MMU Planning condition 06 – contamination.

Summary of site investigation reports carried out.

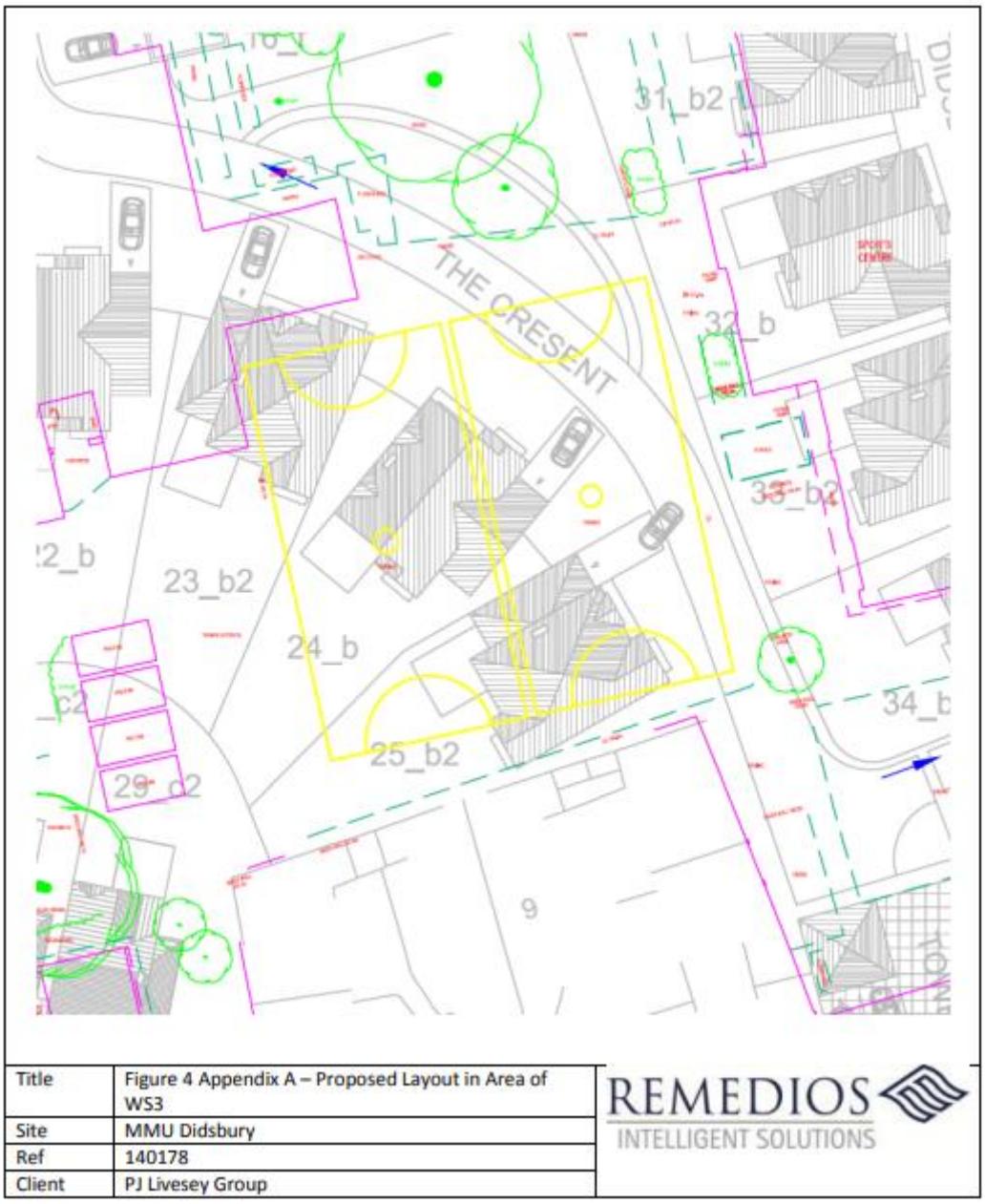
Remedios. November 2014.

- Identified localised areas of PAH and Arsenic.
- Recommended further investigation to delineate the 'hot spot' areas.

Remedios. January 2015.

- Additional SI carried out as recommended above
- The PAH is associated with a specific layer beneath the tarmac surface of the tennis court.
- This layer comprises black sand, brick, tarmac, clinker, limestone and sandstone to a depth of 400mm below finished ground level.
- No evidence of PAH beyond the boundary of the tennis courts.
- Any soft landscape / garden areas within the boundary of the tennis courts to be remediated by either:
    - Use of a clean cover system
    - Removal of the contaminated material from site.
- A clean cover system would require excavation to a depth of 600mm and import of clean material – due to the depth of the contamination it would be more cost effective to dig and remove from site.
- The elevated levels of Arsenic were discovered at depths of 100mm and 400mm below ground level and when overlaid on the proposed site layout would fall below a road which would effectively remove the pathway to the end user. However, it has been recommended that any soft landscape areas within this area have a clean capping layer applied which would require removal of 600mm of material and replacing with 450mm clean sub-soil and 150mm clean top soil (see figure 2 below)

Figure 1: Location of tennis courts overlaid onto proposed site plan



Title	Figure 4 Appendix A – Proposed Layout in Area of WS3
Site	MMU Didsbury
Ref	140178
Client	PJ Livesey Group

REMEDIOS
INTELLIGENT SOLUTIONS

Figure 2: Asbestos hot spot. Shaded areas show where, as a precautionary measure, a clean cover system should be applied. Black dots show location of asbestos which is below hard standings in all cases.

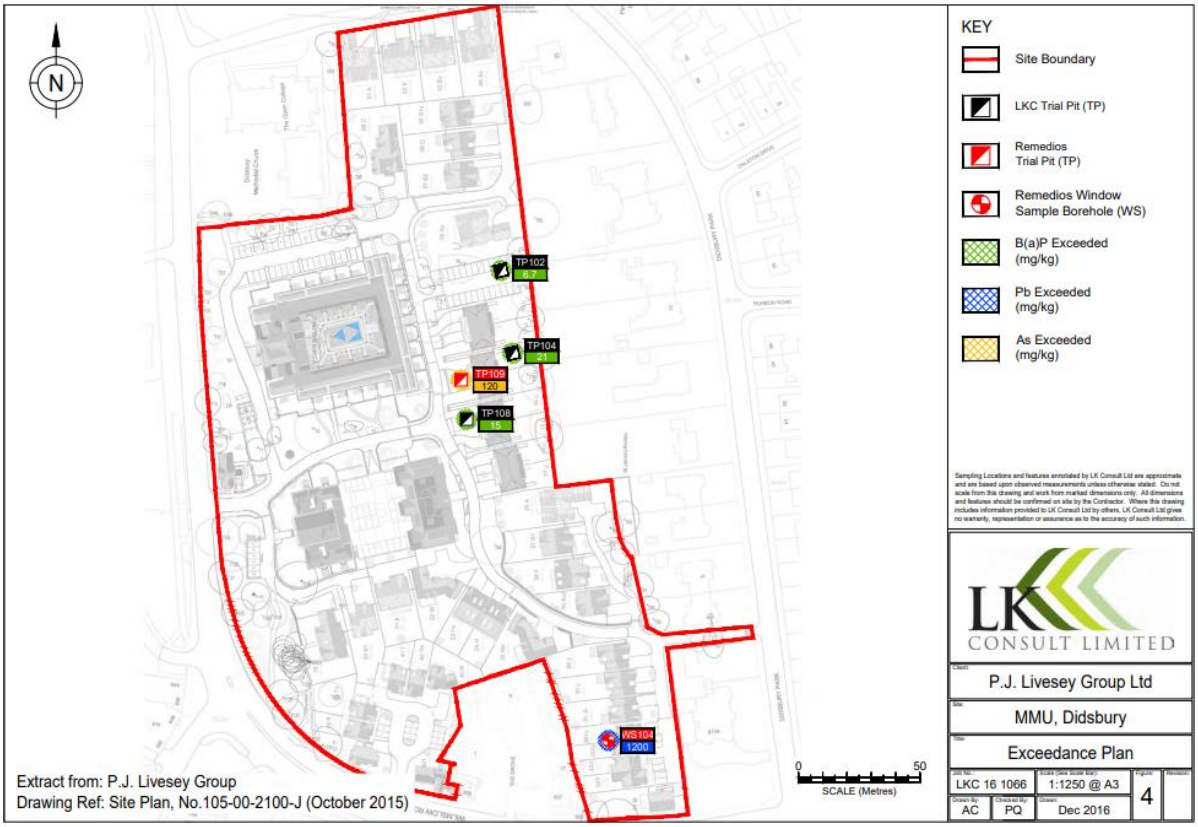


LK Consult. December 2016

- Post demolition site investigation
- PAH exceeded in 3 locations around proposed plots 12-14 and car park area North of these plots
- Remediation options:

- Clean cover system comprising 300mm clean sub soil over a geotextile membrane and 150mm clean top soil
- Further SI to delineate area

Figure 3: Exceedance locations – note TP102 is located under a proposed car park and won't require any remediation.



Summary:

Remediation required:

Area of former tennis courts – plots 23-25

Rear and front gardens to plots 12-14

LK CONSULT LIMITED

PART OF THE LK GROUP

LAND AT
FORMER MMU CAMPUS
DIDSBURY

COMPLETION REPORT -
FORMER 'ADMIN BUILDING'



Prepared for:

PJ Livesey Holdings Ltd
Beacon Road
Trafford Park
Manchester
M17 1AF

By:

LK Consult Ltd
Eton Business Park
Eton Hill Road
Greater Manchester
M26 2ZS

Tel: 0161 763 7200
Email: cl@thelkgroup.com

Date: 28th October 2016
Ref: LKC 16 1066-01

LK Consult Ltd

Document Verification

Site Address	Land at Former MMU Campus, Didsbury		
Report Title	Completion Report - Former 'Admin Building'		
Job Number	LKC 16 1066	**Document Ref.**	LKC 16 1066-01
Date Issued	28th October 2016	**Report Version**	R0
Prepared By	Dr Paul Quimby	**Signature**	
Checked By	Catherine Baranek	**Signature**	

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Holdings Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full.

Those using this information in subsequent assessments or evaluations do so at their own risk.

CONTENTS

1 INTRODUCTION 1

2 SAMPLING AND RISK ASSESSMENT - FORMER 'ADMIN BUILDING' 3

3 CONCLUSIONS AND RECOMMENDATIONS 6

FIGURES

Figure 1: Site Location Plan

Figure 2: Site Boundary and Proposed Layout Plan

Figure 3: Sampling Location Plan

APPENDICES

Appendix A: Validation Checklist

Appendix B: Soil Profile Logs

Appendix C: Photographs

Appendix D: Certificates of Analysis – Soils

Appendix E: Generic Assessment Criteria – Soils

1 INTRODUCTION

1.1 Introduction

LK Consult Ltd (LKC) has been commissioned by PJ Livesey Holdings Ltd to provide a Completion Report for the former 'Admin Building'. This large courtyard building has been refurbished as apartments and town houses with an area of soft landscaping.

This report will assess the former apartment block area to ascertain if it is 'suitable for use' as a residential end use. The post demolition site investigation has not been completed for the site at this stage and the new re-furbished former 'Admin Building' will be handed over soon.

This will not be sufficient to discharge the whole planning conditions relating to contaminated land (planning reference 108541). However, the additional investigation work undertaken for the former 'Admin Building' should be sufficient to discharge contaminated land conditions for this area.

The planning application site boundary is approximately 3.89ha in size and centered at NGR 384868N 390547E (Figure 1). The proposed development for the whole site will comprise 42 houses with gardens, construction of a new apartment block, re-furbishment of the former 'Admin Building' to apartments with landscaped areas and town houses and refurbishment of the former 'Chapel' to apartments with landscaped areas (Figure 2).

1.2 Previous Reports

The following reports have been undertaken by a number of consultants, including LKC:

- 'Phase I Desk Study Report for MMU, Didsbury' by Remedios Ltd (ref: 140168, dated August 2014).
- 'Phase II Ground Engineering Interpretive Report for MMU, Didsbury' by Remedios Ltd (ref: 140178, dated November 2014).
- 'Additional Contamination Hotspot Investigation Report for MMU, Didsbury' by Remedios Ltd (ref: 140178, dated 8th January 2015).
- 'Ground Gas Addendum Letter Report for MMU, Didsbury' by Remedios Ltd (ref: 140178, dated 26th January 2015).
- 'Letter correspondence on Regulator queries for MMU, Didsbury' by Remedios Ltd (ref: 140178, dated 2nd June 2015).
- 'Site Investigation Brief for MMU, Didsbury' by LKC (ref: LKC 16 1066, dated 23rd February 2016).
- 'Email agreeing reduction in environmental capping layer thickness and use of 450mg/kg residential assessment criteria for lead' by LKC (dated 30th June 2016).
- 'Site Works and Validation Checklist for MMU, Didsbury' by LKC (ref: LKC 16 1066, dated 26th July 2016).

LKC understand all previous work has been approved by the appropriate Regulators.

1.3 Summary of Previous Work

Previous work by Remedios Ltd and subsequent work and correspondence by LKC are summarised below:

- Site has been an educational facility since earliest mapping of 1851.
- Site is underlain by Till and sands and gravel superficial deposits (Secondary A Aquifer) over Wilmslow Sandstone Formation (Principal Aquifer).
- The site investigation by Remedios Ltd comprised a combination of window sample boreholes and trial pits.
- The investigation by Remedios Ltd included soil sampling and gas monitoring. No groundwater was encountered.
- Remedios Ltd concluded the risk for hazardous gas was noted as low, where no protection was required.
- Remedios Ltd concluded the risk to groundwater was considered low, due to no significant water present and clay band encountered during the investigation.
- Remedios Ltd recommended an environmental capping layer in soft landscaped areas and gardens around the former Tennis Court, where a PAH hotspot was identified.
- LKC recommended a post demolition site investigation.
- LKC agreed with MCC that lead soil results could be compared to the old SGV of 450mg/kg.
- LKC agreed with MCC that the environmental capping layer could comprise 450mm in rear gardens and 300mm in front gardens and landscaped areas with a break layer comprising either 100mm MOT stone (with less soil required) or geotextile layer.
- Further assessment of the data by LKC noted only 2 soil exceedances (lead 1,200mg/kg and arsenic 120mg/kg). Therefore, contamination may not be widespread across the site. Due to time constraints LKC recommended either an environmental capping layer or higher density soil sampling on a block by block basis to ascertain if an environmental capping layer is required.

1.4 Summary of Required Works and Validation at the Site

All potential remedial and validation requirements are summarised in the validation checklist presented in Appendix A.

Please note the post demolition investigation works are ongoing. Due to other areas of the site being developed concurrently, LKC advised a precautionary environmental capping layer or additional soil sampling on each block of houses (4-6 plots) or shared landscaped areas to ascertain if soil is ‘suitable for use’ on a block specific basis.

Based upon the findings of the above the following works and validation were required at the site:

i) Post demolition site investigation, which is ongoing. This will be reported separately on completion of works.
ii) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (with less soil required) or geotextile marker.
iii) Option 2: Further sampling and risk assessment on a block by block basis (4 soil samples per plot).
iv) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is ‘suitable for use’. All site won or imported material should be tested at a rate of 1 sample per $50m^3$ for topsoil and 1 sample per $150m^3$ for subsoil.
v) Details of unexpected contamination.

vi) Provision of waste transfer noted for any disposal of contaminated soil offsite.

With regards to the former 'Admin Building', due to the time constraints for handover of the building LKC undertook further sampling and risk assessment (Option 2).

2 SAMPLING AND RISK ASSESSMENT - FORMER 'ADMIN BUILDING'

2.1 Introduction

Additional work was considered necessary in the landscaped areas of the former 'Admin Building' to ascertain if an environmental capping layer was required.

The landscaped area around the building remained relatively untouched during site refurbishment and surrounding construction works due to Tree Preservation Orders (TPO's).

LKC investigated 3 points within the landscaped area (ref: TS1-TS3). Additionally, LKC assessed any data points within the vicinity of the former 'Admin Building' from previous investigation work (ref: TP6 and TP7).

Made ground was encountered in all investigation location comprising gravelly sandy clay with rare brick and coal fragments overlying gravelly sand. This is similar strata to the previous site investigation work by Remedios Ltd. All relevant soil profile logs are presented in Appendix B.

All sampling locations are presented in Figure 3 and selected photographs in Appendix C.

2.2 Sampling Protocol

Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation[1].

Soil samples of approximately 500g were recovered in amber jars, amber vials for volatile analysis and plastic tubs. All the samples were labelled and stored in cool boxes prior to being collected by courier at the end of the day for delivery to the Chemtest laboratory in Newmarket for chemical testing. If collection was not possible the same day then samples were stored in the sample storage fridge at the LK Group offices below 4˚C. Samples were tracked using appropriate Chain of Custody forms provided by Chemtest.

Soils were tested for an appropriate suite of contaminats based on previous findings. One sample from each location was taken to represent made ground and tested for the following:

- Arsenic, cadmium, chromium (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc, water soluble sulphate, pH, USEPA PAH 16, asbestos identification and organic matter.

Many of the contamination tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix D. Additionally, relevant Certificate of Analysis have been presented in Appendix D from previous soil samples taken in the boundary of the former 'Admin Building' by Remedios Ltd.

[1] EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

2.3 Soil Risk Assessment

Current good practice requires that the findings from a site investigation should be evaluated on a site specific basis, using a risk based approach[2].

With regards to the soil risk assessment LKC will use the following hierarchy:

- Category 4 Screening Levels (C4SLs).
- LQM Suitable 4 Use Levels (S4ULs).
- ATRISK Soil Screening Values (SSVs) and CL:AIRE Generic Assessment Criteria (GACs).

C4SLs have recently been published[3,4]. The recent change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))[5] used to generate Soil Guideline Values (SGVs) to 'low' (referred to as Lowest Level of Toxicological Concern (LLTCs)). The policy companion document and supporting letter by Defra, dated 3rd September 2014, states that C4SLs *'could be used under the planning regime, as well as within Part 2A'.* Based on these comments LKC considers the justifications and assumptions used to generate 'low' risk are suitable for the planning regime.

Where no C4SLs have been generated LKC will use the LQM S4ULs[6]. Similar assumptions and land uses to C4SLs have been used. However, toxicological information has been based on 'minimal risk' as per previous guidelines and assumptions[7,8,9,10].

If contaminants are not present as C4SLs and S4ULs then LKC will use ATRISK SSVs or CL:AIRE GACs[11]. These follow the 'minimal' risk principal and more stringent exposure parameters and will be conservative.

The use of the old Soil Guideline Value (SGV) for lead of 450mg/kg was agreed with Manchester City Council (MCC).

LKC consider the main risk drivers for PAHs are benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P possibly being a carcinogen and most toxic of the PAHs[12,13] and naphthalene the most volatile and soluble[14]. The new C4SLs indicate B(a)P as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible[15].

[2] EA (2004). "Model Procedures for the Management of Land Contamination." R&D Publication CLR 11.
[3] Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."
[4] CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."
[5] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[6] LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."
[7] EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.
[8] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[9] EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.
[10] EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.
[11] CL:AIRE (2009). "The Soil Generic Assessment Criteria for Human Health Risk Assessment."
[12] EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.
[13] USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."
[14] EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5-079/TR1.
[15] CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)[16] and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

The former 'Admin Building' has been re-furbished as apartments and town houses. The majority of the landscaped areas is to the south and a reasonable land use scenario would be 'POS_{resi}'. However, as a precaution LKC will compare all soil data to a 'residential without home produce' land use.

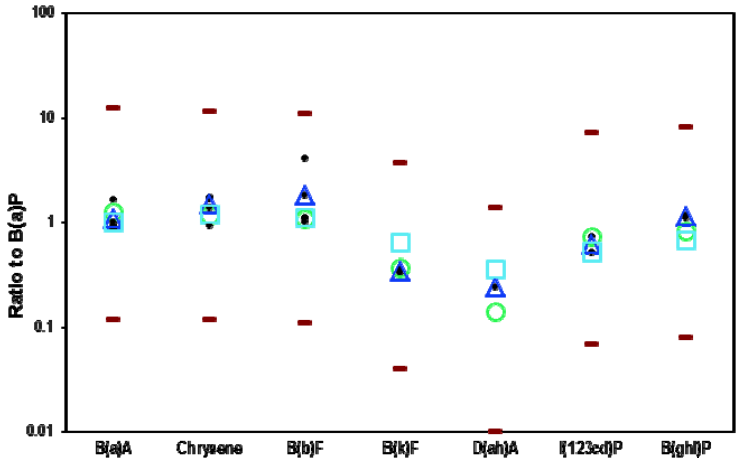
All criteria have been generated using the CLEA V1.06 model[17] based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

A summary of the generic assessment criteria is provided in Appendix E. ATRISK SSVs and CL:AIRE GACs were not required for this dataset and have not been included.

B(a)P as Surrogate Marker

Based on the above assumption for PAHs, LKC undertook an assessment of the data for the site with regards to using B(a)P as a surrogate marker for carcinogenic PAHs as per HPA and CL:AIRE guidelines. The primary toxicological study related to Culp *et.al*[18], which was based on coal tar mixtures (>80,000mg/kg of total PAHs) fed in food to mice over a two year carcinogenicity study.

Graph 1-1 summarises the study site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the HPA document.



Graph 1-1: The ratio of PAH to B(a)P in soil for all available data at the site based on 5 samples (where values were >LOD to allow the calculation of a ratio).

Notes:

B(a)P = Benzo(a)pyrene; D(ah)A = Dibenzo(ah)anthracene; B(a)A = Benzo(a)anthracene; B(b)F = Benzo(b)fluoranthene; B(k)F = benzo(k)fluoranthene; I(123cd)P = Indeno(123cd)pyrene; B(ghi)P = Benzo(ghi)perylene.

● = Ratio to B(a)P for all data ○ = Mean ratio to B(a)P for Culp data △ = Mean ratio to B(a)P from all data at the site

□ = Mean ratio to B(a)P for UK data presented by HPA ▬ = Upper and Lower limits (order of magnitude from Culp data)

All the data points that could be used to calculate ratios fall inside the upper or lower limits.

Based on this distribution of data LKC considers B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for this dataset.

[16] HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.
[17] EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.
[18] Culp, S; Gaylor, D; Sheldon, W; Goldstein, L and Beland, F (1998). " A Comparison of Tumours Induced by Coal Tar and Benzo-a-pyrene in a 2-Year Biossay." Carcinogenesis. **Vol 19**, no. 1, pp. 117-124.

Soil Risk Assessment

No soil samples exceeded the generic assessment criteria. LKC considers soils within the landscaped areas are 'suitable for use' and no specific remediation is required.

3 CONCLUSIONS AND RECOMMENDATIONS

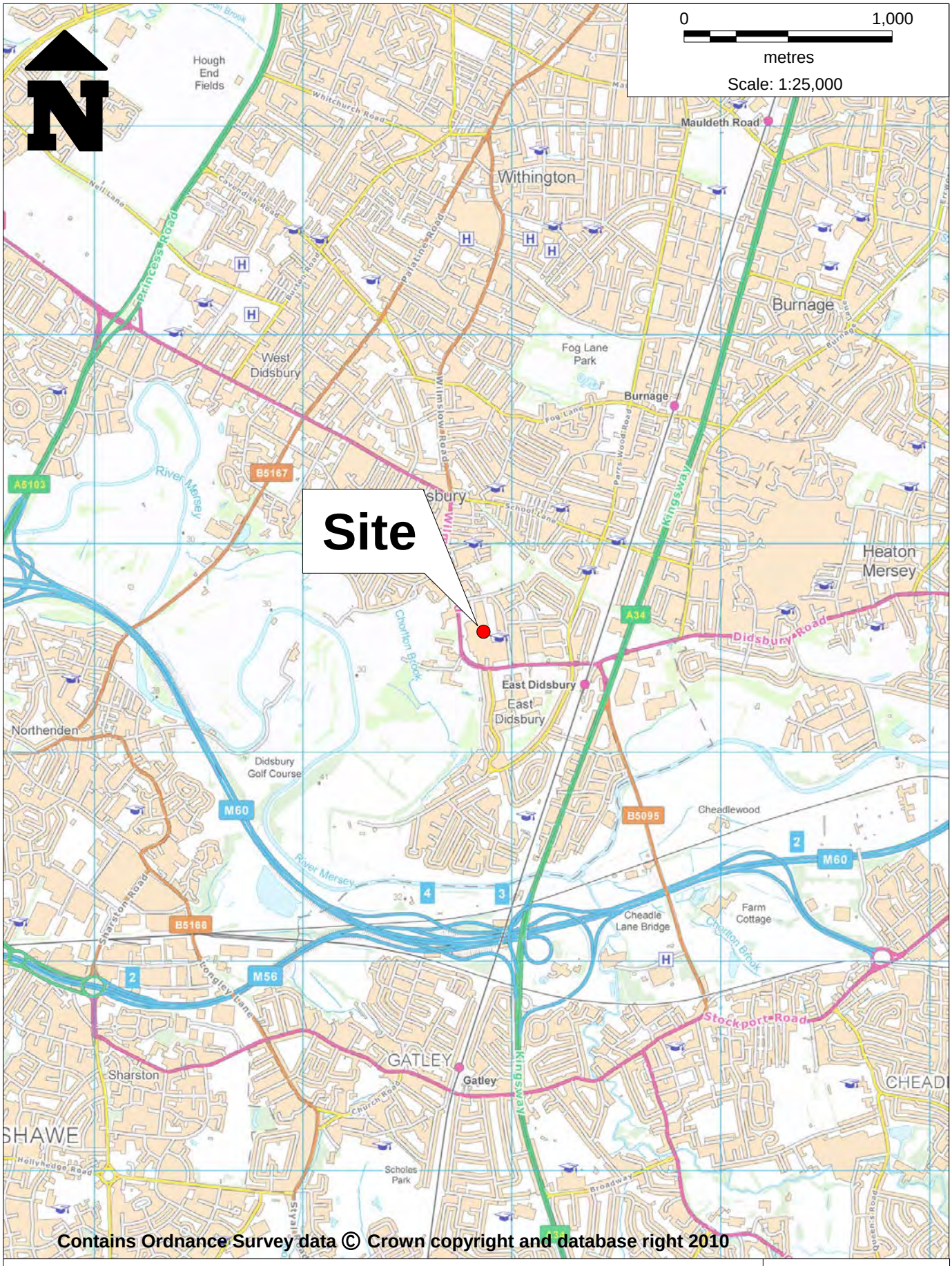
With regards to the former 'Admin Building' soil sampling and further risk assessment of the landscaped areas noted no exceedances.

LKC considers soil is suitable to remain in place and no environmental capping layer is required to mitigate any direct contact risks.

Based on the above LKC considers no remediation is required and no contamination risk has been identified for the former 'Admin Building'.

LKC considers sufficient information has been presented to allow partial discharge of any contamination conditions by MCC for the former 'Admin Building'.

FIGURES



Contains Ordnance Survey data © Crown copyright and database right 2010

Figure 1: Site Location Plan, MMU, Didsbury

Drawn: October 2016 Scale: 1:25,000 @ A4 (see scale bar)

LK CONSULT LIMITED



Extract from: P.J. Livesey Group
Drawing Ref: Site Plan, No.105-00-2100-J (October 2015)

KEY

Site Boundary

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:	P.J. Livesey Group Ltd
Site:	MMU, Didsbury
Title:	Site Boundary & Proposed Site Use Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 16 1066	1:1250 @ A3	2	

Drawn By:	Checked By:	Drawn:
AC	PQ	Oct 2016



Extract from: P.J. Livesey Group
Drawing Ref: Site Plan, No.105-00-2100-J (October 2015)

KEY

- Site Boundary
- Former 'Admin Building'
- Hand Augers (TS) (LKC 2016)
- Trial Pitting (TP) (Remedios 2014)

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: P.J. Livesey Group Ltd

Site: MMU, Didsbury

Title: Sampling Locations Around Former 'Admin Building'

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 16 1066	1:1250 @ A3	3	

Drawn By:	Checked By:	Drawn:
AC	PQ	Oct 2016

APPENDIX A
VALIDATION CHECKLIST

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Post demolition SI	-Post demolition SI ongoing.	-May alter risk assessment.
Imported Subsoil and Topsoil	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
<u>If Required</u> Block Specific SI	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -All data in that block will be risk assessed and a Block by Block assessment and recommendations provided in a report.	-If data fail then an environmental capping layer will still be required and a report will not be needed.
Garden Areas	**<u>Rear Gardens</u>** *Assumed all Plots (until post-demo SI complete). Unless a Block by Block SI is undertaken.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **<u>OR</u>** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	Site manager to photograph laying of separation geotextile **<u>OR</u>** 100mm MOT in each garden area. LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos. -Where no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium.
Landscaped Areas	**<u>All Front gardens and Landscaped Areas</u>** -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **<u>OR</u>** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **<u>OR</u>** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos. -Where no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium.
Site	**<u>Unexpected Contamination</u>** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**<u>Local Authority Site Completion Report</u>** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

<u>NOTE:</u>
Minimum 24 hours notice to attend site.

<u>Contacts</u>

LK Consult
Unit 19, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Rachel Peart – r.peart@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

APPENDIX B
SOIL PROFILE LOGS

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TS1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Hand Auger.			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 18/08/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.60	D1				(0.60)	MADE GROUND:Brown slightly gravelly sandy clay with rare brick and coal fragments. Sand is fine to medium. Gravel is fine to very coarse subangular to rounded comprising sandstone and brick.		
					0.60			
					(0.40)	Light brownish orange very gravelly SAND with occasional subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					1.00	Complete at 1.00m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	KW	LKC 16 1066.TS1

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TS2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Hand Auger.			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 18/08/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.60	D1				(0.60)	MADE GROUND:Brown slightly gravelly sandy clay with rare brick and coal fragments. Sand is fine to medium. Gravel is fine to very coarse subangular to rounded comprising sandstone and brick.		
					0.60			
					(0.40)	Light brownish orange very gravelly SAND with occasional subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					1.00	Complete at 1.00m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	KW	LKC 16 1066.TS2

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TS3

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Hand Auger.			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 18/08/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	D1				(0.50)	MADE GROUND:Brown slightly gravelly sandy clay with rare brick and coal fragments. Sand is fine to medium. Gravel is fine to very coarse subangular to rounded comprising sandstone and brick.		
					0.50			
					(0.50)	Light brownish orange very gravelly SAND with occasional subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					1.00	Complete at 1.00m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	KW	LKC 16 1066.TS3

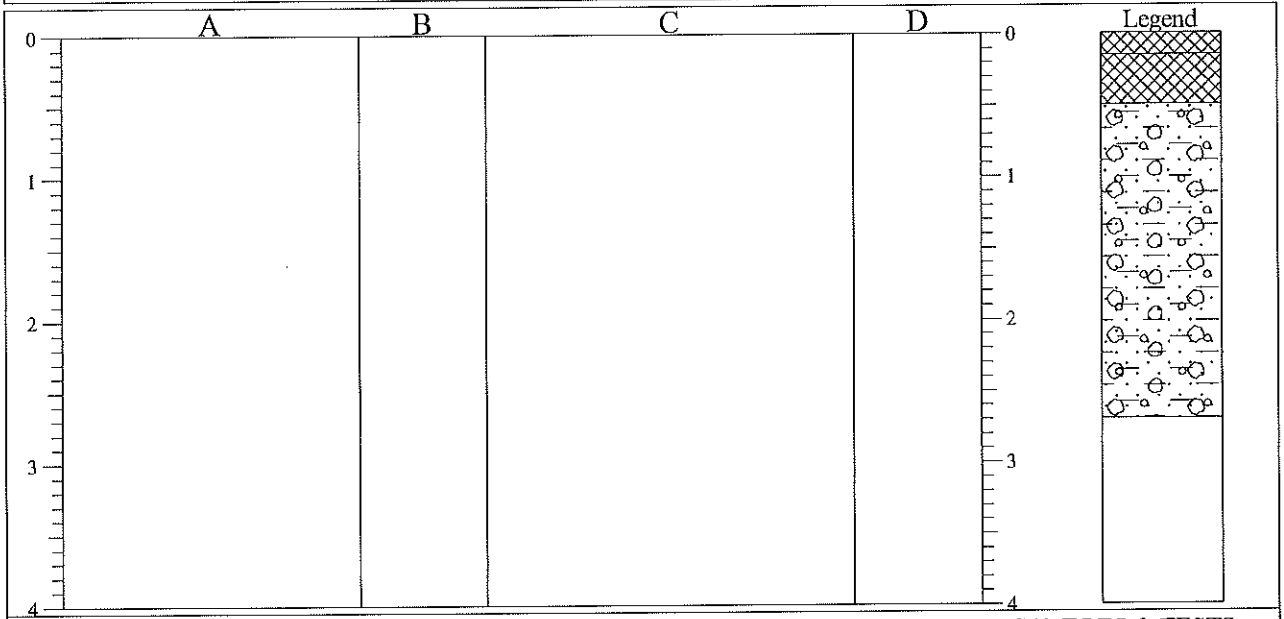
Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

REMEDIOS
INTELLIGENT SOLUTIONS

Remedios Ltd
Heighington Lane, Aycliffe Business Pa
Newton Aycliffe
Telephone: 0191 377 4570

TRIAL PIT LOG

Project				TRIAL PIT No
MMU Didsbury				TP6
Job No	Date	Ground Level (m)	Co-Ordinates ()	
140178				
Contractor				Sheet
DD				1 of 1

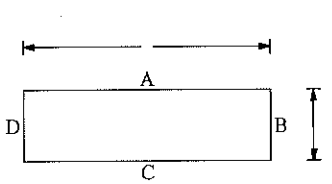


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.15		Tarmac.			
0.15-0.50		MADE GROUND: Multicoloured soft to firm very sandy very gravelly clay. Gravel comprises subangular brick, ceramic, coal and tarmac.	0.15-0.25 0.15	B CH	
0.50-2.70		Light brown/red gravelly to very gravelly SAND with medium cobble content. Gravel and cobbles comprise subrounded to rounded of various lithologies.	0.70	CH	
			2.00	D	
2.70		Hole terminated due to collapse at base.			

Shoring/Support:
Stability:



GENERAL REMARKS

All dimensions in metres Scale 1:50	Client PJ Livesey	Method/ Plant Used	Logged By

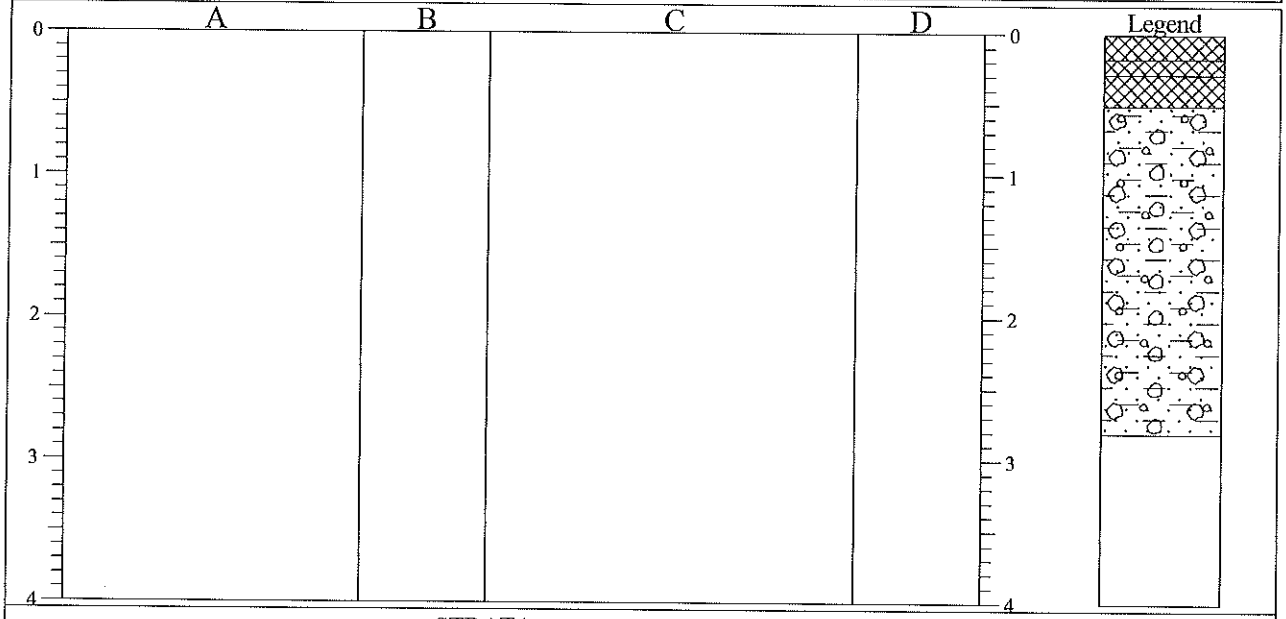
Report ID: AGS4 UK TP || Project: 140178 MMU DIDSBURY.GPJ || Library: GINT STD AGS 4_0.GLB || Date: 11 November 2014

REMEDIOS
INTELLIGENT SOLUTIONS

Remedios Ltd
Heighington Lane, Aycliffe Business Pa
Newton Aycliffe
Telephone: 0191 377 4570

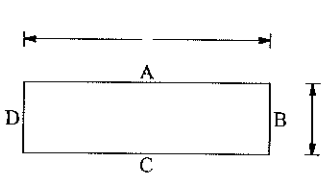
TRIAL PIT LOG

Project				TRIAL PIT No
MMU Didsbury				TP7
Job No	Date	Ground Level (m)	Co-Ordinates ()	
140178				
Contractor				Sheet
DD				1 of 1



STRATA				SAMPLES & TESTS		
Depth	No	DESCRIPTION		Depth	No	Remarks/Tests
0.00-0.17		Tarmac.				
0.17-0.28		MADE GROUND: Limestone subgrade.				
0.28-0.50		MADE GROUND: Firm dark brown sandy gravelly clay. Gravel comprises brick, concrete and coal.		0.30	CH	
0.50-2.80		Light brown/red gravelly to very gravelly SAND with medium cobble content. Gravel and cobbles comprise subrounded to rounded of various lithologies.		0.50-0.60	B	
				2.60	D	
2.80		Hole terminated due to side collapse.				

Shoring/Support:
Stability:



GENERAL REMARKS

All dimensions in metres Scale 1:50	Client PJ Livesey	Method/ Plant Used	Logged By

Report ID: AGS4 UK TP || Project: 140178 MMU DIDSBURY.GPJ || Library: GINT STD AGS 4_0.GLB || Date: 11 November 2014

APPENDIX C
PHOTOGRAPHS





Photographs 1-2: Landscaped areas around southern part of the former 'Admin Building'.



Photograph 3: Near surface soil at TS1.



Photograph 4: Near surface soil at TS2.



Photograph 5: Near surface soil at TS3.

APPENDIX D

CERTIFICATES OF ANALYSIS - SOIL

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING 2183

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Final Report

Report No.:	16-19906-1		
Initial Date of Issue:	26-Aug-2016		
Client	LK Consult		
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS		
Contact(s):	Rachel Peart		
Project	LKC 16 1066 - MMU Didsbury		
Quotation No.:		**Date Received:**	19-Aug-2016
Order No.:	732066	**Date Instructed:**	19-Aug-2016
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	25-Aug-2016
Date Approved:	26-Aug-2016		

Approved By:



Details: Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 - MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			16-19906	16-19906	16-19906
Quotation No.:		**Chemtest Sample ID.:**			339729	339730	339731
		Client Sample ID.:			TS1	TS2	TS3
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			18-Aug-2016	18-Aug-2016	18-Aug-2016
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	16	18	18
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Roots	Roots	Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand
pH	M	2010		N/A	8.0	8.1	8.1
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.20	0.064	0.089
Arsenic	M	2450	mg/kg	1.0	4.2	2.5	3.5
Cadmium	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chromium	M	2450	mg/kg	1.0	15	7.5	9.4
Copper	M	2450	mg/kg	0.50	21	12	16
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	15	6.0	8.9
Lead	M	2450	mg/kg	0.50	33	24	31
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	9.2	6.4	< 5.0
Zinc	M	2450	mg/kg	0.50	54	27	39
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.5	3.8	4.1
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	1.6	1.4	2.3
Anthracene	M	2700	mg/kg	0.10	0.48	0.70	0.92
Fluoranthene	M	2700	mg/kg	0.10	2.6	2.2	3.6
Pyrene	M	2700	mg/kg	0.10	2.9	2.9	4.4
Benzo[a]anthracene	M	2700	mg/kg	0.10	1.3	0.98	1.8
Chrysene	M	2700	mg/kg	0.10	2.5	1.9	3.1
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	1.6	1.1	2.0
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	0.51	0.37	0.65
Benzo[a]pyrene	M	2700	mg/kg	0.10	1.5	1.1	1.8
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	0.56	1.3
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	0.44
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	1.2	2.1
Total Of 16 PAH's	M	2700	mg/kg	2.0	15	14	24

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at our Coventry laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

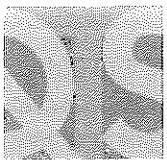
Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk



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

4480

Soil Analysis Certificate						
QTS Environmental Report No: 14-25665	**Date Sampled**	13/10/14	13/10/14	13/10/14	14/10/14	14/10/14
Remedios Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: MMU, Didsbury	**TP / BH No**	TP6	TP6	TP7	TP8	TP8
Project / Job Ref: 140178	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	**Depth (m)**	0.15	0.70	0.30	0.25	0.35
Reporting Date: 22/10/2014	**QTSE Sample No**	121852	121853	121854	121855	121856

Determinand	Unit	RL	Accreditation					
Asbestos Screen	N/a	N/a	**ISO17025**	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	**MCERTS**	6.8	6.9	7.3	7.5	5.8
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Total Sulphate as SO_4	mg/kg	< 200	NONE	315	< 200	251	418	303
W/S Sulphate as SO4 (2:1)	g/l	< 0.01	**MCERTS**		0.05			
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	< 5
Organic Matter	%	< 0.1	NONE	1.1	< 0.1	1.7	2.4	1.3
Total Organic Carbon (TOC)	%	< 0.1	NONE	0.6	< 0.1	1	1.4	0.8
Arsenic (As)	mg/kg	< 2	**MCERTS**	3	< 2	3	5	< 2
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.5	**MCERTS**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chromium (Cr)	mg/kg	< 2	**MCERTS**	12	10	14	17	8
Copper (Cu)	mg/kg	< 4	**MCERTS**	23	10	19	23	9
Lead (Pb)	mg/kg	< 3	**MCERTS**	128	20	60	75	33
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	**MCERTS**	12	13	9	14	6
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	**MCERTS**	38	34	35	59	29
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
EPH (C10 - C40)	mg/kg	< 6	**MCERTS**	< 6	< 6	< 6	23	< 6

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

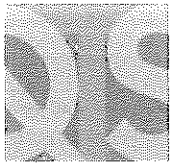
Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Asbestos Analyst: Piotr Lipski

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis [S]



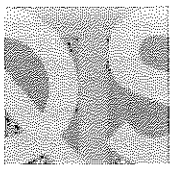
QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 14-25665	**Date Sampled**	13/10/14	13/10/14	13/10/14	14/10/14	14/10/14
Remedios Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: MMU, Didsbury	**TP / BH No**	TP6	TP6	TP7	TP8	TP8
Project / Job Ref: 140178	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	**Depth (m)**	0.15	0.70	0.30	0.25	0.35
Reporting Date: 22/10/2014	**QTSE Sample No**	121852	121853	121854	121855	121856

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.15	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.45	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.76	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	0.22	0.11	< 0.1	2.40	0.12
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.30	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	0.65	0.25	< 0.1	1.30	0.13
Pyrene	mg/kg	< 0.1	MCERTS	0.52	0.23	< 0.1	1.12	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.26	0.13	< 0.1	0.24	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	0.22	0.13	< 0.1	0.26	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.20	0.16	< 0.1	0.24	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.16	0.14	< 0.1	0.15	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	2.2	< 1.6	< 1.6	7.4	< 1.6

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

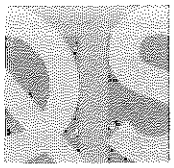


QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - TPH CWG Banded						
QTS Environmental Report No: 14-25665	Date Sampled	13/10/14	13/10/14	13/10/14	14/10/14	14/10/14
Remedios Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: MMU, Didsbury	TP / BH No	TP6	TP6	TP7	TP8	TP8
Project / Job Ref: 140178	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.15	0.70	0.30	0.25	0.35
Reporting Date: 22/10/2014	QTSE Sample No	121852	121853	121854	121855	121856

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Aliphatic >C10 - C12	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Aliphatic >C12 - C16	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Aliphatic >C16 - C21	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Aliphatic >C21 - C34	mg/kg	< 6	NONE	< 6	< 6	< 6	< 6	< 6
Aliphatic (C5 - C34)	mg/kg	< 12	NONE	< 12	< 12	< 12	< 12	< 12
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic >C8 - C10	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Aromatic >C10 - C12	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Aromatic >C12 - C16	mg/kg	< 1	NONE	< 1	< 1	< 1	1	< 1
Aromatic >C16 - C21	mg/kg	< 1	NONE	< 1	< 1	< 1	4	< 1
Aromatic >C21 - C35	mg/kg	< 6	NONE	< 6	< 6	< 6	< 6	< 6
Aromatic (C5 - C35)	mg/kg	< 12	NONE	< 12	< 12	< 12	< 12	< 12
Total >C5 - C35	mg/kg	< 24	NONE	< 24	< 24	< 24	< 24	< 24

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C



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

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 4480

Soil Analysis Certificate - BTEX / MTBE							
QTS Environmental Report No: 14-25665	Date Sampled	13/10/14	13/10/14	13/10/14	14/10/14	14/10/14
Remedios Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: MMU, Didsbury	TP / BH No	TP6	TP6	TP7	TP8	TP8
Project / Job Ref: 140178	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.15	0.70	0.30	0.25	0.35
Reporting Date: 22/10/2014	QTSE Sample No	121852	121853	121854	121855	121856

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
p & m-xylene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
o-xylene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

APPENDIX E

GENERIC ASSESSMENT CRITERIA - SOIL

Substance	Residential (with home-grown produce)	Residential (without home-grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37 mg/kg	40 mg/kg	49 mg/kg	640 mg/kg	79 mg/kg	170 mg/kg
Benzene	0.87 mg/kg	3.3 mg/kg	0.18 mg/kg	98 mg/kg	140 mg/kg	230 mg/kg
Benzo(a)pyrene	5.0 mg/kg	5.3 mg/kg	5.7 mg/kg	77 mg/kg	10 mg/kg	21 mg/kg
Cadmium	22 mg/kg	150 mg/kg	3.9 mg/kg	410 mg/kg	220 mg/kg	880 mg/kg
Chromium VI	21 mg/kg	21 mg/kg	170 mg/kg	49 mg/kg	21 mg/kg	250 mg/kg
Lead	200 mg/kg	310 mg/kg	80 mg/kg	2300 mg/kg	630 mg/kg	1300 mg/kg

Summary Table for the Generic Assessment Criteria for Human Health Risk Assessment Land Quality Management (LQM) S4ULs.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Metals	Inorganic Arsenic	6%	37	40	43	640	79	170
	Beryllium	6%	1.7	1.7	35	12	2.2	63
	Boron	6%	290	11,000	45	240,000	21,000	46,000
	Cadmium	6%	11	85	1.9	190	120	532
	Chromium (III)	6%	910	910	18,000	8,600	1,500	33,000
	Chromium (VI)	6%	6.0	6.0	1.8	33	7.7	220
	Copper	6%	2,400	7,100	520	68,000	12,000	44,000
	Elemental Mercury	6%	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}
	Inorganic Mercury	6%	40	56	19	1,100	120	240
	Methylmercury	6%	11	15	6.0	320	40	68
	Nickel	6%	180	180	230	980	230	3,400
	Selenium	6%	250	430	88	12,000	1,100	1,800
	Vanadium	6%	410	1,200	91	9,000	2,000	5,000
	Zinc	6%	3,700	40,000	620	730,000	81,000	170,000
BTEX Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90
		2.5%	0.17	0.70	0.034	47	72	100
		6%	0.37	1.4	0.075	90	73	110
	Toluene	1%	130	880 (869) ^{vap}	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
		2.5%	290	1,900	51	110,000 (1,920) ^{vap}	56,000	95,000 (1,920) ^{vap}
		6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	Ethylbenzene	1%	47	83	16	5,700 (518) ^{vap}	24,000	17,000 (518) ^{vap}
		2.5%	110	190	39	13,000 (1,220) ^{vap}	24,000	22,000 (1,220) ^{vap}
		6%	260	440	91	27,000 (2,840) ^{vap}	25,000	27,000 (2,840) ^{vap}
	o-xylene	1%	60	88	28	6,600 (478) ^{sol}	41,000	17,000 (478) ^{sol}
		2.5%	140	210	67	15,000 (1,120) ^{sol}	42,000	24,000 (1,120) ^{sol}
		6%	330	480	160	33,000 (2,620) ^{sol}	43,000	33,000 (2,620) ^{sol}
	m-xylene	1%	59	82	31	6,200 (625) ^{vap}	41,000	17,000 (625) ^{vap}
		2.5%	140	190	74	14,000 (1,470) ^{vap}	42,000	24,000 (1,470) ^{vap}
		6%	320	450	170	31,000 (3,460) ^{vap}	43,000	32,000 (3,460) ^{vap}
	p-xylene	1%	56	79	29	5,900 (576) ^{sol}	41,000	17,000 (576) ^{sol}
		2.5%	130	180	69	14,000 (1,350) ^{sol}	42,000	23,000 (1,350) ^{sol}
		6%	310	430	160	30,000 (3,170) ^{sol}	43,000	31,000 (3,170) ^{sol}

NOTES

$^{Sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000
		2.5%	5,400	35,000	950	540,000	74,000	150,000
		6%	11,000	37,000	2,200	540,000	74,000	150,000
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49
		2.5%	11	14	6.5	170	29	56
		6%	13	15	13	180	29	62
	Benzo(a)pyrene (only)	1%	2.2	3.2	0.97	35	5.7	11
		2.5%	2.7	3.2	2.0	35	5.7	12
		6%	3.0	3.2	3.5	36	5.7	13
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13
		2.5%	3.3	4.0	2.1	44	7.2	15
		6%	3.7	4.0	3.9	45	7.2	16
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400
		2.5%	340	360	470	4,000	640	1,500
		6%	350	360	640	4,000	640	1,600
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370
		2.5%	93	110	75	1,200	190	410
		6%	100	110	130	1,200	190	440
	Chrysene	1%	15	30	4.1	350	57	93
		2.5%	22	31	9.4	350	57	110
		6%	27	32	19	350	57	120
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3
		6%	0.3	0.32	0.43	3.6	0.58	1.4
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300
		2.5%	560	1,600	130	23,000	3,100	6,300
		6%	890	1,600	290	23,000	3,100	6,400
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150
		2.5%	36	46	21	510	82	170
		6%	41	46	39	510	82	180
	Naphthalene	1%	2.3 ^{f}	2.3 ^{f}	4.1 ^{f}	190 ^{f} (76.4) ^{sol}	4,900 ^{f}	1,200 ^{f} (76.4) ^{sol}
		2.5%	5.6 ^{f}	5.6 ^{f}	10 ^{f}	460 ^{f} (183) ^{sol}	4,900 ^{f}	1,900 ^{f} (183) ^{sol}
		6%	13 ^{f}	13 ^{f}	24 ^{f}	1,100 ^{f} (432) ^{sol}	4,900 ^{f}	3,000
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200
		2.5%	220	1,500	38	22,000	3,100	6,200
		6%	440	1,500	90	22,000	3,100	6,300
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000
		2.5%	1,200	3,800	270	54,000	7,400	15,000
		6%	2,000	3,800	620	54,000	7,400	15,000
	Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4
		2.5%	0.98	1.2	0.67	15	2.2	4.7
		6%	1.1	1.2	1.2	15	2.2	4.8

NOTES

$^{sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = naphthalene is based on comparison of inhalation exposure with TDI_{inhal} for localised effect.

All GAC are based on sandy loam soils with a pH 7.

LQM Generic Assessment Criteria (mg/kg) Dry weight soil

	Contaminant	SOM	Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Petroleum Hydrocarbons	**Aliphatic**							
	EC 5-6	1%	42	42	730	3,200 (304) ^{sol}	570,000(304)^{sol}	95,000 (304) ^{sol}
	EC>6-8	1%	100	100	2,300	7,800 (144) ^{sol}	600,000	150,000 (144) ^{sol}
	EC>8-10	1%	27	27	320	2,000 (78) ^{sol}	13,000	14,000 (78) ^{vap}
	EC>10-12	1%	130 (48) ^{vap}	130 (48) ^{vap}	2,200	9,700 (48) ^{sol}	13,000	21,000 (48) ^{vap}
	EC>12-16	1%	1,100 (24) ^{sol}	1,100 (24) ^{sol}	11,000	59,000 (24) ^{sol}	13,000	25,000 (24) ^{sol}
	EC>16-35	1%	65,000 (8.48) ^{f,sol}	65,000 (8.48) ^{f,sol}	260,000 ^{f}	160,000 ^{f}	250,000 ^{f}	450,000 ^{f}
	EC>35-44	1%	65,000 (8.48) ^{f,sol}	65,000 (8.48) ^{f,sol}	260,000 ^{f}	160,000 ^{f}	250,000 ^{f}	450,000 ^{f}
	Aliphatic							
	EC 5-6	2.5%	78	78	1,700	5,900 (558) ^{sol}	590,000	130,000 (558) ^{sol}
	EC>6-8	2.5%	230	230	5,600	17,000 (322) ^{sol}	610,000	220,000 (322) ^{sol}
	EC>8-10	2.5%	65	65	770	4,800 (190) ^{vap}	13,000	18,000 (190) ^{vap}
	EC>10-12	2.5%	330 (118) ^{vap}	330 (118) ^{vap}	4,400	23,000 (118) ^{vap}	13,000	23,000 (118) ^{vap}
	EC>12-16	2.5%	2,400 (59) ^{sol}	2,400 (59) ^{sol}	13,000	82,000 (59) ^{sol}	13,000	25,000 (59) ^{sol}
	EC>16-35	2.5%	92,000 (21) ^{f,sol}	92,000 (21) ^{f,sol}	270,000 ^{f}	1,700,000 ^{f}	250,000 ^{f}	480,000 ^{f}
	EC>35-44	2.5%	92,000 (21) ^{f,sol}	92,000 (21) ^{f,sol}	270,000 ^{f}	1,700,000 ^{f}	250,000 ^{f}	480,000 ^{f}
	Aliphatic							
	EC 5-6	6%	160	160	3,900	12,000 (1,150) ^{sol}	600,000	180,000 (1,150) ^{sol}
	EC>6-8	6%	530	530	13,000	40,000 (736) ^{sol}	620,000	320,000 (736) ^{sol}
	EC>8-10	6%	150	150	1,700	11,000 (451) ^{vap}	13,000	21,000 (451) ^{vap}
	EC>10-12	6%	760 (283) ^{vap}	760 (283) ^{vap}	7,300	47,000 (283) ^{vap}	13,000	24,000 (283) ^{vap}
	EC>12-16	6%	4,300 (142) ^{sol}	4,400 (142) ^{sol}	13,000	90,000 (142) ^{sol}	13,000	26,000 (142) ^{sol}
	EC>16-35	6%	110,000^{f}	110,000^{f}	270,000 ^{f}	1,800,000^{f}	250,000 ^{f}	490,000 ^{f}
	EC>35-44	6%	110,000^{f}	110,000^{f}	270,000 ^{f}	1,800,000^{f}	250,000 ^{f}	490,000 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	1%	70	370	13	26,000 (1,220) ^{sol}	56,000	76,000 (1,220) ^{sol}
	EC>7-8(toluene)	1%	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
	EC>8-10	1%	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}
	EC>10-12	1%	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}
	EC>12-16	1%	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000
	EC>16-21	1%	260 ^{f}	1,900 ^{f}	46 ^{f}	28,000 ^{f}	3,800 ^{f}	7,600 ^{f}
	EC>21-35	1%	1,100 ^{f}	1,900 ^{f}	370 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>35-44	1%	1,100 ^{f}	1,900 ^{f}	370^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	2.5%	140	690	27	46,000 (2,260) ^{sol}	56,000	84,000 (2,260) ^{sol}
	EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) ^{sol}	56,000	95,000 (1,920) ^{sol}
	EC>8-10	2.5%	83	110	21	8,100 (1,500) ^{vap}	5,000	8,500 (1,500) ^{vap}
	EC>10-12	2.5%	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (899) ^{sol}
	EC>12-16	2.5%	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000
	EC>16-21	2.5%	540 ^{f}	1,900 ^{f}	110 ^{f}	28,000 ^{f}	3,800 ^{f}	7,700 ^{f}
	EC>21-35	2.5%	1,500 ^{f}	1,900 ^{f}	820 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>35-44	2.5%	1,500 ^{f}	1,900 ^{f}	820 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	6%	300	1,400	57	86,000 (4,710) ^{sol}	56,000	92,000 (4,710) ^{sol}
	EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	EC>8-10	6%	190	270	51	17,000 (3,580) ^{vap}	5,000	9,300 (3,580) ^{vap}
	EC>10-12	6%	380	1,200	4	34,000 (2,150) ^{sol}	5,000	10,000
	EC>12-16	6%	660	2,500	130	38,000	5,100	10,000
	EC>16-21	6%	930^{f}	1,900 ^{f}	260 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>21-35	6%	1,700 ^{f}	1,900 ^{f}	1,600 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}
	EC>35-44	6%	1,700 ^{f}	1,900 ^{f}	1,600 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}
	Aliphatic +Aromatic >EC44	1%	1,600 ^{f}	1,900 ^{f}	1,200 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
		2.5%	1,800 ^{f}	1,900 ^{f}	2,100 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
		6%	1,900 ^{f}	1,900 ^{f}	3,000 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}

NOTES

$^{Sol\ /\ vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	7.1E-03	9.2E-03	4.6E-03	0.67	29	21
		2.5%	1.1E-02	1.3E-02	8.3E-03	0.97	29	24
		6%	1.9E-02	2.3E-02	1.6E-02	1.7	29	28
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) vap
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) vap
		6%	39	40	240	3,000	140,000	100,000 (6,392) vap
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800
		2.5%	3.4	8.0	0.89	550	1,400	2,100
		6%	7.5	17	2.0	1,100	1,400	2,300
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500
		2.5%	2.8	3.5	1.9	250	1,400	1,800
		6%	6.4	8.2	4.4	560	1,400	2,100
	Tetrachloroethene (PCE)	1%	0.18	0.18	0.65	19	1,400	810 (424) sol
		2.5%	0.39	0.40	1.5	42	1,400	1,100 (951) sol
		6%	0.90	0.92	3.6	95	1,400	1,500
	Tetrachloromethane (carbon tetrachloride)	1%	2.6E-02	2.6E-02	0.45	2.9	890	190
		2.5%	5.6E-02	5.6E-02	1.0	6.3	920	270
		6%	0.13	0.13	2.4	14	950	400
	Trichloroethene (TCE)	1%	1.6E-02	1.7E-02	4.1E-02	1.2	120	70
		2.5%	3.4E-02	3.6E-02	9.1E-02	2.6	120	91
		6%	7.5E-02	8.0E-02	0.21	5.7	120	120
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600
		2.5%	1.7	2.1	0.83	170	2,500	2,800
		6%	3.4	4.2	1.7	350	2,500	3,100
	Chloroethene (vinyl chloride)	1%	6.4E-04	7.7E-04	5.5E-04	5.9E-02	3.5	4.8
		2.5%	8.7E-04	1.0E-03	1.0E-03	7.7E-02	3.5	5.0
		6%	1.4E-03	1.5E-03	1.8E-03	0.12	3.5	5.4
	2,4,6-Trinitritoluene (TNT)	1%	1.6	65	0.24	1,000	130	260
		2.5%	3.7	66	0.58	1,000	130	270
		6%	8.1	66	1.4	1,000	130	270
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) sol
		2.5%	250	13,000	38	210,000	26,000	51,000
		6%	540	13,000	85	210,000	27,000	53,000
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) vap
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) vap
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) vap
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30
		2.5%	6.6	7.4	6.1	170	18	31
		6%	7.1	7.5	9.8	170	18	31
	Dieldrin	1%	0.97	7.0	0.17	170	18	30
		2.5%	2.0	7.3	0.41	170	18	30
		6%	3.5	7.4	0.96	170	18	31
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300
		2.5%	7.8	620	1.2	9,400	1,200	2,400
		6%	17.4	620	2.7	9,400	1,200	2,400
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26
		6%	0.14	6.6	2.2E-02	140	16	27
	Endosulfanns (2 isomers)	1%	7.4	160 (3.0E-03) vap	1.2	5,600 (3.0E-03) vap	1,200	2,300
		2.5%	18	280 (7.0E-03) vap	2.9	7,400 (7.0E-03) vap	1,200	2,400
		6%	41	410 (1.6E-02) vap	6.8	8,400 (1.6E-02) vap	1,200	2,500
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15
		2.5%	0.2	3.8	3.2E-02	65	8.1	15
		6%	0.46	3.8	7.7E-02	65	8.1	16

NOTES

Sol / vap = solubility / vapour limit (potentially use if free product identified, although highly conservative).

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) [sol]
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) [sol]
		6%	2.4	2.4	32	290	14,000	2,900
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) [sol]	90,000	24,000 (571) [sol]
		2.5%	55	57	230	4,800 (1,370) [sol]	95,000	36,000 (1,370) [sol]
		6%	130	130	540	11,000 (3,240) [sol]	98,000	51,000 (3,270) [sol]
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) [vap]
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) [vap]
		6%	15	15	320	1,300	19,000	4,000 (1,880) [vap]
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) [vap]	78	110 (39) [vap]
		2.5%	1.6	1.9	0.90	120 (98.1) [vap]	79	120
		6%	3.7	4.3	2.2	240 (235) [vap]	79	130
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) [sol]	100	190
		2.5%	12	30	3.1	770 (107) [sol]	100	190
		6%	22	38	7.0	830	100	190
	Hexachlorobenzene	1%	1.8 (0.20) [vap]	4.1 (0.20) [vap]	0.47	110 (0.20) [vap]	16	30
		2.5%	3.3 (0.50) [vap]	5.7 (0.50) [vap]	1.1	120	16	30
		6%	4.9	6.7 (1.2) [vap]	2.5	120	16	30
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 [g]	94	0.13 [g]	3,500	620	1,100
		2.5%	2.0	150	0.30	4,000	620	1,100
		6%	4.5	210	0.70	4,300	620	1,100
	Pentachlorophenol	1%	0.22	27 (16.4) [vap]	3.0E-02	400	60	110
		2.5%	0.52	29	8.0E-02	400	60	120
		6%	1.2	31	0.19	400	60	120
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300
		2.5%	0.29	0.29	10	22	11,000	1,900
		6%	0.62	0.62	23	47	11,000	2,700
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48
		2.5%	0.7	0.78	0.61	66	25	50
		6%	1.6	1.8	1.4	120	25	51
	Phenol	1%	280	750	66	760 [dir] (31,000)	760 [dir] (11,000)	760 [dir] (8,600)
		2.5%	550	1,300	140	1,500 [dir] (35,000)	1,500 [dir] (11,000)	1,500 [dir] (9,700)
		6%	1,100	2,300	280	3,200 [dir] (37,000)	3,200 [dir] (11,000)	3,200 [dir] (11,000)

NOTES

[sol / vap] = solubility / vapour limit (potentially use if free product identified, although highly conservative).

[dir] = S4uls based on threshold protective of direct skin contact with phenol (brackets long term exposure for illustration purposes).

[g] = derived based on 2,3,4,6-tetrachlorophenol.

Bury Business Centre
Kay Street, Bury BL9 6BU

Tel: 0161 763 7200
Fax: 0161 763 7318

The Corn Exchange, Fenwick Street
Liverpool L2 7QL

Tel: 0151 235 8716

Unit 121, Wright Business Centre
1 Longmay Road, Glasgow G33 4EL

Tel: 0141 773 6269

PART OF THE LK GROUP

Site: **St James Park, Former MMU Campus, Didsbury**
Plots: **1-4, 21 and 24**
Date: **3rd May 2019**
NHBC Ref: **Phase 2 - 713376**

1 INTRODUCTION

LK Consult (LKC) has been appointed by PJ Livesey Holdings Ltd to validate the depth of the garden capping layer laid down at the development at St James Park, Former MMU Campus, Didsbury.

This validation report concerns Plots 1-4, 21 and 24. These plots consist of a rear garden with Plots 21 and 24 having a small area of soft landscaping to the front of the property. Plots 1-4 have a paved driveway to the front.

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

i) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (included in total soil depth) **or** geotextile marker.
ii) Option 2: Further sampling and risk assessment on a block by block basis (nominally a total of 4 soil samples per plot with 1 in the front garden) or selected soil samples in any landscaped areas. If soil results are below generic assessment criteria then no specific clean validated environmental cover depth will be required, but a nominal 150mm covering of topsoil as a growing medium (if required).
iii) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is 'suitable for use'. All site won or imported material should be tested at a rate of 1 sample per 50m^3 for topsoil and 1 sample per 150m^3 for subsoil.
iv) Details of unexpected contamination.
v) Provision of waste transfer notes for any disposal of contaminated soil offsite.

A validation checklist was provided to the ground workers and presented in Appendix A.

2 IMPORTED MATERIAL

Topsoil for use in the garden and soft landscaping areas has been imported to site. The material used comprised approximately 600m^3 of topsoil supplied by Huperade from a greenfield site at New Manor Farm, Stretford.

Composite topsoil samples were taken from garden areas (ref: TS401-TS403 and TS501-TS503) and subjected to the following analytical suite as a conservative measure:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

Soil samples were collected in plastic tubs, amber glass jars and amber vials and despatched to Chemtest of Newmarket in cool boxes with ice packs.

Soil results for the topsoil are presented in Appendix B. No elevated levels of contaminants were identified in the soil samples collected when compared to Generic Assessment Criteria presented in the agreed Remediation Strategy and presented again in Appendix C.

3 CAPPING LAYER IN GARDEN AREAS

For these plots, Option 1 was undertaken by PJ Livesey. The recommendation for the garden capping layer in Plots 1-4 and 21 and 24 was that it should comprise a minimum 300mm thickness to the front and 450mm to the rear.

LKC attended site on 4th and 5th July 2018 and 17th October 2018 to inspect the capping layer construction and depth in the rear and front garden areas. Photographs are provided in Appendix D and the observations are summarised below.

Location	Topsoil Depth (mm)	Subsoil Depth (mm)	Membrane or 100mm MOT	Total Depth (mm)	Required Depth (mm)	Pass (✓) or Fail (x)
Plot 1 Front	Fully hardstood					
Plot 1 Rear	480	0	Membrane	480	450	✓
Plot 2 Front	Fully hardstood					
Plot 2 Rear	530	0	MOT	530	450	✓
Plot 3 Front	Fully hardstood					
Plot 3 Rear	450	0	Membrane	450	300	✓
Plot 4 Front	Fully hardstood					
Plot 4 Rear	450	0	Membrane	450	450	✓
Plot 21 Front	590	0	Membrane	590	300	✓
Plot 21 Rear	480	0	Membrane	480	450	✓
Plot 24 Front	300	0	Membrane	300	300	✓
Plot 24 Rear	500	0	Membrane	500	450	✓

LKC were able to verify that, in the places inspected within the rear gardens of Plots 1-4 and the front and rear gardens of plots 21 and 24, the capping layer depths were in accordance with the requirements of the Remediation Strategy.

4 CONCLUSIONS

LKC has completed the validation of the garden capping layers within Plots 1-4, 21 and 24 and conclude that, in the places inspected, chemically suitable material has been laid to an appropriate depth.

Report Prepared By:



Kerrell Walley
Senior Geo-Environmental Scientist

Report Reviewed By:



Dr Paul Quimby
Director

Enc:

Appendix A: Remediation Strategy Validation Checklist
Appendix B: Certificates of Analysis – Imported Soil
Appendix C: Generic Assessment Criteria Values
Appendix D: Plot Photographs

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Holdings Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Remediation Strategy Validation Checklist

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

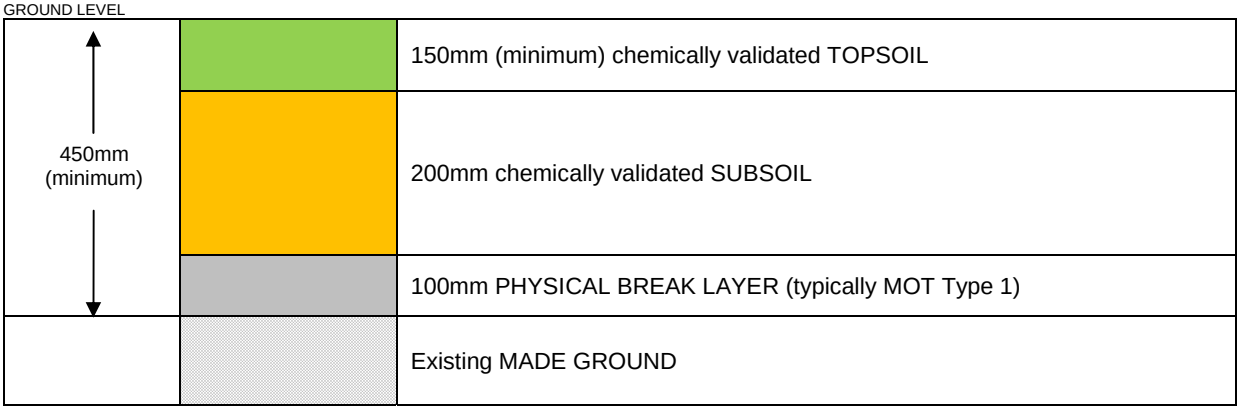
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

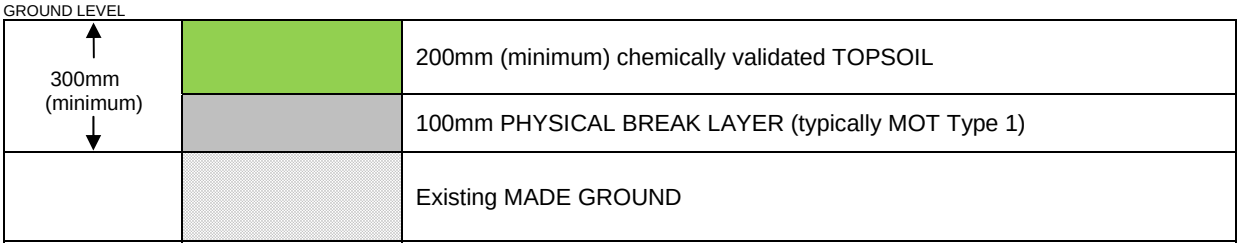
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix B – Certificates of Analysis – Imported Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	18-10339-1
Initial Date of Issue:	24-Apr-2018
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Paul Quimby Contaminated Land
Project	LKC 16 1066 MMU Didsbury

Quotation No.:		**Date Received:**	17-Apr-2018
Order No.:	736050	**Date Instructed:**	17-Apr-2018
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	23-Apr-2018
Date Approved:	24-Apr-2018		

Approved By:



Details: Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury

Client: LK Consult			**Chemtest Job No.:**		18-10339	18-10339	18-10339
Quotation No.:			**Chemtest Sample ID.:**		607446	607447	607448
			Client Sample ID.:		TS401	TS402	TS403
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		16-Apr-2018	16-Apr-2018	16-Apr-2018
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	15	13	12
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones, Roots	Stones, Roots	Stones, Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached
pH	M	2010		N/A	7.8	7.9	7.8
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40	0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	0.023	0.017
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	17	18	16
Cadmium	M	2450	mg/kg	0.10	0.21	0.22	0.18
Chromium	M	2450	mg/kg	1.0	12	12	9.9
Copper	M	2450	mg/kg	0.50	300	390	320
Mercury	M	2450	mg/kg	0.10	0.26	0.27	0.24
Nickel	M	2450	mg/kg	0.50	16	16	14
Lead	M	2450	mg/kg	0.50	230	280	240
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	18	19	17
Zinc	M	2450	mg/kg	0.50	310	360	310
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.3	5.5	4.7
Fuel Type	N	2670		N/A	PAH	PAH	PAH
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0

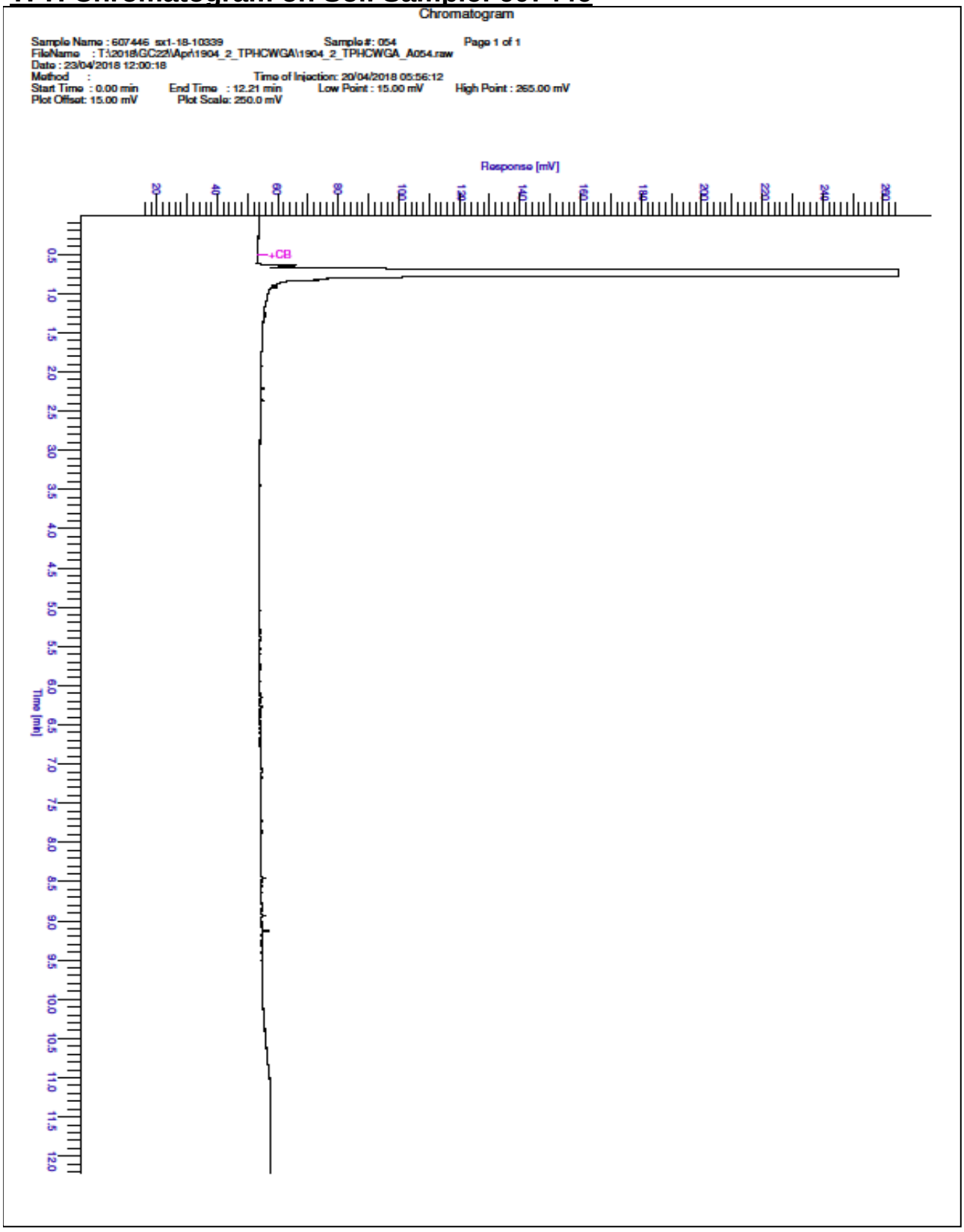
Chemtest
The right chemistry to deliver results

Results - Soil

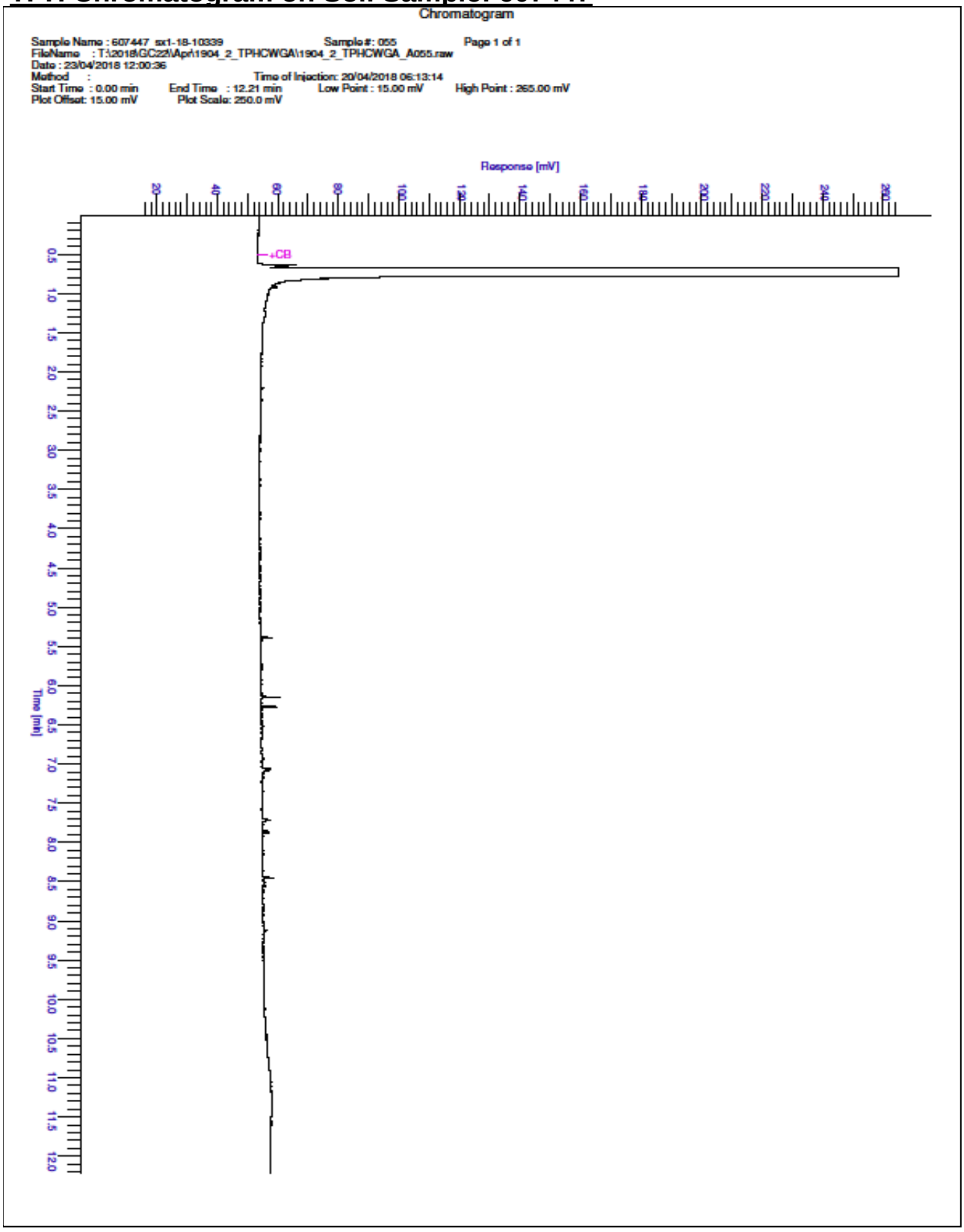
Project: LKC 16 1066 MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-10339	18-10339	18-10339
Quotation No.:		**Chemtest Sample ID.:**			607446	607447	607448
		Client Sample ID.:			TS401	TS402	TS403
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			16-Apr-2018	16-Apr-2018	16-Apr-2018
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	5.7	9.2	10
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	21	30	20
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	26	39	31
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	26	39	31
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Naphthalene	M	2800	mg/kg	0.10	0.24	0.67	0.23
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	0.15	0.20
Fluorene	M	2800	mg/kg	0.10	< 0.10	0.14	0.14
Phenanthrene	M	2800	mg/kg	0.10	0.87	1.5	1.6
Anthracene	M	2800	mg/kg	0.10	0.18	0.31	0.35
Fluoranthene	M	2800	mg/kg	0.10	1.4	2.4	2.6
Pyrene	M	2800	mg/kg	0.10	1.3	2.2	2.7
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.66	1.3	1.6
Chrysene	M	2800	mg/kg	0.10	0.69	1.3	1.6
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	0.90	1.6	2.0
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.29	0.56	0.78
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.62	1.1	1.6
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.49	0.75	1.0
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	0.15	0.17
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.46	0.79	0.99
Total Of 16 PAH's	N	2800	mg/kg	2.0	8.1	15	18
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30

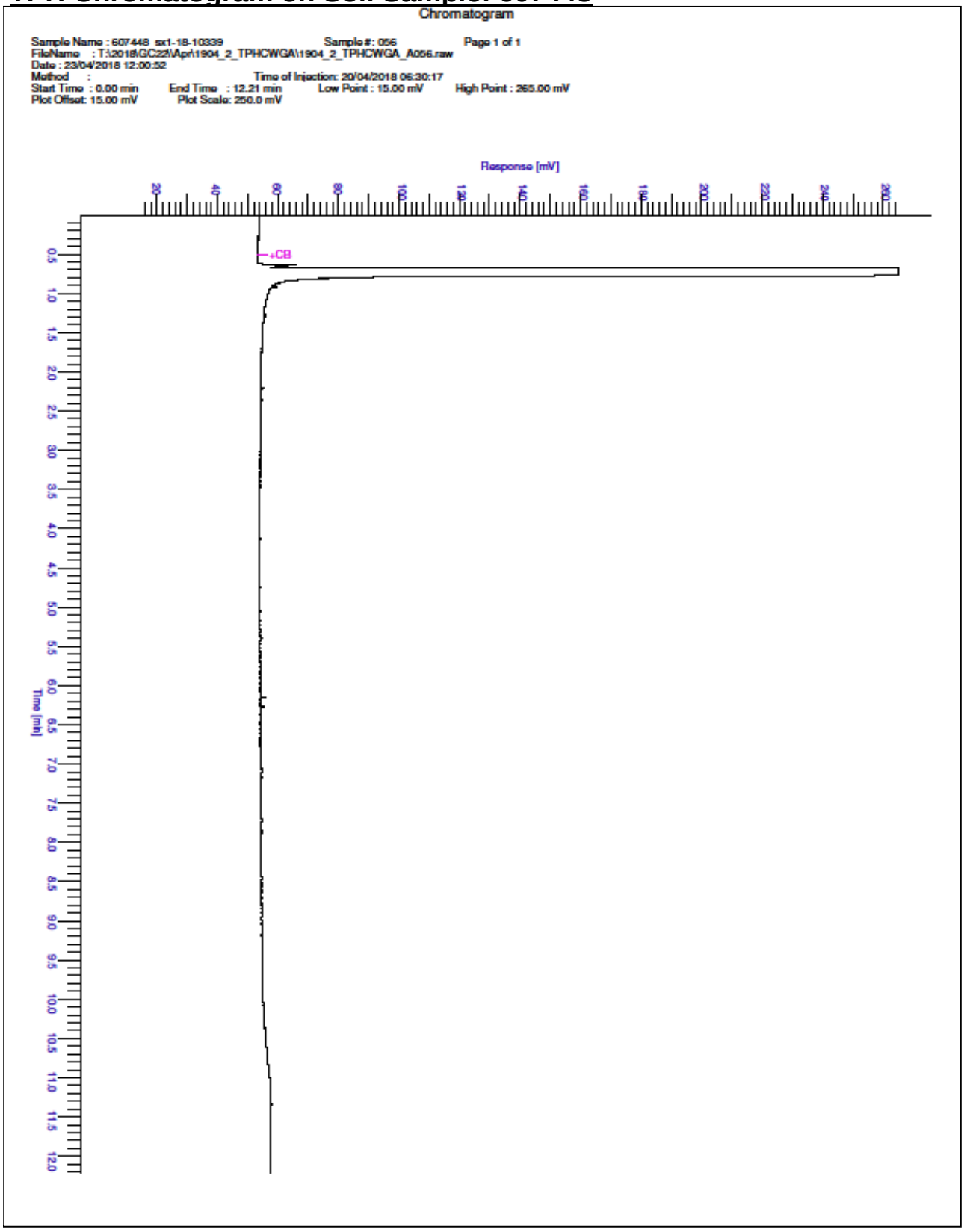
TPH Chromatogram on Soil Sample: 607446



TPH Chromatogram on Soil Sample: 607447



TPH Chromatogram on Soil Sample: 607448



Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	18-34206-1
Initial Date of Issue:	12-Nov-2018
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Contaminated Land Paul Quimby
Project	LKC 16 1066 Former MMU Campus, Didsbury

Quotation No.:		**Date Received:**	02-Nov-2018
Order No.:	736496	**Date Instructed:**	02-Nov-2018
No. of Samples:	10		
Turnaround (Wkdays):	5	**Results Due:**	08-Nov-2018
Date Approved:	12-Nov-2018		

Approved By:



Details: Robert Monk, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206
Quotation No.:		**Chemtest Sample ID.:**			718221	718222	718223	718224	718225	718226	718227	718228
		Client Sample ID.:			TSS01	TS502	TS503	Plot 22	Plot 22	Plot 22	Plot 22	Plot 23
		Sample Location:						S101	S102	S103	S104	S101
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Date Sampled:			31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	16	12	14	13	14	11	11	13
Soil Colour	N	2040		N/A	Brown,	Brown,	Brown,	Brown,	Brown,	Brown,	Brown,	Brown,
Other Material	N	2040		N/A	Stones,	Stones,	Stones,	Stones,	Stones,	Stones,	Stones,	Stones, Roots,
Soil Texture	N	2040		N/A	Loam,	Loam,	Loam,	Loam,	Loam,	Loam,	Loam,	Loam,
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached					
pH	M	2010		N/A	8.1	8.3	8.3	8.2	8.2	8.4	8.7	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.54	0.64	0.52					
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.015	0.027	< 0.010	0.035	0.022	0.083	0.18	0.030
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50					
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50					
Arsenic	M	2450	mg/kg	1.0	14	12	10	13	13	13	15	13
Cadmium	M	2450	mg/kg	0.10	0.28	0.22	0.20	0.24	0.21	0.36	0.32	0.23
Chromium	M	2450	mg/kg	1.0	12	11	11	12	11	14	11	11
Copper	M	2450	mg/kg	0.50	29	29	23	23	28	25	22	26
Mercury	M	2450	mg/kg	0.10	0.42	0.41	0.34	0.35	0.46	0.34	0.30	0.39
Nickel	M	2450	mg/kg	0.50	15	15	13	14	14	15	13	14
Lead	M	2450	mg/kg	0.50	110	110	88	97	100	96	92	92
Selenium	M	2450	mg/kg	0.20	0.28	0.22	0.25	< 0.20	0.30	< 0.20	< 0.20	0.22
Vanadium	U	2450	mg/kg	5.0	16	15	14	15	15	18	14	14
Zinc	M	2450	mg/kg	0.50	61	63	54	52	56	61	50	55
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.8	4.8	4.1	3.1	5.7	5.3	3.5	4.1
Fuel Type	N	2670		N/A	PAH	PAH	PAH					
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	46	33	26					
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	46	33	26					
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206
Quotation No.:		**Chemtest Sample ID.:**			718221	718222	718223	718224	718225	718226	718227	718228
		Client Sample ID.:			TSS01	TS502	TS503	Plot 22	Plot 22	Plot 22	Plot 22	Plot 23
		Sample Location:						S101	S102	S103	S104	S101
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Date Sampled:			31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	9.8	5.7	4.1					
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	200	92	42					
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	210	97	46					
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	250	130	73					
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Naphthalene	M	2800	mg/kg	0.10	0.13	0.20	0.24	0.46	0.13	0.67	0.11	0.33
Acenaphthylene	N	2800	mg/kg	0.10	0.11	0.16	0.10	0.24	0.15	0.24	< 0.10	0.26
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	0.13	0.46	0.38	0.21	1.8	< 0.10	0.22
Fluorene	M	2800	mg/kg	0.10	< 0.10	0.17	0.27	0.32	0.23	1.6	0.12	0.24
Phenanthrene	M	2800	mg/kg	0.10	1.6	2.8	4.2	4.0	3.0	14	1.6	3.6
Anthracene	M	2800	mg/kg	0.10	0.33	0.65	0.86	1.1	0.72	3.7	0.36	1.1
Fluoranthene	M	2800	mg/kg	0.10	3.2	4.5	5.1	4.7	4.7	18	2.9	5.4
Pyrene	M	2800	mg/kg	0.10	3.3	4.7	4.9	4.6	4.2	15	3.1	5.2
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.98	1.9	1.9	1.6	1.7	6.8	1.3	2.1
Chrysene	M	2800	mg/kg	0.10	1.3	2.3	2.1	2.0	2.0	7.6	1.5	2.5
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.3	2.4	2.3	1.9	2.0	8.1	1.7	2.6
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.38	0.84	0.66	0.62	0.54	3.4	0.56	0.78
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.83	1.6	1.6	1.4	1.5	6.9	1.4	1.9
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.41	0.92	0.82	0.66	0.63	4.2	0.68	1.0
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.76	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.63	1.1	1.1	0.96	0.91	3.9	0.87	1.3
Total Of 16 PAH's	N	2800	mg/kg	2.0	15	24	27	25	23	97	16	29
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30					

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult			**Chemtest Job No.:**		18-34206	18-34206
Quotation No.:			**Chemtest Sample ID.:**		718229	718230
			Client Sample ID.:		Plot 23	Plot 23
			Sample Location:		S102	S103
			Sample Type:		SOIL	SOIL
			Date Sampled:		31-Oct-2018	31-Oct-2018
			Asbestos Lab:		DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	15	16
Soil Colour	N	2040		N/A	Brown,	Brown,
Other Material	N	2040		N/A	Stones, Roots,	Stones,Roots,
Soil Texture	N	2040		N/A	Loam,	Loam,
Chromatogram (TPH)	N			N/A		
pH	M	2010		N/A	8.2	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40		
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.029	0.072
Cyanide (Free)	M	2300	mg/kg	0.50		
Cyanide (Total)	M	2300	mg/kg	0.50		
Arsenic	M	2450	mg/kg	1.0	13	15
Cadmium	M	2450	mg/kg	0.10	0.26	0.27
Chromium	M	2450	mg/kg	1.0	12	14
Copper	M	2450	mg/kg	0.50	27	32
Mercury	M	2450	mg/kg	0.10	0.41	0.57
Nickel	M	2450	mg/kg	0.50	15	17
Lead	M	2450	mg/kg	0.50	110	120
Selenium	M	2450	mg/kg	0.20	0.27	0.26
Vanadium	U	2450	mg/kg	5.0	15	18
Zinc	M	2450	mg/kg	0.50	59	70
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.8	4.8
Fuel Type	N	2670		N/A		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0		
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0		
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0		
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0		
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0		

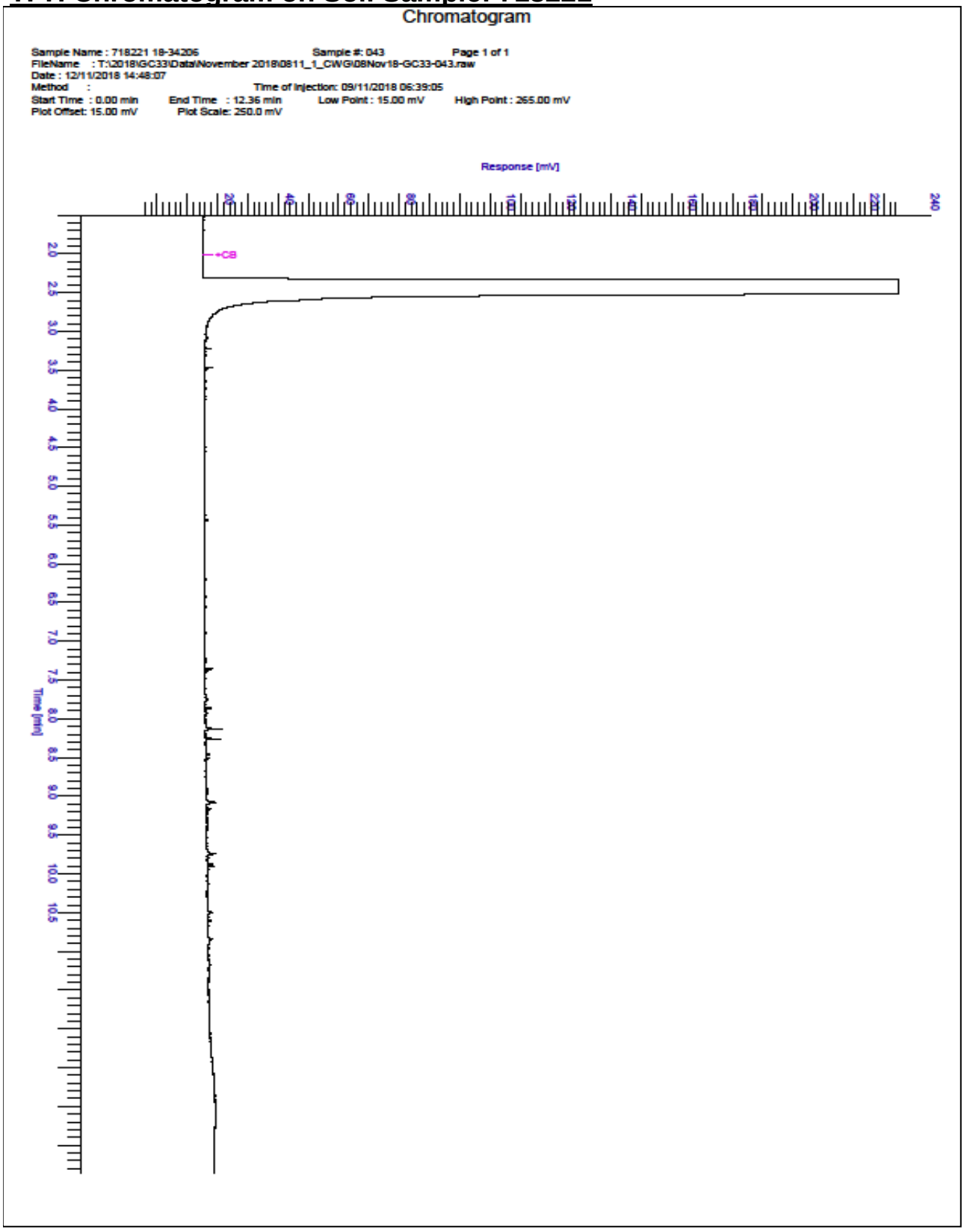
Chemtest
The right chemistry to deliver results

Results - Soil

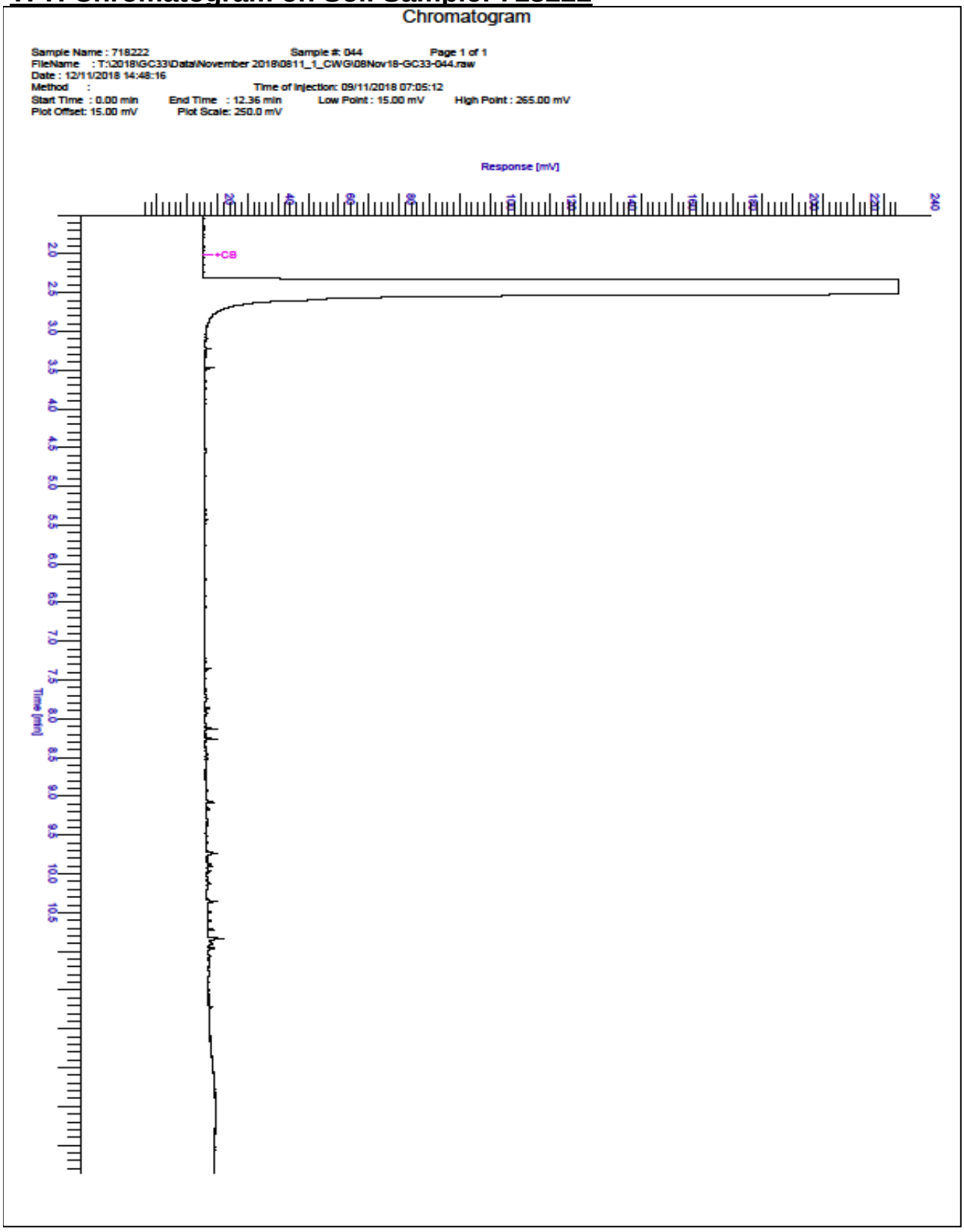
Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-34206	18-34206
Quotation No.:		**Chemtest Sample ID.:**			718229	718230
		Client Sample ID.:			Plot 23	Plot 23
		Sample Location:			S102	S103
		Sample Type:			SOIL	SOIL
		Date Sampled:			31-Oct-2018	31-Oct-2018
		Asbestos Lab:			DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0		
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		
Benzene	M	2760	µg/kg	1.0		
Toluene	M	2760	µg/kg	1.0		
Ethylbenzene	M	2760	µg/kg	1.0		
m & p-Xylene	M	2760	µg/kg	1.0		
o-Xylene	M	2760	µg/kg	1.0		
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0		
Naphthalene	M	2800	mg/kg	0.10	0.13	0.65
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	0.14
Acenaphthene	M	2800	mg/kg	0.10	0.19	0.85
Fluorene	M	2800	mg/kg	0.10	0.15	0.62
Phenanthrene	M	2800	mg/kg	0.10	2.1	6.2
Anthracene	M	2800	mg/kg	0.10	0.47	1.4
Fluoranthene	M	2800	mg/kg	0.10	3.6	7.3
Pyrene	M	2800	mg/kg	0.10	3.2	6.5
Benzo[a]anthracene	M	2800	mg/kg	0.10	1.4	2.4
Chrysene	M	2800	mg/kg	0.10	1.6	3.1
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.6	3.0
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.52	0.94
Benzo[a]pyrene	M	2800	mg/kg	0.10	1.3	2.3
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.70	1.3
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.92	1.7
Total Of 16 PAH's	N	2800	mg/kg	2.0	18	38
Total Phenols	M	2920	mg/kg	0.30		

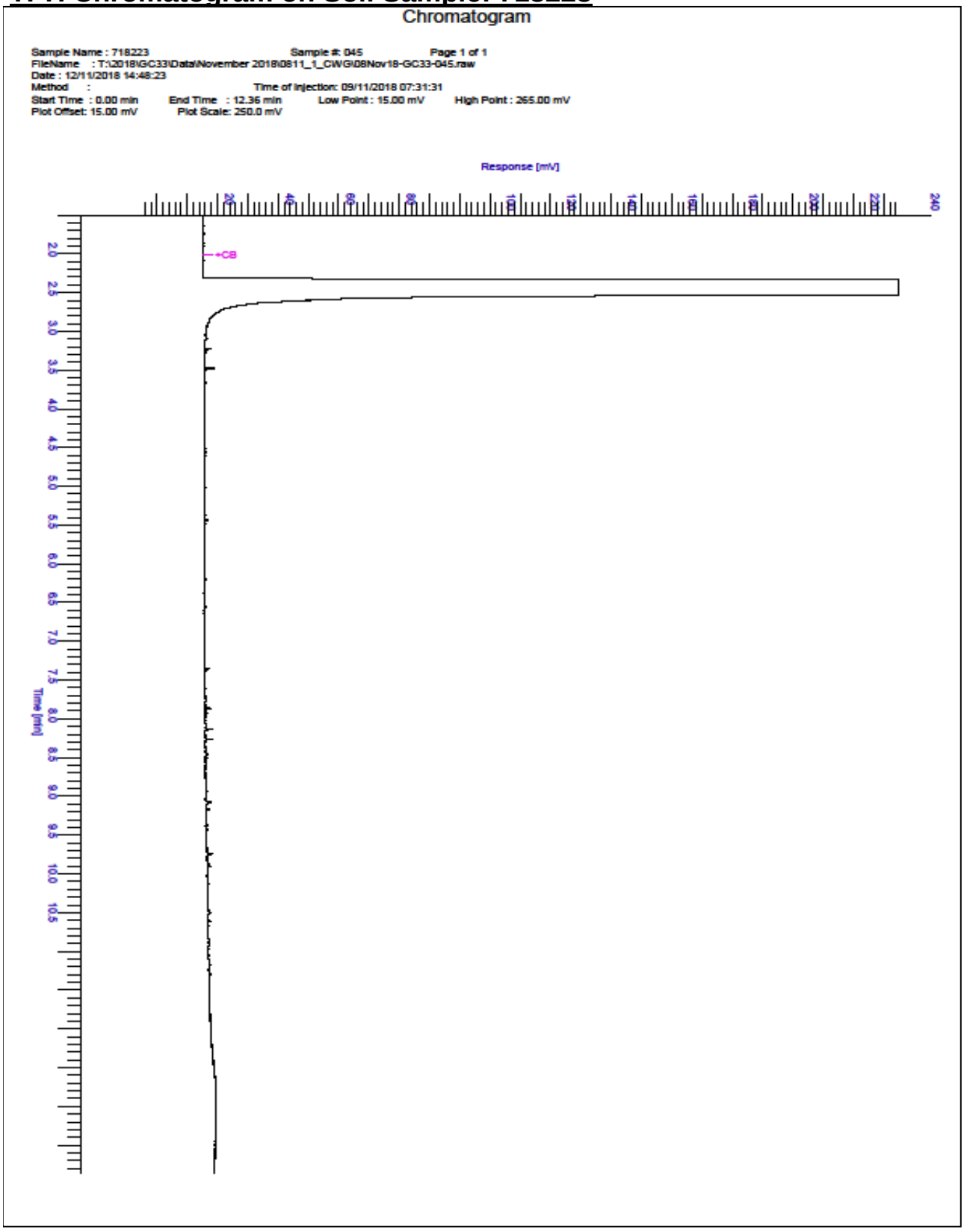
TPH Chromatogram on Soil Sample: 718221



TPH Chromatogram on Soil Sample: 718222



TPH Chromatogram on Soil Sample: 718223



Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Summary of Category 4 Screening Levels: 2015

Substance	Residential (with home-grown produce)	Residential (without home-grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37 mg/kg	40 mg/kg	49 mg/kg	640 mg/kg	79 mg/kg	170 mg/kg
Benzene	0.87 mg/kg	3.3 mg/kg	0.18 mg/kg	98 mg/kg	140 mg/kg	230 mg/kg
Benzo(a)pyrene	5.0 mg/kg	5.3 mg/kg	5.7 mg/kg	77 mg/kg	10 mg/kg	21 mg/kg
Cadmium	22 mg/kg	150 mg/kg	3.9 mg/kg	410 mg/kg	220 mg/kg	880 mg/kg
Chromium VI	21 mg/kg	21 mg/kg	170 mg/kg	49 mg/kg	21 mg/kg	250 mg/kg
Lead	200 mg/kg	310 mg/kg	80 mg/kg	2300 mg/kg	630 mg/kg	1300 mg/kg

Summary Table for the Generic Assessment Criteria for Human Health Risk Assessment Land Quality Management (LQM) S4ULs.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Metals	Inorganic Arsenic	6%	37	40	43	640	79	170
	Beryllium	6%	1.7	1.7	35	12	2.2	63
	Boron	6%	290	11,000	45	240,000	21,000	46,000
	Cadmium	6%	11	85	1.9	190	120	532
	Chromium (III)	6%	910	910	18,000	8,600	1,500	33,000
	Chromium (VI)	6%	6.0	6.0	1.8	33	7.7	220
	Copper	6%	2,400	7,100	520	68,000	12,000	44,000
	Elemental Mercury	6%	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}
	Inorganic Mercury	6%	40	56	19	1,100	120	240
	Methylmercury	6%	11	15	6.0	320	40	68
	Nickel	6%	180	180	230	980	230	3,400
	Selenium	6%	250	430	88	12,000	1,100	1,800
	Vanadium	6%	410	1,200	91	9,000	2,000	5,000
	Zinc	6%	3,700	40,000	620	730,000	81,000	170,000
BTEX Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90
		2.5%	0.17	0.70	0.034	47	72	100
		6%	0.37	1.4	0.075	90	73	110
	Toluene	1%	130	880 (869) ^{vap}	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
		2.5%	290	1,900	51	110,000 (1,920) ^{vap}	56,000	95,000 (1,920) ^{vap}
		6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	Ethylbenzene	1%	47	83	16	5,700 (518) ^{vap}	24,000	17,000 (518) ^{vap}
		2.5%	110	190	39	13,000 (1,220) ^{vap}	24,000	22,000 (1,220) ^{vap}
		6%	260	440	91	27,000 (2,840) ^{vap}	25,000	27,000 (2,840) ^{vap}
	o-xylene	1%	60	88	28	6,600 (478) ^{sol}	41,000	17,000 (478) ^{sol}
		2.5%	140	210	67	15,000 (1,120) ^{sol}	42,000	24,000 (1,120) ^{sol}
		6%	330	480	160	33,000 (2,620) ^{sol}	43,000	33,000 (2,620) ^{sol}
	m-xylene	1%	59	82	31	6,200 (625) ^{vap}	41,000	17,000 (625) ^{vap}
		2.5%	140	190	74	14,000 (1,470) ^{vap}	42,000	24,000 (1,470) ^{vap}
		6%	320	450	170	31,000 (3,460) ^{vap}	43,000	32,000 (3,460) ^{vap}
	p-xylene	1%	56	79	29	5,900 (576) ^{sol}	41,000	17,000 (576) ^{sol}
		2.5%	130	180	69	14,000 (1,350) ^{sol}	42,000	23,000 (1,350) ^{sol}
		6%	310	430	160	30,000 (3,170) ^{sol}	43,000	31,000 (3,170) ^{sol}

NOTES

$^{Sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000
		2.5%	5,400	35,000	950	540,000	74,000	150,000
		6%	11,000	37,000	2,200	540,000	74,000	150,000
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49
		2.5%	11	14	6.5	170	29	56
		6%	13	15	13	180	29	62
	Benzo(a)pyrene (only)	1%	2.2	3.2	0.97	35	5.7	11
		2.5%	2.7	3.2	2.0	35	5.7	12
		6%	3.0	3.2	3.5	36	5.7	13
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13
		2.5%	3.3	4.0	2.1	44	7.2	15
		6%	3.7	4.0	3.9	45	7.2	16
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400
		2.5%	340	360	470	4,000	640	1,500
		6%	350	360	640	4,000	640	1,600
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370
		2.5%	93	110	75	1,200	190	410
		6%	100	110	130	1,200	190	440
	Chrysene	1%	15	30	4.1	350	57	93
		2.5%	22	31	9.4	350	57	110
		6%	27	32	19	350	57	120
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3
		6%	0.3	0.32	0.43	3.6	0.58	1.4
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300
		2.5%	560	1,600	130	23,000	3,100	6,300
		6%	890	1,600	290	23,000	3,100	6,400
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150
		2.5%	36	46	21	510	82	170
		6%	41	46	39	510	82	180
	Naphthalene	1%	2.3 ^{f}	2.3 ^{f}	4.1 ^{f}	190 ^{f} (76.4) ^{sol}	4,900 ^{f}	1,200 ^{f} (76.4) ^{sol}
		2.5%	5.6 ^{f}	5.6 ^{f}	10 ^{f}	460 ^{f} (183) ^{sol}	4,900 ^{f}	1,900 ^{f} (183) ^{sol}
		6%	13 ^{f}	13 ^{f}	24 ^{f}	1,100 ^{f} (432) ^{sol}	4,900 ^{f}	3,000
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200
		2.5%	220	1,500	38	22,000	3,100	6,200
		6%	440	1,500	90	22,000	3,100	6,300
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000
		2.5%	1,200	3,800	270	54,000	7,400	15,000
		6%	2,000	3,800	620	54,000	7,400	15,000
	Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4
		2.5%	0.98	1.2	0.67	15	2.2	4.7
		6%	1.1	1.2	1.2	15	2.2	4.8

NOTES

$^{sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = naphthalene is based on comparison of inhalation exposure with TDI_{inhal} for localised effect.

All GAC are based on sandy loam soils with a pH 7.

LQM Generic Assessment Criteria (mg/kg) Dry weight soil

	Contaminant	SOM	Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Petroleum Hydrocarbons	**Aliphatic**							
	EC 5-6	1%	42	42	730	3,200 (304) ^{sol}	570,000(304)^{sol}	95,000 (304) ^{sol}
	EC>6-8	1%	100	100	2,300	7,800 (144) ^{sol}	600,000	150,000 (144) ^{sol}
	EC>8-10	1%	27	27	320	2,000 (78) ^{sol}	13,000	14,000 (78) ^{vap}
	EC>10-12	1%	130 (48) ^{vap}	130 (48) ^{vap}	2,200	9,700 (48) ^{sol}	13,000	21,000 (48) ^{vap}
	EC>12-16	1%	1,100 (24) ^{sol}	1,100 (24) ^{sol}	11,000	59,000 (24) ^{sol}	13,000	25,000 (24) ^{sol}
	EC>16-35	1%	65,000 (8.48) ^{f,sol}	65,000 (8.48) ^{f,sol}	260,000 ^{f}	160,000 ^{f}	250,000 ^{f}	450,000 ^{f}
	EC>35-44	1%	65,000 (8.48) ^{f,sol}	65,000 (8.48) ^{f,sol}	260,000 ^{f}	160,000 ^{f}	250,000 ^{f}	450,000 ^{f}
	Aliphatic							
	EC 5-6	2.5%	78	78	1,700	5,900 (558) ^{sol}	590,000	130,000 (558) ^{sol}
	EC>6-8	2.5%	230	230	5,600	17,000 (322) ^{sol}	610,000	220,000 (322) ^{sol}
	EC>8-10	2.5%	65	65	770	4,800 (190) ^{vap}	13,000	18,000 (190) ^{vap}
	EC>10-12	2.5%	330 (118) ^{vap}	330 (118) ^{vap}	4,400	23,000 (118) ^{vap}	13,000	23,000 (118) ^{vap}
	EC>12-16	2.5%	2,400 (59) ^{sol}	2,400 (59) ^{sol}	13,000	82,000 (59) ^{sol}	13,000	25,000 (59) ^{sol}
	EC>16-35	2.5%	92,000 (21) ^{f,sol}	92,000 (21) ^{f,sol}	270,000 ^{f}	1,700,000 ^{f}	250,000 ^{f}	480,000 ^{f}
	EC>35-44	2.5%	92,000 (21) ^{f,sol}	92,000 (21) ^{f,sol}	270,000 ^{f}	1,700,000 ^{f}	250,000 ^{f}	480,000 ^{f}
	Aliphatic							
	EC 5-6	6%	160	160	3,900	12,000 (1,150) ^{sol}	600,000	180,000 (1,150) ^{sol}
	EC>6-8	6%	530	530	13,000	40,000 (736) ^{sol}	620,000	320,000 (736) ^{sol}
	EC>8-10	6%	150	150	1,700	11,000 (451) ^{vap}	13,000	21,000 (451) ^{vap}
	EC>10-12	6%	760 (283) ^{vap}	760 (283) ^{vap}	7,300	47,000 (283) ^{vap}	13,000	24,000 (283) ^{vap}
	EC>12-16	6%	4,300 (142) ^{sol}	4,400 (142) ^{sol}	13,000	90,000 (142) ^{sol}	13,000	26,000 (142) ^{sol}
	EC>16-35	6%	110,000^{f}	110,000^{f}	270,000 ^{f}	1,800,000^{f}	250,000 ^{f}	490,000 ^{f}
	EC>35-44	6%	110,000^{f}	110,000^{f}	270,000 ^{f}	1,800,000^{f}	250,000 ^{f}	490,000 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	1%	70	370	13	26,000 (1,220) ^{sol}	56,000	76,000 (1,220) ^{sol}
	EC>7-8(toluene)	1%	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
	EC>8-10	1%	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}
	EC>10-12	1%	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}
	EC>12-16	1%	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000
	EC>16-21	1%	260 ^{f}	1,900 ^{f}	46 ^{f}	28,000 ^{f}	3,800 ^{f}	7,600 ^{f}
	EC>21-35	1%	1,100 ^{f}	1,900 ^{f}	370 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>35-44	1%	1,100 ^{f}	1,900 ^{f}	370^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	2.5%	140	690	27	46,000 (2,260) ^{sol}	56,000	84,000 (2,260) ^{sol}
	EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) ^{sol}	56,000	95,000 (1,920) ^{sol}
	EC>8-10	2.5%	83	110	21	8,100 (1,500) ^{vap}	5,000	8,500 (1,500) ^{vap}
	EC>10-12	2.5%	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (899) ^{sol}
	EC>12-16	2.5%	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000
	EC>16-21	2.5%	540 ^{f}	1,900 ^{f}	110 ^{f}	28,000 ^{f}	3,800 ^{f}	7,700 ^{f}
	EC>21-35	2.5%	1,500 ^{f}	1,900 ^{f}	820 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>35-44	2.5%	1,500 ^{f}	1,900 ^{f}	820 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	6%	300	1,400	57	86,000 (4,710) ^{sol}	56,000	92,000 (4,710) ^{sol}
	EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	EC>8-10	6%	190	270	51	17,000 (3,580) ^{vap}	5,000	9,300 (3,580) ^{vap}
	EC>10-12	6%	380	1,200	4	34,000 (2,150) ^{sol}	5,000	10,000
	EC>12-16	6%	660	2,500	130	38,000	5,100	10,000
	EC>16-21	6%	930^{f}	1,900 ^{f}	260 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>21-35	6%	1,700 ^{f}	1,900 ^{f}	1,600 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}
	EC>35-44	6%	1,700 ^{f}	1,900 ^{f}	1,600 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}
	Aliphatic +Aromatic >EC44	1%	1,600 ^{f}	1,900 ^{f}	1,200 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
		2.5%	1,800 ^{f}	1,900 ^{f}	2,100 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
		6%	1,900 ^{f}	1,900 ^{f}	3,000 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}

NOTES

$^{Sol\ /\ vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil: Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	7.1E-03	9.2E-03	4.6E-03	0.67	29	21
		2.5%	1.1E-02	1.3E-02	8.3E-03	0.97	29	24
		6%	1.9E-02	2.3E-02	1.6E-02	1.7	29	28
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) vap
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) vap
		6%	39	40	240	3,000	140,000	100,000 (6,392) vap
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800
		2.5%	3.4	8.0	0.89	550	1,400	2,100
		6%	7.5	17	2.0	1,100	1,400	2,300
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500
		2.5%	2.8	3.5	1.9	250	1,400	1,800
		6%	6.4	8.2	4.4	560	1,400	2,100
	Tetrachloroethene (PCE)	1%	0.18	0.18	0.65	19	1,400	810 (424) sol
		2.5%	0.39	0.40	1.5	42	1,400	1,100 (951) sol
		6%	0.90	0.92	3.6	95	1,400	1,500
	Tetrachloromethane (carbon tetrachloride)	1%	2.6E-02	2.6E-02	0.45	2.9	890	190
		2.5%	5.6E-02	5.6E-02	1.0	6.3	920	270
		6%	0.13	0.13	2.4	14	950	400
	Trichloroethene (TCE)	1%	1.6E-02	1.7E-02	4.1E-02	1.2	120	70
		2.5%	3.4E-02	3.6E-02	9.1E-02	2.6	120	91
		6%	7.5E-02	8.0E-02	0.21	5.7	120	120
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600
		2.5%	1.7	2.1	0.83	170	2,500	2,800
		6%	3.4	4.2	1.7	350	2,500	3,100
	Chloroethene (vinyl chloride)	1%	6.4E-04	7.7E-04	5.5E-04	5.9E-02	3.5	4.8
		2.5%	8.7E-04	1.0E-03	1.0E-03	7.7E-02	3.5	5.0
		6%	1.4E-03	1.5E-03	1.8E-03	0.12	3.5	5.4
	2,4,6-Trinitritoluene (TNT)	1%	1.6	65	0.24	1,000	130	260
		2.5%	3.7	66	0.58	1,000	130	270
		6%	8.1	66	1.4	1,000	130	270
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) sol
		2.5%	250	13,000	38	210,000	26,000	51,000
		6%	540	13,000	85	210,000	27,000	53,000
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) vap
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) vap
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) vap
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30
		2.5%	6.6	7.4	6.1	170	18	31
		6%	7.1	7.5	9.8	170	18	31
	Dieldrin	1%	0.97	7.0	0.17	170	18	30
		2.5%	2.0	7.3	0.41	170	18	30
		6%	3.5	7.4	0.96	170	18	31
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300
		2.5%	7.8	620	1.2	9,400	1,200	2,400
		6%	17.4	620	2.7	9,400	1,200	2,400
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26
		6%	0.14	6.6	2.2E-02	140	16	27
	Endosulfanns (2 isomers)	1%	7.4	160 (3.0E-03) vap	1.2	5,600 (3.0E-03) vap	1,200	2,300
		2.5%	18	280 (7.0E-03) vap	2.9	7,400 (7.0E-03) vap	1,200	2,400
		6%	41	410 (1.6E-02) vap	6.8	8,400 (1.6E-02) vap	1,200	2,500
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15
		2.5%	0.2	3.8	3.2E-02	65	8.1	15
		6%	0.46	3.8	7.7E-02	65	8.1	16

NOTES

Sol / vap = solubility / vapour limit (potentially use if free product identified, although highly conservative).

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) ^{sol}
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) ^{sol}
		6%	2.4	2.4	32	290	14,000	2,900
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) ^{sol}	90,000	24,000 (571) ^{sol}
		2.5%	55	57	230	4,800 (1,370) ^{sol}	95,000	36,000 (1,370) ^{sol}
		6%	130	130	540	11,000 (3,240) ^{sol}	98,000	51,000 (3,270) ^{sol}
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) ^{vap}
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) ^{vap}
		6%	15	15	320	1,300	19,000	4,000 (1,880) ^{vap}
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) ^{vap}	78	110 (39) ^{vap}
		2.5%	1.6	1.9	0.90	120 (98.1) ^{vap}	79	120
		6%	3.7	4.3	2.2	240 (235) ^{vap}	79	130
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) ^{sol}	100	190
		2.5%	12	30	3.1	770 (107) ^{sol}	100	190
		6%	22	38	7.0	830	100	190
	Hexachlorobenzene	1%	1.8 (0.20) ^{vap}	4.1 (0.20) ^{vap}	0.47	110 (0.20) ^{vap}	16	30
		2.5%	3.3 (0.50) ^{vap}	5.7 (0.50) ^{vap}	1.1	120	16	30
		6%	4.9	6.7 (1.2) ^{vap}	2.5	120	16	30
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 ^{g}	94	0.13 ^{g}	3,500	620	1,100
		2.5%	2.0	150	0.30	4,000	620	1,100
		6%	4.5	210	0.70	4,300	620	1,100
	Pentachlorophenol	1%	0.22	27 (16.4) ^{vap}	3.0E-02	400	60	110
		2.5%	0.52	29	8.0E-02	400	60	120
		6%	1.2	31	0.19	400	60	120
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300
		2.5%	0.29	0.29	10	22	11,000	1,900
		6%	0.62	0.62	23	47	11,000	2,700
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48
		2.5%	0.7	0.78	0.61	66	25	50
		6%	1.6	1.8	1.4	120	25	51
	Phenol	1%	280	750	66	760 ^{dir} (31,000)	760 ^{dir} (11,000)	760 ^{dir} (8,600)
		2.5%	550	1,300	140	1,500 ^{dir} (35,000)	1,500 ^{dir} (11,000)	1,500 ^{dir} (9,700)
		6%	1,100	2,300	280	3,200 ^{dir} (37,000)	3,200 ^{dir} (11,000)	3,200 ^{dir} (11,000)

NOTES

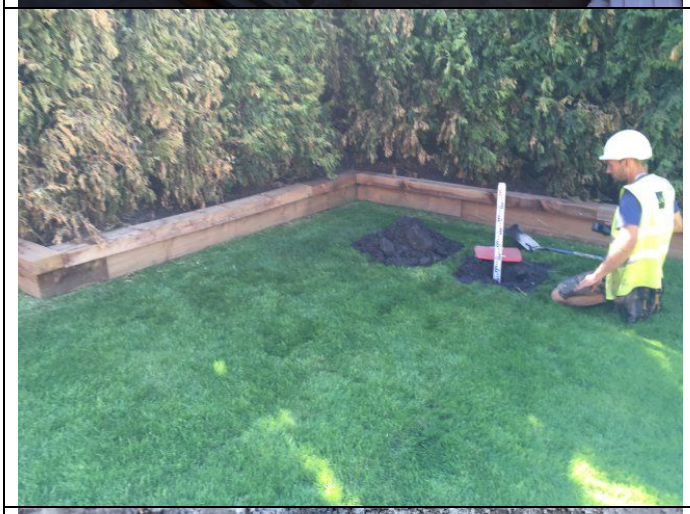
$^{Sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^{dir} = S4uls based on threshold protective of direct skin contact with phenol (brackets long term exposure for illustration purposes).

^{g} = derived based on 2,3,4,6-tetrachlorophenol.

Appendix C – Plot Photographs

Plot 1

	**Photograph 1:** View of front garden of Plot 1. Plot is fully hardstood.
	**Photograph 2:** View of the rear garden of Plot 1.
	**Photograph 3:** View of soil in capping layer excavation in rear garden of Plot 1 with geotextile membrane visible.

	**Photograph 4:** Depth measurement in rear garden of Plot 1.

Plot 2

	**Photograph 5:** View of front garden of Plot 2. Plot is fully hardstood.
	**Photograph 6:** View of the rear garden of Plot 2.
	**Photograph 7:** View of soil in capping layer excavation in rear garden of Plot 2 with MOT break layer visible.

	**Photograph 8:** Depth measurement in rear garden of Plot 2.

Plot 3

	**Photograph 9:** View of front garden of Plot 3. Plot is fully hardstood.
	**Photograph 10:** View of the rear garden of Plot 3.
	**Photograph 11:** View of soil in capping layer excavation in rear garden of Plot 3 with geotextile membrane visible.

	**Photograph 12:** Depth measurement in rear garden of Plot 3.

Plot 4

	**Photograph 13:** View of front garden of Plot 4. Plot is fully hardstood.
	**Photograph 14:** View of the rear garden of Plot 4.
	**Photograph 15:** View of soil in capping layer excavation in rear garden of Plot 4 with geotextile membrane visible.

	**Photograph 16:** Depth measurement in rear garden of Plot 4.

Plot 21

	**Photograph 17:** View of front garden of Plot 21.
	**Photograph 18:** View of soil in capping layer excavation in front garden of Plot 21 with geotextile membrane visible.
	**Photograph 19:** Depth measurement in front garden of Plot 21.

	**Photograph 20:** View of the rear garden of Plot 21.
	**Photograph 21:** View of soil in capping layer excavation in rear garden of Plot 21 with geotextile membrane visible.
	**Photograph 22:** Depth measurement in rear garden of Plot 21.

Plot 24

	**Photograph 23:** View of front garden of Plot 24.
	**Photograph 24:** View of soil in capping layer excavation in front garden of Plot 24 with geotextile membrane visible.
	**Photograph 25:** Depth measurement in front garden of Plot 24.

	**Photograph 26:** View of the rear garden of Plot 24.
	**Photograph 27:** View of soil in capping layer excavation in rear garden of Plot 24 with geotextile membrane visible.
	**Photograph 28:** Depth measurement in rear garden of Plot 24.

LAND AT FORMER MMU CAMPUS
ST JAMES PARK, DIDSBURY

COMPLETION REPORT PLOTS 20, 22 & 23

Job Number: LKC 16 1066
Date: May 2019
Client: PJ Livesey Holdings Ltd



INCREASING LAND VALUE

LK GROUP


ASBESTOS SURVEYS
FLOOD RISK ASSESSMENT
CONTAMINATED LAND INVESTIGATIONS
JAPANESE KNOTWE


LAND REMEDIATION
PROJECT MANAGEMENT
AIR TIGHTNESS TESTING
VALIDATION
GEOTECHNICAL INVESTIGATIONS
LK GROUP
LK GROUP
LK GROUP

LK Consult Document Verification			
Site Address	Land at Former MMU Campus, St James Park, Didsbury, Greater Manchester, M20 2RN		
Report Title	Completion Report Plots 20, 22 and 23		
Job Number	LKC 16 1066	**Document Ref.**	CL-602-LKC 16 1066-01
Date Issued	3rd May 2019	**Report Version**	R0
Prepared By	Kerrell Walley	**Signature**	
Reviewed By	Dr Paul Quimby	**Signature**	

Revision Record			
Revision No.	**Date**	**Nature of Revision**	**Approved By**

DISCLAIMER

This report has been prepared by LK Consult (LKC) who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant, experienced in preparing reports of a similar scope.

However, to the extent that the report is based or relies upon information contained in records, reports or other materials provided to LKC, which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Holdings Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full.

Those using this information in subsequent assessments or evaluations do so at their own risk.

CONTENTS

1 Introduction 1
1.1 Background 1
1.2 Previous Reports 1
1.3 Validation Requirements 1
2 Sampling and Risk Assessment 3
2.1 Introduction 3
2.2 Sampling Protocol 3
3 Soil Risk Assessment 5
3.1 Introduction 5
3.2 Methodology 5
4 Conclusions 11

FIGURES

Figure 1: Site Location Plan
Figure 2: Site Boundary Plan
Figure 3: Sampling Location Plan (Plots 20,22 and 23)

APPENDICES

Appendix A: Validation Summary
Appendix B: Profile Logs
Appendix C: Photographs
Appendix D: Certificate of Analysis - Soil
Appendix E: Generic Assessment Criteria Values
Appendix F: Statistical Output Sheets

1 Introduction

1.1 Background

LK Consult Ltd (LKC) has been commissioned by PJ Livesey Holdings Ltd to provide a completion report for the plots 20, 22 and 23 at their development site St James Park on the Former MMU Campus, Didsbury.

The planning application site boundary is approximately 3.89ha in size and centered at NGR 384868N 390547E (Figure 1). The proposed development for the whole site will comprise 42 houses with gardens, construction of a new apartment block, re-furbishment of the former 'Administration Building' to apartments with landscaped areas and town houses and refurbishment of the former 'Chapel' to apartments with landscaped areas (Figure 2).

This report will assess the made ground beneath the Plots 20, 22 and 23 to ascertain if it is 'suitable for use' as a residential end use, and to determine whether a formal capping layer is required.

1.2 Previous Reports

The following reports have been undertaken by a number of consultants, including LKC:

- 'Phase I Desk Study Report for MMU, Didsbury' by Remedios Ltd (ref: 140168, dated August 2014).
- 'Phase II Ground Engineering Interpretive Report for MMU, Didsbury' by Remedios Ltd (ref: 140178, dated November 2014).
- 'Additional Contamination Hotspot Investigation Report for MMU, Didsbury' by Remedios Ltd (ref: 140178, dated 8th January 2015).
- 'Ground Gas Addendum Letter Report for MMU, Didsbury' by Remedios Ltd (ref: 140178, dated 26th January 2015).
- 'Letter correspondence on Regulator queries for MMU, Didsbury' by Remedios Ltd (ref: 140178, dated 2nd June 2015).
- 'Site Investigation Brief for MMU, Didsbury' by LKC (ref: LKC 16 1066, dated 23rd February 2016).
- 'Email agreeing reduction in environmental capping layer thickness and use of 450mg/kg residential assessment criteria for lead' by LKC (dated 30th June 2016).
- 'Site Works and Validation Checklist for MMU, Didsbury' by LKC (ref: LKC 16 1066, dated 26th July 2016).

LKC understand all previous work has been approved by the appropriate Regulators. A number of plot validation reports for other plots across the site have been issued to the client.

1.3 Validation Requirements

All potential remedial and validation requirements are summarised in the validation checklist presented in Appendix A.

Please note the post demolition investigation works are ongoing. Due to other areas of the site being developed concurrently, LKC advised a precautionary environmental capping layer or additional soil sampling on each block of houses (4-6 plots) or shared landscaped areas to ascertain if soil is 'suitable for use' on a block specific basis.

Based upon the findings of the above the following works and validation were required at the site:

i) Post demolition site investigation, which is ongoing. This will be reported separately on completion of works.
ii) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (with less soil required) or geotextile marker.
iii) Option 2: Further sampling and risk assessment on a block by block basis (4 soil samples per plot).
iv) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is 'suitable for use'. All site won or imported material should be tested at a rate of 1 sample per 50m^3 for topsoil and 1 sample per 150m^3 for subsoil.
v) Details of unexpected contamination.
vi) Provision of waste transfer noted for any disposal of contaminated soil offsite.

LKC undertook a validation visit at the site and subsequently failed the cover systems in Plots 20, 22 and 23. Table 1-1 outlines the reason for failures.

Plot Number	Front Garden Topsoil Depth (mm)	Membrane or 100mm MOT	Pass (✓) or Fail (x)	Rear Garden Topsoil Depth (mm)	Membrane or 100mm MOT	Pass (✓) or Fail (x)
20	400	MOT	✓	300	Membrane	**x**
22	300	Membrane	✓	500	None	**x**
23	300	Membrane	✓	450	None	**x**

Table 1-1: Summary of cover system in gardens of Plots 20, 22 and 23.

The cover systems in all front gardens passed and no further work was required.

Due to the lack of sufficient soil depth in the rear of Plot 20 and the absence of a break layer or geotextile membrane in the rears of Plots 22 and 23, further testing of the underlying made ground was required in line with Option 2 of the remediation strategy.

2 Sampling and Risk Assessment

2.1 Introduction

As part of general validation work across the development site, LKC visit site frequently to regularly take soil samples of imported and site won material and to verify the depths of gardens and soft landscaping areas.

Additional work was considered necessary in the rear gardens of Plots 20, 22 and 23 due to insufficient depth of a cover system and / or the absence of a separation layer (geotextile membrane or break layer) for these plots.

Sampling of the made ground beneath the imported soil in the rears of the plots was undertaken to ascertain if an environmental capping layer was required.

LKC investigated 3 points within each of the rear gardens of Plots 20, 22 and 23. The sampling points involved hand excavated trial holes through imported soil, from which made ground was then sampled.

As discussed in Section 3.2.2, a further visit was required to carry out further sampling in the rear garden of Plot 22 due to an elevated Benzo(a)pyrene (B(a)P) result in the made ground. Further sampling was deemed necessary in order to carry out statistical analysis on the material to demonstrate the suitability of the soil. The additional investigation involved the excavation of 6no. locations in the rear garden of Plot 22 through imported topsoil, to sample the underlying made ground.

Made ground was encountered in all investigation locations comprising gravelly clayey sand with rare brick, ash and coal fragments. This is similar strata to the previous site investigation work carried out by LKC. All relevant soil profile logs are presented in Appendix B.

All sampling locations are presented in Figure 3 and selected photographs in Appendix C.

2.2 Sampling Protocol

2.2.1 Soil Sampling (Contamination)

Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation[1].

Soil samples of approximately 500g were recovered in amber jars, amber vials for volatile analysis and plastic tubs. All the samples were labelled and stored in cool boxes prior to being collected by courier at the end of the day for delivery to the Chemtest laboratory in Newmarket for chemical testing. If collection was not possible the same day then samples were stored in the sample storage fridge at the LK Group offices below 4˚C. Samples were tracked using appropriate Chain of Custody forms provided by Chemtest.

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 2-1 shows the soil testing undertaken.

[1] EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

Suites and Contaminants	No. Samples	Location & Depth	Justification
Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.	16	Plot 20 S101 Plot 20 S102 Plot 20 S103 Plot 23 S101 Plot 23 S102 Plot 23 S103	A basic suite with a broad selection of contaminants tested on made ground samples in the rear gardens of Plots 20 and 23 due to the lack of sufficient soil depth in Plot 20 and absence of a separation layer in Plot 23. No significant evidence of contamination was identified (with the exception of occasional ash and coal).
		Plot 22 S101 Plot 22 S102 Plot 22 S103 Plot 22 S104	A basic suite with a broad selection of contaminants tested on made ground samples in the front and rear garden of Plot 22 due to the absence of a separation layer. No significant evidence of contamination was identified (with the exception of occasional ash and coal).
		Plot 22 R1 Plot 22 R2 Plot 22 R3 Plot 22 R4 Plot 22 R5 Plot 22 R6	Further PAH sampling carried out in the rear garden of Plot 22 due to the identification of elevated B(a)P in sample Plot 22 S103 from made ground.

Table 2-1: Summary of soil sample testing undertaken.

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; PAH=polycyclic aromatic hydrocarbons, SOM=Soil Organic Matter.

3 Soil Risk Assessment

3.1 Introduction

Current good practice requires that the findings from a site investigation should be evaluated on a site-specific basis, using a risk-based approach. Risk assessment involves identification and evaluation of the hazards presented by the concentrations of contaminants measured followed by an evaluation of the risks which are associated with these hazards (CLR11[2]).

3.2 Methodology

With regards to the soil risk assessment LKC will use the following hierarchy:

- Category 4 Screening Levels (C4SLs).
- LQM Suitable 4 Use Levels (S4ULs).
- ATRISK Soil Screening Values (SSVs) and CL:AIRE Generic Assessment Criteria (GACs).

C4SLs were published in 2013[3,4]. The recent change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))[5] used to generate Soil Guideline Values (SGVs) to 'low' (referred to as Lowest Level of Toxicological Concern (LLTCs)). The policy companion document and supporting letter by Defra, dated 3rd September 2014, states that C4SLs *'could be used under the planning regime, as well as within Part 2A'.* Based on these comments LKC considers the justifications and assumptions used to generate 'low' risk are suitable for the planning regime.

Where no C4SLs have been generated LKC will use the LQM S4ULs[6]. Similar assumptions and land uses to C4SLs have been used. However, toxicological information has been based on 'minimal risk' as per previous guidelines and assumptions[7,8,9,10].

If contaminants are not present as C4SLs and S4ULs then LKC will use ATRISK SSVs or CL:AIRE GACs[11]. These follow the 'minimal' risk principle and more stringent exposure parameters and will be conservative.

The use of the old Soil Guideline Value (SGV) for lead of 450mg/kg was agreed with Manchester City Council (MCC).

[2] EA (2004). "Model Procedures for the Management of Land Contamination." R&D Publication CLR 11.
[3] Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."
[4] CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."
[5] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[6] LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."
[7] EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.
[8] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[9] EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.
[10] EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.
[11] CL:AIRE (2009). "The Soil Generic Assessment Criteria for Human Health Risk Assessment."

LKC consider the main risk drivers for PAHs are benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P possibly being a carcinogen and most toxic of the PAHs[12,13] and naphthalene the most volatile and soluble[14]. The new C4SLs indicate B(a)P as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible[15]. For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)[16] and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

The former MMU campus has been redeveloped into residential houses with the former administration building and chapel refurbished as apartments and town houses. Therefore LKC will compare all soil data to a 'residential with home produce' land use.

All criteria have been generated using the CLEA V1.06 model[17] based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

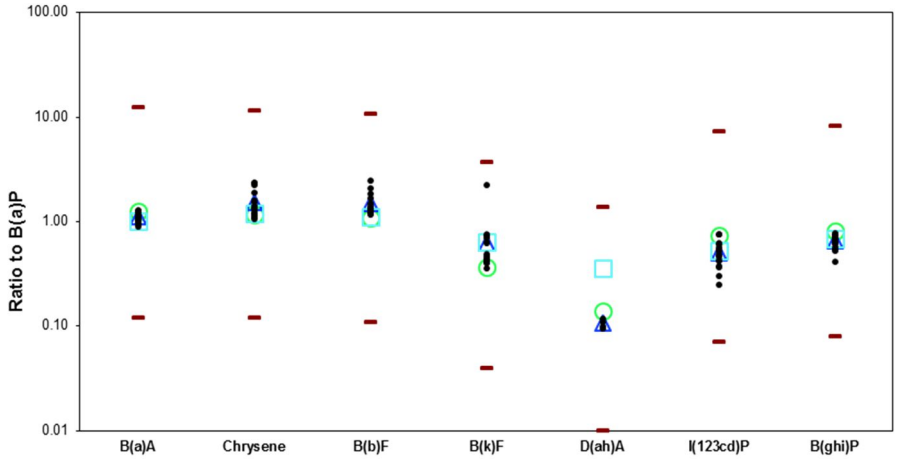
A summary of the generic assessment criteria is provided in Appendix E. ATRISK SSVs and CL:AIRE GACs were not required for this dataset and have not been included.

B(a)P as Surrogate Marker

Based on the above assumption for PAHs, LKC undertook an assessment of the data for the site with regards to using B(a)P as a surrogate marker for carcinogenic PAHs as per HPA and CL:AIRE guidelines. The primary toxicological study related to Culp *et.al*[18], which was based on coal tar mixtures (>80,000mg/kg of total PAHs) fed in food to mice over a two-year carcinogenicity study.

Graph 3-1 summarises the study site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the HPA document.

[12] EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.
[13] USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."
[14] EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5- 079/TR1.
[15] CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."
[16] HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.
[17] EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.
[18] Culp, S; Gaylor, D; Sheldon, W; Goldstein, L and Beland, F (1998). " A Comparison of Tumours Induced by Coal Tar and Benzo-a-pyrene in a 2-Year Bioassay." Carcinogenesis. **Vol 19**, no. 1, pp. 117-124.



Graph 3-1: The ratio of PAH to B(a)P in soil for all available data at the site based on 16 samples (where values were >LOD to allow the calculation of a ratio).

Notes:
B(a)P = Benzo(a)pyrene; D(ah)A = Dibenzo(ah)anthracene; B(a)A = Benzo(a)anthracene; B(b)F = Benzo(b)fluoranthene;
B(k)F = benzo(k)fluoranthene; I(123cd)P = Indeno(123cd)pyrene; B(ghi)P = Benzo(ghi)perylene
● = Ratio to B(a)P for all data ○ = Mean ratio to B(a)P for Culp data △ = Mean ratio to B(a)P from all data at the site
□ = Mean ratio to B(a)P for UK data presented by HPA ▬ = Upper and Lower limits (order of magnitude from Culp data)

All the data points that could be used to calculate ratios fall inside the upper or lower limits.

Based on this distribution of data LKC considers B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for this dataset.

3.2.2 Soil Results Comparison against Assessment Criteria

Plots 20 & 23

Due to insufficient depth of soil (300mm) in the rear of Plot 20 and the absence of a separation layer in the rear of Plot 23, the made ground underlying imported topsoil has been subjected to contamination testing.

Results have been compared to the relevant assessment criteria and no elevated contaminants were identified. Therefore LKC considers the made ground to be of low risk and no formal capping layer is required in the rear gardens of Plots 20 and 23.

Plot 22

Due to the absence of a separation layer in the rear of Plot 22, further testing was carried out on the made ground underlying imported topsoil.

All analysis sheets are presented in Appendix D. Elevated and pertinent results are presented in Table 3-1.

Contaminant	Units	No. of samples	Elevated Results	Sample Location	Criteria (1%/2.5%/6%)	Source of Criteria
PAHs						
Benzo(a)pyrene	mg/kg	10	6.9	Plot 22 S103	5	C4SL
GENERAL						
pH	pH	10	Range 8.1 to 9.5			
SOM	%	10	Range 2.6 to 5.7			
Asbestos	N/A	10	None detected			

Table 3-1: Summary of elevated and pertinent analytical results.

Notes:
Only results that exceeded assessment criteria have been shown and results from **all depths** are noted.
Results have been compared to the nearest appropriate SOM.

Elevated PAHs have been identified in one of the samples (S103) from Plot 22 therefore further sampling (Plot 22 R1-R6) was undertaken in order to perform a statistical analysis to ascertain whether the made ground was suitable for use (see section 3.2.3).

3.2.3 Statistical Analysis

Statistical analysis has been undertaken on the data generated from the made ground in the rear of Plot 22 due to elevated levels of B(a)P, as the nature of the soil and the proposed land use is similar.

Current UK guidance on the use of statistical testing (CL:AIRE/CIEH[19]) for contaminated land has been revised from the original CLR7[20] methodology. The latest guidance separates the planning and Part 2A regimes and is based upon the Null Hypothesis and Alternate Hypothesis approach. LKC have used the ESI contaminated land statistics calculator[21] to undertake this work, which follows the new UK guidance.

For the planning scenario the question to be answered will be “can we confidently say that the level of contamination on this land is low relative to some appropriate measure of risk [e.g. C4SL or GAC values].” The statistical test should show which hypothesis is true within a defined level of confidence (normally 95%), using the upper confidence limit ($UCL_{0.95}$).

For the planning scenario, where the aim is to demonstrate the land is suitable for use the Null Hypothesis is the level of concentration that “is the same as, or higher than, the critical concentration [e.g. C4SL, S4UL, SSV or GAC value]” and the Alternative Hypothesis will be where the level of concentration “is lower than the critical concentration (Cc) .”

If the Null Hypothesis is rejected, then it can be concluded that the Alternative Hypothesis is true (true mean (μ)<Cc) and that potentially the site may be ‘suitable for use.’ If the Null Hypothesis is accepted (μ>Cc) then further measures may be needed and land may not be ‘suitable for use.’

Care must be used in selecting data for the statistical test. Where possible the site should be zoned (vertically and laterally). This is because these statistics cannot be

[19] CL:AIRE (2008). “Guidance on Comparing Soil Contamination Data with a Critical Concentration.”
[20] EA (2002). “Assessment of Risks to Human Health from Land Contamination: An Overview of the Development of Soil Guideline Values and related Research (CLR7).”
[21] ESI (2011). “ESI Contaminated Land Statistics Calculator User Manual.” Version 2.

undertaken on targeted (unbiased) samples. LKC did not undertake targeted sampling in these areas of the site therefore the use of the statistical analysis is considered applicable.

Soil concentrations that are considered outliers may show areas that deviate from the true mean concentration and need to be investigated separately (e.g. they may be hotspots that need to be remediated separately). These are calculated using the Grubb test originally described in CLR7, but only relates to normally distributed data. Log transformation may be used on data to also establish normal distribution for outliers, if required, following CL:AIRE guidance. The test for outliers was based on a 5% level of significance.

In addition, detection limits are dealt with by using half the limits of detection (LOD) as per the guidelines.

Furthermore, the guidance takes into account if the data follows a normal distribution (parametric), where a one-sided t-test can be used or non-normal distribution (non-parametric), where the Chebychev theorem should be used. This is done by using the Shapiro-Wilk test and graphical use of q-q plots.

Statistical Analysis Assessment – Plot 22

Nine soil samples from the rear garden of Plot 22 and one representative sample from the front garden were used in the statistical analysis. Output sheets are provided in Appendix F and a summary of the statistical findings is presented in Table 3-2.

An outlier was identified for B(a)P however the CIEH guidance (page 25) indicates that outliers should only be removed from the dataset where there is an obvious demonstrable error in the laboratory data or clear evidence of more than one soil population. For this dataset there were no demonstrable laboratory errors in the data and made ground was of similar composition. Therefore, as stipulated in the CIEH guidance note 'outlying data should be assumed to be genuine and reflective of the full range of soil concentrations to which receptors may be exposed'.

Plot 22									
Contaminant	**Critical Conc. (Old SGV) mg/kg**	**n**	**Max Value (exceedences)**	**LOD (Number)**	**Outlier**	**Distribution**	**Mean mg/kg**	**$UCL_{0.95}$ mg/kg**	**μ<Cc**
B(a)P	5.0	10	6.9	<0.1 (0)	1	NN	1.821	4.37	✓

Table 3-2: Summary of statistical analysis for made ground in the rear garden of Plot 22, land at former MMU Campus, St James Park, Didsbury.

Notes

NN = Non-normal Distribution; ✓ = μ<Cc; X = μ>Cc or not enough evidence.

Considering the above the upper confidence limit ($UCL_{0.95}$) on the true mean concentration for the full B(a)P dataset is 4.37mg/kg compared with the C4SL of 5.0mg/kg.

The dataset is considered to be reflective of soil in Plot 22 and not an outlier.

The Null Hypothesis for B(a)P can be rejected and therefore the B(a)P concentration in the soil is not considered to pose a significant risk to future users.

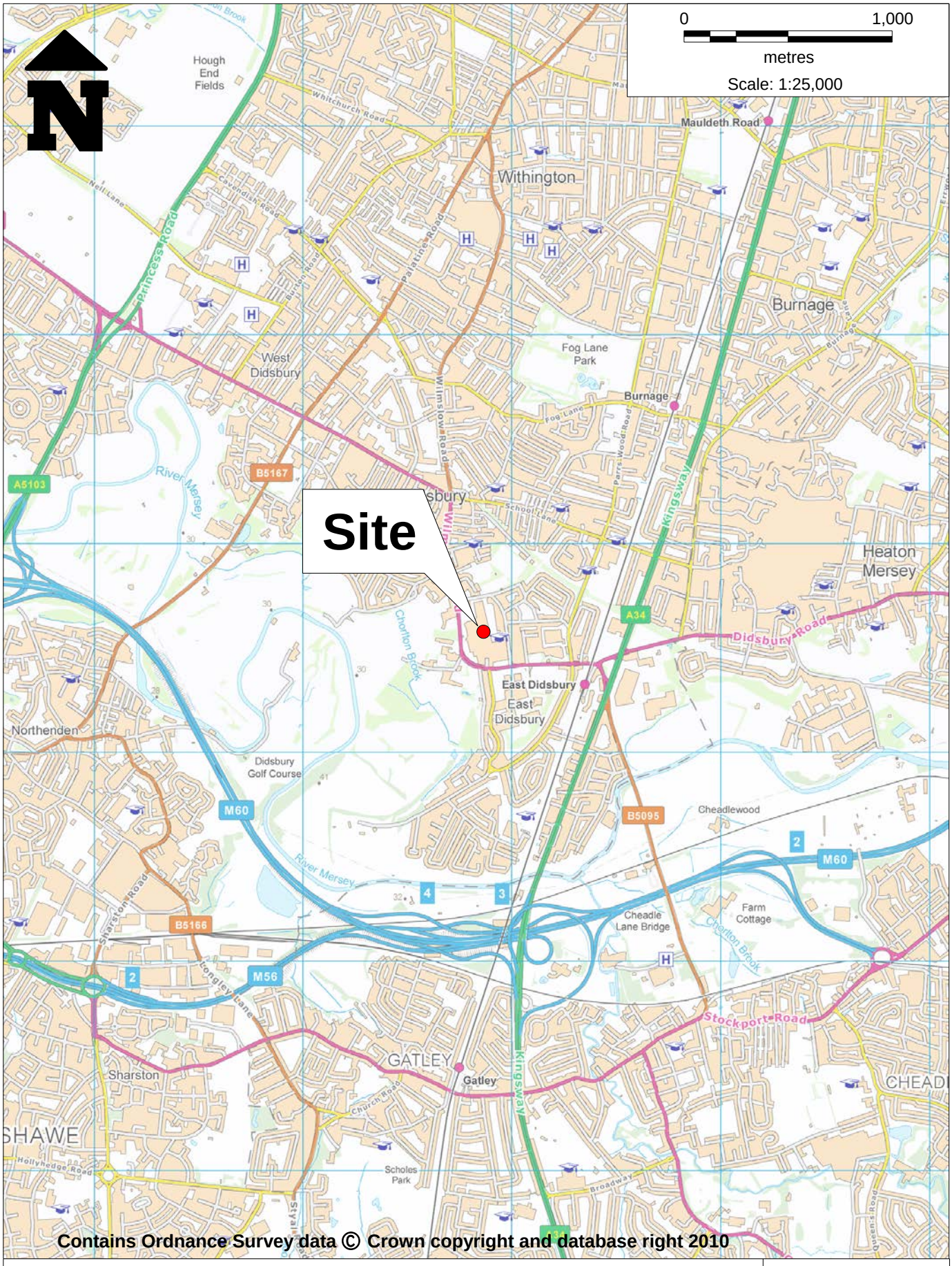
It should also be noted that the rear garden of Plot 22 comprises a soil depth of 500mm therefore, this provides additional reassurance that the underlying made ground is a low risk to the end user and no formal capping layer is required.

4 Conclusions

Additional site investigation work was carried out in the rear gardens of Plots 20, 22 and 23 due to an insufficient depth of a cover system (Plot 20) and the absence of a geotextile membrane (Plots 22 and 23).

Based on additional sampling and risk assessment, LKC consider the made ground underlying imported soil in the rear gardens of Plots 20, 22 and 23 to be suitable for use.

Figures

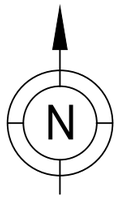


Contains Ordnance Survey data © Crown copyright and database right 2010

Figure 1: Site Location Plan, MMU, Didsbury

Drawn: October 2016 Scale: 1:25,000 @ A4 (see scale bar)

LK CONSULT LIMITED





Extract from: P.J. Livesey Group
Drawing Ref: Site Plan, No.105-00-2100-J (October 2015)

KEY

Site Boundary

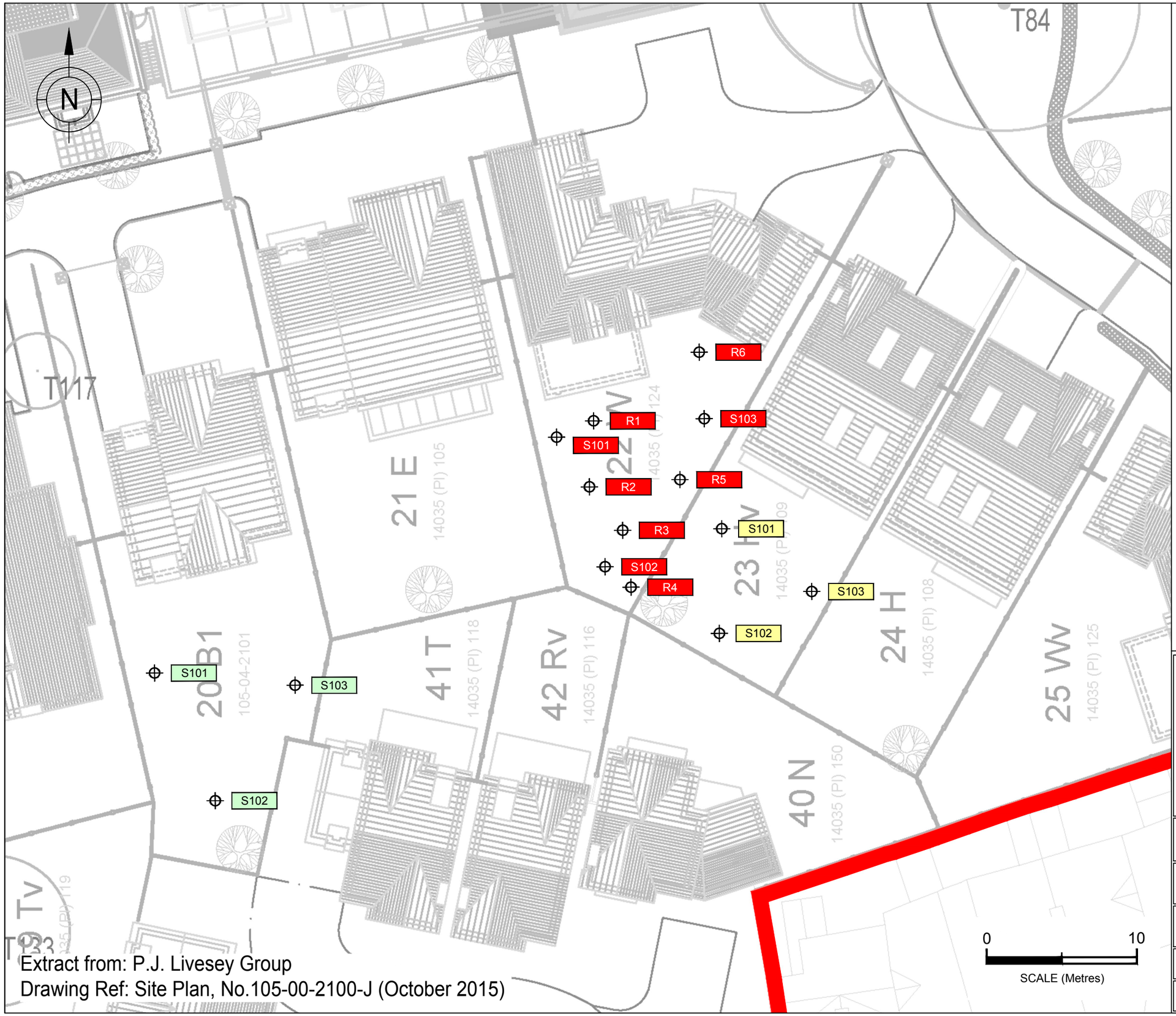
Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing 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:	P.J. Livesey Group Ltd
Site:	MMU, Didsbury
Title:	Site Boundary & Proposed Site Use Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 16 1066	1:1250 @ A3	2	

Drawn By:	Checked By:	Drawn:
AC	PQ	Oct 2016



Extract from: P.J. Livesey Group
Drawing Ref: Site Plan, No.105-00-2100-J (October 2015)

KEY

Site Boundary

Hand Excavated Trial Hole Location

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: P.J. Livesey Holdings Ltd

Site: Land at Former MMU Campus, St. James Park, Didsbury

Title: Sampling Location Plan (Plots 20, 22 & 23)

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 16 1066	1:250 @ A3	3	

Drawn By:	Checked By:	Drawn:
AC	KW	Mar 2016

Appendix A

Validation Summary

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

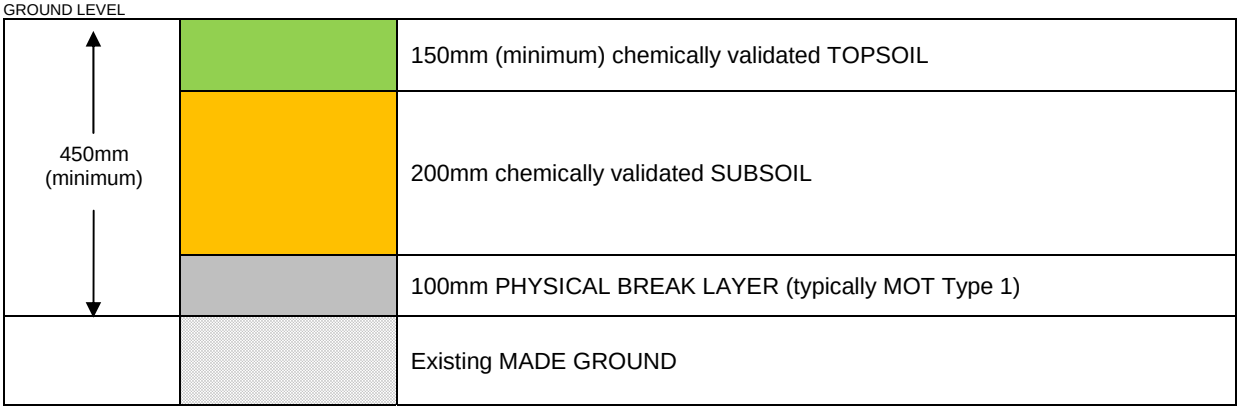
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

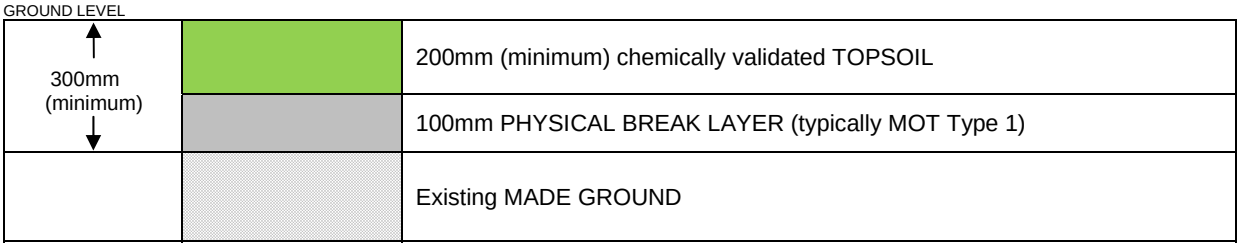
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix B

Profile Logs

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP101

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit.			P.J. Livesey Group Ltd	LKC 16 1066

Location	Dates	Project Contractor	Sheet
	08/03/2016	Bemus	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.20	D1 PID = 0.0ppm				(0.20) 0.20	MADE GROUND: Dark brown/black gravelly slightly clayey sand with occasional subangular cobbles of sandstone, rare whole bricks, coal, pottery fragments, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
0.20-0.80	D2				(0.60) 0.80	Brown gravelly slightly clayey SAND with occasional rootlets. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
1.00-1.50	D3				(1.00) 1.80	Brownish orange very gravelly SAND with abundant subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
						Complete at 1.80m		



Remarks

Trial pit dry and stable.

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP101

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP102

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit.			P.J. Livesey Group Ltd	LKC 16 1066

Location	Dates	Project Contractor	Sheet
	06/07/2016	Bemus	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.40	D1 PID = 0.0ppm				(0.40)	MADE GROUND: Dark brown gravelly clayey sand with abundant angular to subangular cobbles of brick and sandstone, occasional fragments of pottery, glass, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
0.40-0.60	D2				0.40 (0.20) 0.60	MADE GROUND: Red brick sand and gravel subbase. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
1.50-2.00	B1				(2.20)	Light brownish orange very gravelly SAND with occasional subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					2.80	Complete at 2.80m		



Remarks

Trial pit dry and stable

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP102

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP103

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit.			P.J. Livesey Group Ltd	LKC 16 1066

Location	Dates	Project Contractor	Sheet
	06/07/2016	Bemus	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.30	D1 PID = 0.0ppm				(0.30)	MADE GROUND: Dark brown gravelly slightly clayey sand with abundant angular to subangular cobbles of brick and sandstone, occasional fragments of glass, pottery, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
0.50-1.00 0.50-1.00	B1 D2				0.30 (0.80)	Light brownish orange very gravelly SAND with occasional subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					1.10	Complete at 1.10m		



Remarks

Trial pit dry and stable.

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP103

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP104

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit.			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 06/07/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.60	D1 PID = 0.0ppm				(0.80)	MADE GROUND: Dark brown very gravelly slightly clayey sand with abundant angular to subangular cobbles of brick and sandstone; occasional fragments of glass, pottery, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
1.00-1.50	D2				0.80	Light brownish orange very gravelly SAND with occasional subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone. Colour lightens with depth.		
1.50-2.00	B1				(1.80)			
					2.60	Complete at 2.60m		



Remarks

Trial pit dry and stable.

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP104

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP105

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit.			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 06/07/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.60	D1 PID = 0.0ppm				(0.60)	MADE GROUND: Dark brown gravelly slightly clayey sand with abundant angular to subangular cobbles of brick and sandstone; occasional glass, pottery, tarmac, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
0.60-1.00	D2				0.60	Brownish orange very gravelly SAND with abundant subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
1.00-1.50	B1				(0.80)			
					1.40	Complete at 1.40m		



Remarks

Trial pit dry and stable.

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP105

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP106

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit.			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 06/07/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.60	D1 PID = 0.0ppm				(0.60)	MADE GROUND: Dark brown very gravelly slightly clayey sand with abundant angular to subangular cobbles of brick and sandstone; occasional fragments of glass, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
0.60-1.00	D2				0.60	Brownish orange very gravelly SAND with subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse subangular to subrounded comprising sandstone.		
1.50-2.00	B1				(1.80)			
					2.40	Complete at 2.40m		



Remarks

Trial pit dry and stable.

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP106

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	Site MMU, Didsbury	Trial Pit Number TP107
Excavation Method Trial Pit.	Client P.J. Livesey Group Ltd	Job Number LKC 16 1066
Dimensions Location	Ground Level (mOD) Dates 06/07/2016	Project Contractor Bemus	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	D1 PID = 0.0ppm				(0.60)	MADE GROUND: Dark brown gravelly slightly clayey sand with abundant angular to subangular cobbles of brick and sandstone; occasional glass, pottery, timber, rootlets, clothing, food wrappers, tarmac, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					0.60			
1.00-1.50	D2				(1.40)	Brownish orange very gravelly SAND with abundant subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
1.50-2.00	B1				2.00	Complete at 2.00m		



Remarks

Trial pit dry and stable.

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP107

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP108

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit.			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 06/07/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	D1 PID = 0.0ppm				(1.10)	MADE GROUND: Dark brown gravelly slightly clayey sand with abundant angular to subangular cobbles of brick and sandstone; occasional glass, pottery, tarmac, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone. Possible former brick drain encountered at 0.5mbgl.		
1.10-1.50	D2				1.10 (1.40)	Brownish orange very gravelly SAND with abundant subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
2.00-2.50	B1				2.50	Complete at 2.50m		



Remarks

Trial pit dry and stable.

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP108

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP109

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 06/07/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.70	D1 PID = 0.0ppm				(0.70)	MADE GROUND: Dark brown gravelly slightly clayey sand with abundant angular to subangular cobbles of brick and sandstone; occasional glass, pottery, tarmac, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone. Possible brick wall encountered at 0.3mbgl.		
0.70-1.00	D2				0.70	Brownish orange very gravelly SAND with abundant subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
1.50-2.00	B1				(1.70)			
					2.40	Complete at 2.40m		



Remarks

Trial pit dry and stable.

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP109

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** MMU, Didsbury	**Trial Pit Number** **TP110**	
Excavation Method Trial Pit.	**Dimensions**	**Ground Level (mOD)**	**Client** P.J. Livesey Group Ltd	**Job Number** LKC 16 1066
	Location	**Dates** 06/07/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	D1 PID = 0.0ppm				(0.10) 0.10	MADE GROUND: Compacted red brick and gravel. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					(0.60)	MADE GROUND: Dark brown gravelly slightly clayey sand with abundant angular to subangular cobbles of brick and sandstone; occasional glass, pottery, tarmac, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					0.70			
1.00-1.50	D2					Brownish orange very gravelly SAND with abundant subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					(1.40)			
1.50-2.00	B1							
					2.10	Complete at 2.10m		



Remarks

Trial pit dry and stable.

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP110

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP111

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit.			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 06/07/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.40	D1 PID = 0.0ppm				(0.40)	MADE GROUND: Dark brown black gravelly sandy clay with abundant angular to subangular cobbles of brick and sandstone; occasional glass, pottery, brick, rootlets, ash and clinker. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					0.40 (0.10) 0.50	MADE GROUND: White to grey subangular sandstone subbase. Sandstone is fine to coarse angular to subrounded.		
0.50-1.00	D2				(0.80)	MADE GROUND: Brownish orange very gravelly slightly clayey sand with occasional brick fragments and rootlets. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
					1.30 (1.20)	Brownish orange very gravelly SAND with subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse subangular to subrounded comprising sandstone.		
2.50-2.70	B1				2.50 (0.20) 2.70	Brownish red slightly gravelly slightly sandy CLAY. Sand is fine to medium. Gravel is fine to medium angular to subrounded comprising sandstone.		
			Water strike(1) at 2.70m.			Complete at 2.70m		▽1



Remarks

Trial pit stable.

Scale (approx)	Logged By	Figure No.
1:20	KW	LKC 16 1066.TP111

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP112

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit.			P.J. Livesey Group Ltd	LKC 16 1066

Location	Dates	Project Contractor	Sheet
	01/08/2016	Bemus	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-2.00	D2				(1.20)	MADE GROUND: Brownish orange cobbly very gravelly sand with abundant brick fragments and occassional half bricks. Sand is fine to medium. Gravel is fine to coarse angular to subrounded comprising sandstone.		
0.50-1.00	D1 PID = 0.0ppm				1.20			
					(1.30)	Brownish orange slightly gravelly SAND with subangular cobbles of sandstone. Sand is fine to medium. Gravel is fine to coarse subangular to subrounded comprising sandstone.		
					2.50	Complete at 2.50m		



Remarks

Trial pit stable.

Scale (approx)	Logged By	Figure No.
1:20	PQ	LKC 16 1066.TP112

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP113

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			P.J. Livesey Group Ltd	LKC 16 1066

Location	Dates	Project Contractor	Sheet
	30/11/2016	Bemus	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50 0.00-0.50	ES1 PID <0.1ppm				(0.50) 0.50	MADE GROUND: Brown slightly cobbley gravelly sand with occasional wood. Sand is fine to coarse. Gravel is fine to coarse, angular to rounded, of brick, concrete, coal, sandstone, and pebble.		
					(0.50) 1.00	Pale orange slightly gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble and sandstone.		
					(1.00) 2.00	Pale orange gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble and sandstone.		
					2.05	Black very gravelly sandy CONGLOMERATE (possible iron pan cemented gravel). Sand is coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble.		
					(0.65) 2.70	Pale orange very gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble and sandstone.		
						Complete at 2.70m		



Remarks

No groundwater encountered.

Scale (approx)	Logged By	Figure No.
1:20	NS	LKC 16 1066.TP113

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP114

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 30/11/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.30 0.00-0.30	ES1 PID <0.1ppm				(0.30)	MADE GROUND: Dark brown very gravelly sandy clay with occasional brick and wire. Sand is fine to coarse. Gravel is fine to coarse, angular to rounded, of brick, concrete, coal, tarmacadam, sandstone, and pebble.		
					0.30			
					(0.70)	Orange gravelly SAND. Sand is medium to coarse. Gravel is fine to coarse, sub-rounded to rounded, of pebble and sandstone.		
					1.00			
					(1.50)	Orange very gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble and sandstone.		
2.50	SV 50.67kPa		Water strike(1) at 2.50m. 54, 54, 44/Av. 50.67		2.50			▽1
					(0.20)	Firm consistency medium strength brown sandy CLAY. Sand is fine to medium.		
					2.70	Complete at 2.70m		



Remarks

Scale (approx)	Logged By	Figure No.
1:20	NS	LKC 16 1066.TP113

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP115

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			P.J. Livesey Group Ltd	LKC 16 1066
	Location	**Dates** 30/11/2016	**Project Contractor** Bemus	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50 0.00-0.50	ES1 PID <0.1ppm				0.05 (0.25)	MADE GROUND: Dark brown sandy slightly gravelly clay with frequent rootlets and occasional wood. Sand is fine to medium. Gravel is fine to medium, angular to sub-rounded, of brick, sandstone, coal, slate and limestone.		
					0.30 (0.20)	MADE GROUND: Light grey sandy gravel (MOT). Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded, of limestone.		
					0.50 (0.70)	MADE GROUND: Orange / red sandy gravelly cobbles with occasional wood and wire. Sand is fine to coarse. Gravel and cobbles are fine to coarse, angular to rounded, of brick, slate and coal. Yellow / orange gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble and sandstone.		
					1.20 (1.30)	Yellow / orange very gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble and sandstone.		
2.50	SV 50.67kPa		54, 54, 44/Av. 50.67		2.50	Complete at 2.50m		



Remarks

No groundwater encountered.

Scale (approx)	Logged By	Figure No.
1:20	NS	LKC 16 1066.TP113

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP116

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			P.J. Livesey Group Ltd	LKC 16 1066

Location	Dates	Project Contractor	Sheet
	30/11/2016	Bemus	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50 0.00-0.50	ES1 PID <0.1ppm				(0.20) 0.20	MADE GROUND: Dark brown sandy slightly gravelly clay with frequent rootlets and occasional wood. Sand is fine to medium. Gravel is fine to medium, angular to sub-rounded, of brick, sandstone, coal, slate and limestone.		
					(0.20) 0.40	MADE GROUND: Light grey sandy gravel (MOT). Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded, of limestone.		
					0.45	MADE GROUND: Dark brown / black slightly sandy gravelly clay. Sand is medium to coarse. Gravel is fine to medium, angular to sub-rounded, of brick and limestone.		
					(0.75)	Orange gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble and sandstone with rare coal fragments.		
					1.20	Orange very gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble and sandstone.		
					(0.80)			
					2.00	Firm consistency medium strength brown very sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is fine to medium, sub-angular to sub-rounded, of sandstone and pebble.		
2.50	SV 49kPa		49, 49,49/Av. 49.00		(0.90)			
					2.90	Complete at 2.90m		



Remarks

No groundwater encountered.

Scale (approx)	Logged By	Figure No.
1:20	NS	LKC 16 1066.TP113

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
MMU, Didsbury	TP117

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			P.J. Livesey Group Ltd	LKC 16 1066

Location	Dates	Project Contractor	Sheet
	30/11/2016	Bemus	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.05	MADE GROUND: Brick Paving.		
					0.10			
					(0.10)	MADE GROUND: Tarmacadam.		
					0.20			
0.20-0.35	ES1					MADE GROUND: Concrete.		
0.20-0.35	PID <0.1ppm				(0.20)			
						MADE GROUND: Light grey sandy gravel (MOT). Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded, of limestone.		
					0.40			
						Orange brown gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble and sandstone with rare coal fragments.		
					(0.80)			
					1.20			
						Orange brown very gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-rounded to rounded, of pebble and sandstone.		
					(1.40)			
2.50	SV 49kPa		49, 49,49/Av. 49.00		2.60			
						Complete at 2.60m		



Remarks

No groundwater encountered.

Scale (approx)	Logged By	Figure No.
1:20	NS	LKC 16 1066.TP113

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

Appendix C

Photographs

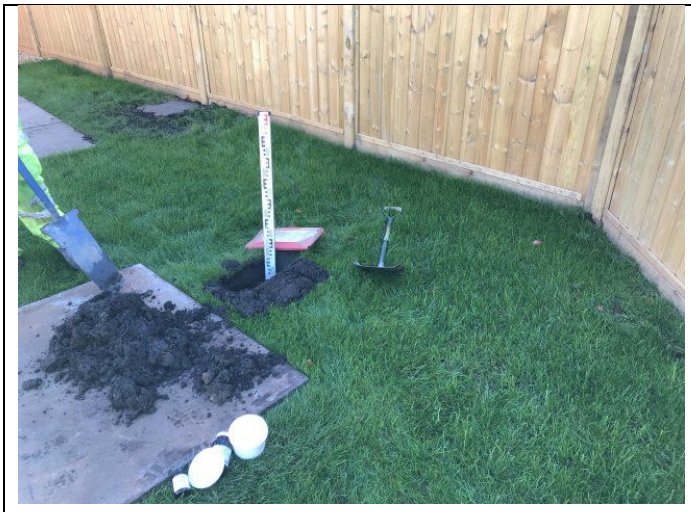
Plot 20

	**Photograph 1:** View of rear garden of Plot 20.
	**Photograph 2:** View of soil in capping layer excavation in rear garden of Plot 20 with geotextile membrane visible.
	**Photograph 3:** Depth measurement in rear garden of Plot 20. The cover system only comprises 300mm over soil and not the required 450mm therefore Option 2 Assessment (plot by plot) of the Remediation Strategy was undertaken.

Plot 22

	**Photograph 4:** View of rear garden of Plot 22.
	**Photograph 5:** View of soil in capping layer excavation in rear garden of Plot 22. No membrane is present, and topsoil has been laid straight onto made ground.
	**Photograph 6:** Depth measurement in rear garden of Plot 22. No separation layer was present however the soil was laid to an appropriate depth, therefore Option 2 Assessment (plot by plot) of the Remediation Strategy was undertaken.

Plot 23

	**Photograph 7:** View of rear garden of Plot 23.
	**Photograph 8:** View of soil in capping layer excavation in rear garden of Plot 23. No membrane is present, and topsoil has been laid straight onto made ground.
	**Photograph 9:** Depth measurement in rear garden of Plot 23. No separation layer was present however the soil was laid to an appropriate depth, therefore Option 2 Assessment (plot by plot) of the Remediation Strategy was undertaken.

Appendix D

Certificates of Analysis - Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	18-19658-1
Initial Date of Issue:	10-Jul-2018
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Contaminated Land Paul Quimby
Project	LKC 16 1066 MMU Didsbury

Quotation No.:		**Date Received:**	06-Jul-2018
Order No.:	736213	**Date Instructed:**	06-Jul-2018
No. of Samples:	3		
Turnaround (Wkdays):	3	**Results Due:**	10-Jul-2018
Date Approved:	10-Jul-2018		

Approved By:



Details: Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-19658	18-19658	18-19658
Quotation No.:		**Chemtest Sample ID.:**			649886	649887	649888
		Client Sample ID.:			S101	S102	S103
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			05-Jul-2018	05-Jul-2018	05-Jul-2018
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	11	13	18
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand
pH	M	2010		N/A	8.2	8.1	8.1
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.20	0.030	0.098
Arsenic	M	2450	mg/kg	1.0	24	17	16
Cadmium	M	2450	mg/kg	0.10	0.61	0.35	0.36
Chromium	M	2450	mg/kg	1.0	19	14	15
Copper	M	2450	mg/kg	0.50	36	59	41
Mercury	M	2450	mg/kg	0.10	0.20	0.36	0.30
Nickel	M	2450	mg/kg	0.50	21	15	14
Lead	M	2450	mg/kg	0.50	210	140	130
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	32	23	23
Zinc	M	2450	mg/kg	0.50	85	96	82
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	3.8	4.1	5.3
Naphthalene	M	2800	mg/kg	0.10	0.16	0.51	0.43
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	0.19	0.18
Acenaphthene	M	2800	mg/kg	0.10	0.22	0.78	0.35
Fluorene	M	2800	mg/kg	0.10	0.16	0.57	0.29
Phenanthrene	M	2800	mg/kg	0.10	2.3	5.4	3.5
Anthracene	M	2800	mg/kg	0.10	0.49	1.2	0.78
Fluoranthene	M	2800	mg/kg	0.10	4.0	10	6.4
Pyrene	M	2800	mg/kg	0.10	3.3	8.5	5.4
Benzo[a]anthracene	M	2800	mg/kg	0.10	1.3	3.7	2.1
Chrysene	M	2800	mg/kg	0.10	1.5	4.5	2.5
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.7	5.2	3.1
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.57	1.7	0.97
Benzo[a]pyrene	M	2800	mg/kg	0.10	1.3	4.1	2.1
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.81	3.1	1.6
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.13	0.48	0.20
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.93	2.6	1.6
Total Of 16 PAH's	N	2800	mg/kg	2.0	19	53	32

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	18-34206-1
Initial Date of Issue:	12-Nov-2018
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Contaminated Land Paul Quimby
Project	LKC 16 1066 Former MMU Campus, Didsbury

Quotation No.:		**Date Received:**	02-Nov-2018
Order No.:	736496	**Date Instructed:**	02-Nov-2018
No. of Samples:	10		
Turnaround (Wkdays):	5	**Results Due:**	08-Nov-2018
Date Approved:	12-Nov-2018		

Approved By:



Details: Robert Monk, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206
Quotation No.:		**Chemtest Sample ID.:**			718221	718222	718223	718224	718225	718226	718227	718228
		Client Sample ID.:			TSS01	TS502	TS503	Plot 22	Plot 22	Plot 22	Plot 22	Plot 23
		Sample Location:						S101	S102	S103	S104	S101
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Date Sampled:			31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	16	12	14	13	14	11	11	13
Soil Colour	N	2040		N/A	Brown,	Brown,	Brown,	Brown,	Brown,	Brown,	Brown,	Brown,
Other Material	N	2040		N/A	Stones,	Stones,	Stones,	Stones,	Stones,	Stones,	Stones,	Stones, Roots,
Soil Texture	N	2040		N/A	Loam,	Loam,	Loam,	Loam,	Loam,	Loam,	Loam,	Loam,
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached					
pH	M	2010		N/A	8.1	8.3	8.3	8.2	8.2	8.4	8.7	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.54	0.64	0.52					
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.015	0.027	< 0.010	0.035	0.022	0.083	0.18	0.030
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50					
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50					
Arsenic	M	2450	mg/kg	1.0	14	12	10	13	13	13	15	13
Cadmium	M	2450	mg/kg	0.10	0.28	0.22	0.20	0.24	0.21	0.36	0.32	0.23
Chromium	M	2450	mg/kg	1.0	12	11	11	12	11	14	11	11
Copper	M	2450	mg/kg	0.50	29	29	23	23	28	25	22	26
Mercury	M	2450	mg/kg	0.10	0.42	0.41	0.34	0.35	0.46	0.34	0.30	0.39
Nickel	M	2450	mg/kg	0.50	15	15	13	14	14	15	13	14
Lead	M	2450	mg/kg	0.50	110	110	88	97	100	96	92	92
Selenium	M	2450	mg/kg	0.20	0.28	0.22	0.25	< 0.20	0.30	< 0.20	< 0.20	0.22
Vanadium	U	2450	mg/kg	5.0	16	15	14	15	15	18	14	14
Zinc	M	2450	mg/kg	0.50	61	63	54	52	56	61	50	55
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.8	4.8	4.1	3.1	5.7	5.3	3.5	4.1
Fuel Type	N	2670		N/A	PAH	PAH	PAH					
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	46	33	26					
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	46	33	26					
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206
Quotation No.:		**Chemtest Sample ID.:**			718221	718222	718223	718224	718225	718226	718227	718228
		Client Sample ID.:			TSS01	TS502	TS503	Plot 22	Plot 22	Plot 22	Plot 22	Plot 23
		Sample Location:						S101	S102	S103	S104	S101
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Date Sampled:			31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	9.8	5.7	4.1					
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	200	92	42					
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	210	97	46					
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	250	130	73					
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Naphthalene	M	2800	mg/kg	0.10	0.13	0.20	0.24	0.46	0.13	0.67	0.11	0.33
Acenaphthylene	N	2800	mg/kg	0.10	0.11	0.16	0.10	0.24	0.15	0.24	< 0.10	0.26
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	0.13	0.46	0.38	0.21	1.8	< 0.10	0.22
Fluorene	M	2800	mg/kg	0.10	< 0.10	0.17	0.27	0.32	0.23	1.6	0.12	0.24
Phenanthrene	M	2800	mg/kg	0.10	1.6	2.8	4.2	4.0	3.0	14	1.6	3.6
Anthracene	M	2800	mg/kg	0.10	0.33	0.65	0.86	1.1	0.72	3.7	0.36	1.1
Fluoranthene	M	2800	mg/kg	0.10	3.2	4.5	5.1	4.7	4.7	18	2.9	5.4
Pyrene	M	2800	mg/kg	0.10	3.3	4.7	4.9	4.6	4.2	15	3.1	5.2
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.98	1.9	1.9	1.6	1.7	6.8	1.3	2.1
Chrysene	M	2800	mg/kg	0.10	1.3	2.3	2.1	2.0	2.0	7.6	1.5	2.5
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.3	2.4	2.3	1.9	2.0	8.1	1.7	2.6
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.38	0.84	0.66	0.62	0.54	3.4	0.56	0.78
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.83	1.6	1.6	1.4	1.5	6.9	1.4	1.9
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.41	0.92	0.82	0.66	0.63	4.2	0.68	1.0
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.76	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.63	1.1	1.1	0.96	0.91	3.9	0.87	1.3
Total Of 16 PAH's	N	2800	mg/kg	2.0	15	24	27	25	23	97	16	29
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30					

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult			**Chemtest Job No.:**		18-34206	18-34206
Quotation No.:			**Chemtest Sample ID.:**		718229	718230
			Client Sample ID.:		Plot 23	Plot 23
			Sample Location:		S102	S103
			Sample Type:		SOIL	SOIL
			Date Sampled:		31-Oct-2018	31-Oct-2018
			Asbestos Lab:		DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	15	16
Soil Colour	N	2040		N/A	Brown,	Brown,
Other Material	N	2040		N/A	Stones, Roots,	Stones,Roots,
Soil Texture	N	2040		N/A	Loam,	Loam,
Chromatogram (TPH)	N			N/A		
pH	M	2010		N/A	8.2	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40		
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.029	0.072
Cyanide (Free)	M	2300	mg/kg	0.50		
Cyanide (Total)	M	2300	mg/kg	0.50		
Arsenic	M	2450	mg/kg	1.0	13	15
Cadmium	M	2450	mg/kg	0.10	0.26	0.27
Chromium	M	2450	mg/kg	1.0	12	14
Copper	M	2450	mg/kg	0.50	27	32
Mercury	M	2450	mg/kg	0.10	0.41	0.57
Nickel	M	2450	mg/kg	0.50	15	17
Lead	M	2450	mg/kg	0.50	110	120
Selenium	M	2450	mg/kg	0.20	0.27	0.26
Vanadium	U	2450	mg/kg	5.0	15	18
Zinc	M	2450	mg/kg	0.50	59	70
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.8	4.8
Fuel Type	N	2670		N/A		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0		
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0		
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0		
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0		
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0		

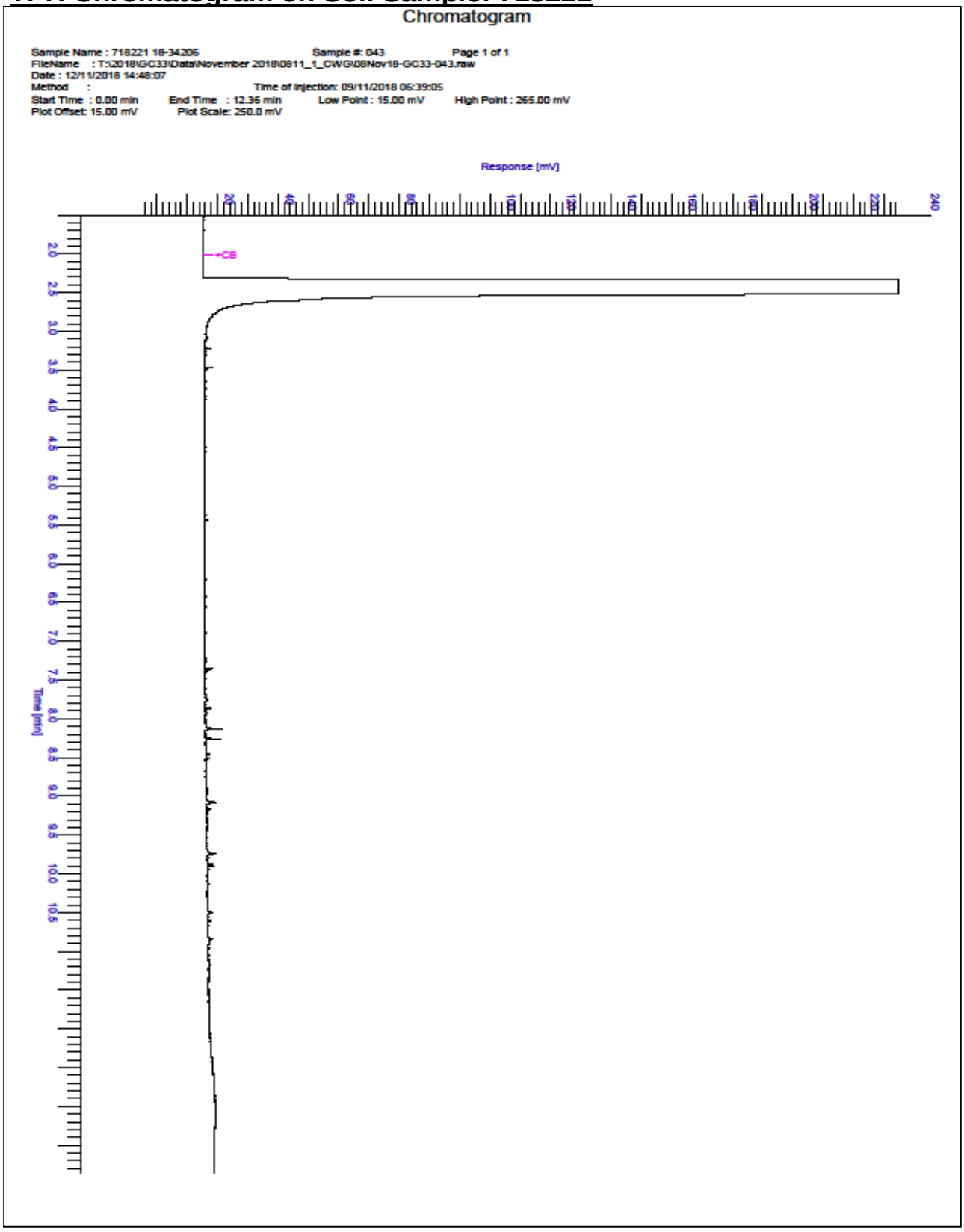
Chemtest
The right chemistry to deliver results

Results - Soil

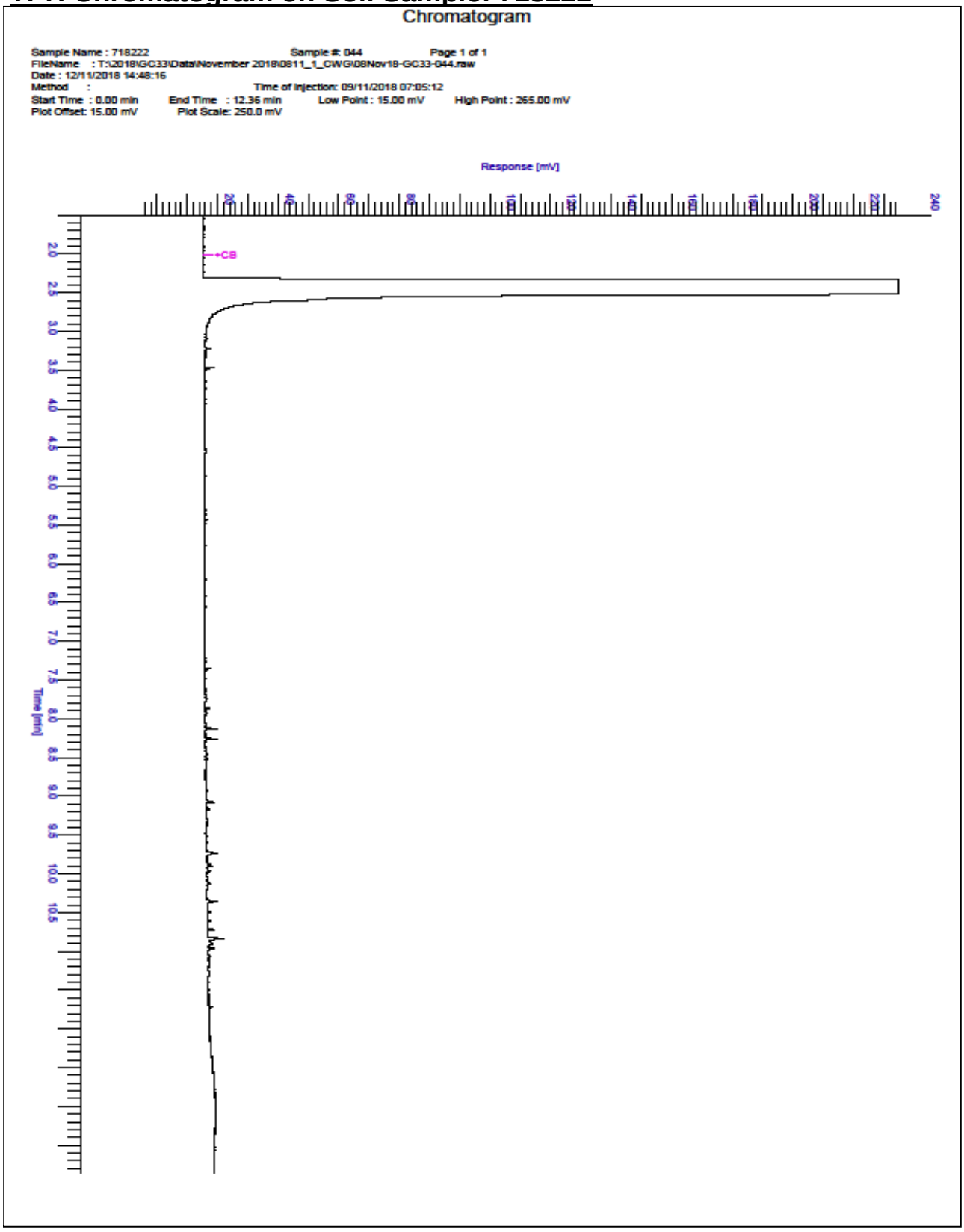
Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-34206	18-34206
Quotation No.:		**Chemtest Sample ID.:**			718229	718230
		Client Sample ID.:			Plot 23	Plot 23
		Sample Location:			S102	S103
		Sample Type:			SOIL	SOIL
		Date Sampled:			31-Oct-2018	31-Oct-2018
		Asbestos Lab:			DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0		
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		
Benzene	M	2760	µg/kg	1.0		
Toluene	M	2760	µg/kg	1.0		
Ethylbenzene	M	2760	µg/kg	1.0		
m & p-Xylene	M	2760	µg/kg	1.0		
o-Xylene	M	2760	µg/kg	1.0		
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0		
Naphthalene	M	2800	mg/kg	0.10	0.13	0.65
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	0.14
Acenaphthene	M	2800	mg/kg	0.10	0.19	0.85
Fluorene	M	2800	mg/kg	0.10	0.15	0.62
Phenanthrene	M	2800	mg/kg	0.10	2.1	6.2
Anthracene	M	2800	mg/kg	0.10	0.47	1.4
Fluoranthene	M	2800	mg/kg	0.10	3.6	7.3
Pyrene	M	2800	mg/kg	0.10	3.2	6.5
Benzo[a]anthracene	M	2800	mg/kg	0.10	1.4	2.4
Chrysene	M	2800	mg/kg	0.10	1.6	3.1
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.6	3.0
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.52	0.94
Benzo[a]pyrene	M	2800	mg/kg	0.10	1.3	2.3
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.70	1.3
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.92	1.7
Total Of 16 PAH's	N	2800	mg/kg	2.0	18	38
Total Phenols	M	2920	mg/kg	0.30		

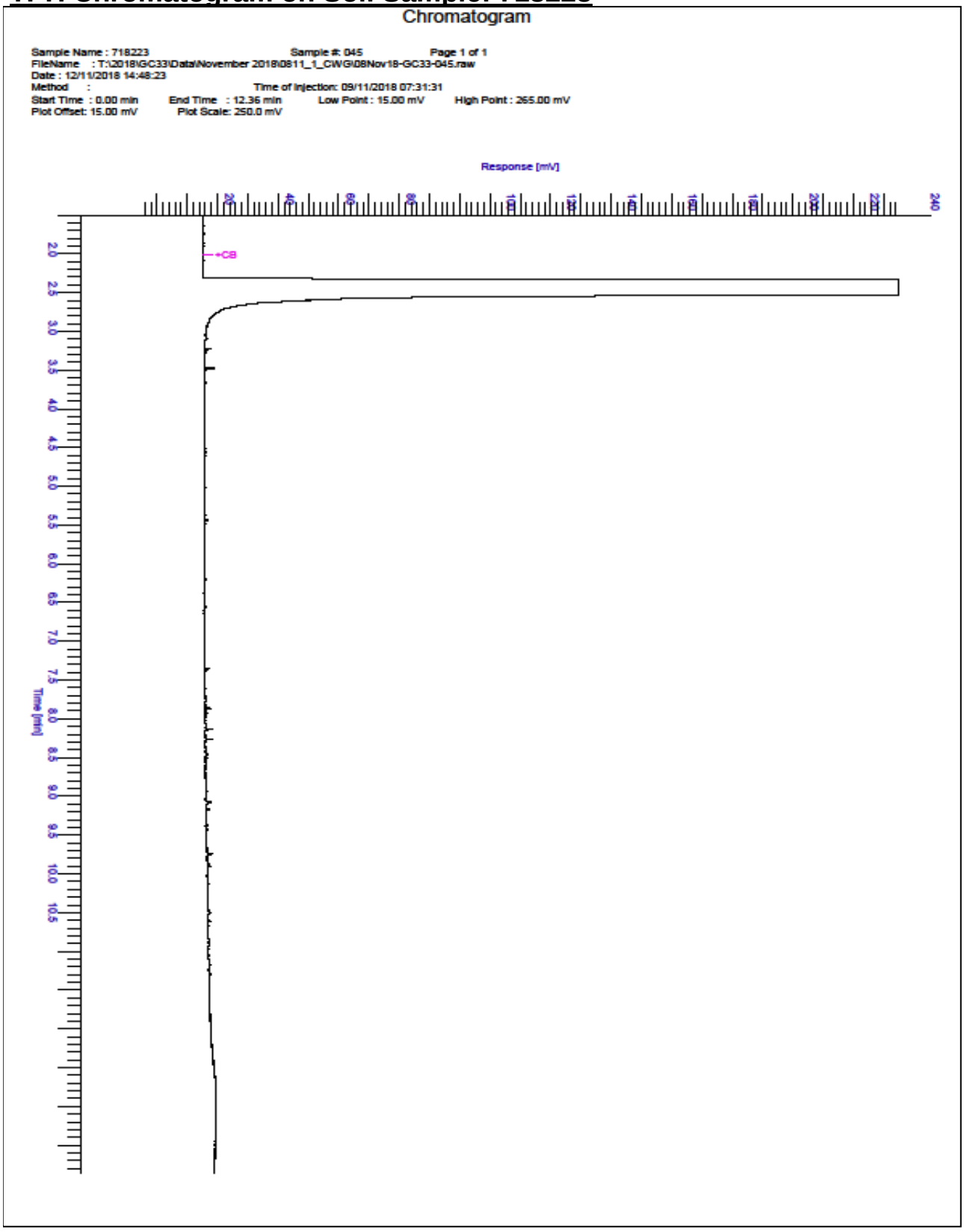
TPH Chromatogram on Soil Sample: 718221



TPH Chromatogram on Soil Sample: 718222



TPH Chromatogram on Soil Sample: 718223



Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	19-06678-1
Initial Date of Issue:	05-Mar-2019
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Contaminated Land Paul Quimby
Project	LKC 16 1066 Didsbury MMU

Quotation No.:		**Date Received:**	22-Feb-2019
Order No.:	736750	**Date Instructed:**	22-Feb-2019
No. of Samples:	6		
Turnaround (Wkdays):	5	**Results Due:**	28-Feb-2019
Date Approved:	05-Mar-2019		

Approved By:



Details: Robert Monk, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 Didsbury MMU

Client: LK Consult			**Chemtest Job No.:**		19-06678	19-06678	19-06678	19-06678	19-06678	19-06678
Quotation No.:			**Chemtest Sample ID.:**		780854	780855	780856	780857	780858	780859
			Client Sample ID.:		Plot 22 R1	Plot 22 R2	Plot 22 R3	Plot 22 R4	Plot 22 R5	Plot 22 R6
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.20	0.35	0.30	0.30	0.30	0.30
			Bottom Depth (m):		0.40	0.50	0.50	0.55	0.50	0.50
			Date Sampled:		21-Feb-2019	21-Feb-2019	21-Feb-2019	21-Feb-2019	21-Feb-2019	21-Feb-2019
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
Naphthalene	M	2800	mg/kg	0.10	0.32	0.14	< 0.10	0.18	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	0.25	0.10	< 0.10	0.19	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	0.16	0.13	< 0.10	0.20	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	0.32	0.10	< 0.10	0.26	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	4.1	2.4	1.3	4.1	1.5	2.9
Anthracene	M	2800	mg/kg	0.10	1.4	0.80	0.44	1.3	0.50	1.0
Fluoranthene	M	2800	mg/kg	0.10	8.1	4.8	3.0	6.4	3.0	5.1
Pyrene	M	2800	mg/kg	0.10	7.8	4.6	2.9	6.8	3.1	4.8
Benzo[a]anthracene	M	2800	mg/kg	0.10	2.5	1.5	0.76	1.6	0.79	1.2
Chrysene	M	2800	mg/kg	0.10	3.5	1.9	1.4	2.9	1.3	2.2
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	3.0	1.8	1.0	2.4	1.4	2.3
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	1.7	0.85	0.38	0.98	0.42	2.1
Benzo[a]pyrene	M	2800	mg/kg	0.10	2.3	1.2	0.60	1.3	0.68	0.93
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.85	0.45	0.15	0.55	0.32	0.28
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	1.5	0.65	0.25	0.95	0.52	0.49
Total Of 16 PAH's	N	2800	mg/kg	2.0	38	21	12	30	14	23

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix E

Certificate of Analysis – Generic Assessment Criteria Values

Summary of Category 4 Screening Levels: 2015

Substance	Residential (with home-grown produce)	Residential (without home-grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37 mg/kg	40 mg/kg	49 mg/kg	640 mg/kg	79 mg/kg	170 mg/kg
Benzene	0.87 mg/kg	3.3 mg/kg	0.18 mg/kg	98 mg/kg	140 mg/kg	230 mg/kg
Benzo(a)pyrene	5.0 mg/kg	5.3 mg/kg	5.7 mg/kg	77 mg/kg	10 mg/kg	21 mg/kg
Cadmium	22 mg/kg	150 mg/kg	3.9 mg/kg	410 mg/kg	220 mg/kg	880 mg/kg
Chromium VI	21 mg/kg	21 mg/kg	170 mg/kg	49 mg/kg	21 mg/kg	250 mg/kg
Lead	200 mg/kg	310 mg/kg	80 mg/kg	2300 mg/kg	630 mg/kg	1300 mg/kg

Summary Table for the Generic Assessment Criteria for Human Health Risk Assessment Land Quality Management (LQM) S4ULs.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Metals	Inorganic Arsenic	6%	37	40	43	640	79	170
	Beryllium	6%	1.7	1.7	35	12	2.2	63
	Boron	6%	290	11,000	45	240,000	21,000	46,000
	Cadmium	6%	11	85	1.9	190	120	532
	Chromium (III)	6%	910	910	18,000	8,600	1,500	33,000
	Chromium (VI)	6%	6.0	6.0	1.8	33	7.7	220
	Copper	6%	2,400	7,100	520	68,000	12,000	44,000
	Elemental Mercury	6%	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}
	Inorganic Mercury	6%	40	56	19	1,100	120	240
	Methylmercury	6%	11	15	6.0	320	40	68
	Nickel	6%	180	180	230	980	230	3,400
	Selenium	6%	250	430	88	12,000	1,100	1,800
	Vanadium	6%	410	1,200	91	9,000	2,000	5,000
	Zinc	6%	3,700	40,000	620	730,000	81,000	170,000
BTEX Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90
		2.5%	0.17	0.70	0.034	47	72	100
		6%	0.37	1.4	0.075	90	73	110
	Toluene	1%	130	880 (869) ^{vap}	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
		2.5%	290	1,900	51	110,000 (1,920) ^{vap}	56,000	95,000 (1,920) ^{vap}
		6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	Ethylbenzene	1%	47	83	16	5,700 (518) ^{vap}	24,000	17,000 (518) ^{vap}
		2.5%	110	190	39	13,000 (1,220) ^{vap}	24,000	22,000 (1,220) ^{vap}
		6%	260	440	91	27,000 (2,840) ^{vap}	25,000	27,000 (2,840) ^{vap}
	o-xylene	1%	60	88	28	6,600 (478) ^{sol}	41,000	17,000 (478) ^{sol}
		2.5%	140	210	67	15,000 (1,120) ^{sol}	42,000	24,000 (1,120) ^{sol}
		6%	330	480	160	33,000 (2,620) ^{sol}	43,000	33,000 (2,620) ^{sol}
	m-xylene	1%	59	82	31	6,200 (625) ^{vap}	41,000	17,000 (625) ^{vap}
		2.5%	140	190	74	14,000 (1,470) ^{vap}	42,000	24,000 (1,470) ^{vap}
		6%	320	450	170	31,000 (3,460) ^{vap}	43,000	32,000 (3,460) ^{vap}
	p-xylene	1%	56	79	29	5,900 (576) ^{sol}	41,000	17,000 (576) ^{sol}
		2.5%	130	180	69	14,000 (1,350) ^{sol}	42,000	23,000 (1,350) ^{sol}
		6%	310	430	160	30,000 (3,170) ^{sol}	43,000	31,000 (3,170) ^{sol}

NOTES

$^{Sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000
		2.5%	5,400	35,000	950	540,000	74,000	150,000
		6%	11,000	37,000	2,200	540,000	74,000	150,000
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49
		2.5%	11	14	6.5	170	29	56
		6%	13	15	13	180	29	62
	Benzo(a)pyrene (only)	1%	2.2	3.2	0.97	35	5.7	11
		2.5%	2.7	3.2	2.0	35	5.7	12
		6%	3.0	3.2	3.5	36	5.7	13
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13
		2.5%	3.3	4.0	2.1	44	7.2	15
		6%	3.7	4.0	3.9	45	7.2	16
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400
		2.5%	340	360	470	4,000	640	1,500
		6%	350	360	640	4,000	640	1,600
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370
		2.5%	93	110	75	1,200	190	410
		6%	100	110	130	1,200	190	440
	Chrysene	1%	15	30	4.1	350	57	93
		2.5%	22	31	9.4	350	57	110
		6%	27	32	19	350	57	120
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3
		6%	0.3	0.32	0.43	3.6	0.58	1.4
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300
		2.5%	560	1,600	130	23,000	3,100	6,300
		6%	890	1,600	290	23,000	3,100	6,400
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150
		2.5%	36	46	21	510	82	170
		6%	41	46	39	510	82	180
	Naphthalene	1%	2.3 ^{f}	2.3 ^{f}	4.1 ^{f}	190 ^{f} (76.4) ^{sol}	4,900 ^{f}	1,200 ^{f} (76.4) ^{sol}
		2.5%	5.6 ^{f}	5.6 ^{f}	10 ^{f}	460 ^{f} (183) ^{sol}	4,900 ^{f}	1,900 ^{f} (183) ^{sol}
		6%	13 ^{f}	13 ^{f}	24 ^{f}	1,100 ^{f} (432) ^{sol}	4,900 ^{f}	3,000
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200
		2.5%	220	1,500	38	22,000	3,100	6,200
		6%	440	1,500	90	22,000	3,100	6,300
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000
		2.5%	1,200	3,800	270	54,000	7,400	15,000
		6%	2,000	3,800	620	54,000	7,400	15,000
	Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4
		2.5%	0.98	1.2	0.67	15	2.2	4.7
		6%	1.1	1.2	1.2	15	2.2	4.8

NOTES

$^{sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = naphthalene is based on comparison of inhalation exposure with TDI_{inhal} for localised effect.

All GAC are based on sandy loam soils with a pH 7.

LQM Generic Assessment Criteria (mg/kg) Dry weight soil

	Contaminant	SOM	Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Petroleum Hydrocarbons	**Aliphatic**							
	EC 5-6	1%	42	42	730	3,200 (304) ^{sol}	570,000(304)^{sol}	95,000 (304) ^{sol}
	EC>6-8	1%	100	100	2,300	7,800 (144) ^{sol}	600,000	150,000 (144) ^{sol}
	EC>8-10	1%	27	27	320	2,000 (78) ^{sol}	13,000	14,000 (78) ^{vap}
	EC>10-12	1%	130 (48) ^{vap}	130 (48) ^{vap}	2,200	9,700 (48) ^{sol}	13,000	21,000 (48) ^{vap}
	EC>12-16	1%	1,100 (24) ^{sol}	1,100 (24) ^{sol}	11,000	59,000 (24) ^{sol}	13,000	25,000 (24) ^{sol}
	EC>16-35	1%	65,000 (8.48) ^{f,sol}	65,000 (8.48) ^{f,sol}	260,000 ^{f}	160,000 ^{f}	250,000 ^{f}	450,000 ^{f}
	EC>35-44	1%	65,000 (8.48) ^{f,sol}	65,000 (8.48) ^{f,sol}	260,000 ^{f}	160,000 ^{f}	250,000 ^{f}	450,000 ^{f}
	Aliphatic							
	EC 5-6	2.5%	78	78	1,700	5,900 (558) ^{sol}	590,000	130,000 (558) ^{sol}
	EC>6-8	2.5%	230	230	5,600	17,000 (322) ^{sol}	610,000	220,000 (322) ^{sol}
	EC>8-10	2.5%	65	65	770	4,800 (190) ^{vap}	13,000	18,000 (190) ^{vap}
	EC>10-12	2.5%	330 (118) ^{vap}	330 (118) ^{vap}	4,400	23,000 (118) ^{vap}	13,000	23,000 (118) ^{vap}
	EC>12-16	2.5%	2,400 (59) ^{sol}	2,400 (59) ^{sol}	13,000	82,000 (59) ^{sol}	13,000	25,000 (59) ^{sol}
	EC>16-35	2.5%	92,000 (21) ^{f,sol}	92,000 (21) ^{f,sol}	270,000 ^{f}	1,700,000 ^{f}	250,000 ^{f}	480,000 ^{f}
	EC>35-44	2.5%	92,000 (21) ^{f,sol}	92,000 (21) ^{f,sol}	270,000 ^{f}	1,700,000 ^{f}	250,000 ^{f}	480,000 ^{f}
	Aliphatic							
	EC 5-6	6%	160	160	3,900	12,000 (1,150) ^{sol}	600,000	180,000 (1,150) ^{sol}
	EC>6-8	6%	530	530	13,000	40,000 (736) ^{sol}	620,000	320,000 (736) ^{sol}
	EC>8-10	6%	150	150	1,700	11,000 (451) ^{vap}	13,000	21,000 (451) ^{vap}
	EC>10-12	6%	760 (283) ^{vap}	760 (283) ^{vap}	7,300	47,000 (283) ^{vap}	13,000	24,000 (283) ^{vap}
	EC>12-16	6%	4,300 (142) ^{sol}	4,400 (142) ^{sol}	13,000	90,000 (142) ^{sol}	13,000	26,000 (142) ^{sol}
	EC>16-35	6%	110,000^{f}	110,000^{f}	270,000 ^{f}	1,800,000^{f}	250,000 ^{f}	490,000 ^{f}
	EC>35-44	6%	110,000^{f}	110,000^{f}	270,000 ^{f}	1,800,000^{f}	250,000 ^{f}	490,000 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	1%	70	370	13	26,000 (1,220) ^{sol}	56,000	76,000 (1,220) ^{sol}
	EC>7-8(toluene)	1%	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
	EC>8-10	1%	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}
	EC>10-12	1%	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}
	EC>12-16	1%	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000
	EC>16-21	1%	260 ^{f}	1,900 ^{f}	46 ^{f}	28,000 ^{f}	3,800 ^{f}	7,600 ^{f}
	EC>21-35	1%	1,100 ^{f}	1,900 ^{f}	370 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>35-44	1%	1,100 ^{f}	1,900 ^{f}	370^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	2.5%	140	690	27	46,000 (2,260) ^{sol}	56,000	84,000 (2,260) ^{sol}
	EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) ^{sol}	56,000	95,000 (1,920) ^{sol}
	EC>8-10	2.5%	83	110	21	8,100 (1,500) ^{vap}	5,000	8,500 (1,500) ^{vap}
	EC>10-12	2.5%	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (899) ^{sol}
	EC>12-16	2.5%	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000
	EC>16-21	2.5%	540 ^{f}	1,900 ^{f}	110 ^{f}	28,000 ^{f}	3,800 ^{f}	7,700 ^{f}
	EC>21-35	2.5%	1,500 ^{f}	1,900 ^{f}	820 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>35-44	2.5%	1,500 ^{f}	1,900 ^{f}	820 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	6%	300	1,400	57	86,000 (4,710) ^{sol}	56,000	92,000 (4,710) ^{sol}
	EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	EC>8-10	6%	190	270	51	17,000 (3,580) ^{vap}	5,000	9,300 (3,580) ^{vap}
	EC>10-12	6%	380	1,200	4	34,000 (2,150) ^{sol}	5,000	10,000
	EC>12-16	6%	660	2,500	130	38,000	5,100	10,000
	EC>16-21	6%	930^{f}	1,900 ^{f}	260 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>21-35	6%	1,700 ^{f}	1,900 ^{f}	1,600 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}
	EC>35-44	6%	1,700 ^{f}	1,900 ^{f}	1,600 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}
	Aliphatic +Aromatic >EC44	1%	1,600 ^{f}	1,900 ^{f}	1,200 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
		2.5%	1,800 ^{f}	1,900 ^{f}	2,100 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
		6%	1,900 ^{f}	1,900 ^{f}	3,000 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}

NOTES

$^{Sol\ /\ vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil: Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	7.1E-03	9.2E-03	4.6E-03	0.67	29	21
		2.5%	1.1E-02	1.3E-02	8.3E-03	0.97	29	24
		6%	1.9E-02	2.3E-02	1.6E-02	1.7	29	28
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) vap
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) vap
		6%	39	40	240	3,000	140,000	100,000 (6,392) vap
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800
		2.5%	3.4	8.0	0.89	550	1,400	2,100
		6%	7.5	17	2.0	1,100	1,400	2,300
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500
		2.5%	2.8	3.5	1.9	250	1,400	1,800
		6%	6.4	8.2	4.4	560	1,400	2,100
	Tetrachloroethene (PCE)	1%	0.18	0.18	0.65	19	1,400	810 (424) sol
		2.5%	0.39	0.40	1.5	42	1,400	1,100 (951) sol
		6%	0.90	0.92	3.6	95	1,400	1,500
	Tetrachloromethane (carbon tetrachloride)	1%	2.6E-02	2.6E-02	0.45	2.9	890	190
		2.5%	5.6E-02	5.6E-02	1.0	6.3	920	270
		6%	0.13	0.13	2.4	14	950	400
	Trichloroethene (TCE)	1%	1.6E-02	1.7E-02	4.1E-02	1.2	120	70
		2.5%	3.4E-02	3.6E-02	9.1E-02	2.6	120	91
		6%	7.5E-02	8.0E-02	0.21	5.7	120	120
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600
		2.5%	1.7	2.1	0.83	170	2,500	2,800
		6%	3.4	4.2	1.7	350	2,500	3,100
	Chloroethene (vinyl chloride)	1%	6.4E-04	7.7E-04	5.5E-04	5.9E-02	3.5	4.8
		2.5%	8.7E-04	1.0E-03	1.0E-03	7.7E-02	3.5	5.0
		6%	1.4E-03	1.5E-03	1.8E-03	0.12	3.5	5.4
	2,4,6-Trinitritoluene (TNT)	1%	1.6	65	0.24	1,000	130	260
		2.5%	3.7	66	0.58	1,000	130	270
		6%	8.1	66	1.4	1,000	130	270
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) sol
		2.5%	250	13,000	38	210,000	26,000	51,000
		6%	540	13,000	85	210,000	27,000	53,000
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) vap
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) vap
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) vap
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30
		2.5%	6.6	7.4	6.1	170	18	31
		6%	7.1	7.5	9.8	170	18	31
	Dieldrin	1%	0.97	7.0	0.17	170	18	30
		2.5%	2.0	7.3	0.41	170	18	30
		6%	3.5	7.4	0.96	170	18	31
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300
		2.5%	7.8	620	1.2	9,400	1,200	2,400
		6%	17.4	620	2.7	9,400	1,200	2,400
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26
		6%	0.14	6.6	2.2E-02	140	16	27
	Endosulfanns (2 isomers)	1%	7.4	160 (3.0E-03) vap	1.2	5,600 (3.0E-03) vap	1,200	2,300
		2.5%	18	280 (7.0E-03) vap	2.9	7,400 (7.0E-03) vap	1,200	2,400
		6%	41	410 (1.6E-02) vap	6.8	8,400 (1.6E-02) vap	1,200	2,500
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15
		2.5%	0.2	3.8	3.2E-02	65	8.1	15
		6%	0.46	3.8	7.7E-02	65	8.1	16

NOTES

Sol / vap = solubility / vapour limit (potentially use if free product identified, although highly conservative).

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) ^{sol}
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) ^{sol}
		6%	2.4	2.4	32	290	14,000	2,900
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) ^{sol}	90,000	24,000 (571) ^{sol}
		2.5%	55	57	230	4,800 (1,370) ^{sol}	95,000	36,000 (1,370) ^{sol}
		6%	130	130	540	11,000 (3,240) ^{sol}	98,000	51,000 (3,270) ^{sol}
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) ^{vap}
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) ^{vap}
		6%	15	15	320	1,300	19,000	4,000 (1,880) ^{vap}
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) ^{vap}	78	110 (39) ^{vap}
		2.5%	1.6	1.9	0.90	120 (98.1) ^{vap}	79	120
		6%	3.7	4.3	2.2	240 (235) ^{vap}	79	130
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) ^{sol}	100	190
		2.5%	12	30	3.1	770 (107) ^{sol}	100	190
		6%	22	38	7.0	830	100	190
	Hexachlorobenzene	1%	1.8 (0.20) ^{vap}	4.1 (0.20) ^{vap}	0.47	110 (0.20) ^{vap}	16	30
		2.5%	3.3 (0.50) ^{vap}	5.7 (0.50) ^{vap}	1.1	120	16	30
		6%	4.9	6.7 (1.2) ^{vap}	2.5	120	16	30
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 ^{g}	94	0.13 ^{g}	3,500	620	1,100
		2.5%	2.0	150	0.30	4,000	620	1,100
		6%	4.5	210	0.70	4,300	620	1,100
	Pentachlorophenol	1%	0.22	27 (16.4) ^{vap}	3.0E-02	400	60	110
		2.5%	0.52	29	8.0E-02	400	60	120
		6%	1.2	31	0.19	400	60	120
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300
		2.5%	0.29	0.29	10	22	11,000	1,900
		6%	0.62	0.62	23	47	11,000	2,700
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48
		2.5%	0.7	0.78	0.61	66	25	50
		6%	1.6	1.8	1.4	120	25	51
	Phenol	1%	280	750	66	760 ^{dir} (31,000)	760 ^{dir} (11,000)	760 ^{dir} (8,600)
		2.5%	550	1,300	140	1,500 ^{dir} (35,000)	1,500 ^{dir} (11,000)	1,500 ^{dir} (9,700)
		6%	1,100	2,300	280	3,200 ^{dir} (37,000)	3,200 ^{dir} (11,000)	3,200 ^{dir} (11,000)

NOTES

$^{Sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^{dir} = S4uls based on threshold protective of direct skin contact with phenol (brackets long term exposure for illustration purposes).

^{g} = derived based on 2,3,4,6-tetrachlorophenol.

Appendix F

Statistical Output Sheet

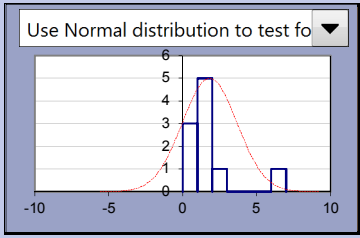
Test Results

BaP

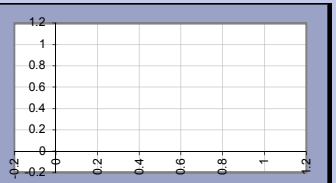
Client/client ref: PJ Livesey Hold | Site ref: Land at Former MMU Campus, St James F | Date: 3rd May 2019

Project ref: LKC 16 1066 | Data description: Plot 22 10 samples front and rear | User details: KW

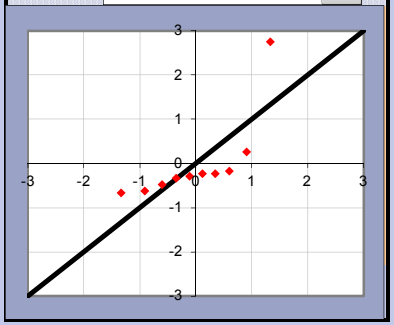
Dataset:	BaP
Sample mean $\bar{x}$	1.821
Sample standard deviation, s	1.8477
Sample size, n	10
Critical concentration, Cc	5



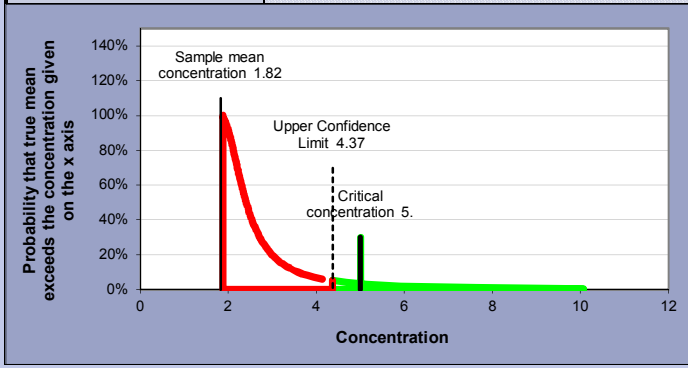
Outliers & non-detects	
Outliers present?	**Yes**
Significance level	1%
Outliers excluded	0
Non-detects	0



Normality test	
Significance level:	1%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	**97%**
Base decision on:	evidence level
Evidence level required:	**95%**
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | **Back to summary** | **Go to outlier test** | **Go to normality test**

Based across the UK with offices in Manchester, London, Liverpool and Glasgow.

Manchester (Head Office)
Unit 29,
Eton Business Park
Eton Hill Rd, Radcliffe
M26 2ZS

t: 0161 763 7200
e: info@thelkgroup.com

London
Brooklands Business Park
Wellington Way
Weybridge
KT13 0TT

t: 01932 871872
e: info@thelkgroup.com

Glasgow
Wright Business Centre
1 Lonmay Road
Glasgow
G33 4EL

t: 0141 773 6269
e: info@thelkgroup.com

Liverpool
The Corn Exchange
Fenwick Street
Liverpool
L2 7QL

t: 0151 235 8716
e: info@thelkgroup.com

LK GROUP

- Geotechnical
- Contaminated Land
- Flood Risk and Drainage
- Asbestos
- Invasive Species
- Land Remediation
- Project Management
- Land Drilling

Site: **St James Park, Former MMU Campus, Didsbury**
Plots: **40 to 42**
Date: **10th March 2020**
NHBC Ref: **Phase 2 - 713376**

1 INTRODUCTION

LK Consult (LKC) has been appointed by PJ Livesey Holdings Ltd to validate the depth of the garden capping layer laid down at the development at St James Park, Former MMU Campus, Didsbury.

This validation report concerns Plots 40 to 42. These plots consist of a rear garden with a small area of soft landscaping and a paved driveway to the front of the property.

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

i) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (included in total soil depth) **or** geotextile marker.
ii) Option 2: Further sampling and risk assessment on a block by block basis (nominally a total of 4 soil samples per plot with 1 in the front garden) or selected soil samples in any landscaped areas. If soil results are below generic assessment criteria then no specific clean validated environmental cover depth will be required, but a nominal 150mm covering of topsoil as a growing medium (if required).
iii) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is 'suitable for use'. All site won or imported material should be tested at a rate of 1 sample per 50m^3 for topsoil and 1 sample per 150m^3 for subsoil.
iv) Details of unexpected contamination.
v) Provision of waste transfer notes for any disposal of contaminated soil offsite.

A validation checklist was provided to the ground workers and presented in Appendix A.

2 IMPORTED MATERIAL

Topsoil for use in the garden and soft landscaping areas has been imported to site. The material used comprised approximately 600m^3 of topsoil supplied by Huperade from a greenfield site at New Manor Farm, Stretford.

Composite topsoil samples were taken from garden areas (ref: Plot 40 rear TS, Plot 41 front TS and Plot 42 rear TS) and subjected to the following analytical suite as a conservative measure:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

Site won subsoil comprising natural gravelly sand has been used within the capping layer in plots on site (approximately 230m^3).

The subsoil samples were collected from within the gardens (ref: Plot 40 rear SS and Plot 42 rear SS) and subjected to the following analytical suite as a conservative measure:

- Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.

Soil samples were collected in plastic tubs, amber glass jars and amber vials and despatched to Chemtest of Newmarket in cool boxes with ice packs.

Soil results for the topsoil are presented in Appendix B. No elevated levels of contaminants were identified in the soil samples collected when compared to Generic Assessment Criteria presented in the agreed Remediation Strategy and presented again in Appendix C.

3 CAPPING LAYER IN GARDEN AREAS

For these plots, Option 1 was undertaken by PJ Livesey. The recommendation for the garden capping layer in Plots 40 to 42 was that it should comprise a minimum 300mm thickness to the front and 450mm to the rear with a demarcation layer.

LKC attended site on 27th February 2020 to inspect the capping layer construction and depth in the front and rear garden areas. Photographs are provided in Appendix D and the observations are summarised below.

Location	Topsoil Depth (mm)	Subsoil Depth (mm)	Membrane or 100mm MOT	Total Depth (mm)	Required Depth (mm)	Pass (✓) or Fail (x)
Plot 40 Front	450	N/A	Membrane	450	300	✓
Plot 40 Rear	180	320	Membrane	500	450	✓
Plot 41 Front	350	N/A	Membrane	350	300	✓
Plot 41 Rear	300	200	Membrane	500	450	✓
Plot 42 Front	320	N/A	Membrane	320	300	✓
Plot 42 Rear	500	300	Membrane	500	450	✓

LKC were able to verify that, in the places inspected within the front and rear gardens of Plots 40 to 42 the capping layer depths were in accordance with the requirements of the Remediation Strategy.

4 CONCLUSIONS

LKC has completed the validation of the garden capping layers within Plots 40 to 42 and conclude that, in the places inspected, chemically suitable material has been laid to an appropriate depth.

Report Prepared By:



Rachel Peart
Senior Geo-Environmental Scientist

Report Reviewed By:



Dr Paul Quimby
Director

Enc:

Appendix A: Remediation Strategy Validation Checklist
Appendix B: Certificates of Analysis – Imported Soil
Appendix C: Generic Assessment Criteria Values
Appendix D: Plot Photographs

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Holdings Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Remediation Strategy Validation Checklist

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

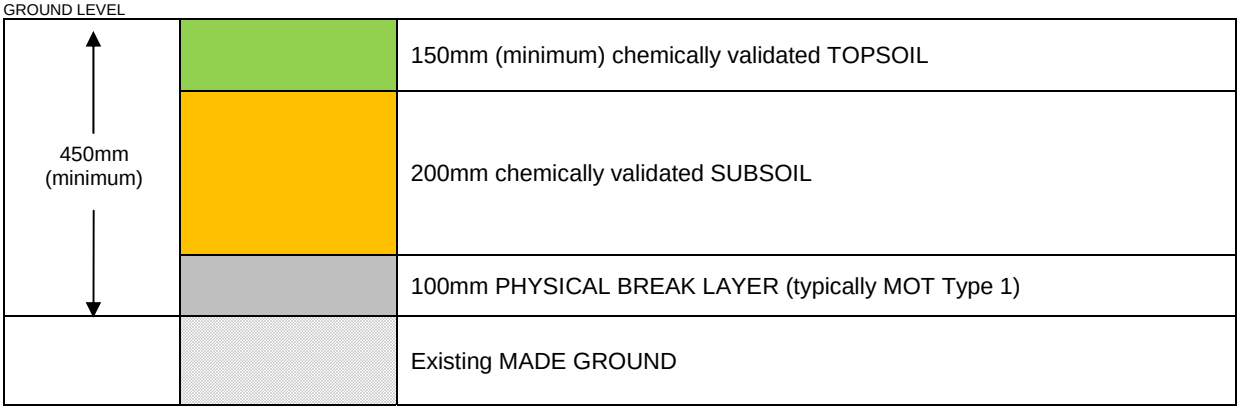
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

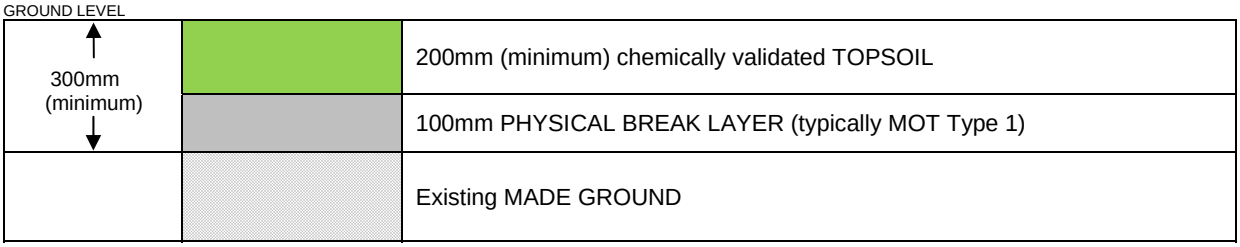
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix B – Certificates of Analysis – Imported Soil

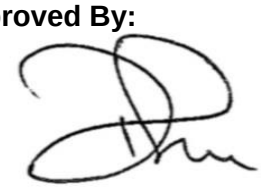
Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-06649-1
Initial Date of Issue:	09-Mar-2020
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Contaminated Land Rachel Peart
Project	LKC 20 1323 - MMU Didsbury

Quotation No.:		**Date Received:**	02-Mar-2020
Order No.:	737631	**Date Instructed:**	02-Mar-2020
No. of Samples:	5		
Turnaround (Wkdays):	5	**Results Due:**	06-Mar-2020
Date Approved:	09-Mar-2020		

Approved By:



Details: Darrell Hall, Director

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 20 1323 - MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			20-06649	20-06649	20-06649	20-06649	20-06649
Quotation No.:		**Chemtest Sample ID.:**			978887	978888	978889	978890	978891
		Client Sample ID.:			Plot 40 (Rear) TS	Plot 42 (Rear) TS	Plot 41 (Front) TS	Plot 40 (Rear) SS	Plot 42 (Rear) SS
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.00	0.00	0.00	0.18	0.20
		Bottom Depth (m):			0.18	0.20	0.20	0.50	0.34
		Date Sampled:			27-Feb-2020	27-Feb-2020	27-Feb-2020	27-Feb-2020	27-Feb-2020
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
ACM Type	U	2192		N/A	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-
Moisture	N	2030	%	0.020	17	15	17	13	12
Soil Colour	N	2040		N/A	Brown,	Brown,	Brown,	Brown,	Brown,
Other Material	N	2040		N/A	Stones, Roots,	Stones, Roots,	Stones, Roots,	Stones, Roots,	Stones, Roots,
Soil Texture	N	2040		N/A	Loam,	Loam,	Loam,	Loam,	Loam,
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached		
pH	M	2010		4.0	8.6	8.3	8.4	8.4	8.2
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.56	0.48	0.47		
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	0.038	< 0.010	0.018	0.021
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50		
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50		
Arsenic	M	2450	mg/kg	1.0	18	17	18	14	9.1
Cadmium	M	2450	mg/kg	0.10	0.51	0.55	0.48	0.25	0.15
Chromium	M	2450	mg/kg	1.0	22	21	19	20	17
Copper	U	2450	mg/kg	0.50	46	47	41	37	24
Mercury	M	2450	mg/kg	0.10	0.36	0.37	0.31	0.21	0.10
Nickel	M	2450	mg/kg	0.50	20	19	20	21	18
Lead	M	2450	mg/kg	0.50	140	200	140	86	43
Selenium	M	2450	mg/kg	0.20	< 0.20	0.34	< 0.20	0.40	0.52
Vanadium	U	2450	mg/kg	5.0	25	22	20	22	16
Zinc	U	2450	mg/kg	0.50	110	120	100	97	66
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	3.3	3.5	2.9	2.2	1.6
Fuel Type	N	2670		N/A	PAH	PAH	PAH		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0		

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 20 1323 - MMU Didsbury

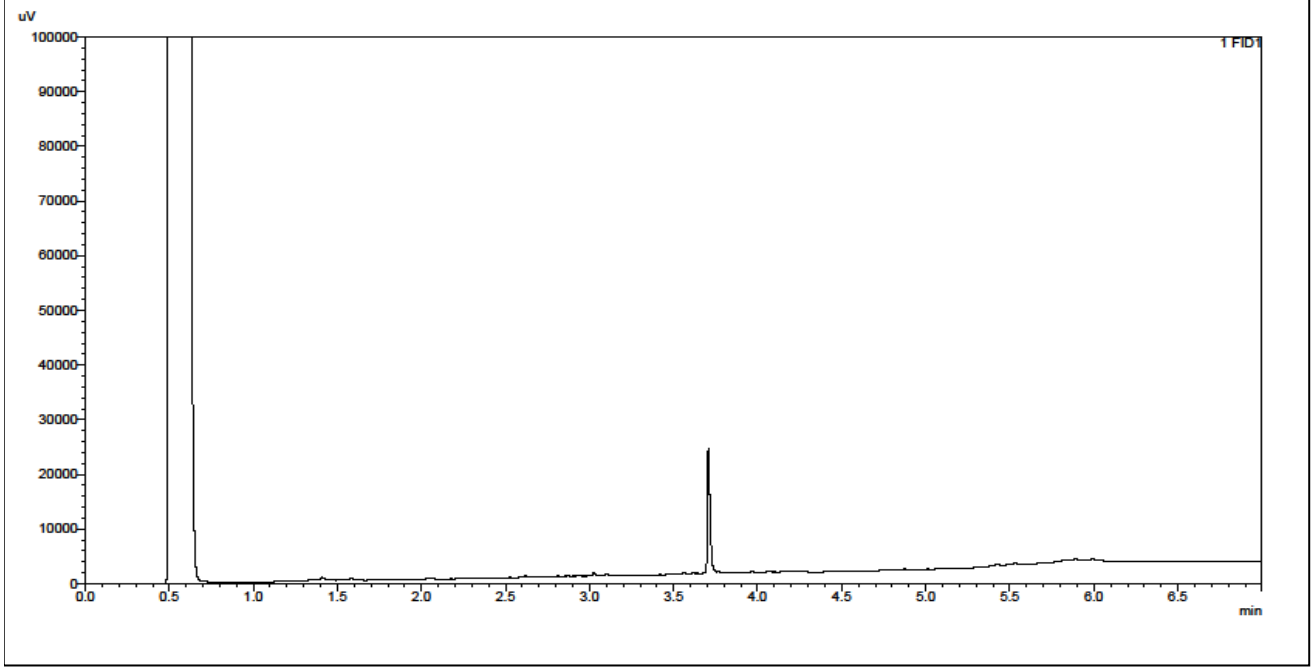
Client: LK Consult		**Chemtest Job No.:**			20-06649	20-06649	20-06649	20-06649	20-06649
Quotation No.:		**Chemtest Sample ID.:**			978887	978888	978889	978890	978891
		Client Sample ID.:			Plot 40 (Rear) TS	Plot 42 (Rear) TS	Plot 41 (Front) TS	Plot 40 (Rear) SS	Plot 42 (Rear) SS
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.00	0.00	0.00	0.18	0.20
		Bottom Depth (m):			0.18	0.20	0.20	0.50	0.34
		Date Sampled:			27-Feb-2020	27-Feb-2020	27-Feb-2020	27-Feb-2020	27-Feb-2020
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	7.2	< 1.0		
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	100	170	140		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	100	180	140		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	100	180	140		
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0		
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0		
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0		
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0		
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0		
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0		
Naphthalene	M	2800	mg/kg	0.10	0.17	< 0.10	0.19	0.49	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	0.15	0.17	0.22	0.11	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	0.63	0.20	0.22	0.87	< 0.10
Fluorene	M	2800	mg/kg	0.10	0.52	0.19	0.28	0.54	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	5.2	2.1	3.1	4.6	0.81
Anthracene	M	2800	mg/kg	0.10	1.2	0.61	0.93	1.3	0.19
Fluoranthene	M	2800	mg/kg	0.10	7.0	4.9	6.8	5.9	1.1
Pyrene	M	2800	mg/kg	0.10	6.2	4.0	6.0	5.3	1.0
Benzo[a]anthracene	M	2800	mg/kg	0.10	2.9	2.3	3.2	2.5	0.44
Chrysene	M	2800	mg/kg	0.10	2.7	2.1	3.0	2.1	0.43
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	3.9	2.9	2.1	3.0	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	1.4	1.1	1.6	1.1	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	2.8	2.6	4.0	2.6	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	2.3	1.8	2.5	1.7	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	0.19	0.38	0.35	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	1.9	1.6	2.1	1.5	< 0.10
Total Of 16 PAH's	N	2800	mg/kg	2.0	39	27	37	34	4.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30		

TPH Chromatogram on Soil Sample: 978887

<Sample Information>

Sample Name : 978887 20-06649
Data Filename : 05 March 2020_05032020_978887 20-06649_025.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 13
Date Acquired : 05/03/2020 18:44:56
Date Processed : 05/03/2020

<Chromatogram>

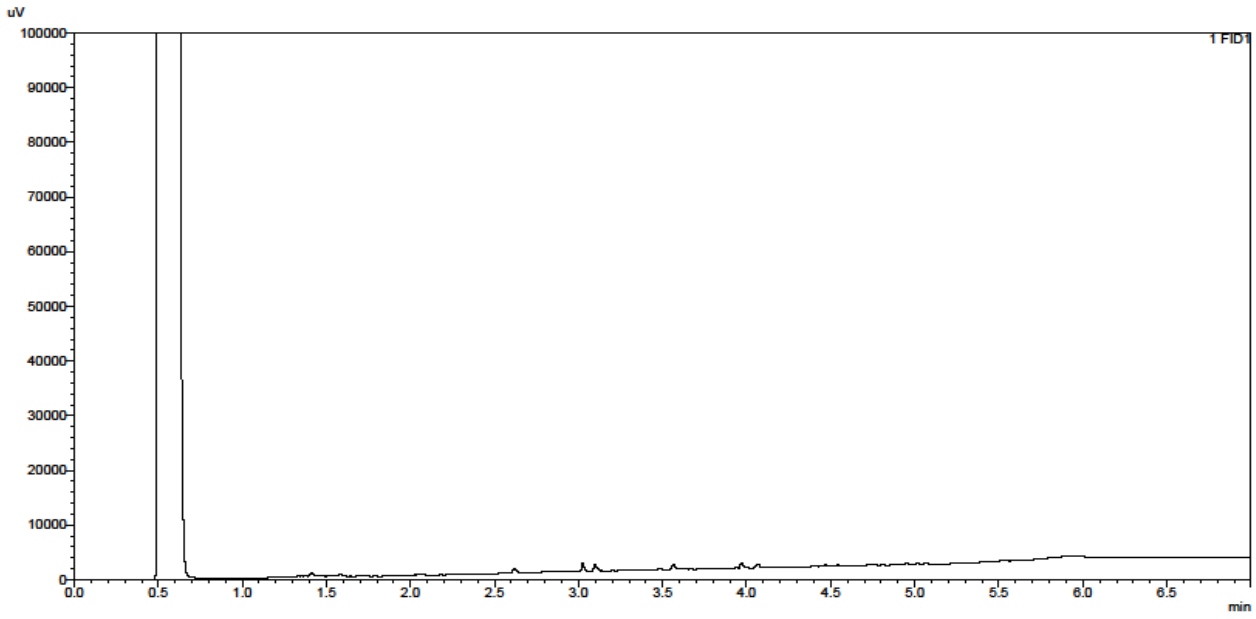


TPH Chromatogram on Soil Sample: 978888

<Sample Information>

Sample Name : 978888 20-06649
Data Filename : 05 March 2020_05032020_978888 20-06649_027.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 14
Date Acquired : 05/03/2020 18:57:47
Date Processed : 05/03/2020

<Chromatogram>

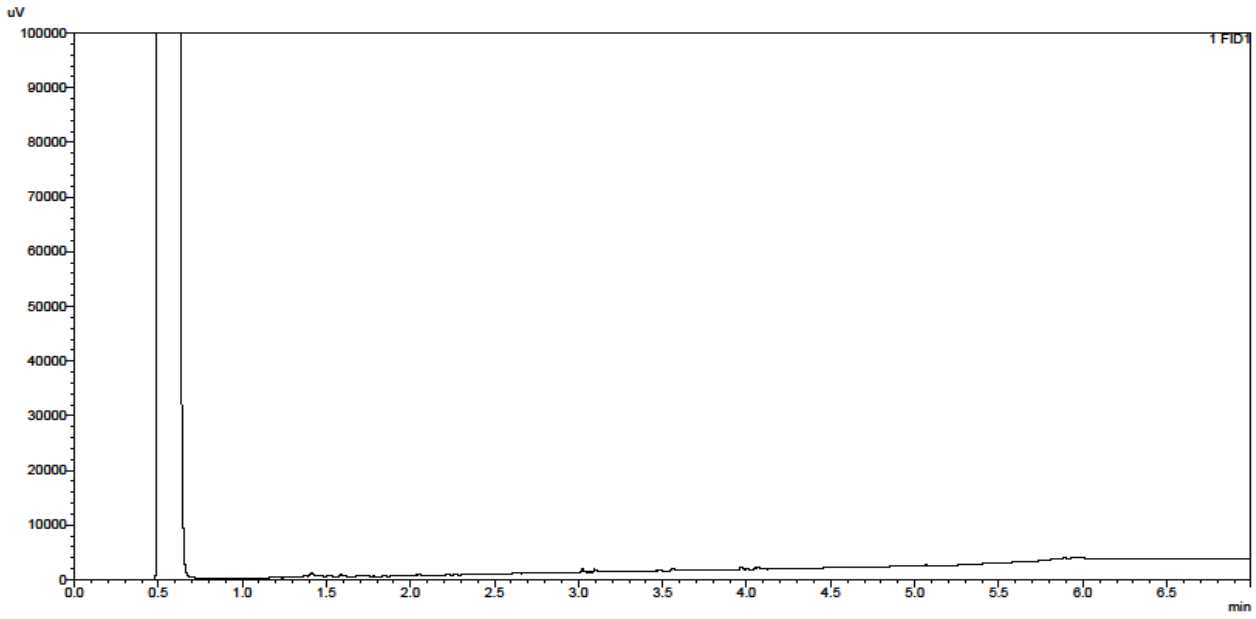


TPH Chromatogram on Soil Sample: 978889

<Sample Information>

Sample Name : 978889 20-06649
Data Filename : 05 March 2020_05032020_978889 20-06649_029.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 15
Date Acquired : 05/03/2020 19:10:39
Date Processed : 05/03/2020

<Chromatogram>



Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix C – Plot Photographs

Plot 40

	**Photograph 1:** View of front garden of Plot 40.
	**Photograph 2:** View of soil in capping layer excavation in front garden of Plot 40 with geotextile membrane visible.
	**Photograph 3:** Depth measurement in front garden of Plot 40.

	**Photograph 4:** View of the rear garden of Plot 40.
	**Photograph 5:** View of soil in capping layer excavation in rear garden of Plot 40 with geotextile membrane visible.
	**Photograph 6:** Depth measurement in rear garden of Plot 40.

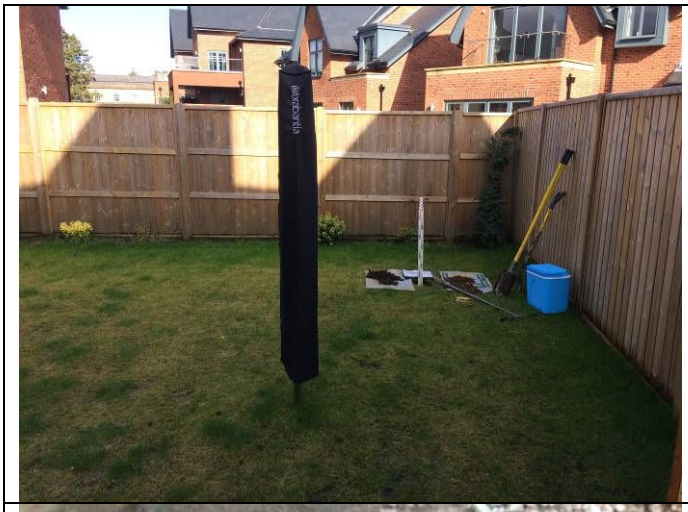
Plot 41

	**Photograph 7:** View of front garden of Plot 41.
	**Photograph 8:** View of soil in capping layer excavation in front garden of Plot 41 with geotextile membrane visible.
	**Photograph 9:** Depth measurement in front garden of Plot 41.

	**Photograph 10:** View of the rear garden of Plot 41.
	**Photograph 11:** View of soil in capping layer excavation in rear garden of Plot 41 with geotextile membrane visible.
	**Photograph 12:** Depth measurement in rear garden of Plot 41.

Plot 42

	**Photograph 13:** View of front garden of Plot 42.
	**Photograph 14:** View of soil in capping layer excavation in front garden of Plot 42 with geotextile membrane visible.
	**Photograph 15:** Depth measurement in front garden of Plot 42.

	**Photograph 16:** View of the rear garden of Plot 42.
	**Photograph 17:** View of soil in capping layer excavation in rear garden of Plot 42 with geotextile membrane visible.
	**Photograph 18:** Depth measurement in rear garden of Plot 42.

Site: St James Park, Former MMU Campus, Didsbury
Plots: 5 to 9
Date: 2nd January 2018
NHBC Ref: Phase 1 – 517456 Phase 2 - 713376

1 INTRODUCTION

LK Consult (LKC) has been appointed by PJ Livesey Holdings Ltd to validate the depth of the garden capping layer laid down at the development at St James Park, Former MMU Campus, Didsbury.

This validation report concerns Plots 5 to 9. These plots consist of a rear garden and a small area of landscaping to the front.

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

i) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (included in total soil depth) **or** geotextile marker.
ii) Option 2: Further sampling and risk assessment on a block by block basis (nominally a total of 4 soil samples per plot with 1 in the front garden) or selected soil samples in any landscaped areas. If soil results are below generic assessment criteria then no specific clean validated environmental cover depth will be required, but a nominal 150mm covering of topsoil as a growing medium (if required).
iii) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is „suitable for use". All site won or imported material should be tested at a rate of 1 sample per 50m^3 for topsoil and 1 sample per 150m^3 for subsoil.
iv) Details of unexpected contamination.
v) Provision of waste transfer notes for any disposal of contaminated soil offsite.

2 IMPORTED / SITE WON MATERIAL

Topsoil for use in the garden and soft landscaping areas has been imported to site. The material used comprised approximately 150m^3 of topsoil supplied by Grabserve from a greenfield site at New Manor Farm, Stretford and approximately 200m^3 of topsoil from Huperade Soil Supplies in Timperley.

Site won subsoil comprising natural gravelly sand has been used within the capping layer in plots on site (approximately 450m^3).

Composite topsoil and subsoil samples were taken from garden areas (ref: TS201-TS203 and SS201-SS203) were subjected to the following analytical suite as a conservative measure:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation[1].

Soil samples were collected in plastic tubs, amber glass jars and amber vials and despatched to Chemtest of Newmarket in cool boxes with ice packs.

Soil results for the topsoil and subsoil are presented in Appendix A. No elevated levels of contaminants were identified in the soil samples collected when compared to Generic Assessment Criteria presented in the agreed Remediation Strategy. The Validation Checklist provided to the ground workers is presented in Appendix B.

3 CAPPING LAYER IN GARDEN AREAS

The recommendation for the garden capping layer in Plots 5 to 9 was that it should comprise a minimum 300mm thickness to the front and 450mm to the rear.

LKC attended site on 14th September and 9th November 2017 to inspect the capping layer construction and depth in the rear and front garden areas. Photographs are provided in Appendix C and the observations are summarised below.

Location	Topsoil Depth (mm)	Subsoil Depth (mm)	Total Depth (mm)	Required Depth (mm)	Pass (✓) or Fail (x)
Plot 5 front	300	MOT present	300	150	✓
Plot 5 rear	150	300 Membrane present	450	450	✓
Plot 6 front	300	MOT present	300	150	✓
Plot 6 rear	150	300 MOT present	450	450	✓
Plot 7 front	300	MOT present	300	150	✓
Plot 7 rear	150	300 Membrane present	450	450	✓
Plot 8 front	300	MOT present	300	150	✓
Plot 8 rear	200	250 Membrane present	450	450	✓
Plot 9 front	350	Membrane present	350	150	✓
Plot 9 rear	150	300 Membrane present	450	450	✓

During the site validation works, LKC were unable to penetrate the 100mm MOT break layer with hand excavation tools (spade and hand auger) and as such were unable to fully validate the thickness of the break layer, however this adds a level of comfort that the break is suitable for its proposed purpose.

[1] EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

LKC were able to verify that, in the places inspected within the front and rear gardens of Plots 5 to 9, the capping layer depths were in accordance with the requirements of the Remediation Strategy.

4 CONCLUSIONS

LKC has completed the validation of the garden capping layers within 5 to 9 and conclude that, in the places inspected, chemically suitable material has been laid to an appropriate depth.

Report Prepared By:



Kerrell Walley
Geo-Environmental Scientist

Report Reviewed By:



Dr Paul Quimby
Director

Enc:

Appendix A: Certificates of Analysis – Imported and Site Won Soil
Appendix B: Remediation Strategy Validation Checklist
Appendix C: Plot Photographs

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of Watson Homes. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Certificates of Analysis – Imported and Site Won Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Amended Report

Report No.:	17-24325-3		
Initial Date of Issue:	22-Sep-2017	**Date of Re-Issue:**	05-Oct-2017
Client	LK Consult		
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS		
Contact(s):	Contaminated Land Paul Quimby		
Project	LKC 16 1066 MMU Didsbury		
Quotation No.:		**Date Received:**	15-Sep-2017
Order No.:	735698	**Date Instructed:**	15-Sep-2017
No. of Samples:	6		
Turnaround (Wkdays):	5	**Results Due:**	21-Sep-2017
Date Approved:	22-Sep-2017		
Approved By:			
Details:	Robert Monk, Technical Manager		

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury

Client: LK Consult			**Chemtest Job No.:**		17-24325	17-24325	17-24325	17-24325	17-24325	17-24325
Quotation No.:			**Chemtest Sample ID.:**		511610	511611	511612	511614	511615	511616
			Client Sample ID.:		TS201	TS202	TS203	SS201	SS202	SS203
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Date Sampled:		14-Sep-2017	14-Sep-2017	14-Sep-2017	14-Sep-2017	14-Sep-2017	14-Sep-2017
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type	U	2192		N/A	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Asbestos by Gravimetry	U	2192	%	0.001						
Total Asbestos	N	2192	%	0.001						
Moisture	N	2030	%	0.020	18	14	25	12	10	9.3
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown,	Brown	Brown
Other Material	N	2040		N/A	Stones, Roots	Stones, Roots	Stones, Roots	Stones, Roots	Stones, Roots	Stones
Soil Texture	N	2040		N/A	Sand	Loam	Clay	Loam	Sand	Sand
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached	See Attached	See Attached	See Attached
pH	M	2010		N/A	8.2	8.1	7.6	8.2	9.3	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40	0.53	0.56	< 0.40	0.48	< 0.40
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.040	0.17	0.11	< 0.010	0.25	0.030
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	15	19	22	7.4	9.5	9.7
Cadmium	M	2450	mg/kg	0.10	0.34	0.37	0.54	< 0.10	0.13	0.14
Chromium	M	2450	mg/kg	1.0	19	15	19	18	17	15
Copper	M	2450	mg/kg	0.50	48	47	72	16	17	18
Mercury	M	2450	mg/kg	0.10	0.31	0.30	0.46	< 0.10	< 0.10	0.12
Nickel	M	2450	mg/kg	0.50	18	15	22	18	17	15
Lead	M	2450	mg/kg	0.50	120	110	150	28	37	39
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	21	20	25	16	17	15
Zinc	M	2450	mg/kg	0.50	110	93	140	37	44	55
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.3	4.5	7.4	0.86	1.2	1.7
Fuel Type	N	2670		N/A	PAH	PAH	PAH	PAH	PAH	N/A
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	22	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	22	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

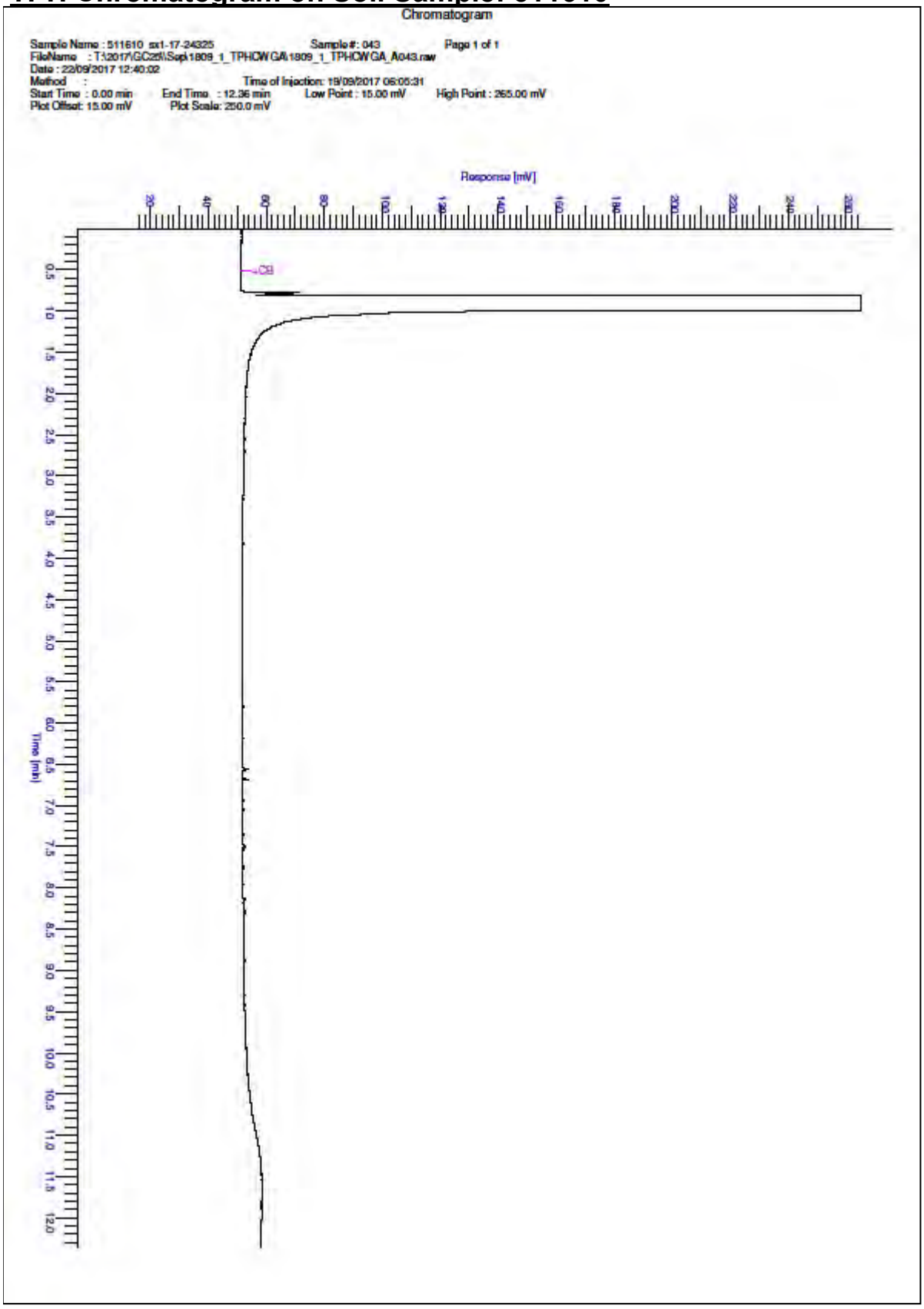
Chemtest
The right chemistry to deliver results

Results - Soil

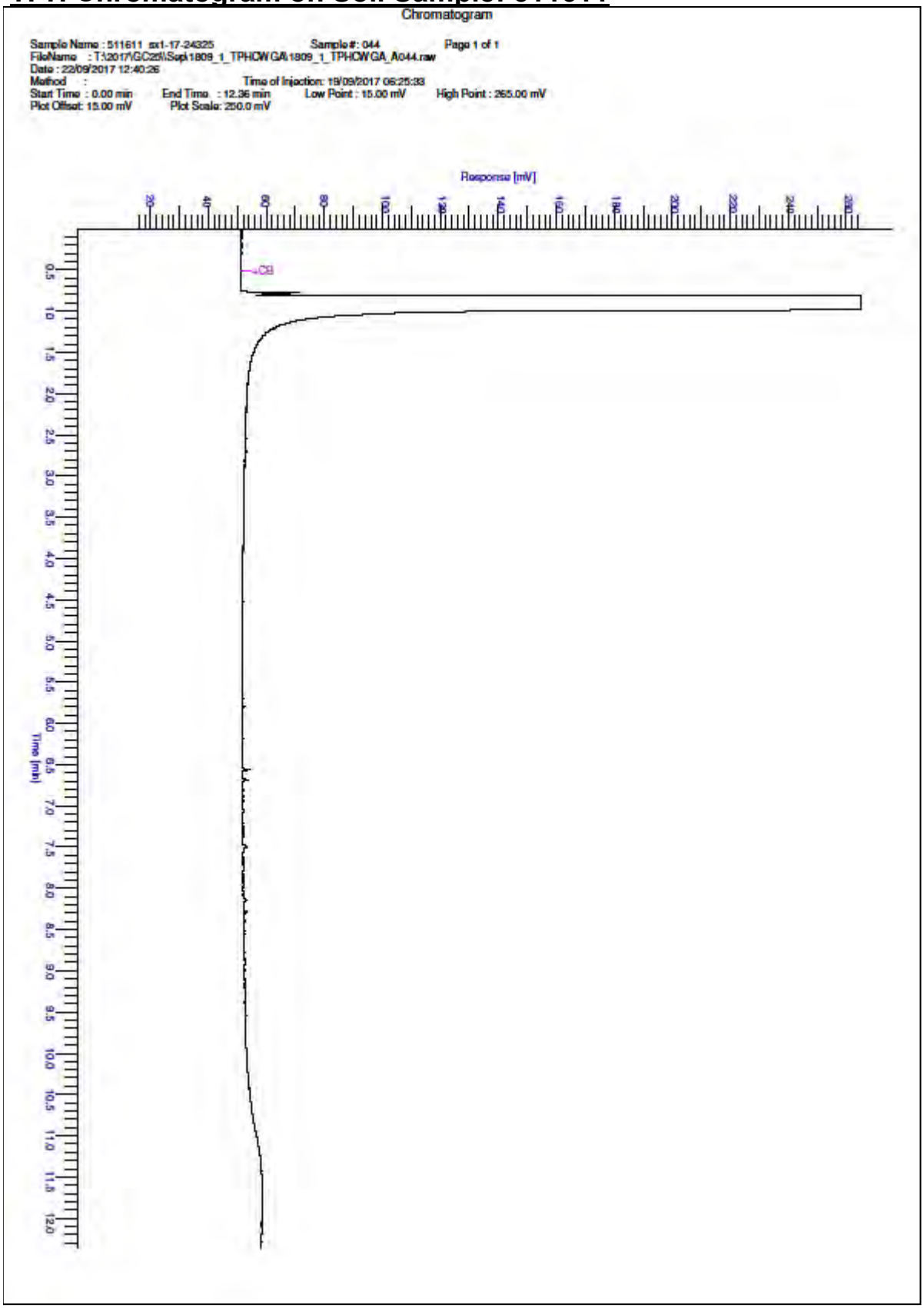
Project: LKC 16 1066 MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			17-24325	17-24325	17-24325	17-24325	17-24325	17-24325
Quotation No.:		**Chemtest Sample ID.:**			511610	511611	511612	511614	511615	511616
		Client Sample ID.:			TS201	TS202	TS203	SS201	SS202	SS203
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Date Sampled:			14-Sep-2017	14-Sep-2017	14-Sep-2017	14-Sep-2017	14-Sep-2017	14-Sep-2017
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	8.7	9.1	13	4.6	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	14	21	24	3.3	23	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	22	30	38	8.0	23	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	22	30	38	< 10	45	< 10
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene	M	2800	mg/kg	0.10	0.18	0.12	0.49	< 0.10	0.15	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	0.26	0.11	0.56	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	0.20	0.10	0.45	< 0.10	0.11	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	2.8	1.8	4.4	0.64	0.97	0.32
Anthracene	M	2800	mg/kg	0.10	0.73	0.39	1.1	0.18	0.22	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	4.6	2.9	6.1	1.1	1.2	0.59
Pyrene	M	2800	mg/kg	0.10	4.0	2.7	5.5	0.97	1.0	0.51
Benzo[a]anthracene	M	2800	mg/kg	0.10	2.2	1.2	3.3	0.28	0.40	0.14
Chrysene	M	2800	mg/kg	0.10	2.2	1.3	3.4	0.30	0.46	0.14
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	2.8	1.7	4.0	0.32	0.58	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.84	0.46	1.5	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	2.1	1.2	3.5	0.16	0.37	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	1.3	0.60	2.5	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	0.20	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	1.2	0.66	2.4	< 0.10	0.11	< 0.10
Total Of 16 PAH's	N	2800	mg/kg	2.0	26	15	40	4.0	5.6	< 2.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

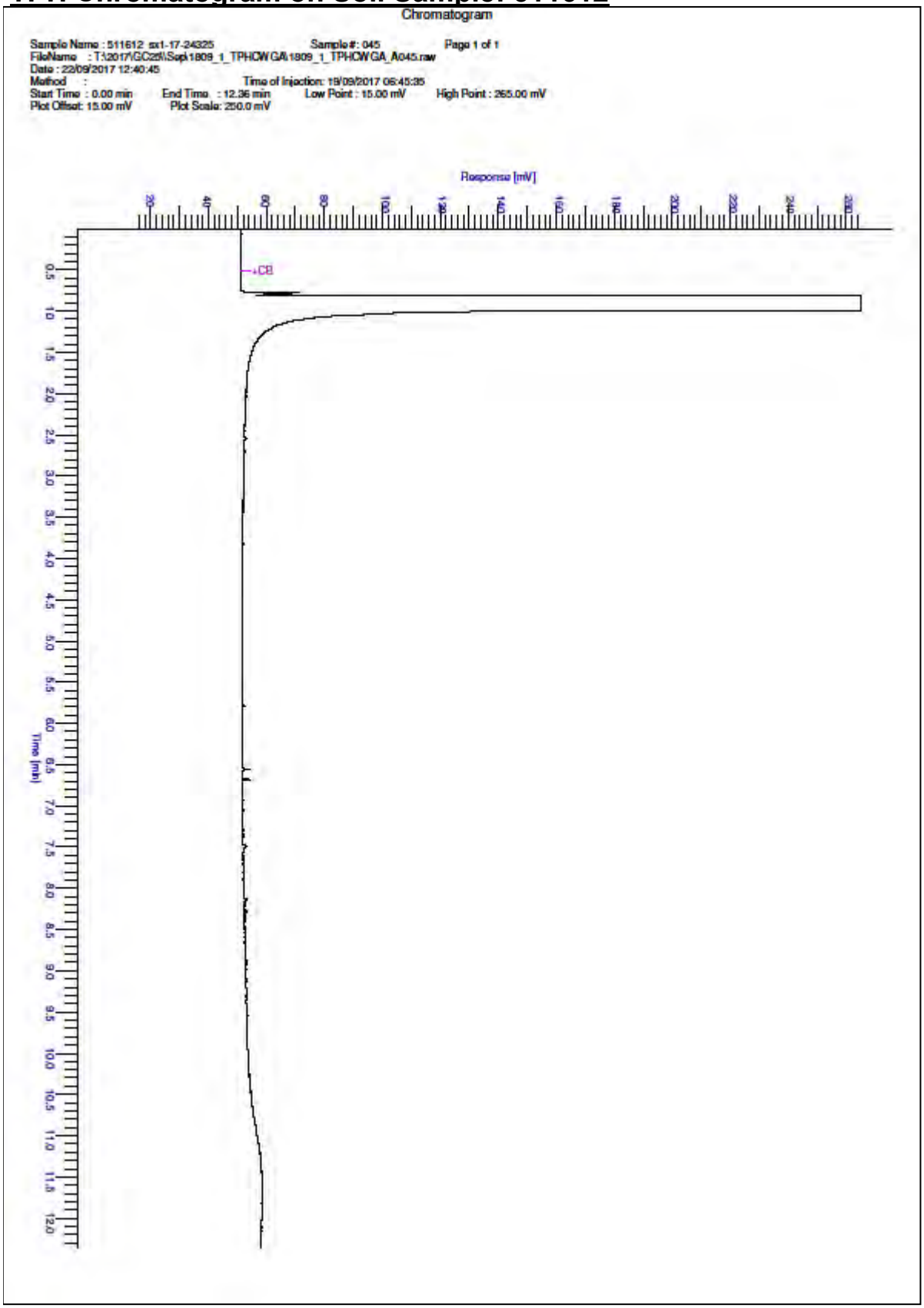
TPH Chromatogram on Soil Sample: 511610



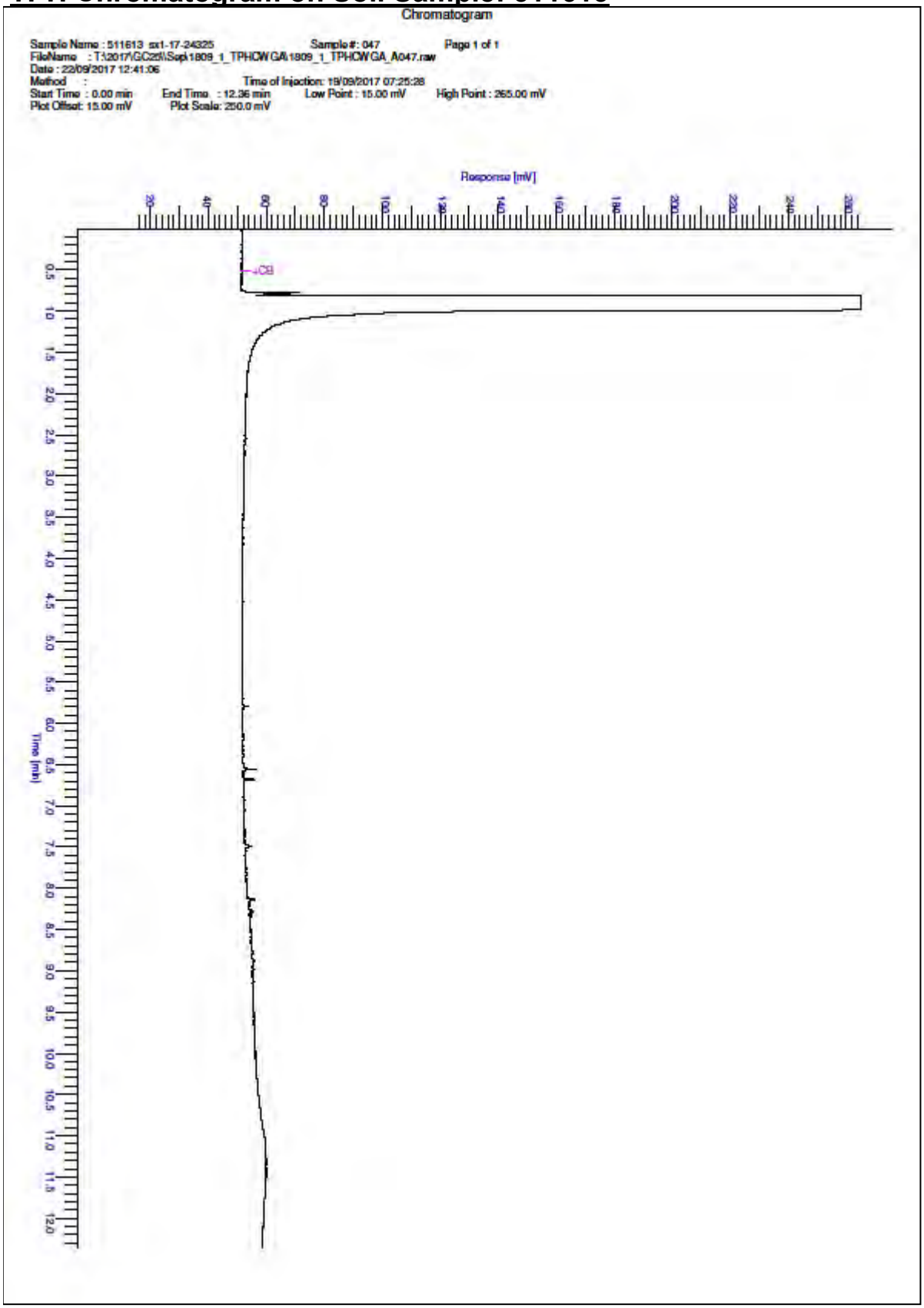
TPH Chromatogram on Soil Sample: 511611



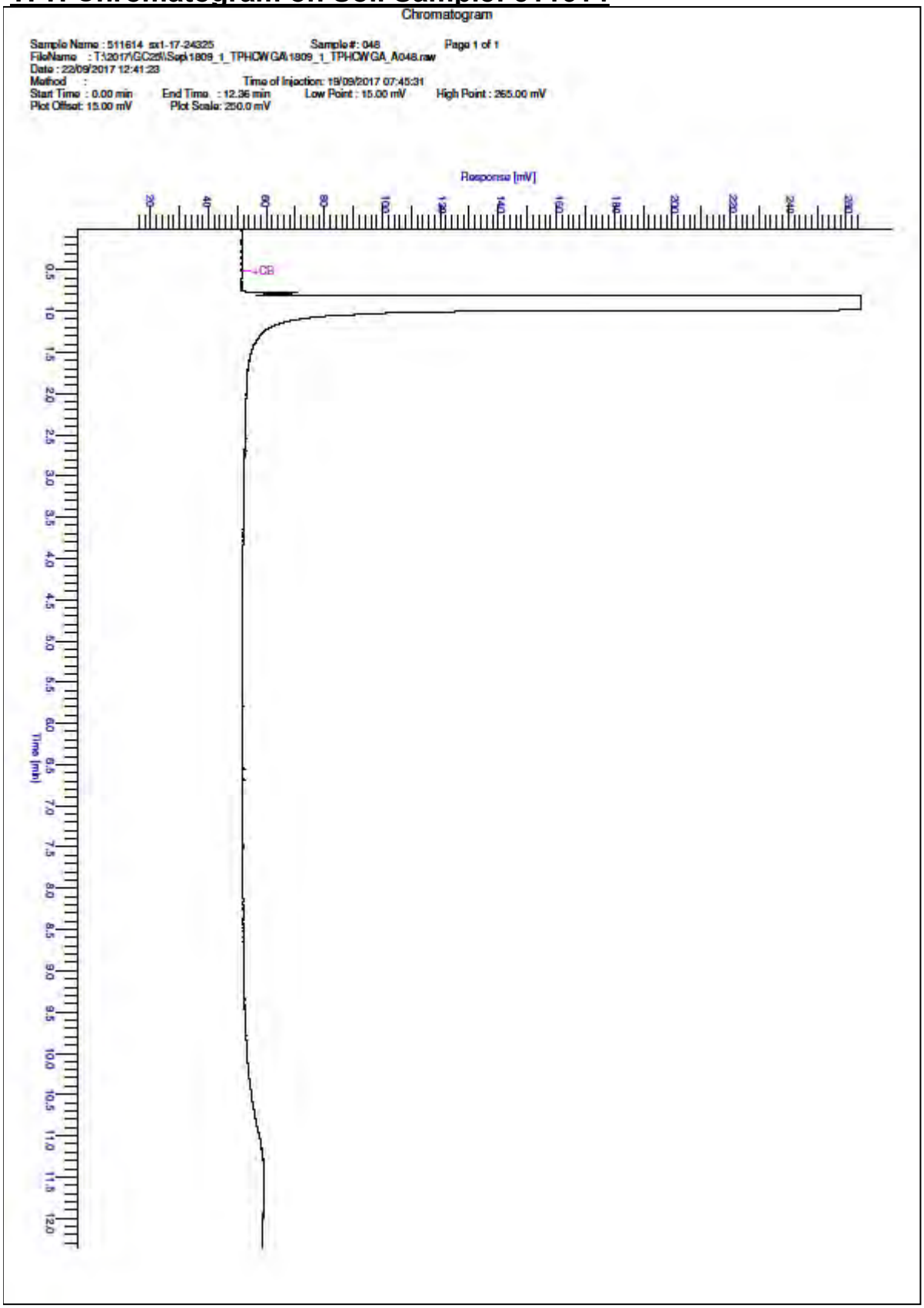
TPH Chromatogram on Soil Sample: 511612



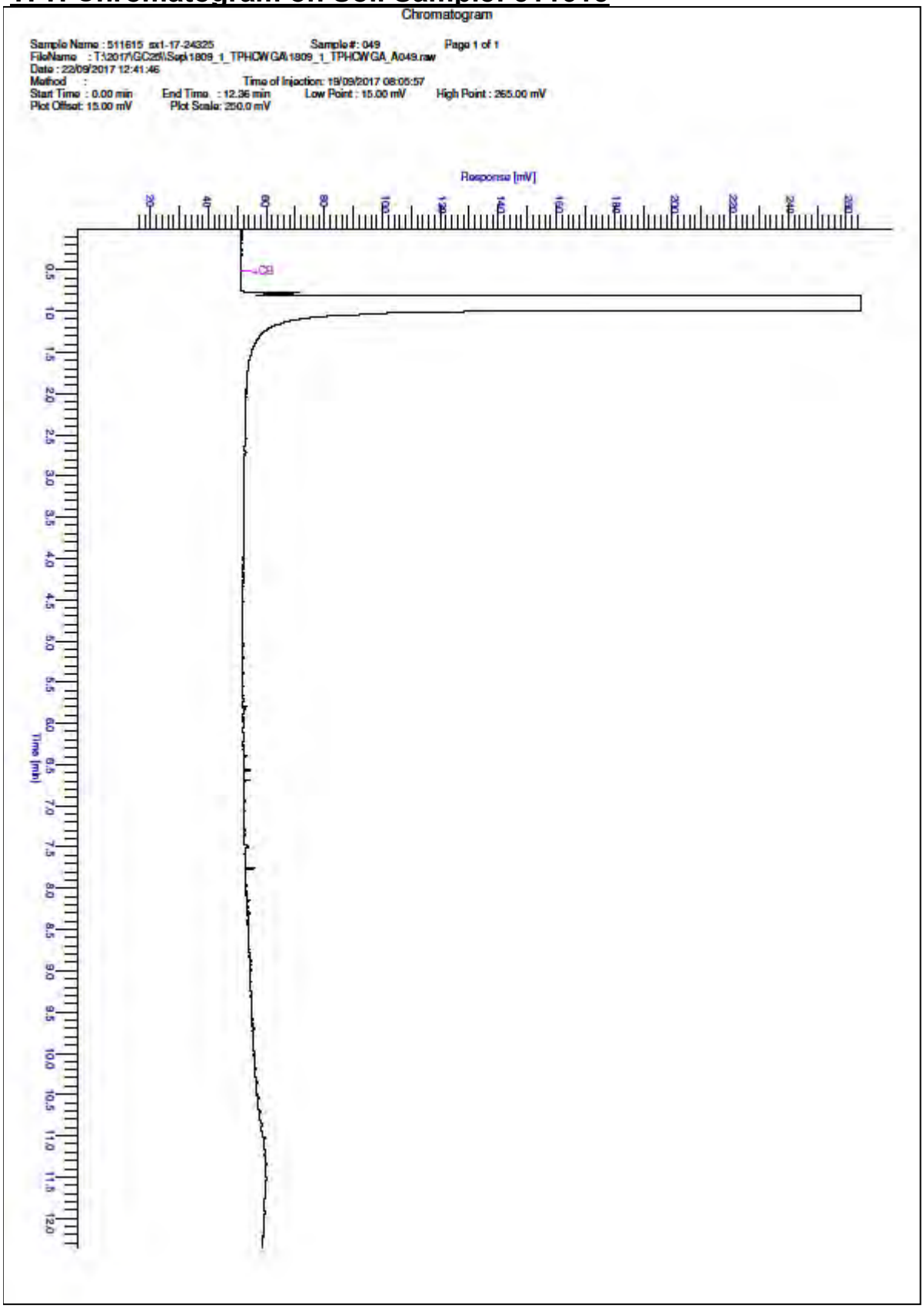
TPH Chromatogram on Soil Sample: 511613



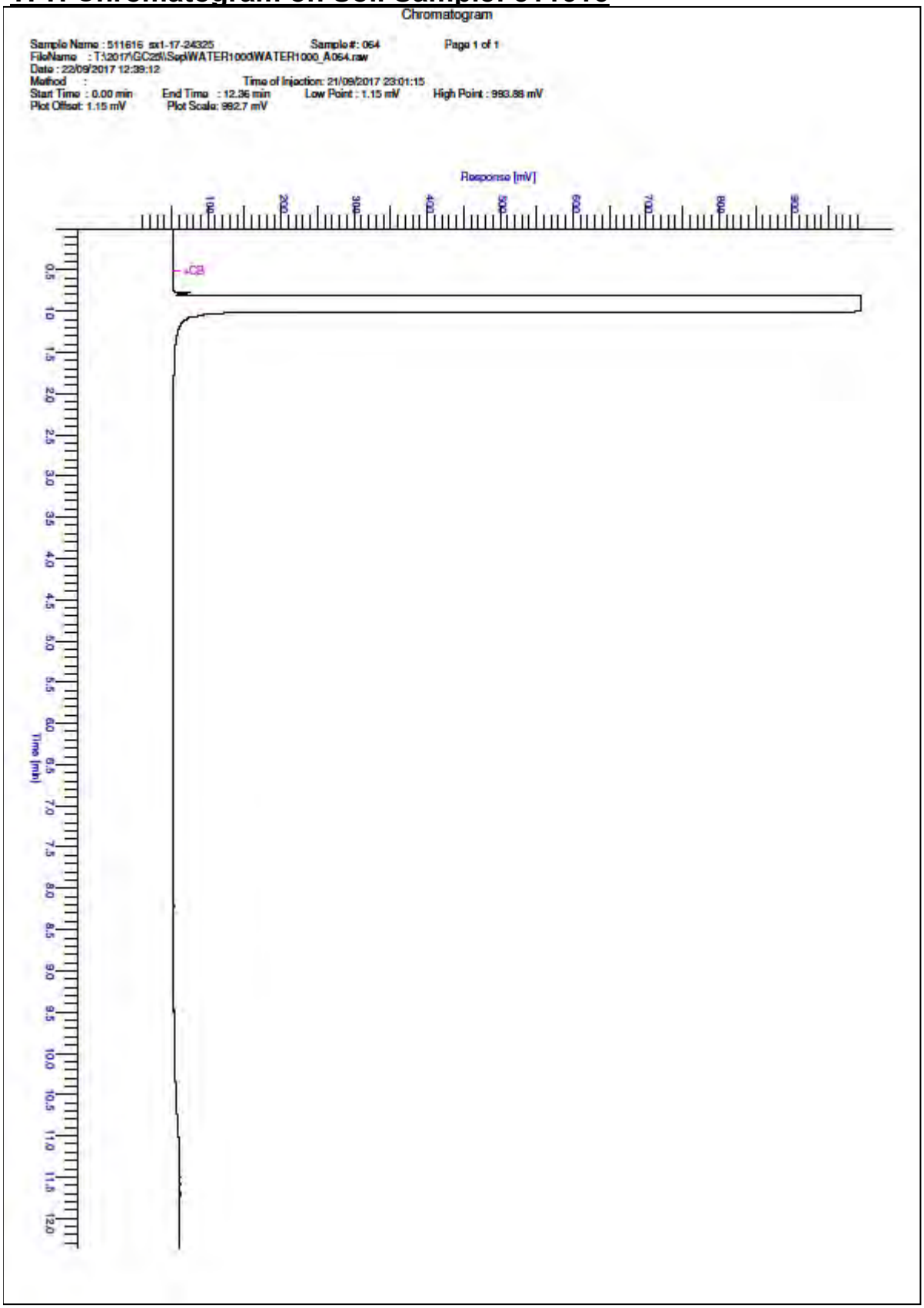
TPH Chromatogram on Soil Sample: 511614



TPH Chromatogram on Soil Sample: 511615



TPH Chromatogram on Soil Sample: 511616



Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix B – Remediation Strategy Validation Checklist

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

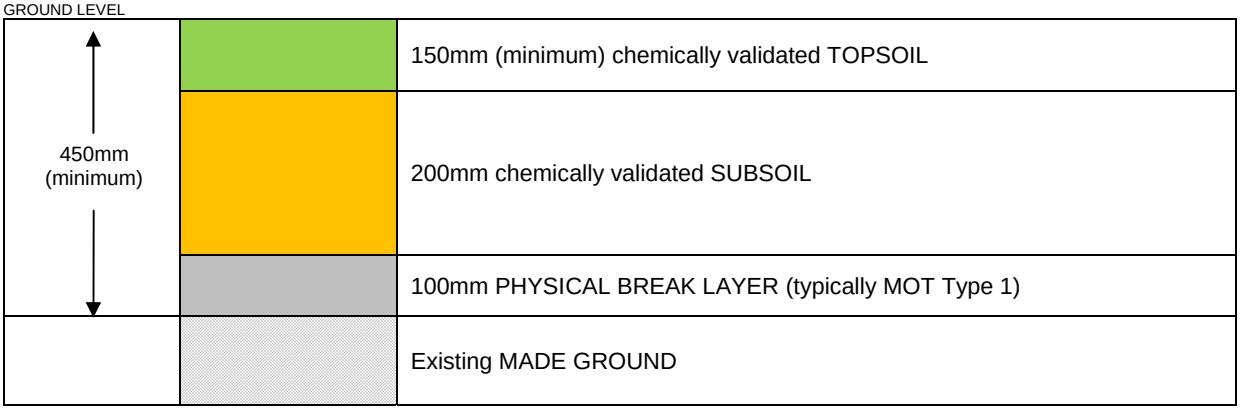
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

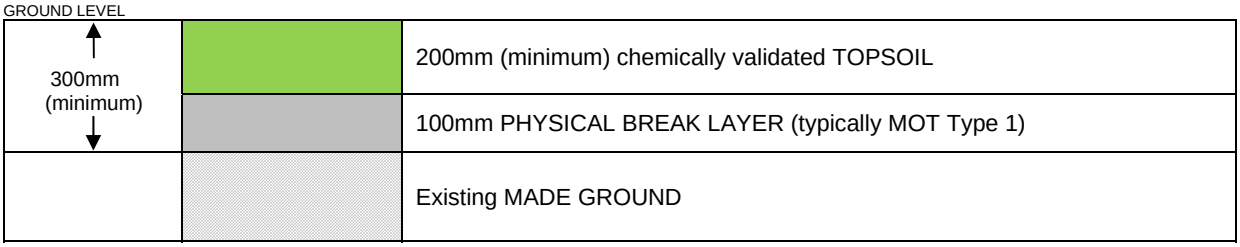
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix C – Plot Photographs

Plot 5

	**Photograph 1:** View of front garden of Plot 5.
	**Photograph 2:** View of soil in capping layer excavation in front garden of Plot 5 with MOT break layer visible.
	**Photograph 3:** Depth measurement in front garden of Plot 5.

	**Photograph 4:** View of rear garden of Plot 5.
	**Photograph 5:** View of soil in capping layer excavation in rear garden of Plot 5 with membrane visible.
	**Photograph 6:** Depth measurement in rear garden of Plot 5.

Plot 6

	**Photograph 7:** View of front garden of Plot 6.
	**Photograph 8:** View of soil in capping layer excavation in front garden of Plot 6 with MOT break layer visible.
	**Photograph 9:** Depth measurement in front garden of Plot 6.

	**Photograph 10:** View of rear garden of Plot 6.
	**Photograph 11:** View of soil in capping layer excavation in rear garden of Plot 6 with MOT visible.
	**Photograph 12:** Depth measurement in rear garden of Plot 6.

Plot 7

	**Photograph 13:** View of front garden of Plot 7.
	**Photograph 14:** View of soil in capping layer excavation in front garden of Plot 7 with MOT break layer visible.
	**Photograph 15:** Depth measurement in front garden of Plot 7.

	**Photograph 16:** View of rear garden of Plot 7.
	**Photograph 17:** View of soil in capping layer excavation in rear garden of Plot 7 with geotextile membrane visible.
	**Photograph 18:** Depth measurement in rear garden of Plot 7.

Plot 8

	**Photograph 19:** View of front garden of Plot 8.
	**Photograph 20:** View of soil in capping layer excavation in front garden of Plot 8 with MOT break layer visible.
	**Photograph 21:** Depth measurement in front garden of Plot 8.

	**Photograph 22:** View of rear garden of Plot 8.
	**Photograph 23:** View of soil in capping layer excavation in rear garden of Plot 8 with geotextile membrane visible.
	**Photograph 24:** Depth measurement in rear garden of Plot 8.

Plot 9

	**Photograph 25:** View of front garden of Plot 9.
	**Photograph 26:** View of soil in capping layer excavation in front garden of Plot 9 with geotextile membrane visible.
	**Photograph 27:** Depth measurement in front garden of Plot 9.

	**Photograph 28:** View of rear garden of Plot 9.
	**Photograph 29:** View of soil in capping layer excavation in rear garden of Plot 9 with geotextile membrane visible.
	**Photograph 30:** Depth measurement in rear garden of Plot 9.

Eton Business Park, Eton Hill Road,
Manchester M26 2ZS

Tel: 0161 763 7200

The Corn Exchange, Fenwick Street,
Liverpool L2 7QL

Tel: 0151 235 8716

Unit 121, Wright Business Centre,
1 Lonmay Road, Glasgow G33 4EL

Tel: 0141 773 6269

www.thelkgroup.com

PART OF THE LK GROUP

Site: **St James Park, Former MMU Campus, Didsbury**
Plots: **10 to 17**
Date: **17th October 2017**
NHBC Ref: **Phase A – 517456**

1 INTRODUCTION

LK Consult (LKC) has been appointed by PJ Livesey Holdings Ltd to validate the depth of the garden capping layer laid down at the development at St James Park, Former MMU Campus, Didsbury.

This validation report concerns Plots 10 to 17. These plots consist of a rear garden and a small area of landscaping to the front.

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

i) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (included in total soil depth) **or** geotextile marker.
ii) Option 2: Further sampling and risk assessment on a block by block basis (nominally a total of 4 soil samples per plot with 1 in the front garden) or selected soil samples in any landscaped areas. If soil results are below generic assessment criteria then no specific clean validated environmental cover depth will be required, but a nominal 150mm covering of topsoil as a growing medium (if required).
iii) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is 'suitable for use'. All site won or imported material should be tested at a rate of 1 sample per $50m^3$ for topsoil and 1 sample per $150m^3$ for subsoil.
iv) Details of unexpected contamination.
v) Provision of waste transfer notes for any disposal of contaminated soil offsite.

2 IMPORTED / SITE WON MATERIAL

Topsoil for use in the garden and soft landscaping areas has been imported to site. The material used comprised approximately $150m^3$ of topsoil supplied by Grabserve from a greenfield site at New Manor Farm, Stretford and approximately $200m^3$ of topsoil from Huperade Soil Supplies in Timperley.

Composite topsoil samples were taken from garden areas (ref: TS101-TS104) were subjected to the following analytical suite as a conservative measure:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

Site won subsoil comprising natural gravelly sand has been used within the capping layer in plots on site (approximately $230m^3$).

The subsoil was stockpiled onsite and samples were collected (ref: Sand 1 to Sand 3) and subjected to the following analytical suite as a conservative measure:

- Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.

Stockpile sampling of the site won subsoil was undertaken in accordance with guidance given in ISO 10381 Part 8[1]. Selected photos of stockpiles are presented in Appendix A. Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation[2].

Soil samples were collected in plastic tubs, amber glass jars and amber vials and despatched to Chemtest of Newmarket in cool boxes with ice packs.

Soil results for the topsoil and subsoil are presented in Appendix B. No elevated levels of contaminants were identified in the soil samples collected when compared to Generic Assessment Criteria presented in the agreed Remediation Strategy. The Validation Checklist provided to the ground workers is presented in Appendix C.

[1] ISO (2006). "Soil Quality – Sampling – Part 8: Guidance on Sampling of Stockpiles". ISO10381-8.
[2] EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

3 CAPPING LAYER IN GARDEN AREAS

The recommendation for the garden capping layer in Plots 10 to 17 was that it should comprise a minimum 300mm thickness to the front and 450mm to the rear.

LKC attended site on 14th and 25th September 2017 to inspect the capping layer construction and depth in the rear and front garden areas. Photographs are provided in Appendix D and the observations are summarised below.

Location	Topsoil Depth (mm)	Subsoil Depth (mm)	Membrane or 100mm MOT	Total Depth (mm)	Required Depth (mm)	Pass (✓) or Fail (x)
Plot 10 front	250	N/A	MOT	350	300	✓
Plot 10 rear	150	250	Membrane	400	450	x
Plot 11 front	250	N/A	Membrane and MOT	350	300	✓
Plot 11 rear	150	150	Membrane	300	450	x
Plot 12 front	350	N/A	MOT	450	300	✓
Plot 12 rear	150	300	Membrane	450	450	✓
Plot 13 front	300	N/A	MOT	400	300	✓
Plot 13 rear	150	250	Membrane	400	450	x
Plot 14 front	400	N/A	Membrane	400	300	✓
Plot 14 rear	150	150	Membrane	300	450	x
Plot 15 front	450	N/A	Membrane	450	300	✓
Plot 15 rear	150	300	Membrane	450	450	✓
Plot 16 front	350	N/A	Membrane	350	300	✓
Plot 16 rear	150	200	Membrane	350	450	x
Plot 17 front	350	N/A	Membrane	350	300	✓
Plot 17 rear	200	300	Membrane	500	450	✓

During the site validation works, LKC were unable to penetrate the 100mm MOT break layer with hand excavation tools (spade and hand auger) and as such were unable to fully validate the thickness of the break layer, however this adds a level of comfort that the break is suitable for its proposed purpose.

LKC were able to verify that, in the places inspected within the front gardens of Plots 10 to 17, the capping layer depths were in accordance with the requirements of the Remediation Strategy.

The rear gardens of Plots 10 to 17 have a stepped profile with the lower area flagged and the upper area grassed. The minimum 450mm capping layer was not achieved in the rear gardens of Plots 10, 11, 13, 14 and 16. The rear gardens of Plots 10 to 17 include mature trees towards the east which are part of the Didsbury St James Conservation Area. These

trees are protected by Tree Preservation Orders (TPOs) which limits the ground work which can be carried out within the tree's Root Protection Area (RPA).

Therefore, validation pits in the upper area of the rear gardens had limited depths due to the TPOs present in this area of the site.

With reference to the Arboriculture Report carried out by Urban Green (ref:10768, dated June 2015) *'changes in ground level can be harmful to trees where stripping or filling of soil is carried out in the RPA. It is therefore important that no significant changes in level occur within the RPA of retained trees.'*

This statement is also confirmed in BS5837:2012 'Trees in relation to design, demolition and construction – Recommendations' 7.2.1 *'To avoid damage to tree roots, existing ground levels should be retained within the RPA. Intrusion into soil (other than for piling) within the RPA is generally not acceptable, and topsoil within it should be retained.'*

Therefore, when excavating the existing material to meet the capping layer requirements, the necessary depth could not be achieved.

To add a level of comfort, LKC undertook soil sampling from the made ground before the clean environmental cover system was installed in the upper areas of the rears of Plots 10 to 17. LKC attended site on 1st November 2016 and duly collected 5no. samples of the existing soil from the upper areas behind Plots 10 to 17 (ref P10T-P15T). Selected photographs of the rear gardens prior to remediation are presented in Appendix E

Sampling was undertaken in accordance with guidance given above. No elevated levels of contamination were identified when compared to Generic Assessment Criteria. Results are presented in Appendix F.

Therefore, given the above, LKC consider the reduced capping layer provided to the rear of Plots 10 to 17 to be acceptable.

4 CONCLUSIONS

LKC has completed the validation of the garden capping layers within Plots 10 to 17 and conclude that, in the places inspected, chemically suitable material has been laid to an appropriate depth when considering garden constraints (TPOs).

Report Prepared By:



Kerrell Walley
Geo-Environmental Scientist

Report Reviewed By:



Dr Paul Quimby
Director

Enc:

Appendix A: Stockpile Photographs
Appendix B: Certificates of Analysis – Imported and Site Won Soil
Appendix C: Remediation Strategy Validation Checklist
Appendix D: Plot Photographs
Appendix E: Plot Photographs before Remediation
Appendix F: Certificates of Analysis – Made Ground below Capping Layer

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Holdings Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Stockpile Photographs

	**Photograph 1:** Stockpiles of site won sand excavated from site.
	**Photograph 2:** View of site won sand excavated from site.
	**Photograph 3:** View of stockpiles to be reused as site won material on site.

Appendix B – Certificates of Analysis – Imported and Site Won Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-26078-1
Initial Date of Issue:	31-Oct-2016
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Rachel Peart Contaminated Land
Project	LKC 16 1066 MMU Didsbury (Huperade)

Quotation No.:		**Date Received:**	27-Oct-2016
Order No.:	732176	**Date Instructed:**	27-Oct-2016
No. of Samples:	4		
Turnaround (Wkdays):	3	**Results Due:**	31-Oct-2016
Date Approved:	31-Oct-2016		

Approved By:



Details: Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury (Huperade)

Client: LK Consult		**Chemtest Job No.:**			16-26078	16-26078	16-26078	16-26078
Quotation No.:		**Chemtest Sample ID.:**			370759	370760	370761	370762
		Client Sample ID.:			TS101	TS102	TS103	TS104
		Sample Type:			SOIL	SOIL	SOIL	SOIL
		Date Sampled:			25-Oct-2016	25-Oct-2016	25-Oct-2016	25-Oct-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	15	16	15	16
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay	Clay	Clay
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached	See Attached
pH	M	2010		N/A	9.0	8.7	8.6	8.5
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.73	0.53	0.55	0.58
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.12	0.056	0.061	0.066
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	12	13	13	13
Cadmium	M	2450	mg/kg	0.10	0.26	0.30	0.27	0.30
Chromium	M	2450	mg/kg	1.0	15	15	15	13
Copper	M	2450	mg/kg	0.50	36	39	41	29
Mercury	M	2450	mg/kg	0.10	0.28	0.32	0.97	0.25
Nickel	M	2450	mg/kg	0.50	16	18	18	13
Lead	M	2450	mg/kg	0.50	86	99	90	75
Selenium	M	2450	mg/kg	0.20	0.33	0.24	0.29	0.22
Vanadium	U	2450	mg/kg	5.0	18	19	19	15
Zinc	M	2450	mg/kg	0.50	76	82	82	58
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	3.5	4.8	3.3	3.8
Fuel Type	N	2670		N/A	PAH	PAH	PAH	PAH
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	M	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	5.4	1.7	12	14
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	14	13	24	17

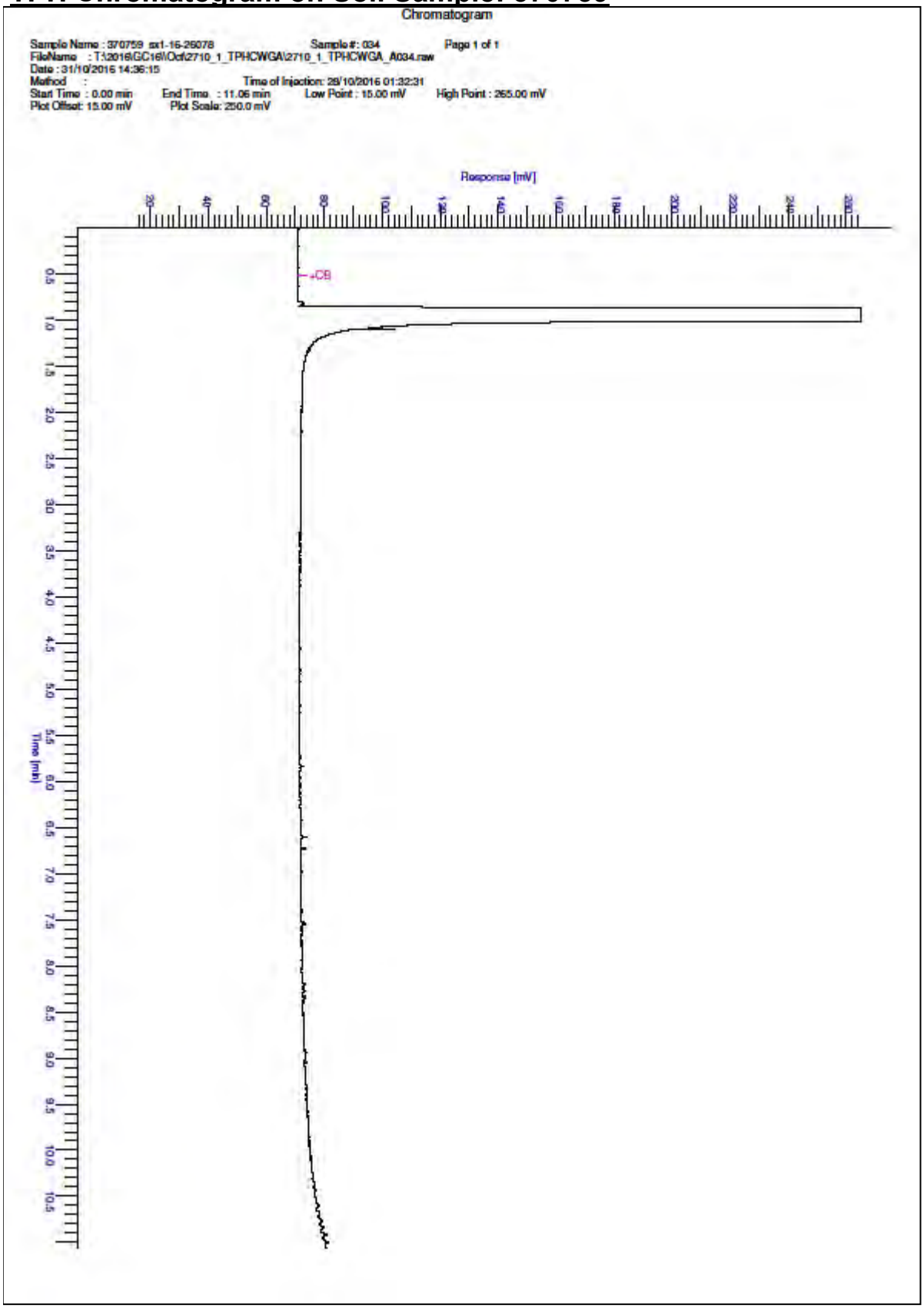
Chemtest
The right chemistry to deliver results

Results - Soil

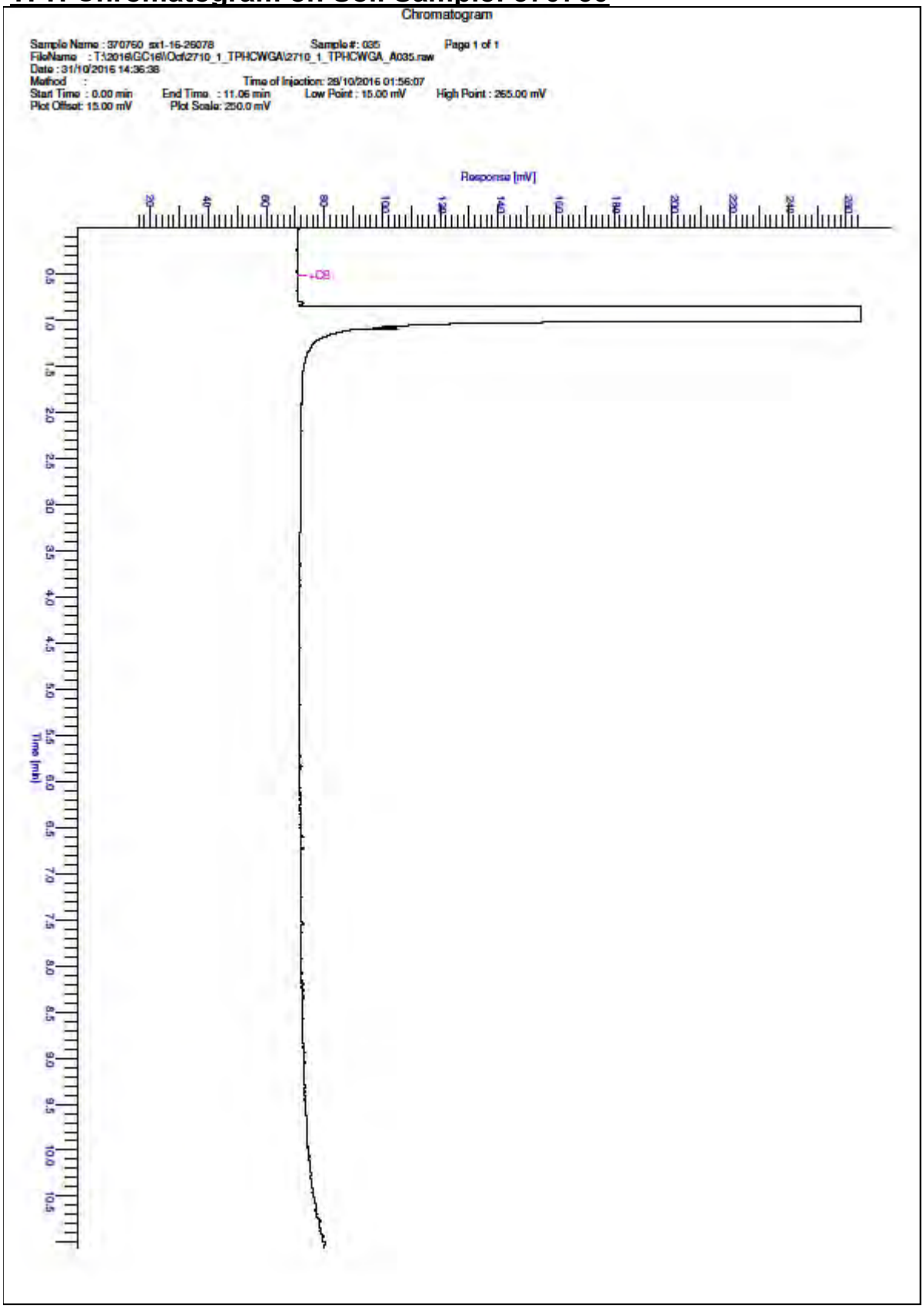
Project: LKC 16 1066 MMU Didsbury (Huperade)

Client: LK Consult		**Chemtest Job No.:**			16-26078	16-26078	16-26078	16-26078
Quotation No.:		**Chemtest Sample ID.:**			370759	370760	370761	370762
		Client Sample ID.:			TS101	TS102	TS103	TS104
		Sample Type:			SOIL	SOIL	SOIL	SOIL
		Date Sampled:			25-Oct-2016	25-Oct-2016	25-Oct-2016	25-Oct-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	40	33	60	46
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	3.5	4.8	5.9	6.0
Total Aromatic Hydrocarbons	M	2680	mg/kg	5.0	63	52	100	82
Total Petroleum Hydrocarbons	M	2680	mg/kg	10	63	52	100	82
Naphthalene	M	2700	mg/kg	0.10	< 0.10	0.10	0.20	0.30
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	0.45	0.16	0.15
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	0.81	0.18	0.13
Fluorene	M	2700	mg/kg	0.10	< 0.10	0.18	0.13	0.18
Phenanthrene	M	2700	mg/kg	0.10	1.2	2.1	1.6	1.1
Anthracene	M	2700	mg/kg	0.10	0.33	0.60	0.54	0.14
Fluoranthene	M	2700	mg/kg	0.10	2.3	4.3	2.5	2.0
Pyrene	M	2700	mg/kg	0.10	2.1	3.9	2.7	1.9
Benzo[a]anthracene	M	2700	mg/kg	0.10	1.1	2.3	1.3	1.0
Chrysene	M	2700	mg/kg	0.10	1.8	3.0	2.0	1.6
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	1.5	2.8	1.9	1.4
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	0.81	1.5	1.2	0.91
Benzo[a]pyrene	M	2700	mg/kg	0.10	1.3	2.2	1.3	1.1
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	0.92	1.4	1.0	0.53
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	0.56	0.48	0.37	0.32
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	0.94	1.3	1.1	0.77
Total Of 16 PAH's	M	2700	mg/kg	2.0	15	27	18	14
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30

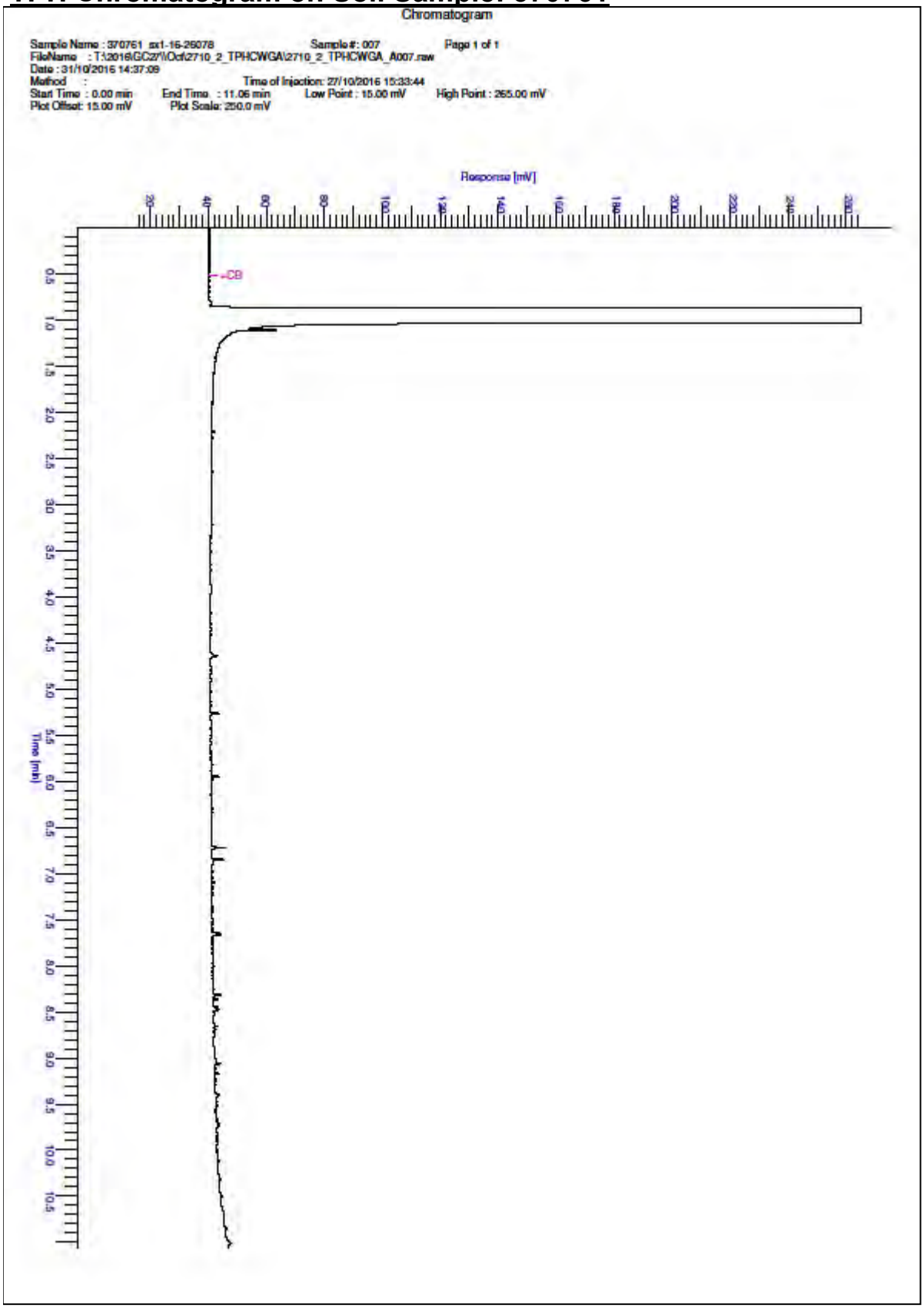
TPH Chromatogram on Soil Sample: 370759



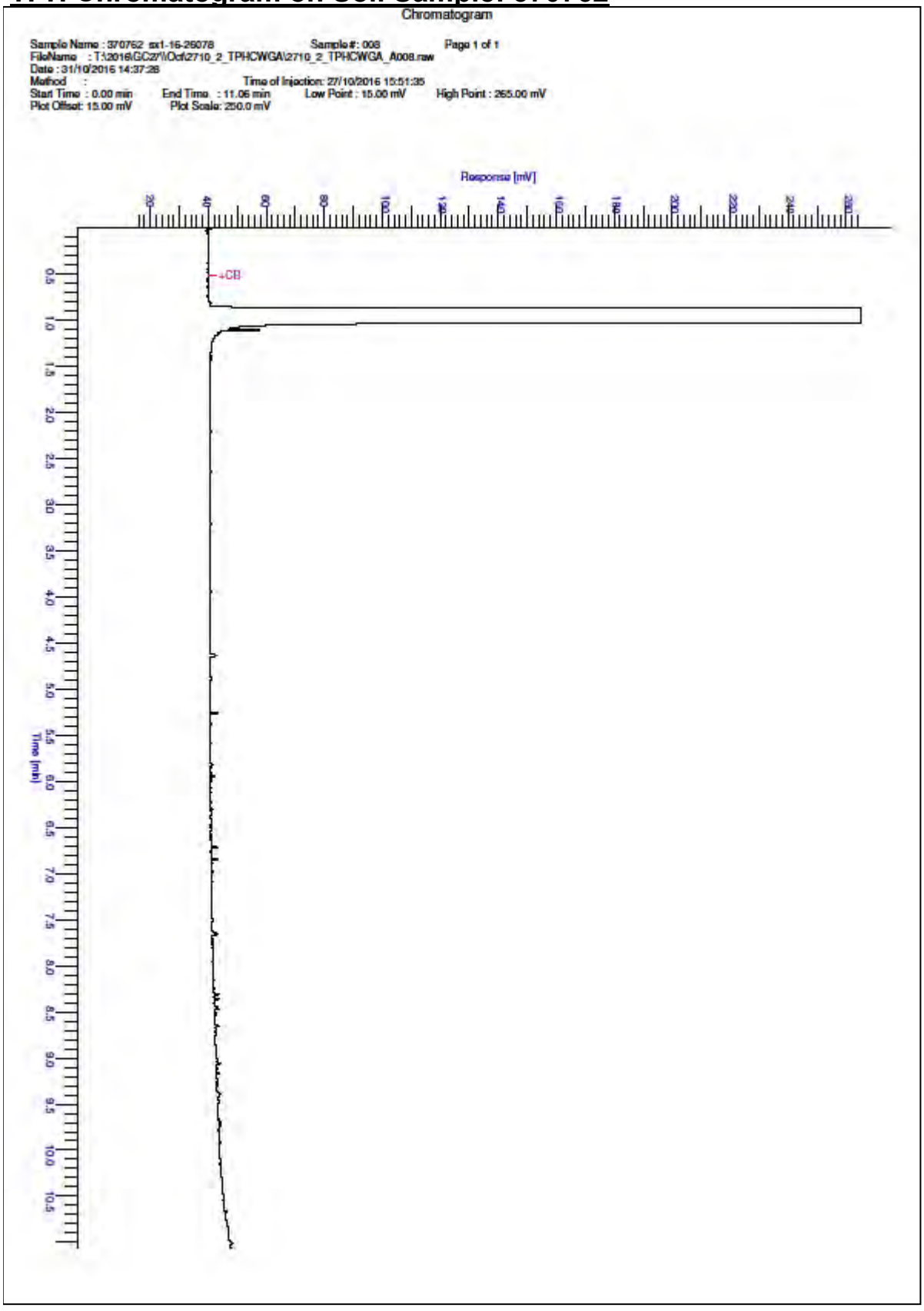
TPH Chromatogram on Soil Sample: 370760



TPH Chromatogram on Soil Sample: 370761



TPH Chromatogram on Soil Sample: 370762



Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Accreditation	Parameters included	Method summary
2010	pH Value of Soils	UKAS accreditedMCERTS accredited	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)		Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)		Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	UKAS accreditedMCERTS accredited	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	UKAS Accredited	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	UKAS accreditedMCERTS accredited	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	UKAS accreditedMCERTS accredited	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils		Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	UKAS accreditedMCERTS accredited	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	UKAS accreditedMCERTS accredited*	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Normal Level TPH A/A Split is MCERTS accredited. Low Level TPH A/A Split is unaccredited	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	UKAS accreditedMCERTS accredited	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	UKAS accreditedMCERTS accredited*	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2920	Phenols in Soils by HPLC	UKAS accreditedMCERTS accredited	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Chemtest
The right chemistry to deliver results

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-28631-1
Initial Date of Issue:	25-Nov-2016
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Paul Quimby Contaminated Land
Project	LKC 16 1066 MMU Didsbury

Quotation No.:		**Date Received:**	23-Nov-2016
Order No.:	732176	**Date Instructed:**	23-Nov-2016
No. of Samples:	3		
Turnaround (Wkdays):	3	**Results Due:**	25-Nov-2016
Date Approved:	25-Nov-2016		

Approved By:



Details: Robert Monk, Technical Development Chemist

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury

Client: LK Consult			**Chemtest Job No.:**		16-28631	16-28631	16-28631
Quotation No.:			**Chemtest Sample ID.:**		381845	381846	381847
			Client Sample ID.:		SAND1	SAND2	SAND3
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		22-Nov-2016	22-Nov-2016	22-Nov-2016
			Asbestos Lab:		COVENTRY		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	6.4	8.8	8.5
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand
pH	M	2010		N/A	8.5	8.6	8.3
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	0.030	0.024
Arsenic	M	2450	mg/kg	1.0	1.4	2.4	1.3
Cadmium	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chromium	M	2450	mg/kg	1.0	5.9	7.6	4.8
Copper	M	2450	mg/kg	0.50	5.7	7.8	4.9
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	8.2	9.7	5.7
Lead	M	2450	mg/kg	0.50	4.0	5.6	3.2
Selenium	M	2450	mg/kg	0.20	0.22	0.21	< 0.20
Vanadium	U	2450	mg/kg	5.0	5.3	7.5	5.5
Zinc	M	2450	mg/kg	0.50	17	21	14
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	0.43	< 0.40	< 0.40
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0

Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix C – Remediation Strategy Validation Checklist

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

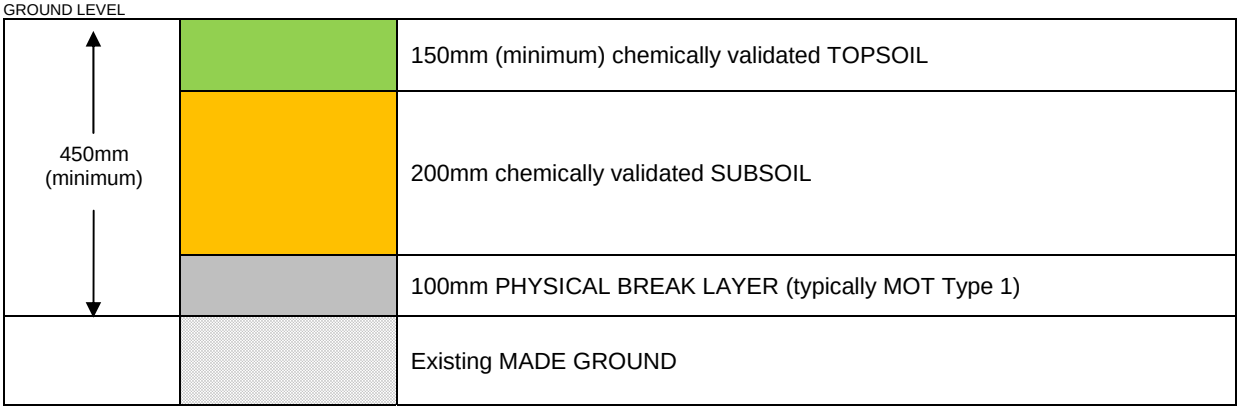
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

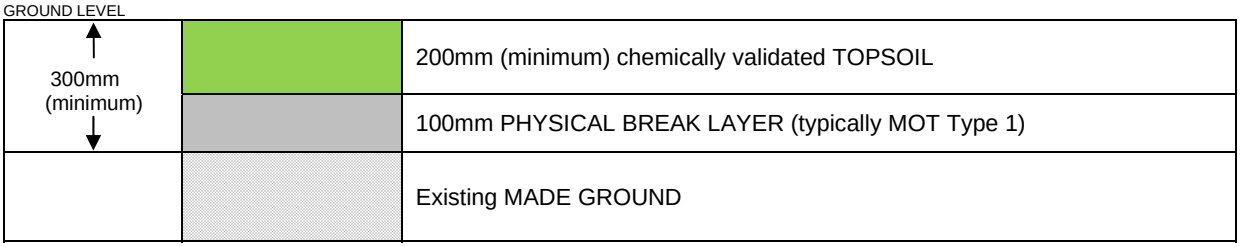
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix D – Plot Photographs

Plot 10

	**Photograph 4:** View of front garden of Plot 10.
	**Photograph 5:** View of soil in capping layer excavation in front garden of Plot 10 with MOT break layer visible.
	**Photograph 6:** Depth measurement in front garden of Plot 10.

	**Photograph 7:** View of the upper level of the rear garden of Plot 10. Northern extent of photo shows the lower level (fully paved).
	**Photograph 8:** View of soil in capping layer excavation in rear garden of Plot 10 with geotextile membrane visible.
	**Photograph 9:** Depth measurement in rear garden of Plot 10.

Plot 11

	**Photograph 10:** View of front garden of Plot 11.
	**Photograph 11:** View of soil in capping layer excavation in front garden of Plot 11 with geotextile membrane visible.
	**Photograph 12:** Depth measurement in front garden of Plot 11.

	**Photograph 13:** View of the upper level of the rear garden of Plot 11. Please note the lower level of the rear garden was fully paved.
	**Photograph 14:** View of soil in capping layer excavation in rear garden of Plot 11 with geotextile membrane visible.
	**Photograph 15:** Depth measurement in rear garden of Plot 11.

Plot 12

	**Photograph 16:** View of front garden of Plot 12.
	**Photograph 17:** View of soil in capping layer excavation in front garden of Plot 12 with geotextile membrane visible.
	**Photograph 18:** Depth measurement in front garden of Plot 12.

	**Photograph 19:** View of the upper level of the rear garden of Plot 12 with evidence of flagging. Please note the lower level of the rear garden was fully paved.
	**Photograph 20:** View of soil in capping layer excavation in rear garden of Plot 12 with geotextile membrane visible.
	**Photograph 21:** Depth measurement in rear garden of Plot 12.

Plot 13

	**Photograph 22:** View of front garden of Plot 13.
	**Photograph 23:** View of soil in capping layer excavation in front garden of Plot 13 with geotextile membrane visible.
	**Photograph 24:** Depth measurement in front garden of Plot 13.

	**Photograph 25:** View of the upper level of the rear garden of Plot 13 with evidence of flagging. Please note the lower level of the rear garden was fully paved.
	**Photograph 26:** View of soil in capping layer excavation in rear garden of Plot 13 with geotextile membrane visible.
	**Photograph 27:** Depth measurement in rear garden of Plot 13.

Plot 14

	**Photograph 28:** View of front garden of Plot 14.
	**Photograph 29:** View of soil in capping layer excavation in front garden of Plot 14 with geotextile membrane visible.
	**Photograph 30:** Depth measurement in front garden of Plot 14.

	**Photograph 31:** View of the upper level of the rear garden of Plot 14 with evidence of flagging in the lower level of the garden.
	**Photograph 32:** View of soil in capping layer excavation in rear garden of Plot 14 with geotextile membrane visible.
	**Photograph 33:** Depth measurement in rear garden of Plot 14.

Plot 15

	**Photograph 34:** View of front garden of Plot 15.
	**Photograph 35:** View of soil in capping layer excavation in front garden of Plot 15 with geotextile membrane visible.
	**Photograph 36:** Depth measurement in front garden of Plot 15.

	**Photograph 37:** View of the upper level of the rear garden of Plot 15 with evidence of flagging in the lower level of the garden.
	**Photograph 38:** View of soil in capping layer excavation in rear garden of Plot 15 with geotextile membrane visible.
	**Photograph 39:** Depth measurement in rear garden of Plot 15.

Plot 16

	**Photograph 40:** View of front garden of Plot 16.
	**Photograph 41:** View of soil in capping layer excavation in front garden of Plot 16 with geotextile membrane visible.
	**Photograph 42:** Depth measurement in front garden of Plot 16.

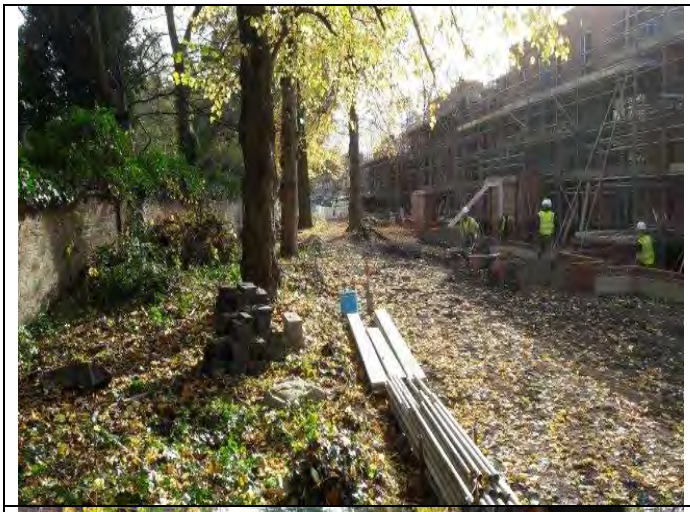
	**Photograph 43:** View of the upper level of the rear garden of Plot 16 with evidence of flagging. Please note the lower level of the rear garden was fully paved.
	**Photograph 44:** View of soil in capping layer excavation in rear garden of Plot 16 with geotextile membrane visible.
	**Photograph 45:** Depth measurement in rear garden of Plot 16.

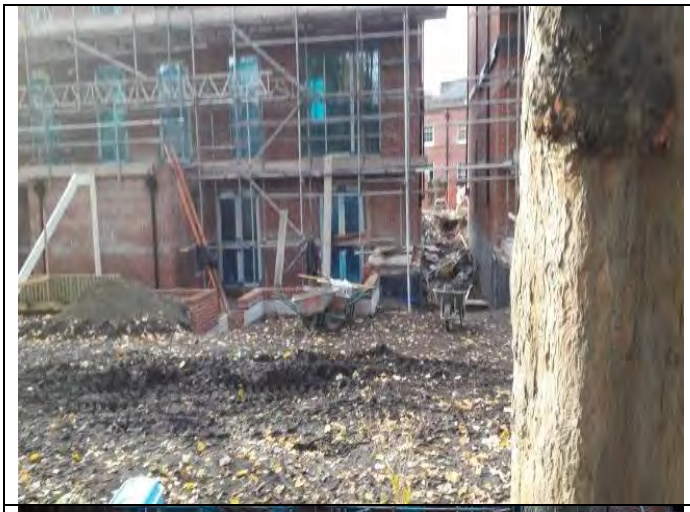
Plot 17

	**Photograph 46:** View of front garden of Plot 17.
	**Photograph 47:** View of soil in capping layer excavation in front garden of Plot 17 with geotextile membrane visible.
	**Photograph 48:** Depth measurement in front garden of Plot 17.

	**Photograph 49:** View of the upper level of the rear garden of Plot 17 with evidence of flagging in the lower level of the garden.
	**Photograph 50:** View of soil in capping layer excavation in rear garden of Plot 17 with geotextile membrane visible.
	**Photograph 51:** Depth measurement in rear garden of Plot 17.

Appendix E – Plot Photographs before Remediation

	**Photograph 52:** View along the upper levels of the rear gardens of Plots 10 to 17 prior to remediation. Mature trees protected under TPOs are present in view.
	**Photograph 53:** View of the upper level of the rear garden of Plot 10 with a mature tree under a TPO present in view.
	**Photograph 54:** View of the upper level of the rear garden of Plot 11 with a mature tree under a TPO present in view.

	**Photograph 55:** View of the upper level of the rear garden of Plot 12 with a mature tree under a TPO present in view.
	**Photograph 56:** View of the upper levels of the rear gardens of Plots 13 and 14 with several mature trees under TPOs present in view.
	**Photograph 57:** View of the upper level of the rear garden of Plot 15 with a mature tree under a TPO present in view.

Appendix F – Certificates of Analysis – Made Ground below Capping Layer

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-26624-1
Initial Date of Issue:	04-Nov-2016
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Paul Quimby Contaminated Land
Project	LKC 16 1066 MMU Didsbury

Quotation No.:		**Date Received:**	02-Nov-2016
Order No.:	732168	**Date Instructed:**	02-Nov-2016
No. of Samples:	5		
Turnaround (Wkdays):	3	**Results Due:**	04-Nov-2016
Date Approved:	04-Nov-2016		

Approved By:



Details: Keith Jones, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury

Client: LK Consult			**Chemtest Job No.:**		16-26624	16-26624	16-26624	16-26624	16-26624
Quotation No.:			**Chemtest Sample ID.:**		373261	373262	373263	373264	373265
			Client Sample ID.:		P10(T)	P11(T)	P12(T)	P13-14(T)	P15(T)
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
			Date Sampled:		01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016	01-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
ACM Type	U	2192		N/A	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	23	19	19	18	19
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones, Roots	Stones, Roots	Stones, Roots	Stones, Roots	Stones, Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand
pH	M	2010		N/A	7.4	7.8	7.7	7.5	6.3
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.074	0.019	< 0.010	< 0.010	< 0.010
Arsenic	M	2450	mg/kg	1.0	21	18	16	14	17
Cadmium	M	2450	mg/kg	0.10	0.83	0.85	0.76	0.62	0.61
Chromium	M	2450	mg/kg	1.0	21	23	21	18	20
Copper	M	2450	mg/kg	0.50	49	63	59	46	49
Mercury	M	2450	mg/kg	0.10	0.39	0.47	0.59	0.49	0.52
Nickel	M	2450	mg/kg	0.50	24	24	22	19	21
Lead	M	2450	mg/kg	0.50	190	220	360	340	290
Selenium	M	2450	mg/kg	0.20	0.36	0.85	0.63	0.47	0.64
Vanadium	U	2450	mg/kg	5.0	23	28	27	24	30
Zinc	M	2450	mg/kg	0.50	350	190	170	150	140
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	16	15	9.0	7.2	8.6
Naphthalene	M	2700	mg/kg	0.10	1.2	0.68	0.35	0.54	1.1
Acenaphthylene	M	2700	mg/kg	0.10	0.45	0.21	0.13	< 0.10	0.12
Acenaphthene	M	2700	mg/kg	0.10	0.31	0.16	0.14	0.13	0.14
Fluorene	M	2700	mg/kg	0.10	0.36	0.17	< 0.10	< 0.10	0.12
Phenanthrene	M	2700	mg/kg	0.10	4.3	2.1	1.2	1.2	1.3
Anthracene	M	2700	mg/kg	0.10	0.97	0.53	0.30	0.36	0.25
Fluoranthene	M	2700	mg/kg	0.10	8.2	3.8	2.7	2.7	3.0
Pyrene	M	2700	mg/kg	0.10	8.5	3.9	2.9	2.7	3.2
Benzo[a]anthracene	M	2700	mg/kg	0.10	4.2	1.9	1.5	1.4	1.7
Chrysene	M	2700	mg/kg	0.10	4.8	2.0	1.6	1.4	1.6
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	6.2	2.8	2.2	1.9	2.4
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	2.9	1.9	1.4	1.3	1.5
Benzo[a]pyrene	M	2700	mg/kg	0.10	4.4	2.2	1.6	1.4	1.9
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	3.4	1.8	1.2	1.2	1.3
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	1.1	0.95	0.16	0.63	0.73
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	3.8	2.3	1.5	1.0	1.4
Total Of 16 PAH's	M	2700	mg/kg	2.0	55	27	19	18	22

Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Eton Business Park, Eton Hill Road,
Manchester M26 2ZS

Tel: 0161 763 7200

The Corn Exchange, Fenwick Street,
Liverpool L2 7QL

Tel: 0151 235 8716

Unit 121, Wright Business Centre,
1 Lonmay Road, Glasgow G33 4EL

Tel: 0141 773 6269

www.thelkgroup.com

PART OF THE LK GROUP

Site: **St James Park, Former MMU Campus, Didsbury**
Plots: **19, 25, 37-39, 801 and The Lodge**
Date: **15th July 2019**
NHBC Ref: **Phase 2 - 713376**

1 INTRODUCTION

LK Consult (LKC) has been appointed by PJ Livesey Holdings Ltd to validate the depth of the garden capping layer laid down at the development at St James Park, Former MMU Campus, Didsbury.

This validation report concerns Plots 19, 25, 37-39, 801 and The Lodge. These plots consist of a rear garden with Plots 25, 37 and 39 having a small area of soft landscaping to the front of the property. Plots 19, 38, 801 and The Lodge have a paved driveway to the front.

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

i) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (included in total soil depth) **or** geotextile marker.
ii) Option 2: Further sampling and risk assessment on a block by block basis (nominally a total of 4 soil samples per plot with 1 in the front garden) or selected soil samples in any landscaped areas. If soil results are below generic assessment criteria then no specific clean validated environmental cover depth will be required, but a nominal 150mm covering of topsoil as a growing medium (if required).
iii) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is 'suitable for use'. All site won or imported material should be tested at a rate of 1 sample per $50m^3$ for topsoil and 1 sample per $150m^3$ for subsoil.
iv) Details of unexpected contamination.
v) Provision of waste transfer notes for any disposal of contaminated soil offsite.

A validation checklist was provided to the ground workers and presented in Appendix A.

2 IMPORTED MATERIAL

Topsoil for use in the garden and soft landscaping areas has been imported to site. The material used comprised approximately $600m^3$ of topsoil supplied by Huperade from a greenfield site at New Manor Farm, Stretford.

Composite topsoil samples were taken from garden areas (ref: TS401-TS403 and TS501-TS503) and subjected to the following analytical suite as a conservative measure:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

Soil samples were collected in plastic tubs, amber glass jars and amber vials and despatched to Chemtest of Newmarket in cool boxes with ice packs.

Soil results for the topsoil are presented in Appendix B. No elevated levels of contaminants were identified in the soil samples collected when compared to Generic Assessment Criteria presented in the agreed Remediation Strategy and presented again in Appendix C.

3 CAPPING LAYER IN GARDEN AREAS

For these plots, Option 1 was undertaken by PJ Livesey. The recommendation for the garden capping layer in Plots 19, 25, 37-39, 801 and The Lodge was that it should comprise a minimum 300mm thickness to the front and 450mm to the rear with a demarcation layer.

LKC attended site on 17th April and 14th May 2019 to inspect the capping layer construction and depth in the rear and front garden areas. Photographs are provided in Appendix D and the observations are summarised below.

Location	Topsoil Depth (mm)	Subsoil Depth (mm)	Membrane or 100mm MOT	Total Depth (mm)	Required Depth (mm)	Pass (✓) or Fail (x)
Plot 19 Front	Fully Hardstood					
Plot 19 Rear	600	N/A	Membrane	600	450	✓
Plot 25 Front	500	N/A	Membrane	500	300	✓
Plot 25 Rear	570	N/A	Membrane	570	450	✓
Plot 37 Front	300	N/A	Membrane	300	300	✓
Plot 37 Rear	450	N/A	Membrane	450	450	✓
Plot 38 Front	Fully Hardstood					
Plot 38 Rear	450	N/A	Membrane	450	450	✓
Plot 39 Front	330	N/A	Membrane	330	300	✓
Plot 39 Rear	640	N/A	Membrane	640	450	✓
Plot 801 Front	Fully Hardstood					
Plot 801 Rear	500	N/A	Membrane	500	450	✓
The Lodge Front	Fully Hardstood					
The Lodge Rear	720	N/A	MOT	720	450	✓

LKC were able to verify that, in the places inspected within the front and rear gardens of Plots 19, 25, 37-39, 801 and The Lodge, and the front gardens of Plots 25, 37 and 39 the capping layer depths were in accordance with the requirements of the Remediation Strategy.

4 CONCLUSIONS

LKC has completed the validation of the garden capping layers within Plots 19, 25, 37-39, 801 and The Lodge and conclude that, in the places inspected, chemically suitable material has been laid to an appropriate depth.

Report Prepared By:



Kerrell Walley
Senior Geo-Environmental Scientist

Report Reviewed By:



Dr Paul Quimby
Director

Enc:

Appendix A: Remediation Strategy Validation Checklist
Appendix B: Certificates of Analysis – Imported Soil
Appendix C: Generic Assessment Criteria Values
Appendix D: Plot Photographs

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Holdings Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Remediation Strategy Validation Checklist

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

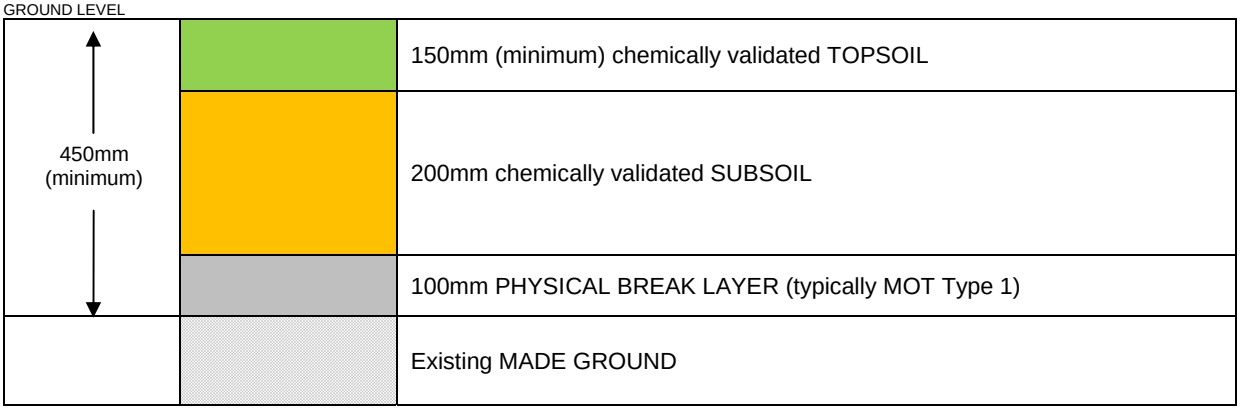
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

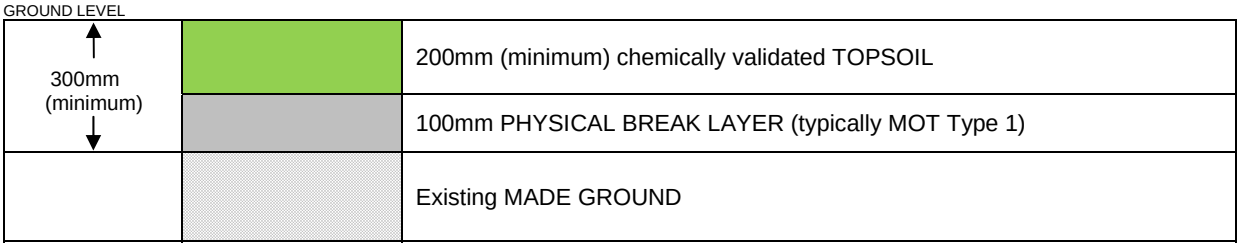
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix B – Certificates of Analysis – Imported Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	18-10339-1
Initial Date of Issue:	24-Apr-2018
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Paul Quimby Contaminated Land
Project	LKC 16 1066 MMU Didsbury

Quotation No.:		**Date Received:**	17-Apr-2018
Order No.:	736050	**Date Instructed:**	17-Apr-2018
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	23-Apr-2018
Date Approved:	24-Apr-2018		

Approved By:



Details: Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury

Client: LK Consult			**Chemtest Job No.:**		18-10339	18-10339	18-10339
Quotation No.:			**Chemtest Sample ID.:**		607446	607447	607448
			Client Sample ID.:		TS401	TS402	TS403
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		16-Apr-2018	16-Apr-2018	16-Apr-2018
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	15	13	12
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones, Roots	Stones, Roots	Stones, Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached
pH	M	2010		N/A	7.8	7.9	7.8
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40	0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	0.023	0.017
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	17	18	16
Cadmium	M	2450	mg/kg	0.10	0.21	0.22	0.18
Chromium	M	2450	mg/kg	1.0	12	12	9.9
Copper	M	2450	mg/kg	0.50	300	390	320
Mercury	M	2450	mg/kg	0.10	0.26	0.27	0.24
Nickel	M	2450	mg/kg	0.50	16	16	14
Lead	M	2450	mg/kg	0.50	230	280	240
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	18	19	17
Zinc	M	2450	mg/kg	0.50	310	360	310
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.3	5.5	4.7
Fuel Type	N	2670		N/A	PAH	PAH	PAH
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0

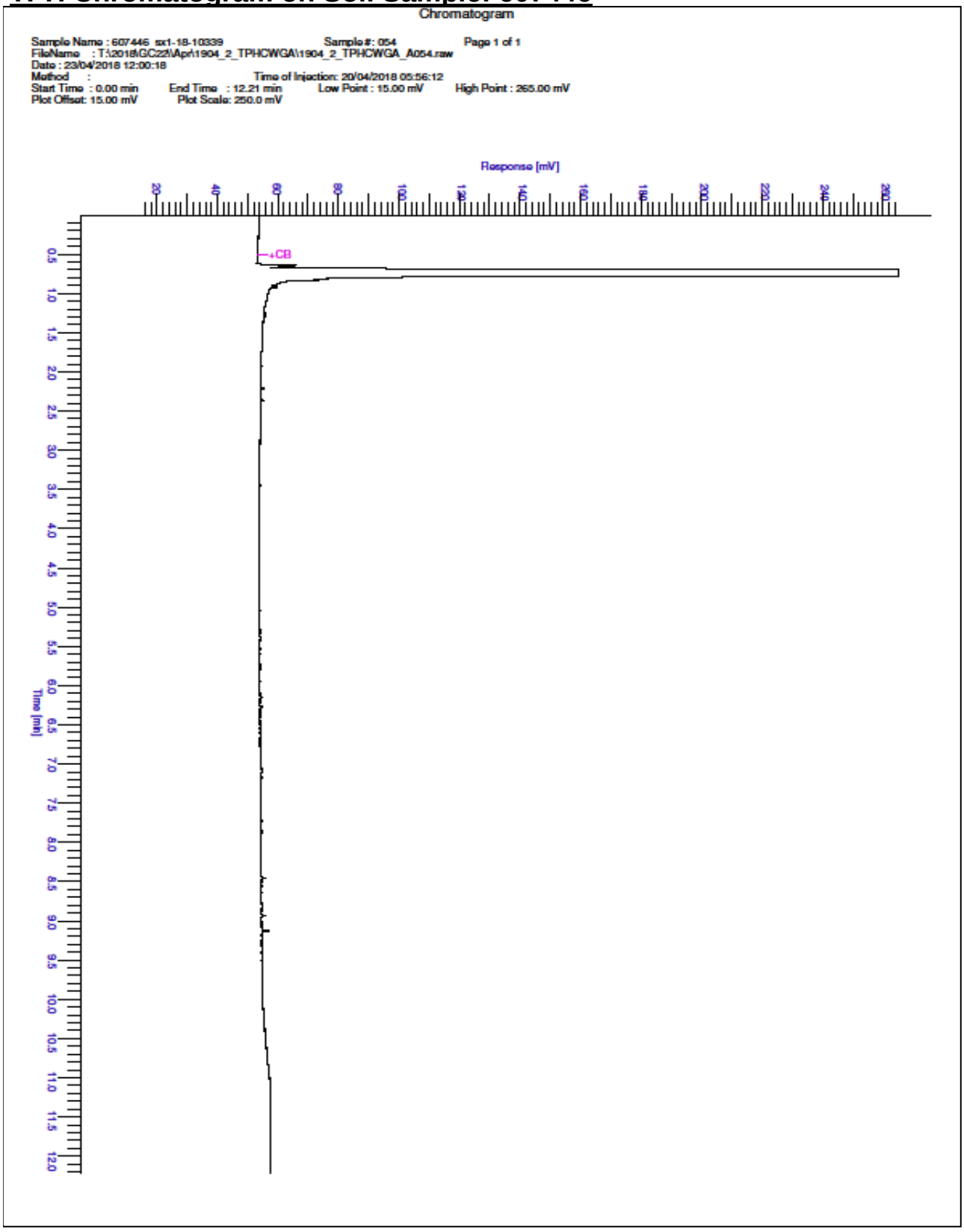
Chemtest
The right chemistry to deliver results

Results - Soil

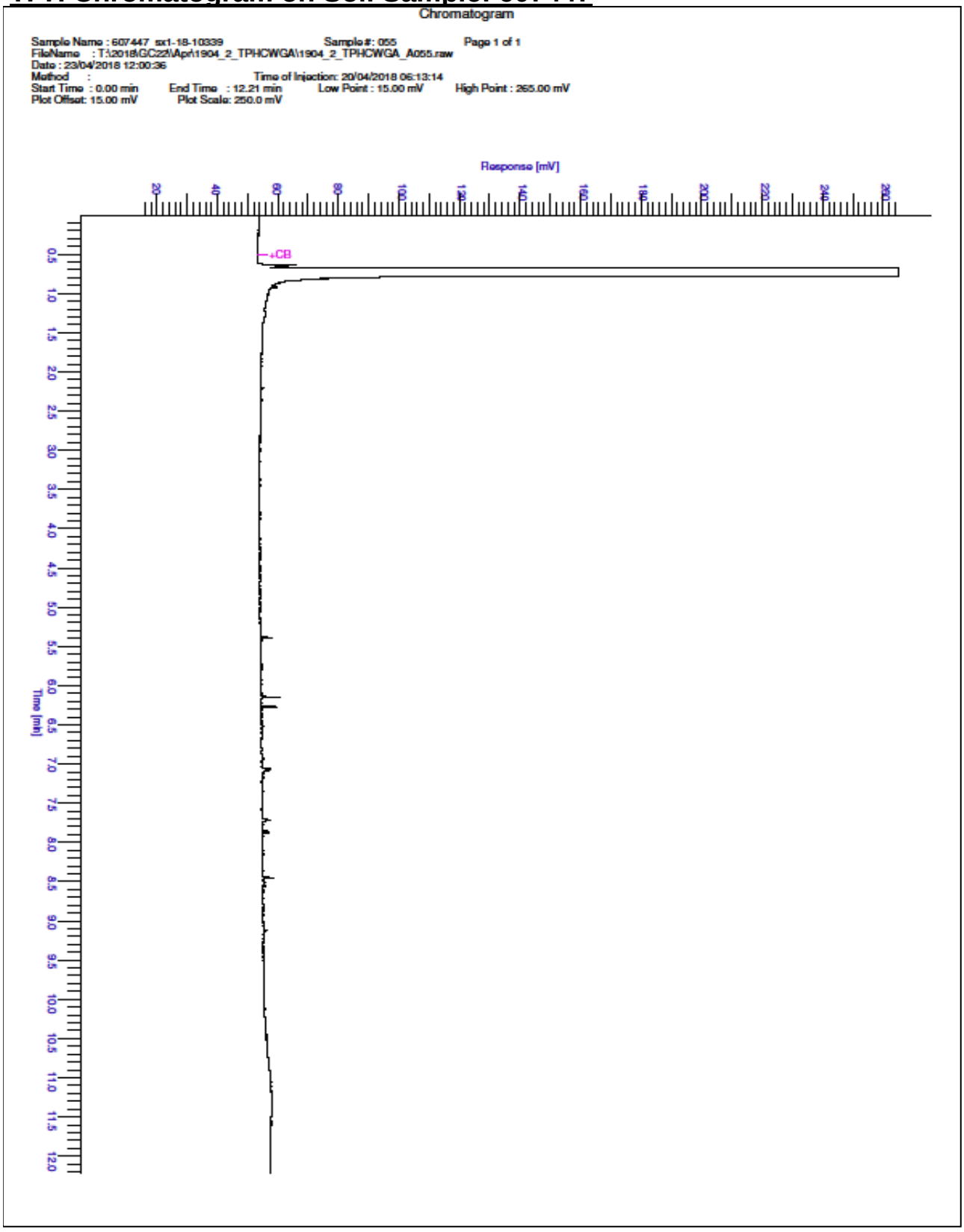
Project: LKC 16 1066 MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-10339	18-10339	18-10339
Quotation No.:		**Chemtest Sample ID.:**			607446	607447	607448
		Client Sample ID.:			TS401	TS402	TS403
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			16-Apr-2018	16-Apr-2018	16-Apr-2018
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	5.7	9.2	10
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	21	30	20
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	26	39	31
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	26	39	31
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Naphthalene	M	2800	mg/kg	0.10	0.24	0.67	0.23
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	0.15	0.20
Fluorene	M	2800	mg/kg	0.10	< 0.10	0.14	0.14
Phenanthrene	M	2800	mg/kg	0.10	0.87	1.5	1.6
Anthracene	M	2800	mg/kg	0.10	0.18	0.31	0.35
Fluoranthene	M	2800	mg/kg	0.10	1.4	2.4	2.6
Pyrene	M	2800	mg/kg	0.10	1.3	2.2	2.7
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.66	1.3	1.6
Chrysene	M	2800	mg/kg	0.10	0.69	1.3	1.6
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	0.90	1.6	2.0
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.29	0.56	0.78
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.62	1.1	1.6
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.49	0.75	1.0
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	0.15	0.17
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.46	0.79	0.99
Total Of 16 PAH's	N	2800	mg/kg	2.0	8.1	15	18
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30

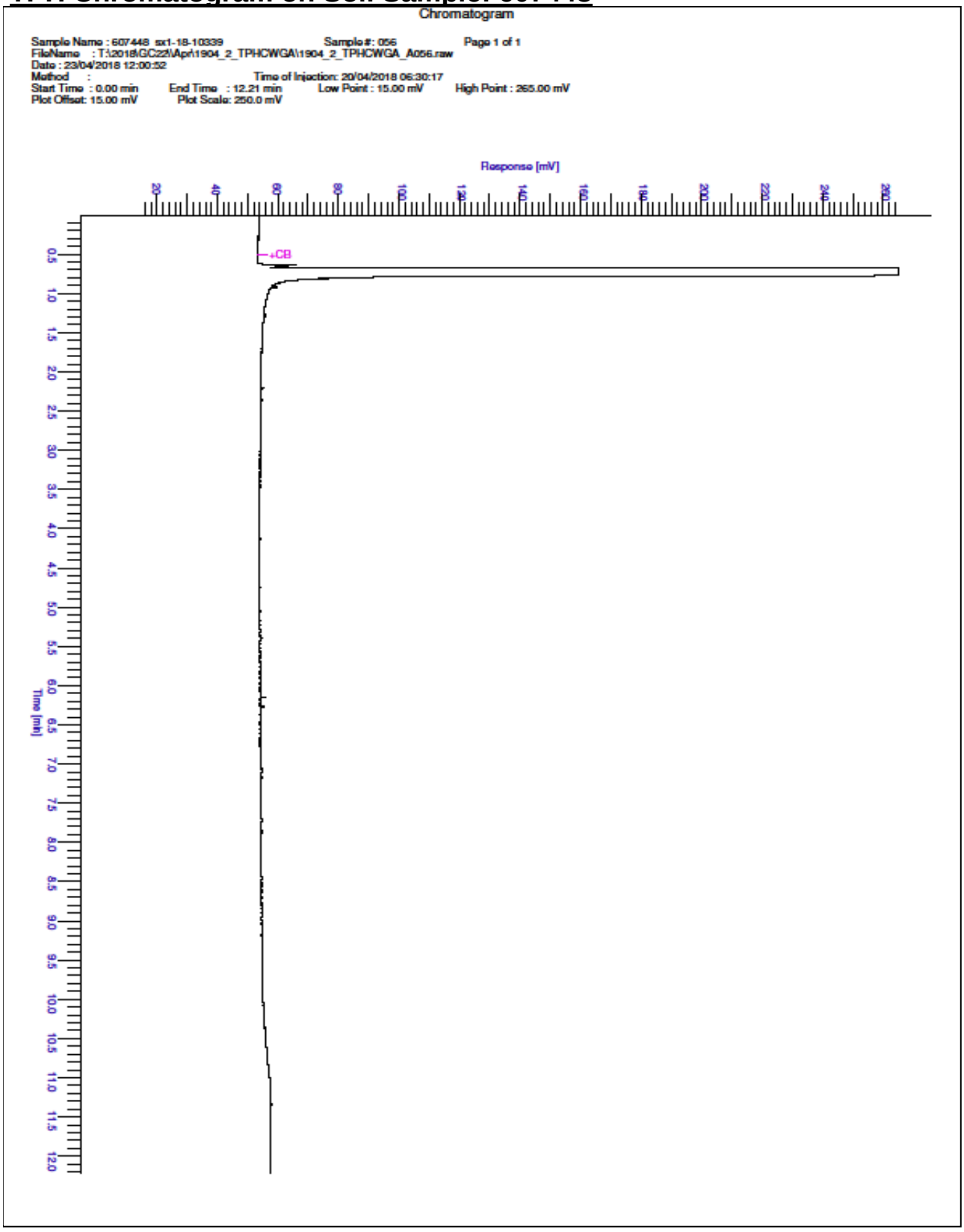
TPH Chromatogram on Soil Sample: 607446



TPH Chromatogram on Soil Sample: 607447



TPH Chromatogram on Soil Sample: 607448



Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	18-34206-1
Initial Date of Issue:	12-Nov-2018
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Contaminated Land Paul Quimby
Project	LKC 16 1066 Former MMU Campus, Didsbury

Quotation No.:		**Date Received:**	02-Nov-2018
Order No.:	736496	**Date Instructed:**	02-Nov-2018
No. of Samples:	10		
Turnaround (Wkdays):	5	**Results Due:**	08-Nov-2018
Date Approved:	12-Nov-2018		

Approved By:



Details: Robert Monk, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206
Quotation No.:		**Chemtest Sample ID.:**			718221	718222	718223	718224	718225	718226	718227	718228
		Client Sample ID.:			TSS01	TS502	TS503	Plot 22	Plot 22	Plot 22	Plot 22	Plot 23
		Sample Location:						S101	S102	S103	S104	S101
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Date Sampled:			31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	16	12	14	13	14	11	11	13
Soil Colour	N	2040		N/A	Brown,	Brown,	Brown,	Brown,	Brown,	Brown,	Brown,	Brown,
Other Material	N	2040		N/A	Stones,	Stones,	Stones,	Stones,	Stones,	Stones,	Stones,	Stones, Roots,
Soil Texture	N	2040		N/A	Loam,	Loam,	Loam,	Loam,	Loam,	Loam,	Loam,	Loam,
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached					
pH	M	2010		N/A	8.1	8.3	8.3	8.2	8.2	8.4	8.7	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.54	0.64	0.52					
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.015	0.027	< 0.010	0.035	0.022	0.083	0.18	0.030
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50					
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50					
Arsenic	M	2450	mg/kg	1.0	14	12	10	13	13	13	15	13
Cadmium	M	2450	mg/kg	0.10	0.28	0.22	0.20	0.24	0.21	0.36	0.32	0.23
Chromium	M	2450	mg/kg	1.0	12	11	11	12	11	14	11	11
Copper	M	2450	mg/kg	0.50	29	29	23	23	28	25	22	26
Mercury	M	2450	mg/kg	0.10	0.42	0.41	0.34	0.35	0.46	0.34	0.30	0.39
Nickel	M	2450	mg/kg	0.50	15	15	13	14	14	15	13	14
Lead	M	2450	mg/kg	0.50	110	110	88	97	100	96	92	92
Selenium	M	2450	mg/kg	0.20	0.28	0.22	0.25	< 0.20	0.30	< 0.20	< 0.20	0.22
Vanadium	U	2450	mg/kg	5.0	16	15	14	15	15	18	14	14
Zinc	M	2450	mg/kg	0.50	61	63	54	52	56	61	50	55
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.8	4.8	4.1	3.1	5.7	5.3	3.5	4.1
Fuel Type	N	2670		N/A	PAH	PAH	PAH					
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	46	33	26					
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	46	33	26					
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206	18-34206
Quotation No.:		**Chemtest Sample ID.:**			718221	718222	718223	718224	718225	718226	718227	718228
		Client Sample ID.:			TSS01	TS502	TS503	Plot 22	Plot 22	Plot 22	Plot 22	Plot 23
		Sample Location:						S101	S102	S103	S104	S101
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Date Sampled:			31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018	31-Oct-2018
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	9.8	5.7	4.1					
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	200	92	42					
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0					
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	210	97	46					
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	250	130	73					
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0					
Naphthalene	M	2800	mg/kg	0.10	0.13	0.20	0.24	0.46	0.13	0.67	0.11	0.33
Acenaphthylene	N	2800	mg/kg	0.10	0.11	0.16	0.10	0.24	0.15	0.24	< 0.10	0.26
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	0.13	0.46	0.38	0.21	1.8	< 0.10	0.22
Fluorene	M	2800	mg/kg	0.10	< 0.10	0.17	0.27	0.32	0.23	1.6	0.12	0.24
Phenanthrene	M	2800	mg/kg	0.10	1.6	2.8	4.2	4.0	3.0	14	1.6	3.6
Anthracene	M	2800	mg/kg	0.10	0.33	0.65	0.86	1.1	0.72	3.7	0.36	1.1
Fluoranthene	M	2800	mg/kg	0.10	3.2	4.5	5.1	4.7	4.7	18	2.9	5.4
Pyrene	M	2800	mg/kg	0.10	3.3	4.7	4.9	4.6	4.2	15	3.1	5.2
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.98	1.9	1.9	1.6	1.7	6.8	1.3	2.1
Chrysene	M	2800	mg/kg	0.10	1.3	2.3	2.1	2.0	2.0	7.6	1.5	2.5
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.3	2.4	2.3	1.9	2.0	8.1	1.7	2.6
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.38	0.84	0.66	0.62	0.54	3.4	0.56	0.78
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.83	1.6	1.6	1.4	1.5	6.9	1.4	1.9
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.41	0.92	0.82	0.66	0.63	4.2	0.68	1.0
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.76	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.63	1.1	1.1	0.96	0.91	3.9	0.87	1.3
Total Of 16 PAH's	N	2800	mg/kg	2.0	15	24	27	25	23	97	16	29
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30					

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult			**Chemtest Job No.:**		18-34206	18-34206
Quotation No.:			**Chemtest Sample ID.:**		718229	718230
			Client Sample ID.:		Plot 23	Plot 23
			Sample Location:		S102	S103
			Sample Type:		SOIL	SOIL
			Date Sampled:		31-Oct-2018	31-Oct-2018
			Asbestos Lab:		DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	15	16
Soil Colour	N	2040		N/A	Brown,	Brown,
Other Material	N	2040		N/A	Stones, Roots,	Stones,Roots,
Soil Texture	N	2040		N/A	Loam,	Loam,
Chromatogram (TPH)	N			N/A		
pH	M	2010		N/A	8.2	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40		
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.029	0.072
Cyanide (Free)	M	2300	mg/kg	0.50		
Cyanide (Total)	M	2300	mg/kg	0.50		
Arsenic	M	2450	mg/kg	1.0	13	15
Cadmium	M	2450	mg/kg	0.10	0.26	0.27
Chromium	M	2450	mg/kg	1.0	12	14
Copper	M	2450	mg/kg	0.50	27	32
Mercury	M	2450	mg/kg	0.10	0.41	0.57
Nickel	M	2450	mg/kg	0.50	15	17
Lead	M	2450	mg/kg	0.50	110	120
Selenium	M	2450	mg/kg	0.20	0.27	0.26
Vanadium	U	2450	mg/kg	5.0	15	18
Zinc	M	2450	mg/kg	0.50	59	70
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.8	4.8
Fuel Type	N	2670		N/A		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0		
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0		
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0		
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0		
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0		

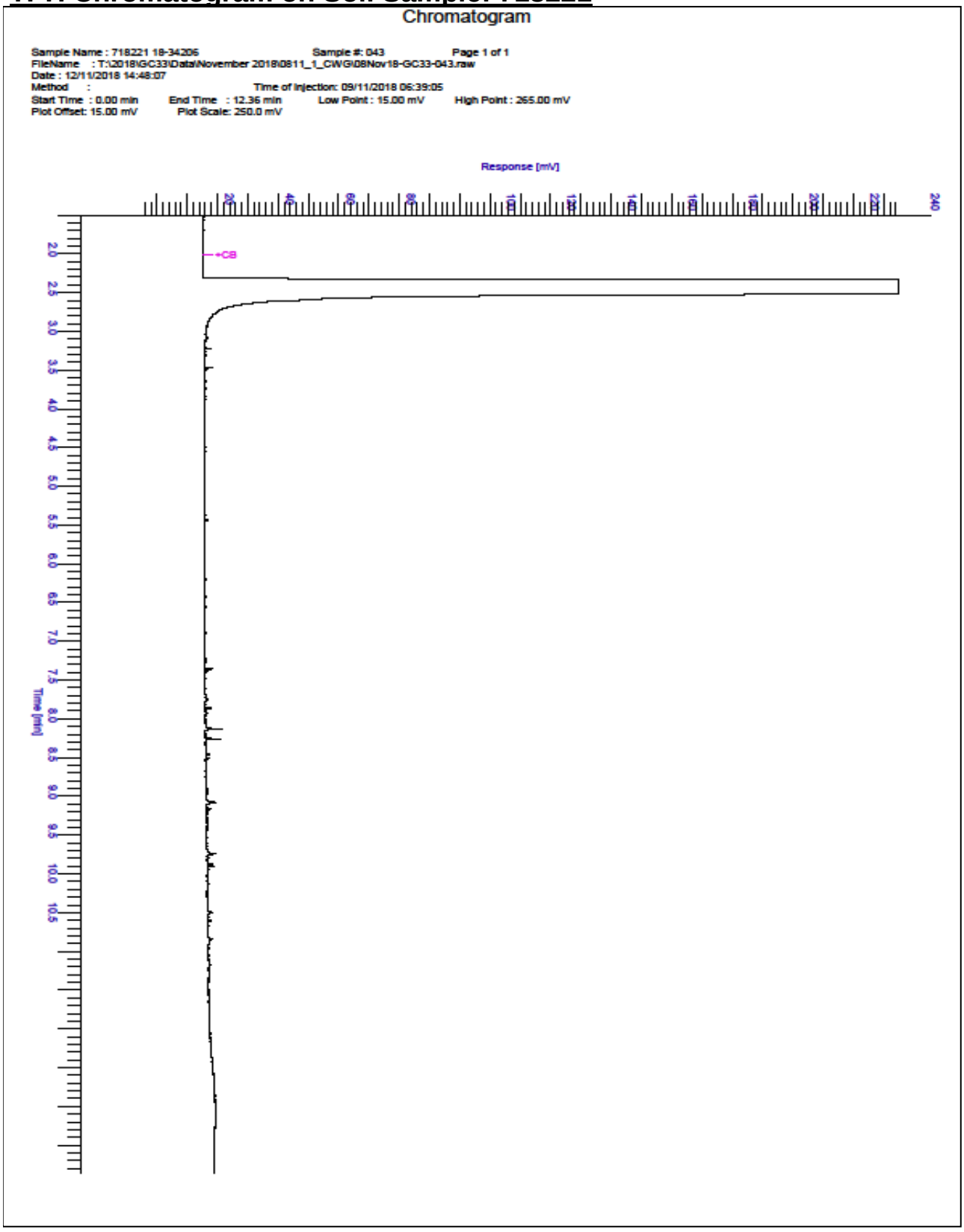
Chemtest
The right chemistry to deliver results

Results - Soil

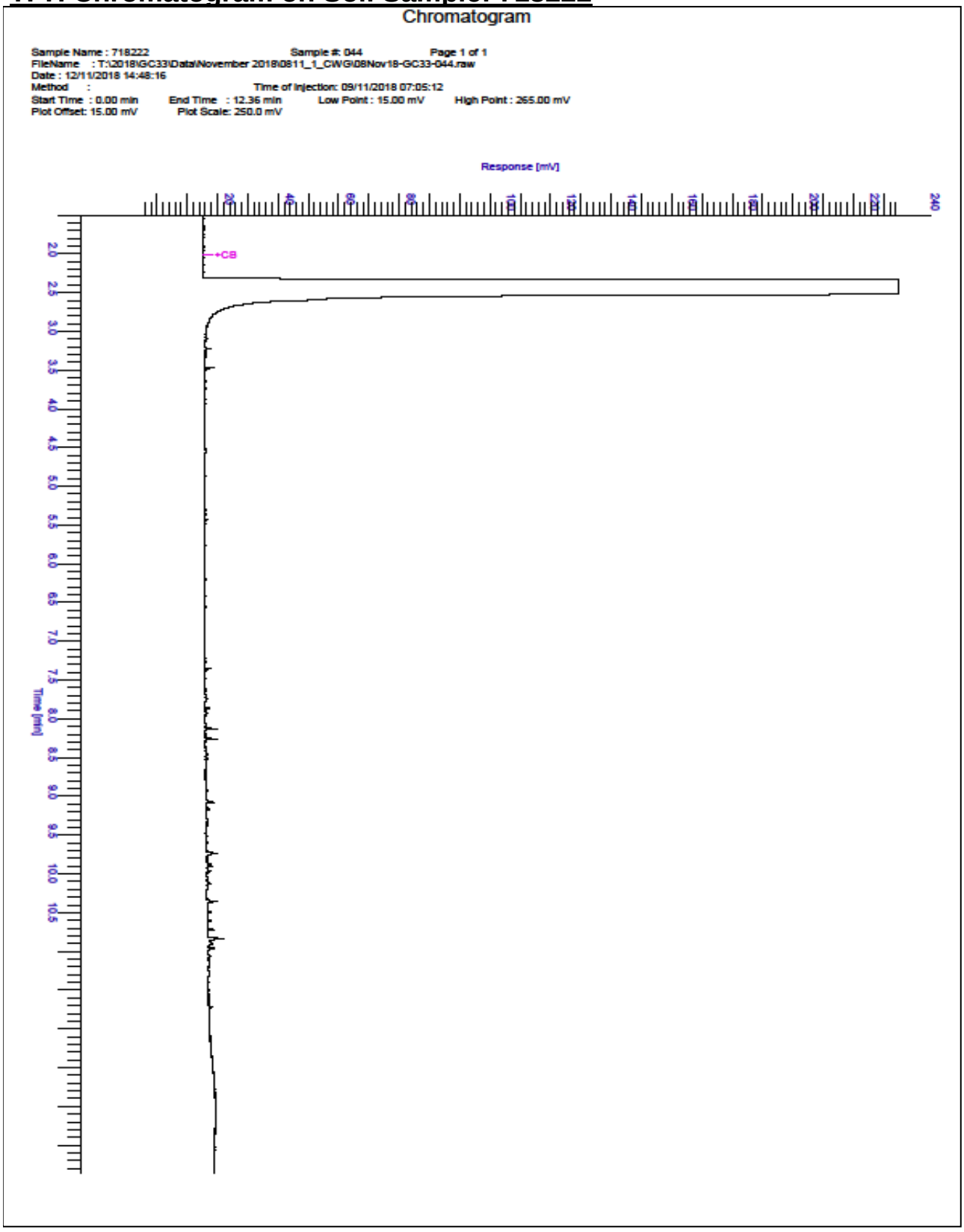
Project: LKC 16 1066 Former MMU Campus, Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-34206	18-34206
Quotation No.:		**Chemtest Sample ID.:**			718229	718230
		Client Sample ID.:			Plot 23	Plot 23
		Sample Location:			S102	S103
		Sample Type:			SOIL	SOIL
		Date Sampled:			31-Oct-2018	31-Oct-2018
		Asbestos Lab:			DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0		
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		
Benzene	M	2760	µg/kg	1.0		
Toluene	M	2760	µg/kg	1.0		
Ethylbenzene	M	2760	µg/kg	1.0		
m & p-Xylene	M	2760	µg/kg	1.0		
o-Xylene	M	2760	µg/kg	1.0		
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0		
Naphthalene	M	2800	mg/kg	0.10	0.13	0.65
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	0.14
Acenaphthene	M	2800	mg/kg	0.10	0.19	0.85
Fluorene	M	2800	mg/kg	0.10	0.15	0.62
Phenanthrene	M	2800	mg/kg	0.10	2.1	6.2
Anthracene	M	2800	mg/kg	0.10	0.47	1.4
Fluoranthene	M	2800	mg/kg	0.10	3.6	7.3
Pyrene	M	2800	mg/kg	0.10	3.2	6.5
Benzo[a]anthracene	M	2800	mg/kg	0.10	1.4	2.4
Chrysene	M	2800	mg/kg	0.10	1.6	3.1
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.6	3.0
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.52	0.94
Benzo[a]pyrene	M	2800	mg/kg	0.10	1.3	2.3
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.70	1.3
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.92	1.7
Total Of 16 PAH's	N	2800	mg/kg	2.0	18	38
Total Phenols	M	2920	mg/kg	0.30		

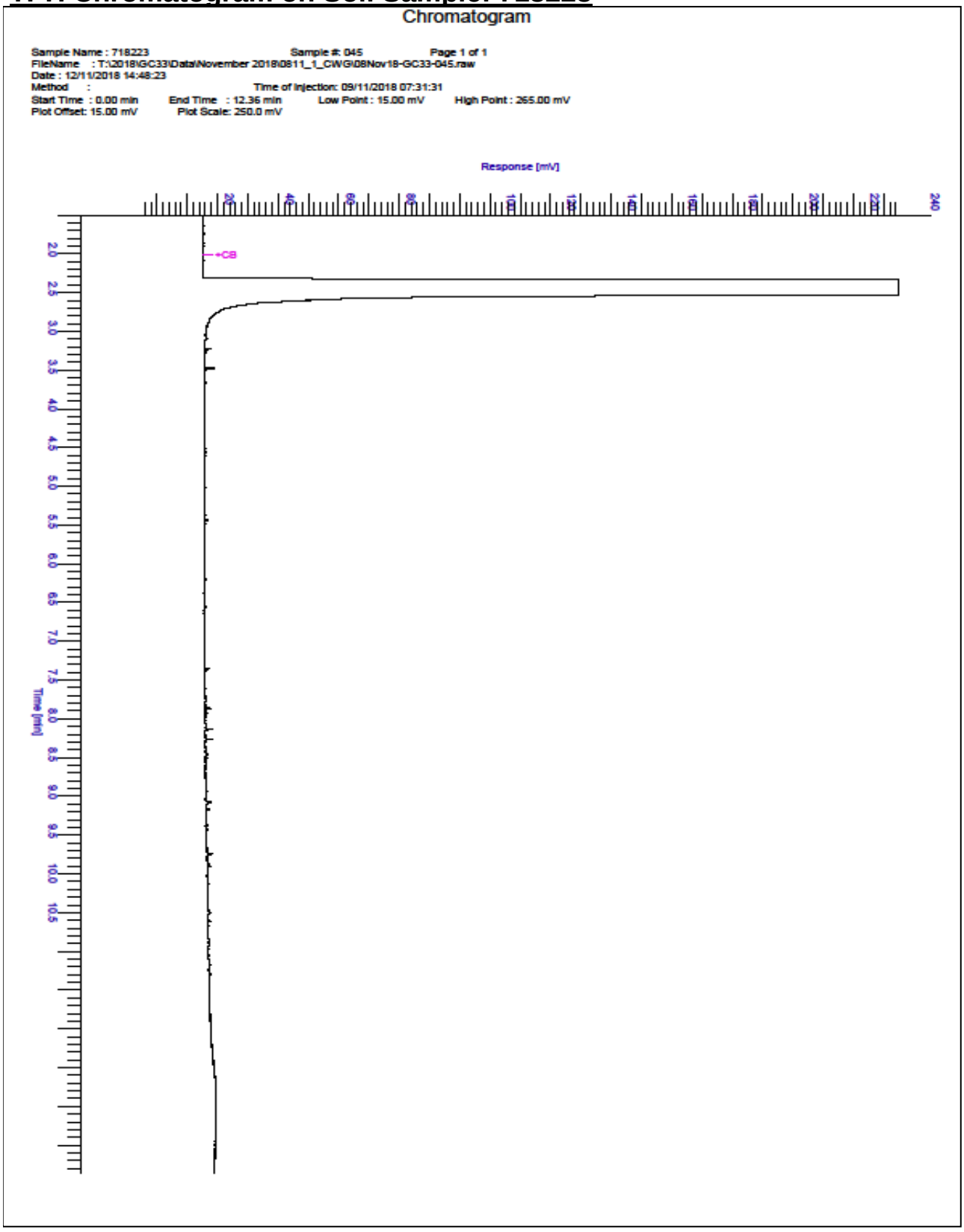
TPH Chromatogram on Soil Sample: 718221



TPH Chromatogram on Soil Sample: 718222



TPH Chromatogram on Soil Sample: 718223



Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix C – Plot Photographs

Plot 19

	**Photograph 1:** View of front garden of Plot 19.
	**Photograph 2:** View of the rear garden of Plot 19.
	**Photograph 3:** View of soil in capping layer excavation in rear garden of Plot 19 with geotextile membrane visible.

	**Photograph 4:** Depth measurement in rear garden of Plot 19.

Plot 25

	**Photograph 5:** View of soil in capping layer excavation in front garden of Plot 25 with geotextile membrane visible.
	**Photograph 6:** Depth measurement in front garden of Plot 25.
	**Photograph 7:** View of the rear garden of Plot 25.

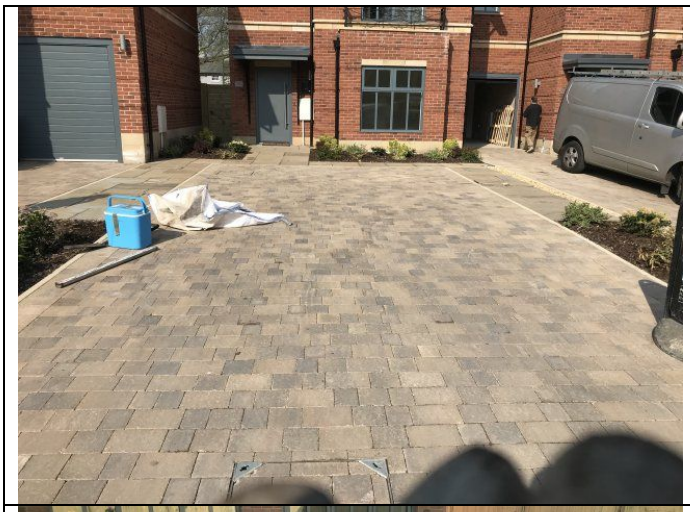
	**Photograph 8:** View of soil in capping layer excavation in rear garden of Plot 25 with geotextile membrane visible.
	**Photograph 9:** Depth measurement in rear garden of Plot 25.

Plot 37

	**Photograph 10:** View of front garden of Plot 37.
	**Photograph 11:** View of soil in capping layer excavation in front garden of Plot 37 with geotextile membrane visible.
	**Photograph 12:** Depth measurement in front garden of Plot 37.

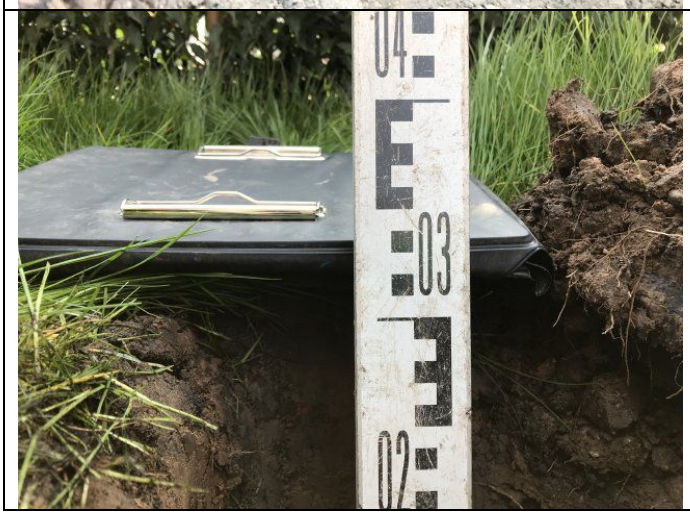
	**Photograph 13:** View of the rear garden of Plot 37.
	**Photograph 14:** View of soil in capping layer excavation in rear garden of Plot 37 with geotextile membrane visible.
	**Photograph 15:** Depth measurement in rear garden of Plot 37.

Plot 38

	**Photograph 16:** View of front garden of Plot 38.
	**Photograph 17:** View of the rear garden of Plot 38.
	**Photograph 18:** View of soil in capping layer excavation in rear garden of Plot 38 with geotextile membrane visible.

	**Photograph 19:** Depth measurement in rear garden of Plot 38.

Plot 39

	**Photograph 20:** View of front garden of Plot 39.
	**Photograph 21:** View of soil in capping layer excavation in front garden of Plot 39 with geotextile membrane visible.
	**Photograph 22:** Depth measurement in front garden of Plot 39.

	**Photograph 23:** View of the rear garden of Plot 39.
	**Photograph 24:** View of soil in capping layer excavation in rear garden of Plot 39 with geotextile membrane visible.
	**Photograph 25:** Depth measurement in rear garden of Plot 39.

Plot 801

	**Photograph 26:** View of front garden of Plot 801.
	**Photograph 27:** View of soil in capping layer excavation in rear garden of Plot 801 with geotextile membrane visible.
	**Photograph 28:** Depth measurement in rear garden of Plot 801.

The Lodge

	**Photograph 29:** View of rear garden of The Lodge.
	**Photograph 30:** View of soil in capping layer excavation in rear garden of The Lodge with MOT visible.
	**Photograph 31:** Depth measurement in rear garden of The Lodge.

Based across the UK with offices in Manchester, London, Liverpool and Glasgow.

Manchester (Head Office)
Unit 29,
Eton Business Park
Eton Hill Rd, Radcliffe
M26 2ZS

t: 0161 763 7200
e: info@thelkgroup.com

London
Brooklands Business Park
Wellington Way
Weybridge
KT13 0TT

t: 01932 871872
e: info@thelkgroup.com

Glasgow
Wright Business Centre
1 Lonmay Road
Glasgow
G33 4EL

t: 0141 773 6269
e: info@thelkgroup.com

Liverpool
The Corn Exchange
Fenwick Street
Liverpool
L2 7QL

t: 0151 235 8716
e: info@thelkgroup.com

LK GROUP

- Geotechnical
- Contaminated Land
- Flood Risk and Drainage
- Asbestos
- Invasive Species
- Land Remediation
- Project Management
- Land Drilling

Site: **St James Park, Former MMU Campus, Didsbury**
Plots: **26-28**
Date: **18th June 2018**
NHBC Ref: **Phase 2 - 713376**

1 INTRODUCTION

LK Consult (LKC) has been appointed by PJ Livesey Holdings Ltd to validate the depth of the garden capping layer laid down at the development at St James Park, Former MMU Campus, Didsbury.

This validation report concerns Plots 26 to 28. These plots consist of a rear garden and a small area of landscaping to the front. Plot 26 has a paved driveway to the front of the property.

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

i) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (included in total soil depth) **or** geotextile marker.
ii) Option 2: Further sampling and risk assessment on a block by block basis (nominally a total of 4 soil samples per plot with 1 in the front garden) or selected soil samples in any landscaped areas. If soil results are below generic assessment criteria then no specific clean validated environmental cover depth will be required, but a nominal 150mm covering of topsoil as a growing medium (if required).
iii) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is 'suitable for use'. All site won or imported material should be tested at a rate of 1 sample per $50m^3$ for topsoil and 1 sample per $150m^3$ for subsoil.
iv) Details of unexpected contamination.
v) Provision of waste transfer notes for any disposal of contaminated soil offsite.

A validation checklist was provided to the ground workers and is presented in Appendix A.

2 IMPORTED MATERIAL

Topsoil for use in the garden and soft landscaping areas has been imported to site. The material used comprised approximately $200m^3$ of topsoil supplied by Huperade from a greenfield site at New Manor Farm, Stretford.

Composite topsoil samples were taken from garden areas (ref: TS301-TS303) were subjected to the following analytical suite as a conservative measure:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

Soil samples were collected in plastic tubs, amber glass jars and amber vials and despatched to Chemtest of Newmarket in cool boxes with ice packs.

Soil results for the topsoil are presented in Appendix B. No elevated levels of contaminants were identified in the soil samples collected when compared to Generic Assessment Criteria presented in the agreed Remediation Strategy.

3 CAPPING LAYER IN GARDEN AREAS

Option 1 was undertaken by PJ Livesey. The recommendation for the garden capping layer in Plots 26 to 28 was that it should comprise a minimum 300mm thickness to the front and 450mm to the rear.

LKC attended site on 10th November 2017 and 12th January 2018 to inspect the capping layer construction and depth in the rear and front garden areas. Photographs are provided in Appendix C and the observations are summarised below.

Location	Topsoil Depth (mm)	Subsoil Depth (mm)	Membrane or 100mm MOT	Total Depth (mm)	Required Depth (mm)	Pass (✓) or Fail (x)
Plot 26 Front	Fully hardstood					
Plot 26 Rear	450	0	Membrane	450	450	✓
Plot 27 Front	500	0	Membrane	500	300	✓
Plot 27 Rear	450	0	Membrane	450	450	✓
Plot 28 Front	450	0	Membrane	450	300	✓
Plot 28 Rear	450	0	Membrane	450	450	✓

LKC were able to verify that, in the places inspected within the front and rear gardens of Plots 26 to 28, the capping layer depths were in accordance with the requirements of the Remediation Strategy.

4 CONCLUSIONS

LKC has completed the validation of the garden capping layers within Plots 26 to 28 and conclude that, in the places inspected, chemically suitable material has been laid to an appropriate depth.

Report Prepared By:



Kerrell Walley
Geo-Environmental Scientist

Report Reviewed By:



Dr Paul Quimby
Director

Enc:

Appendix A: Remediation Strategy Validation Checklist
Appendix B: Certificates of Analysis – Imported and Site Won Soil
Appendix C: Plot Photographs

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Holdings Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Remediation Strategy Validation Checklist

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

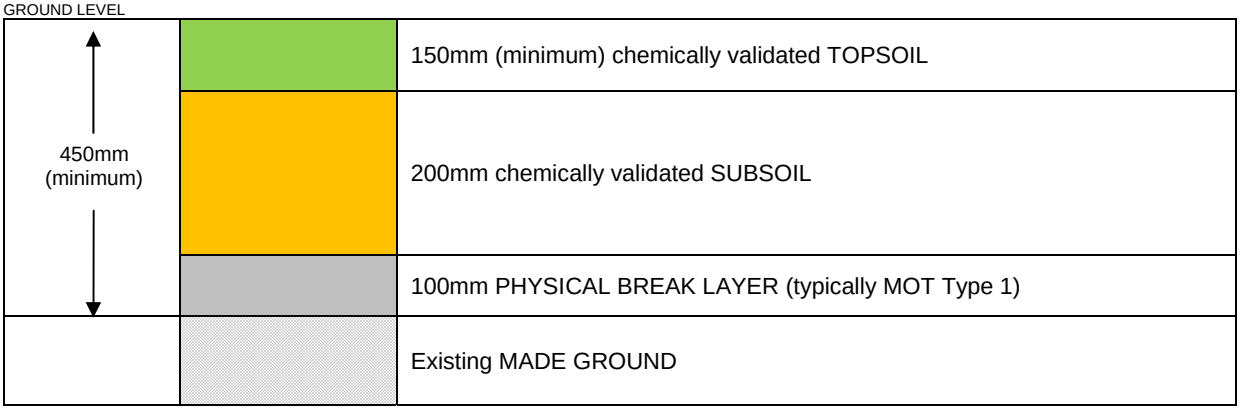
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

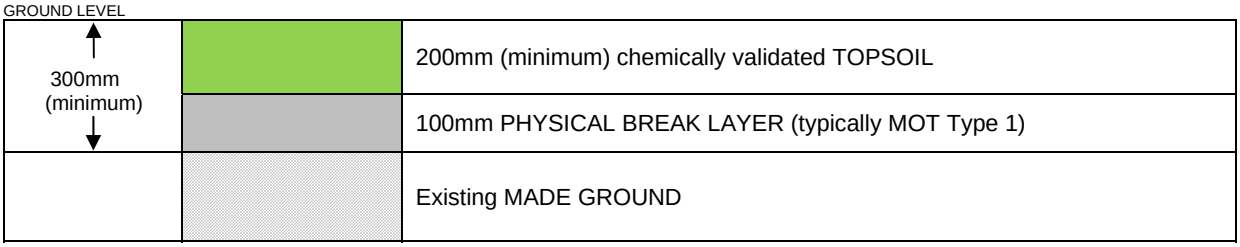
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix B – Certificates of Analysis – Imported Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	18-00954-1
Initial Date of Issue:	19-Jan-2018
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Contaminated Land Paul Quimby
Project	LKC 16 1066 MMU Didsbury

Quotation No.:		**Date Received:**	15-Jan-2018
Order No.:	735877	**Date Instructed:**	15-Jan-2018
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	19-Jan-2018
Date Approved:	19-Jan-2018		

Approved By:



Details: Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-00954	18-00954	18-00954
Quotation No.:		**Chemtest Sample ID.:**			563283	563284	563285
		Client Sample ID.:			TS301	TS302	TS303
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			11-Jan-2018	11-Jan-2018	11-Jan-2018
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	20	21	22
Soil Colour	N	2040		N/A	Brown	Brown, Grey	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Stones	Sand	Sand, Clay
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached
pH	M	2010		N/A	7.8	7.8	7.8
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.85	0.72	0.78
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.17	0.12	0.060
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	11	15	14
Cadmium	M	2450	mg/kg	0.10	0.27	0.35	0.34
Chromium	M	2450	mg/kg	1.0	18	20	19
Copper	M	2450	mg/kg	0.50	41	46	50
Mercury	M	2450	mg/kg	0.10	0.30	0.34	0.37
Nickel	M	2450	mg/kg	0.50	17	18	19
Lead	M	2450	mg/kg	0.50	90	94	110
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	22	23	22
Zinc	M	2450	mg/kg	0.50	85	87	100
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	5.9	5.0	5.3
Fuel Type	N	2670		N/A	PAH/H.oil	PAH	PAH
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	65	11	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	65	11	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	1.6

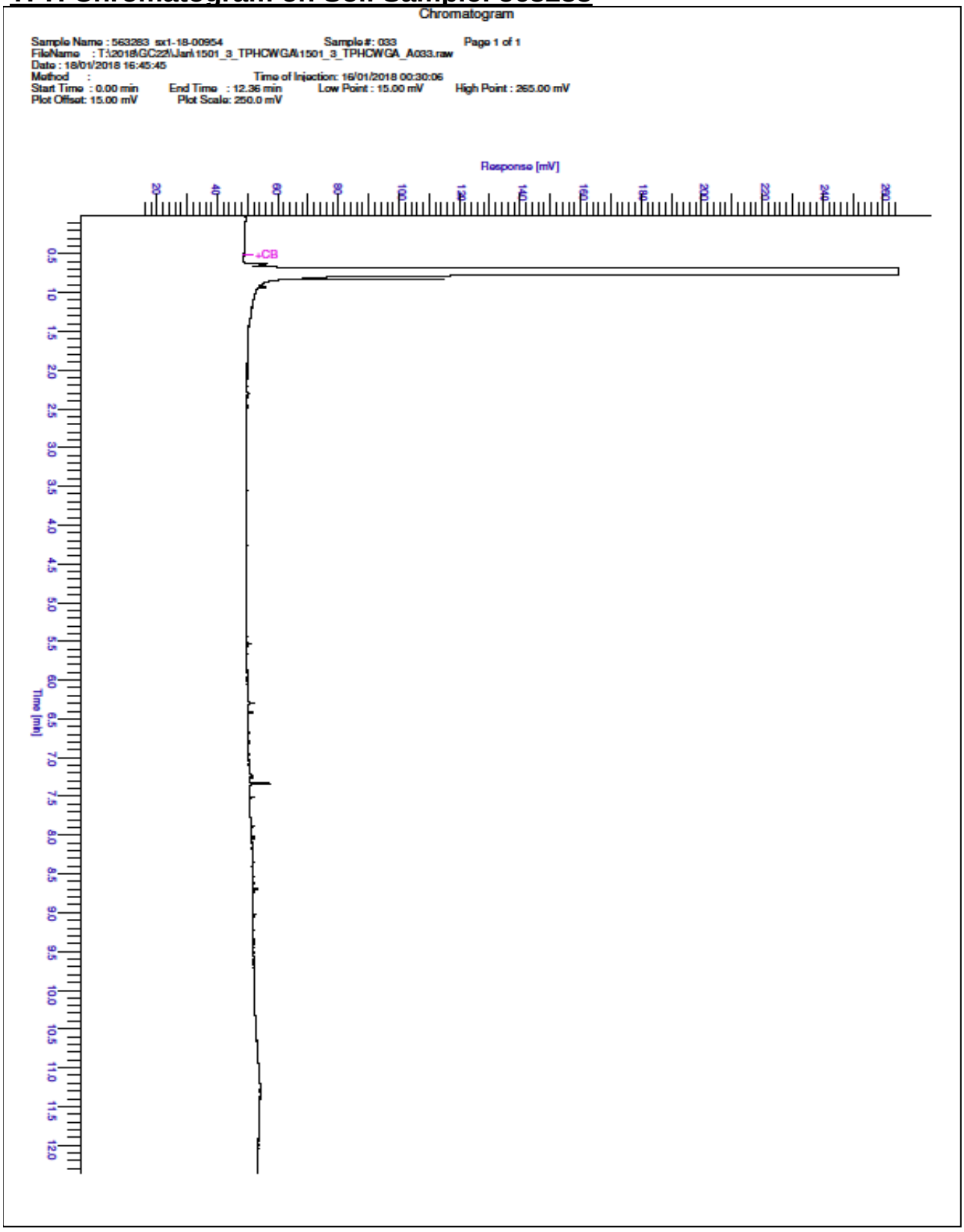
Chemtest
The right chemistry to deliver results

Results - Soil

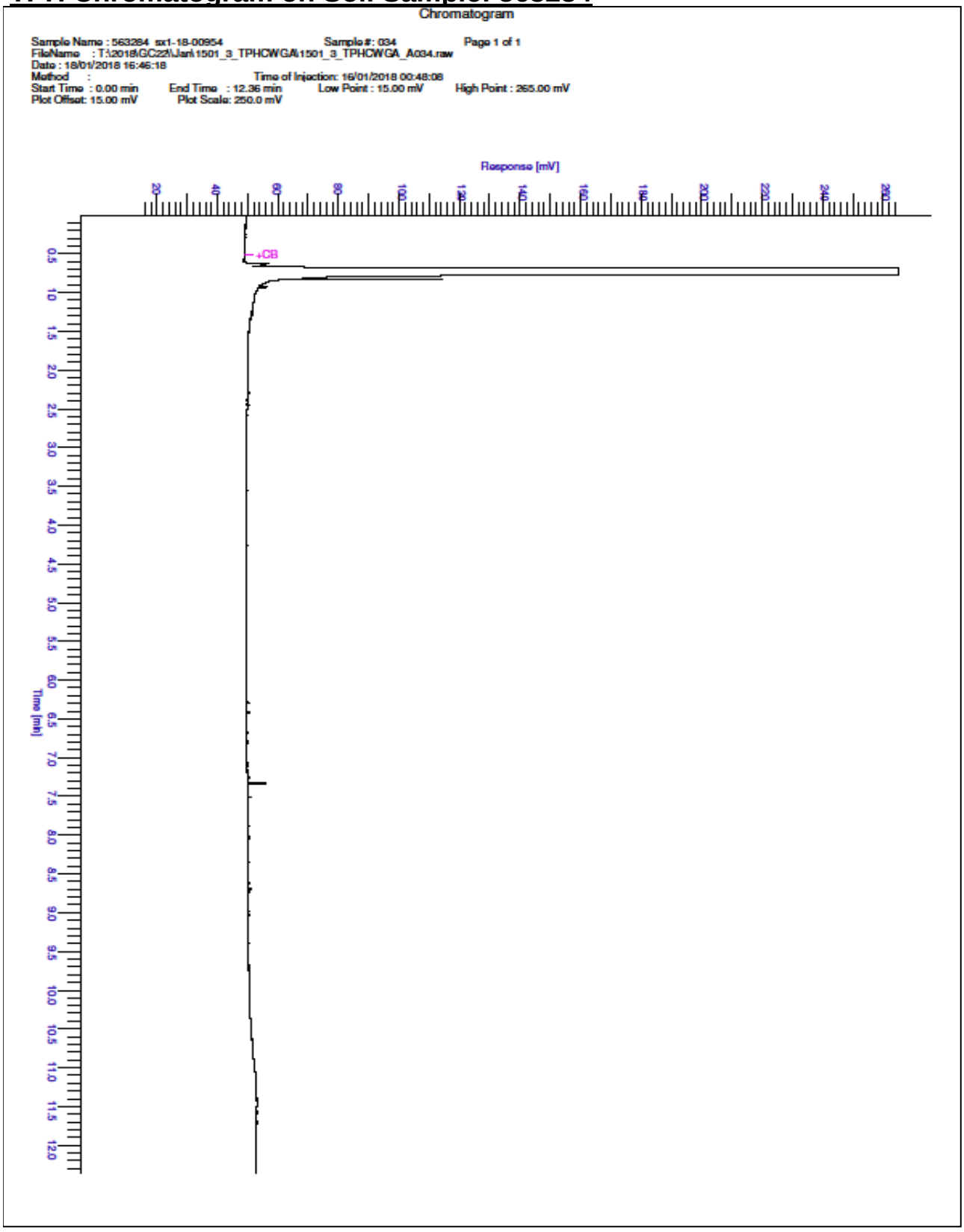
Project: LKC 16 1066 MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-00954	18-00954	18-00954
Quotation No.:		**Chemtest Sample ID.:**			563283	563284	563285
		Client Sample ID.:			TS301	TS302	TS303
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			11-Jan-2018	11-Jan-2018	11-Jan-2018
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	1.2	< 1.0	4.6
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	97	12	18
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	98	12	24
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	160	22	24
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.23
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.25
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	0.90	0.68	1.7
Anthracene	M	2800	mg/kg	0.10	0.12	< 0.10	0.29
Fluoranthene	M	2800	mg/kg	0.10	2.3	1.4	2.9
Pyrene	M	2800	mg/kg	0.10	2.4	1.4	2.8
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.85	0.37	1.1
Chrysene	M	2800	mg/kg	0.10	1.1	0.62	1.2
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.2	0.54	1.4
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.33	0.12	0.31
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.89	0.39	0.92
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.40	0.14	0.43
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.59	0.31	0.61
Total Of 16 PAH's	N	2800	mg/kg	2.0	11	6.0	14
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30

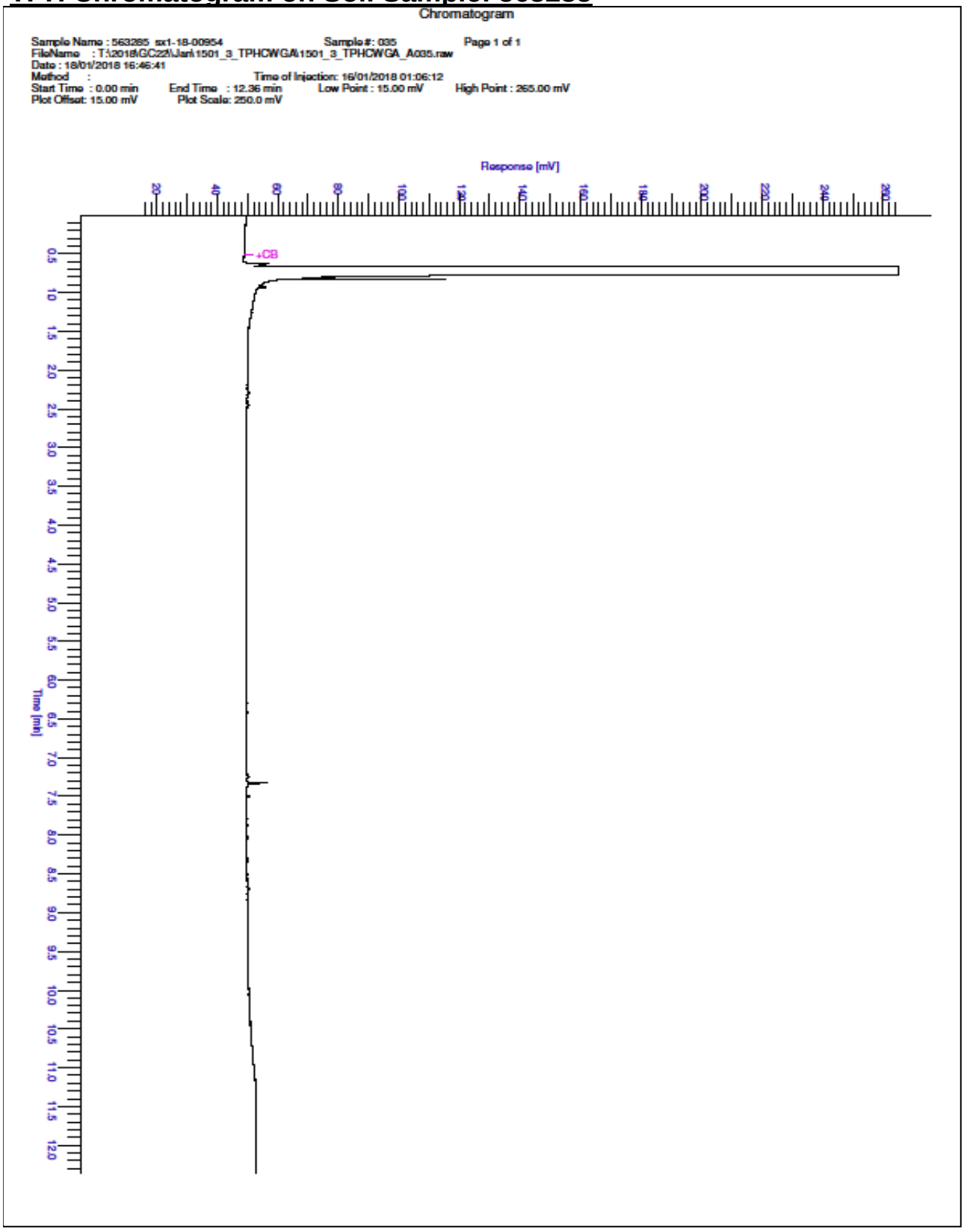
TPH Chromatogram on Soil Sample: 563283



TPH Chromatogram on Soil Sample: 563284



TPH Chromatogram on Soil Sample: 563285



Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix C – Plot Photographs

Plot 26

	**Photograph 1:** View of front garden of Plot 26. The garden is fully hardstood.
	**Photograph 2:** View of the rear garden of Plot 26.
	**Photograph 3:** View of soil in capping layer excavation in rear garden of Plot 26 with geotextile membrane visible.

	**Photograph 4:** Depth measurement in rear garden of Plot 26.

Plot 27

	**Photograph 5:** View of front garden of Plot 27.
	**Photograph 6:** View of soil in capping layer excavation in front garden of Plot 27 with geotextile membrane visible.
	**Photograph 7:** Depth measurement in front garden of Plot 27.

	**Photograph 8:** View of the rear garden of Plot 27.
	**Photograph 9:** View of soil in capping layer excavation in rear garden of Plot 27 with geotextile membrane visible.
	**Photograph 10:** Depth measurement in rear garden of Plot 27.

Plot 28

	**Photograph 11:** View of front garden of Plot 28.
	**Photograph 12:** View of soil in capping layer excavation in front garden of Plot 28 with geotextile membrane visible.
	**Photograph 13:** Depth measurement in front garden of Plot 28.

	**Photograph 14:** View of the rear garden of Plot 28.
	**Photograph 15:** View of soil in capping layer excavation in rear garden of Plot 28 with geotextile membrane visible.
	**Photograph 16:** Depth measurement in rear garden of Plot 28.

Site: **St James Park, Former MMU Campus, Didsbury**
Plots: **29 & 30**
Date: **2nd January 2018**
NHBC Ref: **Phase 2 - 713376**

1 INTRODUCTION

LK Consult (LKC) has been appointed by PJ Livesey Holdings Ltd to validate the depth of the garden capping layer laid down at the development at St James Park, Former MMU Campus, Didsbury.

This validation report concerns Plots 29 and 30. These plots consist of a rear garden and a small area of landscaping to the front.

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

i) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (included in total soil depth) **or** geotextile marker.
ii) Option 2: Further sampling and risk assessment on a block by block basis (nominally a total of 4 soil samples per plot with 1 in the front garden) or selected soil samples in any landscaped areas. If soil results are below generic assessment criteria then no specific clean validated environmental cover depth will be required, but a nominal 150mm covering of topsoil as a growing medium (if required).
iii) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is 'suitable for use'. All site won or imported material should be tested at a rate of 1 sample per $50m^3$ for topsoil and 1 sample per $150m^3$ for subsoil.
iv) Details of unexpected contamination.
v) Provision of waste transfer notes for any disposal of contaminated soil offsite.

2 IMPORTED / SITE WON MATERIAL

Topsoil for use in the garden and soft landscaping areas has been imported to site. The material used comprised approximately $150m^3$ of topsoil supplied by Grabserve from a greenfield site at New Manor Farm, Stretford and approximately $200m^3$ of topsoil from Huperade Soil Supplies in Timperley.

Composite topsoil samples were taken from garden areas (ref: TS101-TS104) were subjected to the following analytical suite as a conservative measure:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

Site won subsoil comprising natural gravelly sand has been used within the capping layer in plots on site (approximately $450m^3$).

The subsoil was stockpiled onsite and samples were collected (ref: Sand 1 to Sand 3) and subjected to the following analytical suite as a conservative measure:

- Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.

Stockpile sampling of the site won subsoil was undertaken in accordance with guidance given in ISO 10381 Part 8[1]. Selected photos of stockpiles are presented in Appendix A. Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation[2].

Soil samples were collected in plastic tubs, amber glass jars and amber vials and despatched to Chemtest of Newmarket in cool boxes with ice packs.

Soil results for the topsoil and subsoil are presented in Appendix B. No elevated levels of contaminants were identified in the soil samples collected when compared to Generic Assessment Criteria presented in the agreed Remediation Strategy. The Validation Checklist provided to the ground workers is presented in Appendix C.

[1] ISO (2006). "Soil Quality – Sampling – Part 8: Guidance on Sampling of Stockpiles". ISO10381-8.
[2] EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

3 CAPPING LAYER IN GARDEN AREAS

The recommendation for the garden capping layer in Plots 29 and 39 was that it should comprise a minimum 300mm thickness to the front and 450mm to the rear.

LKC attended site on 14th and 25th September 2017 to inspect the capping layer construction and depth in the rear and front garden areas. Photographs are provided in Appendix D and the observations are summarised below.

Location	Topsoil Depth (mm)	Subsoil Depth (mm)	Membrane or 100mm MOT	Total Depth (mm)	Required Depth (mm)	Pass (✓) or Fail (x)
Plot 29 front	150	250	Membrane	400	300	✓
Plot 29 rear	150	300	Membrane	450	450	✓
Plot 30 front	150	300	Membrane	450	300	✓
Plot 30 rear	150	300	Membrane	450	450	✓

LKC were able to verify that, in the places inspected within the front and rear gardens of Plots 29 and 30, the capping layer depths were in accordance with the requirements of the Remediation Strategy.

4 CONCLUSIONS

LKC has completed the validation of the garden capping layers within Plots 29 and 30 and conclude that, in the places inspected, chemically suitable material has been laid to an appropriate depth.

Report Prepared By:



Kerrell Walley
Geo-Environmental Scientist

Report Reviewed By:



Dr Paul Quimby
Director

Enc:

Appendix A: Stockpile Photographs
Appendix B: Certificates of Analysis – Imported and Site Won Soil
Appendix C: Remediation Strategy Validation Checklist
Appendix D: Plot Photographs

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been

independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Holdings Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Stockpile Photographs

	**Photograph 1:** Stockpiles of site won sand excavated from site.
	**Photograph 2:** View of site won sand excavated from site.
	**Photograph 3:** View of stockpiles to be reused as site won material on site.

Appendix B – Certificates of Analysis – Imported and Site Won Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-26078-1
Initial Date of Issue:	31-Oct-2016
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Rachel Peart Contaminated Land
Project	LKC 16 1066 MMU Didsbury (Huperade)

Quotation No.:		**Date Received:**	27-Oct-2016
Order No.:	732176	**Date Instructed:**	27-Oct-2016
No. of Samples:	4		
Turnaround (Wkdays):	3	**Results Due:**	31-Oct-2016
Date Approved:	31-Oct-2016		

Approved By:



Details: Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury (Huperade)

Client: LK Consult		**Chemtest Job No.:**			16-26078	16-26078	16-26078	16-26078
Quotation No.:		**Chemtest Sample ID.:**			370759	370760	370761	370762
		Client Sample ID.:			TS101	TS102	TS103	TS104
		Sample Type:			SOIL	SOIL	SOIL	SOIL
		Date Sampled:			25-Oct-2016	25-Oct-2016	25-Oct-2016	25-Oct-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	15	16	15	16
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay	Clay	Clay
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached	See Attached
pH	M	2010		N/A	9.0	8.7	8.6	8.5
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.73	0.53	0.55	0.58
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.12	0.056	0.061	0.066
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	12	13	13	13
Cadmium	M	2450	mg/kg	0.10	0.26	0.30	0.27	0.30
Chromium	M	2450	mg/kg	1.0	15	15	15	13
Copper	M	2450	mg/kg	0.50	36	39	41	29
Mercury	M	2450	mg/kg	0.10	0.28	0.32	0.97	0.25
Nickel	M	2450	mg/kg	0.50	16	18	18	13
Lead	M	2450	mg/kg	0.50	86	99	90	75
Selenium	M	2450	mg/kg	0.20	0.33	0.24	0.29	0.22
Vanadium	U	2450	mg/kg	5.0	18	19	19	15
Zinc	M	2450	mg/kg	0.50	76	82	82	58
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	3.5	4.8	3.3	3.8
Fuel Type	N	2670		N/A	PAH	PAH	PAH	PAH
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	M	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	5.4	1.7	12	14
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	14	13	24	17

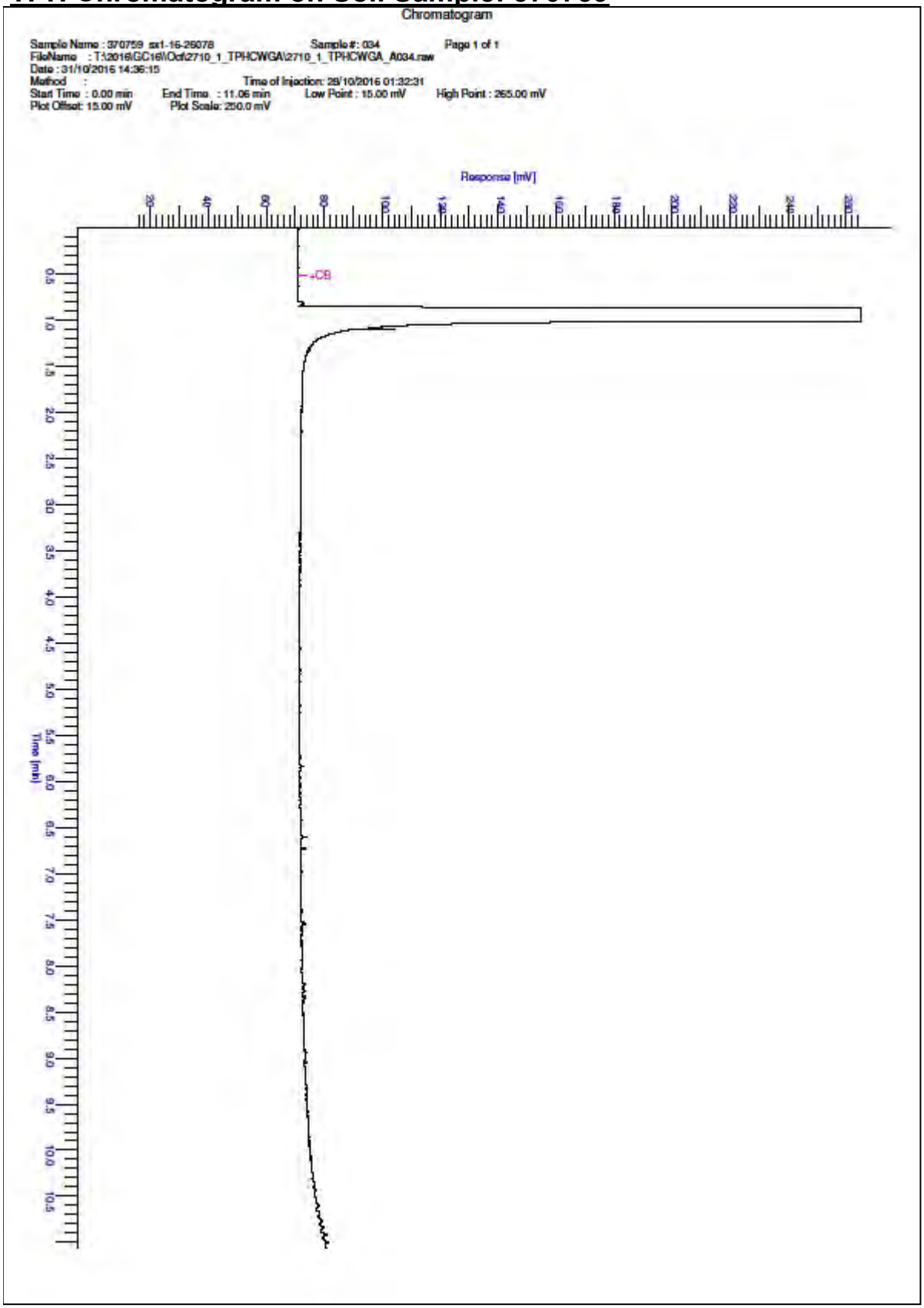
Chemtest
The right chemistry to deliver results

Results - Soil

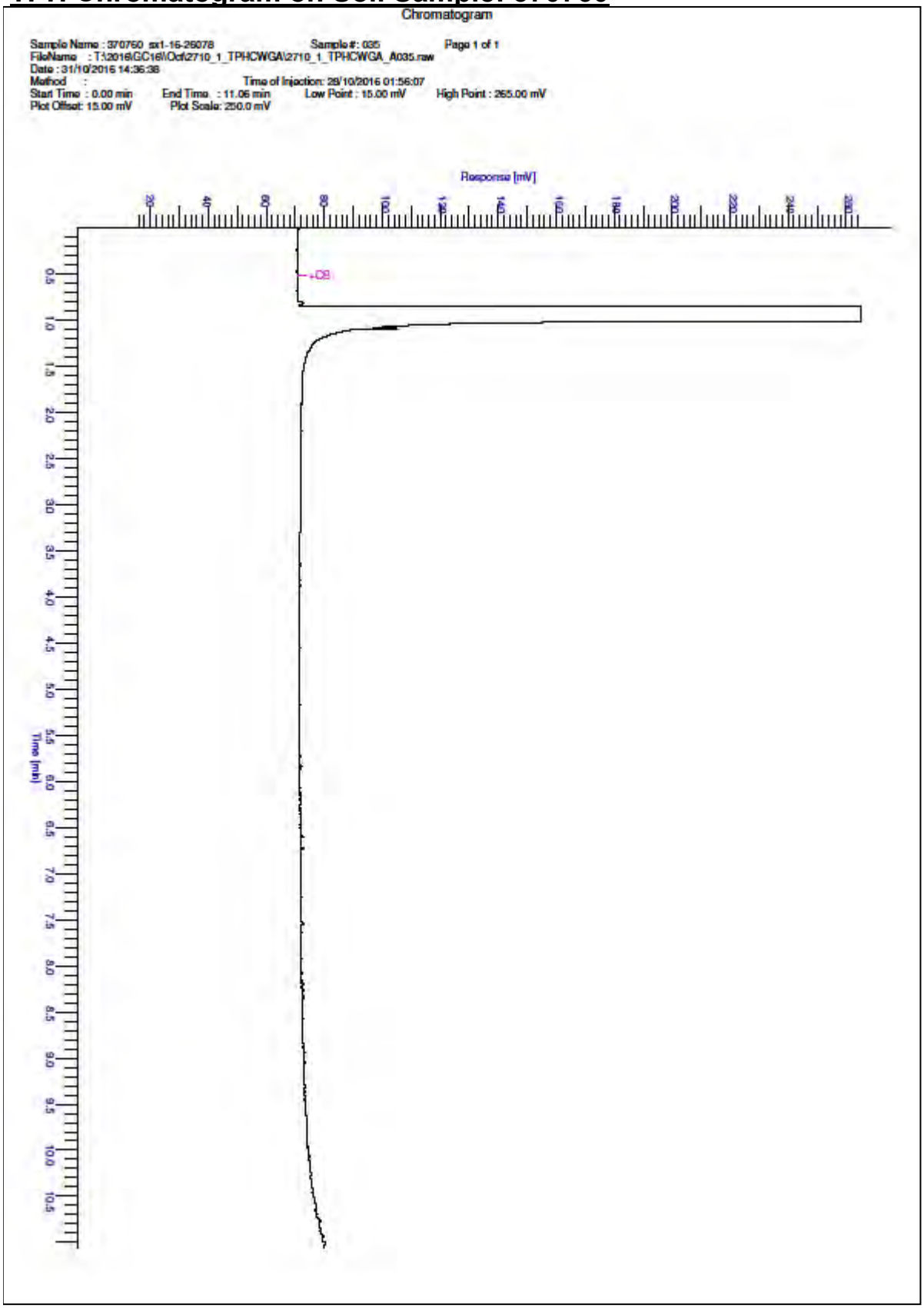
Project: LKC 16 1066 MMU Didsbury (Huperade)

Client: LK Consult		**Chemtest Job No.:**			16-26078	16-26078	16-26078	16-26078
Quotation No.:		**Chemtest Sample ID.:**			370759	370760	370761	370762
		Client Sample ID.:			TS101	TS102	TS103	TS104
		Sample Type:			SOIL	SOIL	SOIL	SOIL
		Date Sampled:			25-Oct-2016	25-Oct-2016	25-Oct-2016	25-Oct-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	40	33	60	46
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	3.5	4.8	5.9	6.0
Total Aromatic Hydrocarbons	M	2680	mg/kg	5.0	63	52	100	82
Total Petroleum Hydrocarbons	M	2680	mg/kg	10	63	52	100	82
Naphthalene	M	2700	mg/kg	0.10	< 0.10	0.10	0.20	0.30
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	0.45	0.16	0.15
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	0.81	0.18	0.13
Fluorene	M	2700	mg/kg	0.10	< 0.10	0.18	0.13	0.18
Phenanthrene	M	2700	mg/kg	0.10	1.2	2.1	1.6	1.1
Anthracene	M	2700	mg/kg	0.10	0.33	0.60	0.54	0.14
Fluoranthene	M	2700	mg/kg	0.10	2.3	4.3	2.5	2.0
Pyrene	M	2700	mg/kg	0.10	2.1	3.9	2.7	1.9
Benzo[a]anthracene	M	2700	mg/kg	0.10	1.1	2.3	1.3	1.0
Chrysene	M	2700	mg/kg	0.10	1.8	3.0	2.0	1.6
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	1.5	2.8	1.9	1.4
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	0.81	1.5	1.2	0.91
Benzo[a]pyrene	M	2700	mg/kg	0.10	1.3	2.2	1.3	1.1
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	0.92	1.4	1.0	0.53
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	0.56	0.48	0.37	0.32
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	0.94	1.3	1.1	0.77
Total Of 16 PAH's	M	2700	mg/kg	2.0	15	27	18	14
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30

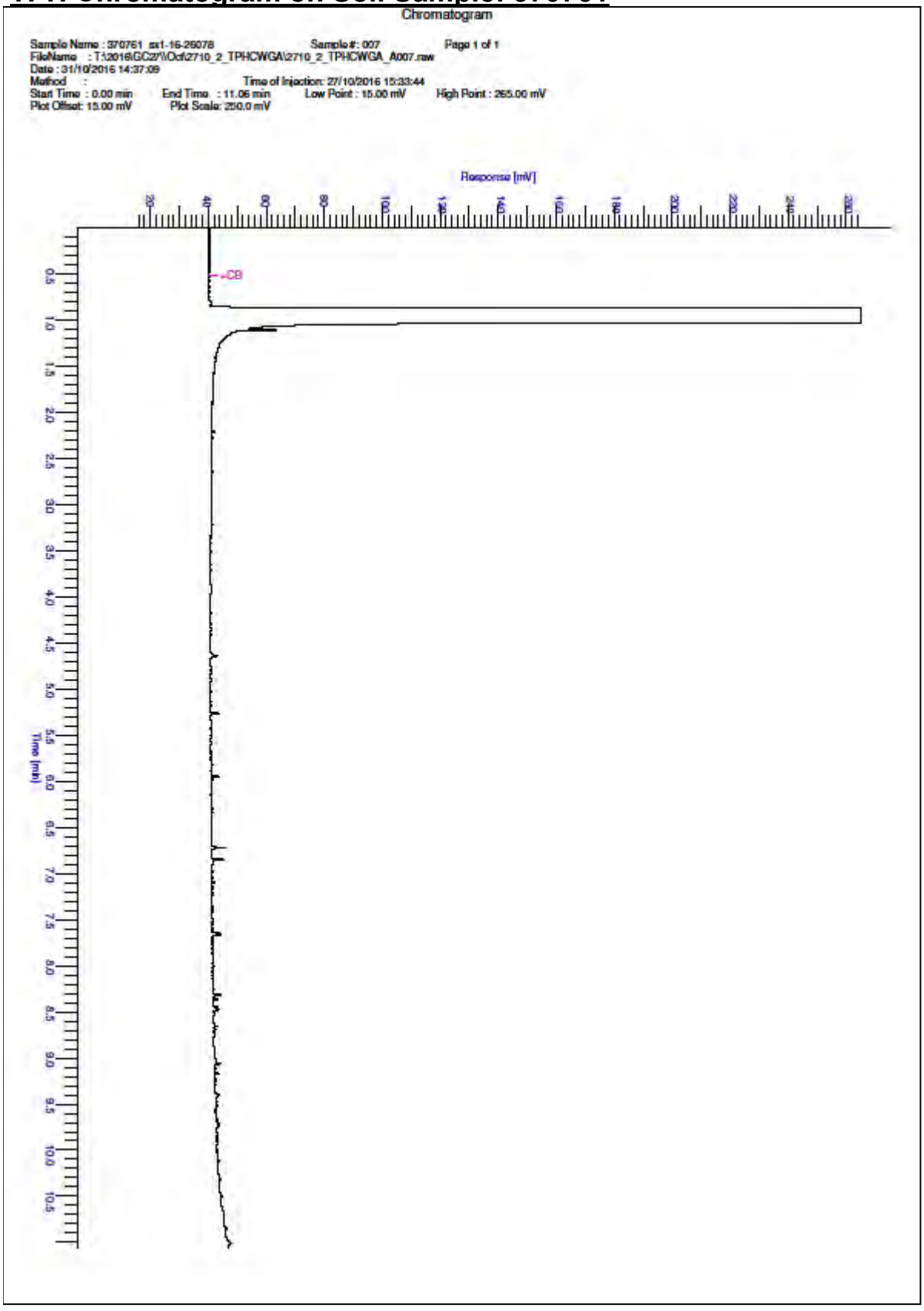
TPH Chromatogram on Soil Sample: 370759



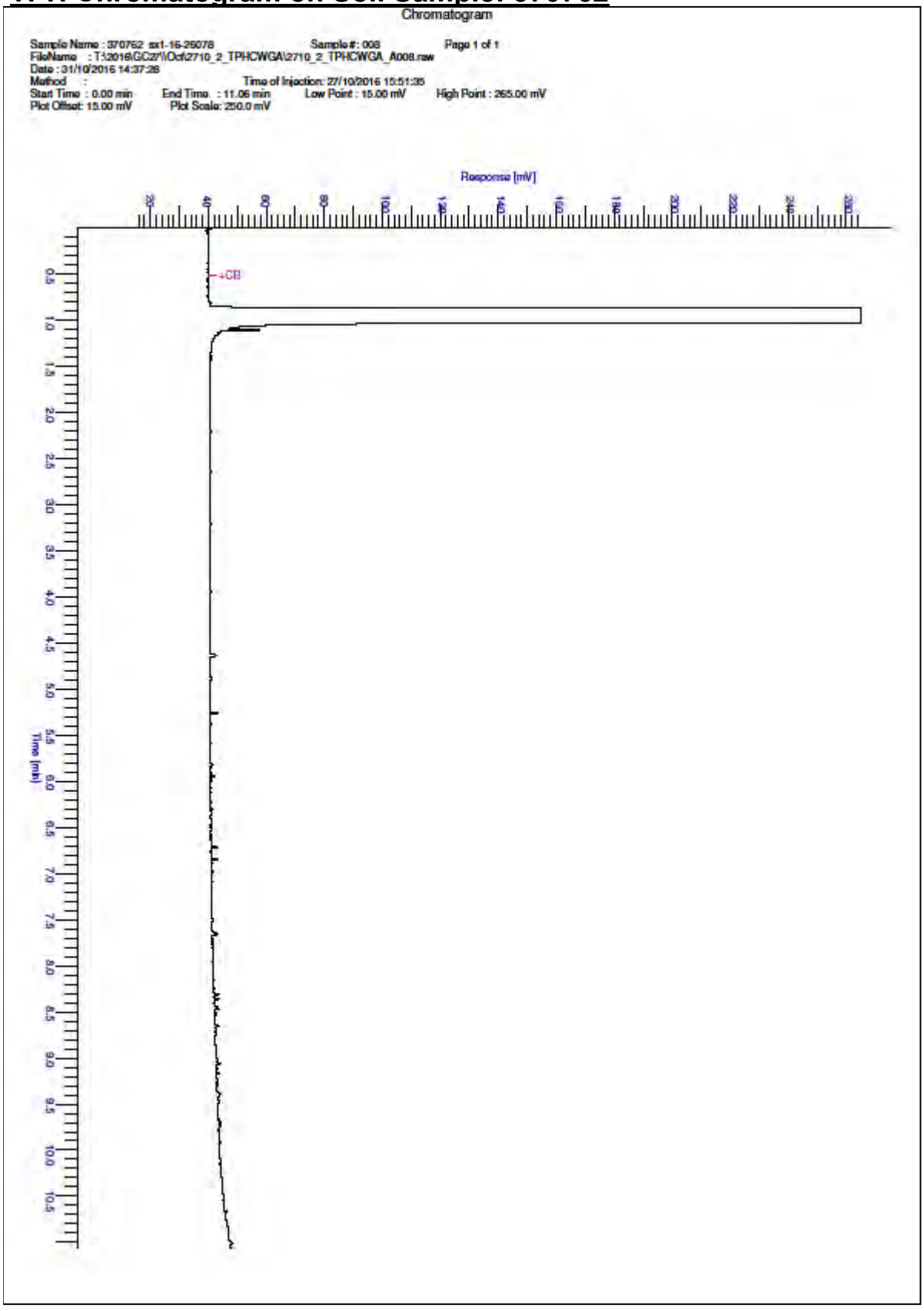
TPH Chromatogram on Soil Sample: 370760



TPH Chromatogram on Soil Sample: 370761



TPH Chromatogram on Soil Sample: 370762



Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Accreditation	Parameters included	Method summary
2010	pH Value of Soils	UKAS accreditedMCERTS accredited	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)		Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)		Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	UKAS accreditedMCERTS accredited	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	UKAS Accredited	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	UKAS accreditedMCERTS accredited	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	UKAS accreditedMCERTS accredited	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils		Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	UKAS accreditedMCERTS accredited	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	UKAS accreditedMCERTS accredited*	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Normal Level TPH A/A Split is MCERTS accredited. Low Level TPH A/A Split is unaccredited	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	UKAS accreditedMCERTS accredited	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	UKAS accreditedMCERTS accredited*	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2920	Phenols in Soils by HPLC	UKAS accreditedMCERTS accredited	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Chemtest
The right chemistry to deliver results

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-28631-1
Initial Date of Issue:	25-Nov-2016
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Paul Quimby Contaminated Land
Project	LKC 16 1066 MMU Didsbury

Quotation No.:		**Date Received:**	23-Nov-2016
Order No.:	732176	**Date Instructed:**	23-Nov-2016
No. of Samples:	3		
Turnaround (Wkdays):	3	**Results Due:**	25-Nov-2016
Date Approved:	25-Nov-2016		

Approved By:



Details: Robert Monk, Technical Development Chemist

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury

Client: LK Consult			**Chemtest Job No.:**		16-28631	16-28631	16-28631
Quotation No.:			**Chemtest Sample ID.:**		381845	381846	381847
			Client Sample ID.:		SAND1	SAND2	SAND3
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		22-Nov-2016	22-Nov-2016	22-Nov-2016
			Asbestos Lab:		COVENTRY		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	6.4	8.8	8.5
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand
pH	M	2010		N/A	8.5	8.6	8.3
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	0.030	0.024
Arsenic	M	2450	mg/kg	1.0	1.4	2.4	1.3
Cadmium	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chromium	M	2450	mg/kg	1.0	5.9	7.6	4.8
Copper	M	2450	mg/kg	0.50	5.7	7.8	4.9
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	8.2	9.7	5.7
Lead	M	2450	mg/kg	0.50	4.0	5.6	3.2
Selenium	M	2450	mg/kg	0.20	0.22	0.21	< 0.20
Vanadium	U	2450	mg/kg	5.0	5.3	7.5	5.5
Zinc	M	2450	mg/kg	0.50	17	21	14
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	0.43	< 0.40	< 0.40
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0

Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix C – Remediation Strategy Validation Checklist

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

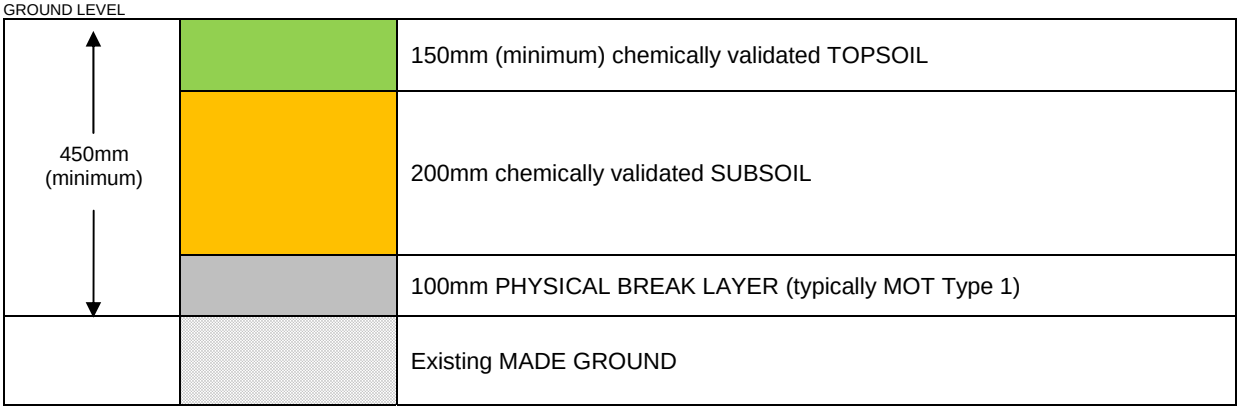
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

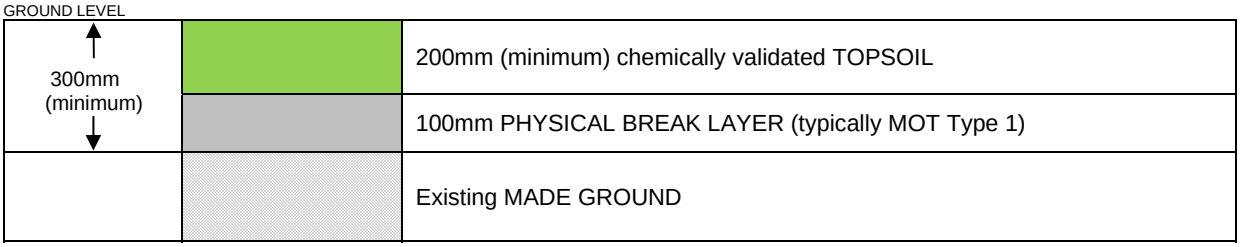
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix D – Plot Photographs

Plot 29

	**Photograph 1:** View of front garden of Plot 29.
	**Photograph 2:** View of soil in capping layer excavation in front garden of Plot 29 with geotextile membrane visible.
	**Photograph 3:** Depth measurement in front garden of Plot 29.

	**Photograph 4:** View of the rear garden of Plot 29.
	**Photograph 5:** View of soil in capping layer excavation in rear garden of Plot 29 with geotextile membrane visible.
	**Photograph 6:** Depth measurement in rear garden of Plot 29.

Plot 30

	**Photograph 7:** View of front garden of Plot 30.
	**Photograph 8:** View of soil in capping layer excavation in front garden of Plot 30 with geotextile membrane visible.
	**Photograph 9:** Depth measurement in front garden of Plot 30.

	**Photograph 10:** View of the rear garden of Plot 30.
	**Photograph 11:** View of soil in capping layer excavation in rear garden of Plot 30 with geotextile membrane visible.
	**Photograph 12:** Depth measurement in rear garden of Plot 30.

Eton Business Park, Eton Hill Road,
Manchester M26 2ZS

Tel: 0161 763 7200

The Corn Exchange, Fenwick Street,
Liverpool L2 7QL

Tel: 0151 235 8716

Unit 121, Wright Business Centre,
1 Lonmay Road, Glasgow G33 4EL

Tel: 0141 773 6269

www.thelkgroup.com

PART OF THE LK GROUP

Site: St James Park, Former MMU Campus, Didsbury
Plots: 31, 35 and 36
Date: 18th June 2018
NHBC Ref: Phase 2 - 713376

1 INTRODUCTION

LK Consult (LKC) has been appointed by PJ Livesey Holdings Ltd to validate the depth of the garden capping layer laid down at the development at St James Park, Former MMU Campus, Didsbury.

This validation report concerns Plots 31, 35 and 36. These plots consist of a rear garden with Plot 31 having a small area of soft landscaping to the front of the property. Plots 35 and 36 have a paved driveway to the front.

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

i) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (included in total soil depth) **or** geotextile marker.
ii) Option 2: Further sampling and risk assessment on a block by block basis (nominally a total of 4 soil samples per plot with 1 in the front garden) or selected soil samples in any landscaped areas. If soil results are below generic assessment criteria then no specific clean validated environmental cover depth will be required, but a nominal 150mm covering of topsoil as a growing medium (if required).
iii) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is 'suitable for use'. All site won or imported material should be tested at a rate of 1 sample per $50m^3$ for topsoil and 1 sample per $150m^3$ for subsoil.
iv) Details of unexpected contamination.
v) Provision of waste transfer notes for any disposal of contaminated soil offsite.

A validation checklist was provided ot the ground workers and presented in Appendix A.

2 IMPORTED MATERIAL

Topsoil for use in the garden and soft landscaping areas has been imported to site. The material used comprised approximately $200m^3$ of topsoil supplied by Huperade from a greenfield site at New Manor Farm, Stretford.

Composite topsoil samples were taken from garden areas (ref: TS301-TS303) were subjected to the following analytical suite as a conservative measure:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

Soil samples were collected in plastic tubs, amber glass jars and amber vials and despatched to Chemtest of Newmarket in cool boxes with ice packs.

Soil results for the topsoil are presented in Appendix B. No elevated levels of contaminants were identified in the soil samples collected when compared to Generic Assessment Criteria presented in the agreed Remediation Strategy.

3 CAPPING LAYER IN GARDEN AREAS

Option 1 was undertaken by PJ Livesey. The recommendation for the garden capping layer in Plots 31, 35 and 36 was that it should comprise a minimum 300mm thickness to the front and 450mm to the rear.

LKC attended site on 12th January 2018 to inspect the capping layer construction and depth in the rear and front garden areas. Photographs are provided in Appendix C and the observations are summarised below.

Location	Topsoil Depth (mm)	Subsoil Depth (mm)	Membrane or 100mm MOT	Total Depth (mm)	Required Depth (mm)	Pass (✓) or Fail (x)
Plot 31 Front	450	0	Membrane	450	300	✓
Plot 31 Rear	450	0	Membrane	450	450	✓
Plot 35 Front	Fully hardstood					
Plot 35 Rear	450	0	Membrane	450	450	✓
Plot 35 Front	Fully hardstood					
Plot 36 Rear	450	0	Membrane	450	450	✓

LKC were able to verify that, in the places inspected within the front and rear gardens of Plots 31, 35 and 36, the capping layer depths were in accordance with the requirements of the Remediation Strategy.

4 CONCLUSIONS

LKC has completed the validation of the garden capping layers within Plots 31, 35 and 36 and conclude that, in the places inspected, chemically suitable material has been laid to an appropriate depth.

Report Prepared By:

Kerrell Walley
Geo-Environmental Scientist

Report Reviewed By:

Dr Paul Quimby
Director

Enc:

Appendix A: Remediation Strategy Validation Checklist
Appendix B: Certificates of Analysis – Imported and Site Won Soil
Appendix C: Plot Photographs

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Holdings Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Remediation Strategy Validation Checklist

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

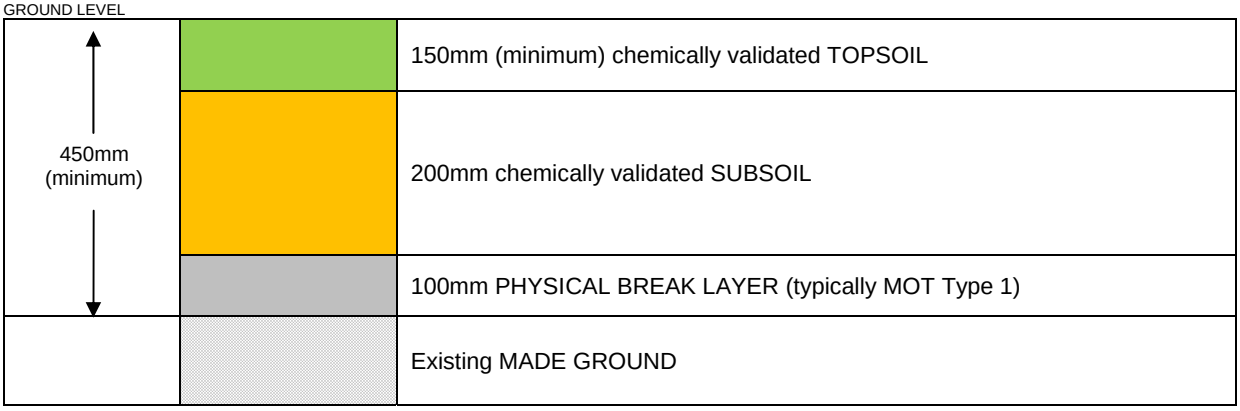
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

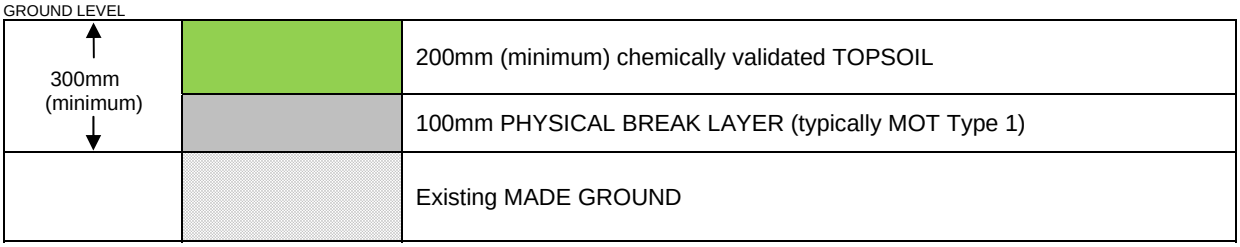
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix B – Certificates of Analysis – Imported Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	18-00954-1
Initial Date of Issue:	19-Jan-2018
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Contaminated Land Paul Quimby
Project	LKC 16 1066 MMU Didsbury

Quotation No.:		**Date Received:**	15-Jan-2018
Order No.:	735877	**Date Instructed:**	15-Jan-2018
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	19-Jan-2018
Date Approved:	19-Jan-2018		

Approved By:



Details: Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-00954	18-00954	18-00954
Quotation No.:		**Chemtest Sample ID.:**			563283	563284	563285
		Client Sample ID.:			TS301	TS302	TS303
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			11-Jan-2018	11-Jan-2018	11-Jan-2018
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	20	21	22
Soil Colour	N	2040		N/A	Brown	Brown, Grey	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Stones	Sand	Sand, Clay
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached
pH	M	2010		N/A	7.8	7.8	7.8
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.85	0.72	0.78
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.17	0.12	0.060
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	11	15	14
Cadmium	M	2450	mg/kg	0.10	0.27	0.35	0.34
Chromium	M	2450	mg/kg	1.0	18	20	19
Copper	M	2450	mg/kg	0.50	41	46	50
Mercury	M	2450	mg/kg	0.10	0.30	0.34	0.37
Nickel	M	2450	mg/kg	0.50	17	18	19
Lead	M	2450	mg/kg	0.50	90	94	110
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	22	23	22
Zinc	M	2450	mg/kg	0.50	85	87	100
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	5.9	5.0	5.3
Fuel Type	N	2670		N/A	PAH/H.oil	PAH	PAH
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	65	11	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	65	11	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	1.6

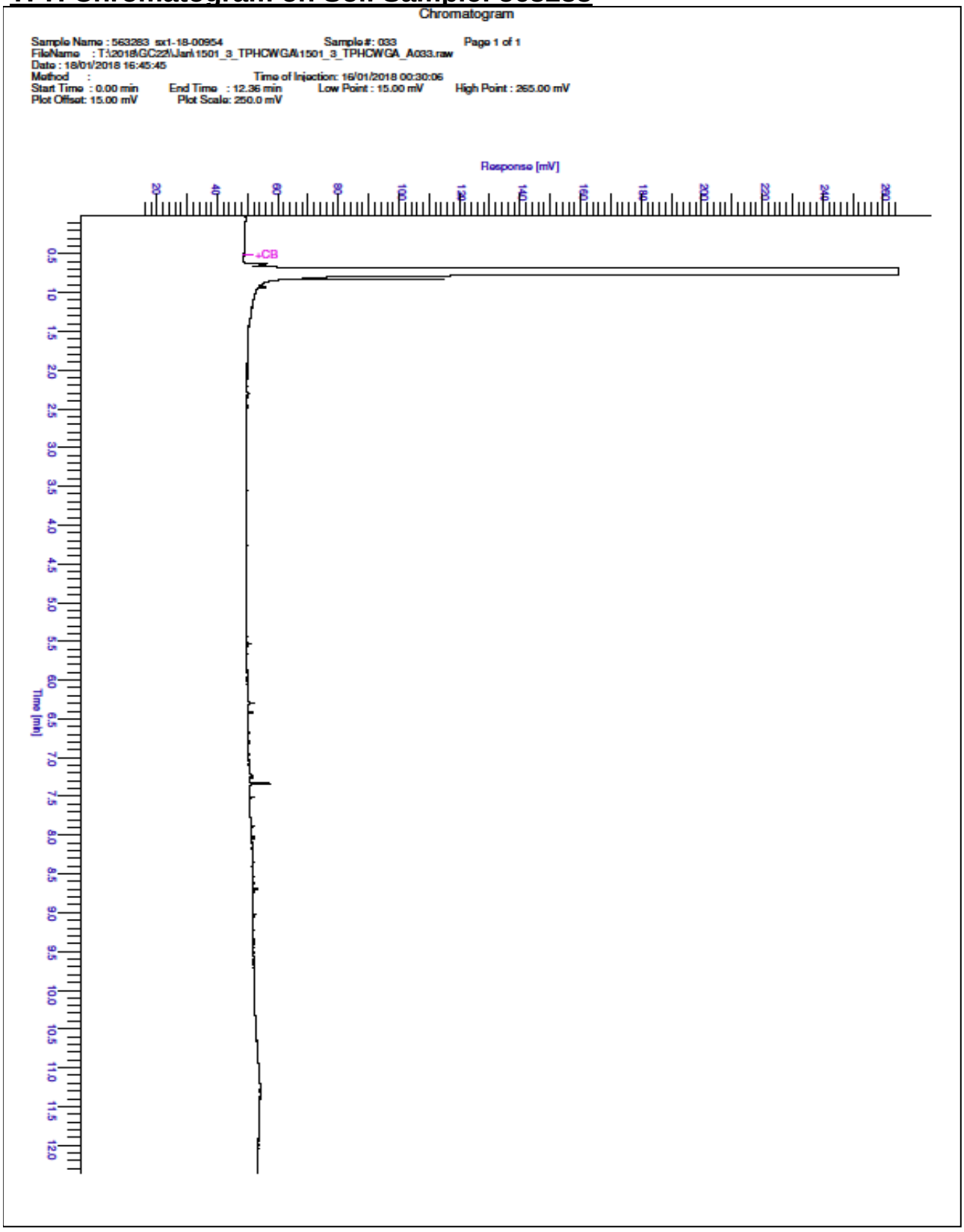
Chemtest
The right chemistry to deliver results

Results - Soil

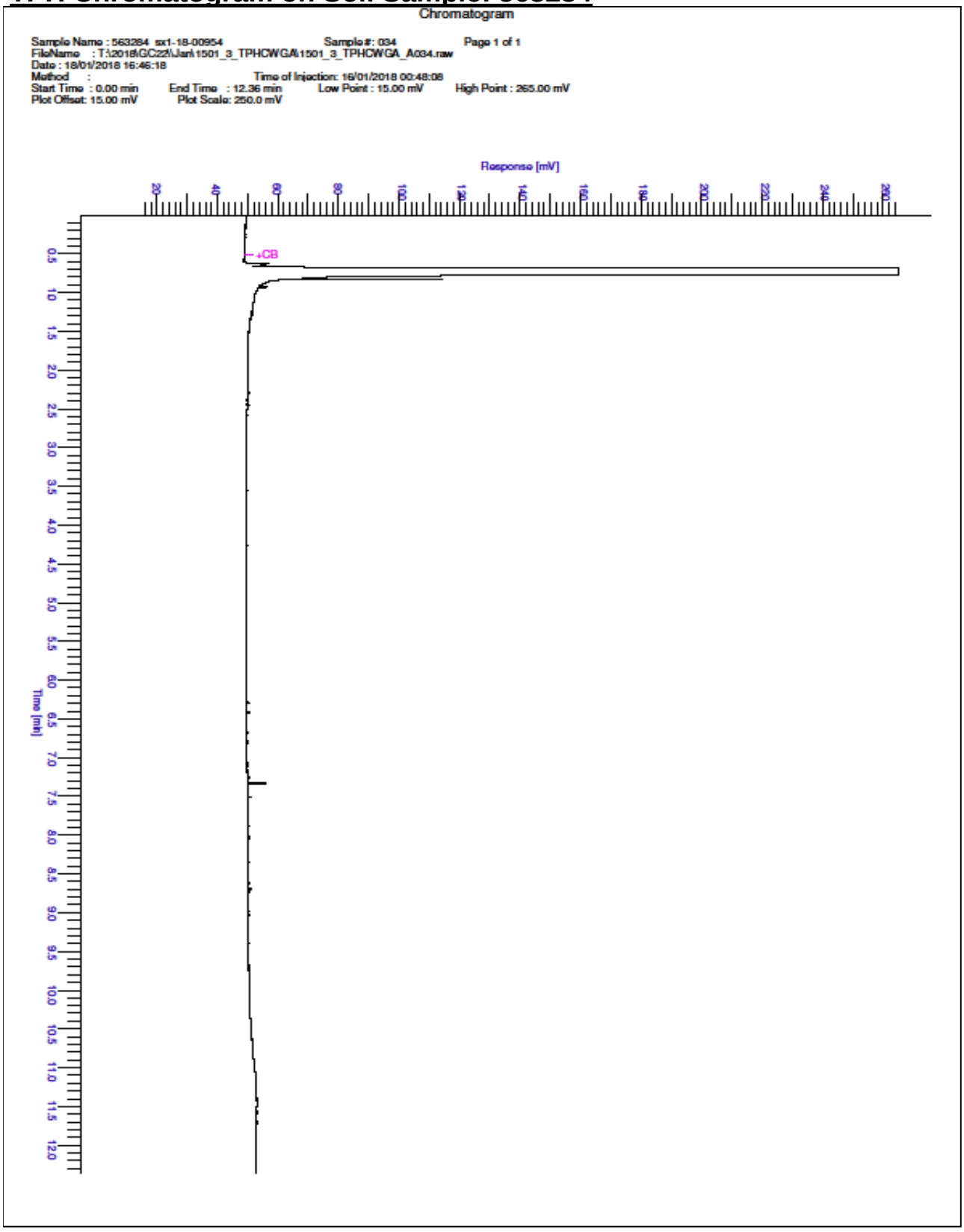
Project: LKC 16 1066 MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-00954	18-00954	18-00954
Quotation No.:		**Chemtest Sample ID.:**			563283	563284	563285
		Client Sample ID.:			TS301	TS302	TS303
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			11-Jan-2018	11-Jan-2018	11-Jan-2018
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	1.2	< 1.0	4.6
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	97	12	18
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	98	12	24
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	160	22	24
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.23
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.25
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	0.90	0.68	1.7
Anthracene	M	2800	mg/kg	0.10	0.12	< 0.10	0.29
Fluoranthene	M	2800	mg/kg	0.10	2.3	1.4	2.9
Pyrene	M	2800	mg/kg	0.10	2.4	1.4	2.8
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.85	0.37	1.1
Chrysene	M	2800	mg/kg	0.10	1.1	0.62	1.2
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.2	0.54	1.4
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.33	0.12	0.31
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.89	0.39	0.92
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.40	0.14	0.43
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.59	0.31	0.61
Total Of 16 PAH's	N	2800	mg/kg	2.0	11	6.0	14
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30

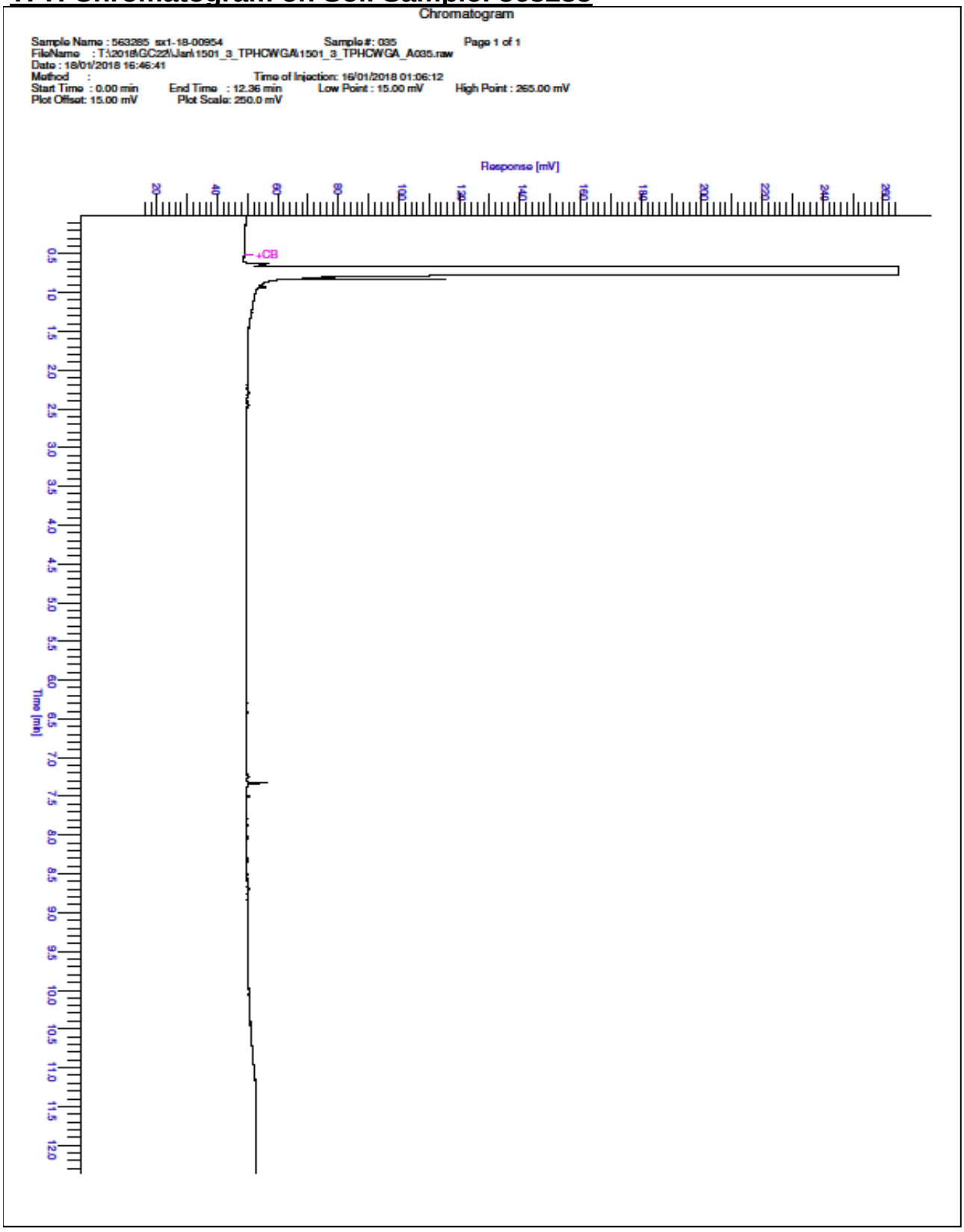
TPH Chromatogram on Soil Sample: 563283



TPH Chromatogram on Soil Sample: 563284



TPH Chromatogram on Soil Sample: 563285



Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix C – Plot Photographs

Plot 31

	**Photograph 1:** View of front garden of Plot 31.
	**Photograph 2:** View of soil in capping layer excavation in front garden of Plot 31 with geotextile membrane visible.
	**Photograph 3:** Depth measurement in front garden of Plot 31.

	**Photograph 4:** View of the rear garden of Plot 31.
	**Photograph 5:** View of soil in capping layer excavation in rear garden of Plot 31 with geotextile membrane visible.
	**Photograph 6:** Depth measurement in rear garden of Plot 31.

Plot 35

	**Photograph 7:** View of front garden of Plot 35. Plot is fully hardstood.
	**Photograph 8:** View of the rear garden of Plot 35.
	**Photograph 9:** View of soil in capping layer excavation in rear garden of Plot 35 with geotextile membrane visible.

	**Photograph 10:** Depth measurement in rear garden of Plot 35.

Plot 36

	**Photograph 11:** View of front garden of Plot 36. Plot is fully hardstood.
	**Photograph 12:** View of the rear garden of Plot 36.
	**Photograph 13:** View of soil in capping layer excavation in rear garden of Plot 36 with geotextile membrane visible.

	**Photograph 14:** Depth measurement in rear garden of Plot 36.

Site: **St James Park, Former MMU Campus, Didsbury**
Plots: **32-34 and 43**
Date: **18th June 2018**
NHBC Ref: **Phase 2 - 713376**

1 INTRODUCTION

LK Consult (LKC) has been appointed by PJ Livesey Holdings Ltd to validate the depth of the garden capping layer laid down at the development at St James Park, Former MMU Campus, Didsbury.

This validation report concerns Plots 32-34 and 43. These plots consist of a rear garden and paved driveways to the front. Plot 43 has a small area of landscaping to the front of the property.

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

i) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (included in total soil depth) **or** geotextile marker.
ii) Option 2: Further sampling and risk assessment on a block by block basis (nominally a total of 4 soil samples per plot with 1 in the front garden) or selected soil samples in any landscaped areas. If soil results are below generic assessment criteria then no specific clean validated environmental cover depth will be required, but a nominal 150mm covering of topsoil as a growing medium (if required).
iii) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is 'suitable for use'. All site won or imported material should be tested at a rate of 1 sample per $50m^3$ for topsoil and 1 sample per $150m^3$ for subsoil.
iv) Details of unexpected contamination.
v) Provision of waste transfer notes for any disposal of contaminated soil offsite.

A validation checklist was provided to the ground workers and is presented in Appendix A.

2 IMPORTED MATERIAL

Topsoil for use in the garden and soft landscaping areas has been imported to site. The material used comprised approximately $200m^3$ of topsoil supplied by Huperade from a greenfield site at Woodcote Road, Altrincham.

Composite topsoil samples were taken from garden areas (ref: TS401-TS403) were subjected to the following analytical suite as a conservative measure:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

Soil samples were collected in plastic tubs, amber glass jars and amber vials and despatched to Chemtest of Newmarket in cool boxes with ice packs.

Soil results for the topsoil are presented in Appendix B. No elevated levels of contaminants were identified in the soil samples collected when compared to Generic Assessment Criteria presented in the agreed Remediation Strategy.

3 CAPPING LAYER IN GARDEN AREAS

Option 1 was undertaken by PJ Livesey.The recommendation for the garden capping layer in Plots 32-34 and 43 was that it should comprise a minimum 300mm thickness to the front and 450mm to the rear.

LKC attended site on 7th February and 16th April 2018 to inspect the capping layer construction and depth in the rear and front garden areas. Photographs are provided in Appendix C and the observations are summarised below.

Location	Topsoil Depth (mm)	Subsoil Depth (mm)	Membrane or 100mm MOT	Total Depth (mm)	Required Depth (mm)	Pass (✓) or Fail (x)
Plot 32 Front	Fully hardstood.					
Plot 32 Rear	600	0	Membrane	600	450	✓
Plot 33 Front	Fully hardstood.					
Plot 33 Rear	650	0	Membrane	650	450	✓
Plot 34 Front	Fully hardstood.					
Plot 34 Rear	450	0	Membrane	450	450	✓
Plot 43 Front	500	0	Membrane	500	300	✓
Plot 43 Rear	550	0	Membrane	550	450	✓

LKC were able to verify that, in the places inspected within the front and rear gardens of Plots 32-34 and 43, the capping layer depths were in accordance with the requirements of the Remediation Strategy.

4 CONCLUSIONS

LKC has completed the validation of the garden capping layers within Plots 32-34 and 43 and conclude that, in the places inspected, chemically suitable material has been laid to an appropriate depth.

Report Prepared By:



Kerrell Walley
Geo-Environmental Scientist

Report Reviewed By:



Dr Paul Quimby
Director

Enc:

Appendix A: Remediation Strategy Validation Checklist

Appendix B: Certificates of Analysis – Imported and Site Won Soil
Remediation Strategy Validation Checklist
Appendix C: Plot Photographs

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Holdings Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Remediation Strategy Validation Checklist

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

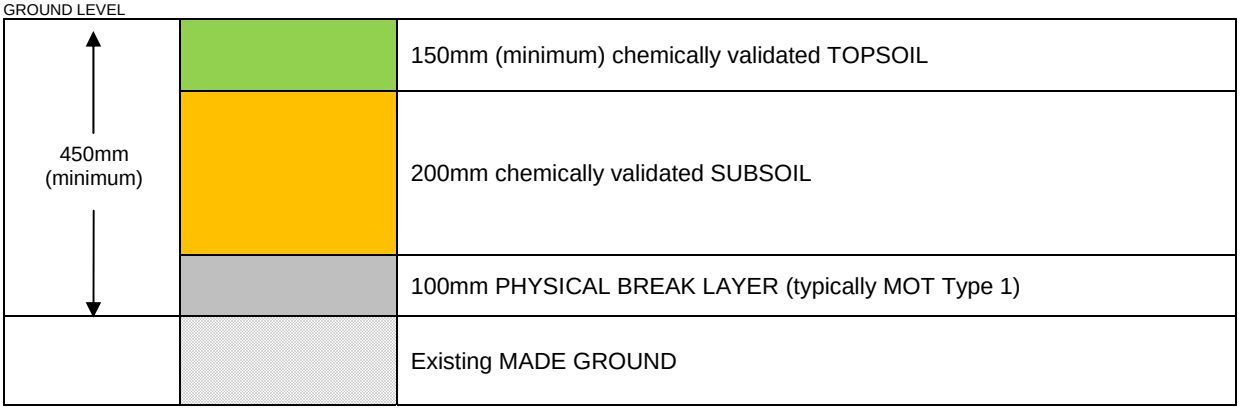
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

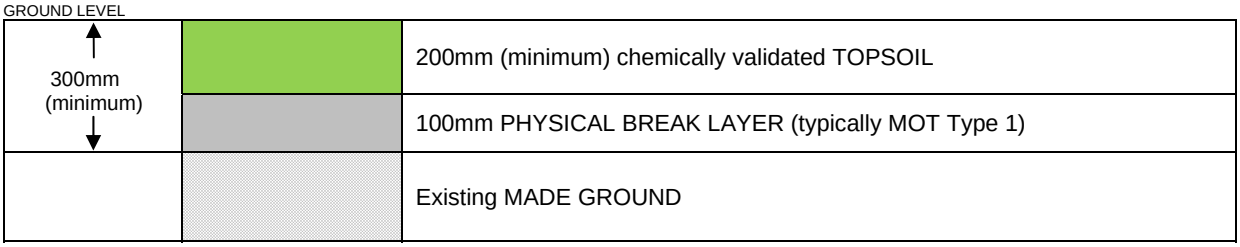
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix B – Certificates of Analysis – Imported Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	18-10339-1
Initial Date of Issue:	24-Apr-2018
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Paul Quimby Contaminated Land
Project	LKC 16 1066 MMU Didsbury

Quotation No.:		**Date Received:**	17-Apr-2018
Order No.:	736050	**Date Instructed:**	17-Apr-2018
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	23-Apr-2018
Date Approved:	24-Apr-2018		

Approved By:



Details: Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury

Client: LK Consult			**Chemtest Job No.:**		18-10339	18-10339	18-10339
Quotation No.:			**Chemtest Sample ID.:**		607446	607447	607448
			Client Sample ID.:		TS401	TS402	TS403
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		16-Apr-2018	16-Apr-2018	16-Apr-2018
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	15	13	12
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones, Roots	Stones, Roots	Stones, Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached
pH	M	2010		N/A	7.8	7.9	7.8
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40	0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	0.023	0.017
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	17	18	16
Cadmium	M	2450	mg/kg	0.10	0.21	0.22	0.18
Chromium	M	2450	mg/kg	1.0	12	12	9.9
Copper	M	2450	mg/kg	0.50	300	390	320
Mercury	M	2450	mg/kg	0.10	0.26	0.27	0.24
Nickel	M	2450	mg/kg	0.50	16	16	14
Lead	M	2450	mg/kg	0.50	230	280	240
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	18	19	17
Zinc	M	2450	mg/kg	0.50	310	360	310
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.3	5.5	4.7
Fuel Type	N	2670		N/A	PAH	PAH	PAH
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0

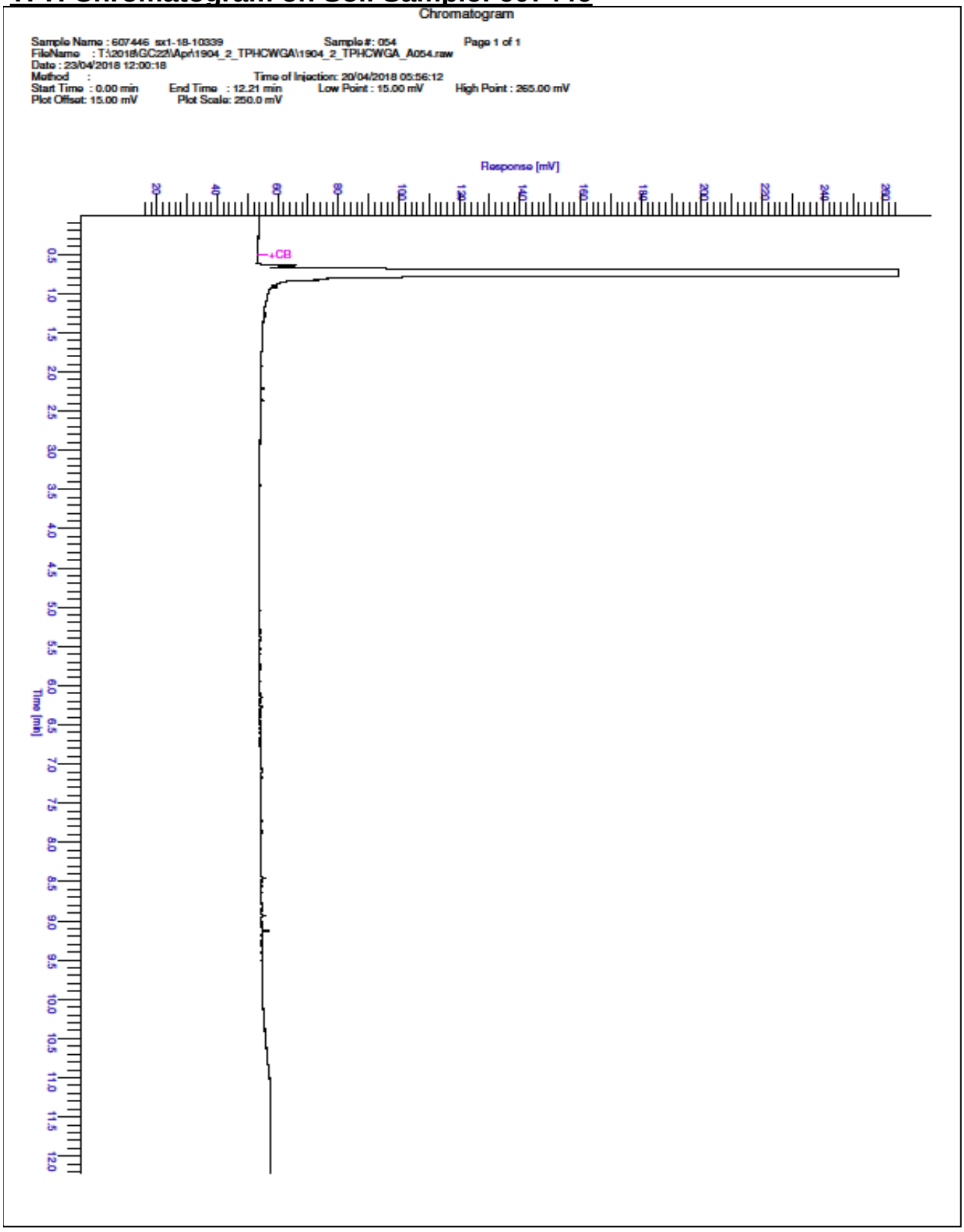
Chemtest
The right chemistry to deliver results

Results - Soil

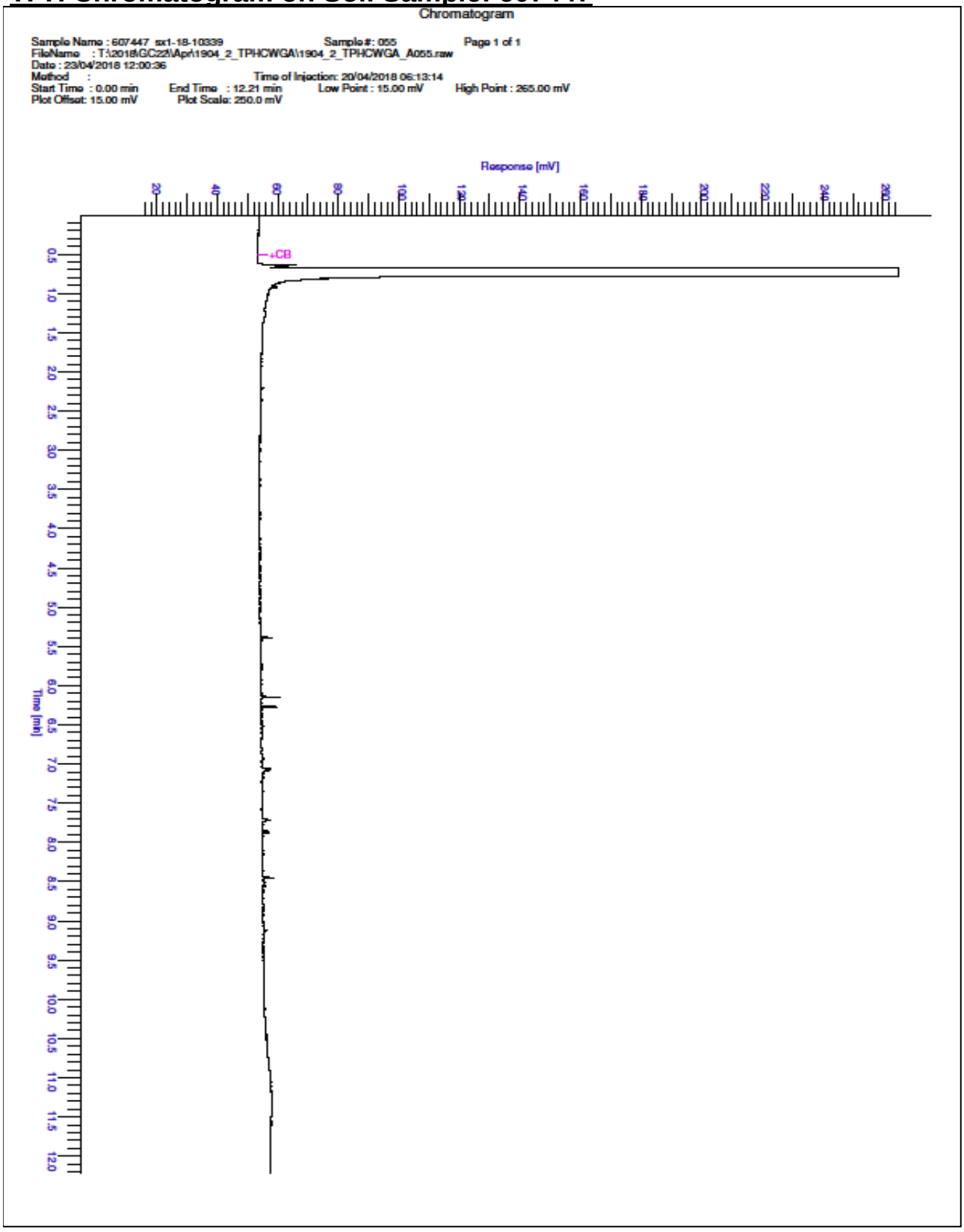
Project: LKC 16 1066 MMU Didsbury

Client: LK Consult		**Chemtest Job No.:**			18-10339	18-10339	18-10339
Quotation No.:		**Chemtest Sample ID.:**			607446	607447	607448
		Client Sample ID.:			TS401	TS402	TS403
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			16-Apr-2018	16-Apr-2018	16-Apr-2018
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	5.7	9.2	10
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	21	30	20
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	26	39	31
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	26	39	31
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Naphthalene	M	2800	mg/kg	0.10	0.24	0.67	0.23
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	0.15	0.20
Fluorene	M	2800	mg/kg	0.10	< 0.10	0.14	0.14
Phenanthrene	M	2800	mg/kg	0.10	0.87	1.5	1.6
Anthracene	M	2800	mg/kg	0.10	0.18	0.31	0.35
Fluoranthene	M	2800	mg/kg	0.10	1.4	2.4	2.6
Pyrene	M	2800	mg/kg	0.10	1.3	2.2	2.7
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.66	1.3	1.6
Chrysene	M	2800	mg/kg	0.10	0.69	1.3	1.6
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	0.90	1.6	2.0
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.29	0.56	0.78
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.62	1.1	1.6
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.49	0.75	1.0
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	0.15	0.17
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.46	0.79	0.99
Total Of 16 PAH's	N	2800	mg/kg	2.0	8.1	15	18
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30

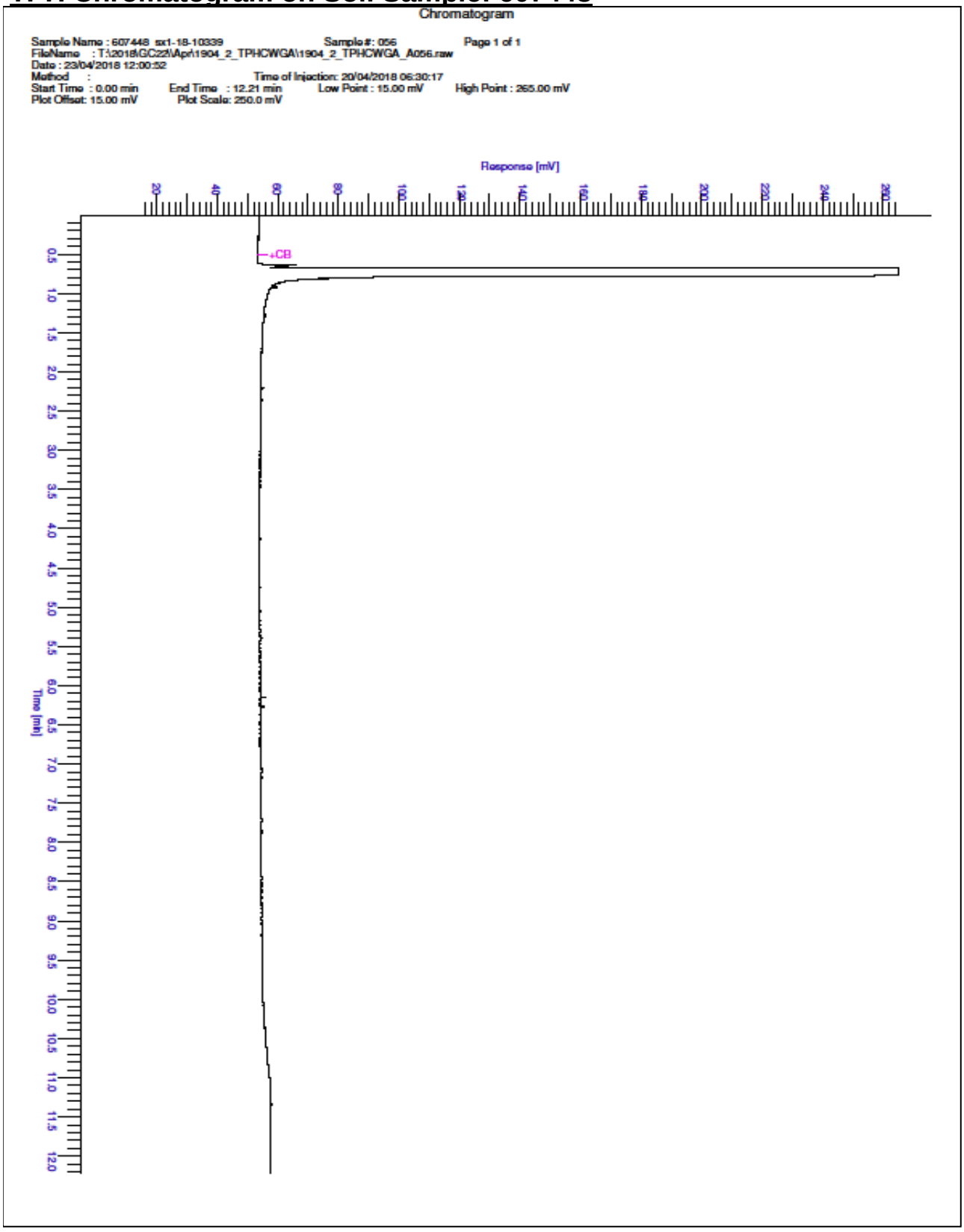
TPH Chromatogram on Soil Sample: 607446



TPH Chromatogram on Soil Sample: 607447



TPH Chromatogram on Soil Sample: 607448



Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix C – Plot Photographs

Plot 32

	**Photograph 1:** View of front garden of Plot 32. To be fully hardstood.
	**Photograph 2:** View of the rear garden of Plot 32.
	**Photograph 3:** View of soil in capping layer excavation in rear garden of Plot 32 with geotextile membrane visible.

	**Photograph 4:** Depth measurement in rear garden of Plot 32.

Plot 33

	**Photograph 5:** View of front garden of Plot 33. To be fully hardstood.
	**Photograph 6:** View of the rear garden of Plot 33.
	**Photograph 7:** View of soil in capping layer excavation in rear garden of Plot 33 with geotextile membrane visible.

	**Photograph 8:** Depth measurement in rear garden of Plot 33.

Plot 34

	**Photograph 9:** View of front garden of Plot 34. To be fully hardstood.
	**Photograph 10:** View of the rear garden of Plot 34.
	**Photograph 11:** View of soil in capping layer excavation in rear garden of Plot 34 with geotextile membrane visible.

	**Photograph 12:** Depth measurement in rear garden of Plot 34.

Plot 43

	**Photograph 13:** View of front garden of Plot 43.
	**Photograph 14:** View of soil in capping layer excavation in front garden of Plot 43 with geotextile membrane visible.
	**Photograph 15:** Depth measurement in front garden of Plot 43.

	**Photograph 16:** View of the rear garden of Plot 43.
	**Photograph 17:** View of soil in capping layer excavation in rear garden of Plot 43 with geotextile membrane visible.
	**Photograph 18:** Depth measurement in rear garden of Plot 43.

Site: **St James Park, Former MMU Campus, Didsbury**
Plots: **The Chapel**
Date: **2nd January 2018**
NHBC Ref: **Phase A – 517456**

1 INTRODUCTION

LK Consult (LKC) has been appointed by PJ Livesey Holdings Ltd to validate the depth of the garden capping layer laid down at the development at St James Park, Former MMU Campus, Didsbury.

This validation report concerns the soft landscaping areas around The Chapel.

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

The requirement for remedial works across the site arose as a result of previous site investigations and risk assessments carried out by LK Consult Limited (ref. LKC 16 1066-02 Post Demolition Site Investigation, Risk Assessment and Updated Remediation Strategy, dated 15th December 2016) which outlined the remediation and validation requirements. These comprised the following recommendations:

i) Option 1: Environmental capping layer comprising 450mm clean suitable soil in rear gardens and 300mm in front gardens and areas of landscaping over either 100mm MOT stone (included in total soil depth) **or** geotextile marker.
ii) Option 2: Further sampling and risk assessment on a block by block basis (nominally a total of 4 soil samples per plot with 1 in the front garden) or selected soil samples in any landscaped areas. If soil results are below generic assessment criteria then no specific clean validated environmental cover depth will be required, but a nominal 150mm covering of topsoil as a growing medium (if required).
iii) Validation testing of any site won or imported material to be re-used onsite in gardens and soft landscaping to ensure it is 'suitable for use'. All site won or imported material should be tested at a rate of 1 sample per 50m^3 for topsoil and 1 sample per 150m^3 for subsoil.
iv) Details of unexpected contamination.
v) Provision of waste transfer notes for any disposal of contaminated soil offsite.

2 IMPORTED MATERIAL

Topsoil for use in the soft landscaping areas has been imported to site. The material used comprised approximately 150m^3 of topsoil supplied by Grabserve from a greenfield site at New Manor Farm, Stretford and approximately 200m^3 of topsoil from Huperade Soil Supplies in Timperley.

Composite topsoil samples were taken from garden areas (ref: TS101-TS104) and were subjected to the following analytical suite as a conservative measure:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation1.

Soil samples were collected in plastic tubs, amber glass jars and amber vials and despatched to Chemtest of Newmarket in cool boxes with ice packs.

Soil results for the topsoil are presented in Appendix A. No elevated levels of contaminants were identified in the soil samples collected when compared to Generic Assessment Criteria presented in the agreed Remediation Strategy. The Validation Checklist provided to the ground workers is presented in Appendix B.

3 CAPPING LAYER IN GARDEN AREAS

The recommendation for the garden capping layer in areas of soft landscaping was that it should comprise a minimum 300mm thickness.

LKC attended site on 14th September 2017 to inspect the capping layer construction and depth in areas around The Chapel. Photographs are provided in Appendix C and the observations are summarised below.

An annotated site layout plan highlighting the soft landscaping around The Chapel is included in Appendix D.

Location	Topsoil Depth (mm)	Subsoil Depth (mm)	Membrane or 100mm MOT	Total Depth (mm)	Required Depth (mm)	Pass (✓) or Fail (x)
North (a)	300	N/A	Membrane	300	300	✓
North (b)	300	N/A	MOT	400	300	✓
North (c)	300	N/A	Membrane	300	300	✓
South (a)	300	N/A	Membrane	300	300	✓

During the site validation works, LKC were unable to penetrate the 100mm MOT break layer with hand excavation tools (spade and hand auger) and as such were unable to fully validate the thickness of the break layer, however this adds a level of comfort that the break is suitable for its proposed purpose.

LKC were able to verify that, in the places inspected within the soft landscaping around The Chapel, the capping layer depths were in accordance with the requirements of the Remediation Statement.

[1] EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

4 CONCLUSIONS

LKC has completed the validation of the garden capping layers within the soft landscaping around The Chapel and conclude that, in the places inspected, chemically suitable material has been laid to an appropriate depth.

Report Prepared By:



Kerrell Walley
Geo-Environmental Scientist

Report Reviewed By:



Dr Paul Quimby
Director

Enc:

Appendix A: Certificates of Analysis – Imported Soil
Appendix B: Remediation Strategy Validation Checklist
Appendix C: Plot Photographs
Appendix D: Annotated Site Layout Plan

Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of PJ Livesey Homes Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Certificates of Analysis – Imported Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-26078-1
Initial Date of Issue:	31-Oct-2016
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Rachel Peart Contaminated Land
Project	LKC 16 1066 MMU Didsbury (Huperade)

Quotation No.:		**Date Received:**	27-Oct-2016
Order No.:	732176	**Date Instructed:**	27-Oct-2016
No. of Samples:	4		
Turnaround (Wkdays):	3	**Results Due:**	31-Oct-2016
Date Approved:	31-Oct-2016		

Approved By:



Details: Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1066 MMU Didsbury (Huperade)

Client: LK Consult		**Chemtest Job No.:**			16-26078	16-26078	16-26078	16-26078
Quotation No.:		**Chemtest Sample ID.:**			370759	370760	370761	370762
		Client Sample ID.:			TS101	TS102	TS103	TS104
		Sample Type:			SOIL	SOIL	SOIL	SOIL
		Date Sampled:			25-Oct-2016	25-Oct-2016	25-Oct-2016	25-Oct-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	15	16	15	16
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay	Clay	Clay
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached	See Attached
pH	M	2010		N/A	9.0	8.7	8.6	8.5
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.73	0.53	0.55	0.58
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.12	0.056	0.061	0.066
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	12	13	13	13
Cadmium	M	2450	mg/kg	0.10	0.26	0.30	0.27	0.30
Chromium	M	2450	mg/kg	1.0	15	15	15	13
Copper	M	2450	mg/kg	0.50	36	39	41	29
Mercury	M	2450	mg/kg	0.10	0.28	0.32	0.97	0.25
Nickel	M	2450	mg/kg	0.50	16	18	18	13
Lead	M	2450	mg/kg	0.50	86	99	90	75
Selenium	M	2450	mg/kg	0.20	0.33	0.24	0.29	0.22
Vanadium	U	2450	mg/kg	5.0	18	19	19	15
Zinc	M	2450	mg/kg	0.50	76	82	82	58
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	3.5	4.8	3.3	3.8
Fuel Type	N	2670		N/A	PAH	PAH	PAH	PAH
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	M	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	5.4	1.7	12	14
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	14	13	24	17

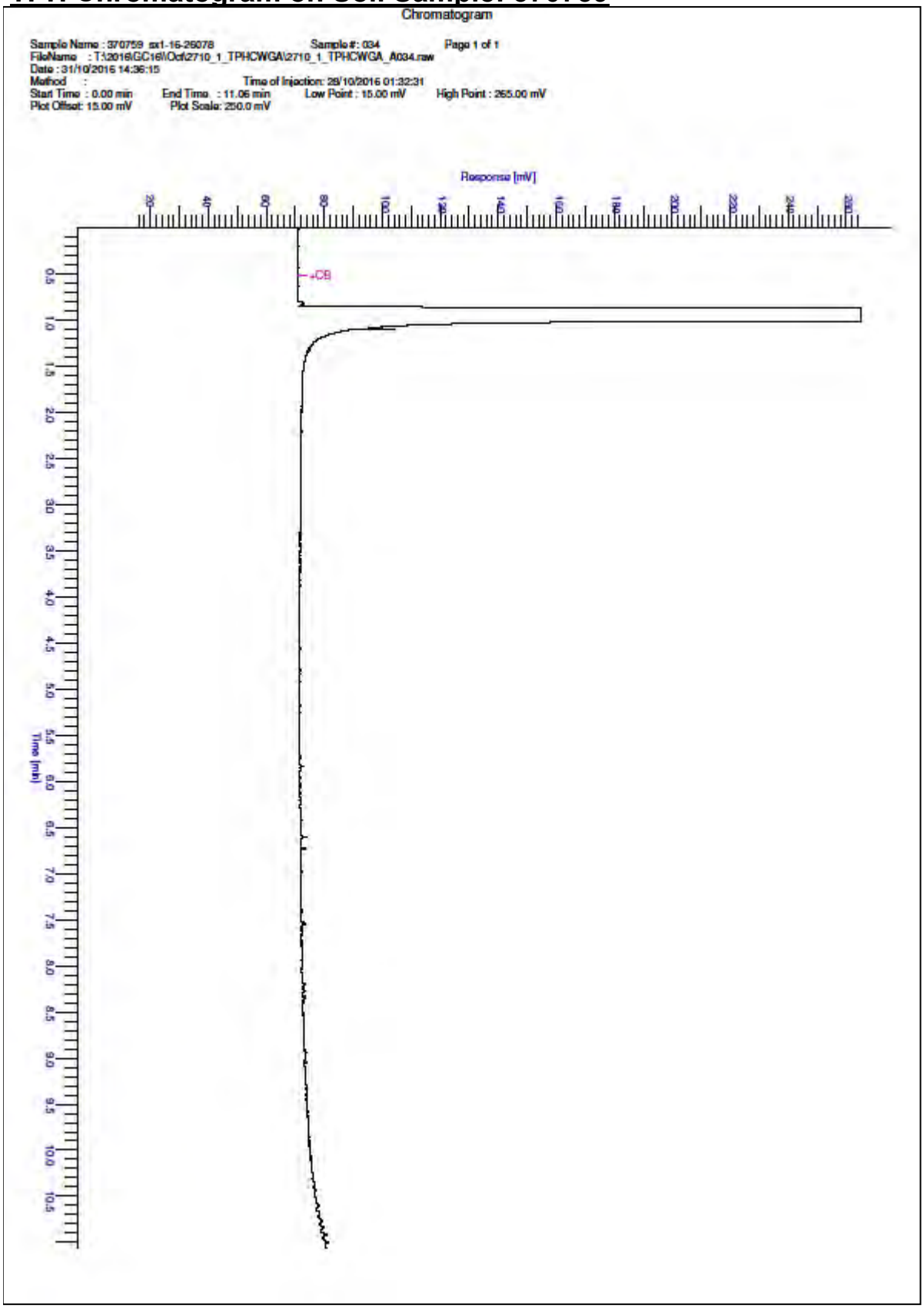
Chemtest
The right chemistry to deliver results

Results - Soil

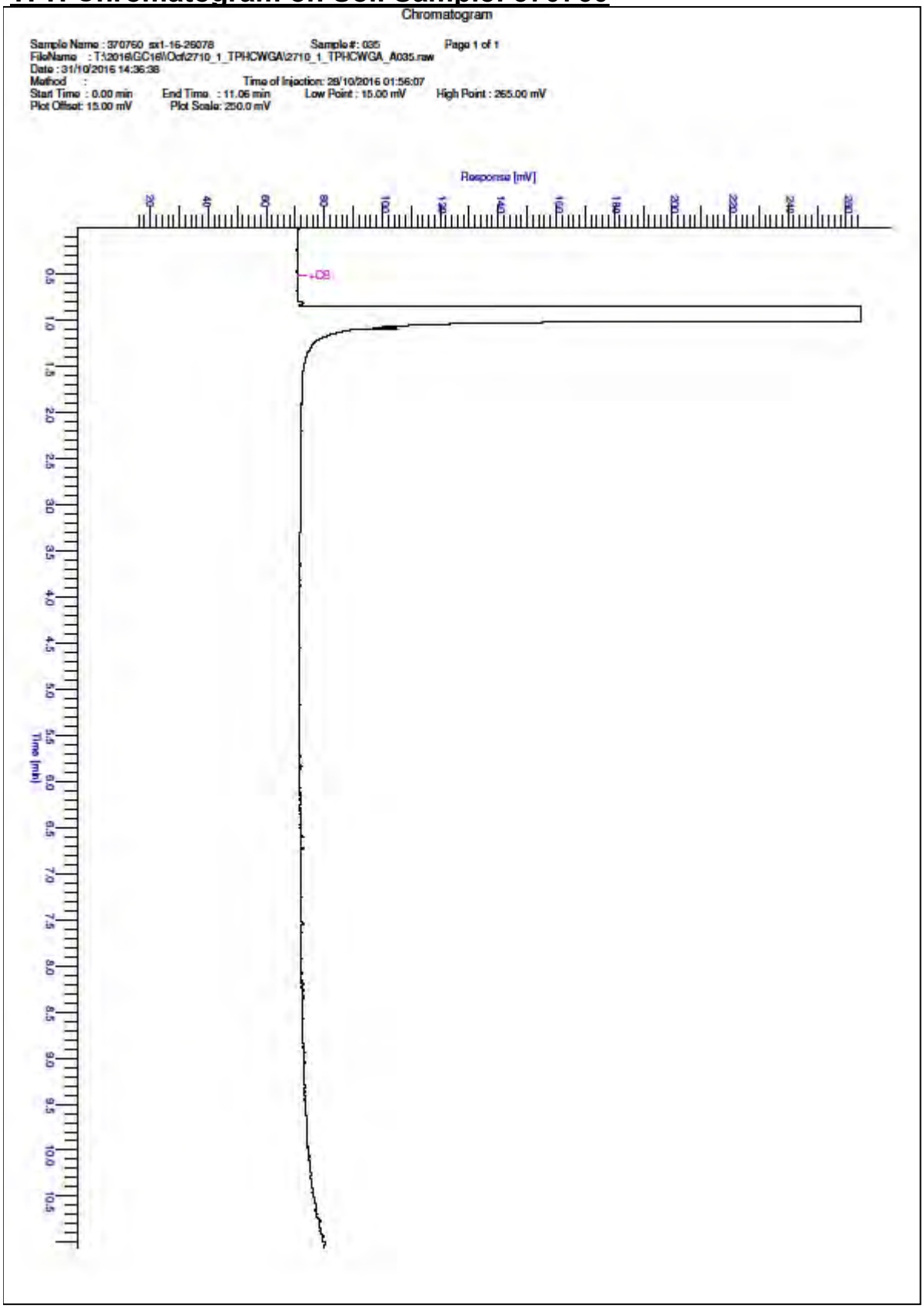
Project: LKC 16 1066 MMU Didsbury (Huperade)

Client: LK Consult		**Chemtest Job No.:**			16-26078	16-26078	16-26078	16-26078
Quotation No.:		**Chemtest Sample ID.:**			370759	370760	370761	370762
		Client Sample ID.:			TS101	TS102	TS103	TS104
		Sample Type:			SOIL	SOIL	SOIL	SOIL
		Date Sampled:			25-Oct-2016	25-Oct-2016	25-Oct-2016	25-Oct-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	40	33	60	46
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	3.5	4.8	5.9	6.0
Total Aromatic Hydrocarbons	M	2680	mg/kg	5.0	63	52	100	82
Total Petroleum Hydrocarbons	M	2680	mg/kg	10	63	52	100	82
Naphthalene	M	2700	mg/kg	0.10	< 0.10	0.10	0.20	0.30
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	0.45	0.16	0.15
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	0.81	0.18	0.13
Fluorene	M	2700	mg/kg	0.10	< 0.10	0.18	0.13	0.18
Phenanthrene	M	2700	mg/kg	0.10	1.2	2.1	1.6	1.1
Anthracene	M	2700	mg/kg	0.10	0.33	0.60	0.54	0.14
Fluoranthene	M	2700	mg/kg	0.10	2.3	4.3	2.5	2.0
Pyrene	M	2700	mg/kg	0.10	2.1	3.9	2.7	1.9
Benzo[a]anthracene	M	2700	mg/kg	0.10	1.1	2.3	1.3	1.0
Chrysene	M	2700	mg/kg	0.10	1.8	3.0	2.0	1.6
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	1.5	2.8	1.9	1.4
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	0.81	1.5	1.2	0.91
Benzo[a]pyrene	M	2700	mg/kg	0.10	1.3	2.2	1.3	1.1
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	0.92	1.4	1.0	0.53
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	0.56	0.48	0.37	0.32
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	0.94	1.3	1.1	0.77
Total Of 16 PAH's	M	2700	mg/kg	2.0	15	27	18	14
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30

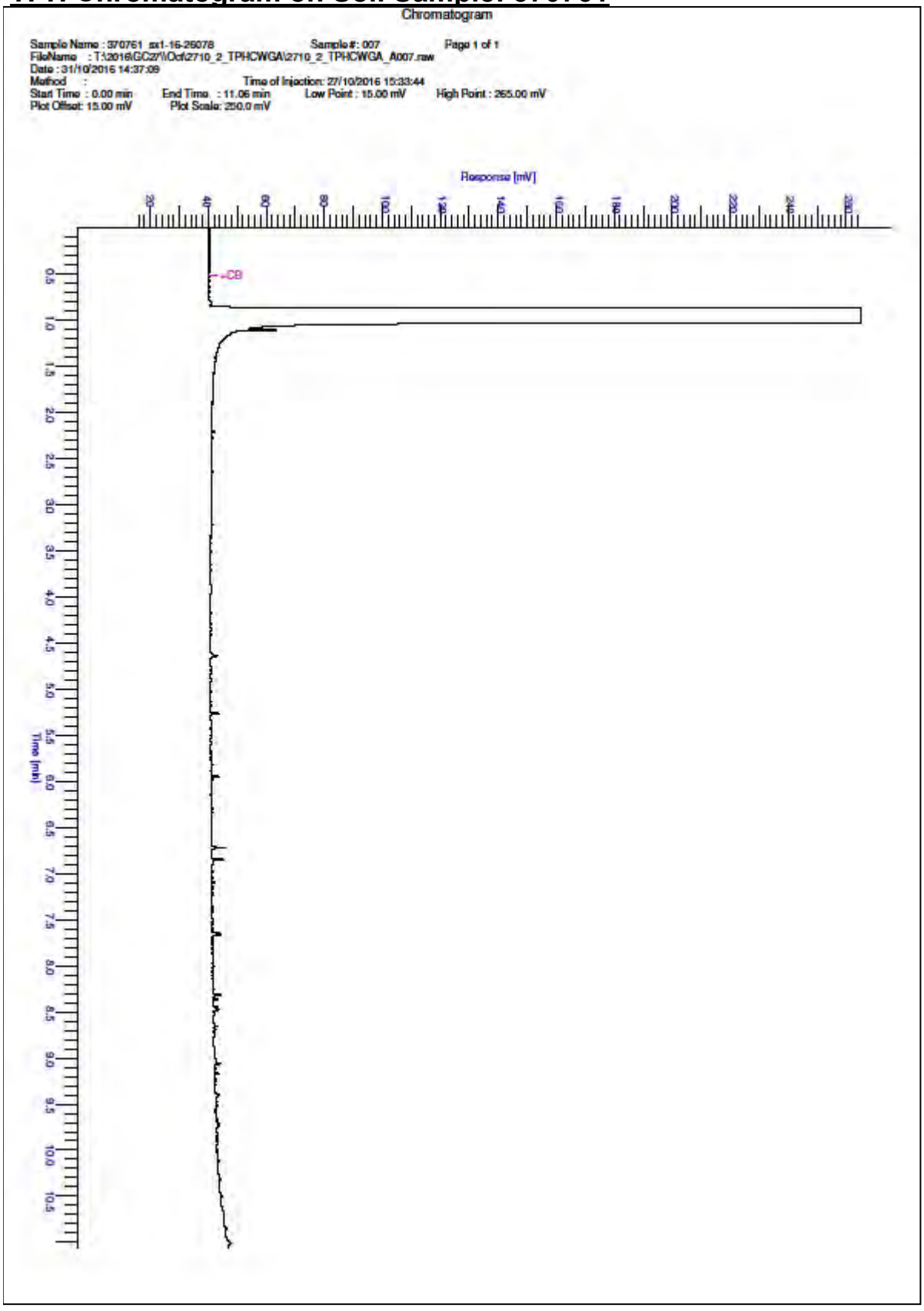
TPH Chromatogram on Soil Sample: 370759



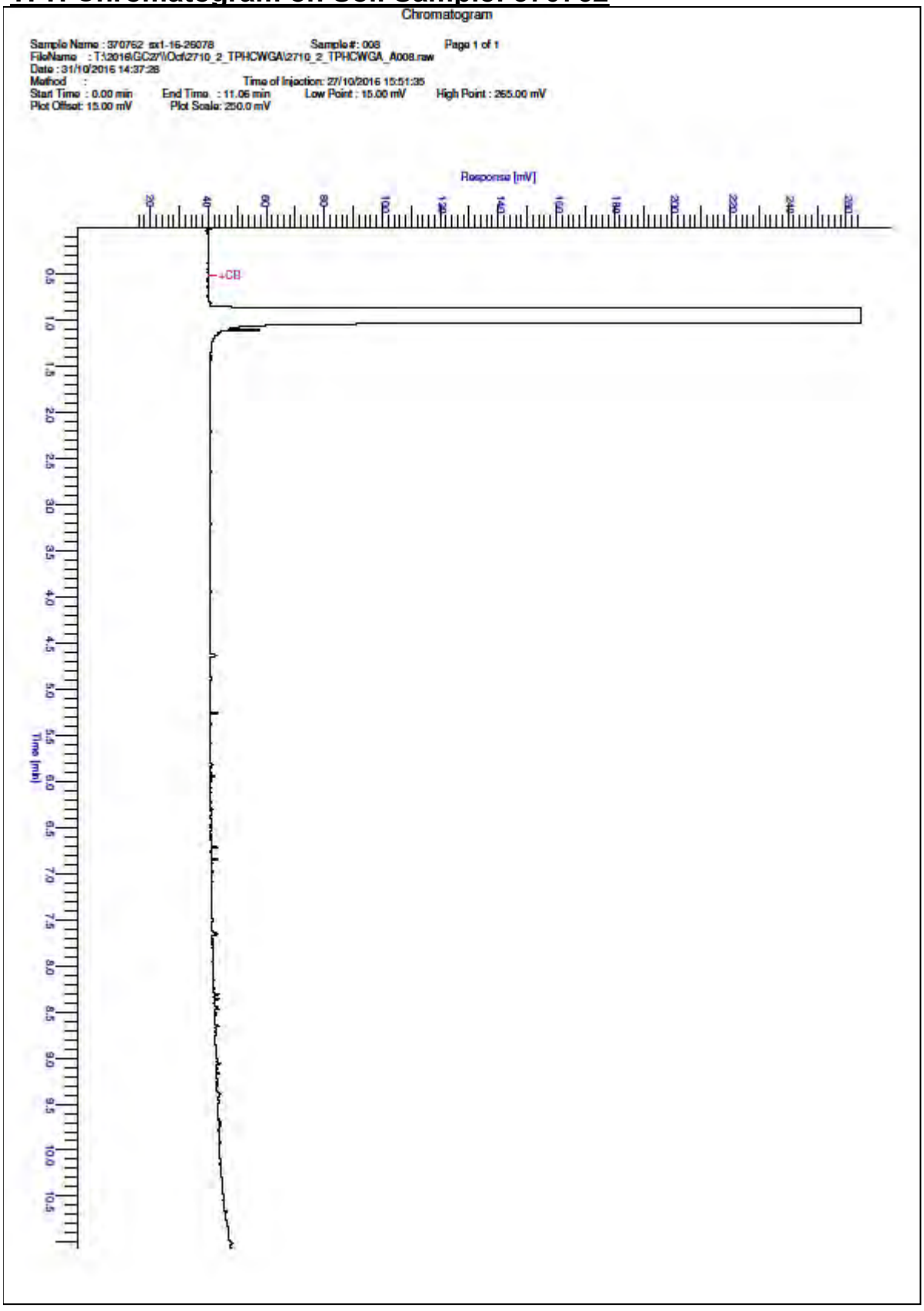
TPH Chromatogram on Soil Sample: 370760



TPH Chromatogram on Soil Sample: 370761



TPH Chromatogram on Soil Sample: 370762



Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Accreditation	Parameters included	Method summary
2010	pH Value of Soils	UKAS accreditedMCERTS accredited	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)		Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)		Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	UKAS accreditedMCERTS accredited	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	UKAS Accredited	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	UKAS accreditedMCERTS accredited	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	UKAS accreditedMCERTS accredited	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils		Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	UKAS accreditedMCERTS accredited	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	UKAS accreditedMCERTS accredited*	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Normal Level TPH A/A Split is MCERTS accredited. Low Level TPH A/A Split is unaccredited	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	UKAS accreditedMCERTS accredited	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	UKAS accreditedMCERTS accredited*	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2920	Phenols in Soils by HPLC	UKAS accreditedMCERTS accredited	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Chemtest
The right chemistry to deliver results

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix B – Remediation Strategy Validation Checklist

Site Works / Validation Check List – LKC 16 1066 – MMU Didsbury Housing Development

Plots	Validation Work	Additional Notes
Imported / Site Won Soil / stone	-Require information from soil provider on source and amount of soil provided (if sourced offsite). -LKC will need to collect and analyse a suitable number of samples per stockpile/source. -Topsoil tested at 1 sample 50m^3. -Subsoil tested at 1 sample per 150m^3. -Stone tested at 1 sample per 500m^3. -If provenance proven that subsoil is natural quarried material then no testing required. -A minimum of 3 samples per source is required. -If site won material then should be stockpiled and tested at the same rate, but will need appropriate exemptions / permits to re-use onsite.	-Soil sampling should be undertaken from source or from a stockpile onsite. Can be sampled when in gardens; however, may have to be removed if unsuitable. -Soil samples will be undertaken on an accelerated 3 working day turnaround.
Option 2 **Block Specific SI**	-Useful if time constraints and where you do not wish for an environmental capping layer. -Nominal 3 soil sample from rear garden and 1 soil sample from front. -Selected soil sampling in landscaped (POS) areas. -All data in that block / POS will be risk assessed and a Block by Block / POS assessment and recommendations provided in a report. -This additional sampling will apply near TPO's, where the full environmental capping layer may not be able to be achieved. Due to root protection.	-If data fail then an environmental capping layer will still be required and a report will not be needed. - If soil passes and no formal environmental capping layer is required then a formal depth is not necessary. A nominal 150mm topsoil is recommended as a growing medium and to cover undesirable material.
Option 1 **Garden Areas**	**Rear Gardens** *Unless a Block by Block site investigation is undertaken and soil passes.* -450mm total depth soil capping layer (includes minimum 150m topsoil) required for these plots. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 350mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Option 1 **Landscaped Areas**	**All Front gardens and Landscaped Areas** *Unless a Block by Block / POS site investigation is undertaken and soil passes.* -300mm total depth soil capping layer (includes minimum 150m topsoil) required for these landscaped areas. -This includes a Hi-Viz geotextile at the base of the capping layer **OR** 100mm MOT type 1 (minimal fines) and 200mm depth soil capping layer (includes minimum 150mm topsoil).	-Site manager to photograph laying of separation geotextile **OR** 100mm MOT in each garden area. -LKC need to validate the depth of the cover layer by digging small hole in each garden area, measuring the depth and taking validatory photos.
Site	**Unexpected Contamination** -During earthworks if contractor finds visual or olfactory evidence of contamination and/or asbestos then LKC should be informed and if necessary material will need to be sampled so that it can be disposed of at an appropriate licensed tip. -Material should be stockpiled on Visqueen and covered prior to disposal and/or testing. -All disposal tickets will be required for the Completion Report.	-If considerable earthworks or soil movement is occurring it would be advisable that LKC undertake a Watching Brief during earthworks.
Site	**Local Authority Site Completion Report** -Manchester Council require a Site Completion Report for whole site once all validation complete. -Individual plot reports may be required for NHBC for individual plot sales before site is fully completed.	-Can only be done once development is completed. -Manchester Council may provide a letter of comfort for each plot that has been completed satisfactory (if individual plot reports undertaken).

NOTE:
Minimum 24 hours notice to attend site.

Contacts

LK Consult
Unit 29, Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200

Paul Quimby – p.quimby@thelkgroup.com

Kerrell Walley – k.walley@thelkgroup.com

SUITABILITY OF ANY IMPORTED MATERIAL AS CLEAN COVER

Recommended validation sampling requirements for environmental capping layer soils presented in the following table.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown / Site Won	Suite B	
Subsoil	Brownfield / Unknown / Site Won	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (su (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / min. fines)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Recommended validation sampling requirements for environmental capping layer soils.

Notes:

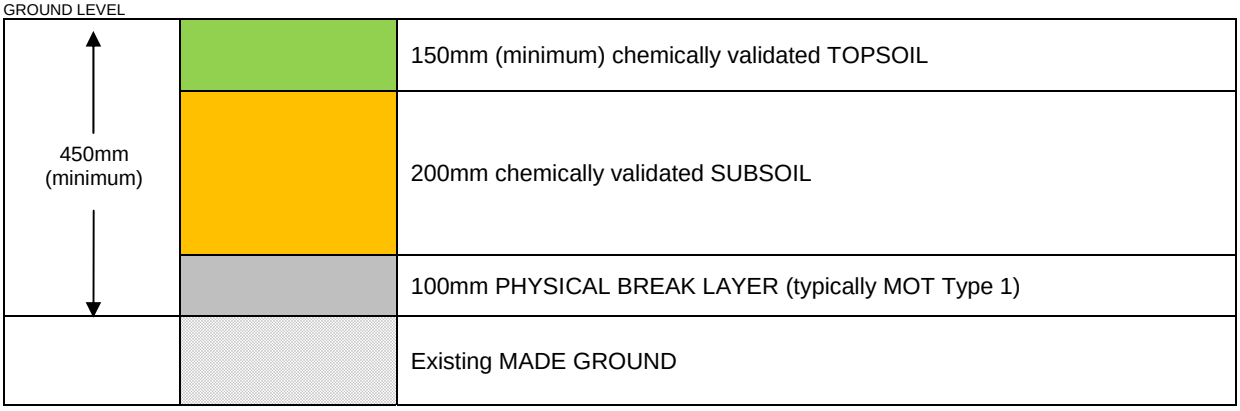
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

ENVIRONMENTAL COVER LAYER

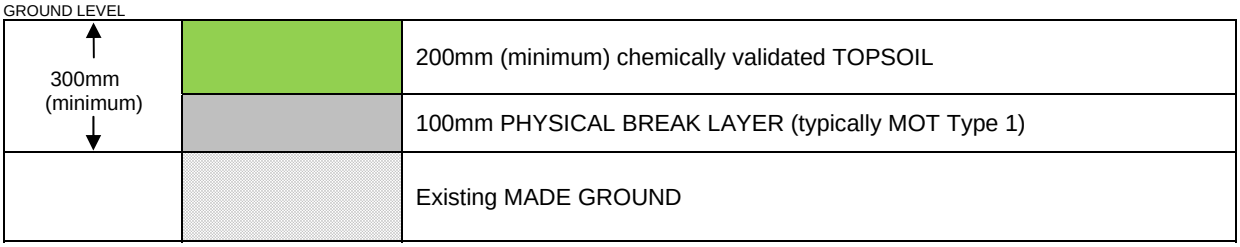
Private Gardens

Private garden areas should comprise a cover layer depth of at least 450mm. A typical construction detail is provided below. Subsoil may be replaced by topsoil if required.



Soft Landscaped Areas and Front Gardens

Soft landscaping areas and front gardens should comprise a cover layer depth of at least 300mm. A typical construction detail is provided below:



If suitable break layer material is not available, then the **break layer may be substituted for a separation geotextile** and the subsoil / topsoil depth increased by 100mm to maintain the required capping layer material depth.

Appendix C – Plot Photographs

North (a)

	**Photograph 1:** View of soft landscaping in North (a) section of The Chapel.
	**Photograph 2:** View of soil in capping layer excavation in North (a) section of The Chapel with geotextile membrane visible.
	**Photograph 3:** Depth measurement in North (a) section of The Chapel.

North (b)

	**Photograph 4:** View of soft landscaping in North (b) section of The Chapel.
	**Photograph 5:** View of soil in capping layer excavation in North (b) section of The Chapel with MOT visible.
	**Photograph 6:** Depth measurement in North (b) section of The Chapel.

North (c)

	**Photograph 7:** View of soft landscaping in North (c) section of The Chapel.
	**Photograph 8:** View of soil in capping layer excavation in North (c) section of The Chapel with geotextile membrane visible.
	**Photograph 9:** Depth measurement in North (c) section of The Chapel.

South (a)

	**Photograph 10:** View of soft landscaping in South (a) section of The Chapel.
	**Photograph 11:** View of soil in capping layer excavation in South (a) section of The Chapel with geotextile membrane visible.
	**Photograph 12:** Depth measurement in South (a) section of The Chapel.

Appendix D – Annotated Site Layout Plan

PJ Livesey GROUP

REVISIONS

Rev	Date	Description
A	04/12/15	Roads realigned, parking amended.
B	15/01/16	Plot 10 drive and footpath to Plot 19 amended to retain trees.
C	23/02/16	Road between plots 18 to 24 and 16 to 28 amended. Main entrance wall and gates updated.
D	19/05/16	Parking in front of admin and chapel amended.
E	27/05/16	Rear carpark complex amended,removed parking spot by lodge in accordance with civic society.
F	23.06.16	Admin plot 06 boundary amended, road amendment, rear of admin DT/BE
G	29.06.	Decking by Plot 8 amended DT/BE
H	12/07/16	Visitor parking and road in front of Block 18 amended. Road between Admin and plots 9-13 amended. Underground car park amended. Various plot boundary amendments.
J	19/07/16	Legal boundary added BE

WARNING
Critical Dimensions required by Consultants/ Contractors/ Subcontractors must not be scaled from this drawing. Dimensions required are to be obtained from the drawing office

Didsbury Campus Site Plan

105- 00- 2100-J

Scale 1:500 @A1 Date Oct15
Drawn AR/DMM Checked

MMU-Didsbury Campus,
Wilmslow Road,
Didsbury,
Manchester, M20 2RR

P.J.Livesey Living Space Ltd
Ashburton Park
Ashburton Road West
Trafford Park
Manchester M17 1AF
Tel : 0161 873 7878
Fax : 0161 848 8671
design@pjlivesey.co.uk

COPYRIGHT
This Drawing may not be used or reproduced in any way without the written consent of the P.J.Livesey Group Limited

The P. J. Livesey Group Ltd
www.pjlivesey-group.co.uk

Scale 1:500
0m 25m 50m

General Site Plan.dwg
Last Saved By: beth.egerton

Eton Business Park, Eton Hill Road,
Manchester M26 2ZS

Tel: 0161 763 7200

The Corn Exchange, Fenwick Street,
Liverpool L2 7QL

Tel: 0151 235 8716

Unit 121, Wright Business Centre,
1 Lonmay Road, Glasgow G33 4EL

Tel: 0141 773 6269

www.thelkgroup.com

PART OF THE LK GROUP