Land Contamination Phase 2 & Geotechnical Investigation

YEX2487 – Meadows Hall, Richmond

February 2022

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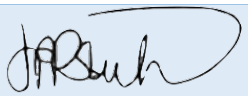
Reviewed	Jonny Roberts	Principal Geo-Environmental Engineer		24 June 2022
Authorised	Colin Hiscock	Technical Director		24 June 2022

Issue	Date	Description	Prepared	Reviewed	Authorised
00	24 June 2022	Final Report	JvM	JR	CH

Contents

Executive Summary

The below tables present a snapshot of the geotechnical and geoenvironmental recommendations for the proposed development. It is advised that the report is read in its entirety to gain a better understanding of our recommendations.

The development comprises erection of 1no. mansion block of 8no. residential units and 5no. residential mew units with associated hardstanding and soft landscaping.

For the terraced mews block, the use of either driven pre-cast concrete piles or bored CFA piles may be appropriate taken into the competent strata at depth. Alternatively, the use of vibro improvement techniques may be appropriate.

For the mansion block, it is considered that deepened strip or spread foundations constructed within the underlying natural gravels could be designed assuming an allowable increase in load given below.

Foundation Type	*Strip Foundations (m)*			*Spread Foundations (m)*		
Foundation Width	0.6	1.0	1.5	1.0	2.0	3.0
Foundation Depth (below finished levels)	3.0			3.0		
Allowable increase in stress (kN/m^2)	100	165	165	210	210	210

Alternatively, the use of either a contiguous or secant piled wall may be possible in order to support the excavation and carry the building load.

A ground bearing floor slab is considered appropriate where natural granular soils or vibro-improved soils are at formation. A suspended floor slab is appropriate for a piled foundation solution.

Laboratory testing can be summarised as:

	Minimum	*Maximum*	*Design Sulphate Class*	*ACEC Class*
Water Soluble Sulphate	16mg/l	1,629mg/l	DS-3	AC-3
Total (Acid Sulphate)	<0.01%	0.11%		
pH	7.4	10.6		
Total potential Sulphates	0.03	1.71		

Natural Moisture Content Range	21 - 35%
Modified Plasticity Index Range	34 - 64%
NHBC Volume Change Potential	Medium to High

Further Works Required

We have identified a contamination and/or gas risk on the site. Further works are required to either categorise or remediate the site.

	Contaminant Found
Soil – Metals	✓
Soil - Hydrocarbons	X
Soil – Asbestos	X

Introduction

Your Environment (YE) was instructed by RenKap Ltd to conduct a Geoenvironmental (SI) and Geotechnical Investigation (GI) at a site identified as Meadows Hall, Church Road, Richmond TW10 6LN.

This report seeks to address the potential pollutant linkages identified within this report and update the Conceptual Site Model (CSM) together with defining geotechnical parameters to assist with design of the development.

We are content that as a result of the SI works, we have characterised the ground conditions and the potential for contamination to exist on site.

The works comprised of the following:

- 2 deep cable percussion borehole to a maximum of 20.45m
- 6 hand excavated pits to a maximum depth of 1.2m
- Standard Penetration Testing (SPT)
- Laboratory testing for a general suite of contaminants, sulphates, pH, gradings, plasticity and triaxial strength determination

The development includes for:

- Erection of 1no. mansion block of 8no. residential units and 5no. residential mew units with associated hardstanding and soft landscaping

The proposed redevelopment plans for the site can be reviewed within Appendix A.

Site Information

A Phase 1 Preliminary Risk Assessment (Desktop Study) has been undertaken for the site; STM Environmental ref: PH1-2020-000088, dated September 2020. The following information is a summary of the pertinent historic, geological and environmental information.

Access	Access is directly from Church Road.
Topography	The site is level at approximately 19.0m AOD.
Vegetation	Coarse vegetation, shrubs and immature trees along periphery.
Buildings / Floor	Concrete floor slab across eastern and northern parts.
Surface Permeability	Predominantly impermeable hardstanding.
Drainage	Anticipated surface water drainage present.
Services	Not known.
Surrounds	North – Residential East – Residential South – Residential West – Church Road and Residential
Geology	Solid strata are London Clay Formation.
Hydrogeology	Solid – Unproductive Aquifer.
Abstraction Licences	No groundwater abstractions within 500m of the site.
Groundwater Vulnerability	The groundwater vulnerability in the vicinity of the site is classified as low due to the Unproductive Aquifer underlying the site.
Surface Water features	There are no records within 250m.
Source Protection Zones	There are no records within 250m.
River Network	No significant freshwater watercourses within 250m.
Landfills and/or Ground Workings	No historic landfills or ground workings are recorded <250m.

Site History

At least since the 1860s, the site comprises open land associated with the garden of an adjacent residential property. After 1912, 2no. unspecified tanks are present on site. Since 1971, Meadows Hall occupied the site. Widespread residential development has occurred in the environs together with works (later an ice cream factory), a telephone exchange, electricity substation, garage and an ambulance station.

Sources, Pathways and Receptors

Potential Sources

Source	*Identified by*	*Location*	*Description*
Made ground on site associated with historic development	Historical study and mapping	On site	Due to the previous development history on site it is possible for made ground to contain a variety of contaminants such as PAH, TPH, asbestos and heavy metals.

The following contaminants are potentially associated with the on-site sources:

- Heavy Metals
- Potential Asbestos Containing Material (PACM's)
- Polycyclic Aromatic Hydrocarbons (PAH)
- Total Petroleum Hydrocarbons (TPH)

The following contaminants are potentially associated with off-site sources:

- Heavy Metals
- Potential Asbestos Containing Material (PACM's)
- Polycyclic Aromatic Hydrocarbons (PAH)
- Total Petroleum Hydrocarbons (TPH)

Pathways

Pathway	*Medium*	*Properties*
Direct Contact	Dust, solid and liquid phase	There may be direct contact with potentially impacted soil and Made Ground across the site. There is a possibility of dust fumes being produced during earthworks in the construction phase. Dermal contact and ingestion of potentially contaminated soils during construction or operational phase of the site.
Leaching through Made Ground	Unsaturated flow	Potential for leaching and migration of potential contaminants along preferential flow paths in the ground.
Foundations and Underground Infrastructure and Obstructions	Preferential flow	Contaminants will flow the path of least resistance which can be gaps around foundations, services and floor construction

Migration of Ground Gas and Radon	Gaseous flow	Infilled land material is likely to be variable in composition. Migration through granular material within superficial deposits is possible.

Receptors

Category	*Receptor*	*Properties*
Humans	End users (such as residents and visitors)	Potential contact with contaminated soils in existing/proposed soft landscaping areas. Potential contact with ground gas within enclosed buildings
	Construction workers	Reworking of contaminant impacted materials in underlying soil during construction works can expose workers to contamination.
Property	Materials and site structures	Foundations and site services may be damaged by potentially aggressive compounds present in soils.
Controlled Waters	Underlying superficial / bedrock Aquifer and surface water	The site is recorded as having an Unproductive Aquifer within the bedrock.
Plant (species and uptake) and Wildlife	Various	Attributes will be influenced by factors such as relative quality, scale, rarity and substitutability; however, it is understood that the site is proposed to be totally hard surfaced.

Preliminary Conceptual Site Model (CSM)

The assessment is undertaken based on the current proposals for the site and is based on the findings of the Phase 1 report conducted by STM Environmental ref: PH1-2020-000088, Dated September 2020.

Proposed Land use Assessment Criteria

Residential with consumption of homegrown produce

Any change in the development proposals for the site involving a change in end use class will result in a requirement for this assessment to be revised.

On Site					
Source	*Pathways*	*Receptor*	*Severity*	*Probability*	*Risk*
Made Ground possibly containing metals, TPH and PAH	Ingestion, dermal contact, inhalation of dusts and vapours	Future end users and site visitors	Medium	Low	Moderate to low
		Construction Workers			
		Residents and visitors	Medium	Unlikely	Low
	Leaching through soils and migration via groundwater or soil pores	Controlled Waters	Mild	Unlikely	Low
	Permeation of water pipes	Construction materials, future end users and site visitors	Medium	Low	Moderate to Low
	Uptake	Plant and Wildlife	Mild	Unlikely	Low
Asbestos at/near ground surface in Made Ground	Inhalation of fibres in airborne dust	Future end users and site visitors	Medium	Low	Moderate to Low
		Construction Workers			
Ground Gases: From Made Ground: CH_4, CO, CO_2 and H_2S	Gas migration and build up within buildings (explosion/ asphyxiation risk)	Future end users and building structures	Medium	Unlikely	Low

Off site					
Source	*Pathways*	*Receptor*	*Severity*	*Probability*	*Risk*
Land uses in the vicinity possibly containing potential contaminants.	Leaching through soils and migration via groundwater or soil pore moisture	Future end users and site visitors	Medium	Low	Moderate to low
	Ingestion, dermal contact, inhalation of dusts/vapours	Future end users and site visitors			
Ground Gases: From Made Ground: CH4, CO, CO2 and H2S	Gas migration and build up within buildings (explosion/ asphyxiation risk)	Future end users and building structures	Medium	Unlikely	Low

Fieldworks

All works were completed between January 4th and 5th, 2022. In summary the investigation included:

- A two-man team ascertained the routes of any below ground services in close proximity to the proposed exploratory hole positions, using a CAT scan and lifting up of any manhole covers. Following the CAT scan, hand dug starter pits were completed to a depth of 1.0 metres below ground level (mbgl), where appropriate.
- Two (2no.) cable percussion boreholes (BH01 and BH02) were completed to a maximum depth of 20.45mbgl.
- Six (6no.) hand excavated trial pits (HTP01 to HTP06) were completed to a maximum depth of 1.2mbgl. The locations of exploratory positions were selected relative to the current and proposed redevelopment plans for the site.
- Soil samples were removed from shallow sub surface locations, with further samples taken at depth at every 0.5mbgl or when the underlying stratum changed. Samples were subsequently placed in suitable containers including 1kg tubs and 250ml glass jars and placed in cool boxes with cool packs prior to storage within our *in-house* laboratory fridges and then subsequent forwarding to our designated laboratory for analysis.
- During this work, the soils encountered were logged in general accordance with BS5930:2015+A1:2020, and full descriptions are given on the borehole records, which are also appended to this report.
- Standard Penetration Tests were undertaken during the drilling to provide an assessment of the relative density/strength of the underlying deposits with depth.
- Upon completion, all exploratory holes were back filled, compacted, and made good to existing levels and finishes, with any surplus spoil bagged up and removed from site.

The positions of the boreholes and trial pits can be viewed in Appendix B and the logs are available in Appendix C.

Geology & Groundwater Conditions

Ground Conditions

Hardstanding

A review of the ground conditions within some of the exploratory holes indicates a surface cover of macadam and/or reinforced concrete at thicknesses of between 100mm and 200mm.

Made Ground

Directly beneath the hardstanding or at the surface elsewhere, Made Ground comprising either gravelly sand or sandy gravel of brick, concrete, macadam, tile, metal and plastic was confirmed to depths of between 0.65 and 3.1mbgl.

Natural Granular Soils

Medium dense sandy GRAVEL was encountered beneath the Made Ground and proved to depths of between 3.8 and 3.9mbgl.

Natural Cohesive Soils

Underlying the natural gravel, firm and firm to stiff sandy gravelly CLAY was present to between 5.45 and 6.0mbgl. This stratum in turn was underlain by firm and stiff fissured indistinctly laminated silty CLAY, which was proved to the base of the boreholes to at least 20.45mbgl.

A summary of the SPT N values (uncorrected values) with increasing depth is presented in the table below together with an indication of the equivalent undrained shear strength.

Stratum (field description)	*Depth BGL (m)*	*Uncorrected SPT N Value Range*	*Relative Density*	*Equivalent Undrained Shear Strength(kN/m²)*[1]
Granular Made Ground	2	8	Loose	_
Sandy GRAVEL	1.2	15	Medium dense	-
	2	19	Medium dense	-
	3	10-22	Medium dense	-
Firm sandy gravelly CLAY	4.2	11	-	55
	5	8	-	40
Firm and stiff fissured indistinctly laminated silty CLAY	8	10	-	50
	10	18	-	90
	11	22	-	110
	13	19	-	95
	14	22	-	110
	16	27	-	135
	17	23	-	115
	19	28	-	140

[1] *Stroud and Butler, 1974*

	20	27	-	135

Groundwater

No free groundwater was encountered during the advancement of the boreholes to a maximum depth of 20.45mbgl.

It should be noted that groundwater levels are dependent upon seasonal variations and can change after periods of prolonged rainfall or drought.

Visual and Olfactory Observations

With the exception of general anthropogenic material identified, no visual and/or olfactory evidence of potential significant contamination was noted within any soils encountered as part of the investigative works undertaken.

Permeability Testing

Falling head permeability tests were undertaken at depths of 4.0mbgl in BH01, 2.2mbgl in BH02 during the advancement of the boreholes and 0.9mbgl in HTP01. All tests were completed within the natural granular strata. The soakage rates were good within 2 of the tests (BH02 and HTP01) recording soil infiltration rates of between $7.3x10^{-5}$ and $3.7x10^{-5}$ m/s. However, in BH01 it was not possible to calculate an infiltration rate due to the water level not attaining 25% effective depth.

Geotechnical Laboratory Testing

25 soil samples were forwarded to a UKAS & MCERTS accredited laboratory facility with 11 samples submitted to our in-house geotechnical laboratory and 6 samples forwarded to an external UKAS accredited geotechnical laboratory.

Sulphates and pH

7 samples of the Made Ground and natural soils were submitted for assessment of water-soluble sulphate, total sulphate, pH value and total sulphur concentrations.

	Minimum	*Maximum*
Water Soluble Sulphate	16mg/l	1,629mg/l
Total (Acid Sulphate)	<0.01%	0.11%
pH	7.4	10.6
Total potential Sulphates	0.03	1.71

Atterberg Limits and Natural Moisture Content

9 samples of the natural clays were submitted for determination of the Natural Moisture Content and Plasticity Index.

Natural Moisture Content Range	21 - 35%
Modified Plasticity Index Range	34 - 64%
NHBC Volume Change Potential	Medium to High

The natural cohesive strata may be classified as being of medium to high volume change potential in accordance with NHBC guidelines.

Particle Size Distribution (PSD)

2 samples of the natural granular deposits have been subjected to sieve analyses to establish their PSD.

These natural granular soils may be classified as being slightly clayey/silty sandy to very sandy fine to coarse GRAVEL.

Undrained Shear Strength in Triaxial Compression (QU)

Six (6no.) undisturbed samples of the underlying natural clays were subject to triaxial compression testing to determine their undrained shear strength. The results of the testing are summarised in the table below.

Stratum (field description)	BH ID	Depth BGL (m)	Natural Moisture Content (%)	Undrained Shear Strength (kN/m²)
Firm to stiff sandy gravelly CLAY	BH02	4.0	28	87
Firm to stiff sandy gravelly CLAY	BH01	5.0	32	98
Stiff silty CLAY	BH02	9.05	30	78
Stiff silty CLAY	BH01	11.5	30	104
Stiff silty CLAY	BH01	14.5	27	121
Stiff silty CLAY	BH02	18.5	27	147

All geotechnical laboratory certificates can be reviewed within Appendix D.

Foundation Recommendations

Terraced Mews Block

Deep granular Made Ground was proven to a maximum depth of 3.1mbgl within this part of the site underlain by natural medium dense sandy gravel in turn underlain by firm becoming stiff clays proved to at least 20.45mbgl. Free groundwater was not encountered.

The presence of weak, variable and deep Made Ground would preclude the use of conventional shallow strip or spread foundations due to the potential for excessive total and differential settlements. Alternative foundation solutions should be adopted or techniques sought to improve the strength of these materials.

Consideration may be given to the use of piles to transfer the foundation loads through the weak Made Ground soils to more competent natural soils at depth. For preliminary design purposes it is considered that either driven pre-cast concrete piles or bored CFA piles are likely to represent the most economical foundation solution. In order to formulate a suitable design, it is recommended that the advice of specialist piling contractors be sought. In addition, the pile design should include provision for negative skin friction within any weaker overlying Made Ground and natural soils as these deposits may be subject to collapse compression if not treated.

It may be necessary to construct a working platform for the piling rig and any other plant required during the works. Such a design should be undertaken in accordance with the procedures given in the BRE publication: Working platforms for tracked plant.

An alternative solution may be to use shallow reinforced strip or spread foundations supported by vibro-stone columns. An explanation of this method of construction is provided in the *NHBC Standards, Part 4, Foundations, Chapter 4.6 Vibratory ground improvement techniques*. Briefly the method includes the insertion of a gravel column through the weak near surface soils by inserting a vibrating poker into the ground and filling the void created with coarse gravel. These columns are positioned at designed spacing on the line of the footings, which are subsequently constructed using reinforced concrete. There are several techniques available, subject to the nature, composition, and thickness of Made Ground and natural soils and in order to fully assess the efficacy of this approach the advice of specialist contractors should be sought.

The chosen contractor will be required to provide design calculations, including settlement analysis, to demonstrate that the design meets the client's specification for the work. In addition, all works should be undertaken in accordance with the appropriate specifications, which should be provided.

Should any very loose, cohesive, or weak material be encountered they should be locally removed and replaced with lean-mix concrete or compacted granular soil. In addition, if the excavations are required to stand open for any period, then a blinding layer of lean-mix concrete should be placed in the excavation bases. This will reduce loosening of the sub-grade due to the ingress of surface water.

The excavator must be advanced correctly to ensure trench walls are vertical and the base horizontal as any slight inclination will result in eccentric loading of footings.

Any remnant structures and foundations, from historic on-site development, should be removed and replaced with a suitable engineered granular backfill and compacted in layers.

Mansion Block

Within this area of the site, shallow granular Made Ground was proven to <1mbgl underlain by natural medium dense sandy gravel to 3.8mbgl in turn underlain by firm becoming stiff clays proved to at least 20.45mbgl. No free groundwater was encountered.

It is understood that it is proposed to construct a 4 storey residential block incorporating a basement. The proposed development is likely to be capable of being constructed on deepened strip or spread foundations. The use of either blockwork and reinforced concrete or cantilever retaining structures may be considered. Allowing for the depth of basement construction, these could be placed at depths of around 3.0mbgl in natural granular soils described as being in at least a medium dense in situ condition. It is considered that deepened strip or spread foundations constructed within the underlying medium dense gravels could be designed assuming an allowable increase in load given below.

Foundation Type	*Strip Foundations (m)*			*Spread Foundations (m)*		
Foundation Width	0.6	1.0	1.5	1.0	2.0	3.0
Foundation Depth (below basement level)	3.0			3.0		
Allowable increase in stress (kN/m^2)	100	165	165	210	210	210

The allowable increase in stress given above assumes a factor of safety against general shear failure of 3 and an uncorrected N value of 20 at the foundation depth and no free groundwater, providing the bearing surface has been adequately compacted. Settlements at these loading intensities should remain within tolerable limits for the type of structure proposed provided that the underlying soils are carefully inspected immediately following final trimming of the excavations.

Moreover, any support deemed as necessary to nearby structures should be maintained at all times given the excavation of the planned basement. An allowance for groundwater in the design should not be necessary with respect to the uplift effects on the basement. However, the basement should be suitably waterproofed.

Any remnant structures and foundations, from historic on-site development, should be removed and replaced with a suitable engineered granular backfill and compacted in layers.

In view of the potential difficulties in excavating deep trench fill foundations within the natural granular soils, consideration may be directed to the use of piles to transfer the foundation loads through the upper granular natural soils to more competent soils at depth. This method would also provide support to existing soils as a temporary works solution. In view of the basement construction, it is likely that either a contiguous or secant piled wall may be possible in order to support the excavation and carry the building load. However, the efficacy of these approaches will be guided by cost and temporary works practicalities and constraints of the site. In order to formulate a suitable design, it is recommended that the advice of specialist piling contractors be sought.

Basement

Whilst this report is not a Basement Impact Assessment (BIA), the following comments are applicable. The proposed development is to be located nearby to existing properties and it is unknown if these

buildings have basements. As such, a BIA may become necessary. Further enquiries will therefore be required during detailed design, using Party Wall Act protocols if necessary, in order to determine the likely/actual relative levels of the ground floors and the depth of the basement. In order to construct the basement, excavation of the soils adjacent to existing foundations may be required. It is normal when excavating soils adjacent to foundations that the 45-degree rule is utilised whereby soils are not disturbed within this zone created by a line drawn down from the existing foundation at 45 degrees.

In view of the above, some ground movement is inevitable when basements are constructed. When underpinning methods are used the magnitude of the movements in the ground being supported by the new basement walls is dependent primarily on:

-The geology;

-The adequacy of temporary support to both the underpinning excavations and the partially complete underpins prior to installation of full permanent support; and

-The quality of workmanship when constructing the permanent structure.

The following minimum temporary support requirements are recommended for any proposed underpins and RC retaining walls:

-Full face support must be installed as the excavations progress for all excavations (in the anticipated shallow and deeper natural sands) required for the basement.

-Temporary support will be required to all the new underpins and RC retaining wall panels, which must be maintained until the full permanent support has been completed, including allowing time for the concrete to gain adequate strength.

All temporary support should use high stiffness systems installed in a timely manner with excavation limited in accordance with best practice, in order to minimise the ground movements. Full details of the temporary works should be provided in the contractor's method statements. In view of this careful support of existing soils and foundations would be required during the construction phase. A high quality of workmanship and use of best practice methods of temporary support are therefore crucial to the satisfactory control of ground movements alongside basement excavations.

When underpinning or constructing RC retaining walls in panels of limited width on a similar 'hit and miss' basis, it is inevitable that the ground will be unsupported or only partially supported for a short period during excavation of each pin/panel, even when support is installed sequentially as the excavation progresses. This means that the behaviour of the ground will depend on the quality of workmanship and suitability of the methods used.

Condition surveys should be undertaken of the neighbouring properties, including the boundary walls, before the works commence in order to provide a factual record of any pre-existing damage. Such surveys are usually carried out while negotiating a Party Wall Agreement and are beneficial to all parties concerned.

Precise movement monitoring should be undertaken weekly throughout the period during which the basement walls and slab are constructed with three sets of initial readings taken before excavation of the basement starts in order to obtain a baseline assessment of the current degree of movements in the building. Readings may revert to fortnightly once all the perimeter support is in place.

The accuracy of this system of monitoring is usually quoted as +/- 2mm. Thus, if recorded movements in either direction reach 5mm, then the frequency of readings should be increased as appropriate to the severity of the movement, and consideration should be given to installing additional targets. If the recorded movements in either direction reach 7mm, then work should stop until new method statements have been prepared and approved by the appointed structural engineer.

If any structural cracks appear in the main loadbearing walls then those cracks should be monitored using the Demec system (or similar) on the same frequency as the target monitoring. The method of damage assessment may adopt the limiting tensile strain approach as described by Burland et al (1977), Boscardin and Cording (1989) and Burland (2001); see Table 2.5 and Figure 2.18 in Ciria C580.

Floor Slabs

Where floor slabs are to be cast onto natural granular soils or in the event of the use of vibro improvement techniques, the use of ground bearing floor slabs is considered as appropriate. Where a piled foundation is to be adopted, then suspended floor slabs should be used.

Sulphates and Concrete

The test results indicate that the Made Ground and natural soils fall within Design Sulphate Class DS-3 and ACEC Class AC-3. Consequently, concrete should be designed accordingly, assuming mobile groundwater conditions.

Surface Water Drainage

The natural granular strata generally demonstrated good infiltration rates with 2 of the 3 permeability tests demonstrating good soakage rates.

Therefore, it is considered that the natural granular strata beneath the site demonstrate good permeability and would promote the use of soakaways as an effective means of surface water disposal.

Excavations

Free groundwater was not encountered during the investigation to a maximum depth of 20.45mbgl. However, groundwater levels are subject to seasonal variation or changes in local drainage conditions.

The proposed basement extension will need to be fully waterproofed in order to provide adequate long-term control of moisture ingress from the groundwater and infiltrating surface water, perched groundwater and any long term rise to above basement level. Detailed recommendations for the waterproofing system are beyond the scope of this report although it is noted that, as a minimum, it would be prudent for the system to be designed in compliance with the requirements of BS8102:2009. Good workmanship will be crucial to the success of whatever system is selected.

The National House Building Council published new guidance on waterproofing of basements in November 2014 (NHBC Standards, Chapter 5.4). Compliance would be compulsory if an NHBC warranty is required, otherwise it may provide a useful guide to best practice.

Groundwater may represent a particular problem to the construction. However, it should be recognized that minor water ingress may combine in any long trench excavations to create a significant volume of water which may cause local problems during construction. Any minor groundwater seepages or significant standing water within excavations may be removed by de-watering. Advice on groundwater control is given in CIRIA Report No 515 – Groundwater Control Design and Practice.

The stability of the excavation faces cannot be guaranteed and therefore temporary support to the excavation faces may become necessary unless the foundations are constructed using trench-fill techniques. In this method the foundation trenches should be excavated, inspected, and backfilled with concrete as a continuous operation. Under no circumstances should operatives be allowed to enter unsupported excavations.

Consideration should be given to installing trench support/shoring or battering to maintain excavation stability during foundation construction/services installation, given the presence of both deep Made Ground and deep natural granular soils. Due to the potential for unpredictable collapse, excavations requiring man entry should be either battered back to a safe angle (approximately 35^0 or 1.5H:1V) or adequately shored to provide safe working conditions within excavations. Advice on excavation support is given in CIRIA Report No 97 – Trenching Practice.

Where trench support/shoring is utilised an appropriately qualified and experienced engineer should design the support system. The shoring/support will require regular inspection in accordance with published guidelines to ensure that the support/shoring is adequate for the ground conditions present.

Chemical Laboratory Testing

A total of eighteen (18no.) samples of the Made Ground and natural soils have been analysed at a UKAS and MCERTS accredited laboratory. This testing comprised of:

- Speciated Total Petroleum Hydrocarbons (TPH CWG Aromatic/aliphatic split)
- Heavy metals and other metalloids
- Speciated Polycyclic Aromatic Hydrocarbons (PAH)
- Asbestos presence
- Soil organic matter (SOM)
- MTBE & BTEX
- pH and water soluble sulphate

The results of this laboratory testing have been compared to the Soil Guideline Values (SGVs) as well as the CIEH 'LQM' guideline values for inorganic and organic contaminants in soils.

The proposed development of the site is intended to comprise of residential and therefore screening has been made against a land use of 'residential with homegrown produce'.

Selection of Screening Criteria

The on site receptors for the study site are considered to be:

- Construction workers (during redevelopment of the site only);
- Future maintenance workers (following redevelopment);
- Future end users and site visitors (following redevelopment);
- Trespassers (during redevelopment); and
- Off-site receptors to include the English Channel.

Risks to construction workers during the redevelopment process will be mitigated by adhering to appropriate health and safety legislation, and the wearing of appropriate personal protective equipment (PPE). During redevelopment, the site will be securely fenced to prevent trespassers from accessing the site, and good site management practices will be implemented to mitigate exposure to off-site receptors.

The potential pathways for contaminants within the soil to onsite human health receptors following redevelopment are considered to be:

- Direct ingestion of soil and soil derived dust – unlikely due to total hard cover
- Dermal contact with soil outside and soil derived dust inside – unlikely due to total hard cover
- Inhalation of soil derived dust inside and outside - unlikely due to total hard cover
- Inhalation of soil derived vapours inside and outside

The potential pathways for contaminants within the soil to off-site human health receptors following redevelopment are considered to be:

- Direct ingestion of soil and soil derived dust - unlikely due to total hard cover
- Dermal contact with soil outside and soil derived dust inside - unlikely due to total hard cover
- Inhalation of soil derived dust inside and outside - unlikely due to total hard cover
- Inhalation of soil derived vapours inside and outside if contamination within soil is able to migrate across the site boundary

In the first instance, the results of this laboratory testing have been compared to generic assessment criteria (GAC) for the residential without homegrown produce land use scenario. These incorporate the following pathways:

- Direct ingestion of soil and soil derived dust - unlikely due to total hard cover
- Dermal contact with soil outside and soil derived dust inside - unlikely due to total hard cover
- Inhalation of soil derived dust inside and outside - unlikely due to total hard cover
- Inhalation of soil derived vapours inside and outside

Contaminants have been screened against revised LQM/CIEH S4UL criteria[2] where available. These GAC have been designed for use under planning, using Health Criteria Values based on minimal risk, and updated exposure parameters. The S4UL are intended to replace the previous LQM/CIEH GAC. The S4UL are based on the assumption of a sandy loam soil the 1.0% soil organic matter (SOM) criteria have been used, where available and appropriate, in the first instance. All soil samples were analysed for %SOM with values of 0.1% and, hence, this conservative approach is considered appropriate for initial screening.

[2] Nathanail et al. (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, 2015. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3495

Where no S4UL are available, the EIC/ AGS/ CL:AIRE/ GAC[3] have been used. The toxicological criteria within these are also based on minimal risk. It is recognised that these criteria have not recently been updated, and in particular, do not incorporate the slightly higher inhalation rates that have been used within the S4UL. However, given that they incorporate additional pathways, they are considered suitable for an initial screen. The EIC/ AGS/ CL:AIRE/ GAC are also based on a sandy loam soil and the 1% SOM criteria have been used in the first instance.

There is neither an S4UL nor a EIC/ AGS/ CL:AIRE/ GAC available for lead. In the absence of a GAC based on minimal risk, the C4SL for lead has been used. It is recognised that this is based on a "low level of toxicological concern" rather than on a minimal risk level. However, it is considered appropriate for use under planning, especially for a site where there will effectively be no pathways for inorganic metals following redevelopment.

All the GAC are based on a sandy loam soil. This is considered appropriate for use for initial screening.

All the GAC assume unsaturated soils. However, the use of the GAC are considered to be conservative, because they assume a certain air-filled porosity and water-filled porosity.

The GAC also assume that no free phase product is present and are not intended for use in this instance. No free product was observed within soils during the site investigation.

[3] CL:AIRE (2010) The EIC/AGS/CL:AIRE Generic Assessment Criteria for Human Health Risk Assessment

Soil Chemical Testing Results & Screening

All of the soil contamination laboratory analytical results are presented within Appendix D and presented below:

Metals[4]

Determinant	Min	Max	GAC	Number of exceedances
Arsenic	11	24	37*	0
Cadmium	<0.2	3.4	11*	0
Chromium (III)	47	134	910*	0
Copper	8.4	39	2400*	0
Lead	27	519	200*	**6**
Mercury	<0.5	<0.5	40*a	0
Nickel	8.9	23	180*b	0
Selenium	0.4	0.8	250*	0
Zinc	33	236	3700*	0
Total Phenols	<0.5	<0.5	420*	0
Total Cyanide	<1	<1	140*	0

Six exceedances were identified for lead located in BH01 (0.8m), HTP03 (0.2m), HTP03 (0.6m), HTP03 (1.0m), HTP04 (0.6m) and HTP05 (0.45m).

[4] LQM/CIEH GAC for Residential with homegrown produce land use scenario based on a sandy loam soil and 1% SOM. Based on the inorganic mercury GAC as the conceptual site model does not suggest that other forms of mercury are likely to be present on site. LQM issued an update to the nickel S4ULs in August 2015 and this has been taken into account.

Organics

Determinant	Min	Max	GAC	Number of exceedances
Naphthalene	<0.02	<0.4	2.3*	0
Acenaphthylene	<0.02	0.4	170*	0
Acenaphthene	<0.02	<0.2	210*	0
Fluorene	<0.02	<0.2	170*	0
Phenanthrene	<0.02	0.59	95*	0
Anthracene	<0.01	<0.11	2400*	0
Fluoranthene	<0.01	1.07	280*	0
Pyrene	<0.01	1.34	620*	0
Benzo(a)anthracene	<0.01	0.80	7.2*	0
Chrysene	<0.03	0.75	15*	0
Benzo(b)fluoranthene	<0.02	0.82	2.6*	0
Benzo(k)fluoranthene	<0.02	0.43	77*	0
Benzo(a)pyrene	<0.02	0.97	2.2*	0
Indeno(1,2,3-cd)pyrene	<0.02	0.82	27*	0
Dibenz(a,h)anthracene	<0.02	0.14	0.24*	0
Benzo(ghi)perylene	<0.02	0.57	320*	0

There were no exceedances for PAH congeners in the samples analysed.

Determinant	Min	Max	GAC[5]	Number of exceedances
Aliphatic >C5 - C6	<0.01	<0.01	42*	0
Aliphatic >C6 - C8	<0.01	<0.01	100*	0
Aliphatic >C8 - C10	<0.01	<0.01	27*	0
Aliphatic >C10 - C12	<4	<4	130*	0
Aliphatic >C12 - C16	<4	<4	1100*	0
Aliphatic >C16 – C35	<1	13.1	65000*	0
Aromatic >C5 - C7	<0.01	<0.01	70*	0
Aromatic >C7 - C8	<0.01	<0.01	130*	0
Aromatic >C8 - C10	<0.01	<0.01	34*	0
Aromatic >C10 - C12	<1	<1	74*	0
Aromatic >C12 - C16	<1	<1	140*	0
Aromatic >C16 - C21	<1	37	260*	0
Aromatic >C21 - C35	5	377	1100*	0

There are no exceedances noted from the screening undertaken on the respective TPH CWG bands. The majority of which were below the level of detection (LoD).

Determinant	Min	Max	GAC	Number of exceedances
Benzene	<0.01	<0.01	380*	0
Toluene	<0.01	<0.01	880000*	0
Ethylbenzene	<0.01	<0.01	83000*	0
p & m-xylene	<0.02	<0.02	79000*	0
o-xylene	<0.01	<0.01	79000*	0
MTBE	<0.02	<0.02	49000*	0

There were no exceedances for BTEX/MTBE congeners, all of which were below the level of detection (LoD).

Others

The asbestos screening returned a negative result for the presence of fibrous material from all samples analysed.

The soil contamination laboratory certificates can be reviewed in Appendix E.

[5] LQM/CIEH GAC Residential with Homegrown Produce land use scenario based on a sandy loam soil and 1.0% SOM. It is noted that the LQM/CIEH S4UL guidance recommends an additive approach for the TPH fraction, so that a hazard index approach is used. Based on a preliminary conservative comparison of maximum concentrations to S4ULs, no forward modelling is necessary to prove that this would still result in no exceedances at the site.

Contamination Investigation Findings

Risks to Human Health

Given the depth of Made Ground identified, no visual and/or olfactory evidence of potential contamination was noted within any soils encountered during the SI works undertaken.

Overall, there were six (6no.) exceedances identified:

Lead (GAC of 200mg/kg) within BH01 at a depth of 0.8mbgl (288mg/kg) and HTP03 at a depth of 0.2mbgl (377mg/kg), 0.6mbgl (519mg/kg) and 1.0mbgl (211mg/kg), HTP04 at a depth of 0.6mbgl (225mg/kg) and HPT05 at a depth of 0.45m (250mg/kg).

Therefore, it would be reasonable to conclude that there is a possible risk to human health receptors.

Risk to Groundwater Receptors

Due to the lack of exceedances of mobile contaminants of concern in analysed samples and absence of free groundwater, it is reasonable to conclude that the site poses a low risk to controlled waters.

Risks to Plants and Wildlife

A negligible risk has been attributed given the concentrations of phytotoxic contaminants below elevated concentrations and often below the limit of detection.

Risks to Site Workers

Given recorded elevated concentrations of determinands, precautions should be taken to minimise exposure of site workers during ground works through the implementation of site safety procedures and the use of suitable personal protective equipment (PPE). Such precautions should include, but not be limited to:

- Personal hygiene, washing and changing procedures;
- Availability of site welfare;
- Provision of PPE appropriate to the task; and
- Daily safety briefings and tool box talks.
- All site works will be undertaken in accordance with the guidelines prepared by the Health and Safety Executive (1991) and all work will be carried out in accordance with the Principal Contractor's Health and Safety Plan.

Risks to Proposed Structures

Water supply pipes are assumed to be installed in the new development. Prior to installation, contact should be made with the local water supplier to determine if upgraded water supply pipes are required.

Updated Conceptual Site Model and Risk Assessment

The Conceptual Site Model has been re-formulated based upon the results from the SI in accordance with BS10175:2015.

On Site					
Source	*Pathways*	*Receptor*	*Severity*	*Probability*	*Risk*
Made Ground possibly containing metals, TPH and PAH	Ingestion, dermal contact, inhalation of dusts and vapours	Future end users and site visitors	Medium	Low	Moderate to low
		Construction Workers			
		Residents and visitors	Medium	Unlikely	Low
	Leaching through soils and migration via groundwater or soil pores	Controlled Waters	Mild	Unlikely	Low
	Permeation of water pipes	Construction materials, future end users and site visitors	Medium	Low	Moderate to Low
	Uptake	Plant and Wildlife	Mild	Unlikely	Low
Asbestos at/near ground surface in Made Ground	Inhalation of fibres in airborne dust	Future end users and site visitors	Medium	Low	Low
		Construction Workers			
Ground Gases: From Made Ground: CH_4, CO, CO_2 and H_2S	Gas migration and build up within buildings (explosion/ asphyxiation risk)	Future end users and building structures	Medium	Unlikely	Low

Off site

Source	*Pathways*	*Receptor*	*Severity*	*Probability*	*Risk*
Land uses in the vicinity possibly containing potential contaminants.	Leaching through soils and migration via groundwater or soil pore moisture	Future end users and site visitors	Medium	Low	Low
	Ingestion, dermal contact, inhalation of dusts/vapours	Future end users and site visitors			
Ground Gases: From Made Ground: CH4, CO, CO2 and H2S	Gas migration and build up within buildings (explosion/ asphyxiation risk)	Future end users and building structures	Medium	Unlikely	Low

Contamination Recommendations

The following recommendations made do not constitute a formal remediation strategy and/or validation report. A remediation strategy should be agreed with the relevant local authority prior to such works commencing and/or the production of a validation report.

Soils

Given the identified lead contamination across the site and in the proposed areas of soft landscaping, we would recommend that soils are removed in these garden areas to a depth of 600mm, a geotextile layer is installed at a depth of 600mm across the entire proposed soft landscaping area followed by 600mm of clean imported material, comprised of 300mm of subsoil and 300mm of topsoil. The removal of this shallow subsoil from across the site would be sufficient to mitigate the risks posed by the contamination encountered during the site investigation.

As construction workers are likely to come into contact with contaminated soils during the removal of the soil and subsequent groundworks, safe working practices should be implemented and appropriate PPE should be used to mitigate the risks of contact with contaminated soils.

Alternatively, a layer of hardstanding could be installed across the garden areas. This would act as capping layer, breaking the pathway for interaction between future inhabitants and the identified contamination in the soil below.

A remedial strategy should be formulated and presented to the Local Authority Planning Authority to seek their comments and approval in advance of such works proceeding.

Watching Brief and Discovery Strategy

A watching brief should be maintained by the Main Contractor at all times during the groundworks stage. Should any unforeseen contamination, such as oils or soils/groundwater with an unusual colour or odour, be encountered during groundworks then the following procedure should be implemented:

Work to cease in that area to prevent exposure to ground workers and potential contaminants being spread around;

Notify a Geo-Environmental Consultant, to attend site and sample material;

Notify the Environmental Health Department / Contaminated Land Officer(s) of the Local Planning Authority.

If the nature and extent of the contamination is unmanageable under the procedure set out above, then a suitable management, mitigation or remediation procedure will be agreed with the CLO. However, this is considered unlikely at this particular site.

Asbestos

Although screening has revealed no asbestos to be present within the samples analysed from exploratory holes undertaken, it cannot be guaranteed that asbestos is not present within the soils across the remainder of the site. Consequently, we would recommend that a watching brief be

adopted with regards to the site for the potential of finding any Asbestos Containing Materials (ACMs). If any ACMs are identified these need to be dealt with accordingly in relation to the Hazardous Waste Regulations 2005.

Services

If new services will be installed as part of the redevelopment of the site, we would recommend the local water authority be contacted to determine their specification for the type of pipework which should be used on this site.

All services and in particular potable water supply pipework should comprise of material that is resistant to attack and degradation to chemical attack.

Material Disposal

Soils to be removed off site should be managed in accordance with The Environmental Protection (Duty of Care) Regulations 1991.

It may be prudent to undertake Waste Acceptance Criteria (WAC) analyses on the soils to be removed.

Surface Water Disposal

It should be noted that the Environment Agency does not recommend that soakaways be placed within Made Ground, potentially contaminative land or in ground previously identified as contaminated.

Verification Reporting

It is recommended that you confirm with the relevant environmental consultees whether they require a validation and/or closure report providing documentation/audit trail for the completion of any remediation/mitigation works completed on site.

If a Verification Report is required it should include, but not be limited to, the following:

Site visit records and photographic records from the watching brief

Duty of care records for disposal of waste material including the landfill site(s) or disposal facility where the material has been disposed and a copy of the Contractor's current waste carrier's licence (to be provided by Contractor)

Records and test certificates relating to the management and disposal or unforeseen contaminants and/or ACMs (if any)

Details of source and chemical test results for imported materials, if any.

Confirmation of water supply pipe materials installed

Report Submission

This report should be submitted to the Local Planning Authority at the earliest opportunity to seek their acceptance of the findings of this report.

Notes and Limitations

YE have prepared this report with all reasonable skill, care and diligence. The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources.

YE take no responsibility for conditions which have not been revealed by the boreholes, or which occur between boreholes. Whilst every effort has been made to interpret the conditions between investigation locations, such information is only indicative, and liability cannot be accepted for its accuracy.

The opinions given in this report have been dictated by the finite data on which are they based and are relevant only to the purpose for which the report was commissioned.

Information reviewed should not be considered exhaustive and has accepted in good faith as providing true and representative data with respect to site conditions. Should additional information become available which may influence the opinion expressed in this report, YE reserves the right to review such information and, if warranted, to alter the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed.

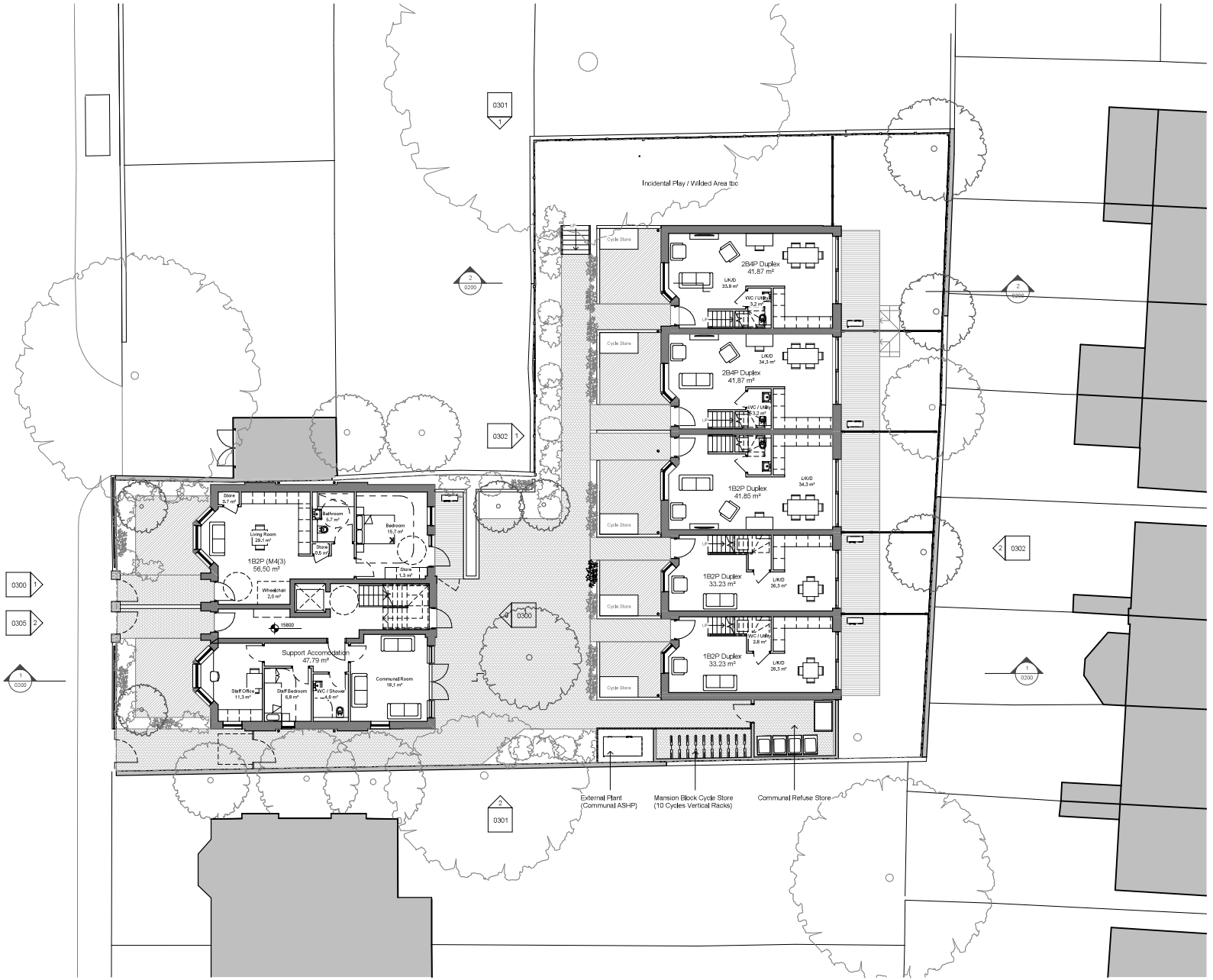
The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted industry practices at this time and as such is not a guarantee that the study site is free of hazardous conditions.

This report has been prepared solely for the use of the named client, and may not be relied upon by other parties without written consent from YE. YE disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

The information contained in this report is intended for the use of the named client (or their approved contractors). Should a third party rely on any part of this report, that party does so wholly at its own risk and YE disclaim any liability to such parties. Should the purposes for which the report is used, or the proposed use of the site change, this report may no longer be valid and further use of reliance upon the report in those circumstances shall be at the client's sole and own risk. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. YE should in all such altered circumstances be commissioned to review and update this report accordingly.

YEX2487
Meadows Hall, Richmond TW10 6LN
February 22

Appendix A
Proposed Development Plan



0 1m 2m 5m

Tree Canopy Zone
(translated from Tree Survey)

Root Protection Zone
(translated from Tree Survey)

DRAFT

Date

Revision	Date	Description

project
Meadows Hall

drawing title
Proposed Ground Floor Plan

drawing number
WP-0733-A-0110

revision

scale @ A1
1 : 100

First Issue
10/12/2021

drawing purpose
DRAFT

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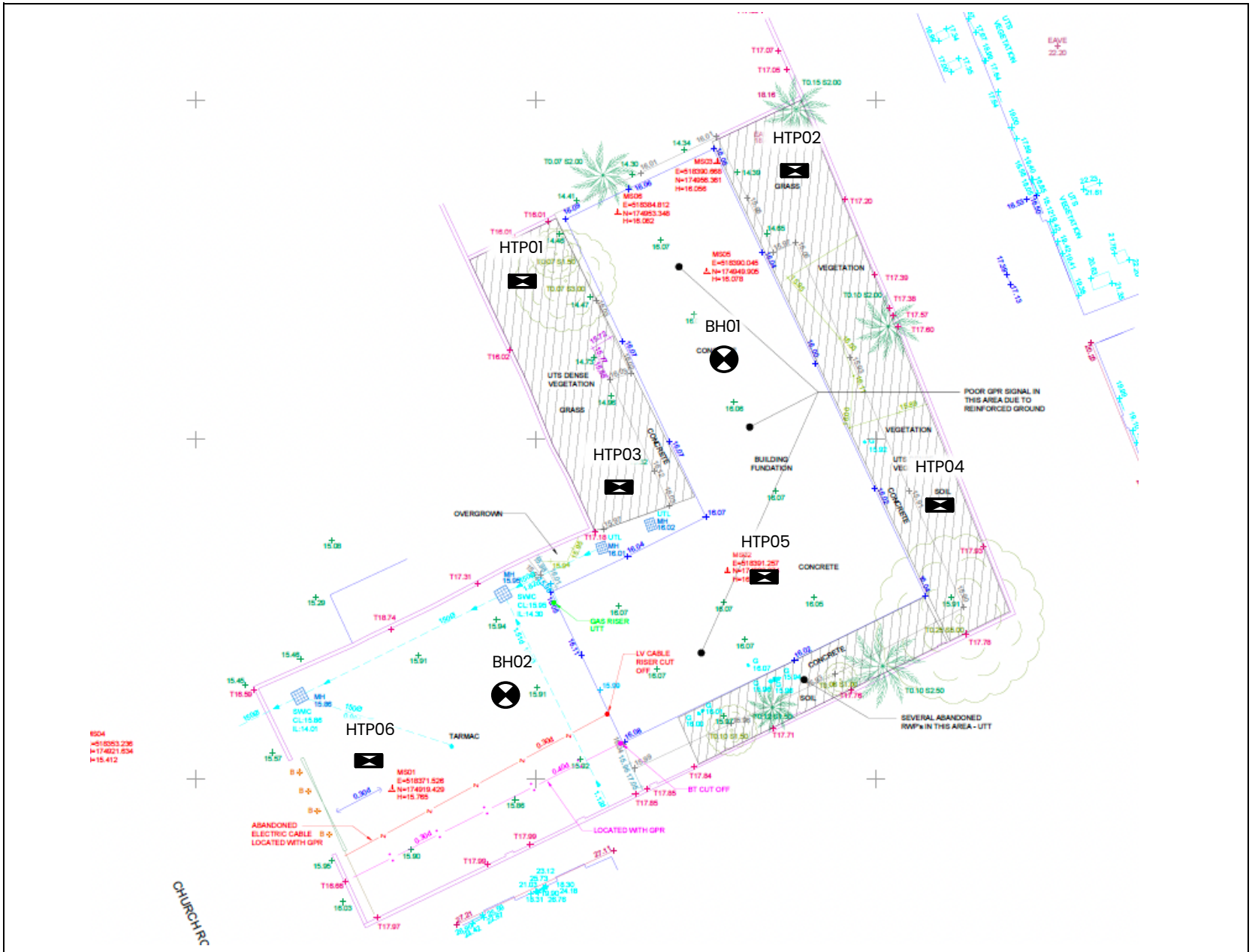
YEX2487
Meadows Hall, Richmond TW10 6LN
February 22

Appendix B
Site Investigation Plan



Site Investigation Plan

YOUR ENVIRONMENT	Meadows Hall TW10 6LN YEX2487 Jan-22

YEX2487
Meadows Hall, Richmond TW10 6LN
February 22

Appendix C
Borehole Logs

Borehole Log

Borehole No. **BH01**

Sheet 1 of 3

Project Name: Meadows Hall	Project No. YEX2487	Co-ords:	Hole Type CP
Location: Chruch Road, Richmond, TW10 6LN		Level:	Scale 1:50
Client: RenKap Ltd		Dates: 04/01/2022	Logged By LB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20 - 0.30	D		0.20			MADE GROUND. CONCRETE
		0.20 - 0.55	B					MADE GROUND. Sandy fine to coarse angular GRAVEL of brick, concrete and macadam
		0.40	ES					
		0.50 - 0.60	D					
		0.50 - 0.95	B					
		0.80	ES					
		1.20 - 1.30	D					
		1.20 - 1.65	B					
					1.65			MADE GROUND. Dark brown gravelly fine to coarse SAND. Gravel is fine to coarse angular of brick and concrete
		2.00 - 2.45	B					
		2.00	S	N=8 (1,1/2,2,2,2)				
		3.00 - 3.45	B					
		3.00	S	N=10 (1,1/2,2,3,3)	3.10			Medium dense orange sandy fine to coarse angular to subrounded GRAVEL of flint
		3.90 - 4.00	D		3.90			Firm brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse angular of flint
		3.90 - 4.20	B					
		4.20 - 4.65	B					
		4.20	S	N=11 (1,1/2,3,3,3)				
		5.00 - 5.45	U	Ublow=100				
		5.45 - 5.55	D		5.45			Firm becoming stiff grey fissured indistinctly laminated silty CLAY
		6.00 - 6.10	D					
		6.50 - 6.95	B					
		7.50 - 7.60	D					
		8.00 - 8.45	U	Ublow=100				
		9.00 - 9.45	U	Ublow=110				
		10.00 - 10.45	B					
								Continued on Next Sheet

Remarks

No groundwater encountered.

Borehole Log

Borehole No. **BH01**

Sheet 2 of 3

Project Name: Meadows Hall	Project No. YEX2487	Co-ords:	Hole Type CP
Location: Chruch Road, Richmond, TW10 6LN		Level:	Scale 1:50
Client: RenKap Ltd		Dates: 04/01/2022	Logged By LB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.00	S	N=18 (2,3/4,4,5,5)				Firm becoming stiff grey fissured indistinctly laminated silty CLAY
		11.00 - 11.10	D					
		11.50	U	Ublow=120				
		11.95 - 12.05	D					
		12.50 - 12.60	D					
		13.00 - 13.45 13.00	B S	N=19 (1,2/3,4,5,7)				
		14.00 - 14.10	D					
		14.50 - 14.95	U	Ublow=120				
		14.95 - 15.05	D					
		15.50 - 15.60	D					
		16.00 - 16.45 16.00	B S	N=27 (2,3/5,7,7,8)				
		17.00 - 17.10	D					
		17.50 - 17.95	U	Ublow=120				
		17.95 - 18.05	D					
		18.50 - 18.60	D					
		19.00 - 19.45 19.00	B S	N=28 (2,4/4,6,9,9)				

Continued on Next Sheet

11 12 13 14 15 16 17 18 19 20

Remarks

No groundwater encountered.

Borehole Log

			Borehole No. **BH01** Sheet 3 of 3
Project Name: Meadows Hall	Project No. YEX2487	Co-ords:	Hole Type CP
Location: Chruch Road, Richmond, TW10 6LN		Level:	Scale 1:50
Client: RenKap Ltd		Dates: 04/01/2022	Logged By LB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					20.45			Firm becoming stiff grey fissured indistinctly laminated silty CLAY End of Borehole at 20.45m

21 22 23 24 25 26 27 28 29 30

Remarks
No groundwater encountered.

Borehole Log

Borehole No. **BH02**

Sheet 1 of 3

Project Name: Meadows Hall	Project No. YEX2487	Co-ords:	Hole Type CP
Location: Chruch Road, Richmond, TW10 6LN		Level:	Scale 1:50
Client: RenKap Ltd		Dates: 05/01/2022	Logged By LB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND. Macadam over CONCRETE with reabar
		0.30	D		0.35			MADE GROUND. Grey slightly clayey sandy fine to coarse angular GRAVEL of concrete brick and macadam
		0.30	ES					
		0.30 - 0.50	B		0.65			MADE GROUND. Dark brown gravelly fine to coarse SAND. Gravel is fine to coarse angular of brick and concrete
		0.50	D					
		0.50	ES					
		0.50 - 0.80	B					
		0.80	ES		1.20			Orangish brown slightly clayey sandy fine to coarse angular to subangular GRAVEL of flint
		0.90	D					
		0.90 - 1.20	B					Medium dense orangish brown sandy fine to coarse angular to subrounded GRAVEL of flint
		1.20 - 1.65	B					
		1.20	C	N=15 (2,3/3,3,4,5)				
		2.00 - 2.45	B					
		2.00	C	N=19 (2,4/4,5,5,5)				
		2.45	D					
		3.00 - 3.45	B					
		3.00	C	N=22 (2,3/4,4,6,8)				
		3.70	D					
		3.70 - 4.00	B		3.80			Firm to stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded of flint
		4.00 - 4.45	U	Ublow=60				
		4.50	D					
		5.00	S	N=8 (1,1/2,2,2,2)				
		5.45	D					
					6.00			Stiff grey fissured indistinctly laminated silty CLAY
		6.50 - 6.95	U	Ublow=70				
		6.95	D					
		7.50	D					
		8.00	S	N=10 (1,2/2,2,3,3)				
		9.00	D					
		9.50 - 9.95	U	Ublow=100				
		9.95	D					

Continued on Next Sheet

Remarks

No groundwater encountered.

Borehole Log

Borehole No. **BH02**

Sheet 2 of 3

Project Name: Meadows Hall	Project No. YEX2487	Co-ords:	Hole Type CP
Location: Chruch Road, Richmond, TW10 6LN		Level:	Scale 1:50
Client: RenKap Ltd		Dates: 05/01/2022	Logged By LB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								Stiff grey fissured indistinctly laminated silty CLAY	
		10.50	D						
		10.50	D						
		11.00	S	N=22 (2,3/4,5,6,7)					11
		12.00	D						12
		12.50 - 12.95	U	Ublow=120					
		12.95	D						13
		13.50	D						
		14.00	S	N=22 (2,3/4,6,6,6)					14
		15.00	D						15
		15.50 - 15.95	U	Ublow=100					
		15.95	D						16
		16.50	D						
		17.00	S	N=23 (2,3/4,5,7,7)					17
		18.00	D						18
		18.50 - 18.95	U	Ublow=110					
		18.95	D						19
		19.50	D						
		20.00	S	N=27 (2,4/5,7,7,8)					20
								Continued on Next Sheet	

Remarks

No groundwater encountered.

AGS

Borehole Log

			Borehole No. **BH02** Sheet 3 of 3
Project Name: Meadows Hall	Project No. YEX2487	Co-ords:	Hole Type CP
Location: Chruch Road, Richmond, TW10 6LN		Level:	Scale 1:50
Client: RenKap Ltd		Dates: 05/01/2022	Logged By LB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					20.45			Stiff grey fissured indistinctly laminated silty CLAY End of Borehole at 20.45m

Remarks
No groundwater encountered.

Trial Pit Log

TrialPit No: HTP01
Sheet 1 of 1

Project Name: Meadows Hall	Project No. YEX2487	Co-ords: - Level:	Date 04/01/2022
Location: Chruch Road, Richmond, TW10 6LN		Dimensions (m): Depth 0.90	Scale 1:25
Client: RenKap Ltd			Logged LB

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES					MADE GROUND. Dark brown gravelly fine to coarse SAND. Gravel is fine to coarse angular of brick and concrete
	0.30	ES					
				0.70			Orangish brown sandy fine to coarse angular to subangular GRAVEL of flint
	0.85	ES		0.90			End of Pit at 0.90m

Remarks: No groundwater encountered.

Stability:

Trial Pit Log

TrialPit No: HTP02
Sheet 1 of 1

Project Name: Meadows Hall	Project No. YEX2487	Co-ords: - Level:	Date 05/01/2022
Location: Chruch Road, Richmond, TW10 6LN		Dimensions (m): Depth 0.70	Scale 1:25
Client: RenKap Ltd			Logged LB

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.25	ES		0.70			MADE GROUND. Dark brown gravelly fine to coarse SAND. Gravel is fine to coarse angular of brick, concrete, tile, metal and plastic
							End of Pit at 0.70m

Remarks: No groundwater encountered.

Stability:

Trial Pit Log

TrialPit No: HTP03
Sheet 1 of 1

Project Name: Meadows Hall	Project No. YEX2487	Co-ords: - Level:	Date 04/01/2022
Location: Chruch Road, Richmond, TW10 6LN		Dimensions (m): Depth 1.20	Scale 1:25
Client: RenKap Ltd			Logged LB

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES					MADE GROUND. Dark brown gravelly fine to coarse SAND. Gravel is fine to coarse angular of brick, concrete, tile, metal, plastic and flint
	0.60	ES					
	1.00	ES					
				1.20			End of Pit at 1.20m

1
2
3
4
5

Remarks: No groundwater encountered.

Stability:

Trial Pit Log

TrialPit No: HTP04
Sheet 1 of 1

Project Name: Meadows Hall	Project No. YEX2487	Co-ords: - Level:	Date 04/01/2022
Location: Chruch Road, Richmond, TW10 6LN		Dimensions (m): Depth 0.70	Scale 1:25
Client: RenKap Ltd			Logged LB

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES					MADE GROUND. Dark brown gravelly fine to coarse SAND. Gravel is fine to coarse angular of brick, concrete, tile, metal, plastic and flint
	0.60	ES		0.70			End of Pit at 0.70m

Remarks: No groundwater encountered.

Stability:

Trial Pit Log

TrialPit No: HTP05
Sheet 1 of 1

Project Name: Meadows Hall	Project No. YEX2487	Co-ords: - Level:	Date 04/01/2022
Location: Chruch Road, Richmond, TW10 6LN		Dimensions (m): Depth 0.50	Scale 1:25
Client: RenKap Ltd			Logged LB

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.15	ES		0.50			MADE GROUND. Dark brown gravelly fine to coarse SAND. Gravel is fine to coarse angular of brick, concrete, tile, metal, plastic and flint
	0.45	ES					End of Pit at 0.50m

Remarks: No groundwater encountered.

Stability:

Trial Pit Log

TrialPit No: HTP06
Sheet 1 of 1

Project Name: Meadows Hall	Project No. YEX2487	Co-ords: - Level:	Date 04/01/2022
Location: Chruch Road, Richmond, TW10 6LN		Dimensions (m): Depth 0.70	Scale 1:25
Client: RenKap Ltd			Logged LB

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.25	ES		0.20			MADE GROUND. Macadam over CONCRETE with reabar
	0.40	ES		0.40			MADE GROUND. Grey slightly clayey sandy fine to coarse angular GRAVEL of concrete brick and macadam
				0.70			MADE GROUND. Dark brown gravelly fine to coarse SAND. Gravel is fine to coarse angular of brick and concrete
							End of Pit at 0.70m

Remarks: No groundwater encountered.

Stability:

YEX2487
Meadows Hall, Richmond TW10 6LN
February 22

Appendix D
Geotechnical Laboratory Results

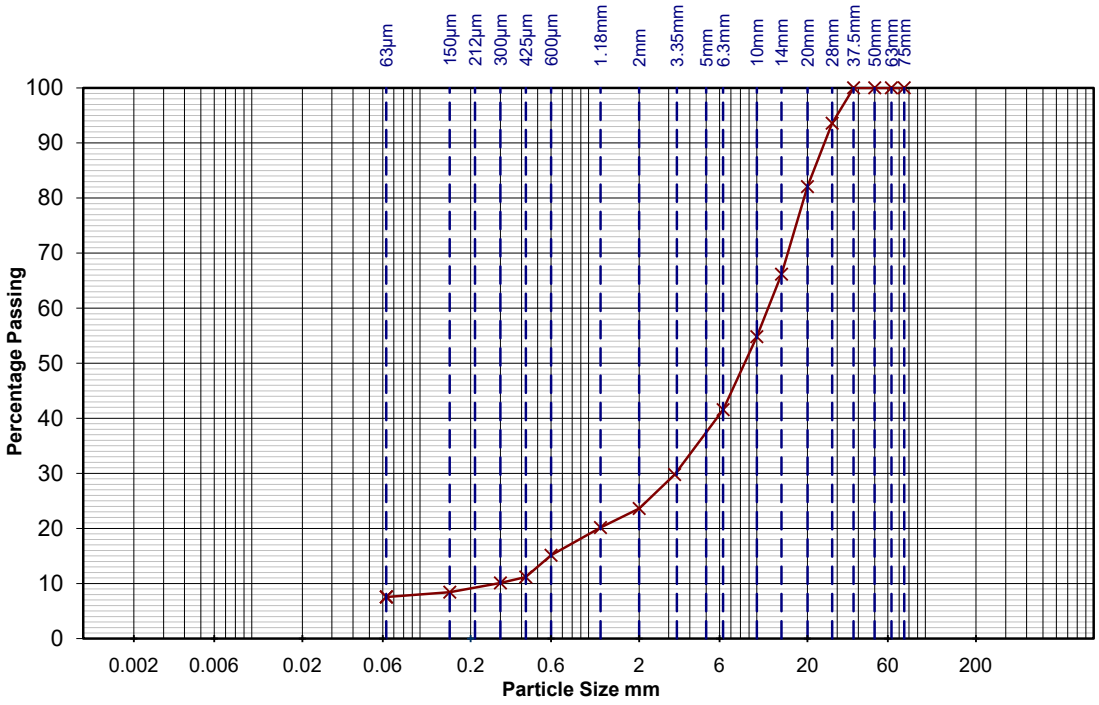
Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: RenKap Ltd
Site: Meadows Hall, Richmond
BH/TP No. -
Sample No. BH02
Tested by: A.Shah **Chkd by:** JR **Depth:** 1.2-1.65m

Date: 19/01/2022 **Date:** 19/01/2022

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	93.6	82.0	66.2	54.8	41.6	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	29.8	23.6	20.2	15.1	10.1	11.2	-	8.4	7.5



DESCRIPTION: Slightly clayey/silty sandy fine to coarse GRAVEL

Remarks:	Contract Number YEX 2487
	Figure number 1

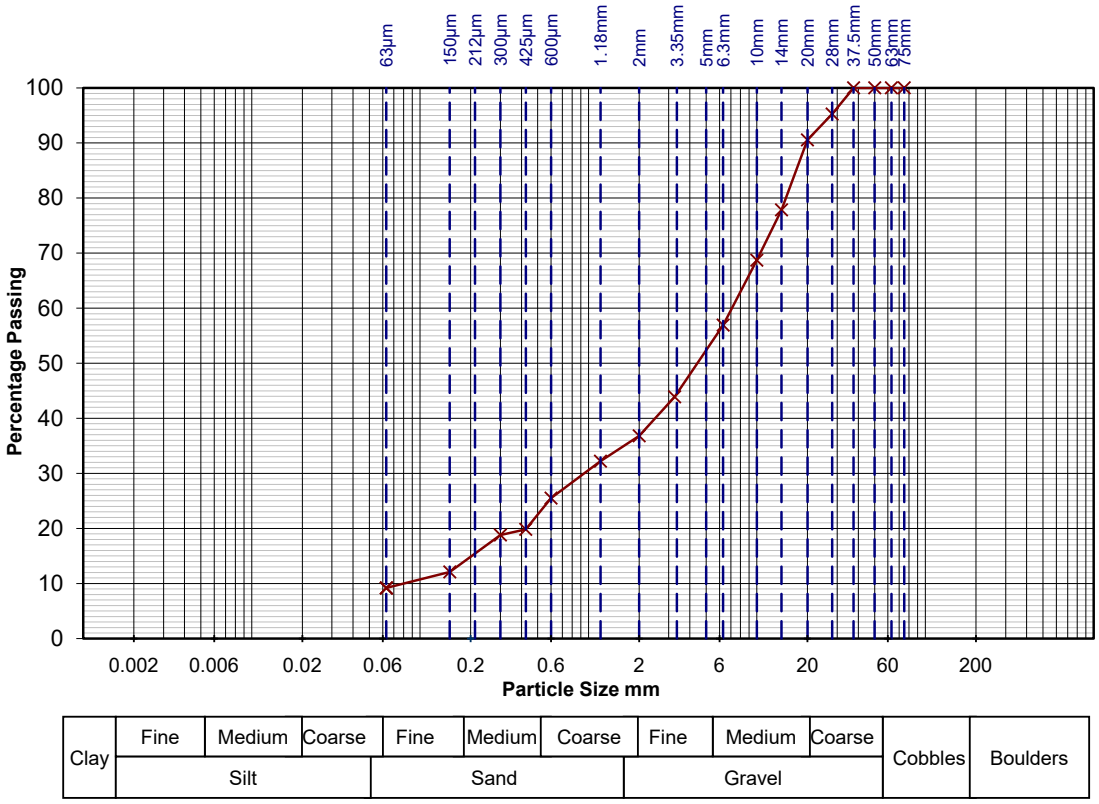
Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: RenKap Ltd
Site: Meadows Hall, Richmond
BH/TP No. -
Sample No. BH02
Tested by: A.Shah **Chkd by:** JR **Depth:** 3.0-3.45m

Date: 19/01/2022 **Date:** 19/01/2022

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	95.3	90.5	77.8	68.7	56.9	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	43.9	36.8	32.2	25.5	18.8	19.9	-	12.1	9.2



DESCRIPTION: Slighty clayey/silty very sandy fine to coarse GRAVEL

Remarks:	Contract Number YEX 2487
	Figure number 1

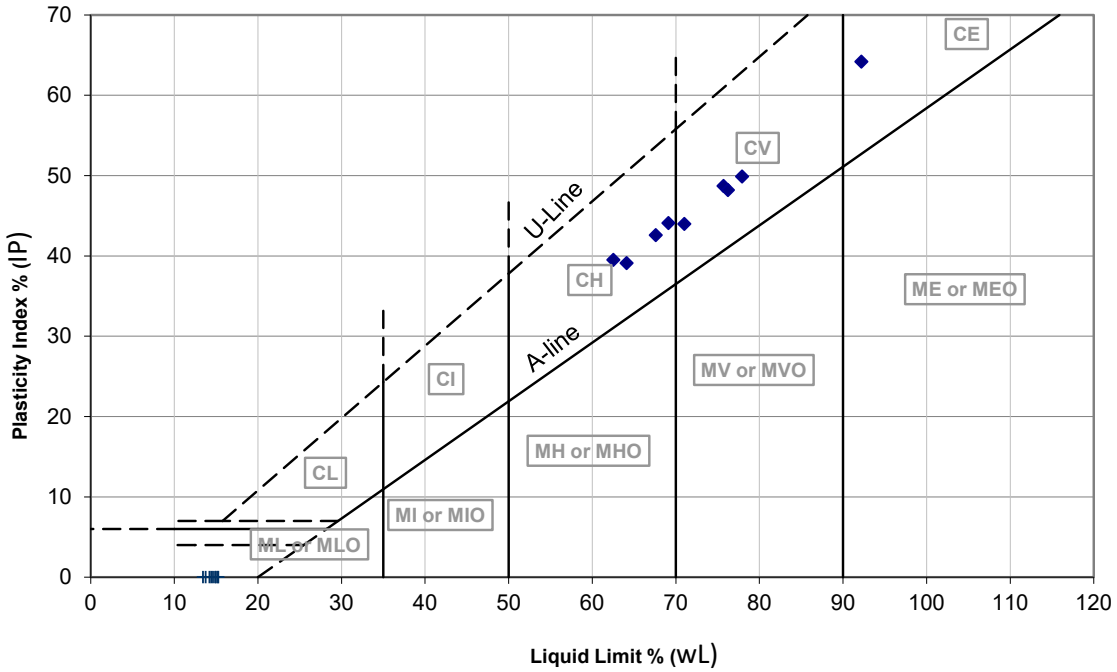
YOUR ENVIRONMENT
Chilgrove Business Centre
Chilgrove Park Road
Chichester
PO18 9HU

Client: RenKap Ltd

Job No:	Site:	Date:	Sheet:
YEX 2487	Meadows Hall, Richmond	19/01/2022	1

Interpretation of Moisture Content, Liquid and Plastic Limits

Location	Depth (m)	Moisture Content (w) (%)	Liquid Limit (w_L) (%)	Plastic Limit (w_P) (%)	Plasticity Index (I_P) (%)	Retained by 0.425mm (%)	Modified (w) (w') (%)	Modified (I_P) (I_P') (%)	Liquidity/ Consistency (I_L) (%)	Liquidity/ Consistency (I_C) (%)	Casagrande Class	N.H.B.C Class (%)
BH01	4.2-4.65	25.36	62.5	23	39.5	15	30	34	0.1	0.9	C H	MEDIUM
BH01	8.0-8.45	35.41	71	27	44	0	35	44	0.2	0.8	C V	HIGH
BH01	12.5-12.6	22.84	92.2	28	64.2	0	23	64	-0.1	1.1	C E	HIGH
BH01	18.5-18.6	21.23	69.1	25	44.1	0	21	44	-0.1	1.1	C H	HIGH
BH02	4.45-4.55	24.54	67.6	25	42.6	10	27	38	0.0	1.0	C H	MEDIUM
BH02	7.5-7.6	24.33	75.7	27	48.7	0	24	49	-0.1	1.1	C V	HIGH
BH02	10.5-10.6	23.19	77.9	28	49.9	0	23	50	-0.1	1.1	C V	HIGH
BH02	15.0-15.1	20.82	76.2	28	48.2	0	21	48	-0.1	1.1	C V	HIGH
BH02	20-20.45	22.32	64.1	25	39.1	0	22	39	-0.1	1.1	C H	MEDIUM



LABORATORY REPORT

4043

Contract Number: PSL22/0192

Report Date: 08 February 2022

Client's Reference: YEX2487

Client Name: Your Environment
Gateshead Business Park
Delp New Road
Delph
Oldham
OL3 5DE

For the attention of: Jonny Roberts

Contract Title: Meadows Hall, Richmond

Date Received: 10/1/2022
Date Commenced: 10/1/2022
Date Completed: 8/2/2022

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

A Watkins (Director)
R Berriman (Quality Manager)
S Royle (Laboratory Manager)

L Knight (Assistant Laboratory Manager)
S Eyre (Senior Technician)
T Watkins (Senior Technician)

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Doncaster DN4 0AR
tel: +44 (0)844 815 6641
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e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH01		U	5.00	5.45	Stiff brown slightly sandy CLAY.
BH01		U	11.50	11.95	Stiff brown slightly sandy CLAY.
BH01		U	14.50	14.95	Stiff brown slightly sandy CLAY.
BH02		U	4.00	4.45	Stiff brown slightly sandy CLAY.
BH02		U	9.05	9.45	Stiff brown slightly sandy CLAY.
BH02		U	18.50	18.95	Stiff brown mottled grey slightly sandy CLAY.

UKAS TESTING
4043

PSL
Professional Soils Laboratory

Meadows Hall, Richmond

Contract No:
PSL22/0192
Client Ref:
YEX2487

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

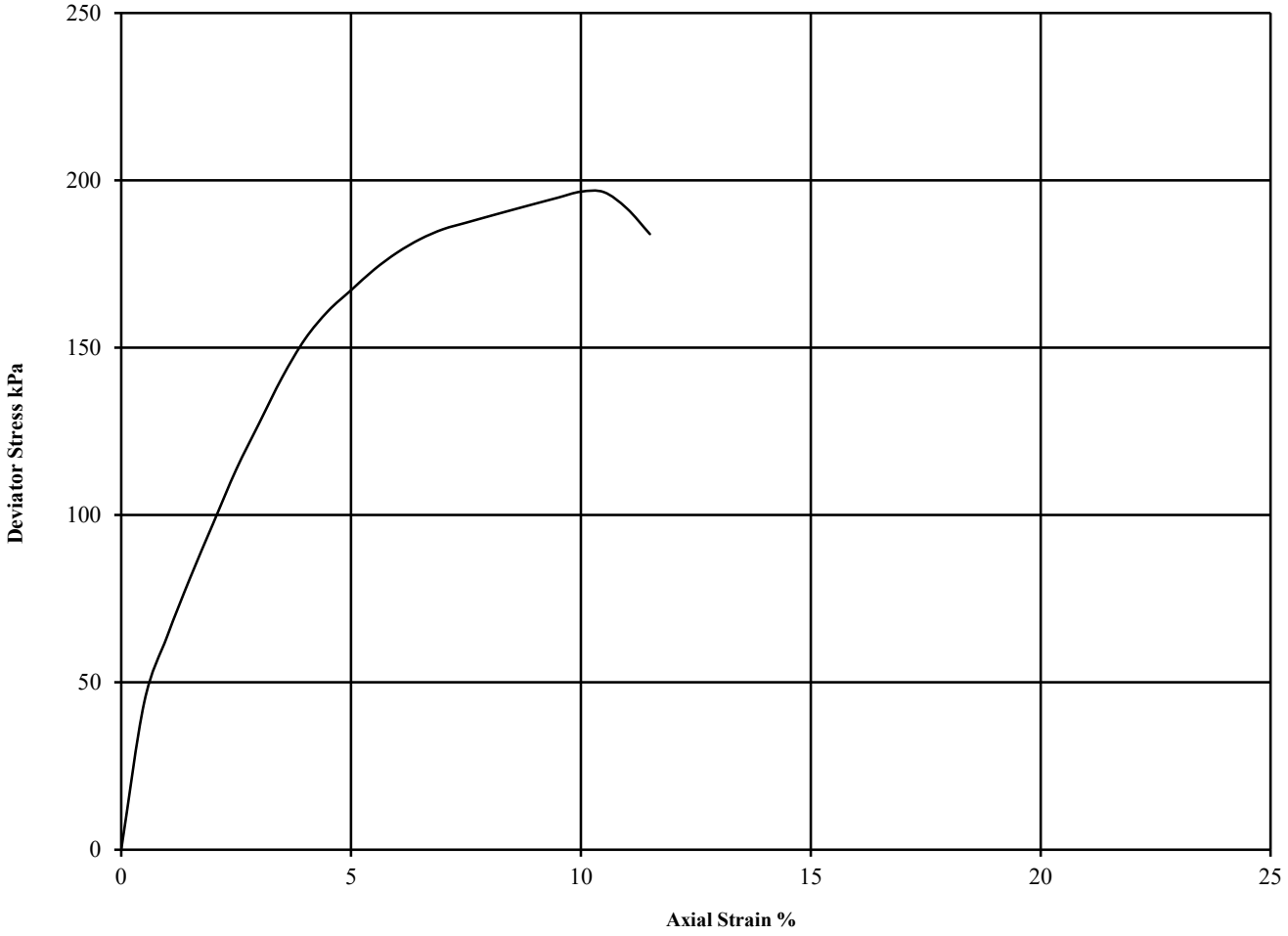
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH01 **Top Depth (m):** 5.00

Sample Number: **Base Depth (m):** 5.45

Sample Type U



Diameter (mm):		100	Height (mm):		200	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	32	1.92	1.45	125	197	98	10.0	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Meadows Hall, Richmond

Contract No: PSL22/0192

Client Ref: YEX2487

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

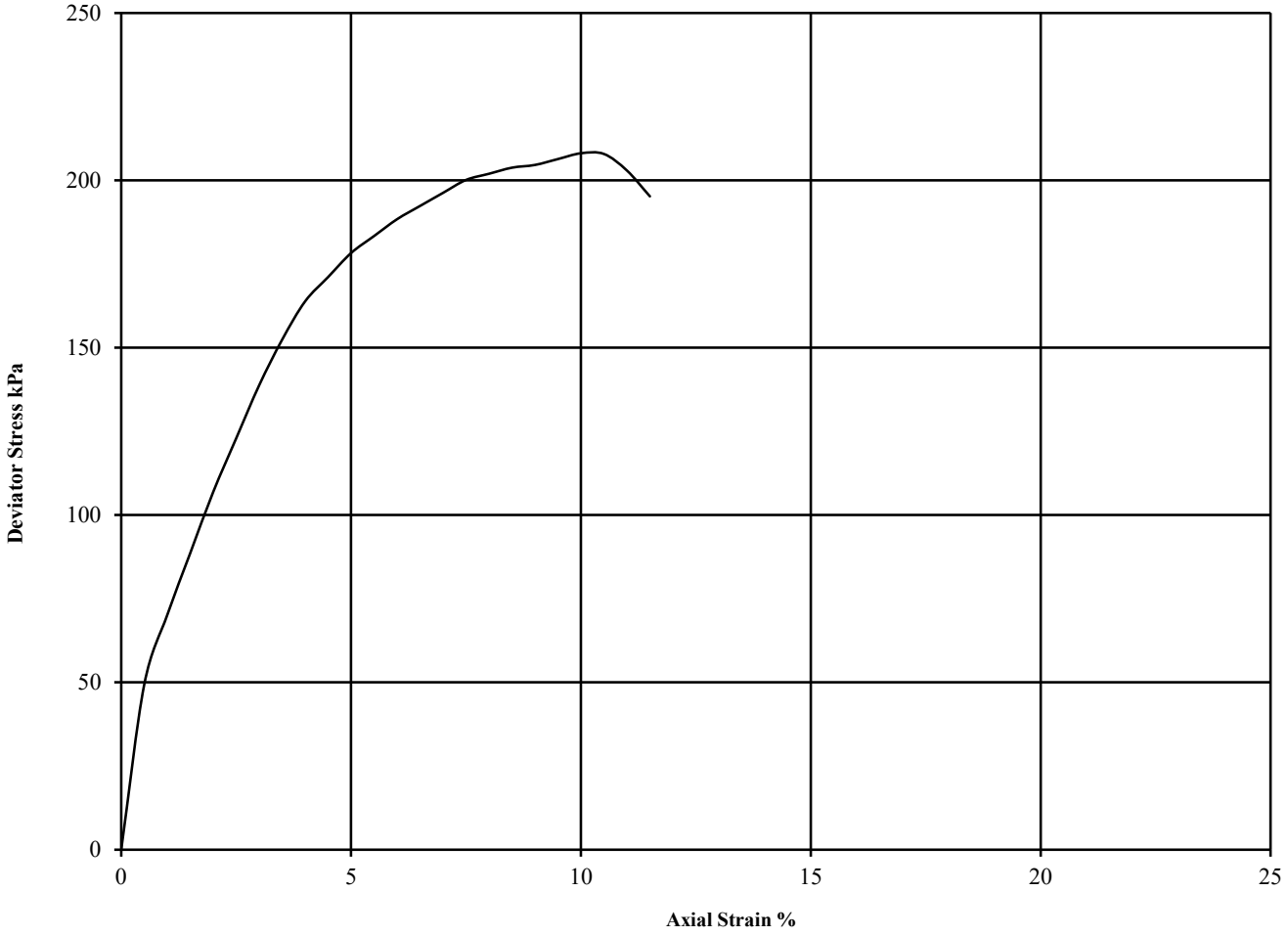
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH01 **Top Depth (m):** 11.50

Sample Number: **Base Depth (m):** 11.95

Sample Type U



Diameter (mm):		100	Height (mm):		200	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	30	1.90	1.46	250	208	104	10.0	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Meadows Hall, Richmond

Contract No: PSL22/0192

Client Ref: YEX2487

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

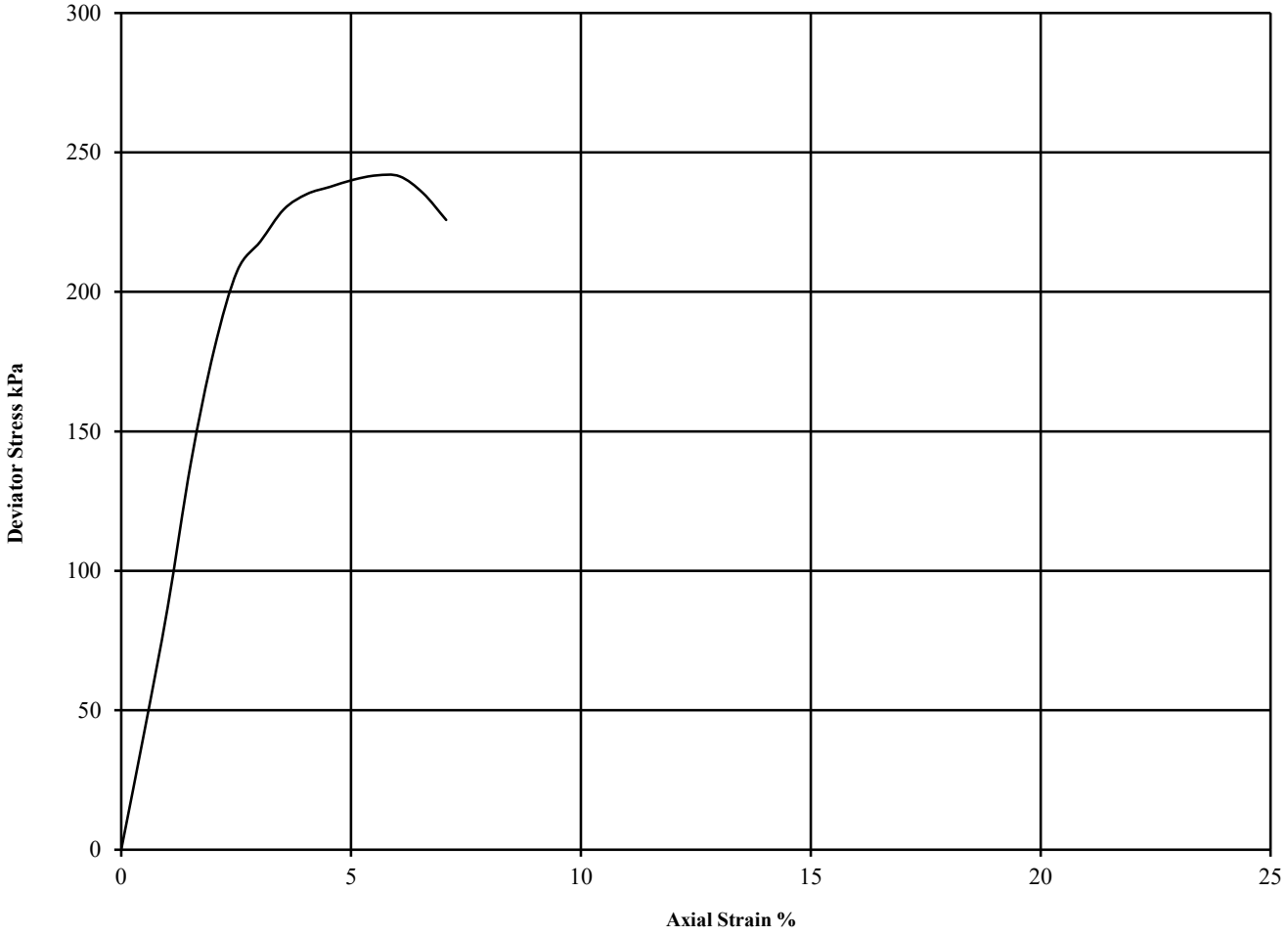
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH01 **Top Depth (m):** 14.50

Sample Number: **Base Depth (m):** 14.95

Sample Type U



Diameter (mm):		103	Height (mm):		204	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	27	1.99	1.56	350	242	121	5.6	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Meadows Hall, Richmond

Contract No: PSL22/0192

Client Ref: YEX2487

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

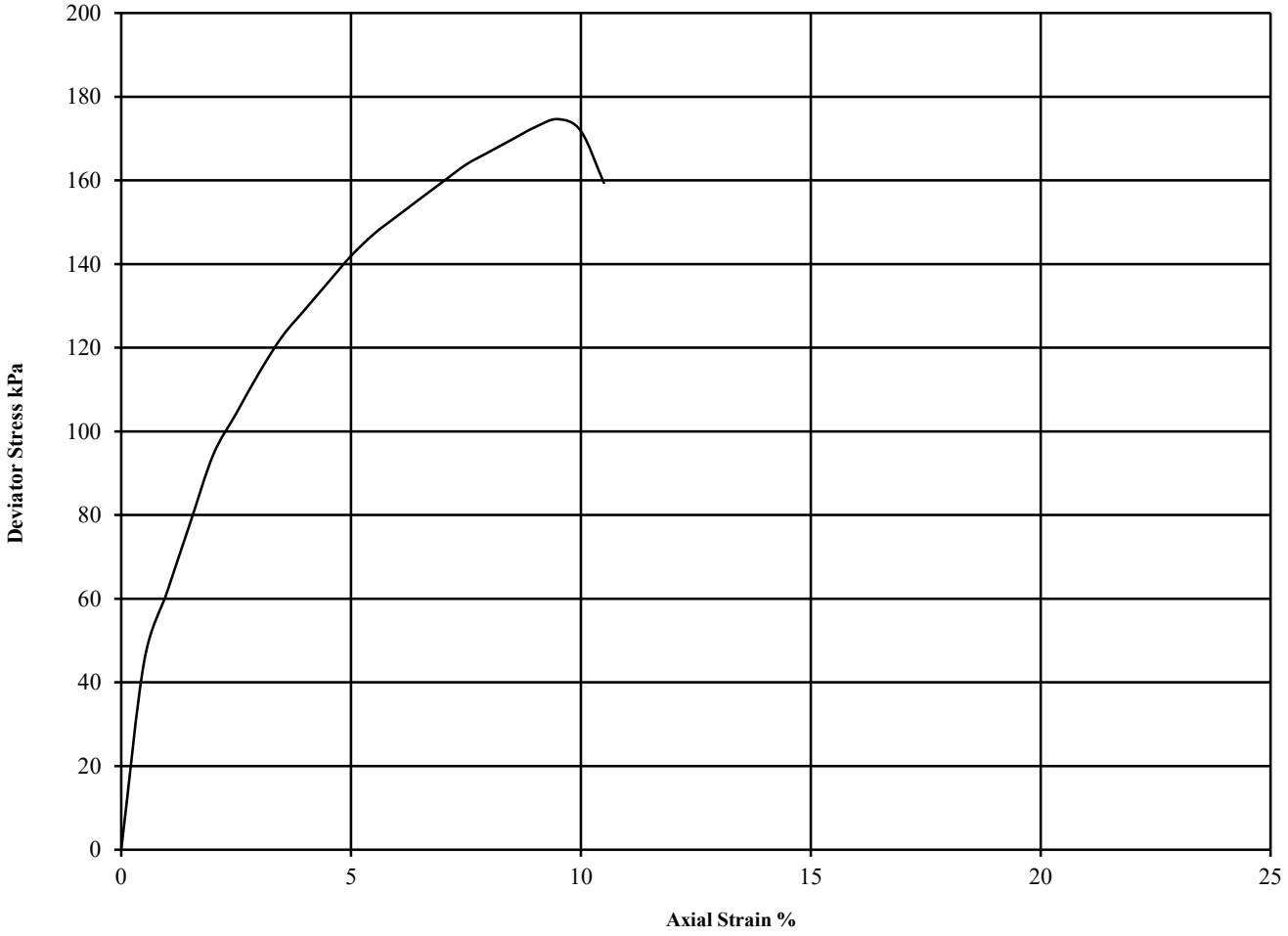
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH02 **Top Depth (m):** 4.00

Sample Number: **Base Depth (m):** 4.45

Sample Type U



Diameter (mm):		100	Height (mm):		200	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	28	1.96	1.53	100	175	87	9.5	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Meadows Hall, Richmond

Contract No: PSL22/0192

Client Ref: YEX2487

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

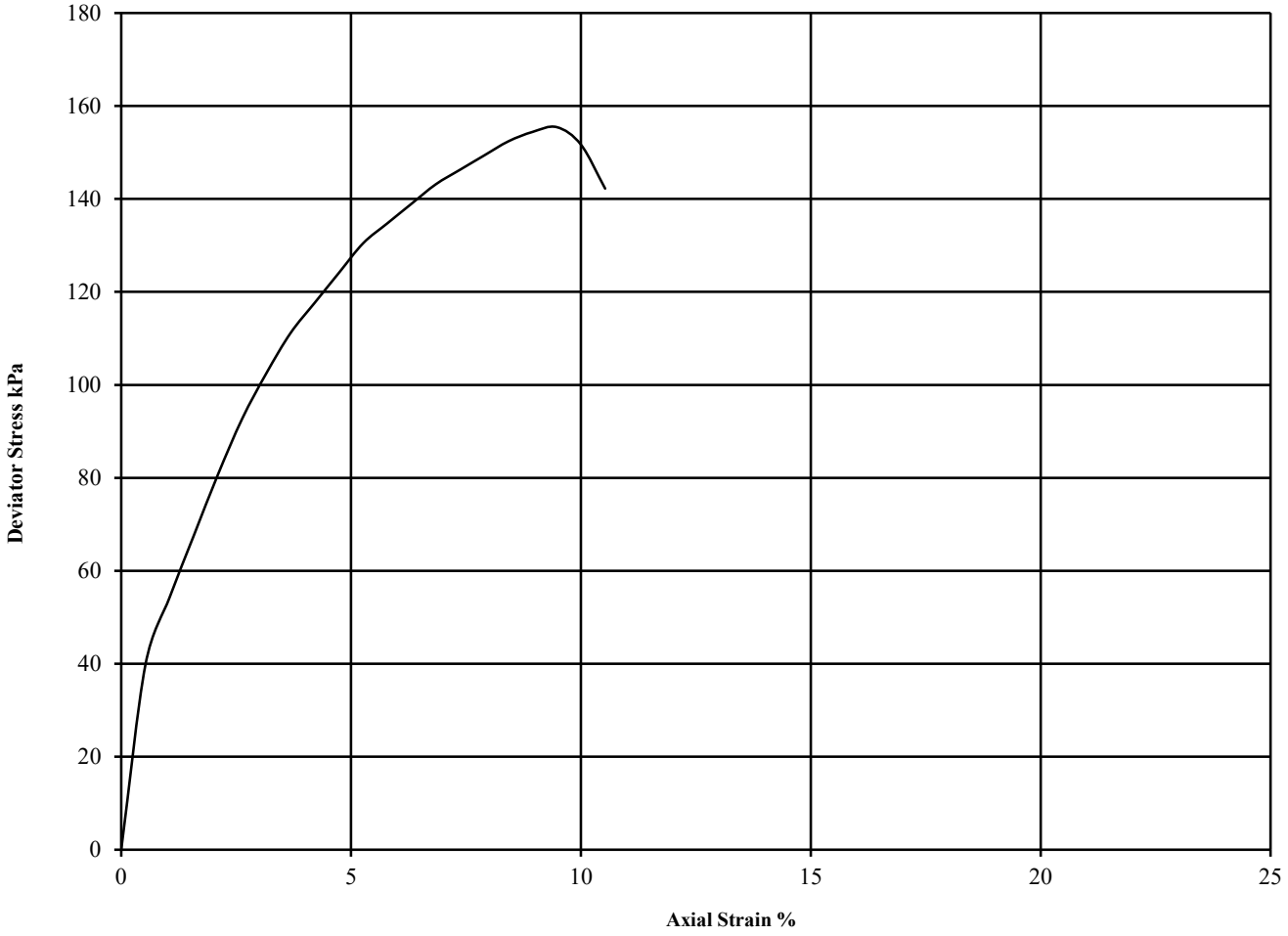
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH02 **Top Depth (m):** 9.05

Sample Number: **Base Depth (m):** 9.45

Sample Type U



Diameter (mm):		100	Height (mm):		190	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	30	1.95	1.50	250	155	78	9.5	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Meadows Hall, Richmond

Contract No: PSL22/0192

Client Ref: YEX2487

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

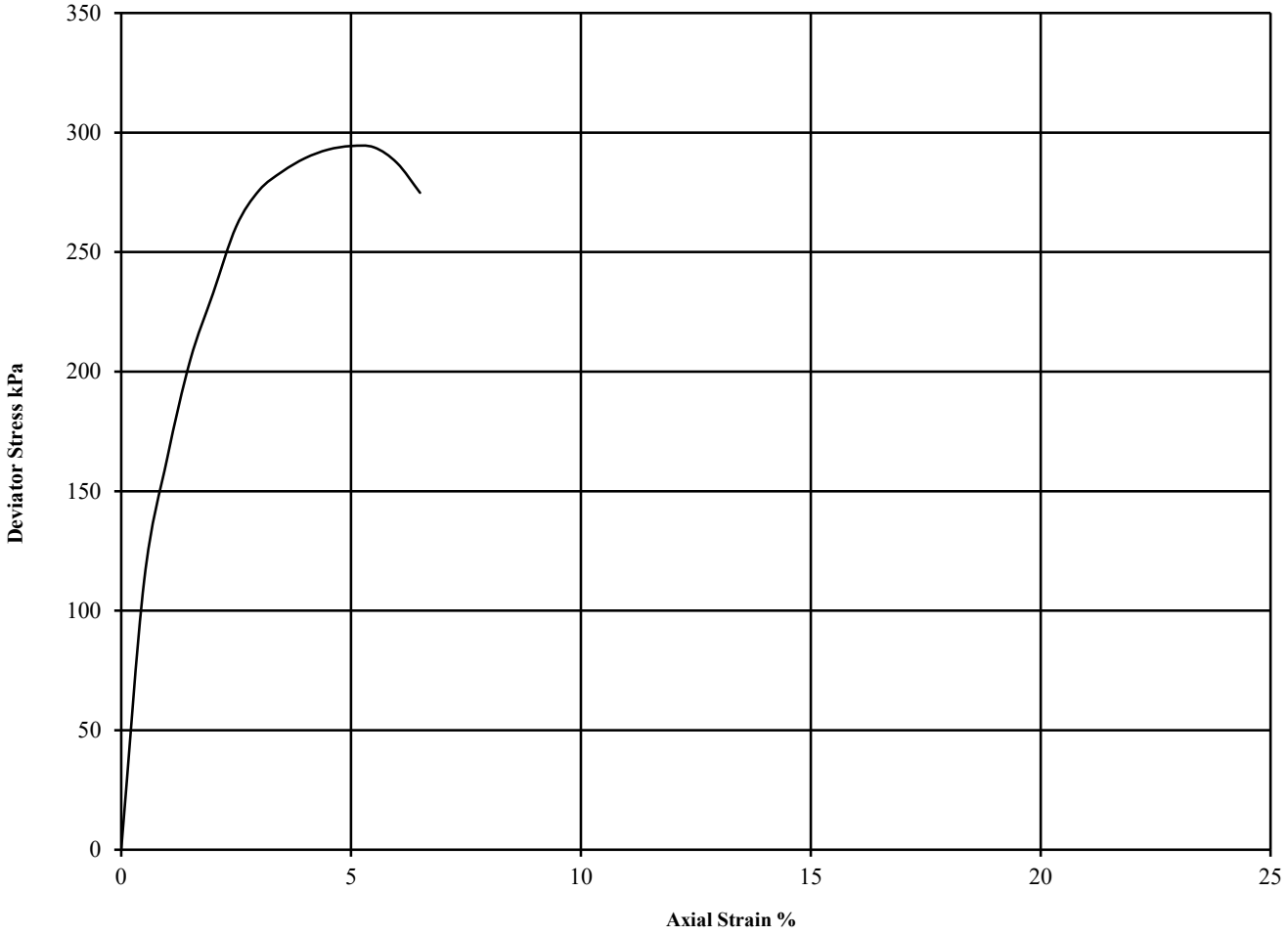
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH02 **Top Depth (m):** 18.50

Sample Number: **Base Depth (m):** 18.95

Sample Type U



Diameter (mm):		100	Height (mm):		200	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.37
1	27	2.00	1.58	450	294	147	5.0	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Meadows Hall, Richmond

Contract No: PSL22/0192

Client Ref: YEX2487

YEX2487
Meadows Hall, Richmond TW10 6LN
February 22

Appendix E
Chemical Laboratory Results

ANALYTICAL TEST REPORT

Contract no: 104355

Contract name: Meadows Hall

Client reference: YEX2487

Clients name: YourEnvironment

Clients address: Unit 2, Woodhorn Business Centre
Chichester
West Sussex
PO20 2BX

Samples received: 10 January 2022

Analysis started: 10 January 2022

Analysis completed: 17 January 2022

Report issued: 17 January 2022

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing
NAD	No Asbestos Detected

Approved by:

Megan Harris

Senior Reporting Administrator

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
104355-1	BH01	0.40	Clayey Sand with Gravel	-	-	11.5
104355-2	BH01	0.80	Clayey Sand with Gravel	-	-	13.4
104355-3	BH02	0.30	Loamy Clayey Sand with Gravel	-	-	10.6
104355-4	BH02	0.50	Loamy Clayey Sand with Gravel	-	-	11.1
104355-5	BH02	0.80	Clayey Sand with Gravel	-	-	4.7
104355-6	HTP01	0.10	Sandy Clayey Loam with Gravel	-	-	10.5
104355-7	HTP01	0.50	Sandy Clayey Loam with Gravel & Roots	-	-	9.9
104355-8	HTP01	0.85	Loamy Clayey Sand with Gravel	-	-	7.3
104355-9	HTP02	0.25	Sandy Clayey Loam with Gravel & Roots	-	-	13.5
104355-10	HTP03	0.20	Sandy Clayey Loam with Gravel & Roots	-	-	20.2
104355-11	HTP03	0.60	Sandy Clayey Loam with Gravel & Roots	-	-	15.7
104355-12	HTP03	1.00	Sandy Clayey Loam with Gravel	-	-	9.7
104355-13	HTP04	0.20	Sandy Clayey Loam with Gravel & Roots	-	-	21.5
104355-14	HTP04	0.60	Sandy Clayey Loam with Gravel & Roots	-	-	11.8
104355-15	HTP05	0.15	Sandy Clayey Loam with Gravel & Roots	-	-	11.1
104355-16	HTP05	0.45	Sandy Clayey Loam with Gravel & Roots	-	-	10.8
104355-17	HTP06	0.25	Clayey Sand with Gravel	-	-	12.1
104355-18	HTP06	0.40	Clayey Sand with Gravel	-	-	12.9

Chemtech Environmental Limited

SOILS

Lab number			104355-1	104355-2	104355-3	104355-4	104355-5	104355-6
Sample id			BH01	BH01	BH02	BH02	BH02	HTP01
Depth (m)			0.40	0.80	0.30	0.50	0.80	0.10
Date sampled			06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	11	12	13	13	14	23
Cadmium (total)	CE127 M	mg/kg Cd	0.2	0.2	<0.2	<0.2	<0.2	<0.2
Chromium (total)	CE127 M	mg/kg Cr	84	81	106	103	134	107
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	39	20	15	16	8.4	18
Lead (total)	CE127 M	mg/kg Pb	134	288	100	88	27	180
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	17	17	16	15	16	19
Selenium (total)	CE127 M	mg/kg Se	0.8	0.7	0.6	0.6	0.4	0.8
Zinc (total)	CE127 M	mg/kg Zn	104	94	68	70	36	81
pH	CE004 M	units	10.3	9.6	10.9	9.3	8.7	7.9
Sulphate (2:1 water soluble)	CE061 U	mg/l SO_4	1629	1626	263	248	17	21
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE197	% w/w C	1.4	0.4	0.5	0.9	1.0	0.2
Estimate of OMC (calculated from TOC)	CE197	% w/w	2.4	0.7	0.9	1.6	1.8	0.4
PAH								
Naphthalene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthylene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluorene	CE087 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Phenanthrene	CE087 M	mg/kg	<0.02	0.03	0.03	0.07	<0.02	0.16
Anthracene	CE087 U	mg/kg	<0.02	0.03	<0.02	<0.02	<0.02	0.02
Fluoranthene	CE087 M	mg/kg	0.02	0.06	0.09	0.12	<0.02	0.51
Pyrene	CE087 M	mg/kg	0.02	0.05	0.09	0.10	<0.02	0.44
Benzo(a)anthracene	CE087 U	mg/kg	0.03	0.05	0.06	0.07	<0.02	0.24
Chrysene	CE087 M	mg/kg	<0.03	0.04	0.05	0.06	<0.03	0.27
Benzo(b)fluoranthene	CE087 M	mg/kg	0.03	0.09	0.07	0.09	<0.02	0.42
Benzo(k)fluoranthene	CE087 M	mg/kg	<0.03	<0.03	0.03	0.04	<0.03	0.15
Benzo(a)pyrene	CE087 U	mg/kg	0.02	0.07	0.06	0.08	<0.02	0.30
Indeno(123cd)pyrene	CE087 M	mg/kg	0.03	0.08	0.06	0.07	<0.02	0.32
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	0.07
Benzo(ghi)perylene	CE087 M	mg/kg	0.03	0.07	0.05	0.05	<0.02	0.30
PAH (total of USEPA 16)	CE087	mg/kg	<0.34	0.59	0.59	0.76	<0.34	3.22
BTEX & TPH								
MTBE	CE192 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m & p-Xylene	CE192 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
o-Xylene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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SOILS

Lab number			104355-1	104355-2	104355-3	104355-4	104355-5	104355-6
Sample id			BH01	BH01	BH02	BH02	BH02	HTP01
Depth (m)			0.40	0.80	0.30	0.50	0.80	0.10
Date sampled			06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022
Test	**Method**	**Units**						
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	<1	<1	<1	<1	2
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	<1	<1	<1	<1	<1	3
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	<4	<4	<4	<4	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	<4	<4	<4	<4	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	26	48	42	19	5	172
EPH Aliphatic (>C35-C44)	CE068	mg/kg	<10	<10	16	<10	<10	148
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

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SOILS

Lab number			104355-7	104355-8	104355-9	104355-10	104355-11	104355-12
Sample id			HTP01	HTP01	HTP02	HTP03	HTP03	HTP03
Depth (m)			0.50	0.85	0.25	0.20	0.60	1.00
Date sampled			06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	21	13	9.8	15	24	23
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	<0.2	<0.2	2.2	3.4	0.8
Chromium (total)	CE127 M	mg/kg Cr	118	108	74	90	93	121
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	18	13	16	36	34	31
Lead (total)	CE127 M	mg/kg Pb	150	53	159	377	519	211
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	19	15	9.7	23	22	21
Selenium (total)	CE127 M	mg/kg Se	0.7	0.5	0.4	0.8	0.8	0.8
Zinc (total)	CE127 M	mg/kg Zn	85	51	81	236	224	121
pH	CE004 M	units	7.4	7.4	7.4	7.9	7.8	7.6
Sulphate (2:1 water soluble)	CE061 U	mg/l SO_4	23	19	70	23	15	15
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE197	% w/w C	1.7	1.9	0.9	4.6	3.4	3.3
Estimate of OMC (calculated from TOC)	CE197	% w/w	2.8	3.2	1.6	7.8	5.8	5.6
PAH								
Naphthalene	CE087 M	mg/kg	<0.02	<0.02	0.02	0.03	0.04	<0.02
Acenaphthylene	CE087 M	mg/kg	<0.02	<0.02	<0.02	0.03	0.06	<0.02
Acenaphthene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluorene	CE087 U	mg/kg	<0.02	<0.02	<0.02	<0.02	0.02	<0.02
Phenanthrene	CE087 M	mg/kg	0.10	<0.02	0.22	0.36	0.59	0.20
Anthracene	CE087 U	mg/kg	<0.02	<0.02	0.05	0.08	0.11	0.05
Fluoranthene	CE087 M	mg/kg	0.33	0.03	0.63	1.07	1.59	0.51
Pyrene	CE087 M	mg/kg	0.29	0.03	0.56	0.91	1.34	0.42
Benzo(a)anthracene	CE087 U	mg/kg	0.17	0.02	0.33	0.56	0.80	0.26
Chrysene	CE087 M	mg/kg	0.18	<0.03	0.34	0.57	0.75	0.26
Benzo(b)fluoranthene	CE087 M	mg/kg	0.28	0.02	0.52	0.82	1.05	0.37
Benzo(k)fluoranthene	CE087 M	mg/kg	0.10	<0.03	0.20	0.34	0.43	0.14
Benzo(a)pyrene	CE087 U	mg/kg	0.23	0.02	0.46	0.71	0.97	0.33
Indeno(123cd)pyrene	CE087 M	mg/kg	0.23	0.03	0.41	0.67	0.82	0.28
Dibenz(ah)anthracene	CE087 M	mg/kg	0.04	<0.02	0.08	0.14	0.16	0.05
Benzo(ghi)perylene	CE087 M	mg/kg	0.20	<0.02	0.37	0.57	0.70	0.25
PAH (total of USEPA 16)	CE087	mg/kg	2.16	<0.34	4.18	6.87	9.42	3.13
BTEX & TPH								
MTBE	CE192 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m & p-Xylene	CE192 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
o-Xylene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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SOILS

Lab number			104355-7	104355-8	104355-9	104355-10	104355-11	104355-12
Sample id			HTP01	HTP01	HTP02	HTP03	HTP03	HTP03
Depth (m)			0.50	0.85	0.25	0.20	0.60	1.00
Date sampled			06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022
Test	**Method**	**Units**						
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	<1	2	3	5	2
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	2	<1	3	5	6	3
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	<4	<4	<4	<4	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	<4	<4	<4	<4	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	93	27	54	56	42	60
EPH Aliphatic (>C35-C44)	CE068	mg/kg	89	11	18	19	11	50
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

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SOILS

Lab number			104355-13	104355-14	104355-15	104355-16	104355-17	104355-18
Sample id			HTP04	HTP04	HTP05	HTP05	HTP06	HTP06
Depth (m)			0.20	0.60	0.15	0.45	0.25	0.40
Date sampled			06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	9.2	15	8.9	14	8.1	16
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	0.2	0.3	0.3	<0.2	<0.2
Chromium (total)	CE127 M	mg/kg Cr	47	89	89	106	140	127
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	17	26	20	33	8.3	19
Lead (total)	CE127 M	mg/kg Pb	151	225	144	250	31	138
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	8.9	15	12	15	16	17
Selenium (total)	CE127 M	mg/kg Se	0.4	0.7	0.6	0.7	0.6	0.8
Zinc (total)	CE127 M	mg/kg Zn	88	115	153	211	33	55
pH	CE004 M	units	7.9	7.8	7.4	7.4	10.6	10.1
Sulphate (2:1 water soluble)	CE061 U	mg/l SO_4	84	108	55	21	225	124
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE197	% w/w C	0.2	2.4	4.4	3.3	1.8	0.6
Estimate of OMC (calculated from TOC)	CE197	% w/w	0.3	4.2	7.6	5.7	3.1	1.0
PAH								
Naphthalene	CE087 M	mg/kg	0.03	0.03	0.03	0.03	<0.02	<0.02
Acenaphthylene	CE087 M	mg/kg	0.02	0.02	0.03	0.03	<0.02	<0.02
Acenaphthene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluorene	CE087 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Phenanthrene	CE087 M	mg/kg	0.30	0.35	0.30	0.38	0.04	0.07
Anthracene	CE087 U	mg/kg	0.04	0.06	0.05	0.05	<0.02	<0.02
Fluoranthene	CE087 M	mg/kg	0.80	0.76	0.85	0.85	0.16	0.21
Pyrene	CE087 M	mg/kg	0.66	0.63	0.71	0.71	0.18	0.18
Benzo(a)anthracene	CE087 U	mg/kg	0.36	0.37	0.40	0.40	0.04	0.12
Chrysene	CE087 M	mg/kg	0.37	0.37	0.41	0.42	0.04	0.12
Benzo(b)fluoranthene	CE087 M	mg/kg	0.54	0.53	0.64	0.62	0.05	0.16
Benzo(k)fluoranthene	CE087 M	mg/kg	0.21	0.21	0.26	0.24	<0.03	0.08
Benzo(a)pyrene	CE087 U	mg/kg	0.45	0.47	0.52	0.55	0.04	0.14
Indeno(123cd)pyrene	CE087 M	mg/kg	0.41	0.40	0.53	0.47	0.04	0.14
Dibenz(ah)anthracene	CE087 M	mg/kg	0.08	0.08	0.10	0.10	<0.02	0.04
Benzo(ghi)perylene	CE087 M	mg/kg	0.37	0.36	0.47	0.44	0.03	0.12
PAH (total of USEPA 16)	CE087	mg/kg	4.63	4.65	5.31	5.31	0.62	1.38
BTEX & TPH								
MTBE	CE192 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m & p-Xylene	CE192 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
o-Xylene	CE192 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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SOILS

Lab number			104355-13	104355-14	104355-15	104355-16	104355-17	104355-18
Sample id			HTP04	HTP04	HTP05	HTP05	HTP06	HTP06
Depth (m)			0.20	0.60	0.15	0.45	0.25	0.40
Date sampled			06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022
Test	**Method**	**Units**						
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	3	3	3	3	<1	<1
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	3	3	4	4	<1	<1
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	<4	<4	<4	<4	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	8	<4	37	20	7	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	136	48	199	135	377	43
EPH Aliphatic (>C35-C44)	CE068	mg/kg	48	34	76	48	244	25
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	10	mg/l SO_4
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	As received		0.5	mg/kg PhOH
CE197	Total Organic Carbon (TOC)	Carbon Analyser	Dry		0.1	% w/w C
CE197	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry		0.1	% w/w
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
CE192	MTBE	Headspace GC-FID	As received	U	0.02	mg/kg
CE192	Benzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	Toluene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	Ethylbenzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	m & p-Xylene	Headspace GC-FID	As received	U	0.02	mg/kg
CE192	o-Xylene	Headspace GC-FID	As received	U	0.01	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	As received		1	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	As received		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	As received		6	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	As received		6	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	As received		15	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	As received		10	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
104355-1	BH01	0.40	N	
104355-2	BH01	0.80	N	
104355-3	BH02	0.30	N	
104355-4	BH02	0.50	N	
104355-5	BH02	0.80	N	
104355-6	HTP01	0.10	N	
104355-7	HTP01	0.50	N	
104355-8	HTP01	0.85	N	
104355-9	HTP02	0.25	N	
104355-10	HTP03	0.20	N	
104355-11	HTP03	0.60	N	
104355-12	HTP03	1.00	N	
104355-13	HTP04	0.20	N	
104355-14	HTP04	0.60	N	
104355-15	HTP05	0.15	N	
104355-16	HTP05	0.45	N	
104355-17	HTP06	0.25	N	
104355-18	HTP06	0.40	N	

Chemtech Environmental Limited

ADDITIONAL INFORMATION

Notes

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Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

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Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

For soils and solids, analytical results are inclusive of stones, where applicable.

ANALYTICAL TEST REPORT

Contract no: 104394

Contract name: Meadows Hall

Client reference: YEX2487

Clients name: YourEnvironment

Clients address: Unit 2, Woodhorn Business Centre
Chichester
West Sussex
PO20 2BX

Samples received: 11 January 2022

Analysis started: 11 January 2022

Analysis completed: 17 January 2022

Report issued: 17 January 2022

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing

Approved by:

Megan Harris

Senior Reporting Administrator

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
104394-1	BH01	2.00-2.45	Sandy Loamy Clay with Gravel	-	-	11.4
104394-2	BH01	3.90-4.00	Sandy Loamy Clay with Gravel	-	-	15.8
104394-3	BH01	7.50-7.60	Loamy Clay	-	-	21.9
104394-4	BH01	15.50-15.60	Loamy Clay	-	-	20.3
104394-5	BH02	2.00-2.45	Sandy Clay with Gravel	-	-	2.6
104394-6	BH02	9.00-9.10	Loamy Clay	-	-	20.5
104394-7	BH02	18.00-18.10	Loamy Clay	-	-	18.2

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SOILS

Lab number			104394-1	104394-2	104394-3	104394-4	104394-5	104394-6
Sample id			BH01	BH01	BH01	BH01	BH02	BH02
Depth (m)			2.00-2.45	3.90-4.00	7.50-7.60	15.50-15.60	2.00-2.45	9.00-9.10
Date sampled			06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022	06/01/2022
Test	**Method**	**Units**						
pH	CE004 M	units	8.1	8.4	8.1	9.1	8.9	8.9
Sulphate (2:1 water soluble)	CE061 U	mg/l SO_4	139	53	388	164	24	158
Sulphate (2:1 water soluble)	CE061 U	g/l SO_4	0.14	0.05	0.39	0.16	0.02	0.16
Sulphate (total)	CE062 M	mg/kg SO_4	544	391	1115	548	<100	604
Sulphate (total)	CE062 M	% w/w SO_4	0.05	0.04	0.11	0.05	<0.01	0.06
Sulphur (total)	CE119	% w/w S	0.02	0.01	0.18	0.36	0.01	0.44

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SOILS

Lab number			104394-7
Sample id			BH02
Depth (m)			18.00-18.10
Date sampled			06/01/2022
Test	**Method**	**Units**	
pH	CE004 M	units	9.1
Sulphate (2:1 water soluble)	CE061 U	mg/l SO_4	114
Sulphate (2:1 water soluble)	CE061 U	g/l SO_4	0.11
Sulphate (total)	CE062 M	mg/kg SO_4	522
Sulphate (total)	CE062 M	% w/w SO_4	0.05
Sulphur (total)	CE119	% w/w S	0.57

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	10	mg/l SO_4
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	0.01	g/l SO_4
CE062	Sulphate (total)	Acid extraction, ICP-OES	Dry	M	100	mg/kg SO_4
CE062	Sulphate (total)	Acid extraction, ICP-OES	Dry	M	0.01	% w/w SO_4
CE119	Sulphur (total)	Acid extraction, ICP-OES	Dry		0.01	% w/w S

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104394-2	BH01	3.90-4.00	N	
104394-3	BH01	7.50-7.60	N	
104394-4	BH01	15.50-15.60	N	
104394-5	BH02	2.00-2.45	N	
104394-6	BH02	9.00-9.10	N	
104394-7	BH02	18.00-18.10	N	

Chemtech Environmental Limited

ADDITIONAL INFORMATION

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