



Geo-Environmental Assessment

Scotland Hall Road Recreation Ground, Manchester, M40 2RF

Presented to Manchester City F.C. City in the Community Foundation

Issued: December 2019

Delta-Simons Project No. 18-1673.04



Delta-Simons Environmental Consultants Limited
Head Office: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR
Tel: 01522 882555 | www.deltasimons.com



Report Details

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Report Title	Geo-Environmental Assessment
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Delta-Simons Contact	Mike.OHalloran@deltasimons.com

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				Jade Roche Graduate Consultant Tom Bywater Graduate Consultant	Chris Everitt Principal	Richard Lawless Unit Director

About us

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Executive Summary

Brief	Delta-Simons Environmental Consultants Limited ("Delta-Simons") was instructed by Manchester City F.C. City in the Community Foundation (the "Client") to undertake a Geo-Environmental Assessment for Scotland Hall Recreation Ground, Manchester, M40 2RF (hereafter referred to as the "Site"). The proposed development of the Site comprises the construction of a new Multi Use Games Area (MUGA) and associated footpaths in the west of the Site within the existing park area. The purpose of this assessment is to identify the potential for land contamination issues to be present at the Site in the context of the proposed development, to support the planning application and to provide a geotechnical assessment.
Site Setting	The Site is currently in use as recreational grounds, comprising areas of well-maintained grass, limited areas of tarmac hardstanding in use as sports pitches, grassed play areas/equipment and footpaths. Historically, the Site appears to have been a recreational park since the 1960s but was subject to clay pitting and disposal of refuse in the early 20th Century.
Ground Conditions	The current ground investigation recorded a variable thickness of Made Ground, underlain in parts by hardstanding tarmac and concrete. Superficial Deposits in the form of Devensian Till comprise the remaining ground conditions beneath the variable Made Ground.
Land Contamination Assessment	<i>Human Health</i> Elevated Polyaromatic Hydrocarbons (PAHs) have been recorded in the shallow Made Ground. The main exposure pathways are ingestion and dermal contact. Additionally, asbestos fibres were identified in some samples. The only exposure pathway is inhalation. These pollutant linkages can be broken by the installation of a clean cover system in the soft landscaped areas or a landscaped bund. <i>Controlled Waters</i> No potential risk to controlled waters has been identified, given the absence of significant potentially mobile contamination sources and distance to controlled water receptors. <i>Ground Gas</i> No ground gas monitoring was undertaken as no buildings are proposed to be developed on-Site.
Recommendations	Based on the findings of this report, the following recommendations for supplementary works made; ▲ Preparation of a Remediation Strategy to mitigate risks to human health associated with the identified asbestos and PAHs. Waste classification has not been undertaken as part of the scope of works, should it be proposed to dispose of materials from the Site then specific additional investigations may be needed to classify the materials in accordance with current regulatory requirements.
This is intended as a summary only. Further detail and the limitations of the assessment are provided within the main body of the Report.	

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1.0 Introduction

1.1 Appointment

Delta-Simons Environmental Consultants Limited ("Delta-Simons") was instructed by Manchester City F.C. City in the Community Foundation (the "Client") to prepare a Preliminary (Geo-Environmental) Risk Assessment for Scotland Hall Recreation Ground, Manchester, M40 2RF (the "Site").

1.2 Context & Purpose

It is understood that the Site is to be developed for the construction of a new Multi Use Games Area (MUGA) and associated footpaths in the west of the Site within the existing park area.

Sketches of the development proposals are presented in Drawing 1.

The aim is as per the proposal: to support discharge of relevant planning conditions for the proposed development. The objective of the investigation was to complete a geo-environmental assessment of the proposed development area. The investigation has characterised shallow ground conditions, from which risks to end-users, the environment has been assessed, with mitigation measures outlined, where appropriate.

The proposed development is located on a small area in the west of the Site (current MUGA).

1.3 Scope of Works

The scope of the investigation and layout of this report has been designed with consideration of 'the Model Procedures for the Management of Land Contamination (CLR 11)', the relevant requirements of the National Planning Policy Framework 2019 (NPPF) (paragraphs 170 & 178-180)¹ and the Planning Practice Guidance (Land Affected by Contamination)².

The project was carried out to an agreed brief as set out in Delta-Simons' multiple environmental proposal dated 4th October 2019 (ref.18-1673.01). The scope of works is outlined in Section 3.2.1.

Specific sections of this report may generally follow guidance set out in Eurocode 7 for a Ground Investigation Report (GIR), as defined in BS EN 1997-1:2004 and BS EN 1997-2:2007. Eurocode 7 includes specific guidance on the number and spacing of investigation positions, methods of investigation and sample quality to be achieved which may not have been met by this investigation.

1.4 Existing Information

This report should be read in conjunction with the Delta-Simons Preliminary Geo-Environmental Risk Assessment Report, dated November 2019.

1.5 Limitations

The assessment is limited to the issues agreed within the proposal for the works. Notes on limitations associated with this assessment are provided in Appendix A.

¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf

² <https://www.gov.uk/guidance/land-affected-by-contamination>

2.0 Site Details

2.1 Site Setting

A summary of the current Site status, environmental setting and key historical features is presented below. This has been summarised from the existing Delta-Simons Preliminary Risk Assessment which should be consulted for further detail.

Co-ordinates	Centred approximately at National Grid Reference 388250, 399650.	Elevation	80.0 m AOD
		Area	1.84 Ha
Site Location	The Site is located off the southern end of Scotland Hall Road, with the northern boundary flush to Amos Avenue. A Site location map is provided as Figure 1. Residential buildings occupy the areas towards the north, east and west of the Site. Adjacent to the southern boundary of the Site, a railway trends east-west, beyond which is Clayton Vale Park and the River Medlock. Additionally, a wooded area of large mature trees and bushes occupies the south-east of the Site.		
Current Site Use	The Site is currently in use as a recreational ground, comprising areas of well-maintained grass, limited areas of tarmac hardstanding in use as sports pitches, grassed play areas/equipment and footpaths. The Site is generally flat with a gentle slope towards the south-west. The north-eastern side of the Site comprises of raised mounds (approximately 0.3 – 0.8 m), suspected to be a product of the historical clay pitting and refuse disposal.		
Proposed Development	The proposed development of the Site comprises the construction of a new Multi Use Games Area (MUGA) and associated footpaths in the west of the Site within the existing park area. Sketches of the development proposals are presented in Drawing 1. The proposed development will only impact a small area in the west of the Site (current MUGA).		
Environmental Setting	Ground conditions below the Site are anticipated to comprise a sequence of Made Ground (variable thickness) then, superficial deposits of Devensian Till and Glaciofluvial Deposits, comprising sand and gravel, and underlying bedrock of the Collyhurst Sandstone Formation. The EA classify the superficial deposits (Devensian Till and Glaciofluvial Deposits) as a Secondary A Aquifer and bedrock (Collyhurst Sandstone Formation) classed as a Principal Aquifer. The nearest surface water feature is the River Medlock located approximately 90 m south of the Site. According to the Envirocheck Report, there are no licensed abstraction records from surface water located within 500 m of the Site.		
Key Historical Features	The Site appears to have been in agricultural use from before 1848. The 1893 maps show evidence of a pit of unknown designation. On the 1951 map, the former pit is labelled as a refuse heap. The 1981 maps show the Site labelled as a playground and in the 1987 map the Site is labelled as a Recreational Ground. The Landmark Envirocheck® Report lists the Site as entirely within an area recorded as a historical landfill and areas within potentially infilled land (non-water). This is thought likely to be associated with the pit, and refuse heap indicated on the historical mapping between 1884 and 1951.		
Summary of Previous Reports	Deposited waste within the landfill is understood to have included inert and industrial waste, registered as having been operated by Clayton Vale Power Station, active between 1901 and 1980.		

	Potential sources of contamination within 250 m of the Site include: ▲ Industrial works including Culcheth Bleach Works, Clayton Vale Print and Dye works approximately 200 m to 250 m to the east and south-east of the Site shown from the earliest map edition (1848) to the 1984 mapping; ▲ The London Midland and Scottish Railway trending west to east, adjacent to the southern Site boundary with associated sidings present from the earliest mapping (1848) to the current mapping; and ▲ To the south of the Site excavated and infilled areas likely associated with Clayton Vale Historic Landfill and Recorded Landfill areas present between approximately 50 m to 150 m which shown from the 1932 map edition and were no longer shown circa the 1992 mapping.
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2.2 Consideration of Relevant Pollutant Linkages

The Site is a small subsection of a wider landfill extending north, east and south around the Site, risk to controlled waters presented by the larger waste mass can reasonably be inferred to significantly outweigh those presented by the Site itself. Furthermore, the works proposed will not significantly change risk to controlled waters. As such, if it is considered that it would be disproportionate to assess risk presented by the Site to controlled waters receptors in isolation of the wider Scotland Hall Road playing fields. Therefore, no further consideration of this theoretical linkage has been made.

The PRA presents the conceptual site model for the Site and identified that the key contaminant linkage for which warranted for the assessment was from potential contaminants in Made Ground (arising from the former use of the Site as a landfill) to future users of the MUGA. As such this report assesses sole that linkage.

3.0 Site Investigation

3.1 Intrusive Investigation

Delta-Simons carried out intrusive investigation work on 5th of November 2019 to assess the potential linkages identified in the outline conceptual model, specifically potential risks to future users of the Site.

3.1.1 Health & Safety Considerations

Service plans for the site were acquired; and the location of hand pits were placed accordingly at least 5 m away from any. As a further precaution, hand pitting was conducted with any unidentified services kept in mind.

An initial assessment of the Site identified a Low risk in relation to Unexploded Ordnance (UXO) and so no specific precautionary measures were required for the works.

Future Contractors should undertake their own assessment of UXO risk in relation to their specific proposed scope of works.

3.2 Scope of Ground Investigation and Rationale

3.2.1 Scope

The ground investigation comprised the following items:

- ▲ One day of hand pitting by two Delta-Simons Geo-Environmental engineers at 8 locations (HP1 – HP8). All intrusive locations were logged to BS5930:2015 Code of Practice for Site Investigations.
- ▲ Retrieval of 14 soil samples targeting the top 600mm of the proposed development considering risks to human health and possible foundations. Soil samples has been obtained from areas of soft cover proposed to be included within the development.
- ▲ Submission of 14 samples for laboratory chemical analysis, comprising a range of common potential contaminants including metals, asbestos screen, asbestos quantification where required, Polyaromatic Hydrocarbons (PAHs) and Total Petroleum Hydrocarbons (TPHs).

N.B. In locations encountering hard standing tarmac or concrete (approximately 0.2 – 0.4 m bgl), it was only feasible to retrieve one sample.

3.3 Ground Investigation Factual Data

The exploratory holes were located using a handheld GPS unit with a lateral accuracy of approximately +/- 5m. An intrusive exploratory hole location plan is presented as Figure 2.

Trial pit logs are presented as Appendix B.

3.4 Environmental Sampling, In-Situ Testing and Laboratory Analysis

Soils collected for laboratory analysis were placed in a variety of containers appropriate to the anticipated testing suite. Samples were stored in accordance with Delta-Simons' quality procedures to maintain sample integrity and preservation and to minimise the chance of cross contamination. Records of the samples taken as part of the site investigation works, including their depths and location, are included within the exploratory hole records in Appendix B.

Samples analysed for environmental purposes were placed in chilled cool boxes on site and transported to the laboratory for analysis on completion of the site investigation works/groundwater sampling visit.

4.0 Ground Summary

4.1 Introduction

The sections below summarise the ground conditions encountered during the site investigation.

4.2 Ground Model

A summary of the observed ground conditions at the Site is provided below.

Summary of Observed Ground Conditions				
Strata	Typical Strata Description	Depth Range of Strata Base (m)	Maximum Proven Thickness (m)	Comments
Topsoil	Grass over soft brown sandy CLAY. Sand is fine. Frequent roots.	0.05-0.35	0.35	Identified in all exploratory holes. Except HP1 which identified clayey, gravelly SAND.
Limestone Sub-base	Blackish brown angular fine to medium GRAVEL of natural lithologies.	0.40	0.05	Identified in HP2 and HP6.
Made Ground	Variable: Sand and gravel with concrete, asphalt, brick, glass, clinker, wood, and natural lithologies with rare coal.	0.05-0.60	0.55	Identified in HP1, HP3, HP4, HP5, HP6 and HP7.
Hardstanding	Asphalt	0.45	0.05	Identified in HP1.
Devensian Till	Firm brown mottled orange and grey slightly sandy CLAY. Sand is fine.	0.60	0.35	Identified in HP7.

4.3 Visual and Olfactory Evidence of Contamination - Soils

Visual or olfactory evidence of potential gross contamination was observed during the investigation in some of the exploratory holes, as summarised below.

Exploratory Hole	Depth (m bgl)	Evidence
HP2	0.35-0.40	Slight to moderate tar odour
HP5	0.15-0.25	Slight tar odour
HP6	0.40	Tar odour

4.4 Groundwater

Groundwater was not encountered in any of the excavated hand pits.

5.0 Generic Quantitative Risk Assessment

5.1 Introduction

The presence of hazardous substances in or on a site is generally only of concern if an actual or potential unacceptable risk exists. Legislation and guidance on the assessment of contaminated sites, consistent with UK best practice, acknowledges the need for a tiered risk-based approach. A Preliminary Risk Assessment is presented in Section 2.2. This section represents a Generic Quantitative Risk Assessment (GQRA) being a comparison of site contaminant levels against Generic Assessment Criteria.

5.2 Human Health GQRA

The assessment of risks in relation to human health has been undertaken using Generic Assessment Criteria (GAC) as detailed within the appropriate tables. Risks from soil, groundwater and Non-Aqueous Phase Liquids (NAPL) have been considered. The GAC are predominantly based on long term (chronic) risk to health. However, in the limited circumstances where short-term (acute) risks are more pronounced, these GAC have been utilised to ensure a thorough and conservative initial assessment is undertaken.

The end use scenario adopted for the assessment is a Public Open Space end use, considered appropriate based on the proposed recreational development.

5.2.1 Risks from Soil Sources

Based on the proposed use of the Site for light industrial use, the soil and groundwater chemical data has been compared against a Public Open Space end use GAC for 1% soil organic matter (SOM) content.

Five Made Ground soil samples (out of 14 analysed in total) recorded the presence of asbestos. In HP1 between 0.0 and 0.20 m bgl, HP1 between 0.25 m and 0.40 m bgl, HP6 between 0.20 m and 0.40 m bgl, HP7 between 0.20 and 0.25 m bgl, HP8 between 0.10 and 0.50 m bgl were all detected to contain loose fibres of chrysotile.

The asbestos quantification determined that the total percentages of asbestos detected within the samples analysed are as follows:

- ▲ HP1 (0.0-0.2 m bgl): <0.001%
- ▲ HP1 (0.25-0.40 m bgl): <0.001%
- ▲ HP6 (0.20-0.40 m bgl): 0.011%
- ▲ HP7 (0.20-0.25 m bgl): 0.002%
- ▲ HP8 (0.10-0.50 m bgl): <0.001%

Nine Made Ground soil samples (out of 14 analysed in total) recorded elevated concentrations of Benzo[b]fluoranthene, Benzo[a]pyrene and Dibenzo(a,h)anthracene in HP1 between 0.25 and 0.40m, HP2 between 0.10 and 0.35m, HP2 between 0.35 and 0.40m, HP3 between 0.10 and 0.40m, HP5 between 0.15 and 0.25m, HP5 between 0.30 and 0.50m, HP6 between 0.00 and 0.15m, HP6 between 0.20 and 0.40m, HP8 between 0.10 and 0.50m.

Two Made Ground soil samples (out of 14 analyses in total) recorded elevated concentrations of Benzo[a]anthracene and Chrysene in HP1 between 0.25 and 0.40m, HP2 between 0.35 and 0.40m.

The laboratory results show that the contamination is generally confined to the near surface soils (<0.5 m bgl). The identified PAH fractions are not considered to be potentially volatile contaminants, Indeed, concentrations of VOC and short chain, potentially volatile hydrocarbons are below the laboratory limits of detection and/or GAC.

The laboratory results for contaminants exceeding detection limit compared to their respective GAC are presented in the table below.

The primary exposure pathways considered in the risk assessment are as follows:

- ▲ Ingestion of soil and dust and/or oral background exposure;
- ▲ Inhalation of dust (background); and
- ▲ Direct dermal contact.

Contaminant	No. Samples	Max Conc. (mg/kg)	GAC (mg/kg)	GAC Source	No. Exceed GAC	Volatile	Location of Exceedances (depth) -	Area of Site of Exceedance*
Asbestos	14	-	Detected	DS	5	N	HP1 (0.0-0.20m) – Chrysotile fibres, <0.001% total asbestos in sample; HP1 (0.25-0.40m) – Chrysotile fibres, <0.001% total asbestos in sample; HP6 (0.20-0.40m) – Chrysotile fibres, 0.011% total asbestos in sample HP7 (0.20-0.25m) – Chrysotile fibres, 0.002% total asbestos in sample HP8 (0.10-0.50m) – Chrysotile fibres <0.001% total asbestos in sample	West, south, north-east, east
Polyaromatic Hydrocarbons								
Naphthalene	14	55	1200	LQM	0	Y	-	-
Acenaphthylene	14	4.2	29000	LQM	0	Y	-	-
Acenaphthene	14	200	29000	LQM	0	Y	-	-
Fluorene	14	120	20000	LQM	0	Y	-	-
Phenanthrene	14	910	6200	LQM	0	N	-	-
Anthracene	14	220	150000	LQM	0	N	-	-
Fluoranthene	14	1200	6300	LQM	0	N	-	-
Pyrene	14	1100	15000	LQM	0	N	-	-
Benzo[a]anthracene	14	250	49	LQM	2	N	HP1 (0.25-0.40m), HP2 (0.35-0.40m)	West
Chrysene	14	240	93	LQM	2	N	HP1 (0.25-0.40m), HP2 (0.35-0.40m)	West
Benzo[b]fluoranthene	14	270	13	LQM	9	N	HP1 (0.25-0.40m), HP2 (0.10-0.35m), HP2 (0.35-0.40m), HP3 (0.10-0.40m), HP5 (0.15-0.25m), HP5 (0.30-0.50m), HP6 (0.00-0.15m), HP6 (0.20-0.40m), HP8 (0.10-0.50m)	West, south, east, north-west
Benzo[k]fluoranthene	14	180	370	LQM	0	N	-	-

Contaminant	No. Samples	Max Conc. (mg/kg)	GAC (mg/kg)	GAC Source	No. Exceed GAC	Volatile	Location of Exceedances (depth) -	Area of Site of Exceedance*
Benzo[a]pyrene	14	250	11	LQM	9	N	HP1 (0.25-0.40m), HP2 (0.10-0.35m), HP2 (0.35-0.40m), HP3 (0.10-0.40m), HP5 (0.15-0.25m), HP5 (0.30-0.50m), HP6 (0.00-0.15m), HP6 (0.20-0.40m), HP8 (0.10-0.50m)	West, south, east, north-west
Indeno(1,2,3-c,d)pyrene	14	110	150	LQM	0	N	-	-
Dibenz(a,h)anthracene	14	37	1.1	LQM	9	N	HP1 (0.25-0.40m), HP2 (0.10-0.35m), HP2 (0.35-0.40m), HP3 (0.10-0.40m), HP5 (0.15-0.25m), HP5 (0.30-0.50m), HP6 (0.00-0.15m), HP6 (0.20-0.40m), HP8 (0.10-0.50m)	West, south, east, north-west
Benzo[g,h,i]perylene	14	290	1400	LQM	0	N	-	-
Notes: Shaded = Maximum concentration exceeds GAC C4SL = Category 4 Screening Levels (C4SLs) published by DEFRA. DS = In-house GAC derived by Delta-Simons Environmental Consultants Ltd, 2018. EIC = Guidance values produced by the Environmental Industries Commission (EIC), the Associated of Geotechnical and Geoenvironmental Specialists (AGS) and Contaminated Land: Application in Real Environments (CL:AIRE) in December 2009. LQM = Land Quality Management/CIEH S4UIs for Human Health Risk Assessment, 2014. AGAC = Acute Generic Assessment Criteria published by the Society of Brownfield Risk Assessment (SoBRA) 2019 No GAC = No Generic Assessment Criteria value available for compound. *Area of Site of Exceedance within the development area								

The soil analysis results are considered further in the Conceptual Site Model (CSM) presented in Section 6.0 with regard to potential pollutant linkages.

5.3 Waste Classification

This investigation was not undertaken to classify materials in terms of waste disposal. Where waste disposal is intended then a specific and detailed investigation in accordance with Environment Agency Guidance WM3 may be required.

Should soils be required to be disposed of from Site, the results of the chemical analysis should be forwarded to the proposed receiving facility who will determine what criteria they will accept the waste from Site as. Further investigation in addition to specific waste acceptance criteria (WAC) analysis may be required.

If the concept design of the proposed development can demonstrate need for retention of materials on Site, such as to achieve final levels, or for landscaping purposes, then appropriate materials management planning and controls e.g. under the CL:AIRE DoW: CoP Scheme might enable site won materials to remain on Site. However, appropriate risk mitigation (as per recommendations in section 7) would be necessary.

6.0 Revised Conceptual Site Model

A revised CSM is presented in the table below and has been formulated taking into account all of the available data from the Delta-Simons intrusive investigation, suitable for a Site with a proposed public open space.

Revised Conceptual Site Model				
Source	Pathways	Receptors	Confirmed Risk?	Mitigation
PAHs in shallow Made Ground	Ingestion and/or inhalation of soil/dust and dermal contact	Human health – future site users	Yes	The Made Ground is considered to be suitable for re-use on Site, providing the pollutant linkage is broken by a suitable thickness clean cover system in soft landscaped areas, including a membrane, or the installation of hardstanding over the areas of contamination.
Asbestos in shallow Made Ground	Inhalation	Human health – future site users	Yes	The pollutant linkage with regards to asbestos can also be broken by providing a suitable thickness clean cover system, including a geotextile break layer, in soft landscaped areas or by the installation of hardstanding over the areas of contamination.

7.0 Conclusions & Recommendations

7.1 Contamination Issues

The investigation has been carried out in order to provide information on the quality of the soil and groundwater beneath the Site in the context of land contamination and potential risk to future users of the Site following the proposed redevelopment of the Site for a multi-use games area (MUGA).

7.1.1 Human Health

Asbestos has been identified on-Site within five Made Ground samples out of the 14 analysed. PAHs have been identified on-Site within nine samples out of 14 analysed. The Made Ground identified, which includes the current grassed areas, is considered suitable to re-used on Site providing the source-pathway-receptor linkage is broken. This could be achieved by the following mitigation measures:

1. **Installation of an additional clean cover layer:** An additional layer of certified clean soil, surfaced with turf, could be installed over the existing Site surface to break the pathway. It is anticipated that an additional 300mm of material would suffice, however, the thickness required should be confirmed following consultation with a horticulturalist to ensure a sufficient growing medium thickness is provided.
2. **Retention within a landscaped bund and clean cover layer:** The Made Ground identified on Site could be scraped / removed to a predetermined depth (e.g. 300mm to provide capacity for subsequent placement of the lean cover layer) and retained on site within a landscaped bund, and surfaced with a certified clean cover layer to break the pathway. However, it should be noted that this would need to be agreed with the local council at planning stage, to ensure the certainty of use for the material within the bund, and the works would need to be completed under a Materials Management Plan.
3. **Cover with hardstanding:** The Made Ground identified on Site could be covered with hardstanding rather than with soft landscaping as part of the redevelopment. However, it is understood that a soft landscaped area is required as part of the redevelopment works.

If the source-pathway-receptor linkage cannot be broken while retaining the material on-Site, off-Site disposal may be required.

Groundworkers and sub-surface maintenance workers should be made aware of the possibility of encountering contaminated soils through toolbox talks and in particular the potential presence of asbestos and an appropriate protocol to mitigate exposure of the workforce and general public should be in place. The Contractor will need to prepare a risk assessment which identifies a safe system of work to handle the asbestos containing soils which is likely to include asbestos awareness training, a protocol for unexpected finds (should gross asbestos material be identified) as well as safe working procedures such as damping down of excavations and stockpiles in line with general dust generation mitigation. The risk assessment will need to identify the appropriate levels of PPE and/or respiratory protective equipment (RPE) required. This recommendation should be captured in Site health and safety documentation and in maintenance plans.

7.2 Recommendations for Supplementary Work

Based on the findings of this report, the following recommendations for supplementary works are made;

- ▲ Preparation of a Remediation Strategy to mitigate risks to human health from the identified asbestos and PAHs.

Waste classification has not been undertaken as part of the scope of works; should it be proposed to dispose of materials from the Site then specific additional investigations may be needed to classify the materials in accordance with current regulatory requirements.

Figure 1 – Site Location Plan

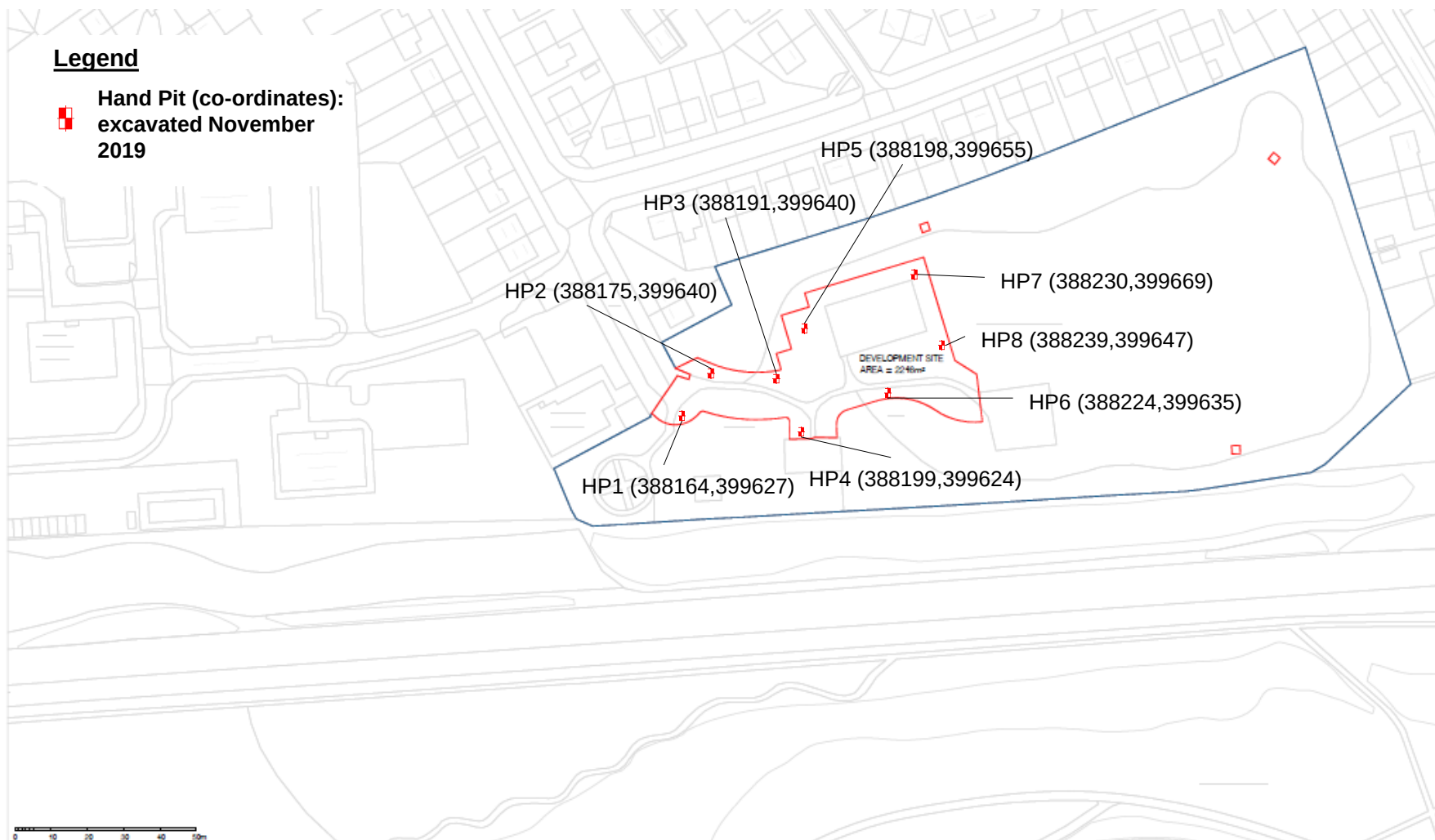


Figure 2 – Exploratory Hole Location Plan

Legend



Hand Pit (co-ordinates):
excavated November
2019



1 LOCATION PLAN
1:1250

Drawing 1 – Proposed Development Plan

Appendix A – Limitations

Limitations

The recommendations contained in this Report represent Delta-Simons professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Delta-Simons does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Due to the evolving regulatory climate specific to Per Fluoro Alkyl Substances (PFAS), the scope of works is not intended to be conclusive as it relates to the identification of any PFAS related issues. While Delta-Simons may advise its Client if Delta-Simons becomes aware of the use of PFAS at the subject property, Delta-Simons makes no representation nor accepts any liability that any or all PFAS issues have been identified and/or revealed to its client through its scope of work, as presented herein.

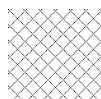
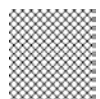
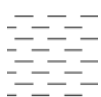
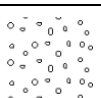
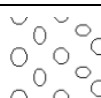
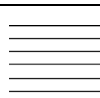
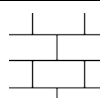
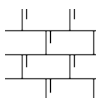
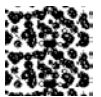
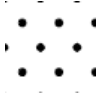
Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client and others. Delta-Simons conclusions, opinions and recommendations has been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by Delta-Simons for the sole and exclusive use of the Client and for the specific purpose for which Delta-Simons was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Delta-Simons, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Delta-Simons does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Delta-Simons from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

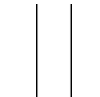
Appendix B – Exploratory Hole Logs

KEY TO BOREHOLE AND TRIAL PIT LOGS

MATERIAL LEGENDS

	Topsoil		Made Ground		Bituminous Material
	Concrete		Clay		Silt
	Sand		Gravel		Peat
	Cobbles		Boulders		Mudstone
	Siltstone		Sandstone		Limestone
	Chalk		Coal		Breccia
	Conglomerate		Igneous		Metamorphic
	Pyroclastic (volcanic ash)		Gypsum		Shale
	Ironstone		Bedrock (Unidentified)		Void

INSTALLATION/BACKFILL LEGENDS

	Sand		Gravel		Bentonite/Grout
	Arisings		Concrete		Plain Pipe
	Slotted Pipe				

Legend symbols in general accordance with BS 5930:1999+A2:2010 and standard industry practice.

KEY TO BOREHOLE AND TRIAL PIT LOGS

SAMPLE TYPES

ACM	Asbestos Containing Material Sample
B	Bulk Disturbed Sample
BLK	Block Sample
C	Core Sample
CBR	Undisturbed Sample for California Bearing Ratio Test – 154mm diameter
D	Disturbed Sample - Tub
ES	Soil Sample for Environmental Testing
EW	Water Sample for Environmental Testing
G	Gas Sample
U	Undisturbed Driven Tube Sample – 70/102mm diameter, 450mm long
W	Water Sample

TEST TYPES

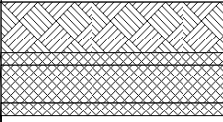
CPT	Cone Penetrometer Test (kN/m ²)
FID	Flame Ionisation Detector Test (ppm)
HV	In-Situ Hand Sheer Vane Test (kN/m ²)
PID	Photoionisation Detector Test (ppm)
SPT (S)	Standard Penetration Test – Split Spoon Sampler
SPT (C)	Standard Penetration Test – Solid 60 Degree Cone

CORE DETAILS

If	Fracture Spacing (mm) – Minimum, Average, Maximum
NI	Non-Intact where >25 fracture spacings per metre
TCR	Total Core Recovery (%)
SCR	Solid Core Recovery (%)
RQD	Rock Quality Designation (%)
AF	Air Flush Return (%)
WF	Water Flush Return (%)

WATER COLUMN DETAILS

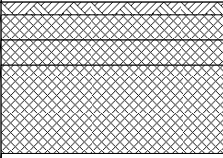
	Water Strike
	Water Level

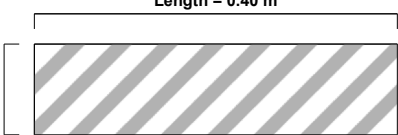
 Head Office 3 Henley Way, Doddington Road Lincoln, LN6 3QR Tel: +44 (0) 1522 882555 Email: info@deltasimons.com		Project No: 18-1673.04b		Hole ID: HP1		Page: 1 of 1			
Hand Dug Trial Pit Log		Date: 05/11/2019		Client: Manchester City F.C. City in the Community Foundation					
Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details		
					Depth (m)	Type Ref	Depth (m)	Results	
MADE GROUND: Grass over brown to dark brown clayey gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of red brick fragments, concrete, asphalt and rare wood. Fine rootlets. [TOPSOIL]. MADE GROUND: Brown mottled cream clayey gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of red brick fragments, concrete, asphalt and rare wood. [TOPSOIL]. MADE GROUND: Dark brown to black slightly clayey gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of concrete, asphalt, natural lithologies, rare brick fragments and rare coal. MADE GROUND: Asphalt. Hand pit complete at 0.45 m bgl.		0.20	78.80		0.00 - 0.20	ES	0.10	PID=0ppmv	
		0.25	78.75		0.25 - 0.40	ES	0.33	PID=2ppmv	
		0.40	78.60						
		0.45	78.55						
Dimensions and Orientation: Length = 0.30 m  Bearing: 0° Inclination: 0 Remarks: 1. Logged in general accordance with BS 5930:2015. 2. Hand excavated between ground level and 0.45 m bgl. Hole terminated in MADE GROUND due to asphalt layer. 3. Groundwater was not encountered during hand pitting. 4. No visual or olfactory evidence of contamination was encountered. 5. Hand pit backfilled with arisings in reverse order of excavation. 6. Consistency is based on finger test as defined by BS EN ISO 14688-1:2002.									
Coordinates: E388164.00 N399627.00		Elevation (mAOD): 79.00		Excavated By: Delta Simons		Plant Used: Hand Tools		Logged: TB Checked: LM Approved: Scale: 1:30	

 Head Office 3 Henley Way, Doddington Road Lincoln, LN6 3QR Tel: +44 (0) 1522 882555 Email: info@deltasimons.com		Project No: 18-1673.04b		Hole ID: HP2		Page: 1 of 1			
Hand Dug Trial Pit Log		Date: 05/11/2019		Client: Manchester City F.C. City in the Community Foundation					
Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details		
					Depth (m)	Type Ref	Depth (m)	Results	
MADE GROUND: Grass cover with frequent roots. [TOPSOIL].		0.10	78.90		0.10 - 0.35	ES	0.24	PID=0ppmv	
MADE GROUND: Brown clayey slightly gravelly fine to medium SAND Gravel is subangular fine to medium of wood, plastic and natural lithologies. [TOPSOIL].		0.35	78.65		0.35 - 0.40	ES			
MADE GROUND: Blackish brown angular fine to medium GRAVEL of natural lithologies. Slight to moderate tar odour. [SUB-BASE].		0.40	78.60						
Hand pit complete at 0.40 m bgl.									
Dimensions and Orientation:		Length = 0.30 m		Bearing: 0°		Remarks: 1. Logged in general accordance with BS 5930:2015. 2. Hand excavated between ground level and 0.4 m bgl. Hole terminated in MADE GROUND due to hard to dig layer. 3. Groundwater was not encountered during hand pitting. 4. A slight to moderate tar odour was noted between 0.35-0.4 m bgl. 5. Hand pit backfilled with arisings in reverse order of excavation. 6. Consistency is based on finger test as defined by BS EN ISO 14688-1:2002.			
Width = 0.20 m		Inclination: 0							
Coordinates: E388175.00 N399640.00		Elevation (mAOD): 79.00		Excavated By: Delta Simons		Plant Used: Hand Tools		Logged: RR	
						Checked: LM		Approved:	
								Scale: 1:30	

 Head Office 3 Henley Way, Doddington Road Lincoln, LN6 3QR Tel: +44 (0) 1522 882555 Email: info@deltasimons.com		Project No: 18-1673.04b		Hole ID: HP3		Page: 1 of 1		
		Project: Scotland Hall Road Recreation Ground, Manchester						
Hand Dug Trial Pit Log				Date: 05/11/2019		Client: Manchester City F.C. City in the Community Foundation		
Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
MADE GROUND: Grass over soft brown sandy CLAY. Sand is fine. Frequent roots. [TOPSOIL].		0.10	77.90		0.10 - 0.40	ES	0.25	PID=0ppmv
MADE GROUND: Blackish brown slightly clayey sandy angular fine to medium GRAVEL of glass, brick, clinker, wood and natural lithologies. Sand is fine to medium. Hand pit complete at 0.40 m bgl.		0.40	77.60					
Dimensions and Orientation: Length = 0.40 m Width = 0.20 m  Bearing: 0° Inclination: 0				Remarks: 1. Logged in general accordance with BS 5930:2015. 2. Hand excavated between ground level and 0.4 m bgl. Hole terminated in MADE GROUND due to hard to dig layer. 3. Groundwater was not encountered during hand pitting. 4. No visual or olfactory evidence of contamination was encountered. 5. Hand pit backfilled with arisings in reverse order of excavation. 6. Consistency is based on finger test as defined by BS EN ISO 14688-1:2002.				
Coordinates: E388191.00 N399640.00		Elevation (mAOD): 78.00		Excavated By: Delta Simons		Plant Used: Hand Tools		Logged: TB Checked: LM Approved: Scale: 1:30

Coordinates: E388199.00 N399624.00	Elevation (mAOD): 80.00	Excavated By: Delta Simons	Plant Used: Hand Tools	Logged: RR	Checked: LM	Approved:	Scale: 1:30
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 Head Office 3 Henley Way, Doddington Road Lincoln, LN6 3QR Tel: +44 (0) 1522 882555 Email: info@deltasimons.com		Project No: 18-1673.04b		Hole ID: HP5		Page: 1 of 1					
Hand Dug Trial Pit Log		Date: 05/11/2019		Client: Manchester City F.C. City in the Community Foundation							
Description of Strata MADE GROUND: Grass over soft brown sandy CLAY. Sand is fine to medium. [TOPSOIL]. MADE GROUND: Orangish brown sandy angular fine to medium GRAVEL of brick and natural lithologies. Sand is fine to medium. MADE GROUND: Black ashy fine to medium SAND. Slight tar odour. MADE GROUND: Orangish brown sandy subrounded to rounded fine to coarse GRAVEL of brick and natural lithologies. Sand is fine to medium. Hand pit complete at 0.60 m bgl.	Legend 	Strata Depth (m) 0.05 0.15 0.25 0.60	Reduced Level (mAOD) 76.95 76.85 76.75 76.40	Water Strike (m)	Sample Details Depth (m) Type Ref		Test Details Depth (m) Results				
		0.15 - 0.25 0.30 - 0.50	ES ES		0.20 0.40	PID=0ppmv PID=0ppmv					
Dimensions and Orientation: Length = 0.30 m Width = 0.30 m 		Bearing: 0° Inclination: 0		Remarks: 1. Logged in general accordance with BS 5930:2015. 2. Hand excavated between ground level and 0.6 m bgl. Hole terminated in MADE GROUND. 3. Groundwater was not encountered during hand pitting. 4. A slight tar odour was noted between 0.15 and 0.25 m bgl. 5. Hand pit backfilled with arisings in reverse order of excavation. 6. Consistency is based on finger test as defined by BS EN ISO 14688-1:2002.							
Coordinates: E388198.00 N399655.00		Elevation (mAOD): 77.00		Excavated By: Delta Simons		Plant Used: Hand Tools		Logged: RR	Checked: LM	Approved:	Scale: 1:30

 Head Office 3 Henley Way, Doddington Road Lincoln, LN6 3QR Tel: +44 (0) 1522 882555 Email: info@deltasimons.com		Project No: 18-1673.04b		Hole ID: HP6		Page: 1 of 1			
Hand Dug Trial Pit Log		Date: 05/11/2019		Client: Manchester City F.C. City in the Community Foundation					
Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details		
					Depth (m)	Type Ref	Depth (m)	Results	
MADE GROUND: Grass over soft brown sandy CLAY with frequent roots. Sand is fine. [TOPSOIL].		0.15	78.85		0.00 - 0.15	ES	0.08	PID=0ppmv	
MADE GROUND: Brown slightly clayey gravelly fine to medium SAND. Gravel is angular fine to medium of brick, glass, wood and plastic.		0.39	78.61		0.20 - 0.40	ES	0.30	PID=0ppmv	
MADE GROUND: Black angular fine to medium GRAVEL. Tar odour. (SUB-BASE).		0.40	78.60						
Hand pit complete at 0.40 m bgl.									
Dimensions and Orientation: 		Bearing: 0° Inclination: 0		Remarks: 1. Logged in general accordance with BS 5930:2015. 2. Hand excavated between ground level and 0.4 m bgl. Hole terminated in MADE GROUND due to hard to dig layer. 3. Groundwater was not encountered during hand pitting. 4. A tar odour was noted between 0.39 and 0.4 m bgl. 5. Hand pit backfilled with arisings in reverse order of excavation. 6. Consistency is based on finger test as defined by BS EN ISO 14688-1:2002.					
Coordinates: E388224.00 N399635.00		Elevation (mAOD): 79.00		Excavated By: Delta Simons		Plant Used: Hand Tools		Logged: RR Checked: LM Approved: Scale: 1:30	

 Head Office 3 Henley Way, Doddington Road Lincoln, LN6 3QR Tel: +44 (0) 1522 882555 Email: info@deltasimons.com			Project No: 18-1673.04b		Hole ID: HP7		Page: 1 of 1				
Hand Dug Trial Pit Log			Date: 05/11/2019		Client: Manchester City F.C. City in the Community Foundation						
Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details				
					Depth (m)	Type Ref	Depth (m)	Results			
MADE GROUND: Grass over soft brown sandy CLAY with frequent roots. Sand is fine. [TOPSOIL].		0.10	78.90		0.20 - 0.25	ES	0.23	PID=0ppmv			
MADE GROUND: Orangish brown angular fine to medium GRAVEL of brick.		0.20	78.80								
MADE GROUND: Black ashy fine to medium SAND.		0.25	78.75								
MADE GROUND: Firm brown mottled orange and grey slightly sandy CLAY. Sand is fine.		0.60	78.40								
Hand pit complete at 0.60 m bgl.											
Dimensions and Orientation: Length = 0.50 m Width = 0.40 m  Bearing: 0° Inclination: 0											
Remarks: 1. Logged in general accordance with BS 5930:2015. 2. Hand excavated between ground level and 0.6 m bgl. Hole terminated in CLAY. 3. Groundwater was not encountered during hand pitting. 4. No visual or olfactory evidence of contamination was encountered. 5. Hand pit backfilled with arisings in reverse order of excavation. 6. Consistency is based on finger test as defined by BS EN ISO 14688-1:2002.											
Coordinates: E388230.00 N399669.00		Elevation (mAOD): 79.00		Excavated By: Delta Simons		Plant Used: Hand Tools		Logged: RR	Checked: LM	Approved:	Scale: 1:30

 Head Office 3 Henley Way, Doddington Road Lincoln, LN6 3QR Tel: +44 (0) 1522 882555 Email: info@deltasimons.com		Project No: 18-1673.04b		Hole ID: HP8		Page: 1 of 1		
		Project: Scotland Hall Road Recreation Ground, Manchester						
Hand Dug Trial Pit Log				Date: 05/11/2019		Client: Manchester City F.C. City in the Community Foundation		
Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
MADE GROUND: Grass over soft brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to medium angular of brick. [TOPSOIL]. MADE GROUND: Brown slightly clayey gravelly fine to medium SAND with moderate cobble content. Gravel is angular to subangular fine to coarse of metal, brick, wood, asphalt, glass and natural lithologies. Hand pit complete at 0.50 m bgl.	 	0.10	77.90		0.10 - 0.50	ES	0.30	PID=0ppmv
		0.50	77.50					
Dimensions and Orientation: Length = 0.40 m Width = 0.30 m 		Bearing: 0° Inclination: 0		Remarks: 1. Logged in general accordance with BS 5930:2015. 2. Hand excavated between ground level and 0.5 m bgl. Hole terminated in MADE GROUND. 3. Groundwater was not encountered during hand pitting. 4. No visual or olfactory evidence of contamination was encountered. 5. Hand pit backfilled with arisings in reverse order of excavation. 6. Consistency is based on finger test as defined by BS EN ISO 14688-1:2002.				
Coordinates: E388239.00 N399647.00		Elevation (mAOD): 78.00		Excavated By: Delta Simons		Plant Used: Hand Tools		Logged: RR Checked: LM Approved: Scale: 1:30

Appendix C – Soil Chemical Analysis Results

**Mike Ohalloran**

Delta-Simons
Suite C1
Joseph's Well
Hanover Walk
Leeds
LS3 1AB

e: mike.ohalloran@deltasimons.com

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

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

Analytical Report Number : 19-71384

Replaces Analytical Report Number : 19-71384, issue no. 1

Project / Site name:	Scotland Hall Road	Samples received on:	08/11/2019
Your job number:	18-1673.07	Samples instructed on:	12/11/2019
Your order number:	DS50950	Analysis completed by:	04/12/2019
Report Issue Number:	2	Report issued on:	04/12/2019
Samples Analysed:	14 soil samples		

Signed: 

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

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

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

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

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

Analytical Report Number: 19-71384

Project / Site name: Scotland Hall Road

Your Order No: DS50950

Lab Sample Number	1359433	1359434	1359435	1359436	1359437
Sample Reference	HP1	HP1	HP2	HP2	HP3
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.00-0.20	0.25-0.40	0.10-0.35	0.35-0.40	0.10-0.40
Date Sampled	05/11/2019	05/11/2019	05/11/2019	05/11/2019	05/11/2019
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	17	18
Total mass of sample received	kg	0.001	NONE	1.0	1.0

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.9	7.9	7.7	7.8	7.7
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	22	35	28	31	160
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.011	0.018	0.014	0.016	0.082
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	11.0	17.7	14.1	15.6	82.2

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.38	17	0.89	2.6	0.86
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	3.1	0.42	3.4	0.45
Acenaphthene	mg/kg	0.05	MCERTS	0.73	80	3.9	16	3.3
Fluorene	mg/kg	0.05	MCERTS	0.54	52	2.4	21	2.2
Phenanthrene	mg/kg	0.05	MCERTS	4.1	410	23	230	22
Anthracene	mg/kg	0.05	MCERTS	0.95	100	20	59	5.6
Fluoranthene	mg/kg	0.05	MCERTS	8.0	550	48	280	45
Pyrene	mg/kg	0.05	MCERTS	7.9	490	44	240	43
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.6	250	24	120	22
Chrysene	mg/kg	0.05	MCERTS	3.4	240	16	99	15
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.9	270	23	110	20
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	2.1	130	8.9	43	10
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.6	250	19	99	19
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.6	110	8.3	46	8.8
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.47	37	2.3	15	2.3
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.7	130	8.7	50	9.5

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	43.0	3120	252	1440	228
-----------------------------	-------	-----	--------	------	------	-----	------	-----

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	12	21	18	18	25
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4	3.9	1.1	1.1	0.9
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	20	24	22	24
Copper (aqua regia extractable)	mg/kg	1	MCERTS	58	88	110	76	290
Lead (aqua regia extractable)	mg/kg	1	MCERTS	110	120	230	160	300
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.5	< 0.3	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16	24	25	32	33
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	220	230	210	210

Analytical Report Number: 19-71384

Project / Site name: Scotland Hall Road

Your Order No: DS50950

Lab Sample Number	1359433	1359434	1359435	1359436	1359437
Sample Reference	HP1	HP1	HP2	HP2	HP3
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.00-0.20	0.25-0.40	0.10-0.35	0.35-0.40	0.10-0.40
Date Sampled	05/11/2019	05/11/2019	05/11/2019	05/11/2019	05/11/2019
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Monoaromatics & Oxygenates

Benzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
p & m-xylene	mg/kg	0.001	MCERTS	< 0.001	0.006	< 0.001	< 0.001	< 0.001
o-xylene	mg/kg	0.001	MCERTS	< 0.001	0.004	< 0.001	< 0.001	< 0.001
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	28	< 1.0	< 1.0	1.3
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	3.0	150	12	< 2.0	8.2
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	8.0	190	45	< 8.0	26
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	43	450	150	< 8.0	90
TPH-CWG - Aliphatic >EC35 - EC40	mg/kg	10	NONE	10	84	49	< 10	22
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	54	820	200	< 10	130

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	0.035	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	6.2	34	5.4	61	2.2
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	18	320	120	140	17
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	92	1600	1200	930	170
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	210	2100	1800	1800	370
TPH-CWG - Aromatic >EC35 - EC40	mg/kg	10	NONE	52	86	310	140	85
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	330	4000	3100	2900	560

TPH (C35 - C40)	mg/kg	10	MCERTS	62	170	360	140	110
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Analytical Report Number: 19-71384

Project / Site name: Scotland Hall Road

Your Order No: DS50950

Lab Sample Number	1359438	1359439	1359440	1359441	1359442
Sample Reference	HP4	HP4	HP5	HP5	HP6
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.00-0.10	0.10-0.40	0.15-0.25	0.30-0.50	0.00-0.15
Date Sampled	05/11/2019	05/11/2019	05/11/2019	05/11/2019	05/11/2019
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	19	13
Total mass of sample received	kg	0.001	NONE	1.0	0.90

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.7	7.7	6.6	7.1	7.4
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	20	47	58	26	27
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0099	0.024	0.029	0.013	0.014
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	9.9	23.5	28.8	12.9	13.7

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	1.9	2.5	35	2.0
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.44	0.65	3.8	0.44
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	2.6	17	15	4.2
Fluorene	mg/kg	0.05	MCERTS	< 0.05	2.1	9.4	17	2.7
Phenanthrene	mg/kg	0.05	MCERTS	0.89	17	77	97	25
Anthracene	mg/kg	0.05	MCERTS	0.23	3.7	17	24	6.1
Fluoranthene	mg/kg	0.05	MCERTS	1.8	25	110	100	53
Pyrene	mg/kg	0.05	MCERTS	1.9	23	95	98	52
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.94	10	48	43	25
Chrysene	mg/kg	0.05	MCERTS	0.60	10	44	43	19
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.90	11	45	39	28
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.60	4.3	22	21	8.8
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.92	9.5	39	39	23
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.34	3.9	18	16	11
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	1.1	6.0	5.5	2.9
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.42	4.1	17	15	12

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	9.51	130	569	615	276
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	26	48	13	20
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	0.6	< 0.2	0.5	1.0
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	23	25	14	28
Copper (aqua regia extractable)	mg/kg	1	MCERTS	34	180	80	48	89
Lead (aqua regia extractable)	mg/kg	1	MCERTS	100	140	78	98	220
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.5	< 0.3	0.5	0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	24	39	55	23	43
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	88	160	83	86	190

Analytical Report Number: 19-71384

Project / Site name: Scotland Hall Road

Your Order No: DS50950

Lab Sample Number				1359438	1359439	1359440	1359441	1359442
Sample Reference				HP4	HP4	HP5	HP5	HP6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.00-0.10	0.10-0.40	0.15-0.25	0.30-0.50	0.00-0.15
Date Sampled				05/11/2019	05/11/2019	05/11/2019	05/11/2019	05/11/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Monoaromatics & Oxygenates								
Benzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
p & m-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
o-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	15	8.3	3.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	33	17	9.3
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	37	24	26
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	110	68	180
TPH-CWG - Aliphatic >EC35 - EC40	mg/kg	10	NONE	< 10	< 10	12	< 10	58
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	200	120	220

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	5.9	18	78	12
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	5.7	62	120	190	44
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	230	660	750	320
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	22	430	940	1100	1200
TPH-CWG - Aromatic >EC35 - EC40	mg/kg	10	NONE	< 10	14	12	16	94
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	36	730	1700	2100	1600

TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	14	24	19	150
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Analytical Report Number: 19-71384

Project / Site name: Scotland Hall Road

Your Order No: DS50950

Lab Sample Number	1359443	1359444	1359445	1359446	
Sample Reference	HP6	HP7	HP7	HP8	
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)	0.20-0.40	0.20-0.25	0.25-0.60	0.10-0.50	
Date Sampled	05/11/2019	05/11/2019	05/11/2019	05/11/2019	
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	12	19
Total mass of sample received	kg	0.001	NONE	1.0	0.80

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile	Chrysotile	-	Chrysotile	
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Detected	Not-detected	Detected	
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	0.011	0.002	-	< 0.001	
Asbestos Quantification Total	%	0.001	ISO 17025	0.011	0.002	-	< 0.001	

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.8	7.2	6.7	7.3	
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	24	120	85	39	
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.012	0.060	0.043	0.020	
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	12.0	60.2	42.7	19.5	

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	1.9	0.34	< 0.05	4.6	
Acenaphthylene	mg/kg	0.05	MCERTS	0.62	< 0.05	< 0.05	0.50	
Acenaphthene	mg/kg	0.05	MCERTS	5.7	< 0.05	< 0.05	13	
Fluorene	mg/kg	0.05	MCERTS	3.7	< 0.05	< 0.05	7.8	
Phenanthrene	mg/kg	0.05	MCERTS	37	0.46	< 0.05	61	
Anthracene	mg/kg	0.05	MCERTS	11	< 0.05	< 0.05	13	
Fluoranthene	mg/kg	0.05	MCERTS	81	0.94	0.31	82	
Pyrene	mg/kg	0.05	MCERTS	77	0.85	0.26	71	
Benzo(a)anthracene	mg/kg	0.05	MCERTS	37	0.45	< 0.05	32	
Chrysene	mg/kg	0.05	MCERTS	39	0.44	< 0.05	32	
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	44	0.36	< 0.05	36	
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	21	0.26	< 0.05	16	
Benzo(a)pyrene	mg/kg	0.05	MCERTS	39	0.36	< 0.05	28	
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	20	< 0.05	< 0.05	14	
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	5.6	< 0.05	< 0.05	4.6	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	23	< 0.05	< 0.05	14	

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	445	4.46	< 0.80	430	
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	20	44	12	25	
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.3	< 0.2	< 0.2	1.0	
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	29	32	35	38	
Copper (aqua regia extractable)	mg/kg	1	MCERTS	140	120	24	140	
Lead (aqua regia extractable)	mg/kg	1	MCERTS	300	36	23	250	
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	0.7	
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	37	52	34	47	
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	240	62	56	310	

Analytical Report Number: 19-71384

Project / Site name: Scotland Hall Road

Your Order No: DS50950

Lab Sample Number				1359443	1359444	1359445	1359446	
Sample Reference				HP6	HP7	HP7	HP8	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				0.20-0.40	0.20-0.25	0.25-0.60	0.10-0.50	
Date Sampled				05/11/2019	05/11/2019	05/11/2019	05/11/2019	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		
Monoaromatics & Oxygenates								
Benzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
Toluene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
Ethylbenzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
p & m-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
o-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	1.4	< 1.0	< 1.0	3.2	
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	16	< 2.0	< 2.0	19	
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	43	< 8.0	< 8.0	25	
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	290	< 8.0	< 8.0	110	
TPH-CWG - Aliphatic >EC35 - EC40	mg/kg	10	NONE	79	< 10	< 10	12	
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	350	< 10	< 10	150	
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	26	< 1.0	< 1.0	27	
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	96	< 2.0	< 2.0	180	
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	840	< 10	< 10	750	
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	2400	< 10	< 10	1200	
TPH-CWG - Aromatic >EC35 - EC40	mg/kg	10	NONE	140	< 10	< 10	28	
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	3300	< 10	< 10	2200	
TPH (C35 - C40)	mg/kg	10	MCERTS	220	< 10	< 10	40	



Analytical Report Number: **19-71384**
Project / Site name: **Scotland Hall Road**
Your Order No: **DS50950**

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

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

Quantitative Analysis

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

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

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

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1359433	HP1	0.00-0.20	101	Loose Fibres	Chrysotile	< 0.001	< 0.001
1359434	HP1	0.25-0.40	104	Loose Fibres	Chrysotile	< 0.001	< 0.001
1359443	HP6	0.20-0.40	135	Loose Fibrous Debris	Chrysotile	0.011	0.011
1359444	HP7	0.20-0.25	104	Loose Fibrous Debris	Chrysotile	0.002	0.002
1359446	HP8	0.10-0.50	100	Loose Fibres	Chrysotile	< 0.001	< 0.001

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

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1359433	HP1	None Supplied	0.00-0.20	Brown loam and clay with gravel and vegetation.
1359434	HP1	None Supplied	0.25-0.40	Brown loam and clay with gravel and vegetation.
1359435	HP2	None Supplied	0.10-0.35	Brown loam and clay with gravel and vegetation.
1359436	HP2	None Supplied	0.35-0.40	Brown loam and clay with gravel and vegetation.
1359437	HP3	None Supplied	0.10-0.40	Brown loam and clay with gravel and vegetation.
1359438	HP4	None Supplied	0.00-0.10	Brown loam and clay with gravel and vegetation.
1359439	HP4	None Supplied	0.10-0.40	Brown loam and clay with gravel and vegetation.
1359440	HP5	None Supplied	0.15-0.25	Brown loam and clay with gravel and vegetation.
1359441	HP5	None Supplied	0.30-0.50	Brown loam and clay with gravel and vegetation.
1359442	HP6	None Supplied	0.00-0.15	Brown loam and clay with gravel and vegetation.
1359443	HP6	None Supplied	0.20-0.40	Brown loam and clay with gravel and vegetation.
1359444	HP7	None Supplied	0.20-0.25	Brown loam and clay with gravel and vegetation.
1359445	HP7	None Supplied	0.25-0.60	Brown clay and sand with gravel and vegetation.
1359446	HP8	None Supplied	0.10-0.50	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 19-71384

Project / Site name: Scotland Hall Road

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L0738-PL	W	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In-house method based on BS1377 Part 2, 1990, Classification tests	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
TPH Chromatogram in Soil	TPH Chromatogram in Soil.	In-house method	L064-PL	D	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/cleanup.	L088/76-PL	W	MCERTS

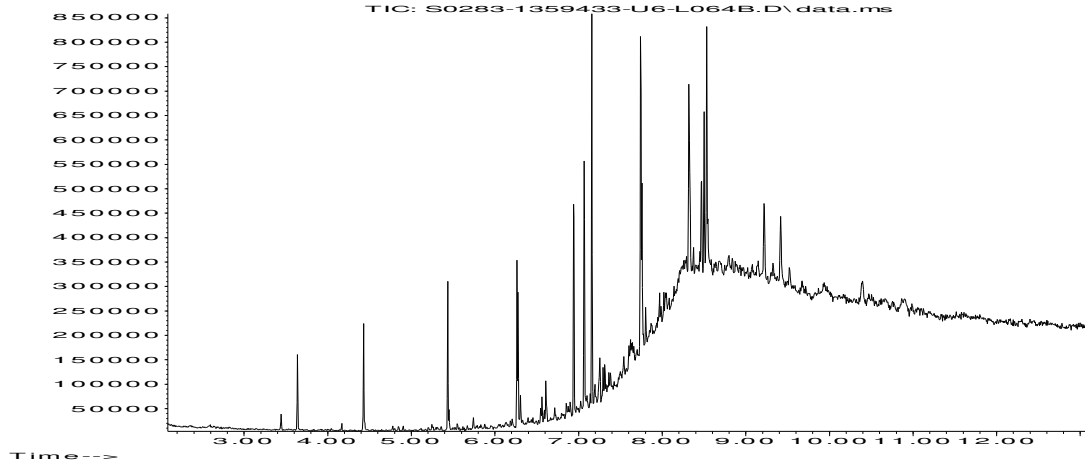
For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

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

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

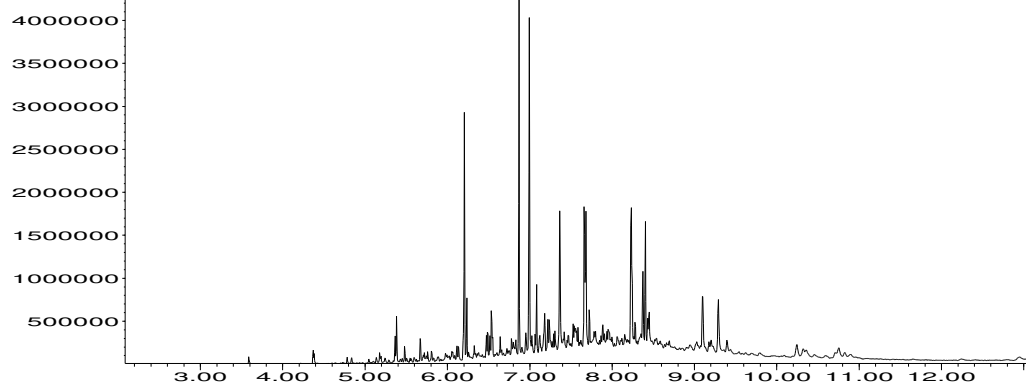
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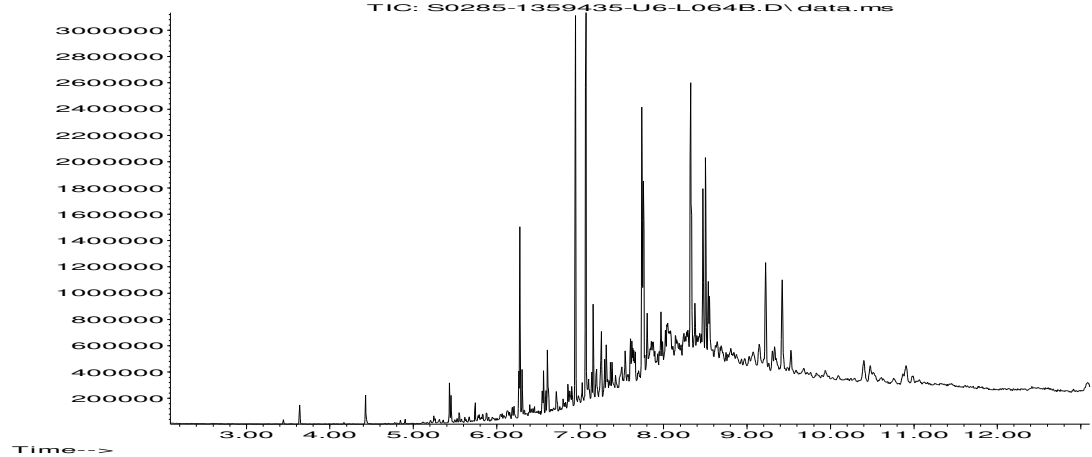
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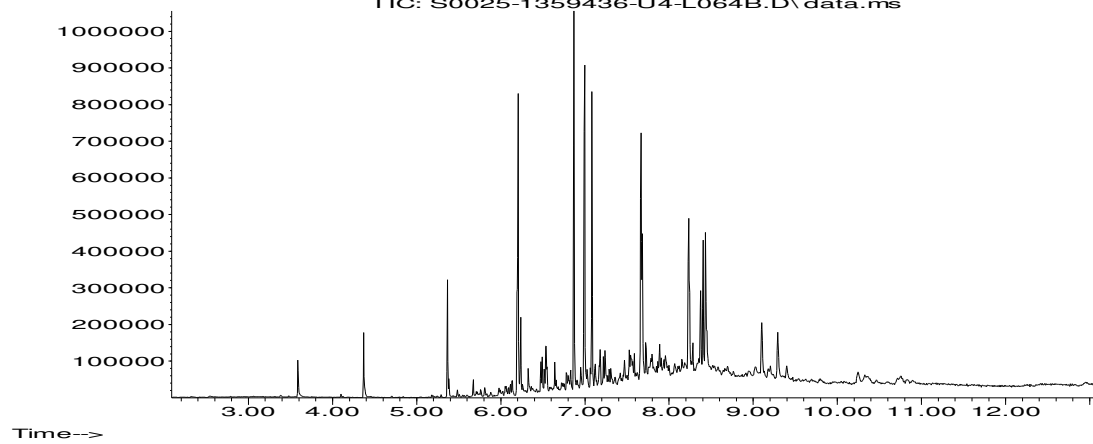
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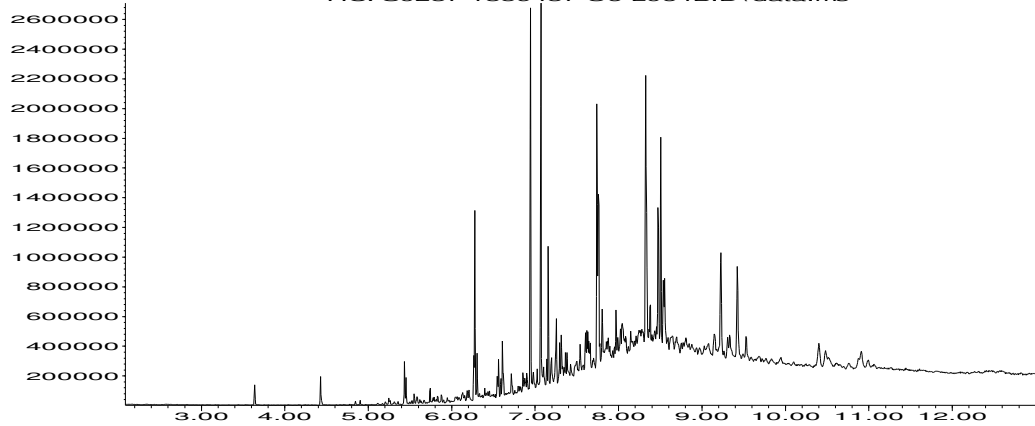
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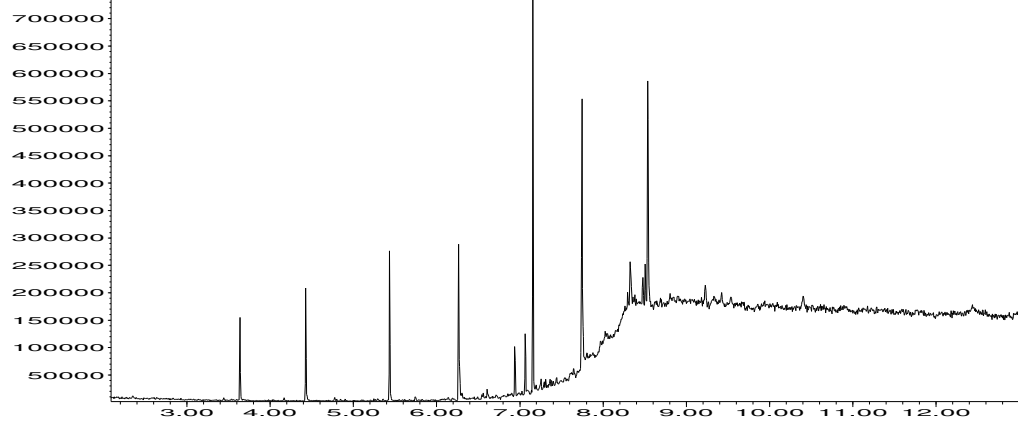
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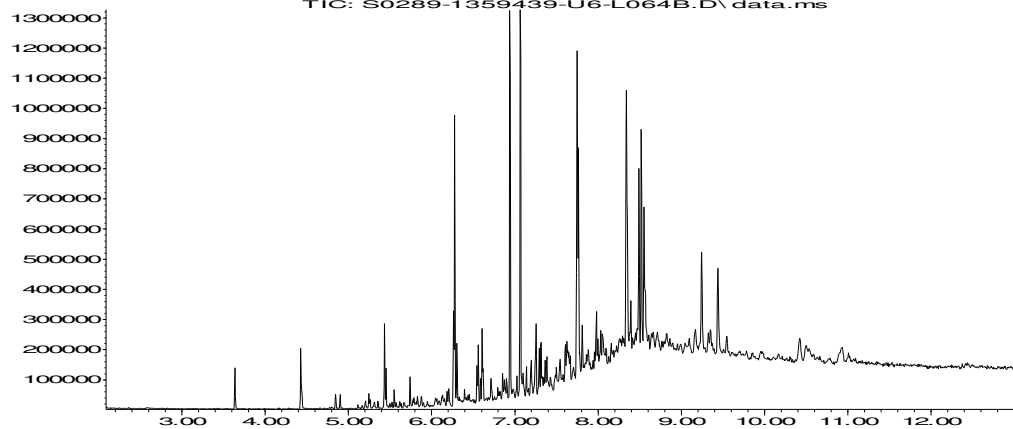
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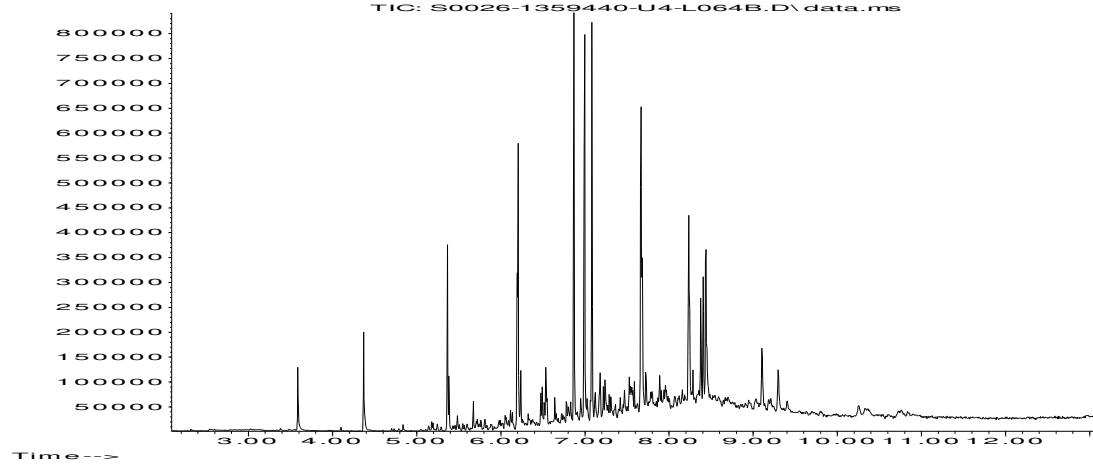
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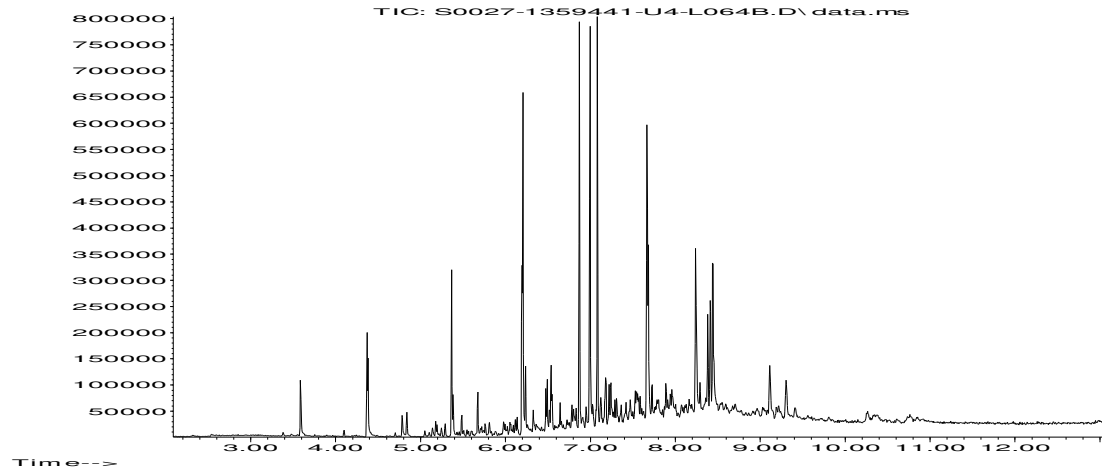
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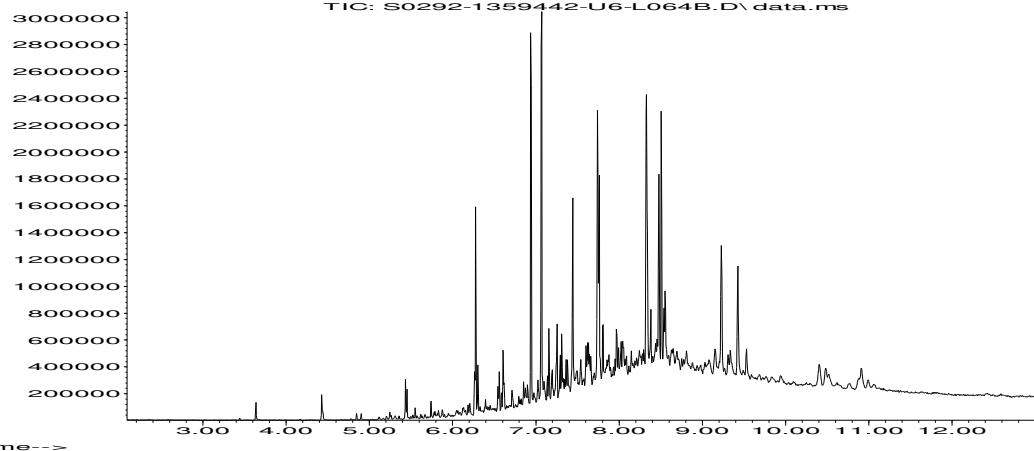
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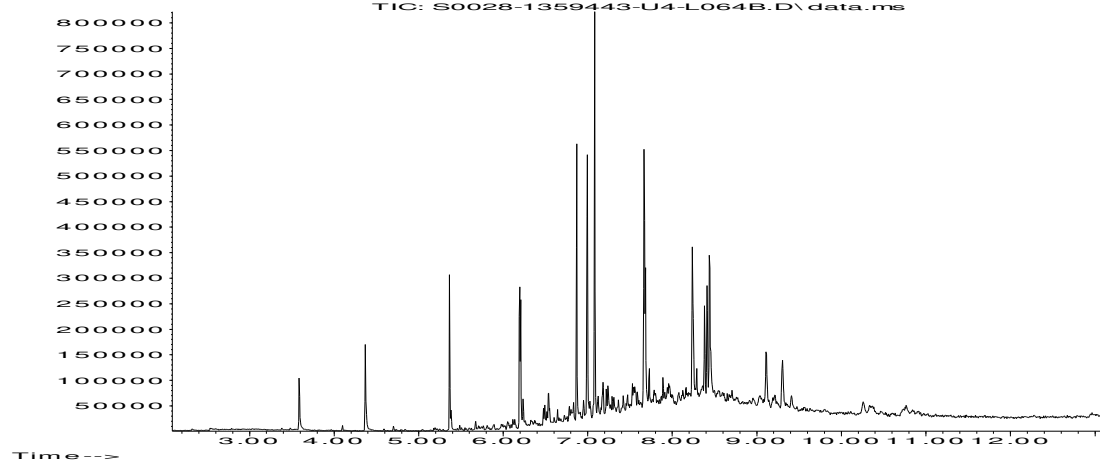
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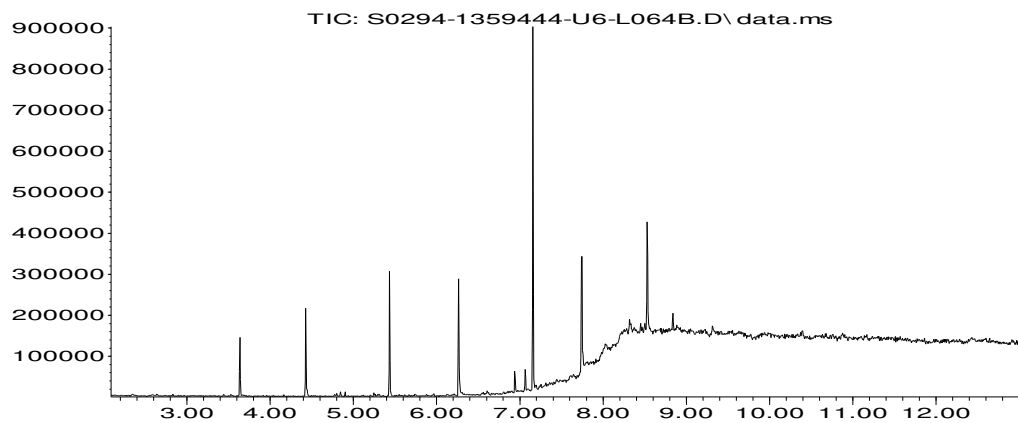
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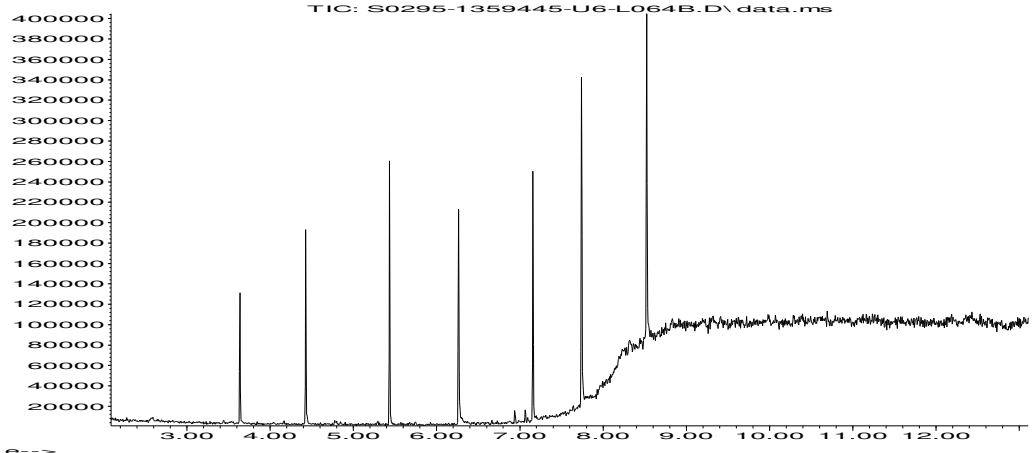


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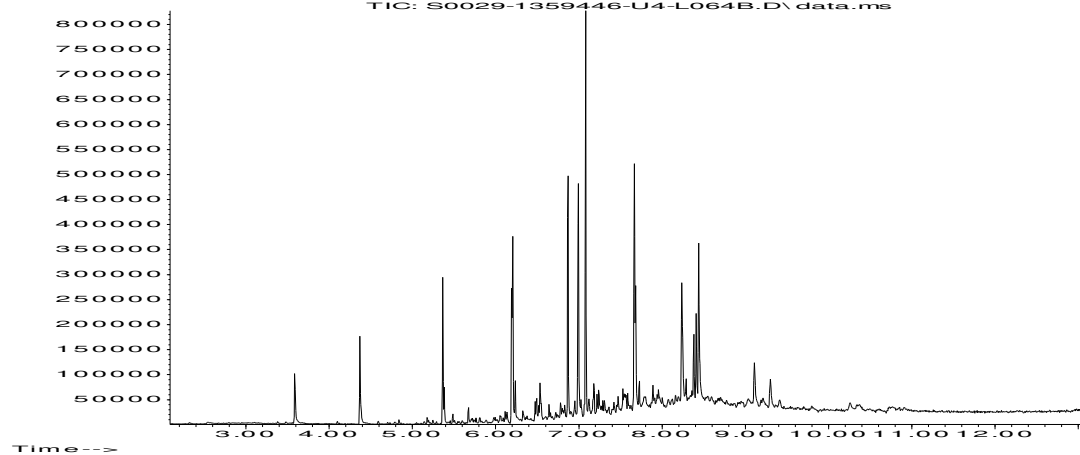
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Appendix D – Risk Definitions

Contaminated Land Risk Definitions

The following methodology is based on the methodology presented in CIRIA C552 Contaminated Land Risk Assessment: A Guide to Good Practice 2001. It requires the classification of the:

- ▲ Magnitude of the potential consequence (severity) of the Risk occurring: and
- ▲ Magnitude of the Probability (likelihood) of the Risk occurring.

The classifications are then compared to indicate the risk presented by each pollutant linkage.

Consequence to Receptor Definition Matrix

	Human Health	Controlled Waters	Buildings/Services
Severe Consequence	Acute or chronic permanent impact on human health.	Sensitive controlled water pollution ongoing, or just about to occur.	Catastrophic collapse
Medium Consequence	Chronic permanent impact on human health	Gradual pollution of sensitive controlled water	Degradation of materials
Mild Consequence	Chronic temporary impact on human health	Gradual pollution of non-sensitive controlled water	Damage to building rendering it unsafe to occupy (eg foundation damage resulting in instability).
Minor Consequence	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc).	Slight discoloration of water	Easily repairable effects of damage to buildings, structures and services, i.e discoloration of concrete

Probability Definitions

Probability	Definition in Context
Higher	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution. Positive evidence of source, pathway and receptor.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term. Suspect source, pathway, and receptor
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term No evidence of hazard, pathway, and receptor

Standard Risk Matrix

		Consequence/Magnitude of impact			
		Severe	Medium	Mild	Minor
Probability	High	Very High	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/low	Low
	Low Likelihood	Moderate	Moderate/low	Low	Very Low
	Unlikely	Moderate/low	Low	Very Low	Very Low

Classified risks and likely action

Significance Level	Definition/Comments
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required. Demonstrable contaminated land situation, highest threat & liability level, urgent action recommended.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term. Likely contaminated land situation, risk assessment and action recommended.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, if it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term. Plausible contaminated land situation, risk assessment and possible action recommended.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild. Unlikely contaminated land situation, possible risk assessment and possible action.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe. Negligible risk, no action recommended except vigilance for changes in conditions.

Geotechnical Risk Classification

The geohazards listed in the report within Section 4 follow guidance presented in Clayton, C.R.I. (2001) *Managing Geotechnical Risk*, Thomas Telford and the Highways Agency document HD22/08 '*Managing Geotechnical Risk*' (2008) which aims to identify and manage the geotechnical risks associated with a scheme throughout its lifespan, from planning to construction to maintenance.

For each geohazard the probability of the hazard occurring (P) has been considered together with the impact it would have (I) if it were to happen to calculate the risk rating between 1 and 25.

Risks that fall within Moderate, Significant and Severe categories below are considered to be **substantial** and are therefore listed within the report.

Probability	(P)		Impact	(I)		(R)	Risk
Very Likely (VLk)	5	X	Very High (VH)	5	=	20 – 25	Severe
Likely (Lk)	4		High (H)	4		15 – 19	Substantial
Plausible (P)	3		Medium (M)	3		10 – 14	Moderate
Unlikely (U)	2		Low (L)	2		5 – 9	Minor
Very Unlikely (VU)	1		Very Low (VL)	1		1 – 4	Negligible