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Additional Site Investigation & Risk Assessment Report

Project Name: The Roundhouse

Location: 100A Chalk Farm Road, London, NW1 8EH

Client: Roundhouse Trust

Project ID: J14197

Report Date: 28th November 2019

Report Issue: 2

SUMMARY

The site, which extended to about 0.05ha, comprised an area of car parking, currently occupied by steel shipping containers, used for storage. It was proposed to redevelop the site with two dance studios.

Geological records indicated the site to be underlain by London Clay.

A historical Ordnance Survey map search and desk study was carried out by others and indicated that the site has had a history of industrial use, as railway land.

An Unexploded Ordnance (UXO) risk assessment was not undertaken by a specialist subcontractor, as part of these works.

Two phases of intrusive investigation were carried out. Access to the site area was restricted by the presence of shipping containers. The depth of penetration for a number of trial holes was limited by the presence of subsurface concrete slabs.

Access to the site area was restricted by the presence of shipping containers. The depth of penetration was limited by the presence of subsurface concrete slabs. Further investigation will be required in these areas.

The soils encountered comprised Made Ground to a depth of at least 4.7mbgl to 5.2mbgl, underlain by firm brown, becoming stiff and grey with depth clay (London Clay) to a depth of 18.0mbgl.

Groundwater levels were found to stand at between 3.3mbgl to 3.9mbgl, during monitoring. This represents perched water situated upon the top of the London Clay, in the zone of the Made Ground.

A piled foundation solution is recommended, due to the depth of the Made Ground (>5.0mbgl). NHBC Volume Change Potential precautions do not apply.

The sulphate content of the fill and natural soil was found to fall within Class DS4. The ACEC classification for the site is AC4. Groundwater is mobile.

Excavations will likely require de-watering, as there is perched groundwater within the Made Ground.

Suspended floor slabs are advised, due to the presence of Made Ground at the site surface.

Detailed information on the proposed development, such as detailed final layout, loadings and serviceability limits was not provided. Accordingly, where geotechnical design advice is provided, it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules.

There is evidence of landfill gas contamination, comprising elevated levels of methane and carbon dioxide.

Traces of asbestos containing materials, comprising loose fibres of chrysotile were noted within the Made Ground tested from BH2A. Quantification analysis was carried out and the result obtained was <0.001% by weight, which would generally be regarded as low risk.

Seven rounds of soil gas monitoring have been carried out. The gas screening value calculated for the site classifies the site as characteristic situation 2 (CS2). Basic soil gas protection measures would be required for this development.

The presence of contamination may affect the classification of waste soils, or the potential for their re-use.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

As with any site, areas of contamination not identified during investigation works may come to light during the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site. The presence of contamination may affect the classification of waste soils, or the potential for their re-use.

A formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Roundhouse Trust and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

Author	E Richardson **ARSM MSc FGS**	
Check / Review	M W Stevenson **MICE**	

For and on behalf of Southern Testing Laboratories Limited

DOCUMENT HISTORY AND STATUS

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A INTRODUCTION

1 Authority

Our authority for carrying out this work is contained in a completed STL project order form, from the Roundhouse Trust, dated 3 September 2019. A further completed STL project order form, dated 7 October 2020, was returned by the Roundhouse Trust, for the soil gas monitoring programme.

2 Location

The site was located in Chalk Farm, 800m north west of Camden Town, Chalk Farm, London, NW1. The approximate National Grid Reference of the site was TQ 28189 84326.

The site location is indicated on Figure 1 within Appendix A.

3 Proposed Construction

It is proposed to construct two new dance studios, which are to be built in the yard just to the north of the Roundhouse building. Details of proposed site layout have not been provided to STL at this stage.

For the purposes of the contamination risk assessment, the proposed development land use is classified as Commercial/Industrial CLEA Model Ref [1] / C4SL Report Ref [2].

The gas sensitivity of the proposed development is rated as Low CIRIA C665 Ref [3].

4 Object

This is a Phase II additional geotechnical and contamination (risk estimation and evaluation) investigation (Tier 1).

The object of the investigation was to assess foundation bearing conditions and other soil parameters relevant to the proposed development, and to assess the likely nature and extent of soil, groundwater and soil gas contamination on the site.

5 Scope

This report presents our exploratory hole logs and test results and our interpretation of these data.

A UXO risk assessment was not requested within our brief for the investigation.

As with any site there may be differences in soil conditions between exploratory hole positions.

This report is not an engineering design and the figures and calculations contained in the report should be used by the Engineer, taking note that variations will apply, according to variations in design loading, in techniques used, and in site conditions. Our figures therefore should not supersede the Engineer's design.

The ground investigation has been completed with reference to BS 5930 Ref [4] and BS 10175 Ref [5].

Waste Classification of soils has not been included within the brief for the investigation.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of The Roundhouse Trust and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The recommendations contained in this report may not be appropriate to alternative development schemes.

Detailed information on the proposed development, such as detailed final layout, loadings and serviceability limits was not provided. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

B DESK STUDY AND WALKOVER SURVEY

6 Desk Study and Previous Reporting

The site has been the subject of a desk study and three site investigation reports, as listed below:

Ref	Date	Author	Title/Ref No.	Subject
1	Oct 2014	AP Geotechnics	Phase 1 Environmental Assessment Ref: 4144-1	Desk study
2	Oct 2014	AP Geotechnics	Phase 2 Geo-environmental Investigation Ref: 4144-2	Intrusive investigation
3	Mar 2017	STL	Revised Desk Study, Site Investigation & Risk Assessment Report STL Ref: J13005	Desk study and additional intrusive investigation
4	Nov 2019	STL	Additional Site Investigation & Risk Assessment Report STL Ref: J14197	Additional site investigation & risk assessment

These reports provide reasonable coverage and characterisation of the site and information derived from these reports is discussed below. The reader is referred to the original reports for supporting detail if needed. These reports are referred to below by the number given in the left hand column of the above table.

A significant thickness of Made Ground (>5.0m) was found to underlie the site. Based upon a commercial land use, there were no results of concern noted for the soil samples subject to chemical analysis for this site.

Elevated levels of methane were noted during the initial ground gas monitoring visit, undertaken in October 2019, for report number 4 (ref: J14197). Additional rounds of ground gas monitoring were recommended, to calculate the gas screening value for this site and to characterise the site.

6.1 Geology

The British Geological Survey Map No 256, indicated that the site geology consisted of London Clay.

6.1.1 London Clay

The London Clay mainly comprises blue-grey or grey-brown fissured clay and silty clay, which weathers to brown near the surface. It commonly contains thin courses of carbonate concretions ('cementstone nodules'), selenite crystals and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation.

Although slopes will stand in the clay at steep angles in the short term, the long-term stable slope angle is about 7o for grassed, or cleared slopes, and a few degrees more for wooded slopes.

This formation is known to contain pyrite.

6.2 Historical Borehole Records

A search of previous exploratory hole records both from the online British Geological Survey database [6] and Southern Testing in-house records, revealed some records within the near vicinity of this site, both from the STL source.

The previous intrusive investigation that was the subject of report AWPG ref 4144-2, referred to in Section 6, included a cable percussive borehole to a depth of 18mbgl. In this borehole, a thickness of 4.8m of Made Ground was noted, underlain by London Clay.

6.3 UXO Risk Management

The possibility of unexploded ordnance (UXO) being encountered on a site falls within the category of a potentially significant risk and should be address as a legal duty under the Construction (Design and Management) Regulations by the Client as early as possible in a project.

The CIRIA publication C681 Ref [7] has been developed to provide a consistent framework for the management of potential risk posed by UXO during site investigation and groundwork phases of construction. The process adopts a tiered approach, divided into four distinct stages; Preliminary risk assessment, Detailed risk assessment, Risk mitigation and Implementation.

The agreed scope of work did not allow for either a preliminary or detailed UXO risk assessment.

Reference has been made to the London County Council Bomb Damage Maps [8] which comprise hand-coloured 1:2,500 Ordnance Survey base sheets originally published in 1916 but updated by the London County Council to maps issued in 1945. The colouring applied to the maps records a scale of damage to London's built environment during the war caused by the aerial bombardment.

Map 38 records the site and buildings to the north as having suffered general blast damage. However, a neighbouring building to the west – Chalk Farm Station - was shown to have suffered serious damage.

Three separate High Explosive bomb strikes were recorded just to the east, close to Belmont Road between October 7, 1940 and June 6, 1941.

The maps have been reviewed for information purposes only and should not be perceived as part of a preliminary or detailed UXO risk assessment.

7 Site Walkover Survey

A walkover survey was carried out on 27 September 2019.

7.1 General Site Description and Boundaries

The subject site was located to the west of the Roundhouse building, between the Roundhouse and the new offices. The surface comprised tarmac, noted to be in a good state of repair and the area was used for parking vehicles and for storage purposes.

The northern boundary with the junction of Chalk Farm Road and Regents Park Road comprised a retaining wall, around five metres in height, constructed from brick.

The main railway line into Euston Station was situated to the south. The offices for the Roundhouse were located to the west side and the Roundhouse building was situated to the east.

Access to the site was via Regents Park Road.

7.2 Topography and Drainage

The site was flat and level, but it was noted to be raised from the level of the Roundhouse, by about four to five metres.

The site drained via the combined sewerage system, to either Regents Park Road or Chalk Farm Road. A five metre deep, possible soakaway chamber was located to the east side of the site.

7.3 Vegetation

Very little vegetation was associated with this site; however two London plane trees were located just beyond the north east site boundary, on Chalk Farm Road.

7.4 Buildings and Land Use on Site and Nearby

A number of lockable metal shipping containers, used for storage purposes were located upon the site. They were stacked one on top of the other, to give two levels. A rubbish compacter machine was situated to the centre. The Roundhouse was located to the east side.

7.5 Inaccessible Site Areas

The shipping containers and the rubbish crusher machine restricted access to the site in general. The presence of the site hoarding also restricted access to the retaining wall boundary.

7.6 Site Photographs

A series of photographs showing the site is included in Appendix G.

C PRELIMINARY SITE MODELS

8 Conceptual Engineering Geological Ground Model

From the desk study information and walkover undertaken at this site the following conceptual ground model has been formulated.

Data Source	Comments
Geology	The recorded soils beneath the site comprise London Clay with a superficial covering of Made Ground. The Made Ground is known to be >5m in thickness. The gravel is anticipated to be in the region of 5m in thickness. A piled foundation solution will be required. Arisings from piling operations will need to be disposed of appropriately.
Former Site Use	The site has been used previously as railway sidings. The land level is known to have been raised by around 5 metres across the site. A piled foundation option will be required.
Groundwater	Perched groundwater at the Made Ground / London Clay interface will be encountered at a depth of around 4mbgl to 5.0mbgl. Some de-watering will likely be required.
Surface Water	The site is not located within an area of potential flooding.
Potential Geo-hazards	London Clay underlies the site and this stratum is known to have high swelling and shrinkage potential.
Other Comments	-

On the basis of the available information the geotechnical categorization for the proposed structure(s) is considered to fall within Geotechnical Category 2 – Conventional structure with no exceptional risk or difficult ground or loading conditions; Eurocode 7 Ref [9].

9 Conceptual Site Model

In the context of this report, the conceptual model summarises the potential pollutant linkages identified for the site and forms the basis of the risk assessment for the site. The preliminary model comprises the potential sources of contamination, receptors that could be harmed and exposure pathways identified from the desk study and walkover survey. These potential linkages form the basis upon which the investigation is designed and reported.

9.1 Potential Sources of Contamination

The site has a history of railway land use and is located within an area of mixed uses, comprising industrial, railway land, commercial and residential.

A number of potentially contaminative uses have been identified, both on site and in the locality.

Potential contaminants associated with these uses have been compiled from DoE industry profiles, other desk study information (previous desk study) and our experience of such sites.

9.1.1 On-Site Sources

Potential Source	Potential Contaminants
Made ground	Metals, asbestos containing materials, petroleum hydrocarbons, PAH compounds, soil gas emissions
Railway land use	Metals, asbestos containing materials, petroleum hydrocarbons, PAH compounds
Fabric of previous buildings	Asbestos Containing Materials (ACMs)

9.1.2 Off-Site Sources

The site may be impacted by contamination migrating from beyond the site boundary. The following potential off-site sources have been identified.

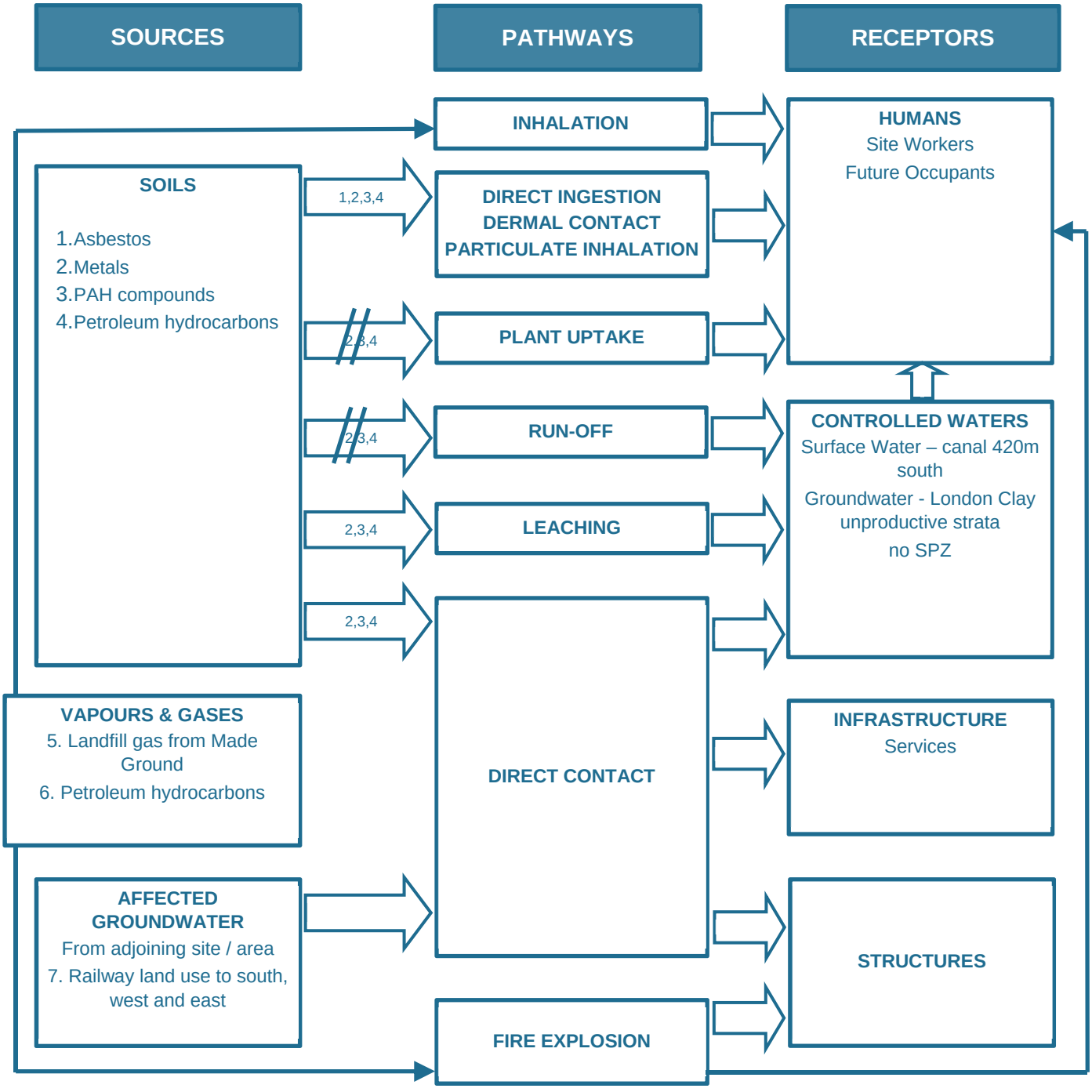
Potential Source	Distance from Site Boundary (m)	Direction	Potential Contaminants	Likely hazard to Site
Railway land use (including Made Ground)	0	S and E	Metals, asbestos containing materials, petroleum hydrocarbons, PAH compounds, soil gas emissions	High
Motorcycle servicing	48	NE	Petroleum hydrocarbons, PAH compounds	Low
Motorcycle servicing	52	NE	Petroleum hydrocarbons, PAH compounds	Low
Works (five number, activities unknown)	124-195	E	Metals, asbestos containing materials, petroleum hydrocarbons, PAH compounds	Very low
Fuel filling station	152	E	Petroleum hydrocarbons, PAH compounds	Very low

There appears to be no apparent risk from the motorcycle servicing to this site. The works and fuel filling station appear to be at sufficient distance not to impact the site.

The main source of potential risk to the site relates to the railway land use, which also includes the presence of Made Ground.

9.2 Pollutant Linkages and Conceptual Site Model Summary

The following diagram shows the potential pollutant linkages identified for the site and summarises the preliminary conceptual model:



// Denotes potential pollutant linkage not complete.

D GROUND INVESTIGATION

10 Strategy and Method

The strategy adopted for the intrusive investigation comprised the following:

Activity / Method	Purpose	Max Depth Range (mbgl)	Installations / Notes
WLSA-D (previous investigation - 2017) Dynamic Windowless Sampling	Boreholes to investigate the shallow ground conditions within external areas. To allow SPT's and collection of samples for geotechnical and contamination testing.	(0.3)/3.5 to 5.5	No installations
BH1-2 Cable Percussive	Boreholes to assess deeper ground conditions and allow SPT's and samples for geotechnical testing. Installation of land gas and groundwater monitoring wells.	18.0	150mm diameter boreholes 50mm gas / groundwater monitoring wells installed within both boreholes, to a depth of 5.0mbgl
TP 1-4 Hand-dug	Inspection pits to prove existing foundations details.	1.5 / 1.6	TP3 not completed due to concrete obstructions
SA1 JCB 3CX	Trial pit to investigate the shallow ground conditions and to allow for assessment of soakage potential using the BRE365 method.	2.5 / 3.5	BRE365 Soakage test trial pit gravel filled
DP 1-4	Dynamic probes	-	The presence of a concrete slab prevented dynamic probe installation in all locations, therefore probing was not carried out

Exploratory hole locations are shown on Figure 2 in Appendix A.

In-situ test and sampling methods descriptions employed are given in Appendix B, together with the test results.

SPT Energy Ratio certificates and a Summary Table of SPT N Values is provided within Appendix B.

The presence of the site boundary hording fence prevented access to the retaining wall, to undertake dynamic probes. STL attempted the dynamic probes at locations adjacent to the hoarding fence, but found a concrete slab to be present in all the locations, at around a depth of 0.4mbgl to 0.6mbgl. This slab could not be broken through.

The presence of the site hoarding, the storage containers and also concrete hardstanding limited and restricted access for the fieldwork. Additional fieldwork will be required once access to the entire site is available.

The area around TP3 could not be fully assessed. This was due to the presence of a concrete hard standing at a depth of around 0.3mbgl. This concrete extended around the trial pit area for about a metre and a half.

Refusal on concrete obstructions were noted in windowless sample borehole WLSC, at a depth of 0.3mbgl and borehole WLSD, at a depth of 0.75mbgl.

11 Weather Conditions

The initial intrusive investigation was undertaken on 22 March 2017 (windowless sample boreholes), at which time the weather was variable.

The additional intrusive fieldwork was carried out between 27 and 30 September 2019, at which time the weather was variable.

12 Soils as Found

The soils encountered are described in detail in the attached exploratory hole logs (Appendix A), but in general comprised a covering of Made Ground, underlain by London Clay. A summary is given below.

Depth (mbgl)	Thickness (m)	Soil Type	Description
GL-5.0/5.2	4.7/5.2	Made Ground	Blacktop over variable soft gravelly sandy CLAY and loose clayey sandy GRAVEL, with gravel of brick and railway ballast – Made Ground
4.7/5.2-18.0	>13.0	London Clay	Stiff brown becoming fissured grey silty CLAY

The soils found are generally in accordance with those anticipated.

12.1 Visual and Olfactory Evidence of Contamination

Evidence of possible contamination in the form of Made Ground with ash content was recorded at the location of all trial holes.

These occurrences are discussed in Section F.

13 Groundwater Observations

Groundwater was observed in the exploratory holes as follows:

Hole ID	Groundwater Depth (mbgl)	Comment	Stratum
BH1	3.33 - 3.91	Within standpipe	Made Ground
BH2	3.88 - 3.94	Within standpipe	Made Ground
WLSB	5.2	During drilling	Base of Made Ground

E DISCUSSION OF GEOTECHNICAL TEST RESULTS AND RECOMMENDATIONS

14 Geotechnical Laboratory Tests

The following geotechnical laboratory testing was carried out on selected samples in order to aid material classification and characterise soil properties. The test method references and results are given in Appendix C.

Laboratory Test	No of Samples Tested	Stratum
Moisture Content	16	London Clay
Atterberg Limit	16	London Clay
Sulphate and pH	4	London Clay
BRE SD1 Suite	5	London Clay
Single Stage Unconsolidated Undrained Triaxial Test (UT)	6	London Clay

15 Soil Classification and Properties

15.1 Made Ground

Shallow surface hard standing in the form of Blacktop and concrete was encountered at each exploratory hole location. The made ground materials beneath was found to be generally composed of sandy gravelly clays. These contained various anthropogenic materials, including brick, track ballast, wood and metal.

The made ground should be anticipated to be very variable in both composition and thickness across the site and potentially having a high compressibility.

STL attempted the dynamic probes at locations adjacent to the hording fence, but found a concrete slab to be present in all locations, at around a depth of 0.4mbgl to 0.6mbgl. This slab could not be broken through.

The area around TP3 could not be fully assessed. This was due to the presence of a concrete hard standing at a depth of around 0.3mbgl. This concrete extended around the trial pit area for about a metre and a half.

Refusal on concrete obstructions were noted in windowless sample borehole WLSC, at a depth of 0.3mbgl and borehole WLSD, at a depth of 0.75mbgl. Thus the Made Ground could not be fully assessed.

15.2 London Clay Formation

The London Clay soils at this site were generally seen as firm becoming stiff and very stiff very closely fissured sandy clays. Fine sand partings were commonly noted, along with selenite crystals.

The Atterberg limit results for this material indicates clays of high and very high plasticity. Liquid Limit results were seen within the range 74% to 80%, Plastic Limit results between 23% to 31% and Plasticity Indices between 46% to 55%; indicating a High Volume Change Potential.

A plot of cohesion against depth within the London Clay has been included within Appendix D, as Figure 3. Based upon the limited UUT test results and SPT N values (using a factor f_1 of 4.5 as suggested by Stroud). It should be noted that a factor f_1 of 6 provides an apparently better correlation with the UUT results; which could either be a function of the very limited number of data points or the sandy nature of the London Clay at this site.

15.3 Summary of Geotechnical Parameters

Soil Type: London Clay

Parameters	Range	Suggested Design Value
Plasticity Index (%)	46-55	49
Effective Cohesion (kPa)	68-233	See Figure 3

16 Groundwater Levels

Groundwater levels vary considerably from season to season and year to year, often rising close to the ground surface in wet or winter weather, and falling in periods of drought. Long-term monitoring from boreholes or standpipes is required to assess the ground water regime and this was not possible during the course of this site investigation.

Groundwater levels were found to stand between 3.33mbgl and 3.94mbgl within the monitoring standpipes placed in BH1 and BH2, during the rounds of groundwater monitoring.

Based on the observations to date, allowance should be made for seepages within the Made Ground materials. Where seepages are encountered the soils will soften rapidly.

It is envisaged that seepages above the water table could be controlled within excavations by locally pumping from sumps.

17 Swelling and Shrinkage

Shrinkable soils are subject to changes in volume as their moisture content is altered. Soil moisture contents vary from season to season and can be influenced by a number of factors including the action of roots. The resulting shrinkage or swelling of the soil can cause subsidence or heave damage to foundations, the structures they support and services.

However with the depth of Made Ground, NHBC precautions are not required in this instance.

Full details of protective measures are given in NHBC Standards Ref [10], Chapter 4.2 to which the reader is referred.

18 Soakaways

Soakage testing was carried out in trial pits SA1. These indicated a good rate of infiltration.

On the basis of these test results and given the soil types present, the site is considered suitable for shallow soakaway drainage.

The BRE Digest 365 paper on soakaway design allows for the design of trench soakaways as well as traditional square and circular soakaways.

The test to measure the soil infiltration rate is carried out in pits which are excavated to the full depth of the proposed soakaway. The trial pits are filled and allowed to drain to empty or near empty, three times, on the same day or on consecutive days.

The pit is considered full when the water level is the same as the proposed inlet invert. The time for the water level to fall from ¾ full to ¼ full is obtained and the soil infiltration rate is obtained from the following formula:

$$f = \frac{V_{p75-25}}{a_{p50} \, x \, t_{p75-25}}$$

Where:

f	=	The soil infiltration rate (in this case expressed in l/m²/minute);
V_{p75-25}	=	The effective storage volume of water in the trial pit between 75% and 25% effective depth;
a_{p50}	=	The internal surface area of the trial pit up to 50% effective depth and excluding the base area;
t_{p75-25}	=	The time for the water level to fall from 75% to 25% effective depth.

The soakage rate in this report is expressed as l/m²/minute, which is a convenient rate to use. The BRE Digest 365 uses a unit of m/sec, which is the value in l/m²/minute divided by 60,000.

18.1 Soakage Test Results

The BRE paper DG365, Ref [11] describes a method for site testing to determine soil infiltration rates at the proposed site of a soakaway. The in situ test method is described in Appendix B.

A total of two sets of soakage tests were undertaken, at the SA1 trial pit location, as shown on the attached site plan Figure 2, Appendix A. The full results of the soakage tests are presented within Appendix B.

The DG365 Ref [11], states that each pit should be allowed to drain three times to near empty, with filling on the same or consecutive days. This not was possible for the trial pit SA1 during the duration of the site works (one day).

The infiltration rate from each trial hole is summarised in the table below. The soakage rate in this report in expressed as l/m²/minute, which is a convenient rate to use. The BRE use a unit of m/sec, which is the value in l/m²/minute divided by 60,000.

Test ID	Test Depth (mbgl)	Design Infiltration Rate		Notes
		l/m²/minute	m/sec	
SA1	2.8	2.36	3.95x10-5	Nearly empty pit Two tests undertaken

Note: The Design Infiltration Rate is the lowest of the three tests

Typically, a minimum soakage rate of 0.1 l/m²/min (1.6 x10^{-6}m/sec) is required for conventional soakaways to meet the BRE Digest 365 requirement of a soakaway half empty for a time period of less than 24 hours.

The results, in all cases they were above the required value of 0.1 l/m²/min. Hence, the test results indicate good soakage rates for the locations tested.

The results will need to be examined by a Drainage Engineer to consider the infiltration drainage options for the proposed development, and determine the factor of safety to be applied, should this be required. As a general comment, the Kent Design Guide indicates that a factor of safety of at least 2 should be adopted.

Soakaways must be kept remote from structures, due to the risk of collapse of the Made Ground. We suggest a minimum distance of 10m between soakaways and structures. Only clean water should be allowed to enter into the soakaways, as silty water will clog fissures and joints and will reduce the efficiency of the soakaway.

Installation of soakaways into Made Ground is generally not recommended and an alternative scheme for disposal of surface water may be needed.

All surface water discharge solutions must be discussed and approved by the relevant regulatory authorities prior to installation, in particular to Environment Agency.

18.2 General Guidance on Design of Soakaways

Any soakaway scheme may require the approval of the Environment Agency, Building Control and, where applicable, the adopting Highways Authority.

Soakaways are used to store the immediate surface water run-off from hard surfaced areas, such as roof or carparks, and allow for efficient infiltration into the adjacent soil. They should be designed to discharge their stored water sufficiently quickly to provide the necessary capacity to receive run-off from a subsequent storm. The time taken for discharge depends upon the soakaway shape and size, and the surrounding soil's infiltration characteristics.

Groundwater levels can vary considerably from season to season and year to year, often rising in wet or winter weather, and falling in periods of drought. As such, a high groundwater table may affect the storage capacity of soakaways. In addition, it should be noted that an unsaturated zone may be required between the base of soakaways and the groundwater table, by the Environment Agency. Longer term monitoring may be required to establish actual groundwater levels as part of the planning approval process.

The design of soakaways can be square, circular (conventional) or trench excavations, and may be rubble filled, perforated precast concrete ring units, plastic cells or any similar structure that collects rainwater and run-off and allow discharge directly into the ground. Depending on the geological conditions, and depth at which suitable infiltration is achieved, soakaways can also be deep bored.

Long-term maintenance and inspection must be considered during the design and construction process. Maintenance of silt traps, gully pots and interceptors will improve the long-term performance of soakaways. The use of wet well chambers within the soakaway system can further assist in pollutant trapping and extending the operating life of soakaways.

Generally, roof and surface run-off should not significantly impact on groundwater quality and subject to appropriate approvals from the Environment Agency could be discharged directly to soakaways. However, although again subject to approvals from the Environment Agency, paved surface run-off for larger trafficked areas should generally be passed through a suitable form of oil interception device prior to discharge to the soakaway.

Care must be taken to ensure that the discharge of large volumes of surface run-off into the soil does not disrupt the existing sub-surface drainage patterns. Similarly in areas of sloping topography, consideration should be given to the siting of soakaways to avoid potential discharge and or flooding of down slope areas.

19 Sulphates and Acidity

Chemical analysis of the underlying soils has been undertaken to establish the aggressive chemical environment for concrete in accordance with the BRE Special Digest 1, Ref [12]. The site category determined is that of a brownfield location containing pyrites (or potential pyrites), as the underlying soils form part of the London Clay Formation.

The recorded pH values are in the range 8.1 to 10.9.

The Design Sulphate Class is DS 4. Groundwater should be assumed to be mobile. The ACEC site classification is AC 4.

20 Foundation and Bearing Capacity

All loadings should be transferred beneath any fill or made ground, topsoil, soft or disturbed soils and be placed within the underlying natural clay soils.

In this instance, due to the thickness of the Made Ground beneath this site, a piled foundation solution is recommended.

21 Piling

As with any piling scheme, discussions should be held with selected piling contractors to discuss the technical and financial merits of their various systems. With respect to overall resources, the equipment available should be appropriate for the soils described and anticipated and be able to achieve the depths and diameters considered with an appropriate safety margin.

Noting that seepages/inflows were noted and standing water levels were encountered/measured, the specialist contractor should take appropriate measures to ensure that his system caters for the ingress of groundwater.

From the viewpoint of pile type and given the close proximity of adjacent structures, a bored pile solution is considered to be a more appropriate pile type. In terms of bored piles and, noting the presence of potentially unstable soils (made ground and sandy gravels), and groundwater, a continuous flight auger grout injected pile (CFA) or segmented flight auger (SFA) would be best suited to the ground conditions encountered. Careful monitoring during construction of these pile types is however required.

It should be noted that subsurface obstructions could be encountered in the form of old foundations, drain runs etc. accordingly allowances for their removal/breaking out should be made when carrying out piling works and excavations.

Piles on this site will derive the majority of their capacity from the skin friction within the London Clay, base resistance will provide a much smaller contribution. Within the London Clay the design of piles is typically based on a cohesive model using a plot of undrained cohesion versus depth derived from both SPT results and triaxial tests. The equivalence factor for SPT to undrained cohesion was chosen as f1 = 4.5. The plot of results from the boreholes is appended as Figure 3 (Appendix D) on which a suggested design line is indicated. The contribution of skin friction within the terrace gravel utilises a value for the angle of friction (ϕ) derived from the SPT results.

For the purpose of providing preliminary estimates of pile capacities, we have assumed the following crude soil model, which is based on the findings of our borehole.

Depth to base (mbgl)	Soil Type
GL - 5.0	Made Ground – nil skin friction assumed
5.0 – 18.0	Clay – Cohesion profile as plotted in Figure 3 Appendix D

A standing water table of 3.9mbgl has been assumed at this stage.

A series of estimated bored pile capacities and also CFA pile capacities have been tabulated in Tables P1 and P2 within Appendix D.

On the basis of the pile capacities given in Table P2, it is estimated that a 450mm diameter pile with a toe set at around 12m BGL would have a safe allowable load of 255kN, assuming a factor of safety of 2.5.

The above noted pile capacities are for individually loaded piles. It is anticipated that the final design will be subject to more detailed calculations and structural analysis; as such our preliminary assumed parameters and calculated values should therefore not supersede the Engineer's or specialist piling Contractors final design.

22 Floor Slabs

Allowance should be made for fully suspended ground floor slabs.

23 Settlement

Based on the recommendations given above, settlement for the proposed structure should be within tolerable limits.

24 Excavations and Dewatering

An allowance should be made for breaking out sub-surface obstructions associated with existing and past developments.

The Made Ground and clay materials will be prone to instability in open excavations during wet weather or where seepages are encountered and will soften rapidly if exposed to moisture or the elements. The sand materials will run and be highly unstable in excavations or boring operations below the water table.

Where excavation is proposed in close proximity to existing structures care will need to be taken to avoid undermining existing foundations.

Hard ground, such as concrete may be encountered, and where necessary allowance should be made for breaking these using hydraulic hammers or the like mounted on the excavation plant, to facilitate excavation.

Significant inflows of groundwater into excavations should not be anticipated, nor would the requirement for specialist de-watering activities.

Seepage of groundwater into excavations should be anticipated, especially from the superficial soils. However, these should be managed with simple pumping methods/or specialist de-watering system will be required such as well-pointing.

Statutory close support will be required in all excavations where personnel must work.

25 Retaining Structures

STL were unable to assess the existing retaining wall, due to the presence of the site hoarding and concrete hard standings, further probing will be needed to assess this structure, when suitable access is fully available.

26 Road Construction

It is anticipated that proposed pavement areas will be formed in the Made Ground.

For preliminary design purposes of a CBR value of 2% can be assumed for pavement design. However, given that the soils are likely to be disturbed by construction plant during demolition and construction it may be prudent to reassess the CBR value as construction progresses.

It should be noted that there is at risk of collapse differential settlement if the Made Ground is inundated with water.

The most important element of any road construction is drainage and attention must be given not only to the drainage of the subsoil but to the various layers of construction. To this end, the formation should be shaped to a camber or crossfall to allow water movement out of the sub-base. Silty soils soften extremely quickly if allowed to become wet or if they are excavated below the water table and this softening can give rise to a very substantial increase in costs.

Sub-base and coarse capping materials tend to segregate during placing operations, particularly when end tipped. On soft clay subgrades this can lead to punching and softening of the formation. The use of a layer of sand or geofabric will minimise the problem.

The formation should be proof rolled and any soft spots found should be excavated and replaced with compacted granular material. The surface of the formation should then be compacted, prior to laying the road sub base.

Construction traffic should be kept off formations and it is often advisable to leave a protective layer of soil above formation level until the last moment before placing the sub-base.

The formation should be considered potentially frost-susceptible/not frost-susceptible.

F DISCUSSION OF GEOENVIRONMENTAL TEST RESULTS AND RECOMMENDATIONS

27 Analytical Framework

There is no single methodology that covers all the various aspects of the assessment of potentially contaminated land and groundwater. Therefore, the analytical framework adopted for this investigation is made up of a number of procedures, which are outlined below. All of these are based on a Risk Assessment methodology centred on the identification and analysis of Source – Pathway – Receptor linkages.

The CLEA model Ref [1], provides a methodology for quantitative assessment of the long-term risks posed to human health by exposure to contaminated soils. Toxicological data is used to calculate a Soil Guideline Value (SGV) for an individual contaminant, based on the proposed site use; these represent minimal risk concentrations and may be used as screening values.

In the absence of any published SGVs for certain substances, Southern Testing have derived or adopted Tier 1 screening values for initial assessment of the soil, based on available current UK guidance including the LQM/CIEH S4UL's Ref [13] and CL:AIRE Soil Generic Assessment Criteria Ref [14]. In addition, in 2014, DEFRA Ref [15] published the results of a research programme to develop screening values to assist decision making under Part 2A of the Environmental Protection Act. Category 4 screening levels were published for 6 substances, with reference to human health risk only. This guidance includes revisions of the CLEA exposure parameters, presenting parameters for public open space land use scenarios, and also of the toxicological approach. The screening levels represent a low risk scenario, based on a 'Low Level of Toxicological Concern' rather than the 'Minimal Risk' of CLEA, and the analytical results of this investigation may be considered relative to these levels.

Site-specific assessments are undertaken wherever possible and/or applicable.

CLEA requires a statistical treatment of the test results to take into account the normal variations in concentration of potential contaminants in the soil and allow comparisons to be made with published guidance.

The results of any groundwater analyses are compared to relevant quality criteria, e.g. Environmental Quality Standards (EQS) or Drinking Water Standards (DWS).

Ground gases are assessed in accordance with the guidance given in CIRIA C665 Ref [3] and BS8485 Ref [16].

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based upon them. Their validity should be confirmed at the time of site development.

28 Site Investigation – Soils

28.1 Sampling Regime

The number of sample locations was limited by access restrictions and was intended to provide general coverage.

Access was restricted by the presence of shipping containers, buildings, concrete obstructions and buried services, and the operational needs of the on-site business.

28.2 Testing

The potential for contamination by Made Ground and railway land use was identified in the preliminary conceptual model. Observations made on site indicated that the Made Ground was extensive in depth. Therefore, the following tests were selected.

Test Suite	No of Samples 2017	No of Samples 2019	Soil Tested
STL Key Contamination Suite	8	6	12 Made Ground 2 natural ground
Asbestos Screen	8	6	12 Made Ground 2 natural ground
Banded petroleum hydrocarbons C6-C40	3	-	3 Made Ground
WAC	-	1	1 Made Ground

The test results are presented in full in Appendix E. A summary and discussion of the significance of the results and identified contamination sources is given below.

28.3 Test Results and Identified Contamination Sources

28.3.1 General Contaminants

The results of the key contaminant tests have been analysed in accordance with the CLEA methodology. The samples have been grouped into two populations comprising Made Ground, and natural soil. For each parameter in each population the sample mean is calculated and compared to a Tier 1 screening value. If the sample mean exceeds the screening value, the soil may be regarded as contaminated and further assessment may be required. If neither the sample mean nor any single value exceeds the screening value, the soil may be regarded as not contaminated, though further confirmatory assessment may be required. Where any single parameter value exceeds the screening value but the sample mean does not, further statistical analysis may be applied to that parameter if the available data is suitable. Such analysis would include an assessment of the Normality of the distribution of the data, consideration of the presence of outliers, and the calculation of a UCL estimate of the mean.

Summary data is presented in the tables below and the laboratory analysis is included in Appendix E. The screening values and source notes are presented in Table 1 “Tier 1 Screening Values” at the front of Appendix E.

Soil Type: Made Ground

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Commercial Tier 1 Screening Values
Arsenic (As)	Mg/kg	12	7.6-25	12	640
Cadmium (Cd)	Mg/kg	12	<0.2-0.7	0.26	190
Trivalent Chromium (CrIII)*	Mg/kg	12	8.6-41	24	8600
Hexavalent Chromium (CrVI)	Mg/kg	12	<4	4	33
Lead (Pb)	Mg/kg	12	33-280	130	2330
Mercury (Hg)	Mg/kg	12	<0.3	0.3	29-320
Selenium (Se)	Mg/kg	12	<1	1	12,000
Nickel (Ni)	Mg/kg	12	6.2-25	18	980
Copper (Cu)	Mg/kg	12	16-120	52	68,000
Zinc (Zn)	Mg/kg	12	46-250	96	730,000
Phenol	Mg/kg	12	<1-2.2	1.1	440-1300
Benzo(a)pyrene (BaP)	Mg/kg	12	<0.05-11	2.1	36
Naphthalene	Mg/kg	12	<0.05-1.5	0.32	77-430[+]
Total Cyanide (CN)	Mg/kg	12	<1	1	-
Acidity (pH values)	-	12	8.1-10.9	9.5	-
Soil Organic Matter	%	12	1.2-7	3.1	-

* Assumed as Total Cr minus CrVI

Results were compared to the STL Tier 1 screening values for a commercial land use and no results of concern were noted.

Benzo(a)pyrene is used as a surrogate marker for all genotoxic PAH's, in line with HPA guidance Ref [17]. The test data has been compared with the concentration limits reported for the Culp study, as recommended by HPA

The measured concentrations of PAH's exceed the UKWIR threshold(s) for the use of plastic water supply pipes / British Plastics Federation Pipes Group thresholds for drainage and sewage pipes.

Soil Type: Natural Ground

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Commercial Tier 1 Screening Values
Arsenic (As)	Mg/kg	2		-	640
Cadmium (Cd)	Mg/kg	2	12-14	-	190
Trivalent Chromium (CrIII)*	Mg/kg	2	<0.2	-	8600
Hexavalent Chromium (CrVI)	Mg/kg	2	53-56	-	33
Lead (Pb)	Mg/kg	2	<4	-	2330
Mercury (Hg)	Mg/kg	2	<0.3	-	29-320
Selenium (Se)	Mg/kg	2	<1	-	12,000
Nickel (Ni)	Mg/kg	2	46-48	-	980
Copper (Cu)	Mg/kg	2	37-39	-	68,000
Zinc (Zn)	Mg/kg	2	86	-	730,000
Phenol	Mg/kg	2	<1	-	440-1300
Benzo(a)pyrene (BaP)	Mg/kg	2	<0.05	-	36
Naphthalene	Mg/kg	2	<0.05	-	77-430^{+}
Total Cyanide (CN)	Mg/kg	2	<1	-	-
Acidity (pH values)	-	2	7.7-8.2	-	-
Soil Organic Matter	%	2	0.5	-	

** Assumed as Total Cr minus CrVI*

Based upon the two samples of natural ground that were analysed, there is no potential contamination associated with the natural ground for this site.

Benzo(a)pyrene is used as a surrogate marker for all genotoxic PAH's, in line with HPA guidance Ref [17]. The test data has been compared with the concentration limits reported for the Culp study, as recommended by HPA.

28.3.2 Asbestos Containing Materials

Asbestos containing materials were detected in one the samples analysed, however none were observed in the exploratory holes. However, it should be noted that the exploratory holes are of small size, relative to the area investigated and the investigation was constrained by site usage. Therefore, the samples obtained may not reflect the full composition of the soils on the site, and there is always the potential for pockets of asbestos or for asbestos containing materials to be present, which have not been detected in the sampling.

It is also our experience that asbestos containing materials are quite often encountered in buried pockets and beneath slabs (sometimes adhering to the concrete) on older sites. It is, therefore, advised that further examination is carried out in trial pits, when suitable access is available.

No assessment of the existing buildings has been made.

The Made Ground analysed from BH2A was noted to contain loose fibres of chrysotile.

Quantification analysis was duly undertaken and the result was <0.001% by weight, which is usually considered to be low risk.

28.3.3 Organic Contaminants

The following table summarises the results of the analysis for petroleum hydrocarbons.

Hydrocarbon Substance or Fraction	Measured Concentrations in mg/kg		
	WLSA @ 0.5m	WLSB @ 1.9m	WLSD @ 0.6m
>EC6-EC10	<0.1	<0.1	<0.1
>EC8-EC10	<10	<10	<10
>EC10-EC12	1.6	1.6	14
>EC12-EC16	11	<10	350
>EC16-EC21	70	36	1800
>EC21-EC40	420	57	3400

Results from WLSD could be considered elevated.

The measured concentrations of the petroleum hydrocarbon fractions VOC/SVOCs exceed the UKWIR threshold(s) for the use of plastic water supply pipes/British Plastics Federation Pipes Group thresholds for drainage and sewage pipes.

29 Site Investigation - Gas

29.1 Gas Sources

The desk study identified two potential gas sources, in the form of Made Ground, located beneath the site and beneath adjacent land.

These type of sources are characterised as being of Low generation potential, Wilson and Haines Ref [18].

Potential exposure pathways include inhalation of indoor gas vapours that would enter the new building via construction joints, cracks, openings in suspended timber or concrete floors, gaps around service ducts and cavity walls. Gas vapours would then accumulate within the new building. Inhalation of outdoor gas vapours by site end users is also possible.

29.2 Monitoring Programme and Results

The sensitivity of the proposed development is rated as Low and, therefore, a minimum of six sets of gas readings should be taken over a period of six months (CIRIA C665 Ref [3], Table 5.5).

In this instance one initial round of monitoring was carried out, in October 2019. A monitoring programme, comprising six further monitoring visits, was then instigated in 2020.

The results of the monitoring programme are given in full in Appendix F and are summarised below.

Borehole Gas Monitoring Results		
Monitoring well	BH1	BH2
Response zone / Stratum	1m – 5.0m bgl Made Ground	1m – 5.0m bgl Made Ground
Evidence of contamination	-	-
No. of Monitoring Events	7	7
Methane range CH_4 (%)	4.7 – 10.9	<0.1
Carbon dioxide range CO_2 (%)	1 - 4.8	<0.1 - 0.6
Oxygen range O_2 (%)	3.5 - 13.9	19.3 – 20.4
Flow rate range (l/hr)	<0.1 – 1.3	<0.1

Borehole Gas Monitoring Results		
BH pressure range (Pa)	<0.1 - 10	<0.1 - 4
PID measurement (ppm)	<0.1 – 0.1	0.1 - 0.9
Water level (mbgl)	3.33 - 3.91	3.88 - 3.94
Atmospheric pressure during monitoring (mb)	992 – 1041	992 - 1039

Levels of methane that would be considered above natural background levels (4.7% v/v – 10.9% v/v) were noted in borehole BH1, on all seven of the monitoring visits.

Levels of carbon dioxide that would be considered above natural background levels (4.4% v/v – 4.8% v/v) were noted in borehole BH1, on six of the seven monitoring rounds.

Elevated levels of methane or carbon dioxide were generally not noted in borehole BH2.

29.3 Identified Gas Regime

The maximum peak flow rate observed was 1.3 ℓ/h.

A flow rate of 1.3 ℓ/h, in combination with the maximum gas concentration of 10.9% v/v for methane, would give a gas screening value (GSV) of 0.142ℓ/hr, which is characteristic of CS2 (Characteristic Situation), where gas emissions would be classified as being of low risk.

Levels of methane observed were above 1% v/v; however the flow rates were noted to be low.

On this basis, basic soil gas protection measures to CS2, will be required for this development.

30 Summary of Identified Contamination

Elevated levels of soil gas emissions are associated with the Made Ground that underlies this site. The site is classified as CS2 (Characteristic Situation).

The Made Ground analysed from BH2A was noted to contain loose fibres of chrysotile asbestos. Quantification analysis was duly undertaken and the result was <0.001% by weight, which is usually considered to be low risk.

31 Risk Evaluation

The object of the risk evaluation is to assess the pollution linkages for specific contaminant groups considered in the conceptual model, identify any unacceptable risks and, therefore establish whether there is a need for further investigation and/or remedial action.

The risks are considered in the context of the specific development proposals for the site and, therefore, the conclusions may not be appropriate for alternative schemes.

31.1 Asbestos Containing Materials

No significant asbestos contamination has been identified on site to date.

Loose fibres (concentration of <0.001% by weight) were identified within a sample of Made Ground taken from BH2A.

However, it is possible, given the variable nature of the Made Ground soils on site, that buried pockets of asbestos containing materials may be discovered. Therefore, a discovery strategy should be in place, prior to the commencement of any ground works.

31.2 Soil Gas Emissions

Soil gas monitoring has revealed that elevated levels of soil gas emissions (primarily methane, with some carbon dioxide) are associated with the Made Ground that underlies this site.

Basic soil gas protection measures, to CS2, would be needed for the proposed new buildings.

31.3 Revised Conceptual Model

The preliminary site model has been refined in light of the findings of this investigation and is summarised below.

Metals	Petroleum Hydrocarbons	PAH Compounds	Land Gas	Asbestos	Pathways	Receptors
N	P	N	n/a	Y	Ingestion and inhalation of contaminated soil and dust	Human Health
N	P	N	n/a	n/a	Dermal contact with contaminated soil and dust	
N	P	N	Y	n/a	Inhalation of vapours or gases	
n/a	n/a	n/a	n/a	n/a	Uptake into edible fruit and vegetables	
n/a	n/a	n/a	n/a	n/a	Surface water run-off into surface water features	Water Environment
n/a	n/a	n/a	n/a	n/a	Migration through ground into surface water or groundwater	
n/a	n/a	n/a	n/a	n/a	Off-site migration of contaminated groundwater	
n/a	n/a	n/a	n/a	n/a	Vegetation on site growing in contaminated soil	Flora and Fauna
n/a	n/a	n/a	n/a	n/a	Aquatic life in affected waters	
N	P	N	n/a	n/a	Contact with contaminated soils	Building materials / buried services
N	N	N	P	n/a	Fire or explosion	

Key:

Y Pollutant linkage likely
N Pollutant linkage not likely
P Pollutant linkage possible
n/a Pathway not applicable to contaminant

31.4 Relevant Pollutant Linkages

A number of Relevant Pollutant Linkages for which remedial action will be required have been identified in the revised conceptual model, as follows.

Contaminant / Source	Pathways	Receptor
Asbestos containing materials in Made Ground	Soil/dust ingestion/inhalation	Site/construction workers
Soil gas emissions	Inhalation of internal vapours	Site end users
PAH compounds in Made Ground	Direct contact	Structures/services

32 Soil Waste Management

The Made Ground analysed from BH2A was noted to contain loose fibres of chrysotile. Quantification analysis was duly undertaken and the result was <0.001% by weight, which is usually considered to be low risk.

The potential for the presence of further asbestos containing materials should be borne in mind.

32.1 Disposal of Soils

Some soils will require removal from site and disposal to suitably licensed landfills. Different guidelines and charges will apply to different waste classifications. As waste producers, the Developer holds responsibilities under the various governing regulations, particularly the Waste Duty of Care Code of Practice under the Environmental Protection Act 1990, Ref [19].

The chemical analyses appended to this report can be used to inform the initial classification of the soils as either Hazardous or Non-Hazardous, and derive the appropriate EWC code, for offsite disposal or transfer. Waste Acceptance Criteria (WAC) testing may be needed for confirmation of the material's classification, and will be required to demonstrate an inert classification.

There are strict requirements in place for the accurate description of wastes using EWC codes and, therefore, it is essential that materials that would be given different descriptions (e.g. blacktop, made ground and natural soils), as well as those with different classifications, are carefully segregated during excavation and storage on site. This will also ensure the most cost effective disposal. Mixing these materials can give rise to significant difficulties in disposal and also substantially increase costs.

Soil arisings may be transferred to other development sites under a Materials Management Plan, where certain criteria are met, in accordance with the CL:AIRE Definition of Waste Code of Practice Ref [20].

All soils leaving site will need to be pre-treated. Waste minimisation by selective excavation is a recognised form of pre-treatment.

33 Discussion and Conclusions

Basic soil gas protection measures, to CS2, will be needed for this development.

As with any site, areas of contamination not identified during site investigation works may come to light in the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site.

A formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works.

34 General Guidance

Allowance should be made for verification of any remedial works by suitably experienced personnel.

It may be that specific local requirements apply to this site, of which we are not aware at this time.

In general terms, the workforce and general public should be protected from contact with contaminated material. There is a range of relevant documents published by the Health and Safety Executive, and organisations such as CIRIA, and the BRE.

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Southern Testing
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ST Consult
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APPENDIX A

Site Plans and Exploratory Hole Logs

A

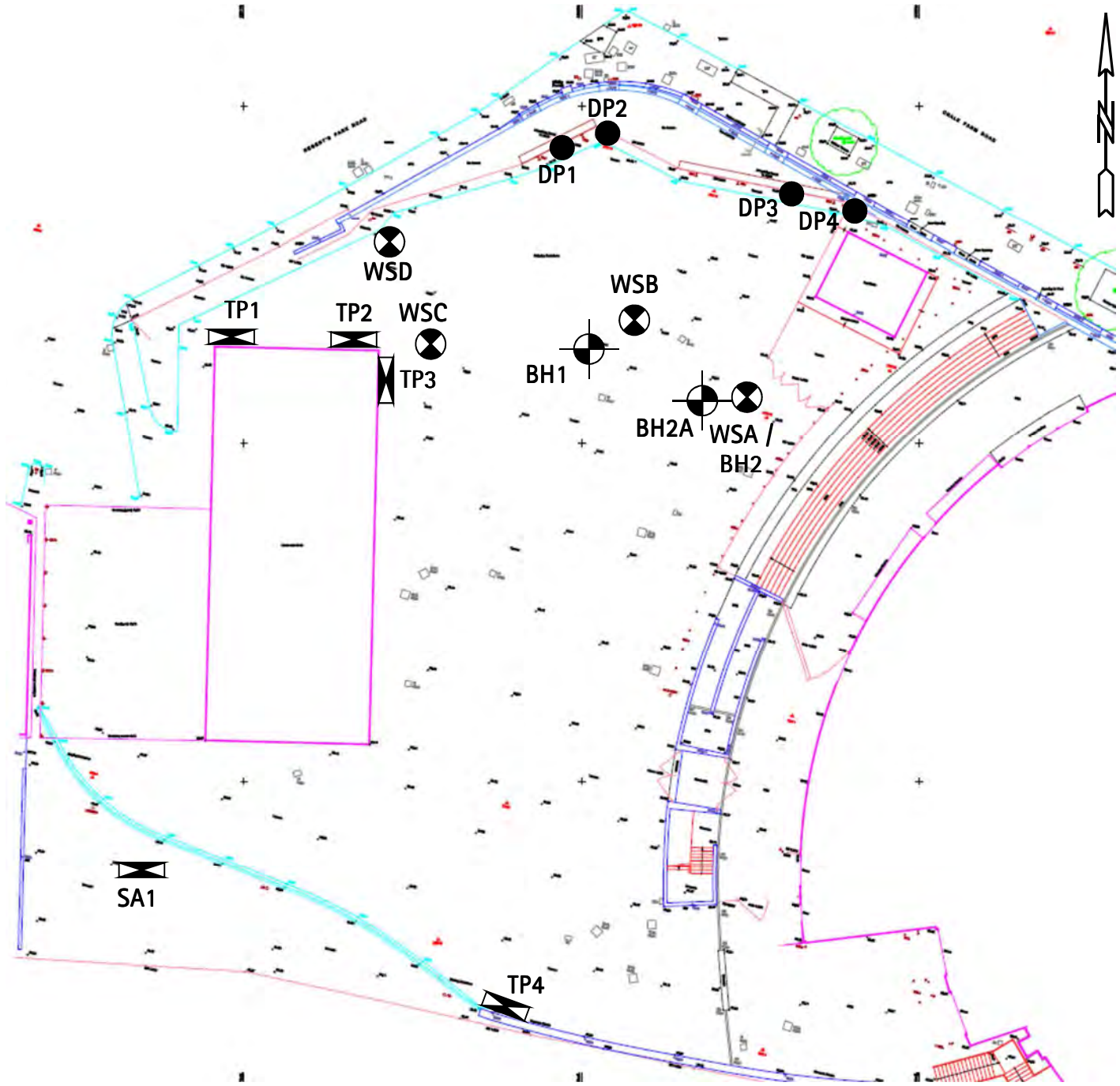
NB: Contains Ordnance Survey Data © Crown copyright and database right 2019.

Site: The Roundhouse, 100A Chalk Farm Road, London, NW1 8EH	STL: J14197	Fig No: 1
Date: 27th November 2019	Site Location Plan	

Southern Testing

Southern Testing: Keeble House, Stuart Way, East Grinstead, West Sussex RH19 4QA
ST Consult: Twigden Barns, Brixworth Road, Creaton, Northampton NN6 8NN

ST Consult



Cable percussive borehole

Windowless sample borehole (2017)

Dynamic probe (aborted)

Hand dug trial pit / machine dug soakaway

NB:	Positions of Boreholes and/or Trial Pits are only indicative unless dimensioned		
Site:	Dance Studios, The Roundhouse, 100a Chalk Farm Road, Camden, NW1	STL: J14197	Fig No: 2
Date:	27 November 2019	Exploratory Hole Location Plan – Not to Scale	

Southern Testing

Southern Testing: Keeble House, Stuart Way, East Grinstead, West Sussex RH19 4QA
ST Consult: Twigden Barns, Brixworth Road, Creaton, Northampton NN6 8NN

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Key to Exploratory Hole Logs, Plans and Sections

Backfill Symbols		Pipe Symbols		Principal Soil Types		Principal Rock Types		Drilling Records	
Arisings		Plain Pipe		Topsoil		Mudstone		Water Strike	
Concrete		Slotted Pipe		Made Ground		Claystone		Depth Water Rose	
Blacktop		Piezometer		Clay		Siltstone		Total Core Recovery (%) [TCR]	
Bentonite		Piezometer Tip		Silt		Sandstone		Solid Core Recovery (%) [SCR]	
Gravel Filter		Filter Tip		Sand		Limestone		Rock Quality Index (%) RQD]	
Sand Filter		Extensometer		Gravel		Chalk		Fracture Index (fractures / m) [FI]	
		Inclinometers		Peat					

All soil and rock descriptions are in general accordance with BS5930 2015, BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. Chalk descriptions are also based on CIRIA C574 and "Logging the Chalk – R.N. Mortimer 2015". The Geology Code is only provided where a positive identification of the sample strata has been made.

Location / Method Identifiers	
BH	Borehole (undefined)
CP	Cable Percussive
RC	Rotary Core
RO	Rotary Open Hole
ODC	Rotary Odex/Symmetrix drilling cased
CP+RC	Cable Percussive to Rotary Core
SNC	Sonic
CFA	Continuous Flight Auger
FA	Flight Auger
VC	Vibro Core
WLS+RC	Windowless (Dynamic) Sampler to Rotary Core
WLS	Windowless Sampler
WS	Window Sampler
HA	Hand Auger
C	Road / Pavement Core
IP	Inspection Pit (Hand Excavation)
TP	Trial Pit (Machine Excavated)
OP	Observation Pit (Supported Excavation Hand or Machine)

In-situ Test Location / Method	
DP	Dynamic Probe
CPT	Cone Penetration Test
CBR	In-situ CBR Test
DCP	CBR using Dynamic Cone Penetrometer
CBRT	CBR using TRL Probe
PB	Plate Bearing Test
SPT (S)	Standard Penetration Test (Split Barrel Sampler)
SPT (C)	Standard Penetration Test (Solid Cone)
N	SPT Result
-/-	Blows/Penetration (mm) after seating drive
-*/-	Total Blows / Penetration (mm)
( )	Extrapolated Value
PPT	Perth Penetration (In-House Method - Equivalent N Value)
HP / UCS	Strength from Hand Penetrometer (kN/m^2)
IVN	Strength from Hand Vane ((kN/m^2) P = peak, R = residual
PID	Photo Ionisation Detector (ppm)
MEXE	Mexi-Cone CBR (%)

Samples / Test Type	
B	Bulk Sample
BLK	Block Sample
C	Core Sample
CBRS	CBR Mould Sample
D	Small Disturbed Sample
ES	Environmental Sample (Soil)
EW	Environmental Sample (Water)
GS	Environmental Sample (Gas)

Samples / Test Type	
SPTLS	Standard Penetration Test Split Barrel Sample
TW	Thin Wall Push In Sample (e.g. Shelby Sampler)
U	Undisturbed Open Drive Sample (blows to take)
UT	Thin Wall Undisturbed Open Drive Sample (blows to take)
W	Water Sample (Geotechnical)
SP	Sample from Stockpile
P	Piston Sample
AMAL	Amalgamated Sample

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Start - End Date	Project ID:	Hole Type:	BH1
27/09/2019	J14197	CP	Sheet 1 of 2

Project Name:	the Roundhouse, Chalk Farm Road, Chalk Farm	Remarks:	Co-ordinates:	Level:	Logger:
					NCH
Location:	London				
Client:					

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
						(0.40)			Dark to grey brown, silty sandy clayey GRAVEL. Gravel comprises subrounded to subangular, fine to coarse sized fragments of Blacktop, limestone, brick, flint with rare fragments of chalk and clinker.
		0.50 - 1.00	B					0.40	
						(0.35)			CONCRETE.
		0.80	ES					0.75	Variable MADE GROUND comprising sandy gravelly CLAYs and clayey sandy GRAVELS.
		1.20 - 1.65	B						*From 0.75 to 1.50m - Made Ground comprising of grey brown silty clayey sandy GRAVEL. Gravel is fine to coarse sized brick, concrete, flint and clinker fragments.*
		1.20	SPT(C)	N=3 (1,0/1,0,1,1)					*From 1.50m - Made Ground becoming increasing clayey with depth.*
		1.50	HP	UCS(kPa)=<40					
		2.00	ES						
		2.00 - 2.50	B						
		2.00	SPT(C)	N=3 (1,1/0,1,1,1)					
		2.50	HP	UCS(kPa)=100.0					
		3.00	ES			(4.45)			
		3.00 - 3.50	B						
		3.00	SPT(C)	N=3 (1,0/1,1,0,1)					
		3.50	HP	UCS(kPa)=60.0					*From 3.50m - Rare to frequent organic patches with rare pseudo-fibreous root fragments.*
		4.00	ES						
		4.00 - 4.50	B						
		4.00	SPT(C)	N=4 (1,1/1,1,1,1)					
		4.50	HP	UCS(kPa)=60.0					
		5.00 - 5.50	B						
		5.00	SPT(C)	N=7 (1,0/1,1,2,3)				5.20	Stiff, light brown mottled grey, silty CLAY.
		5.20	HP	UCS(kPa)=240.0					*From 5.2 to 5.5m - Rare subrounded fine to medium sized flint gravel.*
		5.50	HP	UCS(kPa)=240.0					
		6.50	U			(2.30)			
			HP	UCS(kPa)=290.0					*From 6.5m - Becoming fissured.*
		7.00	HP	UCS(kPa)=340.0					
		7.50	HP	UCS(kPa)=290.0				7.50	Extremely closely fissured, stiff to very stiff, light brown mottled grey, silty CLAY with rare selenite speckling. Fissures are closed with rare silt infill.
		8.00	SPT(S)	N=21 (3,3/4,6,5,6)					*From 7.5m to 8.5m - Frequent medium sand grain sized selenite crystals.*
		8.50	HP	UCS(kPa)=390.0					
		9.50	U						
			HP	UCS(kPa)=250.0					
		10.00	HP	UCS(kPa)=430.0					

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
18.00	150	5.50	150										

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Start - End Date	Project ID:	Hole Type:	BH1
27/09/2019	J14197	CP	Sheet 2 of 2

Project Name:	the Roundhouse, Chalk Farm Road, Chalk Farm	Remarks:	Co-ordinates:	Level:	Logger:
					NCH
Location:	London				
Client:					

Well	Water Strikes	Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		Depth (m bgl)	Type	Results					
		10.50	HP	UCS(kPa)=460.0					Extremely closely fissured, stiff to very stiff, light brown mottled grey, silty CLAY with rare selenite speckling. Fissures are closed with rare silt infill.
									From 10.0m - Becoming very stiff.
		11.00	SPT(S)	N=23 (3,4/5,6,6,6)					*At 10.0m - Abundant selenite crystals up to fine gravel sized fragments.*
		11.50	HP	UCS(kPa)=520.0					
		12.50	U						*From 12.5m - Infrequent orange brown mottling.*
			HP	UCS(kPa)=400.0					
		13.00	HP	UCS(kPa)=440.0					*At 13.0m - Abundant selenite crystals up to fine gravel sized fragments.*
		13.50	HP	UCS(kPa)=560.0					*From 13.0m - Becoming grey with depth.*
		14.00	SPT(S)	N=28 (5,5/6,7,7,8)		(10.50)			
		14.50	HP	UCS(kPa)=110.0					
		15.50	U						*At 15.5m - Rare light grey silty veining.*
			HP	UCS(kPa)=570.0					
		16.00	HP	UCS(kPa)=460.0					
		16.50	HP	UCS(kPa)=490.0					
		17.00	SPT(S)	N=29 (4,5/6,7,8,8)					
		17.50	HP	UCS(kPa)=380.0					
		18.00	HP	UCS(kPa)=580.0				18.00	*At 18.0m - Rare light grey silty veining.*
									End of Borehole at 18.00m

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
18.00	150	5.50	150										

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Start - End Date	Project ID:	Hole Type:	BH2
30/09/2019	J14197	CP	Sheet 1 of 2

Project Name:	the Roundhouse, Chalk Farm Road, Chalk Farm	Remarks:	Co-ordinates:	Level:	Logger:
					NCH
Location:	London	borehole drilled in same location as WLSA			
Client:					

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
						(0.05)		0.05	Blacktop
						(0.20)		0.25	Loose brown fine to coarse GRAVEL sub-base with scant sand matrix
		0.70	ES			(0.35)		0.60	Loose dark brown grey silty fine to coarse SAND (some sand of ash) with some fine to coarse gravel of brick and concrete - Made Ground
						(0.40)		1.00	
						(0.10)		1.10	Soft grey silty sandy CLAY with some fine to coarse gravel of brick, concrete, flint and railway ballast - Made Ground
									concrete
		2.80	ES						Very soft / loose dark brown grey silty sandy CLAY (some sand of ash) with some fine to coarse gravel of brick, concrete and railway ballast - Made Ground
						(3.90)			
		3.50	ES						
								5.00	Stiff, light brown, silty CLAY with rare selenite speckling
		5.50	HP	UCS(kPa)=210.0					
						(2.00)			
		6.50	HP	UCS(kPa)=360.0					*From 6.5m - Becoming fissured.*
		7.00	HP	UCS(kPa)=360.0				7.00	Extremely closely fissured, stiff to very stiff, light brown mottled grey, silty CLAY with rare selenite speckling. Fissures are closed with rare silt infill.
		7.50	HP	UCS(kPa)=360.0					*At 7.5m - Frequent fine to medium sand grain sized selenite crystals.*
		8.00	SPT(S)	N=20 (2,3/4,5,5,6)					
		8.50	HP	UCS(kPa)=450.0					
		9.50	HP	UCS(kPa)=390.0					
		10.00	HP	UCS(kPa)=550.0					

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
18.00	150	4.50	150										

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Start - End Date	Project ID:	Hole Type:	BH2
30/09/2019	J14197	CP	Sheet 2 of 2

Project Name:	the Roundhouse, Chalk Farm Road, Chalk Farm	Remarks:	Co-ordinates:	Level:	Logger:
					NCH
Location:	London	borehole drilled in same location as WLSA			
Client:					

Well	Water Strikes	Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		Depth (m bgl)	Type	Results					
		10.50	HP	UCS(kPa)=450.0					Extremely closely fissured, stiff to very stiff, light brown mottled grey, silty CLAY with rare selenite speckling. Fissures are closed with rare silt infill.
									At 10.0m - Frequent selenite crystals up to fine gravel sized fragments.
		11.00	SPT(S)	N=22 (4,4/5,5,6,6)					
		11.50	HP	UCS(kPa)=450.0					*At 11.5m - Frequent selenite crystals up to medium sand grain sized.*
		12.50	HP	UCS(kPa)=430.0					*From 12.5m - Becoming grey with depth.*
		13.00	HP	UCS(kPa)=600.0					*From 13.0m - Becoming very stiff.*
		13.50	HP	UCS(kPa)=560.0					
		14.00	SPT(S)	N=27 (4,5/6,7,7,7)		(11.00)			
		14.50	HP	UCS(kPa)=590.0					
		15.50	HP	UCS(kPa)=560.0					
		16.00	HP	UCS(kPa)=600.0					
		16.50	HP	UCS(kPa)=490.0					
		17.00	SPT(S)	N=28 (5,5/6,7,7,8)					
		17.50	HP	UCS(kPa)=410.0					
		18.00	HP	UCS(kPa)=<40				18.00	End of Borehole at 18.00m

11 12 13 14 15 16 17 18 19 20

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
18.00	150	4.50	150										

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Start - End Date	Project ID:	Hole Type:	BH2a
27/09/2019	J14197	CP	Sheet 1 of 1

Project Name:	the Roundhouse, Chalk Farm Road, Chalk Farm	Remarks:	Co-ordinates:	Level:	Logger:
					NCH
Location:	London	Obstruction encountered at 1.60m, casing unable to advance beyond 2.0m - Borehole Terminated.			
Client:					

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
						(1.10)		1.10	Variable MADE GROUND comprising sandy gravelly CLAYs and clayeys sandy GRAVELS.
						(0.40)		1.50	Orange brown, subrounded fine flint GRAVEL.
						(1.50)		3.00	Grey brown to orange brown, silty sandy gravelly CLAY. Gravel is fine to coarse sized fragments of brick, concrete, flint and rare limestone and clinker.
									End of Borehole at 3.00m

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
3.00	150	2.00	150										

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Start - End Date:	Project ID:	Machine Type:	SA1
27/09/2019	J14197	JCB 3CX	Sheet 1 of 1

Project Name:	the Roundhouse, Chalk Farm Road, Chalk Farm	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
					er
Location:	London	Soakaway test pit. Trial pit dug in area raised above existing site level by about one metre			
Client:					

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
0.50	ES			(1.80)			Dark grey silty fine to coarse SAND with frequent angular fine to coarse gravel of ballast, brick and concrete, occasional blacktop gravel, metal and plastic noted - Made Ground
1.70	ES						
				(0.20)		1.80	concrete
				(0.80)		2.00	Dark grey silty fine to coarse SAND with frequent angular fine to coarse gravel of ballast, brick and concrete, occasional metal and plastic noted - Made Ground
						2.80	Pit terminated at 2.800m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.70	unstable	dry
Length:	1.50		
Depth:	2.80		

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Start - End Date:	Project ID:	Machine Type:	TP1
01/10/2019	J14197	hand	Sheet 1 of 1

Project Name:	the Roundhouse, Chalk Farm Road, Chalk Farm	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
					er
Location:	London				
Client:					

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
				(0.05)		0.05	blacktop surfacing
				(0.75)			Dark grey brown silty fine to coarse SAND (some sand of ash) with some to frequent fine to coarse angular gravel of railway ballast, brick, occasional clinker, metal, blacktop, flint and concrete gravel noted - Made Ground
						0.80	Pit terminated at 0.800m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.80	stable	dry
Length:	0.60		
Depth:	0.80		

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Start - End Date:	Project ID:	Machine Type:	TP2
01/10/2019	J14197	hand	Sheet 1 of 1

Project Name:	the Roundhouse, Chalk Farm Road, Chalk Farm	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
					er
Location:	London				
Client:					

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
				(0.05)		0.05	blacktop surfacing
0.25	ES			(0.25)		0.30	Dark grey brown silty fine to coarse SAND (some sand of ash) with some to frequent fine to coarse angular gravel of railway ballast, brick, occasional clinker, blacktop, flint and concrete gravel noted - Made Ground
							Pit terminated at 0.300m.

1
2
3
4

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.50	stable	dry
Length:	0.50		
Depth:	0.30		

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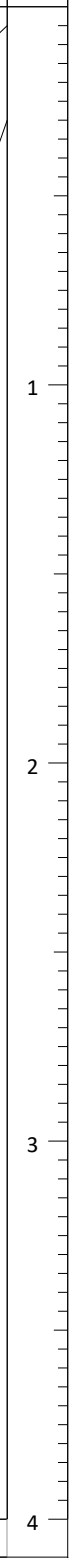
Start - End Date:	Project ID:	Machine Type:	TP3
01/10/2019	J14197	hand	Sheet 1 of 1

Project Name:	the Roundhouse, Chalk Farm Road, Chalk Farm	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
					er
Location:	London				
Client:					

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
				(0.05)		0.05	blacktop surfacing
				(0.25)		0.30	Dark grey brown silty fine to coarse SAND (some sand of ash) with some to frequent fine to coarse angular gravel of railway ballast, brick, occasional clinker, metal, blacktop, flint and concrete gravel noted - Made Ground
							Pit terminated at 0.300m.



Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.90	stable	dry
Length:	0.70		
Depth:	0.30		

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Start - End Date:	Project ID:	Machine Type:	TP4
01/10/2019	J14197	hand	Sheet 1 of 1

Project Name:	the Roundhouse, Chalk Farm Road, Chalk Farm	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
					er
Location:	London				
Client:					

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
				(0.05)		0.05	blacktop surfacing
				(0.25)		0.30	Dark grey brown silty fine to coarse SAND (some sand of ash) with some to frequent fine to coarse angular gravel of railway ballast, brick, occasional clinker, blacktop, flint and concrete gravel noted - Made Ground
							Pit terminated at 0.350m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.50	stable	dry
Length:	0.50		
Depth:	0.35		

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Start - End Date	Project ID:	Hole Type:	WLSA
22/03/2017	J13005	WLS	Sheet 1 of 1

Project Name:	The Roandhouse, 100a Chalk Farm Road, NW1	Remarks:	Co-ordinates:	Level:	Logger:
Location:	Camden	dry			
Client:	the Roundhouse				

Backfill	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
						(0.05)		0.05	Tarmac
						(0.20)			Loose brown fine to coarse GRAVEL sub-base with scant gravel of sand
								0.25	
						(0.35)			Loose dark brown grey silty fine to coarse SAND (some sand of ash) with some fine to coarse gravel of brick and concrete - Made Ground
		0.50	ES					0.60	
						(0.40)			Soft grey silty sandy CLAY with some fine to coarse gravel of brick, concrete, flint and railway ballast - Made Ground
		1.00	ES					1.00	
		1.00	SPT	47 (10,13/47 for 160mm)		(0.10)		1.10	Concrete
		1.30	D						Very soft / loose dark brown grey silty sandy CLAY (some sand of ash) with some fine to coarse gravel of brick, concrete and railway ballast - Made Ground
		2.00	SPT	N=5 (1,0/1,3,1,0)					
						(2.40)			
		2.50	ES						
		3.00	SPT	N=0 (1,0/0,0,0,0)					
								3.50	End of borehole at 3.50m

1 2 3 4 5

Hole Details		Casing Details		Water Strike (m bgl)				Readings (m bgl)			Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth	Casing	Sealed	Rose to:	Time (min)	Remarks	From	To	Time	Remarks

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Start - End Date	Project ID:	Hole Type:	WLSB
22/03/2017	J13005	WLS	Sheet 1 of 2

Project Name:	The Roandhouse, 100a Chalk Farm Road, NW1	Remarks:	Co-ordinates:	Level:	Logger:
Location:	Camden	groundwater noted at 5.2mbgl			
Client:	the Roundhouse				

Backfill	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
						(0.05)		0.05	Tarmac
		0.25	ES			(0.30)			Loose dark grey silty fine to coarse SAND (some sand of ash) with some fine to coarse gravel of brick and concrete - Made Ground
								0.35	concrete (weak)
						(0.55)			
								0.90	Soft dark grey brown silty sandy CLAY with some fine to coarse gravel of brick, flint and railway ballast - Made Ground
		1.00	SPT	N=6 (2,1/2,1,2,1)					
		1.80	D						
		1.90	ES						
		2.00	SPT	N=4 (1,1/1,1,1,1)					
		2.30	ES						
						(3.00)			
		2.50	D						
		3.00	SPT	N=9 (1,0/1,2,2,4)					
		3.20	D						
		3.50	ES						
								3.90	Soft to firm brown grey silty CLAY with occasional fine to coarse gravel of brick - Made Ground
		4.00	SPT	N=5 (3,1/1,1,1,2)					
		4.20	D						
						(0.80)			
								4.70	Firm brown grey silty CLAY
		4.90	D						
		5.00	SPT	N=13 (2,4/3,4,3,3)					

Continued on next sheet.

Hole Details		Casing Details		Water Strike (m bgl)				Readings (m bgl)			Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth	Casing	Sealed	Rose to:	Time (min)	Remarks	From	To	Time	Remarks
				06-03-2017	5.22			5.01	20	Medium				

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Start - End Date	Project ID:	Hole Type:	WLSB
22/03/2017	J13005	WLS	Sheet 2 of 2

Project Name:	The Roandhouse, 100a Chalk Farm Road, NW1	Remarks:	Co-ordinates:	Level:	Logger:
Location:	Camden	groundwater noted at 5.2mbgl			
Client:	the Roundhouse				

Backfill	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
						(0.80)		5.50	End of borehole at 5.50m

Hole Details		Casing Details		Water Strike (m bgl)				Readings (m bgl)			Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth	Casing	Sealed	Rose to:	Time (min)	Remarks	From	To	Time	Remarks
				06-03-2017	5.22			5.01	20	Medium				

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Start - End Date	Project ID:	Hole Type:	WLSC
22/03/2017	J13005	WLS	Sheet 1 of 1

Project Name:	The Roandhouse, 100a Chalk Farm Road, NW1	Remarks:	Co-ordinates:	Level:	Logger:
Location:	Camden	dry, refusal on concrete at 0.3mbgl			
Client:	the Roundhouse				

Backfill	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
						(0.05)		0.05	Tarmac
						(0.25)			Concrete
								0.30	End of borehole at 0.30m

1
2
3
4
5

Hole Details		Casing Details		Water Strike (m bgl)				Readings (m bgl)			Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth	Casing	Sealed	Rose to:	Time (min)	Remarks	From	To	Time	Remarks

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Start - End Date	Project ID:	Hole Type:	WLSD
22/03/2017	J13005	WLS	Sheet 1 of 1

Project Name:	The Roandhouse, 100a Chalk Farm Road, NW1	Remarks:	Co-ordinates:	Level:	Logger:
Location:	Camden	dry, refusal on concrete at 0.75mbgl			
Client:	the Roundhouse				

Backfill	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
						(0.15)		0.15	Tarmac
		0.20	ES			(0.25)		0.40	Loose dark brown silty fine to coarse SAND with some to frequent gravel of brick, concrete and railway ballast - Made Ground
						(0.05)		0.45	Concrete
		0.60	ES			(0.25)		0.70	Loose dark grey / black silty fine to coarse SAND (sand of ash and coal) with some fine to coarse gravel of brick, coal and railway ballast - Made Ground
						(0.05)		0.75	Concrete
									End of borehole at 0.75m

1 2 3 4 5

Hole Details		Casing Details		Water Strike (m bgl)				Readings (m bgl)			Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth	Casing	Sealed	Rose to:	Time (min)	Remarks	From	To	Time	Remarks

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APPENDIX B

Field Sampling and In-Situ Test Methods and Results

B

Soil and Rock Descriptions

All soil and rock descriptions are in general accordance with BS5930 Ref [4].

Anthropogenic soils ('made ground' or 'fill') describe materials which have been placed by man and can be divided into those composed of reworked natural soils and those composed of or containing man-made materials. 'Fill' is used to describe material placed in a controlled manner and 'made ground' is used to describe materials placed without strict engineering control.

The classification of materials such as topsoil is based on visual description only and should not be interpreted to mean that the material complies with criteria used in BS 3882 Ref [21].

Chalk descriptions are based on CIRIA C574 Ref [22] and Mortimore Ref [23].

The geology code is only provided on logs where a positive identification of the sample strata has been made.

Inspection Pit

Inspection pits are hand excavated from the surface (maximum depth 1.2 – 1.5m) using appropriate tools to locate and avoid existing buried services at exploratory hole positions. They are also regularly used as part of investigations on existing structures to expose and determine foundation detail.

Trial Pits and Trenches

Trial pits and trenches are unsupported excavations, mechanically excavated by machine to the required depth to enable visual examination, in situ testing and sampling as required from outside the excavation.

Dynamic Sampling - Window or Windowless

Window sampling is carried out by driving hollow steel tubes incorporating a longitudinal access slot (window) and a cutting shoe into the ground using a percussive 'breaker'. This enables recovery of a continuous soil sample for examination and sub-sampling.

Windowless samplers are designed for taking disturbed, continuous soil samples to depths up to 10 metres (depending on ground conditions). The samplers comprise steel tubes of about 50-100mm diameter with a rigid plastic liner (no window) and are driven into the ground with a sliding hammer mounted on a tracked purpose-designed soil sampling rig. After driving and extracting the sampler from the ground, the plastic liner is extracted together with the enclosed soil sample. The sample can then either be extracted, split and sub-sampled or plastic end caps may be fitted, the tube labelled and transported for future examination and sub-sampling.

Soil samples are disturbed by the driving process with both techniques and can be regarded as being between Class 5 up to Class 3 samples at best (in favourable ground).

The major advantage of using windowless samplers is that the plastic liner greatly reduces the possibility of cross-contamination between successive samples.

An equivalent in-situ test to the Standard Penetration Test can be carried out with the windowless sampler rig.

Disturbed Samples

Disturbed samples were taken from exploratory holes in general accordance with BS 5930 [4] and BS EN ISO 22475-1 Ref [24] as required and stored in appropriately labelled containers. Details of the type, size and depth of sample will be recorded within the exploratory hole record. Such samples can be regarded as being between Class 5 up to Class 3 quality depending upon their method of sampling.

Environmental Samples

Environmental samples were taken from the boreholes at regular intervals in the made ground and natural soils as indicated on the exploratory hole logs. The sampling strategy was in general accordance with BS10175 Ref [5] and BS ISO 18400 Refs [25], [26], [27], [28] & [29].

These samples were collected and stored in glass jars or plastic pots and transferred to the laboratory in cool boxes as appropriate to the proposed laboratory testing.

Monitoring Well

A groundwater and/or ground gas monitoring well consists of a perforated pipe, which is installed in the ground. The standpipe is typically 50mm nominal in diameter and is installed in a lined borehole. It is perforated from the base with a sand/gravel surround through the soil horizon of interest to an appropriate depth below ground level. Above this there is a bentonite seal with solid pipework and is provided with an end cap or a gas valve at the top as appropriate.

Gas monitoring is carried out via the gas tap. Water sampling/purging can be undertaken by removing the gas tap and bung.

The well is usually completed at the surface with a flush cast iron cover or raised lockable cover.

Groundwater Samples

Groundwater samples were taken from exploratory holes as indicated on the logs. These samples were collected in glass or teflon bottles and transferred to the laboratory in cool boxes as appropriate to the proposed laboratory testing.

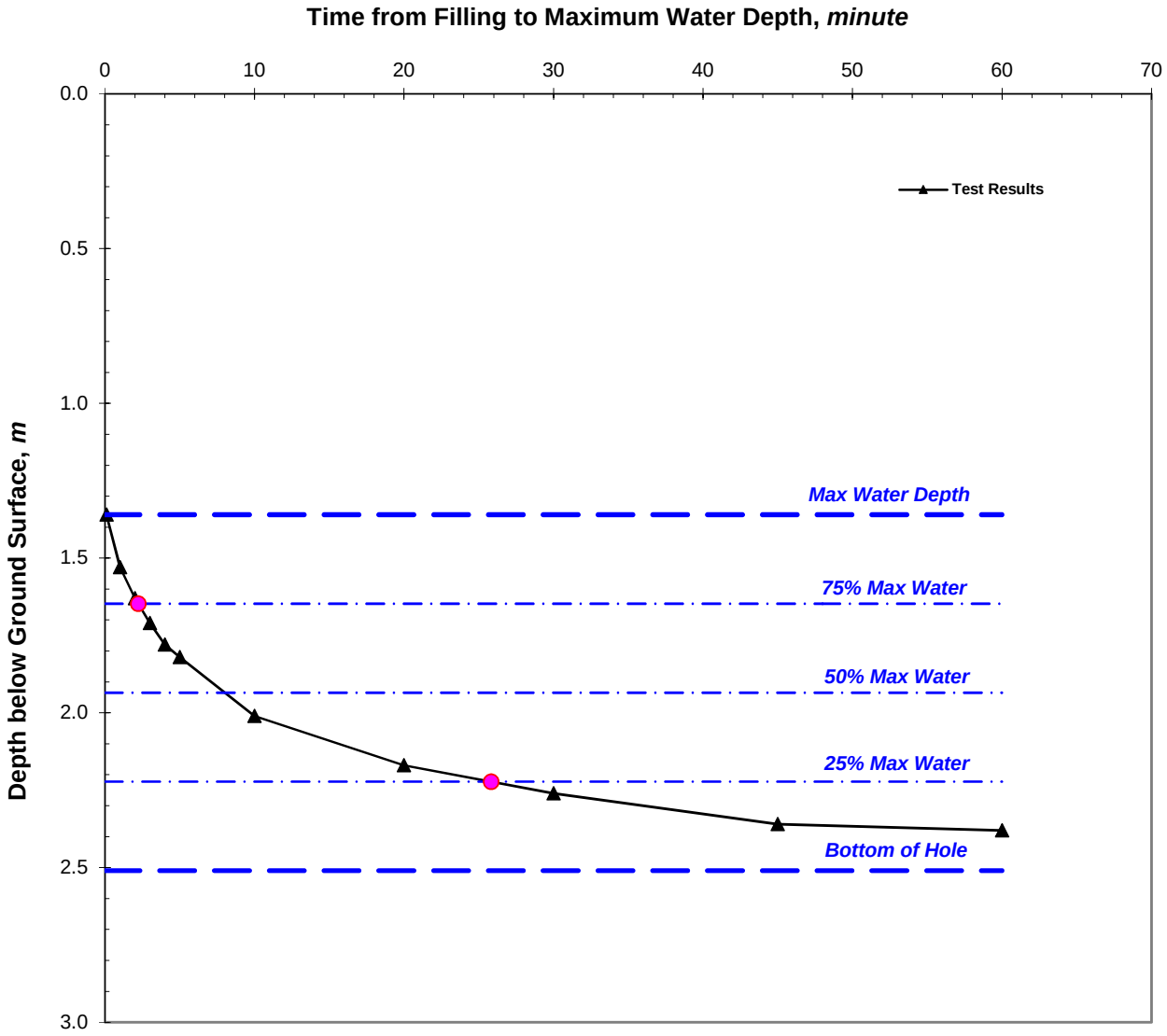
Monitoring wells were purged prior to sampling, removing a minimum of three times the volume of water in the well.

Groundwater Monitoring – Dip Meter

The dip meter is used to measure standing water levels within boreholes. The probe is lowered into the borehole until the meter detects the groundwater with an audible ‘beep’. The level is then read from the tape.

BRE Digest DG365 Soakage Test

Test Hole No: 1
Test No: Test No 1 (Initial)



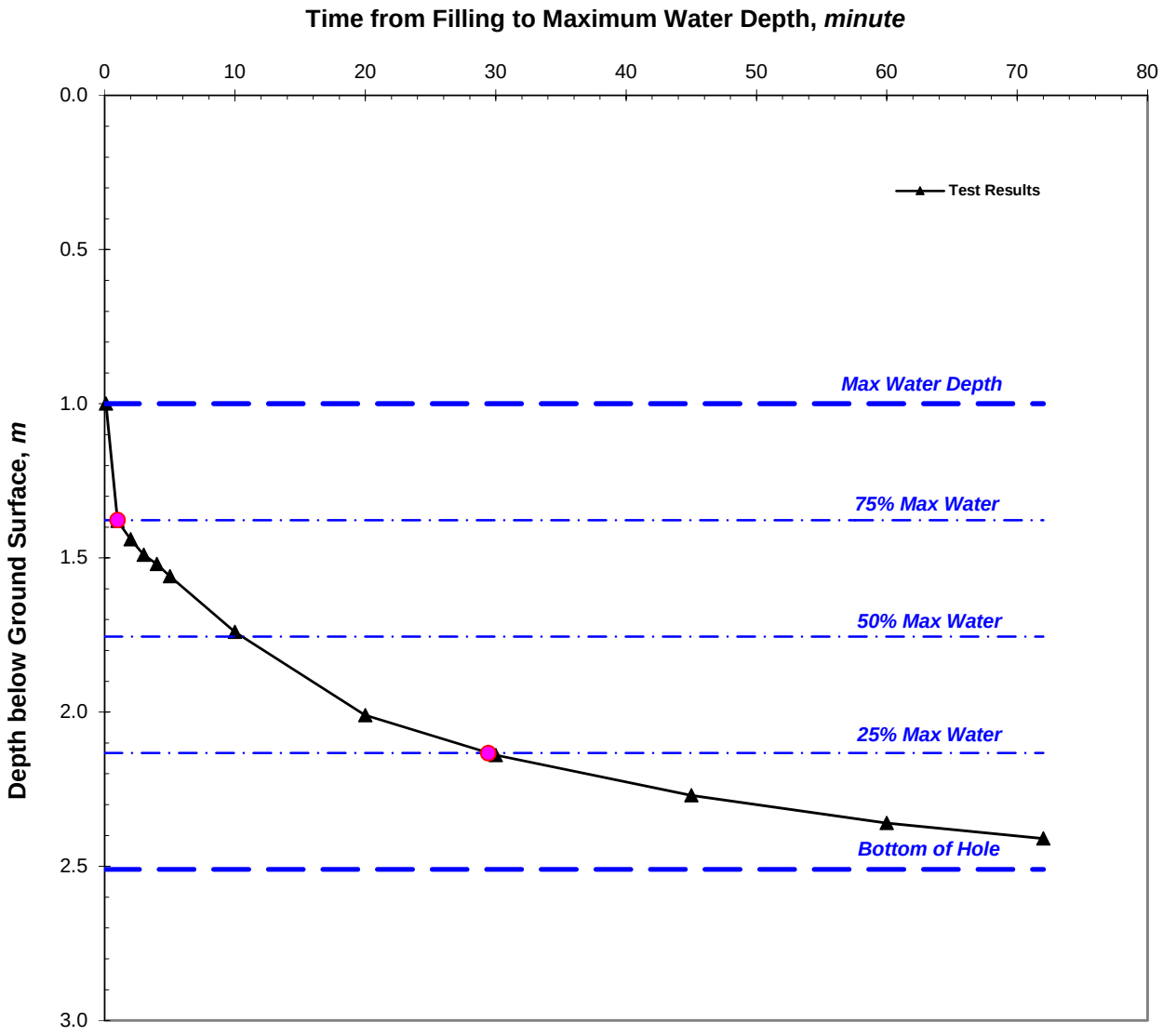
Pit Length, m	1.500	Depth to Water at Start of Test, *m*	1.360
Pit Width, m	0.700	Max Water Dropdown during Test, *m*	1.020
Depth to Pit Base, m	2.510	Total Soakage Test Time, *min*	60.0
Depth to Top of Permeable Soils, *m*		Mean Internal Discharge Area, m^2	3.580
Depth to Groundwater Surface, *m*		Discharge Rate, *litre/min*	8.948
Depth to Top of Granular Fill, *m*	1.400	Soakage Rate, *litre/m^2/min*	**2.50**
Voids Assumed for Granular Fill, %	35%	BRE Soil Infiltration Rate, *m/sec*	**4.17E-05**

Comments: *Depth to the bottom 2.51*
Pit was nearly emptied at finish of test.

Client:	Roundhouse Trust	**Job No:**	J14197	**Test Date:**	30/Jan/2019		
Site:	Roundhouse, 100a Chalk Farm Road, Lond	**Tested By:**	KK	**Engineer:**	ER	**Fig.**	**S1**

BRE Digest DG365 Soakage Test

Test Hole No: 1
Test No: Test No 2 (Repeated)



Pit Length, m	1.500	Depth to Water at Start of Test, *m*	1.000
Pit Width, m	0.700	Max Water Dropdown during Test, *m*	1.410
Depth to Pit Base, m	2.510	Total Soakage Test Time, *min*	72.0
Depth to Top of Permeable Soils, *m*		Mean Internal Discharge Area, m^2	4.372
Depth to Groundwater Surface, *m*		Discharge Rate, *litre/min*	10.300
Depth to Top of Granular Fill, *m*	1.400	Soakage Rate, *litre/m^2/min*	**2.36**
Voids Assumed for Granular Fill, %	35%	BRE Soil Infiltration Rate, *m/sec*	**3.93E-05**

Comments: *Depth to the bottom 2.51*
Pit was nearly emptied at finish of test.

Client:	Roundhouse Trust	**Job No:**	J14197	**Test Date:**	30/Jan/2019		
Site:	Roundhouse, 100a Chalk Farm Road, Lond	**Tested By:**	KK	**Engineer:**	ER	**Fig.**	**S2**

Summary Sheet

Results of BRE Digest DG365 Soakage Tests

Site :	Roundhouse, 100a Chalk Farm Road, London NV				**Job No :**	J14197	
Client :	Roundhouse Trust				**O S Reference :**		
Tested By :	KK			**Engineer:**	ER	**Test Date :**	27/Sep/2019

Hole No	Test No	Hole Depth *m*	Soakage Rate for Each Test *litre/m² /min*	Soakage Rate for Each Hole *litre/m² /min*	*m/sec*	Water Level at Finish of Test	Remarks
1	No 1	2.51	2.50	2.36	3.93E-5	Nearly empty pit.	Depth to the bottom 2.51
1	No 2	2.51	2.36			Nearly empty pit.	Depth to the bottom 2.51
Mean Value of All Calculated Soakage Rates :				**2.36** *litre/m² /min*	**3.93E-5** *m/sec*		

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APPENDIX C

Geotechnical Laboratory Test Methods and Results

C

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Atterberg and Moisture Content Summary

BS1377-2 cl.3.2, 3.3, 4.2, 4.3 & BS EN ISO 17892-1

AGS

Project Name	The Roundhouse, London NW1						Project Number		J14197	
Client	Roundhouse Trust				PE	ER	Date Issued		18-Oct-19	
Location	Depth m	Sample Type	Visual Description	Comments	Natural MC %	Liquid Limit %	Plastic Limit %	Plasticity Index	Classi-fication	Passing 425 micron %
2	7.50	D	*Stiff brown veined grey CLAY.*		*32*	*81*	*26*	*55*	*CV*	*100*
2	9.50	D	*Very stiff light brown CLAY with selenite crystals.*		*33*	*84*	*29*	*55*	*CV*	*100*
2	10.50	D	*Very stiff brown CLAY with selenite crystals.*		*31*	*77*	*27*	*50*	*CV*	*100*
2	12.50	D	*Very stiff fissured grey brown CLAY.*		*29*	*77*	*27*	*50*	*CV*	*100*
2	13.50	D	*Very stiff dark brown CLAY.*		*28*	*73*	*23*	*50*	*CV*	*100*
2	14.50	D	*Very stiff dark grey brown CLAY.*		*29*	*77*	*28*	*49*	*CV*	*100*
2	16.00	D	*Very stiff fissured grey brown CLAY.*		*29*	*79*	*28*	*51*	*CV*	*100*
2	17.50	D	*Very stiff dark grey CLAY.*		*32*	*76*	*28*	*48*	*CV*	*100*
BH1	6.50	D	*Stiff brown calcareous CLAY.*		*32*	*79*	*28*	*51*	*CV*	*100*
BH1	8.50	D	*Very stiff light grey CLAY with selenite crystals.*		*32*	*79*	*31*	*48*	*CV*	*100*

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Atterberg and Moisture Content Summary

BS1377-2 cl.3.2, 3.3, 4.2, 4.3 & BS EN ISO 17892-1

AGS

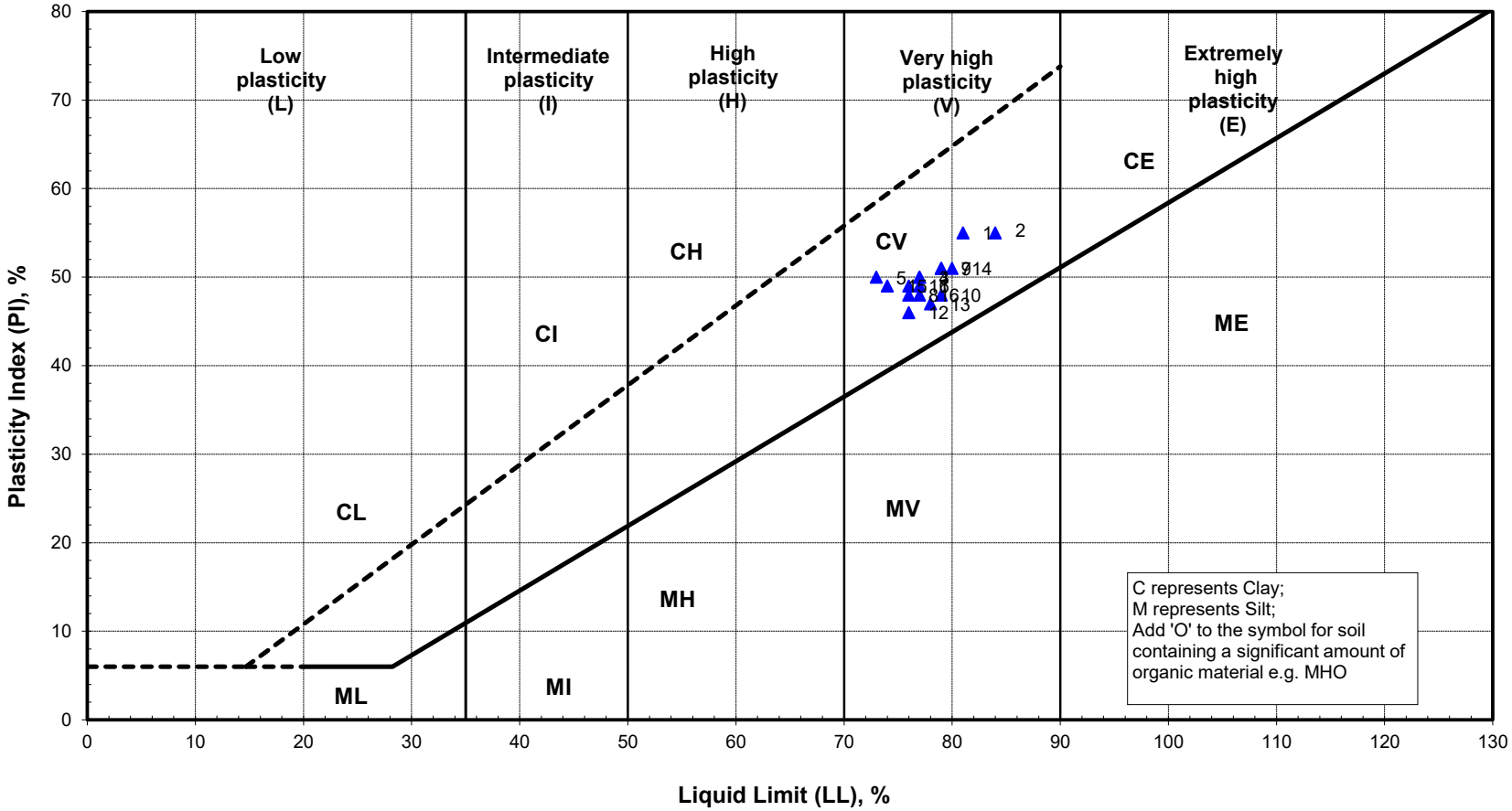
Project Name	*The Roundhouse, London NW1*						**Project Number**		*J14197*	
Client	*Roundhouse Trust*				**PE**	*ER*	**Date Issued**		*18-Oct-19*	
Location	Depth m	Sample Type	Visual Description	Comments	Natural MC %	Liquid Limit %	Plastic Limit %	Plasticity Index	Classi-fication	Passing 425 micron %
BH1	10.00	D	*Firm dark brown mottled black CLAY with selenite crystals.*		*30*	*76*	*27*	*49*	*CV*	*100*
BH1	12.50	D	*Very stiff brown grey CLAY.*		*29*	*76*	*30*	*46*	*CV*	*100*
BH1	13.50	D	*Very stiff dark grey CLAY.*		*26*	*78*	*31*	*47*	*CV*	*100*
BH1	15.50	D	*Very stiff dark grey CLAY.*		*29*	*80*	*29*	*51*	*CV*	*100*
BH1	16.50	D	*Very stiff fissured grey brown CLAY.*		*28*	*74*	*25*	*49*	*CV*	*100*
BH1	18.00	D	*Very stiff dark grey CLAY.*		*27*	*77*	*29*	*48*	*CV*	*100*

Plasticity Chart for Atterberg Limit Tests

Project Name	*The Roundhouse, London NW1*			**Project Number**	*J14197*
Client Name	*Roundhouse Trust*	**PE**	*ER*	**Date Issued**	*18-Oct-19*

Key

No.	TH No.	Depth
1	2	7.50
2	2	9.50
3	2	10.50
4	2	12.50
5	2	13.50
6	2	14.50
7	2	16.00
8	2	17.50
9	BH1	6.50
10	BH1	8.50
11	BH1	10.00
12	BH1	12.50
13	BH1	13.50
14	BH1	15.50
15	BH1	16.50
16	BH1	18.00



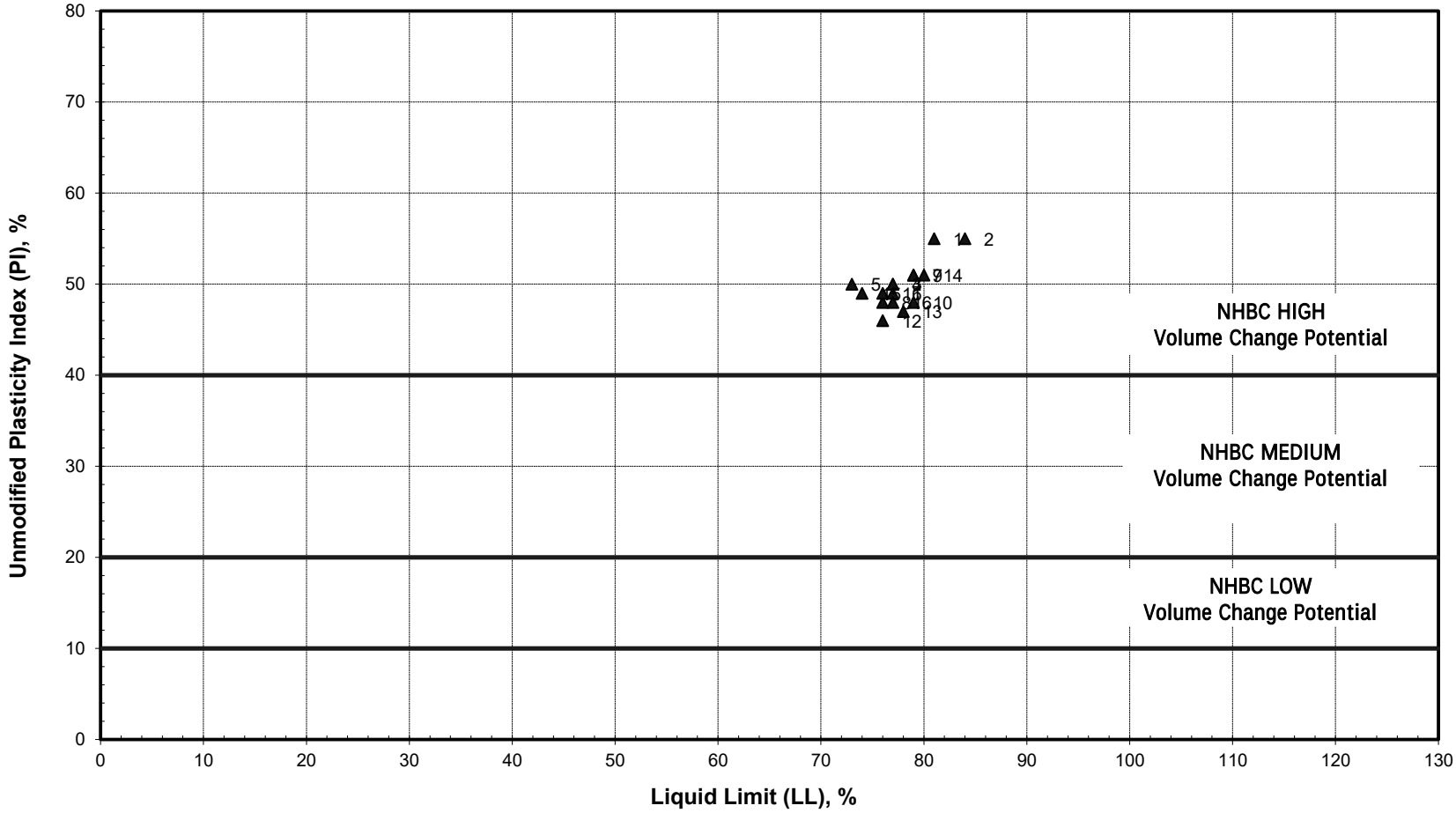
Liquid Limit		**Plastic Limit**		**Plasticity Index**	
Maximum Value	84	Maximum Value	31	Maximum Value	55
Minimum Value	73	Minimum Value	23	Minimum Value	46
Average Value	78	Average Value	28	Average Value	50

NHBC Classification for Volume Change Potential

Project Name	*The Roundhouse, London NW1*			**Project Number**	*J14197*
Client Name	*Roundhouse Trust*	**PE**	*ER*	**Date Issued**	*18-Oct-19*

Key

No.	TH No.	Depth
1	2	7.50
2	2	9.50
3	2	10.50
4	2	12.50
5	2	13.50
6	2	14.50
7	2	16.00
8	2	17.50
9	BH1	6.50
10	BH1	8.50
11	BH1	10.00
12	BH1	12.50
13	BH1	13.50
14	BH1	15.50
15	BH1	16.50
16	BH1	18.00



Liquid Limit		**Plastic Limit**		**Unmodified Plasticity Index**	
Maximum Value	84	Maximum Value	31	Maximum Value	55
Minimum Value	73	Minimum Value	23	Minimum Value	46
Average Value	78	Average Value	28	Average Value	50

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CHEMICAL & ELECTROCHEMICAL TESTING SUMMARY

To BS1377-3 cl 5.6 & 9.5

AGS

Project Name		*The Roundhouse, London NW1*					**Project Number**		***J14197***	
Client		*Roundhouse Trust*			**PE**	*ER*	**Date Issued**		*18-Oct-19*	
TH No.	Depth m	Sample Type	Visual Description	Comments	Passing 2mm %	pH Value	Soil Sulphate 2:1 Water Extract		Groundwater Sulphate	
							g/l SO_3	BRE mg/l SO_4	g/l SO_3	BRE mg/l SO_4
2	7.00	D	*Stiff brown CLAY.*		*100*	*8.0*	*2.58*	*3091*		
2	11.50	D	*Very stiff brown CLAY.*		*100*	*8.0*	*2.57*	*3082*		
BH1	7.00	D	*Stiff light brown mottled grey CLAY.*		*100*	*7.9*	*2.60*	*3120*		
BH1	11.50	D	*Very stiff dark grey brown CLAY.*		*100*	*8.1*	*1.38*	*1661*		

The samples above may have been crushed to pass a 2mm sieve. Samples dried at 50°C.

N.D. = Not Detected

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IMMEDIATE UNDRAINED TRIAXIAL SUMMARY

To BS1377-7

AGS

Project Name	*The Roundhouse, London NW1*			Project Number	*J14197*
Client	*Roundhouse Trust*	PE	*ER*	Date Issued	*18-Oct-19*

Location	Depth (m)	Sample Type	Visual Description	Comments	Test Type	UCS by Hand Pen. (KPa)	NMC (%)	Cell Press. (KPa)	Deviator Stress (KPa)	Apparent Cohesion C_u (KPa)	Bulk Density (Mg/m^3)
2	6.50	UT	*Stiff brown CLAY with occasional selenite crystals.*		*Single Stage*	*250*	*33.4*	*130*	*153*	*77*	*1.85*
2	9.50	UT	*Stiff brown mottled grey CLAY.*		*Single Stage*	*250*	*34.1*	*190*	*214*	*107*	*1.89*
2	12.50	UT	*Very stiff dark brown CLAY.*		*Single Stage*	*600*	*27.6*	*250*	*466*	*233*	*1.95*
2	15.50	UT	*Very stiff fissured dark grey brown CLAY. Unsuitable for test-sample sheared diagonally throughout.*	*Unsuitable to test - sample sheared diagonally throughout.*	*Single Stage*	*600+*	*28.8*				
BH1	6.50	U	*Stiff yellow brown mottled orange and grey CLAY with occasional patches of fine selenite crystals.*		*Single Stage*	*320*	*33.0*	*130*	*136*	*68*	*1.86*
BH1	9.50	U	*Very stiff fissured brown CLAY with occasional selenite crystals.*		*Single Stage*	*550*	*31.6*	*190*	*214*	*107*	*1.86*
BH1	12.50	U	*Very stiff fissured brown CLAY. Unsuitable to test-sheared surfaces throughout.*	*Unsuitable - sample sheared throughout.*	*Single Stage*	*600+*	*28.0*				
BH1	15.50	U	*Very stiff fissured dark grey brown CLAY.*		*Single Stage*	*600+*	*28.8*	*310*	*225*	*113*	*1.88*

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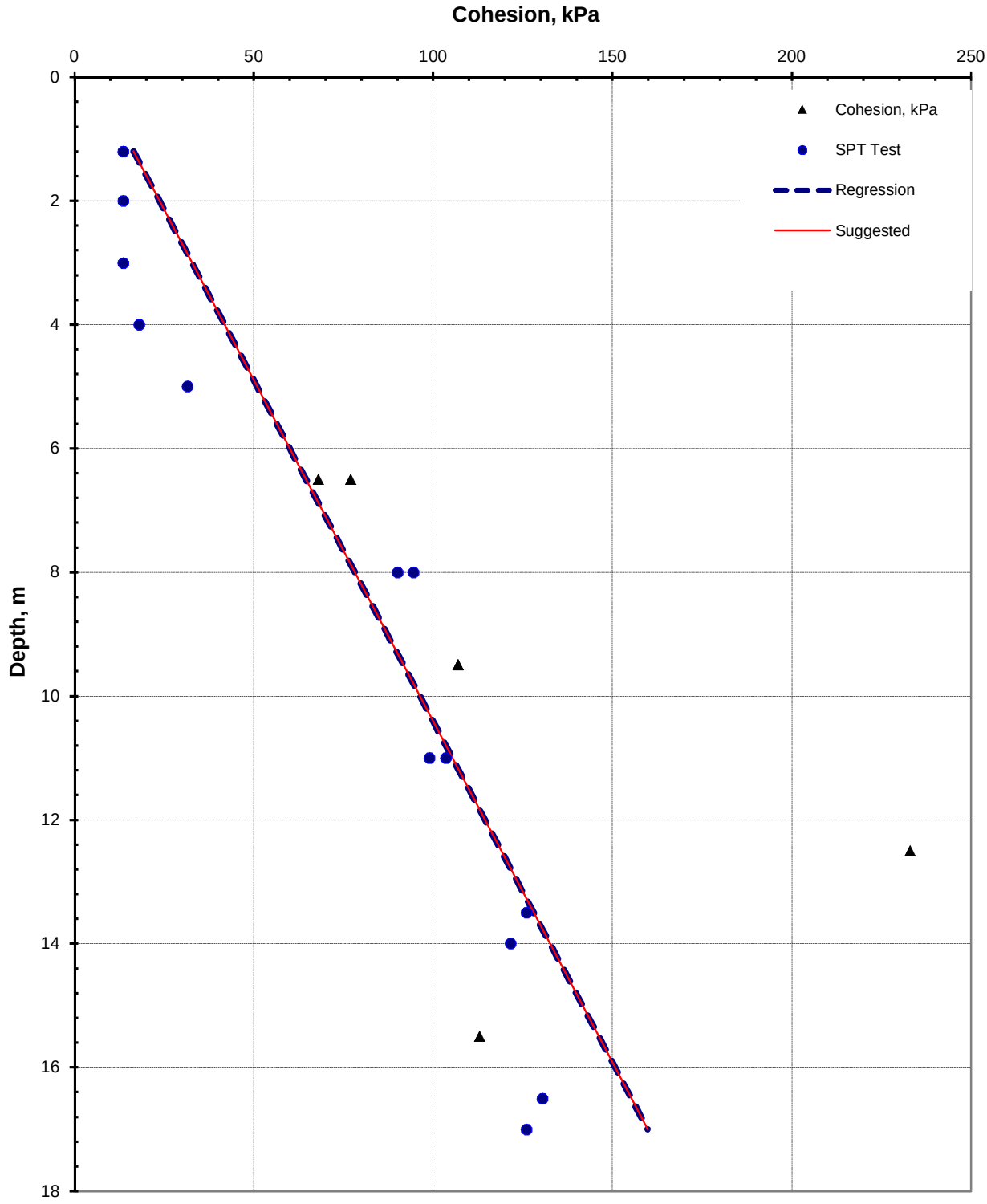
APPENDIX D

Geotechnical Figures and Tables

D

Plot of Cohesion vs Depth



Linear Regression of the Test Results: *Slope =* 9.1 *kPa/m,* *Zero intercept =* 5.5 *kPa*

Suggested Design Line: *Slope =* 9.1 *kPa/m,* *Zero intercept =* 5.5 *kPa*

Client:	**Roundhouse Trust**	**Site:**	**Roundhouse, 100a Chalk Farm Road, London N**		
Job No:	J14197	**Date:**	01/11/2019	**Figure No:**	3

Site : Roundhouse, 100a Chalk Farm Road, London NW1 **Client :** Roundhouse Trust
Job No : J14197 **Date :** 01/11/19 **Table :** P-1

Bearing Capacity of Bored Piles (kN)

Pile	Factor of Safety = 2.0						Factor of Safety = 2.5						Factor of Safety = 3.0					
Length	Pile Diameter, mm						Pile Diameter, mm						Pile Diameter, mm					
m	300	350	400	450	500	600	300	350	400	450	500	600	300	350	400	450	500	600
6.0	30	35	45	55	65	90	25	30	35	45	50	70	20	25	30	35	45	60
7.0	45	55	70	80	95	125	35	45	55	65	75	100	30	35	45	55	65	85
8.0	65	75	95	110	130	165	50	60	75	90	100	135	40	50	60	75	85	110
9.0	85	100	120	140	165	210	65	80	95	115	130	170	55	65	80	95	110	140
10.0	105	125	150	175	205	260	85	100	120	140	160	210	70	85	100	115	135	175
11.0	130	155	185	215	245	310	105	125	145	170	195	250	85	105	120	140	165	210
12.0	155	185	220	255	290	370	125	150	175	205	230	295	105	125	145	170	195	245
13.0	180	220	255	295	340	430	145	175	205	240	270	345	120	145	170	200	225	285
14.0	210	255	295	345	390	495	170	205	240	275	315	395	140	170	200	230	260	330
15.0	245	290	340	390	445	560	195	230	270	315	355	450	160	195	225	260	295	375
16.0	275	330	385	445	505	630	220	265	310	355	405	505	185	220	255	295	335	420
17.0	310	370	435	500	565	710	250	295	345	400	455	565	210	250	290	335	375	470
18.0	350	415	485	555	630	785	280	330	390	445	505	630	230	275	325	370	420	525

Note: 1. Nil skin friction on the pile shaft was assumed to a depth of 5.00 m.
2. The calculated cohesion depth line gave a zero intercept of 5.5 kPa and slope of 9.1kPa/m.
3. A value of 7.50 was used for bearing capacity, and 0.45 for adhesion, for the clays.
4. An allowable load with underline represents Maximum working load (allowable stresses of 6.25MPa adopted).

THE ABOVE FIGURES MUST NOT SUPERCEDE THE ENGINEER'S DESIGN

Site : Roundhouse, 100a Chalk Farm Road, London NW1 **Client :** Roundhouse Trust
Job No : J14197 **Date :** 01/11/19 **Table :** P-2

Bearing Capacity of CFA Piles (kN)

Pile	Factor of Safety = 2.0						Factor of Safety = 2.5						Factor of Safety = 3.0					
Length	Pile Diameter, mm						Pile Diameter, mm						Pile Diameter, mm					
m	300	350	400	450	500	600	300	350	400	450	500	600	300	350	400	450	500	600
6.0	30	35	45	55	65	90	25	30	35	45	50	70	20	25	30	35	45	60
7.0	45	55	70	80	95	125	35	45	55	65	75	100	30	35	45	55	65	85
8.0	65	75	95	110	130	165	50	60	75	90	100	135	40	50	60	75	85	110
9.0	85	100	120	140	165	210	65	80	95	115	130	170	55	65	80	95	110	140
10.0	105	125	150	175	205	260	85	100	120	140	160	210	70	85	100	115	135	175
11.0	130	155	185	215	245	310	105	125	145	170	195	250	85	105	120	140	165	210
12.0	155	185	220	255	290	370	125	150	175	205	230	295	105	125	145	170	195	245
13.0	180	220	255	295	340	430	145	175	205	240	270	345	120	145	170	200	225	285
14.0	210	255	295	345	390	495	170	205	240	275	315	395	140	170	200	230	260	330
15.0	245	290	340	390	445	560	195	230	270	315	355	450	160	195	225	260	295	375
16.0	275	330	385	445	505	630	220	265	310	355	405	505	185	220	255	295	335	420
17.0	310	370	435	500	565	710	250	295	345	400	455	565	210	250	290	335	375	470
18.0	350	415	485	555	630	785	280	330	390	445	505	630	230	275	325	370	420	525

Note: 1. Nil skin friction on the pile shaft was assumed to a depth of 5.00 m.
2. The calculated cohesion depth line gave a zero intercept of 5.5 kPa and slope of 9.1kPa/m.
3. A value of 7.50 was used for bearing capacity, and 0.45 for adhesion, for the clays.
4. An allowable load with underline represents Maximum working load (allowable stresses of 6.25MPa adopted).

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APPENDIX E

Contamination Laboratory Test Methods and Results

E

These screening values are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

Table 1 – Tier 1 Screening Values							
Contaminant	Units	Proposed Land Use					
		Residential with home grown produce consumption	Residential without home grown produce consumption	Open Space * (Residential)	Open Space * (Park)	Allotments	Commercial / Industrial
Arsenic (As) [2]	mg/kg	37	40	79	170	43	640
Cadmium (Cd) [2]	mg/kg	11	85	120	555	1.9	190
Trivalent Chromium (CrIII) [2]	mg/kg	910	910	1,500	33,000	18,000	8600
Hexavalent Chromium (CrVI) [2]	mg/kg	6	6	7.7	220	1.8	33
Lead (Pb) [3]	mg/kg	200	310	630	1300	80	2330
Mercury (Hg) [1,2,7]	mg/kg	7.6-11	9.2-15	40	68-71	6.0	29-320
Selenium (Se) [2]	mg/kg	250	430	1,100	1,800	88	12,000
Nickel (Ni) [2,4]	mg/kg	130	180	230	800	53	980
Copper (Cu) [2,4]	mg/kg	2,400	7,100	12,000	44,000	520	68,000
Zinc (Zn) [2,4]	mg/kg	3,700	40,000	81,000	170,000	620	730,000
Phenol [1,2]	mg/kg	120-380	440-1200	440-1300	440-1300	23-83	440-1300
Benzo[a]pyrene [1,5]	mg/kg	1.7-2.4	2.6	4.9	10	0.67-2.7	36
Naphthalene [1,2]	mg/kg	2.3-1.3	2.3-13	77-430^{+}	77-430^{+}	4.1-24	77-430^{+}
Total Cyanide (CN) [6]	mg/kg	/	/	/	/	/	/
Free Cyanide [6]	mg/kg	/	/	/	/	/	/
Complex Cyanides [6]	mg/kg	/	/	/	/	/	/
Thiocyanate [6]	mg/kg	/	/	/	/	/	/

Notes:

* Open Space levels calculated on the basis of the exposure modelling developed in the C4SL research.

+ Screening values constrained to saturation limit. Higher values may be acceptable on a site specific basis.

[1] Where ranges of values are given for organic contaminants the screening value is dependent on the Soil +Organic Matter.

[2] LQM/CIEH S4UL (2014). Copyright Land Quality Management Ltd. reproduced with permission; Publication Number S4UL 3116. All rights reserved.

[3] C4SL (DEFRA 2014).

[4] Copper, Zinc and Nickel may have phototoxic effects at the given concentrations. Alternative criteria should be adopted for importation of Topsoil or other soils for cultivation. BS3882:2015 and BS8601:2013 suggest values of 200 to 300mg/kg for Zn, 100 to 200mg/kg for Cu, and 60 to 110mg/kg for Ni, for topsoil and subsoil, depending on pH.

[5] Based on the Surrogate Marker approach and modelled using the modified exposure parameters of C4SL but retaining 'minimal risk' HCV.

[6] Screening criteria derived on a site specific basis if test results indicate.

[7] S4UL for Methyl Mercury, higher concentrations may be tolerable if inorganic mercury is the only species present. Lower concentrations apply for elemental Mercury.

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Eliza Richardson
Southern Testing Laboratories Ltd
Keeble House
Stuart Way
East Grinstead
West Sussex
RH19 4QA

t: 01342 333100
f: 01342 410321
e: contamresults@southerntesting.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-64095

Project / Site name:	The Roundhouse, London NW1	**Samples received on:**	03/10/2019
Your job number:	J14197	**Samples instructed on:**	03/10/2019
Your order number:	J14197-2	**Analysis completed by:**	14/10/2019
Report Issue Number:	1	**Report issued on:**	14/10/2019
Samples Analysed:	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

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Analytical Report Number: 19-64095

Project / Site name: The Roundhouse, London NW1
Your Order No: J14197-2

Lab Sample Number				1321739	1321740			
Sample Reference				BH2	BH2			
Sample Number				None Supplied	None Supplied			
Depth (m)				2.80	3.50			
Date Sampled				27/09/2019	27/09/2019			
Time Taken				0900	0900			
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1			
Moisture Content	%	N/A	NONE	17	15			
Total mass of sample received	kg	0.001	NONE	0.50	0.48			
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected			
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	9.4	8.3			
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1			
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.64	0.20			
Sulphide	mg/kg	1	MCERTS	75	44			
Organic Matter	%	0.1	MCERTS	1.4	1.8			
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	0.69	0.26			
Anthracene	mg/kg	0.05	MCERTS	0.16	< 0.05			
Fluoranthene	mg/kg	0.05	MCERTS	1.0	0.29			
Pyrene	mg/kg	0.05	MCERTS	0.89	0.24			
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.71	0.23			
Chrysene	mg/kg	0.05	MCERTS	0.50	0.15			
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.65	< 0.05			
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.40	< 0.05			
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.58	< 0.05			
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.29	< 0.05			
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.36	< 0.05			
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	6.25	1.17			
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.3	11			
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2			
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0			
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	31	27			
Copper (aqua regia extractable)	mg/kg	1	MCERTS	55	39			
Lead (aqua regia extractable)	mg/kg	1	MCERTS	210	280			
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3			
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	22			
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0			
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	78	47			

Analytical Report Number : 19-64095

Project / Site name: The Roundhouse, London NW1

* 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 *
1321739	BH2	None Supplied	2.80	Brown clay and sand with gravel.
1321740	BH2	None Supplied	3.50	Brown clay and sand with gravel.

Analytical Report Number : 19-64095

Project / Site name: The Roundhouse, London NW1

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
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.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical 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

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.

Eliza Richardson
Southern Testing Laboratories Ltd
Keeble House
Stuart Way
East Grinstead
West Sussex
RH19 4QA

t: 01342 333100
f: 01342 410321
e: contamresults@southerntesting.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-64098

Project / Site name:	The Roundhouse, London NW1	**Samples received on:**	03/10/2019
Your job number:	J17197	**Samples instructed on:**	03/10/2019
Your order number:	J14197-3	**Analysis completed by:**	14/10/2019
Report Issue Number:	1	**Report issued on:**	14/10/2019
Samples Analysed:	1 soil sample		

Signed: Karoline 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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Analytical Report Number: 19-64098

Project / Site name: The Roundhouse, London NW1
Your Order No: J14197-3

Lab Sample Number				1321743				
Sample Reference				TP2				
Sample Number				None Supplied				
Depth (m)				0.25				
Date Sampled				01/10/2019				
Time Taken				1100				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	4.7				
Total mass of sample received	kg	0.001	NONE	1.1				
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected				
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	10.5				
Total Cyanide	mg/kg	1	MCERTS	< 1				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.14				
Sulphide	mg/kg	1	MCERTS	21				
Organic Matter	%	0.1	MCERTS	6.5				
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0				
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	0.26				
Pyrene	mg/kg	0.05	MCERTS	0.35				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80				
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.4				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	27				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	16				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	33				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	46				

Analytical Report Number : 19-64098

Project / Site name: The Roundhouse, London NW1

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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 *
1321743	TP2	None Supplied	0.25	Brown loam and clay with gravel.

Analytical Report Number : 19-64098

Project / Site name: The Roundhouse, London NW1

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
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.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical 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

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.

Eliza Richardson
Southern Testing Laboratories Ltd
Keeble House
Stuart Way
East Grinstead
West Sussex
RH19 4QA

t: 01342 333100
f: 01342 410321
e: contamresults@southerntesting.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-64102

Project / Site name:	The Roundhouse, London NW1	**Samples received on:**	03/10/2019
Your job number:	J14197	**Samples instructed on:**	03/10/2019
Your order number:	J14197-3	**Analysis completed by:**	14/10/2019
Report Issue Number:	1	**Report issued on:**	14/10/2019
Samples Analysed:	1 wac multi sample		

Signed:

Zina Abdul Razzak
Senior Quality Specialist
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.

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

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i2 Analytical
7 Woodshots Meadow
Croxley Green Business Park
Watford, WD18 8YS

Telephone: 01923 225404
Fax: 01923 237404
email:reception@i2analytical.com

Waste Acceptance Criteria Analytical Results

Report No:	**19-64102**						
					Client:	**SOUTHERNT**	
Location	**The Roundhouse, London NW1**						
Lab Reference (Sample Number)	1321760				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	01/10/2019				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP2						
Depth (m)	0.25						
Solid Waste Analysis							
TOC (%)**	4.1				3%	5%	6%
Loss on Ignition (%) **	7.7				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	10.5				--	>6	--
Acid Neutralisation Capacity (mol / kg)	37				--	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	mg/l	mg/l		mg/kg	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.010	< 0.010		< 0.050	0.5	2	25
Barium *	0.021	0.014		0.15	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.087	0.021		0.32	0.5	10	70
Copper *	0.27	0.038		0.77	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.015	0.0038		0.056	0.5	10	30
Nickel *	0.0088	< 0.0010		0.019	0.4	10	40
Lead *	< 0.0050	< 0.0050		0.047	0.5	10	50
Antimony *	< 0.0050	< 0.0050		< 0.020	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	< 0.0010	0.0013		< 0.020	4	50	200
Chloride *	11	< 4.0		39	800	4000	25000
Fluoride	0.31	0.21		2.2	10	150	500
Sulphate *	32	16		190	1000	20000	50000
TDS*	210	150		1600	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	18	7.6		94	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.1						
Dry Matter (%)	95						
Moisture (%)	4.7						
Stage 1							
Volume Eluate L2 (litres)	0.34						
Filtered Eluate VE1 (litres)	0.30						

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

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Analytical Report Number : 19-64102

Project / Site name: The Roundhouse, London NW1

* 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 *
1321760	TP2	None Supplied	0.25	Brown loam and clay with gravel.

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

Analytical Report Number : 19-64102

Project / Site name: The Roundhouse, London NW1

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
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046-PL	W	NONE
BTEX (Sum of BTEX compounds) in soil	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride in WAC leachate (BS EN 12457-3 Prep)	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
DOC in WAC leachate (BS EN 12457-3 Prep)	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR analyser.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L037-PL	W	NONE
Fluoride in WAC leachate (BS EN 12457-3 Prep)	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L033-PL	W	ISO 17025
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in WAC leachate (BS EN 12457-3 Prep)	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
Mineral Oil in Soil C10 - C40	Determination of dichloromethane/hexane extractable hydrocarbons in soil by GC-MS.	In-house method based on USEPA 8270	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
PCB's by GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Phenol Index in WAC leachate (BS EN 12457-3 Prep)	Determination of monohydric phenols in leachate by continuous flow analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated WAC-17 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. MCERTS accredited except Coronene.	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 in WAC leachate (BS EN 12457-3 Prep)	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
TDS in WAC leachate (BS EN 12457-3 Prep)	Determination of total dissolved solids in leachate by electrometric measurement.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L031-PL	W	NONE
Total organic carbon 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	L023-PL	D	MCERTS

Analytical Report Number : 19-64102

Project / Site name: The Roundhouse, London NW1

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

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.

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

Eliza Richardson
Southern Testing Laboratories Ltd
Keeble House
Stuart Way
East Grinstead
West Sussex
RH19 4QA

t: 01342 333100
f: 01342 410321
e: contamresults@southerntesting.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-70144

Replaces Analytical Report Number : 19-70144, issue no. 1

Project / Site name:	The Roundhouse, London NW1	**Samples received on:**	05/11/2019
Your job number:	J14197	**Samples instructed on:**	05/11/2019
Your order number:	J14197-5	**Analysis completed by:**	22/11/2019
Report Issue Number:	2	**Report issued on:**	22/11/2019
Samples Analysed:	3 soil samples		

Signed:

Rachel Bradley

Deputy Quality Manager
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: 19-70144

Project / Site name: The Roundhouse, London NW1
Your Order No: J14197-5

Lab Sample Number				1352913	1352914	1352915		
Sample Reference				BH1	2A	2		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				6.50	1.00	7.50		
Date Sampled				27/09/2019	27/09/2019	27/09/2019		
Time Taken				1200	1200	1200		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	20	20	20		
Total mass of sample received	kg	0.001	NONE	0.90	2.0	2.0		
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile	-		
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Not-detected		
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	< 0.001	-		
Asbestos Quantification Total	%	0.001	ISO 17025	-	< 0.001	-		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.2	9.2	7.7		
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	3.5	0.41	2.0		
Sulphide	mg/kg	1	MCERTS	2.3	< 1.0	< 1.0		
Organic Matter	%	0.1	MCERTS	0.5	1.1	0.5		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Phenanthrene	mg/kg	0.05	MCERTS	0.59	1.3	< 0.05		
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.33	< 0.05		
Fluoranthene	mg/kg	0.05	MCERTS	0.44	1.6	< 0.05		
Pyrene	mg/kg	0.05	MCERTS	0.37	1.4	< 0.05		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.77	< 0.05		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.63	< 0.05		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.54	< 0.05		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.46	< 0.05		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.52	< 0.05		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.23	< 0.05		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.32	< 0.05		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	1.40	8.16	< 0.80		
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	12	25	14		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	56	28	53		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	39	66	37		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	34	160	14		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	46	21	48		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	86	62	86		

Analytical Report Number: 19-70144
Project / Site name: The Roundhouse, London NW1
Your Order No: J14197-5

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1352914	2A	1.00	142	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number : 19-70144

Project / Site name: The Roundhouse, London NW1

* 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 *
1352913	BH1	None Supplied	6.50	Brown clay with gravel.
1352914	2A	None Supplied	1.00	Brown clay and sand with gravel and brick.
1352915	2	None Supplied	7.50	Brown clay.

Analytical Report Number : 19-70144

Project / Site name: The Roundhouse, London NW1

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
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
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
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

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.

CERTIFICATE OF ANALYSIS

Site :	Roundhouse, 100a Chalk Farm Road, London NW1	**Job No :**	J14197
Sample Group :	Made Ground	**Client :**	Roundhouse Trust
Test Suite :	STL Key Contaminants Suite	**Date Issued :**	01/Nov/2019

Sample Ref:		WLSA	WLSA	WLSB	WLSB	WLSB
Depth unit	m	0.5	1	0.25	1.9	2.3
Lab ID		714112	714113	714114	714115	714116
pH Value		10.9	10.6	10.2	8.5	8.1
Asbestos		Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Description						
Asbestos Type						
Total Arsenic (As)	mg/kg	13	11	9.2	15	14
Total Cadmium (Cd)	mg/kg	< 0.2	< 0.2	0.4	< 0.2	< 0.2
Total Chromium (Cr)	mg/kg	22	23	22	23	27
Hexavalent Chromium (CrVI)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Total Copper (Cu)	mg/kg	78	49	120	83	35
Total Lead (Pb)	mg/kg	120	96	120	180	120
Total Mercury (Hg)	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Total Nickel (Ni)	mg/kg	19	17	16	21	20
Total Selenium (Se)	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Zinc (Zn)	mg/kg	130	85	250	77	55
Phenol	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Cyanide (CN)	mg/kg	< 1	< 1	< 1	< 1	< 1
Free Cyanide	mg/kg					
Complex Cyanide	mg/kg					
Thiocyanate as SCN	mg/kg					
Total Sulphate (SO4)	mg/kg					
Soluble Sulphate* (SO4)	g/l	0.45	0.51	0.4	0.17	0.6
Sulphide (S)	mg/kg	41	37	36	< 1.0	59
Benzo(a)pyrene	mg/kg	2.3	2.6	4	2.5	< 0.10
Naphthalene	mg/kg	< 0.05	0.35	< 0.05	0.27	0.2
Total of 16 EPA PAHs	mg/kg					
Elemental Sulphur	mg/kg					
Wt. loss on drying	% of wet					
Retained on 2mm sieve	% of dry					
EPH/GC	mg/kg					
Soil Organic Matter	%	2.1	2.3	3.7	1.8	3.2
-- dependent option	* 1:2 Extract					
EXTRAS						
Moisture Content (Dry Weight)	%					
Material Passing a 2mm Sieve	%					
Naphthalene		< 0.05	0.35	< 0.05	0.27	0.2
Acenaphthylene		0.26	< 0.10	0.26	< 0.10	< 0.10
Acenaphthene		0.2	0.81	0.25	0.24	< 0.10
Fluorene		0.22	0.66	0.29	0.26	< 0.10
Phenanthrene		2.2	4.8	2.6	3.1	0.51
Anthracene		0.77	1.2	0.91	0.88	0.16
Fluoranthene		4	5.7	6	6.1	0.34
Pyrene		4.2	4.9	5.6	5.3	0.27
Benzo(a)Anthracene		2.3	2.6	3.6	2.9	< 0.10
Chrysene		1.7	2	2.8	2.3	< 0.05
Benzo(b)Fluoranthene		2.1	2.2	3.9	2.5	< 0.10
Benzo(k)Fluoranthene		1.6	1.6	3.3	1.9	< 0.10
Benzo(a)Pyrene		2.3	2.6	4	2.5	< 0.10
Indeno(123-cd)Pyrene		1.2	1.2	2.2	1.1	< 0.10
Dibenzo(ah)Anthracene		0.25	0.27	0.45	0.26	< 0.10
Benzo(ghi)Perylene		1.4	1.4	2.6	1.2	< 0.05

- : not determined -- : dependent option I/S : insufficient sample nt : not tested

Southern Testing

Southern Testing: Keeble House, Stuart Way, East Grinstead, West Sussex RH19 4QA
ST Consult: Twigden Barns, Brixworth Road, Creaton, Northampton NN6 8NN

ST Consult

CERTIFICATE OF ANALYSIS

Site :	Roundhouse, 100a Chalk Farm Road, London NW1	**Job No :**	J14197
Sample Group :	Made Ground	**Client :**	Roundhouse Trust
Test Suite :	STL Key Contaminants Suite	**Date Issued :**	01/Nov/2019

Sample Ref:		WLSB	WLSD	WLSD	BH2	BH2
Depth unit	m	3.5	0.2	0.6	2.8	3.5
Lab ID		714117	714118	714119	1321739	1321740
pH Value		8.5	10.6	9.7	9.4	8.3
Asbestos		Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Description						
Asbestos Type						
Total Arsenic (As)	mg/kg	14	7.6	11	9.3	11
Total Cadmium (Cd)	mg/kg	< 0.2	0.7	< 0.2	< 0.2	< 0.2
Total Chromium (Cr)	mg/kg	41	8.6	14	31	27
Hexavalent Chromium (CrVI)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Total Copper (Cu)	mg/kg	36	16	33	55	39
Total Lead (Pb)	mg/kg	66	59	110	210	280
Total Mercury (Hg)	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Total Nickel (Ni)	mg/kg	25	6.2	12	23	22
Total Selenium (Se)	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Zinc (Zn)	mg/kg	52	59	210	78	47
Phenol	mg/kg	< 1.0	< 1.0	2.2	< 1	< 1
Total Cyanide (CN)	mg/kg	< 1	< 1	< 1	< 1	< 1
Free Cyanide	mg/kg					
Complex Cyanide	mg/kg					
Thiocyanate as SCN	mg/kg					
Total Sulphate (SO4)	mg/kg					
Soluble Sulphate* (SO4)	g/l	0.17	0.18	0.24	0.64	0.2
Sulphide (S)	mg/kg	11	18	3.6	75	44
Benzo(a)pyrene	mg/kg	0.26	1.4	11	0.58	< 0.05
Naphthalene	mg/kg	0.25	0.96	1.5	< 0.05	< 0.05
Total of 16 EPA PAHs	mg/kg					
Elemental Sulphur	mg/kg					
Wt. loss on drying	% of wet					
Retained on 2mm sieve	% of dry					
EPH/GC	mg/kg					
Soil Organic Matter	%	1.2	4.6	7	1.4	1.8
-- dependent option	* 1:2 Extract					
EXTRAS						
Moisture Content (Dry Weight)	%					
Material Passing a 2mm Sieve	%					
Naphthalene		0.25	0.96	1.5	< 0.05	< 0.05
Acenaphthylene		< 0.10	0.35	0.39	< 0.05	< 0.05
Acenaphthene		< 0.10	0.78	4.2	< 0.05	< 0.05
Fluorene		0.22	1.1	5.1	< 0.05	< 0.05
Phenanthrene		0.92	4.6	31	0.69	0.26
Anthracene		0.35	1.6	9.3	0.16	< 0.05
Fluoranthene		0.76	4.5	36	1	0.29
Pyrene		0.61	3.5	28	0.89	0.24
Benzo(a)Anthracene		0.31	1.8	14	0.71	0.23
Chrysene		0.24	1.5	10	0.5	0.15
Benzo(b)Fluoranthene		0.22	1.6	15	0.65	< 0.05
Benzo(k)Fluoranthene		0.17	0.67	4.2	0.4	< 0.05
Benzo(a)Pyrene		0.26	1.4	11	0.58	< 0.05
Indeno(123-cd)Pyrene		< 0.10	0.64	4.7	0.29	< 0.05
Dibenzo(ah)Anthracene		< 0.10	< 0.10	1.4	< 0.05	< 0.05
Benzo(ghi)Perylene		< 0.05	0.74	5.1	0.36	< 0.05

- : not determined -- : dependent option I/S : insufficient sample nt : not tested

CERTIFICATE OF ANALYSIS

Site :	Roundhouse, 100a Chalk Farm Road, London NW1	**Job No :**	J14197
Sample Group :	natural ground	**Client :**	Roundhouse Trust
Test Suite :	STL Key Contaminants Suite	**Date Issued :**	18/Nov/2019

Sample Ref:		BH1	BH'2
Depth unit	m	6.5	7.5
Lab ID		1352913	1352915
pH Value		8.2	7.7
Asbestos		Not-detected	Not-detected
Asbestos Description			
Asbestos Type			
Total Arsenic (As)	mg/kg	12	14
Total Cadmium (Cd)	mg/kg	< 0.2	< 0.2
Total Chromium (Cr)	mg/kg	56	53
Hexavalent Chromium (CrVI)	mg/kg	< 4.0	<4.0
Total Copper (Cu)	mg/kg	39	37
Total Lead (Pb)	mg/kg	34	14
Total Mercury (Hg)	mg/kg	< 0.3	< 0.3
Total Nickel (Ni)	mg/kg	46	48
Total Selenium (Se)	mg/kg	< 1.0	< 1.0
Total Zinc (Zn)	mg/kg	86	86
Phenol	mg/kg	< 1	< 1
Total Cyanide (CN)	mg/kg	< 1	< 1
Free Cyanide	mg/kg		
Complex Cyanide	mg/kg		
Thiocyanate as SCN	mg/kg		
Total Sulphate (SO4)	mg/kg		
Soluble Sulphate* (SO4)	g/l	3.5	2
Sulphide (S)	mg/kg	2.3	< 1.0
Benzo(a)pyrene	mg/kg	< 0.05	< 0.05
Naphthalene	mg/kg	< 0.05	< 0.05
Total of 16 EPA PAHs	mg/kg		
Elemental Sulphur	mg/kg		
Wt. loss on drying	% of wet		
Retained on 2mm sieve	% of dry		
EPH/GC	mg/kg		
Soil Organic Matter	%	0.5	0.5
-- dependent option	* 1:2 Extract		
EXTRAS			
Moisture Content (Dry Weight)	%		
Material Passing a 2mm Sieve	%		
Naphthalene		< 0.05	< 0.05
Acenaphthylene		< 0.05	< 0.05
Acenaphthene		< 0.05	< 0.05
Fluorene		< 0.05	< 0.05
Phenanthrene		0.59	< 0.05
Anthracene		< 0.05	< 0.05
Fluoranthene		0.44	< 0.05
Pyrene		0.37	< 0.05
Benzo(a)Anthracene		< 0.05	< 0.05
Chrysene		< 0.05	< 0.05
Benzo(b)Fluoranthene		< 0.05	< 0.05
Benzo(k)Fluoranthene		< 0.05	< 0.05
Benzo(a)Pyrene		< 0.05	< 0.05
Indeno(123-cd)Pyrene		< 0.05	< 0.05
Dibenzo(ah)Anthracene		< 0.05	< 0.05
Benzo(ghi)Perylene		< 0.05	< 0.05

- : not determined -- : dependent option I/S : insufficient sample nt : not tested

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APPENDIX F

Monitoring Data

F

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SOIL GAS AND GROUND WATER DAILY RECORD SHEET

Project Name:	Roundhouse, 100a Chalk Farm Road, London NW1, NW1 8EH	Project Engineer: ER	Date:	02-Oct-19	Project No:
Client:	Roundhouse Trust	Operative: PG	Day of the week:	Wednesday	J14197

Well / TH No.	Atmospheric Pressure (mb) and Ambient Temperature		PID (ppm)	BH pressure (Pa)	Flow Rate (l/hr)		CH_4 (%)	CO_2 (%)	O_2 (%)	CO (ppm)	H_2S (ppm)	Depth to base of well (m below top of cover)	Water level (m below top of cover)	Height of Cover (m above GL)	Details of water samples (colour, clarity, odour etc)	Ground Conditions (soft, wet/dry, frozen etc) & Weather Conditions	General Remarks
BH01	1014 11C	P	0.1	2.0	0.2	P	9.5	1.9	10.7	0.0	0.0	5.60	3.91	0.00		Warm,dry,sunny	Monitoring extended to 7mins
		S	0.0	0.0	0.0	S	4.7	1.0	13.9	0.0	0.0						
		Time Of Readings: 10:15 10:24				Time Of Readings: 10:16 - 10:23						Time Of Readings: 10:25					
BH02	1013 11C	P	0.5	0.0	0.0	P	0.0	0.6	19.3	0.0	0.0	5.10	3.91	0.00		Warm,dry,sunny	
		S	0.5	0.0	0.0	S	0.0	0.6	19.3	0.0	0.0						
		Time Of Readings: 10:27 10:32				Time Of Readings: 10:28-10:31						Time Of Readings: 10:33					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					

P = Peak Reading, S = Steady reading | Equipment Used: Interface Meter, MiniRAE 2000, GFM435 Gas Analyser | Checked By: ER

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SOIL GAS AND GROUND WATER DAILY RECORD SHEET

Project Name:	Roundhouse, 100a Chalk Farm Road, London NW1, NW1 8EH	Project Engineer: ER	Date: 22-Oct-20
Client: Roundhouse Trust	Operative: JS	Day of the week: Thursday	Project No: J14197

		Land Gas Data										Groundwater Data			Remarks		
Well / TH No.	Atmospheric Pressure (mb) and Ambient Temperature		PID	BH pressure	Flow Rate		CH_4	CO_2	O_2	CO	H_2S	Depth to base of well	Water level	Height of Cover	Details of water samples (colour, clarity, odour etc)	Ground Conditions (soft, wet/dry, frozen etc) & Weather Conditions	General Remarks
			ppm	Pa	l/hr		%	%	%	ppm	ppm	m below top of cover	m below top of cover	m above GL			
BH 1	13°C 1007	P	0.0	5.0	-0.1	P	16.6	6.5	0.0	0.0	0.0	5.61	3.33	0.00		Dry, Sunny, Windy	Monitoring extended to 10 mintues.
		S	0.0	0.0	0.0	S	10.9	4.6	4.5	0.0	0.0						
		Time Of Readings: 10:28 10:15				Time Of Readings: 10:17 - 10:27						Time Of Readings: 10:30					
BH 2	13°C 1005	P	0.2	-3.0	-10.3	P	-0.1	0.2	19.6	10.0	0.0	5.10	3.91	0.00		Dry, Sunny, Windy	CO briefly rose to 10 but only for a few seconds, then stabilised to zero.
		S	0.2	0.0	0.0	S	-0.1	0.2	19.6	0.0	0.0						
		Time Of Readings: 10:48 10:40				Time Of Readings: 10:42 - 10:47						Time Of Readings: 10:50					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					

P = Peak Reading, S = Steady reading

Equipment Used: Interface Meter, MiniRAE 2000, GFM435 Gas Analyser

Checked By: ER

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SOIL GAS AND GROUND WATER DAILY RECORD SHEET

Project Name: Roundhouse, 100a Chalk Farm Road, London NW1, NW1 8EH	Project Engineer: ER	Date: 05-Nov-20	Project No:
Client: Roundhouse Trust	Operative: JS	Day of the week: Thursday	J14197

Well / TH No.	Atmospheric Pressure (mb) and Ambient Temperature		PID (ppm)	BH pressure (Pa)	Flow Rate (l/hr)		CH_4 (%)	CO_2 (%)	O_2 (%)	CO (ppm)	H_2S (ppm)	Depth to base of well (m below top of cover)	Water level (m below top of cover)	Height of Cover (m above GL)	Details of water samples (colour, clarity, odour etc)	Ground Conditions (soft, wet/dry, frozen etc) & Weather Conditions	General Remarks
BH 1	6°C 1041	P	0.0	0.0	0.0	P	9.2	6.3	0.5	0.0	0.0	5.60	3.63	0.00		Dry Tarmac, Sunny, Windy	
		S	0.0	0.0	0.0	S	6.9	4.8	4.9	0.0	0.0						
		Time Of Readings: 11:23 11:10				Time Of Readings: 11:12 - 11:22						Time Of Readings: 11:25					
BH 2	6°C 1039	P	0.1	4.0	13.0	P	0.0	0.1	19.4	0.0	0.0	5.10	3.94	0.00		Dry Tarmac, Sunny, Windy	
		S	0.1	0.0	0.0	S	0.0	0.1	19.8	0.0	0.0						
		Time Of Readings: 11:38 11:30				Time Of Readings: 11:32 - 11:37						Time Of Readings: 11:40					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					

P = Peak Reading, S = Steady reading — Equipment Used: Interface Meter, MiniRAE 2000, GFM435 Gas Analyser — Checked By: ER

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SOIL GAS AND GROUND WATER DAILY RECORD SHEET

Project Name:	Roundhouse, 100a Chalk Farm Road, London NW1, NW1 8EH	Project Engineer: ER	Date: 19-Nov-20
Client: Roundhouse Trust	Operative: JS	Day of the week: Thursday	Project No: J14197

Well / TH No.	Atmospheric Pressure (mb) and Ambient Temperature		PID	BH pressure	Flow Rate		CH_4	CO_2	O_2	CO	H_2S	Depth to base of well	Water level	Height of Cover	Details of water samples (colour, clarity, odour etc)	Ground Conditions (soft, wet/dry, frozen etc) & Weather Conditions	General Remarks
			ppm	Pa	l/hr		%	%	%	ppm	ppm	m below top of cover	m below top of cover	m above GL			
			Land Gas Data									**Groundwater Data**			**Remarks**		
BH 1	9°C 1025	P	0.0	0.0	0.0	P	7.7	6.1	0.0	0.0	0.0	5.61	3.51	0.00		Wet Tarmac, Light Rain, Windy	
		S	0.0	0.0	0.0	S	6.4	4.8	3.5	0.0	0.0						
			Time Of Readings: 11:38 11:25				Time Of Readings: 11:27 - 11:37					Time Of Readings: 11:40					
BH 2	9°C 1025	P	0.1	0.0	0.0	P	-0.2	0.1	19.7	0.0	0.0	5.10	3.89	0.00		Wet Tarmac, Light Rain, Windy	
		S	0.1	0.0	0.0	S	-0.2	0.1	19.7	0.0	0.0						
			Time Of Readings: 11:53 11:45				Time Of Readings: 11:47 - 11:52					Time Of Readings: 11:55					
		P				P											
		S				S											
			Time Of Readings:				Time Of Readings:					Time Of Readings:					
		P				P											
		S				S											
			Time Of Readings:				Time Of Readings:					Time Of Readings:					
		P				P											
		S				S											
			Time Of Readings:				Time Of Readings:					Time Of Readings:					
		P				P											
		S				S											
			Time Of Readings:				Time Of Readings:					Time Of Readings:					

P = Peak Reading, S = Steady reading

Equipment Used: Interface Meter, MiniRAE 2000, GFM435 Gas Analyser

Checked By: ER

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SOIL GAS AND GROUND WATER DAILY RECORD SHEET

Project Name:	Roundhouse, 100a Chalk Farm Road, London NW1, NW1 8EH	Project Engineer: ER	Date:	03-Dec-20	Project No:
Client:	Roundhouse Trust	Operative: JS	Day of the week:	Thursday	J14197

Well / TH No.	Atmospheric Pressure (mb) and Ambient Temperature		Land Gas Data: PID (ppm)	BH pressure (Pa)	Flow Rate (l/hr)		CH_4 (%)	CO_2 (%)	O_2 (%)	CO (ppm)	H_2S (ppm)	Groundwater Data: Depth to base of well (m below top of cover)	Water level (m below top of cover)	Height of Cover (m above GL)	Remarks: Details of water samples (colour, clarity, odour etc)	Ground Conditions (soft, wet/dry, frozen etc) & Weather Conditions	General Remarks
BH 1	6°C 992	P	0.2	10.0	2.4	P	6.7	5.8	0.1	0.0	0.0	5.60	3.42	0.00		Wet Tarmac, Heavy Rain	
		S	0.0	6.0	1.3	S	5.6	4.6	4.4	0.0	0.0						
		Time Of Readings:	10:23	10:10		Time Of Readings:	10:12 - 10:22					Time Of Readings:	10:25				
BH 2	6°C 992	P	1.0	0.0	0.0	P	-0.2	0.0	20.0	0.0	0.0	5.10	3.88	0.00		Wet Tarmac, Heavy Rain	
		S	0.9	0.0	0.0	S	-0.2	0.0	20.0	0.0	0.0						
		Time Of Readings:	10:36	10:30		Time Of Readings:	10:32 - 10:35					Time Of Readings:	10:38				
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					

P = Peak Reading, S = Steady reading

Equipment Used: Interface Meter, MiniRAE 2000, GFM435 Gas Analyser

Checked By: ER

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SOIL GAS AND GROUND WATER DAILY RECORD SHEET

Project Name:	Roundhouse, 100a Chalk Farm Road, London NW1, NW1 8EH	Project Engineer: ER		Date:	23-Dec-20
Client:	Roundhouse Trust	Operative:	JS	Day of the week:	Wednesday
Project No:	J14197				

Well / TH No.	Atmospheric Pressure (mb) and Ambient Temperature		PID (ppm)	BH pressure (Pa)	Flow Rate (l/hr)		CH_4 (%)	CO_2 (%)	O_2 (%)	CO (ppm)	H_2S (ppm)	Depth to base of well (m below top of cover)	Water level (m below top of cover)	Height of Cover (m above GL)	Details of water samples (colour, clarity, odour etc)	Ground Conditions (soft, wet/dry, frozen etc) & Weather Conditions	General Remarks
BH 1	11°C 1005	P	0.1	2.0	0.2	P	8.3	5.4	0.0	0.0	0.0	5.61	3.52	0.00		Overcast, Wet Tarmac	
		S	0.0	0.0	0.1	S	6.9	4.5	3.8	0.0	0.0						
		Time Of Readings: 9:43 9:30				Time Of Readings: 9:32 - 9:42						Time Of Readings: 9:45					
BH 2	11°C 1003	P	0.6	0.0	0.0	P	-0.1	0.0	19.8	0.0	0.0	5.09	3.90	0.00		Overcast, Wet Tarmac	
		S	0.6	0.0	0.0	S	-0.1	0.0	20.4	0.0	0.0						
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					

P = Peak Reading, S = Steady reading

Equipment Used: Interface Meter, MiniRAE 2000, GFM435 Gas Analyser

Checked By: ER

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SOIL GAS AND GROUND WATER DAILY RECORD SHEET

Project Name:	Roundhouse, 100a Chalk Farm Road, London NW1, NW1 8EH	Project Engineer:	ER	Date: 05-Jan-21	Project No:
Client:	Roundhouse Trust	Operative:	JS	Day of the week: Tuesday	J14197

Well / TH No.	Atmospheric Pressure (mb) and Ambient Temperature		PID (ppm)	BH pressure (Pa)	Flow Rate (l/hr)		CH_4 (%)	CO_2 (%)	O_2 (%)	CO (ppm)	H_2S (ppm)	Depth to base of well (m below top of cover)	Water level (m below top of cover)	Height of Cover (m above GL)	Details of water samples (colour, clarity, odour etc)	Ground Conditions (soft, wet/dry, frozen etc) & Weather Conditions	General Remarks
BH 1	3°C 1021	P	0.1	1.0	0.4	P	8.6	5.2	0.1	0.0	0.0	5.61	3.67	0.00		Overcast, Wet Tarmac	
		S	0.1	0.0	0.0	S	6.9	4.4	3.5	0.0	0.0						
		Time Of Readings: 10:31 10:20				Time Of Readings: 10:22 - 10:32						Time Of Readings: 10:35					
BH 2	3°C 1019	P	0.4	0.0	0.0	P	-0.2	0.1	19.8	0.0	0.0	5.10	3.93	0.00		Overcast, Wet Tarmac	
		S	0.4	0.0	0.0	S	-0.2	0.1	19.8	0.0	0.0						
		Time Of Readings: 10:46 10:40				Time Of Readings: 10:42 - 10:45						Time Of Readings: 10:48					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					

P = Peak Reading, S = Steady reading — Equipment Used: Interface Meter, MiniRAE 2000, GFM435 Gas Analyser — Checked By: ER

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APPENDIX G

Photographs

G

Retaining wall to north end of site - south west

Retaining wall to north end of site - north

Retaining wall to north end of site - east

Retaining wall to north end of site - east

Retaining wall to north end of site - west

Retaining wall to north end of site – east corner

Retaining wall to north end of site – north west

Retaining wall to north end of site – north west

DP1

DP1

DP2

DP3

	
DP3	CP3
	
DP4	DP4

	
DP4	DP4
	
DP4	DP4

	
TP1	TP1
	
TP1	TP1

	
TP2	TP2
	
TP3	TP3

	
TP4	TP4
	
TP3	TP3

	
TP4	TP4
	
TP4	TP4

	
TP5	TP5
	
TP5	TP5

	
TP5	

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ST Consult
Environmental & Geotechnical

Head Office
East Grinstead
Tel: 01342 333100
enquiries@southerntesting.co.uk

ST Consult Midlands
Northampton
Tel: 01604 500020
creaton@stconsult.co.uk

ST Consult Thames Valley
Hannington
Tel: 01635 800 950
hannington@stconsult.co.uk

ST Consult North West
Warrington
Tel: 01925 661 735
warrington@stconsult.co.uk

FS 29280 EMS 506775 OHS 506776