 Bath Road |                     |                                 |                       | Client:<br>RDP Architects |                                                      |                                    |          | Hole ID:<br>BH1                                                            |            |                  |              |                       |         |
|                                                                                 | Contract Number:<br>17898       |                     | Start and End Date:<br>10/10/19 |                       | Logged By:<br>JL          |                                                      | Checked By:                        |          | Status:<br>DRAFT                                                           |            | Hole Type:<br>CP |              |                       |         |
|                                                                                 | Easting:                        |                     | Northing:                       |                       | Ground Level:             |                                                      | Plant Used:<br>Dando 150           |          | Print Date:<br>04/11/2019                                                  |            | Scale:<br>1:25   |              |                       |         |
| Weather:                                                                        |                                 |                     | Termination:                    |                       |                           |                                                      | SPT Hammer: N/R, Energy Ratio: N/R |          |                                                                            |            | Sheet 4 of 4     |              |                       |         |
| Samples & In Situ Testing                                                       |                                 |                     |                                 |                       | Strata Details            |                                                      |                                    |          |                                                                            |            |                  |              | Groundwater           |         |
| Depth                                                                           | Type                            | Results             | Level (mAOD)                    | Depth (m) (Thickness) | Legend                    | Strata Description                                   |                                    |          |                                                                            |            |                  | Water Strike | Backfill/Installation |         |
| 15.50                                                                           | D                               |                     |                                 | (1.00)                |                           | Firm grey CLAY with claystone. LONDON CLAY FORMATION |                                    |          |                                                                            |            |                  |              |                       |         |
| 16.00                                                                           | D                               |                     |                                 | 16.00                 |                           | Stiff grey silty CLAY. LONDON CLAY FORMATION         |                                    |          |                                                                            |            |                  | 16           |                       |         |
| 16.50                                                                           | SPT                             | N=28 (4,4/6,6,7,9)  |                                 |                       |                           |                                                      |                                    |          |                                                                            |            |                  |              |                       |         |
| 17.00                                                                           | D                               |                     |                                 |                       |                           |                                                      |                                    |          |                                                                            |            |                  | 17           |                       |         |
| 17.50                                                                           | U                               |                     |                                 |                       |                           |                                                      |                                    |          |                                                                            |            |                  |              |                       |         |
| 18.00 - 18.45                                                                   | D                               | Ublow = 100         |                                 | (4.00)                |                           |                                                      |                                    |          |                                                                            |            |                  | 18           |                       |         |
| 18.50                                                                           | D                               |                     |                                 |                       |                           |                                                      |                                    |          |                                                                            |            |                  |              |                       |         |
| 19.00                                                                           | D                               |                     |                                 |                       |                           |                                                      |                                    |          |                                                                            |            |                  | 19           |                       |         |
| 19.50                                                                           | SPT                             | N=33 (4,6/6,8,9,10) |                                 |                       |                           |                                                      |                                    |          |                                                                            |            |                  |              |                       |         |
| 20.00                                                                           | D                               |                     |                                 | 20.00                 |                           | End of Borehole at 20.00m                            |                                    |          |                                                                            |            |                  | 20           |                       |         |
| Start & End of Shift Observations                                               |                                 |                     |                                 |                       | Borehole Diameter         |                                                      | Casing Diameter                    |          | Remarks:                                                                   |            |                  |              |                       |         |
| Date                                                                            | Time                            | Depth (m)           | Casing (m)                      | Water (m)             | Depth (m)                 | Dia (mm)                                             | Depth (m)                          | Dia (mm) | Water added throughout drilling of gravelly layers, no roots were observed |            |                  |              |                       |         |
|                                                                                 |                                 |                     |                                 |                       |                           |                                                      | 4.50                               | 150      |                                                                            |            |                  |              |                       |         |
|                                                                                 |                                 |                     |                                 |                       |                           |                                                      |                                    |          | Water Strikes                                                              |            |                  |              |                       |         |
| Chiselling                                                                      |                                 |                     |                                 |                       | Installation              |                                                      |                                    |          | Strike (m)                                                                 | Casing (m) | Sealed (m)       | Time (mins)  | Rose to (m)           | Remarks |
| From (m)                                                                        | To (m)                          | Duration            | Remarks                         |                       | Top (m)                   | Base (m)                                             | Type                               | Dia (mm) |                                                                            |            |                  |              |                       |         |
|                                                                                 |                                 |                     |                                 |                       | 0.00                      | 1.00                                                 | PLAIN                              | 50       |                                                                            |            |                  |              |                       |         |
|                                                                                 |                                 |                     |                                 |                       | 1.00                      | 5.00                                                 | SLOTTED                            | 50       |                                                                            |            |                  |              |                       |         |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.    |                                 |                     |                                 |                       |                           |                                                      |                                    |          |                                                                            |            |                  |              |                       |         |

|                                                                                 |                                 |                                |                                 |                       |                                                                                   |                                                                                                                                                  |                                    |            |                                                                            |            |                  |              |                       |         |
|---------------------------------------------------------------------------------|---------------------------------|--------------------------------|---------------------------------|-----------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------|----------------------------------------------------------------------------|------------|------------------|--------------|-----------------------|---------|
|  | Contract Name:<br>234 Bath Road |                                |                                 |                       | Client:<br>RDP Architects                                                         |                                                                                                                                                  |                                    |            | Hole ID:<br>BH2                                                            |            |                  |              |                       |         |
|                                                                                 | Contract Number:<br>17898       |                                | Start and End Date:<br>10/10/19 |                       | Logged By:<br>JL                                                                  |                                                                                                                                                  | Checked By:                        |            | Status:<br>DRAFT                                                           |            | Hole Type:<br>CP |              |                       |         |
|                                                                                 | Easting:                        |                                | Northing:                       |                       | Ground Level:                                                                     |                                                                                                                                                  | Plant Used:<br>Dando 150           |            | Print Date:<br>04/11/2019                                                  |            | Scale:<br>1:25   |              |                       |         |
| Weather:                                                                        |                                 |                                | Termination:                    |                       |                                                                                   |                                                                                                                                                  | SPT Hammer: N/R, Energy Ratio: N/R |            |                                                                            |            | Sheet 1 of 3     |              |                       |         |
| Samples & In Situ Testing                                                       |                                 |                                |                                 |                       | Strata Details                                                                    |                                                                                                                                                  |                                    |            |                                                                            |            |                  |              | Groundwater           |         |
| Depth                                                                           | Type                            | Results                        | Level (mAOD)                    | Depth (m) (Thickness) | Legend                                                                            | Strata Description                                                                                                                               |                                    |            |                                                                            |            |                  | Water Strike | Backfill/Installation |         |
| 0.20                                                                            | D ES                            |                                |                                 | 0.10                  |  | Block Paving. MADE GROUND                                                                                                                        |                                    |            |                                                                            |            |                  |              |                       |         |
|                                                                                 |                                 |                                |                                 | (0.40)                |  | Sub-base roadstone. MADE GROUND                                                                                                                  |                                    |            |                                                                            |            |                  |              |                       |         |
| 0.50<br>0.50 - 1.00                                                             | ES<br>B                         |                                |                                 | 0.50                  |  | Soft, grey, gravelly, sandy CLAY. Sand is fine. Gravel is fine to coarse, angular to sub-rounded, flint, brick, tarmac and concrete. MADE GROUND |                                    |            |                                                                            |            |                  |              |                       |         |
|                                                                                 |                                 |                                |                                 | (0.50)                |  |                                                                                                                                                  |                                    |            |                                                                            |            |                  |              |                       |         |
| 1.00                                                                            | D ES                            |                                |                                 | 1.00                  |  | Dense orangey brown slightly clayey, sandy fine to coarse angular flint GRAVEL. Sand is fine to medium. TAPLOW GRAVEL MEMBER                     |                                    |            |                                                                            |            |                  | 1            |                       |         |
| 1.50<br>1.50 - 2.00                                                             | SPT<br>B                        | 50 (25 for 130mm/50 for 135mm) |                                 |                       |  |                                                                                                                                                  |                                    |            |                                                                            |            |                  |              |                       |         |
| 2.00                                                                            | D                               |                                |                                 |                       |  |                                                                                                                                                  |                                    |            |                                                                            |            |                  | 2            |                       |         |
| 2.50<br>2.50 - 3.00                                                             | SPT<br>B                        | 50 (6,12/50 for 240mm)         |                                 | (3.20)                |  |                                                                                                                                                  |                                    |            |                                                                            |            |                  |              |                       |         |
| 3.00                                                                            | D                               |                                |                                 |                       |  |                                                                                                                                                  |                                    |            |                                                                            |            |                  | 3            |                       |         |
| 3.50<br>3.50 - 4.00                                                             | SPT<br>B                        | N=41 (4,5/8,8,11,14)           |                                 |                       |  |                                                                                                                                                  |                                    |            |                                                                            |            |                  |              |                       |         |
| 4.00                                                                            | D                               |                                |                                 |                       |  |                                                                                                                                                  |                                    |            |                                                                            |            |                  | 4            |                       |         |
| 4.50<br>4.50 - 4.60<br>4.70 - 5.00                                              | SPT<br>B<br>B                   | N=10 (3,3/2,2,3,3)             |                                 | (0.80)                |  | Brown weathered CLAY. LONDON CLAY FORMATION                                                                                                      |                                    |            |                                                                            |            |                  |              |                       |         |
| 5.00                                                                            | D                               |                                |                                 | 5.00                  |  |                                                                                                                                                  |                                    |            |                                                                            |            |                  | 5            |                       |         |
| Start & End of Shift Observations                                               |                                 |                                |                                 |                       | Borehole Diameter                                                                 |                                                                                                                                                  | Casing Diameter                    |            | Remarks:                                                                   |            |                  |              |                       |         |
| Date                                                                            | Time                            | Depth (m)                      | Casing (m)                      | Water (m)             | Depth (m)                                                                         | Dia (mm)                                                                                                                                         | Depth (m)                          | Dia (mm)   | Water added throughout drilling of gravelly layers, no roots were observed |            |                  |              |                       |         |
|                                                                                 |                                 |                                |                                 |                       |                                                                                   |                                                                                                                                                  | 4.50<br>5.50                       | 150<br>150 |                                                                            |            |                  |              |                       |         |
|                                                                                 |                                 |                                |                                 |                       |                                                                                   |                                                                                                                                                  |                                    |            |                                                                            |            |                  |              |                       |         |
| Chiselling                                                                      |                                 |                                |                                 |                       | Installation                                                                      |                                                                                                                                                  |                                    |            | Water Strikes                                                              |            |                  |              |                       |         |
| From (m)                                                                        | To (m)                          | Duration                       | Remarks                         |                       | Top (m)                                                                           | Base (m)                                                                                                                                         | Type                               | Dia (mm)   | Strike (m)                                                                 | Casing (m) | Sealed (m)       | Time (mins)  | Rose to (m)           | Remarks |
|                                                                                 |                                 |                                |                                 |                       |                                                                                   |                                                                                                                                                  |                                    |            |                                                                            |            |                  |              |                       |         |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.    |                                 |                                |                                 |                       |                                                                                   |                                                                                                                                                  |                                    |            |                                                                            |            |                  |              |                       |         |

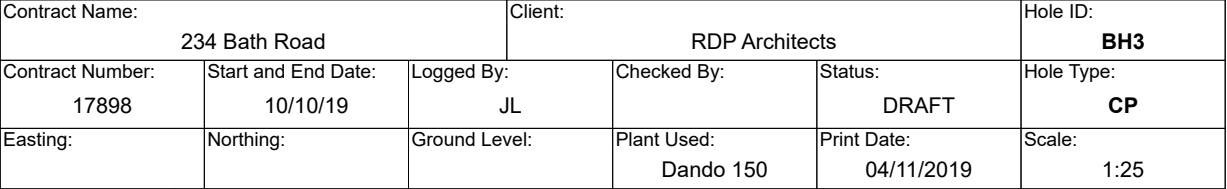
|                                                                                 |                                 |                    |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  |              |                       |         |
|---------------------------------------------------------------------------------|---------------------------------|--------------------|---------------------------------|-----------------------|------------------------------------------------------------------------------------|------------------------------------------------|------------------------------------|----------|----------------------------------------------------------------------------|------------|------------------|--------------|-----------------------|---------|
|  | Contract Name:<br>234 Bath Road |                    |                                 |                       | Client:<br>RDP Architects                                                          |                                                |                                    |          | Hole ID:<br>BH2                                                            |            |                  |              |                       |         |
|                                                                                 | Contract Number:<br>17898       |                    | Start and End Date:<br>10/10/19 |                       | Logged By:<br>JL                                                                   |                                                | Checked By:                        |          | Status:<br>DRAFT                                                           |            | Hole Type:<br>CP |              |                       |         |
|                                                                                 | Easting:                        |                    | Northing:                       |                       | Ground Level:                                                                      |                                                | Plant Used:<br>Dando 150           |          | Print Date:<br>04/11/2019                                                  |            | Scale:<br>1:25   |              |                       |         |
| Weather:                                                                        |                                 |                    | Termination:                    |                       |                                                                                    |                                                | SPT Hammer: N/R, Energy Ratio: N/R |          |                                                                            |            |                  | Sheet 2 of 3 |                       |         |
| Samples & In Situ Testing                                                       |                                 |                    |                                 | Strata Details        |                                                                                    |                                                |                                    |          |                                                                            |            |                  | Groundwater  |                       |         |
| Depth                                                                           | Type                            | Results            | Level (mAOD)                    | Depth (m) (Thickness) | Legend                                                                             | Strata Description                             |                                    |          |                                                                            |            |                  | Water Strike | Backfill/Installation |         |
| 5.50                                                                            | D                               | N=13 (2,2/3,3,3,4) |                                 | (10.00)               |  | Firm to stiff grey CLAY. LONDON CLAY FORMATION |                                    |          |                                                                            |            |                  | 6            |                       |         |
| 6.00                                                                            | SPT                             |                    |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  |              |                       |         |
| 6.50                                                                            | D                               |                    |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  |              |                       |         |
| 7.00                                                                            | D                               |                    |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  |              |                       |         |
| 7.50 - 7.95                                                                     | U                               | Ublow = 84         |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  | 8            |                       |         |
| 8.00                                                                            | D                               |                    |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  |              |                       |         |
| 8.50                                                                            | D                               |                    |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  |              |                       |         |
| 9.00                                                                            | SPT                             | N=22 (2,3/4,5,6,7) |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  |              |                       |         |
| 9.50                                                                            | D                               |                    |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  | 9            |                       |         |
| 10.00                                                                           | D                               |                    |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  |              |                       |         |
| Start & End of Shift Observations                                               |                                 |                    |                                 | Borehole Diameter     |                                                                                    | Casing Diameter                                |                                    | Remarks: |                                                                            |            |                  |              |                       |         |
| Date                                                                            | Time                            | Depth (m)          | Casing (m)                      | Water (m)             | Depth (m)                                                                          | Dia (mm)                                       | Depth (m)                          | Dia (mm) | Water added throughout drilling of gravelly layers, no roots were observed |            |                  |              |                       |         |
|                                                                                 |                                 |                    |                                 |                       |                                                                                    |                                                | 4.50                               | 150      |                                                                            |            |                  |              |                       |         |
|                                                                                 |                                 |                    |                                 |                       |                                                                                    |                                                | 5.50                               | 150      |                                                                            |            |                  |              |                       |         |
| Chiselling                                                                      |                                 |                    |                                 |                       | Installation                                                                       |                                                |                                    |          | Water Strikes                                                              |            |                  |              |                       |         |
| From (m)                                                                        | To (m)                          | Duration           | Remarks                         |                       | Top (m)                                                                            | Base (m)                                       | Type                               | Dia (mm) | Strike (m)                                                                 | Casing (m) | Sealed (m)       | Time (mins)  | Rose to (m)           | Remarks |
|                                                                                 |                                 |                    |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  |              |                       |         |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.    |                                 |                    |                                 |                       |                                                                                    |                                                |                                    |          |                                                                            |            |                  |              |                       |         |

|                                                                                 |                              |                    |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           |                        |          |
|---------------------------------------------------------------------------------|------------------------------|--------------------|------------------------------|-----------------------|------------------------|------------------------------------------------|------------------------------------|----------------------------------------------------------------------------------------|------------------------|------------|---------------|---------------------------|------------------------|----------|
|  | Contract Name: 234 Bath Road |                    |                              |                       | Client: RDP Architects |                                                |                                    |                                                                                        | Hole ID: BH2           |            |               |                           |                        |          |
|                                                                                 | Contract Number: 17898       |                    | Start and End Date: 10/10/19 |                       | Logged By: JL          |                                                | Checked By:                        |                                                                                        | Status: DRAFT          |            | Hole Type: CP |                           |                        |          |
|                                                                                 | Easting:                     |                    | Northing:                    |                       | Ground Level:          |                                                | Plant Used: Dando 150              |                                                                                        | Print Date: 04/11/2019 |            | Scale: 1:25   |                           |                        |          |
| Weather:                                                                        |                              |                    | Termination:                 |                       |                        |                                                | SPT Hammer: N/R, Energy Ratio: N/R |                                                                                        |                        |            | Sheet 3 of 3  |                           |                        |          |
| Samples & In Situ Testing                                                       |                              |                    |                              |                       | Strata Details         |                                                |                                    |                                                                                        |                        |            |               |                           | Groundwater            |          |
| Depth                                                                           | Type                         | Results            | Level (mAOD)                 | Depth (m) (Thickness) | Legend                 | Strata Description                             |                                    |                                                                                        |                        |            |               | Water Strike              | Backfill/ Installation |          |
| 10.50 - 10.95                                                                   | U                            | Ublow = 100        |                              |                       |                        | Firm to stiff grey CLAY. LONDON CLAY FORMATION |                                    |                                                                                        |                        |            |               |                           |                        |          |
| 11.00                                                                           | D                            |                    |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           | 11                     |          |
| 11.50                                                                           | D                            |                    |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           |                        |          |
| 12.00                                                                           | SPT                          | N=21 (3,3/4,5,5,7) |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           | 12                     |          |
| 12.50                                                                           | D                            |                    |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           |                        |          |
| 13.00                                                                           | D                            |                    |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           | 13                     |          |
| 13.50 - 13.95                                                                   | U                            | Ublow = 100        |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           |                        |          |
| 14.00                                                                           | D                            |                    |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           | 14                     |          |
| 14.50                                                                           | D                            |                    |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           |                        |          |
| 15.00                                                                           | SPT                          | N=26 (3,3/5,6,7,8) |                              | 15.00                 |                        |                                                |                                    |                                                                                        |                        |            |               | End of Borehole at 15.00m |                        |          |
| Start & End of Shift Observations                                               |                              |                    |                              | Borehole Diameter     |                        | Casing Diameter                                |                                    | Remarks:<br>Water added throughout drilling of gravelly layers, no roots were observed |                        |            |               |                           |                        |          |
| Date                                                                            | Time                         | Depth (m)          | Casing (m)                   | Water (m)             | Depth (m)              | Dia (mm)                                       | Depth (m)                          |                                                                                        |                        |            |               |                           |                        | Dia (mm) |
|                                                                                 |                              |                    |                              |                       |                        |                                                | 4.50                               |                                                                                        |                        |            |               |                           |                        | 150      |
|                                                                                 |                              |                    |                              |                       |                        |                                                | 5.50                               | 150                                                                                    |                        |            |               |                           |                        |          |
| Chiselling                                                                      |                              |                    |                              |                       | Installation           |                                                |                                    |                                                                                        | Water Strikes          |            |               |                           |                        |          |
| From (m)                                                                        | To (m)                       | Duration           | Remarks                      |                       | Top (m)                | Base (m)                                       | Type                               | Dia (mm)                                                                               | Strike (m)             | Casing (m) | Sealed (m)    | Time (mins)               | Rose to (m)            | Remarks  |
|                                                                                 |                              |                    |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           |                        |          |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.    |                              |                    |                              |                       |                        |                                                |                                    |                                                                                        |                        |            |               |                           |                        |          |



|                           |                |             |
|---------------------------|----------------|-------------|
| Samples & In Situ Testing | Strata Details | Groundwater |
|---------------------------|----------------|-------------|

| Start & End of Shift Observations |        |           |            |           | Borehole Diameter |              | Casing Diameter  |            | Remarks:<br><br>Water added throughout drilling of gravelly layers, no roots were observed |            |            |             |             |         |
|-----------------------------------|--------|-----------|------------|-----------|-------------------|--------------|------------------|------------|--------------------------------------------------------------------------------------------|------------|------------|-------------|-------------|---------|
| Date                              | Time   | Depth (m) | Casing (m) | Water (m) | Depth (m)         | Dia (mm)     | Depth (m)        | Dia (mm)   |                                                                                            |            |            |             |             |         |
|                                   |        |           |            |           |                   |              | 3.00<br>7.00     | 150<br>150 |                                                                                            |            |            |             |             |         |
|                                   |        |           |            |           |                   |              |                  |            |                                                                                            |            |            |             |             |         |
|                                   |        |           |            |           |                   |              |                  |            |                                                                                            |            |            |             |             |         |
|                                   |        |           |            |           |                   |              |                  |            |                                                                                            |            |            |             |             |         |
| Chiselling                        |        |           |            |           | Installation      |              |                  |            | Water Strikes                                                                              |            |            |             |             |         |
| From (m)                          | To (m) | Duration  | Remarks    |           | Top (m)           | Base (m)     | Type             | Dia (mm)   | Strike (m)                                                                                 | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|                                   |        |           |            |           | 0.00<br>1.00      | 1.00<br>5.00 | PLAIN<br>SLOTTED | 50<br>50   |                                                                                            |            |            |             |             |         |
|                                   |        |           |            |           |                   |              |                  |            | Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.               |            |            |             |             |         |

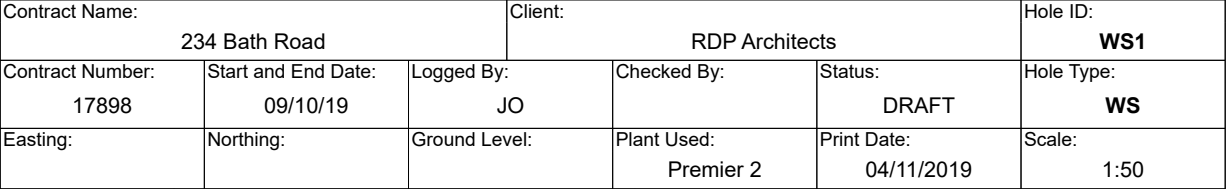


|          |              |                                    |              |
|----------|--------------|------------------------------------|--------------|
| Weather: | Termination: | SPT Hammer: N/R, Energy Ratio: N/R | Sheet 2 of 4 |
|----------|--------------|------------------------------------|--------------|

| Start & End of Shift Observations |        |           |            |           | Borehole Diameter |              | Casing Diameter  |            | Remarks:<br><br>Water added throughout drilling of gravelly layers, no roots were observed |            |            |             |             |         |
|-----------------------------------|--------|-----------|------------|-----------|-------------------|--------------|------------------|------------|--------------------------------------------------------------------------------------------|------------|------------|-------------|-------------|---------|
| Date                              | Time   | Depth (m) | Casing (m) | Water (m) | Depth (m)         | Dia (mm)     | Depth (m)        | Dia (mm)   |                                                                                            |            |            |             |             |         |
|                                   |        |           |            |           |                   |              | 3.00<br>7.00     | 150<br>150 |                                                                                            |            |            |             |             |         |
|                                   |        |           |            |           |                   |              |                  |            |                                                                                            |            |            |             |             |         |
|                                   |        |           |            |           |                   |              |                  |            |                                                                                            |            |            |             |             |         |
|                                   |        |           |            |           |                   |              |                  |            |                                                                                            |            |            |             |             |         |
| Chiselling                        |        |           |            |           | Installation      |              |                  |            | Water Strikes                                                                              |            |            |             |             |         |
| From (m)                          | To (m) | Duration  | Remarks    |           | Top (m)           | Base (m)     | Type             | Dia (mm)   | Strike (m)                                                                                 | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|                                   |        |           |            |           | 0.00<br>1.00      | 1.00<br>5.00 | PLAIN<br>SLOTTED | 50<br>50   |                                                                                            |            |            |             |             |         |
|                                   |        |           |            |           |                   |              |                  |            | Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.               |            |            |             |             |         |

|                                                                                 |                              |                    |                              |                       |                        |                                        |                                    |          |                                                                              |            |               |              |                        |         |
|---------------------------------------------------------------------------------|------------------------------|--------------------|------------------------------|-----------------------|------------------------|----------------------------------------|------------------------------------|----------|------------------------------------------------------------------------------|------------|---------------|--------------|------------------------|---------|
|  | Contract Name: 234 Bath Road |                    |                              |                       | Client: RDP Architects |                                        |                                    |          | Hole ID: BH3                                                                 |            |               |              |                        |         |
|                                                                                 | Contract Number: 17898       |                    | Start and End Date: 10/10/19 |                       | Logged By: JL          |                                        | Checked By:                        |          | Status: DRAFT                                                                |            | Hole Type: CP |              |                        |         |
|                                                                                 | Easting:                     |                    | Northing:                    |                       | Ground Level:          |                                        | Plant Used: Dando 150              |          | Print Date: 04/11/2019                                                       |            | Scale: 1:25   |              |                        |         |
| Weather:                                                                        |                              |                    | Termination:                 |                       |                        |                                        | SPT Hammer: N/R, Energy Ratio: N/R |          |                                                                              |            | Sheet 3 of 4  |              |                        |         |
| Samples & In Situ Testing                                                       |                              |                    |                              |                       | Strata Details         |                                        |                                    |          |                                                                              |            |               |              | Groundwater            |         |
| Depth                                                                           | Type                         | Results            | Level (mAOD)                 | Depth (m) (Thickness) | Legend                 | Strata Description                     |                                    |          |                                                                              |            |               | Water Strike | Backfill/ Installation |         |
| 10.50 - 10.95                                                                   | U                            | Ublow = 68         |                              |                       |                        | Firm grey CLAY. LONDON CLAY FORMATION  |                                    |          |                                                                              |            |               |              |                        |         |
| 11.00                                                                           | D                            |                    |                              |                       |                        |                                        |                                    |          |                                                                              |            |               |              | 11                     |         |
| 11.50                                                                           | D                            |                    |                              |                       |                        |                                        |                                    |          |                                                                              |            |               |              |                        |         |
| 12.00                                                                           | SPT                          | N=20 (2,3/4,5,5,6) |                              | (7.40)                |                        |                                        |                                    |          |                                                                              |            |               |              | 12                     |         |
| 12.50                                                                           | D                            |                    |                              |                       |                        |                                        |                                    |          |                                                                              |            |               |              |                        |         |
| 13.00                                                                           | D                            |                    |                              |                       |                        | Stiff grey CLAY. LONDON CLAY FORMATION |                                    |          |                                                                              |            |               | 13           |                        |         |
| 13.50 - 13.95                                                                   | U                            | Ublow = 88         |                              |                       |                        |                                        |                                    |          |                                                                              |            |               |              |                        |         |
| 14.00                                                                           | D                            |                    |                              | 14.00                 |                        |                                        |                                    |          |                                                                              |            |               |              | 14                     |         |
| 14.50                                                                           | D                            |                    |                              |                       |                        |                                        |                                    |          |                                                                              |            |               |              |                        |         |
| 15.00                                                                           | SPT                          | N=26 (4,5/5,7,6,8) |                              |                       |                        |                                        |                                    |          |                                                                              |            |               |              | 15                     |         |
| Start & End of Shift Observations                                               |                              |                    |                              | Borehole Diameter     |                        | Casing Diameter                        |                                    | Remarks: |                                                                              |            |               |              |                        |         |
| Date                                                                            | Time                         | Depth (m)          | Casing (m)                   | Water (m)             | Depth (m)              | Dia (mm)                               | Depth (m)                          | Dia (mm) | Water added throughout drilling of gravelly layers, no roots were observed   |            |               |              |                        |         |
|                                                                                 |                              |                    |                              |                       |                        |                                        | 3.00                               | 150      |                                                                              |            |               |              |                        |         |
|                                                                                 |                              |                    |                              |                       |                        |                                        | 7.00                               | 150      |                                                                              |            |               |              |                        |         |
| Chiselling                                                                      |                              |                    |                              |                       | Installation           |                                        |                                    |          | Water Strikes                                                                |            |               |              |                        |         |
| From (m)                                                                        | To (m)                       | Duration           | Remarks                      |                       | Top (m)                | Base (m)                               | Type                               | Dia (mm) | Strike (m)                                                                   | Casing (m) | Sealed (m)    | Time (mins)  | Rose to (m)            | Remarks |
|                                                                                 |                              |                    |                              |                       | 0.00                   | 1.00                                   | PLAIN                              | 50       |                                                                              |            |               |              |                        |         |
|                                                                                 |                              |                    |                              |                       | 1.00                   | 5.00                                   | SLOTTED                            | 50       | Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm. |            |               |              |                        |         |
|                                                                                 |                              |                    |                              |                       |                        |                                        |                                    |          |                                                                              |            |               |              |                        |         |

|                                                                                 |                              |                    |                              |                       |                        |                                        |                                    |            |                                                                                        |            |               |                           |                       |         |
|---------------------------------------------------------------------------------|------------------------------|--------------------|------------------------------|-----------------------|------------------------|----------------------------------------|------------------------------------|------------|----------------------------------------------------------------------------------------|------------|---------------|---------------------------|-----------------------|---------|
|  | Contract Name: 234 Bath Road |                    |                              |                       | Client: RDP Architects |                                        |                                    |            | Hole ID: BH3                                                                           |            |               |                           |                       |         |
|                                                                                 | Contract Number: 17898       |                    | Start and End Date: 10/10/19 |                       | Logged By: JL          |                                        | Checked By:                        |            | Status: DRAFT                                                                          |            | Hole Type: CP |                           |                       |         |
|                                                                                 | Easting:                     |                    | Northing:                    |                       | Ground Level:          |                                        | Plant Used: Dando 150              |            | Print Date: 04/11/2019                                                                 |            | Scale: 1:25   |                           |                       |         |
| Weather:                                                                        |                              |                    | Termination:                 |                       |                        |                                        | SPT Hammer: N/R, Energy Ratio: N/R |            |                                                                                        |            | Sheet 4 of 4  |                           |                       |         |
| Samples & In Situ Testing                                                       |                              |                    |                              |                       | Strata Details         |                                        |                                    |            |                                                                                        |            |               |                           | Groundwater           |         |
| Depth                                                                           | Type                         | Results            | Level (mAOD)                 | Depth (m) (Thickness) | Legend                 | Strata Description                     |                                    |            |                                                                                        |            |               | Water Strike              | Backfill/Installation |         |
| 15.50                                                                           | D                            |                    |                              |                       |                        | Stiff grey CLAY. LONDON CLAY FORMATION |                                    |            |                                                                                        |            |               |                           |                       |         |
| 16.00                                                                           | D                            |                    |                              |                       |                        |                                        |                                    |            |                                                                                        |            |               |                           |                       |         |
| 16.50 - 16.95                                                                   | U                            | Ublow = 100        |                              |                       |                        |                                        |                                    |            |                                                                                        |            |               |                           |                       |         |
| 17.00                                                                           | D                            |                    |                              |                       |                        |                                        |                                    |            |                                                                                        |            |               |                           |                       |         |
| 18.00                                                                           | SPT                          | N=32 (6,6/7,8,8,9) |                              |                       |                        |                                        |                                    |            |                                                                                        |            |               |                           |                       |         |
| 18.50                                                                           | D                            |                    |                              |                       |                        |                                        |                                    |            |                                                                                        |            |               |                           |                       |         |
| 19.00                                                                           | D                            |                    |                              |                       |                        |                                        |                                    |            |                                                                                        |            |               |                           |                       |         |
| 19.50 - 19.95                                                                   | U                            | Ublow = 100        |                              |                       |                        |                                        |                                    |            |                                                                                        |            |               |                           |                       |         |
| 20.00                                                                           | D                            |                    |                              |                       |                        |                                        |                                    |            |                                                                                        |            |               |                           |                       |         |
|                                                                                 |                              |                    |                              |                       | 20.00                  |                                        |                                    |            |                                                                                        |            |               | End of Borehole at 20.00m |                       |         |
| Start & End of Shift Observations                                               |                              |                    |                              |                       | Borehole Diameter      |                                        | Casing Diameter                    |            | Remarks:<br>Water added throughout drilling of gravelly layers, no roots were observed |            |               |                           |                       |         |
| Date                                                                            | Time                         | Depth (m)          | Casing (m)                   | Water (m)             | Depth (m)              | Dia (mm)                               | Depth (m)                          | Dia (mm)   |                                                                                        |            |               |                           |                       |         |
|                                                                                 |                              |                    |                              |                       |                        |                                        | 3.00<br>7.00                       | 150<br>150 |                                                                                        |            |               |                           |                       |         |
|                                                                                 |                              |                    |                              |                       |                        |                                        |                                    |            | Water Strikes                                                                          |            |               |                           |                       |         |
| Chiselling                                                                      |                              |                    |                              |                       | Installation           |                                        |                                    |            | Strike (m)                                                                             | Casing (m) | Sealed (m)    | Time (mins)               | Rose to (m)           | Remarks |
| From (m)                                                                        | To (m)                       | Duration           | Remarks                      |                       | Top (m)                | Base (m)                               | Type                               | Dia (mm)   |                                                                                        |            |               |                           |                       |         |
|                                                                                 |                              |                    |                              |                       | 0.00<br>1.00           | 1.00<br>5.00                           | PLAIN<br>SLOTTED                   | 50<br>50   |                                                                                        |            |               |                           |                       |         |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.    |                              |                    |                              |                       |                        |                                        |                                    |            |                                                                                        |            |               |                           |                       |         |



|                           |                |             |
|---------------------------|----------------|-------------|
| Samples & In Situ Testing | Strata Details | Groundwater |
|---------------------------|----------------|-------------|

| Start & End of Shift Observations                                            |        |           |            |           | Borehole Diameter |          | Casing Diameter |          | Remarks:<br><br>No roots or groundwater observed. |            |            |             |             |         |
|------------------------------------------------------------------------------|--------|-----------|------------|-----------|-------------------|----------|-----------------|----------|---------------------------------------------------|------------|------------|-------------|-------------|---------|
| Date                                                                         | Time   | Depth (m) | Casing (m) | Water (m) | Depth (m)         | Dia (mm) | Depth (m)       | Dia (mm) |                                                   |            |            |             |             |         |
|                                                                              |        |           |            |           |                   |          |                 |          |                                                   |            |            |             |             |         |
|                                                                              |        |           |            |           |                   |          |                 |          |                                                   |            |            |             |             |         |
| Chiselling                                                                   |        |           |            |           | Installation      |          |                 |          | Water Strikes                                     |            |            |             |             |         |
| From (m)                                                                     | To (m) | Duration  | Remarks    |           | Top (m)           | Base (m) | Type            | Dia (mm) | Strike (m)                                        | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|                                                                              |        |           |            |           |                   |          |                 |          |                                                   |            |            |             |             |         |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm. |        |           |            |           |                   |          |                 |          |                                                   |            |            |             |             |         |

|                                                                                 |                                   |           |                                 |                       |                                                                                   |                                                                                                                                                         |                          |               |                                   |            |                  |              |                        |         |
|---------------------------------------------------------------------------------|-----------------------------------|-----------|---------------------------------|-----------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|---------------|-----------------------------------|------------|------------------|--------------|------------------------|---------|
|  | Contract Name:<br>234 Bath Road   |           |                                 |                       | Client:<br>RDP Architects                                                         |                                                                                                                                                         |                          |               | Hole ID:<br>WS2                   |            |                  |              |                        |         |
|                                                                                 | Contract Number:<br>17898         |           | Start and End Date:<br>09/10/19 |                       | Logged By:<br>JO                                                                  |                                                                                                                                                         | Checked By:              |               | Status:<br>DRAFT                  |            | Hole Type:<br>WS |              |                        |         |
|                                                                                 | Easting:                          |           | Northing:                       |                       | Ground Level:                                                                     |                                                                                                                                                         | Plant Used:<br>Premier 2 |               | Print Date:<br>04/11/2019         |            | Scale:<br>1:50   |              |                        |         |
| Weather:                                                                        |                                   |           | Termination:                    |                       |                                                                                   |                                                                                                                                                         |                          |               |                                   |            |                  | Sheet 1 of 1 |                        |         |
| Samples & In Situ Testing                                                       |                                   |           |                                 | Strata Details        |                                                                                   |                                                                                                                                                         |                          |               |                                   |            |                  | Groundwater  |                        |         |
| Depth                                                                           | Type                              | Results   | Level (mAOD)                    | Depth (m) (Thickness) | Legend                                                                            | Strata Description                                                                                                                                      |                          |               |                                   |            |                  | Water Strike | Backfill/ Installation |         |
| 0.50<br>0.80<br>1.00<br>1.20                                                    | ES+D<br>TTJ<br>ES+D<br>TTJ<br>D+B |           |                                 | 0.10                  |  | Brick paving. MADE GROUND                                                                                                                               |                          |               |                                   |            |                  |              |                        |         |
|                                                                                 |                                   |           |                                 | 0.20                  |  | Sand (sub-base). MADE GROUND                                                                                                                            |                          |               |                                   |            |                  |              |                        |         |
|                                                                                 |                                   |           |                                 | (0.30)                |  | Scalpings. MADE GROUND                                                                                                                                  |                          |               |                                   |            |                  |              |                        |         |
|                                                                                 |                                   |           |                                 | 0.50                  |  | Firm, black, very sandy SILT/sandy CLAY with occasional fine to coarse flint, brick and concrete gravel. Occasional ash fragments. MADE GROUND          |                          |               |                                   |            |                  |              |                        |         |
|                                                                                 |                                   |           |                                 | (0.30)                |  | Dense, orangey brown, sandy, fine to coarse sub angular to sub rounded flint GRAVEL. TAPLOW GRAVEL MEMBER                                               |                          |               |                                   |            |                  |              |                        |         |
| 1.80                                                                            | D                                 |           |                                 | 0.80                  |                                                                                   |                                                                                                                                                         |                          |               |                                   |            |                  |              |                        |         |
|                                                                                 |                                   |           |                                 | 1.00                  |                                                                                   |                                                                                                                                                         |                          |               |                                   |            |                  |              |                        |         |
|                                                                                 |                                   |           |                                 | 1.00                  |  | Dense, orangey brown, very gravelly, fine to coarse SAND. Gravel is, fine to coarse sub angular to angular flint and rinded flint. TAPLOW GRAVEL MEMBER |                          |               |                                   |            |                  |              |                        |         |
|                                                                                 |                                   |           |                                 | (1.00)                |                                                                                   |                                                                                                                                                         |                          |               |                                   |            |                  |              |                        |         |
|                                                                                 |                                   |           |                                 | 2.00                  |                                                                                   | End of Borehole at 2.00m                                                                                                                                |                          |               |                                   |            |                  |              |                        |         |
| Start & End of Shift Observations                                               |                                   |           |                                 | Borehole Diameter     |                                                                                   | Casing Diameter                                                                                                                                         |                          | Remarks:      |                                   |            |                  |              |                        |         |
| Date                                                                            | Time                              | Depth (m) | Casing (m)                      | Water (m)             | Depth (m)                                                                         | Dia (mm)                                                                                                                                                | Depth (m)                | Dia (mm)      | No roots or groundwater observed. |            |                  |              |                        |         |
|                                                                                 |                                   |           |                                 |                       |                                                                                   |                                                                                                                                                         |                          |               |                                   |            |                  |              |                        |         |
| Chiselling                                                                      |                                   |           |                                 | Installation          |                                                                                   |                                                                                                                                                         |                          | Water Strikes |                                   |            |                  |              |                        |         |
| From (m)                                                                        | To (m)                            | Duration  | Remarks                         |                       | Top (m)                                                                           | Base (m)                                                                                                                                                | Type                     | Dia (mm)      | Strike (m)                        | Casing (m) | Sealed (m)       | Time (mins)  | Rose to (m)            | Remarks |
|                                                                                 |                                   |           |                                 |                       |                                                                                   |                                                                                                                                                         |                          |               |                                   |            |                  |              |                        |         |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.    |                                   |           |                                 |                       |                                                                                   |                                                                                                                                                         |                          |               |                                   |            |                  |              |                        |         |

|                                                                                 |                                 |           |                                 |                                                                                   |                                                                                                                                                                                                             |                              |                          |               |                                            |            |                  |              |                       |         |
|---------------------------------------------------------------------------------|---------------------------------|-----------|---------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------|---------------|--------------------------------------------|------------|------------------|--------------|-----------------------|---------|
|  | Contract Name:<br>234 Bath Road |           |                                 |                                                                                   | Client:<br>RDP Architects                                                                                                                                                                                   |                              |                          |               | Hole ID:<br>WS3                            |            |                  |              |                       |         |
|                                                                                 | Contract Number:<br>17898       |           | Start and End Date:<br>09/10/19 |                                                                                   | Logged By:<br>JO                                                                                                                                                                                            |                              | Checked By:              |               | Status:<br>DRAFT                           |            | Hole Type:<br>WS |              |                       |         |
|                                                                                 | Easting:                        |           | Northing:                       |                                                                                   | Ground Level:                                                                                                                                                                                               |                              | Plant Used:<br>Premier 2 |               | Print Date:<br>04/11/2019                  |            | Scale:<br>1:50   |              |                       |         |
| Weather:                                                                        |                                 |           | Termination:                    |                                                                                   |                                                                                                                                                                                                             |                              |                          |               |                                            |            |                  | Sheet 1 of 1 |                       |         |
| Samples & In Situ Testing                                                       |                                 |           |                                 | Strata Details                                                                    |                                                                                                                                                                                                             |                              |                          |               |                                            |            |                  | Groundwater  |                       |         |
| Depth                                                                           | Type                            | Results   | Level (mAOD)                    | Depth (m) (Thickness)                                                             | Legend                                                                                                                                                                                                      | Strata Description           |                          |               |                                            |            |                  | Water Strike | Backfill/Installation |         |
| 0.60<br>0.90<br>1.20                                                            | ES+D<br>TTJ<br>ES+D             |           |                                 | 0.10                                                                              |                                                                                                                            | Brick paving. MADE GROUND    |                          |               |                                            |            |                  |              |                       |         |
|                                                                                 |                                 |           |                                 | 0.20                                                                              |                                                                                                                            | Sand (sub-base). MADE GROUND |                          |               |                                            |            |                  |              |                       |         |
|                                                                                 |                                 |           |                                 | (0.30)                                                                            |                                                                                                                            | Scalpings. MADE GROUND       |                          |               |                                            |            |                  |              |                       |         |
|                                                                                 | 0.50                            |           |                                 |  | Firm to stiff, orangey brown, gravelly, silty, friable CLAY. Gravel is fine to medium sub-angular flint. A pocket of fine to medium sub-angular flint at 0.90 to 1.00. RARE FINE ROOTS. LANGLEY SILT MEMBER |                              |                          |               |                                            |            |                  |              |                       |         |
|                                                                                 | (0.50)                          |           |                                 |  | Orangey brown, gravelly, silty, fine SAND. Gravel is, fine to medium sub angular flint. TAPLOW GRAVEL MEMBER                                                                                                |                              |                          |               |                                            |            |                  |              |                       |         |
|                                                                                 | D                               |           |                                 | 1.00                                                                              |                                                                                                                                                                                                             |                              |                          |               |                                            |            |                  |              |                       |         |
|                                                                                 |                                 |           |                                 | (0.30)                                                                            |                                                                                                                                                                                                             |                              |                          |               |                                            |            |                  |              |                       |         |
|                                                                                 |                                 |           |                                 | 1.30                                                                              |                                                                                                                                                                                                             | End of Borehole at 1.30m     |                          |               |                                            |            |                  |              |                       |         |
| Start & End of Shift Observations                                               |                                 |           |                                 | Borehole Diameter                                                                 |                                                                                                                                                                                                             | Casing Diameter              |                          | Remarks:      |                                            |            |                  |              |                       |         |
| Date                                                                            | Time                            | Depth (m) | Casing (m)                      | Water (m)                                                                         | Depth (m)                                                                                                                                                                                                   | Dia (mm)                     | Depth (m)                | Dia (mm)      | No groundwater observed. Roots to 1.0m bgl |            |                  |              |                       |         |
|                                                                                 |                                 |           |                                 |                                                                                   |                                                                                                                                                                                                             |                              |                          |               |                                            |            |                  |              |                       |         |
| Chiselling                                                                      |                                 |           |                                 | Installation                                                                      |                                                                                                                                                                                                             |                              |                          | Water Strikes |                                            |            |                  |              |                       |         |
| From (m)                                                                        | To (m)                          | Duration  | Remarks                         |                                                                                   | Top (m)                                                                                                                                                                                                     | Base (m)                     | Type                     | Dia (mm)      | Strike (m)                                 | Casing (m) | Sealed (m)       | Time (mins)  | Rose to (m)           | Remarks |
|                                                                                 |                                 |           |                                 |                                                                                   |                                                                                                                                                                                                             |                              |                          |               |                                            |            |                  |              |                       |         |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.    |                                 |           |                                 |                                                                                   |                                                                                                                                                                                                             |                              |                          |               |                                            |            |                  |              |                       |         |

| Start & End of Shift Observations                                            |            |            |             |             | Borehole Diameter |          | Casing Diameter |          | Remarks:                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |            |            |             |             |         |  |  |  |  |  |  |                                                                              |  |  |  |  |  |
|------------------------------------------------------------------------------|------------|------------|-------------|-------------|-------------------|----------|-----------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|------------|-------------|-------------|---------|--|--|--|--|--|--|------------------------------------------------------------------------------|--|--|--|--|--|
| Date                                                                         | Time       | Depth (m)  | Casing (m)  | Water (m)   | Depth (m)         | Dia (mm) | Depth (m)       | Dia (mm) |                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |            |            |             |             |         |  |  |  |  |  |  |                                                                              |  |  |  |  |  |
|                                                                              |            |            |             |             |                   |          |                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |            |            |             |             |         |  |  |  |  |  |  |                                                                              |  |  |  |  |  |
|                                                                              |            |            |             |             |                   |          |                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |            |            |             |             |         |  |  |  |  |  |  |                                                                              |  |  |  |  |  |
|                                                                              |            |            |             |             |                   |          |                 |          | <div> <div>No groundwater observed. Roots to 1.0m bgl</div> <div>Water Strikes</div> <table border="1"> <tr> <th>Strike (m)</th> <th>Casing (m)</th> <th>Sealed (m)</th> <th>Time (mins)</th> <th>Rose to (m)</th> <th>Remarks</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="6">Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.</td> </tr> </table> </div> | Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |  |  |  |  |  |  | Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm. |  |  |  |  |  |
| Strike (m)                                                                   | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks           |          |                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |            |            |             |             |         |  |  |  |  |  |  |                                                                              |  |  |  |  |  |
|                                                                              |            |            |             |             |                   |          |                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |            |            |             |             |         |  |  |  |  |  |  |                                                                              |  |  |  |  |  |
| Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm. |            |            |             |             |                   |          |                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |            |            |             |             |         |  |  |  |  |  |  |                                                                              |  |  |  |  |  |
| Chiselling                                                                   |            |            |             |             | Installation      |          |                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |            |            |             |             |         |  |  |  |  |  |  |                                                                              |  |  |  |  |  |
| From (m)                                                                     | To (m)     | Duration   | Remarks     |             | Top (m)           | Base (m) | Type            | Dia (mm) |                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |            |            |             |             |         |  |  |  |  |  |  |                                                                              |  |  |  |  |  |
|                                                                              |            |            |             |             |                   |          |                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |            |            |             |             |         |  |  |  |  |  |  |                                                                              |  |  |  |  |  |



|               |                                               |             |            |          |  |           |      |
|---------------|-----------------------------------------------|-------------|------------|----------|--|-----------|------|
| Project Name: | 234 Bath Road                                 | Project No. | 17898      | Co-ords: |  | Hole Type | DP   |
| Location:     | 234 Bath Road, Harlington, Middlesex, UB3 5AR | Level:      | m AOD      |          |  | Scale     | 1:50 |
| Client:       | RDP Architects                                | Dates:      | 09/10/2019 |          |  | Logged By | JO   |

| Depth<br>(m) | Blows/100mm          |    |                           |    |                                                                                       | Torque<br>(Nm) |
|--------------|----------------------|----|---------------------------|----|---------------------------------------------------------------------------------------|----------------|
|              | 0                    | 10 | 20                        | 30 | 40                                                                                    |                |
| 1            | 6                    | 5  | 8                         | 9  | 14                                                                                    | 20             |
| 2            | 16                   | 17 | 20                        | 20 | 22                                                                                    |                |
| 3            | 17                   | 19 | 19                        | 19 | 19                                                                                    | 40             |
| 4            | 15                   | 15 | 18                        | 17 | 18                                                                                    |                |
| 5            | 24                   | 23 | 18                        | 12 | 12                                                                                    | 40             |
| 6            | 11                   | 12 | 13                        | 10 | 7                                                                                     |                |
| 7            | 4                    | 3  | 3                         | 3  | 3                                                                                     | 40             |
| 8            | 2                    | 3  | 3                         | 3  | 3                                                                                     |                |
| 9            | 2                    | 3  | 3                         | 3  | 3                                                                                     | 40             |
| 10           | 2                    |    |                           |    |                                                                                       |                |
| 11           |                      |    |                           |    |                                                                                       |                |
| 12           |                      |    |                           |    |                                                                                       |                |
| 13           |                      |    |                           |    |                                                                                       |                |
| 14           |                      |    |                           |    |                                                                                       |                |
| 15           |                      |    |                           |    |                                                                                       |                |
| 16           |                      |    |                           |    |                                                                                       |                |
| 17           |                      |    |                           |    |                                                                                       |                |
| 18           |                      |    |                           |    |                                                                                       |                |
| 19           |                      |    |                           |    |                                                                                       |                |
| 20           |                      |    |                           |    |                                                                                       |                |
| 21           |                      |    |                           |    |                                                                                       |                |
| 22           |                      |    |                           |    |                                                                                       |                |
| 23           |                      |    |                           |    |                                                                                       |                |
| 24           |                      |    |                           |    |                                                                                       |                |
| 25           |                      |    |                           |    |                                                                                       |                |
| 26           |                      |    |                           |    |                                                                                       |                |
| 27           |                      |    |                           |    |                                                                                       |                |
| 28           |                      |    |                           |    |                                                                                       |                |
| 29           |                      |    |                           |    |                                                                                       |                |
| 30           |                      |    |                           |    |                                                                                       |                |
| 31           |                      |    |                           |    |                                                                                       |                |
| 32           |                      |    |                           |    |                                                                                       |                |
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| 36           |                      |    |                           |    |                                                                                       |                |
| 37           |                      |    |                           |    |                                                                                       |                |
| 38           |                      |    |                           |    |                                                                                       |                |
| 39           |                      |    |                           |    |                                                                                       |                |
| 40           |                      |    |                           |    |                                                                                       |                |
| 41           |                      |    |                           |    |                                                                                       |                |
| 42           |                      |    |                           |    |                                                                                       |                |
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| 44           |                      |    |                           |    |                                                                                       |                |
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| 46           |                      |    |                           |    |                                                                                       |                |
| 47           |                      |    |                           |    |                                                                                       |                |
| 48           |                      |    |                           |    |                                                                                       |                |
| 49           |                      |    |                           |    |                                                                                       |                |
| 50           |                      |    |                           |    |                                                                                       |                |
| 51           |                      |    |                           |    |                                                                                       |                |
| 52           |                      |    |                           |    |                                                                                       |                |
| 53           |                      |    |                           |    |                                                                                       |                |
| 54           |                      |    |                           |    |                                                                                       |                |
| 55           |                      |    |                           |    |                                                                                       |                |
| 56           |                      |    |                           |    |                                                                                       |                |
| 57           |                      |    |                           |    |                                                                                       |                |
| 58           |                      |    |                           |    |                                                                                       |                |
| 59           |                      |    |                           |    |                                                                                       |                |
| 60           |                      |    |                           |    |                                                                                       |                |
| 61           |                      |    |                           |    |                                                                                       |                |
| 62           |                      |    |                           |    |                                                                                       |                |
| 63           |                      |    |                           |    |                                                                                       |                |
| 64           |                      |    |                           |    |                                                                                       |                |
| 65           |                      |    |                           |    |                                                                                       |                |
| 66           |                      |    |                           |    |                                                                                       |                |
| 67           |                      |    |                           |    |                                                                                       |                |
| 68           |                      |    |                           |    |                                                                                       |                |
| 69           |                      |    |                           |    |                                                                                       |                |
| 70           |                      |    |                           |    |                                                                                       |                |
| 71           |                      |    |                           |    |                                                                                       |                |
| 72           |                      |    |                           |    |                                                                                       |                |
| 73           |                      |    |                           |    |                                                                                       |                |
| 74           |                      |    |                           |    |                                                                                       |                |
| 75           |                      |    |                           |    |                                                                                       |                |
| 76           |                      |    |                           |    |                                                                                       |                |
| 77           |                      |    |                           |    |                                                                                       |                |
| 78           |                      |    |                           |    |                                                                                       |                |
| 79           |                      |    |                           |    |                                                                                       |                |
| 80           |                      |    |                           |    |                                                                                       |                |
| 81           |                      |    |                           |    |                                                                                       |                |
| 82           |                      |    |                           |    |                                                                                       |                |
| 83           |                      |    |                           |    |                                                                                       |                |
| 84           |                      |    |                           |    |                                                                                       |                |
| 85           |                      |    |                           |    |                                                                                       |                |
| 86           |                      |    |                           |    |                                                                                       |                |
| 87           |                      |    |                           |    |                                                                                       |                |
| 88           |                      |    |                           |    |                                                                                       |                |
| 89           |                      |    |                           |    |                                                                                       |                |
| 90           |                      |    |                           |    |                                                                                       |                |
| 91           |                      |    |                           |    |                                                                                       |                |
| 92           |                      |    |                           |    |                                                                                       |                |
| 93           |                      |    |                           |    |                                                                                       |                |
| 94           |                      |    |                           |    |                                                                                       |                |
| 95           |                      |    |                           |    |                                                                                       |                |
| 96           |                      |    |                           |    |                                                                                       |                |
| 97           |                      |    |                           |    |                                                                                       |                |
| 98           |                      |    |                           |    |                                                                                       |                |
| 99           |                      |    |                           |    |                                                                                       |                |
| 100          |                      |    |                           |    |                                                                                       |                |
| Remarks      | Fall Height 750mm    |    | Cone Base Diameter 50.5mm |    |  |                |
|              | Hammer Weight 64.5kg |    | Final Depth 6m            |    |                                                                                       |                |
|              | Probe Type DPSH      |    | Energy Ratio (Er) %       |    |                                                                                       |                |

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**Probe Log**

Probe No.

**DP3**

Sheet 1 of 1

|               |                                               |             |       |          |            |           |      |
|---------------|-----------------------------------------------|-------------|-------|----------|------------|-----------|------|
| Project Name: | 234 Bath Road                                 | Project No. | 17898 | Co-ords: |            | Hole Type | DP   |
| Location:     | 234 Bath Road, Harlington, Middlesex, UB3 5AR |             |       | Level:   | m AOD      | Scale     | 1:50 |
| Client:       | RDP Architects                                |             |       | Dates:   | 09/10/2019 | Logged By | JO   |

| Depth (m) | Blows/100mm |               |        |                    | Torque (Nm) |
|-----------|-------------|---------------|--------|--------------------|-------------|
| 0         |             |               |        |                    |             |
| 1         | 6           | 17            | 25     | 34                 | 20          |
|           |             |               |        | 40                 | 60          |
|           |             |               |        | 37                 |             |
|           |             |               |        | 37                 |             |
| 2         |             |               |        |                    |             |
| 3         |             |               |        |                    |             |
| 4         |             |               |        |                    |             |
| 5         |             |               |        |                    |             |
| 6         |             |               |        |                    |             |
| 7         |             |               |        |                    |             |
| 8         |             |               |        |                    |             |
| 9         |             |               |        |                    |             |
| 10        |             |               |        |                    |             |
| Remarks   |             | Fall Height   | 750mm  | Cone Base Diameter | 50.5mm      |
|           |             | Hammer Weight | 64.5kg | Final Depth        | 1.5m        |
|           |             | Probe Type    | DPSH   | Energy Ratio (Er)  | %           |



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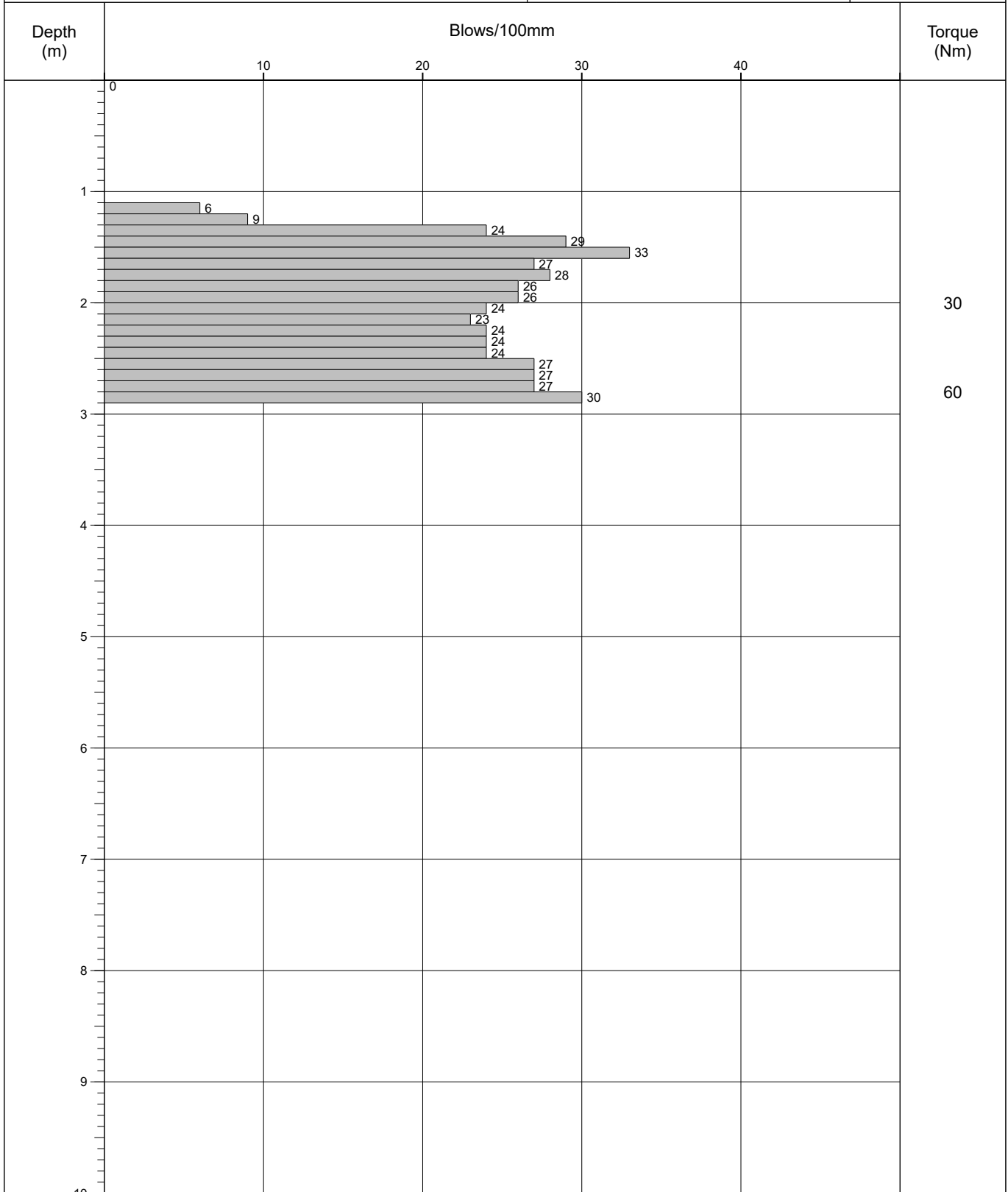
**Probe Log**

Probe No.

**DP4**

Sheet 1 of 1

|               |                                               |             |       |          |            |           |      |
|---------------|-----------------------------------------------|-------------|-------|----------|------------|-----------|------|
| Project Name: | 234 Bath Road                                 | Project No. | 17898 | Co-ords: |            | Hole Type | DP   |
| Location:     | 234 Bath Road, Harlington, Middlesex, UB3 5AR |             |       | Level:   | m AOD      | Scale     | 1:50 |
| Client:       | RDP Architects                                |             |       | Dates:   | 09/10/2019 | Logged By | JO   |



|         |               |        |                    |        |
|---------|---------------|--------|--------------------|--------|
| Remarks | Fall Height   | 750mm  | Cone Base Diameter | 50.5mm |
|         | Hammer Weight | 64.5kg | Final Depth        | 2.8m   |
|         | Probe Type    | DPSH   | Energy Ratio (Er)  | %      |



## Appendix B Geotechnical In-Situ and Laboratory Testing

### Appendix B.1 Classification

#### **Classification based on SPT “N” values:**

The inferred undrained strength of the cohesive soils was based on the SPT “N” blow counts, derived from the relationship suggested by Stroud (1974) and classified using Table B.1.1. (Ref: Stroud, M. A. 1974, “The Standard Penetration Test – its application and interpretation”, Proc. ICE Conf. on Penetration Testing in the UK, Birmingham. Thomas Telford, London.).

**Table B.1.1 SPT “N” Blow Count Cohesive Classification**

| <b>Classification</b> | <b>Undrained Cohesive Strength <math>C_u</math> (kPa)</b> |
|-----------------------|-----------------------------------------------------------|
| Extremely low         | <10                                                       |
| Very low              | 10 – 20                                                   |
| Low                   | 20 – 40                                                   |
| Medium                | 40 – 75                                                   |
| High                  | 75 – 150                                                  |
| Very high             | 150 – 300                                                 |
| Extremely high        | > 300                                                     |

**Note:** (Ref: BS EN ISO 14688-2:2004+A1:2013 Clause 5.3.)

The relative density of granular soils was classified based of the relationship given in Table B.1.2.

The *UK National Annex to Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing*, NA 3.7 SPT test, BS EN 1997-2:2007, Annex F states “Relative density descriptions on borehole records should also be based on uncorrected SPT N values, unless significantly disturbed, using the density classification in BS 5930:2015, Table 7.

**Table B.1.2 SPT “N” Blow Count Granular Classification**

| <b>Classification</b> | <b>SPT “N” blow count (blows/300mm)</b> |
|-----------------------|-----------------------------------------|
| Very loose            | 0 to 4                                  |
| Loose                 | 4 to 10                                 |
| Medium dense          | 10 to 30                                |
| Dense                 | 30 to 50                                |
| Very dense            | Greater than 50                         |

**Note:** (Ref: The Standard Penetration Test (SPT): Methods and Use, CIRIA Report 143, 1995)

## Appendix B.2 Interpretation

**Table B.2.1 Interpretation of SPT Tests**

| BH                                                                                                                                            | Strata                                  | SPT N <sub>60</sub> Blow Counts <sup>1</sup> | Inferred Cohesive Strength/Relative Density |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|----------------------------------------------|---------------------------------------------|
| BH1                                                                                                                                           | TPGR<br>1.00 – 4.00<br>GRAVEL           | 22 - 50                                      | Medium dense to very dense                  |
|                                                                                                                                               | LC<br>4.00 – 20.00 <sup>2</sup><br>CLAY | 17 - 33                                      | High to very high<br>(Cu = 85kPa – 165kPa)  |
| BH2                                                                                                                                           | TPGR<br>1.00 – 4.20<br>GRAVEL           | 41 - 50                                      | Dense to very dense                         |
|                                                                                                                                               | LC<br>4.20 – 15.00 <sup>2</sup><br>CLAY | 10 - 26                                      | Medium to high<br>(Cu = 50kPa to 130kPa)    |
| BH3                                                                                                                                           | TPGR<br>1.00 – 6.40<br>GRAVEL           | 14 - 50                                      | Medium dense to very dense                  |
|                                                                                                                                               | LC<br>6.40 – 20.00 <sup>2</sup><br>CLAY | 17 - 32                                      | High to very high<br>(Cu = 85kPa to 160kPa) |
| <b>Note:</b><br><sup>1</sup> Hammer Efficiency = 60%. <sup>1</sup> 1.00*SPT N = SPT N <sub>60</sub><br><sup>2</sup> Final depth of trial hole |                                         |                                              |                                             |

**Table B.2.2 Interpretation of DPSH Blow Counts**

| DP  | Strata                                                                   | Equivalent SPT N <sub>60</sub> Blow Counts <sup>2</sup> | Inferred Cohesive Strength/Relative Density |
|-----|--------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------|
| DPI | TPGR<br>1.10 – 3.20 <sup>1</sup><br>Assumed SAND                         | 38 - >50                                                | Dense to very dense                         |
|     | TPGR<br>3.20 – 3.40 <sup>1</sup><br>Assumed SAND                         | 11 - 15                                                 | Medium dense                                |
|     | TPGR<br>3.40 <sup>1</sup> – 3.80 <sup>1</sup><br>Assumed SAND            | 27 - >50                                                | Medium dense to very dense                  |
|     | LC<br>3.80 <sup>1</sup> – 6.00 <sup>3</sup><br>Assumed CLAY <sup>4</sup> | 4 - 11                                                  | Very low to medium<br>(Cu = 20kPa – 55kPa)  |
| DP2 | TPGR<br>1.10 – 4.70 <sup>1</sup><br>Assumed SAND                         | 19 - >50                                                | Medium dense to very dense                  |
|     | LC<br>4.70 <sup>1</sup> – 6.00 <sup>3</sup><br>Assumed CLAY <sup>4</sup> | 8 - 27                                                  | Low to high<br>(Cu = 40kPa – 135kPa)        |

| DP  | Strata                                            | Equivalent SPT<br>N <sub>60</sub> Blow Counts <sup>2</sup> | Inferred Cohesive Strength/Relative Density         |
|-----|---------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------|
| DP3 | TPGR<br>1.10 – 1.60 <sup>13</sup><br>Assumed SAND | 23 - >50                                                   | Medium dense to very dense                          |
| DP4 | LASI<br>1.10 – 1.50<br>Gravelly CLAY              | 23 - 126                                                   | High to extremely high*<br>(Cu = 115kPa to >300kPa) |
|     | TPGR<br>1.50 – 2.90 <sup>13</sup><br>Assumed SAND | >50                                                        | Very dense                                          |

**Notes:**<sup>1</sup> Ground conditions inferred past the base of windowless sampler boreholes.<sup>2</sup> Inferred from energy ratio efficiency = 79%. <sup>1</sup> 1.33\*SPT N = SPT N<sub>60</sub><sup>3</sup> Final depth of the dynamic probe<sup>4</sup> Based on marked decrease in blow counts and ground conditions revealed in the cable percussive BHs

\* high blow counts could be attributed to gravel bands

**Table B.2.3 Interpretation of Atterberg Limit Tests**

| Stratum | Moisture Content (%) | Plasticity Index (%) | Passing 425µm Sieve (%) | Modified Plasticity Index (%) | Soil Classification | Volume Change Potential BRE |
|---------|----------------------|----------------------|-------------------------|-------------------------------|---------------------|-----------------------------|
| LC      | 71-80                | 46 - 53              | 100                     | 46 - 53                       | CV                  | High                        |

**Note:** BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results)

NHBC Volume Change Potential refers to NHBC Standards Chapter 4.2

Soils Classification based on British Soil Classification System

The most common use of the term clay is to describe a soil that contains enough clay-sized material or clay minerals to exhibit cohesive properties. The fraction of clay-sized material required varies, but can be as low as 15%. Unless stated otherwise, this is the sense used in Digest 240. The term can be used to denote the clay minerals. These are specific, naturally occurring chemical compounds, predominately silicates. The term is often used as a particle size descriptor. Soil particles that have a nominal diameter of less than 2 µm are normally considered to be of clay size, but they are not necessarily clay minerals. Some clay minerals are larger than 2 µm and some particles, 'rock flour' for example, can be finer than 2 µm but are not clay minerals.

(The Atterberg Limit Tests were undertaken in accordance with BS 1377:Part 2:1990 Clauses 3.2, 4.3 and 5)

**Table B.2.4 Interpretation of PSD Tests**

| Location | Depth (m bgl) | Soil Description                                                       | Volume Change Potential BRE | Passing 63µm Sieve (%) |
|----------|---------------|------------------------------------------------------------------------|-----------------------------|------------------------|
| BH1      | 2.00          | Brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL | No                          | 1                      |
| BH2      | 2.00          | Brown slightly fine to coarse sandy fine to coarse GRAVEL              | No                          | 0                      |
| BH3      | 2.00          | Brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL | No                          | 1                      |
| BH3      | 5.00          | Brown fine to coarse sandy fine to coarse GRAVEL                       | No                          | 0                      |

| Location | Depth<br>(m bgl) | Soil Description | Volume Change<br>Potential<br>BRE | Passing<br>63µm Sieve (%) |
|----------|------------------|------------------|-----------------------------------|---------------------------|
|----------|------------------|------------------|-----------------------------------|---------------------------|

**Note:** BRE 240 states that a soil has a volume change potential when the clay fraction **exceeds 15%**. Only the silt and clay combined fraction are determined by sieving therefore the volume change potential is estimated from the percentage passing the 63µm sieve.

(The Particle Size Distribution Tests were undertaken in accordance with BS 1377: Part 2: 1990 Clause 9)

**Table B.2.5 Interpretation of QUU Tests**

| Location | Stratum | Sample Depth<br>(m bgl) | Moisture<br>Content (%) | Soil Strength | Shear Strength<br>(kPa) |
|----------|---------|-------------------------|-------------------------|---------------|-------------------------|
| BH1      | LC      | 6.00                    | 23                      | High          | 79                      |
| BH1      | LC      | 9.00                    | 30                      | High          | 112                     |
| BH1      | LC      | 12.00                   | 24                      | High          | 79                      |
| BH1      | LC      | 18.00                   | 22                      | Very high     | 215                     |
| BH2      | LC      | 7.50                    | 24                      | High          | 82                      |
| BH2      | LC      | 10.50                   | 22                      | High          | 115                     |
| BH2      | LC      | 13.50                   | 20                      | Very high     | 217                     |
| BH3      | LC      | 7.50                    | 27                      | Medium        | 62                      |
| BH3      | LC      | 10.50                   | 23                      | High          | 105                     |
| BH3      | LC      | 13.50                   | 17                      | High          | 150                     |
| BH3      | LC      | 16.50                   | 20                      | Very high     | 170                     |
| BH3      | LC      | 19.50                   | 22                      | Very high     | 164                     |

**Note:**

(The QUU Tests were undertaken in accordance with BS 1377:1990 - Part 7 : 8)

## **Appendix B.3   Geotechnical In-Situ and Laboratory Results**



## Contract Number: 46073

Client Ref: **17898**

Report Date: **23-10-2019**

Client PO: **17898**

Client **Soils Limited**  
**Newton House**  
**Cross Road**  
**Tadworth**  
**Surrey**  
**KT20 5SR**

Contract Title: **234 Bath Road, Harlington**  
For the attention of: **Nikos Sidiropoulos**

Date Received: **16-10-2019**

Date Completed: **23-10-2019**

| Test Description                                                                                                                                            | Qty |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Moisture Content</b><br>BS 1377:1990 - Part 2 : 3.2 - * UKAS                                                                                             | 3   |
| <b>1 Point Liquid &amp; Plastic Limit</b><br>BS 1377:1990 - Part 2 : 4.4 & 5.3 - * UKAS                                                                     | 3   |
| <b>PSD Wet Sieve method</b><br>BS 1377:1990 - Part 2 : 9.2 - * UKAS                                                                                         | 4   |
| <b>BRE Reduced Suite</b><br><b>includes pH, water &amp; acid soluble sulphate and total sulphur</b><br>BRE - BR279 - @ Non Accredited Test                  | 8   |
| <b>Quick Undrained Triaxial Compression test - single specimen at one confining pressure (100mm or 38mm diameter)</b><br>BS 1377:1990 - Part 7 : 8 - * UKAS | 12  |
| <b>Disposal of samples for job</b>                                                                                                                          | 1   |

Notes: **Observations and Interpretations are outside the UKAS Accreditation**

\* - denotes test included in laboratory scope of accreditation

# - denotes test carried out by approved contractor

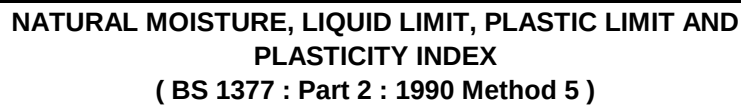
@ - denotes non accredited tests

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 except in full, without the prior written approval of the laboratory.

#### Approved Signatories:

Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)

Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)



**46073**

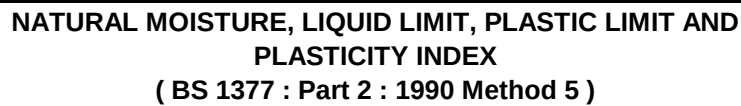
**234 Bath Road, Harlington**

**17/10/2019**

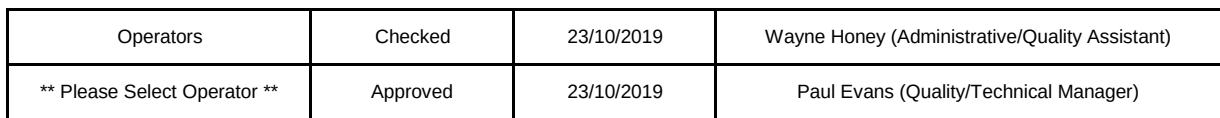
## DESCRIPTIONS

|                              |          |            |                                                |
|------------------------------|----------|------------|------------------------------------------------|
| Operators                    | Checked  | 23/10/2019 | Wayne Honey (Administrative/Quality Assistant) |
| ** Please Select Operator ** | Approved | 23/10/2019 | Paul Evans (Quality/Technical Manager)         |



[illegible]

### PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION BS 5930:1999+A2:2010





**PARTICLE SIZE DISTRIBUTION  
BS 1377 Part 2:1990  
Wet Sieve, Clause 9.2**

Contract Number **46073**

Borehole/Pit No. **BH1**

Site Name **234 Bath Road, Harlington**

Sample No.

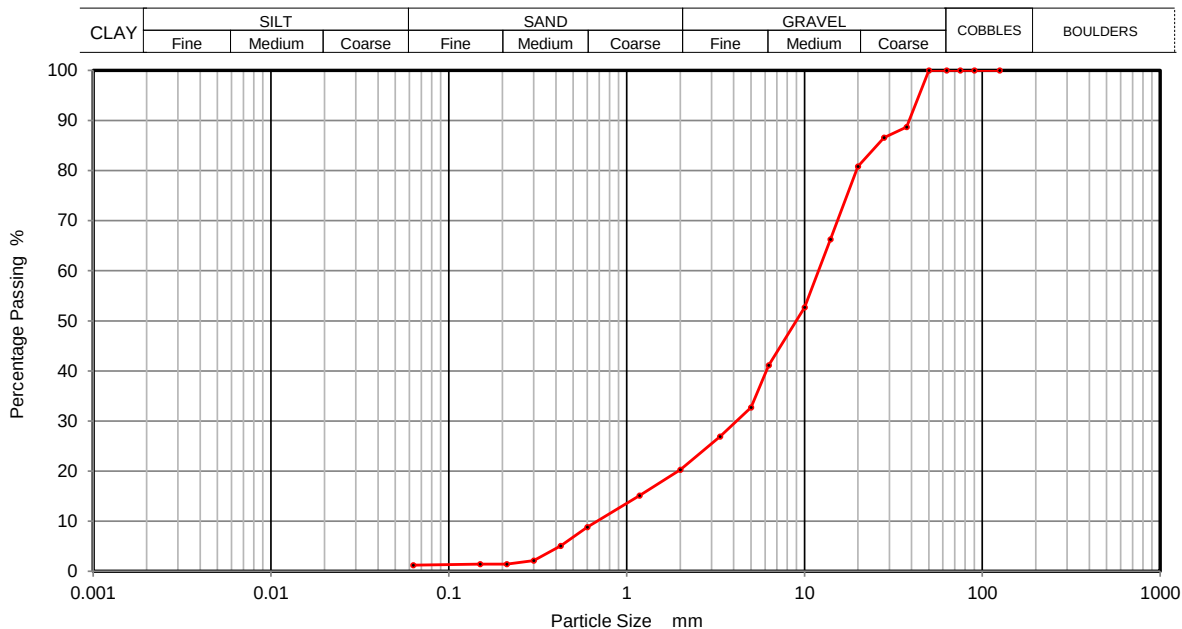
Soil Description **Brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL**

Depth Top **2.00**

Depth Base

Date Tested **19/10/2019**

Sample Type **D**



| Sieving          |           | Sedimentation    |           |
|------------------|-----------|------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125              | 100       |                  |           |
| 90               | 100       |                  |           |
| 75               | 100       |                  |           |
| 63               | 100       |                  |           |
| 50               | 100       |                  |           |
| 37.5             | 89        |                  |           |
| 28               | 87        |                  |           |
| 20               | 81        |                  |           |
| 14               | 66        |                  |           |
| 10               | 53        |                  |           |
| 6.3              | 41        |                  |           |
| 5                | 33        |                  |           |
| 3.35             | 27        |                  |           |
| 2                | 20        |                  |           |
| 1.18             | 15        |                  |           |
| 0.6              | 9         |                  |           |
| 0.425            | 5         |                  |           |
| 0.3              | 2         |                  |           |
| 0.212            | 1         |                  |           |
| 0.15             | 1         |                  |           |
| 0.063            | 1         |                  |           |

| Sample Proportions | % dry mass |
|--------------------|------------|
| Cobbles            | 0          |
| Gravel             | 80         |
| Sand               | 19         |
| Silt and Clay      | 1          |
|                    |            |
|                    |            |

**Remarks**

Preparation and testing in accordance with BS1377 unless noted below

|           |          |            |             |                 |
|-----------|----------|------------|-------------|-----------------|
| Operators | Checked  | 22/10/2019 | Wayne Honey | <i>W. Honey</i> |
| RO/MH     | Approved | 23/10/2019 | Paul Evans  | <i>P. Evans</i> |



2788



**PARTICLE SIZE DISTRIBUTION  
BS 1377 Part 2:1990  
Wet Sieve, Clause 9.2**

Contract Number **46073**

Borehole/Pit No. **BH2**

Site Name **234 Bath Road, Harlington**

Sample No.

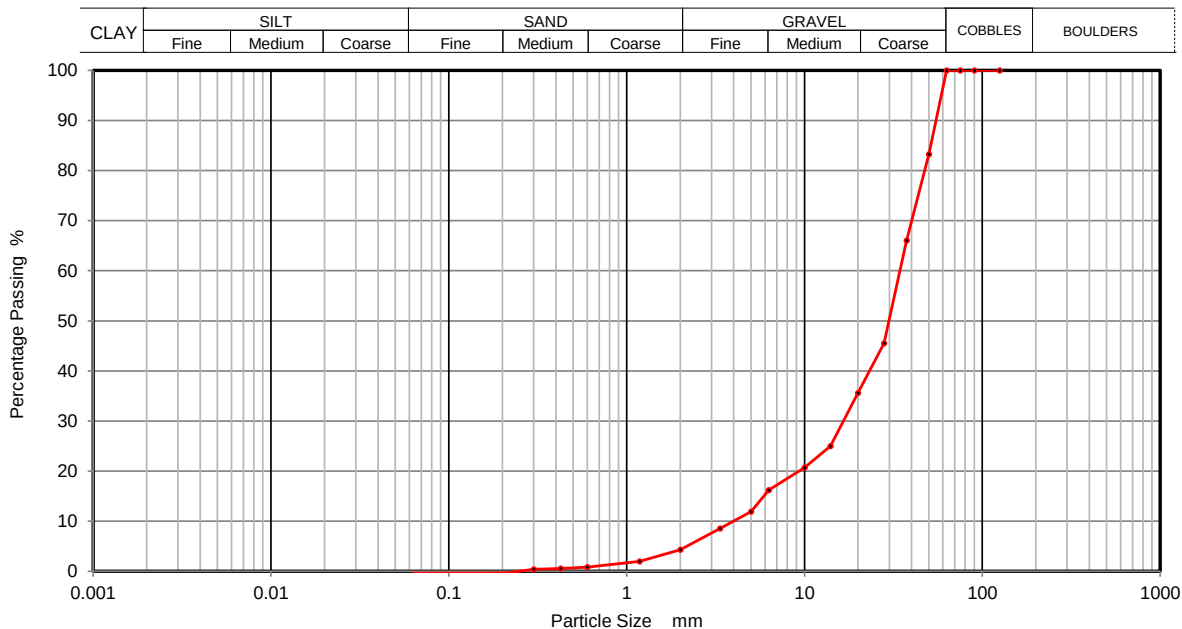
Soil Description **Brown slightly fine to coarse sandy fine to coarse GRAVEL**

Depth Top **2.00**

Depth Base

Date Tested **19/10/2019**

Sample Type **D**



| Sieving          |           | Sedimentation    |           |
|------------------|-----------|------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125              | 100       |                  |           |
| 90               | 100       |                  |           |
| 75               | 100       |                  |           |
| 63               | 100       |                  |           |
| 50               | 83        |                  |           |
| 37.5             | 66        |                  |           |
| 28               | 46        |                  |           |
| 20               | 36        |                  |           |
| 14               | 25        |                  |           |
| 10               | 21        |                  |           |
| 6.3              | 16        |                  |           |
| 5                | 12        |                  |           |
| 3.35             | 9         |                  |           |
| 2                | 4         |                  |           |
| 1.18             | 2         |                  |           |
| 0.6              | 1         |                  |           |
| 0.425            | 1         |                  |           |
| 0.3              | 0         |                  |           |
| 0.212            | 0         |                  |           |
| 0.15             | 0         |                  |           |
| 0.063            | 0         |                  |           |

| Sample Proportions | % dry mass |
|--------------------|------------|
| Cobbles            | 0          |
| Gravel             | 96         |
| Sand               | 4          |
| Silt and Clay      | 0          |
|                    |            |
|                    |            |

Remarks  
Preparation and testing in accordance with BS1377 unless noted below

|           |          |            |             |                 |
|-----------|----------|------------|-------------|-----------------|
| Operators | Checked  | 22/10/2019 | Wayne Honey | <i>W. Honey</i> |
| RO/MH     | Approved | 23/10/2019 | Paul Evans  | <i>P. Evans</i> |





**PARTICLE SIZE DISTRIBUTION**  
**BS 1377 Part 2:1990**  
**Wet Sieve, Clause 9.2**

Contract Number

**46073**

Borehole/Pit No.

**BH3**

Site Name

**234 Bath Road, Harlington**

Sample No.

Soil Description

Brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL

Depth Top

**2.00**

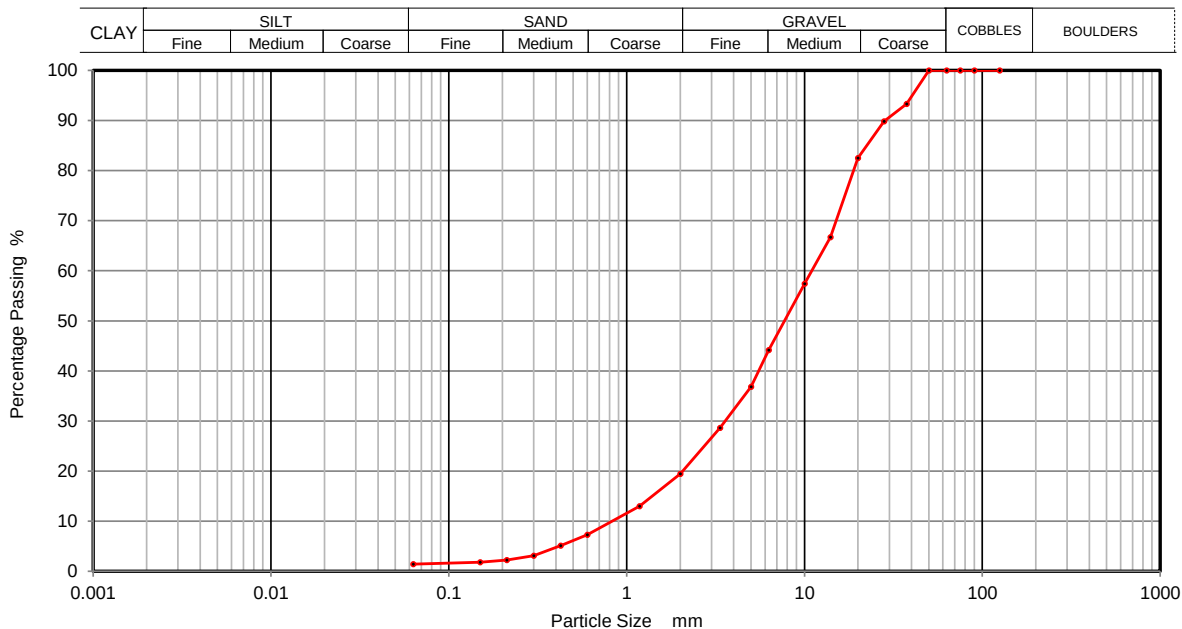
Depth Base

Date Tested

19/10/2019

Sample Type

**D**



| Sieving          |           | Sedimentation    |           |
|------------------|-----------|------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125              | 100       |                  |           |
| 90               | 100       |                  |           |
| 75               | 100       |                  |           |
| 63               | 100       |                  |           |
| 50               | 100       |                  |           |
| 37.5             | 93        |                  |           |
| 28               | 90        |                  |           |
| 20               | 83        |                  |           |
| 14               | 67        |                  |           |
| 10               | 57        |                  |           |
| 6.3              | 44        |                  |           |
| 5                | 37        |                  |           |
| 3.35             | 29        |                  |           |
| 2                | 19        |                  |           |
| 1.18             | 13        |                  |           |
| 0.6              | 7         |                  |           |
| 0.425            | 5         |                  |           |
| 0.3              | 3         |                  |           |
| 0.212            | 2         |                  |           |
| 0.15             | 2         |                  |           |
| 0.063            | 1         |                  |           |

| Sample Proportions | % dry mass |
|--------------------|------------|
| Cobbles            | 0          |
| Gravel             | 81         |
| Sand               | 18         |
| Silt and Clay      | 1          |
|                    |            |
|                    |            |

**Remarks**

Preparation and testing in accordance with BS1377 unless noted below

|           |          |            |             |          |
|-----------|----------|------------|-------------|----------|
| Operators | Checked  | 22/10/2019 | Wayne Honey | W. Honey |
| RO/MH     | Approved | 23/10/2019 | Paul Evans  | P. Evans |



2788



**PARTICLE SIZE DISTRIBUTION**  
**BS 1377 Part 2:1990**  
**Wet Sieve, Clause 9.2**

Contract Number

**46073**

Borehole/Pit No.

**BH3**

Site Name

**234 Bath Road, Harlington**

Sample No.

Soil Description

Brown fine to coarse sandy fine to coarse GRAVEL

Depth Top

**5.00**

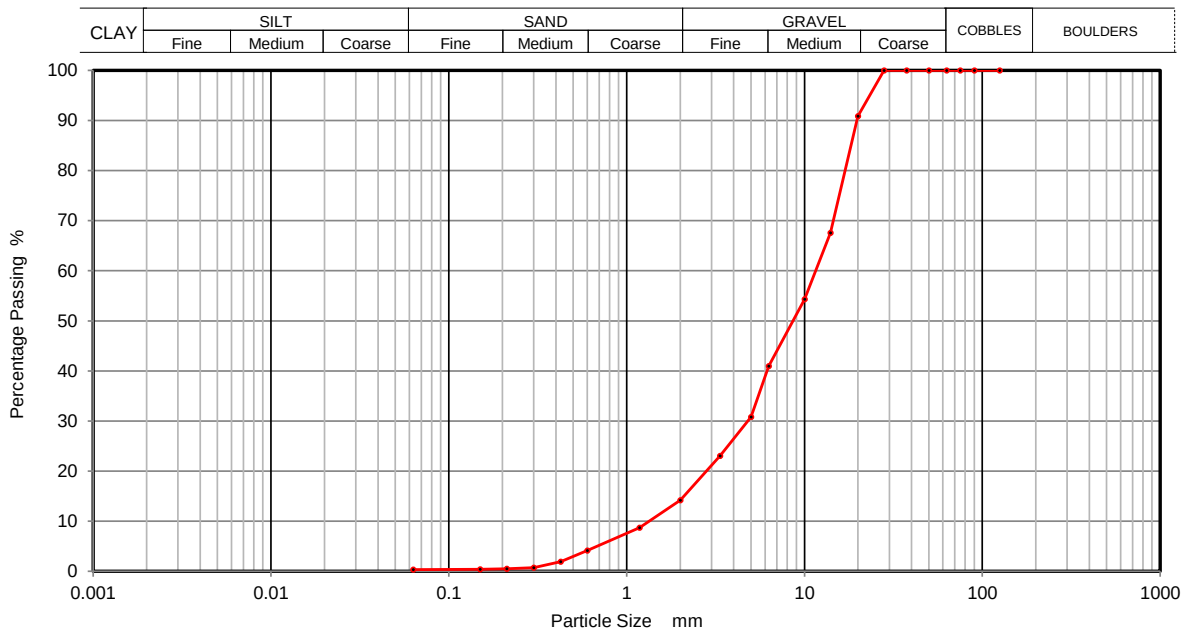
Depth Base

Date Tested

19/10/2019

Sample Type

**D**



| Sieving          |           | Sedimentation    |           |
|------------------|-----------|------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125              | 100       |                  |           |
| 90               | 100       |                  |           |
| 75               | 100       |                  |           |
| 63               | 100       |                  |           |
| 50               | 100       |                  |           |
| 37.5             | 100       |                  |           |
| 28               | 100       |                  |           |
| 20               | 91        |                  |           |
| 14               | 68        |                  |           |
| 10               | 54        |                  |           |
| 6.3              | 41        |                  |           |
| 5                | 31        |                  |           |
| 3.35             | 23        |                  |           |
| 2                | 14        |                  |           |
| 1.18             | 9         |                  |           |
| 0.6              | 4         |                  |           |
| 0.425            | 2         |                  |           |
| 0.3              | 1         |                  |           |
| 0.212            | 0         |                  |           |
| 0.15             | 0         |                  |           |
| 0.063            | 0         |                  |           |

| Sample Proportions | % dry mass |
|--------------------|------------|
| Cobbles            | 0          |
| Gravel             | 86         |
| Sand               | 14         |
| Silt and Clay      | 0          |
|                    |            |
|                    |            |

**Remarks**

Preparation and testing in accordance with BS1377 unless noted below

|           |          |            |             |                 |
|-----------|----------|------------|-------------|-----------------|
| Operators | Checked  | 22/10/2019 | Wayne Honey | <i>W. Honey</i> |
| RO/MH     | Approved | 23/10/2019 | Paul Evans  | <i>P. Evans</i> |



## Certificate of Chemical Analysis (BRE BR 279)

[illegible]



**Single Stage Unconsolidated-Undrained Triaxial  
Test  
BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH1

Site Name 234 Bath Road, Harlington

Sample No.

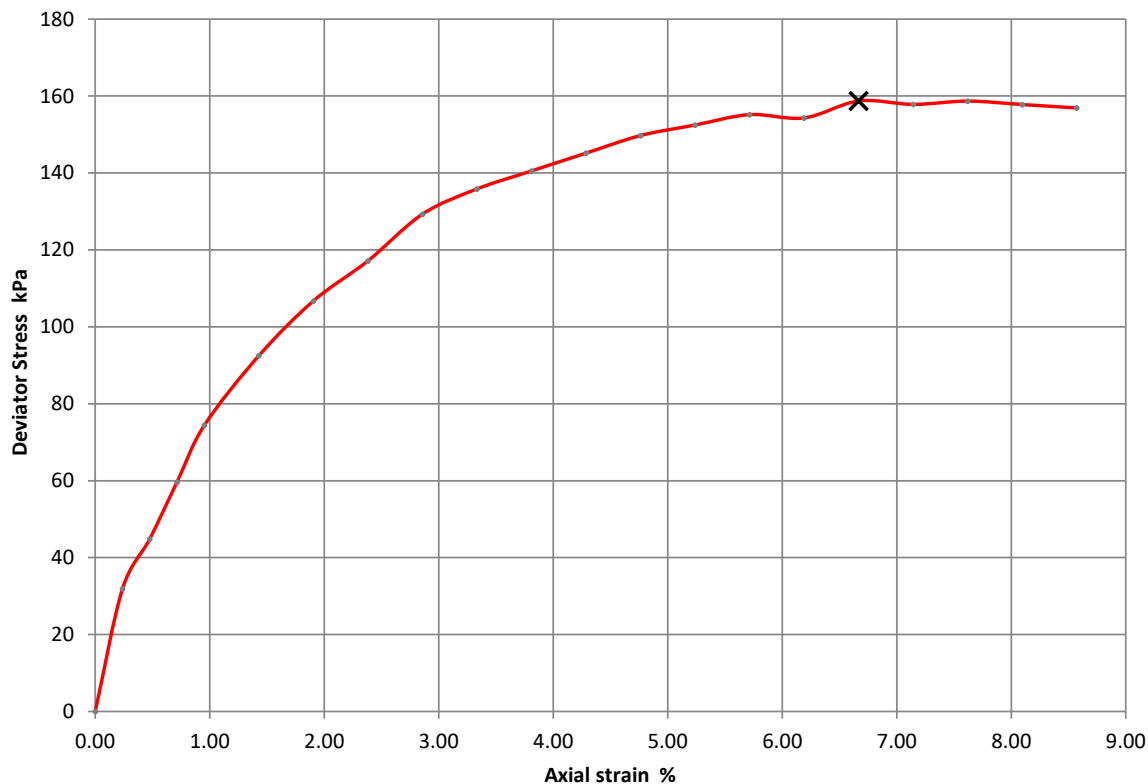
Soil Description Brown silty CLAY

Depth Top (m) 6.00

Depth Base (m) 6.45

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 23           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.90         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.55         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 105          |
| Cell Pressure (kPa)               | 120          |
| Deviator Stress (kPa)             | 159          |
| Undrained Shear Strength (kPa)    | 79           |
| Failure Strain (%)                | 7            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test

Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial  
Test**  
**BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH1

Site Name 234 Bath Road, Harlington

Sample No.

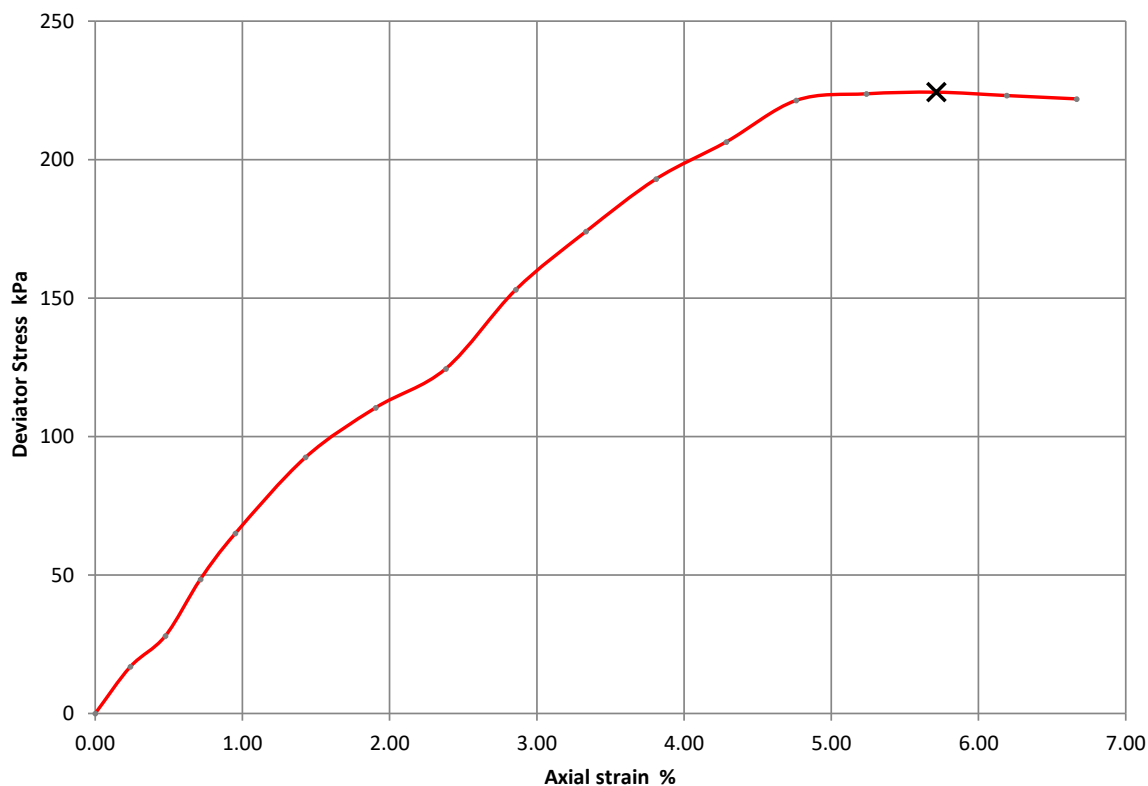
Soil Description Dark brown silty CLAY

Depth Top (m) 9.00

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 30           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.90         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.46         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 105          |
| Cell Pressure (kPa)               | 180          |
| Deviator Stress (kPa)             | 224          |
| Undrained Shear Strength (kPa)    | 112          |
| Failure Strain (%)                | 6            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test

Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial Test**  
**BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH1

Site Name 234 Bath Road, Harlington

Sample No.

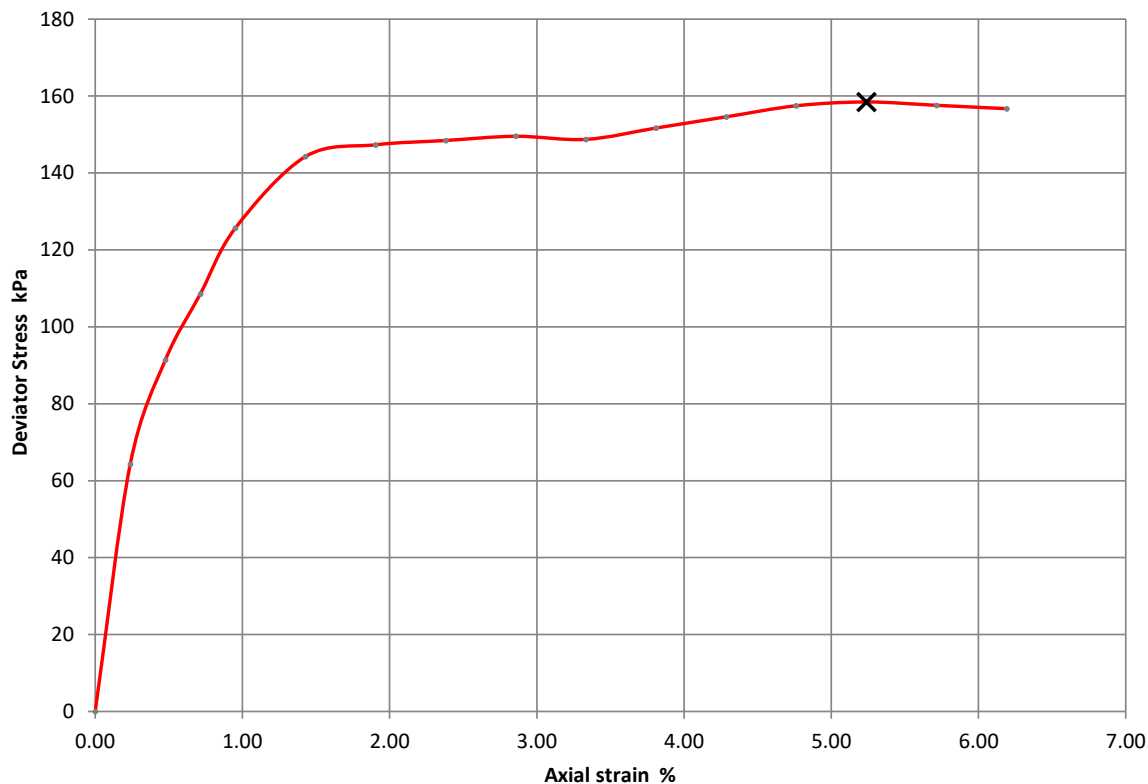
Soil Description Dark brown silty CLAY

Depth Top (m) 12.00

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 24           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.97         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.59         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 103          |
| Cell Pressure (kPa)               | 240          |
| Deviator Stress (kPa)             | 158          |
| Undrained Shear Strength (kPa)    | 79           |
| Failure Strain (%)                | 5            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test



Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial  
Test  
BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH01

Site Name 234 Bath Road, Harlington

Sample No.

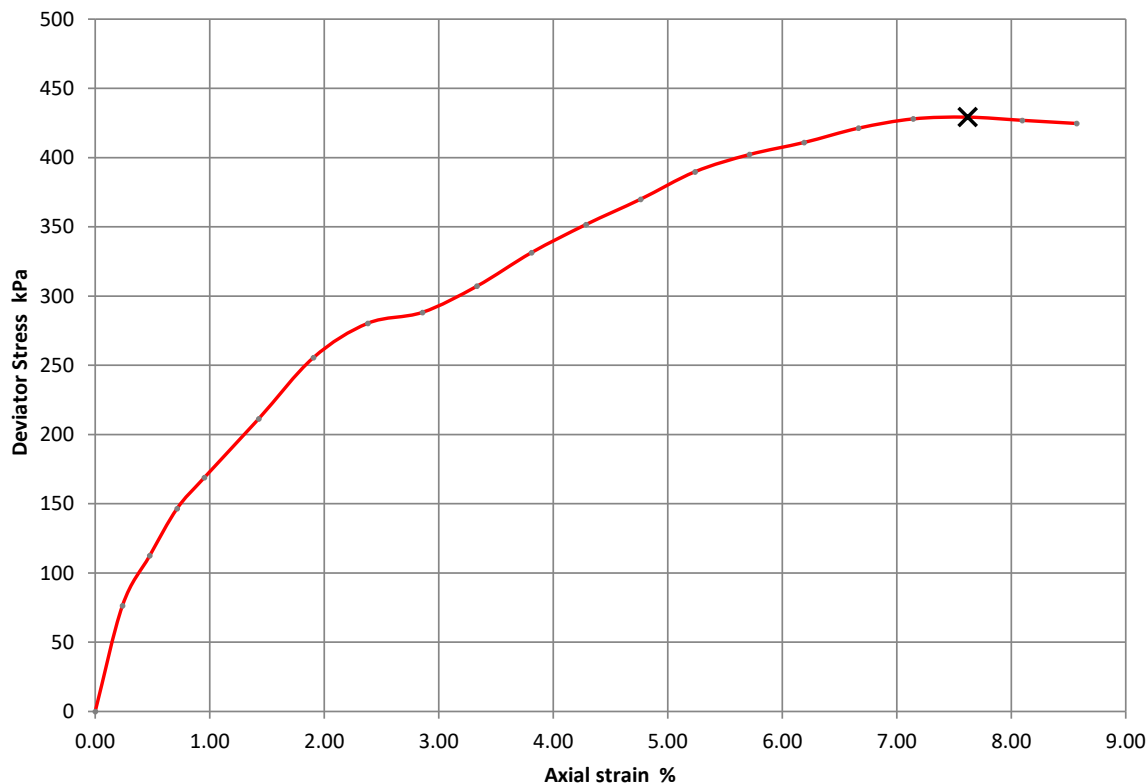
Soil Description Brown silty CLAY

Depth Top (m) 18.00

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 22           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.96         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.61         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 104          |
| Cell Pressure (kPa)               | 360          |
| Deviator Stress (kPa)             | 429          |
| Undrained Shear Strength (kPa)    | 215          |
| Failure Strain (%)                | 8            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test

Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial  
Test  
BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH2

Site Name 234 Bath Road, Harlington

Sample No.

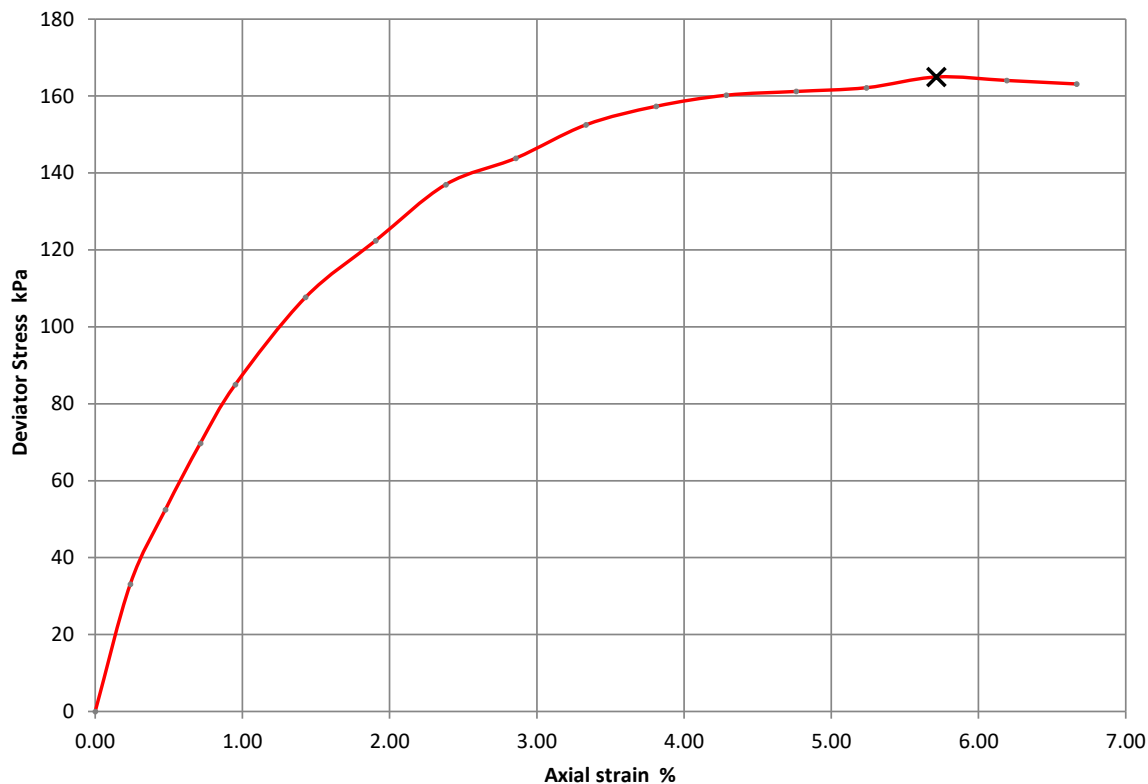
Soil Description Dark brown silty CLAY

Depth Top (m) 7.50

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 24           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.91         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.55         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 103          |
| Cell Pressure (kPa)               | 150          |
| Deviator Stress (kPa)             | 165          |
| Undrained Shear Strength (kPa)    | 82           |
| Failure Strain (%)                | 6            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test



Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial Test**  
**BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH02

Site Name 234 Bath Road, Harlington

Sample No.

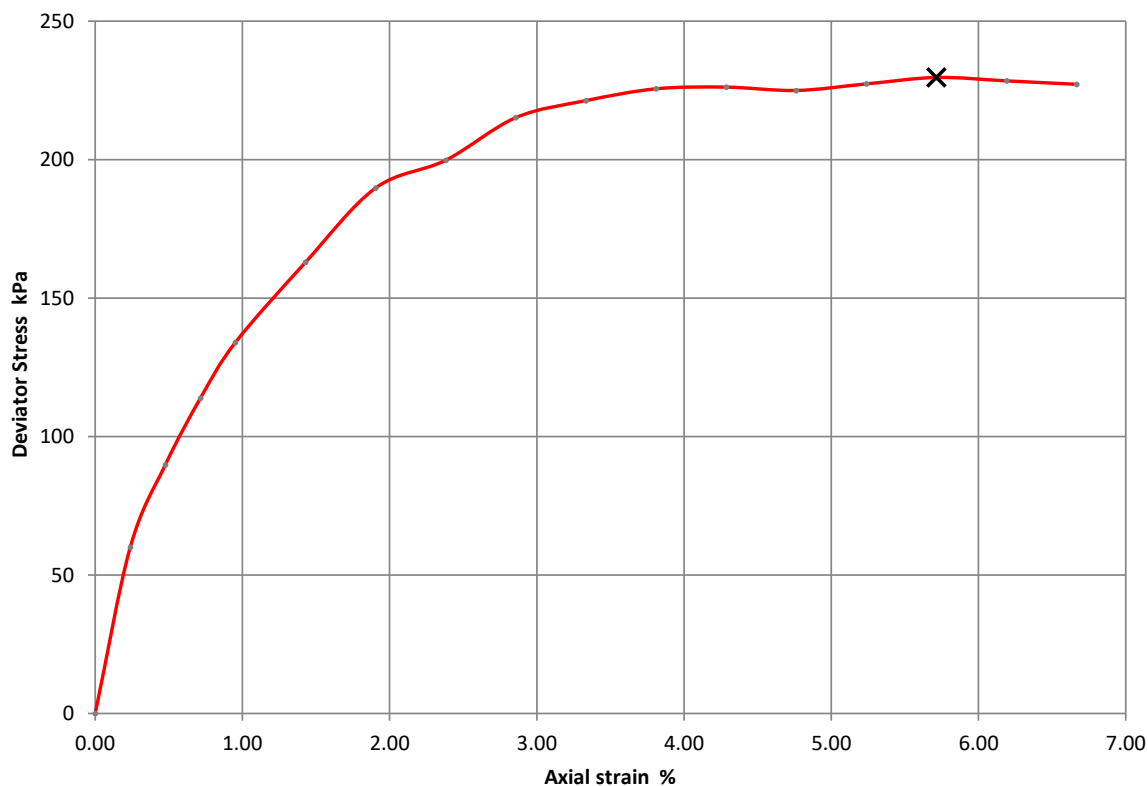
Soil Description Brown silty CLAY

Depth Top (m) 10.50

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 22           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.90         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.55         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 105          |
| Cell Pressure (kPa)               | 220          |
| Deviator Stress (kPa)             | 230          |
| Undrained Shear Strength (kPa)    | 115          |
| Failure Strain (%)                | 6            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test

Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial  
Test  
BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH2

Site Name 234 Bath Road, Harlington

Sample No.

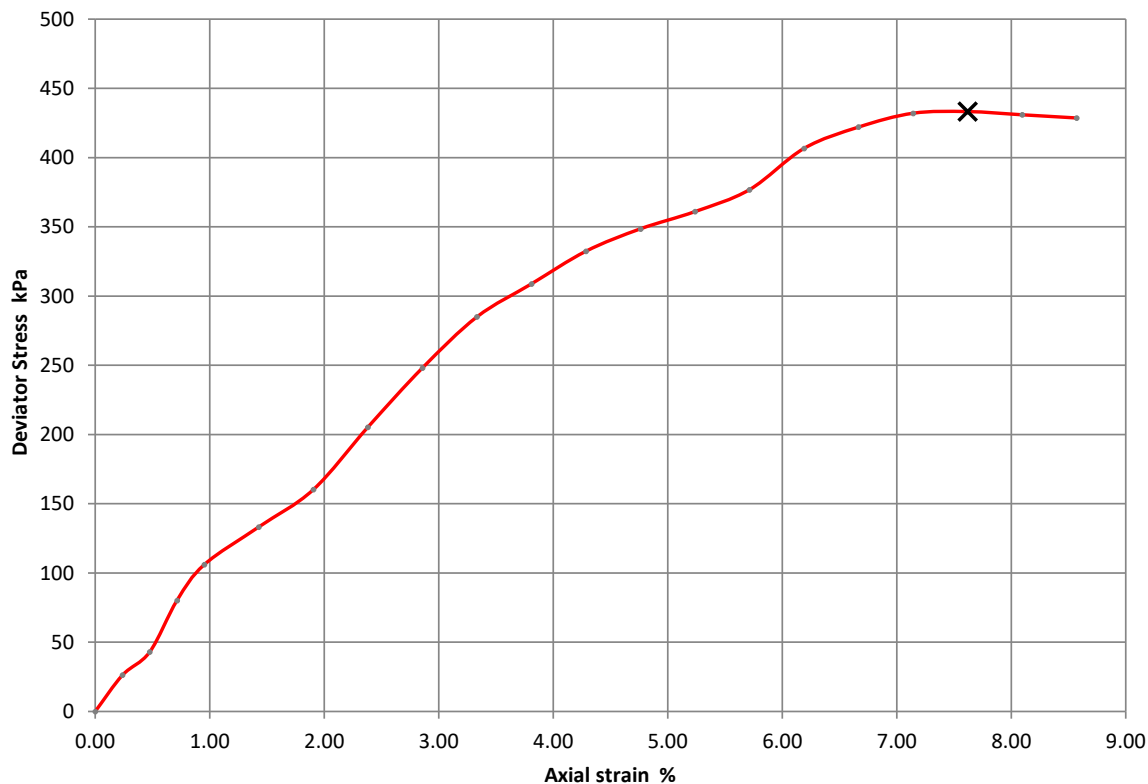
Soil Description Dark brown silty CLAY

Depth Top (m) 13.50

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 20           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.96         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.63         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 105          |
| Cell Pressure (kPa)               | 260          |
| Deviator Stress (kPa)             | 433          |
| Undrained Shear Strength (kPa)    | 217          |
| Failure Strain (%)                | 8            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test



Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial  
Test  
BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH03

Site Name 234 Bath Road, Harlington

Sample No.

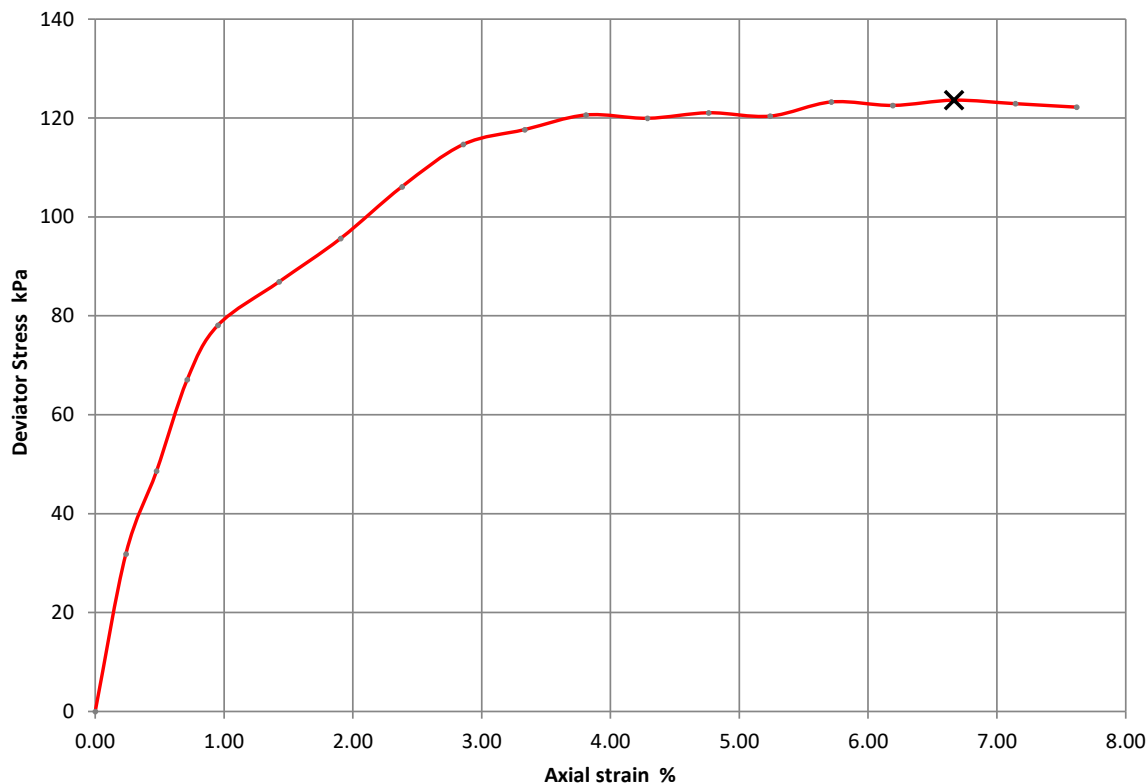
Soil Description Dark brown silty CLAY

Depth Top (m) 7.50

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 27           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.94         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.53         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 105          |
| Cell Pressure (kPa)               | 150          |
| Deviator Stress (kPa)             | 124          |
| Undrained Shear Strength (kPa)    | 62           |
| Failure Strain (%)                | 7            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test

Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial Test**  
**BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH03

Site Name 234 Bath Road, Harlington

Sample No.

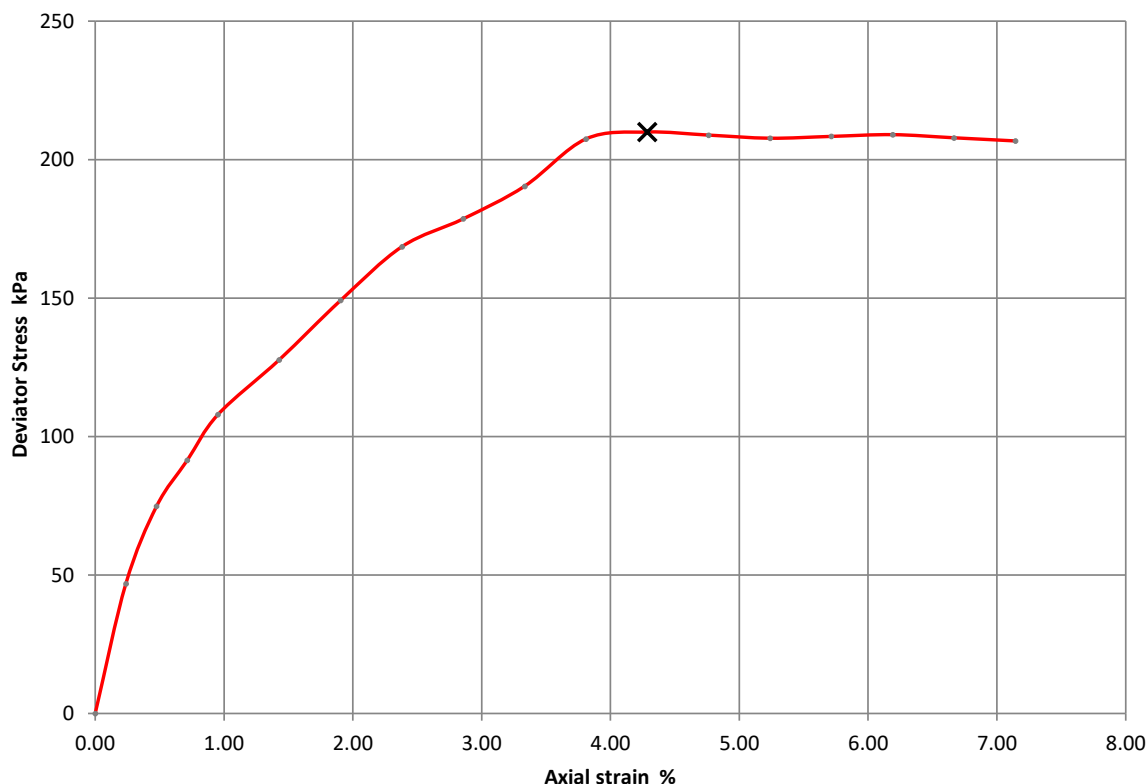
Soil Description Dark brown silty CLAY

Depth Top (m) 10.50

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 23           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.91         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.55         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 105          |
| Cell Pressure (kPa)               | 200          |
| Deviator Stress (kPa)             | 210          |
| Undrained Shear Strength (kPa)    | 105          |
| Failure Strain (%)                | 4            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test



Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial  
Test  
BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH3

Site Name 234 Bath Road, Harlington

Sample No.

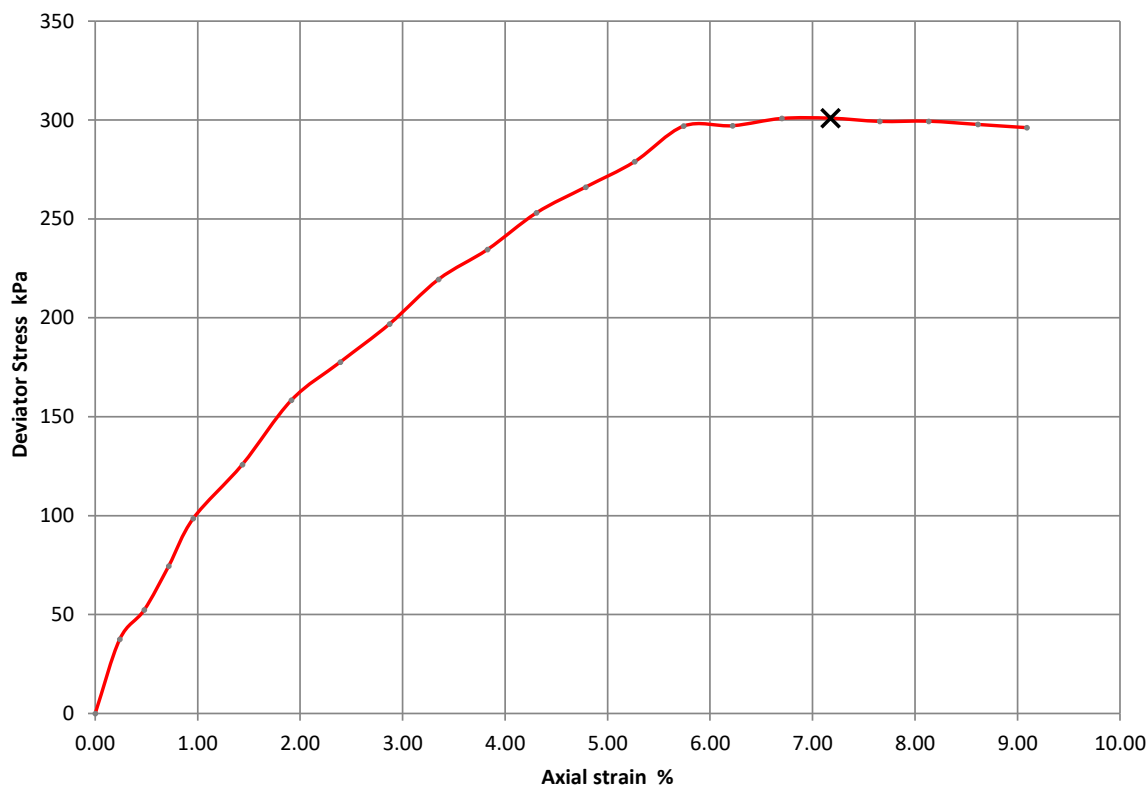
Soil Description Dark brown silty CLAY

Depth Top (m) 13.50

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 17           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.95         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.66         |
| Specimen Length (mm)              | 209          |
| Specimen Diameter (mm)            | 105          |
| Cell Pressure (kPa)               | 260          |
| Deviator Stress (kPa)             | 301          |
| Undrained Shear Strength (kPa)    | 150          |
| Failure Strain (%)                | 7            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.44         |

Specimen Post Test

Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial  
Test**  
**BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH3

Site Name 234 Bath Road, Harlington

Sample No.

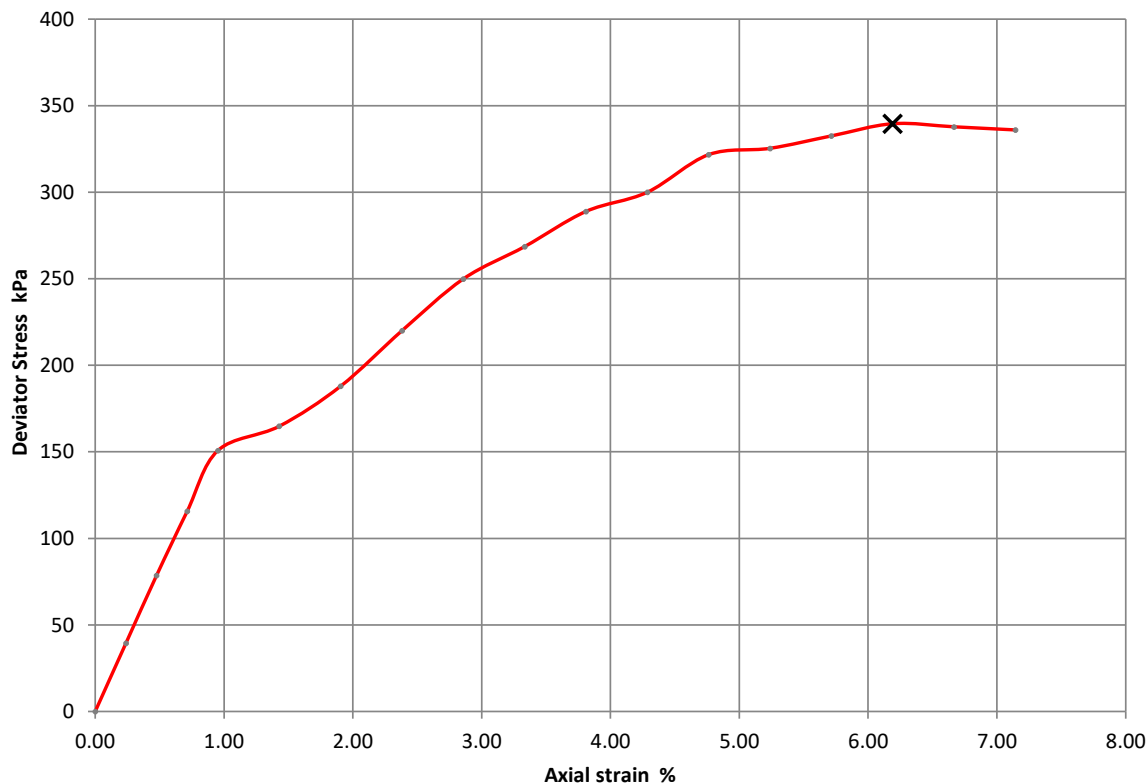
Soil Description Dark brown silty CLAY

Depth Top (m) 16.50

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 20           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.96         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.64         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 105          |
| Cell Pressure (kPa)               | 330          |
| Deviator Stress (kPa)             | 340          |
| Undrained Shear Strength (kPa)    | 170          |
| Failure Strain (%)                | 6            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test



Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |





**Single Stage Unconsolidated-Undrained Triaxial  
Test  
BS 1377 : 1990 Part 7 : 8**

Contract Number 46073

Borehole/Pit No. BH3

Site Name 234 Bath Road, Harlington

Sample No.

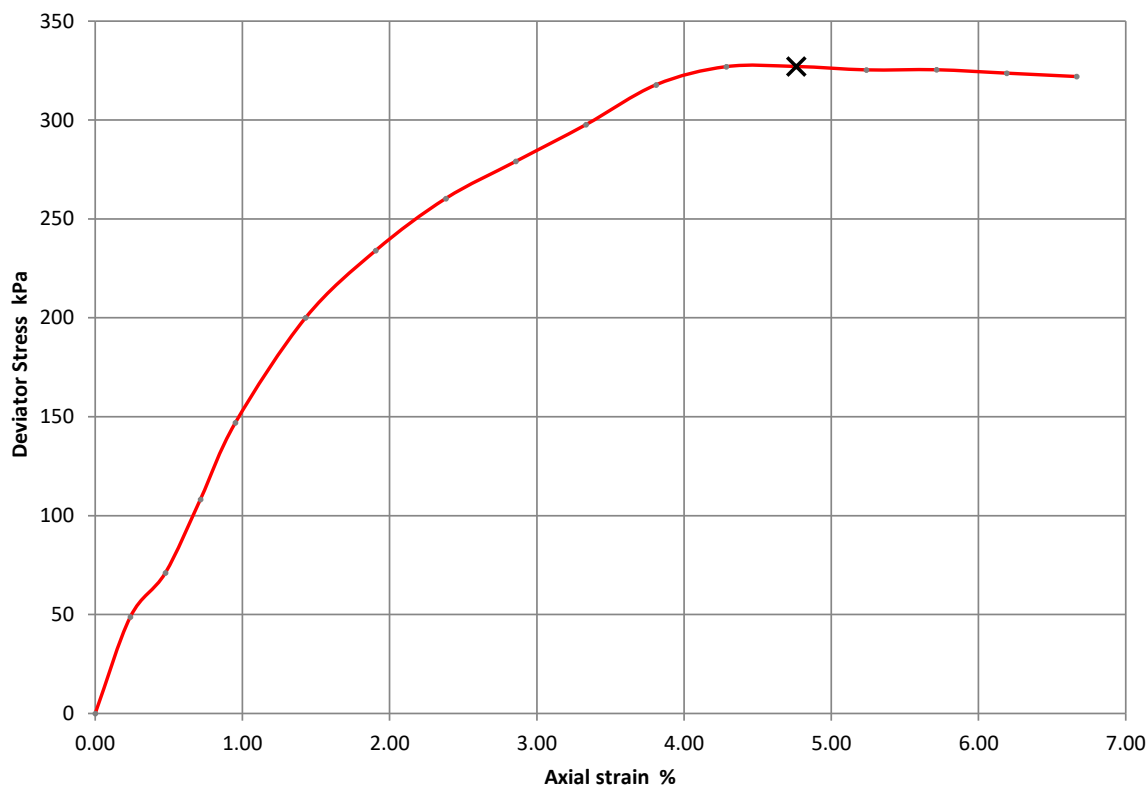
Soil Description Brown silty CLAY

Depth Top (m) 19.50

Depth Base (m)

Date Tested 18/10/2019

Sample Type U



|                                   |              |
|-----------------------------------|--------------|
| Moisture Content (%)              | 22           |
| Bulk Density (Mg/m <sup>3</sup> ) | 1.96         |
| Dry Density (Mg/m <sup>3</sup> )  | 1.61         |
| Specimen Length (mm)              | 210          |
| Specimen Diameter (mm)            | 105          |
| Cell Pressure (kPa)               | 400          |
| Deviator Stress (kPa)             | 327          |
| Undrained Shear Strength (kPa)    | 164          |
| Failure Strain (%)                | 5            |
| Mode Of Failure                   | Compound     |
| Membrane Used/Thickness           | Rubber/0.3mm |
| Rate of Strain (%/min)            | 1.43         |

Specimen Post Test



Sample Split



|          |            |            |  |
|----------|------------|------------|--|
| Checked  | 22/10/2019 | Emma Sharp |  |
| Approved | 23/10/2019 | Paul Evans |  |



## **Appendix C    Foundation Design**

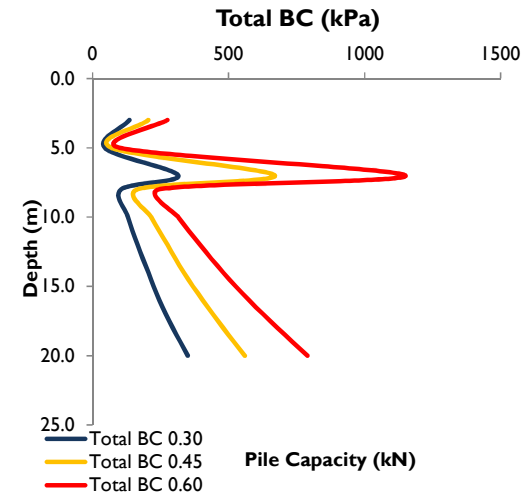
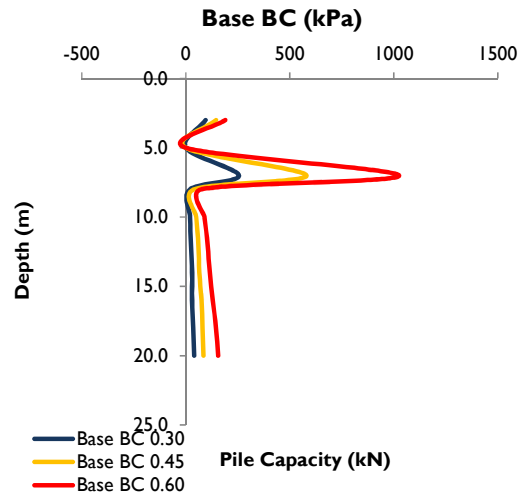
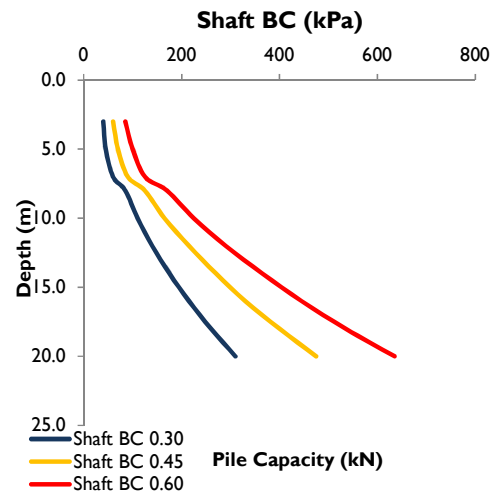
### **Appendix C.1   Preliminary Pile Design**

## Preliminary Pile Working Loads

### Single Vertically Loaded Pile (kN)

| Parameters:             | FOS:    | Shaft | Base | Alpha Value ( $\alpha$ ): | 0.45                    | Maximum no. of layers | 2 |
|-------------------------|---------|-------|------|---------------------------|-------------------------|-----------------------|---|
| Name: <u>Harlington</u> | Clay:   | 3     | 3    | GW Level: 0               | NC Value:               | 9                     |   |
| Job No: <u>17898</u>    | Chalk:  | 0     | 0    |                           | Specific Chalk Density: | 0                     |   |
| Date: <u>5.11.19</u>    | Gravel: | 0     | 0    |                           | Depth to top of strata: | 0                     |   |

Notes:



### Pile Diameter (m):

| Pile Depths |         | 0.3   |      |       | 0.45  |      |       | 0.6   |      |       | Layer |
|-------------|---------|-------|------|-------|-------|------|-------|-------|------|-------|-------|
| Material    | (m bgl) | Shaft | Base | Total | Shaft | Base | Total | Shaft | Base | Total |       |
| Gravel      | 3.0     | 40    | 95   | 135   | 60    | 145  | 205   | 85    | 190  | 275   | 1     |
| Gravel      | 5.0     | 45    | 0    | 45    | 70    | 0    | 70    | 100   | 0    | 100   | 1     |
| Gravel      | 7.0     | 60    | 255  | 315   | 90    | 580  | 670   | 125   | 1025 | 1150  | 1     |
| Clay        | 8.0     | 85    | 20   | 105   | 125   | 40   | 165   | 170   | 75   | 245   | 2     |
| Clay        | 10.0    | 110   | 20   | 130   | 165   | 50   | 215   | 225   | 90   | 315   | 2     |
| Clay        | 12.0    | 140   | 25   | 165   | 215   | 60   | 275   | 290   | 105  | 395   | 2     |
| Clay        | 14.0    | 175   | 30   | 205   | 270   | 65   | 335   | 365   | 115  | 480   | 2     |
| Clay        | 16.0    | 215   | 30   | 245   | 330   | 75   | 405   | 445   | 130  | 575   | 2     |
| Clay        | 18.0    | 260   | 35   | 295   | 400   | 80   | 480   | 535   | 145  | 680   | 2     |
| Clay        | 20.0    | 310   | 40   | 350   | 475   | 85   | 560   | 635   | 155  | 790   | 2     |

## **Appendix D    Chemical Laboratory Testing**

### **Appendix D.1   Chemical Laboratory Results**



**Nikos Sidiropoulos**

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## **Analytical Report Number : 19-66602**

|                             |                     |                               |            |
|-----------------------------|---------------------|-------------------------------|------------|
| <b>Project / Site name:</b> | Bath Rd, Harlington | <b>Samples received on:</b>   | 17/10/2019 |
| <b>Your job number:</b>     | 17898               | <b>Samples instructed on:</b> | 17/10/2019 |
| <b>Your order number:</b>   |                     | <b>Analysis completed by:</b> | 24/10/2019 |
| <b>Report Issue Number:</b> | 1                   | <b>Report issued on:</b>      | 24/10/2019 |
| <b>Samples Analysed:</b>    | 2 soil samples      |                               |            |

**Signed:** *Karolina Marek*

Karolina Marek  
Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

|           |                           |
|-----------|---------------------------|
| soils     | - 4 weeks from reporting  |
| leachates | - 2 weeks from reporting  |
| waters    | - 2 weeks from reporting  |
| asbestos  | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-66602  
Project / Site name: Bath Rd, Harlington

|                                         |       |                       |                         |               |               |  |  |  |
|-----------------------------------------|-------|-----------------------|-------------------------|---------------|---------------|--|--|--|
| Lab Sample Number                       |       |                       |                         | 1334308       | 1334309       |  |  |  |
| Sample Reference                        |       |                       |                         | WS1           | WS2           |  |  |  |
| Sample Number                           |       |                       |                         | None Supplied | None Supplied |  |  |  |
| Depth (m)                               |       |                       |                         | 0.70          | 0.80          |  |  |  |
| Date Sampled                            |       |                       |                         | 09/10/2019    | 09/10/2019    |  |  |  |
| Time Taken                              |       |                       |                         | None Supplied | None Supplied |  |  |  |
| Analytical Parameter<br>(Soil Analysis) | Units | Limit of<br>detection | Accreditation<br>Status |               |               |  |  |  |
|                                         |       |                       |                         |               |               |  |  |  |
|                                         |       |                       |                         |               |               |  |  |  |
|                                         |       |                       |                         |               |               |  |  |  |
| Stone Content                           | %     | 0.1                   | NONE                    | 42            | < 0.1         |  |  |  |
| Moisture Content                        | %     | N/A                   | NONE                    | 7.5           | 4.3           |  |  |  |
| Total mass of sample received           | kg    | 0.001                 | NONE                    | 1.3           | 1.2           |  |  |  |

|                  |      |     |           |              |              |  |  |  |
|------------------|------|-----|-----------|--------------|--------------|--|--|--|
| Asbestos in Soil | Type | N/A | ISO 17025 | Not-detected | Not-detected |  |  |  |
|------------------|------|-----|-----------|--------------|--------------|--|--|--|

#### General Inorganics

|                                                             |          |         |        |      |      |  |  |  |
|-------------------------------------------------------------|----------|---------|--------|------|------|--|--|--|
| pH - Automated                                              | pH Units | N/A     | MCERTS | 8.0  | 7.7  |  |  |  |
| Total Cyanide                                               | mg/kg    | 1       | MCERTS | < 1  | < 1  |  |  |  |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l      | 0.00125 | MCERTS | 0.15 | 0.16 |  |  |  |
| Sulphide                                                    | mg/kg    | 1       | MCERTS | 1.5  | 2.7  |  |  |  |
| Organic Matter                                              | %        | 0.1     | MCERTS | 1.1  | 0.4  |  |  |  |
| Total Organic Carbon (TOC)                                  | %        | 0.1     | MCERTS | 0.6  | 0.2  |  |  |  |

#### Total Phenols

|                            |       |   |        |       |       |  |  |  |
|----------------------------|-------|---|--------|-------|-------|--|--|--|
| Total Phenols (monohydric) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 |  |  |  |
|----------------------------|-------|---|--------|-------|-------|--|--|--|

#### Speciated PAHs

|                        |       |      |        |        |        |  |  |  |
|------------------------|-------|------|--------|--------|--------|--|--|--|
| Naphthalene            | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 |  |  |  |
| Acenaphthylene         | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 |  |  |  |
| Acenaphthene           | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 |  |  |  |
| Fluorene               | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 |  |  |  |
| Phenanthrene           | mg/kg | 0.05 | MCERTS | 0.23   | < 0.05 |  |  |  |
| Anthracene             | mg/kg | 0.05 | MCERTS | 0.07   | < 0.05 |  |  |  |
| Fluoranthene           | mg/kg | 0.05 | MCERTS | 0.48   | < 0.05 |  |  |  |
| Pyrene                 | mg/kg | 0.05 | MCERTS | 0.41   | < 0.05 |  |  |  |
| Benzo(a)anthracene     | mg/kg | 0.05 | MCERTS | 0.25   | < 0.05 |  |  |  |
| Chrysene               | mg/kg | 0.05 | MCERTS | 0.30   | < 0.05 |  |  |  |
| Benzo(b)fluoranthene   | mg/kg | 0.05 | MCERTS | 0.35   | < 0.05 |  |  |  |
| Benzo(k)fluoranthene   | mg/kg | 0.05 | MCERTS | 0.16   | < 0.05 |  |  |  |
| Benzo(a)pyrene         | mg/kg | 0.05 | MCERTS | 0.27   | < 0.05 |  |  |  |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | 0.20   | < 0.05 |  |  |  |
| Dibenz(a,h)anthracene  | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 |  |  |  |
| Benzo(ghi)perylene     | mg/kg | 0.05 | MCERTS | 0.21   | < 0.05 |  |  |  |

#### Total PAH

|                             |       |     |        |      |        |  |  |  |
|-----------------------------|-------|-----|--------|------|--------|--|--|--|
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | 2.93 | < 0.80 |  |  |  |
|-----------------------------|-------|-----|--------|------|--------|--|--|--|

#### Heavy Metals / Metalloids

|                                    |       |      |        |       |       |  |  |  |
|------------------------------------|-------|------|--------|-------|-------|--|--|--|
| Arsenic (aqua regia extractable)   | mg/kg | 1    | MCERTS | 14    | 5.4   |  |  |  |
| Beryllium (aqua regia extractable) | mg/kg | 0.06 | MCERTS | 0.59  | 0.50  |  |  |  |
| Boron (water soluble)              | mg/kg | 0.2  | MCERTS | 1.0   | 0.7   |  |  |  |
| Cadmium (aqua regia extractable)   | mg/kg | 0.2  | MCERTS | 0.9   | < 0.2 |  |  |  |
| Chromium (hexavalent)              | mg/kg | 4    | MCERTS | < 4.0 | < 4.0 |  |  |  |
| Chromium (aqua regia extractable)  | mg/kg | 1    | MCERTS | 32    | 24    |  |  |  |
| Copper (aqua regia extractable)    | mg/kg | 1    | MCERTS | 26    | 16    |  |  |  |
| Lead (aqua regia extractable)      | mg/kg | 1    | MCERTS | 54    | 30    |  |  |  |
| Mercury (aqua regia extractable)   | mg/kg | 0.3  | MCERTS | < 0.3 | < 0.3 |  |  |  |
| Nickel (aqua regia extractable)    | mg/kg | 1    | MCERTS | 22    | 17    |  |  |  |
| Selenium (aqua regia extractable)  | mg/kg | 1    | MCERTS | < 1.0 | 3.7   |  |  |  |
| Vanadium (aqua regia extractable)  | mg/kg | 1    | MCERTS | 33    | 21    |  |  |  |
| Zinc (aqua regia extractable)      | mg/kg | 1    | MCERTS | 87    | 50    |  |  |  |



**Analytical Report Number : 19-66602**

**Project / Site name: Bath Rd, Harlington**

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

| Lab Sample Number | Sample Reference | Sample Number | Depth (m) | Sample Description *                       |
|-------------------|------------------|---------------|-----------|--------------------------------------------|
| 1334308           | WS1              | None Supplied | 0.70      | Brown clay and sand with stones and gravel |
| 1334309           | WS2              | None Supplied | 0.80      | Brown clay and sand with gravel.           |

**Analytical Report Number : 19-66602**

**Project / Site name: Bath Rd, Harlington**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name                               | Analytical Method Description                                                                                                                                          | Analytical Method Reference                                                                                                       | Method number | Wet / Dry Analysis | Accreditation Status |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|----------------------|
| Asbestos identification in soil                    | Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.                                                  | In house method based on HSG 248                                                                                                  | A001-PL       | D                  | ISO 17025            |
| Boron, water soluble, in soil                      | Determination of water soluble boron in soil by hot water extract followed by ICP-OES.                                                                                 | In-house method based on Second Site Properties version 3                                                                         | L038-PL       | D                  | MCERTS               |
| Hexavalent chromium in soil                        | Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.                  | In-house method                                                                                                                   | L080-PL       | W                  | MCERTS               |
| Metals in soil by ICP-OES                          | Determination of metals in soil by aqua-regia digestion followed by ICP-OES.                                                                                           | In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.                                              | L038-PL       | D                  | MCERTS               |
| Moisture Content                                   | Moisture content, determined gravimetrically. (30 oC)                                                                                                                  | In-house method based on BS1377 Part 2, 1990, Classification tests                                                                | L019-UK/PL    | W                  | NONE                 |
| Monohydric phenols in soil                         | Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.                                                 | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)                   | L080-PL       | W                  | MCERTS               |
| Organic matter (Automated) in soil                 | Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.                                          | BS1377 Part 3, 1990, Chemical and Electrochemical Tests""                                                                         | L009-PL       | D                  | MCERTS               |
| pH in soil (automated)                             | Determination of pH in soil by addition of water followed by automated electrometric measurement.                                                                      | In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests                                                  | L099-PL       | D                  | MCERTS               |
| Speciated EPA-16 PAHs in soil                      | Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.                 | In-house method based on USEPA 8270                                                                                               | L064-PL       | D                  | MCERTS               |
| Stones content of soil                             | Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.                                            | In-house method based on British Standard Methods and MCERTS requirements.                                                        | L019-UK/PL    | D                  | NONE                 |
| Sulphate, water soluble, in soil (16hr extraction) | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).              | In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES. | L038-PL       | D                  | MCERTS               |
| Sulphide in soil                                   | Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode. | In-house method                                                                                                                   | L010-PL       | D                  | MCERTS               |
| Total cyanide in soil                              | Determination of total cyanide by distillation followed by colorimetry.                                                                                                | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)                   | L080-PL       | W                  | MCERTS               |
| Total organic carbon (Automated) in soil           | Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.                                          | In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""                                                | L009-PL       | D                  | MCERTS               |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

| Sample ID | Other ID | Sample Type | Job      | Sample Number | Sample Deviation Code | test_name             | test_ref | Test Deviation code |
|-----------|----------|-------------|----------|---------------|-----------------------|-----------------------|----------|---------------------|
| WS1       |          | S           | 19-66602 | 1334308       | c                     | Sulphide in soil      | L010-PL  | c                   |
| WS1       |          | S           | 19-66602 | 1334308       | c                     | Total cyanide in soil | L080-PL  | c                   |
| WS2       |          | S           | 19-66602 | 1334309       | c                     | Sulphide in soil      | L010-PL  | c                   |
| WS2       |          | S           | 19-66602 | 1334309       | c                     | Total cyanide in soil | L080-PL  | c                   |

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## **Analytical Report Number : 19-66756**

|                             |                     |                               |            |
|-----------------------------|---------------------|-------------------------------|------------|
| <b>Project / Site name:</b> | Bath Rd, Harlington | <b>Samples received on:</b>   | 17/10/2019 |
| <b>Your job number:</b>     | 17898               | <b>Samples instructed on:</b> | 17/10/2019 |
| <b>Your order number:</b>   |                     | <b>Analysis completed by:</b> | 24/10/2019 |
| <b>Report Issue Number:</b> | 1                   | <b>Report issued on:</b>      | 24/10/2019 |
| <b>Samples Analysed:</b>    | 4 soil samples      |                               |            |

**Signed:** *Karolina Marek*

Karolina Marek  
Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

|           |                           |
|-----------|---------------------------|
| soils     | - 4 weeks from reporting  |
| leachates | - 2 weeks from reporting  |
| waters    | - 2 weeks from reporting  |
| asbestos  | - 6 months from reporting |

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-66756  
Project / Site name: Bath Rd, Harlington

|                                         |       |                       |                         |               |               |               |               |  |
|-----------------------------------------|-------|-----------------------|-------------------------|---------------|---------------|---------------|---------------|--|
| Lab Sample Number                       |       |                       |                         | 1335157       | 1335158       | 1335159       | 1335160       |  |
| Sample Reference                        |       |                       |                         | BH1           | BH2           | BH3           | BH3           |  |
| Sample Number                           |       |                       |                         | None Supplied | None Supplied | None Supplied | None Supplied |  |
| Depth (m)                               |       |                       |                         | 0.20          | 0.50          | 0.50          | 1.00          |  |
| Date Sampled                            |       |                       |                         | 11/10/2019    | 11/10/2019    | 11/10/2019    | 11/10/2019    |  |
| Time Taken                              |       |                       |                         | None Supplied | None Supplied | None Supplied | None Supplied |  |
| Analytical Parameter<br>(Soil Analysis) | Units | Limit of<br>detection | Accreditation<br>Status |               |               |               |               |  |
|                                         |       |                       |                         |               |               |               |               |  |
|                                         |       |                       |                         |               |               |               |               |  |
|                                         |       |                       |                         |               |               |               |               |  |
|                                         |       |                       |                         |               |               |               |               |  |
| Stone Content                           | %     | 0.1                   | NONE                    | 26            | < 0.1         | < 0.1         | 29            |  |
| Moisture Content                        | %     | N/A                   | NONE                    | 3.5           | 9.3           | 11            | 4.6           |  |
| Total mass of sample received           | kg    | 0.001                 | NONE                    | 1.3           | 1.2           | 1.2           | 1.2           |  |

|                  |      |     |           |              |              |              |              |  |
|------------------|------|-----|-----------|--------------|--------------|--------------|--------------|--|
| Asbestos in Soil | Type | N/A | ISO 17025 | Not-detected | Not-detected | Not-detected | Not-detected |  |
|------------------|------|-----|-----------|--------------|--------------|--------------|--------------|--|

#### General Inorganics

|                                                             |          |         |        |       |      |       |       |  |
|-------------------------------------------------------------|----------|---------|--------|-------|------|-------|-------|--|
| pH - Automated                                              | pH Units | N/A     | MCERTS | 9.7   | 10.0 | 8.6   | 8.4   |  |
| Total Cyanide                                               | mg/kg    | 1       | MCERTS | < 1   | < 1  | < 1   | < 1   |  |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l      | 0.00125 | MCERTS | 0.043 | 0.60 | 0.038 | 0.072 |  |
| Sulphide                                                    | mg/kg    | 1       | MCERTS | < 1.0 | 9.0  | < 1.0 | < 1.0 |  |
| Organic Matter                                              | %        | 0.1     | MCERTS | < 0.1 | 1.2  | 0.6   | 0.4   |  |
| Total Organic Carbon (TOC)                                  | %        | 0.1     | MCERTS | < 0.1 | 0.7  | 0.4   | 0.2   |  |

#### Total Phenols

|                            |       |   |        |       |       |       |       |  |
|----------------------------|-------|---|--------|-------|-------|-------|-------|--|
| Total Phenols (monohydric) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |  |
|----------------------------|-------|---|--------|-------|-------|-------|-------|--|

#### Speciated PAHs

|                        |       |      |        |        |        |        |        |  |
|------------------------|-------|------|--------|--------|--------|--------|--------|--|
| Naphthalene            | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |  |
| Acenaphthylene         | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |  |
| Acenaphthene           | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |  |
| Fluorene               | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |  |
| Phenanthrene           | mg/kg | 0.05 | MCERTS | < 0.05 | 0.84   | < 0.05 | < 0.05 |  |
| Anthracene             | mg/kg | 0.05 | MCERTS | < 0.05 | 0.23   | < 0.05 | < 0.05 |  |
| Fluoranthene           | mg/kg | 0.05 | MCERTS | < 0.05 | 1.7    | < 0.05 | < 0.05 |  |
| Pyrene                 | mg/kg | 0.05 | MCERTS | < 0.05 | 2.3    | < 0.05 | < 0.05 |  |
| Benzo(a)anthracene     | mg/kg | 0.05 | MCERTS | < 0.05 | 1.4    | < 0.05 | < 0.05 |  |
| Chrysene               | mg/kg | 0.05 | MCERTS | < 0.05 | 1.3    | < 0.05 | < 0.05 |  |
| Benzo(b)fluoranthene   | mg/kg | 0.05 | MCERTS | < 0.05 | 1.6    | < 0.05 | < 0.05 |  |
| Benzo(k)fluoranthene   | mg/kg | 0.05 | MCERTS | < 0.05 | 0.46   | < 0.05 | < 0.05 |  |
| Benzo(a)pyrene         | mg/kg | 0.05 | MCERTS | < 0.05 | 1.3    | < 0.05 | < 0.05 |  |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | 0.58   | < 0.05 | < 0.05 |  |
| Dibenz(a,h)anthracene  | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |  |
| Benzo(ghi)perylene     | mg/kg | 0.05 | MCERTS | < 0.05 | 0.69   | < 0.05 | < 0.05 |  |

#### Total PAH

|                             |       |     |        |        |      |        |        |  |
|-----------------------------|-------|-----|--------|--------|------|--------|--------|--|
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | < 0.80 | 12.3 | < 0.80 | < 0.80 |  |
|-----------------------------|-------|-----|--------|--------|------|--------|--------|--|

#### Heavy Metals / Metalloids

|                                    |       |      |        |       |       |       |       |  |
|------------------------------------|-------|------|--------|-------|-------|-------|-------|--|
| Arsenic (aqua regia extractable)   | mg/kg | 1    | MCERTS | 6.5   | 7.6   | 6.6   | 16    |  |
| Beryllium (aqua regia extractable) | mg/kg | 0.06 | MCERTS | 0.08  | 0.43  | 0.65  | 0.63  |  |
| Boron (water soluble)              | mg/kg | 0.2  | MCERTS | 0.4   | 2.1   | 2.1   | 0.4   |  |
| Cadmium (aqua regia extractable)   | mg/kg | 0.2  | MCERTS | 0.6   | 0.9   | < 0.2 | < 0.2 |  |
| Chromium (hexavalent)              | mg/kg | 4    | MCERTS | < 4.0 | < 4.0 | < 4.0 | < 4.0 |  |
| Chromium (aqua regia extractable)  | mg/kg | 1    | MCERTS | 7.3   | 17    | 26    | 30    |  |
| Copper (aqua regia extractable)    | mg/kg | 1    | MCERTS | 7.4   | 19    | 12    | 14    |  |
| Lead (aqua regia extractable)      | mg/kg | 1    | MCERTS | 42    | 60    | 19    | 13    |  |
| Mercury (aqua regia extractable)   | mg/kg | 0.3  | MCERTS | < 0.3 | < 0.3 | < 0.3 | < 0.3 |  |
| Nickel (aqua regia extractable)    | mg/kg | 1    | MCERTS | 4.6   | 19    | 18    | 24    |  |
| Selenium (aqua regia extractable)  | mg/kg | 1    | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |  |
| Vanadium (aqua regia extractable)  | mg/kg | 1    | MCERTS | 6.2   | 26    | 40    | 33    |  |
| Zinc (aqua regia extractable)      | mg/kg | 1    | MCERTS | 81    | 77    | 45    | 37    |  |

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|                                         |               |                       |                         |               |  |
|-----------------------------------------|---------------|-----------------------|-------------------------|---------------|--|
| Lab Sample Number                       | 1335157       | 1335158               | 1335159                 | 1335160       |  |
| Sample Reference                        | BH1           | BH2                   | BH3                     | BH3           |  |
| Sample Number                           | None Supplied | None Supplied         | None Supplied           | None Supplied |  |
| Depth (m)                               | 0.20          | 0.50                  | 0.50                    | 1.00          |  |
| Date Sampled                            | 11/10/2019    | 11/10/2019            | 11/10/2019              | 11/10/2019    |  |
| Time Taken                              | None Supplied | None Supplied         | None Supplied           | None Supplied |  |
| Analytical Parameter<br>(Soil Analysis) | Units         | Limit of<br>detection | Accreditation<br>Status |               |  |

#### Monoaromatics & Oxygenates

|                                    |       |   |        |       |       |       |   |  |
|------------------------------------|-------|---|--------|-------|-------|-------|---|--|
| Benzene                            | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | - |  |
| Toluene                            | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | - |  |
| Ethylbenzene                       | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | - |  |
| p & m-xylene                       | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | - |  |
| o-xylene                           | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | - |  |
| MTBE (Methyl Tertiary Butyl Ether) | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | - |  |

#### Petroleum Hydrocarbons

|                                         |       |       |        |         |         |         |   |  |
|-----------------------------------------|-------|-------|--------|---------|---------|---------|---|--|
| TPH-CWG - Aliphatic >EC5 - EC6          | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |  |
| TPH-CWG - Aliphatic >EC6 - EC8          | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |  |
| TPH-CWG - Aliphatic >EC8 - EC10         | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |  |
| TPH-CWG - Aliphatic >EC10 - EC12        | mg/kg | 1     | MCERTS | < 1.0   | < 1.0   | < 1.0   | - |  |
| TPH-CWG - Aliphatic >EC12 - EC16        | mg/kg | 2     | MCERTS | < 2.0   | < 2.0   | < 2.0   | - |  |
| TPH-CWG - Aliphatic >EC16 - EC21        | mg/kg | 8     | MCERTS | < 8.0   | < 8.0   | < 8.0   | - |  |
| TPH-CWG - Aliphatic >EC21 - EC35        | mg/kg | 8     | MCERTS | < 8.0   | 52      | < 8.0   | - |  |
| TPH-CWG - Aliphatic > EC35 - EC44       | mg/kg | 8.4   | NONE   | < 8.4   | 56      | < 8.4   | - |  |
| <b>TPH-CWG - Aliphatic (EC5 - EC35)</b> | mg/kg | 10    | MCERTS | < 10    | 56      | < 10    | - |  |
| <b>TPH-CWG - Aliphatic (EC5 - EC44)</b> | mg/kg | 10    | NONE   | < 10    | 110     | < 10    | - |  |

|                                        |       |       |        |         |         |         |   |  |
|----------------------------------------|-------|-------|--------|---------|---------|---------|---|--|
| TPH-CWG - Aromatic >EC5 - EC7          | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |  |
| TPH-CWG - Aromatic >EC7 - EC8          | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |  |
| TPH-CWG - Aromatic >EC8 - EC10         | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |  |
| TPH-CWG - Aromatic >EC10 - EC12        | mg/kg | 1     | MCERTS | < 1.0   | < 1.0   | < 1.0   | - |  |
| TPH-CWG - Aromatic >EC12 - EC16        | mg/kg | 2     | MCERTS | < 2.0   | 8.9     | < 2.0   | - |  |
| TPH-CWG - Aromatic >EC16 - EC21        | mg/kg | 10    | MCERTS | < 10    | 27      | < 10    | - |  |
| TPH-CWG - Aromatic >EC21 - EC35        | mg/kg | 10    | MCERTS | < 10    | 190     | < 10    | - |  |
| TPH-CWG - Aromatic > EC35 - EC44       | mg/kg | 8.4   | NONE   | < 8.4   | 99      | < 8.4   | - |  |
| <b>TPH-CWG - Aromatic (EC5 - EC35)</b> | mg/kg | 10    | MCERTS | < 10    | 220     | < 10    | - |  |
| <b>TPH-CWG - Aromatic (EC5 - EC44)</b> | mg/kg | 10    | NONE   | < 10    | 320     | < 10    | - |  |

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| Lab Sample Number                       |       |                       |                         | 1335157       | 1335158       | 1335159       | 1335160       |  |
|-----------------------------------------|-------|-----------------------|-------------------------|---------------|---------------|---------------|---------------|--|
| Sample Reference                        |       |                       |                         | BH1           | BH2           | BH3           | BH3           |  |
| Sample Number                           |       |                       |                         | None Supplied | None Supplied | None Supplied | None Supplied |  |
| Depth (m)                               |       |                       |                         | 0.20          | 0.50          | 0.50          | 1.00          |  |
| Date Sampled                            |       |                       |                         | 11/10/2019    | 11/10/2019    | 11/10/2019    | 11/10/2019    |  |
| Time Taken                              |       |                       |                         | None Supplied | None Supplied | None Supplied | None Supplied |  |
| Analytical Parameter<br>(Soil Analysis) | Units | Limit of<br>detection | Accreditation<br>Status |               |               |               |               |  |
| <b>Organochlorine Pesticides (OCP)</b>  |       |                       |                         |               |               |               |               |  |
| Aldrin                                  | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| BHC-alpha (benzene hexachloride)        | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| BHC-beta                                | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| BHC-delta                               | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| BHC-gamma (Lindane, gamma HCH)          | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Chlordane-cis                           | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Chlordane-trans                         | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Chlorothalonil                          | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| DDD-o,p'                                | µg/kg | 1                     | NONE                    | -             | < 1.0         | -             | -             |  |
| DDD-p,p'                                | µg/kg | 1                     | NONE                    | -             | < 1.0         | -             | -             |  |
| DDE-o, p'                               | µg/kg | 1                     | NONE                    | -             | < 1.0         | -             | -             |  |
| DDE-p,p'                                | µg/kg | 1                     | NONE                    | -             | 2.4           | -             | -             |  |
| DDT-o,p'                                | µg/kg | 1                     | NONE                    | -             | < 1.0         | -             | -             |  |
| DDT-p,p'                                | µg/kg | 1                     | NONE                    | -             | < 1.0         | -             | -             |  |
| Dichlorobenzonitrile, 2,6-              | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Dieldrin                                | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Endosulfan I (alpha isomer)             | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Endosulfan II (beta isomer)             | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Endosulfan sulfate                      | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Endrin                                  | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Endrin aldehyde                         | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Endrin ketone                           | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Heptachlor                              | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Heptachlor exo-epoxide                  | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Hexachlorobenzene                       | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Hexachlorobutadiene                     | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Isodrin                                 | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Methoxychlor, p,p'                      | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Pentachlorobenzene                      | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Tecnazene                               | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Tetrachlorobenzene, 1,2,4,5-            | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Trichlorobenzene, 1,2,3-                | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Trichlorobenzene, 1,3,5-                | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |
| Trifluralin                             | µg/kg | 10                    | NONE                    | -             | < 10          | -             | -             |  |



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\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

| Lab Sample Number | Sample Reference | Sample Number | Depth (m) | Sample Description *                       |
|-------------------|------------------|---------------|-----------|--------------------------------------------|
| 1335157           | BH1              | None Supplied | 0.20      | Brown gravelly sand with stones.           |
| 1335158           | BH2              | None Supplied | 0.50      | Brown loam and sand with gravel and brick. |
| 1335159           | BH3              | None Supplied | 0.50      | Brown loam and clay with gravel.           |
| 1335160           | BH3              | None Supplied | 1.00      | Brown clay and sand with stones and gravel |

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**Project / Site name: Bath Rd, Harlington**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name                               | Analytical Method Description                                                                                                                                          | Analytical Method Reference                                                                                                       | Method number | Wet / Dry Analysis | Accreditation Status |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|----------------------|
| Asbestos identification in soil                    | Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.                                                  | In house method based on HSG 248                                                                                                  | A001-PL       | D                  | ISO 17025            |
| Boron, water soluble, in soil                      | Determination of water soluble boron in soil by hot water extract followed by ICP-OES.                                                                                 | In-house method based on Second Site Properties version 3                                                                         | L038-PL       | D                  | MCERTS               |
| BTEX and MTBE in soil (Monoaromatics)              | Determination of BTEX in soil by headspace GC-MS.                                                                                                                      | In-house method based on USEPA8260                                                                                                | L0738-PL      | W                  | MCERTS               |
| Hexavalent chromium in soil                        | Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.                  | In-house method                                                                                                                   | L080-PL       | W                  | MCERTS               |
| Metals in soil by ICP-OES                          | Determination of metals in soil by aqua-regia digestion followed by ICP-OES.                                                                                           | In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.                                              | L038-PL       | D                  | MCERTS               |
| Moisture Content                                   | Moisture content, determined gravimetrically. (30 oC)                                                                                                                  | In-house method based on BS1377 Part 2, 1990, Classification tests                                                                | L019-UK/PL    | W                  | NONE                 |
| Monohydric phenols in soil                         | Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.                                                 | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)                   | L080-PL       | W                  | MCERTS               |
| Organic matter (Automated) in soil                 | Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.                                          | BS1377 Part 3, 1990, Chemical and Electrochemical Tests""                                                                         | L009-PL       | D                  | MCERTS               |
| Organochlorine Pesticides in soil by GC MS/MS      | Determination of Pesticides in soil by GC MS/MS                                                                                                                        | Organochlorine Pesticides in soil by GC MS/MS                                                                                     | L0558-PL      | D                  | NONE                 |
| pH in soil (automated)                             | Determination of pH in soil by addition of water followed by automated electrometric measurement.                                                                      | In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests                                                  | L099-PL       | D                  | MCERTS               |
| Speciated EPA-16 PAHs in soil                      | Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.                 | In-house method based on USEPA 8270                                                                                               | L064-PL       | D                  | MCERTS               |
| Stones content of soil                             | Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.                                            | In-house method based on British Standard Methods and MCERTS requirements.                                                        | L019-UK/PL    | D                  | NONE                 |
| Sulphate, water soluble, in soil (16hr extraction) | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).              | In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES. | L038-PL       | D                  | MCERTS               |
| Sulphide in soil                                   | Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode. | In-house method                                                                                                                   | L010-PL       | D                  | MCERTS               |
| Total cyanide in soil                              | Determination of total cyanide by distillation followed by colorimetry.                                                                                                | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)                   | L080-PL       | W                  | MCERTS               |
| Total organic carbon (Automated) in soil           | Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.                                          | In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""                                                | L009-PL       | D                  | MCERTS               |
| TPH in (Soil)                                      | Determination of TPH bands by HS-GC-MS/GC-FID                                                                                                                          | In-house method, TPH with carbon banding and silica gel split/cleanup.                                                            | L076-PL       | D                  | NONE                 |

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The results included within the report are representative of the samples submitted for analysis.

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**Project / Site name: Bath Rd, Harlington**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name | Analytical Method Description                                             | Analytical Method Reference                     | Method number | Wet / Dry Analysis | Accreditation Status |
|----------------------|---------------------------------------------------------------------------|-------------------------------------------------|---------------|--------------------|----------------------|
| TPHCWG (Soil)        | Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID. | In-house method with silica gel split/clean up. | L088/76-PL    | W                  | MCERTS               |

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

## **Appendix D.2   General Assessment Criteria**

## HUMAN HEALTH RISK ASSESSMENT

### 1.1 Introduction

Human Health Generic Quantitative Risk Assessment (GQRA) involves the comparison of contaminant concentrations measured in soil at the site with Generic Assessment Criteria (GAC).

GAC are conservative values adopted to ensure that they are applicable to the majority of possible contaminated site. These values may be published Contaminated Land Exposure Assessment Model (CLEA) derived GAC derived by a third party or the Environment Agency/ DEFRA. It is imperative to the risk assessor to understand the uncertainties and limitations associated with these GAC to ensure that they are used appropriately. Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a Detailed Quantitative Risk Assessment (DQRA) may be undertaken to develop site specific values for relevant soil contaminants based on the site specific conditions.

### 1.2 General Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'.

#### 1.2.1 Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment Model (CLEA).

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**The CLEA Guidance comprises the following documents:**

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- EA Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
  - EA Science Report SC050021/SR3: Updated technical background to the CLEA model.
  - EA CLEA Bulletin (2009).
  - CLEA software version 1.04 (2009)
  - Toxicological reports and SGV technical notes.
- 

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**The CLEA guidance and tools:**

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1. do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures.
  2. do not cover risks to the environment, such as groundwater, ecosystems or buildings.
  3. do not provide a definitive test for telling when human health risks are significant.
  4. are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.
- 

### 1.3 Soil Guideline Values (2009)

The EA are publishing a series of SGV reports for a selection of common contaminants relevant to the assessment of land contamination.

SGV's are generic assessment criteria based on CLEA standard land-uses and can be used to simplify the assessment of human health risks from long-term exposure to

chemical contamination in soil. They do not cover short-term exposure (i.e. construction and maintenance workers), acute exposure or other risks such as fire, suffocation or explosion, as might arise from an accumulation of gases such as methane and carbon dioxide, or either odour or aesthetic issues.

SGV's represent 'trigger values', indicators that soil concentrations above the SGV level may pose a possibility of *significant harm* to human health. The converse, where soil concentrations are less than the SGV, is that the long-term human health risks are considered to be tolerable or minimal.

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

#### **1.4 Ongoing development of CLEA based guidance**

The EA is involved in a programme of publishing SGV's and related toxicity data (the TOX reports). As at July 2009 ten SGV's and matching TOX reports had been published. Soil Assessment Criteria (SAC's) may be derived using toxicity data from the updated TOX reports, where these are published, or from the original TOX reports. SGV reports also take account of recent updates for plant uptake and other factors.

- 
- GAC's developed by CLEA guidance and given in this report will need to be assessed against updated TOX reports and SGV's when these are published.
  - SGV reports may give values that differ from the GAC's used in this report.
  - These variations may materially alter the remediation requirement for the site, requiring either an increase or decrease in the extent, type and cost of remediation.
- 

#### **1.5 Phytotoxicity**

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

ICRCL 70/90: *Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing.*

#### **1.6 Other Generic Assessment Criteria**

If an SGV is not available for a substance identified in the soil then the range of Generic Assessment Criteria published from a collaborative research by Land Quality Management Limited (LQM) and the Chartered Institute of Environmental Health (CIEH) are used for example. In the case of Lead, Category 4 screening levels (C4SLs) have replaced the AtRisk Soil SSV.

##### **1.6.1 EIC/AGS/CL: AIRE**

The report represents the collaborative effort of risk assessors from 26 EIC and AGS member companies to produce generic assessment criteria (GAC) for soils for human health risk assessment. The project involved the collation and review of physico-chemical data, toxicological data and information on background

exposure for 44 contaminants sometimes encountered on land affected by contamination in the UK and the derivation of GAC for 351 of these using the CLEA model (v1.06). The GAC are intended to complement soil guideline values (SGV) produced by the Environment Agency of England and Wales and the 2nd edition GAC produced by LQM and CIEH (Nathanail et al, 2009). All three sets of assessment criteria have been derived in general accordance with the Environment Agency of England and Wales Contaminated Land Exposure Assessment (CLEA) guidance and thus the combined efforts of these three groups have resulted in a useful set of screening criteria for the assessment of risks to human health from soil contamination for more than 120 potentially contaminative substances.

#### **1.6.2 CL: AIRE Category 4 screening levels (C4SLs) (2014)**

A new statutory DEFRA guidance recently (i.e. August 2014) published some GACs with a more pragmatic (but still strongly precautionary) approach in their derivation called the Category 4 screening levels (C4SLs). These values provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land. They are intended as generic screening values, (ii) they describe a level of risk that whilst above 'minimal' is still 'low' and (iii) they provide a 'higher simple test' for deciding that land is suitable for use and definitely not contaminated. These values were derived for four generic land uses: residential, commercial, allotments, and public open space.

#### **1.6.3 LQM/CIEH Suitable 4 Use Level (S4UL) (2015)**

The new S4UL's ((Nathanail et al, 2015), was developed for around 85 substances and are intended to enable a screening assessment of the risks posed by soil quality on development sites. The updated LQM/CIEH GAC publication was developed to accommodate recent developments in the understanding of chemical, toxicological and routine exposure to soil-based contaminants. The S4ULs were:

- based on Health Criteria Values, updated to reflect changes since 2009
- derived for the standard CLEA land uses and the two public open space scenarios developed by Defra SP1010
- developed for ca 85 substances (those previously covered by the LQM/CIEH GAC and the SGV substances);
- Compliant with SR2 and the long standing principle of 'suitable for use' and reflecting changes to exposure parameters produced by Defra SP1010.

For derivation of these Generic Assessment Criteria reference must be made to: Nathanail, P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A., Ogden, R., Scott, D. *The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (3<sup>rd</sup> edition)*. **Land Quality Press**. 2015.

## 1.7 Standard Land-use Scenarios

The standard land-use scenarios used to develop conceptual exposure models are presented in the following sections:

### 1.7.1 Residential

Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

- 
- Critical receptor is a young female child (zero to six years old)
  - Exposure duration is six years.
  - Exposure pathways include direct soil and indoor dust ingestion, consumption of home-grown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
  - Building type is a two-storey small terraced house.
- 

A sub-set of this land-use is residential apartments with communal landscaped gardens where the consumption of home grown vegetables will not occur.

### 1.7.2 Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption.

Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

- 
- Critical receptor is a young female child (zero to six years old)
  - Exposure duration is six years.
  - Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
  - There is no building.
- 

### 1.7.3 Commercial/Industrial

The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work.

- 
- Critical receptor is a working female adult (aged 16 to 65 years old).
  - Exposure duration is a working lifetime of 49 years.
  - Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
  - Building type is a three-storey office (pre 1970).
-

#### 1.7.4 Public Open Space within Residential Area

The generic scenario refers to any grassed area 0.05 ha and that is close to Housing.

- 
- Grassed area of up to 0.05 ha and a considerable proportion of this (up to 50%) may be bare soil
- 
- Predominantly used by children for playing and may be used for activities such as a football kick about
- 
- Sufficiently close proximity to home for tracking back of soil to occur, thus indoor exposure pathways apply
- 
- older children as the critical receptor on basis that they will use site most frequently (Age class 4-9)
- 
- ingestion rate 75 mg.day<sup>-1</sup>
- 

#### 1.7.5 Public Open Space Park

This generic scenario refers to any public park that is more than 0.5ha in area:

- 
- Public park (>0.5 ha), predominantly grassed and may also contain children's play equipment and border areas of soil containing flowers or shrubs (75% cover)
- 
- Female child age classes 1-6
- 
- Soil ingestion rate of 50 mg.day<sup>-1</sup>
- 
- Occupancy period outdoors = 2 hours.day<sup>-1</sup>
- 
- Exposure frequency of 170 days.year<sup>-1</sup> for age classes 2-18 and 85 days.year<sup>-1</sup> for age class 1
- 
- Outdoor exposure pathways only (no tracking back).
- 

### 1.8 Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of an SGV/GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaken to develop site specific values for relevant soil contaminants.

- 
- Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.
- 
- Developing more accurate parameters using site data.
- 

### 1.9 Current Criteria

Table 1 presents the current Generic Assessment Criteria and reference should be made to the original publications if needed.

### 1.10 Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) and CL: AIRE Category 4 screening levels (C4SLs) (2014) addressed the statistical treatment of test results and their comparison to Soil Guideline Values.

Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95<sup>th</sup> percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

The DEFRA discussion paper Assessing risks from land contamination – a proportionate approach ('the way forward') (CLAN06/2006) aimed to increase understanding of the role that statistics can play in quantifying the uncertainty attached to the estimates of the mean concentration of contaminants in soil. In direct response CLAIRE/CIEH published a joint report, *Guidance in comparing soil contamination data with a critical concentration* (CLAIRE/CIEH 2008). A software implementation of the statistical techniques given in the report was published by ESI International (2008).

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**Treatment of Hot-Spots**

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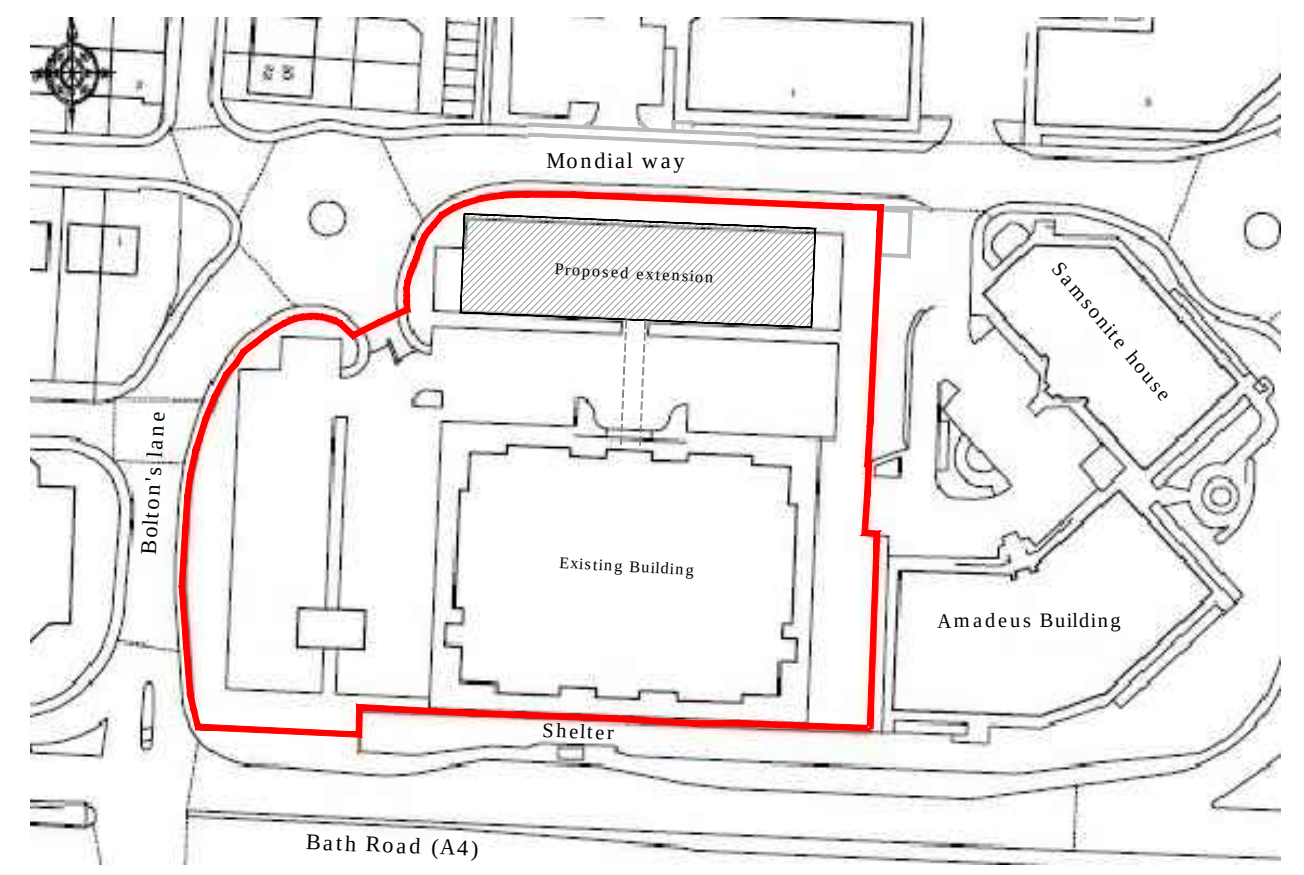
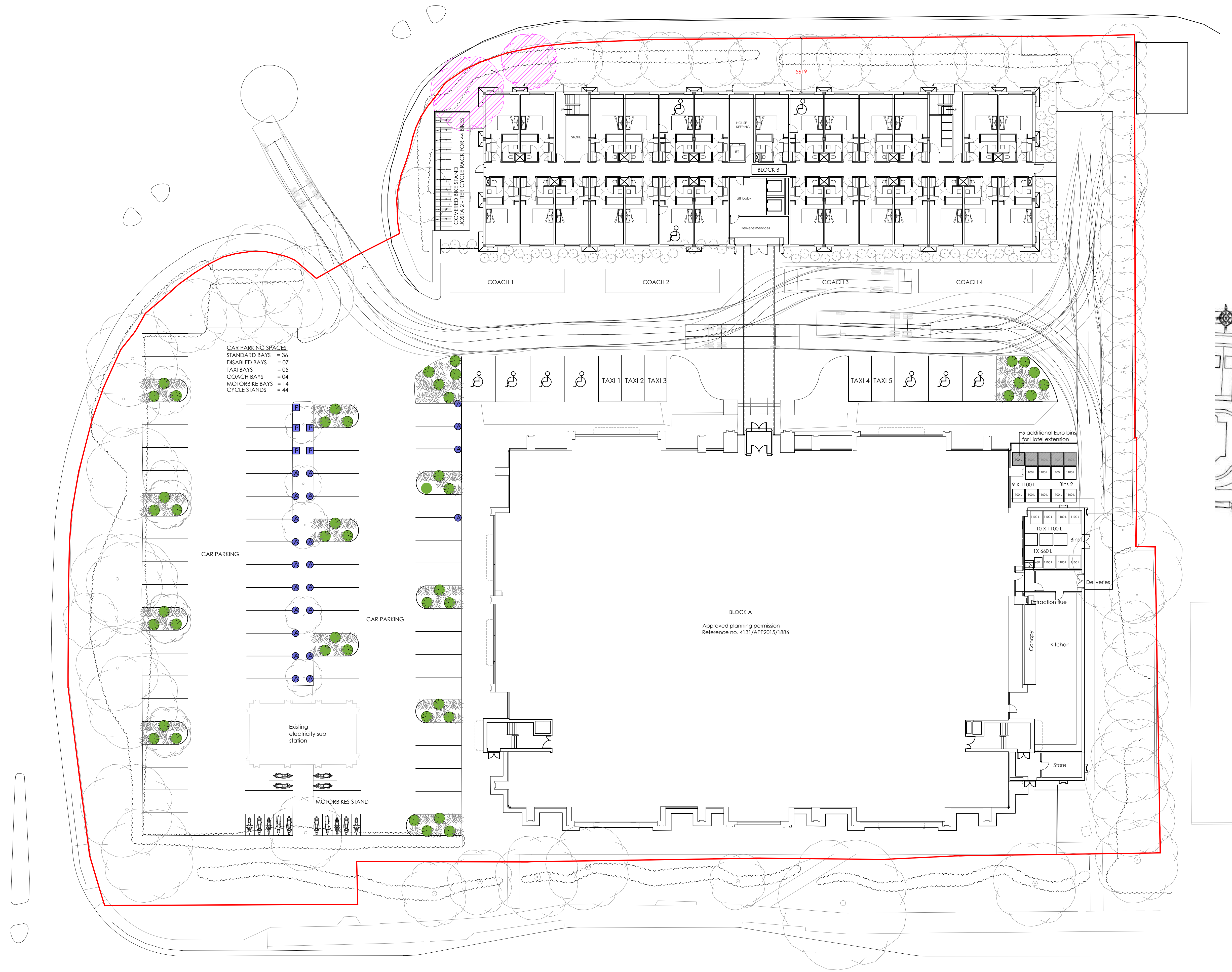
- A statistical test is applied to establish whether the data is a part of a single set, or whether data outliers are present.
  - Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, the hot-spot(s) may be excluded and the mean of the remaining data assessed.
-

| Land Use                         |                      |           | Residential With or Without Plant Uptake |       |       |         |       |       |            |        |        | Public Open Space (POS) |         |         |             |        |        |        |                     |                     | Name     | Authority | Date     |      |
|----------------------------------|----------------------|-----------|------------------------------------------|-------|-------|---------|-------|-------|------------|--------|--------|-------------------------|---------|---------|-------------|--------|--------|--------|---------------------|---------------------|----------|-----------|----------|------|
|                                  |                      |           | With                                     |       |       | Without |       |       | Allotments |        |        | Commercial              |         |         | Residential |        |        | Park   |                     |                     |          |           |          |      |
|                                  |                      |           | SOM                                      | 1.0   | 2.5   | 6       | 1     | 2.5   |            |        |        |                         |         |         |             |        |        |        |                     |                     |          |           |          | 6    |
| Type                             | Contaminants         | Species   | Year                                     |       |       |         |       |       |            |        |        |                         |         |         |             |        |        |        |                     |                     |          |           |          |      |
| Metals                           | Antimony             |           | 2010                                     |       |       |         | 550   |       |            |        |        |                         | 7500    |         |             |        |        |        | EIC/AGS/<br>CL:AIRE | EIC/AGS/<br>CL:AIRE | 2010     |           |          |      |
|                                  | Arsenic              |           | 2014                                     | 37    |       |         | 40    |       |            | 49     |        |                         | 640     |         |             | 79     |        |        | 168                 | C4SL                | DEFRA    | 2014      |          |      |
|                                  |                      |           | 2015                                     | 37    |       |         | 40    |       |            | 40     |        |                         | 640     |         |             | 79     |        |        | 170                 | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  | Beryllium            |           | 2015                                     | 1.7   |       |         | 1.7   |       |            | 35     |        |                         | 12      |         |             | 2.2    |        |        | 63                  | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  | Boron                |           | 2015                                     | 290   |       |         | 11000 |       |            | 45     |        |                         | 240000  |         |             | 21000  |        |        | 46000               | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  | Cadmium              |           | 2015                                     | 11    |       |         | 85    |       |            | 1.9    |        |                         | 190     |         |             | 120    |        |        | 532                 | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  | Chromium             | III       | 2014                                     | 26    |       |         | 149   |       |            | 4.9    |        |                         | 410     |         |             | 220    |        |        | 880                 | C4SL                | DEFRA    | 2014      |          |      |
|                                  |                      |           | 2015                                     | 910   |       |         | 910   |       |            | 18000  |        |                         | 8600    |         |             | 1500   |        |        | 33000               | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  |                      | VI        | 2014                                     | 21    |       |         | 21    |       |            | 170    |        |                         | 49      |         |             | 23     |        |        | 250                 | C4SL                | DEFRA    | 2014      |          |      |
|                                  |                      | VI        | 2015                                     | 6     |       |         | 6     |       |            | 1.8    |        |                         | 33      |         |             | 7.7    |        |        | 220                 | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  | Copper               |           | 2015                                     | 2400  |       |         | 7100  |       |            | 520    |        |                         | 68000   |         |             | 12000  |        |        | 44000               | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  | Lead                 |           |                                          | 200   |       |         | 310   |       |            | 80     |        |                         | 2330    |         |             | 630    |        |        | 1300                | C4SL                | DEFRA    | 2014      |          |      |
|                                  | Mercury              | Elemental | 2012                                     | 1.0   |       |         | 1.0   |       |            | 26     |        |                         | 26      |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2015                                     | 1.2   |       |         | 1.2   |       |            | 21     |        |                         | 58      |         |             | 16     |        |        | 30                  | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  |                      | Inorganic | 2012                                     | 170   |       |         | 170   |       |            | 80     |        |                         | 36000   |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2015                                     | 40    |       |         | 56    |       |            | 19     |        |                         | 1100    |         |             | 120    |        |        | 240                 | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  |                      | Methyl    | 2012                                     | 11    |       |         | 11    |       |            | 8      |        |                         | 410     |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2015                                     | 11    |       |         | 15    |       |            | 6      |        |                         | 320     |         |             | 40     |        |        | 68                  | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  | Nickel               |           | 2012                                     | 130   |       |         | 130   |       |            | 230    |        |                         | 1800    |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2015                                     | 130   |       |         | 180   |       |            | 53     |        |                         | 980     |         |             | 230    |        |        | 800                 | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  | Selenium             |           | 2012                                     | 350   |       |         | 350   |       |            | 120    |        |                         | 13000   |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2015                                     | 250   |       |         | 430   |       |            | 88     |        |                         | 12000   |         |             | 1100   |        |        | 1800                | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  | Vanadium             |           | 2015                                     | 410   |       |         | 1200  |       |            | 91     |        |                         | 9000    |         |             | 2000   |        |        | 5000                | S4UL                | LQM/CIEH | 2015      |          |      |
|                                  | Zinc                 |           | 2015                                     | 3700  |       |         | 40000 |       |            | 620    |        |                         | 730000  |         |             | 81000  |        |        | 170000              | S4UL                | LQM/CIEH | 2015      |          |      |
| BTEX & MTBE                      | Benzene              |           | 2012                                     | 0.33  |       |         | 0.33  |       |            | 0.07   |        |                         | 95      |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2014                                     | 0.87  |       |         | 3.3   |       |            | 0.18   |        |                         | 98      |         |             | 140    |        |        | 230                 | C4SL                | DEFRA    | 2014      |          |      |
|                                  |                      |           | 2015                                     | 0.087 | 0.17  | 0.37    | 0.38  | 0.7   | 1.4        | 0.017  | 0.034  | 0.075                   | 27      | 47      | 90          | 72     | 72     | 73     | 90                  | 100                 | 110      | S4UL      | LQM/CIEH | 2015 |
|                                  | Toluene              |           | 2012                                     | 610   |       |         | 610   |       |            | 120    |        |                         | 4400    |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2015                                     | 130   | 290   | 660     | 880   | 1900  | 3900       | 22     | 51     | 120                     | 65000   | 110000  | 180000      | 56000  | 56000  | 56000  | 87000               | 95000               | 100000   | S4UL      | LQM/CIEH | 2015 |
|                                  | Ethylbenzene         |           | 2012                                     | 350   |       |         | 350   |       |            | 90     |        |                         | 2800    |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2015                                     | 47    | 110   | 260     | 83    | 190   | 440        | 16     | 39     | 91                      | 4700    | 13000   | 27000       | 24000  | 24000  | 25000  | 17000               | 22000               | 27000    | S4UL      | LQM/CIEH | 2015 |
|                                  | Xylenes              | o-xylene  | 2012                                     | 250   |       |         | 250   |       |            | 160    |        |                         | 2600    |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2015                                     | 60    | 140   | 330     | 88    | 210   | 480        | 28     | 67     | 160                     | 6600    | 15000   | 33000       | 41000  | 42000  | 43000  | 17000               | 24000               | 33000    | S4UL      | LQM/CIEH | 2015 |
|                                  |                      | m-xylene  | 2012                                     | 240   |       |         | 240   |       |            | 180    |        |                         | 3500    |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2015                                     | 59    | 140   | 320     | 82    | 190   | 450        | 31     | 74     | 170                     | 6200    | 14000   | 31000       | 41000  | 42000  | 43000  | 17000               | 24000               | 32000    | S4UL      | LQM/CIEH | 2015 |
|                                  |                      | p-xylene  | 2012                                     | 230   |       |         | 230   |       |            | 160    |        |                         | 3200    |         |             |        |        |        |                     |                     | SGV      | DEFRA     | 2012     |      |
|                                  |                      |           | 2015                                     | 56    | 130   | 310     | 79    | 180   | 310        | 29     | 69     | 160                     | 5900    | 14000   | 30000       | 41000  | 42000  | 43000  | 17000               | 23000               | 31000    | S4UL      | LQM/CIEH | 2015 |
| Petroleum Hydrocarbons Fractions | Aliphatic >C5 - C6   |           | 2015                                     | 42    | 78    | 160     | 42    | 78    | 160        | 730    | 1700   | 3900                    | 3200    | 5900    | 12000       | 570000 | 590000 | 600000 | 95000               | 130000              | 180000   | S4UL      | LQM/CIEH | 2015 |
|                                  | Aliphatic >C6 - C8   |           | 2015                                     | 100   | 230   | 530     | 100   | 230   | 530        | 2300   | 5600   | 13000                   | 7800    | 17000   | 40000       | 600000 | 610000 | 620000 | 150000              | 220000              | 320000   | S4UL      | LQM/CIEH | 2015 |
|                                  | Aliphatic >C8 - C10  |           | 2015                                     | 27    | 65    | 150     | 27    | 65    | 150        | 320    | 770    | 1700                    | 2000    | 4800    | 11000       | 13000  | 13000  | 13000  | 14000               | 18000               | 21000    | S4UL      | LQM/CIEH | 2015 |
|                                  | Aliphatic >C10 - C12 |           | 2015                                     | 130   | 330   | 760     | 130   | 330   | 770        | 2200   | 4400   | 7300                    | 9700    | 23000   | 47000       | 13000  | 13000  | 13000  | 21000               | 23000               | 24000    | S4UL      | LQM/CIEH | 2015 |
|                                  | Aliphatic >C12 - C16 |           | 2015                                     | 1100  | 2400  | 4300    | 1100  | 2400  | 4400       | 11000  | 13000  | 13000                   | 59000   | 82000   | 90000       | 13000  | 13000  | 13000  | 25000               | 25000               | 26000    | S4UL      | LQM/CIEH | 2015 |
|                                  | Aliphatic >C16 - C35 |           | 2015                                     | 65000 | 92000 | 110000  | 65000 | 92000 | 110000     | 260000 | 270000 | 270000                  | 1600000 | 1700000 | 1800000     | 250000 | 250000 | 250000 | 450000              | 480000              | 490000   | S4UL      | LQM/CIEH | 2015 |
|                                  | Aliphatic >C35 - C44 |           | 2015                                     | 65000 | 92000 | 140000  | 65000 | 92000 | 110000     | 260000 | 270000 | 270000                  | 1600000 | 1700000 | 1800000     | 250000 | 250000 | 250000 | 450000              | 480000              | 490000   | S4UL      | LQM/CIEH | 2015 |
|                                  |                      |           |                                          |       |       |         |       |       |            |        |        |                         |         |         |             |        |        |        |                     |                     |          |           |          |      |
|                                  | Aromatic >C5 - C7    |           | 2015                                     | 70    | 140   | 300     | 370   | 690   | 1400       | 13     | 27     | 57                      | 26000   | 46000   | 86000       | 56000  | 56000  | 56000  | 76000               | 84000               | 92000    | S4UL      | LQM/CIEH | 2015 |
|                                  | Aromatic >C7 - C8    |           | 2015                                     | 130   | 290   | 660     | 860   | 1800  | 3900       | 22     | 51     | 120                     | 56000   | 110000  | 180000      | 56000  | 56000  | 56000  | 87000               | 95000               | 100000   | S4UL      | LQM/CIEH | 2015 |
|                                  | Aromatic >C8 - C10   |           | 2015                                     | 34    | 83    | 190     | 47    | 110   | 270        | 8.6    | 21     | 51                      | 3500    | 8100    | 17000       | 5000   | 5000   | 5000   | 7200                | 8500                | 9300     | S4UL      | LQM/CIEH | 2015 |
|                                  | Aromatic >C10 - C12  |           | 2015                                     | 74    | 180   | 380     | 250   | 590   | 1200       | 13     | 31     | 74                      | 16000   | 28000   | 34000       | 5000   | 5000   | 5000   | 9200                | 9700                | 10000    | S4UL      | LQM/CIEH | 2015 |
|                                  | Aromatic >C12 - C16  |           | 2015                                     | 140   | 330   | 660     | 1800  | 2300  | 2500       | 23     | 57     | 130                     | 36000   | 37000   | 38000       | 5100   | 5100   | 5000   | 10000               | 10000               | 10000    | S4UL      | LQM/CIEH | 2015 |
| Aromatic >C16 - C21              |                      | 2015      | 260                                      | 540   | 930   | 1900    | 1900  | 1900  | 46         | 110    | 260    | 28000                   | 28000   | 28000   | 3800        | 3800   | 3800   | 7600   | 7700                | 7800                | S4UL     | LQM/CIEH  | 2015     |      |

| Land Use                                            |                                                                |         | Residential With or Without Plant Uptake |         |         |                               |         |       |            |         |        | Public Open Space (POS) |        |        |             |        |        |        |        |        | Name   | Authority | Date     |      |  |  |
|-----------------------------------------------------|----------------------------------------------------------------|---------|------------------------------------------|---------|---------|-------------------------------|---------|-------|------------|---------|--------|-------------------------|--------|--------|-------------|--------|--------|--------|--------|--------|--------|-----------|----------|------|--|--|
|                                                     |                                                                |         | Allotments                               |         |         |                               |         |       | Commercial |         |        |                         |        |        | Residential |        |        |        |        |        |        |           |          | Park |  |  |
|                                                     |                                                                |         | With<br>home-grown produce               |         |         | Without<br>home-grown produce |         |       | 1          | 2.5     | 6      | 1                       | 2.5    | 6      | 1           | 2.5    | 6      | 1      | 2.5    | 6      |        |           |          |      |  |  |
| Type                                                | Contaminants                                                   | Species | Year                                     | 1.0     | 2.5     | 6                             | 1       | 2.5   | 6          | 1       | 2.5    | 6                       | 1      | 2.5    | 6           | 1      | 2.5    | 6      | 1      | 2.5    | 6      |           |          |      |  |  |
|                                                     | Aromatic >C21 - C35                                            |         | 2015                                     | 1100    | 1500    | 1700                          | 1900    | 1900  | 1900       | 370     | 820    | 1600                    | 28000  | 28000  | 28000       | 3800   | 3800   | 3800   | 7800   | 7800   | 7900   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Aromatic >C34 - C44                                            |         | 2015                                     | 1100    | 1500    | 1700                          | 1900    | 1900  | 1900       | 370     | 820    | 1600                    | 28000  | 28000  | 28000       | 3800   | 3800   | 3800   | 7800   | 7800   | 7900   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Aliphatic + Aromatic >C44 - C70                                |         |                                          | 1600    | 1800    | 1900                          | 1900    | 1900  | 1900       | 1200    | 2100   | 3000                    | 28000  | 28000  | 28000       | 3800   | 3800   | 3800   | 7800   | 7800   | 7900   | S4UL      | LQM/CIEH | 2015 |  |  |
| Polycyclic Aromatic Hydrocarbons<br>(PAH's) (mg/kg) | Acenaphthene                                                   |         | 2015                                     | 210     | 510     | 1100                          | 3000    | 4700  | 6000       | 34      | 85     | 200                     | 84000  | 97000  | 100000      | 15000  | 15000  | 15000  | 29000  | 30000  | 30000  | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Acenaphthylene                                                 |         | 2015                                     | 170     | 420     | 920                           | 2900    | 4600  | 6000       | 28      | 69     | 160                     | 83000  | 97000  | 100000      | 15000  | 15000  | 15000  | 29000  | 30000  | 30000  | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Anthracene                                                     |         | 2015                                     | 2400    | 5400    | 11000                         | 31000   | 35000 | 37000      | 380     | 950    | 2200                    | 520000 | 54000  | 540000      | 74000  | 74000  | 74000  | 150000 | 150000 | 150000 | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Benzo(a)anthracene                                             |         | 2015                                     | 7.2     | 11      | 13                            | 11      | 14    | 15         | 2.9     | 6.5    | 13                      | 170    | 170    | 180         | 29     | 29     | 29     | 49     | 56     | 62     | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Benzo(a)pyrene                                                 |         | 2014                                     |         |         | 5                             |         |       | 5.3        |         |        | 5.7                     |        |        | 76          |        |        | 10     |        | 21     | C4SL   | DEFRA     | 2014     |      |  |  |
|                                                     |                                                                |         | 2015                                     | 2.2     | 2.7     | 3                             | 3.2     | 3.2   | 3.2        | 0.97    | 2      | 3.5                     | 35     | 35     | 36          | 5.7    | 5.7    | 5.7    | 11     | 12     | 13     | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Benzo(b)fluoranthene                                           |         | 2015                                     | 2.6     | 3.3     | 3.7                           | 3.9     | 4.0   | 4.0        | 0.99    | 2.1    | 3.9                     | 44     | 44     | 45          | 7.1    | 7.2    | 7.2    | 13     | 15     | 16     | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Benzo(ghi)perylene                                             |         | 2015                                     | 320     | 340     | 250                           | 360     | 360   | 360        | 290     | 470    | 640                     | 3900   | 4000   | 4000        | 640    | 640    | 640    | 1400   | 1500   | 1600   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Benzo(k)fluoranthene                                           |         | 2015                                     | 77      | 93      | 100                           | 110     | 110   | 110        | 37      | 75     | 130                     | 1200   | 1200   | 1200        | 190    | 190    | 190    | 370    | 410    | 440    | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Chrysene                                                       |         | 2015                                     | 15      | 22      | 27                            | 30      | 31    | 32         | 4.1     | 9.4    | 19                      | 350    | 350    | 350         | 57     | 57     | 57     | 93     | 110    | 120    | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Dibenz(a,h)anthracene                                          |         | 2015                                     | 0.24    | 0.28    | 0.3                           | 0.31    | 0.32  | 0.32       | 0.14    | 0.27   | 0.43                    | 3.5    | 3.6    | 3.6         | 0.57   | 0.57   | 0.58   | 1.1    | 1.3    | 1.4    | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Fluoranthene                                                   |         | 2015                                     | 280     | 560     | 890                           | 1500    | 1600  | 1600       | 52      | 130    | 290                     | 23000  | 23000  | 23000       | 3100   | 3100   | 3100   | 6300   | 6300   | 6400   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Fluorene                                                       |         | 2015                                     | 170     | 400     | 860                           | 2800    | 3800  | 4500       | 27      | 67     | 160                     | 63000  | 68000  | 71000       | 9900   | 9900   | 9900   | 20000  | 20000  | 20000  | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Indeno(1,2,3-cd)pyrene                                         |         | 2015                                     | 27      | 36      | 41                            | 45      | 46    | 46         | 9.5     | 21     | 39                      | 500    | 510    | 510         | 82     | 82     | 82     | 150    | 170    | 180    | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Naphthalene                                                    |         | 2015                                     | 2.3     | 5.6     | 13                            | 2.3     | 5.6   | 13         | 4.1     | 10     | 24                      | 190    | 460    | 1100        | 4900   | 4900   | 4900   | 1200   | 1900   | 3000   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Phenanthrene                                                   |         | 2015                                     | 95      | 220     | 440                           | 1300    | 1500  | 1500       | 15      | 38     | 90                      | 22000  | 22000  | 23000       | 3100   | 3100   | 3100   | 6200   | 6200   | 6300   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Pyrene                                                         |         | 2015                                     | 620     | 1200    | 2000                          | 3700    | 3800  | 3800       | 110     | 270    | 620                     | 54000  | 54000  | 54000       | 7400   | 7400   | 4700   | 15000  | 15000  | 15000  | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Coal Tar(Bap as surrogate matter)                              |         | 2015                                     | 0.79    | 0.98    | 1.1                           | 1.2     | 1.2   | 1.2        | 0.32    | 0.67   | 1.2                     | 15     | 15     | 15          | 2.2    | 2.2    | 2.2    | 4.4    | 4.7    | 4.8    | S4UL      | LQM/CIEH | 2015 |  |  |
| Chloroalkanes &<br>alkenes                          | 1,2 Dichloroethane                                             |         | 2015                                     | 0.0071  | 0.011   | 0.019                         | 0.0092  | 0.013 | 0.023      | 0.0046  | 0.0083 | 0.016                   | 0.67   | 0.97   | 1.7         | 29     | 29     | 29     | 21     | 24     | 28     | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | 1,1,1 Trichloroethane                                          |         | 2015                                     | 8.8     | 18      | 39                            | 9       | 18    | 40         | 48      | 110    | 240                     | 660    | 1300   | 3000        | 140000 | 140000 | 140000 | 57000  | 76000  | 100000 | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | 1,1,2,2 Tetrachloroethane                                      |         | 2015                                     | 1.6     | 3.4     | 7.5                           | 3.9     | 8     | 17         | 0.41    | 0.89   | 2                       | 270    | 550    | 1100        | 1400   | 1400   | 1400   | 1800   | 2100   | 2300   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | 1,1,1,2 Tetrachloroethane                                      |         | 2015                                     | 1.2     | 2.8     | 6.4                           | 1.5     | 3.5   | 8.2        | 0.79    | 1.9    | 4.4                     | 110    | 250    | 560         | 1400   | 1400   | 1400   | 1500   | 1800   | 2100   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Tetrachloroethene                                              |         | 2015                                     | 0.18    | 0.39    | 0.9                           | 0.18    | 0.4   | 0.92       | 0.65    | 1.5    | 3.6                     | 19     | 42     | 95          | 1400   | 1400   | 1400   | 810    | 1100   | 1500   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Tetrachloromethane (Carbon Tetrachloride)                      |         | 2015                                     | 0.026   | 0.056   | 0.13                          | 0.026   | 0.056 | 0.13       | 0.45    | 1      | 2.4                     | 2.9    | 6.3    | 14          | 890    | 920    | 950    | 190    | 270    | 400    | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Trichloroethene                                                |         | 2015                                     | 0.016   | 0.034   | 0.075                         | 0.017   | 0.036 | 0.08       | 0.041   | 0.091  | 0.21                    | 1.2    | 2.6    | 5.7         | 120    | 120    | 120    | 70     | 91     | 120    | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Trichloromethane                                               |         | 2015                                     | 0.91    | 1.7     | 3.4                           | 1.2     | 2.1   | 4.2        | 0.42    | 0.83   | 1.7                     | 99     | 170    | 350         | 2500   | 2500   | 2500   | 2600   | 2800   | 3100   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Vinyl Chloride (chloroethene)                                  |         | 2015                                     | 0.00064 | 0.00087 | 0.0014                        | 0.00077 | 0.001 | 0.0015     | 0.00055 | 0.001  | 0.0018                  | 0.059  | 0.077  | 0.12        | 3.5    | 3.5    | 3.5    | 4.8    | 5      | 5.4    | S4UL      | LQM/CIEH | 2015 |  |  |
| Explosives                                          | 2,4,6 Trinitrotoluene                                          |         | 2015                                     | 1.6     | 3.7     | 8.1                           | 65      | 66    | 66         | 0.24    | 0.58   | 1.4                     | 1000   | 1000   | 1000        | 130    | 130    | 130    | 260    | 270    | 270    | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane) |         | 2015                                     | 120     | 250     | 540                           | 13000   | 13000 | 13000      | 17      | 38     | 85                      | 210000 | 210000 | 210000      | 26000  | 26000  | 27000  | 49000  | 51000  | 53000  | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)   |         | 2015                                     | 5.7     | 13      | 26                            | 6700    | 6700  | 6700       | 0.86    | 1.9    | 3.9                     | 110000 | 110000 | 110000      | 13000  | 13000  | 13000  | 23000  | 23000  | 24000  | S4UL      | LQM/CIEH | 2015 |  |  |
| Pesticides                                          | Aldrin                                                         |         | 2015                                     | 5.7     | 6.6     | 7.1                           | 7.3     | 7.4   | 7.5        | 3.2     | 6.1    | 9.6                     | 170    | 170    | 170         | 18     | 18     | 18     | 30     | 31     | 31     | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Dieldrin                                                       |         | 2015                                     | 0.97    | 2       | 3.5                           | 7       | 7.3   | 7.4        | 0.17    | 0.41   | 0.96                    | 170    | 170    | 170         | 18     | 18     | 18     | 30     | 30     | 31     | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Atrazine                                                       |         | 2015                                     | 3.3     | 7.6     | 17.4                          | 610     | 620   | 620        | 0.5     | 1.2    | 2.7                     | 9300   | 9400   | 9400        | 1200   | 1200   | 1200   | 2300   | 2400   | 2400   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Dichlorvos                                                     |         | 2015                                     | 0.032   | 0.066   | 0.14                          | 6.4     | 6.5   | 6.6        | 0.0049  | 0.01   | 0.022                   | 140    | 140    | 140         | 16     | 16     | 16     | 26     | 26     | 27     | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Alpha - Endosulfan                                             |         | 2015                                     | 7.4     | 18      | 41                            | 160     | 280   | 410        | 1.2     | 2.9    | 6.8                     | 5600   | 7400   | 8400        | 1200   | 1200   | 1200   | 2400   | 2400   | 2500   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Beta - Endosulfan                                              |         | 2015                                     | 7       | 17      | 39                            | 190     | 320   | 440        | 1.1     | 2.7    | 6.4                     | 6300   | 7800   | 8700        | 1200   | 1200   | 1200   | 2400   | 2400   | 2500   | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Alpha -Hexachlorocyclohexanes                                  |         | 2015                                     | 0.23    | 0.55    | 1.2                           | 6.9     | 9.2   | 11         | 0.035   | 0.087  | 0.21                    | 170    | 180    | 180         | 24     | 24     | 24     | 47     | 48     | 48     | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Beta -Hexachlorocyclohexanes                                   |         | 2015                                     | 0.085   | 0.2     | 0.46                          | 3.7     | 3.8   | 3.8        | 0.013   | 0.032  | 0.077                   | 65     | 65     | 65          | 8.1    | 8.1    | 8.1    | 15     | 15     | 16     | S4UL      | LQM/CIEH | 2015 |  |  |
|                                                     | Gamma -Hexachlorocyclohexanes                                  |         | 2015                                     | 0.06    | 0.14    | 0.33                          | 2.9     | 3.3   | 3.5        | 0.0092  | 0.023  | 0.054                   | 67     | 69     | 70          | 8.2    | 8.2    | 8.2    | 14     | 15     | 15     | S4UL      | LQM/CIEH | 2015 |  |  |
| Chlorobenzenes                                      | Chlorobenzene                                                  |         | 2015                                     | 0.46    | 1       | 2.4                           | 0.46    | 1     | 2.4        | 5.9     | 14     | 32                      | 56     | 1      |             |        |        |        |        |        |        |           |          |      |  |  |

| Land Use                                                      |                                            |                                                                                                             | Residential With or Without Plant Uptake |      |      |         |      |      |            |      |      | Public Open Space (POS) |      |      |             |       |       |       |      |      | Name | Authority | Date     |      |
|---------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------|------|------|---------|------|------|------------|------|------|-------------------------|------|------|-------------|-------|-------|-------|------|------|------|-----------|----------|------|
|                                                               |                                            |                                                                                                             | With                                     |      |      | Without |      |      | Allotments |      |      | Commercial              |      |      | Residential |       |       | Park  |      |      |      |           |          |      |
|                                                               |                                            |                                                                                                             | SOM                                      | 1.0  | 2.5  | 6       | 1    | 2.5  |            |      |      |                         |      |      |             |       |       |       |      |      |      |           |          | 6    |
| Type                                                          | Contaminants                               | Species                                                                                                     | Year                                     |      |      |         |      |      |            |      |      |                         |      |      |             |       |       |       |      |      |      |           |          |      |
| Phenols & Chlorophenols                                       | 1,2,3,4,-Tetrachlorobenzene                |                                                                                                             | 2015                                     | 15   | 36   | 78      | 24   | 56   | 120        | 4.4  | 11   | 26                      | 1700 | 3080 | 4400        | 830   | 830   | 830   | 1500 | 1600 | 1600 | S4UL      | LQM/CIEH | 2015 |
|                                                               | 1,2,3,5,- Tetrachlobenzene                 |                                                                                                             | 2015                                     | 0.66 | 1.6  | 3.7     | 0.75 | 1.9  | 4.3        | 0.38 | 0.9  | 2.2                     | 49   | 120  | 240         | 78    | 79    | 79    | 110  | 120  | 130  | S4UL      | LQM/CIEH | 2015 |
|                                                               | 1,2,4, 5,- Tetrachlobenzene                |                                                                                                             | 2015                                     | 0.33 | 0.77 | 1.6     | 0.73 | 1.7  | 3.5        | 0.06 | 0.16 | 0.37                    | 42   | 72   | 96          | 13    | 13    | 13    | 25   | 26   | 26   | S4UL      | LQM/CIEH | 2015 |
|                                                               | Pentachlrobenzene                          |                                                                                                             | 2015                                     | 5.8  | 12   | 22      | 19   | 30   | 38         | 1.2  | 3.1  | 7                       | 640  | 770  | 830         | 100   | 100   | 100   | 190  | 190  | 190  | S4UL      | LQM/CIEH | 2015 |
|                                                               | Hexachlorobenzene                          |                                                                                                             | 2015                                     | 1.8  | 3.3  | 4.9     | 4.1  | 5.7  | 6.7        | 0.47 | 1.1  | 2.5                     | 110  | 120  | 120         | 16    | 16    | 16    | 30   | 30   | 30   | S4UL      | LQM/CIEH | 2015 |
|                                                               | Phenols                                    |                                                                                                             | 2012                                     |      |      | 420     |      |      | 420        |      |      | 280                     |      |      | 3200        |       |       |       |      |      |      | SGV       | DEFRA    | 2012 |
|                                                               |                                            |                                                                                                             | 2015                                     | 120  | 200  | 380     | 440  | 690  | 1200       | 23   | 42   | 83                      | 440  | 690  | 1300        | 440   | 690   | 1300  | 440  | 690  | 1300 | S4UL      | LQM/CIEH | 2015 |
|                                                               | Chlorophenols (4 Congeners)                |                                                                                                             | 2015                                     | 0.87 | 2    | 4.5     | 94   | 150  | 210        | 0.13 | 0.3  | 0.7                     | 3500 | 4000 | 4300        | 620   | 620   | 620   | 1100 | 1100 | 1100 | S4UL      | LQM/CIEH | 2015 |
|                                                               | Pentachlorophenols                         |                                                                                                             | 2015                                     | 0.22 | 0.52 | 1.2     | 27   | 29   | 31         | 0.03 | 0.08 | 0.19                    | 400  | 400  | 400         | 60    | 60    | 60    | 110  | 120  | 120  | S4UL      | LQM/CIEH | 2015 |
| Others                                                        | Carbon Disulphide                          |                                                                                                             | 2015                                     | 0.14 | 0.29 | 0.62    | 0.14 | 0.29 | 0.62       | 4.8  | 10   | 23                      | 11   | 22   | 47          | 11000 | 11000 | 12000 | 1300 | 1900 | 2700 | S4UL      | LQM/CIEH | 2015 |
|                                                               | Hexachloro-1,3-Butadiene                   |                                                                                                             | 2015                                     | 0.29 | 0.7  | 1.6     | 0.32 | 0.78 | 1.8        | 0.25 | 0.61 | 1.4                     | 31   | 66   | 120         | 25    | 25    | 25    | 48   | 50   | 51   | S4UL      | LQM/CIEH | 2015 |
|                                                               | Sum of PCDDs, PCDFs and dioxin-like PCB's. |                                                                                                             | 2012                                     |      |      | 8       |      |      | 8          |      |      | 8                       |      |      | 240         |       |       |       |      |      |      | SGV       | DEFRA    | 2012 |
| NOTE                                                          |                                            |                                                                                                             |                                          |      |      |         |      |      |            |      |      |                         |      |      |             |       |       |       |      |      |      |           |          |      |
| Priority                                                      |                                            | Guideline (mg kg <sup>-1</sup> )                                                                            |                                          |      |      |         |      |      |            |      |      |                         |      |      |             |       |       |       |      |      |      |           |          |      |
| 1                                                             |                                            | Site Specific Assessment Criteria (SSAC) (Soils Limited)                                                    |                                          |      |      |         |      |      |            |      |      |                         |      |      |             |       |       |       |      |      |      |           |          |      |
| 2                                                             |                                            | 2014: Category 4 Screening Level (C4SL) (Contaminated Land: Application in Real Environment (CL:ARE), 2014) |                                          |      |      |         |      |      |            |      |      |                         |      |      |             |       |       |       |      |      |      |           |          |      |
| 3                                                             |                                            | 2012: Soil Guideline Value (SGV) (Environment Agency, 2009)                                                 |                                          |      |      |         |      |      |            |      |      |                         |      |      |             |       |       |       |      |      |      |           |          |      |
| 4                                                             |                                            | 2015: Suitable 4 Use Level (S4UL) (Nathanail <i>et al</i> , 2015)                                           |                                          |      |      |         |      |      |            |      |      |                         |      |      |             |       |       |       |      |      |      |           |          |      |
| For Generic Risk Assessment, the values in Bold have priority |                                            |                                                                                                             |                                          |      |      |         |      |      |            |      |      |                         |      |      |             |       |       |       |      |      |      |           |          |      |

## **Appendix E      Information Provided by the Client**



Block A - Existing building converted to hotel  
 Block B - Proposed hotel extension

**PLANNING ISSUE**

|   |            |                                           |
|---|------------|-------------------------------------------|
| C | 15.07.2016 | No. of disabled parking bays reduced to 7 |
| B | 01.06.2016 | Trees shown in purple hatch to be removed |
| A | 16.05.2016 | Building relocated                        |

| REV. | DATE | DESCRIPTION |
|------|------|-------------|
|      |      |             |

Do not scale from the drawing. It is the responsibility of the Contractors, Sub Contractors and Suppliers to check all relevant dimensions and levels of site and buildings before commencing any shop drawings or building work. Any discrepancies should be notified to the Supervising Officer.

**PROJECT:** PROPOSED HOTEL EXTENSION  
 HEATHROW POINT WEST  
 234 BATH ROAD, UB3 5AP

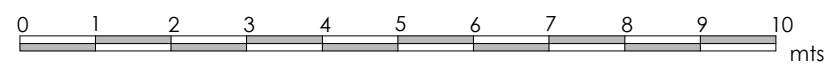
**DRAWING TITLE:**  
 Location & Proposed site plan

|               |                         |             |            |
|---------------|-------------------------|-------------|------------|
| SCALE:        | 1:200                   | DATE:       | 10.03.2016 |
| DRAWN BY:     | AM                      | CHECKED BY: | SR         |
| CAD Ref No. : | NOVO HOTEL DESIGN 1.DWG |             |            |

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|                                                                                                         |                            |    |            |
|---------------------------------------------------------------------------------------------------------|----------------------------|----|------------|
| 20 Mortlake High Street<br>London<br>SW14 6LN<br>Tel/Ans: 020 8570 2646<br>Email: rdp@rdparchitects.com | DRAWING No.<br>890/RDP/P02 | A1 | REV. A B C |
|---------------------------------------------------------------------------------------------------------|----------------------------|----|------------|

**PROPOSED SITE PLAN**  
 SCALE 1:200



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