Phase II Interpretative Ground Assessment

At

Benchill Road, Manchester

Client: Wythenshawe Community Housing Group

Reference: 33029-SUT-ZZ-00-RP-G-7201

Date: November 2023

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Phase II Interpretative Ground Assessment

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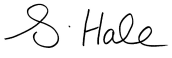
Report Reference: 33029-SUT-ZZ-00-RP-G-7201

Issue: P01 Date: November 2023

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Revision History:

Rev.	Date	Description	Prepared	Checked	Approved
P01	November 2023	Interim Report	SH	DB	WGB
		Signatures:			

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Foreword (Geotechnical and Environmental Assessment)

This report has been prepared for the sole internal use and reliance of the Client named on page 1. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Sutcliffe Investigation; such authorisation not to be unreasonably withheld. If any unauthorised third party comes into possession of this report, they rely on it at their risk and the authors owe them no duty of care and skill.

The report presents observations and factual data obtained during our site investigation and provides an assessment of Geotechnical and environmental issues with respect to information provided by the Client regarding the proposed development. Further advice should be sought from Sutcliffe Investigation prior to significant revision of the development proposals. Primary aims of this exploratory phase of investigation were to identify salient geotechnical and environmental issues affecting the site to enable the client to obtain budget costs for the necessary site preparatory and remedial works.

The report should be read in its entirety, including all associated drawings and appendices. Sutcliffe Investigation cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

The findings and opinions conveyed in this report (including review of any third-party reports) are based on information obtained from a variety of sources as detailed within this report, and which Sutcliffe Investigation believes are reliable. All reasonable care and skill have been applied in examining the information obtained. Nevertheless, Sutcliffe Investigation cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

The report represents the findings and opinions of experienced Geotechnical and environmental consultants. Sutcliffe Investigations does not provide legal advice and the advice of lawyers may also be required.

Intrusive investigation can only investigate shallow ground beneath a small proportion of the total site area. It is possible therefore that the intrusive investigation undertaken by Sutcliffe Investigation, whilst fully appropriate, may not have encountered all significant subsurface conditions. Any opinions expressed as to the possible configuration of strata between, or below exploratory holes are for guidance only and no responsibility is accepted as to its accuracy.

It should be borne in mind that the timescale over which the investigation was undertaken might not allow the establishment of equilibrium groundwater levels. Particularly relevant in this context is that groundwater levels are susceptible to seasonal and other variations and may be higher during the wetter periods than those encountered during this commission.

Where the report refers to the potential presence of invasive weeds such as Japanese Knotweed, or the presence of asbestos containing materials, it should be noted that the observations are for information only and should be verified by a suitably qualified expert.

This report assumes that ground levels will not change significantly from those existing at present. If this is not to be the case, then some modification to this report may be required.

It should be noted that the banning of the co-disposal of hazardous and non-hazardous waste was introduced in 2011, as a result of the implementation within the UK of the Landfill Directive. This will considerably affect the current practices and procedures for the handling and disposal of wastes, in particular hazardous wastes. In addition, it will be a requirement for all wastes to be pre-treated and to comply with certain waste acceptance procedures prior to sending wastes to landfill. The full potential effects of these important changes are not known at this stage, but it is perceived that disposal costs will rise, particularly for hazardous wastes, and waste pre-treatment may, in some cases, become an ‘additional’ redevelopment cost with regard to the remediation of contaminated sites.

Should this report recommend materials could be excavated and removed off-site for landfill disposal, then it should be noted that the costs, timescales and implications of the pending changes to waste management legislation could not be predicted at this stage. Sutcliffe Investigation will not be responsible for changing practices, etc that may affect the viability of necessary remedial actions or of the implications of potential alternative treatment techniques.

Sutcliffe Investigation reserves the right to amend their conclusions and recommendations in the light of further information that may become available. General notes and limitations relevant to all Sutcliffe Investigations are described in the Foreword and should be read in conjunction with this report.

Executive Summary

INTRODUCTION	Sutcliffe Investigations were instructed by Wythenshawe Community Housing Group (the "client") to undertake a Phase II ground assessment for the site at Benchill Road, Manchester, M22 8LF. This report assesses the ground based geotechnical and environmental risks, constraints and liabilities associated with the proposed development of the site. This is required in support of the discharge of contaminated land planning conditions assigned to the site and to allow the design of economic foundation solutions.
SITE DESCRIPTION	The site is irregular in shape, 0.53ha in area and can be accessed via Rothley Avenue and Benchill Avenue to the west and south of the site respectively. The site comprises a large one-storey building with associated hardstanding that covers the majority of the site. The building is mixed-use, this includes two home care centres, offices and a massage parlour. Most of the hardstanding is used for car parking. A small building and a few cargo containers are noted on the south-eastern section of the site. Areas of soft landscaping cover the outskirts of the site. Two telephone masts are noted on the southern edges of the site and are connected via an overhead cable running E/W. Three tall posts with security cameras are dotted in the northern, south-western and eastern corners of the site. Metal fencing marks the perimeter for the majority of the site.
DEVELOPMENT PROPOSAL	The proposed development for the site is for 23No. residential properties with associated gardens and vehicle parking facilities.
PRELIMINARY CONCEPTUAL MODEL	Historical maps have indicated that a few buildings and woodland were noted in the southern and northern sections of the site respectively from 1877 to 1960 when the site was cleared. Part of a pond was noted encroaching onto the south-western corner of the site from 1877 to 1935. By 1990 a large building was noted in the centre of the site and is still present on-site. Historical aerial photography dated 2000 shows hardstanding on-site used for vehicle parking. With the exception of Made Ground and minor volumes of hydrocarbon contamination potentially being present on-site, the potential for significant / gross contamination to have arisen at the site as a result of the current and former usage on site is considered to be low.
PREVIOUS WORKS	Sutcliffe have completed a Phase I Desk Study, a synopsis of which is provided in Section 2 of this report. No other previous studies are known to have been undertaken to Sutcliffe's knowledge.
SITE INVESTIGATION	Field works were undertaken on 9th – 11th October 2023 by VC Drilling and PM Sampling, specialist ground investigation contractors and comprised: - 10No. Window Sample Holes (WS101-WS110) - 1No. Cable Percussion Boreholes (BH101)* - 2No Soakaway Tests - 2No. Pipeline Risk Assessment Tests - Contamination samples from various depth in the Made Ground and Topsoil. - Leachate samples. - Geotechnical Samples - Gas monitoring wells. - Monitoring of ground gas / ground water with installed locations. * Although this was attempted, the machine was unable to penetrate the concrete and the hole was abandoned.
GROUND CONDITIONS	Made Ground: Made Ground comprised of Topsoil and Asphalt over light brownish grey, very sandy, angular fine to coarse GRAVEL OF LIMESTONE (SUBBASE), dark brown, slightly silty, slightly clayey, slightly gravelly, fine to medium SAND. Gravel is angular to sub rounded, fine to coarse of brick, ash and mixed lithologies and dark brown slightly silty, slightly gravelly, fine to medium SAND with frequent rootlets (grass over topsoil) Gravel is fine to medium, angular to sub rounded of mixed lithology including glass. Concrete was also only noted in BH101.

	Natural Ground: Natural ground comprised of brown / grey / orange / red clayey, gravelly, silty fine SAND. Gravel is angular to sub angular fine to coarse of mixed lithologies including sandstone, medium dense becoming very dense, reddish brown, mottled grey, slightly clayey, slightly silty, slightly gravelly, fine SAND. Gravel is angular to sub angular, fine to coarse of sandstone and weak, laminated, brown / orange / grey / red, silty, clayey, highly weathered, fine SANDSTONE – recovered as gravelly, fine SAND.
GROUNDWATER	Groundwater was not encountered during the site investigation.
SOIL INFILTRATION	During site investigation works 2No. Soakaway tests were undertaken. Both tests failed and alternative drainage solutions will be required.
ENVIRONMENTAL RISK ASSESSMENT	Long Term Human Health The statistical analysis for C16 to C21 Aromatic and C21 to C35 Aromatic exceeded contaminants indicates that there is a very high probability that the true mean concentrations are below the critical concentrations and Sutcliffe are confident that these contaminants are unlikely to pose a site wide risk to human health. However, the statistical analysis for Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(ah)anthracene exceeded contaminants indicates that there is a very high probability that the true mean concentrations are above the critical concentrations and Sutcliffe are confident that these contaminants are likely to pose a site wide risk to human health. Based on the above, site wide remediation and validation will be required to ensure the site is suitable for the proposed end user and there is no longer any risk to long term human health. Controlled Waters – Groundwater Resources The UK DWS Leachate screening identified concentrations of Arsenic, Lead and Benzo(a)pyrene that could pose a risk to the Secondary B Aquifer. However, due to the likely depth of groundwater and the effects of natural attenuation, the risk is unlikely to be significant. Controlled Waters – Surface Water Resources The EQS Leachate screening identified concentrations of Copper, Lead, Zinc, Anthracene, Fluoranthene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Benzo(ghi)perylene and Indeno(123cd)pyrene that could pose a risk to the local surface water features. However, the nearest surface water feature is noted 205m north of the site, and relates to a stream, as such the risk is unlikely to be significant.
ASBESTOS	Asbestos containing materials (ACM) were not observed within samples screened.
GROUND GAS RISK ASSESSMENT	Based on the recorded ground gas levels to date with a number of readings for Carbon Dioxide exceeding the 5% threshold value, the site will currently be classified as a Characteristic Situation 2 indicating gas protection measures will currently be required. However, this is based on only 2No. monitoring visits and a final assessment will be made on completion of the ground gas monitoring.
RADON	According to the Envirocheck Report, the site is not within a radon affected area, as <1% of homes are above the action level hence no radon protection measures are necessary.
GEOTECHNICAL ASSESSMENT	General It is understood that consideration is being given to the development of residential properties with associated garden areas and infrastructure. Due to the ground conditions encountered it would be Sutcliffe's recommendation that traditional strip footings are recommended. No groundwater ingress was recorded during site investigation works. Sub-surface concrete that is only in contact with Made Ground can be Design Sulphate Class DS-1, with an ACEC Classification of AC-1s. Ground Floor Construction Based upon the amount of Made Ground noted on site it is not recommended that a ground-bearing slab is utilised on site. Sutcliffe Investigations therefore propose a suspended P.C Unit ground floor be adopted. Geotechnical Uncertainty The site has been subject to previous development and therefore, the potential for relic foundations and obstructions cannot be discounted.

	Additionally, during site investigation works, the concrete in the area of BH101 could not be penetrated.
WASTE CLASSIFICATION	As discussed above, the Waste Classification Report states that soils sampled at WS101 (0.10-0.40m bgl) are classified as 'Hazardous Waste' due to the exceedance of Total TPH (C6 to C40) at 2890mg/kg. All remaining soils analysed are classified as 'Non-Hazardous' waste. Notwithstanding, the final decision on waste classification is determined by the accepting landfill, and consultation with landfill operators be carried out during the development of the SMMP.
RECOMMENDATIONS	The following actions are recommended: - Design a Phase III Remediation & Validation Proposal for submission to planning department. - Design SMMP – management of material on and off site. - Post Demolition Sampling. - Good hygiene practices should be employed during construction work, in addition, the findings of this investigation should be included within the contractors H&S file and an assessment of risks associated with short term human health completed. No consumption of food or smoking should occur without prior hand washing. If dust is encountered, dust masks should be worn, and dust suppression employed.

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1 Introduction

1.1 Terms of Reference

Sutcliffe Investigations were instructed by Wythenshawe Community Housing Group (*the "client"*) to undertake a Phase II ground assessment for the site at Benchill Road, Manchester, M22 8LF.

A plan detailing the sites existing site layout is presented as *Drawing Ref. 8933-MDA-ST-XX-DR-A-901* produced by Michael Dyson Associates Ltd.

This report assesses the ground based geotechnical and environmental risks, constraints and liabilities associated with the proposed development of the site. This is required in support of the discharge of contaminated land planning conditions assigned to the site and to allow the design of economic foundation solutions.

1.2 Development Proposal & Legislative Context

Development Proposal

The proposed development for the site is for 23No. residential properties with associated gardens and vehicle parking facilities. The proposed development is presented as *Drawing Ref: 8933-MDA-ST-XX-DR-A-902 REV B* produced by Michael Dyson Associates Ltd.

Legislative Context

The presence of contaminants which may pose a risk to human health, or the environment is a material planning consideration. For planning it should be considered whether the site is suitable for its new use, and the responsibility for securing a safe development (including cumulative effects of pollution on health, and the potential sensitivity of the proposed development to adverse effects from pollution,) rests with the developer and/or landowner. Planning is concerned with the site's proposed use not its current use, where the amount of contamination is expected to be low relative to the level of risk. This is the opposite to Part 2A which considers high levels (significant harm) and the current use of the site.

Section 57 of the Environment Act 1995 adds Part 2A (ss.78A-18YC) to the Environmental Protection Act 1990 and contains the legislative framework for identifying and dealing with contaminated land. Where development is undertaken on land which may be affected by contamination, the National Planning Policy Framework, paragraph 120 to 122 considers pollution and remediation. This links the contaminated land regime within the development process.

For there to be an environmental liability associated with the site there must be a perceived source (a contaminant), a receptor (humans, living organisms or property) and a pathway between them. The potential presence of all of these aspects would result in a complete contaminant linkage.

In accordance with environmental legislation and the associated guidelines, assuming the site is to be redeveloped as housing, it should be noted that any redevelopment of the site could actually create new pathways that could increase the liabilities associated with the

site. In addition, the basis of the intrusive ground assessment is to refine the preliminary conceptual model.

1.3 Site Location and Setting

The site is located at Benchill Road, Manchester, M22 8LF at National Grid Reference (NGR) 382600, 388380, within a predominantly residential area.

A location plan and aerial photograph of the site are shown as *Figure 1 & 2*.

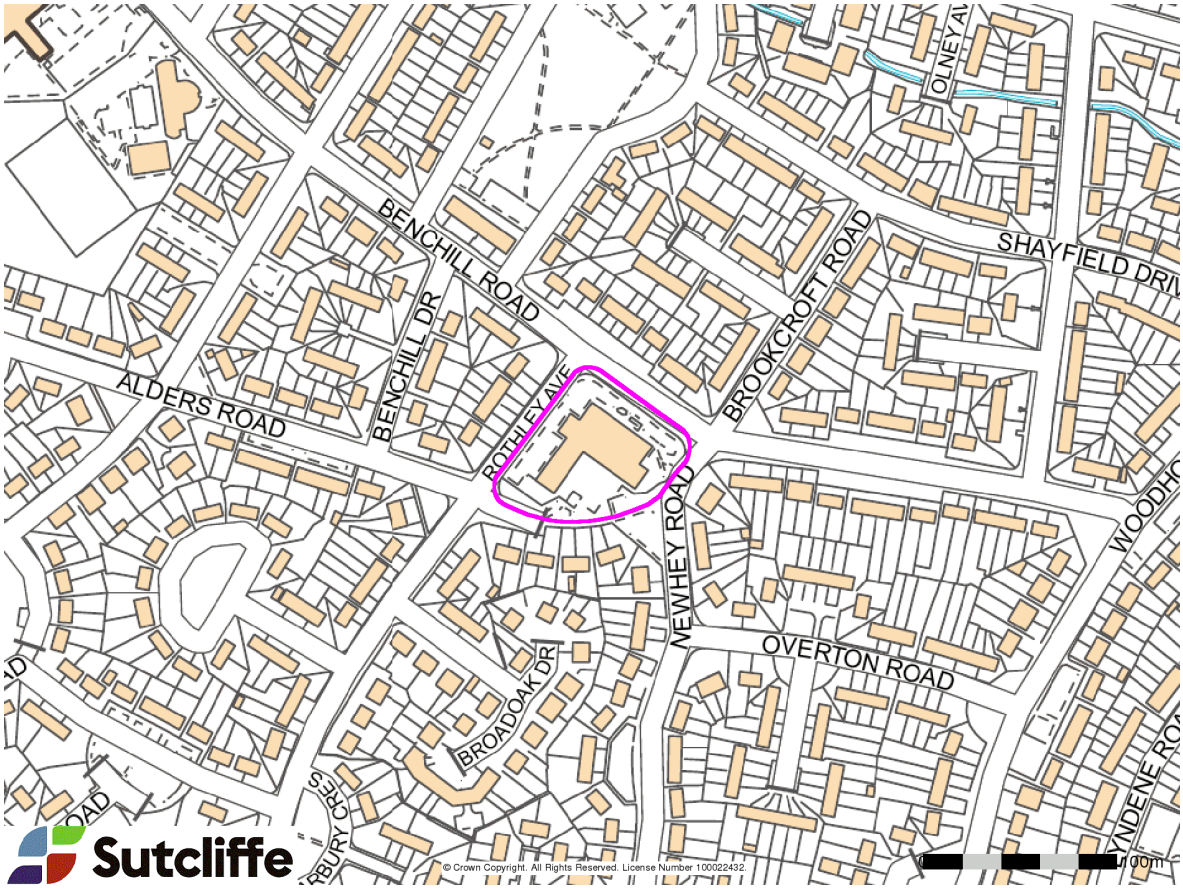


Figure 1: General Location of Site

1.4 Site Description and Layout

The site is irregular in shape, 0.53ha in area and can be accessed via Rothley Avenue and Benchill Avenue to the west and south of the site respectively. The site comprises a large one-storey building with associated hardstanding that covers the majority of the site. The building is mixed-use, this includes two home care centres, offices and a massage parlour. Most of the hardstanding is used for car parking. A small building and a few cargo containers are noted on the south-eastern section of the site. Areas of soft landscaping cover the outskirts of the site.

Two telephone masts are noted on the southern edges of the site and are connected via an overhead cable running E/W. Three tall posts with security cameras are dotted in the northern, south-western and eastern corners of the site. Metal fencing marks the perimeter for the majority of the site.

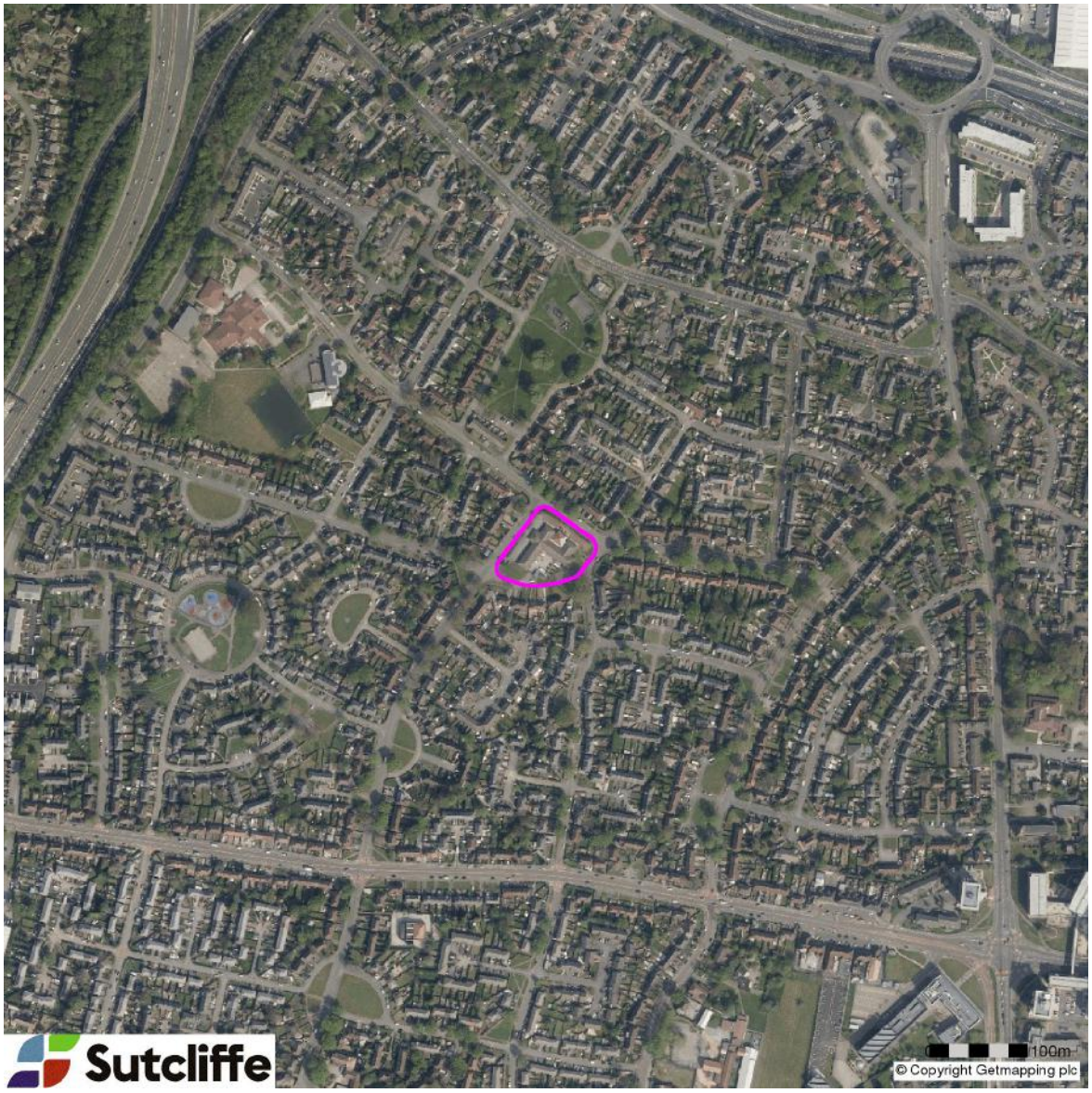


Figure 2: Aerial Photograph of the Site

1.5 Previous Studies

Sutcliffe have completed a Phase I Preliminary Risk Assessment (PRA). (*Report Reference: 33029-SUT-ZZ-00-RP-G-7101*), a synopsis of which is provided in *Section 2* of this report. No other previous studies are known to have been undertaken to Sutcliffe's knowledge.

1.6 Objectives & Scope of Assessment

The aim of the intrusive ground investigation is to identify potential geotechnical & environmental liabilities and constraints, associated with the development of the site area in support of the following:

- A planning application and the discharge of contaminated land conditions where reasonably practicable that may have been assigned to the site and to include the design of a remediation scheme, if required as part of the National Planning Policy Framework (NPPF).
- To assess the likelihood of reuse of materials that are site won or disposal options for surplus material.

- The preliminary design of detailed and economic foundations options inclusive of all information and specifications relating to foundation types, the location of underlying rock, (if encountered), preparation of ground, concrete grades, reuse of materials for both the proposed building, and the existing foundations.

2 Preliminary Conceptual Risk Assessment

2.1 Introduction

The Phase I PRA completed by Sutcliffe is summarised below. This report should be read in conjunction with Report Ref.: *33029-SUT-ZZ-00-RP-G-7101.*

2.2 Site History

On-site

The earliest available historical map (1877) showed the site comprised a few buildings of unknown use in the southern half of the site and woodland in the northern half of the site. A pond was noted to encroach onto the south-western corner of the site however, it was no longer mapped by the 1934 – 1935 mapping. No significant changes were noted until the 1960 mapping when the buildings and woodland were no longer mapped. By 1977 a small building of unknown use was noted in the south-eastern section of the site. By 1990 the small building was no longer mapped, and a large building was noted in the centre of the site. By 1999 slight changes were noted to the building footprint. The aerial photography dated 2000 showed hardstanding on-site was used for vehicle parking. No further significant changes or features were noted on-site from the available historical mapping.

Offsite

The earliest historical map dated 1877 showed the surrounding area of the site comprised predominantly of field land along with woodland areas, ponds and sporadic dwellings. Woodland was noted immediately north of the site and a road was noted adjacent to the site's southern boundary. Ponds were noted immediately west of the site, 200m west and 230m south-west of the site. A bundle of ponds were noted 190m south-south-west of the site. A stream running NW/SE was noted 205m north-north-east of the site.

By 1898 two more ponds were noted 180m south of the site and 225m south-east of the site. The pond located 200m west of the site was no longer mapped. By 1934 – 1935 mapping showed significant residential expansion within the immediate vicinity of the site in all surrounding directions. All ponds noted previously were no longer mapped.

No significant changes occurred until the 2006 mapping when an area of residential properties noted 150m west of the site were no longer mapped. No other significant changes or features were noted off-site from the available historical mapping.

Historical Contamination Potential

Site

Historical maps have indicated that a few buildings and woodland were noted in the southern and northern sections of the site respectively from 1877 to 1960 when the site was cleared. Part of a pond was noted encroaching onto the south-western corner of the site from 1877 to 1935. By 1990 a large building was noted in the centre of the site and is still present on-site.

Historical aerial photography dated 2000 shows hardstanding on-site used for vehicle parking.

With the exception of Made Ground and minor volumes of hydrocarbon contamination potentially being present on-site, the potential for significant / gross contamination to have arisen at the site as a result of the current and former usage on site is considered to be low. However, the possibility of contamination albeit likely to be localised cannot be discounted.

Surrounding Area

No identifiable significant potentially contaminative activities were identified as having taken place in the immediate surrounding area.

Therefore, the potential for off-site sources of contamination to impact the site is considered low.

2.3 Geotechnical Constraints

Coal Mining

The site is not within a coal mining area. No further action was required to assess the risks associated with coal mining assets.

Geology

No records of artificial ground or faults have been identified within the development site boundary or within 500m of the site. No action is required with respect to foundation design.

Historical Land Use

The site has been subject to previous development and therefore, the potential for relic foundations and obstructions cannot be discounted.

2.4 Potential Contaminant Linkages

Sources

Based on the information from the desk study, historical maps, published information, and a site walkover a summary of potential contaminant sources is provided in *Table 2.1*.

Table 2.1: Potential Source(s) of Contamination

Ref.	Potential Sources	Potential Contaminants
S1 (On-site)	Made Ground associated with existing and historic buildings, as well as infilled pond.	All metals, fuel, hydrocarbons, PAHs oils and localised ground gas.
	Hydrocarbon leaks associated with vehicle parking.	Hydrocarbons, PAHs and TPHs.

S1 (On-site)

Made Ground associated with the existing structure is anticipated below site. By its nature, Made Ground can contain a wide range of potentially contaminated material which may also generate leachate. A minor pollution incident did occur on-site in 1997 with oils polluting a freshwater stream.

Vehicle parking is evident onsite associated with the sites previous use. As such, hydrocarbons could have been introduced to the site via leaking of vehicles parked on-site which may pose a risk to human health. A vapour risk may also be present, dependent on the volume of hydrocarbons present. Any such leaks / spills are anticipated to be relatively minor / small in scale.

Pathways

Exposure pathways are the potential routes and mechanisms by which potential on-site sources could be linked to the identified potential receptors and thereby expose them to potential harm.

The following potential exposure pathways have been identified at the site:

Table 2.2: Pathways

Ref.	Pathway	Description
P1	Direct contact with potential contaminants.	Dermal absorption, ingestion and inhalation of contaminants via direct contact. Construction workers may come into contact during the site works, however this will be for a short time and therefore limited exposure will occur. PPE can be used and worn as a precaution to reduce the risk.
P2	Ingestion of potential contaminants.	
P3	Inhalation of potential contaminants.	
P4	Leaching and migration of contaminants.	Migration off-site may be likely due to the presence of the impermeable Devensian Till potentially facilitating lateral migration of perched groundwater. Onsite drainage may be at risk from shallow contamination if present.
P5	Vertical and lateral migration of ground gases / vapours.	Hydrocarbon spills / leaks may be present but are unlikely to translate into a vapour risk due to anticipated low volumes. No permanent gas sources are envisioned onsite; the thickness of Made Ground is not anticipated deep enough to pose a permanent gas risk. No viable sources of offsite permanent gas sources or migration pathways to site envisioned.

P1-P3 (Direct contact)

Soft landscaping is planned within the proposed development. If Made Ground containing contaminative material is present onsite, human health risks to future site users may be present if such Made Ground is left in situ in the planned soft landscaped areas.

P4 (Leaching & Migration)

Groundwater on site is anticipated to be perched water as opposed to a water table, and not in hydraulic conductivity with the underlying Bedrock Aquifer due to the anticipated presence of a significant thickness of impermeable Devensian Till. As such downward migration of any potential leachates generated is not envisioned. The aquifer designations for the superficial deposits and bedrock are both low sensitivity receptors.

Downward migration of potential small-scale hydrocarbon spillage is also unlikely due to the existing hardstanding acting as a barrier.

Lateral migration of any leachates generated may be possible, percolating rainwater is likely to be perched on top of the impermeable Devensian Till which has the potential to migrate laterally.

P5 (Migration of ground gas / vapours)

Made Ground thicknesses are expected to be relatively limited given the development present onsite. As such, it is considered unlikely that a thickness of Made Ground capable of generating significant thickness of permanent gases will be present, and consequently the risks to human health from permanent gases generated on-site is considered to be low.

While the potential for hydrocarbon contamination on site is thought possible, volumes expected are anticipated to be relatively low, and as such are considered unlikely to pose a viable human health risk from any vapours released for future site users.

Receptors

Based on the site's environmental setting and the proposed future end-use of the area following redevelopment, the following potential receptors have been identified:

Table 2.3: Receptors

Ref.	Receptor	Description
R1	Current & future site users	Site users; personnel, general workers and maintenance workers,
R2	Construction Workers	Contractors working on the development of the site. Construction workers, maintenance workers or other personnel who may be directly exposed to contaminated materials in the course of their activities).
R3	Controlled Waters	Surface water features and on-site drainage
R4	Adjacent Site Users	Adjacent site users. Third-party land (i.e. the possibility of contamination migrating off-site onto third party land via contaminated groundwater, surface water run-off).
R5	Infrastructure / Buried services	Proposed buildings and buried services

R1

The site is proposed to have a residential end-use, considered to be a vulnerable end-user due to elevated potential exposure times.

R2

Construction works will be required for any redevelopment.

R3

Secondary Undifferentiated Aquifer and Secondary B Aquifers have been identified below site, which are both considered to be relatively vulnerable receptors.

R4

The site is surrounded by residential houses, considered to be relatively vulnerable receptors.

R5

The proposed development will be founded below ground level and will be in contact with any soils below ground level.

2.5 Risk Evaluation

An evaluation of the risk that each contaminant linkage poses to the project (as identified in the *Section 2*) has been undertaken, in general accordance with CIRIA guidance document C552, 2001 (as detailed in *Appendix B*) and in *Tables 2.4*, *2.5* and *2.6* below.

The evaluation and resultant actions identified are based on available information presented within the Phase I PRA (*Report reference: 33029-SUT-ZZ-00-RP-G-7101*)

Table 2.4: Classification of consequence

Classification	Definition
Severe	Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters.
Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures.
Mild	Pollution of non-sensitive waters, minor damage to buildings or structures.
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non-sensitive ecosystems or species.

Table 2.5: Classification of Probability

Classification	Definition
High Likelihood	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.
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

Classification	Definition
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.

Table 2.6: Risk Assessment Matrix

Consequence					
Severe	Medium	Mild	Minor		
Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk	High Likelihood	Probability
High Risk	Moderate Risk	Moderate / Low Risk	Low Risk	Likely	
Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk	Low Likelihood	
Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk	Unlikely	
Low Risk	Very Low Risk	Very Low Risk	Very Low Risk	Negligible Likelihood	

Each potential contaminant linkage is identified in *Table 2.7* below.

The evaluation and the resultant actions identified are based on the available information presented within this report. A visual representation of the Preliminary CSM is presented as *Figure 3.*

During the development there is a potential for short term human health risk to construction workers. These should be assessed and anticipated by the contractor under CDM Regulations 2015.

Table 2.7: Preliminary Risk Evaluation of Potential Contaminant Linkages

1. Hazard Identification		2. Hazard Assessment				3. Risk Estimation		4. Risk Evaluation	5. Managing the Risk
Contaminant Source		Pathway		Receptor		Consequence	Probability	Classification	Action required
S1	Potentially contaminated soil on-site	P1	Dermal contact	R1/2	Site users	Medium	Likely	Moderate Risk	It is possible that harm could arise to a designated receptor from an identified hazard. Investigation is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
		P2	Ingestion of soil / soil dust	R1/2	Site users	Medium	Likely	Moderate Risk	
		P3	Inhalation of vapours / soil gas	R1/2	Site users	Severe	Likely	High Risk	
		P4	Leaching and migration of contaminants	R3/5	Secondary B Aquifer	Medium	Low	Moderate / Low Risk	
		P5	Vertical and lateral migration of ground gases / vapours.	R1	Site users	Severe	Unlikely	Moderate / Low Risk	
				R4	Property	Severe	Unlikely	Moderate / Low Risk	

3 Ground Investigation

3.1 Design Rationale

The aim and design of the ground assessment is to satisfy planning conditions assigned to the site by reference to the National Planning Policy Framework (NPPF). This will identify elevated concentrations of determinands with the aim of assessing long term human health risks to site users and groundwater resources. In addition, the works have been designed to allow the design of economic foundation solutions for the proposed new builds.

3.2 Fieldwork

Field works were undertaken on 9th – 11th October 2023 by VC Drilling and PM Sampling, specialist ground investigation contractors and comprised:

- 10No. Window Sample Holes (WS101-WS110)
- 1No. Cable Percussion Boreholes (BH101)*
- 2No Soakaway Tests
- 2No. Pipeline Risk Assessment Tests
- Contamination samples from various depth in the Made Ground and Topsoil.
- Leachate samples.
- Geotechnical Samples
- Gas monitoring wells.
- Monitoring of ground gas / ground water with installed locations.

* Although this was attempted, the machine was unable to penetrate the concrete and the hole was abandoned.

All works were supervised by a suitably qualified Sutcliffe engineer. The investigation was carried out in general accordance with the following standards:

- BS10175:2011+A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice;
- R&D Technical Report P5-066/TR Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination, 2001 (Environment Agency).
- BS 5930:2015 Code of practice for site investigations; and,
- BS EN ISO 22475-1:2006 Geotechnical investigation and testing. Sampling methods and groundwater measurements. Technical principles for execution.

Site Investigation logs collated as part of the ground investigation completed by Sutcliffe are presented in *Appendix C.*

3.3 Health & Safety

Service plans for the development site have been obtained and are included as part of the Phase I PRA. Copies of these plans are maintained on site by the Sutcliffe engineer who is also responsible for clearing the areas to be investigated by use of a Cable Avoidance Tool (CAT) and signal generator (Genny).

3.4 Sampling Strategy

Due to the history of the site, with limited development having occurred, a non-targeted sampling strategy was used to obtain a site wide representation of the site and the potential contamination issues. The only exception to this was a sample was taken from the southwestern corner of the site where the former pond encroached onto the site, this was also for the purpose of installing a ground gas monitoring well.

The site area is 5,300m^2 ÷ 8 sample positions = 662.50m^2 ÷ 0.8 = 828.13

√828.13m^2 = a 28.78m grid.

Therefore, this gives an 80% probability of finding a circular area of interest of 828.13m^2.

A summary of exploratory hole detailing rationale is shown in *Table 3.1* below.

Table 3.1: Summary of Site Activities

Ref. No.	Location Rationale	Method	Completed Depth (mbgl)	Installation Details	Testing & Sampling details
WS101	General Site Coverage (HH, CW, GG)	Window Sampler	2.39	Standpipe installed to 1.50m bgl	SPTs, Small bulk samples
WS102	General Site Coverage (HH)	Window Sampler	1.78	No installation	SPTs, Small bulk samples
WS103	General Site Coverage (HH, UU)	Window Sampler	1.61	No installation	SPTs, Small bulk samples
WS104	General Site Coverage (HH, CW, GG)	Window Sampler	2.40	Standpipe installed to 2.00m bgl	SPTs, Small bulk samples
WS105	General Site Coverage (HH)	Window Sampler	2.40	No installation	SPTs, Small bulk samples
WS106	General Site Coverage (HH, CW)	Window Sampler	1.61	No installation	SPTs, Small bulk samples
WS107	General Site Coverage (HH)	Window Sampler	2.30	No installation	SPTs, Small bulk samples
WS108	General Site Coverage (GG)	Window Sampler	2.09	No installation	SPTs, Small bulk samples
WS109	General Site Coverage (GG)	Window Sampler	1.59	Standpipe installed to 1.00m bgl	SPTs, Small bulk samples
WS110	General Site Coverage (HH, CW, UU)	Window Sampler	1.59	No installation	SPTs, Small bulk samples
SA101	Infiltration Test	JCB	1.50	-	-
SA102	Infiltration Test	JCB	1.95	-	-

Ref. No.	Location Rationale	Method	Completed Depth (mbgl)	Installation Details	Testing & Sampling details
BH101*	-	-	-	-	-

GG – Ground Gas / CW – Controlled Water / HH – Human Health / UU – Pipeline Risk Assessment

* Although this was attempted, the machine was unable to penetrate the concrete and the hole was abandoned.

A plan detailing the position of sampling locations on an existing layout of the site is presented as *Drawing Ref. 33029-SUT-ZZ-00-DR-G-7251.*

3.5 Chemical Laboratory Testing

Selected soil samples (Made Ground & Topsoil) were collected at various depths and horizons and submitted for chemical analysis, details of which are presented in *Table 3.2.*

Table 3.2: Summary of Soils Analysis (Total & Leachate Concentrations)

Suite Reference	Analysis Suite
Soils Suite	Metals suite, speciated (16) polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons according to the Total Petroleum Hydrocarbon Working Group (TPHCWG), asbestos screen, total cyanide, phenols and soil organic matter.
Leachate	Metals suite, speciated (16) PAHs.
Pipline RA Suite	EPH CWG, VOCs, SVOCs, VPH CWG, Ph, Electrical Conductivity and Redox Potential

All samples were analysed by MCERTS accredited soil analysis laboratory Envirolab under UKAS accredited methods. All samples have been taken in accordance with current British Standards.

Envirolab are appropriately accredited for the works required and are an approved supplier under the Sutcliffe's Quality Management System.

Analytical test certificates are presented in *Appendix D.*

TPH Speciated aromatic and aliphatic bands with BTEX analysis have been carried out in line with the TPHCWG. The toxicity and migration risk associated with a TPH is dependent on the specific aliphatic aromatic carbon banding.

Of particular concern are the low molecular weight compounds, which are highly mobile and show a greater level of toxicity that the higher molecular weight compounds. Therefore, a low TPH consisting of low molecular weight aliphatic and aromatic carbon banding compounds may present more of a risk than a high TPH consisting of heavy weight aliphatic and aromatic carbon banding compounds.

Based on the TPHCWG the aromatic band C5 – C7 is considered to consist only of Benzene and the aromatic band C7 – C8 of Toluene. Therefore, the more specific BTEX analysis has been used for risk assessment rather than the aromatic bands.

3.6 Drainage

It is recommended that the client / developer contact United Utilities with respect to capacity in existing foul and surface water sewers in the vicinity of the development area.

3.7 Water Supply

Sutcliffe have carried out 2No. Pipeline Risk Assessment tests on soil samples collected at proposed pipeline depth. Results of this testing have indicated that Barrier Pipe will be required.

3.8 Services

It is recommended that the client / developer contact the relevant service provided to ascertain the requirements for power reinforcement and / or relocation / diversion of existing services.

4 Ground Model

4.1 General

The following section describes the ground conditions encountered during the intrusive ground assessment completed by Sutcliffe.

4.2 Made Ground / Topsoil

A summary of the strata depths and thicknesses for Made Ground and Topsoil is detailed in Table 4.1 and Table 4.2 below.

Table 4.1: Ground Conditions Encountered (Made Ground)

Strata	Depths encountered (mbgl)		Thickness (m)		
	Min	Max	Min	Max	Average
TOPSOIL	0.00	0.70	0.70	0.70	0.70
MADE GROUND	0.00	1.00	0.25	1.00	0.61

Table 4.2: Ground Conditions Encountered (Made Ground – Detailed)

Strata	Depths encountered (mbgl)		Thickness (m)		
	Min	Max	Min	Max	Average
Dark brown, slightly silty, fine to medium SAND with frequent rootlets (Grass over topsoil)[1]	0.00	0.70	0.70	0.70	0.70
Asphalt[2]	0.00	0.10	0.10	0.10	0.10
Light brownish grey, very sandy, angular fine to coarse GRAVEL OF LIMESTONE (SUBBASE).[2]	0.10	0.40	0.15	0.30	0.22
Dark brown, slightly silty, slightly clayey, slightly gravelly, fine to medium SAND. Gravel is angular to sub rounded, fine to coarse of brick, ash and mixed lithologies.[3]	0.00	1.00	0.35	0.85	0.56
Dark brown slightly silty, slightly gravelly, fine to medium SAND with frequent rootlets (grass over topsoil) Gravel is fine to medium, angular to sub rounded of mixed lithology including glass.[4]	0.00	0.40	0.15	0.40	0.28
Concrete[5]**	0.00	1.90**	1.90	1.90	1.90

[1] Only encountered in WS107.
[2] Encountered in WS102-WS106 and SA101.
[3] Not encountered in WS102-103, WS107 & WS109.
[4] Only encountered in WS108-109 & SA102
[5] Only encountered in BH101.
*** Final Depth of Strata not proven, average thickness on identified ground.*

4.3 Natural Ground

A summary of the strata depths and thicknesses for natural ground is detailed in *Table 4.3* and *4.4* below.

Table 4.3: Ground Conditions Encountered (Natural – General)

Strata	Depths encountered (mbgl)		Thickness (m)		
	Min	Max	Min	Max	Average
SAND	0.25	2.01	0.30	1.20	0.86
SANDSTONE (recovered as SAND)	1.00	2.40	0.16	0.70	0.48
SANDSTONE	1.00	1.60	0.60	0.60	0.60

Table 4.4: Ground Conditions Encountered (Natural – Detailed)

Strata	Depths encountered (mbgl)		Thickness (m)		
	Min	Max	Min	Max	Average
Brown / grey / orange / red clayey, gravelly, silty fine SAND. Gravel is angular to sub angular fine to coarse of mixed lithologies including sandstone.[1**]	0.25	2.01**	0.30	1.20	0.83
Medium dense becoming very dense, reddish brown, mottled grey, slightly clayey, slightly silty, slightly gravelly, fine SAND. Gravel is angular to sub angular, fine to coarse of sandstone.[2**]	0.40	1.59**	1.30	1.59	1.45
Weak, laminated, brown / orange / grey / red, silty, clayey, highly weathered, fine SANDSTONE – recovered as gravelly, fine SAND. [3**]	1.00	2.40**	0.16	0.70	0.48

[1] Not encountered in WS109.
[2] Only encountered at two locations – WS104 & WS109.
3 Not encountered in WS108 & WS109
*** Final Depth of Strata not proven, average thickness on identified ground.*

4.4 Standard Penetration Tests (SPT)

The standard penetration test (SPT) is used to provide geotechnical engineering properties for foundation design purposes. The results can be used to determine the relative density, bearing capacity, and settlement of granular soil. The results can also be used to correlate the approximate strength of cohesive soil.

The SPT results are detailed in *Table 4.5* and *Figure 4* hereunder.

Table 4.5: SPT Results

Strata	No. of Tests	Range / Value	Average
SAND	8	12-50	28.9
SANDSTONE	8	50	50

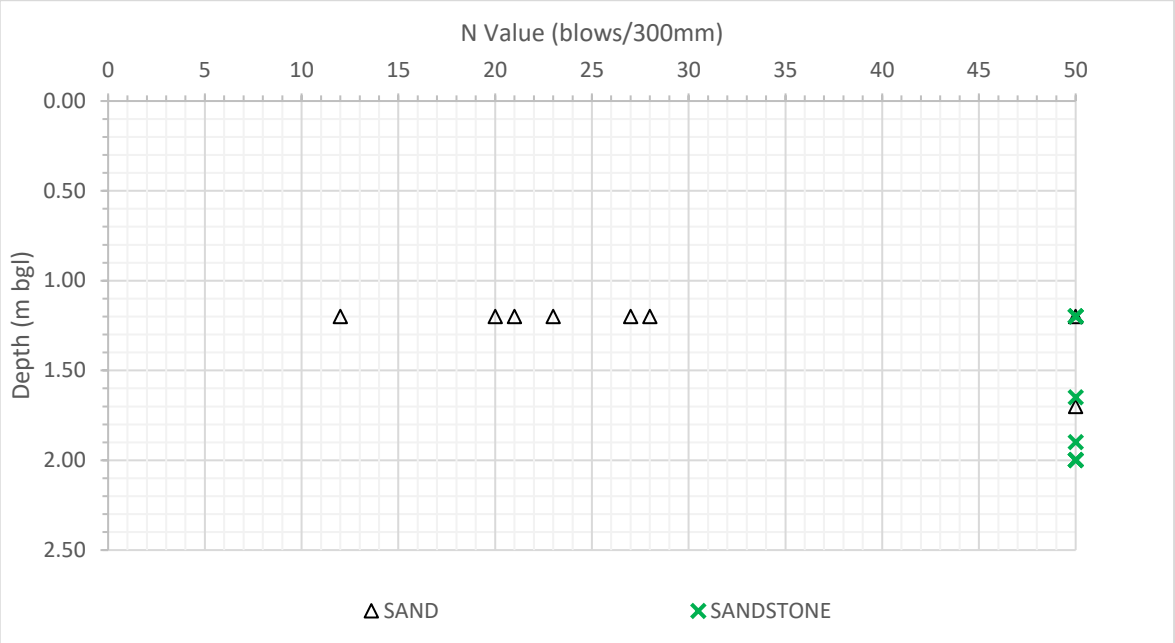


Figure 4: SPT Results

4.5 Field Evidence of Contaminated Soils

Made Ground was noted within every investigation location conducted. Within the Made Ground, addition contamination indicators were also noted:

Table 4.6: Field Evidence of Contaminated Soils

Ref. No.	Depth	Contamination Indicator
WS104	0.25 – 0.80	Ash
WS105	0.40 – 0.80	Ash
WS106	0.40 – 0.75	Ash
WS108	0.15 – 1.00	Ash

Apart from the above instances, no other visual or olfactory contamination indicators were noted during the site investigation.

4.6 Groundwater

Groundwater was not encountered during the site investigation.

5 Geotechnical Laboratory Testing and Assessment

5.1 General

In total 6No. samples were recovered from site for the purpose of geotechnical laboratory testing. A breakdown of the testing scheduled is set out in *Table 5.1* below.

Table 5.1: Geotechnical Testing

Ref. No.	Depth (m)	Particle Size Distribution
WS101	1.20	✓
WS102	0.50	✓
WS104	1.20	✓
WS106	0.80	✓
WS109	0.40	✓
WS110	0.60	✓

5.2 Particle Size Distribution

PSD testing was scheduled on 6No. samples recovered from site. The result of this testing is outlined below in *Table 5.2*.

Table 5.2: PSD Test Results

Borehole Number	Depth (m)	Sieve Percentage (%)		
		Gravel	Sand	Silt/Clay
WS101	1.20	21	61	18
WS102	0.50	6	50	44
WS104	1.20	4	28	68
WS106	0.80	6	44	50
WS109	0.40	12	60	28
WS110	0.60	4	50	46

The results of this testing are comparable with the observed ground conditions encountered during the site investigation.

5.3 Soil Infiltration

During site investigation works 2No. Soakaway tests were undertaken. Both tests failed and alternative drainage solutions will be required.

5.4 Stability

No evidence of instability was noted in the exploratory holes that were undertaken on site; however, it is noted that these were only small diameter holes and that due to the amount of Made Ground noted on-site shoring would likely be required if any groundworks are to be left open during site works.

5.5 Soluble Sulphate and pH

It is envisaged foundations will extend through the Made Ground and into the natural strata and samples taken from the Made Ground have been submitted for pH and water-soluble sulphate (2:1 soil/water extract) analysis.

The highest water-soluble sulphate concentration and the lowest pH value for the Made Ground is shown in *Table 5.3.*

Table 5.3: Soluble sulphate and pH classification

Soil Type	Lowest pH Values	Highest Soluble Sulphate Concentration (g/l)
Made Ground	6.82	<0.01

Therefore, in accordance with Table C2 of BRE: Special Digest 1 2005, sub-surface concrete that is in contact with Made Ground should be Design Sulphate Class **DS-1**, with the ACEC classification of **AC-1s**.

A complete set of geotechnical laboratory certificates are presented in *Appendix F*.

5.6 Foundation Recommendations

General

It is understood that consideration is being given to the development of residential properties with associated garden areas and infrastructure.

Due to the ground conditions encountered it would be Sutcliffe's recommendation that traditional strip footings are recommended.

No groundwater ingress was recorded during site investigation works.

Sub-surface concrete that is only in contact with Made Ground can be Design Sulphate Class DS-1, with an ACEC Classification of AC-1s.

Ground Floor Construction

Based upon the amount of Made Ground noted on site it is not recommended that a ground-bearing slab is utilised on site. Sutcliffe Investigations therefore propose a suspended P.C Unit ground floor be adopted.

Designated Concrete Mixes

The following designated mix in accordance with BRE Special Digest SD1 and BS 8500: Part1: 2015 will be suitable for use on this site.

Table 5.4: Designated Concrete Mixes

Application	DS-1 Conditions (Made Ground and Natural) ACEC Class AC-1s
Unreinforced strip / trench fill footings	GEN1
Reinforced strip / trench fill footing (mesh reinforcement)	RC30

Reinforced strip / trench fill footings (rebar etc)	RC30
Unreinforced concrete floor slabs	GEN2
In situ reinforced concrete floor slabs	RC30

**Note: Although RC 30 is in line with BS8500, Sutcliffe Investigation recommend the use of RC35 for concrete used in structurally sensitive works, to provide greater certainty of compliance with strength verification tests. Tolerable mixes dispatched by a batching plant are +/- 10%, and delays on site can also result in deterioration of the concrete.*

5.7 Geotechnical Uncertainty

The site has been subject to previous development and therefore, the potential for relic foundations and obstructions cannot be discounted.

Additionally, during site investigation works, the concrete in the area of BH101 could not be penetrated.

6 Long Term Human Health Risk Assessment

6.1 Methodology

Based on the Preliminary Risk Assessment and Ground Model for this site, a Generic Quantitative Risk Assessment for human health has been undertaken in accordance with LCRM and SR (SC050021 series) (DEFRA) guidance as well as CL:AIRE Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration (2020) and comprises the following:

- Selection of appropriate generic screening values for human health assessment.
- Creation of relevant datasets from which to undertake the assessment.
- Assessment of contamination distribution and comparison of site data to screening values using relevant statistical tests (in accordance with CIEH guidance).
- Assessment of risks to receptors.
- Determination of requirements for further investigation or remediation.

6.2 Selection of Soil Screening Values

Soil screening values appropriate for a *Residential with Plant Uptake end use* were selected.

6.3 Creation of Relevant Datasets

As part of the desk study assessment and Preliminary Conceptual Model, Made Ground was identified as the principal potential source identified for contamination in the risk evaluation, with the potential for hydrocarbon leaks associated with vehicle parking. (Section *2.0*). Consequently, the sampling strategy targeted Made Ground encountered on site.

6.4 Identification of Contaminants of Concern

The results of the soil analysis from the investigation are shown in *Appendix D.* These results were then compared against the relevant GACs for 2.5% soil organic matter (S.O.M.). The average percentage S.O.M. was 2.99% for 8No. samples.

Elevated levels of contamination were recorded in two samples taken from site when assessed against the *2.5%* S.O.M. *Residential with Plant Uptake* end use values.

Table 6.1: Chemical Analysis Results for Made Ground

Contaminant	Threshold Value (mg/kg)	Location	Depth (m bgl)	Recorded Concentration (mg/kg)
C16 to C21 Aromatic	540	WS101	0.10-0.40	986
C21 to C35 Aromatic	1500	WS101	0.10-0.40	1560
Dibenzo(b)fluoranthene	3.3	WS101	0.10-0.40	8.17
		WS106	0.40-0.75	7.13
Benzo(a)pyrene	2.7	WS101	0.10-0.40	6.65
		WS106	0.40-0.75	5.95
Dibenzo(ah)anthracene	0.28	WS101	0.10-0.40	0.83

Contaminant	Threshold Value (mg/kg)	Location	Depth (m bgl)	Recorded Concentration (mg/kg)
		WS106	0.40-0.75	0.70

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6.5 Assessment

The soil analytical data has been assessed following CL:AIRE guidance, LCRM and NHBC R&D Publication 66 2008 *"Guidance for the Safe Development of Housing on Land Affected by Contamination".*

The purpose of human health risk assessment for planning is to decide whether the land is suitable for the proposed end use and does not pose a risk to human health.

Statistical analysis in accordance with CL:AIRE publication *Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration (2020)* was used to assist in answering the key question raised above.

Utilising the 2-way confidence interval method, the likelihood of whether the true mean is less than the critical concentration can be calculated and aid with decision making in terms of further investigation or remediation.

This assessment will be using an 85% confidence interval to state that:

*Sutcliffe are **85%** confident that the true mean concentration (μ) for the contaminant lies between **x** mg/kg and **y** mg/kg.*

A 99% confidence interval will be used to state that:

*Sutcliffe are **99%** confident that the true mean concentration (μ) for the contaminant does not lie outside of **x** mg/kg and **y** mg/kg.*

Results of the Statistical analysis is presented in *Appendix D.*

6.6 Statistical Analysis

C16 to C21 Aromatic

There was 1No. exceedance of the C16 to C21 Aromatic screening value from the sample analysed at WS101. The critical concentration of this contaminant is **540mg/kg.**

Statistical Analysis of the sample screened for this contaminant indicated that:

- Sutcliffe are 85% confident that the true mean concentration (μ) for C16 to C21 Aromatic lies between 0.00mg/kg and 271.89mg/kg.
- Sutcliffe are 99% confident that the true mean concentration (μ) for C16 to C21 Aromatic does not lie outside of 0.00mg/kg and 435.68mg/kg.

C21 to C35 Aromatic

There was 1No. exceedance of the C21 to C35 Aromatic screening value from the sample analysed at WS101. The critical concentration of this contaminant is **1500mg/kg.**

Statistical Analysis of the sample screened for this contaminant indicated that:

- Sutcliffe are 85% confident that the true mean concentration (μ) for C21 to C35 Aromatic lies between 6.13mg/kg and 498.87mg/kg.
- Sutcliffe are 99% confident that the true mean concentration (μ) for C21 to C35 Aromatic does not lie outside of 0.00mg/kg and 761.26mg/kg.

Benzo(b)fluoranthene

There were 2No. exceedances of the Benzo(b)fluoranthene screening value from samples analysed at WS101 & WS106. The critical concentration of this contaminant is **3.3mg/kg.**

Statistical Analysis of samples screened for the contaminant indicate that:

- Sutcliffe are 85% confident that the true mean concentration (μ) for Benzo(b)fluoranthene lies between 0.13mg/kg and 4.07mg/kg.
- Sutcliffe are 99% confident that the true mean concentration (μ) for Benzo(b)fluoranthene does not lie outside of 0.00mg/kg and 6.37mg/kg.

Benzo(a)pyrene

There were 2No. exceedances of the Benzo(a)pyrene screening value from samples analysed at WS101 & WS106. The critical concentration of this contaminant is **2.7mg/kg.**

Statistical Analysis of samples screened for the contaminant indicate that:

- Sutcliffe are 85% confident that the true mean concentration (μ) for Benzo(b)fluoranthene lies between 0.12mg/kg and 3.36mg/kg.
- Sutcliffe are 99% confident that the true mean concentration (μ) for Benzo(b)fluoranthene does not lie outside of 0.00mg/kg and 5.25mg/kg.

Dibenzo(ah)anthracene

There were 2No. exceedances of the Dibenzo(ah)anthracene screening value from samples analysed at WS101 & WS106. The critical concentration of this contaminant is **0.28mg/kg.**

Statistical Analysis of samples screened for the contaminant indicate that:

- Sutcliffe are 85% confident that the true mean concentration (μ) for Benzo(b)fluoranthene lies between 0.01mg/kg and 0.40mg/kg.
- Sutcliffe are 99% confident that the true mean concentration (μ) for Benzo(b)fluoranthene does not lie outside of 0.00mg/kg and 0.64mg/kg.

Based on the results of the statistical analysis, Sutcliffe are not confident that the true mean concentration lies below the critical concentration.

6.7 Discussion

The statistical analysis for C16 to C21 Aromatic and C21 to C35 Aromatic exceeded contaminants indicates that there is a very high probability that the true mean concentrations are below the critical concentrations and Sutcliffe are confident that these contaminants are unlikely to pose a site wide risk to human health.

However, the statistical analysis for Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(ah)anthracene exceeded contaminants indicates that there is a very high probability that the true mean concentrations are above the critical concentrations and Sutcliffe are confident that these contaminants are likely to pose a site wide risk to human health.

Based on the above, site wide remediation and validation will be required to ensure the site is suitable for the proposed end user and there is no longer any risk to long term human health.

6.8 Asbestos

Asbestos containing materials (ACM) were not observed within samples screened.

6.9 Conclusions

Based on the results of the statistical analysis, the site does pose a risk to human health, and remediation works will be required as part of the development to ensure that the site is suitable for occupation and no longer poses a risk to human health.

7 Controlled Waters Risk Assessment

7.1 Methodology

Based on the Preliminary Risk Assessment and Ground Model for this site, a Level 1 Screening Assessment has been undertaken in general accordance with Environment Agency guidance Environment Agency Remedial Targets Methodology, Hydrogeological Risk Assessment for Land Contamination, 2006.

The methodology comprises:

- Identification of potential contaminant linkages.
  - Selection of appropriate generic screening values for controlled waters.
  - Screening measured concentrations of leachate against the generic screening values available for UK Drinking Water Standards (UK DWS) and Environmental Quality Standards (EQS).
- Assessment of contaminant distribution and risk to receptors.
  - Identification of contaminants of concern and relevant contaminant linkages.
  - Identification of potential contaminants and contaminant linkages which are no longer of concern.

7.2 Identification of Potential Contaminant Linkages

Contaminant linkages have been identified in *Section 2.0* between the Made Ground and the underlying aquifer.

7.3 Selection of Generic Screening Values

Screening values for Drinking Water Standards (DWS) have been used to assess leachability. DWS are relevant to potable receptors (Secondary B Aquifer).

Environmental Quality Standards (EQS) screening values have been used to assess risks to surface water resources. The nearest surface watercourse relates to a stream 205m north of the site.

7.4 Leachate Screening – UK DWS & EQS

Metals, TPHCWG and Speciated PAHs were assessed. Exceedances of relevant UK DWS and EQS screening criteria were encountered, details of which are identified in *Table 7.1 & 7.2.* It should be noted that several determinands have limits of detection greater than their respective screening values. Due to the level of uncertainty associated with such results, these exceedances are not considered significant and are excluded from the table below.

Table 7.1: Leachate Exceedances Summary - DWS

Determinant	DWS Threshold (µg/l)	Range of concentrations (µg/l)	Location	Depth (m bgl)	Recorded Concentration (µg/l)
Arsenic	10	3-0.10	WS104	0.40-0.80	10
Lead	10	29-57	WS101	0.10-0.40	44
			WS104	0.40-0.80	57
			WS106	0.40-0.75	29
			WS110	0.00-0.60	37
Benzo(a)pyrene	0.01	<0.01-0.44	WS101	0.10-0.40	0.44
			WS106	0.40-0.75	0.28

Table 7.2: Leachate Exceedances Summary - EQS

Determinant	EQS Threshold	Range of concentrations	Location	Depth (m bgl)	Recorded Concentration
Copper	1	24-33µg/l	WS101	0.10-0.40	24
			WS104	0.40-0.80	31
			WS106	0.40-0.75	29
			WS110	0.00-0.60	33
Lead	14	29-57µg/l	WS101	0.10-0.40	44
			WS104	0.40-0.80	57
			WS106	0.40-0.75	29
			WS110	0.00-0.60	37
Zinc	10.9	25-73	WS101	0.10-0.40	67
			WS104	0.40-0.80	25
			WS106	0.40-0.75	40
			WS110	0.00-0.60	73
Anthracene	0.1	<0.01-0.17	WS101	0.10-0.40	0.17
Fluoranthene	0.12	0.03-5.53	WS101	0.10-0.40	5.53
			WS104	0.40-0.80	0.12
			WS106	0.40-0.75	0.60
Benzo(b)fluoranthene	0.017	<0.01-0.61	WS101	0.10-0.40	0.61
			WS106	0.40-0.75	0.38
benzo(k)fluoranthene	0.017	<0.01-0.24	WS101	0.10-0.40	0.24
			WS106	0.40-0.75	0.18
Benzo(a)pyrene	0.27	<0.01-0.44	WS101	0.10-0.40	0.44
			WS106	0.40-0.75	0.28
Benzo(ghi)perylene	0.0082	<0.01-0.24	WS101	0.10-0.40	0.24
			WS106	0.40-0.75	0.20
Indeno(123cd)pyrene	0.002	<0.01-0.28	WS101	0.10-0.40	0.28
			WS106	0.40-0.75	0.21

Leachate screening tables are presented in *Appendix G.* Analytical certificates are presented in *Appendix D.*

7.5 Contaminant Distributions and Risk to Receptors

Several determinands exceeded the DWS and EQS screening values. However, the risk to controlled waters (groundwater & surface waters) is diminished as a result of the following:

- The recorded concentrations are not significantly high and the site is underlain by a Secondary B Aquifer.

7.6 Conclusion

Exceedances of DWS and EQS screening criteria are not considered significant given the likely depth to groundwater, effects of natural attenuation, lack of nearby groundwater abstractions and the absence of any surface water courses that could be in continuity with ground water beneath the site.

8 Ground Gas & Groundwater Risk Assessment

8.1 CIRIA C665 Assessment

Gas monitoring wells were installed in 4No. exploratory hole locations (WS101, WS104, WS108 & WS109) as part of the ground investigation completed by Sutcliffe.

A full copy of all gas monitoring readings and water levels can be found in *Appendix E.*

8.2 Methodology

A ground gas risk assessment has been undertaken in general accordance with the British Standard BS8485:2015+A1:2019, "*Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings".*

The guidance is written specifically for use by designers of gas protection measures relating to the development of a site. Reference has also been made to the CIRIA document C665:2007: "*Assessing Risks Posed by Hazardous Ground Gases to Buildings"* and to the Health and Safety Executive document EH40/2005 "Workplace Exposure Limits".

Our assessment comprises the following:

- Review of results.
- Calculation of Hazardous Gas Flow Rate for Methane (CH_4) and Carbon Dioxide (CO_2)
- Assessment of risks from ground gas.
- Development options.

8.3 Review of Field Data

Two (2) rounds of gas and groundwater monitoring have been undertaken.

Gas monitoring was undertaken using a fully calibrated GFM gas monitor which measured concentrations of oxygen, carbon dioxide and methane as well as gas flow emission rates.

Monitoring of groundwater installations were undertaken using an electronic ATEX Dipmeter.

The findings are summarised below in *Table 8.1* and the results are presented in full in *Appendix E*.

Table 8.1: Summarised Ground Gas and Groundwater Monitoring Data

Location	*MAX Flow Rate (l/hr)*	*MAX CH_4 (%)*	*MAX CO_2 (%)*	*MIN O_2 (%)*	*Atmospheric Pressure*	*Water Level (m bgl)*
26/10/202						
WS101	0.00	0.0	8.0	2.8	1001mb	1.50
WS104	0.00	0.0	2.3	15.4	1001mb	1.20
WS108	0.00	0.0	4.8	7.8	1001mb	1.57
WS109	0.00	0.0	3.3	16.0	1001mb	0.90
23/11/2023						
WS101	0.00	0.0	0.6	9.9	1016mb	1.35
WS104	0.00	0.0	6.6	7.1	1016mb	1.53
WS108	-0.30	0.0	5.8	8.0	1016mb	1.05
WS109	0.00	0.0	0.6	9.9	1016mb	0.75
-						
WS101	-	-	-	-	-	-
WS104	-	-	-	-	-	-
WS108	-	-	-	-	-	-
WS109	-	-	-	-	-	-
-						
WS101	-	-	-	-	-	-
WS104	-	-	-	-	-	-
WS108	-	-	-	-	-	-
WS109	-	-	-	-	-	-
-						
WS101	-	-	-	-	-	-
WS104	-	-	-	-	-	-
WS108	-	-	-	-	-	-
WS109	-	-	-	-	-	-
-						
WS101	-	-	-	-	-	-
WS104	-	-	-	-	-	-
WS108	-	-	-	-	-	-
WS109	-	-	-	-	-	-

8.4 Calculation of Hazardous Gas Flow Rate (HGFR)

A hazardous gas flow rate (HGFR) is derived, representative of the actual flow of gas from the borehole. This, combined with a consideration of other factors such as maximum concentration, is used to characterise the site.

HGFRs for both methane and carbon dioxide based on steady state flow and concentration have been calculated as:

HGFR = maximum gas concentration on visit x measured borehole flow rate on visit.

Results of the calculation are presented in *Appendix E*.

Methane HGFR

The highest calculated HGFR per borehole for methane is presented below:

Table 8.2: Methane HGFR

Ref. No.	Flow (l/h)[1]	CH_4 (%)[2]	HGFR CH_4 (l/h)	Characteristic Situation
WS101	0.00	0.10	0.0001	CS1
WS104	0.00	0.10	0.0001	CS1
WS108	-0.30	0.10	0.0003	CS1
WS109	0.00	0.10	0.0001	CS1

[1] Where maximum recorded flow is <0.1l/h, 0.1l/h has been used as recommended in CIRIA C665.
[2] Where maximum recorded concentration is <0.1%, 0.1% has been used as recommended in BS8485.

Carbon Dioxide HGFR

The highest calculated HGFR per borehole for carbon dioxide is presented below:

Table 8.3: Carbon Dioxide HGFR

Ref. No.	Flow (l/h)[1]	CO_2 (%)[2]	HGFR CO_2 (l/h)	Characteristic Situation
WS101	0.00	8.0	0.0080	CS1
WS104	0.00	6.6	0.0066	CS1
WS108	-0.30	5.8	0.0174	CS1
WS109	0.00	0.6	0.0006	CS1

[1] Where maximum recorded flow is <0.1l/h, 0.1l/h has been used as recommended in CIRIA C665.
[2] Where maximum recorded concentration is <0.1%, 0.1% has been used as recommended in BS8485.

8.5 Ground Gas Risk Assessment

In accordance with CIRIA C665 the ground gas monitoring results indicate that the site has a HGFR of 0.0003l/hr for methane and 0.0174l/hr for carbon dioxide.

This results in the site being classified as Characteristic Situation 1 – Very Low Risk and require no protective measures to be installed.

Notwithstanding, this is a preliminary assessment based on 2No. monitoring visits) and will be reviewed on the completion of the monitoring program (6No. visits) within the final report.

However, CIRIA C665 states in Table 8.5 (Wilson & Card)

- for a typical Carbon Dioxide maximum concentration above 5% that a Characteristic Situation 2 classification be considered.

As there have been a number of readings above 5% CO_2 during the monitoring period it is Sutcliffe's recommendation that the site is currently classified as Characteristic Situation 2.

Using BS8485:2015+A1:2019, "*Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings"* a total of 3.5 points is required for the proposed end use, *Table 8.4* details the protection measures required to achieve this point total.

Table 8.4: BS8485 (2015+A1:2019) Point Score Summary

GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER	
Floor and substructure design	SCORE
Precast suspended segmental subfloor (i.e., beam and block)	0

GAS PROTECTION SCORES FOR VENTILATION PROTECTION MEASURES			
Protection Element System		Comments	SCORE
Passive sub floor dispersal layer: Very Good Performance Media used to provide the dispersal layer are: • *Clear void;* • *Polystyrene void former blanket;* • *Geocomposite void former blanket;* • *No-fines gravel layer with gas drains;* • *No-fines gravel layer.*	Very Good performance	The ventilation effectiveness of different media depends on several different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. The selected score should be assigned considering the recommendations in Annex B of BS8485:2015. Passive ventilation should be designed to meet at least "good performance".	2.5

GAS PROTECTION SCORE FOR THE GAS RESISTANT MEMBRANE		
Protection Element System	Comments	SCORE
Gas resistant membrane meeting all the following criteria: • *Sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/m2/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method;* • *Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions;* • *Sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab);* • *Sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools etc);* • *Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and,* • *Verified in accordance with CIRIA C735.*	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. For example, a minimum 0.40mm thickness (equivalent to 370g/m^2 for polyethylene) reinforced membrane (virgin polymer) meets the performance criteria opposite. If a membrane is installed that does not meet all the criteria opposite, then the score is zero.	2

8.6 Radon

According to the Envirocheck Report, the site is not within a radon affected area, as <1% of homes are above the action level hence no radon protection measures are necessary.

8.7 Groundwater Protection Measures

Groundwater was observed to be standing at 0.75-1.57m bgl during the monitoring investigation.

Based on the Resting Groundwater Levels (RWLs) no discernible groundwater flow has been recorded.

There is no evidence at this stage of significant perched water either in the Made Ground or in the natural stratum encountered on site that would suggest special groundwater protection measures to the building foundations are required.

In light of these observations, contractors should allow for pumping to develop and maintain dry working conditions, in foundation and service trench excavations.

9 Land Contamination Risks and Remediation Requirements

9.1 Revised Conceptual Model

Based on the findings of the human health, the preliminary conceptual model has been revised as shown in *Figure 5*. The drawing shows all contaminant linkages from the preliminary conceptual model, identifying those which remain relevant.

9.2 Discounted Contaminant Linkages

Controlled Waters – Groundwater Resources

The UK DWS Leachate screening identified concentrations of Arsenic, Lead and Benzo(a)pyrene that could pose a risk to the Secondary B Aquifer. However, due to the likely depth of groundwater and the effects of natural attenuation, the risk is unlikely to be significant.

Controlled Waters – Surface Water Resources

The EQS Leachate screening identified concentrations of Copper, Lead, Zinc, Anthracene, Fluoranthene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Benzo(ghi)perylene and Indeno(123cd)pyrene that could pose a risk to the local surface water features. However, the nearest surface water feature is noted 205m north of the site, and relates to a stream, as such the risk is unlikely to be significant.

9.3 Remaining Potential Contaminant Linkages

Long Term Human Health

Elevated levels of C16 to C21 Aromatic, C21 to C35 Aromatic, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(ah)anthracene were noted with statistical analysis indicating the presence of site wide contamination that will require remediation to be safe for Human Health.

Construction workers may be exposed via dermal contact, ingestion and inhalation of soil / dust during the construction period. Adjacent site users may also be exposed to contaminated soils via inhalation of dust generated during the construction phase.

Ground Gas

Ground Gas monitoring is currently ongoing.

Table 9.1: Summary of Remaining Contaminant Linkages

1. Hazard Identification		2. Hazard Assessment				3. Risk Estimation		4. Risk Evaluation	5. Managing the Risk
Contaminant Source		Pathway		Receptor		Consequence	Probability	Classification	Action required
S1	Potentially contaminated soil on-site	P1	Dermal contact	R1/2	Site users	Medium	Likely	Moderate	Elevated levels of C16 to C21 Aromatic, C21 to C35 Aromatic, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(ah)anthracene were noted with statistical analysis indicating the presence of site wide contamination that will require remediation to be safe for Human Health. Construction workers may be exposed via dermal contact, ingestion and inhalation of soil / dust during the construction period. Adjacent site users may also be exposed to contaminated soils via inhalation of dust generated during the construction phase.
		P2	Ingestion of soil / soil dust	R1/2	Site users	Medium	Likely	Moderate	
		P3	Inhalation of vapours / soil gas	R1/2	Site users	Severe	Unlikely	Moderate / Low Risk	
		P4	Leaching and migration of contaminants	R3/5	Secondary B Aquifer	Medium	Low	Moderate / Low Risk	No Action Required
		P5	Lateral migration of soil gas / vapours	R1	Site users	Severe	Unlikely	Moderate / Low Risk	Ground gas monitoring is currently ongoing.
				R4	Property	Severe	Unlikely	Moderate / Low Risk	

9.4 Additional Works Required to Assess Outstanding Contaminant Linkages

Based on the proposed development plan, a remediation strategy will be required and will include validation of imported material. Additionally, any site derived material scheduled for reuse would need to be designed to assess the risks to future site users.

On completion of the scheduled demolition works and breaking out of the concrete slab, further investigation will be required in the area of the building to determine that the underlying material does not cause a human health risk and to determine the spread of any demolition waste and the potential risk it poses.

9.5 Remediation Requirements

Human Health – Soils

Elevated levels of Elevated levels of C16 to C21 Aromatic, C21 to C35 Aromatic, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(ah)anthracene have been recorded on site and indicate the presence of site wide contamination that will require remediation to be safe for Human Health. This will require the removal of 600mm material from site and the importing of clean tested material to create a capping break layer in garden areas on site, with hardcover providing a break layer in other areas of the site.

Human Health – Ground Gas

Based on the recorded ground gas levels to date with a number of readings for Carbon Dioxide exceeding the 5% threshold value, the site will currently be classified as a Characteristic Situation 2 indicating gas protection measures will currently be required. However, this is based on only 2No. monitoring visits and a final assessment will be made on completion of the ground gas monitoring.

10 Waste Classification

10.1 Preliminary Waste Classification

A preliminary waste classification was carried out to determine the classification of soil contamination data using HazWasteOnline program, which creates the standard 'Hazardous / Non-Hazardous' classification of soils.

A summary of the preliminary waste classification is provided in *Table 10.1* below.

Table 10.1: Preliminary Waste Classification Summary

Ref. No.	Depth (m bgl)	Classification	Exceeded Contaminant	Value (mg/kg)
WS101	0.10 - 0.40	Hazardous	TPH (C6 to C40) Petroleum Group	2890
WS102	0.10 - 0.25	Non-Hazardous	-	-
WS103	0.10 - 0.35	Non-Hazardous	-	-
WS104	0.40 - 0.80	Non-Hazardous	-	-
WS105	0.40 - 0.80	Non-Hazardous	-	-
WS106	0.40 - 0.75	Non-Hazardous	-	-
WS107	0.00 - 0.70	Non-Hazardous	-	-
WS110	0.00 - 0.60	Non-Hazardous	-	-

The full Waste Classification Report is provided in Appendix H.

Notwithstanding, the final decision on waste classification is determined by the accepting landfill, and consultation with landfill operators be carried out during the development of the SMMP.

10.2 Asbestos

Asbestos containing materials (ACM) were not observed within samples screened.

10.3 Waste Acceptance Criteria (WAC)

WAC analysis has not been carried out to determine if the preliminary waste classification results can be downgraded.

10.4 Discussion

As discussed above, the Waste Classification Report states that soils sampled at WS101 (0.10-0.40m bgl) are classified as 'Hazardous Waste' due to the exceedance of Total TPH (C6 to C40) at 2890mg/kg.

All remaining soils analysed are classified as 'Non-Hazardous' waste.

Notwithstanding, the final decision on waste classification is determined by the accepting landfill, and consultation with landfill operators be carried out during the development of the SMMP.

11 Recommendations

11.1 Further Works

The following actions are recommended:

- Design a Phase III Remediation & Validation Proposal for submission to planning department.
- Design SMMP – management of material on and off site.
- Post Demolition Sampling
- Good hygiene practices should be employed during construction work, in addition, the findings of this investigation should be included within the contractors H&S file and an assessment of risks associated with short term human health completed. No consumption of food or smoking should occur without prior hand washing. If dust is encountered, dust masks should be worn, and dust suppression employed.

12 References

- BRE Special Digest (1991) 'Sulphate and acidic resistance of concrete in the ground' 363
- BRE Special Digest (2001) 'Aggressive Chemical Environment for Concrete (ACEC) Site Classification.
- CIRIA (1995) Report 149. 'Protecting development from methane. Methane and associated Hazards to Construction.' London
- CIRIA (2007) C665. 'Assessing risks posed by hazardous ground gases to buildings.' London
- DETR/Partners in Technology (1997) Passive venting of soil gases beneath buildings research report-guide for design.
- Department of the Environment. Transport and the Regions. *Environment Protection Act* (1990) Part IIA: Contaminated Land.
- Environment Agency (2000) 'Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination. Research and Development. Technical Report. P5-066/TR', Bristol.
- Environment Agency (2002) 'Department for Environment, Food and Rural Affairs and The Environment Agency. Assessment Of Risks to Human Health from Land Contamination: An Overview of The Development of Soil Guideline Values and Related Research', Environment Agency, Bristol. CLR report No. 7.
- Environment Agency (2002) 'Department for Environment, Food and Rural Affairs and The Environment Agency. 'Priority Contaminants for The Assessment of Land', Environment Agency, Bristol. CLR report No. 8
- Environment Agency (2002) 'Department for Environment, Food and Rural Affairs and The Environment Agency. The Contaminated Land Exposure Assessment (CLEA) Model: Technical Basis and Algorithms', Environment Agency, Bristol. CLR report No. 1

Appendix A – General Notes

Generic Notes – Sutcliffe Investigations

Environmental Setting

General

Third party information obtained from the British Geological Survey (BGS), the Coal Authority, the Local Authority etc is presented in the Correspondence Appendix of the Geoenvironmental Report.

Geology, Mining & Quarrying

In order to establish the geological setting of a site, Sutcliffe Investigations refer to BGS maps for the area and the relevant geological memoir.

A coal mining report is obtained from the Coal Authority. Further information is sourced from the Local Authority and by reference to current and historical OS plans.

Landfills

Sutcliffe Investigations obtain data from the Landmark Information Group, the Environment Agency and the Local Authority with respect to known areas of landfilling within 250m of the proposed development site. Reference is also made to historical OS plans, which are inspected for evidence of backfilled quarries, railway cuttings, colliery spoil tips etc.

Radon

Radon is a colourless, odourless gas, which is radioactive. It is formed in strata that contain uranium and radium (most notably granite) and can move through fissures eventually discharging to atmosphere, or the spaces under and within buildings. Where radon occurs in high concentrations, it can pose a risk to health.

In order to assess potential risks associated with radon gas, Sutcliffe Investigations refer to BRE Report BR211, 1999: *"Radon: guidance on protective measures for new dwellings".*

BR211 provides a preliminary indication of the measures required for a particular site, but it is also often necessary to request a Stage 2 Protective Measures Site Report from the BGS.

The level of protection needed is site-specific and is determined by reference to the radon potential map for the area followed by a geological assessment of the site. This information is contained in the Annexes of BR211.

Annex A – derived from statistical analysis of radon measurements in existing houses carried out by the NRPB and grouped on 5km grid.

Annex B – based on an assessment of the same radon measurements grouped by geological units. The maps show the 5km grid squares underlain completely or in part, by geological units which potentially exceed the action levels for radon protective measures. The grid squares are coded according to highest potential within the square. In many cases the actual geological radon potential varies considerably within a grid square.

Sutcliffe Investigations adopt the following procedure when assessing risk associated with radon.

Firstly, Annex A maps are reviewed to see whether the site requires full, basic or no measures. If the site is in a dark brown square, full radon protection measures are required. If the site is in a light brown square, reference should be made to Annex B.

Secondly, Annex B maps are reviewed to see whether a further geological assessment is required which may result in upgrading the result from Annex A. If a site lies within a shaded square, it may require radon protection and Sutcliffe Investigations request a Stage 2 Protective Measures Site Report from the BGS.

If the site is in a square that is not coloured or shaded in either set of maps then no radon protection is needed and therefore a BGS Report is not normally necessary.

The BGS geological assessment involves checking whether the site is on or close to a geological unit that has statistically been found to have elevated radon potential. The geological assessment is based on either 1:50,000 or the 1:250,000 scale data. The search area specified as part of the request is increased by 50m in areas where 1:50,000 data is available and by 500m in areas with 1:250,000 scale data to allow for potential inaccuracies in the position of boundaries. The BGS report indicates the highest level of protection required within the search area and its buffer zone.

When requesting a BGS report, Sutcliffe Projects select the search radius carefully, since too large a search radius may result in the inclusion of areas underlain by geological units of a higher radon potential, thereby giving rise to recommending too high a level of protection.

The report also includes (where available), a list of the geological units included in the assessment. Sutcliffe Investigations check that these actually underlie the site, rather than the buffer zone only.

On the basis of radon measurements in dwellings and on their geological interpretation, the BGS report stipulates the level of protective measures required for the proposed development site, and this could be:

1. no measures
2. basic measures or
3. full measures

Details of these measures are provided in the Hazardous Gas section of this Geoenvironmental Report.

Hydrogeology

Sutcliffe Investigations obtain information from the Environment Agency (EA) and the Landmark Information Group with respect to:

- groundwater quality
- recorded pollution incidents
- licensed groundwater abstractions

Reference is also made to the EA document “Policy and Practice for the Protection of Groundwater” (1998) and the relevant Groundwater Vulnerability Map.

Bedrock and any overlying granular Drift deposits are classified by the EA.

Major aquifers: “*Highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public water supply and other purposes*”.

Minor aquifers: “*Fractured or potentially fractured rocks which do not have a high primary permeability, or other formations or variable permeability. Although these acquifers will seldom produce large quantities of water for abstractions, they are important both for local supplies and in supplying base flow to rivers*”.

Non-aquifers: “*Formations which are generally regarded as containing insignificant quantities of groundwater. However groundwater flow through such rocks, although imperceptible, does take place and needs to be considered in assessing the risk associated with persistent pollutants. Some non-acquifers can yield water in sufficient quantities for domestic use*”.

Groundwater vulnerability is determined by 4 variables:

1. The presence and nature of overlying soil (the weathered zone affected by living organisms; soil in the UK can extend up to 2m in depth). Physical properties of the soil affect the downward passage of water and its ability to attenuate pollutants. The EA make reference to a three-fold classification of soil types:-

    - Soils of **low** leaching potential are defined as "*soils in which the pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal, or they have the ability to attenuate diffuse pollutants*".

    - Soils of **intermediate** leaching potential are defined as "*soils which have a moderate ability to attenuate diffuse source pollutants or in which it is possible that some non-absorbed diffuse source pollutants and liquid discharges could penetrate the soil layer*".

    - Soils of high leaching potential are defined as "*soils with little ability to attenuate diffuse source pollutants and in which non-absorbed diffuse source pollutants and liquid discharges have the potential to move rapidly to underlying strata or to shallow groundwater*".

    In urban areas and restored mineral workings the soil information is based on fewer observations than elsewhere. A worst-case vulnerability (H) is therefore assumed for these areas and for current mineral workings by the EA. All are given a designation of **HU** unless proved otherwise.

2. The presence and nature of Drift, which often overlies bedrock. Where Drift is of substantial thickness and low permeability, it can provide an effective barrier to surface pollutant migration. Permeability Drift is classified as a Minor Aquifer except where it is in probable hydraulic continuity with a Major Aquifer, where it is regarded as part of the Major Aquifer unless proven otherwise by site investigation.

3. The nature of the geological strata (bedrock). Rocks that contain groundwater in exploitable quantities are called aquifers.

4. The depth of the unsaturated zone; i.e. that part of the aquifer which lies above the water table.

The EA have also designated Source Protection Zones, which are based on proximity to a groundwater source (springs, wells and abstraction boreholes). The size of a Source Protection Zone may vary from tens to several thousand hectares.

Hydrology

Sutcliffes obtain information from the Environment Agency and the Landmark Information Group with respect to:

- Surface water quality
- Recorded pollution incidents
- Licensed abstractions (groundwater & surface waters)
- Licensed discharge consents
- Site susceptibility to flooding

The EA have set **water quality** targets for all rivers. These targets are known as River Quality Objectives (RQOs). The water quality scheme used to set RQO planning targets is known as the River Ecosystem scheme. The scheme comprises five classes (RE1 to RE5) which reflect the chemical quality requirements of communities of plants and animals occurring in our rivers.

General Quality Assessment (GQA) grades reflect actual water quality. They are based on the most recent analytical testing undertaken by the EA. There are six GQA grades (denoted A to F) defined by the concentrations of biochemical oxygen demand, total ammonia and dissolved oxygen.

The susceptibility of a site to **flooding** is assessed by reference to a Flood Map on the Environment Agency's website. These maps provides show natural floodplains – areas potentially at risk of flooding it a river rises above its banks or high tides and stormy seas cause flooding in coastal areas.

There are different kinds of area shown on the Flood Map:

1. Dark blue areas could be flooded by the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year, or by a river by a flood that has a 1% (1 in 200) or greater chance of happening each year.

2. Light blue areas show the additional extend of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance or occurring each year.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

The maps also show all flood defences built in the last five years to protect against river floods with a 1% (1 in 100) chance of happening each year, or floods from the sea with a 0.5% (1 in 200) chance of happening each year, together with some, but not all, older defences and defences which protect against smaller floods.

The Agency's assessment of the likelihood of flooding from rivers and the sea at any location is based on the presence and effect of all flood defences, predicted flood levels and ground levels.

It should also be noted that as the floodplain shown is the 1 in 100 year (or 1 in 200 year as appropriate) areas outside this may be flooded by more extreme floods (e.g. the 1 in 1000 year flood). Also, parts of the areas shown at risk of flooding will be flooded by lesser floods (e.g. the 1 in 5 year flood). In some places due to the shape of the river valley the smaller floods will flood a very similar extent to larger floods but to a lesser depth.

If a site falls within a floodplain, it is recommended that a flood survey be undertaken by a specialist consultant who can advise on appropriate mitigating measures; i.e. raising slab levels, provision of storage etc.

COMAH & Explosive Sites

Sutcliffe Investigations obtain information from the Landmark Information Group with respect to COMAH or explosive sites within 1km of the proposed development site. Sutcliffe Investigations' report refers to any that are present and recommends that the Client seeks further advice from the HSE.

Areas around COMAH sites (chemical plants etc) are zoned with respect to the implementation of emergency plans. The HSE are a statutory consultee to the local planning authority for all COMAH sites. The COMAH site may have to revise its emergency action plan if development occurs. This might be quite straightforward or could entail significant expenditure. Consequently, the COMAH site may object to a proposed development (although it is the Local Authority who have final say and they are likely to place more weight on advice from the HSE).

Preliminary Conceptual Ground Model

The site's environmental setting (and proposed end use) is used by Sutcliffe Investigations to assess the significance of any contamination encountered during the subsequent ground investigation.

Generic Notes – Sutcliffes Geoenvironmental Investigations

2. Ground Investigation Fieldwork

General

Sutcliffe Ground Investigations are undertaken in accordance with current UK guidance including:

- BS5930:1999 "*Code of practice for site investigation*"
- BS10175:2001 "Code of practice for the identification of potentially contaminated sites"
- Contaminated Land Reports 1 to 6, most notably CLR Report No. 4 "*Sampling strategies for contaminated land*"
- "*Guidance on the protection soil sampling strategies for land contamination*" – EA R&D Technical report P5-066/TR (2001)
- AGS: 1996 "*Guide to the selection of Geotechnical Soil Laboratory Testing*"

Exploratory hole logs are represented in Appendices to this Geoenvironmental Report. These logs include details of the:

- Investigation technique adopted
- Samples taken
- Descriptions of the solid strata and any groundwater encountered
- Results of any insitu testing
- Any gas/groundwater monitoring well installed

Exploratory Hole Locations

Exploratory hole locations are selected by Sutcliffe Investigations, prior to commencement of fieldwork, to provide a representative view of the strata beneath the site and to target potential contaminant sources identified during the preliminary investigation (desk study). Additional exploratory locations are often determined by the site engineer in light of the ground conditions actually encountered; this enables better delineation of the depth and lateral extent of organic contamination, poor ground, relict structures etc.

Investigation Techniques

Ground conditions can be investigated by a number of techniques; the procedures used are in general accordance with BS5930: 1999 and BS1377: 1990. Techniques most commonly used by Sutcliffe Investigations include:

- Machine excavated trial pits, usually equipped with a backactor and a 0.6m wide bucket
- Cable percussive (Shell & Auger) boreholes, typically using 150mm diameter tools and casing
- Window or windowless sampling boreholes. Constraints associated with existing buildings, operations and underground service runs can render some sites partly or wholly inaccessible to a mechanical excavator. In such circumstances, window sampling is often the most appropriate technique. A window sampling drilling rig can be manoeuvred in areas of restricted access and results in minimal disturbance of the ground (a 150mm diameter tarmac/concrete core can be lifted and put to one side). However, it should be noted that window sampling allows only a limited inspection of the ground (especially made ground with a significant proportion of coarse material).
- Rotary percussive open-hole probeholes are typically drilled using a tricone rock roller bit with air as the flushing medium. Probeholes are generally lined through made ground with temporary steel casing to prevent hole collapse.

Where installed, gas/groundwater monitoring wells typically comprise a lower slotted section, surrounded by a filter pack of 10mm non-calcareous gravel and an upper plain section surrounded in part by a bentonite seal and in part by gravel or arisings. The top of the plain pipe is cut off below ground level and the monitoring well protected by a square, stopcock type manhole cover set in concrete, or the plain pipe is cut off just above ground level and the well protected by 100mm diameter steel borehole helmet set in concrete.

Monitoring well details, including the location of the response zone and bentonite seal are presented on the relevant exploratory hole logs.

Insitu Testing

Where relative densities of granular materials given on the trial pit and window sample logs are based on visual inspection only, they do not relate to any specific bearing capacities. However, wherever possible, Sutcliffe Investigations employ a mackintosh probe to assess relative density. Mackintosh probe results can be related to approximate allowable bearing capacities.

The relative densities of granular materials encountered in cable percussive boreholes are based on Standard Penetration Test (SPT) results. SPTs are carried out boreholes, in accordance with BS 1377 1990, Part 9 Section 3.3. Where full penetration (600mm) is not possible, N values are calculated by linear extrapolation and are shown on the logs as N* = x.

The strength of cohesive deposits is determined using a hand shear vane.

Shear strength test results reported on trial pit logs are considered to be more reliable than those reported on window sample logs. Significant sample disturbance occurs during window sampling and consequently shear strength results on disturbed window samples are generally lower than results obtained during trial pitting, in-situ or in large excavated blocks.

Sampling

Representative soil/fill samples are taken at regular intervals from the exploratory holes to assist in description of the ground and to allow selected laboratory testing to be performed. The type of sample taken is dependent on the nature of the stratum and the purpose of the analysis.

Where the soils encountered contain a significant proportion of coarse grained material, truly representative samples are not typically obtained – only the finer fraction is placed in sample containers. However, a visual estimate of the amount of coarse material is made on site.

NB: Coarse constituents not sampled are defined as: coarse gravel, cobble and boulder (i.e. any ‘particles’ with an average diameter greater than 20mm).

Occasionally, unrepresentative ‘spot’ samples are also taken from some exploratory locations for contaminant analysis, typically where unusual, localised pockets of materials are encountered.

Samples of soil for chemical testing are placed into 1 litre plastic tubs prior to delivery to the selected laboratory. Samples of water are taken in one litre brown glass bottles and stored in cool boxes, at a temperature of approximately 4°C, until delivery to the selected laboratory. Soil/fill samples for organic analysis are also stored in cool boxes.

Groundwater

Where encountered during fieldwork, groundwater is recorded on exploratory hole logs. If monitoring wells are installed, groundwater levels are also recorded on one or more occasions after completion of the fieldwork.

It should be borne in mind that the rapid excavation rates used during a ground investigation may not allow the establishment of equilibrium water levels. Water levels are likely to fluctuate with season/rainfall and could be substantially higher at wetter times of the year than those found during this investigation.

Long term monitoring of standpipes of piezometers is always recommended if water levels are likely to have a significant effect on earthworks or foundation design.

Description of Strata

The soils encountered during an Sutcliffes ground investigation are described (logged) in general accordance with BS 5930. The descriptions and depth of strata encountered are presented on the exploratory hole logs and summarised in the Ground Conditions section within the main body of text.

The materials encountered in the trial pits are logged, samples taken and tests performed on the in-situ materials in the excavation faces, to depths of up to 1.2m; below this depth these operations are conducted at the surface on disturbed samples recovered from the excavation.

Key to Exploratory Hole Logs

Keys to logs are presented in the Appendix(ces) containing the logs. These are two keys – Symbols and Legends and Terms and Definitions.

Health and Safety

All work was carried out in accordance with the procedures detailed in the DGEL Health and Safety Manuel and SUKD health and Safety Procedures.

Generic Notes – Sutcliffes Geoenvironmental Investigations

3. Geotechnical Laboratory Tests

General

Soil Samples are delivered to the laboratory for testing along with a schedule of testing drawn up by Sutcliffe Investigations. All tests are carried out in accordance with BS 1377:1990.

The test results are presented as received in an Appendix to this Geoenvironmental Report.

The following laboratory testing are routinely carried out on a selection of samples:

- Atterberg limits & moisture contents
- Soluble sulphate & pH

The additional tests are typically only scheduled where significant earthworks regrade is anticipated:

- Grading
- Compaction tests
- Particle density

Attenberg Limits & Moisture Content

The Liquid and Plastic Limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average Plasticity Index (PI) for each “type” of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth. Sutcliffe Investigations typically only consider a soil to be shrinkable if the proportion finer than 63μm is > 35%.

PI results are compared against guidance given in the NHBC Standards, Chapter 4.2 (revised April 2003) which advocates the use of modified Plasticity Index (I’p) defined as:

I’p = Ip * (% < 425μm/100)

ie if PI is 30%, but the soil contains 80% < 425μm, then I’p = 30 * 80/100 = 24%

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425μm sieve is routinely reported by testing labs.

Sutcliffe Investigations apply engineering judgement where PI results are spread over a range of classifications. Consideration is given to:

- The average values for each particular soil type (ie differentiate between residual soil and alluvium)
- The number of results in each class and
- The actual values

Unless the judgement strongly indicates otherwise, Sutcliffe Investigations typically adopt a conservative approach and recommend assumption of the higher classification.

Soluble Sulphate and pH

Sulphates in soil and groundwater are the chemical agents most likely to attack sub-surface concrete, resulting in expansion and softening of the concrete to a mush. Another common cause of concrete deterioration is groundwater acidity.

The rate of chemical attack depends on the concentration of aggressive ions and their replenishment at the reaction surface. The rate of replenishment is related to the presence and mobility of groundwater.

Sutcliffe Investigations refer to BRE Special Digest 1 (SD1) “Concrete in aggressive ground. Part 1: Assessing the aggressive chemical environment” (2001). SD 1 provides definitions of:

- The nature of the site (Greenfield, brownfield or pyretic)
- The groundwater regime (static, mobile or highly mobile)
- The Design Sulphate Class (DC Class) and
- The Aggressive Chemical Environment for Concrete (ACEC Class)

Sutcliffe reports clearly state each of the above for the site being considered.

The concentrations of sulphate in aqueous soil/fill extracts are determined in the laboratory using the gravimetric method. The results are expressed in terms of SO_4 for direct comparison with BS 5328:1997. The pH value of each sample was determined by the electrometric method.

SD1 also discusses determination of “representative” sulphate concentration from a number of tests. Essentially if <10 samples of a given soil-type have been tested, the highest measured sulphate concentration should be taken. If >10 samples have been tested, the mean of the highest 20% of the sulphate test can be taken. With respect to groundwater, the highest sulphate concentration should always be taken.

With respect to pH (soil & groundwater) the value used is the lowest value if <10 samples have been tested and the mean of the lowest 20% if >10 samples have been tested.

Generic Notes – Sutcliffe Investigations Geoenvironmental Investigations

4. Contamination Laboratory Analysis & Interpretation (including WAC)

General

An assessment of potential contaminants associated with the former usages of the site is undertaken with reference to CLR 8 "*Potential contaminants for the assessment of land*" and the relevant DETR Industry Profile(s).

Common Inorganic Contaminants

These include:

- Metals, most notably cadmium, copper, chromium, mercury, lead, nickel and zinc
- Semi-metals, most notably arsenic, selenium and (water soluble) boron
- Non-metals, most notably sulphur
- Inorganic anions, most notably cyanides (free & complex), sulphates, sulphides and nitrates

With respect to the terminology used by most analytical laboratories:

Total cyanide = Free cyanide + Complex cyanide

Total cyanide (CN) is determined by acid extraction; whereas free cyanide is the water soluble fraction.

Complex cyanide is "bound" in compounds and is hard to breakdown. Laboratory determination of complex CN involves subjecting the sample to uv digestion for determination of both free and total CN.

Thiocyanate (SCN) is a different species combined with sulphur.

Elemental sulphur (S) and free sulphur are the same. Total sulphur is all forms, including that present in sulphates (SO_4) sulphates etc.

There are 2 forms of chromium (Cr), chromium VI and chromium III. Chromium VI is the more toxic of these. In soils, total chromium is determined by a strong aqua regia acid digestion. Chromium VI is an empirical method based on a water extract test.

Common Organic Contaminants

Petroleum hydrocarbons are a mixture of hydrocarbons produced from the distillation of crude oil. They include aliphatics (alkanes, alkenes and cycloalkanes), aromatics (single or multi benzene ringed compounds) and hydrocarbon-like compounds containing minor amounts of oxygen, sulphur or nitrogen.

Petroleum hydrocarbons can be grouped based on the carbon number range:-

GRO – Gasoline Range Organics (typically C_6 to C_{10}). Also referred to as PRO – Petroleum Range Organics
DRO – Diesel Range Organics (typically C_{10} to C_{28})
LRO – Lubricating Oil Range Organics (typically C_{28} to C_{40})
MRO – Mineral Oil Range Organics (typically C_{18} to C_{44})

However, it should be borne in mind that the terms "GRO" and "DRO" analysis are purely descriptive terms, the exact definition of which varies.

Total Petroleum Hydrocarbons (TPH) is also a poorly defined term; some testing laboratories regard TPH as hydrocarbons ranging from C_5 – C_{40}, whereas other define TPH as C_{10} – C_{30}.

The composition of a TPH plume migrating through the ground can vary significantly; this is primarily dictated by the nature of the source (eg petrol, diesel, engine oil etc). Furthermore, different hydrocarbons are affected differently by weathering processes and this can result in further variation in the chemical composition of the TPH.

Gasoline contains light aliphatic hydrocarbons rapidly (especially within the C4 to C5 range) that will evaporate. The aromatic hydrocarbons in gasoline are primarily benzene, toluene, ethylbenzene and xylenes, referred to as BTEX. Small amounts of polyaromatic hydrocarbons (PAHs) such as benzo(a)pyrene may also be present.

Diesel and light fuel oils have higher molecular weights than gasoline. Consequently, they are less volatile and less water soluble. About 25 to 35% is composed of aromatic hydrocarbons. BTEX concentrations are generally low.

Heavy Fuel Oils are typically dark in colour and considerably more viscous than water. They contain 15 to 40% aromatic hydrocarbons. Polar NSO compounds are also present.

Lubricating Oils are relatively viscous and insoluble in groundwater. They may contain 10 to 30% aromatics, including the heavier PAHs. NSO compounds are also common.

Polycyclic Aromatic Hydrocarbons (PAHs) have more than two fused benzene rings as a structural characteristic. PAH compounds are present in both petrol and diesel, although insignificantly lower concentrations than in coal tars. Certain PAH compounds are carcinogenic (Benzo(a)pyrene) and/or mobile in the environment (naphthalene).

Polychlorinated Biphenyls (PCBs)

Volatile Organic Compounds (VOCs) The volatile organic compound (VOC) headspace concentration of all soil samples was made with a photoionization detector (PID) fitted with a 10.2 eV lamp. This gives a semi-quantitative VOC concentration record as parts per million (ppm) (Vol/Vol). Prior to the VOC headspace reading, the background levels of VOCs were recorded. The PID was recalibrated with standard isobutylene in zero air after every 10 headspace readings.

Semi-Volatile Organic Compounds (sVOCs)

Phenols

Solvents, pesticides, herbicides

Dioxins & furans

Methods of Analysis (Organic Compounds)

Toluene Extractable Matter (TEM) results provide a screening test for organic contamination. The sample is air dried a 30°C and ground prior to addition of the solvent (toluene). The solvent extraction is aggressive and most organic compounds (fuels, oils, tars, humic material, animal fats and vegetable oil) are dissolved, as are some other inorganic contaminants such as sulphur. However, the volatiles (lighter fuel fraction etc) are lost during evaporation of the solvent.

Total Petroleum Hydrocarbon (TPH) by IR (also known as mineral oil by some testing laboratories) is undertaken on “as received” samples. Tetrachloroethylene is the solvent, and fluoroscil is used to removed humic material, animal fats and vegetable oil. Consequently this analysis detects a wide range of “mineral” organics from volatiles (BTEX and gasoline) through diesel and oils to tars (including the very heavy, stable tars such as asphalt and bitumen).

TPH by GC-FID is more refined analytical technique which only detects hydrocarbons (aliphatic and aromatic) in the range C_{10} to C_{40} (volatiles, heavy tars, humic material and sulphur are not detected). The laboratory can provide a breakdown of the TPH results into diesel range organics (**DRO**) and heavier lubricating oil range organics (**LRO**).

GRO (PRO) by GC-FID analysis detects the more volatile C_6 – C_9 hydrocarbons (aliphatic and aromatic) including those organic compounds present in petrol.

Speciated VOC (by GC-MS) analysis quantifies the concentrations of 30 USA-EPA priority compounds. These include chlorinated alkanes and alkenes (in the molecular weight range chloroethane to tetrachloroethane); trimethlybenzenes; and the 4 BTEX compounds (benzene, ethyl-benzene, toluene & xylene).

Speciated sVOC by (GC-MS) analysis quantifies the concentration of a variety of organic compounds, including the 16 USA-EPA priority PAHs, phenols, 7 USA EPA priority PCB congeners, herbicides & pesticides.

Note: PAHs are hydrocarbons and consequently (where present) will be picked up when scheduling TPH by GC-FID. Napthalene (the lightest PAH) is also one of the 58 US EPA VOCs.

Speciated TPH by GC-FID provides a "banded "TPH", initially split into aromatic and aliphatic fractions and then further divided into fraction specific carbon bandings based upon behavioural characteristics.

Note: Risk assessment models require physiochemical properties (solubilities, toxicitities etc) of compounds in order to model their behaviour in the environment. These physiochermical properties cannot be derived from a single "TPH", "GRO" or "DRO" value. However, the carbon banded fractions can be used in risk assessment models.

If the relative proportion of each carbon banding within the "TPH" impact at a site is known, the risks posed by each individual fraction can be assessed and a simple back calculation applied to calculate an overall "TPH" screening value based upon the percentage weight fraction of each banding present in the "TPH". Specialised analytical techniques and data interpretation skills are required to identify each carbon banding.

Current Guidance

The UK approach to the consideration of contaminated land is based upon the principles of risk assessment. This in turn is founded upon the use of so called source⇒ pathway⇒ target principles in order to establish the presence or potential presence of a pollutant linkage.

Sutcliffe Investigations adopt a tiered approach to risk assessment, consistent with UK guidance and best practice. The initial step of such a risk assessment (or Tier 1) is the comparison of site data with appropriate guidance levels, intervention levels or remedial targets.

In March 2002 DEFRA and the Environment Agency published a series of technical research papers (R & D Publications CLR 7, 8, 9 and 10) introducing the UK approach to the assessment of risk to **human health** from land contamination. This methodology and approach represents current scientific knowledge and thinking. The overall methodology also included the Contaminated Land Exposure Model (CLEA) and some Soil Guidance Values (SGV's).

At the time of writing this report, these guidelines only address seven contaminants and the development of both the CLEA model and additional SGV's in ongoing. Where published, SGV's have been utilised as intervention values for the purpose of an initial Tier 1 assessment.

Where SGV's were not published at the time of writing this report, appropriate Tier 1 human health related assessment have been based upon information that was best available at the time of the study.

With respect to the assessment of potential **phytotoxic effects** of contaminants, Sutcliffe Investigations refer to "The Soil Code" (Maff, 1998) for copper and zinc. The CLEA SGV is adopted for nickel.

The potential risk to **building materials** is considered through reference to relevant BRE Digests, with particular emphasis on BRE Special Digest 1, 'Sulphate and Acid Resistance of Concrete in the Ground', 2001.

With respect to the interpretation of the calorific values, at present there are no accepted methods to assess whether a sample is combustible and under what circumstances it might smoulder. Some guidance is given in ICRCL Note 61/84 "Notes on the fire hazards of contaminated land" which states that:

"In general ……. it seems likely that materials whose CV's exceed 10MJ/kg are almost certainly combustible, while those with values below 2MJ/kg are unlikely to burn".

Tier 1 **groundwater** risk assessments are undertaken by comparing leachate concentrations with the appropriate water quality standard. Depending upon the specific characteristics and environmental setting of the site the appropriate standard is likely to be one of the following:

- Water Supply (Water Quality) Regulations 1989
- Environmental Quality Standards (for Freshwater)
- The Surface Waters (Abstraction for Drinking Water) Regulations

The tier 1 risk assessment of **landfill gas** is undertaken through reference to the following documents:

- Approved Document C, Building Regulations 1991
- CIRIA Report 149, “Protecting Development from Methane”, 1995

Should any Tier 1 criteria be exceeded, then three potential courses of action are available. (The first is only applicable in terms of human health, but the second and third could also be applied to groundwater or landfill gas).

- Undertake further statistical following the approach set out in Appendix A of CLR 7 in order to determine whether contaminant concentrations of inorganic contaminants within soil/fill actually present a risk (only applicable to assessing the risk to human health).
- Based on a qualitative risk assessment, advocate an appropriate level of remediation to “break” the pollutant linkage – for example the removal of the contaminated materials or the provision of a clean cover.
- Carry out a more detailed quantitative risk assessment in order to determine whether contamination risks actually exist.

However, the issue of **averaging area** requires further consideration. CLR 7 is ambiguous and could be interpreted as advocating the concept of a single garden as an appropriate averaging area.

This concept has massive implications with respect to ground investigation design and cost. To comply, investigations for residential development on brownfield sites would need to recover and analyse about 6 samples from each garden; this implies exploratory locations on a very tight grid, perhaps 5m to 10m spacings, with a huge increase in the number of samples analysed (cf test schedules currently issued by most practitioners).

In any case, Sutcliffe Investigations consider the concept of a single garden as an averaging area to be inappropriate. Statistical analysis of sample results by fill type, and/or by former use in a given sub-area of the site (i.e. with reference to the Conceptual Site Model), is considered a more appropriate methodology.

Analysis by soil/fill type is appropriate for essentially immobile contaminants associated with a particular fill type, for example arsenic in colliery spoil, metals in ash & clinker, sulphate in plaster-rich demolition rubble etc.

Analysis by former use is appropriate where more mobile contaminants have entered the ground, for example diesel associated with leakage from a former fuel tank, downward migration of leachable metals through granular materials, various soluble contaminants present in a wastewater leaking into the ground via a fractured sewer etc. In these circumstances, it may be appropriate to undertake statistical analysis of sample results from a variety of different soil/fill types. However, consideration would have to be given to factors such as porosity which might influence impregnation of a mobile contaminant into the soil mass; ie contamination would be normally be more pervasive and significant in granular soils than cohesive soils.

There is a suggestion in para 4.7 of CLR 7 that the approach outlined above was intended and the Environment Agency have confirmed that an averaging area can be larger than a single garden, if:

- Contaminant concentrations are within the same statistical population as determined using the maximum value test. The sample data being representative of the averaging area and the mean concentration of the averaging area.
- “Hot spots” are treated as separate zones or averaging areas (as defined by the maximum value test).
- The sampling strategy takes into account uncertainty (spatial heterogeneity) in contaminant concentration

Waste Classification & WAC

In the context of waste soils generated by remediation and/or groundworks activities on brownfield sites, the following definitions (from the Landfill Regulations 2002) apply:

- Inert (e.g. uncontaminated ‘natural soil, bricks, concrete, tiles & ceramics)
- Non-Hazardous (e.g. soil excavated from a contaminated site which contains dangerous substances, but at concentrations below prescribed thresholds).
- Hazardous (e.g. soil excavated from a contaminated site which contains dangerous substances at concentrations above prescribed thresholds).

Dangerous substances include compounds containing a variety of determinants commonly found in contaminated soils on brownfield sites, for example arsenic, lead, chromium, benzene etc.

From 16th July 2005, landfill operators will require Waste Acceptance Citeria (WAC) laboratory data, if soil is classified as **hazardous** and such waste must have been subjected to pre-treatment. However, subject to WAC testing it may be possible to classify it as stable, non-reactive hazardous waste, which can be placed within a dedicated cell within the non-hazardous landfill.

Sutcliffe Investigations typically only include WAC analysis in site investigation proposals and reports, if significant off-site disposal (of soil classified as hazardous waste) is anticipated for example where redevelopment proposals include basement construction etc.

If off-site disposal of soils classified as hazardous waste were undertaken during redevelopment, then WAC analysis should be scheduled at an early stage in the remediation programme.

However, organic compounds (BTEX, TPH, PAH etc) are the most common contaminants that result in soils being classed as hazardous. These contaminants can often be dealt with by alternative technologies (eg by bioremediation or stabilisation) and consequently retention on site is often possible.

It should be noted that **non-hazardous** soil waste can go to a non-hazardous landfill facility; no further testing (eg WAC) is required.

Generic Notes – Sutcliffe Investigations

5. Hazardous Gas

General

Hazardous gas is considered to be any mixture of potentially explosive, toxic or asphyxiating gases, most notably methane, carbon dioxide and oxygen (deficiency).

In addition, radon, a naturally occurring radioactive gas is also considered. Further information about radon is included in Notes 1 – Environmental Setting.

Assessment of potential risks associated with hazardous gas are based on a review of data obtained from the Landmark information Group, the Environment Agency and the Local Authority and the British Geological Survey.

Reference is also made to historical OS plans, which are inspected for evidence of backfilled quarries, railway cuttings, colliery spoil tips etc.

Where landfilling has occurred within 250m of the site boundary, the Local Planning Authority may request a landfill gas investigation in accordance with the Town and Country Planning General Development Order, 1988.

Sources

Potential sources of hazardous gas are:

- Landfill sites
- Made ground, especially where significant depths are present
- Shallow mineworks associated with coal extraction
- Geological strata, including peat, organic silts, coal-bearing strata and limestone (reaction with acidic waters), granite (radon)
- Groundwater can sometimes act as a “carrier” for hazardous gas
- Leakages from pipelines or storage tanks
- Sewers, septic tanks and cess pits

Generation

Wherever biodegradable material is deposited, landfill gas (principally a mixture of methane and carbon dioxide) is likely to be generated by microbial activity. Carbon dioxide is an asphyxiant and toxic; methane is flammable and a mixture containing between 5% and 15% methane by volume in air is explosive. Landfill gas in the ground is unlikely in itself to pose a significant risk, though it may damage vegetation. However, infiltration of landfill gas into confined spaces (e.g. cellars, services, etc) may give rise to considerable risk.

There is no typical figure for the length of time that landfill gas will be evolved, but at many sites significant gas generation continues for at least 15 years after the last deposit of waste.

Migration

Gas migration from a landfill site may occur in several ways. It may migrate through adjacent strata; the distance of migration being dependent on the pressure gradients, volume of gas and permeability of the strata. Where there are faults, cavities and fissures within the strata, gas may move considerable distances. Other migration pathways for gas include man-made features such as mine shafts, roadways and underground services.

Gas migration is influenced by a number of climatic factors, such as atmospheric pressure variations, water table level variations and the influence of a covering of snow or ice over the surface of the site and surrounding area.

Current Guidance

Guidance on landfill gas monitoring control at landfill sites is given two technical memoranda, Waste Management Paper Nos. 26 and 27 published by the Department of the Environment.

Waste Management Paper 27, 1991 recommends that no dwellings should be constructed within 50m of any landfill that has the capacity to produce large volumes of landfill gas. No garden should extend to within 10m of the landfilled waste. However, development closer to landfill has been permitted where a comprehensive gas risk assessment has been completed (typically based on a minimum of 6 to 12 month monitoring programme) and appropriate gas exclusion measures designed.

The current advice with regard to monitoring for landfill gas is that if the trigger value of 1% volume (20% LEL) for methane and 1.5% volume for carbon dioxide is exceeded then remedial/control measures will be required.

It should be noted that the guideline limit for carbon dioxide of 1.5% volume recommended in Waste Management paper No. 27 is the short term (10 minute) occupational exposure limit for carbon dioxide quoted by the Health and Safety Executive in their publication EH40. The long term (8 hour) occupational exposure limit for carbon dioxide is 0.5% volume.

Approved Document C to the Department of the Environment's Building Regulations 1992 requires what where there may be gaseous contamination of the ground but the level of methane is unlikely to exceed 1% by volume, the ground floor of any house or similar small building shall be constructed of suspended concrete and ventilated as described in BRE Digest Report "Construction of New Buildings on Gas Contaminated Land". The document also requires specific design measures to be taken if a level of 5% volume carbon dioxide exists or is exceeded within the ground.

Although the above guidance is still relevant it has been more recently updated within the following documents published by the Construction Industry Research and Information Association (CIRIA).

CIRIA Report 149 'Protecting Development from Methane' (1995)
CIRIA Report 150 'Methane Investigation Strategies' (1995)
CIRIA Report 151 'Interpreting Measurement of Gas in the Ground' (1995)
CIRIA Report 152 'Risk Assessment for Methane and other gases from the ground' (1995)

The above documents are intended to provide advice on how to investigate and deal with the gas contaminated ground with respect to development.

CIRIA Report 149 characterised sites based on the recorded methane/carbon dioxide concentration and emission rates recorded during a suitable gas investigation. Characteristic situation 1 is deemed to be the lowest risk scenario with the risk rating increasing up to 6. The characteristic situations are classified as follows:

Gassing regime in ground			
Methane (% by volume in air)	Carbon dioxide (% by volume in air)	Emission rate [1] (m/s)	Characteristic situation [2]
< 0.1	< 1.5	not detected	1
> 0.1 – 1	> 1.5 – 5	not detected	2
> 1 - 5	< 5	not detected	3
> 5 – 20	< 20	< 0.01	4
> 20	> 20	> 0.01 – 0.05	5
> 20	> 20	> 0.05	6

Notes:
1. Emission rate values measures as equivalent total gas flow velocity from a 50mm diameter borehole: for methods of measurement see Crowhurst and Manchester (1992).
2. Highest measures parameter used as determining factor.

CIRIA Report 151 (1995) identified that there is currently inadequate guidance on trigger concentrations for ground gases. The current emphasis on using gas concentrations for trigger values particularly in Waste Management Paper 27 and the Building Regulations, should be revised to consider gas pressures, borehole flow rates and estimated surface emission rates.

It was concluded that the most important aspect of relating the gas regime below or adjacent to a site, to the risk it poses to any development, is the surface emission rate i.e. how quickly the gas is coming out of the ground. The lower the surface emission rate the lower the risk. This is considered further in the DETR Partners in Technology Report 'Passive venting of soil gases beaneath buildings' (September 1997).

CIRIA Report 149 (1995), reference Table 28, reviewed over 100 case studies of development affeceted by gas to establish current UK practices for gas control. The report classified the gassing regimes fround within 6 Characteristic Situations. The highest measures parameter, either methane or carbon dioxide concentration and/or emission rate were used to define the Characteristic Situation for each case history site. The report then related the typical range of mitigation measures that has been adopted at each study site to the characteristic gas situation.

To achieve a more consistent design of protection measures Table 28 of CIRIA 149 was rewritten (Wilson and Card, 1999) in terms of borehole gas volume flow rate and gas concentrations, as reproduced in the table below. This was done to reflect the importance of recognising the gas surface emission rate.

Characteristic situations based on Gas Flux

Characteristic Situation	Limiting CH_4 Concentration (% v/v)	Limiting CO_2 Concentrations (% v/v)	Limiting Borehole Flow Velocity (m/s)	Limiting Borehole Gas Volume Flow (litre/hour)	
				CH_4	CO_2
1	< 0.1	< 0.1	< 0.005	< 0.035	< 0.035
2	< 1.0	< 1.5	< 0.005	< 0.35	< 0.5
3	< 5.0	< 5.0	< 0.005	< 1.75	< 1.75
4	< 20	< 20	< 0.01	< 14	< 14
5	> 20	> 20	< 0.05	< 70	< 70
6	> 20	> 20	< 0.05	> 70	> 70

Gas Monitoring Procedure

Sutcliffe Investigations adopt a standard gas monitoring procedure, in accordance with CIRIA guidance. This procedure involves the measurement, in the following order of:

- Atmospheric temperature, pressure and ambient oxygen concentration on site immediately prior to and on completion of monitoring.
- Gas emission rate.
- Methane, oxygen and carbon dioxide concentrations using and infra-red gas analyser.
- Standing water level using a dipmeter.

In addition, ground conditions at each sampling location are recorded together with prevailing weather conditions and any other observations such as any vandalism.

Where samples of gas are required for laboratory analysis, Gresham Tubes are used. Gas concentrations in the well are typically recorded immediately before and after retrieval of a sample.

Appendix B – CIRIA Guidance Document C552 2001

RISK ASSESSMENT FOR THE WATER ENVIRONMENT

The risk assessment has been developed to provide a greater level of standardisation. It includes relevant elements from TAG (Transport Analysis Guidance) Table 1 relating to the features described as river, floodplain, groundwater and stillwaters, including their attributes/services and selected/modified indicators of quality and possible measures. Two additional columns have been added for 'grading' and 'importance level'. These columns expand on the limited number of examples provided in TAG Table 2. Table 1 has been developed with reference to TAG, Highways Agency's 'New Approach to Appraisal' (NATA), the Water Framework Directive and other sources as referenced in the table.

Table 1 here relies on easily available data to avoid unnecessary data collection. Should inadequate data be available a 'worst case' should be assumed. The table is designed to act as a guide to determining importance and to raise the level of compatibility in predicting the significance of impacts on the water environment.

Once Table 1 has been used to determine the importance of the environmental attributes that may be affected by a particular development project, Tables 3 and 4 of TAG Unit 3.3.11 can be used to estimate the significance of potential impacts. These tables are reproduced here as Tables 2 and 3 respectively. Table 2 provides a methodology for determining impact magnitude. Table 3 is a matrix that allows the significance of the impact to be calculated based on the impact magnitude and the importance of the attribute. The significance of impacts can range from 'insignificant' to 'very significant'.

Table 1: Water features, their attributes, indicators of quality, grading and importance (adapted from Table 1 of TAG unit 3.3.11)

Feature	Attribute / Service	Indicator of Quality	Measure	Grading	Importance Level
River	Water Supply	Chemical water quality	Environment Agency's Chemical General Quality Assessment (GQA)	A B C-D E-F	Very High High Medium Low
		Industrial / agricultural abstractions	Location and volume of abstraction	All abstractions within 2km downstream: >1000m3/day 500-1000m3/day 50-499m3/day <50m3/day	 Very High High Medium Low
		Drinking water supply	Classification defined within The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996. No 3001[2]	Classification: DW1 or DW2 within critical travel time for pollution downstream DW3 within critical time downstream Not designated	 Very High High Medium - Low
	Biodiversity[3]	Biological Water Quality	Environment Agency's Biological GQA[1]	A B C-D E-F	Very High High Medium Low
		Fisheries Quality	Fisheries status as defined within the Freshwater Fish Directive 78/659/EEC	Designated salmonid fishery Designated cyprinid fishery Undesignated fishery Not a fishery	Very High High Medium Low

Feature	Attribute / Service	Indicator of Quality	Measure	Grading	Importance Level
River	Transport and dilution of waste product	Surface Water / effluent discharges	Type of discharges with reference to the EC Dangerous Substances Directive (76/464/EEC and Daughter Directives)	All discharges within 2km up or downstream: List I List II Other discharge / no discharge	 Very High - High Medium Medium - Low
	Recreation	Riverside access	Presence / absence of route and importance	National trail / cycleway Regional trail Definitive footpath / bridleway No route	Very High High Medium Low
		Presence of clubs/ recreation use	Presence / absence	Club recreation use present No club / recreation use	Very High - High - Medium Low
	Conveyance of flow and material	Presence of water courses	Size of watercourses[5]	Main River > 10m wide Main River < 10m wide Ordinary watercourse >5m wide Other	Very High High Medium Low
Floodplain	Flood defence	Importance in relation to flood defence	Status of flood plain area	Designated washland Active floodplain Existing defended area Does not flood	Very High High Medium Low
			Return period	> (ie more frequent then) 1 in 25 years < 1 in 25 years <1 in 100 years (urban) <1 in 50 years <1 in 200 years	Very High High Medium Medium Low
Groundwater	Water supply	Industrial / agricultural abstractions	Location and volume of abstraction	All abstraction points within zone of influence of development: >1000m3/day >500-1000m3/day 50-499m3/day <50m3/day	 Very High High Medium Low
		Drinking water supply	Presence of potable public supply or private water supply within zone of influence of development	Public supply Private water supply >10m3/day or serves >50 people[6] Other private water supply No supply	Very High High Medium Low
		Groundwater vulnerability	Source protection status	Within zone 1,2 or 3 of a source protection zone Not within a source protection zone	Very High High Medium Low
			Classification of aquifer vulnerability	Major aquifer with H soils or I soils or U soils. Minor aquifer with H soils or U soils Major aquifer with L soils. Minor aquifer with L soils or non aquifer	Very High High Medium Low
	Conveyance of flood flows	Acceptance potential of flood flows	Soil type / groundwater table levels[8]	Gravels with low water table (>1m below infiltration point) Sands with low water table All soil types with high water table Clay	Very High High Medium Low
Stillwaters (lakes and ponds)	Biodiversity[3]	Biological water quality	Classification system to be developed under the Water Framework Directive for ecological status / potential		
		Fisheries quality	Fisheries status as defined within the Freshwater Fish Directive 78/659/EEC	Designated salmonid fishery Designated cyprinid fishery Undesignated fishery Not a fishery	Very High-high High - medium Medium - low Low
	Water supply	Use for abstraction	Presence / absence	Abstraction No abstraction	Very High - High – Medium[9] Low
	Recreation	Presence of clubs / recreation use	Presence / absence	Club recreation use present No club / recreation use	Very High - High - Medium[4] Low

Notes to Table 1

1 If the river is unclassified and hence has no GQA grade, the quality can be measured or assumptions can be made based on the grade of the nearest classified stretch.

2 An importance level of high or very high must also be awarded if the water feature provides more than 10m3/day of drinking water, or serves more than 50 people, which is the definition used in the Water Framework Directive to define drinking water protected areas.

3 Conservation value is not included, as this should be included within an ecology/nature conservation assessment.

4 This required judgement on a case by case basis because the importance of use by people is being assessed, and they are sensitive to being categorised as unimportant. Careful assessment is thus required, using as much data as possible eg on the facilities, their scale and frequency of use, membership levels and economic value.

5 An importance level of 'Medium' or greater must also be awarded if a river has a catchment greater than 10km2, as this means that it will be classified as a water body under the Water Framework Directive. Other measures are available for describing the ability of watercourses to convey flow and material (such as the carrying capacity of the channel for flood flows) and could if necessary be substituted.

6 Based on criteria given within the Water Frame Work Directive for features to be designated as drinking water protected areas.

7 Adapted from NRA Policy and Practice for the Protection of Groundwater, Groundwater Vulnerability Sheets, NRA 1994. Because soil information in urban areas is less reliable and based on fewer observations than in rural areas, the worst case is assumed and such land is classified as being high of leaching potential. H = high, I = Intermediate, L = Low and U = Unclassified leaching potential.

8 This uses a coarse basis of permeability together with the ability of the existing ground conditions to accept additional flows. For example, gravels in a river floodplain are unlikely to have a high acceptance potential because of raised water table due to river flows. Sands above a relatively dry substrata would have a high potential, however caution is required in areas such as chalk with highly fluctuating groundwater levels.

9 Depends on use of water, volume abstracted etc. An importance level of 'High' or 'Very high' mus be awarded if the water feature provides more than 10m3/day of drinking water, or serves more than 50 people, which is the definition used in the Water Framework Directive to define drinking water protected areas.

Table 2: Criteria for determining impact magnitude (reproduced from Table 3 of TAG unit 3.3.11)

Magnitude	Criteria	Example
Major	Results in loss of attribute	• Loss of EC designated Salmonid fishery • Compromise employment source • Pollution of potable source of abstraction • Change in GQA grade of river reach • Loss of flood storage / increased flood risk
Moderate	Results in impact on integrity of attribute or loss of art of attribute	• Loss in productivity of a fishery • Contribution of a significant proportion of the effluent in the receiving river, but insufficient to change its GQA grade • Reduction in the economic value of the feature
Minor	Results in minor impact on attribute	• Measurable change in attribute, but of limited size and/or proportion
Negligible	Results in an impact on attribute but of insufficient magnitude to affect the use / integrity	• Discharges to watercourse but no significant loss in quality, fishery productivity or biodiversity • No significant impact on the economic value of the feature • No increase in flood risk

Table 3: Significance Criteria of Potential Impacts
(Reproduced from Table 4 of TAG unit 3.3.11)

Magnitude of Potential impact	Importance of Attribute			
	Very High	**High**	**Medium**	**Low**
Major	Very Significant	Very Significant	Significant	Low Significant
Moderate	Very Significant	Significant	Low Significant	Insignificant
Minor	Significant	Low Significant	Insignificant	Insignificant
Negligible	Low Significant	Insignificant	Insignificant	Insignificant

Table 4: Proposed impact assessment summary table

Feature	Attribute / Service	Importance Level	Magnitude of Impact	Significance of Impact
River	Water Supply	Very High	Minor	Significant

References

1 The Highways Agency et al, Design Manual for Roads and Bridges, Vol 11. Environmental Assessment, 1993.
2 DETR 'Guidance on the New Approach to Appraisal, 1998.
3 Department for Transport, Transport Analysis Guidance (TAG) 2003

RISK ASSESSMENT METHODOLOGY

GENERAL

The purpose of this appendix is to describe in detail the concepts underlying the risk based approach to assessing potentially contaminated land, introduce the roles of key legislation and describe the qualitative methodology adopted for evaluating and characterising risk.

Current best practice in the UK promotes a risk-based approach to dealing with both soil and groundwater contamination. The principal aim of the approach is to ensure protection of human health and the environment in a thorough, transparent and cost-effective manner.

Fundamental to the risk-based approach is the concept that for 'Contaminated Land' to be designated, as a consequence of historic activities, a pathway for contamination must be shown to exist between a source of contamination and a receptor. The combined presence of a source, pathway and a receptor is described as a 'pollutant linkage'.

The concepts associated with a contaminant source, pathway and receptor are defined in DETR Circular 02/2000 'Contaminated Land Environmental Protection Act 1990: Part II A'. A ***source*** of contamination may be considered as a 'substance, which is in, on or under land that has the potential to cause harm or to cause pollution of controlled waters'. A ***receptor*** can be considered as either 'a living organism, a group of living organisms, an ecological system or a piece of property which is being, or could be harmed, by a contaminant or controlled waters which are being, or could be, polluted by a contaminant'. A ***pathway*** may be considered as one or more routes by, or through, which a receptor is being, or could be, exposed to or affected, by a contaminant. Typical pathways may include migration in groundwater, surface water run-off or infiltration, inhalation, dermal contact and ingestion.

The risks posed by an identified pollutant linkage can often be mitigated by removing the source of contamination, treating the source of contamination, blocking the relevant pathway(s) or by protecting the receptor.

PRINCIPLES OF RISK EVALUATION

The risk evaluation methodology presented below is qualitative in nature, and is therefore a subjective method. It is based upon guidance presented in CIRIA publication referenced C552, 'Contaminated land risk assessment - A guide to good practice', 2001 and involves the classification of the following.

The magnitude of the potential **consequence** (severity) of risks occurring (Table 1).

The magnitude of the **probability** (likelihood) of the risk occurring (Table 2).

These are then considered in conjunction to give a risk matrix (Table 3)

Table 1 - Classification of consequence

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIA. Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health ("significant harm" as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem. (Note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).	Concentrations of a contaminant from site exceed the generic or site-specific assessment criteria. Leaching of contaminants from a site to a major or minor aquifer. Death of a species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the *Draft Circular on Contaminated Land*, DETR, 2000). Damage to sensitive buildings/structures/ services or the environment.	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discolouration of concrete.

Table 2 - Classification of probability

Classification	Definition
High likelihood	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.
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.
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.

Table 3 - Comparison of consequence against probability

		Consequence			
		Severe	*Medium*	*Mild*	*Minor*
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table 4 - Description of the classified risks and likely action required

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.
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.
Moderate Risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is 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.
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.
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.

Table 5 - Response action likely to be required in relation to estimated risk

KEY

- Mitigation and remedial measures required
- Mitigation and remedial measures likely
- Remedial measures unlikely
- Remedial measures not required

Appendix C – Site Investigation Logs

Sutcliffe

Site	Number
Benchill Road, Manchester	WS101

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 10/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10-0.40	ES				(0.40) 0.40	MADE GROUND: Dark brown, slightly silty, slightly gravelly, fine to medium SAND.			
					(0.35) 0.75	MADE GROUND: Dark brown, slightly clayey, slightly silty, very gravelly, fine to medium SAND. Gravel is angular to sub angular, fine to coarse of brick and mixed lithology.			
1.20-1.65 1.20-1.80	SPT N=21 B		2,3/4,6,5,6		(0.45) 1.20	Brown, very clayey, slightly gravelly, fine SAND. Gravel is angular to sub angular, fine to medium of mixed lithology.			
					(0.60) 1.80	Light grey mottled light brown, slightly silty, gravelly, fine SAND. Gravel is angular, fine to coarse of sandstone.			
2.00-2.39	SPT 50/235		6,11/14,14,17,5		(0.59) 2.39	Weak, laminated, light brown, slightly silty, highly weathered, fine SANDSTONE. Recovered as gravelly, fine SAND.			
						Complete at 2.39m			

Remarks

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.WS101

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Sutcliffe

Site	Number
Benchill Road, Manchester	WS102

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 09/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.25	ES				0.10 (0.15) 0.25	MADE GROUND: Asphalt		
0.50-1.00	B					MADE GROUND: Light brownish grey, very sandy, angular fine to coarse GRAVEL of limestone (subbase).		
					(1.20)	Orangish brown, clayey, silty, slightly gravelly, fine SAND.		
1.20-1.65	SPT N=23		2,4/3,4,6,10		1.45			
1.65-1.78	SPT 25*/95 50/35		17,8/50		(0.33) 1.78	Weak, laminated, orangish brown, highly weathered, fine SANDSTONE. Recovered as		
						Complete at 1.78m		

Remarks

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.WS102

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Sutcliffe

Site	Number
Benchill Road, Manchester	WS103

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 09/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.35	ES				0.10 (0.25) 0.35	MADE GROUND: Asphalt MADE GROUND: Light brownish grey, very sandy, angular fine to coarse GRAVEL of limestone (subbase).		
0.80-1.20	ES				(1.10)	Reddish brown, clayey, silty, fine SAND.		
1.20-1.61	SPT 50/260		5,7/7,8,10,25		1.45 (0.16) 1.61	Weak, light grey, highly weathered, fine SANDSTONE. Recovered as gravelly fine SAND.		
						Complete at 1.61m		

Remarks

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.WS103

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Sutcliffe

Site	Number
Benchill Road, Manchester	WS104

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 09/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					0.10 (0.15) 0.25	MADE GROUND: Asphalt			
0.40-0.80	ES				(0.55) 0.80	MADE GROUND: Light brownish grey, very sandy, angular fine to coarse GRAVEL of limestone (subbase).			
1.00-1.50	ES				(0.50) 1.30	MADE GROUND: Dark brown, silty, slightly gravelly, fine to medium SAND. Gravel is fine to coarse, sub rounded of ash and mixed lithology.			
1.20-1.65	SPT N=12		2,2/3,2,3,4		(0.60) 1.90	Medium dense, reddish brown, very clayey, fine SAND.			
						Medium dense, reddish brown, clayey, gravelly, fine Sand.			
2.00-2.40	SPT 50/250		4,7/10,11,14,15		(0.50) 2.40	Weak, reddish brown, clayey, silty, highly weathered, fine SANDSTONE. Recovered as gravelly fine SAND.			
						Complete at 2.40m			

Remarks

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.WS104

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Sutcliffe

Site	Number
Benchill Road, Manchester	WS105

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 09/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.10 (0.30)	MADE GROUND: Asphalt		
0.40-0.80	ES				0.40 (0.40)	MADE GROUND: Light brownish grey, very sandy, angular fine to coarse GRAVEL of limestone (subbase).		
					0.80	MADE GROUND: Dark brown, slightly silty, slightly gravelly, fine to medium SAND. gravel is angular to sub rounded, fione to coarse of ash and mixed lithology.		
1.20-1.65	SPT N=28		3,4/6,6,6,10		(1.00)	Orangish brown, slightly silty, slightly gravelly, fine SAND. Gravel is fine to coarse, sub angular to sub roudned of mixed lithology.		
					1.80			
2.00-2.40	SPT 50/250		8,8/10,12,17,11		(0.60)	Weak, orangish brown, slightly silty, slightly clayey, highly weathered, fine SANDSTONE. Recovered as gravelly fine SAND.		
					2.40	Complete at 2.40m		

Remarks

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.WS105

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Sutcliffe

Site	Number
Benchill Road, Manchester	WS106

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 09/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.10 (0.30)	MADE GROUND: Asphalt		
0.40-0.75	ES				0.40 (0.35)	MADE GROUND: Light brownish grey, very sandy, angular fine to coarse GRAVEL of limestone (subbase).		
0.80-1.40	B				0.75 (0.65)	MADE GROUND: Dark brown, slightly silty, slightly gravelly, fine to medium SAND. gravcel is angular to sub angular fine to coarse of ash, brick, and mixed lithology.		
1.20-1.61	SPT 50/260		3,3/9,13,14,14		1.40 (0.21) 1.61	Orangish brown, very clayey, slightly silty, fine SAND.		
						Weak, Orangish brown mottled light brown, slightly clayey, slightly silty, highly weathered, fine SANDSTONE. Reocvered as gravelly, fine SAND.		
						Complete at 1.61m		

Remarks

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.WS106

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Sutcliffe

Site	Number
Benchill Road, Manchester	WS107

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 09/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.70	ES				(0.70)	Dark brown, slightly silty, fine to medium SAND with frequent rootlets (Grass over topsoil)		
					0.70 (0.30)	Light brown, slightly gravelly, fine to medium SAND. Gravel is rounded to sub rounded, fine to coarse, of mixed lithology.		
					1.00			
1.20-1.65	SPT N=27		2,3/4,5,8,10		(0.60)	Light grey, slightly clayey, slightly silty, gravelly, fine SAND. Gravel is angular, fine to medium of SANDSTONE.		
					1.60			
1.90-2.30	SPT 50/250		9,10/11,12,14,13		(0.70)	Reddish brown, slightly silty, clayey, highly weathered, fine SANDSTONE. Recovered as gravelly fine SAND.		
					2.30	Complete at 2.30m		

Remarks

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.WS107

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Site	Number
Benchill Road, Manchester	WS108

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 10/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.15) 0.15	MADE GROUND: Dark brown, slightly silty, slightly gravelly, fine to medium SAND with frequent rootlets (Grass over topsoil). Gravel is fine to medium, angular to sub rounded of mixed lithology and glass.			
					(0.85)				
					1.00	MADE GROUND: dark brown, slightly silty, gravelly, fine to medium SAND. Gravel is angular to sub rounded, fine to coarse of ash, brick, mixed lithology.			
1.20-1.65	SPT N=20		1,2/4,4,6,6		(1.01)	Orangish brown, clayey, slightly gravelly, fine SAND. Gravel is fine, angular to sub angular of mixed lithology.			
1.70-2.09	SPT 50/235		7,10/16,23,11		2.01	Complete at 2.09m			

Remarks

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.WS108

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Site	Number
Benchill Road, Manchester	WS109

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 10/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.40-1.00	B				(0.40) 0.40	MADE GROUND: Dark brown, slightly silty, slightly gravelly, fine to medium SAND with frequent rootlets. Gravel is fine to medium, angular to sub rounded of mixed lithology and glass.			
1.20-1.65	SPT N=50		4,6/12,13,15,10		(1.19) 1.59	Medium dense becoming very dense, reddish brown, mottled grey, slightly clayey, slightly silty, slightly gravelly, fine SAND. Gravel is angular to sub angular, fine to coarse of sandstone.			
						Complete at 1.59m			

Remarks

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.WS109

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Sutcliffe

Site	Number
Benchill Road, Manchester	WS110

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 10/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.60	ES				(0.60)	MADE GROUND: Dark brown, slighthly silty, slightly clayey, slightly gravelly, fine to medium SAND. Gravel is angular, fine to medium of brick and mixed lithology.		
0.60-1.00	B				0.60			
0.80-1.00	ES				(0.40)	Reddish brown, silty, slightly clayey, slightly gravelly, fine SAND. Gravel is sub angular to angular, fine to medium of SANDSTONE.		
1.20-1.59	SPT 50/235		2,4/6,14,18,12		1.00			
					(0.59)	Reddish brown, slightly silty, slightly clayey, highly weathered, fine SANDSTONE. Recovered as gravelly fine SAND.		
					1.59	Complete at 1.59m		

Remarks

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.WS110

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Sutcliffe

Site	Borehole Number
Benchill Road, Manchester	BH101

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion			Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 09/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(1.90)	MADE GROUND: Concrete.		
						1.90	Terminated at 1.90m		

Remarks
Concrete coring terminated at 1.90mbgl.

Scale (approx)	Logged By
1:50	MW

Figure No. 33029LG.BH101

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Sutcliffe

Site	Trial Pit Number
Benchill Road, Manchester	SA101

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	1.6m x 0.6m x 1.5m		Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 11/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.10 (0.15) 0.25	MADE GROUND: Asphalt MADE GROUND: Light brownish grey, very sandy, angular fine to coarse GRAVEL of limestone (subbase).		
					(0.85) 1.10	Reddish brown, silty, clayey, fine SAND. Gravel is angular to sub rounded fine to medium of mixed lithology		
					(0.40) 1.50	Light grey mottled reddish brown, silty, highly weathered, fine SANDSTONE. Recovered as gravelly, fine SAND.		
						Complete at 1.50m		



Remarks

Scale (approx)	Logged By	Figure No.
1:50	MW	33029LG.SA101

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Sutcliffe

Site	Trial Pit Number
Benchill Road, Manchester	SA102

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	1.45m x 0.6m x 1.95m		Wythenshawe Community Housing Group	33029LG
	Location	**Dates** 11/10/2023	**Engineer** MW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30) 0.30	MADE GROUND: Dark brown, slightly silty, slightly gravelly, fine to medium SAND with frequent rootlets (Grass over topsoil). Gravel is fine to medium, angular to sub rounded of mixed lithology and glass.		
					(0.45) 0.75	MADE GROUND: brown, silty, clayey, slightly gravelly, fine to medium SAND. Gravel is angular, fine to medium of brick and mixed lithology.		
					(0.50) 1.25	Light grey, fine to coarse, SAND.		
					(0.70) 1.95	Reddish brown, silty, slightly clayey, highly weathered, fine SANDSTONE. Recovered as gravelly fine SAND.		
						Complete at 1.95m		



Remarks

Scale (approx)	Logged By	Figure No.
1:50	MW	33029LG.SA101

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Appendix D – Analytical Certificates

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/10082
Issue Number: 1 **Date:** 31 October, 2023

Client: Sutcliffe
18-20 Harrington Street
Liverpool
L2 9QA

Project Manager: (Use) D Evans; D Bowen; A Tosh; W Baldwin/(Use) Sa
Project Name: Benchill
Project Ref: 33029LG
Order No: 10014
Date Samples Received: 11/10/23
Date Instructions Received: 12/10/23
Date Analysis Completed: 31/10/23

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
% Moisture at <40C$_A$	7.5	3.0	3.4	-	7.7	14.3	11.6	% w/w	0.1	A-T-044
% Stones >10mm$_A$	45.4	43.2	37.2	<0.1	14.2	<0.1	18.9	% w/w	0.1	A-T-044
pH$_D^{M\#}$	8.07	9.01	8.93	8.54	8.04	7.70	7.86	pH	0.01	A-T-031s
Electrical conductivity @ 20degC$_D$	-	-	-	140	-	-	-	µs/cm	10	A-T-037s
Sulphate (water sol 2:1)$_D^{M\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D^{M\#}$	270	<200	<200	-	210	260	320	mg/kg	200	A-T-028s
Cyanide (total)$_A^{M\#}$	<1	<1	<1	-	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Sulphide$_A$	<5	22	<5	-	28	15	<5	mg/kg	5	A-T-043-s
Sulphur (elemental)$_D^{M\#}$	170	<5	<5	-	16	8	110	mg/kg	5	A-T-029s
Organic Matter$_D^{M\#}$	5.8	1.8	2.4	-	2.1	3.7	3.5	% w/w	0.1	A-T-032s
Arsenic$_D^{M\#}$	5	1	<1	-	5	7	6	mg/kg	1	A-T-024s
Boron (water soluble)$_D^{M\#}$	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium$_D^{M\#}$	<0.5	0.6	<0.5	-	0.5	<0.5	<0.5	mg/kg	0.5	A-T-024s
Copper$_D^{M\#}$	31	7	6	-	21	25	32	mg/kg	1	A-T-024s
Chromium$_D^{M\#}$	11	9	9	-	9	13	15	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	-	<1	<1	<1	mg/kg	1	A-T-040s
Chromium (trivalent)	11	9	9	-	9	13	15	mg/kg	1	Calc
Lead$_D^{M\#}$	34	11	13	-	38	45	61	mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17	-	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel$_D^{M\#}$	18	10	9	-	9	12	17	mg/kg	1	A-T-024s
Selenium$_D^{M\#}$	<1	<1	<1	-	<1	<1	<1	mg/kg	1	A-T-024s
Zinc$_D^{M\#}$	94	34	26	-	55	44	71	mg/kg	5	A-T-024s
Redox Potential (water soluble)$_D$	-	-	-	160	-	-	-	mV		Redox
Leachate Prep NRA (10:1)$_A$	*	-	-	-	*	-	*			A-T-001
pH (leachable)$_A$	7.26	-	-	-	7.47	-	7.32	pH	0.01	A-T-031w
Sulphate (leachable)$_A$	5.74	-	-	-	5.87	-	39.73	mg/l	1	A-T-026w
Cyanide (total) (leachable)$_A$	<0.005	-	-	-	<0.005	-	<0.005	mg/l	0.005	A-T-042wTCN
Phenols (total by HPLC) (leachable)$_A$	0.02	-	-	-	<0.01	-	<0.01	mg/l	0.01	A-T-050w
Sulphide (leachable)$_A$	<0.1	-	-	-	<0.1	-	<0.1	mg/l	0.1	A-T-043-w
DOC (leachable)$_A$	3.5	-	-	-	7.2	-	11.4	mg/l	2	A-T-032w
Arsenic (leachable)$_A$	8	-	-	-	10	-	3	µg/l	1	A-T-025w
Boron (leachable)$_A$	<10	-	-	-	16	-	12	µg/l	10	A-T-025w

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
Cadmium (leachable)$_A$	<1	-	-	-	<1	-	<1	µg/l	1	A-T-025w
Copper (leachable)$_A$	24	-	-	-	31	-	29	µg/l	4	A-T-025w
Chromium (leachable)$_A$	2	-	-	-	2	-	3	µg/l	1	A-T-025w
Chromium (hexavalent) (leachable)$_A$	<0.05	-	-	-	<0.05	-	<0.05	mg/l	0.05	A-T-040w
Chromium (trivalent)	<0.05	-	-	-	<0.05	-	<0.05	mg/l	0.05	Calc
Lead (leachable)$_A$	44	-	-	-	57	-	29	µg/l	1	A-T-025w
Mercury (leachable)$_A$	<0.1	-	-	-	<0.1	-	<0.1	µg/l	0.1	A-T-025w
Nickel (leachable)$_A$	<2	-	-	-	<2	-	5	µg/l	2	A-T-025w
Selenium (leachable)$_A$	<1	-	-	-	<1	-	1	µg/l	1	A-T-025w
Sulphur (elemental/free) (leachable)$_A$	<0.1	-	-	-	<0.1	-	<0.1	mg/l	0.1	A-T-029w
Zinc (leachable)$_A$	67	-	-	-	25	-	40	µg/l	2	A-T-025w
TPH total (>C6-C40) (leachable)$_A$	319	-	-	-	<80	-	<80	µg/l	80	A-T-007w

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD	NAD	NAD	-	NAD	NAD	NAD			A-T-045
Asbestos Matrix (visual)$_{D}$	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope)$_{D}$	-	-	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	N/A	N/A	-	N/A	N/A	N/A			A-T-045

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
PAH-16MS										
Acenaphthene$_A^{M\#}$	2.25	0.08	0.08	-	0.27	0.18	1.06	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	0.97	0.76	0.84	-	1.23	1.53	1.45	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	6.02	<0.02	<0.02	-	0.37	<0.02	3.04	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	10.7	<0.04	<0.04	-	0.87	<0.04	7.60	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	6.65	<0.04	<0.04	-	0.60	<0.04	5.95	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	8.17	<0.05	<0.05	-	0.72	<0.05	7.13	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	3.16	<0.05	<0.05	-	<0.05	<0.05	3.18	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	3.70	<0.07	<0.07	-	<0.07	<0.07	3.08	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	11.3	<0.06	<0.06	-	1.02	<0.06	8.02	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A$	0.83	<0.04	<0.04	-	<0.04	<0.04	0.70	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	28.2	<0.08	<0.08	-	2.18	<0.08	16.9	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	1.87	<0.01	<0.01	-	0.19	<0.01	1.33	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	3.98	<0.03	<0.03	-	0.38	<0.03	3.95	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	0.38	<0.03	<0.03	-	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	26.5	<0.03	<0.03	-	1.39	<0.03	10.7	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	22	<0.07	<0.07	-	1.83	<0.07	14.2	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A$	137	0.84	0.92	-	11.1	1.71	88.3	mg/kg	0.01	A-T-019s

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
PAH-16MS (leachable)										
Acenaphthene (leachable)$_A$	0.62	-	-	-	0.09	-	0.07	µg/l	0.01	A-T-019w
Acenaphthylene (leachable)$_A$	<0.01	-	-	-	<0.01	-	0.05	µg/l	0.01	A-T-019w
Anthracene (leachable)$_A$	0.17	-	-	-	0.03	-	0.07	µg/l	0.01	A-T-019w
Benzo(a)anthracene (leachable)$_A$	1.23	-	-	-	0.02	-	0.34	µg/l	0.01	A-T-019w
Benzo(a)pyrene (leachable)$_A$	0.44	-	-	-	<0.01	-	0.28	µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (leachable)$_A$	0.61	-	-	-	0.01	-	0.38	µg/l	0.01	A-T-019w
Benzo(ghi)perylene (leachable)$_A$	0.24	-	-	-	<0.01	-	0.20	µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (leachable)$_A$	0.24	-	-	-	<0.01	-	0.18	µg/l	0.01	A-T-019w
Chrysene (leachable)$_A$	1.10	-	-	-	0.03	-	0.42	µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (leachable)$_A$	0.05	-	-	-	<0.01	-	0.05	µg/l	0.01	A-T-019w
Fluoranthene (leachable)$_A$	5.53	-	-	-	0.12	-	0.60	µg/l	0.01	A-T-019w
Fluorene (leachable)$_A$	0.08	-	-	-	0.06	-	0.05	µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (leachable)$_A$	0.28	-	-	-	<0.01	-	0.21	µg/l	0.01	A-T-019w
Naphthalene (leachable)$_A$	<0.01	-	-	-	<0.01	-	0.02	µg/l	0.01	A-T-019w
Phenanthrene (leachable)$_A$	0.26	-	-	-	0.16	-	0.13	µg/l	0.01	A-T-019w
Pyrene (leachable)$_A$	3.87	-	-	-	0.09	-	0.52	µg/l	0.01	A-T-019w
Total PAH-16MS (leachable)$_A$	14.7	-	-	-	0.61	-	3.57	µg/l	0.01	A-T-019w

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
SVOC										
4-Bromophenyl phenyl ether$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Hexachlorobenzene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Diethyl phthalate$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Dimethyl phthalate$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Dibenzofuran$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Carbazole$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Butylbenzyl phthalate$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	-	-	-	<500	-	-	-	µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
4-Nitrophenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
3+4-Methylphenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
4-Chloro-3-methylphenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2-Nitrophenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2-Methylphenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
1,2,4-Trichlorobenzene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2-Chlorophenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2,6-Dinitrotoluene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2,4-Dinitrotoluene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2,4-Dimethylphenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2,4-Dichlorophenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2,4,6-Trichlorophenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2,4,5-Trichlorophenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
1,4-Dichlorobenzene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
1,3-Dichlorobenzene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
1,2-Dichlorobenzene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2-Chloronaphthalene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
2-Methylnaphthalene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Acenaphthylene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Acenaphthene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Anthracene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Benzo(a)anthracene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
Benzo(b)fluoranthene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Benzo(k)fluoranthene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Benzo(a)pyrene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Benzo(ghi)perylene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Chrysene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Fluoranthene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Fluorene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Indeno(1,2,3-cd)pyrene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Phenanthrene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Pyrene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Naphthalene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Dibenzo(ah)anthracene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Phenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Pentachlorophenol$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
n-Dioctylphthalate$_A$	-	-	-	<500	-	-	-	µg/kg	500	A-T-052s
n-Dibutylphthalate$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Nitrobenzene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Isophorone$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Hexachloroethane$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Hexachlorobutadiene$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
SVOC Total (excl. PAH/Phenols/Cresols)$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Phenol Total$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s
Cresol & Chlorinated Phenol Total$_A$	-	-	-	<100	-	-	-	µg/kg	100	A-T-052s

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
VOC										
Dichlorodifluoromethane$_{A}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Chloromethane$_{A}$	-	-	-	<10	-	-	-	µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Bromomethane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Chloroethane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Trichlorofluoromethane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloroethene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Carbon Disulphide$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Dichloromethane$_{A}$	-	-	-	<5	-	-	-	µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloroethane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
2,2-Dichloropropane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Bromochloromethane$_{A}^{\#}$	-	-	-	<5	-	-	-	µg/kg	5	A-T-006s
Chloroform$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloropropene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Carbon Tetrachloride$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,2-Dichloroethane$_{A}^{\#}$	-	-	-	<2	-	-	-	µg/kg	2	A-T-006s
Benzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Trichloroethene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,2-Dichloropropane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Dibromomethane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Bromodichloromethane$_{A}^{\#}$	-	-	-	<10	-	-	-	µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Toluene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,3-Dichloropropane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Tetrachloroethene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Dibromochloromethane$_{A}^{\#}$	-	-	-	<3	-	-	-	µg/kg	3	A-T-006s
1,2-Dibromoethane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s

Envirolab Job Number: 23/10082 **Client Project Name: Benchill**

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
Chlorobenzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_{A}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Ethylbenzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
m & p Xylene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
o-Xylene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Styrene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Bromoform$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Isopropylbenzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_{A}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
Bromobenzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
n-Propylbenzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
2-Chlorotoluene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
4-Chlorotoluene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
tert-Butylbenzene$_{A}^{\#}$	-	-	-	<2	-	-	-	µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
sec-Butylbenzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
4-Isopropyltoluene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_{A}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
n-Butylbenzene$_{A}^{\#}$	-	-	-	<1^{U}	-	-	-	µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_{A}^{\#}$	-	-	-	<1	-	-	-	µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_{A}$	-	-	-	<2	-	-	-	µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_{A}$	-	-	-	<3	-	-	-	µg/kg	3	A-T-006s
Hexachlorobutadiene$_{A}^{\#}$	-	-	-	<1^{U}	-	-	-	µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_{A}$	-	-	-	<3	-	-	-	µg/kg	3	A-T-006s
VOC Total$_{A}$	-	-	-	<10	-	-	-	µg/kg	10	A-T-006s

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
TPH CWG with Clean Up										
Ali >C5-C6$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<20	<10	<10	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12$_A$$^{M\#}$	<20	<10	<10	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16$_A$$^{M\#}$	<20	<10	<10	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C16-C21$_A$$^{M\#}$	<20	<10	<10	<1	<1	<1	6	mg/kg	1	A-T-055s
Ali >C21-C35$_A$$^{M\#}$	50	180	347	6	46	7	31	mg/kg	1	A-T-055s
Total Aliphatics$_A$	-	-	-	6	-	-	-	mg/kg	1	Calc-As Recd
Aro >C5-C7$_A$$^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8$_A$$^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<20	<10	<10	1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<20	<10	<10	<1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16$_A$$^{M\#}$	207	<10	<10	<1	3	1	20	mg/kg	1	A-T-055s
Aro >C16-C21$_A$$^{M\#}$	986	<10	<10	<1	7	6	163	mg/kg	1	A-T-055s
Aro >C21-C35$_A$$^{M\#}$	1560	88	160	2	33	29	611	mg/kg	1	A-T-055s
EPH Total Ali & Aro (>C10-C16)$_A$$^{\#}$	-	-	-	<1	-	-	-	mg/kg	1	A-T-055s
EPH Total Ali & Aro (>C16-C35)$_A$$^{\#}$	-	-	-	8	-	-	-	mg/kg	1	A-T-055s
Total Aromatics$_A$	-	-	-	3	-	-	-	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_A$	-	-	-	9	-	-	-	mg/kg	1	Calc-As Recd
BTEX and MTBE Total$_A$	-	-	-	<0.01	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Benzene$_A$$^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene$_A$$^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A$$^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A$$^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A$$^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE$_A$$^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
VPH total (>C5-C10)$_A$$^{\#}$	-	-	-	<0.01	-	-	-	mg/kg	0.01	A-T-022s

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS103	WS104	WS105	WS106			
Depth to Top	0.10	0.10	0.10	0.80	0.40	0.40	0.40			
Depth To Bottom	0.40	0.25	0.35	1.20	0.80	0.80	0.75			
Date Sampled	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6A	6A	6A	6	6A	6A	6A			
TPH UKCWG with Clean Up										
Ali >C35-C44$_A$	41	87	216	-	55	2	28	mg/kg	1	A-T-055s
Total Aliphatics$_A$	91	266	563	-	101	9	67	mg/kg	1	Calc-As Recd
Aro >C35-C44$_A$	44	78	203	-	43	2	29	mg/kg	1	A-T-055s
Total Aromatics$_A$	2800	167	363	-	86	39	824	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C44)$_A$	2890	433	923	-	188	48	891	mg/kg	1	Calc-As Recd

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
% Moisture at <40C$_A$	15.2	15.3	-					% w/w	0.1	A-T-044
% Stones >10mm$_A$	<0.1	1.2	<0.1					% w/w	0.1	A-T-044
pH$_D^{M\#}$	7.09	6.82	5.14					pH	0.01	A-T-031s
Electrical conductivity @ 20degC$_D$	-	-	12					µs/cm	10	A-T-037s
Sulphate (water sol 2:1)$_D^{M\#}$	<0.01	<0.01	-					g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D^{M\#}$	<200	290	-					mg/kg	200	A-T-028s
Cyanide (total)$_A^{M\#}$	<1	<1	-					mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	-					mg/kg	0.2	A-T-050s
Sulphide$_A$	<5	<5	-					mg/kg	5	A-T-043-s
Sulphur (elemental)$_D^{M\#}$	<5	9	-					mg/kg	5	A-T-029s
Organic Matter$_D^{M\#}$	1.5	3.1	-					% w/w	0.1	A-T-032s
Arsenic$_D^{M\#}$	<1	3	-					mg/kg	1	A-T-024s
Boron (water soluble)$_D^{M\#}$	<1.0	<1.0	-					mg/kg	1	A-T-027s
Cadmium$_D^{M\#}$	<0.5	<0.5	-					mg/kg	0.5	A-T-024s
Copper$_D^{M\#}$	11	27	-					mg/kg	1	A-T-024s
Chromium$_D^{M\#}$	10	22	-					mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	-					mg/kg	1	A-T-040s
Chromium (trivalent)	10	22	-					mg/kg	1	Calc
Lead$_D^{M\#}$	11	66	-					mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17	-					mg/kg	0.17	A-T-024s
Nickel$_D^{M\#}$	5	17	-					mg/kg	1	A-T-024s
Selenium$_D^{M\#}$	<1	<1	-					mg/kg	1	A-T-024s
Zinc$_D^{M\#}$	30	100	-					mg/kg	5	A-T-024s
Redox Potential (water soluble)$_D$	-	-	202					mV		Redox
Leachate Prep NRA (10:1)$_A$	-	*	-							A-T-001
pH (leachable)$_A$	-	7.11	-					pH	0.01	A-T-031w
Sulphate (leachable)$_A$	-	19.38	-					mg/l	1	A-T-026w
Cyanide (total) (leachable)$_A$	-	<0.005	-					mg/l	0.005	A-T-042wTCN
Phenols (total by HPLC) (leachable)$_A$	-	<0.01	-					mg/l	0.01	A-T-050w
Sulphide (leachable)$_A$	-	<0.1	-					mg/l	0.1	A-T-043-w
DOC (leachable)$_A$	-	11.9	-					mg/l	2	A-T-032w
Arsenic (leachable)$_A$	-	5	-					µg/l	1	A-T-025w
Boron (leachable)$_A$	-	<10	-					µg/l	10	A-T-025w

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
Cadmium (leachable)$_A$	-	<1	-					µg/l	1	A-T-025w
Copper (leachable)$_A$	-	33	-					µg/l	4	A-T-025w
Chromium (leachable)$_A$	-	4	-					µg/l	1	A-T-025w
Chromium (hexavalent) (leachable)$_A$	-	<0.05	-					mg/l	0.05	A-T-040w
Chromium (trivalent)	-	<0.05	-					mg/l	0.05	Calc
Lead (leachable)$_A$	-	37	-					µg/l	1	A-T-025w
Mercury (leachable)$_A$	-	0.3	-					µg/l	0.1	A-T-025w
Nickel (leachable)$_A$	-	3	-					µg/l	2	A-T-025w
Selenium (leachable)$_A$	-	<1	-					µg/l	1	A-T-025w
Sulphur (elemental/free) (leachable)$_A$	-	<0.1	-					mg/l	0.1	A-T-029w
Zinc (leachable)$_A$	-	73	-					µg/l	2	A-T-025w
TPH total (>C6-C40) (leachable)$_A$	-	<80	-					µg/l	80	A-T-007w

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD	NAD	-							A-T-045
Asbestos Matrix (visual)$_{D}$	-	-	-							A-T-045
Asbestos Matrix (microscope)$_{D}$	-	-	-							A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	N/A	-							A-T-045

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	0.09	-					mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	0.03	-					mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	0.17	-					mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	0.52	-					mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	0.66	-					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	0.69	-					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	<0.05	-					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	<0.07	-					mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	0.93	-					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A$	<0.04	<0.04	-					mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	0.19	1.36	-					mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	0.05	-					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	0.51	-					mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	<0.03	-					mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	0.08	0.66	-					mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	0.18	1.27	-					mg/kg	0.07	A-T-019s
Total PAH-16MS$_A$	0.45	6.94	-					mg/kg	0.01	A-T-019s

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
PAH-16MS (leachable)										
Acenaphthene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Acenaphthylene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Anthracene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Benzo(a)anthracene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Benzo(a)pyrene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Benzo(ghi)perylene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Chrysene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Fluoranthene (leachable)$_A$	-	0.03	-					µg/l	0.01	A-T-019w
Fluorene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Naphthalene (leachable)$_A$	-	<0.01	-					µg/l	0.01	A-T-019w
Phenanthrene (leachable)$_A$	-	0.03	-					µg/l	0.01	A-T-019w
Pyrene (leachable)$_A$	-	0.02	-					µg/l	0.01	A-T-019w
Total PAH-16MS (leachable)$_A$	-	0.08	-					µg/l	0.01	A-T-019w

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
SVOC										
4-Bromophenyl phenyl ether$_A$	-	-	<100					µg/kg	100	A-T-052s
Hexachlorobenzene$_A$	-	-	<100					µg/kg	100	A-T-052s
Diethyl phthalate$_A$	-	-	<100					µg/kg	100	A-T-052s
Dimethyl phthalate$_A$	-	-	<100					µg/kg	100	A-T-052s
Dibenzofuran$_A$	-	-	<100					µg/kg	100	A-T-052s
Carbazole$_A$	-	-	<100					µg/kg	100	A-T-052s
Butylbenzyl phthalate$_A$	-	-	<100					µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	-	-	<500					µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane$_A$	-	-	<100					µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether$_A$	-	-	<100					µg/kg	100	A-T-052s
4-Nitrophenol$_A$	-	-	<100					µg/kg	100	A-T-052s
3+4-Methylphenol$_A$	-	-	<100					µg/kg	100	A-T-052s
4-Chloro-3-methylphenol$_A$	-	-	<100					µg/kg	100	A-T-052s
2-Nitrophenol$_A$	-	-	<100					µg/kg	100	A-T-052s
2-Methylphenol$_A$	-	-	<100					µg/kg	100	A-T-052s
1,2,4-Trichlorobenzene$_A$	-	-	<100					µg/kg	100	A-T-052s
2-Chlorophenol$_A$	-	-	<100					µg/kg	100	A-T-052s
2,6-Dinitrotoluene$_A$	-	-	<100					µg/kg	100	A-T-052s
2,4-Dinitrotoluene$_A$	-	-	<100					µg/kg	100	A-T-052s
2,4-Dimethylphenol$_A$	-	-	<100					µg/kg	100	A-T-052s
2,4-Dichlorophenol$_A$	-	-	<100					µg/kg	100	A-T-052s
2,4,6-Trichlorophenol$_A$	-	-	<100					µg/kg	100	A-T-052s
2,4,5-Trichlorophenol$_A$	-	-	<100					µg/kg	100	A-T-052s
1,4-Dichlorobenzene$_A$	-	-	<100					µg/kg	100	A-T-052s
1,3-Dichlorobenzene$_A$	-	-	<100					µg/kg	100	A-T-052s
1,2-Dichlorobenzene$_A$	-	-	<100					µg/kg	100	A-T-052s
2-Chloronaphthalene$_A$	-	-	<100					µg/kg	100	A-T-052s
2-Methylnaphthalene$_A$	-	-	<100					µg/kg	100	A-T-052s
Acenaphthylene$_A$	-	-	<100					µg/kg	100	A-T-052s
Acenaphthene$_A$	-	-	<100					µg/kg	100	A-T-052s
Anthracene$_A$	-	-	<100					µg/kg	100	A-T-052s
Benzo(a)anthracene$_A$	-	-	<100					µg/kg	100	A-T-052s

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
Benzo(b)fluoranthene$_A$	-	-	<100					µg/kg	100	A-T-052s
Benzo(k)fluoranthene$_A$	-	-	<100					µg/kg	100	A-T-052s
Benzo(a)pyrene$_A$	-	-	<100					µg/kg	100	A-T-052s
Benzo(ghi)perylene$_A$	-	-	<100					µg/kg	100	A-T-052s
Chrysene$_A$	-	-	<100					µg/kg	100	A-T-052s
Fluoranthene$_A$	-	-	<100					µg/kg	100	A-T-052s
Fluorene$_A$	-	-	<100					µg/kg	100	A-T-052s
Indeno(1,2,3-cd)pyrene$_A$	-	-	<100					µg/kg	100	A-T-052s
Phenanthrene$_A$	-	-	<100					µg/kg	100	A-T-052s
Pyrene$_A$	-	-	<100					µg/kg	100	A-T-052s
Naphthalene$_A$	-	-	<100					µg/kg	100	A-T-052s
Dibenzo(ah)anthracene$_A$	-	-	<100					µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	-	-	<100					µg/kg	100	A-T-052s
Phenol$_A$	-	-	<100					µg/kg	100	A-T-052s
Pentachlorophenol$_A$	-	-	<100					µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine$_A$	-	-	<100					µg/kg	100	A-T-052s
n-Dioctylphthalate$_A$	-	-	<500					µg/kg	500	A-T-052s
n-Dibutylphthalate$_A$	-	-	<100					µg/kg	100	A-T-052s
Nitrobenzene$_A$	-	-	<100					µg/kg	100	A-T-052s
Isophorone$_A$	-	-	<100					µg/kg	100	A-T-052s
Hexachloroethane$_A$	-	-	<100					µg/kg	100	A-T-052s
Hexachlorobutadiene$_A$	-	-	<100					µg/kg	100	A-T-052s
SVOC Total (excl. PAH/Phenols/Cresols)$_A$	-	-	<100					µg/kg	100	A-T-052s
Phenol Total$_A$	-	-	<100					µg/kg	100	A-T-052s
Cresol & Chlorinated Phenol Total$_A$	-	-	<100					µg/kg	100	A-T-052s

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
VOC										
Dichlorodifluoromethane$_{A}$	-	-	<1					µg/kg	1	A-T-006s
Chloromethane$_{A}$	-	-	<10					µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Bromomethane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Chloroethane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Trichlorofluoromethane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,1-Dichloroethene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Carbon Disulphide$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Dichloromethane$_{A}$	-	-	<5					µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,1-Dichloroethane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
2,2-Dichloropropane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Bromochloromethane$_{A}^{\#}$	-	-	<5					µg/kg	5	A-T-006s
Chloroform$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,1-Dichloropropene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Carbon Tetrachloride$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,2-Dichloroethane$_{A}^{\#}$	-	-	<2					µg/kg	2	A-T-006s
Benzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Trichloroethene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,2-Dichloropropane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Dibromomethane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Bromodichloromethane$_{A}^{\#}$	-	-	<10					µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Toluene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,3-Dichloropropane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Tetrachloroethene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Dibromochloromethane$_{A}^{\#}$	-	-	<3					µg/kg	3	A-T-006s
1,2-Dibromoethane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s

Envirolab Job Number: 23/10082 **Client Project Name: Benchill**

Client Project Ref: 33029LG

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
Chlorobenzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_{A}$	-	-	<1					µg/kg	1	A-T-006s
Ethylbenzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
m & p Xylene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
o-Xylene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Styrene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Bromoform$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Isopropylbenzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_{A}$	-	-	<1					µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
Bromobenzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
n-Propylbenzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
2-Chlorotoluene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
4-Chlorotoluene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
tert-Butylbenzene$_{A}^{\#}$	-	-	<2					µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
sec-Butylbenzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
4-Isopropyltoluene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_{A}$	-	-	<1					µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
n-Butylbenzene$_{A}^{\#}$	-	-	<1^{U}					µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_{A}^{\#}$	-	-	<1					µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_{A}$	-	-	<2					µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_{A}$	-	-	<3					µg/kg	3	A-T-006s
Hexachlorobutadiene$_{A}^{\#}$	-	-	<1^{U}					µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_{A}$	-	-	<3					µg/kg	3	A-T-006s
VOC Total$_{A}$	-	-	<10					µg/kg	10	A-T-006s

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
TPH CWG with Clean Up										
Ali >C5-C6$_A$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C6-C8$_A$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	7	20	3					mg/kg	1	A-T-055s
Total Aliphatics$_A$	-	-	3					mg/kg	1	Calc-As Recd
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C12-C16$_A^{M\#}$	1	2	<1					mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	2	6	<1					mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	9	31	2					mg/kg	1	A-T-055s
EPH Total Ali & Aro (>C10-C16)$_A^{\#}$	-	-	<1					mg/kg	1	A-T-055s
EPH Total Ali & Aro (>C16-C35)$_A^{\#}$	-	-	6					mg/kg	1	A-T-055s
Total Aromatics$_A$	-	-	2					mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_A$	-	-	6					mg/kg	1	Calc-As Recd
BTEX and MTBE Total$_A$	-	-	<0.01					mg/kg	0.01	A-T-022s
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
VPH total (>C5-C10)$_A^{\#}$	-	-	<0.01					mg/kg	0.01	A-T-022s

Envirolab Job Number: 23/10082

Client Project Name: Benchill

Client Project Ref: 33029LG

Lab Sample ID	23/10082/8	23/10082/9	23/10082/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS107	WS110	WS110							
Depth to Top	0.00	0.00	0.80							
Depth To Bottom	0.70	0.60	1.00							
Date Sampled	09-Oct-23	10-Oct-23	10-Oct-23							
Sample Type	SOIL	SOIL	SOIL							
Sample Matrix Code	6	6AE	6							
TPH UKCWG with Clean Up										
Ali >C35-C44$_A$	2	8	-					mg/kg	1	A-T-055s
Total Aliphatics$_A$	9	28	-					mg/kg	1	Calc-As Recd
Aro >C35-C44$_A$	2	10	-					mg/kg	1	A-T-055s
Total Aromatics$_A$	15	50	-					mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C44)$_A$	25	78	-					mg/kg	1	Calc-As Recd

Report Notes

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received within the same delivery, will be disposed of **six weeks** after the initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of **six months** after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and Interpretations expressed are outside our scope of accreditation.
The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client.
A deviating sample report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Key

Superscript "#"	Accredited to ISO 17025
Superscript "M"	Accredited to MCertS
Superscript "U"	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript "A"	Analysis performed on as-received Sample
Subscript "D"	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript "^"	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
N/A	Not applicable

Asbestos
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing, and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs
Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.					

Soil Chemical Analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH by method A-T-007:
For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
Results "with Clean up" indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:
EPH CWG results have humics mathematically subtracted through instrument calculation.
Where these humic substances have been identified in any IDs from "TPH CWG with clean up" please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:
Results greater than 12900µS/cm @ 25^{o}C / 11550µS/cm @ 20^{o}C fall outside the accreditation range and as such are unaccredited.

Please contact your client manager if you require any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Sutcliffe, 18-20 Harrington Street, Liverpool, L2 9QA

Project No: 23/10082

Date Received: 12/10/2023 (am)

Project: Benchill

Cool Box Temperatures (°C): 8.8 & 9.2

Clients Project No: 33029LG

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/5	23/10082/6	23/10082/7	23/10082/8	23/10082/9
Client Sample No								
Client Sample ID/Depth	WS101 0.10-0.40m	WS102 0.10-0.25m	WS103 0.10-0.35m	WS104 0.40-0.80m	WS105 0.40-0.80m	WS106 0.40-0.75m	WS107 0.00-0.70m	WS110 0.00-0.60m
Date Sampled	10/10/23	09/10/23	09/10/23	09/10/23	09/10/23	09/10/23	09/10/23	10/10/23
Deviation Code								
F	✓	✓	✓	✓	✓	✓	✓	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/5	23/10082/6	23/10082/7	23/10082/8	23/10082/9
Client Sample No								
Client Sample ID/Depth	WS101 0.10-0.40m	WS102 0.10-0.25m	WS103 0.10-0.35m	WS104 0.40-0.80m	WS105 0.40-0.80m	WS106 0.40-0.75m	WS107 0.00-0.70m	WS110 0.00-0.60m
Date Sampled	10/10/23	09/10/23	09/10/23	09/10/23	09/10/23	09/10/23	09/10/23	10/10/23
Cyanide (total)	✓	✓	✓	✓	✓	✓	✓	✓
Sulphide	✓	✓	✓	✓	✓	✓	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	23/10082/8	23/10082/9	23/10082/10
Client Sample No										
Client Sample ID/Depth	WS101 0.10-0.40m	WS102 0.10-0.25m	WS103 0.10-0.35m	WS103 0.80-1.20m	WS104 0.40-0.80m	WS105 0.40-0.80m	WS106 0.40-0.75m	WS107 0.00-0.70m	WS110 0.00-0.60m	WS110 0.80-1.00m
Date Sampled	10/10/23	09/10/23	09/10/23	09/10/23	09/10/23	09/10/23	09/10/23	09/10/23	10/10/23	10/10/23
A-T-006s				17/10/2023						17/10/2023
A-T-007w	25/10/2023				25/10/2023		25/10/2023		25/10/2023	
A-T-019s	19/10/2023	19/10/2023	19/10/2023		19/10/2023	19/10/2023	19/10/2023	24/10/2023	24/10/2023	
A-T-019w	25/10/2023				25/10/2023		31/10/2023		25/10/2023	
A-T-022s	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023
A-T-024s	23/10/2023	23/10/2023	23/10/2023		23/10/2023	23/10/2023	23/10/2023	23/10/2023	23/10/2023	
A-T-025w	24/10/2023				24/10/2023		24/10/2023		27/10/2023	
A-T-026s	19/10/2023	19/10/2023	19/10/2023		19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023	
A-T-026w	25/10/2023				25/10/2023		27/10/2023		25/10/2023	
A-T-027s	20/10/2023	20/10/2023	20/10/2023		20/10/2023	20/10/2023	20/10/2023	20/10/2023	20/10/2023	
A-T-028s	20/10/2023	20/10/2023	20/10/2023		20/10/2023	20/10/2023	20/10/2023	20/10/2023	20/10/2023	
A-T-029s	26/10/2023	26/10/2023	26/10/2023		26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	
A-T-029w	27/10/2023				27/10/2023		27/10/2023		27/10/2023	
A-T-031s	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023
A-T-031w	24/10/2023				24/10/2023		24/10/2023		24/10/2023	
A-T-032s	23/10/2023	23/10/2023	23/10/2023		23/10/2023	23/10/2023	23/10/2023	23/10/2023	23/10/2023	
A-T-032w	25/10/2023				25/10/2023		25/10/2023		25/10/2023	
A-T-037s				23/10/2023						23/10/2023
A-T-040s	19/10/2023	19/10/2023	19/10/2023		19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023	
A-T-040w	25/10/2023				25/10/2023		25/10/2023		25/10/2023	
A-T-042sTCN	25/10/2023	25/10/2023	25/10/2023		25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023	
A-T-042wTCN	24/10/2023				24/10/2023		24/10/2023		24/10/2023	
A-T-043-s	27/10/2023	27/10/2023	27/10/2023		27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	
A-T-043-w	24/10/2023				24/10/2023		24/10/2023		24/10/2023	
A-T-044	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023
A-T-045	13/10/2023	13/10/2023	13/10/2023		13/10/2023	13/10/2023	13/10/2023	13/10/2023	13/10/2023	
A-T-050s	16/10/2023	16/10/2023	16/10/2023		16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	
A-T-050w	24/10/2023				24/10/2023		24/10/2023		24/10/2023	
A-T-052s				20/10/2023						20/10/2023
A-T-055s	20/10/2023	20/10/2023	20/10/2023	23/10/2023	17/10/2023	17/10/2023	17/10/2023	17/10/2023	17/10/2023	17/10/2023
Calc	25/10/2023	23/10/2023	23/10/2023		25/10/2023	23/10/2023	25/10/2023	23/10/2023	25/10/2023	
Calc-As Recd	20/10/2023	20/10/2023	20/10/2023	20/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023	18/10/2023

Lab Sample ID	23/10082/1	23/10082/2	23/10082/3	23/10082/4	23/10082/5	23/10082/6	23/10082/7	23/10082/8	23/10082/9	23/10082/10
Client Sample No										
Client Sample ID/Depth	WS101 0.10-0.40m	WS102 0.10-0.25m	WS103 0.10-0.35m	WS103 0.80-1.20m	WS104 0.40-0.80m	WS105 0.40-0.80m	WS106 0.40-0.75m	WS107 0.00-0.70m	WS110 0.00-0.60m	WS110 0.80-1.00m
Date Sampled	10/10/23	09/10/23	09/10/23	09/10/23	09/10/23	09/10/23	09/10/23	09/10/23	10/10/23	10/10/23
Redox				24/10/2023						24/10/2023

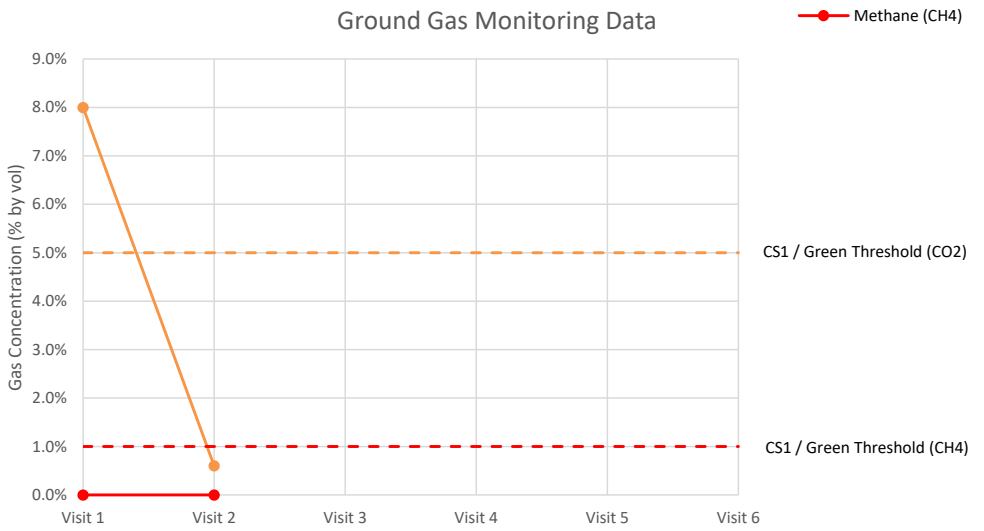
The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

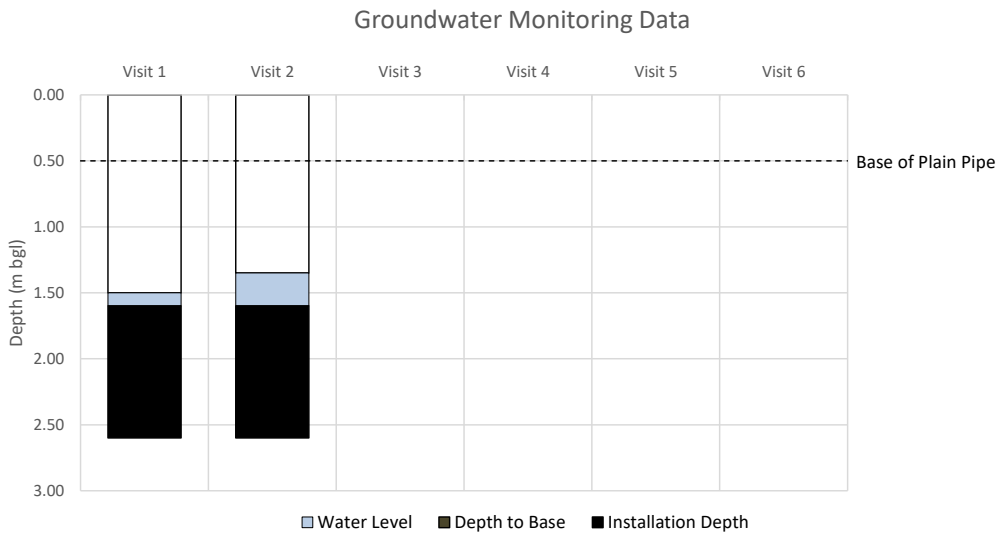
End of Report

Appendix E – Ground Gas & Groundwater Monitoring Data

SUTCLIFFE INVESTIGATIONS	Site Details		Installation Details		Position Ref.:
	Job No.:	33029LG	Installation Date:	10/10/2023	
TEL: 0151 227 3155	Site Name:	Benchill Road, Manchester	Installation Depth (m bgl):	1.50	WS101
FAX: 0151 227 3156	Client:	Wythenshaw Community Houing Group	Base of Plain Pipe (m bgl):	0.50	

Site Monitoring Visit Details							Gas and Groundwater Monitoring Data							Ground Gas Risk Assessment				
Visit No.	Visit Date	Logged By	Weather	Atmospheric Pressure	Pressure Trend	Relative Pressure (mb)	Flow Rate (l/h)	Max CH_4 (% LEL)	Max CH_4 (% by vol)	Max CO_2 (% by vol)	Min O_2 (% by vol)	Water Level (m bgl)	Depth to Base (m bgl)	Gas Type	Max Flow Rate[2] (l/h)	Max Gas Conc.[3] (% by vol)	HGFR[1] (l/h)	<< Please Select Classification >>
Visit 1	26/10/2023	MW	Overcast	1001	Steady	-	0.0	#N/A	0.0%	**8.0%**	2.8%	1.50	1.60	CH_4	-	-	-	-
Visit 2	23/11/2023	AT	Overcast	1016	Rising	0.00	0.0	0.0%	0.0%	0.6%	9.9%	1.35	1.60					
Visit 3	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					
Visit 4	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-	CO_2	-	-	-	-
Visit 5	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					
Visit 6	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					





Instrument Used:	Accuracy of Instrument (% by volume)	CH_4	CO_2	O_2	Comments:
GFM		± 0.5% @ 5%	± 0.5% @ 5%	± 1.0%	
		± 1.0% @15%	± 1.0% @15%		
		±3.0% @>15%	±3.0% @>15%		

[1] Hazardous Gas Flow Rate Assessment Methodology (HGFR) is the calculation of the maximum gas concentration for the location x maximum flow rate for the location.

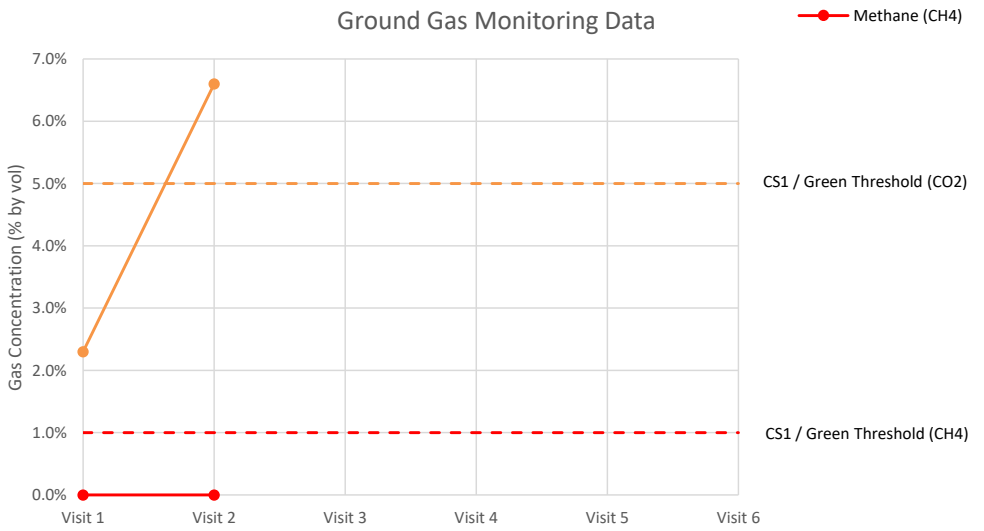
[2] Where maximum recorded flow is <0.1l/h, 0.1l/h has been used to calculate HGFR as recommended in CIRIA C665.

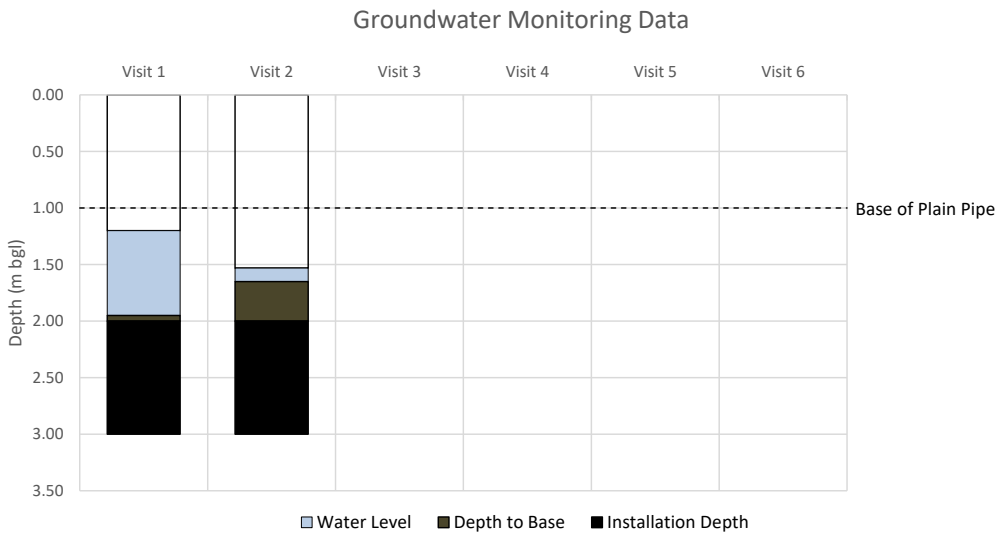
[3] Where maximum recorded concentration is <0.1%, 0.1% has been used as recommended in BS8485.

* Peak flow recorded is likely to be due to a build-up of hydraulic pressure caused by rising water trapping the gas within the solid section of pipe; the initial peak flow is not representative of the rate of gas generation within the ground and can be discounted from the dataset.

SUTCLIFFE INVESTIGATIONS	Site Details		Installation Details		Position Ref.:
	Job No.:	33029LG	Installation Date:	09/10/2023	
TEL: 0151 227 3155	Site Name:	Benchill Road, Manchester	Installation Depth (m bgl):	2.00	WS104
FAX: 0151 227 3156	Client:	Wythenshaw Community Houing Group	Base of Plain Pipe (m bgl):	1.00	

Site Monitoring Visit Details							Gas and Groundwater Monitoring Data							Ground Gas Risk Assessment				
Visit No.	Visit Date	Logged By	Weather	Atmospheric Pressure	Pressure Trend	Relative Pressure (mb)	Flow Rate (l/h)	Max CH_4 (% LEL)	Max CH_4 (% by vol)	Max CO_2 (% by vol)	Min O_2 (% by vol)	Water Level (m bgl)	Depth to Base (m bgl)	Gas Type	Max Flow Rate[2] (l/h)	Max Gas Conc.[3] (% by vol)	HGFR[1] (l/h)	<< Please Select Classification >>
Visit 1	26/10/2023	MW	Overcast	1001	Steady	-	0.0	#N/A	0.0%	2.3%	15.4%	1.20	1.95	CH_4	-	-	-	-
Visit 2	23/11/2023	AT	Overcast	1016	Rising	0.00	0.0	0.0%	0.0%	**6.6%**	7.1%	1.53	1.65					
Visit 3	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					
Visit 4	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-	CO_2	-	-	-	-
Visit 5	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					
Visit 6	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					





Instrument Used:	Accuracy of Instrument (% by volume)	CH_4	CO_2	O_2	Comments:
GFM		± 0.5% @ 5%	± 0.5% @ 5%	± 1.0%	
		± 1.0% @15%	± 1.0% @15%		
		±3.0% @>15%	±3.0% @>15%		

[1] Hazardous Gas Flow Rate Assessment Methodology (HGFR) is the calculation of the maximum gas concentration for the location x maximum flow rate for the location.

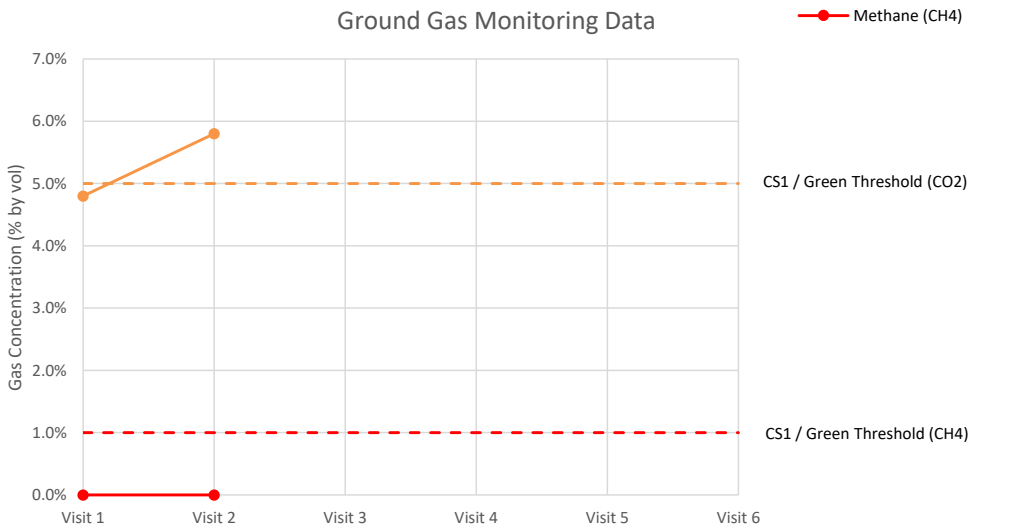
[2] Where maximum recorded flow is <0.1l/h, 0.1l/h has been used to calculate HGFR as recommended in CIRIA C665.

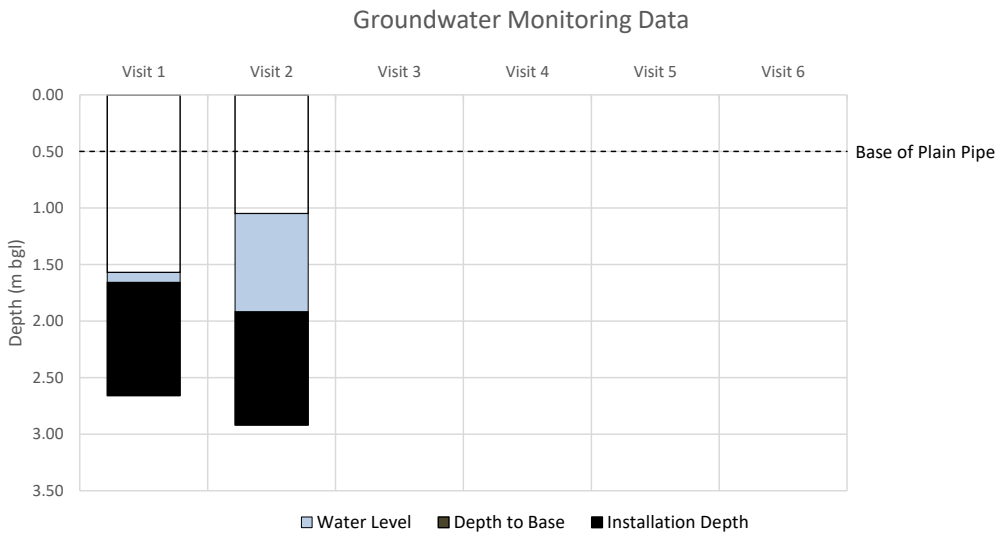
[3] Where maximum recorded concentration is <0.1%, 0.1% has been used as recommended in BS8485.

* Peak flow recorded is likely to be due to a build-up of hydraulic pressure caused by rising water trapping the gas within the solid section of pipe; the initial peak flow is not representative of the rate of gas generation within the ground and can be discounted from the dataset.

SUTCLIFFE INVESTIGATIONS	Site Details		Installation Details		Position Ref.:
	Job No.:	33029LG	Installation Date:	10/10/2023	
TEL: 0151 227 3155	Site Name:	Benchill Road, Manchester	Installation Depth (m bgl):	1.50	WS108
FAX: 0151 227 3156	Client:	Wythenshaw Community Houing Group	Base of Plain Pipe (m bgl):	0.50	

Site Monitoring Visit Details							Gas and Groundwater Monitoring Data							Ground Gas Risk Assessment				
Visit No.	Visit Date	Logged By	Weather	Atmospheric Pressure	Pressure Trend	Relative Pressure (mb)	Flow Rate (l/h)	Max CH_4 (% LEL)	Max CH_4 (% by vol)	Max CO_2 (% by vol)	Min O_2 (% by vol)	Water Level (m bgl)	Depth to Base (m bgl)	Gas Type	Max Flow Rate[2] (l/h)	Max Gas Conc.[3] (% by vol)	HGFR[1] (l/h)	<< Please Select Classification >>
Visit 1	26/10/2023	MW	Overcast	1001	Steady	-	0.0	#N/A	0.0%	4.8%	7.8%	1.57	1.66	CH_4	-	-	-	-
Visit 2	23/11/2023	AT	Overcast	1016	Rising	-0.10	-0.3	0.0%	0.0%	**5.8%**	8.0%	1.05	1.92					
Visit 3	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					
Visit 4	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-	CO_2	-	-	-	-
Visit 5	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					
Visit 6	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					





Instrument Used:	Accuracy of Instrument (% by volume)	CH_4	CO_2	O_2	Comments:
GFM		± 0.5% @ 5%	± 0.5% @ 5%	± 1.0%	
		± 1.0% @15%	± 1.0% @15%		
		±3.0% @>15%	±3.0% @>15%		

[1] Hazardous Gas Flow Rate Assessment Methodology (HGFR) is the calculation of the maximum gas concentration for the location x maximum flow rate for the location.

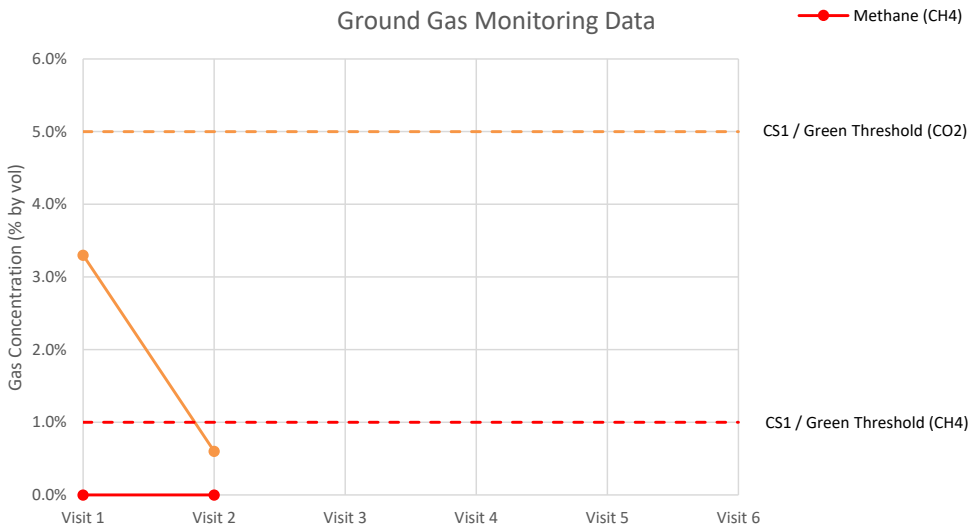
[2] Where maximum recorded flow is <0.1l/h, 0.1l/h has been used to calculate HGFR as recommended in CIRIA C665.

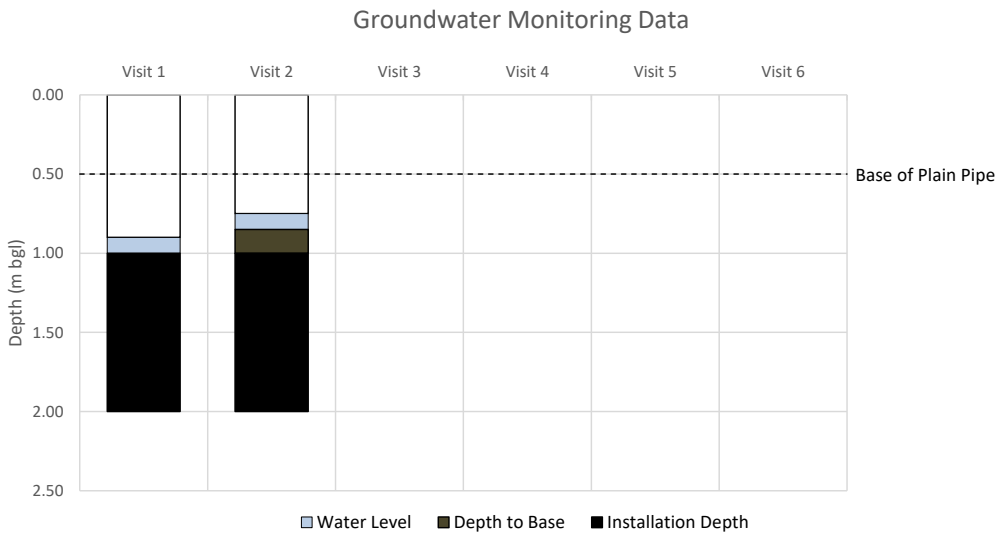
[3] Where maximum recorded concentration is <0.1%, 0.1% has been used as recommended in BS8485.

* Peak flow recorded is likely to be due to a build-up of hydraulic pressure caused by rising water trapping the gas within the solid section of pipe; the initial peak flow is not representative of the rate of gas generation within the ground and can be discounted from the dataset.

SUTCLIFFE INVESTIGATIONS	Site Details		Installation Details		Position Ref.:
	Job No.:	33029LG	Installation Date:	10/10/2023	
TEL: 0151 227 3155	Site Name:	Benchill Road, Manchester	Installation Depth (m bgl):	1.00	WS109
FAX: 0151 227 3156	Client:	Wythenshaw Community Houing Group	Base of Plain Pipe (m bgl):	0.50	

Site Monitoring Visit Details							Gas and Groundwater Monitoring Data							Ground Gas Risk Assessment				
Visit No.	Visit Date	Logged By	Weather	Atmospheric Pressure	Pressure Trend	Relative Pressure (mb)	Flow Rate (l/h)	Max CH_4 (% LEL)	Max CH_4 (% by vol)	Max CO_2 (% by vol)	Min O_2 (% by vol)	Water Level (m bgl)	Depth to Base (m bgl)	Gas Type	Max Flow Rate[2] (l/h)	Max Gas Conc.[3] (% by vol)	HGFR[1] (l/h)	<< Please Select Classification >>
Visit 1	26/10/2023	MW	Overcast	1001	Steady	-	0.0	#N/A	0.0%	3.3%	16.0%	0.90	1.00	CH_4	-	-	-	-
Visit 2	23/11/2023	AT	Overcast	1016	Rising	0.00	0.0	0.0%	0.0%	0.6%	9.9%	0.75	0.85					
Visit 3	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					
Visit 4	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-	CO_2	-	-	-	-
Visit 5	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					
Visit 6	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	-	-					





Instrument Used:	Accuracy of Instrument (% by volume)	CH_4	CO_2	O_2	Comments:
GFM		± 0.5% @ 5%	± 0.5% @ 5%	± 1.0%	
		± 1.0% @15%	± 1.0% @15%		
		±3.0% @>15%	±3.0% @>15%		

[1] Hazardous Gas Flow Rate Assessment Methodology (HGFR) is the calculation of the maximum gas concentration for the location x maximum flow rate for the location.

[2] Where maximum recorded flow is <0.1l/h, 0.1l/h has been used to calculate HGFR as recommended in CIRIA C665.

[3] Where maximum recorded concentration is <0.1%, 0.1% has been used as recommended in BS8485.

* Peak flow recorded is likely to be due to a build-up of hydraulic pressure caused by rising water trapping the gas within the solid section of pipe; the initial peak flow is not representative of the rate of gas generation within the ground and can be discounted from the dataset.

Appendix F – Geotechnical Laboratory Certificates

Units 1 & 2
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CC GEOTECHNICAL LTD
Consulting Geoenvironmental and Geotechnical Engineers

LABORATORY REPORT

CONTRACT NUMBER: CCG-C-23-14311

CONTRACT TITLE: BENCHILL ROAD, WYTHENSHAWE

CLIENT: SUTCLIFFE
18-20 Harrington Street, Liverpool L2 9QA

DATE RECEIVED: 13/10/23
DATE COMMENCED: 19/10/23
DATE COMPLETED: 24/10/23
REPORT DATE: 24/10/23

Test Description	Qty
Particle Size Distribution BS 1377-2:1990 (a)	6

Notes: Observations and interpretations are not accredited by UKAS
All testing undertaken at laboratory permanent facilities
# denotes non-accredited test
a denotes UKAS accredited test
s denotes test undertaken by approved subcontractor
Test results only relate to the samples tested
Sample and sample information supplied by client

This report is issued in accordance with the requirements of the United kingdom Accreditation Services and EN ISO/IEC 17025:2017. The results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without the prior written approval of the laboratory.
Approved Signatories: Chris Bolan (Managing Director) – Daniel Kerfoot (Laboratory Manager)

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
WS101	B	1.20	1.80	-	-	-	-	-	-	-	-	-	Y	Grey very gravelly silty fine to medium SAND. Gravel is fine to medium subangular sandstone. (BS1377Pt2:9.2)
WS102	B	0.50	1.00	-	-	-	-	-	-	-	-	-	Y	Brown sandy slightly gravelly silty CLAY. Gravel is fine to medium subangular sandstone. (BS1377Pt2:9.2)
WS104	B	1.00	1.50	-	-	-	-	-	-	-	-	-	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium subangular sandstone. (BS1377Pt2:9.2)
WS106	B	0.80	1.40	-	-	-	-	-	-	-	-	-	Y	Brown sandy slightly gravelly silty CLAY. Gravel is fine to medium subangular sandstone. (BS1377Pt2:9.2)
WS109	B	0.40	1.00	-	-	-	-	-	-	-	-	-	Y	Brown very silty gravelly fine to medium SAND. Gravel is fine to medium subangular sandstone. (BS1377Pt2:9.2)
WS110	B	0.60	1.00	-	-	-	-	-	-	-	-	-	Y	Brown sandy slightly gravelly silty CLAY. Gravel is fine to medium subangular sandstone. (BS1377Pt2:9.2)

SITE: BENCHILL ROAD, WYTHENSHAWE (CCG-C-23-14311) DATE: 24.10.23

CLIENT: SUTCLIFFE

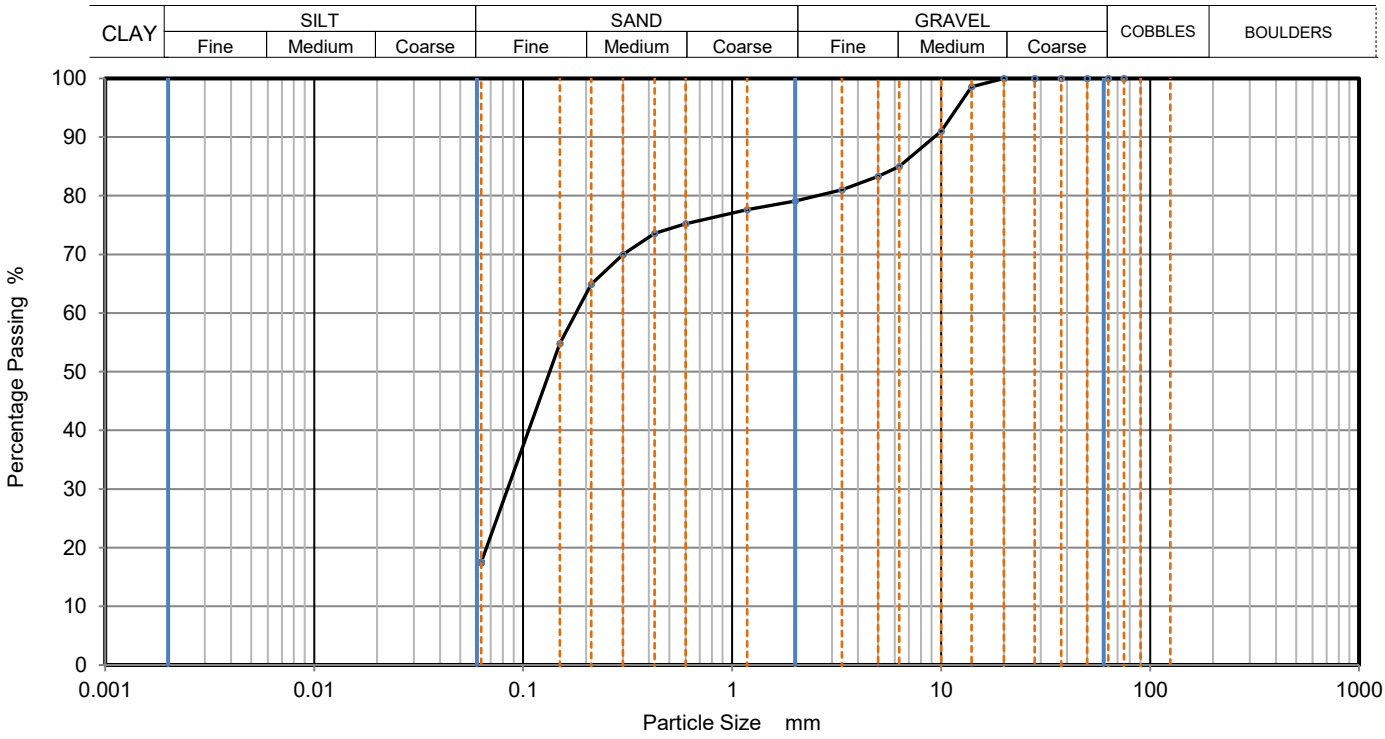
UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

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PARTICLE SIZE DISTRIBUTION

Job Ref	CCG-C-23-14311		
Borehole/Pit No.	WS101		
Site Name	BENCHILL ROAD, WYTHENSHAWE	Sample No.	1
Specimen Description	Grey very gravelly silty fine to medium SAND	Depth, m	1.20
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2	KeyLAB ID	CCGL202310244



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	91		
6.3	85		
5	83		
3.35	81		
2	79		
1.18	78		
0.6	75		
0.425	74		
0.3	70		
0.212	65		
0.15	55		
0.063	18		

Dry Mass of sample, g

Sample Proportions	% dry mass
Very coarse	0
Gravel	21
Sand	61
Fines <0.063mm	18

Grading Analysis		
D100	mm	
D60	mm	0.179
D30	mm	0.0842
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

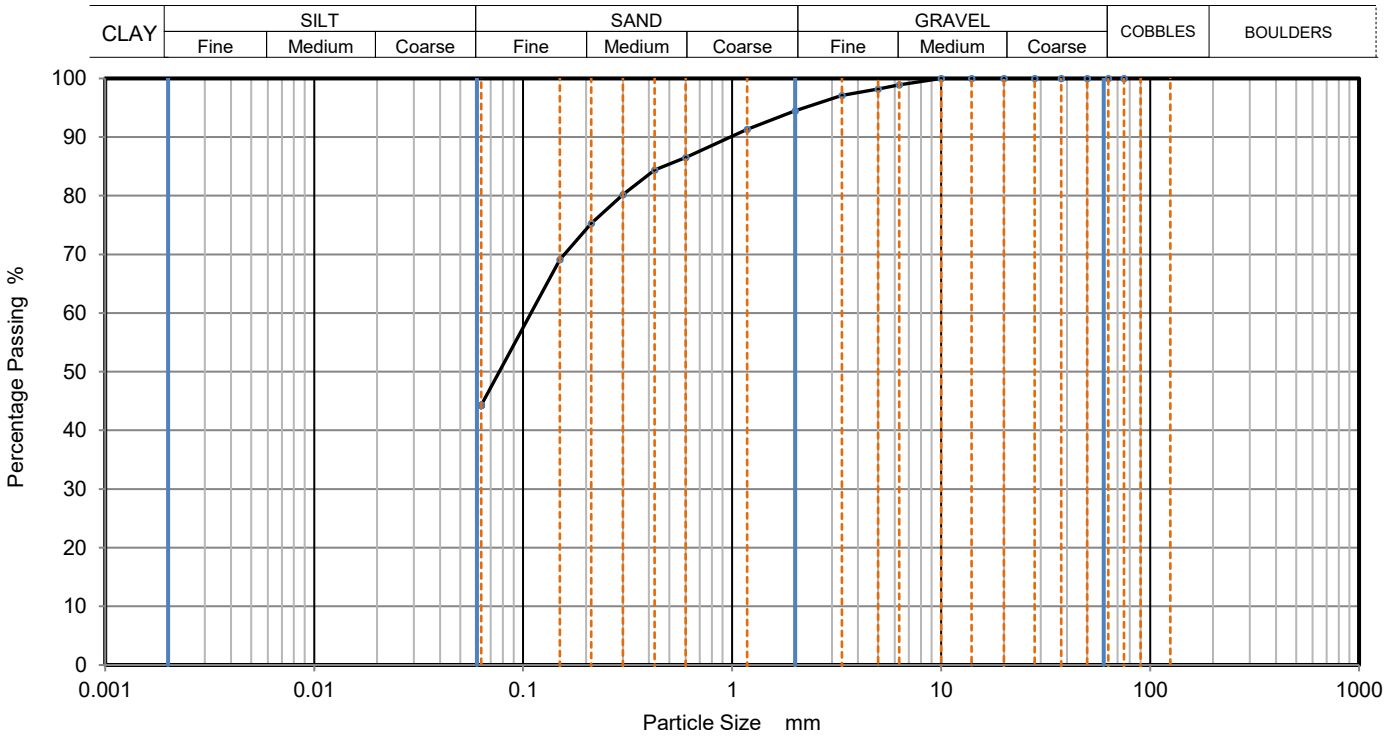
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig 1
JE	DK	DK	24/10/2023 15:08	Sheet

CC Geotechnical Ltd Tel: 0151 545 2750 e: lab@ccgeotechnical.com	**PARTICLE SIZE DISTRIBUTION**	Job Ref	**CCG-C-23-14311**
		Borehole/Pit No.	WS102

Site Name	BENCHILL ROAD, WYTHENSHAWE			Sample No.	1
Specimen Description	Brown sandy slightly gravelly silty CLAY			Depth, m	0.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	CCGL202310245



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	98		
3.35	97		
2	95		
1.18	91		
0.6	87		
0.425	84		
0.3	80		
0.212	75		
0.15	69		
0.063	44		

Dry Mass of sample, g

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	50
Fines <0.063mm	44

Grading Analysis		
D100	mm	
D60	mm	0.109
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

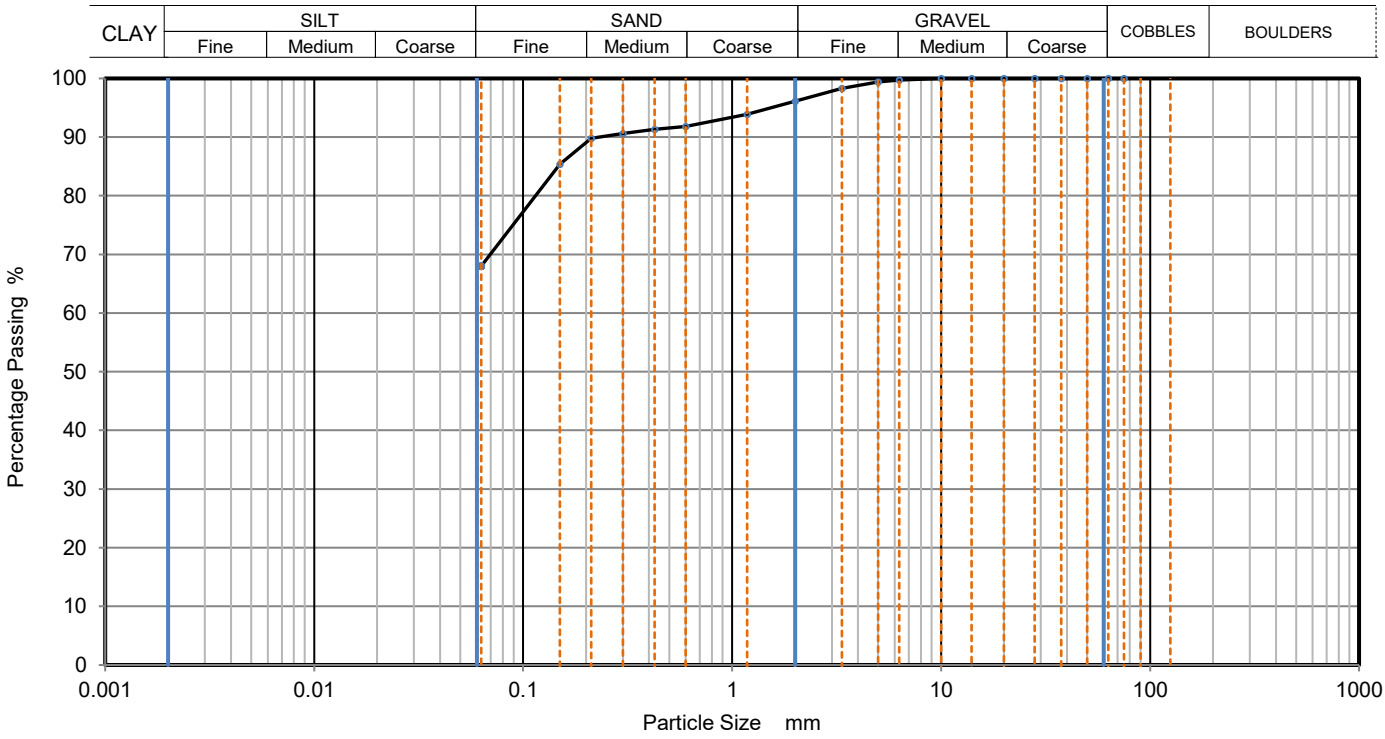
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PARTICLE SIZE DISTRIBUTION

Job Ref	CCG-C-23-14311		
Borehole/Pit No.	WS104		
Site Name	BENCHILL ROAD, WYTHENSHAWE	Sample No.	1
Specimen Description	Brown slightly sandy slightly gravelly silty CLAY	Depth, m	1.20
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2	KeyLAB ID	CCGL202310246



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	98		
2	96		
1.18	94		
0.6	92		
0.425	91		
0.3	91		
0.212	90		
0.15	85		
0.063	68		

Dry Mass of sample, g

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	28
Fines <0.063mm	68

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

Remarks

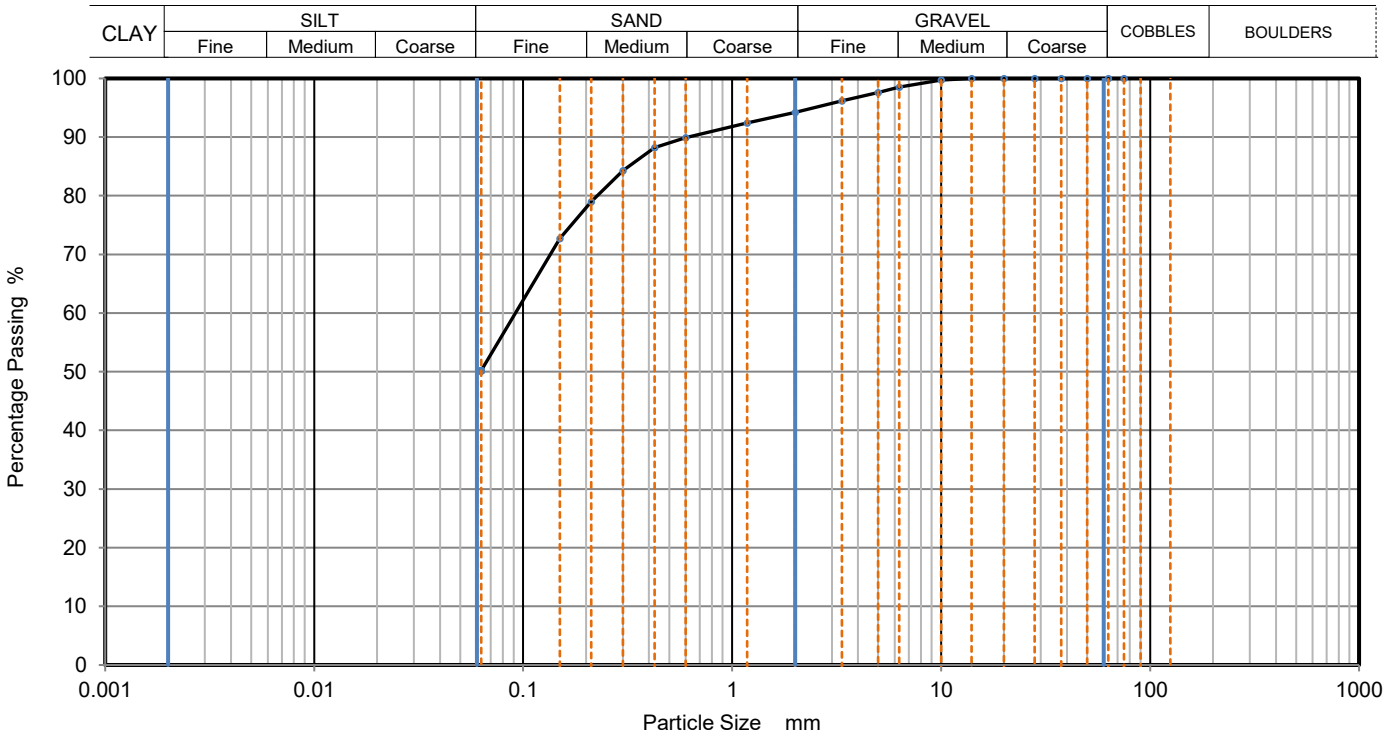
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PARTICLE SIZE DISTRIBUTION

Job Ref	CCG-C-23-14311		
Borehole/Pit No.	WS106		
Site Name	BENCHILL ROAD, WYTHENSHAWE	Sample No.	1
Specimen Description	Brown sandy slightly gravelly silty CLAY	Depth, m	0.80
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2	KeyLAB ID	CCGL202310247



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	98		
3.35	96		
2	94		
1.18	92		
0.6	90		
0.425	88		
0.3	84		
0.212	79		
0.15	73		
0.063	50		

Dry Mass of sample, g

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	44
Fines <0.063mm	50

Grading Analysis		
D100	mm	
D60	mm	0.0918
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

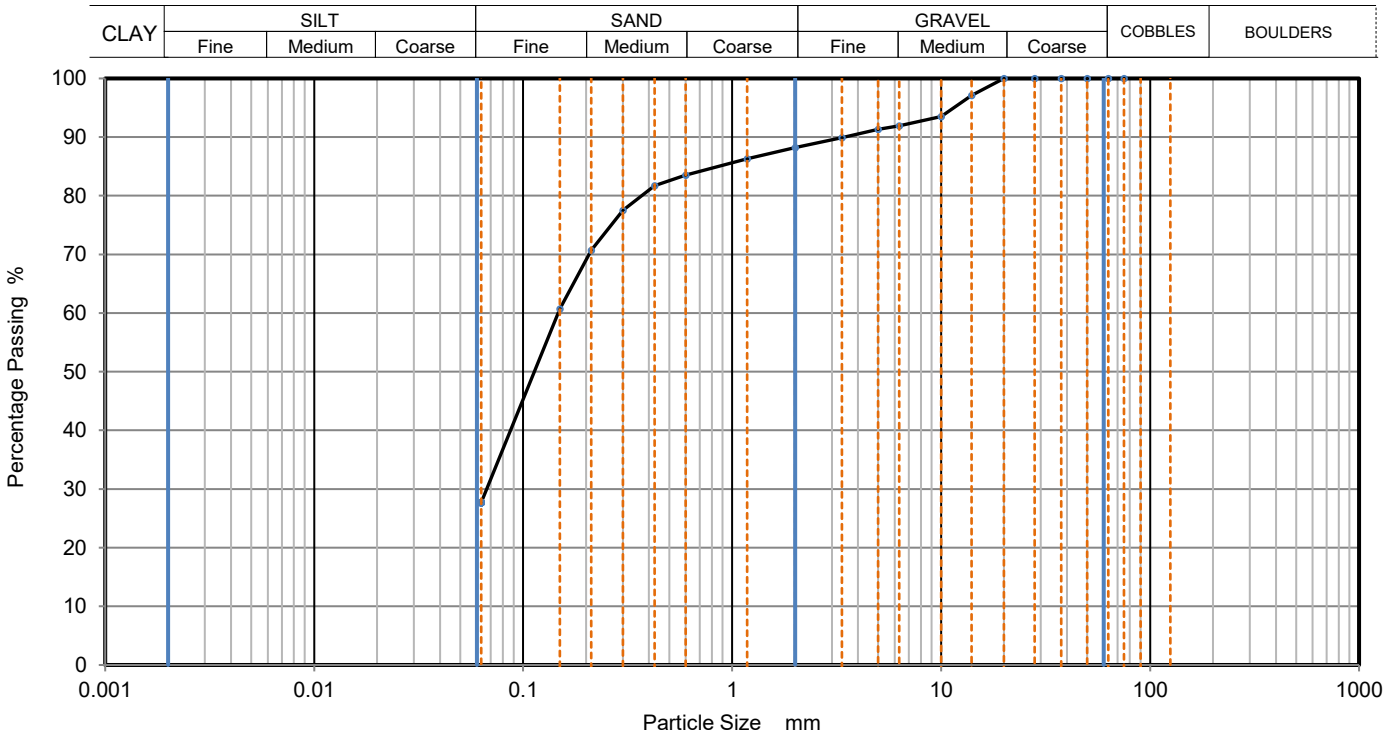
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PARTICLE SIZE DISTRIBUTION

Job Ref	CCG-C-23-14311		
Borehole/Pit No.	WS109		
Site Name	BENCHILL ROAD, WYTHENSHAWE	Sample No.	1
Specimen Description	Brown very silty gravelly fine to medium SAND	Depth, m	0.40
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2	KeyLAB ID	CCGL202310248



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	94		
6.3	92		
5	91		
3.35	90		
2	88		
1.18	86		
0.6	84		
0.425	82		
0.3	78		
0.212	71		
0.15	61		
0.063	28		

Dry Mass of sample, g

Sample Proportions	% dry mass
Very coarse	0
Gravel	12
Sand	60
Fines <0.063mm	28

Grading Analysis		
D100	mm	
D60	mm	0.147
D30	mm	0.0669
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

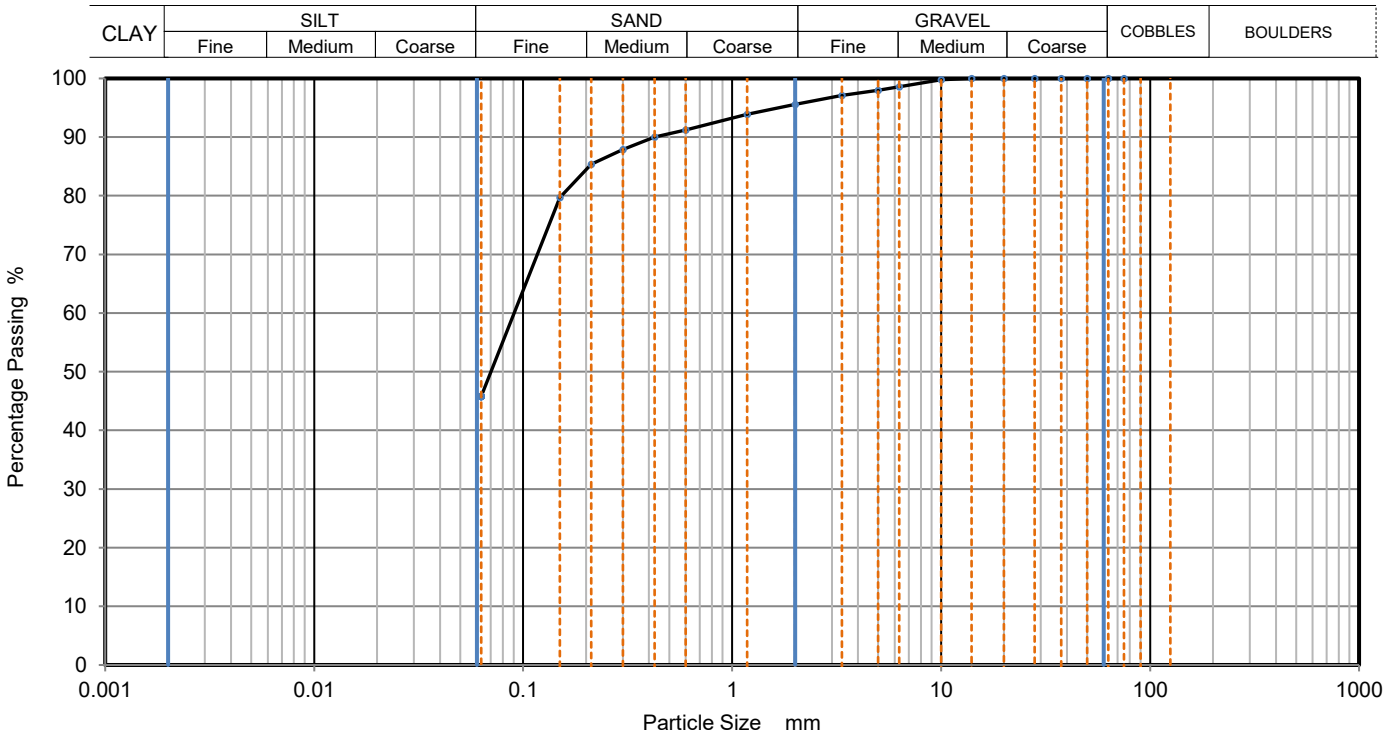
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Operator	Checked	Approved	Sheet printed	Fig 1
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PARTICLE SIZE DISTRIBUTION

Job Ref	CCG-C-23-14311		
Borehole/Pit No.	WS110		
Site Name	BENCHILL ROAD, WYTHENSHAWE	Sample No.	1
Specimen Description	Brown sandy slightly gravelly silty CLAY	Depth, m	0.60
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2	KeyLAB ID	CCGL202310249



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	98		
3.35	97		
2	96		
1.18	94		
0.6	91		
0.425	90		
0.3	88		
0.212	85		
0.15	80		
0.063	46		

Dry Mass of sample, g

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	50
Fines <0.063mm	46

Grading Analysis		
D100	mm	
D60	mm	0.0906
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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Appendix G – Soil Screening Tables

	SUTCLIFFE INVESTIGATIONS TEL: 0151 227 3155 FAX: 0151 227 3156		**Human Health Assessment**												
	Job Name:	Benchill, Manchester		**Job No.:**	33029LG										
	Proposed Land Use:	Residential With Plant Uptake		**S.O.M.:**	2.5										
	Above Threshold:				**Sample ID:**	WS101	WS102	WS103	WS103	WS104	WS105	WS106	WS107	WS110	WS110
	Below Limit of Detection:	<0.01			**Depth Top (m bgl):**	0.10	0.10	0.10	0.80	0.40	0.40	0.40	0.00	0.00	0.80
	Not Tested:	n/t			**Depth Base (m bgl):**	0.40	0.25	0.35	1.20	0.80	0.80	0.75	0.70	0.60	1.00
	No Asbestos Detected:	NAD			**Date Sampled:**	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	10-Oct-23	10-Oct-23
	Contaminant	**Units**	**Threshold Source**	**Threshold Value**	**WS101**	**WS102**	**WS103**	**WS103**	**WS104**	**WS105**	**WS106**	**WS107**	**WS110**	**WS110**	
Metals / Non-Metals / Other Suite	Arsenic (Total)	mg/kg	LQM S4UL	37	5	1	<1	n/t	5	7	6	<1	3	n/t	
	Boron (Soluble)	mg/kg	LQM S4UL	290	<1.0	<1.0	<1.0	n/t	<1.0	<1.0	<1.0	<1.0	<1.0	n/t	
	Cadmium (Total)	mg/kg	LQM S4UL	11	<0.5	0.6	<0.5	n/t	0.5	<0.5	<0.5	<0.5	<0.5	n/t	
	Chromium III	mg/kg	LQM S4UL	910	11	9	9	n/t	9	13	15	10	22	n/t	
	Chromium VI	mg/kg	LQM S4UL	6	<1	<1	<1	n/t	<1	<1	<1	<1	<1	n/t	
	Copper (Total)	mg/kg	LQM S4UL	2400	31	7	6	n/t	21	25	32	11	27	n/t	
	Lead (Total)	mg/kg	C4SL	200	34	11	13	n/t	38	45	61	11	66	n/t	
	Mercury (Total)	mg/kg	LQM S4UL	40	<0.17	<0.17	<0.17	n/t	<0.17	<0.17	<0.17	<0.17	<0.17	n/t	
	Nickel (Total)	mg/kg	LQM S4UL	180	18	10	9	n/t	9	12	17	5	17	n/t	
	Selenium (Total)	mg/kg	LQM S4UL	250	<1	<1	<1	n/t	<1	<1	<1	<1	<1	n/t	
	Zinc (Total)	mg/kg	LQM S4UL	3700	94	34	26	n/t	55	44	71	30	100	n/t	
	Cyanide (Total)	mg/kg	ATKINS	34	<1	<1	<1	n/t	<1	<1	<1	<1	<1	n/t	
	Phenols (Total)	mg/kg	LQM S4UL	550	<0.2	<0.2	<0.2	n/t	<0.2	<0.2	<0.2	<0.2	<0.2	n/t	
	Organic matter	%	LQM S4UL	N/a	5.8	1.8	2.4	n/t	2.1	3.7	3.5	1.5	3.1	n/t	
	Sulphate (Acid Soluble)	mg/kg	LQM S4UL	N/a	270	<200	<200	n/t	210	260	320	<200	290	n/t	
	Sulphate as Water Soluble	g/l	LQM S4UL	N/a	<0.01	<0.01	<0.01	n/t	<0.01	<0.01	<0.01	<0.01	<0.01	n/t	
	Sulphide	mg/kg	LQM S4UL	N/a	<5	22	<5	n/t	28	15	<5	<5	<5	n/t	
	pH	pH units	LQM S4UL	N/a	8.07	9.01	8.93	8.54	8.04	7.7	7.86	7.09	6.82	5.14	
	Sulphur (Elemental)	mg/kg	LQM S4UL	N/a	170	<5	<5	n/t	16	8	110	<5	9	n/t	
Asbestos Suite	Asbestos in soil	N/a		N/a	NAD	NAD	NAD	n/t	NAD	NAD	NAD	NAD	NAD	n/t	
	Asbestos Matrix (microscope)	N/a		N/a	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	
	ACM - Suitable for Water Absorption Test?	N/a		N/a	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	
	Asbestos in soil % composition	% w/w		0.001	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	
TPH Suite	TPH (Total)	mg/kg		N/a	2890	433	923	n/t	188	48	891	25	78	n/t	
	Total Aliphatic	mg/kg		N/a	91	266	563	n/t	101	9	67	9	28	n/t	
	C5 to C6 aliphatic	mg/kg	LQM S4UL	78	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	C6 to C8 aliphatic	mg/kg	LQM S4UL	230	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	C8 to C10 aliphatic	mg/kg	LQM S4UL	65	<20	<10	<10	<1	<1	<1	<1	<1	<1	<1	
	C10 to C12 aliphatic	mg/kg	LQM S4UL	330	<20	<10	<10	<1	<1	<1	<1	<1	<1	<1	
	C12 to C16 aliphatic	mg/kg	LQM S4UL	2400	<20	<10	<10	<1	<1	<1	<1	<1	<1	<1	
	C16 to C35 aliphatic	mg/kg	LQM S4UL	92000	n/t	n/t	n/t	6	46	7	37	7	20	3	
	C35 to C44 aliphatic	mg/kg	LQM S4UL	92000	41	87	216	n/t	55	2	28	2	8	n/t	
	Total Aromatic	mg/kg		N/a	2800	167	363	n/t	86	39	824	15	50	n/t	
	C5 to C7 aromatic (Benzene)	mg/kg	LQM S4UL	140	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	C7 to C8 aromatic (Toluene)	mg/kg	LQM S4UL	290	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	C8 to C10 aromatic	mg/kg	LQM S4UL	83	<20	<10	<10	1	<1	<1	<1	<1	<1	<1	
	C10 to C12 aromatic	mg/kg	LQM S4UL	180	<20	<10	<10	<1	<1	<1	<1	<1	<1	<1	
	C12 to C16 aromatic	mg/kg	LQM S4UL	330	207	<10	<10	<1	3	1	20	1	2	<1	
	C16 to C21 aromatic	mg/kg	LQM S4UL	540	986	<10	<10	<1	7	6	163	2	6	<1	
	C21 to C35 aromatic	mg/kg	LQM S4UL	1500	1560	88	160	2	33	29	611	9	31	2	
	C35 to C44 aromatic	mg/kg	LQM S4UL	1500	44	78	203	n/t	43	2	29	2	10	n/t	
	Aliphatic + Aromatic EC >44-70	mg/kg	LQM S4UL	N/a	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	
BTEX Suite	benzene	mg/kg	LQM S4UL	0.17	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	toluene	mg/kg	LQM S4UL	290	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	ethylbenzene	mg/kg	LQM S4UL	110	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	M&P Xylene	mg/kg	LQM S4UL	130	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	O-Xylene	mg/kg	LQM S4UL	140	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
PAH Suite	naphthalene	mg/kg	LQM S4UL	5.6	0.38	<0.03	<0.03	n/t	<0.03	<0.03	<0.03	<0.03	<0.03	n/t	
	acenaphthylene	mg/kg	LQM S4UL	420	0.97	0.76	0.84	n/t	1.23	1.53	1.45	<0.01	0.03	n/t	
	acenaphthene	mg/kg	LQM S4UL	510	2.25	0.08	0.08	n/t	0.27	0.18	1.06	<0.01	0.09	n/t	
	fluorene	mg/kg	LQM S4UL	400	1.87	<0.01	<0.01	n/t	0.19	<0.01	1.33	<0.01	0.05	n/t	
	phenanthrene	mg/kg	LQM S4UL	220	26.5	<0.03	<0.03	n/t	1.39	<0.03	10.7	0.08	0.66	n/t	
	anthracene	mg/kg	LQM S4UL	5400	6.02	<0.02	<0.02	n/t	0.37	<0.02	3.04	<0.02	0.17	n/t	
	fluoranthene	mg/kg	LQM S4UL	560	28.2	<0.08	<0.08	n/t	2.18	<0.08	16.9	0.19	1.36	n/t	
	pyrene	mg/kg	LQM S4UL	1200	22	<0.07	<0.07	n/t	1.83	<0.07	14.2	0.18	1.27	n/t	
	benzo(a)anthracene	mg/kg	LQM S4UL	11	10.7	<0.04	<0.04	n/t	0.87	<0.04	7.6	<0.04	0.52	n/t	
	chrysene	mg/kg	LQM S4UL	22	11.3	<0.06	<0.06	n/t	1.02	<0.06	8.02	<0.06	0.93	n/t	
	benzo(b)fluoranthene	mg/kg	LQM S4UL	3.3	8.17	<0.05	<0.05	n/t	0.72	<0.05	7.13	<0.05	0.69	n/t	
	benzo(k)fluoranthene	mg/kg	LQM S4UL	93	3.7	<0.07	<0.07	n/t	<0.07	<0.07	3.08	<0.07	<0.07	n/t	
	benzo(a)pyrene	mg/kg	LQM S4UL	2.7	6.65	<0.04	<0.04	n/t	0.6	<0.04	5.95	<0.04	0.66	n/t	
	dibenzo(ah)anthracene	mg/kg	LQM S4UL	0.28	0.83	<0.04	<0.04	n/t	<0.04	<0.04	0.7	<0.04	<0.04	n/t	
	benzo(ghi)perylene	mg/kg	LQM S4UL	340	3.16	<0.05	<0.05	n/t	<0.05	<0.05	3.18	<0.05	<0.05	n/t	
	indeno(123cd)pyrene	mg/kg	LQM S4UL	36	3.98	<0.03	<0.03	n/t	0.38	<0.03	3.95	<0.03	0.51	n/t	

LQM/CIEH S4ULs Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3104. All rights reserved.

	SUTCLIFFE INVESTIGATIONS TEL: 0151 227 3155 FAX: 0151 227 3156		**Controlled Waters Assessment**												
	Job Name:	Benchill, Manchester		**Job No.:**	33029LG										
	Above EQS Threshold:			**Sample ID:**	**WS101**	**WS102**	**WS103**	**WS103**	**WS104**	**WS105**	**WS106**	**WS107**	**WS110**	**WS110**
	Above UK DWS Threshold:														
	Above all Thresholds:			**Depth Top:**	0.10	0.10	0.10	0.80	0.40	0.40	0.40	0.00	0.00	0.80
	Below Limit of Detection:	<0.01		**Depth Base:**	0.40	0.25	0.35	1.20	0.80	0.80	0.75	0.70	0.60	1.00
	Not tested:	n/t		**Date Sampled:**	10-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	09-Oct-23	10-Oct-23	10-Oct-23
	Contaminant Leachate Prep (10:1 Std NRA)*	**Units**	**EQS Threshold**	**UK DWS Threshold**	**WS101**	**WS102**	**WS103**	**WS103**	**WS104**	**WS105**	**WS106**	**WS107**	**WS110**	**WS110**
Metals / Non-Metals / Other Suite	Arsenic (Soluble)*	µg/l	50	10	8	n/t	n/t	n/t	10	n/t	3	n/t	5	n/t
	Boron (Soluble)	µg/l	1000	1000	<10	n/t	n/t	n/t	16	n/t	12	n/t	<10	n/t
	Cadmium (Soluble)	µg/l	0.45 - 1.5	5	<1	n/t	n/t	n/t	<1	n/t	<1	n/t	<1	n/t
	Chromium Trivalent (Soluble)	µg/l	4.7	50	<0.05	n/t	n/t	n/t	<0.05	n/t	<0.05	n/t	<0.05	n/t
	Chromium Hexavalent (Soluble)	µg/l	3.4	50	<0.05	n/t	n/t	n/t	<0.05	n/t	<0.05	n/t	<0.05	n/t
	Copper (Soluble)	µg/l	1	2000	24	n/t	n/t	n/t	31	n/t	29	n/t	33	n/t
	Lead (Soluble)	µg/l	14	10	44	n/t	n/t	n/t	57	n/t	29	n/t	37	n/t
	Mercury (Soluble)	µg/l	0.07	1	<0.1	n/t	n/t	n/t	<0.1	n/t	<0.1	n/t	0.3	n/t
	Nickel (Soluble)	µg/l	34	20	<2	n/t	n/t	n/t	<2	n/t	5	n/t	3	n/t
	Selenium (Soluble)*	µg/l	-	10	<1	n/t	n/t	n/t	<1	n/t	1	n/t	<1	n/t
	Sulphur (Free)	mg/l	-	-	<0.1	n/t	n/t	n/t	<0.1	n/t	<0.1	n/t	<0.1	n/t
	Zinc (Soluble)	µg/l	10.9	5000	67	n/t	n/t	n/t	25	n/t	40	n/t	73	n/t
	Cyanide (Total)*	mg/l	1	50	<0.005	n/t	n/t	n/t	<0.005	n/t	<0.005	n/t	<0.005	n/t
	Phenols (Total)	µg/l	7.7	-	0.02	n/t	n/t	n/t	<0.01	n/t	<0.01	n/t	<0.01	n/t
	Sulphate as SO_3	mg/l	400	250	5.74	n/t	n/t	n/t	5.87	n/t	39.73	n/t	19.38	n/t
	Sulphide as S	µg/l	0.25	-	<0.1	n/t	n/t	n/t	<0.1	n/t	<0.1	n/t	<0.1	n/t
	pH	pH units	-	-	7.26	n/t	n/t	n/t	7.47	n/t	7.32	n/t	7.11	n/t
	TPH Total C6-C40 (leachable)		-	-	319	n/t	n/t	n/t	<80	n/t	<80	n/t	<80	n/t
PAH Suite	naphthalene*	µg/l	130	-	<0.01	n/t	n/t	n/t	<0.01	n/t	0.02	n/t	<0.01	n/t
	acenaphthylene*	µg/l	-	-	<0.01	n/t	n/t	n/t	<0.01	n/t	0.05	n/t	<0.01	n/t
	acenaphthene*	µg/l	-	-	0.62	n/t	n/t	n/t	0.09	n/t	0.07	n/t	<0.01	n/t
	fluorene*	µg/l	-	-	0.08	n/t	n/t	n/t	0.06	n/t	0.05	n/t	<0.01	n/t
	phenanthrene*	µg/l	-	-	0.26	n/t	n/t	n/t	0.16	n/t	0.13	n/t	0.03	n/t
	anthracene*	µg/l	0.1	-	0.17	n/t	n/t	n/t	0.03	n/t	0.07	n/t	<0.01	n/t
	fluoranthene*	µg/l	0.12	-	5.53	n/t	n/t	n/t	0.12	n/t	0.6	n/t	0.03	n/t
	pyrene*	µg/l	-	-	3.87	n/t	n/t	n/t	0.09	n/t	0.52	n/t	0.02	n/t
	benzo(a)anthracene*	µg/l	-	-	1.23	n/t	n/t	n/t	0.02	n/t	0.34	n/t	<0.01	n/t
	chrysene*	µg/l	-	-	1.1	n/t	n/t	n/t	0.03	n/t	0.42	n/t	<0.01	n/t
	benzo(b)fluoranthene*	µg/l	0.017	-	0.61	n/t	n/t	n/t	0.01	n/t	0.38	n/t	<0.01	n/t
	benzo(k)fluoranthene*	µg/l	0.017	-	0.24	n/t	n/t	n/t	<0.01	n/t	0.18	n/t	<0.01	n/t
	benzo(a)pyrene*	µg/l	0.27	0.01	0.44	n/t	n/t	n/t	<0.01	n/t	0.28	n/t	<0.01	n/t
	dibenzo(ah)anthracene*	µg/l	-	-	0.05	n/t	n/t	n/t	<0.01	n/t	0.05	n/t	<0.01	n/t
	benzo(ghi)perylene*	µg/l	0.0082	-	0.24	n/t	n/t	n/t	<0.01	n/t	0.2	n/t	<0.01	n/t
	indeno(123cd)pyrene*	µg/l	0.002	-	0.28	n/t	n/t	n/t	<0.01	n/t	0.21	n/t	<0.01	n/t

Appendix H – Waste Classification Report

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

XIXZW-LC3V6-W1NPV

Job name

Benchill Road

Description/Comments

Project

33029LG

Site

Benchill Road, Manchester

Classified by

Name:
Daniel Evans
Date:
27 Nov 2023 13:58 GMT
Telephone:
0151 227 3155

Company:
Sutcliffe Projects Ltd
18-20 Harrington St
Liverpool
L2 9QA

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: -

Course	Date
Hazardous Waste Classification	-

Purpose of classification

2 - Material Characterisation

Address of the waste

Benchill Road, Manchester **Post Code** M22 8LF

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Redevelopment

Description of the specific process, sub-process and/or activity that created the waste

Excavation of foundations for new build

Description of the waste

Made Ground

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS101	0.10-0.40	Hazardous	HP 3(i), HP 7, HP 11	3
2	WS102	0.10-0.25	Non Hazardous		6
3	WS103	0.10-0.35	Non Hazardous		9
4	WS104	0.40-0.80	Non Hazardous		12
5	WS105	0.40-0.80	Non Hazardous		15
6	WS106	0.40-0.75	Non Hazardous		18
7	WS107	0.00-0.70	Non Hazardous		21
8	WS110	0.00-0.60	Non Hazardous		24

Related documents

#	Name	Description
1	Sutcliffe Suite 2 2023	waste stream template used to create this Job

Report

Created by: Daniel Evans

Created date: 27 Nov 2023 13:58 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	27
Appendix B: Rationale for selection of metal species	28
Appendix C: Version	29

Classification of sample: WS101

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample name:
WS101
Sample Depth:
0.10-0.40 m
Moisture content:
7.5%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.289%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.289%)

Hazard properties (substances considered hazardous until shown otherwise)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.289%)

Determinands

Moisture content: 7.5% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		5 mg/kg	1.32	6.602 mg/kg	0.00066 %		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
3		cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.5	mg/kg	1.142	<0.571	mg/kg	<0.0000571 %		<LOD
4		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		11	mg/kg	1.462	16.077	mg/kg	0.00161 %		
5		chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<1	mg/kg	2.27	<2.27	mg/kg	<0.000227 %		<LOD
6		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		31	mg/kg	1.126	34.903	mg/kg	0.00349 %		
7		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	34	mg/kg	1.56	53.034	mg/kg	0.0034 %		
8		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17	mg/kg	1.353	<0.23	mg/kg	<0.000023 %		<LOD
9		nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		18	mg/kg	2.976	53.573	mg/kg	0.00536 %		
10		selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
11		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		94	mg/kg	2.774	260.77	mg/kg	0.0261 %		
12		TPH (C6 to C40) petroleum group			TPH		2890	mg/kg		2890	mg/kg	0.289 %		
13		pH			PH		8.07	pH		8.07	pH	8.07 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.38	mg/kg		0.38	mg/kg	0.000038 %		
15		acenaphthylene		205-917-1	208-96-8		0.97	mg/kg		0.97	mg/kg	0.000097 %		
16		acenaphthene		201-469-6	83-32-9		2.25	mg/kg		2.25	mg/kg	0.000225 %		
17		fluorene		201-695-5	86-73-7		1.87	mg/kg		1.87	mg/kg	0.000187 %		
18		phenanthrene		201-581-5	85-01-8		26.5	mg/kg		26.5	mg/kg	0.00265 %		
19		anthracene		204-371-1	120-12-7		6.02	mg/kg		6.02	mg/kg	0.000602 %		
20		fluoranthene		205-912-4	206-44-0		28.2	mg/kg		28.2	mg/kg	0.00282 %		
21		pyrene		204-927-3	129-00-0		22	mg/kg		22	mg/kg	0.0022 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		10.7	mg/kg		10.7	mg/kg	0.00107 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		11.3	mg/kg		11.3	mg/kg	0.00113 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		8.17	mg/kg		8.17	mg/kg	0.000817 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		3.7	mg/kg		3.7	mg/kg	0.00037 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		6.65	mg/kg		6.65	mg/kg	0.000665 %		
27		indeno[123-cd]pyrene		205-893-2	193-39-5		3.98	mg/kg		3.98	mg/kg	0.000398 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.83	mg/kg		0.83	mg/kg	0.000083 %		
29		benzo[ghi]perylene		205-883-8	191-24-2		3.16	mg/kg		3.16	mg/kg	0.000316 %		
30		benzene	601-020-00-8	200-753-7	71-43-2		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
31		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-021-00-3	203-625-9	108-88-3									
32		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.344 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS102

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS102
Sample Depth:
0.10-0.25 m
Moisture content:
3%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 3% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		1 mg/kg	1.32	1.32 mg/kg	0.000132 %		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.6 mg/kg	1.142	0.685 mg/kg	0.0000685 %		
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		9 mg/kg	1.462	13.154 mg/kg	0.00132 %		
5	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<1 mg/kg	2.27	<2.27 mg/kg	<0.000227 %		<**LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		7 mg/kg	1.126	7.881 mg/kg	0.000788 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	11 mg/kg	1.56	17.158 mg/kg	0.0011 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17 mg/kg	1.353	<0.23 mg/kg	<0.000023 %		<**LOD**
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		10 mg/kg	2.976	29.763 mg/kg	0.00298 %		
10	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		34 mg/kg	2.774	94.321 mg/kg	0.00943 %		
12	TPH (C6 to C40) petroleum group			TPH		433 mg/kg		433 mg/kg	0.0433 %		
13	pH			PH		9.01 pH		9.01 pH	9.01 pH		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		acenaphthylene				0.76	mg/kg		0.76	mg/kg	0.000076 %		
			205-917-1	208-96-8									
16		acenaphthene				0.08	mg/kg		0.08	mg/kg	0.000008 %		
			201-469-6	83-32-9									
17		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7									
18		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			201-581-5	85-01-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
			204-371-1	120-12-7									
20		fluoranthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<**LOD**
			205-912-4	206-44-0									
21		pyrene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<**LOD**
			204-927-3	129-00-0									
22		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			205-883-8	191-24-2									
30		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-021-00-3	203-625-9	108-88-3									
32		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.06 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations are too low to be considered a flammable risk

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0433%)

Classification of sample: WS103

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS103
Sample Depth:
0.10-0.35 m
Moisture content:
3.4%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 3.4% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		<1 mg/kg	1.32	<1.32 mg/kg	<0.000132 %		<**LOD**
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.5 mg/kg	1.142	<0.571 mg/kg	<0.0000571 %		<**LOD**
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		9 mg/kg	1.462	13.154 mg/kg	0.00132 %		
5	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<1 mg/kg	2.27	<2.27 mg/kg	<0.000227 %		<**LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		6 mg/kg	1.126	6.755 mg/kg	0.000676 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	13 mg/kg	1.56	20.278 mg/kg	0.0013 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17 mg/kg	1.353	<0.23 mg/kg	<0.000023 %		<**LOD**
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		9 mg/kg	2.976	26.786 mg/kg	0.00268 %		
10	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		26 mg/kg	2.774	72.128 mg/kg	0.00721 %		
12	TPH (C6 to C40) petroleum group			TPH		923 mg/kg		923 mg/kg	0.0923 %		
13	pH			PH		8.93 pH		8.93 pH	8.93 pH		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		acenaphthylene				0.84	mg/kg		0.84	mg/kg	0.000084 %		
			205-917-1	208-96-8									
16		acenaphthene				0.08	mg/kg		0.08	mg/kg	0.000008 %		
			201-469-6	83-32-9									
17		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-695-5	86-73-7									
18		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			201-581-5	85-01-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
			204-371-1	120-12-7									
20		fluoranthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
			205-912-4	206-44-0									
21		pyrene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
			204-927-3	129-00-0									
22		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
30		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
32		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.107 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations are too low to be considered a flammable risk

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0923%)

Classification of sample: WS104

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS104
Sample Depth:
0.40-0.80 m
Moisture content:
7.7%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 7.7% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		5	mg/kg	1.32	6.602	mg/kg	0.00066 %		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.5	mg/kg	1.142	0.571	mg/kg	0.0000571 %		
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		9	mg/kg	1.462	13.154	mg/kg	0.00132 %		
5	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<1	mg/kg	2.27	<2.27	mg/kg	<0.000227 %		<**LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		21	mg/kg	1.126	23.644	mg/kg	0.00236 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	38	mg/kg	1.56	59.273	mg/kg	0.0038 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17	mg/kg	1.353	<0.23	mg/kg	<0.000023 %		<**LOD**
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		9	mg/kg	2.976	26.786	mg/kg	0.00268 %		
10	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		55	mg/kg	2.774	152.578	mg/kg	0.0153 %		
12	TPH (C6 to C40) petroleum group			TPH		188	mg/kg		188	mg/kg	0.0188 %		
13	pH			PH		8.04	pH		8.04	pH	8.04 pH		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		acenaphthylene				1.23	mg/kg		1.23	mg/kg	0.000123 %		
			205-917-1	208-96-8									
16		acenaphthene				0.27	mg/kg		0.27	mg/kg	0.000027 %		
			201-469-6	83-32-9									
17		fluorene				0.19	mg/kg		0.19	mg/kg	0.000019 %		
			201-695-5	86-73-7									
18		phenanthrene				1.39	mg/kg		1.39	mg/kg	0.000139 %		
			201-581-5	85-01-8									
19		anthracene				0.37	mg/kg		0.37	mg/kg	0.000037 %		
			204-371-1	120-12-7									
20		fluoranthene				2.18	mg/kg		2.18	mg/kg	0.000218 %		
			205-912-4	206-44-0									
21		pyrene				1.83	mg/kg		1.83	mg/kg	0.000183 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.87	mg/kg		0.87	mg/kg	0.000087 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				1.02	mg/kg		1.02	mg/kg	0.000102 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.72	mg/kg		0.72	mg/kg	0.000072 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.6	mg/kg		0.6	mg/kg	0.00006 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				0.38	mg/kg		0.38	mg/kg	0.000038 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
30		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
32		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.0468 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations are too low to be considered a flammable risk

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0188%)

Classification of sample: WS105

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS105
Sample Depth:
0.40-0.80 m
Moisture content:
14.3%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14.3% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		7 mg/kg	1.32	9.242 mg/kg	0.000924 %		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.5 mg/kg	1.142	<0.571 mg/kg	<0.0000571 %		<**LOD**
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		13 mg/kg	1.462	19 mg/kg	0.0019 %		
5	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<1 mg/kg	2.27	<2.27 mg/kg	<0.000227 %		<**LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		25 mg/kg	1.126	28.147 mg/kg	0.00281 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	45 mg/kg	1.56	70.192 mg/kg	0.0045 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17 mg/kg	1.353	<0.23 mg/kg	<0.000023 %		<**LOD**
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		12 mg/kg	2.976	35.715 mg/kg	0.00357 %		
10	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		44 mg/kg	2.774	122.062 mg/kg	0.0122 %		
12	TPH (C6 to C40) petroleum group			TPH		48 mg/kg		48 mg/kg	0.0048 %		
13	pH			PH		7.7 pH		7.7 pH	7.7 pH		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		acenaphthylene				1.53	mg/kg		1.53	mg/kg	0.000153 %		
			205-917-1	208-96-8									
16		acenaphthene				0.18	mg/kg		0.18	mg/kg	0.000018 %		
			201-469-6	83-32-9									
17		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-695-5	86-73-7									
18		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			201-581-5	85-01-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
			204-371-1	120-12-7									
20		fluoranthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
			205-912-4	206-44-0									
21		pyrene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
			204-927-3	129-00-0									
22		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
30		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
32		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.0317 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations are too low to be considered a flammable risk

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0048%)

Classification of sample: WS106

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS106
Sample Depth:
0.40-0.75 m
Moisture content:
11.6%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 11.6% No Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		6	mg/kg	1.32	7.922	mg/kg	0.000792 %		
2		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
3		cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.5	mg/kg	1.142	<0.571	mg/kg	<0.0000571 %		<**LOD**
4		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		15	mg/kg	1.462	21.923	mg/kg	0.00219 %		
5		chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<1	mg/kg	2.27	<2.27	mg/kg	<0.000227 %		<**LOD**
6		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		32	mg/kg	1.126	36.028	mg/kg	0.0036 %		
7		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	61	mg/kg	1.56	95.149	mg/kg	0.0061 %		
8		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17	mg/kg	1.353	<0.23	mg/kg	<0.000023 %		<**LOD**
9		nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		17	mg/kg	2.976	50.597	mg/kg	0.00506 %		
10		selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<**LOD**
11		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		71	mg/kg	2.774	196.964	mg/kg	0.0197 %		
12		TPH (C6 to C40) petroleum group			TPH		891	mg/kg		891	mg/kg	0.0891 %		
13		pH			PH		7.86	pH		7.86	pH	7.86 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		acenaphthylene				1.45	mg/kg		1.45	mg/kg	0.000145 %		
			205-917-1	208-96-8									
16		acenaphthene				1.06	mg/kg		1.06	mg/kg	0.000106 %		
			201-469-6	83-32-9									
17		fluorene				1.33	mg/kg		1.33	mg/kg	0.000133 %		
			201-695-5	86-73-7									
18		phenanthrene				10.7	mg/kg		10.7	mg/kg	0.00107 %		
			201-581-5	85-01-8									
19		anthracene				3.04	mg/kg		3.04	mg/kg	0.000304 %		
			204-371-1	120-12-7									
20		fluoranthene				16.9	mg/kg		16.9	mg/kg	0.00169 %		
			205-912-4	206-44-0									
21		pyrene				14.2	mg/kg		14.2	mg/kg	0.00142 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				7.6	mg/kg		7.6	mg/kg	0.00076 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				8.02	mg/kg		8.02	mg/kg	0.000802 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				7.13	mg/kg		7.13	mg/kg	0.000713 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				3.08	mg/kg		3.08	mg/kg	0.000308 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				5.95	mg/kg		5.95	mg/kg	0.000595 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				3.95	mg/kg		3.95	mg/kg	0.000395 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				0.7	mg/kg		0.7	mg/kg	0.00007 %		
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				3.18	mg/kg		3.18	mg/kg	0.000318 %		
			205-883-8	191-24-2									
30		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-021-00-3	203-625-9	108-88-3									
32		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.136 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations are too low to be considered a flammable risk

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0891%)

Classification of sample: WS107

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS107
Sample Depth:
0.00-0.70 m
Moisture content:
15.2%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15.2% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		<1 mg/kg	1.32	<1.32 mg/kg	<0.000132 %		<**LOD**
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.5 mg/kg	1.142	<0.571 mg/kg	<0.0000571 %		<**LOD**
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		10 mg/kg	1.462	14.616 mg/kg	0.00146 %		
5	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<1 mg/kg	2.27	<2.27 mg/kg	<0.000227 %		<**LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		11 mg/kg	1.126	12.385 mg/kg	0.00124 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	11 mg/kg	1.56	17.158 mg/kg	0.0011 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17 mg/kg	1.353	<0.23 mg/kg	<0.000023 %		<**LOD**
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		5 mg/kg	2.976	14.881 mg/kg	0.00149 %		
10	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		30 mg/kg	2.774	83.224 mg/kg	0.00832 %		
12	TPH (C6 to C40) petroleum group			TPH		25 mg/kg		25 mg/kg	0.0025 %		
13	pH			PH		7.09 pH		7.09 pH	7.09 pH		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		acenaphthylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			205-917-1	208-96-8									
16		acenaphthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-469-6	83-32-9									
17		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-695-5	86-73-7									
18		phenanthrene				0.08	mg/kg		0.08	mg/kg	0.000008 %		
			201-581-5	85-01-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
			204-371-1	120-12-7									
20		fluoranthene				0.19	mg/kg		0.19	mg/kg	0.000019 %		
			205-912-4	206-44-0									
21		pyrene				0.18	mg/kg		0.18	mg/kg	0.000018 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
30		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
32		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.0171 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations are too low to be considered a flammable risk

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0025%)

Classification of sample: WS110

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS110
Sample Depth:
0.00-0.60 m
Moisture content:
15.3%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15.3% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		3	mg/kg	1.32	3.961	mg/kg	0.000396 %		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.5	mg/kg	1.142	<0.571	mg/kg	<0.0000571 %		<**LOD**
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		22	mg/kg	1.462	32.154	mg/kg	0.00322 %		
5	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<1	mg/kg	2.27	<2.27	mg/kg	<0.000227 %		<**LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		27	mg/kg	1.126	30.399	mg/kg	0.00304 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	66	mg/kg	1.56	102.948	mg/kg	0.0066 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17	mg/kg	1.353	<0.23	mg/kg	<0.000023 %		<**LOD**
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		17	mg/kg	2.976	50.597	mg/kg	0.00506 %		
10	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		100	mg/kg	2.774	277.415	mg/kg	0.0277 %		
12	TPH (C6 to C40) petroleum group			TPH		78	mg/kg		78	mg/kg	0.0078 %		
13	pH			PH		6.82	pH		6.82	pH	6.82 pH		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		acenaphthylene				0.03	mg/kg		0.03	mg/kg	0.000003 %		
			205-917-1	208-96-8									
16		acenaphthene				0.09	mg/kg		0.09	mg/kg	0.000009 %		
			201-469-6	83-32-9									
17		fluorene				0.05	mg/kg		0.05	mg/kg	0.000005 %		
			201-695-5	86-73-7									
18		phenanthrene				0.66	mg/kg		0.66	mg/kg	0.000066 %		
			201-581-5	85-01-8									
19		anthracene				0.17	mg/kg		0.17	mg/kg	0.000017 %		
			204-371-1	120-12-7									
20		fluoranthene				1.36	mg/kg		1.36	mg/kg	0.000136 %		
			205-912-4	206-44-0									
21		pyrene				1.27	mg/kg		1.27	mg/kg	0.000127 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.52	mg/kg		0.52	mg/kg	0.000052 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.93	mg/kg		0.93	mg/kg	0.000093 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.69	mg/kg		0.69	mg/kg	0.000069 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.66	mg/kg		0.66	mg/kg	0.000066 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				0.51	mg/kg		0.51	mg/kg	0.000051 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
30		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
32		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.0553 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations are too low to be considered a flammable risk

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0078%)

Appendix A: Classifier defined and non GB MCL determinands

salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex

GB MCL index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

chromium(III) oxide (worst case) (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Worst Case

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

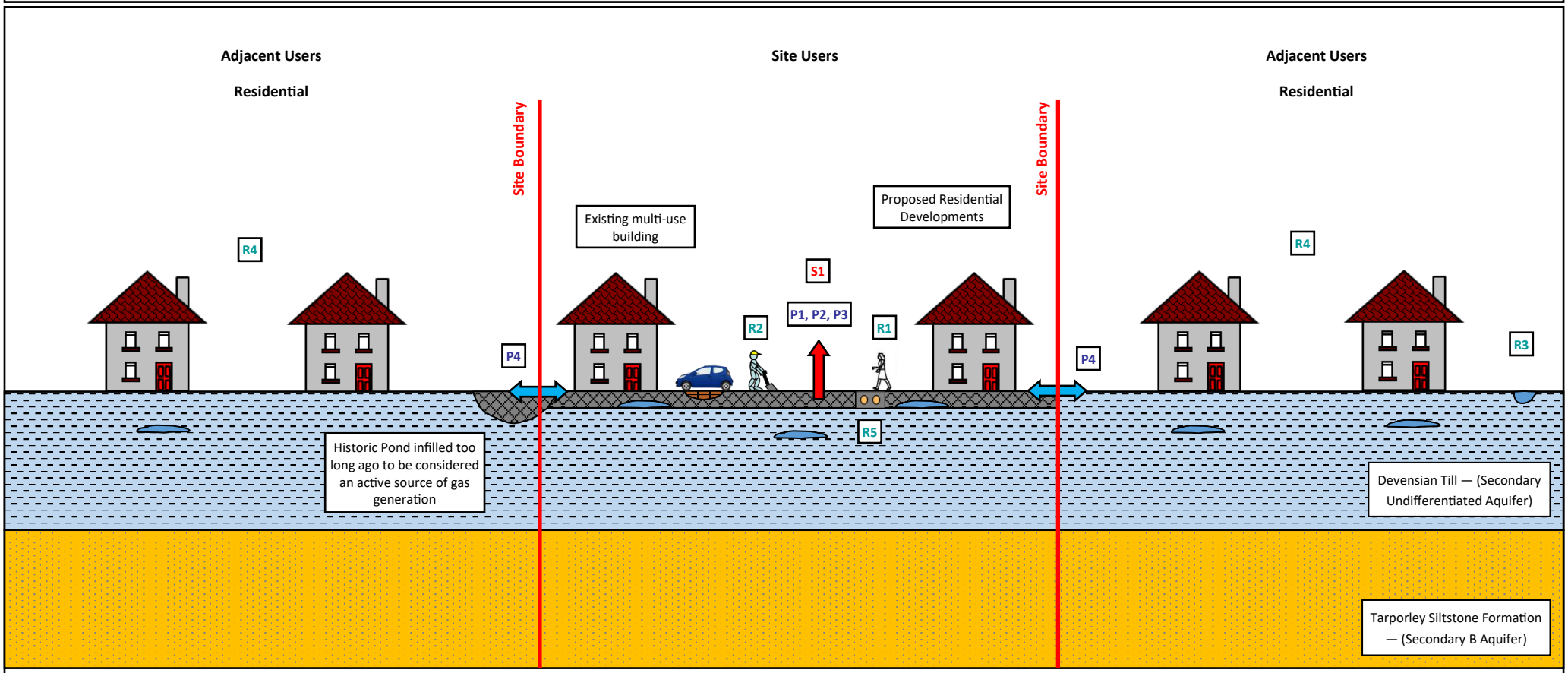
Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2023.325.5817.10787 (21 Nov 2023)
HazWasteOnline Database: 2023.325.5817.10787 (21 Nov 2023)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021
GB MCL List v2.0 - version 2.0 of 20th October 2023

Figure 3 – Preliminary Conceptual Site Model

Preliminary Conceptual Site Model (CSM)



Contamination Source	
S1	Made Ground/Hydrocarbon leak — Onsite

Legend	
	Infilled / Made Ground
	Hydrocarbon leak
	Underground Services
	Inferred Perched Water Table

Receptor	
R1	Future Site Users
R2	Construction Workers
R3	Controlled Waters
R4	Adjacent Site Users
R5	Infrastructure & Buried Services

Pathway	
	Direct Contact / Ingestion
	Leachate Migration
	Ground Gas Migration
P1	Direct Contact
P2	Ingestion
P3	Inhalation
P4	Leaching & Migration
P5	Vertical & Lateral migration of Ground Gas

Sutcliffe

Client: Wythenshawe Community Housing Group

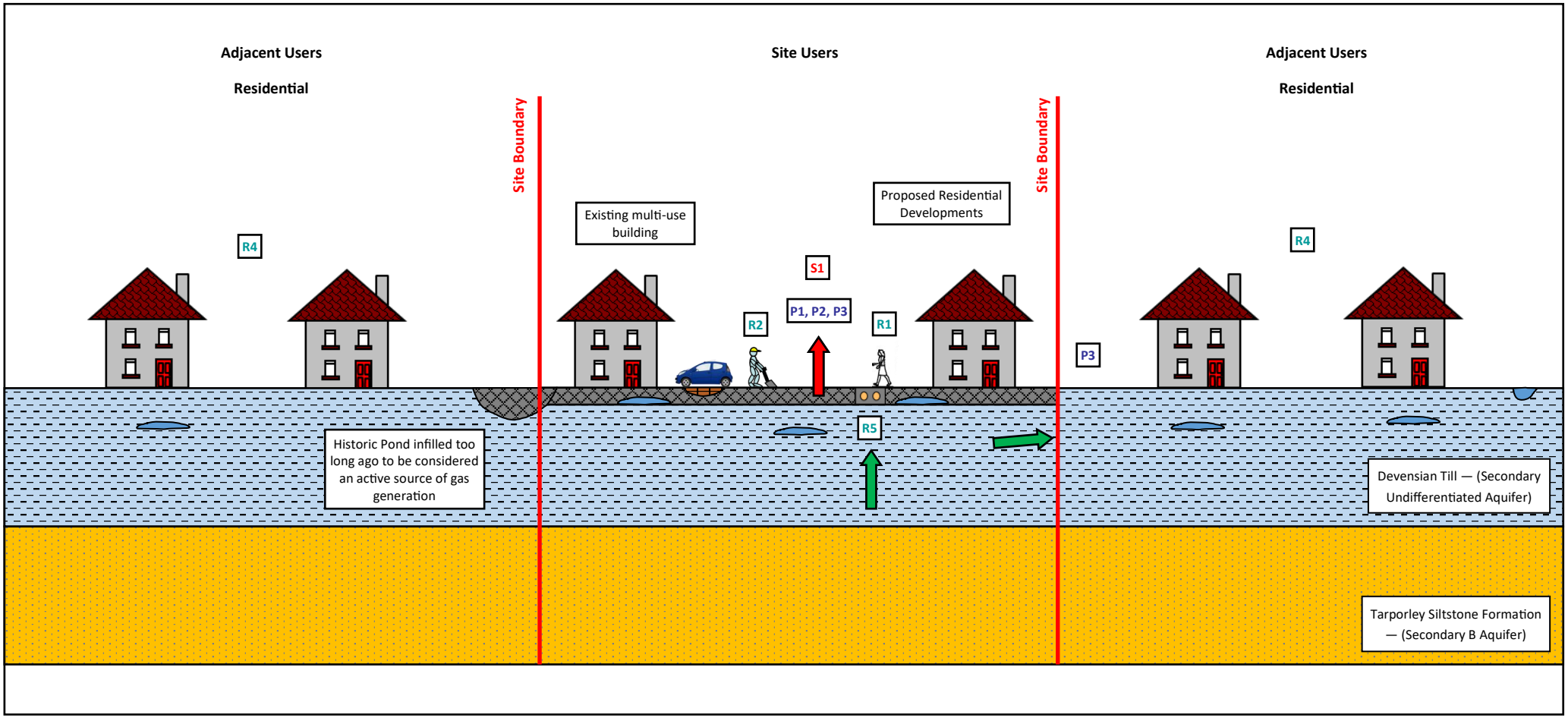
Project: 33029-SUT-ZZ-00-RP-G-7101

Site: Benchill Road, Manchester

Preliminary Conceptual Site Model (CSM)	Draft	1	Scale (at A3): Not to scale
	Issue	1	
Issuing Office: Liverpool	Drawing number: 1		Version: A
Telephone: 0151 227 3155			

Figure 5 – Revised Conceptual Site Model

Revised Conceptual Site Model (CSM)



Contamination Source	
S1	Made Ground/Hydrocarbon leak — Onsite

Legend
Infilled / Made Ground
Hydrocarbon leak
Underground Services
Inferred Perched Water Table

Receptor	
R1	Future Site Users
R2	Construction Workers
R3	Controlled Waters
R4	Adjacent Site Users
R5	Infrastructure & Buried Services

Pathway	
→	Direct Contact / Ingestion
→	Leachate Migration
→	Ground Gas Migration
P1	Direct Contact
P2	Ingestion
P3	Inhalation
P4	Leaching & Migration
P5	Vertical & Lateral migration of Ground Gas

Sutcliffe

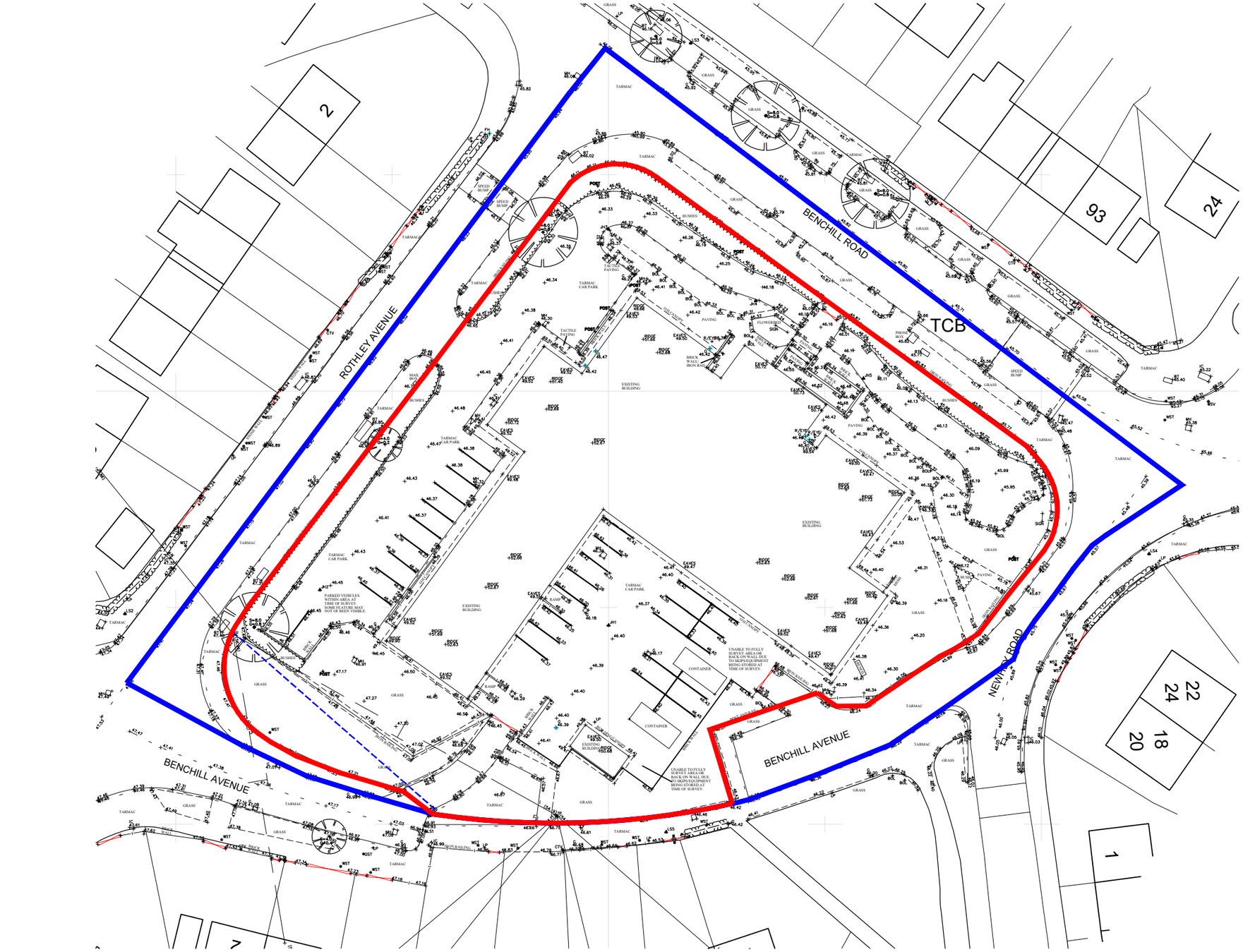
Client: Wythenshawe Community Housing Group

Project: 33029-SUT-ZZ-00-RP-G-7101

Site: Benchill Road, Manchester

Revised Conceptual Site Model (CSM)	Draft	1	Scale (at A3): Not to scale
	Issue	1	
Issuing Office: Liverpool	Drawing number: 5		Version: A
Telephone: 0151 227 3155			

Drawing Ref. – *8933-MDA-ST-XX-DR-A-901* (Existing Layout) & 33029- SUT-ZZ-00-DR-G-7251 - SI Locations on Existing plan



EXISTING SITE PLAN - Scale 1:500

1:500
0 5 10 15 20 25 metres

Do not scale from this drawing.
All dimensions must be checked on site by the Contractor prior to the commencement of any fabrication or building works.
Where applicable, dimensions and details are to be read in conjunction with specialist consultants' drawings and/or other specifications; any disparity is to be brought to the attention of Michael Dyson Associates Limited prior to the commencement of any fabrication or building works.
©This drawing is the property and copyright of Michael Dyson Associates Limited; it shall not be copied to any other party without the express written consent of an authorised director of Michael Dyson Associates Limited.

NOTES

PLANNING APPLICATION BOUNDRY

OTHER LAND IN APPLICANTS OWNERSHIP

REV	DATE	AMENDMENTS	BY	APR'D

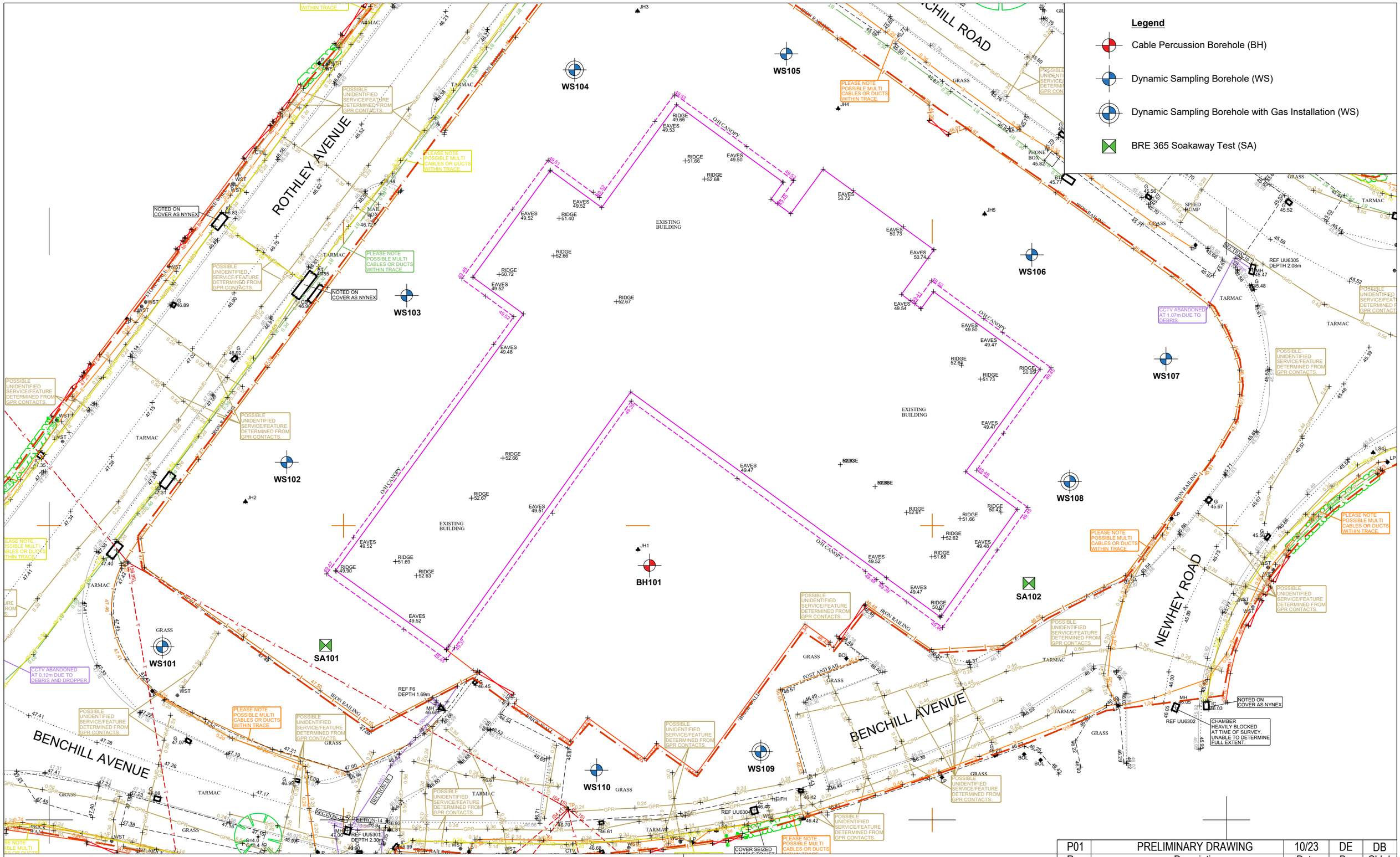
Michael Dyson associates ltd
Excellence in Housing Consultancy
West House, Meltham Road, Honley,
Huddersfield HD9 6LB
t. 01484 666888 f. 01484 664186
w. www.mdyson.co.uk

CLIENT :
Wythenshawe Community Housing

PROJECT :
The Enterprice Centre
Benchill Road
Wythenshawe

TITLE :
Existing Site Plan

DRAWN BY :	AP	APPROVED BY :	
DATE :	25.04.2023	DATE :	
SCALE :	1:500 @ A3	ORIGINAL DRAWING SIZE 297 x 420 - A3	
DRAWING No :	8933-MDA-ST-XX-DR-A-901	REV.	



Sutcliffe

Structural & Civil Engineering
Geotechnical & Environmental Investigations
Building Surveying
Pre Planning Services

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Drawing Status
FOR INFORMATION

Client
WYTHENSHAWE CHG

Project
BENCHILL ROAD
MANCHESTER

Drawing Title
SITE INVESTIGATION LOCATIONS
ON EXISTING PLAN

Rev	Description	Date	By	Chkd
P01	PRELIMINARY DRAWING	10/23	DE	DB

Date	Drawn By	Checked By
OCT 2023	D EVANS	D BOWEN

Scale at A1	Project Number	Status	Revision
NTS	33029LG	P	01

Sheet Number
33029-SUT-ZZ-00-DR-G-7251

Drawing Ref. – *8933-MDA-ST-XX-DR-A-902 REV B* (Proposed Layout)



PROPOSED SITE PLAN - Scale 1:200

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION:

IN ADDITION TO THE HAZARDS / RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING;

Significant Residual Risks :	
Action to be Taken :	Refer to Health and Safety Plan

NOTES:

- OTHER LAND IN APPLICANTS OWNERSHIP
- PLANNING APPLICATION BOUNDRY
- BUILDING DEMOLITION
- ASSUMED OVERHEAD FIBRE CABLES
- EXISTING TREES
- REMOVED EXISTING TREES
- PROPOSED TREES
- PLANTING/BUSHES
- SHED
- BIN STORE
- EV charger provision point

Accommodation Schedule
2Nr 2-Bed 3 Person Bungalows
2Nr 2-Bed 4 Person Houses
12Nr 2-Bed 4 Person Flats
5Nr 3-Bed 5 Person Houses
1Nr 4-Bed 8 Person House
1Nr 4-Bed 8 Person Accessible House

Total - 23Nr Dwellings

Parking Standards
1Nr Parking spaces per House
1Nr Parking spaces per Flat

Total - 23Nr Parking Spaces

REV	DATE	AMENDMENTS	BY	APP'D
B	13.06.23	Dwellings updated to reflect house types design floor plans	AP	PT
A	22.05.23	1nr Bungalow to be relocated to the opposite corner of the site	AP	DC

Do not scale from this drawing.
All dimensions must be checked on site by the Contractor prior to the commencement of any fabrication or building works.
Where applicable, dimensions and details are to be read in conjunction with specialist consultants' drawings and/or other specifications; any disparity is to be brought to the attention of Michael Dyson Associates Limited prior to the commencement of any fabrication or building works.
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CLIENT :
Wythenshawe Community Housing

PROJECT :
The Enterprise Centre
Benchill Road
Wythenshawe

TITLE :
Proposed Site Plan

DRAWN BY :	AP	APPROVED BY :	PT
DATE :	26.04.23	DATE :	
SCALE :	1:200 @ A1	ORIGINAL DRAWING SIZE	841 x 594 - A1
DRAWING No :	8933-MDA-ST-XX-DR-A-902	REV :	B