J Greenwood (Builders) Limited

Unit B9 Greengate Industrial Estate

Greenside Way

Chadderton

M24 1SW

Date: 19th January 2024

LKC Reference: LKC 23 1687-B1-G1

RE: FRANCIS ROAD, WITHINGTON – SITE INVESTIGATION REPORT

1. Introduction

LK Consult Ltd (LKC) has been appointed by J Greenwood (Builders) Ltd to provide a geotechnical investigation report for Francis Road, Withington.

LKC carried out Phase 1 Preliminary Risk Assessment (ref. LKC 21 1501-01), dated 09/21) and a subsequent pre-demolition Phase 2 Ground Investigation (ref. LKC 21 1501-02, dated November 2022).

The Phase 2 report recommended that further boreholes were drilled in order to provide deeper geotechnical information and to delineate the areas where contamination was encountered. The works were to be completed following demolition to allow full access to the site.

Notwithstanding the above, a piled foundation design was being considered and it was requested that a borehole be progressed to rockhead and c. 5m core was recovered to inform the piling contractor's pile design.

2. Summary of Existing Information

A summary of pertinent information from the above reports is provided in Table 2-1.

Site Location	Located north of Francis Road, north east of Kingslea House, Withington, Manchester. Centred at approximate National Grid Reference 385318E 392339N (Figure 1).
Site Area	Approximately 1,600m^2
Current Site Use & Pertinent Features	Vacant employment building.
Geology / Hydrogeology	Superficial: Till, Devensian (diamicton). Secondary (Undifferentiated) Aquifer. Bedrock: Wilmslow Sandstone Formation (sandstone), Lower Coal Measures. Principal Aquifer.
Date of Ground Investigation:	21st October 2022.
Intrusive Investigation Work Undertaken:	4no. window sample boreholes (WS101-WS104).
Monitoring Wells:	Installed in all boreholes.
Soil Sampling:	1no. sample tested for metals, speciated PAHs, pH, sulphate, asbestos and SOM. 4no. samples tested for metals, speciated PAHs, cyanide, pH, sulphate, asbestos, phenol, TPHCWG, BTEX, VOCs, SVOCs and SOM.
Groundwater Sampling:	Insufficient groundwater.
Monitoring:	1no. groundwater monitoring visit.
Insitu and Laboratory Geotechnical Testing:	SPTs, pocket penetrometer tests. 1no. Atterberg Limit test. 2no. PSD tests. 3no. samples tested for BRE SD1 Suite (pH and sulphate).
Ground Conditions	Made Ground to approx. 0.9 – 1.40mbgl. Stiff CLAY to approx. 1.10m-2.10mbgl over medium dense, becoming very dense SAND to the completion depths of the boreholes. Groundwater not encountered during the investigation works.

Table 2-1: Summary of pertinent available information.

3. Exploratory Field Work

The exploratory fieldwork was undertaken on 4th January 2024 and comprised the following:

- 1no. rotary borehole drilled to 10.50 metres below ground level (mbgl) (ref. RH101).

A hand dug pit was dug to 1.2mbgl to ensure avoidance of underground services in the drilling location.

The rotary borehole was drilled in order to investigate the ground conditions at the property.

The scope of works and proposed exploratory hole location was provided by J Greenwood (Builders) Ltd in discussion with their piling contractor. The exploratory hole was positioned to the rear yard of the existing property.

The exploratory hole location is presented in Figure 2.

The profile log is presented in Appendix A and is in line with BS14688-1[1] and BS5930[2]. Photographs of the core boxes are provided in Appendix B.

Durgin the fieldwork the drillers indicated sandstone bedrock at 3.9mbgl. Coring commenced at 4.5mbgl until 10.50mbgl i.e. to a nominal depth of 6.6m into the bedrock.

3.1 Geotechnical Testing

Samples of the rock core were submitted for Point Load Tests and the details are summarised in Table 3-1 below. Certificates of Analysis are provided in Appendix C.

Test	No. Samples	Location	Justification
Point Load Test (PLT)	10	7.06-7.11 7.11-7.20 7.93-7.99 8.25-8.35 8.60-8.68 9.11-9.19 9.98-10.09	Samples across the borehole tested to estimate uniaxial compressive strength.

Table 3-1: Summary of geotechnical testing undertaken.

3.2 Soil Sampling (Contamination)

As further contamination testing was recommended in the previous contamination report the opportunity to collect a further sample was taken. A sample of approximately 500g was recovered in an amber jar and plastic tub and sent to DETS laboratory for chemical testing.

Many of the contamination tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix D. Table 3-2 summarises the soil testing undertaken.

Testing	No. Samples	Justification
Metals / metalloids, pH, sulphate, cyanide suite, TPHCWG, BTEX, MTBE, speciated PAHs, phenol, and hardness.	1	1no. Contamination sample taken in advance of demolition of existing buildings.

Table 3-1: Summary of Soil Testing.

Notes:

If asbestos present during screen identification and quantification will be undertaken.

Metal/metalloids=arsenic, cadmium, chromium, (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc, and boron; TPHCWG=carbon banded and aromatic/aliphatic split petroleum hydrocarbons; PAH=polycyclic aromatic hydrocarbons, BTEX=benzene, toluene, ethylbenzene, and xylenes; MTBE=Methyl tert-butyl ether, SOM=Soil Organic Matter.

[1] British Standards (2002) Geotechnical investigation and testing – Identification and Classification of Soil. Part 1: Identification and description. BS EN ISO 14688-1:2002.

[2] British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.

4. Ground Conditions

4.1 Made Ground

Made ground was recorded in the exploratory hole to 1.20mbgl. The made ground comprised tarmac over concrete. This was underlain by gravelly clayey SAND with anthropogenic material including: ash, clinker, brick and tarmacadam fragments.

With the exception of the anthropogenic material encountered in the made ground (as described above), no further contamination was identified.

4.2 Natural Strata

Natural strata in RH101 comprised CLAY to a depth of 2.50mbgl underlain by SAND to a depth of 3.90mbgl. Sandstone was recorded by the drillers from 3.90mbgl. Coring has proven SANDSTONE to 10.50mbgl.

4.3 Groundwater

No groundwater strike was recorded in the rotary borehole.

5. Summary Conclusions

Within the borehole made ground extends to a depth of 1.20mbgl with brown CLAY until 2.50mbgl. Brown SAND with gravel and clay bands was recorded to 3.90mbgl. This corroborates the findings of the previous shallow window sample boreholes. SANDSTONE bedrock was encountered from 3.90mbgl and proven to 10.50mbgl.

Coring was undertaken in the sandstone bedrock between 4.50-10.50mbgl. No recovery was possible between 4.50-6.50mbgl.

The RQD varies between 9 and 32 over the length of the recovered core.

Point Load Tests were undertaken from variable depths within the recovered sandstone rock core. These tests ranged from 7.06 – 10.09mbgl with diametric I_s values ranged between 0.01-0.03mpa and Axial values ranging between 0.03-0.18mpa.

The contamination test results were all below applicable "residential" generic assessment criteria.

We trust the above and enclosed is of interest. Should you have any queries please do not hesitate to contact.

Report prepared by:	**Report reviewed by:**
Alex Evans	**Rosie Cummings**
Geo-Environmental Engineer	**Principal Geoenvironmental Consultant**

ENC:

Figures:

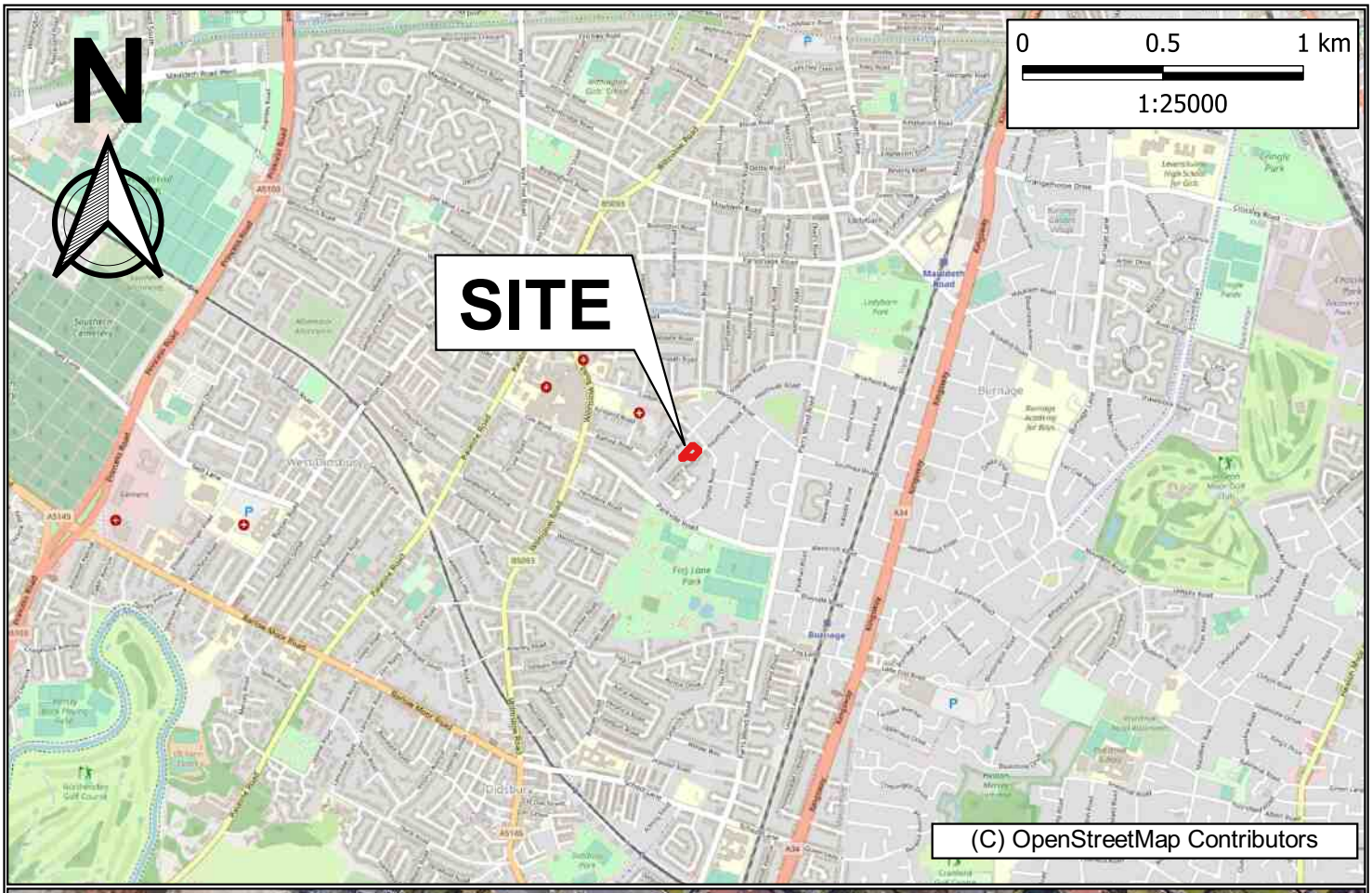
Appendix A: Profile Log

Appendix B: Core Photographs

Appendix C: Certificates of Analysis - Point Load Tests

Appendix D: Certificates of Analysis - Soil Contamination

Figures:



Client: J Greenwood (Builders) Ltd		Title: Site Location & Boundary Plan	
Site: Francis Road, Withington		Scale (see scale bar): 1:25,000 & 1:1500 @ A4	Figure: 1
Job No.: LKC 23 1687	Drawn By: RW	Checked By: CC	Drawn: Jan 2024

LK CONSULT

KEY

Site Boundary

Rotary Borehole (RH)

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

LK CONSULT LIMITED

Client: J Greenwood (Builders) Limited

Site: Francis Road, Withington

Title: Site Investigation Location Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 23 1687	See Scale Bar	2	

Drawn By:	Checked By:	Drawn:
AC	AE	Jan 2024

Appendix A: Profile Log

Rotary Core Log

Location Number: **RH101**

Project Name: Francis Road, Withington	Client: J Greenwood (Builders) Limited	Date: 04/01/2024
Project No. : LKC 23 1687	Contractor: Taylor Drilling Services Ltd	

Level	Logged By	Scale	Page Number
	AE	1:30	Sheet 1 of 2

Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Field Records	Depth (m)	Legend	Stratum Description	Level (m)
						0.10		MADE GROUND: TARMACADAM.	
0.20 - 0.80						0.20		MADE GROUND: CONCRETE.	
								MADE GROUND: Dark brown gravelly SAND with frequent ash, occasional tarmacadam fragments. Sand is fine to coarse. Gravel is fine to medium and subangular to subrounded comprising ash and clinker.	
0.80 - 1.20						0.80		MADE GROUND: Dark brown gravelly clayey SAND with occasional clinker, rare ash and brick. Sand is fine to coarse. Gravel is fine to medium and subangular comprising sandstone and mudstone.	
						1.20		Drillers Description: Brown CLAY.	
						2.50		Drillers Description: Brown SANDS with gravel and clay bands.	
						3.90		Drillers Description: SANDSTONE.	
	0	0	0	NR	No recovery between 4.50 and 6.50mbgl.	4.50		No recovery	

Hole Diameter		Casing Diameter		Water Strike Details		Chiselling		
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Time Elapsed (mins)	Depth Water (m)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)
10.50	127	10.50	114					

Remarks:
Hand dug to 1.2mbgl.
Open hole coring to 4.5mbgl.
Coring from 4.5mbgl to 10.5mbgl.

Rotary Core Log

Location Number: **RH101**

Project Name: Francis Road, Withington	Client: J Greenwood (Builders) Limited	Date: 04/01/2024
Project No. : LKC 23 1687	Contractor: Taylor Drilling Services Ltd	
	Level	Logged By: AE
		Scale: 1:30
		Page Number: Sheet 2 of 2

Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Field Records	Depth (m)	Legend	Stratum Description	Level (m)
					No recovery between 4.50 and 6.50mbgl.			No recovery	
	45	25	9	NI	Non-Intact	6.50		Reddish brown SANDSTONE recovered as coarse angular gravel.	
						6.65		Strong slightly weathered thinly to thickly laminated reddish brown fine to medium grained SANDSTONE.	
				NI	Non-Intact				
				12	Closely spaced, tight and open, sub-horizontal (5°-10°), clean, undulating and planar, rough and smooth discontinuities.				
				NI	Non-Intact				
	76	69	32	10	Closely spaced, tight and open, sub-horizontal (5°-15°), clean, planar, rough and smooth discontinuities.				
				NR	No recovery between 8.25mbgl and 8.50mbgl.				
				16	Closely spaced, tight and open, sub-horizontal (5°-25°), clean, undulating and planar, rough and smooth discontinuities.				
				20	Closely spaced, tight and open, sub-horizontal (5°-20°), clean, undulating and planar, rough and smooth discontinuities.				
				20	Closely spaced, tight and open, sub-horizontal (5°-15°), clean, undulating and planar, rough and smooth discontinuities.				
	99	79	25	12	Closely spaced, tight and open, sub-horizontal (5°-25°), clean, undulating and planar, rough and smooth discontinuities.				
				NI	Non-Intact				
						10.50		End of Borehole at 10.50m	

Hole Diameter		Casing Diameter		Water Strike Details		Chiselling		
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Time Elapsed (mins)	Depth Water (m)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)
10.50	127	10.50	114					

Remarks:
Hand dug to 1.2mbgl.
Open hole coring to 4.5mbgl.
Coring from 4.5mbgl to 10.5mbgl.

Appendix B: Core Photographs

Appendix C: Certificates of Analysis - Point Load Tests

LK GROUP
Unit 29 Eton Business Park
Eton Hill Road, Radcliffe
Manchester, M26 2ZS

Client	**J Greenwood (Builders) Ltd**
Site	**Francis Road, Withington**
Job No.	**LKC 23 1687**

Exploratory Hole: **RH101**

Depth (m)	Test Type*	D (mm)	W (mm)	Load (P) (kN)	D_E^2 (mm^2)	I_S (Mpa)	F	$I_{S\,(50)}$ (MPa)
7.06-7.11	A	46.3	76.3	0.52	4503	0.11	1.14	0.13
7.11-7.20	D	94.9	75.5	0.21	9002	0.02	1.33	0.03
7.11-7.20	A	47.6	75.5	0.15	4574	0.03	1.15	0.04
7.93-7.99	A	65.1	74.6	0.25	6812	0.04	1.23	0.05
8.25-8.35	D	122.8	74.9	0.18	15068	0.01	1.50	0.02
8.25-8.35	A	70.2	74.9	0.92	6694	0.13	1.25	0.16
8.60-8.68	A	82.3	75.4	1.49	7902	0.18	1.30	0.23
9.11-9.19	D	84.4	74.8	0.20	7117	0.03	1.27	0.03
9.11-9.19	A	49.2	74.8	0.70	4686	0.14	1.15	0.16
9.98-10.09	D	83.0	73.6	0.11	6889	0.01	1.26	0.02
9.98-10.09	A	47.0	73.6	0.35	4405	0.07	1.14	0.08

Tested: **AE** **Checked:** **CC**

Date: **10/01/2024** **Date:** **15/01/2024**

Appendix D: Certificates of Analysis - Soil Contamination

Colin Crompton
LK Consult Limited
Unit 29 Eton Business Park
Eton Hill Road
Manchester
M26 2ZS

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 24-00126

Site Reference:	Francis Road, Withington
Project / Job Ref:	LKC 23 1687
Order No:	LKC231687-CC
Sample Receipt Date:	08/01/2024
Sample Scheduled Date:	08/01/2024
Report Issue Number:	1
Reporting Date:	11/01/2024

Authorised by:

Steve Knight
Customer Support Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 24-00126	**Date Sampled**	05/01/24				
LK Consult Limited	**Time Sampled**	None Supplied				
Site Reference: Francis Road, Withington	**TP / BH No**	RH101				
Project / Job Ref: LKC 23 1687	**Additional Refs**	None Supplied				
Order No: LKC231687-CC	**Depth (m)**	0.20 - 0.80				
Reporting Date: 11/01/2024	**DETS Sample No**	692867				

Determinand	**Unit**	**RL**	**Accreditation**					
Asbestos Screen (S)	N/a	N/a	**ISO17025**	Not Detected				
pH	pH Units	N/a	**MCERTS**	8.0				
Total Cyanide	mg/kg	< 1	NONE	< 1				
Free Cyanide	mg/kg	< 1	NONE	< 1				
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	**MCERTS**	801				
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	**MCERTS**	0.80				
Organic Matter (SOM)	%	< 0.1	**MCERTS**	19.2				
Arsenic (As)	mg/kg	< 2	**MCERTS**	30				
W/S Boron	mg/kg	< 1	NONE	1.1				
Cadmium (Cd)	mg/kg	< 0.2	**MCERTS**	0.2				
Chromium (Cr)	mg/kg	< 2	**MCERTS**	17				
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2				
Copper (Cu)	mg/kg	< 4	**MCERTS**	182				
Lead (Pb)	mg/kg	< 3	**MCERTS**	35				
Mercury (Hg)	mg/kg	< 1	**MCERTS**	< 1				
Nickel (Ni)	mg/kg	< 3	**MCERTS**	47				
Selenium (Se)	mg/kg	< 2	**MCERTS**	< 2				
Vanadium (V)	mg/kg	< 1	**MCERTS**	52				
Zinc (Zn)	mg/kg	< 3	**MCERTS**	42				
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

DETS Ltd
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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 24-00126	**Date Sampled**	05/01/24				
LK Consult Limited	**Time Sampled**	None Supplied				
Site Reference: Francis Road, Withington	**TP / BH No**	RH101				
Project / Job Ref: LKC 23 1687	**Additional Refs**	None Supplied				
Order No: LKC231687-CC	**Depth (m)**	0.20 - 0.80				
Reporting Date: 11/01/2024	**DETS Sample No**	692867				

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1				
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1				
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluoranthene	mg/kg	< 0.1	MCERTS	0.13				
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1				
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6				

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Rose Lane
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Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - TPH CWG Banded						
DETS Report No: 24-00126	**Date Sampled**	05/01/24				
LK Consult Limited	**Time Sampled**	None Supplied				
Site Reference: Francis Road, Withington	**TP / BH No**	RH101				
Project / Job Ref: LKC 23 1687	**Additional Refs**	None Supplied				
Order No: LKC231687-CC	**Depth (m)**	0.20 - 0.80				
Reporting Date: 11/01/2024	**DETS Sample No**	692867				

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6 : HS_1D_MS_AL	mg/kg	< 0.01	NONE	< 0.01				
Aliphatic >C6 - C8 : HS_1D_MS_AL	mg/kg	< 0.05	NONE	< 0.05				
Aliphatic >C8 - C10 : EH_CU_1D_AL	mg/kg	< 2	MCERTS	< 2				
Aliphatic >C10 - C12 : EH_CU_1D_AL	mg/kg	< 2	MCERTS	< 2				
Aliphatic >C12 - C16 : EH_CU_1D_AL	mg/kg	< 3	MCERTS	< 3				
Aliphatic >C16 - C21 : EH_CU_1D_AL	mg/kg	< 3	MCERTS	< 3				
Aliphatic >C21 - C34 : EH_CU_1D_AL	mg/kg	< 10	MCERTS	< 10				
Aliphatic >C34 - C44	mg/kg	< 10	NONE	< 10				
Aliphatic (C5 - C44) : HS_1D_MS+EH_CU_1D_AL	mg/kg	< 21	NONE	< 21				
Aromatic >C5 - C7 : HS_1D_MS_AR	mg/kg	< 0.01	NONE	< 0.01				
Aromatic >C7 - C8 : HS_1D_MS_AR	mg/kg	< 0.05	NONE	< 0.05				
Aromatic >C8 - C10 : EH_CU_1D_AR	mg/kg	< 2	MCERTS	< 2				
Aromatic >C10 - C12 : EH_CU_1D_AR	mg/kg	< 2	MCERTS	< 2				
Aromatic >C12 - C16 : EH_CU_1D_AR	mg/kg	< 2	MCERTS	< 2				
Aromatic >C16 - C21 : EH_CU_1D_AR	mg/kg	< 3	MCERTS	< 3				
Aromatic >C21 - C35 : EH_CU_1D_AR	mg/kg	< 10	MCERTS	< 10				
Aromatic >C35 - C44	mg/kg	< 10	NONE	< 10				
Aromatic (C5 - C44) : HS_1D_MS+EH_CU_1D_AR	mg/kg	< 21	NONE	< 21				
Total >C5 - C44 : HS_1D_MS+EH_CU_1D_Total	mg/kg	< 42	NONE	< 42				

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 24-00126	**Date Sampled**	05/01/24				
LK Consult Limited	**Time Sampled**	None Supplied				
Site Reference: Francis Road, Withington	**TP / BH No**	RH101				
Project / Job Ref: LKC 23 1687	**Additional Refs**	None Supplied				
Order No: LKC231687-CC	**Depth (m)**	0.20 - 0.80				
Reporting Date: 11/01/2024	**DETS Sample No**	692867				

Determinand	Unit	RL	Accreditation					
Benzene : HS_1D_MS	ug/kg	< 2	MCERTS	< 2				
Toluene : HS_1D_MS	ug/kg	< 5	MCERTS	< 5				
Ethylbenzene : HS_1D_MS	ug/kg	< 2	MCERTS	< 2				
p & m-xylene : HS_1D_MS	ug/kg	< 2	MCERTS	< 2				
o-xylene : HS_1D_MS	ug/kg	< 2	MCERTS	< 2				
MTBE : HS_1D_MS	ug/kg	< 5	MCERTS	< 5				

DETS Ltd
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Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 24-00126	
LK Consult Limited	
Site Reference: Francis Road, Withington	
Project / Job Ref: LKC 23 1687	
Order No: LKC231687-CC	
Reporting Date: 11/01/2024	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
692867	RH101	None Supplied	0.20 - 0.80	12.8	Black loamy sand with stones and concrete

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
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Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 24-00126
LK Consult Limited
Site Reference: Francis Road, Withington
Project / Job Ref: LKC 23 1687
Order No: LKC231687-CC
Reporting Date: 11/01/2024

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

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List of HWOL Acronyms and Operators
DETS Report No: 24-00126
LK Consult Limited
Site Reference: Francis Road, Withington
Project / Job Ref: LKC 23 1687
Order No: LKC231687-CC
Reporting Date: 11/01/2024

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym
Benzene - HS_1D_MS
Ethylbenzene - HS_1D_MS
MTBE - HS_1D_MS
TPH CWG - Aliphatic >C10 - C12 - EH_CU_1D_AL
TPH CWG - Aliphatic >C12 - C16 - EH_CU_1D_AL
TPH CWG - Aliphatic >C16 - C21 - EH_CU_1D_AL
TPH CWG - Aliphatic >C21 - C34 - EH_CU_1D_AL
TPH CWG - Aliphatic >C5 - C44 - HS_1D_MS+EH_CU_1D_AL
TPH CWG - Aliphatic >C5 - C6 - HS_1D_MS_AL
TPH CWG - Aliphatic >C6 - C8 - HS_1D_MS_AL
TPH CWG - Aliphatic >C8 - C10 - EH_CU_1D_AL
TPH CWG - Aromatic >C10 - C12 - EH_CU_1D_AR
TPH CWG - Aromatic >C12 - C16 - EH_CU_1D_AR
TPH CWG - Aromatic >C16 - C21 - EH_CU_1D_AR
TPH CWG - Aromatic >C21 - C35 - EH_CU_1D_AR
TPH CWG - Aromatic >C5 - C44 - HS_1D_MS+EH_CU_1D_AR
TPH CWG - Aromatic >C5 - C7 - HS_1D_MS_AR
TPH CWG - Aromatic >C7 - C8 - HS_1D_MS_AR
TPH CWG - Aromatic >C8 - C10 - EH_CU_1D_AR
TPH CWG - Total >C5 - C44 - HS_1D_MS+EH_CU_1D_Total
Toluene - HS_1D_MS
m & p-xylene - HS_1D_MS
o-Xylene - HS_1D_MS

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