



Report prepared at

TCM House
Newport Road
Hayes
UB4 8JX

On behalf of

Kearns Property Management Limited

Report reference

19-228.02
Revision A

Report date

April 2020

Prepared by

Aviron Associates Limited

Report Quality Management

Project Name	TCM House, Newport Road, Hayes, UB4 8JX		
Project Title	Phase II Geo-Environmental Risk Assessment		
Client	Kearns Property Management Limited		
Project Number	19-228.02		
Version	Revision A		Date
Prepared by	Gavin Roberts BSc (Hons) FGS	Geo-environmental Engineer	31/03/2020
Prepared by	Orlando Blackwell BEng (Hons) MSc (Eng)	Principal Engineer	07/05/2020
Prepared & Checked by	James Burkitt BEng (Hons) CEnv MRICS	Managing Director	11/05/2020

Aviron Associates Limited (Aviron) has prepared this report in accordance with our fee proposal to the above listed Client or their agents and subsequent instructions pertinent to this which were received from the above listed Client.

This report is confidential and non-assignable by the Client. Aviron shall not be responsible for any use of the report or its contents for any other purpose than for which, and to whom, it was prepared and provided.

Should the Client pass copies of this report to other parties for further comment and advice the whole of the report should be provided and used in the context to which it was prepared.

No professional liability or warranty shall be extended to other parties by Aviron in this connection without the explicit written agreement thereto by Aviron.

Should this report be submitted to stakeholders or statutory bodies by any party other than the above listed Client a copyright law may be infringed and the party submitting the report may not be entitled to do so unless accompanied by a covering letter from Aviron or the Client. For the avoidance of doubt and litigation Aviron should be contacted to establish lawful use of this report.

© Aviron Associates Limited 2020

Aviron Associates Limited
Badgemore House
Badgemore Park
Gravel Hill
Henley on Thames
RG9 4NR

Telephone numbers 01491 413 722
07787 771 686

james@aviron.co.uk
www.aviron.co.uk

Contents

1.0	PROJECT AND SITE INFORMATION	1
2.0	GROUND INVESTIGATION WORK	5
3.0	LABORATORY ANALYSIS	9
4.0	ENVIRONMENTAL INTERPRETIVE GUIDANCE	12
5.0	ASSESSMENT OF SOIL RESULTS	15
6.0	ASSESSMENT OF GEOCHEMICAL GROUNDWATER RESULTS	18
7.0	HAZARDOUS GROUND GAS MONITORING	20
8.0	ENVIRONMENTAL RISK SUMMARY	24
9.0	GEOTECHNICAL DESIGN	31
10.0	CONCLUSIONS AND RECOMMENDATIONS	38
11.0	PROJECT INSTRUCTION AND LIMITATIONS	40
12.0	REFERENCES AND OTHER SOURCES OF INFORMATION	42

Figures

- 1 Existing Site Layout Plan
- 2 Site Photographs
- 3 Proposed Development Plan
- 4 Exploratory Hole Location Plan

Appendices

- I Exploratory Hole Logs and Photographs
- II Field Monitoring Results
- III Soil and Groundwater Contamination Laboratory Results
- IV Soil Geotechnical Laboratory Results

1.0 PROJECT AND SITE INFORMATION

1.1 APPOINTMENT

Aviron Associates Limited (Aviron) was retained by Kearns Property Management Limited (the “Client”) to undertake a Ground Investigation and Phase II Geo-Environmental Risk Assessment (GERA) of the following premises:

TCM House, Newport Road, Hayes, UB4 8JX (hereafter referred to as the “site”).

The purpose of this Phase II GERA is to report on a ground investigation and to supplement a previously issued Phase I Geo-Environmental Assessment (reference 19-228.01, dated August 2019).

This ground investigation and risk assessment shall further evaluate the potential for land contamination and risk to human health and controlled waters. Additionally, ground conditions shall be evaluated providing recommendations for foundation design.

Aviron has relied upon information received from the Client and their agents as accurate, unless contradicted by written documentation or site observations.

1.2 THE SITE

Table 1.2 provides a summary of site details and surrounding area.

Table 1.2 : Site Details

Site Location	The site is located on Newport Road in Hayes, approximately 2.5km to the north-west of Hayes & Harlington railway station.
National Grid Ref.	Centred at approximately 508810E 181920N.
Current Land Use	The site currently comprises an L-shaped structure located along the southern and eastern boundary and a small structure situated in the north-western corner. The L-shaped structure was occupied by an IT consultant and an overseas shipping and delivery business. Figure 1 is presented as the Existing Site Layout Plan. Figure 2 is presented as Site Photographs.
Surrounding Land Use	The site is directly surrounded by commercial developments located within a small industrial estate. Residential properties are situated beyond the commercial developments. Allotment gardens are located approximately 200m to the north-east of the site.
Proposed Land Use	The proposed development involves demolition and clearance of the existing buildings and re-development of a three-storey apartment block.

	Small private terraces provide outdoor amenity space. Additionally, car parking, bicycle and bin stores are allocated. Very limited soft landscaped amenity space is presented. Figure 3 is presented as a Proposed Development Plan.
--	---

1.3 PREVIOUS REPORTS AND INITIAL SITE CONCEPTUALISATION

Prior to reviewing this report, the following report which has been prepared by Aviron should be reviewed:

-  Phase I Geo-Environmental Risk Assessment (GERA), reference 19-228.01, dated August 2019.

Table 1.3.1 is presented as the potential sources of risk identified within the Preliminary Risk Assessment (PRA), presented within the Phase I GERA.

Table 1.3.1: Potential Sources

Source	Description	Comments	On/off-site
1. Made Ground/Soil Contaminants	The historic development of the site including contractors/builder's yard poses a risk of potentially contaminated Made Ground. Contemporary Trade Directory Entries reference made to use of the site as a car breakers & dismantlers.	Metals, hydrocarbons (TPH/PAH), volatile organic compounds, asbestos	On
2. Ground gases/vapours	Degrading hydrocarbons within soils/groundwater beneath the site. Former marshy ground to the west and infilling associated with the former water course and PFS in the vicinity	Methane, carbon dioxide and soil vapours associated with the site and infilled land may migrate within the Boyn Hill Gravel Member towards the site	On and Off

Table 1.3.2 is presented as the initial conceptual site model prepared as part of the PRA.

Table 1.3.2 : Initial Conceptual Site Model (for plausible pollutant linkage pathways)

Source	Receptor	Pathway	Probability	Consequence	Risk & Justification
Source 1 <i>Potentially contaminated</i>	Construction workers	Direct contact	Low likelihood	Mild	Low Short term risk to adults not expected to be significant. Wear PPE.

Made Ground	End users	Direct contact	Likely	Medium	Moderate Anticipated Made Ground due to historical development and potential for soil contamination given 'brownfield' historic use of the site as a builders yard and car breakers & dismantlers. Complete Ground Investigation to quantify risk.
	Adjacent land users	Direct contact via run-off	Unlikely	Mild	Very Low No visual signs of contamination and site enclosed by walls and concrete hard standing with wide spread drainage limiting runoff.
	Soft landscaping	Root uptake	Likely	Medium	Moderate Anticipated Made Ground due to historical development and potential for soil contamination given 'brownfield' historic use of the site as a builders yard and car breakers & dismantlers. Complete Ground Investigation. Any new planting will require a suitable thickness of Topsoil to support plant growth.
	Water supply pipes	Direct contact	Likely	Mild	Moderate/Low Any soil contamination expected at near surface levels. Water main to be laid at circa 1.0m depth. Complete Ground Investigation and consult local water authority.
	Buildings & infrastructure	Direct contact	Likely	Mild	Moderate/Low Aggressive ground conditions could attack concrete (sulphur attack). Complete Ground Investigation.
	Groundwater	Via underlying hydrogeology	Likely	Mild	Moderate/Low Should potentially contaminated Made Ground exist beneath the concrete site surfacing this may impact the underlying aquifer. Complete Ground Investigation.

Source 2 <i>Soil ground gases</i>	Construction workers	Inhalation of vapours/gas	Unlikely	Mild	Very Low Whilst potential ground gas generating risks have been identified. Risk mitigated working in outdoor air.
	End users	Inhalation of vapours/gas	Low likelihood	Medium	Moderate/Low Potential ground gas generating risks have been identified. Complete ground gas monitoring to confirm risk potential.

The overall environmental risk classification for the site is **MODERATE** as a result of the historic development of the site and site environs, to present day and the current use.

The Phase I GERA report recommended the completion of a ground investigation, which should, as a minimum include:

-  An assessment of the Made Ground quality (if encountered) across the site, by spatial coverage.
-  Assessment of the underlying natural strata at depths of root uptake.
-  Soil and groundwater (if encountered) geochemical testing should comprise Aviron's Suite 1, TPH CWG, VOC and asbestos analysis. See section 3.0 for definition of analytical suites.
-  Exploratory holes should be installed with standpipe to construct monitoring wells to enable ground gas monitoring and groundwater monitoring.

2.0 GROUND INVESTIGATION WORK

2.1 METHOD STATEMENT AND GROUND INVESTIGATION APPROACH

A method statement detailing the ground investigation was produced in accordance with current statutory guidance, best practices and the Client's instructions.

A health and safety plan was completed before site work commenced. Ground investigation staff were briefed on the potential contaminants likely to be encountered, and the appropriate personal protective equipment (PPE) to be adopted for this type of investigation.

The ground investigation was conducted in accordance with British Standards; BS5930:2015 'Code of Practice for ground Investigation', BS1377:1990 'Method of test for soils for Civil Engineering Purposes and BS10175:2011 'Investigation of Potentially Contaminated sites'.

2.2 GROUND INVESTIGATION METHODS

Window sample drilling and cable and percussion drilling was undertaken spatially across the site to enable the assessment of ground conditions.

An Exploratory Hole Location Plan is enclosed as **Figure 4**.

All intrusive locations were pre-cleared prior to investigation works using a cable avoidance tool (CAT). This was completed to ensure service avoidance during this exercise.

2.2.1 Cable and Percussion Drilling

Cable percussion borehole BH1 was drilled using a Dando 2000 drilling rig on 20 March 2020 to a depth of 20.0 metres (m) below ground level (bgl). BH1 was located in the centre of the site, as shown in **Figure 4**, for the benefit of appraising deeper ground conditions and in the event that piling is required was completed to serve as the principal pile design borehole.

Standard Penetration Tests were undertaken at 1m intervals to 11.2m bgl and at 2m intervals below 11.2m bgl within the borehole in accordance with BS EN SO 22476-3 "Standard Penetration Test 2005".

Disturbed and undisturbed soil samples were collected from bored arisings for geochemical and geotechnical laboratory tests which are further discussed within section 3.0.

2.2.2 Window Sample Drilling

Window sample boreholes WS1 to WS6 were drilled using an Archway Dart drilling rig on 23 March 2020 to depths of up to 5.0m bgl.

The window sample boreholes were located in accessible areas of the site. Window sample boreholes were undertaken for the benefit of land contamination assessment, foundation design and ground gas/water monitoring.

Table 2.2.2 discusses the rationale of window sample positioning.

Table 2.2.2 : Rationale of Window Sample Positioning

Location	Rationale
WS1	Positioned in the north-east of the site for spatial site coverage and beneath the proposed building. Converted to groundwater monitoring well.
WS2	Positioned in the south-east of the site for spatial site coverage and beneath the proposed building. Converted to groundwater monitoring well.
WS3	Positioned in the centre-west of the site for spatial site coverage and beneath the proposed building. Converted to groundwater monitoring well.
WS4	Positioned in the centre-south of the site for spatial site coverage about the rear elevation of the proposed building and also garden area.
WS5	Positioned in the west of the site for spatial site coverage and within the proposed garden area.
WS6	Positioned in the north-west of the site for spatial site coverage and within the proposed garden area.

Standard Penetration Tests (SPT) were undertaken at 1m intervals up to 5.0m bgl within the boreholes in accordance with BS EN SO 22476-3 "Standard Penetration Test 2005".

Soil samples were also collected from bored arisings for geochemical and geotechnical laboratory tests which are further discussed within section 3.0.

2.3 GROUND CONDITIONS

The Exploratory Hole Logs and Photographs are presented within **Appendix I**.

Detailed strata descriptions are shown on the respective exploratory logs though in general ground conditions comprise:

-  MADE GROUND to depths of between 0.5m bgl (WS5) and 1.5m bgl (BH1); over
-  Interbedded sandy GRAVEL, gravelly SAND and sandy gravelly locally organic CLAY (BOYN HILL GRAVEL MEMBER) to depths of up to 3.5m bgl (BH1); over
-  Firm becoming stiff brown and grey mottled becoming very stiff fissured greyish brown locally slightly sandy CLAY (LONDON CLAY FORMATION) to the termination depth of 20.0m bgl (BH1).

Roots were observed during the ground investigation within the overlying soils encountered in WS5, WS6 and BH1 to depths of 0.5m, 0.6m and 3.5m bgl respectively.

2.4 GROUNDWATER LEVELS

2.4.1 Groundwater Levels : During Ground Investigation Works

Table 2.4.1 describes the groundwater levels encountered during investigation works of 20 and 23 March 2020.

Table 2.4.1 : Groundwater Observations During Investigation Works

Location	Depth – bgl (during works) 20 & 23 March 2020
WS1	2.6m
WS2	2.5m
WS3	0.5m (possibly perched within the Made Ground)
WS4	1.2m (possibly perched on the underlying Clay) and 3.0m
WS5	Dry to 1.2m
WS6	1.2m (possibly perched on the underlying Clay)
BH1	Dry to 20m (though water added during drilling of Gravels)

2.4.2 Groundwater and Gas Monitoring Wells

As part of this investigation, locations WS1, WS2 and WS3 were converted to monitoring wells to enable standing groundwater level monitoring and ground gas monitoring. Wells were installed into 101mm diameter window samples using 63mm external diameter and 50mm internal diameter HDPE standpipe.

Table 2.4.2 describes the construction of the wells.

Table 2.4.2 : Monitoring Well Construction

Location	Depth of plain pipe and bentonite seal (m)	Response zone; depth of slotted pipe with gravel screen (m)	Depth of install (m)
WS1	GL-1.0	1.0-2.0	2.0
WS2	GL-1.0	1.0-3.0	3.0
WS3	GL-1.0	1.0-2.0	2.0

* GL = Ground Level

2.4.3 Groundwater and Gas Post-Investigation Monitoring

In all instances and prior to completing groundwater monitoring and field measurements bulk ground gases and soil vapours were monitored using a GA2000 Gas Analyser and miniRAE Photon-Ionisation Detector (PID) on the dates shown in table 2.4.3.

Table 2.4.3 provides standing level groundwater ‘dips’ during post-investigation monitoring.

Table 2.4.3 : Groundwater Monitoring Depths

Depth – bgl Date	WS1	WS2	WS3
31 March 2020	1.62m	1.73m	0.62m
7 April 2020	1.66m	1.85m	0.62m
14 April 2020	1.66m	1.84m	0.64m
21 April 2020	1.53m	1.61m	0.58m
30 April 2020	1.53m	1.60m	0.60m
7 May 2020	‘Lost’	1.62m	‘Lost’

It is considered that the groundwater encountered within WS1 and WS2 between circa 1.6m and 1.9m bgl forms part of the secondary aquifer of the superficial geology of the Boyn Hill Gravel Member. The groundwater within WS3 is considered to be perched within the underlying Clay strata; which is typically of limited permeability, unlike the Sands and Gravels of WS1 and WS2.

Field monitoring sheets are enclosed in **Appendix II**.

3.0 LABORATORY ANALYSIS

3.1 SOIL GEOCHEMICAL TESTING

Table 3.1 presented the soil samples which were submitted for geochemical analysis.

Table 3.1 : Soil Geochemical Testing

Location	Strata Sampled	Analysis Scheduled
WS1 (0.3m)	Made Ground	Suite 1 + TPH CWG + Asbestos + SOM
WS1 (0.8m)	Natural Gravel	Suite 1 + TPH CWG + Asbestos + SOM + VOC
WS1 (2.0m)	Natural Gravel	Suite 1 + TPH CWG + Asbestos + SOM
WS2 (0.5m)	Made Ground	Suite 1 + TPH CWG + Asbestos + SOM
WS3 (1.4m)	Natural Clay	Suite 1 + TPH CWG + Asbestos + SOM + VOC
WS6 (0.3m)	Made Ground	Suite 1 + TPH CWG + Asbestos + SOM + VOC
WS6 (1.6m)	Natural Clay	Suite 1 + TPH CWG + Asbestos + SOM + VOC
BH1 (0.4m)	Made Ground	Suite 1 + TPH CWG + Asbestos + SOM + VOC

-  Aviron's '**Suite 1**' includes the following parameters; arsenic, barium, cadmium, total chromium, copper, nickel, zinc, lead, mercury, selenium, water soluble boron, total cyanide, total sulphate, water soluble sulphate (SO₄), total sulphur, speciated PAH, total phenols and pH.
-  The **TPH CWG** (Total Petrol Hydrocarbon Criteria Working Group) suite of analysis contains aromatic and aliphatic TPH speciation, Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) and Methyl Tert-Butyl Ether (MTBE).
-  **SOM** (Soil Organic Matter) analysis is completed to enable correct guidance value selection for TPH and PAH.
-  **VOC** (Volatile Organic Compounds) completed to enable screening for solvents, paints or other hydrocarbon related contaminants.
-  **Asbestos** analysis provides a screening for asbestos fibres.

The aforementioned analytical suites were chosen to provide a suitable screening in accordance with the potential contaminants identified within the Phase I GERA.

Soil samples for environmental quality analysis were sent to i2 Analytical Limited.

3.2 SOIL GEOTECHNICAL TESTING

A programme of geotechnical laboratory testing was undertaken at K4 Soils Laboratory. The test procedures used were generally in accordance with the methods described in BS1377:1990. Details of testing used are provided in table 3.2.

Table 3.2 : Soil Geotechnical Testing

Test	Standard	Number of Samples
California Bearing Ratio (CBR) <i>Completed to determine design parameters for road pavement construction.</i>	BS1377:1990:Part 4:Clause 7	2
Particle Size Distribution Analysis (PSD) <i>Completed to determine the grading and material properties of coarse (sand and gravel) soils</i>	BS1377:1990:Part 2:Clause 9	6
Atterberg Limits (and Moisture Content) <i>Completed to determine plasticity, moisture content and volume change potential for fine (clay and silt) soils.</i>	BS1377:1990:Part 2:Clauses 3.2, 4.3 & 5	11
Undrained Triaxial Shear Strength <i>Completed to determine shear strength of fine soils (Clay)</i>	BS1377:1990:Part 7	3
pH, water soluble sulphate, total sulphate & total sulphur <i>completed to determine buried concrete classification.</i>	UKAS accredited (i2 Analytical Limited)	6 (incl. 8 from ES 1)

3.3 GROUNDWATER CHEMICAL TESTING

One round of groundwater sampling was completed on 20 April 2020 and the following samples were submitted for analysis:

-  Two water samples were analysed for Aviron's Suite 1.
-  Two water samples were submitted for a TPH CWG suite of analysis.
-  Two water samples were submitted for Hardness.
-  Two water samples were submitted for VOC analysis.

The aforementioned analytical suites were chosen to provide a suitable screening in accordance with the potential contaminants identified within this assessment.

Groundwater samples for environmental quality analysis were sent to i2 Analytical Limited.

3.4 SAMPLING PROTOCOL

All soil samples were collected from bored and (hand starter pit) excavated arisings using a trowel and following Aviron's standard protocols for soil sampling. To avoid cross contamination, the sampling equipment was cleaned using de-ionised water after each sample was retrieved.

All water samples were collected from groundwater monitoring wells using a bailer, following Aviron's standard protocols for water sampling. To avoid cross contamination, a fresh bailer was used for each investigation location.

Clean latex gloves were used each time a sample was collected, and all samples were placed into clean sterilised containers for submission to the UKAS/MCERTS accredited laboratory.

All sample containers were labelled on-site immediately prior to filling. These samples were identified by a label placed on the body of each container and the following information was recorded:

-  Site name.
-  Date collected.
-  Unique sample number.
-  Soil sample depth.

Samples for geochemical analysis were then placed into a cool box containing ice packs to maintain refrigerated conditions following collection and transport to the laboratory. Ice packs were changed every twenty-four hours where necessary to maintain cool conditions and suppression of volatiles.

4.0 ENVIRONMENTAL INTERPRETIVE GUIDANCE

4.1 GENERIC RISK ASSESSMENT

The purpose of a generic risk assessment is to determine the suitability of the site for the proposed development or is to be used as screening criteria to determine whether a site is contaminated, as defined under Part IIA of the EPA 1990. Parameter concentrations measured in the soil through laboratory analysis have been compared with guidance values which are appropriate to the receptor under consideration.

4.2 GUIDANCE USED FOR ASSESSING SOIL CONTAMINATION

The 'Contaminated Land Exposure Assessment' (CLEA) Soil Guideline Values (SGVs) are used for generic assessment purposes for a limited number of chemical determinants. The SGVs have been derived using a combination of toxicological data and assumptions of the land-use (pathways), building stock and soils.

The CLEA Model (version 1.06) developed by the Environment Agency can be used to derive generic guidance values for a number of chemical determinants for which SGVs are still awaited, using published TOX reports.

For chemical determinants where there are no available SGV, Aviron have applied;

-  "The LQM/CIEH S4ULs for Human Health Risk Assessment" published December 2014. LQM acknowledgement for use of S4ULs.
-  Category 4 Screening Levels (C4SLs) published September 2014 by CL:AIRE. Specifically the C4SL is used for the assessment of lead soil contamination.

Both guides used the CLEA Model (v1.06, adopted by LQM) together with published chemical physical-chemical data and toxicological information to derive acceptable contaminant concentrations to be used as a screening tool to determine the limit where there would be minimal impact to human health.

LQM acknowledgement for use of S4ULs: ***"Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3275. All rights reserved".***

4.3 GUIDANCE USED FOR THE ASSESSMENT RISK TO CONTROLLED WATERS

In accordance with CLR 11 Model Procedures for the Management of Land Contamination (Defra and EA 2004), environmental quality standards (EQS) and drinking water standards can be used a generic assessment values for controlled water receptors. These criteria are used by the Environment Agency and published within their Chemical Standards Database.

Specifically, to this project the 'Driver' which shall be selected as appropriate for determining the most suitable chemical standard shall be for the protection of aquatic life, specifically game fish. Generally, these are the Environmental Quality Standards (EQS) and are 'hardness' related. Where the suitable EQS does not exist the UK Drinking Water Standard (UK DWS) shall be applied to make a conservative assessment.

Application of these standards shall provide a useful screening tool in the absence of other published guidance or site-specific detailed risk assessment.

The assessment criteria used to assess the quality of groundwater beneath a given site should take into account the nature of the receptors which could be affected by the groundwater. The most sensitive receptors are regarded as abstractions, particularly for drinking water, followed by surface waters and sensitive ecosystems. Water abstractions shall not be considered for the subject site. Water supply services are also considered a receptor and should be considered where the services are likely to be in direct contact. As groundwater depths are greater than 1m bgl at the site, it is not considered relevant to adopt guidance criteria based on the protection of water supply.

The most sensitive receptor at the site is the underlying secondary (A) aquifer of the Boyn Hill Gravel Member. The site is not located within a source protection zone.

Where there are exceedances, the contaminants of concern will be subject to further consideration in a tier 2 assessment using site-specific criteria and the EAs Remedial Target Methodology (RTM) model to further determine risk.

For some of the determinants there may not be a corresponding EQS value with which to assess the identified concentrations. Aviron will apply a hierarchy of guidance to assess the results using, in the first instance the UK DWS and then the Dutch Intervention Values and finally the US EPA Primary Drinking Water Quality Regulations.

4.4 GUIDANCE USED FOR THE ASSESSMENT OF HAZARDOUS GROUND GAS

The principal influence for causing the migration of landgas in the ground is changes to barometric pressure. The most onerous landgas emission conditions on a site are usually observed following days of low or rapidly falling barometric pressure below 1000 millibars (mb).

Monitoring is usually performed over a period of several weeks or months in order to increase the chances of visiting the site on days when the conditions for monitoring worst-case results are correct.

Gas monitoring results collected solely during high pressure conditions (>1000mb) may not provide a true value for worst case emission rates from the site.

Methane is produced by a number of processes, which can be biological or chemical in nature. The principal process is from the biogenic decay of organic material and is commonly found associated with landfill and organic marsh deposits or river silts. Methane can also be found associated with coal workings. It is explosive at concentrations of between 5 and 15%, with 5% being termed the lower explosive limit (LEL).

In assessing the risks from hazardous ground gas, reference has been made to the guidance from BS 8485:2015 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings' and CIRIA Report C665 'Assessing risks posed by hazardous ground gases to buildings' 2007 which adopts a risk characterisation strategy based on the maximum flow (L/hour) and maximum steady stated concentration (% v/v) of methane and carbon dioxide from a site to derive gas screening values (GSV) in litres/hour which are comparable with the Modified Wilson and Card classification (shown in Table 8.5 of C665) for any site which isn't intended to be developed as low-rise housing with vented underfloor void.

5.0 ASSESSMENT OF SOIL RESULTS

For the purpose of this assessment current CLEA SGVs, C4SLs and LQM S4ULs 1.0% SOM for residential use without homegrown produce on the basis landscaped areas shall be either communal gardens or simply public open space around the bin and bicycle stores.

Laboratory certificates of analysis for soil samples tested are presented in **Appendix III**.

5.1 HEAVY METALS

All heavy metals and metalloids have recorded acceptable concentrations within the Made Ground and natural strata when compared to the relevant residential end use criterion.

It would appear the current and previous site uses have not impacted the site in terms of metals.

5.2 POLY-CYCLIC AROMATIC HYDROCARBONS

A number of concentrations of PAH species have been recorded at elevated concentrations when compared to the 1.0% SOM S4ULs. Samples that recorded elevated PAH were taken from the overlying Made Ground and underlying natural strata within WS1, WS3 and WS6. Table 5.2 provides a summary of the elevated concentrations.

Table 5.2: Elevated PAH Concentrations

Location (Depth)	Strata Type	Determinants	Concentration (mg/kg)	Guidance Value (mg/kg)
WS1 (0.3m)	Made Ground	Dibenz(a,h)anthracene	0.35	0.31
WS1 (2.0m)	Natural Gravel	Benzo(b)fluoranthene	5.4	3.9
		Benzo(a)pyrene	5.0	3.2
		Dibenz(a,h)anthracene	0.62	0.31
WS3 (1.4m)	Natural Clay	Benzo(b)fluoranthene	8.0	3.9
		Benzo(a)pyrene	6.9	3.2
		Dibenz(a,h)anthracene	0.75	0.31
WS6 (0.3m)	Made Ground	Benzo(a)anthracene	23	11
		Benzo(b)fluoranthene	21	3.9
		Benzo(a)pyrene	19	3.2
		Dibenz(a,h)anthracene	2.5	0.31

The presence of PAH within the samples collected across the site is anticipated to be link with inclusions

within the Made Ground and ashy produce underlying the site.

All PAH concentrations were acceptable within the remaining five samples submitted for analysis.

Further consideration of local PAH soil contamination within the Made Ground is required.

5.3 TOTAL PETROLEUM HYDROCARBONS

All aromatic and aliphatic TPH species have been recorded at acceptable concentrations within Made Ground and underlying natural strata when compared to the LQM/CIEH 1.0% SOM S4ULs. However, the majority of samples have encountered concentrations above the Laboratory Limit of Detection (LOD).

During this assessment BTEX have been recorded at acceptable concentrations within the soil samples submitted where all concentrations have been recorded below the laboratory method LOD.

All concentrations of MTBE were recorded below the laboratory method LOD.

Whilst concentrations of TPH species have been recorded below the corresponding S4ULs the total TPH concentration within samples collected from WS1 (800mg/kg), WS2 (600mg/kg), WS3 (1,990mg/kg), WS6 (2,280mg/kg) and BH1 (2,010mg/kg) were noted. Previously the land contamination industry has used 'rule of thumb' guidance of 500mg/kg-1000mg/kg for total TPH. The high total TPH concentration recorded across the site is likely to result in an increased waste soil classification within the Made Ground materials (for disposal).

It would appear the current and previous site uses have not impacted the site in terms of TPH, BTEX and MTBE in terms of human health risk, however, consideration with regards to disposal is necessary.

5.4 TOTAL CYANIDE

Total cyanide was not detected at concentrations above the laboratory method LOD of 1.0mg/kg in the nine samples submitted for analysis.

5.5 PHENOLS

Total phenols were not detected at concentrations above the laboratory method LOD of 1.0mg/kg in the nine samples submitted for analysis.

5.6 ASBESTOS

One positive detection of asbestos fibres was recorded from a total of eight samples submitted from the site. This is summarised within table 5.7.

Table 5.7 : Asbestos Detections

Determinant	Soil Sample	Strata Type	Type	Quantity	Assessment Criteria
Chrysotile	WS1 (0.3m)	Made Ground	Loose Fibrous Debris	0.003%	Binary (Y/N)

Further consideration of asbestos soil contamination should be made.

5.7 VOLATILE ORGANIC COMPOUNDS

During this assessment VOC have been recorded at acceptable concentrations within the five soil samples tested. All VOC determinants have been recorded at concentrations below the laboratory method LOD.

6.0 ASSESSMENT OF GEOCHEMICAL GROUNDWATER RESULTS

For the purpose of this assessment the Environment Agency chemical standards database has been consulted to determine suitable assessment criteria, which generally comprised the current EQS and UK DWS, where a suitable EQS does not apply.

Laboratory certificates of analysis for water samples are presented in **Appendix III**.

6.1 HEAVY METALS

All concentrations of heavy metals and metalloids are below the required standards for the protection of groundwater quality and also drinking water quality.

It would appear the current and previous site uses have not impacted the site in terms of heavy metals and metalloids contamination within the groundwater.

6.2 POLY-CYCLIC AROMATIC HYDROCARBONS

All PAH species have been recorded at concentrations below the laboratory method LOD of 0.01µg/l within the two samples submitted for analysis.

It would appear the current and previous site uses have not impacted the site in terms of PAH contamination within the groundwater.

6.3 TOTAL PETROLEUM HYDROCARBONS

All TPH species have been recorded at concentrations below the laboratory method LOD of 1.0µg/l within the two samples submitted for analysis.

It would appear the current and previous site uses have not impacted the site in terms of TPH contamination within the groundwater.

6.5 TOTAL CYANIDE

Total cyanide was not detected at concentrations above the laboratory method LOD of 10µg/l in the two samples submitted for analysis.

It would appear the current and previous site uses have not impacted the site in terms of cyanide contamination within the groundwater.

6.6 PHENOLS

Total phenols were not detected at concentrations above the laboratory method LOD of 10µg/l in the two samples submitted for analysis.

It would appear the current and previous site uses have not impacted the site in terms of phenols contamination within the groundwater.

6.7 VOLATILE ORGANIC COMPOUNDS

VOCs were not detected at concentrations above the laboratory method LODs in the two samples submitted for analysis.

It would appear the current and previous site uses have not impacted the site in terms of VOC contamination within the groundwater.

7.0 HAZARDOUS GROUND GAS MONITORING

Results for the ground gas monitoring are presented within **Appendix II**.

7.1 STRATEGY

Three monitoring well installations were constructed in order to provide a suitable representation of the ground gas environment beneath the site. Potential ground gas risks are considered to comprise locally infilled land whereby bio-ground gases may migration through the granular Boyn Hill Gravel Member towards new homes and the historic use of the site as a builder's yard and car breakers & dismantlers.

The installation of the monitoring wells have response zones between 1m and c.3m directly into the underlying Made Ground and natural Gravel strata and shall collect ground gases which may migrate within this unit beneath proposed development buildings.

Each monitoring well was completed with a 1m thick bentonite seal from ground level to 1m bgl to prevent atmospheric influence.

Recent monitoring has shown the headworks to have remained in a good and undamaged condition and thus the monitoring wells are considered to be of high integrity and suitable for use.

7.2 MONITORING

The presence of soil vapours was determined prior to bulk ground gas monitoring on six occasions using a MiniRAE Photon Ionisation Detector (PID) from RAEs Systems. The presence of hazardous bio-gases including methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) was determined on six occasions using a GA2000 Infra-Red Gas Analyser from Geotechnical Instruments Ltd. The flow rate and atmospheric pressure, in millibars (mb), was also measured during the monitoring process. Depth to groundwater was measured using an electronic dip meter. Monitoring was completed on WS1, WS2 and WS3.

Monitoring work was completed on the dates specified within table 7.2 which also summarises weather conditions and atmosphere pressure. To determine rising or falling pressures local 'online' weather trends from the Met Office were consulted.

Table 7.2 : Background Gas Monitoring Data

Date	Atmospheric Pressure	Rising/Falling Pressure?
31/03/2020	1030mB	Falling
07/04/2020	1027mB	Falling
14/04/2020	1027mB	Steady
21/04/2020	1015mB	Rising
30/02/2020	992mB	Falling
07/05/2020	1024mB	Falling

Monitoring was completed by an Aviron field technician initially trained by RAE Systems (and subsequently/periodically in-house) to use the MiniRAE and Geotechnical Instruments Limited (and subsequently/periodically in-house to operate the GA2000. In house training was provided in operation of the electronic dip-metre.

Note 2 of C665 indicates 'worst case' conditions occur during falling and sub-1000mB atmospheric pressures. Section 5.5.1 of C665 indicates 'worst case' conditions are likely to occur during weather conditions such as rainfall, frost or dry weather. Worst case conditions were not encountered during the monitoring period.

7.3 MONITORING

Table 7.3 summarises the results obtained.

Table 7.3 : Summary of Monitoring Results

Gas	Measured Conc. Range (% v/v)		Comments
	Low	High	
CH ₄	0.0	0.1	Methane was detected at very low concentrations in WS3 only on 31 March 2020 and 14 April 2020.
CO ₂	0.1	3.0	Carbon dioxide has been detected at low concentrations, below the guidance value of 5% at which point the characteristic situation is advised to increase to CS2.
O ₂	17.3	19.9	Oxygen has been recorded at ambient concentrations, above 16%, being the point where it is considered there is potential for asphyxiation.

Vapour*	0.4	5.5	Very low vapour (PID) concentrations have been recorded. This concurs with the ground conditions and geochemical laboratory results indicating the absence of soil vapour risk to new units.
---------	-----	-----	---

*vapour concentration in parts per million (ppm)

All monitoring positions remained constant and intact. No replacement monitoring positions were installed during the period of this project. No damage was observed to the monitoring wells during the works.

7.4 VALIDITY OF DATA

The measured results are considered to valid and representative for the following reasons;

1. It is considered the integrity of the monitoring wells has not been compromised as there is no evidence of surface damage which may affect the underlying installations. There is a 'good' bentonite seal within the bored annulus from 1m depth to ground level preventing escape of ground gases and entry of atmospheric gases. The gas valve remained closed prior to all monitoring occasions so passive venting of ground gas is unlikely to have occurred as site visits were unannounced.
2. Gaseous concentrations are reasonably consistent during all phases of work suggesting the integrity of the monitoring well has not been compromised and that abnormal gases conditions/variations are not occurring beneath the site.

7.5 INTERPRETATION OF DATA

Under normal use of the site (i.e. above ground), the risk presented by methane and carbon dioxide is dependent on both the concentrations and the rate of flow. In accordance with Wilson and Card methodology specified in the CIRIA C655 document, gas screening values were determined using the following:

$$GSV \text{ (litres/hour)} = \frac{\text{Maximum steady state concentration (\%)} \times \text{Flow Rate (litres/hour)}}{100}$$

Based on the maximum concentrations and flows recorded, the **GSV for methane** was **0.0002 L/hr** and the **GSV for carbon dioxide** was **0.003 L/hr**.

The GSV for Characteristic Situation 1 (CS1) is <0.07l/h which has been recorded for both methane and carbon dioxide. Additionally maximum concentrations are below 1% and 5% for methane and carbon

dioxide, being the trigger to increase the Characteristic Situation to CS2.

8.0 ENVIRONMENTAL RISK SUMMARY

8.1 CONTAMINATION RISK FROM SOIL TO HUMAN HEALTH – CONSTRUCTION WORKERS

Short-term health risks are considered to exist to construction works in the form of local asbestos fibre release. The overlying unit of Made Ground at location WS1 been impacted by asbestos contamination and thus for the protection of conventional construction works the asbestos contaminated Made Ground should be removed from site prior to the commencement of construction works.

The asbestos fibres identified were encountered within one of the seven investigation locations and as such it is likely the presence of asbestos is local.

Section 8.1.1 present an asbestos management plan.

8.1.1 Asbestos Risk Management

Prior to undertaking groundworks, the risk presented by Asbestos should be managed. The purpose of this is to ensure site operatives, as far as is reasonably possible, do not become exposure to Asbestos Containing Materials (ACMs). The following strategy should be adopted:

- 🌿 Appoint specialist/licensed/competent asbestos consultant/contractor to remove asbestos contaminated Made Ground (known at WS1) at depths in which new construction works (groundworks) shall be completed.
- 🌿 The asbestos consultant/contractor should prepare any necessary notifications to the HSE and any necessary Risk Assessments and Method Statements (RAMS).
- 🌿 The asbestos consultant/contractor should remove the asbestos contaminated soils in-situ and under controlled conditions to prevent fibre release to adjacent land users.
- 🌿 Waste soils should be disposed to a suitable waste management facility.
- 🌿 Once soils have been removed the asbestos consultant/contractor should collect soil validation samples from in and around the resultant excavations/stripped areas to confirm the absence of ACMs thus enabling construction works to progress without associated asbestos risks.

8.1.2 General Risk Management

With the exception of asbestos fibres concentrations of soil determinants are unlikely to present a short-term exposure risk to adult construction workers, specifically from the dermal contact, ingestion and

inhalation pathways. Once the asbestos contaminated soils have been removed it is not expected risks associated with asbestos soil contamination shall remain. Construction workers should ensure suitable Personal Protective Equipment (PPE) is worn, in the event previously unidentified 'hotspots' of contamination may exist following site clearance. PPE should include;

- 🧤 Gloves to prevent dermal contact. It is advised that disposable latex gloves are worn beneath the outer 'work' gloves. This shall prevent skin contact with any contaminated soils which may come into contact with the 'work' gloves.
- 🧤 To prevent ingestion of contaminated soils construction workers should avoid putting hands or objects in their mouth whilst on-site.
- 🧤 To prevent ingestion of contaminated soils prior to eating or drinking, construction workers should ensure their hands are properly washed, rinsed and dried. The use of latex gloves shall restrict any contaminated soils from coming into contact with the skin.
- 🧤 To prevent inhalation of (contaminated soils) fibres construction workers should specialist PPE to be advised by a competent licensed asbestos removal contractor.

8.1.3 Provision for undiscovered contamination

Prior to starting groundworks, a 'toolbox' talk, and site induction should be completed to induct construction workers on the soil quality and contamination within the overlying Made Ground.

The 'toolbox' talk should discuss a procedure for identifying any soils which may be uncovered during demolition/groundworks which have an unpleasant odour or visual appearance. In such an event the contractor should immediately inform the environmental consultant, who in turn should consult the local authority (Environmental Health Officer) to discuss an appropriate strategy to deal with the problem material.

8.2 CONTAMINATION RISK FROM SOIL TO HUMAN HEALTH – END USERS

The soil sampling and geochemical testing scheme has recorded PAH contamination within the Made Ground.

To remove risks to end users a suitable cover system shall be required which will need to incorporate at least 300mm of 'clean cover' within communal gardens. Planters may require an additional thickness of Topsoil to sustain root growth.

Areas of soft landscaping are limited and there is it is likely that during site preparation works to arrange construction levels to enable construction of new road, pavements, foundations, floor slabs and also working platforms at least 300mm of soil shall be stripped from the majority of the site to arrange these levels to enable construction above. Such 'stripping' is likely to reduce levels, enabling a typical 300mm thick clean cover system to communal gardens.

Table 8.2 provides typical cover system requirements.

Table 8.2: Cover Systems

Garden Type	Depth (bgl)	Description
Communal	Ground Level - 300mm	BS3882:2015 'clean' Topsoil
	At 300mm coloured permeable geotextile membrane	Terram Hi-Vis or similar product

8.3 CONTAMINATION RISK FROM SOIL TO HUMAN HEALTH – DOMESTIC WATER SUPPLY

The geochemical laboratory results should be provided to the local water authority to ensure the correct materials are chosen for water supply pipes. Following the formal withdrawal of WRAS Guidance Note No. 9-04-03 (October 2002) The Selection of Materials for Water Supply Pipes to be Laid in Contaminated Land the UK Water Industry Research Ltd (UKWIR) report entitled "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Reference 10/WM/03/21; ISBN: 1 84057 5697) should be consulted.

Generally, all services should be placed within dedicated runs backfilled with clean imported material.

It is recommended this is confirmed by the local water authority prior to installation of new infrastructure.

8.4 CONTAMINATION RISK TO CONTROLLED WATERS

Geological mapping indicated the site to be underlain by superficial geology (Boyn Hill Gravel Member) which is listed as a secondary (A) aquifer.

Perched groundwater has been encountered within WS3 installed into an underlying Clay unit and rests circa 0.6m bgl. The underlying aquifer has been encountered within the natural Sand and Gravel of the Bryon Hill Gravel Member a circa 1.6m to 1.9m bgl during the subsequent monitoring.

It is not considered that the concentrations of contaminants pose a significant risk to the underlying groundwater body.

A **LOW** risk is assigned.

8.5 RISK FROM GROUND GAS

Potential sources of ground gas include off-site infilled land, which if organically infilled may produce ground gas that could migrate through the Boyn Hill Gravel Member toward new homes and potential for degrading hydrocarbons within the site due to the historic site usage.

Six rounds of monitoring have been completed which have recorded acceptable concentrations of carbon dioxide, methane and oxygen. The results indicate a Gas Characteristic Situation CS-1 and NHBC 'Green' Light.

Accordingly, a **VERY LOW** (in the context of C665) risk in this respect is assigned and gas protection is not considered necessary.

8.6 CONCEPTUAL SITE MODEL

Following interpretation of the laboratory results, site dynamics and the aforementioned risk assessment a refined conceptual model has been prepared and is presented in table 8.6.

Table 8.6 : Refined Conceptual Site Model (for plausible pollutant linkage pathways)

Source	Receptor	Pathway	Probability	Consequence	Risk & Justification
Source 1 Asbestos Made Ground contamination (WS1)	Construction workers Adjacent site users	Inhalation	Low likelihood	Severe	Moderate Asbestos fibres have been detected within one of the seven investigation locations. Ensure asbestos contaminated soils are removed from site in a controlled and suitable manner. Refer to section 8.1.1.

	End users	Inhalation	Unlikely	Severe	Moderate/low Long term risks to children and adults may exist from any residual asbestos fibres which may become airborne. However, fibres are expected to be removed during the early stages of groundworks. Prepare Remediation Method Statement for construction of 300mm thick cover system as referred to in section 8.1.1.
Source 2 PAH Made Ground contamination (WS1, WS3, WS6)	Construction workers	Direct contact	High Likelihood	Mild	Moderate Pervasive PAH contamination was encountered within the Made Ground present. Short term risk to adults not expected to be significant. Wear PPE.
	End users	Direct contact	Likely	Medium	Moderate Pervasive PAH contamination was encountered within the Made Ground present. Prepare Remediation Method Statement for construction of 300mm thick cover system as referred to in section 7.1.1.
	Adjacent land users	Direct contact via run-off	Low likelihood	Mild	Low Pervasive PAH contamination was encountered within the Made Ground present. The site is overlaid with hardstanding preventing run-off of soil contaminants. Thus, direct contact and run-off risks are considered to be limited. Prepare Remediation Method Statement for construction of 300mm thick cover system as referred to in section 8.1.1.

	Soft landscaping	Root uptake	High Likelihood	Medium	High Soil contamination recorded within the overlying Made Ground is likely to chemically prevent wholesome plant growth. The physical nature of Made Ground is also unlikely to sustain plant growth. As such the proposed remedial cover system should ensure a suitable thickness of (BS3882:2315) Topsoil to sustain plant growth in proposed gardens/planters.
	Water supply pipes	Direct contact	High Likelihood	Medium	High Water main expected to be installed circa 1.0m depth and expected to be within unit of Made Ground. Contact local water authority in regard of new water main design.
	Buildings & infrastructure	Direct contact	Likely	Medium	Moderate The design sulphate class for the buried concrete beneath the site has been determined as DS-2 and AC-1s (above groundwater level), and DS-2, AC-2 (below the groundwater level).
	Groundwater	Via underlying hydrogeology	Low likelihood	Mild	Low It is not considered that the contaminants recorded and their associated concentrations pose a risk to controlled waters.
Source 3 <i>Soil ground gases</i>	Construction workers	Inhalation of vapours/gas	Unlikely	Mild	Very Low Six rounds of gas monitoring completed indicating CS-1. Risk limited when working in shallow excavation and outdoor air. Wear PPE
	End users	Inhalation of vapours/gas	Unlikely	Mild	Very Low Six rounds of gas monitoring completed indicating CS-1

The overall environmental risk classification for the site is generally **MODERATE** due to unacceptable concentrations of contaminants. The following additional works should be considered:

1. **Asbestos.** A suitably competent/specialist contractor/consultant should ensure the removal of asbestos impacted soils (WS1) prior to commencement of groundworks for the protection of operatives and adjacent site users from uncontrolled fibre release.
2. **Remediation.** This should generally follow the advice within section 8.2 of this report involving the removal of 300mm of contaminated Made Ground in proposed private/communal gardens/amenity space.
3. **Water Main.** This report should be presented to the water authority to ensure the new water main is suitably designed to provide continued safe and wholesome water to new units.
4. **Topsoil.** Any imported Topsoil should be chemically suitable for use within private gardens, meeting the chemical criteria applied within the report.

9.0 GEOTECHNICAL DESIGN

This section provides geotechnical design in connection with the new proposed development and considers the GEO Limit State: failure or excessive deformation of the ground, in accordance with EN 1997 Eurocode 7: Geotechnical Design (and the UK National Annex to Eurocode 7).

It is assumed that the finished floor level of the proposed new building will be approximately the same as the ground level at the locations of each of the exploratory holes undertaken.

The locations of any underground services or engineering works and former foundations are unknown and therefore have not been fully taken into account in the following assessment. It has been assumed that any such works will not compromise foundations and ground stability.

The assessment of the stability of any slopes or retaining structures across or adjacent the site, the requirement for additional retaining structures and the requirements for cut and fill that may be required to facilitate construction is outside the scope of this report.

Where applicable the following assessment includes an allowable bearing resistance assuming conventional construction only and no allowances have been made for interaction between existing adjacent foundations and proposed foundations.

Eurocode 7 Section 2.1 Basis for Geotechnical Design indicates that for each geotechnical design situation it shall be verified that no limit state is exceeded. Geotechnical design requirements have been established by three Geotechnical Categories, 1, 2 and 3. For the purpose of this assessment the development is Geotechnical Category 2: which include conventional types of structure and foundation with no exceptional risk or difficult or loading conditions. Designs for structures in Geotechnical Category 2 should normally include quantitative geotechnical data and analysis to ensure that the fundamental requirements are satisfied. Routine procedures for field and laboratory testing and for design and execution may be used for Geotechnical Category 2 designs.

Due to localised horizons of lower strength CLAY, the anticipated loadings required, the potential for desiccation to have occurred in the overlying CLAY strata across the site to depths of up to 3m bgl and shallow groundwater, the construction of conventional shallow foundations is unlikely to be economically viable. Consideration should therefore be given to supporting the proposed development building on piled foundations.

9.1 EXCAVATION CONDITIONS

Excavation of the materials encountered during the ground investigation should be achieved using conventional hydraulic excavation techniques.

9.1.1 Temporary Works

From the ground investigation undertaken, excavations in the natural (clay) soils may remain stable in the short term. However due to localised areas of Made Ground and coarse (gravel) soils and the requirement for excavations to facilitate the construction, care should be taken to ensure that instability of excavations does not affect existing structures and services (e.g. foundations, roads, boundary walls or buildings) both on and off-site, and temporary support may be required in order to achieve this. Further advice should therefore be sought from the appointed structural engineer and specialist contractor regarding temporary works.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times.

9.1.2 Dewatering

Groundwater was encountered during the ground investigation works at depths of between 0.5m bgl (possibly perched) and 2.6m bgl, which is likely to represent the secondary (A) aquifer of the Boyn Hill Gravel Member. Groundwater was encountered during the return monitoring (as of March/April 2020) in WS1, WS2 and WS3 at depths as shallow as 1.62m, 1.73m and 0.62m (possibly perched) bgl. On the basis of the data obtained, dewatering is expected to be required in excavations below these depths, including dewatering of perched water locally.

9.2 EXISTING SERVICES/SUBSTRUCTURES

Due to the historical development of the site and site environs, existing services or sub-structures should be anticipated. Where foundations or obstructions are encountered during excavations for the proposed foundations, all new foundations should be extended downwards to fully penetrate all redundant former construction.

9.3 BEARING STRATA

Due to localised horizons of lower strength CLAY, the anticipated loadings required, the potential for desiccation to have occurred in the overlying CLAY strata across the site to depths of up to 3m bgl and shallow groundwater, the construction of conventional shallow foundations is unlikely to be economically viable.

Consideration should therefore be given to supporting the proposed development building on piled foundations.

9.3.1 Atterberg Limits and Material Properties

Atterberg limits tests conducted on the shallow CLAY strata (Boyn Hill Gravel Member) beneath the site at depths of between of 1.2m and 3.2m bgl indicate that the fine soils overlying the site comprise inorganic clays of intermediate and very high plasticity (CI/CV) with a modified plasticity index (MPI) of between 5% and 46%. The shallow strata are classified as being of low and high volume change potential. Locally the soils are shown to be non-plastic (WS2 and WS4 at 1.5m) where the MPI is less than 10%, and the results of particle size distribution analysis indicate that the soils comprise clayey sandy GRAVEL of negligible volume change potential. The clay strata at increased depth within the Boyn Hill Gravel Member may represent reworking of the underlying London Clay Formation.

The results of particle size distribution analysis indicate that the natural coarse soils of the Boyn Hill Gravel Member comprise clayey sandy GRAVEL and SAND AND GRAVEL of negligible volume change potential.

Atterberg limits tests conducted on the CLAY strata sampled from greater depths beneath the site of between of 2.8m and 15.2m bgl indicate that the fine soils of the London Clay Formation comprise inorganic clays of locally high plasticity and predominantly very high plasticity (CH/CV) with a modified plasticity index of between 39% and 51%.

For the purposes of this assessment and in accordance with NHBC Standards Chapter 4.2, Building Near Trees, the strata beneath the site are classified as being CLAY and GRAVEL of the Boyn Hill Gravel Member, above CLAY of the London Clay Formation of low to high, negligible and high volume change potential respectively.

9.3.2 Desiccation

Using the ratio of the moisture content (MC) to the liquid limit (LL) (an empirical indicator of desiccation, after Driscoll, 1983), the test result indicates that the CLAY strata across the site are potentially desiccated

(MC:LL ratio 0.36-0.44). The moisture content, shear strength and liquidity index profiles are also shown to be inconsistent between sampling points to depths of approximately 3.0m bgl, below which convergence of the shear strength and material properties is evident. Desiccation is therefore likely to have occurred to depths of up to 3.0m bgl, and to prevent vertical heave foundations should be extended beneath the desiccated zone.

Mitigation measures to prevent heave in the desiccated CLAY strata encountered should also be incorporated into the below ground construction.

9.3.3 Preliminary Design Parameters

In the absence of laboratory triaxial test data an estimated critical state angle of shearing resistance (ϕ'_{crit}) of 25° and 20° is assumed for the overlying CLAY strata of the Boyn Hill Gravel Member and the underlying London Clay Formation beneath the site using the results of plasticity indices and Table 2 of BS8002:1994 September 2001. It is assumed that the drained cohesion (c') is zero. An estimated ϕ'_{crit} of 32° is assumed for the GRAVEL strata of the Boyn Hill Gravel Member using the results of particle size distribution analysis and Table 3 of BS8002:1994 September 2001. The coarse soils are assumed to be rounded and moderately graded.

Preliminary design parameters for the strata encountered beneath the site are included in Table 9.3.3 below.

Table 9.3.3 : Preliminary Design Parameters

Strata	Depth to Base (m bgl)	Volume Change Potential	Unit Weight (kN/m ³)	Angle of Shearing Resistance (ϕ')
CLAY (BHGM)	3.5	Low to High	17-18	25
GRAVEL (BHGM)	3.0	Negligible	19	32
CLAY (LCF)	20.0	High	18-19	20

Laboratory material property test results are presented within **Appendix IV**.

9.4 TREE INFLUENCE ON FOUNDATIONS

When considering the influence of trees on foundations, the material properties of the strata beneath the site and the distance and species of the trees to the foundations are the determining factors.

For the purposes of this assessment the CLAY strata overlying the site are classified as being of low to high volume change potential.

However, provided the proposed development building is supported on piled foundations, an adjustment to foundations depths is not required when considering adjacent tree species.

Heave protection due to the influence of trees and desiccation is however required in this regard.

9.5 FOUNDATION TYPE, DEPTH AND ALLOWABLE BEARING PRESSURE

9.5.1 Trench Fill Foundations

Due to localised horizons of lower strength CLAY, the anticipated loadings required, the potential for desiccation to have occurred in the overlying CLAY strata across the site to depths of up to 3m bgl and shallow groundwater, the construction of conventional shallow foundations is unlikely to be economically viable.

Consideration should therefore be given to supporting the proposed development buildings on piled foundations.

It should be noted that the above recommendations have been made using data in window sample boreholes WS1 to WS6 and cable and percussion borehole BH1 completed.

9.5.2 Piled Foundations

The advice of a piling specialist should be sought to determine the working loads of their proprietary piling technique when considering the ground and groundwater conditions encountered beneath the site, and the health and safety implications of working within the confines of the site and adjacent neighbouring properties.

9.5.3 Ground Floor Slabs

Due to the potential for desiccation to have occurred in the overlying CLAY strata across the site, it is recommended that the ground floor slab beneath the proposed development building is suspended on ground beams.

Mitigation measures to prevent heave in the clay soils encountered should be incorporated into the below ground construction.

9.6 CONCRETE CLASSIFICATION

In accordance with Building Research Establishment (BRE) Special Digest 1: 2005 - Concrete in Aggressive Ground, the following laboratory test data has been used to derive classifications for buried concrete (Table C1, natural ground locations) beneath the site:

 Soluble Sulphate (2:1 extract)	– 0.11g/l to 3.5g/l
 Sulphate (in groundwater)	– 0.4g/l to 0.501g/l
 Total Sulphate	– 0.045% to 2.0%
 Total Sulphur	– 0.025% to 0.98%
 Total Potential Sulphate	– 0.075% to 2.94%
 Oxidisable Sulphide	– <0.3% to 1.81%
 pH	– 7.0 to 10.6

“BRE guidance suggests that ‘if significant number of determination of oxidisable sulphides is above 0.3%, then use the results of total potential sulphate to determine the concrete class”.

Oxidisable sulphide has been calculated above 0.3% SO₄ in the samples tested from BH1 at greater depth. However the action of piling is unlikely to result in worked ground and oxidisable sulphide, therefore the results of soluble sulphate should be considered.

For buried concrete at shallow depth (circa <2m bgl) the Design Sulphate Class for the concrete within the site is therefore DS-2. Assuming static groundwater, the Aggressive Chemical Environment for Concrete (ACEC) Class is AC-1s, and mobile water the ACEC is AC-2.

For piles (>2m bgl) the Design Sulphate Class for is DS-3. Assuming mobile groundwater, the Aggressive Chemical Environment for Concrete (ACEC) Class for piles is AC-3.

It should be noted that additional considerations for the determination of concrete class and appropriate aggregate use are set out in BRE Special Digest 1. These are considerations specific to the soil type, the proposed development and the type of concrete foundations to be used at the site.

Laboratory results for the pH and sulphate testing are included within **Appendix III**.



9.7 PAVEMENT DESIGN

The results of California Bearing Ratio (CBR) tests undertaken using bulk soil samples taken at the locations of WS1 and WS2 at 0.45m bgl and re-compacted in a standard CBR mould at natural moisture content indicate CBR values of 53% and 2.6% for the soils encountered at these locations.

Laboratory results for the CBR testing are included within **Appendix IV**.

10.0 CONCLUSIONS AND RECOMMENDATIONS

This Ground Investigation and Phase II Geo-Environmental Risk Assessment has provided an assessment of the site's geo-environmental setting, previous assessments and an evaluation of ground conditions.

The site investigation comprised the completion of six window sample boreholes to depths of up to 5m bgl and a cable percussion borehole to a depth of 20m bgl.

10.1 ENVIRONMENTAL

Table 10.1 summarises the pertinent environmental risks providing advice on further works and assessment.

Table 10.1 : Environment Risk Summary

Medium	Risk No.	Risk Description	Comments
Soils	1	Local asbestos fibres identified within shallow soils at WS1.	Ensure asbestos contaminated soils are removed from the site in a controlled suitable manner. Prepare Verification Plan
	2	PAH pervasive Made Ground contamination impact to new homeowners.	Construct suitable clean cover system to new gardens and soft landscaped amenity space. Prepare Remediation Method Statement.
	3	Made Ground soil quality may impact water main design.	Consult local water authority prior to water main installation.
	4	Made Ground to new planting.	Made Ground not physically suitable to sustain plant growth. Import suitable Topsoil (BS3882) to sustain planting.
Ground Gas	n/a	Ingress of hazardous ground gases (CO ₂) into new homes and depleted oxygen.	Six rounds of monitoring, including one round at worst-case indicate CS-1/NHBC Green (or otherwise).
Groundwater	n/a	Potentially impacted soil/groundwater contamination impacted controlled waters quality.	Groundwater encountered during monitoring visits considered to comprise the underlying Secondary A aquifer. No significant soil contamination encountered within overlying Made Ground and natural strata. Groundwater beneath the site is considered chemically acceptable.

Once the above four risks have been evaluated and reduced to 'low' or 'very low' the environmental risk assessment can be considered complete and the development suitable for occupancy. In order to achieve this, additional reports and dialogue with the Local Planning Authority and/or Environment Agency may be necessary.

10.2 GEOTECHNICAL

The CLAY strata overlying the site are not considered suitable as the formation on which to construct trench fill foundations, due to lower strength CLAY noted locally, the potential for desiccation to have occurred to depths of up to 3.0m bgl and shallow groundwater.

Consideration will need to be given to the following issues which are likely to prohibit new conventional construction:

1. The reduced bearing resistance in the overlying CLAY strata;
2. Potential for desiccation to have occurred to depths of up to 3.0m bgl.
3. High loads anticipated from the proposed three-storey building;
4. Excavation stability;
5. Elevated groundwater (circa 1.6m bgl);

Thus not only will the reduced bearing resistance and the potential for desiccation influence the foundation solution, difficulties may be experienced in successfully constructing trench fill foundations, both in terms of excavation stability, elevated groundwater and encountering competent strata within economical depth of ground surface, and a piled foundation solution is likely to be necessary.

Soakaway drainage is not considered to be effective based on the high groundwater level encountered.

11.0 PROJECT INSTRUCTION AND LIMITATIONS

11.1 SCOPE OF WORKS

The following scope of work was undertaken to an agreed brief and involves the following:

-  Window sample drilling to circa 5.0m bgl to enable soil sampling and installation of monitoring well apparatus.
-  One cable and percussion borehole to a depth of 20.0m bgl.
-  Log the strata within each exploratory hole noting any water strikes.
-  Collect disturbed soil samples from exploratory holes and submit for geochemical and geotechnical laboratory testing.
-  Install three of the boreholes with HDPE standpipe to enable three rounds of post-investigation ground gas and standing level groundwater monitoring.
-  Groundwater sampling from two of the monitoring installations along with laboratory testing.
-  All soil and groundwater samples shall be collected in accordance with the instruction and ground conditions and submitted to UKAS/MCERTS accredited laboratories for testing.
-  Prepare an interpretative Phase II GERA report to interpret ground conditions with respect to potential environmental risks, providing recommendations for remediation and foundation design.

Aviron has relied upon information received from the Client and their agents as accurate, unless contradicted by written documentation or site observations.

11.2 PUBLISHED GUIDANCE

This report follows the technical approach presented in Contaminated Land Report 11 (CLR11) “Model Procedures for the Management of Land Contamination” prepared by the Environment Agency in 2004. CLR11 provides guidance on the application of management processes when assessing potentially contaminated land.

This project and report have been designed to fulfil the information requirements set out in the Environment Agency Guidance on Requirements for Land Contamination Reports prepared by the Environment Agency in 2005.

Notwithstanding the above this report is additionally prepared in accordance with current guidance notes, standards and practices as set out by the Environment Agency and statutory organisations in order to establish potential and significant pollutant linkages as defined in Part IIA of the Environmental Protection Act 1990.

11.3 LIMITATIONS

Aviron's scope of work has been designed to meet the timeframe and budgets. As such it may follow that further work would be prudent upon evaluation of the ground conditions. The scope of work provided shall provide a view of site conditions and understanding of potential geo-environmental risks and possible mitigation procedures.

The information used in this report has been derived from the site investigation, which in turn were based on known current and historical land uses identified at the site and surrounding area, available to Aviron at the time of the investigation.

Intrusive points chosen relate to the data collected and the risk assessment will rely on these points only. It therefore follows that some areas of the site will not be examined. It is always possible that some areas not investigated may contain conditions which would be impossible to determine due to lack of evidence or time and budget restrictions.

This report provides recommendations for foundation design based upon the ground conditions encountered and where possible makes predictions for possible variations in ground conditions. However, it is always possible that not all variations in ground conditions can be accounted for and shall also be dependent upon design loadings and foundation construction techniques used. Our recommendations should therefore not supersede the project's Consulting Structural and Civil Engineers design.

Should changes in legislation, statutory requirements or industry practices occurred following issue of this report, this report should be viewed in light of these changes.

Should a notable time period elapse between the date issue of this report and the date of application of this report changes to site dynamics may occur and in particular the site inspection notes may no longer be applicable should any change of use occur to the site in the interim.

12.0 REFERENCES AND OTHER SOURCES OF INFORMATION

Aviron Associates Limited. Phase I Geo-Environmental Risk Assessment. August 2019. Ref 19-228.01.

British Geological Survey Website. www.bgs.ac.uk

BRE Special Digest 1:2005. Concrete in Aggressive Ground

BS5930:2015. British Standards Institute. Code of Practice for Ground Investigations

BS10175. British Standards Institute. 2011, Investigation of Potentially Contaminated Land - Code of Practice

BS EN ISO 14688-1:2002 Geotechnical investigation and testing – Identification and Classification of Soil – Identification and Description

BS EN ISO 14688-2:2004 Geotechnical investigation and testing – Identification and Classification of Soil – Principles for a Classification

BS EN ISO 22475-1:2006 Geotechnical investigation and testing - Sampling Methods and Groundwater Measurements

BS EN ISO 22476-3:2005 Standard Penetration Test

BS EN 1997-1:2004 Eurocode 7 Geotechnical Design Part 1 General Rules

BS EN 1997-2:2007 Eurocode 7 Geotechnical Design Part 2 Ground Investigation and Testing

(NA to) BS EN 1997-1:2004 UK National Annex to Eurocode 7 Geotechnical Design Part 1 General Rules

(NA to) BS EN 1997-2:2007 UK National Annex to Eurocode 7 Geotechnical Design Part 2 Ground Investigation and Testing

BS 8485:2015 Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

CIRIA Report C665 'Assessing risks posed by hazardous ground gases to buildings' 2007

DEFRA and Environment Agency, 2004. Model Procedures for the Management of Land Contamination, Contaminated Land Report 11

Environment Agency Website: www.environment-agency.gov.uk

Jardine, Maswose, Burland. 1985. Field and Laboratory Measurements of Soil Stiffness. Proceedings of the 11th International Conference on Soil Mechanics and Foundation Engineering, San Francisco

LQM/CIEH: Paul Nathanail, Caroline McCaffrey, Andy Gillett, Richard Ogden and Judith Nathanail. 2014. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham. ISBN 978-0-9931084-0-2. "Copyright Land Quality Management Limited reproduced with permission; Publication number S4UL3275. All rights reserved"

NHBC (2017). National House Building Council Standards. Chapter 4

NHBC Guidance on Methane and Carbon Dioxide 2007 (Boyle and Witherington, 2007)

SP1010 - Development of Category 4 Screening Levels for Land Affected by Contamination. Final Project Report (Revision 2). Contaminated Land : Applications In Real Environmental (CL:AIRE). September 2014

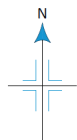
SR2: Human health toxicological assessment of contaminants in soil, Science Report SC050021/SR2, Environment Agency, August 2008

SR7: Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values, Science Report SC050021/SR7, Environment Agency, November 2008

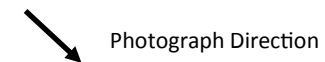
Vesic. Analysis of Ultimate Loads of Shallow Foundations, 1973

Figures

- 1 Existing Site Layout Plan
- 2 Site Photographs
- 3 Proposed Development Plan
- 4 Exploratory Hole Location Plan



Legend



Notes

Figure 1

Drawing Title

Existing Site Layout Plan

Project Number 19-228.02

Project Title

TCM House, Newport Road, Hayes, UB4 8JX

Drawn by GR

Checked by JB

Scale NTS





Photo 1



Photo 2



Photo 3



Photo 4

Legend

Notes

Figure 2

Drawing Title

Site Photographs

Project Number 19-228.02

Project Title

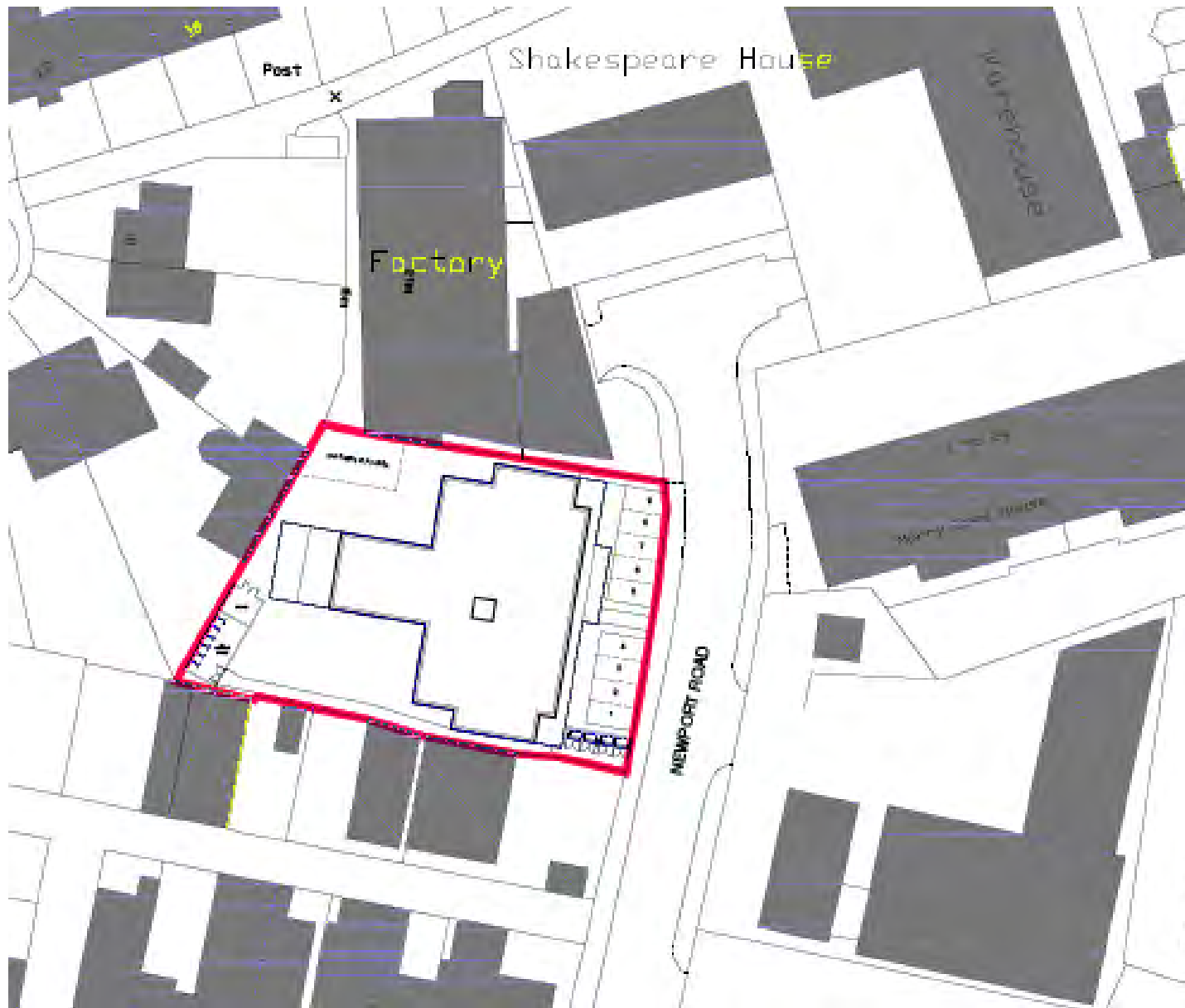
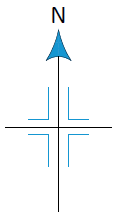
TCM House, Newport Road, Hayes, UB4 8JX

Drawn by GR

Checked by JB

Scale NTS





Legend

Notes

Plan provided by client

Figure 3

Drawing Title

Proposed Development Plan

Project Number 19-228.02

Project Title

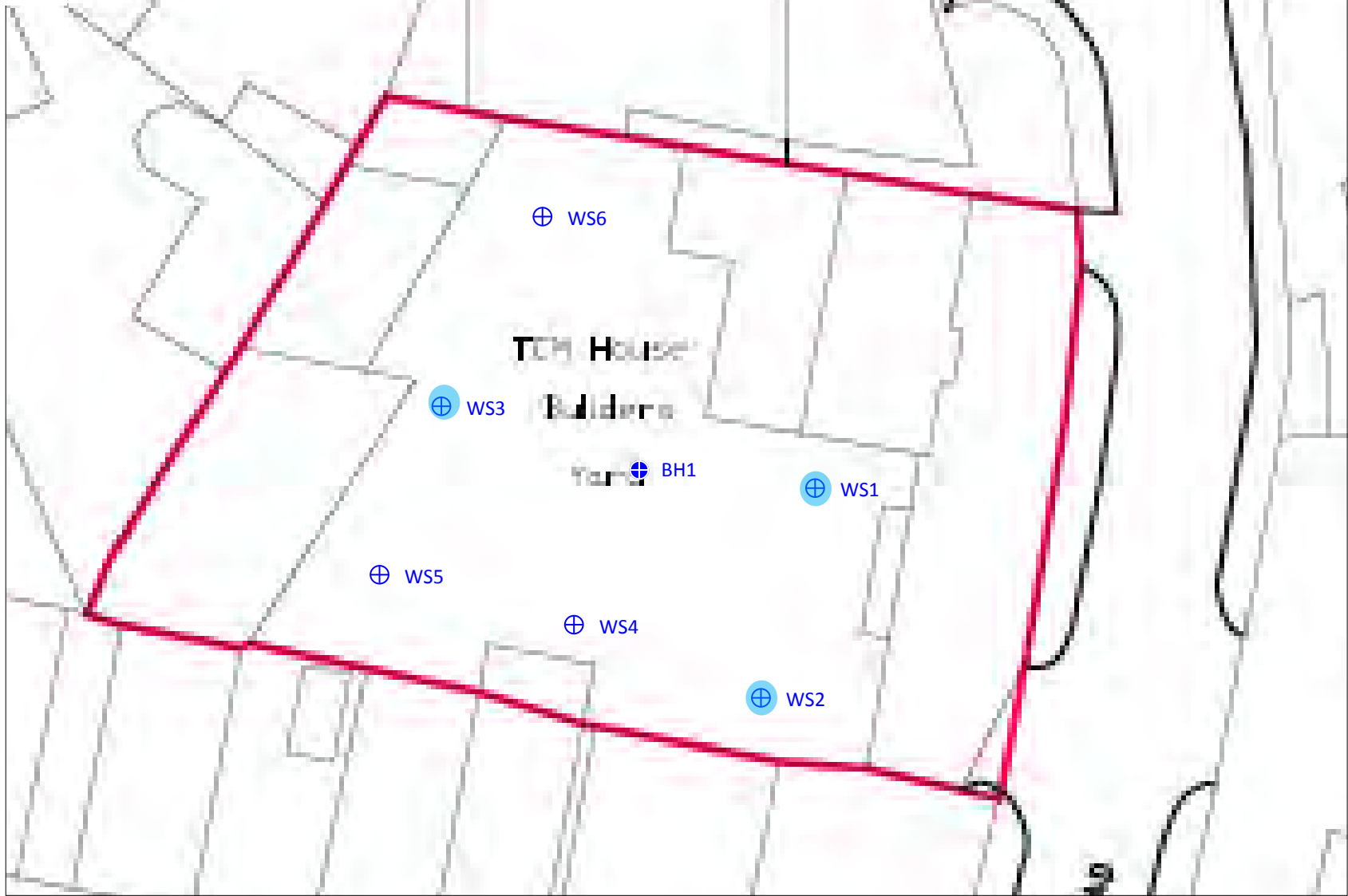
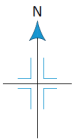
TCM House, Newport Road, Hayes, UB4 8JX

Drawn by GR

Checked by JB

Scale NTS





Legend

- ⊕ Window Sample Location
- ⊕ Borehole Location
- Monitoring Well

Notes

Figure 4

Drawing Title

Exploratory Hole Location Plan

Project Number 19-228.02

Project Title

TCM House, Newport Road, Hayes, UB4 8JX

Drawn by GR

Checked by JB

Scale NTS



Appendices

- I Exploratory Hole Logs and Photographs
- II Field Monitoring Results
- III Soil and Groundwater Contamination Laboratory Results
- IV Soil Geotechnical Laboratory Results

Appendix

I Exploratory Hole Logs and Photographs



Percussion Drilling Log

Project Name: TCM House		Client: Kearns Property Management Limited		Date: 20/03/2020	
Location: Newport Road, Hayes, UB4 8JX		Contractor:			
Project No. : 19-228.02		Crew Name: M Ray		Drilling Equipment:	
Borehole Number BH 1	Hole Type CP	Level	Logged By dn	Scale 1:50	Page Number Sheet 1 of 2

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10			Tarmac	
		0.30			0.30			MADE GROUND brick and concrete cobbles in a dark brown sandy gravel matrix	
		1.00	D					MADE GROUND matrix of orange brown and grey sandy gravelly clay and clayey sandy gravel with very occasional brick fragments	1
		1.20 - 1.65	B						
		1.20	SPT	N=33 (3,6/7,8,8,10)	1.50			Dense orange brown and grey very clayey sandy fine to coarse GRAVEL of flint. Rootlets (BHGM)	2
		1.80	D						
		2.00 - 2.45	B						
		2.00	SPT	N=14 (4,5/5,4,3,2)	2.50			Firm medium strength orange brown and grey mottled sandy very gravelly CLAY with rootlets (BHGM)	3
		3.00	D						
		3.20 - 3.65	U						
		3.70	D		3.50			Firm becoming firm to stiff brown and grey mottled slightly sandy CLAY with partings of light brown silt / fine sand (LCF)	4
		4.00	D						
		4.20	SPTL						
		4.20	S						
		4.20	SPT	N=11 (1,2/2,3,3,3)					
		4.90	D						
		5.20	SPTL						
		5.20	S						
		5.20	SPT	N=13 (2,2/2,3,4,4)					
		6.00	D						
		6.20	SPTL						
		6.20	S						
		6.20	SPT	N=14 (2,2/3,3,4,4)					
		7.00	D		7.00				
		7.20	SPTL						
		7.20	S						
		7.20	SPT	N=16 (2,3/3,4,4,5)				Stiff, high to very high strength, brown with grey veins slightly fissured CLAY with scattered selenite crystals (LCF)	7
		8.00	D						
		8.20	SPTL						
		8.20	S						
		8.20	SPT	N=20 (3,4/4,5,5,6)					
		9.00	D						
		9.20 - 9.65	U						
		9.70	D						
		10.00	D						10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
20.00	150	3.00	150	0.00 12.80	1.20 13.10	01:15 00:30					

Remarks	
---------	--



[illegible]

Remarks	
---------	---



Windowless Sampling Log

Project Name: TCM House		Client: Kearns Property Management Limited		Date: 23/03/2020	
Location: Newport Road, Hayes, UB4 8JX		Contractor:			
Project No. : 19-228.02		Crew Name:		Drilling Equipment:	
Borehole Number WS 2	Hole Type WS	Level	Logged By dn	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.45	B	N=41 (13,11/14,11,8,8)	0.20			Concrete	1
		0.50	ES		0.50			MADE GROUND dark brown sandy gravelly clay with concrete fragments	
								MADE GROUND dark orange brown sandy clayey gravel	
		1.20	SPT	N=35 (11,11/11,9,8,7)	1.20			Dense orange brown slightly clayey sandy fine to coarse sub-angular to sub-rounded GRAVEL of flint with lenses of orange brown and grey mottled sandy clay (BHGM)	2
		1.50	D		1.90			Dense orange brown clayey fine to medium sub-angular to sub-rounded SAND AND GRAVEL of flint (BHGM)	
		2.00 - 2.40	B		2.60			Dense brown slightly clayey gravelly medium SAND. Gravel is predominantly coarse sub-angular to sub-rounded of flint (BHGM)	
		2.00	SPT		2.90			Firm orange brown and grey mottled sandy slightly gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded of flint (LCF)	
		2.90	D		3.00			End of Borehole at 3.0m	3
									4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
Remarks											



Windowless Sampling Log

Project Name: TCM House		Client: Kearns Property Management Limited		Date: 23/03/2020	
Location: Newport Road, Hayes, UB4 8JX		Contractor:			
Project No. : 19-228.02		Crew Name:		Drilling Equipment:	
Borehole Number WS 3	Hole Type WS	Level	Logged By dn	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.60	ES		0.30			MADE GROUND dark brown sandy gravelly clay with brick and concrete fragments	
								MADE GROUND Dark grey sandy coarse gravel with fine brick fragments	
		1.20	D		1.10				1
		1.20	SPT	N=7 (2,1/2,1,2,2)	1.30			Soft to firm grey and brown silty sandy slightly organic CLAY with fine rounded gravel and organic matter - possible made ground. Roots and rootlets. (BHGM)	
		1.40	ES					Firm brown and grey mottled slightly sandy CLAY with partings of light brown silt / fine sand (BHGM)	
		2.00	SPT	N=8 (2,1/2,2,1,3)					2
					3.00				
								End of Borehole at 3.0m	3
									4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
Remarks											



Windowless Sampling Log

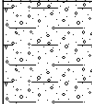
Project Name: TCM House		Client: Kearns Property Management Limited		Date: 23/03/2020	
Location: Newport Road, Hayes, UB4 8JX		Contractor:			
Project No. : 19-228.02		Crew Name:		Drilling Equipment:	
Borehole Number WS 4	Hole Type WS	Level	Logged By dn	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	▼	1.20 1.50 2.00 2.40 - 2.60 2.80 3.00	SPT D SPT B D SPT	N=13 (5,4/4,3,3,3) N=27 (8,9/11,6,6,4) N=14 (2,2/3,3,4,4)	0.60 1.00 1.10 2.20 2.70 3.00			MADE GROUND dark brown sandy gravelly cobbly humic clay with decayed roots	1 <



Windowless Sampling Log

Project Name: TCM House		Client: Kearns Property Management Limited		Date: 23/03/2020	
Location: Newport Road, Hayes, UB4 8JX		Contractor:			
Project No. : 19-228.02		Crew Name:		Drilling Equipment:	
Borehole Number WS 5	Hole Type WS	Level	Logged By dn	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.50			MADE GROUND dark brown sandy gravelly cobbly humic clay with decayed roots	
		0.80	ES					Very dense grey and dark grey clayey sandy fine to coarse sub-angular to sub-rounded GRAVEL of flint (BHGM)	1
		1.20	SPT	N=51 (5,10/10,9,16,16)	1.20				
		1.65	SPT	N=56 (,16,14,12,14)				End of Borehole at 1.2m	2
									3
									4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks





Windowless Sampling Log

Project Name: TCM House		Client: Kearns Property Management Limited		Date: 23/03/2020	
Location: Newport Road, Hayes, UB4 8JX		Contractor:			
Project No. : 19-228.02		Crew Name:		Drilling Equipment:	
Borehole Number WS 6	Hole Type WS	Level	Logged By dn	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.60			MADE GROUND dark brown sandy gravelly cobbly humic clay with decayed roots	
					1.10			MADE GROUND dark grey sandy coarse gravel with fine brick fragments	1
		1.00	ES		1.40			Soft to firm grey and brown silty sandy slightly organic CLAY with fine rounded gravel and organic matter - possible made ground (BHGM)	
		1.20	SPT	N=8 (2,3/3,2,1,2)	1.50			Grey sandy fine to coarse sub-angular to sub-rounded GRAVEL of flint (BHGM)	
		1.60	ES					Firm orange brown and grey mottled sandy slightly gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded of flint (BHGM)	2
		2.00	D						
		2.00	SPT	N=11 (2,2/2,3,3,3)					
					3.00			Stiff brown and grey mottled slightly sandy CLAY with partings of light brown silt / fine sand (LCF)	3
		3.00	SPT	N=17 (3,4/4,4,4,5)					
					4.00				4
		4.00	SPT	N=20 (3,3/4,5,5,6)					
					5.00				5
		5.00	ES					End of Borehole at 5.0m	
		5.00	SPT	N=19 (5,4/5,4,5,5)					
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks



Exploratory Hole Photographs

Project Number	19-228.02	Project Title	TCM House, Newport Road, Hayes, UB4 8JX	Taken by	DN	Date	23/03/2020
----------------	-----------	---------------	---	----------	----	------	------------



WS1



WS2



WS3



WS4



Exploratory Hole Photographs

Project Number 19-228.02

Project Title TCM House, Newport Road, Hayes, UB4 8JX

Taken by DN Date 23/03/2020



WS5



WS6



Appendix

II Field Monitoring Results

MONITORING DATA SHEET

SITE TCM House, Newport Road, Hayes, UB4 8JX

PROJECT 19-228.02



Visit number 1
Date 31/03/2020

EQUIPMENT GA2000 + MiniRAE
TAKEN BY JD

Record of Stable Concentrations										Interpretation			
Location	Time	Flow (l/h)	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Baro. Prs. (mB)	PID (ppm)	Water (m bgl)	Base Well (m bgl)	CO2 GSV (l/h)	CH4 GSV (l/h)	CS	NHBC
Site	11:41am		0.0	0.0	20.6	1030	0.0			n/a	n/a	n/a	n/a
WS1	11:54am	0.1	0.0	3.0	17.8	1030	0.4	1.62	1.76	0.003	0	CS-1	Green
WS2	11:42am	0.0	0.0	1.9	18.7	1030	1.4	1.73	2.70	0	0	CS-1	Green
WS3	12:09pm	0.2	0.1	0.0	19.9	1030	4.7	0.62	1.82	0	0.0002	CS-1	Green

Weather Observations						Pressure Observations				Notes	
State of Ground	Cloud Cover	Wind	Rain	Air Temperature °C		Source	Pressure Records		Trend	Worst case conditions? (<1000mB and Falling)	
						Metoffice	Location	Henley	Falling		
Dry	Clear	Calm	None	Before	10	GA2000	Time	10:15am	Steady		
Moist	Sunny	Light	Slight				Pressure	1033mB	Rising		
Wet	Slight	Moderate	Moderate	After	10						
Snow	Cloudy	Strong	Heavy								
Frozen	Overcast										
	Fog/Mist										

MONITORING DATA SHEET

SITE TCM House, Newport Road, Hayes, UB4 8JX

PROJECT 19-228.02



Visit number 2
Date 07/04/2020

EQUIPMENT GA2000 + MiniRAE
TAKEN BY JD

Record of Stable Concentrations										Interpretation			
Location	Time	Flow (l/h)	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Baro. Prs. (mB)	PID (ppm)	Water (m bgl)	Base Well (m bgl)	CO2 GSV (l/h)	CH4 GSV (l/h)	CS	NHBC
Site	12:11pm		0.0	0.0	20.6	1027	0.0			n/a	n/a	n/a	n/a
WS1	12:12pm	0.0	0.0	2.9	17.8	1027	1.0	1.66	1.76	0	0	CS-1	Green
WS2	12:35pm	0.1	0.0	1.8	18.3	1027	1.4	1.85	2.70	0.0018	0	CS-1	Green
WS3	12:44pm	0.2	0.0	0.1	19.6	1027	5.5	0.62	1.82	0.0002	0	CS-1	Green

Weather Observations						Pressure Observations				Notes	
State of Ground	Cloud Cover	Wind	Rain	Air Temperature °C		Source	Pressure Records		Trend	Worst case conditions? (<1000mB and Falling)	
						Metoffice	Location	Edmonton	Falling		
Dry	Clear	Calm	None	Before	17	GA2000	Time	11:30am	Steady		
Moist	Sunny	Light	Slight				Pressure	1030mb	Rising		
Wet	Slight	Moderate	Moderate	After	18						
Snow	Cloudy	Strong	Heavy								
Frozen	Overcast										
	Fog/Mist										

MONITORING DATA SHEET

SITE TCM House, Newport Road, Hayes, UB4 8JX

PROJECT 19-228.02



Visit number 3
Date 14/02/2020

EQUIPMENT GA2000 + MiniRAE
TAKEN BY JD

Record of Stable Concentrations										Interpretation			
Location	Time	Flow (l/h)	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Baro. Prs. (mB)	PID (ppm)	Water (m bgl)	Base Well (m bgl)	CO2 GSV (l/h)	CH4 GSV (l/h)	CS	NHBC
Site	8:40am		0.0	0.0	20.6	1027	0.0			n/a	n/a	n/a	n/a
WS1	8:42am	0.0	0.0	2.6	17.3	1027	0.8	1.66	1.76	0	0	CS-1	Green
WS2	8:50am	0.1	0.0	2.7	17.7	1027	0.7	1.86	2.70	0.0027	0	CS-1	Green
WS3	9:00am	0.2	0.1	0.1	19.2	1027	0.6	0.64	1.82	0.0002	0.0002	CS-1	Green

Weather Observations						Pressure Observations				Notes	
State of Ground	Cloud Cover	Wind	Rain	Air Temperature °C		Source	Pressure Records		Trend		
						Metoffice	Location	Henley	Falling		
Dry	Clear	Calm	None	Before	2	GA2000	Time	7:45am	Steady		
Moist	Sunny	Light	Slight				Pressure	1028	Rising		
Wet	Slight	Moderate	Moderate	After	3		Worst case conditions? (<1000mB and Falling)		No		
Snow	Cloudy	Strong	Heavy								
Frozen	Overcast										
	Fog/Mist										

MONITORING DATA SHEET

SITE TCM House, Newport Road, Hayes, UB4 8JX

PROJECT 19-228.02



Visit number 4
Date 22/04/2020

EQUIPMENT GA2000 + MiniRAE
TAKEN BY JD

Record of Stable Concentrations										Interpretation			
Location	Time	Flow (l/h)	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Baro. Prs. (mB)	PID (ppm)	Water (m bgl)	Base Well (m bgl)	CO2 GSV (l/h)	CH4 GSV (l/h)	CS	NHBC
Site	10:12am		0.0	0.0	20.6	1015	0.0			n/a	n/a	n/a	n/a
WS1	10:40am	0.1	0.0	1.5	17.8	1015	1.2	1.53	1.76	0.0015	0	CS-1	Green
WS2	10:15am	0.1	0.0	2.5	18.6	1015	0.6	1.61	2.70	0.0025	0	CS-1	Green
WS3	10:26am	0.0	0.1	0.1	19.8	1015	2.8	0.58	1.82	0	0	CS-1	Green

Weather Observations						Pressure Observations				Notes	
State of Ground	Cloud Cover	Wind	Rain	Air Temperature °C		Source	Pressure Records		Trend	Worst case conditions? (<1000mB and Falling)	
						Metoffice	Location	Reading	Falling		
Dry	Clear	Calm	None	Before	14	GA2000	Time	8:50am	Steady		
Moist	Sunny	Light	Slight				Pressure	1016mB	Rising		
Wet	Slight	Moderate	Moderate	After	14						
Snow	Cloudy	Strong	Heavy								
Frozen	Overcast										
	Fog/Mist									No	

MONITORING DATA SHEET

SITE TCM House, Newport Road, Hayes, UB4 8JX

PROJECT 19-228.02



Visit number 5
Date 30/04/2020

EQUIPMENT GA2000 + MiniRAE
TAKEN BY JD

Record of Stable Concentrations										Interpretation			
Location	Time	Flow (l/h)	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Baro. Prs. (mB)	PID (ppm)	Water (m bgl)	Base Well (m bgl)	CO2 GSV (l/h)	CH4 GSV (l/h)	CS	NHBC
Site	10:30am		0.0	0.0	20.6	992	0.0			n/a	n/a	n/a	n/a
WS1	10:58am	0.1	0.0	2.9	17.8	992	0.8	1.53	1.76	0.0029	0	CS-1	Green
WS2	10:40am	0.0	0.0	1.9	18.2	992	1.9	1.60	2.70	0	0	CS-1	Green
WS3	10:49am	0.2	0.1	0.2	19.5	992	2.8	0.60	1.82	0.0004	0.0002	CS-1	Green

Weather Observations						Pressure Observations				Notes	
State of Ground	Cloud Cover	Wind	Rain	Air Temperature °C		Source	Pressure Records		Trend	Worst case conditions? (<1000mB and Falling)	
						Metoffice	Location	Henley	Falling		
Dry	Clear	Calm	None	Before	9	GA2000	Time	9:30am	Steady		
Moist	Sunny	Light	Slight				Pressure	995	Rising		
Wet	Slight	Moderate	Moderate	After	10						
Snow	Cloudy	Strong	Heavy								
Frozen	Overcast										
	Fog/Mist										

MONITORING DATA SHEET

SITE TCM House, Newport Road, Hayes, UB4 8JX

PROJECT 19-228.02



Visit number 6
Date 07/05/2020

EQUIPMENT GA2000 + MiniRAE
TAKEN BY JD

Record of Stable Concentrations										Interpretation			
Location	Time	Flow (l/h)	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Baro. Prs. (mB)	PID (ppm)	Water (m bgl)	Base Well (m bgl)	CO2 GSV (l/h)	CH4 GSV (l/h)	CS	NHBC
Site	8:30am		0.0	0.0	20.6	1024	0.0			n/a	n/a	n/a	n/a
WS1	Covered with waste - expect to be damaged.												
WS2	8:35am	0.0	0.0	1.5	18.4	1024	2.1	1.62	2.70	0	0	CS-1	Green
WS3	Covered with waste - expect to be damaged.												

Weather Observations						Pressure Observations				Notes	
State of Ground	Cloud Cover	Wind	Rain	Air Temperature °C		Source	Pressure Records		Trend		
				Before	15	Metoffice	Location	Henley	Falling		
Dry	Clear	Calm	None			GA2000	Time	7:20am	Steady	Worst case conditions? (<1000mB and Falling)	
Moist	Sunny	Light	Slight				Pressure	1024mB	Rising		
Wet	Slight	Moderate	Moderate	After	17						
Snow	Cloudy	Strong	Heavy								
Frozen	Overcast										
	Fog/Mist										

Appendix

III Soil and Groundwater Contamination Laboratory Results



James Burkitt

Aviron Associates Ltd
Badgemore House
Henley
Oxfordshire
RG9 4NR

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

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

e: Aviron -

Analytical Report Number : 20-94613

Project / Site name:	Kearns, TCM House, Newport Road, Hayes, UB4 8JX	Samples received on:	24/03/2020
Your job number:	19-228.02	Samples instructed on:	25/03/2020
Your order number:	19-228.02	Analysis completed by:	03/04/2020
Report Issue Number:	1	Report issued on:	03/04/2020
Samples Analysed:	9 soil samples		

Signed: 

Dr Claire Stone
Quality Manager

For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

Iss No 20-94613-1 Kearns, TCM House, Newport Road, Hayes, UB4 8JX 19-228.02

This certificate should not be reproduced, except in full, without the express permission of the laboratory.

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

Page 1 of 12



Analytical Report Number: 20-94613

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

Your Order No: 19-228.02

Lab Sample Number				1483556	1483557	1483558	1483559	1483560
Sample Reference				WS 1	WS 1	WS 1	WS 2	WS 3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.80	2.00	0.50	1.40
Date Sampled				23/03/2020	23/03/2020	23/03/2020	23/03/2020	23/03/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	12	3.1	8.6	8.1	11
Total mass of sample received	kg	0.001	NONE	1.1	1.2	0.52	1.2	1.0

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	0.003	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	0.003	-	-	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.6	7.8	8.8	7.8	7.9
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	1600	700	820	1500	770
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.50	0.11	0.29	0.39	0.20
Total Sulphur	mg/kg	50	MCERTS	900	250	600	590	430
Organic Matter	%	0.1	MCERTS	3.8	0.9	1.9	1.8	2.4

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.37
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.38
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.5	1.1	4.4
Fluorene	mg/kg	0.05	MCERTS	0.20	< 0.05	2.8	1.8	6.4
Phenanthrene	mg/kg	0.05	MCERTS	1.3	1.2	12	7.6	23
Anthracene	mg/kg	0.05	MCERTS	0.35	0.36	3.1	2.0	6.9
Fluoranthene	mg/kg	0.05	MCERTS	3.0	1.2	14	7.9	23
Pyrene	mg/kg	0.05	MCERTS	2.7	1.0	11	6.5	18
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.0	0.46	6.3	3.1	9.2
Chrysene	mg/kg	0.05	MCERTS	1.7	0.38	4.5	2.9	6.6
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.3	0.33	5.4	3.0	8.0
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.6	0.18	3.7	1.6	3.3
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.9	0.37	5.0	2.6	6.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.1	< 0.05	2.6	1.2	2.9
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.35	< 0.05	0.62	0.26	0.75
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.3	< 0.05	2.8	1.2	3.2

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	19.8	5.39	75.2	42.7	124
-----------------------------	-------	-----	--------	------	------	------	------	-----



Analytical Report Number: 20-94613

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

Your Order No: 19-228.02

Lab Sample Number				1483556	1483557	1483558	1483559	1483560
Sample Reference				WS 1	WS 1	WS 1	WS 2	WS 3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.80	2.00	0.50	1.40
Date Sampled				23/03/2020	23/03/2020	23/03/2020	23/03/2020	23/03/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16	17	10	16	16
Boron (water soluble)	mg/kg	0.2	MCERTS	3.3	0.9	1.3	1.2	2.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	31	30	27	32	34
Copper (aqua regia extractable)	mg/kg	1	MCERTS	58	8.1	15	19	16
Lead (aqua regia extractable)	mg/kg	1	MCERTS	77	11	23	19	29
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.5	< 0.3	< 0.3	< 0.3	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	34	23	20	31	27
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	97	37	54	52	42

Monoaromatics & Oxygenates

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

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	2.7	11	51
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	93	150	530
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	140	180	640
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	86	81	140
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	330	420	1400

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	5.0	1.5	11
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	6.0	120	59	240
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	11	17	220	82	280
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	51	15	130	36	64
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	63	37	470	180	590



Analytical Report Number: 20-94613

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX
Your Order No: 19-228.02

Lab Sample Number				1483556	1483557	1483558	1483559	1483560
Sample Reference				WS 1	WS 1	WS 1	WS 2	WS 3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.80	2.00	0.50	1.40
Date Sampled				23/03/2020	23/03/2020	23/03/2020	23/03/2020	23/03/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		

VOCs

Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0



Analytical Report Number: 20-94613

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

Your Order No: 19-228.02

Lab Sample Number				1483561	1483562	1483563	1483564	
Sample Reference				WS 6	WS 6	WS 6	BH 1	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				0.30	1.60	5.00	0.40	
Date Sampled				23/03/2020	23/03/2020	23/03/2020	23/03/2020	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
Moisture Content	%	N/A	NONE	5.8	17	17	6.2	
Total mass of sample received	kg	0.001	NONE	1.0	0.83	0.48	0.94	

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-	Not-detected	
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10.6	7.5	7.6	7.8	
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	-	< 1	
Total Sulphate as SO ₄	mg/kg	50	MCERTS	3400	850	20000	450	
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.62	0.36	3.5	0.14	
Total Sulphur	mg/kg	50	MCERTS	3200	370	9800	350	
Organic Matter	%	0.1	MCERTS	5.8	0.6	-	1.3	

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.82	0.32	-	< 0.05	
Acenaphthylene	mg/kg	0.05	MCERTS	0.83	< 0.05	-	< 0.05	
Acenaphthene	mg/kg	0.05	MCERTS	3.5	< 0.05	-	1.2	
Fluorene	mg/kg	0.05	MCERTS	3.7	0.33	-	2.7	
Phenanthrene	mg/kg	0.05	MCERTS	26	1.0	-	6.6	
Anthracene	mg/kg	0.05	MCERTS	8.5	0.25	-	1.8	
Fluoranthene	mg/kg	0.05	MCERTS	49	0.54	-	4.9	
Pyrene	mg/kg	0.05	MCERTS	43	0.48	-	4.1	
Benzo(a)anthracene	mg/kg	0.05	MCERTS	23	0.36	-	1.9	
Chrysene	mg/kg	0.05	MCERTS	21	0.26	-	1.3	
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	21	< 0.05	-	1.7	
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	13	< 0.05	-	0.57	
Benzo(a)pyrene	mg/kg	0.05	MCERTS	19	< 0.05	-	1.4	
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	9.2	< 0.05	-	0.59	
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	2.5	< 0.05	-	< 0.05	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	9.7	< 0.05	-	0.62	

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	254	3.57	-	29.5	
-----------------------------	-------	-----	--------	-----	------	---	------	--

Analytical Report Number: 20-94613

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

Your Order No: 19-228.02

Lab Sample Number				1483561	1483562	1483563	1483564	
Sample Reference				WS 6	WS 6	WS 6	BH 1	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				0.30	1.60	5.00	0.40	
Date Sampled				23/03/2020	23/03/2020	23/03/2020	23/03/2020	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	18	-	14	
Boron (water soluble)	mg/kg	0.2	MCERTS	1.1	0.4	-	1.5	
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	-	< 0.2	
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	41	66	-	59	
Copper (aqua regia extractable)	mg/kg	1	MCERTS	30	26	-	20	
Lead (aqua regia extractable)	mg/kg	1	MCERTS	27	19	-	12	
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	< 0.3	
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	67	-	60	
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	4.3	< 1.0	-	< 1.0	
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	50	86	-	130	

Monoaromatics & Oxygenates

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

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001	
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001	
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001	
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	5.1	6.3	-	36	
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	81	27	-	490	
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	180	48	-	450	
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	510	36	-	90	
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	780	120	-	1100	

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001	
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001	
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001	
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	5.9	4.9	-	21	
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	100	41	-	400	
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	420	150	-	410	
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	920	43	-	81	
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	1500	240	-	910	



Analytical Report Number: 20-94613

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

Your Order No: 19-228.02

Lab Sample Number				1483561	1483562	1483563	1483564
Sample Reference				WS 6	WS 6	WS 6	BH 1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	1.60	5.00	0.40
Date Sampled				23/03/2020	23/03/2020	23/03/2020	23/03/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
VOCs							
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0



Analytical Report Number: 20-94613
Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX
Your Order No: 19-228.02

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

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

Quantitative Analysis

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

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

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

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1483556	WS 1	0.30	140	Loose Fibrous Debris	Chrysotile	0.003	0.003

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



Analytical Report Number : 20-94613

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1483556	WS 1	None Supplied	0.30	Brown clay and loam with gravel and rubble.
1483557	WS 1	None Supplied	0.80	Brown loam and sand with gravel.
1483558	WS 1	None Supplied	2.00	Brown clay and sand with gravel.
1483559	WS 2	None Supplied	0.50	Brown loam and clay with gravel.
1483560	WS 3	None Supplied	1.40	Brown clay and loam with gravel and vegetation.
1483561	WS 6	None Supplied	0.30	Brown loam and clay with gravel and vegetation.
1483562	WS 6	None Supplied	1.60	Brown clay.
1483563	WS 6	None Supplied	5.00	Brown clay.
1483564	BH 1	None Supplied	0.40	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 20-94613

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

Iss No 20-94613-1 Kearns, TCM House, Newport Road, Hayes, UB4 8JX 19-228.02

This certificate should not be reproduced, except in full, without the express permission of the laboratory.

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

Page 10 of 12



Analytical Report Number : 20-94613

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

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

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

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

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS 1		S	20-94613	1483558	b	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	b
WS 1		S	20-94613	1483558	b	Monohydric phenols in soil	L080-PL	b
WS 1		S	20-94613	1483558	b	Speciated EPA-16 PAHs in soil	L064-PL	b
WS 1		S	20-94613	1483558	b	TPHCWG (Soil)	L088/76-PL	b



James Burkitt
Airon Associates Ltd
Badgemore House
Henley
Oxfordshire
RG9 4NR

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS
t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

e: Airon -

Analytical Report Number : 20-94625

Project / Site name:	Kearns, TCM House, Newport Road, Hayes, UB4 8JX	Samples received on:	25/03/2020
Your job number:	19-228.02	Samples instructed on:	25/03/2020
Your order number:	19-228.02	Analysis completed by:	01/04/2020
Report Issue Number:	1	Report issued on:	01/04/2020
Samples Analysed:	4 soil samples		

Signed: *Karolina Marek*

Karolina Marek
PL Head of Reporting Team

For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

Analytical Report Number: 20-94625

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

Your Order No: 19-228.02

Lab Sample Number				1483622	1483623	1483624	1483625	
Sample Reference				BH 1	BH 1	BH 1	BH 1	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				8.00	12.00	16.00	19.50	
Date Sampled				23/03/2020	23/03/2020	23/03/2020	23/03/2020	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		
Stone Content				%	0.1	NONE	< 0.1	< 0.1
Moisture Content				%	N/A	NONE	18	17
Total mass of sample received				kg	0.001	NONE	0.24	0.26

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	8.6	8.2	8.2	
Total Sulphate as SO ₄	mg/kg	50	MCERTS	690	650	850	2000	
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.31	0.25	0.39	1.0	
Total Sulphur	mg/kg	50	MCERTS	4600	3100	4600	6700	



Analytical Report Number : 20-94625

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1483622	BH 1	None Supplied	8.00	Brown clay.
1483623	BH 1	None Supplied	12.00	Brown clay.
1483624	BH 1	None Supplied	16.00	Brown clay.
1483625	BH 1	None Supplied	19.50	Brown clay.

Analytical Report Number : 20-94625

Project / Site name: Kearns, TCM House, Newport Road, Hayes, UB4 8JX

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Total sulphate (as SO ₄ in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS

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

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

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



James Burkitt

Aviron Associates Ltd
Badgemore House
Henley
Oxfordshire
RG9 4NR

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

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

e: Aviron -

Analytical Report Number : 20-97375

Project / Site name:	TCM House, Newport Road	Samples received on:	24/04/2020
Your job number:	19-228-02	Samples instructed on:	24/04/2020
Your order number:	19-228-02	Analysis completed by:	29/04/2020
Report Issue Number:	1	Report issued on:	29/04/2020
Samples Analysed:	2 water samples		

Signed: *A. Czerwińska*

Agnieszka Czerwińska

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

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

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

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

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

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

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

Iss No 20-97375-1 TCM House, Newport Road 19-228-02

This certificate should not be reproduced, except in full, without the express permission of the laboratory.

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

Page 1 of 6



Analytical Report Number: 20-97375

Project / Site name: TCM House, Newport Road

Your Order No: 19-228-02

Lab Sample Number				1498512	1498513			
Sample Reference				WS1	WS2			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				22/04/2020	22/04/2020			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	7.0	7.9			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO ₄	mg/l	0.045	ISO 17025	501	400			
Total Sulphur	mg/l	0.015	NONE	167.0	133.2			
Hardness - Total	mgCaCO ₃ /l	1	ISO 17025	282	211			

Total Phenols

Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10			
----------------------------	------	----	-----------	------	------	--	--	--

Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

Total PAH

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16			
-------------------	------	------	-----------	--------	--------	--	--	--

Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.04	1.33			
Barium (dissolved)	µg/l	0.06	ISO 17025	93	83			
Boron (dissolved)	µg/l	10	ISO 17025	130	110			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.05	0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	97	72			
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.7	0.6			
Copper (dissolved)	µg/l	0.5	ISO 17025	5.3	25			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	9.7	7.8			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Nickel (dissolved)	µg/l	0.5	ISO 17025	7.4	8.7			
Selenium (dissolved)	µg/l	0.6	ISO 17025	57	53			
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.6	2.2			



Analytical Report Number: 20-97375

Project / Site name: TCM House, Newport Road

Your Order No: 19-228-02

Lab Sample Number				1498512	1498513			
Sample Reference				WS1	WS2			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				22/04/2020	22/04/2020			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			



Analytical Report Number: 20-97375

Project / Site name: TCM House, Newport Road

Your Order No: 19-228-02

Lab Sample Number				1498512	1498513			
Sample Reference				WS1	WS2			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				22/04/2020	22/04/2020			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

VOCs

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0			
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0			
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			

U/S = Unsuitable Sample I/S = Insufficient Sample

Iss No 20-97375-1 TCM House, Newport Road 19-228-02

This certificate should not be reproduced, except in full, without the express permission of the laboratory.

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

Page 4 of 6



Analytical Report Number : 20-97375

Project / Site name: TCM House, Newport Road

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total Sulphur in water by ICP-MS	Determination of total sulphur in water by acidification followed by ICP-MS.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L012-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

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

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

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

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS1		W	20-97375	1498512	c	pH at 20oC in water (automated)	L099-PL	c
WS2		W	20-97375	1498513	c	pH at 20oC in water (automated)	L099-PL	c

Appendix

IV Soil Geotechnical Laboratory Results



Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No. 28098	Project Name Kearns, TCM House, Newport Rd, Hayes	Programme	
		Samples received	24/03/2020
Project No. 19-228.02	Client Aviron	Schedule received	25/03/2020
		Project started	26/03/2020
		Testing Started	24/04/2020

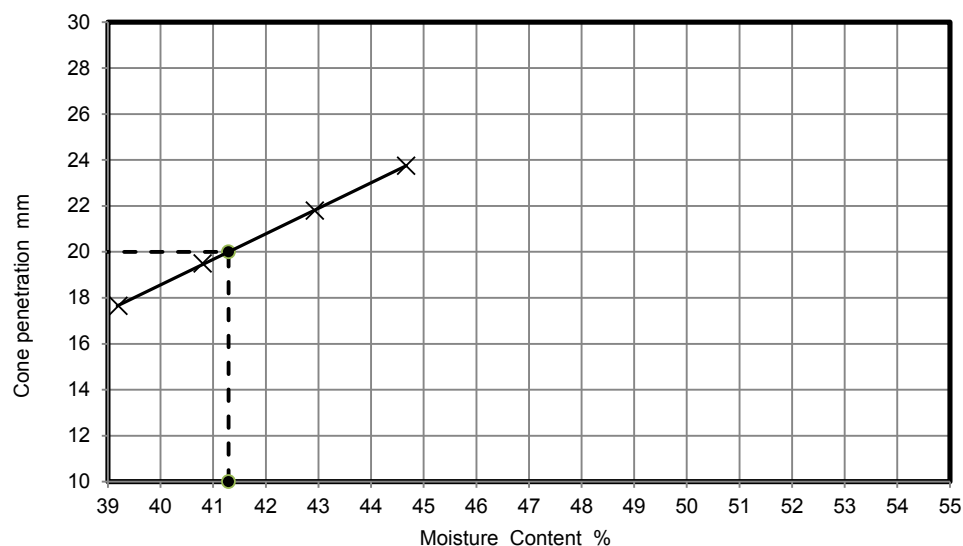
Hole No.	Sample				Soil Description	NMC %	Passing 425µm %	LL %	PL %	PI %	Remarks
	Ref	Top m	Base m	Type							
WS 2	-	1.50	-	D	Orangish brown clayey very sandy GRAVEL (gravel is fm and sub-angular to rounded)	9.2	20	41	17	24	Sample washed to obtain test fraction
WS 2	-	2.90	-	D	Orangish brown slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular to rounded)	27	96	71	29	42	
WS3	-	1.20	-	D	Grey slightly gravelly sandy silty CLAY with occasional roots and rootlets (gravel is fmc and sub-angular to sub-rounded)	21	71	41	22	19	
WS4	-	1.50	-	D	Greyish brown and bluish grey clayey very sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)	11	32	44	19	25	
WS4	-	2.80	-	D	Brown silty CLAY	30	100	74	34	40	
WS6	-	2.00	-	D	Brown slightly mottled bluish grey silty CLAY	33	100	82	36	46	
BH 1	-	3.20	-	U	Medium strength greyish brown silty CLAY with fine sand pockets	32	100	72	28	44	
BH 1	-	9.20	-	U	Very high strength brown silty CLAY with rare fine gravel	26	99	64	24	40	
BH 1	-	15.20	-	U	Very high strength greyish brown silty CLAY	29	100	79	28	51	

 2519	Test Methods: BS1377: Part 2: 1990: Natural Moisture Content : clause 3.2 Atterberg Limits: clause 4.3, 4.4 and 5.0	Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU Tel: 01923 711 288 Email: James@k4soils.com	Checked and Approved Initials J.P Date: 30/04/2020
	Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)		MSF-5-R1



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name			Kearns, TCM House, Newport Rd, Hayes		Job No.	28098
					Borehole/Pit No.	WS 2
Project No.			19-228.02	Client	Sample No.	-
				Aviron	Depth Top	1.50 m
Soil Description			Orangish brown clayey very sandy GRAVEL (gravel is fm and sub-angular to rounded)		Depth Base	- m
					Sample Type	D
					Samples received	24/03/2020
					Schedules received	25/03/2020
					Project Started	26/03/2020
					Date Tested	24/04/2020

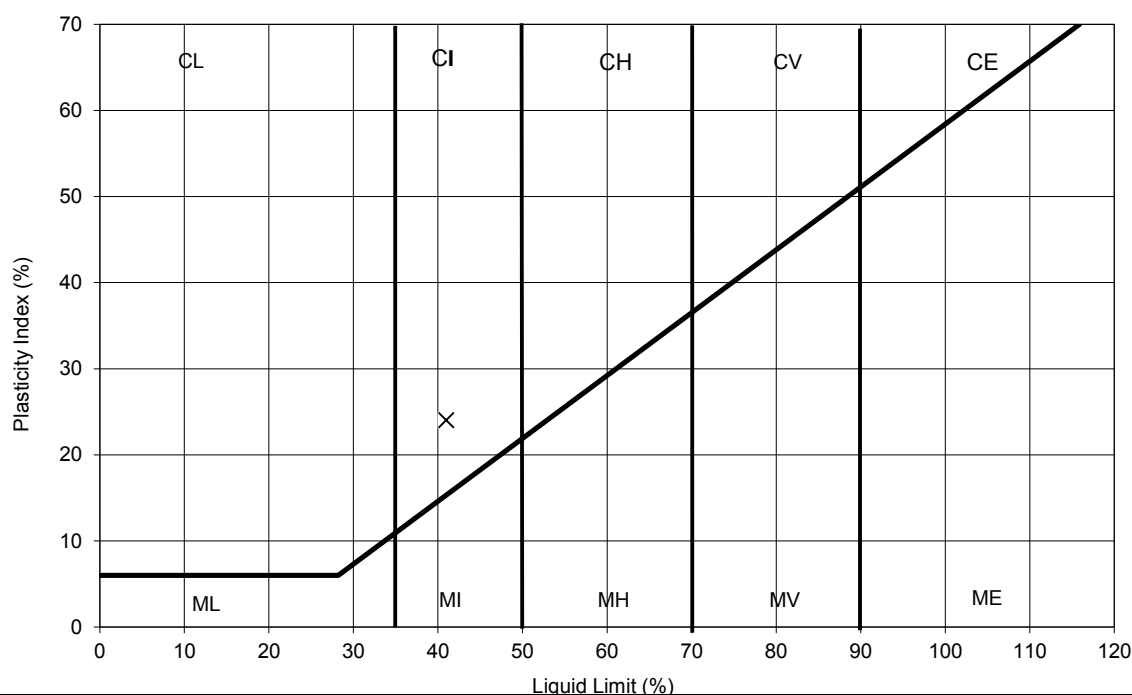


NATURAL MOISTURE CONTENT	9.2	%
% PASSING 425µm SIEVE	20	%
LIQUID LIMIT	41	%
PLASTIC LIMIT	17	%
PLASTICITY INDEX	24	%

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 30/04/2020

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



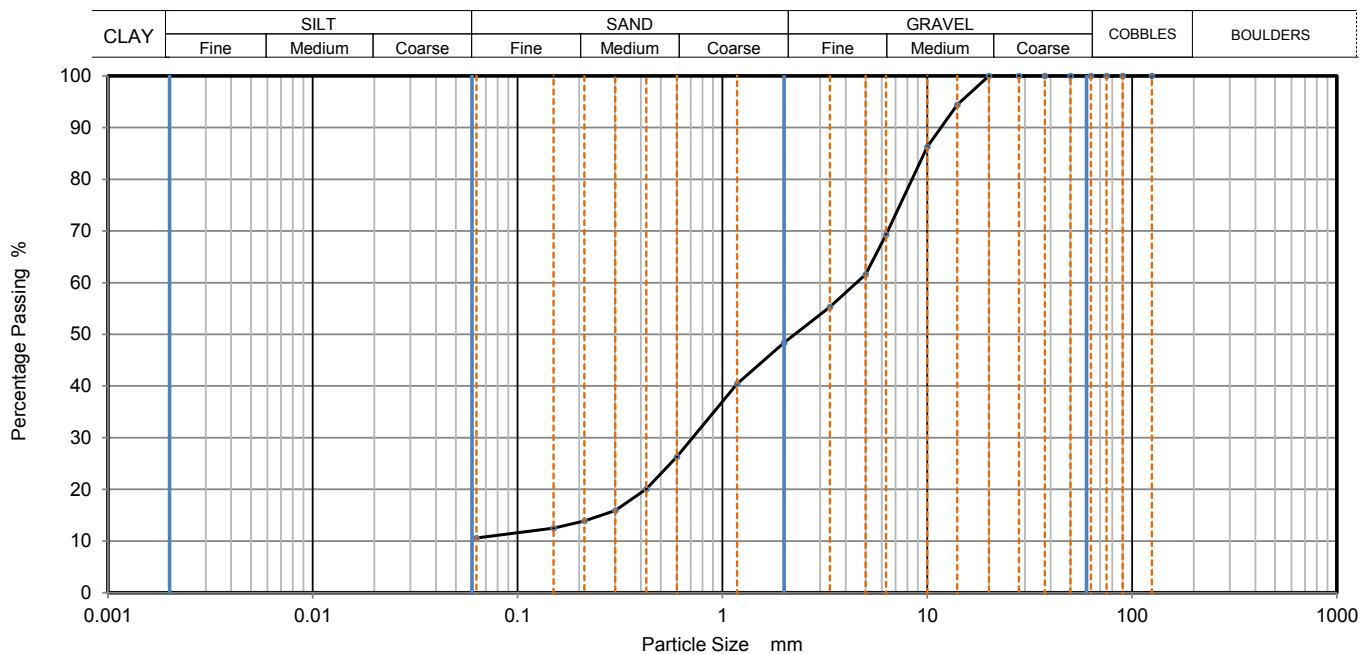
2519



PARTICLE SIZE DISTRIBUTION

Job Ref	28098
Borehole/Pit No.	WS 2
Sample No.	-
Depth Top	1.50 m
Depth Base	- m
Sample Type	D
Samples received	24/03/2020
Schedules received	25/03/2020
Project started	26/03/2020
Date tested	22/04/2020

Site Name	Kearns, TCM House, Newport Rd, Hayes		
Project No.	19-228.02	Client	Aviron
Soil Description	Orangish brown clayey very sandy GRAVEL (gravel is fm and sub-angular to rounded)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	94		
10	86		
6.3	69		
5	62		
3.35	55		
2	48		
1.18	40		
0.6	26		
0.425	20		
0.3	16		
0.212	14		
0.15	13		
0.063	11		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	51.6
Sand	37.8
Fines <0.063mm	10.6

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with BS1377 unless noted below



K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU
Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved

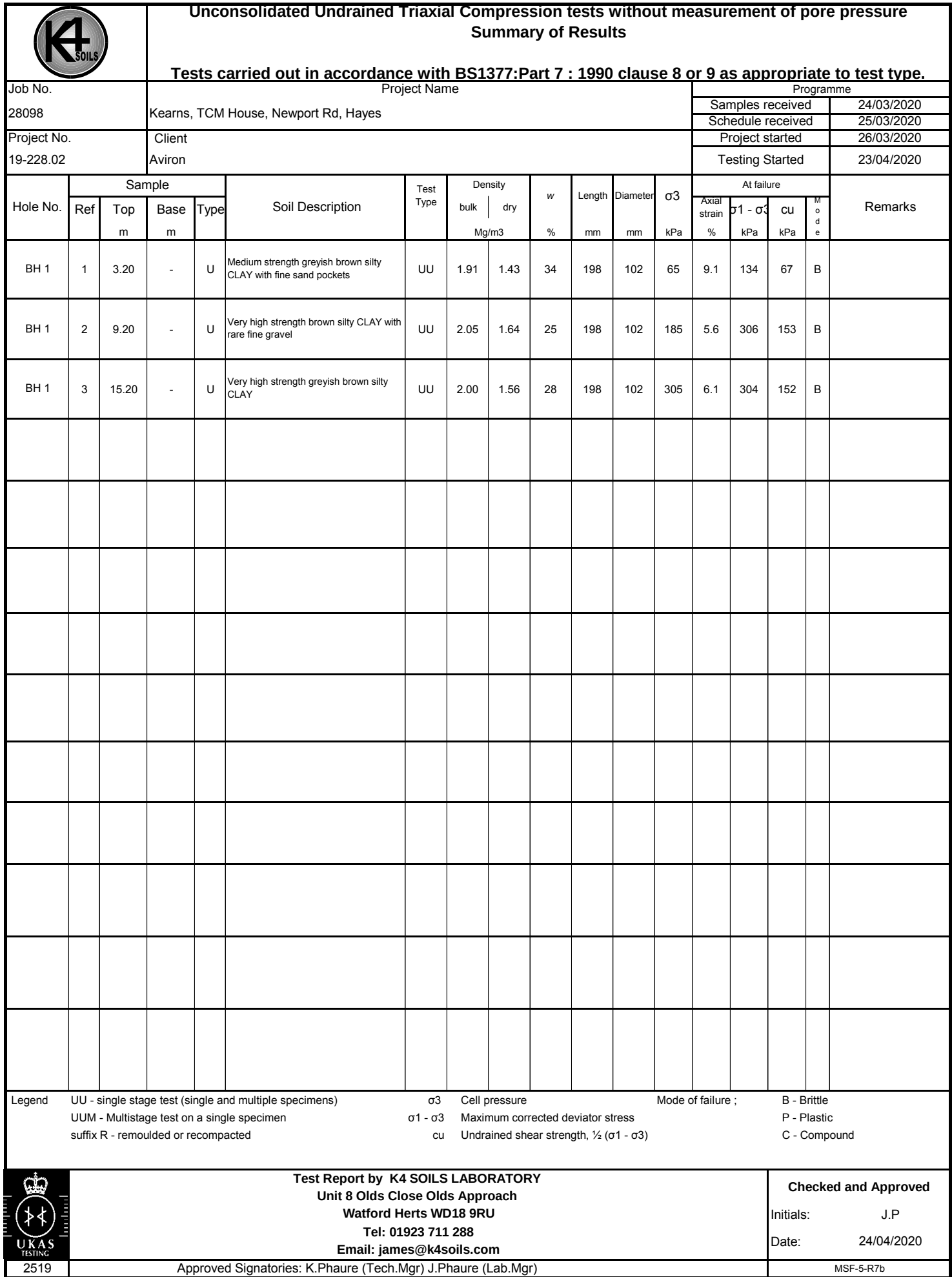
Initials: J.P

Date: 24/04/2020

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3





Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen

Job Ref 28098

Borehole/Pit No. BH 1

Site Name Kearns, TCM House, Newport Rd, Hayes

Sample No. 1

Project No. 19-228.02 Client Aviron

Depth Top 3.20 m

Soil Description

Medium strength greyish brown silty CLAY with fine sand pockets

Depth Base - m

Sample Type U

Samples received 24/03/2020

Schedules received 25/03/2020

Test Method BS1377 : Part 7 : 1990, clause 8, single specimen

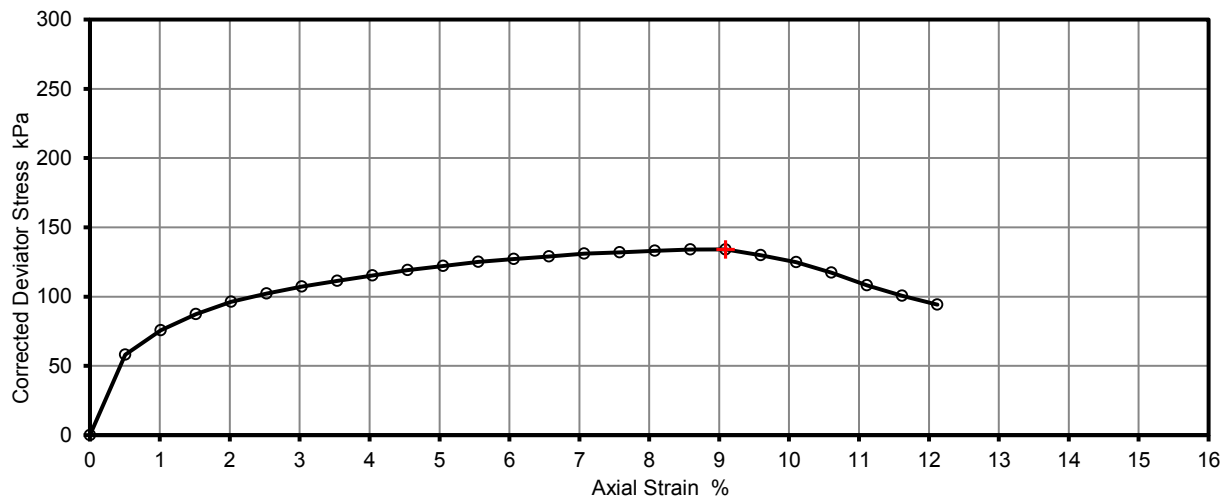
Date of test 23/04/2020

Remarks

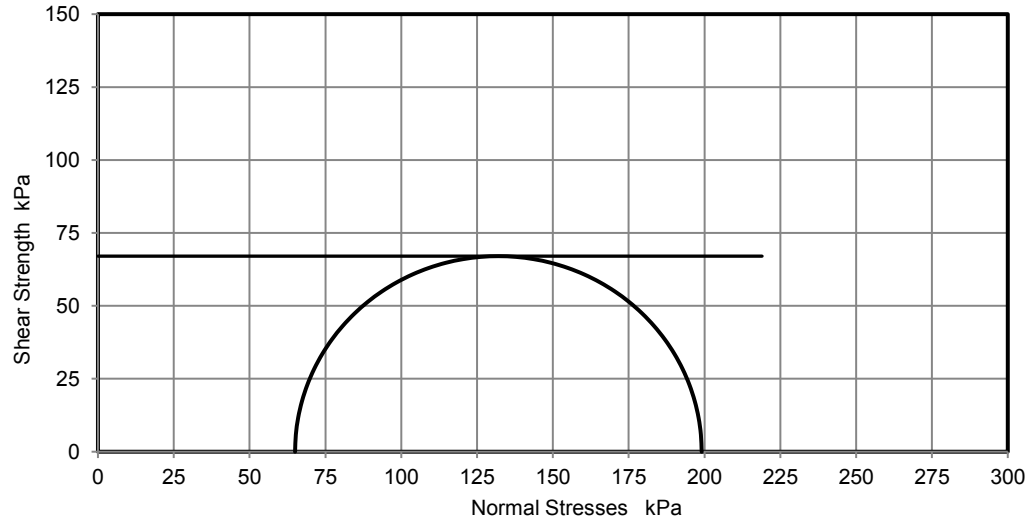
Position within sample

Test Number	1
Length	198.0 mm
Diameter	102.0 mm
Bulk Density	1.91 Mg/m ³
Moisture Content	34 %
Dry Density	1.43 Mg/m ³
Rate of Strain	2.0 %/min
Cell Pressure	65 kPa
Axial Strain	9.1 %
Deviator Stress, ($\sigma_1 - \sigma_3$)f	134 kPa
Undrained Shear Strength, cu	67 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ f
Mode of Failure	Brittle

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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



2519

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date 24/04/2020

MSF-5 R7

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)



California Bearing Ratio (CBR)

Job Ref 28098

Borehole/Pit No. WS 1

Site Name Kearns, TCM House, Newport Rd, Hayes

Sample No. -

Project No. 19-228.02

Client

Avron

Depth Top 0.45 m

Soil Description

Brown slightly clayey sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)

Depth Base - m

Sample Type B

Samples received 24/03/2020

Schedules received 25/03/2020

Test Method BS1377 : Part 4 : 1990, clause 7

Project Started 26/03/2020

Date Tested 20/04/2020

Specimen Preparation

Condition REMOULDED

Details Recompacted with specified standard effort using 2.5kg rammer

Soaking details

Not soaked

Period of soaking - days

Time to surface - days

Amount of swell recorded - mm

Material retained on 20mm sieve removed 22 %

Initial Specimen details Bulk density 2.09 Mg/m3

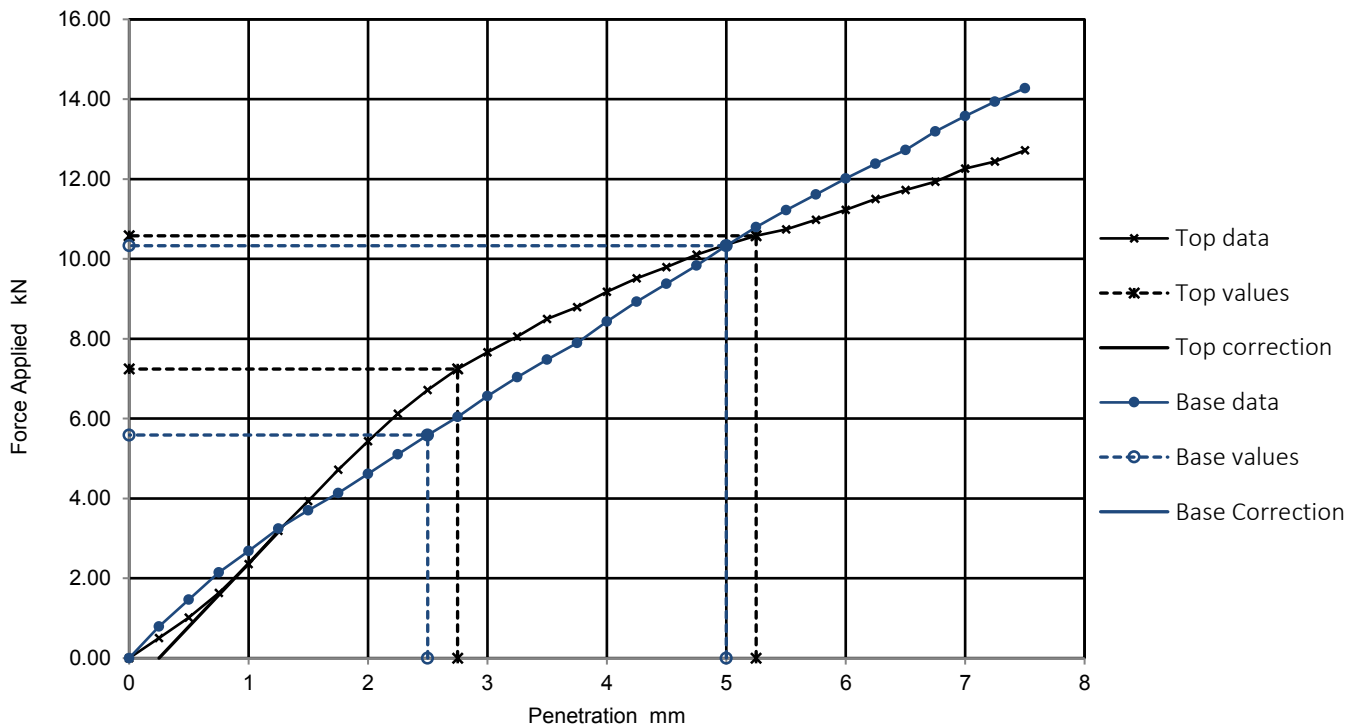
Dry density 1.94 Mg/m3

Moisture content 8.0 %

Surcharge applied 6 kg

4 kPa

Force v Penetration Plots



Results

TOP
BASE

Curve correction applied	CBR Values, %			
	2.5mm	5mm	Highest	Average
Yes	55	53	55	53
No	42	52	52	

Moisture Content %
7.8
7.7

Remarks

1



Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 24/04/2020

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R16



California Bearing Ratio (CBR)

Job Ref 28098

Borehole/Pit No. WS 2

Site Name Kearns, TCM House, Newport Rd, Hayes

Sample No. -

Project No. 19-228.02

Client

Avron

Depth Top 0.45 m

Soil Description

Brown sandy clayey GRAVEL (gravel is fmc and sub-angular to sub-rounded)

Depth Base - m

Sample Type B

Samples received 24/03/2020

Schedules received 25/03/2020

Test Method BS1377 : Part 4 : 1990, clause 7

Project Started 26/03/2020

Date Tested 20/04/2020

Specimen Preparation

Condition REMOULDED

Soaking details Not soaked

Details Recompacted with specified standard effort using 2.5kg rammer

Period of soaking - days

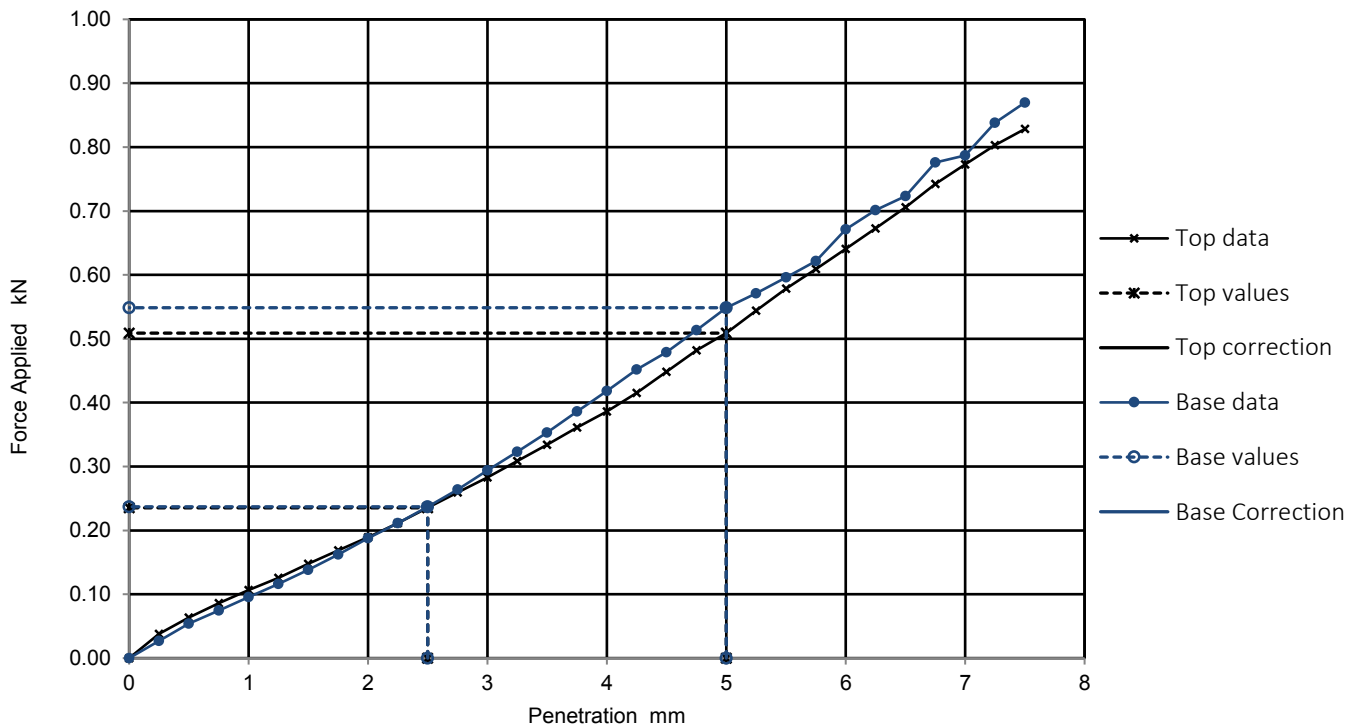
Time to surface - days

Amount of swell recorded - mm

Material retained on 20mm sieve removed 24 %

Initial Specimen details	Bulk density	2.13	Mg/m ³	Surcharge applied	4	kg
	Dry density	1.92	Mg/m ³		2	kPa
	Moisture content	11	%			

Force v Penetration Plots



Results

TOP
BASE

Curve correction applied	CBR Values, %			
	2.5mm	5mm	Highest	Average
No	1.8	2.5	2.5	2.6
No	1.8	2.7	2.7	

Moisture Content %
13
14

Remarks

1



Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 24/04/2020

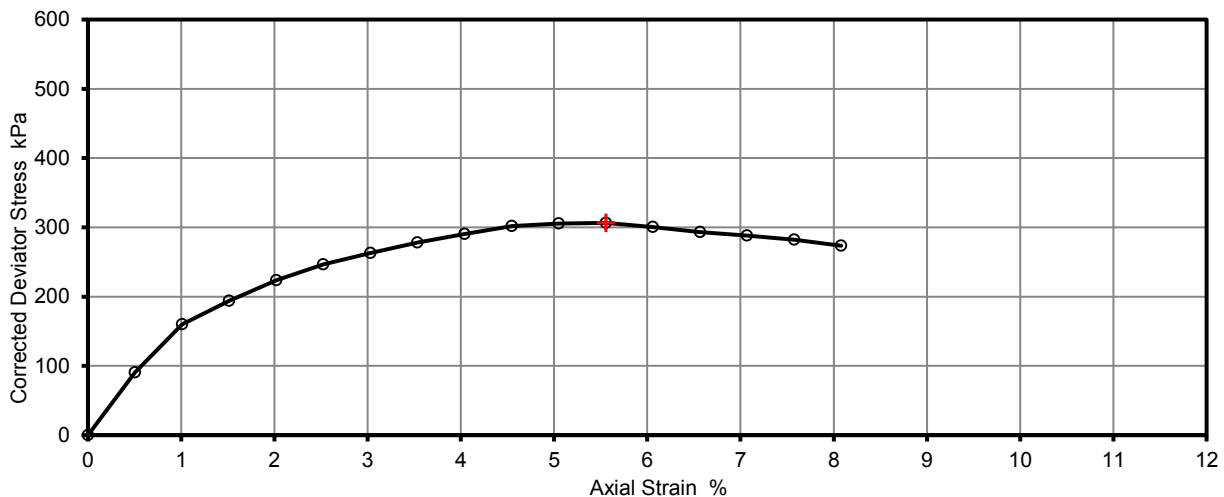
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	28098
				Borehole/Pit No.	BH 1
Site Name	Kearns, TCM House, Newport Rd, Hayes			Sample No.	2
Project No.	19-228.02	Client	Aviron	Depth Top	9.20 m
Soil Description	Very high strength brown silty CLAY with rare fine gravel			Depth Base	- m
				Sample Type	U
				Samples received	24/03/2020
				Schedules received	25/03/2020
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	23/04/2020

Remarks

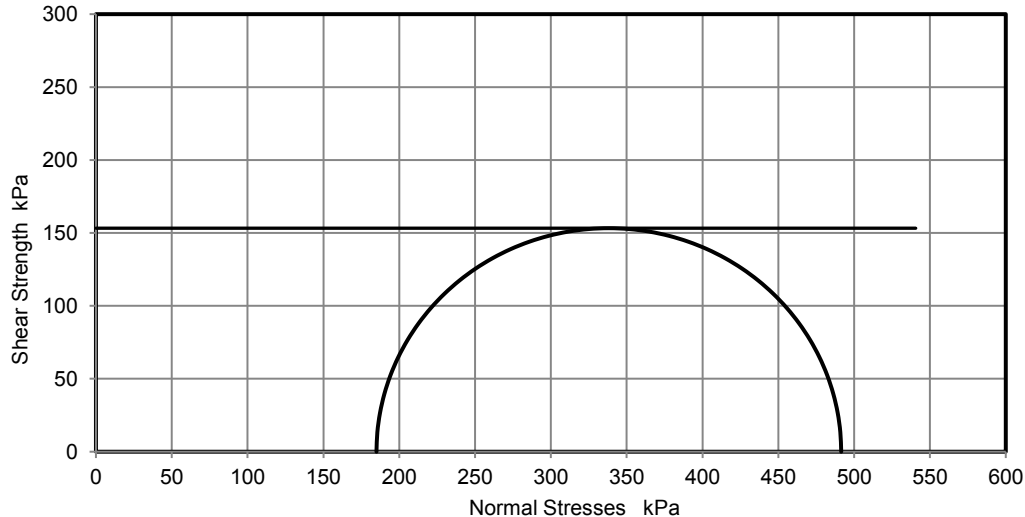
Position within sample

Test Number	1
Length	198.0 mm
Diameter	102.0 mm
Bulk Density	2.05 Mg/m ³
Moisture Content	25 %
Dry Density	1.64 Mg/m ³
Rate of Strain	2.0 %/min
Cell Pressure	185 kPa
Axial Strain	5.6 %
Deviator Stress, ($\sigma_1 - \sigma_3$)f	306 kPa
Undrained Shear Strength, cu	153 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ f
Mode of Failure	Brittle

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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



2519

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 24/04/2020

MSF-5 R7

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

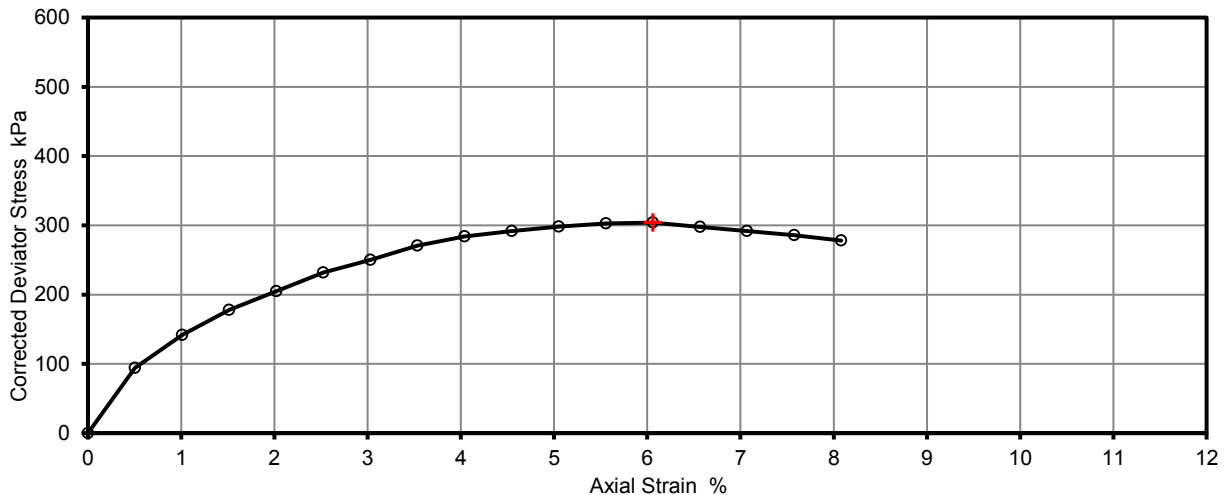
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	28098
				Borehole/Pit No.	BH 1
Site Name	Kearns, TCM House, Newport Rd, Hayes			Sample No.	3
Project No.	19-228.02	Client	Aviron	Depth Top	15.20 m
Soil Description	Very high strength greyish brown silty CLAY			Depth Base	- m
				Sample Type	U
				Samples received	24/03/2020
				Schedules received	25/03/2020
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	23/04/2020

Remarks

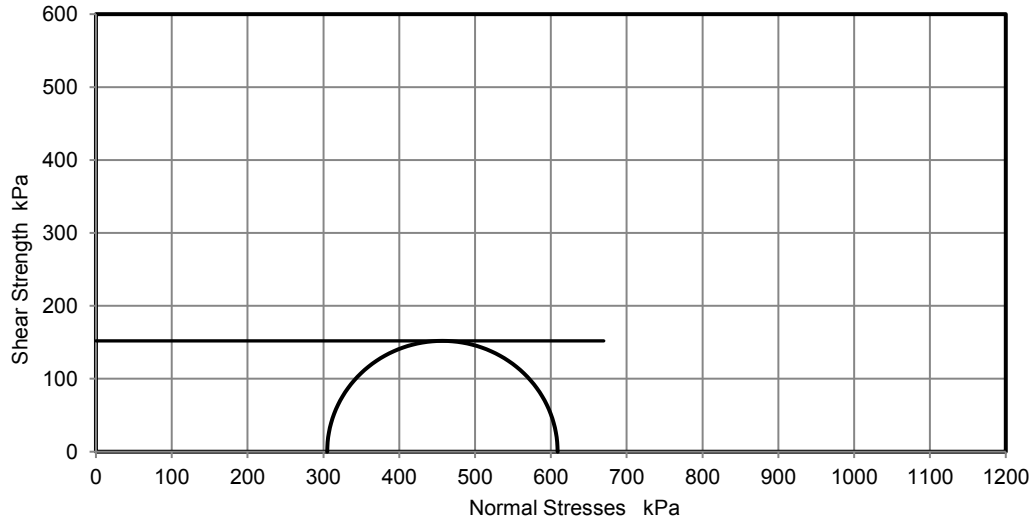
Position within sample

Test Number	1
Length	198.0 mm
Diameter	102.0 mm
Bulk Density	2.00 Mg/m ³
Moisture Content	28 %
Dry Density	1.56 Mg/m ³
Rate of Strain	2.0 %/min
Cell Pressure	305 kPa
Axial Strain	6.1 %
Deviator Stress, ($\sigma_1 - \sigma_3$) f	304 kPa
Undrained Shear Strength, cu	152 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ f
Mode of Failure	Brittle

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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



2519

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 24/04/2020

MSF-5 R7

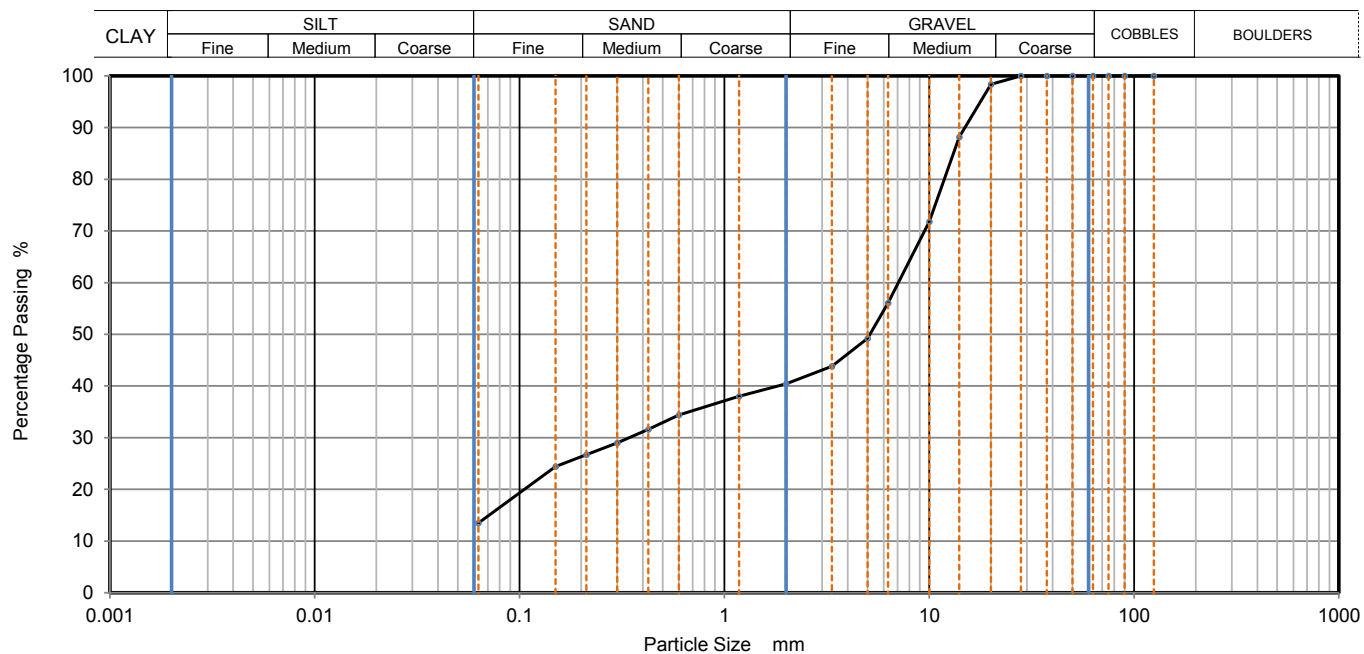
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)



PARTICLE SIZE DISTRIBUTION

Job Ref	28098
Borehole/Pit No.	WS4
Sample No.	-
Depth Top	1.50 m
Depth Base	- m
Sample Type	D
Samples received	24/03/2020
Schedules received	25/03/2020
Project started	26/03/2020
Date tested	22/04/2020

Site Name	Kearns, TCM House, Newport Rd, Hayes		
Project No.	19-228.02	Client	Aviron
Soil Description	Greyish brown and bluish grey clayey very sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	88		
10	72		
6.3	56		
5	49		
3.35	44		
2	40		
1.18	38		
0.6	34		
0.425	32		
0.3	29		
0.212	27		
0.15	24		
0.063	14		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	59.6
Sand	26.9
Fines <0.063mm	13.5

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with BS1377 unless noted below



K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU
Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved

Initials: J.P
Date: 24/04/2020

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

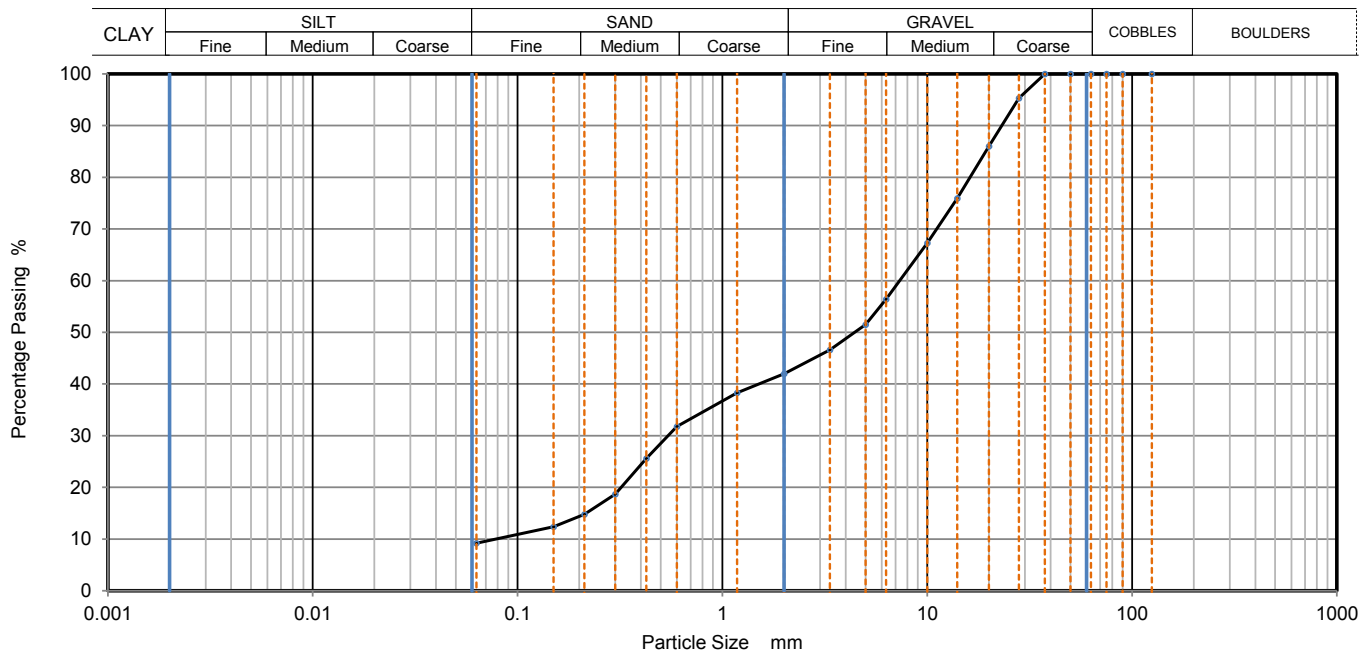
MSF-5-R3



PARTICLE SIZE DISTRIBUTION

Job Ref	28098
Borehole/Pit No.	WS4
Sample No.	-
Depth Top	2.40 m
Depth Base	2.60 m
Sample Type	B
Samples received	24/03/2020
Schedules received	25/03/2020
Project started	26/03/2020
Date tested	22/04/2020

Site Name	Kearns, TCM House, Newport Rd, Hayes		
Project No.	19-228.02	Client	Aviron
Soil Description	Orangish brown clayey very sandy GRAVEL (gravel is fmc and sub-angular to rounded)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	86		
14	76		
10	67		
6.3	56		
5	52		
3.35	47		
2	42		
1.18	38		
0.6	32		
0.425	26		
0.3	19		
0.212	15		
0.15	12		
0.063	9		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	58.0
Sand	32.7
Fines <0.063mm	9.2

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	95
Curvature Coefficient	0.52

Remarks
Preparation and testing in accordance with BS1377 unless noted below



K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU
Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved

Initials: J.P
Date: 24/04/2020

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

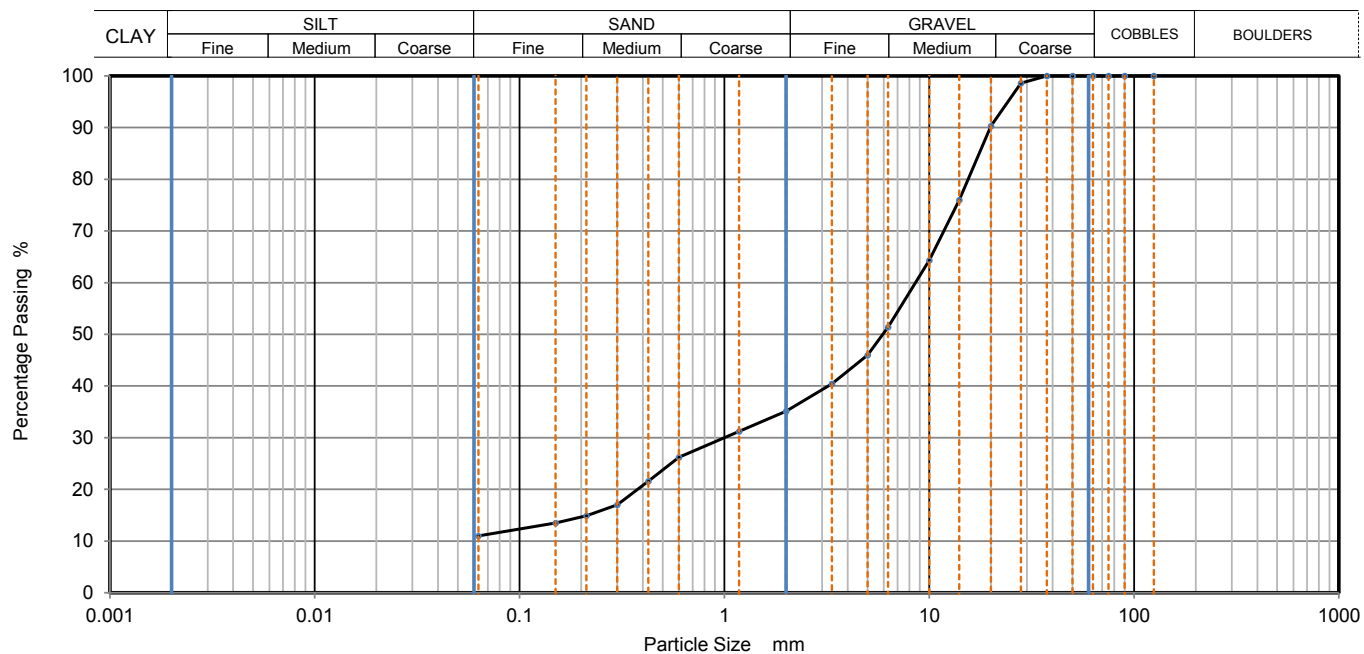
MSF-5-R3



PARTICLE SIZE DISTRIBUTION

Job Ref	28098
Borehole/Pit No.	BH 1
Sample No.	1
Depth Top	1.20 m
Depth Base	- m
Sample Type	B
Samples received	24/03/2020
Schedules received	25/03/2020
Project started	26/03/2020
Date tested	22/04/2020

Site Name	Kearns, TCM House, Newport Rd, Hayes		
Project No.	19-228.02	Client	Aviron
Soil Description	Brown greyish brown clayey very sandy GRAVEL (gravel is fmc and sub-angular to rounded)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	99		
20	90		
14	76		
10	64		
6.3	51		
5	46		
3.35	40		
2	35		
1.18	31		
0.6	26		
0.425	22		
0.3	17		
0.212	15		
0.15	14		
0.063	11		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	64.9
Sand	24.1
Fines <0.063mm	11.0

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with BS1377 unless noted below



K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU
Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved

Initials: J.P
Date: 24/04/2020

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

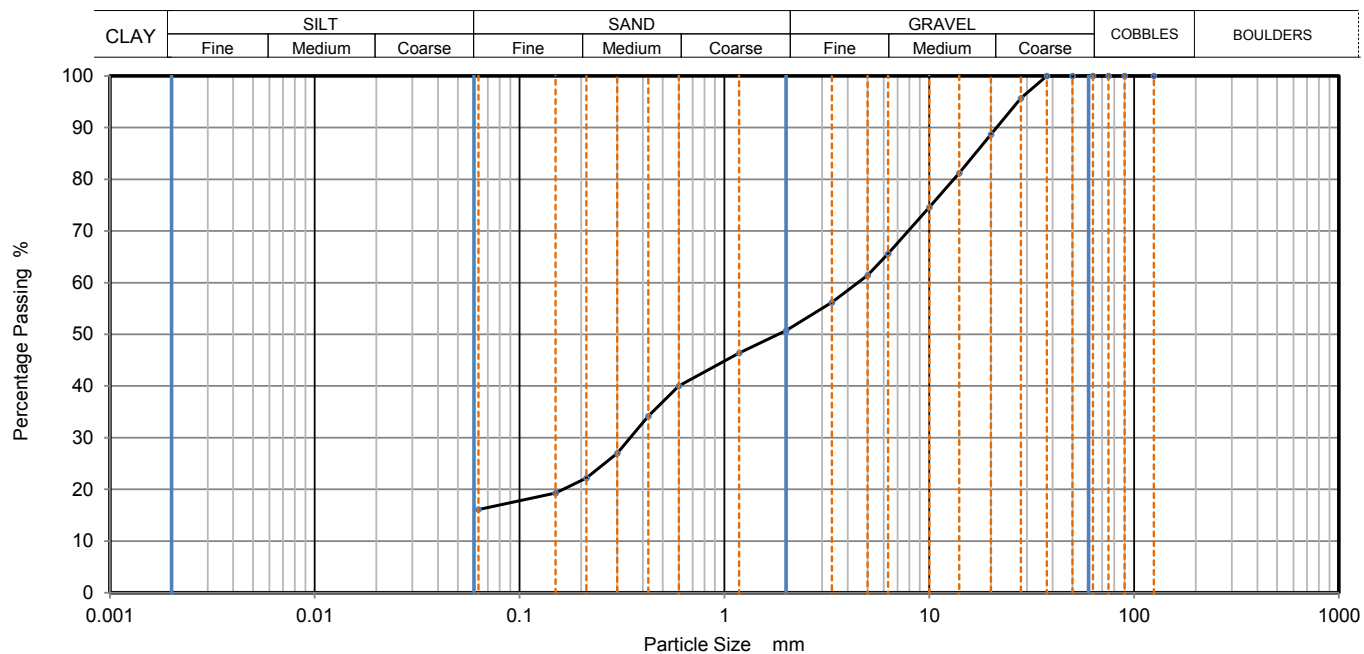
MSF-5-R3



PARTICLE SIZE DISTRIBUTION

Job Ref	28098
Borehole/Pit No.	BH 1
Sample No.	2
Depth Top	2.00 m
Depth Base	- m
Sample Type	B
Samples received	24/03/2020
Schedules received	25/03/2020
Project started	26/03/2020
Date tested	22/04/2020

Site Name	Kearns, TCM House, Newport Rd, Hayes		
Project No.	19-228.02	Client	Aviron
Soil Description	Greyish brown clayey very sandy GRAVEL (gravel is fmc and sub-angular to rounded)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	96		
20	89		
14	81		
10	75		
6.3	66		
5	61		
3.35	56		
2	51		
1.18	46		
0.6	40		
0.425	34		
0.3	27		
0.212	22		
0.15	19		
0.063	16		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	49.3
Sand	34.6
Fines <0.063mm	16.1

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with BS1377 unless noted below



K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU
Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved

Initials: J.P
Date: 24/04/2020

2519

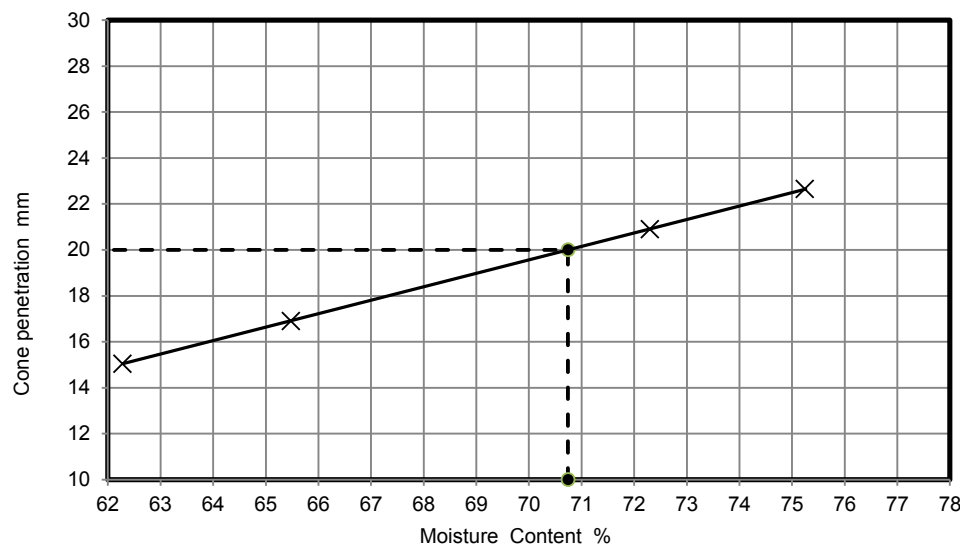
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

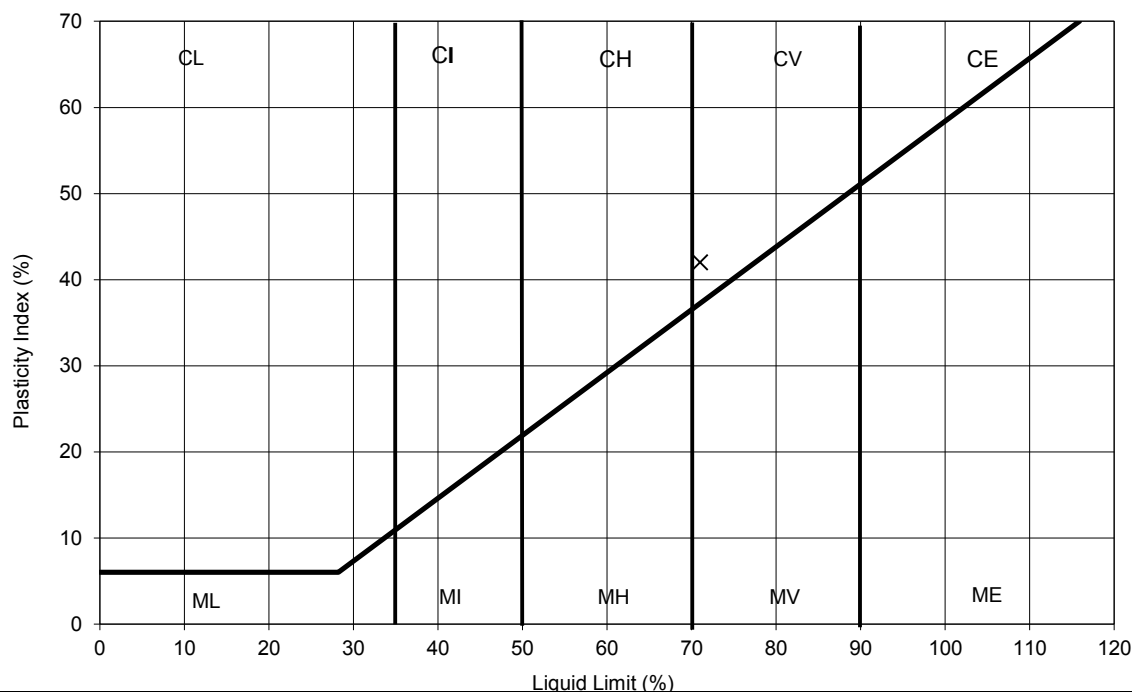
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	28098	
				Borehole/Pit No.	WS 2	
Site Name	Kearns, TCM House, Newport Rd, Hayes			Sample No.	-	
Project No.	19-228.02	Client	Aviron	Depth Top	2.90	m
Soil Description	Orangish brown slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular to rounded)			Depth Base	-	m
				Sample Type	D	
				Samples received	24/03/2020	
				Schedules received	25/03/2020	
				Project Started	26/03/2020	
				Date Tested	24/04/2020	



NATURAL MOISTURE CONTENT	27	%
% PASSING 425µm SIEVE	96	%
LIQUID LIMIT	71	%
PLASTIC LIMIT	29	%
PLASTICITY INDEX	42	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 30/04/2020



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 28098

Borehole/Pit No. WS3

Site Name Kearns, TCM House, Newport Rd, Hayes

Sample No. -

Project No. 19-228.02

Client

Aviron

Depth Top 1.20 m

Depth Base - m

Sample Type D

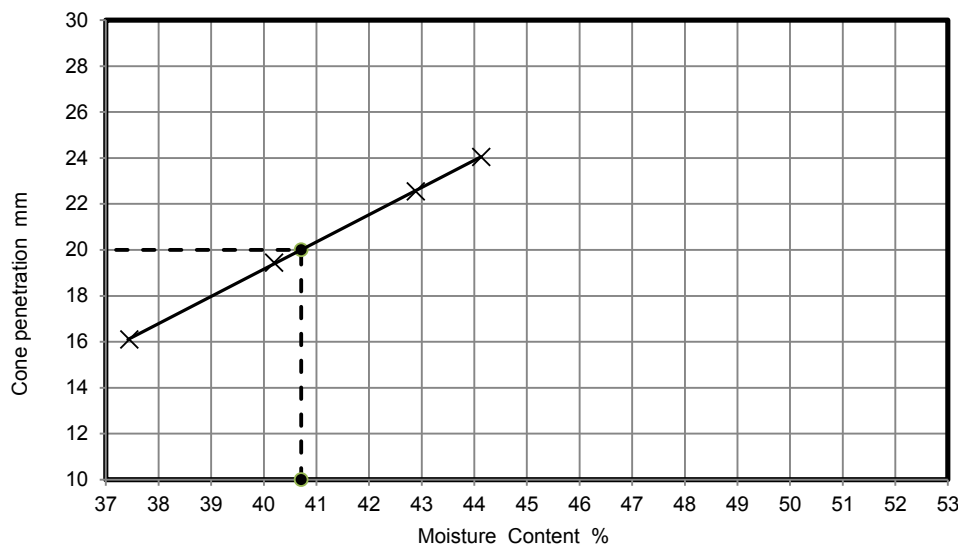
Samples received 24/03/2020

Schedules received 25/03/2020

Project Started 26/03/2020

Date Tested 24/04/2020

Soil Description Grey slightly gravelly sandy silty CLAY with occasional roots and rootlets (gravel is fmc and sub-angular to sub-rounded)



NATURAL MOISTURE CONTENT

21 %

% PASSING 425µm SIEVE

71 %

LIQUID LIMIT

41 %

PLASTIC LIMIT

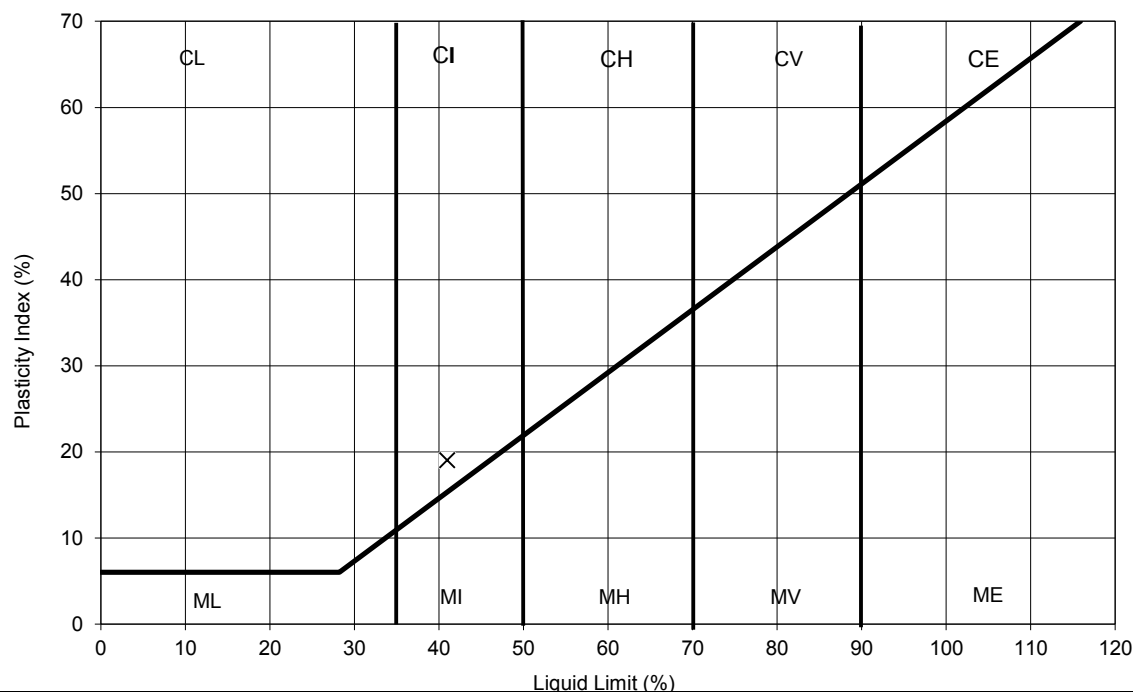
22 %

PLASTICITY INDEX

19 %

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 30/04/2020

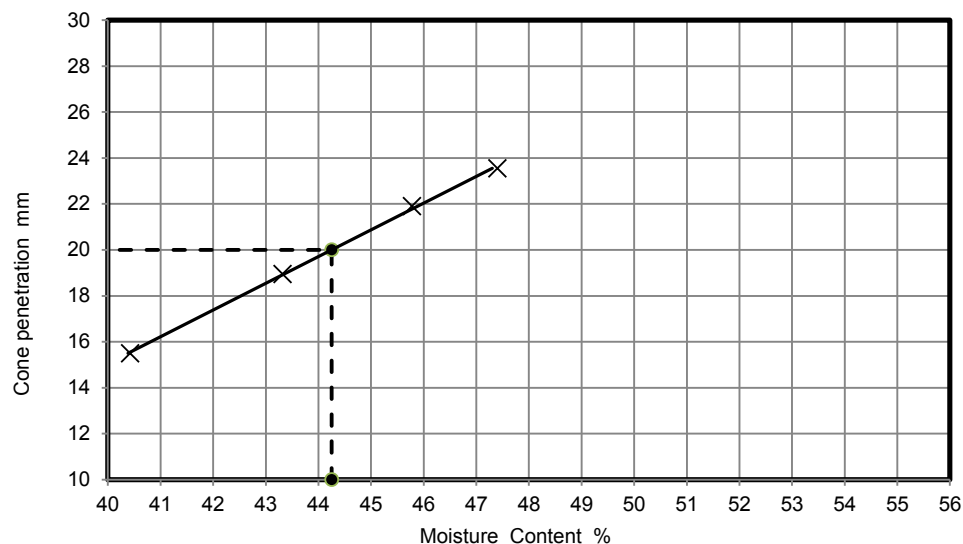
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

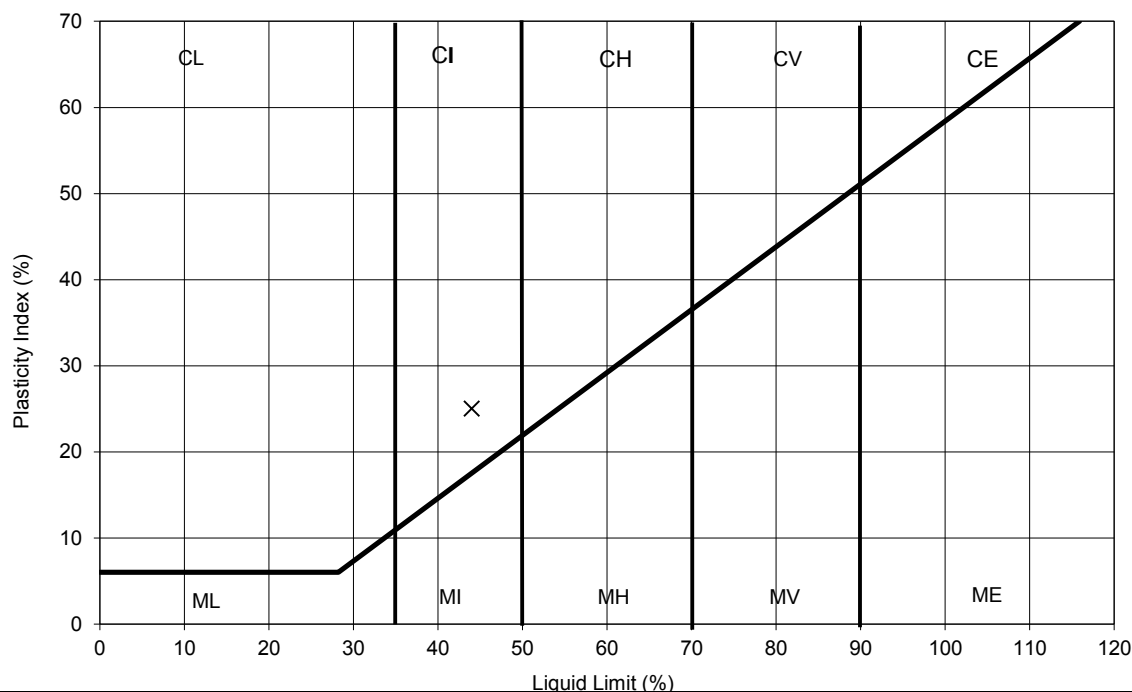
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	28098	
				Borehole/Pit No.	WS4	
Site Name	Kearns, TCM House, Newport Rd, Hayes			Sample No.	-	
Project No.	19-228.02	Client	Aviron	Depth Top	1.50	m
Soil Description	Greyish brown and bluish grey clayey very sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)			Depth Base	-	m
				Sample Type	D	
				Samples received	24/03/2020	
				Schedules received	25/03/2020	
				Project Started	26/03/2020	
				Date Tested	24/04/2020	



NATURAL MOISTURE CONTENT	11	%
% PASSING 425µm SIEVE	32	%
LIQUID LIMIT	44	%
PLASTIC LIMIT	19	%
PLASTICITY INDEX	25	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

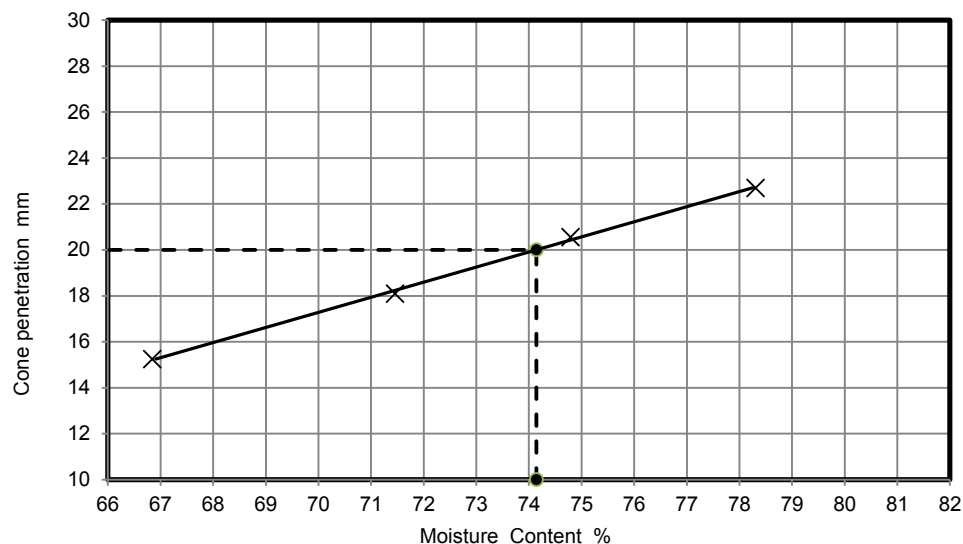
Initials: J.P

Date: 30/04/2020



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

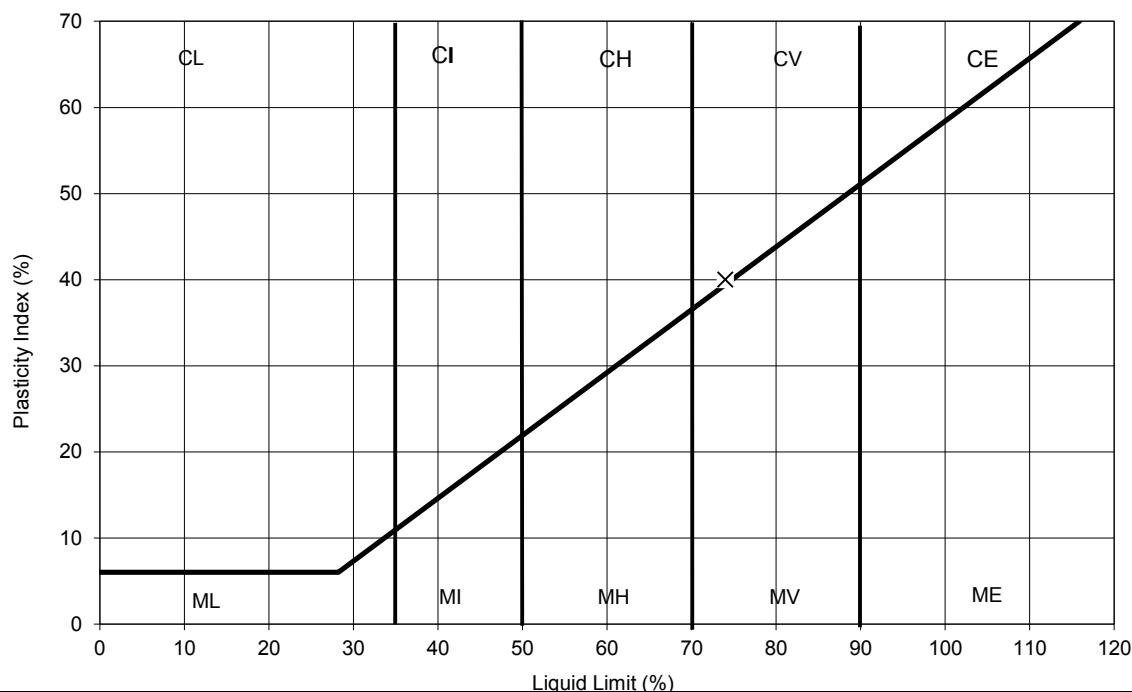
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	28098	
				Borehole/Pit No.	WS4	
Site Name	Kearns, TCM House, Newport Rd, Hayes			Sample No.	-	
Project No.	19-228.02	Client	Aviron	Depth Top	2.80	m
Soil Description	Brown silty CLAY			Depth Base	-	m
				Sample Type	D	
				Samples received	24/03/2020	
				Schedules received	25/03/2020	
				Project Started	26/03/2020	
				Date Tested	24/04/2020	



NATURAL MOISTURE CONTENT	30	%
% PASSING 425µm SIEVE	100	%
LIQUID LIMIT	74	%
PLASTIC LIMIT	34	%
PLASTICITY INDEX	40	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 30/04/2020

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2

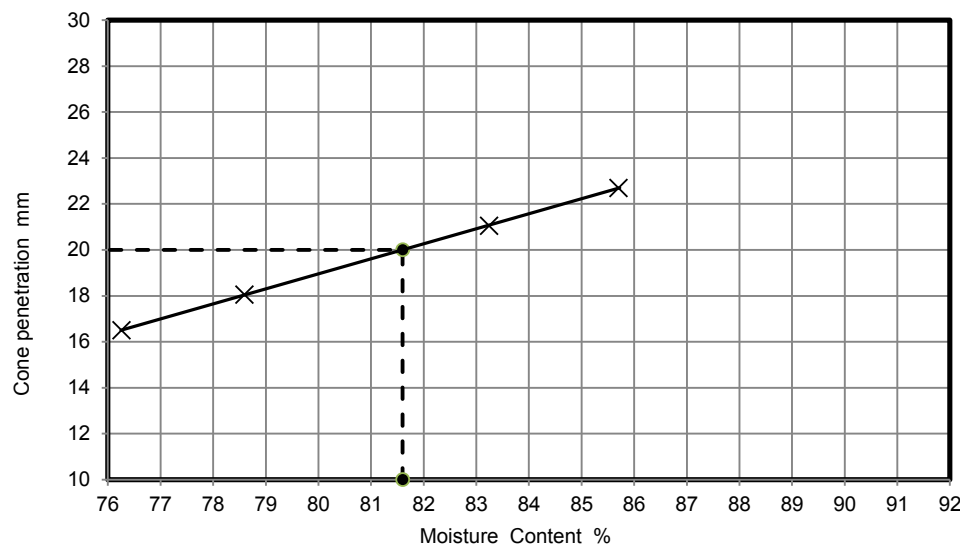


2519



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

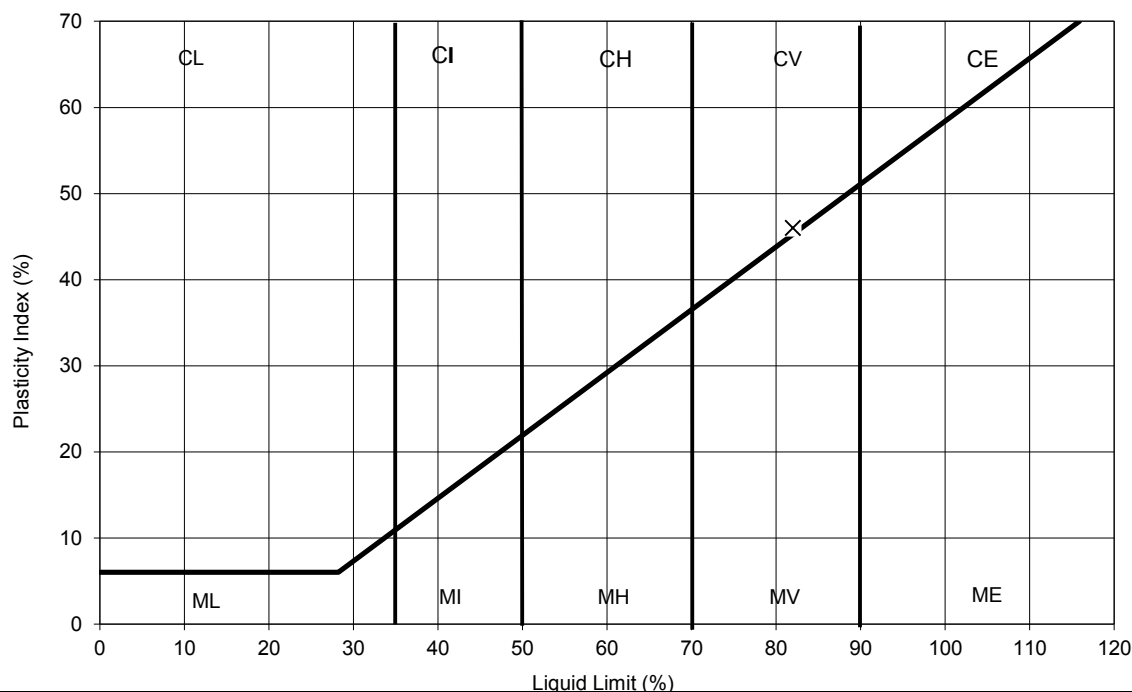
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	28098	
				Borehole/Pit No.	WS6	
Site Name	Kearns, TCM House, Newport Rd, Hayes			Sample No.	-	
Project No.	19-228.02	Client	Aviron	Depth Top	2.00	m
Soil Description	Brown slightly mottled bluish grey silty CLAY			Depth Base	-	m
				Sample Type	D	
				Samples received	24/03/2020	
				Schedules received	25/03/2020	
				Project Started	26/03/2020	
				Date Tested	24/04/2020	



NATURAL MOISTURE CONTENT	33	%
% PASSING 425µm SIEVE	100	%
LIQUID LIMIT	82	%
PLASTIC LIMIT	36	%
PLASTICITY INDEX	46	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 30/04/2020

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2

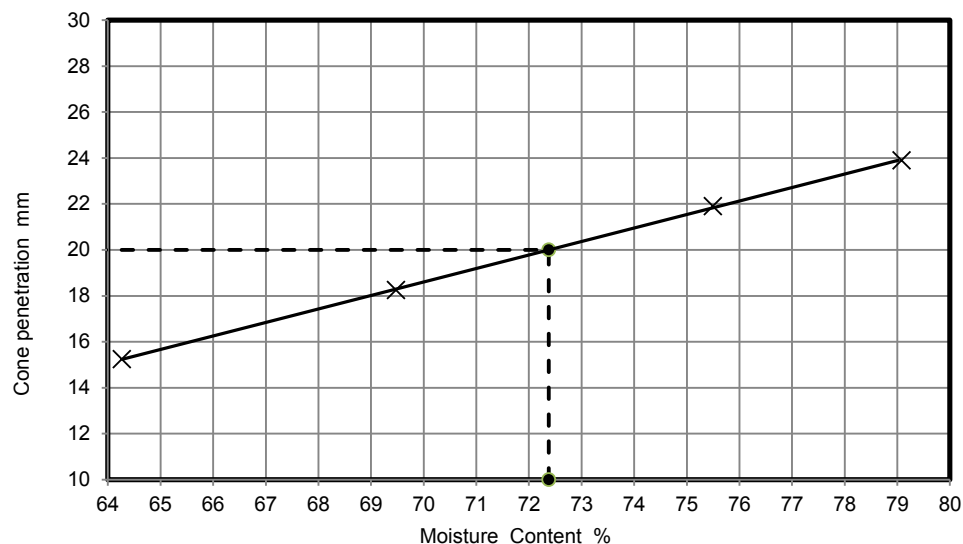


2519



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

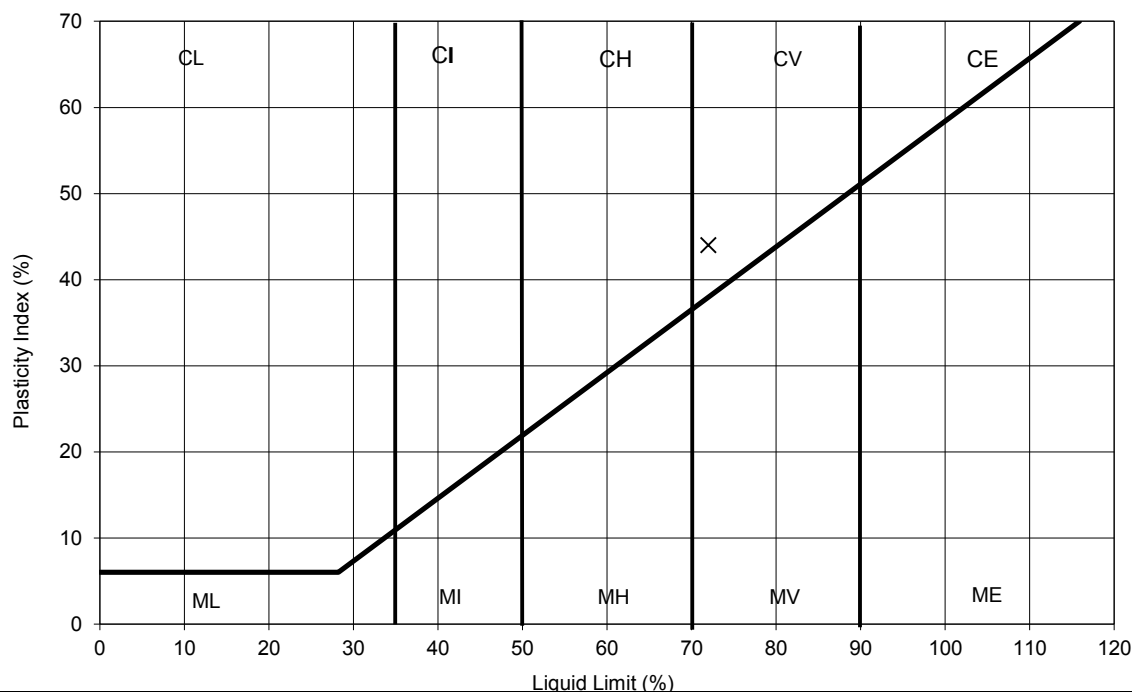
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	28098	
				Borehole/Pit No.	BH 1	
Site Name	Kearns, TCM House, Newport Rd, Hayes			Sample No.	-	
Project No.	19-228.02	Client	Aviron	Depth Top	3.20	m
Soil Description	Medium strength greyish brown silty CLAY with fine sand pockets			Depth Base	-	m
				Sample Type	U	
				Samples received	24/03/2020	
				Schedules received	25/03/2020	
				Project Started	26/03/2020	
				Date Tested	27/04/2020	



NATURAL MOISTURE CONTENT	32	%
% PASSING 425µm SIEVE	100	%
LIQUID LIMIT	72	%
PLASTIC LIMIT	28	%
PLASTICITY INDEX	44	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

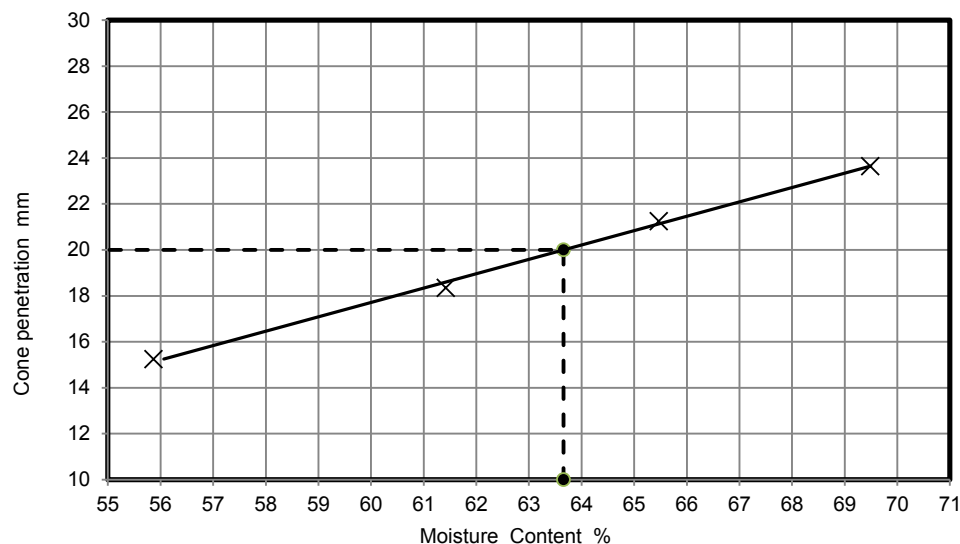
Initials: J.P

Date: 30/04/2020



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

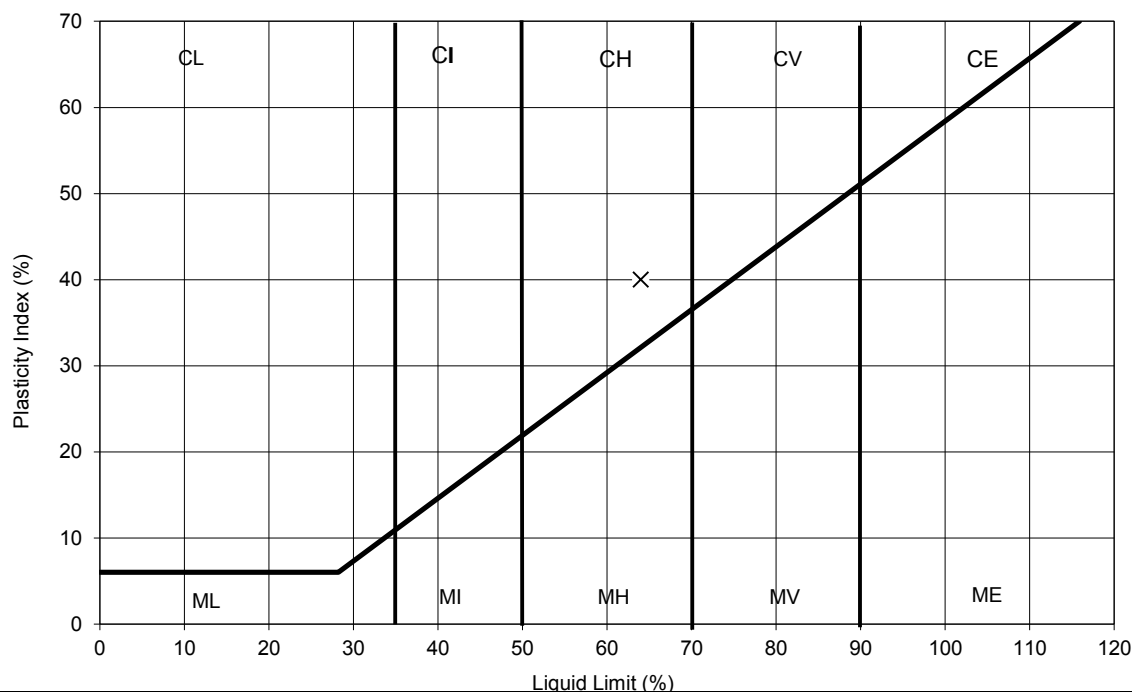
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	28098	
				Borehole/Pit No.	BH 1	
Site Name	Kearns, TCM House, Newport Rd, Hayes			Sample No.	-	
Project No.	19-228.02	Client	Aviron	Depth Top	9.20	m
Soil Description	Very high strength brown silty CLAY with rare fine gravel			Depth Base	-	m
				Sample Type	U	
				Samples received	24/03/2020	
				Schedules received	25/03/2020	
				Project Started	26/03/2020	
				Date Tested	27/04/2020	



NATURAL MOISTURE CONTENT	26	%
% PASSING 425µm SIEVE	99	%
LIQUID LIMIT	64	%
PLASTIC LIMIT	24	%
PLASTICITY INDEX	40	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 30/04/2020

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2

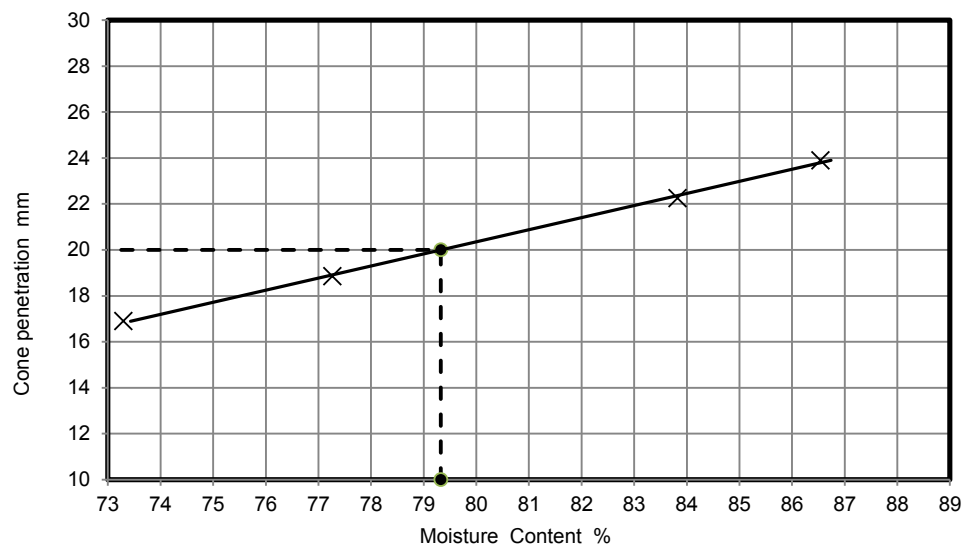


2519



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

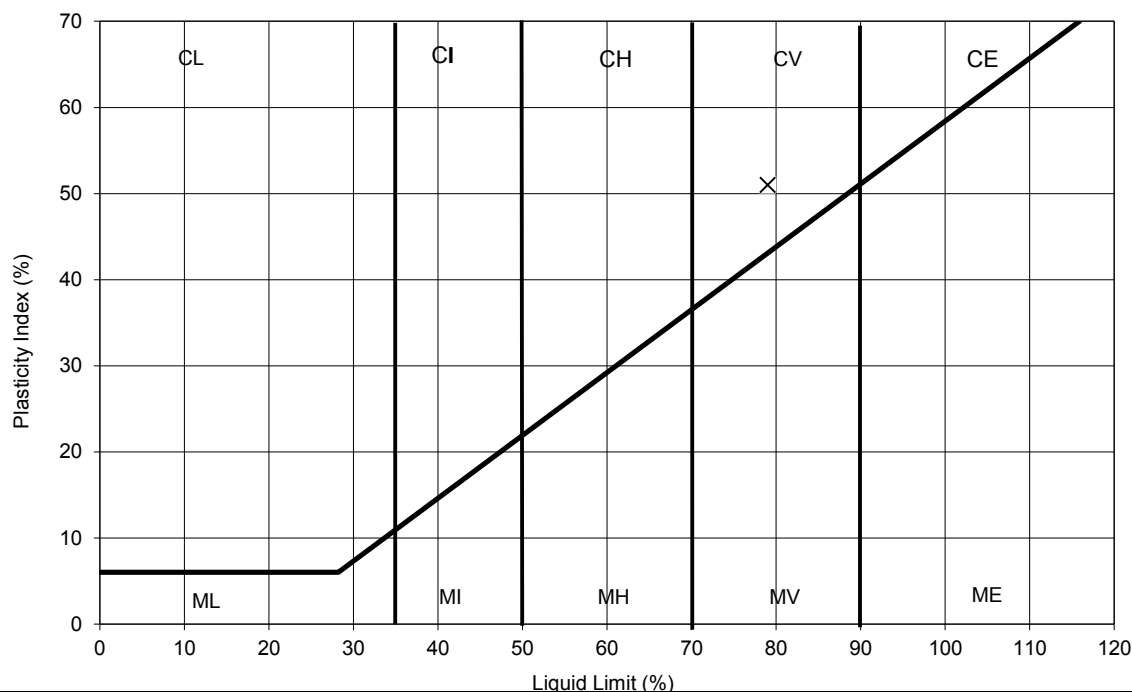
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	28098	
				Borehole/Pit No.	BH 1	
Site Name	Kearns, TCM House, Newport Rd, Hayes			Sample No.	-	
Project No.	19-228.02	Client	Aviron	Depth Top	15.20	m
Soil Description	Very high strength greyish brown silty CLAY			Depth Base	-	m
				Sample Type	U	
				Samples received	24/03/2020	
				Schedules received	25/03/2020	
				Project Started	26/03/2020	
				Date Tested	27/04/2020	



NATURAL MOISTURE CONTENT	29	%
% PASSING 425µm SIEVE	100	%
LIQUID LIMIT	79	%
PLASTIC LIMIT	28	%
PLASTICITY INDEX	51	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 30/04/2020

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



2519

AVIRON ASSOCIATES LIMITED

is a dynamic company of Chartered Environmental Surveyors and Geotechnical Engineers.

We continuously work hard to ensure our services are the most technically competent, efficient and viable in our market place. Our years of experience of vastly varied sites and projects compliment our ability to deliver assured and effective Ground Investigations and Risk Assessments of both Brownfield, Greenfield and Currently Developed Land.

Our clients choose Aviron to plan, design and manage their Ground Investigations and Land Remediation Schemes assisting in land procurement to deliver engineering requirements, discharge planning and ensure their sites are suitable, developable and sustainable.

Our tenaciously committed team ensure regardless of project value we will always deliver quickly, effectively and exceed expectations.



AVIRON ASSOCIATES LIMITED

Badgemore House
Badgemore Park
Gravel Hill
Henley on Thames
Oxfordshire
RG9 4NR

TELEPHONE: 07787 771 686 / 01491 413 722

FAX : 01491 413 722

ENQUIRIES: james@aviron.co.uk

WEB: www.aviron.co.uk