



Phase II Interpretative Ground Assessment

At

Cables Way,
Prescot

Client: John F Beesley

Reference: 30259-SUT-ZZ-00-RP-G-702-0002

Date: October 2022

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Document Control Sheet

Report Reference: 30259-SUT-ZZ-00-RP-G-702-0002

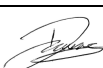
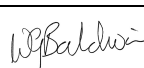
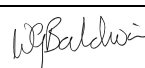
Issue: P02 Date: October 2022

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Revision History:

Rev	Date	Description	Prepared	Checked	Approved
P01	July 2021	Final Report	DE	WGB	WGB
P02	October 2022	Updated following CLO Comments	DE	WGB	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 has 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 that 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 couldn't 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 was instructed by John F Beesley (the “client”) to undertake a Phase II ground assessment for Site Area 1 & Site Area 2, Cables Way, Prescott, L34 1QG. The site is centred on National Grid Reference (NGR) 346610, 392180 and is approximately 1.88ha in area. 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. The report does not include investigations relating to the coal mining issues. These have been dealt with by Groundsolve Limited in their 2373/Prescot/MinRep/es report “SITES AT PRESCOT- MINING REPORT”. Trial pits were excavated to try and locate the mine shaft on site. TP109A and TP109B noted a hard obstruction thought to be the top of the mineshaft.
SITE DESCRIPTION	The sites are rectangular in shape, 0.40ha (Site 1) and 0.78ha (Site 2) and can be accessed via Helsby Court (Site 1, Site 2 West) and Manchester Road (Site 2 East). Site 1 generally consists of a large grassed landscaped area with saplings on the northern boundary adjacent to Cables Way. The south-western corner of the site consists of macadam car park parking area associated with Prescott Office and Business Park. Site 2 is currently divided into two parts with the western section located on the south eastern corner of the Prescott Business Park and the eastern section located between the new fire and police station to the north and a residential development to the south.
DEVELOPMENT PROPOSAL	The proposed layout is for the construction of commercial buildings (Home Improvement Centre and Garden Centre), with Car Parking and infrastructure.
PRELIMINARY CONCEPTUAL MODEL	The earliest available historical map (1850) indicated that the site was undeveloped and largely under agricultural usage. Later from 1927 a building was noted on the eastern section of the site, likely associated with the cable works identified. The development associated with the cable works expanded and grew over time and also included an electricity substation. The site remained relatively unchanged until present day, with no significant features apparent. Due to the previous industrial development noted on site some significant identifiable sources of environmental concern were identified. Therefore, the potential for significant contamination to have arisen at the site as a result of the current and former usage on site is considered to be moderate.
PREVIOUS WORKS	Sutcliffe's have completed a Phase I Desk Studies, synopsis of which is provided in Section 2 of this report. Coal mining risk assessment works have been carried out by Groundsolve Limited under report reference no. 2373/Prescot/MinRep/es - “SITES AT PRESCOT- MINING REPORT”. No other previous studies are known to have been undertaken to Sutcliffe's knowledge.
SITE INVESTIGATION	Site work was undertaken on 29th and 30th March 2021 and consisted of: 9No. Window Sample Holes. 16No. Trial pits (1 converted to a soakaway) Contamination samples from various depth in the made ground. Leachate samples.
GROUND CONDITIONS	Made ground was encountered in all of the exploratory holes apart from TP110, TP111A, TP111B, TP112 and TP112A and was noted to a maximum depth of 3.90m in TP109A. Final depth of made ground was not proven in WS108, WS109, TP105, TP109A, TP109B and TP109C Made ground generally consisted of brown fine to medium grained SAND with brick and concrete fragments, and occasionally graded granular limestone hardcore, rebar and plastic items. There is also sandy CLAY and sandy GRAVEL of natural stone and brick fragments. TP102 and TP105 are noted to have a slight hydrocarbon odour. Redundant cables are encountered in TP103 at 0.6-1.0m bgl. Natural ground was encountered in all boreholes apart from WS108, WS109, TP105, TP109A, TP109B and TP109C and consisted of firm / stiff / very stiff sandy gravelly CLAY / clayey gravelly fine to medium grained SAND, with fine to medium angular to subrounded gravel of mixed lithology. Light brown MUDSTONE fragments and brown highly weathered fine grained SANDSTONE are also noted, both of which were recovered as cobbles / gravel. WS102 notes peaty CLAY.
GROUNDWATER	Groundwater was not recorded in any of the exploratory holes during site investigation works.

SOIL INFILTRATION	1No.infiltration test (SA101) was carried out on site at TP107, shown on Drawing No. 30259-SUT-ZZ-00-DR-G-720-0002 (Site 2). Due to the inefficient infiltration characteristics of the ground at the excavation depths, the soakaway test comprised a single fill. The test result did not provide an infiltration rate due to the inefficiencies of the ground to infiltrate. As the soakaway test failed, it is advised that alternative methods of sustainable drainage are explored (i.e., Permeable Paving).
ENVIRONMENTAL RISK ASSESSMENT	Long Term Human Health There were no contaminants present in soil analysed that exceed its threshold values for Commercial/Industrial land use, therefore the null hypothesis can be rejected. Controlled Waters Risk Assessment For controlled waters there are two assessment criteria, the Environmental Quality Standard (EQS) and the UK Drinking Water Standard (UKDWS). 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.
ASBESTOS	Asbestos fibres were identified within the samples WS104 0.40-0.80m, WS107 0.45-0.7 and TP103 0.45-0.70m. Asbestos delineation indicated that soils at WS104 and TP103 are above the threshold value, hence a risk long term Human Health is indicated.
GROUND GAS RISK ASSESSMENT	On review of both the HGFR and RB17 methods for assessing the gas risk, along with the Radon potential, the recommendation is that Site 1 and Site 2 be classified as Characteristic Situation 2, This classifies the site as having a low to intermediate gas regime identified, which requires gas protection measures, comprising a cast in-situ ground bearing floor slab and a gas resistant membrane.
RADON	In accordance with the Indicative Atlas of Radon in England and Wales Map 17 Lancashire, south Cumbria and western North Yorkshire, the site is in an area of elevated radon potential of 1-3%, hence basic radon protective measures are required.
GEOTECHNICAL ASSESSMENT	It is understood that consideration is being given to the development of commercial buildings (Home Improvement Centre and Garden Centre), with Car Parking and infrastructure. Site 1 – Home Improvement centre It is understood that Site 1 is being redeveloped for commercial use with the construction of a new Home Improvement Centre with associated car parking and infrastructure. Due to the ground conditions encountered it would be Sutcliffe's recommendation that a pad and strip foundation design with an allowable bearing pressure of 500kn/m2 is adopted due to the amount of made ground that has been identified on site. Site 2 – Garden Centre It is understood that Site 2 is being redeveloped for commercial use with the construction of a new Garden Centre with associated car parking and infrastructure. Due to the ground conditions encountered it would be Sutcliffe's recommendation that a reinforced pad and strip foundation design with an allowable bearing pressure of 125kn/m2 is adopted due to the amount of made ground that has been identified on site. Depth of the mine shaft under the building footprint to be c.3.9m bgl. Full assessment of the mine shaft before setting out the foundations. Please refer to the coal mining report for further information regarding coal mining issues and mine shafts. Groundwater was not recorded in any of the exploratory holes 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. NOTE: As the site is in an area of previous coal extraction, reinforced foundations will be required to all buildings Ground Floor Construction It is recommended that ground-bearing slabs are utilised on both sites. It is also recommended that the use of a geotextile over mine shafts. Geotechnical Uncertainty The site has been subject to previous development and previous coal mining and therefore, the potential for relic foundations and obstructions and voids cannot be discounted.

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.  Design AMP – management of Asbestos containing material on and off site.  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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NOTE: The executive summary is an overview of the key findings and conclusions of the report. There may be other information contained in the body of the main report which puts into context the information presented within the executive summary. No reliance should be placed on the executive summary.

Table of Contents

1	Introduction	1
1.1	Terms of Reference	1
1.2	Development Proposal & Legislative Context	1
1.3	Site Location and Setting	2
1.4	Site Description and Layout	3
1.5	Previous Studies	4
1.6	Objectives & Scope of Assessment	5
2	Preliminary Conceptual Risk Assessment	6
2.1	Introduction	6
2.2	Site History	6
2.3	Geotechnical Constraints	6
2.4	Potential Contaminant Linkages	8
2.5	Risk Evaluation	9
3	Ground Investigation	13
3.1	Design Rationale	13
3.2	Fieldwork	13
3.3	Health & Safety	13
3.4	Sampling Strategy	13
3.5	Chemical Laboratory Testing	15
3.6	Drainage	16
3.7	Water Supply	16
3.8	Services	17
4	Ground Model	18
4.1	General	18
4.2	Made Ground	19
4.3	Natural Ground	19
4.4	Field Evidence of Contaminated Soils	20
4.5	Groundwater	20
4.6	Soil Infiltration	20
5	Geotechnical Laboratory Testing and Assessment	21
5.2	Foundation Recommendations	22
5.3	Geotechnical Uncertainty	24
6	Long Term Human Health Risk Assessment	25
6.1	Soils – Long Term Human Health	25

7	Controlled Waters Risk Assessment	27
7.1	Methodology	27
8	Ground Gas Risk Assessment	29
8.1	CIRIA C665 Assessment	29
8.2	Methodology	29
8.3	Review of Field Data	29
8.4	Calculation of Hazardous Gas Flow Rate (HGFR)	31
8.5	RB17 Pragmatic Approach	31
8.6	Radon	33
8.7	Gas Risk Assessment Discussion	33
8.8	Groundwater Protection Measures	34
9	Land Contamination Risks and Remediation Requirements	35
9.1	Revised Conceptual Model	35
9.2	Discounted Contaminant Linkages	35
9.3	Remaining Potential Contaminant Linkages	35
9.4	Additional Works Required to Assess Outstanding Contaminant Linkages	37
9.5	Remediation Requirements	37
10	Recommendations	38
10.1	Further works	38
11	References	39
	Appendices	A
	Appendix A – General Notes	A
	Appendix B – Ciria Guidance Document C552 2001	B
	Appendix C – Window Sample & Trial Pit Logs	C
	Appendix D – Analytical Certificates	D
	Appendix E – Ground Gas and Groundwater Risk Assessment	E
	Appendix F – Geotechnical Laboratory Certificates	F
	Appendix G – Contamination Assessment Tables	G
	Figures	H
	Figure 3: Preliminary Conceptual Model	H
	Figure 6: Revised Conceptual Model	I
	Drawings	J
	Drawing No 201a (Site Plan as Proposed - Home Improvement Centre)	J
	Drawing No 201e (Site Plan as Proposed - Garden Centre)	K
	Drawing No 30259-SUT-ZZ-00-RP-G-702-0001 (Home Improvement Centre)	L
	Drawing No 30259-SUT-ZZ-00-RP-G-702-0002 (Garden Centre)	M

1 Introduction

1.1 Terms of Reference

Sutcliffe Investigations was instructed by John F Beesley (the “client”) to undertake a Phase II ground assessment for Site Area 1 & Site Area 2, Cables Way, Prescott, L34 1QG.

The location of the site is presented as *Figure 1*. The site is centred on National Grid Reference (NGR) 346610, 392180 and is approximately 1.88ha in area. An aerial photograph of the site is presented as *Figure 2*.

A plan detailing the sites layouts are presented on Life Architecture Limited *Drawing No. 201a* and *201e*.

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.

The report does not include investigations relating to the coal mining issues. These have been dealt with by Groundsolve Limited in their 2373/Prescot/MinRep/es report “SITES AT PRESCOT-MINING REPORT”.

Trial pits were excavated to try and locate the mine shafts on site. TP109A and TP109B noted a hard obstruction thought to be the top of the mineshaft.

1.2 Development Proposal & Legislative Context

1.2.1 Development Proposal

The proposed layout is shown in Life Architecture Limited *Drawings (Ref: 201a and 201e)*. This report has been prepared in support of a planning application to develop the site for commercial buildings (Home Improvement Centre and Garden Centre), with Car Parking and infrastructure. Based on information received from the architect, it is anticipated that site levels will be retained to facilitate the proposed development option.

1.2.2 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, paragraphs 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 commercial, 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 sites are located at Cables Way, Prescot, L34 1QG at National Grid Reference (NGR) 346610, 392180 (*Figure 2*), within a predominantly residential area with local amenities also noted in the area.

A site area plan of Site 1 (Green) and Site 2 (Orange) is shown as *Figure 1*, with a location plan and aerial photograph of the sites are shown as *Figure 2 & 3*.

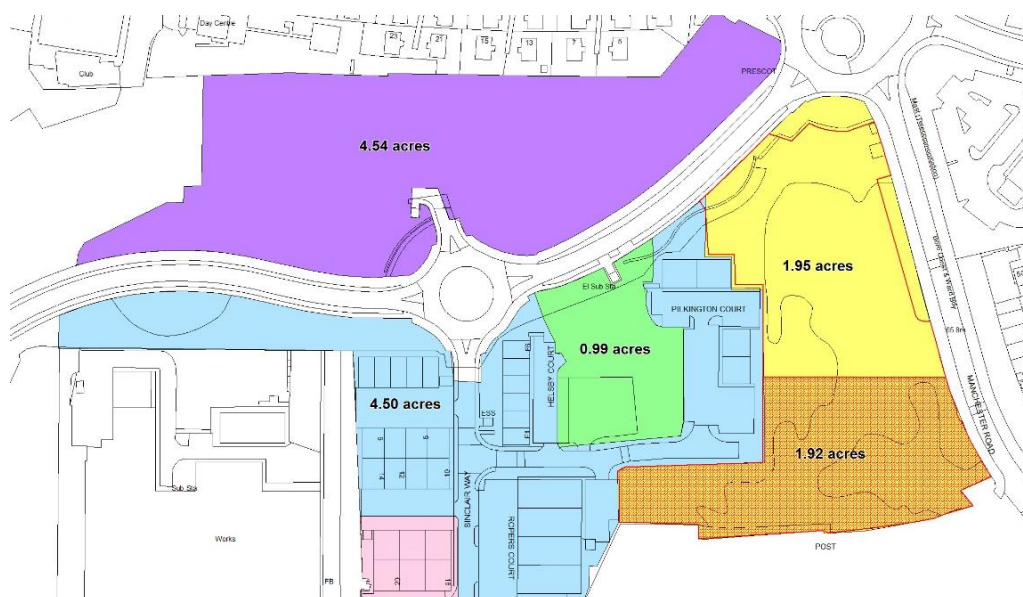


Figure 1: Location of Site 1 (Green) and Site 2 (Orange)

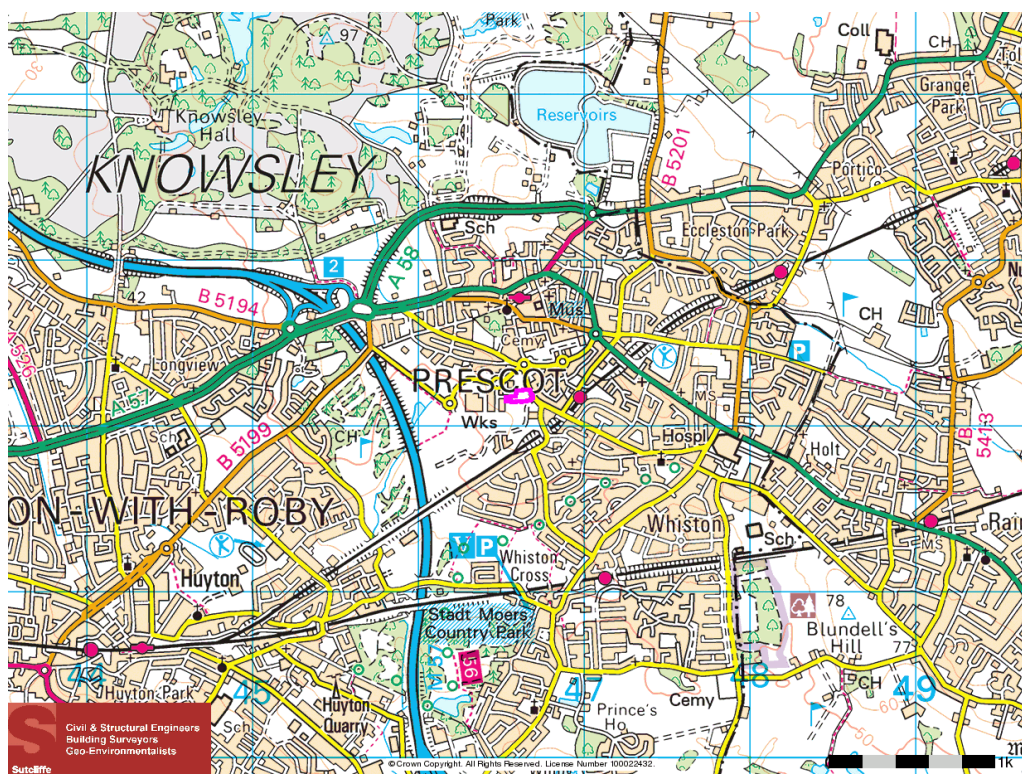


Figure 2: General Location of the Site

1.4 Site Description and Layout

The sites are rectangular in shape, 0.40ha (Site 1) and 0.78ha (Site 2) and can be accessed via Helsby Court (Site 1, Site 2 West) and Manchester Road (Site 2 East).

Site 1 generally consists of a large grassed landscaped area with saplings on the northern boundary adjacent to Cables Way. The south-western corner of the site consists of macadam car park parking area associated with Prescot Office and Business Park.

Site 2 is currently divided into two parts with the western section located on the south eastern corner of the Prescot Business Park and the eastern section located between the new fire and police station to the north and a residential development to the south.

The eastern section consists of a large grassed, terraced, landscaped area with saplings on the upper terrace.

The western section is currently used as contractor parking for the current residential development to the immediate south of the site, having previously being used as the construction and office compound for the construction of the fire station to the immediate north. This section is flat on a similar level to the top tier of the eastern section it is covered in various places with macadam, hardcore and rough grass.



Figure 3: Aerial Photograph of the Site

1.5 Previous Studies

Sutcliffe's have completed a Phase I Preliminary Risk Assessments (PRA) for Site 1 and Site 2 (Report Reference: 30258LG-R01 and 30259LG-R01 respectively), a synopsis of which is provided in Section 2 of this report.

Coal mining risk assessment works have been carried out by Groundsolve Limited under report reference no. 2373/Prescot/MinRep/es - "SITES AT PRESCOT- MINING 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: Phase I Preliminary Risk Assessment, Site Area 1, Cables Way, Prescott, Ref: 30258LG-R01 and Phase I Preliminary Risk Assessment, Site Area 2, Cables Way, Prescott, Ref: 30259LG-R01.

2.2 Site History

The earliest available historical map (1850) indicated that the site was undeveloped and largely under agricultural usage. Later from 1927 a building was noted on the eastern section of the site, likely associated with the cable works identified. The development associated with the cable works expanded and grew over time and also included an electricity substation.

Due to the previous industrial development noted on site some significant identifiable sources of environmental concern were identified. Therefore, the potential for significant contamination to have arisen at the site as a result of the current and former usage on site is considered to be moderate.

Specific development plans were not available at the time of writing the Phase I PRA, but it was known to be B1, B2 or B3 type developments. It is now known that the site is to be developed with commercial buildings (Home Improvement Centre and Garden Centre) with associated infrastructure and Car Parking.

2.3 Geotechnical Constraints

2.3.1 Coal Mining

The site does fall within a coal mining area. Based on the Coal Mining Report (*Report Reference: 51002034408001*) the following is of note:

-  The site is in a surface area that could be affected by underground mining in 2 seams of coal at 140m to 180m depth, last worked in 1863. Any movement in the ground associated with these workings should have stopped by now.
-  The site is in an area where the Coal Authority believes there is coal at or close to the surface; this coal may have been worked at some time in the past. The potential presence of coal workings at or close to the surface should be considered, particularly prior to any site works or future development activity, as ground movement could still be a risk.
-  The site is not within a surface area that could be affected by present or future underground mining; however, reserves of coal do exist in the local area which could be worked in the future.
-  There are 4 coal mining entries on or within 20m of the site, 3 of which have been located, grouted and capped – position and details of the mine entries is presented in the Coal Authority Report presented in Appendix E.

-  The site is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.
-  The property is not within the boundary of an opencast site from which coal has been removed by opencast methods in the past, present or future.
-  There is no record of mine gas emissions requiring action by the Coal Authority.

A full copy of the Coal Authority Mining Report can be found in *Appendix E*.

NOTE: Due to points 2 & 4 coal mining assets are known to exist on site and require investigation.

2.3.2 Geology

2.3.2.1 Artificial Ground

There are no records of any artificial ground onsite or within 500m of the site.

2.3.2.2 Superficial Deposits

The superficial deposits for the site are noted as Devensian Till.

2.3.2.3 Solid Geology

According to the BGS Geology of Britain Viewer and the relevant British Geological Survey (BGS) Solid and Drift Sheets 097 Runcorn (1977) at a scale of 1:50,000 the following geological succession has been identified (*Appendix A*).

Table 3.1: Geology

Strata	Description	Age	Rock type
Solid Geology	Pennine Lower Coal Measures	Langsettian	Mudstone / Siltstone and Sandstone
Solid Geology	Pennine Lower Coal Measures	Westphalian	Sandstone

12 faults / rock segments are noted within 500m of the site; **1 fault is noted on site**, striking from the north west to the south east.

2.3.2.4 British Geological Society (BGS) Logs / Records

The BGS have recorded 2 surface mineral workings within 100m radius of the site, the closest of which was 236m north east of the site, however both these workings have ceased.

2.3.3 Historical Land Use

The site has been subject to previous development and therefore, the potential for relic foundations and obstructions cannot be discounted. A solid obstruction thought to be a mine shaft is noted in TP109A, TP109B and TP109C.

2.4 Potential Contaminant Linkages

2.4.1 Sources

The likely contaminants from made ground associated with former site usage, infilling activity which may be present on site could include:

-  Heavy metals such as cadmium, chromium, copper, lead, nickel and zinc.
-  Asbestos Containing Materials (ACM).
-  Hydrocarbons and organic compounds such as Polycyclic Aromatic Hydrocarbons (PAHs).
-  Ground gases such as methane and carbon dioxide.

The likely contaminants from previous land uses and offsite sources are shown below in *Table 2.1*.

Table 2.1: Potential Source(s) of contamination

Reference	Potential Sources (Onsite)	Potential Contaminants
S1 – Onsite	Demolished cable works and associated electricity substation.	All metals, fuel, hydrocarbons and oils, ACM and localised ground gas.
S2 – Offsite	Infilled Land including landfill within 250m x6	Ground gas.
S3 – Offsite	Previous adjacent cable works with associated tanks / chimney / travelling cranes	All metals, fuel, hydrocarbons and oils, asbestos and localised ground gas.

2.4.2 Receptors

The most sensitive receptors identified using the conceptual site model are considered to be site and adjacent site users, construction and maintenance workers, controlled waters (Secondary A and Secondary (undifferentiated)), infrastructure and buried services. These are most likely to be affected by made ground and any associated contaminants and gas generated from made ground, if present on site.

Human receptors would comprise construction workers, future site users and adjacent site users. It is likely that the exposure to contamination by construction workers will be limited due to the short exposure to the potential contamination and the use of PPE. If ground gases are produced this could be a potential risk to the future site users and properties and workers in confined spaces / trenches etc.

Due to the potential for contaminants to be present on site there is the potential for contaminants to leach and migrate to the underlying Secondary A Aquifer. Drift material is noted to be present under the site and is classified as Secondary Aquifer – Undifferentiated; this will act as an aquiclude, reducing the risk to the underlying aquifer.

Table 2.2 below details the potential receptors.

Table 2.2: 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	Secondary A and Secondary Aquifer – Undifferentiated 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

2.4.3 Pathways Creating Contaminant Linkages

Table 2.3: Pathways

Ref	Pathway	Description
P1	Direct contact with potential contaminants.	Dermal absorption, ingestion and inhalation of contaminants via direct contact.
P2	Ingestion of potential contaminants.	Construction workers may come into contact during the site works; however, this will be for a short time and therefore limited exposure will occur.
P3	Inhalation of potential contaminants.	PPE can be used 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.
P4	Leaching and migration of contaminants.	Leaching of possible contaminants could migrate into the underlying aquifers via shallow groundwater. On site drainage is also at risk from shallow contamination, if present.
P5	Vertical and lateral migration of ground gases / vapours.	There is the potential for contaminants to be present on the site, which could generate ground gas & vapours on site.

2.5 Risk Evaluation

Each potential contaminant linkage is identified in *Table 2.4* below. 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*).

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*.

The evaluation and resultant actions identified are based on available information presented within the Phase I PRAs (Report references: 30258LG – R01 and 30259LG – R01)

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 2.4: 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 of risk being realised	Probability of risk being realised	Classification	Action required
S1	Potentially contaminated soil on Site	P1	Dermal contact	R1/2	Site users	Medium	Low	Moderate / Low	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	Low	Moderate / Low	
		P3	Inhalation of vapours / soil gas	R1/2	Site users	Severe	Unlikely	Moderate / Low	
		P4	Leaching and migration of contaminants	R3/5	Principal aquifer	Medium	Low	Moderate / Low	
		P5	Lateral migration of soil gas / vapours	R1	Site users	Severe	Unlikely	Moderate / Low	
				R4	Property	Severe	Unlikely	Moderate / Low	
S2	Infilled land	P1	Dermal contact	R1/2	Site users	Medium	Low	Moderate / Low	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	Low	Moderate / Low	
		P3	Inhalation of vapours / soil gas	R1/2	Site users	Severe	Unlikely	Moderate / Low	
		P4	Leaching and migration of contaminants	R3/5	Principal aquifer	Medium	Low	Moderate / Low	
		P5	Lateral migration of soil gas / vapours	R1	Site users	Severe	Unlikely	Moderate / Low	
				R4	Property	Severe	Unlikely	Moderate / Low	

1. Hazard Identification		2. Hazard Assessment				3. Risk Estimation		4. Risk Evaluation	5. Managing the Risk
Contaminant Source		Pathway		Receptor		Consequence of risk being realised	Probability of risk being realised	Classification	Action required
S3	Historic cable works	P1	Dermal contact	R1/2	Site users	Medium	Low	Moderate / Low	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	Low	Moderate / Low	
		P3	Inhalation of vapours / soil gas	R1/2	Site users	Severe	Unlikely	Moderate / Low	
		P4	Leaching and migration of contaminants	R3/5	Principal aquifer	Medium	Low	Moderate / Low	
		P5	Lateral migration of soil gas / vapours	R1	Site users	Severe	Unlikely	Moderate / Low	
				R4	Property	Severe	Unlikely	Moderate / Low	

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 29th March & 30th March 2021 by PM Sampling, a specialist ground investigation contractor. 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.
-  BS EN ISO 22475-1:2006 Geotechnical investigation and testing. Sampling methods and groundwater measurements. Technical principles for execution.

Window sample and trial pit logs collated as part of the ground investigation completed by Sutcliffe's 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. A copy 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, including past coal mining activities, a targeted trial pit sampling strategy was used surrounding the 2No.Mine Shafts on site. Sutcliffe also utilised dynamic sampling boreholes positions for general site coverage to obtain a site wide representation of the site and the potential contamination issues.

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

Table 3.1: Summary of Site Activities

Exploratory Hole ID	Site Number	Location Rationale	Method	Completed Depth (mbgl)	Installation Details	Testing & Sampling details
WS101	Site 2	General Site Coverage (HH)	Window Sampler	1.65	No installation	SPTs, Shear Vane, small, bulk samples
WS102	Site 2	General Site Coverage (GG)	Window Sampler	4.18	Standpipe installed to 2.00m bgl	SPTs, Shear Vane, small, bulk samples
WS103	Site 2	General Site Coverage (GG)	Window Sampler	2.18	Standpipe installed to 2.00m bgl	SPTs, Shear Vane, small, bulk samples
WS104	Site 2	General Site Coverage (HH)	Window Sampler	1.84	No installation	SPTs, Shear Vane, small, bulk samples
WS105	Site 2	General Site Coverage (HH)	Window Sampler	2.56	No installation	SPTs, Shear Vane, small, bulk samples
WS106	Site 2	General Site Coverage (GG, CW, HH)	Window Sampler	1.54	Standpipe installed to 1.00m bgl	SPTs, Shear Vane, small, bulk samples
WS107	Site 1	General Site Coverage (GG, CW, HH)	Window Sampler	1.16	Standpipe installed to 1.00m bgl	SPTs, Shear Vane, small, bulk samples
WS108	Site 1	General Site Coverage (CW, HH)	Window Sampler	0.50	No installation	SPTs, Shear Vane, small, bulk samples
WS109	Site 1	General Site Coverage (HH)	Window Sampler	0.70	No installation	SPTs, Shear Vane, small, bulk samples
TP101	Site 2	General Site Coverage (HH)	Trial Pit Excavation	1.55	No installation	Shear Vane, small, bulk samples
TP102	Site 2	General Site Coverage (HH)	Trial Pit Excavation	2.60	No installation	Shear Vane, small, bulk samples
TP103	Site 2	General Site Coverage (HH)	Trial Pit Excavation	2.40	No installation	Shear Vane, small, bulk samples
TP104	Site 2	General Site Coverage (HH)	Trial Pit Excavation	3.30	No installation	Shear Vane, small, bulk samples
TP105	Site 2	General Site Coverage (HH)	Trial Pit Excavation	1.50	No installation	Shear Vane, small, bulk samples
TP106	Site 2	General Site Coverage (HH)	Trial Pit Excavation	3.70	No installation	Shear Vane, small, bulk samples

Exploratory Hole ID	Site Number	Location Rationale	Method	Completed Depth (mbgl)	Installation Details	Testing & Sampling details
TP107 / SA101	Site 2	General Site Coverage (HH, SA)	Trial Pit Excavation	2.10	No installation	Shear Vane, small, bulk samples
TP108	Site 2	General Site Coverage (HH)	Trial Pit Excavation	2.90	No installation	Shear Vane, small, bulk samples
TP109A	Site 2	Targeted – Mine Shaft (HH)	Trial Pit Excavation	3.90	No installation	Shear Vane, small, bulk samples
TP109B	Site 2	Targeted – Mine Shaft (HH)	Trial Pit Excavation	3.00	No installation	Shear Vane, small, bulk samples
TP109C	Site 2	Targeted – Mine Shaft (HH)	Trial Pit Excavation	3.10	No installation	Shear Vane, small, bulk samples
TP110	Site 2	Targeted – Mine Shaft (HH)	Trial Pit Excavation	2.50	No installation	Shear Vane, small, bulk samples
TP111A	Site 2	General Site Coverage (HH)	Trial Pit Excavation	2.60	No installation	Shear Vane, small, bulk samples
TP111B	Site 2	General Site Coverage (HH)	Trial Pit Excavation	3.65	No installation	Shear Vane, small, bulk samples
TP112	Site 2	Targeted – Mine Shaft (HH)	Trial Pit Excavation	3.50	No installation	Shear Vane, small, bulk samples
TP112A	Site 2	Targeted – Mine Shaft (HH)	Trial Pit Excavation	3.10	No installation	Shear Vane, small, bulk samples

GG – Ground Gas / CW – Controlled Water / HH – Human Health / SA – Infiltration Test

Note: 1No. soil sample was analysed in the west of the Site 2 due to the low risk proposed car parking area, which will comprise of hardstanding hence no pathway is anticipated and considered low risk.

A plan detailing the position of sampling locations on an existing layout of the sites are presented as *Drawing No 30259-SUT-ZZ-00-DR-G-720-0001 (Site 1) / 30259-SUT-ZZ-00-DR-G-720-0002 (Site 2)*.

3.5 Chemical Laboratory Testing

Selected soil samples (made ground & natural) 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 – total	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 – total	Metals suite, speciated (16) PAHs.

Note: Although there is reference to a historic electric substation on site, PCB testing was not considered a requirement as the location of the substation on site is under an area of proposed hardstanding hence no pathway is anticipated for these contaminants.

All samples were stored in airtight containers appropriately labelled and transported in cool boxes with icepacks maintained at 4°C, under completed chain of custody documentation to Envirolab laboratories. Sample receipts as received from the laboratory are presented in *Appendix D*.

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 than 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

Please note the testing suite carried out for this site is for human health purposes and may not cover the suite of contaminants required by United Utilities for pipe selection and therefore further testing may 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. The ground comprises between 0.1-3.9m of made ground overlying sandy gravelly CLAY / clayey gravelly fine to medium grained SAND, with fine to medium angular to subrounded gravel of mixed lithology.

A summary of the strata depths and thicknesses is detailed in *Table 4.1*.

Table 4.1: Ground Conditions Encountered

Strata	Depths encountered (mbgl)		Thickness (m)		
	Min	Max	Min	Max	Average
Made Ground.	0.00	3.90*	0.10	3.90	0.96*
Light brown SAND with subangular to angular mudstone fragments and clay bands. ^A	0.90	1.10	0.20	0.20	0.20
Dark grey to light brown and orange, angular to subangular MUDSTONE fragments.	0.60	3.65*	0.05	0.85	0.24*
Firm to stiff, dark brown slightly sandy slightly gravelly slightly peaty CLAY. Gravel is subangular. ^B	0.80	4.00*	0.30	1.20	0.75*
Firm to very stiff, light brown grey, slightly sandy gravelly CLAY. Gravel is subangular to subrounded.	0.30	3.70*	0.80	2.70	1.55*
Brown mottled grey, sandy gravelly CLAY. Gravel is subangular to angular.	0.00	3.60*	0.40	3.60	2.26*
Yellowish brown, slightly sandy, angular to very angular GRAVEL with mudstone fragments. ^C	1.60	1.80*	0.20	0.20	0.20*
Dark grey, fine to coarse grained SANDSTONE fragments.	0.90	1.16*	0.26	0.26	0.26*
Brown, clayey slightly gravelly SAND with occasional cobbles and gravel that is angular to subrounded natural stone.	0.40	3.70*	0.30	2.20	1.28*

Strata	Depths encountered (mbgl)		Thickness (m)		
	Min	Max	Min	Max	Average
Brown, very sandy GRAVEL with abundant cobbles. ^D	0.70	1.40	0.70	0.70	0.70
Brown, highly weathered SANDSTONE, recovered as large cobbles and gravel.	1.40	3.30*	0.10	0.30	0.15*

^A Only encountered at WS101.

^B Only encountered at WS102.

^C Only encountered at WS104.

^D Only encountered at TP101.

* Final Depth of Strata not proven – average thickness on identified ground.

4.2 Made Ground

The made ground comprises brown fine to medium grained SAND with brick and concrete fragments, and occasionally graded granular limestone hardcore, rebar and plastic items. There is also sandy CLAY and sandy GRAVEL of natural stone and brick fragments. TP102 and TP105 are noted to have a slight hydrocarbon odour. Redundant cables are encountered in TP103 at 0.6-1.0m bgl.

The characteristic values for the natural ground are shown below in *Table 4.2* and *Figure 4*.

Table 4.2: Material Properties

Property	No. of Tests	Range	Average
SPT N Values	2	50	50

4.3 Natural Ground

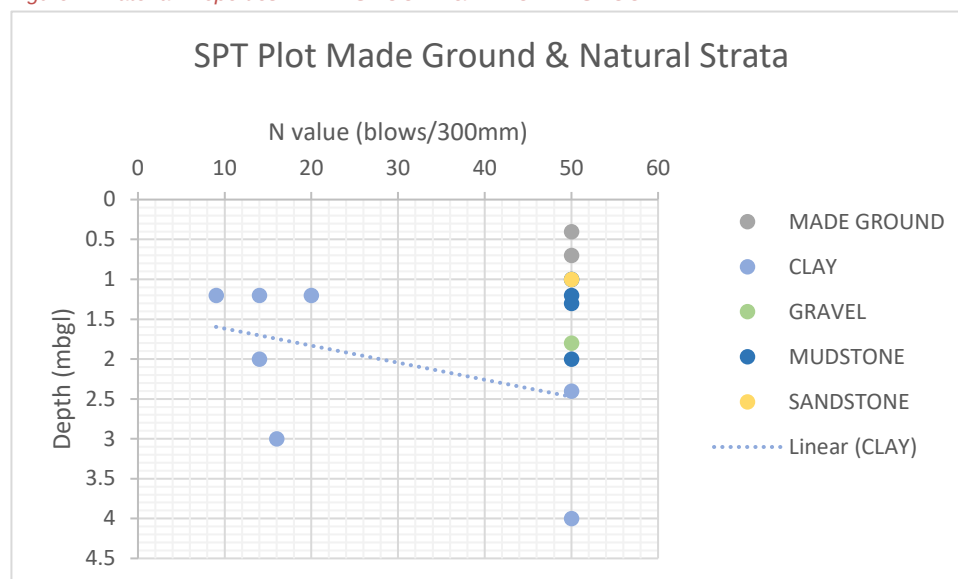
Natural ground comprises firm / stiff / very stiff sandy gravelly CLAY / clayey gravelly fine to medium grained SAND, with fine to medium angular to subrounded gravel of mixed lithology. Light brown MUDSTONE fragments and brown highly weathered fine-grained SANDSTONE are also noted, both of which were recovered as cobbles / gravel. WS102 notes peaty CLAY.

The characteristic values for the natural ground are shown below in *Table 4.3* and *Figure 4*.

Table 4.3: Material Properties

Property	No. of Tests	Range	Average
CLAY SPT N Values	8	9-50	27.9
GRAVEL SPT N Values	1	50	50
MUDSTONE SPT N Values	4	50	50
SANDSTONE SPT N Values	1	50	50

Figure 4: Material Properties MADE GROUND & NATURAL GROUND



4.4 Field Evidence of Contaminated Soils

There was no visual or olfactory evidence of contaminated soil on the site, beyond the identified made ground.

4.5 Groundwater

Groundwater was not recorded in any of the exploratory holes during site investigation works.

4.6 Soil Infiltration

1No.infiltration test (SA101) was carried out on site at TP107, shown on *Drawing No. 30259-SUT-ZZ-00-DR-G-720-0002 (Site 2)*.

Due to the inefficient infiltration characteristics of the ground at the excavation depths, the soakaway test comprised a single fill.

The test result did not provide an infiltration rate due to the inefficiencies of the ground to infiltrate.

As the soakaway test failed, it is advised that alternative methods of sustainable drainage are explored (i.e. Permeable Paving).

5 Geotechnical Laboratory Testing and Assessment

5.1.1 General

In total 3No. samples were recovered from site for the purpose of geotechnical laboratory testing from the following positions WS103 (1.00m bgl), WS104 (0.80m bgl) and WS106 (0.50m bgl). A breakdown of the testing scheduled is set out in *Table 5.1* below.

Table 5.1: Geotechnical Testing

Borehole Number	Plasticity Index	Moisture Content	Particle Size Distribution
WS103	✓	✓	✓
WS104	✓	✓	✓
WS106	✓	✓	✓

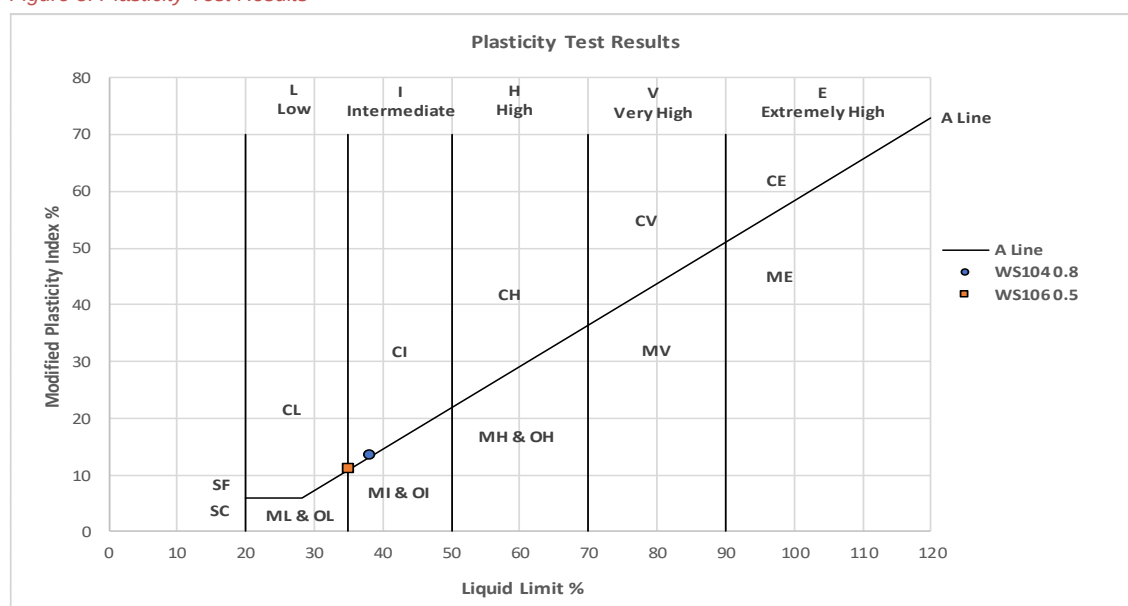
5.1.2 Plasticity Index

A total of 3No. samples were tested to determine the plasticity index of the underlying CLAY strata spread across WS103, WS104 and WS106 and taken from depths of between 0.50-1.00m bgl. The plasticity results and the modified plasticity index are outlined in *Table 5.2* and Figure 5 below.

Table 5.2: Plasticity Test Results

Borehole Number	Depth (m bgl)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Modified Plasticity Index (%)	Soil Classification
WS103	1.00	NP	NP	NP	87	NP	NP
WS104	0.80	38	21	17	80	13.6	CL
WS106	0.50	35	18	17	66	11.22	CL

Figure 5: Plasticity Test Results



Based on the results, the clay is classified as Non-Plastic / Low Plasticity. Plasticity test results are included in *Appendix F*.

5.1.3 Particle Size Distribution

PSD testing was scheduled on 3No. samples recovered from site spread across WS103, WS104 and WS106 and taken from depths of between 0.50-1.00m bgl. The result of this testing is outlined below in *Table 5.3*.

Table 5.3: PSD Test Results

Borehole Number	Depth (m bgl)	Sieve Percentage (%)		
		Gravel	Sand	Silt/Clay
WS103	1.00	5%	19%	76%
WS104	0.80	18%	16%	66%
WS106	0.50	31%	13%	56%

The results of this testing indicate that the ground conditions are variable across the site.

5.1.4 Stability

No evidence of instability was noted in the exploratory holes or trial pits that were undertaken on site; however, it is noted 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.

5.1.5 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 5.4*.

Table 5.4: Soluble sulphate and pH classification

Soil Type	Lowest pH Values	Highest Soluble Sulphate Concentration (g/l)
Made Ground	7.6	0.23

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**. Full details of the concrete specification assessment is presented in *Appendix F*.

5.2 Foundation Recommendations

5.2.1 Site 1 – Home Improvement centre

It is understood that Site 1 is being redeveloped for commercial use with the construction of a new Home Improvement Centre with associated car parking and infrastructure.

Due to the ground conditions encountered it would be Sutcliffe's recommendation that a pad and strip foundation design with an allowable bearing pressure of 500kn/m² is adopted due to the amount of made ground that has been identified on site.

5.2.2 Site 2 – Garden Centre

It is understood that Site 2 is being redeveloped for commercial use with the construction of a new Garden Centre with associated car parking and infrastructure.

Due to the ground conditions encountered it would be Sutcliffe's recommendation that a pad and strip foundation design with an allowable bearing pressure of 125kn/m² is adopted due to the amount of made ground that has been identified on site. Depth of the mine shaft under the building footprint to be c.3.9m bgl.

Full assessment of the mine shaft before setting out the foundations. Please refer to the coal mining report for further information regarding coal mining issues and mine shafts.

NOTE: All foundations are to have reinforcement in to cater for the mining issues on site.

5.2.3 General

Groundwater was not recorded in any of the exploratory holes 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.

5.2.4 Ground Floor Construction

It is recommended that ground-bearing slabs are utilised on both sites. It is also recommended that a geotextile is to be used over mine shafts.

5.2.5 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 5.5: 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.*

5.3 Geotechnical Uncertainty

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

6 Long Term Human Health Risk Assessment

6.1 Soils – Long Term Human Health

6.1.1 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 CLR and SR (SC050021 series) (DEFRA) guidance as well as CL:AIRE guidance on Comparing Soil Contamination Data with a Critical Concentration, May 2008 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.

6.1.2 Selection of Soil Screening Values

Soil screening values appropriate for a *commercial/industrial end use* were selected.

6.1.3 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 (Section 2.0).

6.1.4 Assessment

The soil analytical data has been assessed following CL:AIRE/CIEH guidance, CLR11 Model Procedures Section 2.3, 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. Therefore, the key question to answer is, “*Is there sufficient evidence that the true mean concentration is less than the critical concentration?*”

Statistics are used to assist in answering the key question raised above and to help decide whether to support a particular hypothesis. The null hypothesis is the starting point because it is believed to be true but needs to be proved.

In terms of planning, the hypotheses are as follows:

-  Null Hypothesis (H0) - the true mean is equal to, or greater than the critical concentration.

 Alternative Hypothesis (H1) - the true mean is less than the critical concentration.

The null hypothesis needs to be rejected in order to confirm that the land does not pose a human health risk and is suitable for use under the planning regime.

6.1.5 Identification of Contaminants of Concern

The results of the soil analysis from the investigation are shown in *Appendix G*. These results were then compared against the relevant GACs for 6% soil organic matter (SOM). The average percentage SOM was 5.57% for 15 samples.

There were no contaminants present in soil analysed that exceed its threshold values for Commercial/Industrial land use, therefore the null hypothesis can be rejected and no risk to human health is indicated and is suitable for use under the planning regime.

Contamination Assessment tables are shown in *Appendix G*.

6.1.6 Asbestos

Asbestos fibres were identified within the samples of soil analysed at WS104, WS107 and TP103. All soils with positive asbestos detection were subject to asbestos delineation to determine the effects on long term Human Health. Results of the delineation are presented hereunder.

Table 6.1: Positive asbestos detection and delineation

Sample ID	Depth (m bgl)	Asbestos		Threshold (% w/w)*	Delineation (% w/w)
WS104	0.4-0.8	Chrysotile	Loose Fibres	0.001	0.002
WS107	0.45-0.7	Chrysotile	Loose Fibres	0.001	<0.001
TP103	0.2-0.6	Chrysotile	Loose Fibres	0.001	0.006

**In accordance with CIRIA C733 – Asbestos in soil and made ground: a guide to understanding and managing risks.*

6.1.7 Conclusions

There were no contaminants present in soil analysed that exceed its threshold values for Commercial/Industrial land use, therefore the null hypothesis can be rejected.

Note: Although a slight hydrocarbon odour was observed in the groundwater at TP102 (0.50m bgl), the chemical testing in this area does not replicate high hydrocarbon levels and does not indicate a contamination risk.

Notwithstanding, asbestos detection and delineation of soils at WS104 and TP103 pose a risk long term 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.

7.1.1 Identification of Potential Contaminant Linkages

Contaminant linkages have been identified in *Section 3.0* between the made ground and the underlying aquifer via infiltration and/or migration of dissolved phase contaminants.

7.1.2 Selection of Generic Screening Values

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

Environmental Quality Standards (EQS) screening values have been used to assess risks to surface water resources.

7.1.3 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 Screening Value (µg/l)	Range of concentrations (µg/l)	Location and depth of outliers if present
Arsenic	10	19	WS109 0.20-0.60mbgl – 19µg/l
Lead	10	14	WS109 0.20-0.60mbgl – 14µg/l

Table 7.2: Leachate Exceedances Summary - EQS

Determinant	EQS Screening Value (µg/l)	Range of concentrations (µg/l)	Location and depth of outliers if present
Copper	1	3-33	WS106 0.50-1.00m bgl – 8µg/l
			WS108 0.20-0.60m bgl – 3µg/l
			WS109 0.20-0.60m bgl – 33µg/l

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

7.1.4 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 site is underlain by a layer of Devensian Till which is classified as Secondary Undifferentiated Aquifer that will act as an aquiclude impeding the flow of water to the underlying Secondary A Aquifer.

7.1.5 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 Risk Assessment

8.1 CIRIA C665 Assessment

Gas monitoring wells were installed in 1No. exploratory hole locations on Site 1 (WS107), and 3No. exploratory hole locations on Site 2 (WS102, WS103 and WS106) 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 Gas Screening Values for methane (CH₄) and carbon dioxide (CO₂).
-  Calculation of Hazardous Gas Flow Rate for methane and carbon dioxide
-  Assessment of risks from ground gas.
-  Development options.

8.3 Review of Field Data

Six (6) rounds of gas and groundwater monitoring have been undertaken.

Gas monitoring was undertaken using a fully calibrated GA2000 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 *Table 8.2*, and the results are presented in full in *Appendix E*.

Calibration certificates are also presented in *Appendix E*.

Table 8.1: Summarised Ground Gas and Groundwater Monitoring Data (Site 1)

Location	MAX CH ₄ (%)	MAX CO ₂ (%)	MIN O ₂ (%)	MAX (ppm)	Atmospheric Pressure (mb)	MAX Flow Rate (l/hr)	Water Level (m bgl)
19/04/2021							
WS107	0.0	0.0	15.4	-	1013.00	0.00	Dry
30/04/2021							
WS107	0.0	0.0	13.3	-	1008.00	0.00	Dry
10/05/2021							
WS107	0.0	0.0	11.2	-	989.00	-0.10	0.52
24/04/2021							
WS107	0.0	0.0	10.0	-	993.00	0.30	0.66
15/06/2021							
WS107	0.0	0.0	9.4	-	1013.00	0.00	0.80
30/06/2021							
WS107	0.0	0.0	9.3	-	1011.00	0.00	0.74

Table 8.2: Summarised Ground Gas and Groundwater Monitoring Data (Site 2)

Location	MAX CH ₄ (%)	MAX CO ₂ (%)	MIN O ₂ (%)	MAX (ppm)	Atmospheric Pressure (mb)	MAX Flow Rate (l/hr)	Water Level (m bgl)
19/04/2021							
WS102	0.0	0.0	20.8	-	1012.00	0.00	-
WS103	0.0	0.0	20.8	-	1012.00	0.00	Dry
WS106	0.0	0.0	20.9	-	1013.00	0.00	Dry
30/04/2021							
WS102	0.0	0.0	20.4	-	1008.00	0.00	-
WS103	0.0	0.0	20.4	-	1009.00	0.00	Dry
WS106	0.0	0.0	20.5	-	1009.00	0.00	Dry
10/05/2021							
WS102	0.0	0.0	20.5	-	988.00	-0.20	-
WS103	0.0	0.0	20.5	-	989.00	-0.20	0.56
WS106	0.0	0.0	20.6	-	988.00	0.00	0.49
24/04/2021							
WS102	0.0	0.0	20.4	-	994.00	0.40	-
WS103	0.0	0.0	20.4	-	994.00	0.20	1.04
WS106	0.0	0.0	20.4	-	994.00	-1.20	0.57
15/06/2021							
WS102	0.0	5.8	14.7	-	1014.00	0.00	-
WS103	0.0	3.2	18.4	-	1014.00	0.00	1.79
WS106	0.0	1.4	20.0	-	1013.00	0.00	Dry
30/06/2021							
WS102	0.0	4.5	16.3	-	1010.00	0.00	-
WS103	0.0	1.8	19.2	-	1010.00	0.00	1.24
WS106	0.0	1.4	19.9	-	1010.00	0.00	Dry

Note: Unable to monitor ground water level at WS102 due to the irremovable bung.

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*. The highest calculated HGFR per borehole is presented below:

8.4.1 Site 1 Gas Monitoring

Table 8.2: Summarised Ground Gas Monitoring Data – Site 1

BH Ref	Flow ¹ (l/h)	CH ₄ ² (%)	CO ₂ ² (%)	HGFR CH ₄ (l/h)	HGFR CO ₂ (l/h)	CS	Traffic Light
WS107	0.3	0.1	0.1	0.0003	0.0003	CS1	Green

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.

Based on the results above, the HGFR for Site 1 classifies as Characteristic Situation 1.

8.4.2 Site 2 Gas Monitoring

Table 8.3: Summarised Ground Gas Monitoring Data – Site 1

BH Ref	Flow ¹ (l/h)	CH ₄ ² (%)	CO ₂ ² (%)	HGFR CH ₄ (l/h)	HGFR CO ₂ (l/h)	CS	Traffic Light
WS102	0.1	0.1	5.8	0.0001	0.0058	CS2	Amber 1
WS103	0.1	0.1	3.2	0.0001	0.0032	CS1	Green
WS106	0.1	0.1	1.4	0.0001	0.0014	CS1	Green

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.

Based on the results above, the HGFR for Site 2 classifies as Characteristic Situation 2.

8.5 RB17 Pragmatic Approach

8.5.1 Methodology

Sutcliffe have undertaken a ground gas risk assessment in accordance with “A Pragmatic Approach to Ground Gas Risk Assessment (RB17)”. This is based on the low risk attached to the site from potential sources of ground gas, with only on site made ground considered to be a major source. The development proposal is likely to comprise a “cut” exercise, required to achieve proposed formation levels. In consequence the risk from ground gas is considered negligible and RB17 is considered suitable to assess the risk. Full laboratory results, forensic sample description and calculations can be found in the Appendices, a summary of the results from the testing are presented in *Table 7.1* below.

Our assessment comprises the following:

-  Review of results.
-  Assessment of risks from ground gas.
-  Development options.

8.5.2 Review of Laboratory Data

2No. samples were collected from Site 1 and 5No. samples were collected from Site 2 for the purpose of undertaking forensic testing to obtain the Total Organic Carbon to allow the assessment of the potential for the made ground to generate ground gas.

The samples are generally made ground deposits of brown fine to medium grained SAND with brick and concrete fragments, and occasionally graded granular limestone hardcore, rebar and plastic items. There is also sandy CLAY and sandy GRAVEL of natural stone and brick fragments

The forensic testing was undertaken by Envirolab laboratories in line with RB17 on seven 1kg samples provided by Sutcliffe.

The findings are summarised below and presented in full in *Appendix E*.

Table 8.4: Forensic & TOC Summary for Site 1

Sample ID	Sample Depth (m bgl)	Fine Soil and Gravel <10mm (%)	Coarse Inert Particles >10mm (%)	TOC Fine Soil (%)	Thickness of Made Ground (m)
WS108	0.20-0.60	75.72	24.28	1.25	0.50
WS109	0.20-0.60	72.10	27.90	1.20	0.70
Average				1.23	0.67
Maximum				-	0.90

Table 8.5: Forensic & TOC Summary for Site 2

Sample ID	Sample Depth (m bgl)	Fine Soil and Gravel <10mm (%)	Coarse Inert Particles >10mm (%)	TOC Fine Soil (%)	Thickness of Made Ground (m)
WS101	0.30-0.80	76.48	23.52	2.04	0.90
TP105	0.30-0.80	54.44	45.56	2.65	1.50
TP108	0.50-1.00	71.14	28.86	2.43	0.40
WS105	0.50-1.00	72.72	27.28	0.88	0.70
WS106	0.50-1.00	84.32	15.68	0.7	0.00
Average				1.74	1.32
Maximum				-	3.90

8.5.3 RB17 Discussion

8.5.3.1 Site 1

Using the Pragmatic Approach to Ground Gas Risk Assessment (RB17) the TOC and forensic testing has given an average TOC value of 1.23% with the levels of TOC ranging from 1.20%

to 1.25%. This classifies Site 1 as Characteristic Situation 2, indicating that protection measures are required on this site.

8.5.3.2 Site 2

Using the Pragmatic Approach to Ground Gas Risk Assessment (RB17) the TOC and forensic testing has given an average TOC value of 1.23% with the levels of TOC ranging from 1.20% to 1.25%. This classifies Site 2 as Characteristic Situation 3, indicating that protection measures are required on this site.

8.6 Radon

In accordance with the Indicative Atlas of Radon in England and Wales Map 17 Lancashire, south Cumbria and western North Yorkshire, the site is in an area of elevated radon potential of 1-3%, hence basic radon protective measures are required.

8.7 Gas Risk Assessment Discussion

On review of both the HGFR and RB17 methods for assessing the gas risk, along with the Radon potential, the recommendation is that Site 1 and Site 2 be classified as Characteristic Situation 2.

This classifies the site as having a low to intermediate gas regime identified, which requires gas protection measures, comprising a cast in-situ ground bearing floor slab and a gas resistant membrane.

Gas protection measures should be as prescribed in BRE Report 414 (Johnson, 2001). Membranes should always be fitted by a specialist contractor.

Certification that these passive protection measures have been installed correctly should be provided.

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 2.5 points is required for the proposed end use, Table 8.6 details the protection measures required to achieve this point total.

Table 8.6: BS8485 (2015+A1:2019) Point Score Summary

GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER		
Floor and substructure design		SCORE
Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement)		0.5

GAS PROTECTION SCORE FOR THE GAS RESISTANT MEMBRANE		
Protection Element System	Comments	SCORE
 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;	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/m2 for	2

GAS PROTECTION SCORE FOR THE GAS RESISTANT MEMBRANE		
Protection Element System	Comments	SCORE
 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.	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.	

8.8 Groundwater Protection Measures

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.

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 and finalised as shown in *Figure 6*. The drawing shows all contaminant linkages from the preliminary conceptual model, identifying those which remain relevant.

9.2 Discounted Contaminant Linkages

9.2.1 Controlled Waters – Groundwater & Surface Waters

9.2.1.1 Groundwater Resources

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

9.2.1.2 Surface Water Resources

The EQS Leachate screening identified concentrations of Copper that could pose a risk to the local surface water features. However, the nearest surface water feature is noted 339m west of the site, as such the risk is unlikely to be significant.

9.3 Remaining Potential Contaminant Linkages

9.3.1 Long Term Human Health

There were no contaminants present in soil analysed that exceed its threshold values for Commercial/Industrial land use, therefore the null hypothesis can be rejected. Notwithstanding, asbestos detection and delineation of soils at WS104 and TP103 pose a risk long term Human Health.

Construction workers may be exposed via 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.

9.3.2 Ground Gas

On review of both the HGFR and RB17 methods for assessing the gas risk, along with the Radon potential, the recommendation is that Site 1 and Site 2 be classified as Characteristic Situation 2, indicating that protection measures are required in accordance with *Table 8.6*.

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 of risk being realised	Probability of risk being realised	Classification	Action required
Table 3.1: Sources		Table 3.2: Receptors		Table 3.3: Pathways					
S1	Made Ground (on-site)	P1	Direct contact	R1 / R2 / R4	Future site users / Construction workers / Adjacent site users	Medium	Unlikely	Low	Asbestos has been identified in soils at WS104 and TP103, Construction workers may be exposed via 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. As WS104 and TP03 fall under an area of proposed hardstanding, this will break the source pathway receptor linkages hence no remediation is required. On review of both the HGFR and RB17 methods for assessing the gas risk, along with the Radon potential, the recommendation is that Site 2 be classified as Characteristic Situation 2, indicating that protection measures are required.
		P2	Ingestion			Medium	Likely	Moderate / Low	
		P3	Inhalation of dust / vapours			Medium	Likely	Moderate / Low	
		P1	Direct contact	R5	Infrastructure / Buried Services	Mild	Unlikely	Very Low	
		P5	Vertical and lateral migration of ground gas	R1	Future site users	Severe	Low	Moderate	
				R2	Construction Workers	Severe	Low	Moderate	
				R4	Adjacent	Severe	Unlikely	Moderate / Low	
				R5	Infrastructure / Buried Services	Severe	Unlikely	Moderate / Low	

9.4 Additional Works Required to Assess Outstanding Contaminant Linkages

Based on the proposed development plan, the risk to future site users, with respect to areas of new gardens included within the planning boundary, a remediation strategy will be required and will include validation of imported material and 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 of the existing buildings, 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

9.5.1 Human Health – Soils

Asbestos has been identified in soils at WS104 and TP103, Construction workers may be exposed via 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.

As WS104 and TP03 fall under an area of proposed hardstanding, this will break the source pathway receptor linkages hence no remediation is required.

9.5.2 Human Health – Ground Gas & Radon

On review of both the HGFR and RB17 methods for assessing the gas risk, along with the Radon potential, the recommendation is that Site 1 and Site 2 be classified as Characteristic Situation 2, indicating that protection measures are required in accordance with *Table 8.6*.

9.5.3 Controlled Waters

Exceedances of DWS and EQS screening criteria are not considered significant given the likely depth to groundwater, effects of natural attenuation, dilution factors, protection afforded by the overlying Devensian Till. The site concentrations detected within the made grounds are not considered to pose a significant risk to the Secondary A Aquifer or surface water features in the surrounding area.

10 Recommendations

10.1 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.
-  Design AMP – management of Asbestos containing material on and off site.
-  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.

11 References

BRE Special Digest (1991) 'Sulphate and acidic resistance of concrete in the ground' 363

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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 aquifers 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-aquifers 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

Sutcliffe obtains 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 provide shows natural floodplains – areas potentially at risk of flooding if 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 – Sutcliffe 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 or 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 Sutcliffe's 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 Manual 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

Atterberg 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:

$$I'p = Ip * (\% < 425\mu m / 100)$$

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 (SO₄) 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 C₆ to C₁₀). Also referred to as PRO – Petroleum Range Organics

DRO – Diesel Range Organics (typically C₁₀ to C₂₈)

LRO – Lubricating Oil Range Organics (typically C₂₈ to C₄₀)

MRO – Mineral Oil Range Organics (typically C₁₈ to C₄₄)

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 C₅ – C₄₀, whereas others define TPH as C₁₀ – C₃₀.

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 at 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 fluorosil 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 C₁₀ to C₄₀ (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 C₆ – C₉ 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); trimethylbenzenes; 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. Naphthalene (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, toxicities etc) of compounds in order to model their behaviour in the environment. These physiochemical 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 is 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 Criteria (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 beneath buildings' (September 1997).

CIRIA Report 149 (1995), reference Table 28, reviewed over 100 case studies of development affected by gas to establish current UK practices for gas control. The report classified the gassing regimes found 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 an 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 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 <i>Draft Circular on Contaminated Land</i> , 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

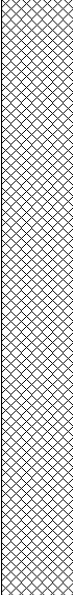
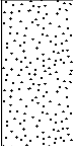
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (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.

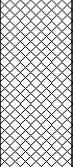
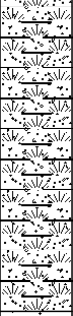
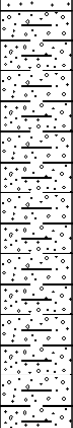
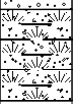
Table 5 - Response action likely to be required in relation to estimated risk

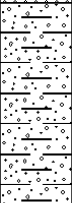
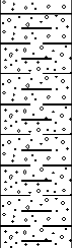
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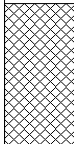
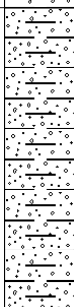
	Mitigation and remedial measures required
	Mitigation and remedial measures likely
	Remedial measures unlikely
	Remedial measures not required

Appendix C –Window Sample & Trial Pit Logs

 Sutcliffe						Site Cables Way, Prescott		Number WS101	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client John F Beesley		Job Number 30259LG	
		Location		Dates 29/03/2021		Engineer Alex Tosh		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.20-0.60	ES1				(0.10)	(TOPSOIL) Grass over dark brown gravelly fine-medium SAND with frequent roots. Gravel is fine subangular.			
0.30-0.80	F1				0.10	(MADE GROUND) Brown fine-medium SAND with fine-medium brick and concrete fragments.			
					(0.80)				
					0.90	Light brown fine-medium SAND with fine-medium subangular-angular mudstone fragments and clay bands.			
					(0.20)				
					1.10	Light brown angular-subangular MUDSTONE fragments.			
					(0.10)				
1.20-1.65	SPT N=50		7,10/12,15,10,13		1.20	Complete at 1.65m			
Remarks								Scale (approx) 1:10	
								Logged By AT	
								Figure No. 30259LG.WS101	

 Sutcliffe						Site Cables Way, Prescott		Number WS102	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client John F Beesley		Job Number 30259LG	
		Location		Dates 29/03/2021		Engineer Alex Tosh		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.20-0.60	ES1				(0.10) 0.10 (0.70) 0.80	(TOPSOIL) Grass over slightly gravelly fine-medium SAND. Gravel is fine-medium subangular-subrounded. (MADE GROUND) Dark brown fine-medium SAND with fine-medium concrete and brick fragments. Dark brown slightly sandy slightly gravelly slightly peaty firm-stiff CLAY. Sand is fine, gravel is fine-medium subangular.	  		
1.20-1.45	SPT 9/100		1,2/2,2,2,3		(1.20)				
2.00-2.45	SPT N=14		4,2/3,3,4,4		2.00 (0.30) 2.30	Grey slightly sandy firm-stiff CLAY. Sand is fine. Light brown slightly sandy gravelly stiff CLAY. Sand is fine, gravel is fine-medium subangular mudstone.	 		
3.00-3.45	SPT N=16		9,3/3,6,3,4		(1.40)				
4.00-4.18	SPT 50/30		13,12/50		3.70 (0.30) 4.00	Dark brown slightly sandy slightly gravelly slightly peaty firm-stiff CLAY. Sand is fine, gravel is fine-medium subangular. Complete at 4.18m			
Remarks							Scale (approx) 1:25	Logged By Figure No. 30259LG.WS102	

 Sutcliffe						Site Cables Way, Prescott		Number WS103	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client John F Beesley		Job Number 30259LG	
		Location		Dates 29/03/2021		Engineer Alex Tosh		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
1.00-1.80	B1		2,2/3,3,4,4		(0.30)	(MADE GROUND) Light brown fine-medium grained SAND with graded granular limestone hardcore.			
	0.30				Brown slightly sandy gravelly firm-stiff CLAY. Sand is fine, gravel is fine-medium subangular-rounded.				
1.20-1.65	SPT N=14				(0.70)				
	1.00				Light brown slightly sandy gravelly stiff CLAY. Sand is fine, gravel is fine-medium subangular-subrounded.				
2.00-2.18	SPT 50/30		12,5/50		(0.80)				
	1.80				Light brown fine-coarse angular-subangular mudstone fragments.				
					2.00	Complete at 2.18m			
Remarks							Scale (approx) 1:25	Logged By AT	Figure No. 30259LG.WS103

 Sutcliffe						Site Cables Way, Prescott		Number WS104	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client John F Beesley		Job Number 30259LG	
		Location		Dates 29/03/2021		Engineer Alex Tosh		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.40-0.80	ES1		3,5/6,5,4,5			(MADE GROUND) Tarmac over graded granular limestone.			
					(0.40)				
0.40	Brown sandy gravelly CLAY. Sand is fine, gravel is fine-medium angular-subangular.								
(0.40)									
0.80	Yellowish brown sandy gravelly friable stiff-very stiff CLAY. Sand is fine-coarse, gravel is fine-medium angular-very angular mudstone.								
(0.80)									
1.60	Yellowish brown slightly sandy fine-medium angular-very angular GRAVEL with mudstone fragments. Sand is fine.								
(0.20)									
1.80	Complete at 1.84m								
Remarks							Scale (approx) 1:20	Logged By AT	
							Figure No. 30259LG.WS104		



Sutcliffe

Site

Cables Way, Prescott

Number
WS105
Excavation Method

Drive-in Windowless Sampler

Dimensions
Ground Level (mOD)
Client

John F Beesley

Job
Number
 30259LG

Location
Dates

29/03/2021

Engineer

Alex Tosh

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.60	ES1				(0.05) 0.05	(MADE GROUND) Graded granular limestone.		
					(0.65)	(MADE GROUND) Brown fine-medium SAND with brick and concrete fragments.		
0.70-1.00	F1				0.70	Light brown slightly sandy gravelly very stiff CLAY. Sand is fine, gravel is fine-coarse subangular-angular.		
1.00-1.45 1.00-2.00	SPT N=50 U1		3,5/6,14,20,10		(1.30)			
					2.00	Complete at 2.56m		
2.40-2.56	SPT 25*/80 50/80		25/50					

Remarks
Scale (approx)

1:20

Logged By

AT

Figure No.

30259LG.WS105



Sutcliffe

Site Cables Way, Prescott						Number WS106			
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client John F Beesley		Job Number 30259LG	
		Location		Dates 29/03/2021		Engineer Alex Tosh		Sheet 1/1	

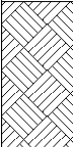
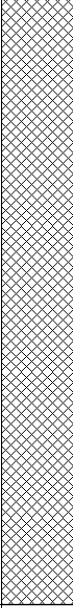
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.20-0.60	ES1				(0.10)	(TOPSOIL) Grass over dark brown sandy topsoil.			
					0.10	Brown sandy gravelly CLAY. Sand is fine, gravel is fine-medium angular-subangular.			
0.50-1.00	F1		19,6/33,17		(0.50)				
0.50-1.50	B1				0.60	Light brown fine-medium MUDSTONE fragments recorded as fine-coarse angular-very angular gravel.			
1.00-1.26	SPT 50/110		22,3/30,20		(0.85)				
1.00-2.00	D1				1.45	Complete at 1.54m			

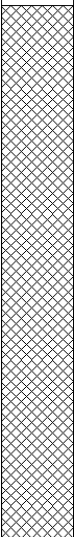
Remarks	Scale (approx) 1:10	Logged By AT
	Figure No. 30259LG.WS106	

Client John F Beesley	Job Number 30259LG
Engineer Alex Tosh	Sheet 1/1

Description	Legend	Water	Instr
(MADE GROUND) LIMESTONE and rubble including fine-coarse angular-subangular gravel.			
(MADE GROUND) Brown sandy CLAY with brick, limestone and concrete fragments.			
Dark grey fine-coarse SANDSTONE fragments.			
Complete at 1.16m			

	Scale (approx)	Logged By
	1:10	AT
	Figure No. 30259LG.WS107	

 Sutcliffe						Site Cables Way, Prescott		Number WS108	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client John F Beesley		Job Number 30259LG	
		Location		Dates 29/03/2021		Engineer Alex Tosh		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.20-0.60 0.20-0.60	ES1 F1				(0.10) (0.40)	(TOPSOIL) Grass over sandy tospoil. Sand is fine-medium. (MADE GROUND) Brown fine-medium SAND with fine-medium subangular-angular brick, gravel and concrete fragments and rebar and plastic items.	 		
0.40-0.48	SPT 25*/80 50/0		25/50		0.50	Complete at 0.50m			
Remarks							Scale (approx)	Logged By	
							1:5	AT	
							Figure No. 30259LG.WS108		

 Sutcliffe						Site Cables Way, Prescott		Number WS109	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client John F Beesley		Job Number 30259LG	
		Location		Dates 29/03/2021		Engineer Alex Tosh		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
0.20-0.60 0.20-0.60	ES1 F1				 (0.70)	(MADE GROUND) Grass over fine-medium SAND with fine-coarse brick and concrete fragments.			
0.70-0.85	SPT 50/0		20,5/50		0.70	Complete at 0.85m			
Remarks								Scale (approx) 1:10	Logged By AT
								Figure No. 30259LG.WS109	

 Sutcliffe						Site Cables Way, Prescott		Trial Pit Number TP101			
Excavation Method Trial Pit		Dimensions		Ground Level (mOD)		Client John F Beesley		Job Number 30259LG			
		Location		Dates 29/03/2021		Engineer Alex Tosh		Sheet 1/1			
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water			
0.05-0.40	ES1				0.05	MADEGROUND (tarmac)					
					(0.15)	MADEGROUND, whitish grey, angular-sub angular, fine-coarse, sandy gravel of natural stone.					
					0.20	MADEGROUND (similar to topsoil), silty, slightly gravelly, fine-medium, SAND. Gravel is angular-sub angular, brick and natural stone.					
					(0.20)	Brown, clayey, slightly gravelly, SAND.					
					0.40	Brown, very sandy GRAVEL with abundant cobbles.					
					(0.30)						
					0.70						
					(0.70)						
					1.40	Brown, highly weathered fine SANDSTONE. Recovered as large cobbles.					
					(0.15)						
1.55	Complete at 1.55m										
Plan						Remarks					
						Scale (approx)		Logged By		Figure No.	
						1:20		AT		30259LG.TP101	

Client John F Beesley	Job Number 30259LG
Engineer Alex Tosh	Sheet 1/1

Description	Legend	Water
MADEGROUND, Whitish grey, angular to sub angular, fine-coarse, sandy, GRAVEL of natural stone and brick fragments. Occasional cobbles of brick fragments. Slight hydrocarbon odour from groundwater at 0.5m		
Brown, very clayey, slightly gravelly, fine-medium, SAND. Gravel is angular-sub angular, fine-medium, natural stone.		
Brown, highly weathered fine-medium sandstone. Recovered as large cobbles.		
Complete at 2.60m		

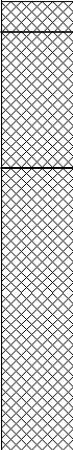
Remarks		
Scale (approx)	Logged By	Figure No.
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Client John F Beesley	Job Number 30259LG
Engineer Alex Tosh	Sheet 1/1

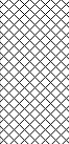
Description	Legend	Water
MADEGROUND (tarmac)		
MADEGROUND, whitish grey, sandy, angular, fine-coarse GRAVEL of natural stone.		
MADEGROUND, (similar to topsoil) slightly silty, slightly gravelly, SAND. Gravel is angular, fine-medium brick fragments.		
Firm, brown, very sandy, gravelly, CLAY with occasional cobbles. Gravel is sub angular-sub rounded, fine-coarse natural stone.		
		
		
		
		
		
		
		
		
		
		
		
		
Brown, highly weathered, fine to medium sandstone recovered as cobbles and gravel.		
Complete at 3.30m		

Remarks		
Scale (approx)	Logged By	Figure No.
1:40	AT	30259LG.TP104

 Sutcliffe						Site Cables Way, Prescott		Trial Pit Number TP105		
Excavation Method Trial Pit		Dimensions		Ground Level (mOD)		Client John F Beesley		Job Number 30259LG		
		Location		Dates 29/03/2021		Engineer Alex Tosh		Sheet 1/1		
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water	
0.55-0.80	ES1				(0.10) 0.10	MADEGROUND (similar to topsoil), dark brown, slightly silty, SAND.				
					(0.45) 0.45	MADEGROUND , whitish grey, angular, fine-coarse, GRAVEL of natural stone. Occasional brick fragments.				
					0.55 0.55	MADEGROUND, brownish grey, gravelly, fine-medium SAND, with abundant boulders of concrete blocks and brick and occasional tar fragments. Redundant block wall encountered to SE of trial pit. Slight hydrocarbon odour. Terminated on redundant concrete floor slab.				
					(0.95) 0.95	Terminated at 1.50m				
Plan						Remarks				
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						Scale (approx) 1:25		Logged By AT		Figure No. 30259LG.TP105



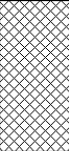
Client John F Beesley	Job Number 30259LG
Engineer Alex Tosh	Sheet 1/1

Description	Legend	Water
MADEGROUND (sim to topsoil), dark brown, slightly silty, slightly gravelly SAND with abundant rootlets. Gravel is angular-sub angular natural stone and brick fragments.		
MADEGROUND, brown, very gravelly, fine-medium, SAND. Gravel is angular-sub angular natural stone and brick fragments.		
MADEGROUND (sim to topsoil), dark brown, slightly gravelly sandy SILT. Gravel is sub angular-sub rounded brick and natural stone.		
Brown, slightly clayey, gravelly, SAND with occasional cobbles. Gravel is sub ang - sub rounded fine-coarse natural stone.	   	
Complete at 3.70m		

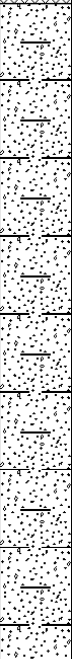
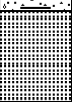
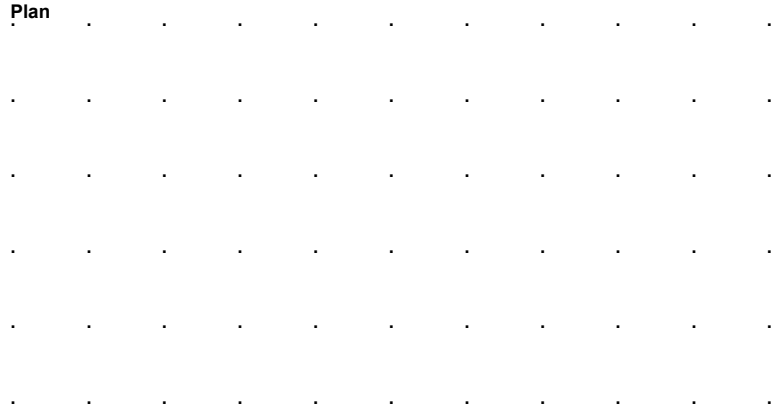
Remarks		
Scale (approx)	Logged By	Figure No.
1:25		30259LG.TP106



Client John F Beesley	Job Number 30259LG
Engineer Alex Tosh	Sheet 1/1

Description	Legend	Water
MADEGROUND, whitish grey, angular-sub angular, fine-coarse, GRAVEL of natural stone.		
MADEGROUND, whitish grey, angular-sub angular, fine-coarse, GRAVEL of natural stone.		
Stiff-very stiff, brown, slightly sandy, CLAY.		
Complete at 2.10m		

Remarks		
Scale (approx)	Logged By	Figure No.
1:25	AT	30259LG.TP107

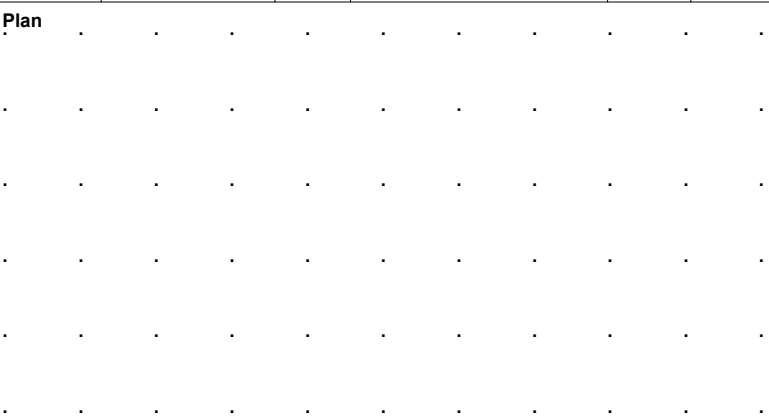
 Sutcliffe						Site Cables Way, Prescott		Trial Pit Number TP108	
Excavation Method Trial Pit		Dimensions		Ground Level (mOD)		Client John F Beesley		Job Number 30259LG	
		Location		Dates 29/03/2021		Engineer Alex Tosh		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.00-0.40	ES1					MADEGROUND, whit grey, sandy, angular-sub angular, fine-coarse, GRAVEL of natural stone.			
					0.40	Brown, very clayey, slightly gravelly, SAND. Gravel is sub angular-sub rounded natural stone.			
					(2.20)				
					2.60	Brown, highly weathered, fine-medium SANDSTONE. Recovered as large cobbles.			
					2.90	Complete at 2.90m			
Plan 						Remarks 			
						Scale (approx) 1:25	Logged By AT	Figure No. 30259LG.TP108	



Site	Trial Pit Number
Cables Way, Prescott	TP109A

Excavation Method Trial Pit	Dimensions	Ground Level (mOD)	Client John F Beesley	Job Number 30259LG
	Location	Dates 30/03/2021	Engineer Alex Tosh	Sheet 1/1

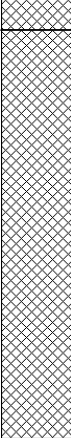
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.10 (0.30) 0.40	(MADE GROUND) Tarmac and graded granular limestone.		
						(MADE GROUND) Brown sandy CLAY with graded granular limestone and brick fragments. Sand is fine-medium.		
						(MADE GROUND) Greyish light brown sandy CLAY with sand bands, brick fragments, concrete fragments and wire. Sand is fine-medium.		
					(3.50)			
					3.90	Complete at 3.90m		

Plan 	Remarks Solid obstruction @ 3.90m thought to be mine shaft.		
	Scale (approx) 1:50	Logged By AT	Figure No. 30259LG.TP109A

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.10	(MADE GROUND) Tarmac and graded granular limestone.		
					(0.40)	(MADE GROUND) Brown sandy CLAY with graded granular limestone and brick fragments. Sand is fine-medium.		
					0.50	(MADE GROUND) Greyish light brown sandy CLAY with brick fragments, concrete fragments and wire. Sand is fine-medium.		
					(2.50)			
					3.00	Complete at 3.00m		

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Client John F Beesley	Job Number 30259LG
Engineer Alex Tosh	Sheet 1/1

Description	Legend	Water
(MADE GROUND) Tarmac and graded granular limestone.		
(MADE GROUND) Brown sandy CLAY. Sand is fine-medium. Clay is possibly reworked.		
(MADE GROUND) Brown sandy gravelly CLAY. Sand is fine-medium, gravel is fine-medium subangular-subrounded. Clay is possibly reworked.		
Complete at 3.10m		

Remarks		
Scale (approx)	Logged By	Figure No.
1:50	AT	30259LG.TP109C



Sutcliffe

Site
Cables Way, Prescott

Trial Pit Number
TP110

Excavation Method Trial Pit	Dimensions	Ground Level (mOD)	Client John F Beesley	Job Number 30259LG
	Location	Dates 30/03/2021	Engineer Alex Tosh	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	(TOPSOIL) Grass over topsoil.		
					(2.30)	Brown grey mottled very sandy gravelly CLAY. Sand is fine-medium, gravel is fine-medium subangular-angular.		
					2.50	Complete at 2.50m		

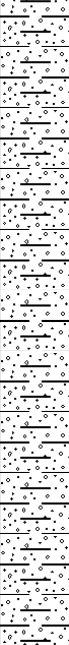
Plan 	Remarks		
	Scale (approx) 1:50	Logged By AT	Figure No. 30259LG.TP110

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.10	(TOPSOIL) Grass over topsoil.		
						Brown grey mottled sandy gravelly CLAY. Sand is fine-medium, gravel is fine-medium subangular.		
								
								
								
								
					(2.30)			
								
								
								
								
								
								
								
								
								
								
					2.40 (0.20) 2.60	Brown, dark grey and orange MUDSTONE fragments.		
						Complete at 2.60m		

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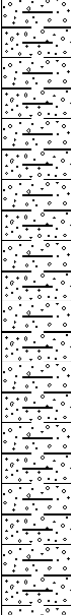


Client John F Beesley	Job Number 30259LG
Engineer Alex Tosh	Sheet 1/1

Description	Legend	Water
(TOPSOIL) Grass over topsoil.		
Brown grey mottled sandy gravelly CLAY. Sand is fine-medium, gravel is fine-medium subangular.		
Brown, dark grey and orange MUDSTONE fragments.		
Complete at 3.65m		

Remarks		
Scale (approx)	Logged By	Figure No.
1:40	AT	30259LG.TP111B

Client John F Beesley	Job Number 30259LG
Engineer Alex Tosh	Sheet 1/1

Description	Legend	Water
(TOPSOIL) Grass over topsoil.		
Brown grey mottled sandy gravelly CLAY. Sand is fine-medium, gravel is fine-medium subangular.		
Brown, dark grey and orange MUDSTONE fragments.		
Complete at 3.50m		

Remarks		
Scale (approx)	Logged By	Figure No.
1:40	AT	30259LG.TP112



Client John F Beesley	Job Number 30259LG
Engineer Alex Tosh	Sheet 1/1

Description	Legend	Water
(TOPSOIL) Grass over topsoil.		
Brown grey mottled very sandy CLAY with fine-medium sand bands and fine-medium very angular-angular mudstone fragments. Sand is fine-medium.		
Brown and dark grey fine-medium MUDSTONE fragments.		
Complete at 3.10m		

Remarks		
Scale (approx)	Logged By	Figure No.
1:40	AT	30259LG.TP112A

Appendix D – Analytical Certificates

FINAL ANALYTICAL TEST REPORT SUPPLEMENT TO TEST REPORT 21/03368/1

Amendments: Request for Additional Analysis

Envirolab Job Number: 21/03368
Issue Number: 2

Date: 29 April, 2021

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

Project Manager: (Use) D Evans; D Bowen; A Tosh; W Baldwin; J Smith
Project Name: Cables Way Manchester Rd Prescott
Project Ref: 30259LG
Order No: 8564
Date Samples Received: 30/03/21
Date Instructions Received: 31/03/21
Date Analysis Completed: 27/04/21

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Sophie France
Client Service Manager

Envirolab Job Number: 21/03368

Client Project Name: Cables Way Manchester Rd Prescott

Client Project Ref: 30259LG

Lab Sample ID	21/03368/1	21/03368/2	21/03368/3	21/03368/4	21/03368/5	21/03368/6	21/03368/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS101	WS101	WS104	TP101	TP102	TP103	TP104			
Depth to Top	0.20	0.30	0.40	0.05	0.00	0.45	0.20			
Depth To Bottom	0.60	0.80	0.80	0.40	0.50	0.70	0.50			
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid	Soil - ES	Solid			
Sample Matrix Code	4AE		6AE	2ABE	7	6AE	7			
% Moisture at <40C _A	16.3	-	15.9	10.7	3.9	17.1	6.0	% w/w	0.1	A-T-044
% Stones >10mm _A	1.0	-	<0.1	30.0	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	7.75	-	7.08	10.27	9.54	7.82	10.56	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.04	-	0.01	0.35	0.02	<0.01	0.21	g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	400	-	830	3800	320	230	1600	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	-	<5	10	<5	<5	<5	mg/kg	5	A-T-S2-s
Sulphur (elemental) _D ^{M#}	19	-	25	<5	<5	9	<5	mg/kg	5	A-T-029s
Organic matter _D ^{M#}	8.7	-	21.5	1.6	8.9	8.5	3.1	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	16	-	12	1	3	7	<1	mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	-	<1.0	1.9	<1.0	<1.0	1.1	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	14.6	-	2.3	0.8	0.8	5.4	0.9	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	845	-	118	30	75	258	47	mg/kg	1	A-T-024s
Chromium _D ^{M#}	18	-	23	16	14	24	18	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	-	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Chromium (trivalent)	18	-	23	16	14	24	18	mg/kg	1	Calc
Lead _D ^{M#}	292	-	63	78	31	121	23	mg/kg	1	A-T-024s
Mercury _D	<0.17	-	<0.17	1.72	3.91	0.75	3.02	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	18	-	20	11	5	20	12	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	-	1	<1	1	1	1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	114	-	69	209	117	142	47	mg/kg	5	A-T-024s

Envirolab Job Number: 21/03368

Client Project Name: Cables Way Manchester Rd Prescott

Client Project Ref: 30259LG

Lab Sample ID	21/03368/1	21/03368/2	21/03368/3	21/03368/4	21/03368/5	21/03368/6	21/03368/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS101	WS101	WS104	TP101	TP102	TP103	TP104			
Depth to Top	0.20	0.30	0.40	0.05	0.00	0.45	0.20			
Depth To Bottom	0.60	0.80	0.80	0.40	0.50	0.70	0.50			
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid	Soil - ES	Solid			
Sample Matrix Code	4AE		6AE	2ABE	7	6AE	7			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	-	Chrysotile	NAD	NAD	Chrysotile	NAD			A-T-045
Asbestos Matrix (microscope) _D	-	-	Loose Fibres	-	-	Loose Fibres	-			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
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing) _D	-	-	0.002	-	-	<0.001	-	% w/w	0.001	A-T-054

Envirolab Job Number: 21/03368

Client Project Name: Cables Way Manchester Rd Prescott

Client Project Ref: 30259LG

Lab Sample ID	21/03368/1	21/03368/2	21/03368/3	21/03368/4	21/03368/5	21/03368/6	21/03368/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS101	WS101	WS104	TP101	TP102	TP103	TP104			
Depth to Top	0.20	0.30	0.40	0.05	0.00	0.45	0.20			
Depth To Bottom	0.60	0.80	0.80	0.40	0.50	0.70	0.50			
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid	Soil - ES	Solid			
Sample Matrix Code	4AE		6AE	2ABE	7	6AE	7			
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	-	0.08	0.43	<0.01	<0.01	0.01	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	-	<0.01	0.02	<0.01	0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	-	0.12	0.56	<0.02	<0.02	0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	-	0.27	1.21	<0.04	0.08	0.06	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.06	-	0.31	1.25	<0.04	0.12	0.06	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	-	0.27	1.00	<0.05	0.12	0.06	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	-	0.19	0.58	<0.05	0.11	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	-	0.13	0.36	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	-	0.36	1.11	<0.06	0.13	0.09	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	-	<0.04	0.09	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	-	0.59	2.64	<0.08	0.18	0.15	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	-	0.06	0.32	<0.01	<0.01	0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.04	-	0.25	0.74	<0.03	0.14	0.06	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	-	0.05	0.20	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.05	-	0.54	2.24	<0.03	0.12	0.11	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	-	0.55	2.43	<0.07	0.17	0.13	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	0.15	-	3.77	15.2	<0.08	1.18	0.76	mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/03368

Client Project Name: Cables Way Manchester Rd Prescott

Client Project Ref: 30259LG

Lab Sample ID	21/03368/1	21/03368/2	21/03368/3	21/03368/4	21/03368/5	21/03368/6	21/03368/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS101	WS101	WS104	TP101	TP102	TP103	TP104			
Depth to Top	0.20	0.30	0.40	0.05	0.00	0.45	0.20			
Depth To Bottom	0.60	0.80	0.80	0.40	0.50	0.70	0.50			
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid	Soil - ES	Solid			
Sample Matrix Code	4AE		6AE	2ABE	7	6AE	7			
TPH UKCWG										
Ali >C5-C6 _A [#]	<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	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	-	1	<10	<5	<1	1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	-	<1	<10	<5	<1	1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	-	1	<10	<5	5	2	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	2	-	1	20	<5	28	4	mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	12	-	125	216	28	283	50	mg/kg	1	A-T-055s
Ali >C35-C44 _A	1	-	38	193	11	203	19	mg/kg	1	A-T-055s
Total Aliphatics _A	15	-	166	439	40	519	78	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<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	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	1	-	4	14	<5	2	2	mg/kg	1	A-T-055s
Aro >C10-C12 _A	<1	-	2	<10	<5	2	2	mg/kg	1	A-T-055s
Aro >C12-C16 _A	4	-	7	25	<5	17	4	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	4	-	13	53	<5	78	7	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	7	-	100	142	19	105	29	mg/kg	1	A-T-055s
Aro >C35-C44 _A	2	-	39	145	9	125	10	mg/kg	1	A-T-055s
Total Aromatics _A	18	-	165	387	28	331	54	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44) _A	33	-	332	823	68	849	132	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<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	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	0.02	-	<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	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Forensic Description										
% of total sample Inert >10mm	-	23.52	-	-	-	-	-	% w/w	0.1	Calc-no stones
% of total sample Wood >10mm	-	<0.10	-	-	-	-	-	% w/w	0.1	Calc-no stones
% of total sample Vegetation >10mm	-	<0.10	-	-	-	-	-	% w/w	0.1	Calc-no stones
% of total sample Cloth >10mm	-	<0.10	-	-	-	-	-	% w/w	0.1	Calc-no stones
% of total sample Other Inert Material >10mm	-	<0.10	-	-	-	-	-	% w/w	0.1	Calc-no stones

Envirolab Job Number: 21/03368

Client Project Name: Cables Way Manchester Rd Prescott

Client Project Ref: 30259LG

Lab Sample ID	21/03368/1	21/03368/2	21/03368/3	21/03368/4	21/03368/5	21/03368/6	21/03368/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS101	WS101	WS104	TP101	TP102	TP103	TP104			
Depth to Top	0.20	0.30	0.40	0.05	0.00	0.45	0.20			
Depth To Bottom	0.60	0.80	0.80	0.40	0.50	0.70	0.50			
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid	Soil - ES	Solid			
Sample Matrix Code	4AE		6AE	2ABE	7	6AE	7			
% of total sample Paper >10mm	-	<0.10	-	-	-	-	-	% w/w	0.1	Calc-no stones
% of total sample Other Degradable Material >10mm	-	<0.10	-	-	-	-	-	% w/w	0.1	Calc-no stones
% of total sample Fine Soil and Gravel <10mm	-	76.48	-	-	-	-	-	% w/w	0.1	Calc-no stones
Total Organic Carbon (Fine Soil) [#]	-	2.04	-	-	-	-	-	% w/w	0.03	Calc-no stones

Envirolab Job Number: 21/03368

Client Project Name: Cables Way Manchester Rd Prescott

Client Project Ref: 30259LG

Lab Sample ID	21/03368/8	21/03368/9	21/03368/10	21/03368/11	21/03368/12	21/03368/13		Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1				
Client Sample ID	TP105	TP105	TP106	TP107	TP108	TP108				
Depth to Top	0.55	0.30	0.00	0.00	0.00	0.50				
Depth To Bottom	0.80	0.80	0.20	0.30	0.40	1.00				
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid	Soil - ES				
Sample Matrix Code	6AE		2AE	2AE	7					
% Moisture at <40C _A	15.9	-	10.7	7.8	3.4	-		% w/w	0.1	A-T-044
% Stones >10mm _A	5.7	-	28.2	53.1	<0.1	-		% w/w	0.1	A-T-044
pH _D ^{M#}	8.53	-	9.18	9.65	9.56	-		pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	-	0.06	0.05	<0.01	-		g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	570	-	720	310	<200	-		mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<1	-	<1	<1	<1	-		mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	-	<0.2	<0.2	<0.2	-		mg/kg	0.2	A-T-050s
Sulphide _A	8	-	<5	6	<5	-		mg/kg	5	A-T-S2-s
Sulphur (elemental) _D ^{M#}	<5	-	<5	<5	<5	-		mg/kg	5	A-T-029s
Organic matter _D ^{M#}	10.8	-	2.2	1.0	1.6	-		% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	10	-	4	2	<1	-		mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	-	<1.0	<1.0	<1.0	-		mg/kg	1	A-T-027s
Cadmium _D ^{M#}	5.8	-	1.2	0.7	<0.5	-		mg/kg	0.5	A-T-024s
Copper _D ^{M#}	407	-	276	47	7	-		mg/kg	1	A-T-024s
Chromium _D ^{M#}	23	-	12	6	7	-		mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	-	<1	<1	<1	-		mg/kg	1	A-T-040s
Chromium (trivalent)	23	-	12	6	7	-		mg/kg	1	Calc
Lead _D ^{M#}	238	-	120	25	21	-		mg/kg	1	A-T-024s
Mercury _D	0.72	-	0.94	0.76	4.27	-		mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	24	-	19	6	3	-		mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	-	<1	<1	1	-		mg/kg	1	A-T-024s
Zinc _D ^{M#}	185	-	82	49	25	-		mg/kg	5	A-T-024s

Envirolab Job Number: 21/03368

Client Project Name: Cables Way Manchester Rd Prescott

Client Project Ref: 30259LG

Lab Sample ID	21/03368/8	21/03368/9	21/03368/10	21/03368/11	21/03368/12	21/03368/13		Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1				
Client Sample ID	TP105	TP105	TP106	TP107	TP108	TP108				
Depth to Top	0.55	0.30	0.00	0.00	0.00	0.50				
Depth To Bottom	0.80	0.80	0.20	0.30	0.40	1.00				
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid	Soil - ES				
Sample Matrix Code	6AE		2AE	2AE	7					
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	-	NAD	NAD	NAD	-				A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	-	N/A	N/A	N/A	-				A-T-045

Envirolab Job Number: 21/03368

Client Project Name: Cables Way Manchester Rd Prescott

Client Project Ref: 30259LG

Lab Sample ID	21/03368/8	21/03368/9	21/03368/10	21/03368/11	21/03368/12	21/03368/13		Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1				
Client Sample ID	TP105	TP105	TP106	TP107	TP108	TP108				
Depth to Top	0.55	0.30	0.00	0.00	0.00	0.50				
Depth To Bottom	0.80	0.80	0.20	0.30	0.40	1.00				
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid	Soil - ES				
Sample Matrix Code	6AE		2AE	2AE	7					
PAH-16MS										
Acenaphthene _A ^{M#}	0.45	-	0.02	0.02	<0.01	-		mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.01	-	<0.01	<0.01	<0.01	-		mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.24	-	0.05	0.03	0.02	-		mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.48	-	0.19	0.12	0.07	-		mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.52	-	0.24	0.19	0.06	-		mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.49	-	0.20	0.17	0.05	-		mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.33	-	0.15	0.12	<0.05	-		mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.17	-	<0.07	<0.07	<0.07	-		mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.56	-	0.23	0.14	0.08	-		mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.07	-	<0.04	<0.04	<0.04	-		mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	1.13	-	0.39	0.20	0.17	-		mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.25	-	<0.01	0.02	<0.01	-		mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.41	-	0.18	0.15	0.04	-		mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.39	-	<0.03	<0.03	<0.03	-		mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	1.07	-	0.18	0.12	0.07	-		mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	1.01	-	0.39	0.20	0.13	-		mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	7.58	-	2.22	1.48	0.69	-		mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/03368

Client Project Name: Cables Way Manchester Rd Prescott

Client Project Ref: 30259LG

Lab Sample ID	21/03368/8	21/03368/9	21/03368/10	21/03368/11	21/03368/12	21/03368/13		Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1				
Client Sample ID	TP105	TP105	TP106	TP107	TP108	TP108				
Depth to Top	0.55	0.30	0.00	0.00	0.00	0.50				
Depth To Bottom	0.80	0.80	0.20	0.30	0.40	1.00				
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid	Soil - ES				
Sample Matrix Code	6AE		2AE	2AE	7					
TPH UKCWG										
Ali >C5-C6 _A [#]	<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	-		mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	-	<1	<1	<1	-		mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	-	<1	<1	<1	-		mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	2	-	<1	<1	<1	-		mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	6	-	2	2	<1	-		mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	158	-	51	45	2	-		mg/kg	1	A-T-055s
Ali >C35-C44 _A	82	-	35	23	<1	-		mg/kg	1	A-T-055s
Total Aliphatics _A	248	-	88	70	2	-		mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<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	-		mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	2	-	2	<1	<1	-		mg/kg	1	A-T-055s
Aro >C10-C12 _A	2	-	<1	<1	<1	-		mg/kg	1	A-T-055s
Aro >C12-C16 _A	7	-	6	2	1	-		mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	19	-	15	4	<1	-		mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	163	-	70	23	2	-		mg/kg	1	A-T-055s
Aro >C35-C44 _A	99	-	29	13	<1	-		mg/kg	1	A-T-055s
Total Aromatics _A	292	-	123	43	3	-		mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44) _A	539	-	211	112	5	-		mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<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	-		mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<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	-		mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<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	-		mg/kg	0.01	A-T-022s
Forensic Description										
% of total sample Inert >10mm	-	45.56	-	-	-	28.86		% w/w	0.1	Calc-no stones
% of total sample Wood >10mm	-	<0.10	-	-	-	<0.10		% w/w	0.1	Calc-no stones
% of total sample Vegetation >10mm	-	<0.10	-	-	-	<0.10		% w/w	0.1	Calc-no stones
% of total sample Cloth >10mm	-	<0.10	-	-	-	<0.10		% w/w	0.1	Calc-no stones
% of total sample Other Inert Material >10mm	-	<0.10	-	-	-	<0.10		% w/w	0.1	Calc-no stones

Envirolab Job Number: 21/03368

Client Project Name: Cables Way Manchester Rd Prescott

Client Project Ref: 30259LG

Lab Sample ID	21/03368/8	21/03368/9	21/03368/10	21/03368/11	21/03368/12	21/03368/13		Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1				
Client Sample ID	TP105	TP105	TP106	TP107	TP108	TP108				
Depth to Top	0.55	0.30	0.00	0.00	0.00	0.50				
Depth To Bottom	0.80	0.80	0.20	0.30	0.40	1.00				
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid	Soil - ES				
Sample Matrix Code	6AE		2AE	2AE	7					
% of total sample Paper >10mm	-	<0.10	-	-	-	<0.10		% w/w	0.1	Calc-no stones
% of total sample Other Degradable Material >10mm	-	<0.10	-	-	-	<0.10		% w/w	0.1	Calc-no stones
% of total sample Fine Soil and Gravel <10mm	-	54.44	-	-	-	71.14		% w/w	0.1	Calc-no stones
Total Organic Carbon (Fine Soil) [#]	-	2.65	-	-	-	2.43		% w/w	0.03	Calc-no stones

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 with the same delivery, will be disposed of six weeks after 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 the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples 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.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

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 analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

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.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need 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: 21/03368

Project: Cables Way Manchester Rd Prescot

Date Received: 31/03/2021 (am)

Clients Project No: 30259LG

Cool Box Temperatures (°C): 18.7, 19.1, 18.8

Lab Sample ID	21/03368/1	21/03368/3	21/03368/4	21/03368/6	21/03368/8	21/03368/10	21/03368/11
Client Sample No	1	1	1	1	1	1	1
Client Sample ID/Depth	WS101 0.20-0.60m	WS104 0.40-0.80m	TP101 0.05-0.40m	TP103 0.45-0.70m	TP105 0.55-0.80m	TP106 0.00-0.20m	TP107 0.00-0.30m
Date Sampled	29/03/21	29/03/21	29/03/21	29/03/21	29/03/21	29/03/21	29/03/21
Deviation Code							
F	✓	✓	✓	✓	✓	✓	✓

Key

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

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/03368/1	21/03368/3	21/03368/4	21/03368/6	21/03368/8	21/03368/10	21/03368/11
Client Sample No	1	1	1	1	1	1	1
Client Sample ID/Depth	WS101 0.20-0.60m	WS104 0.40-0.80m	TP101 0.05-0.40m	TP103 0.45-0.70m	TP105 0.55-0.80m	TP106 0.00-0.20m	TP107 0.00-0.30m
Date Sampled	29/03/21	29/03/21	29/03/21	29/03/21	29/03/21	29/03/21	29/03/21
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.

FINAL ANALYTICAL TEST REPORT SUPPLEMENT TO TEST REPORT 21/03535/1

Amendments: Request for Additional Analysis

Envirolab Job Number: 21/03535
Issue Number: 2

Date: 29 April, 2021

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

Project Manager: (Use) D Evans; D Bowen; A Tosh; W Baldwin; J Smith
Project Name: Cables Way, Prescott
Project Ref: 30259
Order No: 8567
Date Samples Received: 01/04/21
Date Instructions Received: 06/04/21
Date Analysis Completed: 28/04/21

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Sophie France
Client Service Manager

Envirolab Job Number: 21/03535

Client Project Name: Cables Way, Prescott

Client Project Ref: 30259

Lab Sample ID	21/03535/1	21/03535/2	21/03535/3	21/03535/4	21/03535/5	21/03535/6	21/03535/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS105	WS105	WS106	WS106	WS107	WS108	WS109			
Depth to Top	0.20	0.50	0.20	0.50	0.20	0.20	0.20			
Depth To Bottom	0.60	1.00	0.60	1.00	0.60	0.60	0.60			
Date Sampled	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21			
Sample Type	Soil - ES	Soil	Soil - ES	Soil	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	6AE	6AE	6AE	2ABE	4AE			
% Moisture at <40C _A	11.0	-	11.8	-	10.4	9.1	17.5	% w/w	0.1	A-T-044
% Stones >10mm _A	22.1	<0.1	13.1	<0.1	<0.1	31.0	16.4	% w/w	0.1	A-T-044
pH _D ^{M#}	8.53	-	7.22	-	9.93	9.00	8.45	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.05	-	<0.01	-	0.04	0.06	0.02	g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	650	-	<200	-	1100	610	790	mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<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	mg/kg	0.2	A-T-050s
Sulphide _A	<5	-	7	-	<5	<5	10	mg/kg	5	A-T-S2-s
Sulphur (elemental) _D ^{M#}	20	-	<5	-	<5	<5	<5	mg/kg	5	A-T-029s
Organic matter _D ^{M#}	3.3	-	2.9	-	2.5	2.2	4.8	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	4	-	<1	-	2	8	4	mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.8	-	1.7	-	1.2	1.7	0.8	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	108	-	103	-	107	414	75	mg/kg	1	A-T-024s
Chromium _D ^{M#}	17	-	20	-	18	20	13	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	-	<1	-	<1	<1	<1	mg/kg	1	A-T-040s
Chromium (trivalent)	17	-	20	-	18	20	13	mg/kg	1	Calc
Lead _D ^{M#}	80	-	29	-	66	97	140	mg/kg	1	A-T-024s
Mercury _D	1.66	-	<0.17	-	0.63	0.39	0.40	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	15	-	33	-	22	19	12	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	-	<1	-	<1	<1	<1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	61	-	87	-	119	96	122	mg/kg	5	A-T-024s
Leachate Prep NRA (10:1) _A	-	-	*	-	*	*	-			A-T-001
pH (leachable) _A [#]	-	-	7.30	-	6.57	8.44	-	pH	0.01	A-T-031w
Sulphate (leachable) _A [#]	-	-	4.41	-	8.29	4.29	-	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	-	-	<0.01	-	<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-S2-w
DOC (leachable) _A [#]	-	-	2.2	-	11.4	2.2	-	mg/l	0.2	A-T-032w
Arsenic (leachable) _A [#]	-	-	<1	-	<1	19	-	µg/l	1	A-T-025w
Boron (leachable) _A [#]	-	-	<10	-	<10	33	-	µg/l	10	A-T-025w
Cadmium (leachable) _A [#]	-	-	<1	-	<1	<1	-	µg/l	1	A-T-025w
Copper (leachable) _A [#]	-	-	8	-	3	33	-	µg/l	1	A-T-025w

Envirolab Job Number: 21/03535

Client Project Name: Cables Way, Prescott

Client Project Ref: 30259

Lab Sample ID	21/03535/1	21/03535/2	21/03535/3	21/03535/4	21/03535/5	21/03535/6	21/03535/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS105	WS105	WS106	WS106	WS107	WS108	WS109			
Depth to Top	0.20	0.50	0.20	0.50	0.20	0.20	0.20			
Depth To Bottom	0.60	1.00	0.60	1.00	0.60	0.60	0.60			
Date Sampled	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21			
Sample Type	Soil - ES	Soil	Soil - ES	Soil	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	6AE	6AE	6AE	2ABE	4AE			
Chromium (leachable) _A [#]	-	-	<1	-	<1	5	-	µg/l	1	A-T-025w
Chromium (hexavalent) (leachable) _A	-	-	<0.10	-	<0.10	<0.10	-	mg/l	0.05	A-T-040w
Chromium (trivalent) (10:1 leachable)	-	-	<0.10	-	<0.10	<0.10	-	mg/l	0.05	Calc
Lead (leachable) _A [#]	-	-	1	-	2	14	-	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 [#]	-	-	<1	-	2	<1	-	µg/l	1	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 [#]	-	-	6	-	4	9	-	µg/l	1	A-T-025w
TPH total (>C6-C40) (leachable) _A	-	-	<80	-	254	<80	-	µg/l	80	A-T-007w

Envirolab Job Number: 21/03535

Client Project Name: Cables Way, Prescott

Client Project Ref: 30259

Lab Sample ID	21/03535/1	21/03535/2	21/03535/3	21/03535/4	21/03535/5	21/03535/6	21/03535/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS105	WS105	WS106	WS106	WS107	WS108	WS109			
Depth to Top	0.20	0.50	0.20	0.50	0.20	0.20	0.20			
Depth To Bottom	0.60	1.00	0.60	1.00	0.60	0.60	0.60			
Date Sampled	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21			
Sample Type	Soil - ES	Soil	Soil - ES	Soil	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	6AE	6AE	6AE	2ABE	4AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	-	NAD	-	Chrysotile	NAD	NAD			A-T-045
Asbestos Matrix (microscope) _D	-	-	-	-	Loose Fibres	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	-	N/A	-	N/A	N/A	N/A			A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing) _D	-	-	-	-	0.006	-	-	% w/w	0.001	A-T-054

Envirolab Job Number: 21/03535

Client Project Name: Cables Way, Prescott

Client Project Ref: 30259

Lab Sample ID	21/03535/1	21/03535/2	21/03535/3	21/03535/4	21/03535/5	21/03535/6	21/03535/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS105	WS105	WS106	WS106	WS107	WS108	WS109			
Depth to Top	0.20	0.50	0.20	0.50	0.20	0.20	0.20			
Depth To Bottom	0.60	1.00	0.60	1.00	0.60	0.60	0.60			
Date Sampled	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21			
Sample Type	Soil - ES	Soil	Soil - ES	Soil	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	6AE	6AE	6AE	2ABE	4AE			
PAH-16MS										
Acenaphthene _A ^{M#}	0.04	-	<0.01	-	0.38	0.04	0.07	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	-	<0.01	-	<0.01	<0.01	0.02	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.06	-	<0.02	-	0.63	0.09	0.16	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.17	-	<0.04	-	2.01	0.40	0.81	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.26	-	<0.04	-	2.09	0.51	0.89	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.23	-	<0.05	-	2.08	0.52	0.87	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.15	-	<0.05	-	1.05	0.27	0.44	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.10	-	<0.07	-	0.79	0.19	0.36	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.23	-	<0.06	-	2.22	0.47	0.90	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	-	<0.04	-	0.20	0.05	0.09	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	0.41	-	<0.08	-	4.61	0.80	1.58	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.03	-	<0.01	-	0.27	0.02	0.05	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.16	-	<0.03	-	1.13	0.30	0.49	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	-	<0.03	-	0.26	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.24	-	<0.03	-	2.57	0.32	0.64	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	0.39	-	<0.07	-	4.92	0.80	1.55	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	2.47	-	<0.08	-	25.2	4.78	8.92	mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/03535

Client Project Name: Cables Way, Prescott

Client Project Ref: 30259

Lab Sample ID	21/03535/1	21/03535/2	21/03535/3	21/03535/4	21/03535/5	21/03535/6	21/03535/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS105	WS105	WS106	WS106	WS107	WS108	WS109			
Depth to Top	0.20	0.50	0.20	0.50	0.20	0.20	0.20			
Depth To Bottom	0.60	1.00	0.60	1.00	0.60	0.60	0.60			
Date Sampled	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21			
Sample Type	Soil - ES	Soil	Soil - ES	Soil	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	6AE	6AE	6AE	2ABE	4AE			
PAH-16MS (leachable)										
Acenaphthene (leachable) _A	-	-	<0.01	-	<0.01	0.06	-	µg/l	0.01	A-T-019w
Acenaphthylene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Anthracene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Benzo(a)anthracene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Benzo(a)pyrene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Benzo(ghi)perylene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Chrysene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Fluoranthene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Fluorene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Naphthalene (leachable) _A	-	-	0.10	-	0.05	0.15	-	µg/l	0.01	A-T-019w
Phenanthrene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Pyrene (leachable) _A	-	-	<0.01	-	<0.01	<0.01	-	µg/l	0.01	A-T-019w
Total PAH-16MS (leachable) _A	-	-	0.10	-	0.05	0.21	-	µg/l	0.01	A-T-019w

Envirolab Job Number: 21/03535

Client Project Name: Cables Way, Prescott

Client Project Ref: 30259

Lab Sample ID	21/03535/1	21/03535/2	21/03535/3	21/03535/4	21/03535/5	21/03535/6	21/03535/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS105	WS105	WS106	WS106	WS107	WS108	WS109			
Depth to Top	0.20	0.50	0.20	0.50	0.20	0.20	0.20			
Depth To Bottom	0.60	1.00	0.60	1.00	0.60	0.60	0.60			
Date Sampled	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21			
Sample Type	Soil - ES	Soil	Soil - ES	Soil	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	6AE	6AE	6AE	2ABE	4AE			
TPH UKCWG										
Ali >C5-C6 _A [#]	<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	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	-	<1	-	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	-	<1	-	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	-	<1	-	8	<1	1	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	4	-	<1	-	18	3	3	mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	29	-	<1	-	94	23	37	mg/kg	1	A-T-055s
Ali >C35-C44 _A	24	-	<1	-	119	15	34	mg/kg	1	A-T-055s
Total Aliphatics _A	57	-	<1	-	239	42	76	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<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	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	-	<1	-	2	<1	1	mg/kg	1	A-T-055s
Aro >C10-C12 _A	2	-	<1	-	2	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16 _A	46	-	<1	-	10	6	3	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	184	-	<1	-	25	9	11	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	296	-	<1	-	68	21	43	mg/kg	1	A-T-055s
Aro >C35-C44 _A	19	-	<1	-	66	6	22	mg/kg	1	A-T-055s
Total Aromatics _A	546	-	<1	-	173	44	80	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44) _A	603	-	<1	-	412	86	156	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<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	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<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	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<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	mg/kg	0.01	A-T-022s
Forensic Description										
% of total sample Inert >10mm	-	27.28	-	15.68	-	24.28	27.90	% w/w	0.1	Calc-no stones
% of total sample Wood >10mm	-	<0.10	-	<0.10	-	<0.10	<0.10	% w/w	0.1	Calc-no stones
% of total sample Vegetation >10mm	-	<0.10	-	<0.10	-	<0.10	<0.10	% w/w	0.1	Calc-no stones
% of total sample Cloth >10mm	-	<0.10	-	<0.10	-	<0.10	<0.10	% w/w	0.1	Calc-no stones
% of total sample Other Inert Material >10mm	-	<0.10	-	<0.10	-	<0.10	<0.10	% w/w	0.1	Calc-no stones

Envirolab Job Number: 21/03535

Client Project Name: Cables Way, Prescott

Client Project Ref: 30259

Lab Sample ID	21/03535/1	21/03535/2	21/03535/3	21/03535/4	21/03535/5	21/03535/6	21/03535/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	WS105	WS105	WS106	WS106	WS107	WS108	WS109			
Depth to Top	0.20	0.50	0.20	0.50	0.20	0.20	0.20			
Depth To Bottom	0.60	1.00	0.60	1.00	0.60	0.60	0.60			
Date Sampled	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21			
Sample Type	Soil - ES	Soil	Soil - ES	Soil	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	6AE	6AE	6AE	2ABE	4AE			
% of total sample Paper >10mm	-	<0.10	-	<0.10	-	<0.10	<0.10	% w/w	0.1	Calc-no stones
% of total sample Other Degradable Material >10mm	-	<0.10	-	<0.10	-	<0.10	<0.10	% w/w	0.1	Calc-no stones
% of total sample Fine Soil and Gravel <10mm	-	72.72	-	84.32	-	75.72	72.10	% w/w	0.1	Calc-no stones
Total Organic Carbon (Fine Soil) [#]	-	0.88	-	0.70	-	1.25	1.20	% w/w	0.03	Calc-no stones

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 with the same delivery, will be disposed of six weeks after 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 the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples 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.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

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 analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

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.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need 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: 21/03535

Project: Cables Way, Prescott

Date Received: 06/04/2021 (am)

Clients Project No: 30259

Cool Box Temperatures (°C): 10.3

Lab Sample ID	21/03535/1	21/03535/3	21/03535/5	21/03535/6	21/03535/7
Client Sample No	1	1	1	1	1
Client Sample ID/Depth	WS105 0.20-0.60m	WS106 0.20-0.60m	WS107 0.20-0.60m	WS108 0.20-0.60m	WS109 0.20-0.60m
Date Sampled	31/03/21	31/03/21	31/03/21	31/03/21	31/03/21
Deviation Code					
F	✓	✓	✓	✓	✓

Key

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

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/03535/1	21/03535/3	21/03535/5	21/03535/6	21/03535/7
Client Sample No	1	1	1	1	1
Client Sample ID/Depth	WS105 0.20-0.60m	WS106 0.20-0.60m	WS107 0.20-0.60m	WS108 0.20-0.60m	WS109 0.20-0.60m
Date Sampled	31/03/21	31/03/21	31/03/21	31/03/21	31/03/21
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.

Appendix E – Ground Gas and Groundwater Risk Assessment

	SUTCLIFFE INVESTIGATIONS				GAS MEASUREMENTS AND WATER LEVELS			Sheet No.:		1 of 1		
	TEL: 0151 227 3155							Atmospheric Pressure:		1012mb		
	FAX: 0151 227 3156							Weather:		Sunny, mild		
								Pressure Trend:		Steady/Rising		
	VISIT No.: 1											
	CLIENT:		Knowsley Metropolitan Borough Council			SITE:	Cables Way, Prescott					
Date of Fieldwork:			19/04/2021		Logged By:		MW	Job No.:		30259LG		
B/H Ref.	CH ₄		CO ₂	O ₂	Relative Pressure	Flow Rate	P.I.D	Base of Borehole	Base of Plain Pipe	Water Level	Flow affected by WL?	Reduced Water
	%LEL	%by vol	%by vol	%by vol	(mb)	(l/h)	(ppm)	(mbgl)	(mbgl)	(mbgl)	Y/N	(m) A.O.D
WS102	-	0.0	0.0	21.3	1012.00	0.00	-	-	1.00	-	N	-
	-	0.0	0.0	21.1								
	-	0.0	0.0	21.0								
	-	0.0	0.0	20.8								
	-	-	-	-								
-	-	-	-									
WS103	-	0.0	0.0	21.2	1012.00	0.00	-	1.85	1.00	DRY	N	-
	-	0.0	0.0	21.0								
	-	0.0	0.0	20.9								
	-	0.0	0.0	20.8								
	-	-	-	-								
-	-	-	-									
WS106	-	0.0	0.0	21.3	1013.00	0.00	-	0.89	0.50	DRY	N	-
	-	0.0	0.0	21.1								
	-	0.0	0.0	20.9								
	-	0.0	0.0	20.9								
	-	-	-	-								
-	-	-	-									
WS107	-	0.0	0.0	20.5	1013.00	0.00	-	0.88	0.50	DRY	N	-
	-	0.0	0.0	18.5								
	-	0.0	0.0	16.3								
	-	0.0	0.0	15.4								
	-	-	-	-								
-	-	-	-									
COMMENTS: WS102 - Bung irremovable												
INSTRUMENTS USED:		Electronic	ACCURACY OF INSTRUMENT (%) by volume)		CH ₄		CO ₂		O ₂			
GA2000 Gas Monitor					± 0.5% @ 5%		± 0.5% @ 5%					
ATEX Dipmeter					± 1.0% @15%		± 1.0% @15%		± 1.0%			
					±3.0% @>15%		±3.0% @>15%					

A = Accumulated Type Sample

l/h = Litres per hour

%LEL = Lower Explosive Limit (for CH₄ in air 100% = 5% by volume)

SS = Steady State Type Sample

mb = Millibar

P = Peak Type Sample

mbgl = Metres Below Ground Level

	SUTCLIFFE INVESTIGATIONS				GAS MEASUREMENTS AND WATER LEVELS			Sheet No.:		1 of 1				
	TEL: 0151 227 3155							Atmospheric Pressure:		1009mb				
	FAX: 0151 227 3156							Weather:		Cloudy				
								Pressure Trend:		Steady				
	VISIT No.: 2													
	CLIENT:		Knowsley Metropolitan Borough Council			SITE:		Cables Way, Prescott						
	Date of Fieldwork:		30/04/2021			Logged By:		MW	Job No.:		30259LG			
B/H Ref.	CH ₄		CO ₂	O ₂	Relative Pressure	Flow Rate	P.I.D	Base of Borehole	Base of Plain Pipe	Water Level	Flow affected by WL?	Reduced Water		
	%LEL	%by vol	%by vol	%by vol	(mb)	(l/h)	(ppm)	(mbgl)	(mbgl)	(mbgl)	Y/N	(m) A.O.D		
WS102	-	0.0	0.0	20.6	1008.00	0.00	-	-	1.00	-	N	-		
	-	0.0	0.0	20.5										
	-	0.0	0.0	20.4										
	-	0.0	0.0	20.4										
	-	-	-	-										
-	-	-	-											
WS103	-	0.0	0.0	20.7	1009.00	0.00	-	1.85	1.00	DRY	N	-		
	-	0.0	0.0	20.6										
	-	0.0	0.0	20.5										
	-	0.0	0.0	20.4										
	-	-	-	-										
-	-	-	-											
WS106	-	0.0	0.0	20.7	1009.00	0.00	-	0.92	0.50	DRY	N	-		
	-	0.0	0.0	20.6										
	-	0.0	0.0	20.5										
	-	0.0	0.0	20.5										
	-	-	-	-										
-	-	-	-											
WS107	-	0.0	0.0	20.2	1008.00	0.00	-	0.88	0.50	DRY	N	-		
	-	0.0	0.0	17.0										
	-	0.0	0.0	15.0										
	-	0.0	0.0	13.3										
	-	-	-	-										
-	-	-	-											
COMMENTS: WS102 - Bung irremovable														
INSTRUMENTS USED: GA2000 Gas Monitor Electronic ATEX Dipmeter				ACCURACY OF INSTRUMENT (% by volume)		CH ₄		CO ₂		O ₂				
						± 0.5% @ 5%		± 0.5% @ 5%						
						± 1.0% @15%		± 1.0% @15%		± 1.0%				
						±3.0% @>15%		±3.0% @>15%						

A = Accumulated Type Sample

l/h = Litres per hour

%LEL = Lower Explosive Limit (for CH₄ in air 100% = 5% by volume)

SS = Steady State Type Sample

mb = Millibar

P = Peak Type Sample

mbgl = Metres Below Ground Level

	SUTCLIFFE INVESTIGATIONS				GAS MEASUREMENTS AND WATER LEVELS			Sheet No.:		1 of 1			
	TEL: 0151 227 3155							Atmospheric Pressure:		988mb			
	FAX: 0151 227 3156							Weather:		Cloudy/rain			
								Pressure Trend:		Steady			
	VISIT No.: 3												
	CLIENT:		Knowsley Metropolitan Borough Council			SITE:		Cables Way, Prescott					
	Date of Fieldwork:		10/05/2021		Logged By:		MW	Job No.:		30259LG			
B/H Ref.	CH ₄		CO ₂	O ₂	Relative Pressure	Flow Rate	P.I.D	Base of Borehole	Base of Plain Pipe	Water Level	Flow affected by WL?	Reduced Water	
	%LEL	%by vol	%by vol	%by vol	(mb)	(l/h)	(ppm)	(mbgl)	(mbgl)	(mbgl)	Y/N	(m) A.O.D	
WS102	-	0.0	0.0	20.8	988.00	-0.20	-	-	1.00	-	N	-	
	-	0.0	0.0	20.7									
	-	0.0	0.0	20.6									
	-	0.0	0.0	20.5									
	-	-	-	-									
WS103	-	0.0	0.0	20.8	989.00	-0.20	-	1.85	1.00	0.56	Y	-	
	-	0.0	0.0	20.7									
	-	0.0	0.0	20.6									
	-	0.0	0.0	20.5									
	-	-	-	-									
WS106	-	0.0	0.0	20.9	988.00	0.00	-	0.92	0.50	0.49	Y	-	
	-	0.0	0.0	20.8									
	-	0.0	0.0	20.7									
	-	0.0	0.0	20.6									
	-	-	-	-									
WS107	-	0.0	0.0	20.0	989.00	-0.10	-	0.90	0.50	0.52	N	-	
	-	0.0	0.0	15.4									
	-	0.0	0.0	12.4									
	-	0.0	0.0	11.2									
	-	-	-	-									
COMMENTS: WS102 - Bung irremovable													
INSTRUMENTS USED: GA2000 Gas Monitor Electronic ATEX Dipmeter				ACCURACY OF INSTRUMENT (% by volume)		CH ₄		CO ₂		O ₂			
						± 0.5% @ 5%		± 0.5% @ 5%					
						± 1.0% @15%		± 1.0% @15%		± 1.0%			
						±3.0% @>15%		±3.0% @>15%					

A = Accumulated Type Sample

l/h = Litres per hour

%LEL = Lower Explosive Limit (for CH₄ in air 100% = 5% by volume)

SS = Steady State Type Sample

mb = Millibar

P = Peak Type Sample

mbgl = Metres Below Ground Level

	SUTCLIFFE INVESTIGATIONS					GAS MEASUREMENTS AND WATER LEVELS		Sheet No.:		1 of 1			
	TEL: 0151 227 3155							Atmospheric Pressure:		994mb			
	FAX: 0151 227 3156							Weather:		Cloudy			
								Pressure Trend:		Steady			
	VISIT No.: 4												
	CLIENT:		Knowsley Metropolitan Borough Council			SITE:		Cables Way, Prescott					
	Date of Fieldwork:			24/04/2021		Logged By:		MW	Job No.:		30259LG		
B/H Ref.	CH ₄		CO ₂	O ₂	Relative Pressure	Flow Rate	P.I.D	Base of Borehole	Base of Plain Pipe	Water Level	Flow affected by WL?	Reduced Water	
	%LEL	%by vol	%by vol	%by vol	(mb)	(l/h)	(ppm)	(mbgl)	(mbgl)	(mbgl)	Y/N	(m) A.O.D	
WS102	-	0.0	0.0	20.7	994.00	0.40	-	-	1.00	-	N	-	
	-	0.0	0.0	20.6									
	-	0.0	0.0	20.5									
	-	0.0	0.0	20.4									
	-	-	-	-									
WS103	-	0.0	0.0	20.6	994.00	0.20	-	1.85	1.00	1.04	N	-	
	-	0.0	0.0	20.5									
	-	0.0	0.0	20.4									
	-	0.0	0.0	20.4									
	-	-	-	-									
WS106	-	0.0	0.0	20.7	994.00	-1.20	-	0.90	0.50	0.57	N	-	
	-	0.0	0.0	20.6									
	-	0.0	0.0	20.5									
	-	0.0	0.0	20.4									
	-	-	-	-									
WS107	-	0.0	0.0	20.2	993.00	0.30	-	0.88	0.50	0.66	N	-	
	-	0.0	0.0	15.0									
	-	0.0	0.0	11.6									
	-	0.0	0.0	10.0									
	-	-	-	-									
COMMENTS: WS102 - Bung irremovable													
INSTRUMENTS USED: GA2000 Gas Monitor Electronic ATEX Dipmeter				ACCURACY OF INSTRUMENT (% by volume)		CH ₄		CO ₂		O ₂			
						± 0.5% @ 5%		± 0.5% @ 5%					
						± 1.0% @15%		± 1.0% @15%		± 1.0%			
						±3.0% @>15%		±3.0% @>15%					

A = Accumulated Type Sample

l/h = Litres per hour

%LEL = Lower Explosive Limit (for CH₄ in air 100% = 5% by volume)

SS = Steady State Type Sample

mb = Millibar

P = Peak Type Sample

mbgl = Metres Below Ground Level

	SUTCLIFFE INVESTIGATIONS				GAS MEASUREMENTS AND WATER LEVELS			Sheet No.:		1 of 1			
	TEL: 0151 227 3155							Atmospheric Pressure:		1013-1014mb			
	FAX: 0151 227 3156							Weather:		Cloudy			
								Pressure Trend:		Steady			
	VISIT No.: 5												
	CLIENT:		Knowsley Metropolitan Borough Council			SITE:		Cables Way, Prescott					
	Date of Fieldwork:		15/06/2021		Logged By:		MW	Job No.:		30259LG			
B/H Ref.	CH ₄		CO ₂	O ₂	Relative Pressure	Flow Rate	P.I.D	Base of Borehole	Base of Plain Pipe	Water Level	Flow affected by WL?	Reduced Water	
	%LEL	%by vol	%by vol	%by vol	(mb)	(l/h)	(ppm)	(mbgl)	(mbgl)	(mbgl)	Y/N	(m) A.O.D	
WS102	-	0.0	1.0	20.0	1014.00	0.00	-	-	1.00	-	N	-	
	-	0.0	3.0	17.0									
	-	0.0	5.0	15.0									
	-	0.0	5.8	14.7									
	-	-	-	-									
WS103	-	0.0	1.0	10.0	1014.00	0.00	-	1.85	1.00	1.79	N	-	
	-	0.0	2.0	19.0									
	-	0.0	3.0	18.4									
	-	0.0	3.2	18.4									
	-	-	-	-									
WS106	-	0.0	1.0	20.3	1013.00	0.00	-	0.90	0.50	DRY	N	-	
	-	0.0	1.3	20.0									
	-	0.0	1.4	20.0									
	-	0.0	1.4	20.0									
	-	-	-	-									
WS107	-	0.0	0.0	20.0	1013.00	0.00	-	0.89	0.50	0.80	N	-	
	-	0.0	0.0	14.3									
	-	0.0	0.0	10.5									
	-	0.0	0.0	9.4									
	-	-	-	-									
COMMENTS: WS102 - Bung irremovable													
INSTRUMENTS USED: GA2000 Gas Monitor Electronic ATEX Dipmeter				ACCURACY OF INSTRUMENT (% by volume)		CH ₄		CO ₂		O ₂			
						± 0.5% @ 5%		± 0.5% @ 5%					
						± 1.0% @15%		± 1.0% @15%		± 1.0%			
						±3.0% @>15%		±3.0% @>15%					

A = Accumulated Type Sample

l/h = Litres per hour

%LEL = Lower Explosive Limit (for CH₄ in air 100% = 5% by volume)

SS = Steady State Type Sample

mb = Millibar

P = Peak Type Sample

mbgl = Metres Below Ground Level

	SUTCLIFFE INVESTIGATIONS				GAS MEASUREMENTS AND WATER LEVELS			Sheet No.:		1 of 1			
	TEL: 0151 227 3155							Atmospheric Pressure:		1010mb			
	FAX: 0151 227 3156							Weather:		Sunny, clouds			
								Pressure Trend:		Steady			
	VISIT No.: 6												
	CLIENT:		Knowsley Metropolitan Borough Council			SITE:		Cables Way, Prescott					
	Date of Fieldwork:		30/06/2021			Logged By:		MW	Job No.:		30259LG		
B/H Ref.	CH ₄		CO ₂	O ₂	Relative Pressure	Flow Rate	P.I.D	Base of Borehole	Base of Plain Pipe	Water Level	Flow affected by WL?	Reduced Water	
	%LEL	%by vol	%by vol	%by vol	(mb)	(l/h)	(ppm)	(mbgl)	(mbgl)	(mbgl)	Y/N	(m) A.O.D	
WS102	-	0.0	1.0	20.0	1010.00	0.00	-	-	1.00	-	N	-	
	-	0.0	3.0	18.0									
	-	0.0	4.0	17.0									
	-	0.0	4.5	16.3									
	-	-	-	-									
WS103	-	0.0	1.0	20.8	1010.00	0.00	-	1.85	1.00	1.24	N	-	
	-	0.0	1.8	20.0									
	-	0.0	1.8	19.3									
	-	0.0	1.8	19.2									
	-	-	-	-									
WS106	-	0.0	0.5	20.6	1010.00	0.00	-	0.91	0.50	DRY	N	-	
	-	0.0	1.0	20.0									
	-	0.0	1.3	20.0									
	-	0.0	1.4	19.9									
	-	-	-	-									
WS107	-	0.0	0.0	20.0	1011.00	0.00	-	0.81	0.50	0.74	N	-	
	-	0.0	0.0	14.0									
	-	0.0	0.0	10.0									
	-	0.0	0.0	9.3									
	-	-	-	-									
COMMENTS: WS102 - Bung irremovable													
INSTRUMENTS USED: GA2000 Gas Monitor Electronic ATEX Dipmeter				ACCURACY OF INSTRUMENT (% by volume)		CH ₄		CO ₂		O ₂			
						± 0.5% @ 5%		± 0.5% @ 5%					
						± 1.0% @15%		± 1.0% @15%		± 1.0%			
						±3.0% @>15%		±3.0% @>15%					

A = Accumulated Type Sample

l/h = Litres per hour

%LEL = Lower Explosive Limit (for CH₄ in air 100% = 5% by volume)

SS = Steady State Type Sample

mb = Millibar

P = Peak Type Sample

mbgl = Metres Below Ground Level

	SUTCLIFFE INVESTIGATIONS			Calculation of Hazardous Gas Flow Rate			
	TEL: 0151 227 3155						
	FAX: 0151 227 3156						
	CLIENT: Knowsley Metropolitan Borough Council			SITE: Cables Way, Prescott			
				Job No.: 30259LG			
B/H Ref	Flow ² (l/h)	CH ₄ ³ (%)	CO ₂ ³ (%)	HGFR CH ₄ (l/h)	HGFR CO ₂ (l/h)	CS ¹	Traffic Light
WS102	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	0.2	0.1	0.1	0.0002	0.0002	CS1	Green
	0.4	0.1	0.1	0.0004	0.0004	CS1	Green
	0.1	0.1	5.8	0.0001	0.0058	CS2	Amber 1
	0.1	0.1	4.5	0.0001	0.0045	CS1	Green
WS103	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	0.2	0.1	0.1	0.0002	0.0002	CS1	Green
	0.2	0.1	0.1	0.0002	0.0002	CS1	Green
	0.1	0.1	3.2	0.0001	0.0032	CS1	Green
	0.1	0.1	1.8	0.0001	0.0018	CS1	Green
WS106	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	1.2	0.1	0.1	0.0012	0.0012	CS1	Green
	0.1	0.1	1.4	0.0001	0.0014	CS1	Green
	0.1	0.1	1.4	0.0001	0.0014	CS1	Green
WS107	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	0.3	0.1	0.1	0.0003	0.0003	CS1	Green
	0.1	0.1	0.1	0.0001	0.0001	CS1	Green
	0.1	0.1	0.1	0.0001	0.0001	CS1	Green

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



CL:AIRE RB17 Assessment

Job Number:	30259	
Job Name:	Cables Way, Prescott (Site 1)	
Sample ID	WS108	WS109
Depth Top	0.20	0.20
Depth Bottom	0.60	0.60
Date Sampled	31-Mar-21	31-Mar-21
Material Description (% of total sample)		
Inert >10mm	24.28	27.9
Wood >10mm	<0.10	<0.10
Vegetation >10mm	<0.10	<0.10
Cloth >10mm	<0.10	<0.10
Other Inert Material >10mm	<0.10	<0.10
Paper >10mm	<0.10	<0.10
Other Degradable Material >10mm	<0.10	<0.10
Fine Soil and Gravel <10mm	75.72	72.1
Total Organic Carbon (Fine Soil)	1.25	1.2

Age of Made Ground	<20 Years
Average Total Organic Carbon (% of total sample)	1.23
Average Thickness of Made Ground (m)	0.67
Maximum Thickness of Made Ground (m)	0.90

Characteristic Situation (BS 8485 and CIRIA C665)	CS2
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CL:AIRE RB17 Assessment

Job Number:	30259				
Job Name:	Cables Way, Prescott (Site 2)				
Sample ID	WS101	TP105	TP108	WS105	WS106
Depth Top	0.30	0.30	0.50	0.50	0.50
Depth Bottom	0.80	0.80	1.00	1.00	1.00
Date Sampled	29-Mar-21	29-Mar-21	29-Mar-21	31-Mar-21	31-Mar-21
Material Description (% of total sample)					
Inert >10mm	23.52	45.56	28.86	27.28	15.68
Wood >10mm	<0.10	<0.10	<0.10	<0.10	<0.10
Vegetation >10mm	<0.10	<0.10	<0.10	<0.10	<0.10
Cloth >10mm	<0.10	<0.10	<0.10	<0.10	<0.10
Other Inert Material >10mm	<0.10	<0.10	<0.10	<0.10	<0.10
Paper >10mm	<0.10	<0.10	<0.10	<0.10	<0.10
Other Degradable Material >10mm	<0.10	<0.10	<0.10	<0.10	<0.10
Fine Soil and Gravel <10mm	76.48	54.44	71.14	72.72	84.32
Total Organic Carbon (Fine Soil)	2.04	2.65	2.43	0.88	0.7

Age of Made Ground	<20 Years
Average Total Organic Carbon (% of total sample)	1.74
Average Thickness of Made Ground (m)	1.32
Maximum Thickness of Made Ground (m)	3.90

Characteristic Situation (BS 8485 and CIRIA C665)	CS3
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Appendix F – Geotechnical Laboratory Certificates



STRUCTURAL SOILS LTD

TEST REPORT



Report No. 584505-01 (00)

1774

Date 10-May-2021 Contract Cables Way Prescott

Client Envirolab
Address Units 7-8
Sandpits Business Park
Mottram Road
Hyde
SK14 3AR

For the Attention of Michael Knight

Samples submitted by client	21-April-2021	Client Reference	21/04176
Testing Started	27-April-2021	Client Order No.	P0746218
Testing Completed	06-May-2021	Instruction Type	Written

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory.

UKAS Accredited Tests

- | | |
|-------|---|
| 1.01 | Moisture Content (oven drying method) BS1377:Part 2:1990:clause 3.2 (superseded)* |
| 1.02 | Liquid Limit (definitive method) & Plastic Limit BS1377:Part 2:1990,clause 4.3/5.3 (superseded)* |
| 1.10 | Particle Size Distribution wet sieve method BS1377:Part 2:1990,clause 9.2 (superseded)* |
| 1.13a | Particle Size Distribution sedimentation pipette method BS1377:Part 2:1990,clause 9.4 (superseded)* |

* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of .
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd 18 Frogmore Rd Hemel Hempstead HP3 9RT Tel.01442 416661 e-mail dimitris.xirouchakis@soils.co.uk

TESTING VERIFICATION CERTIFICATE



1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **10/05/2021 14:16:19**.

Testing reported after this date is not covered by this Verification Certificate.

Approved Signatory
Sharon Cairns (Laboratory Manager)

(Head Office)
Bristol Laboratory
Unit 1A, Princess Street
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HP3 9RT

Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU



**STRUCTURAL
SOILS LTD**

Contract:

Cables Way Prescott

Job No:

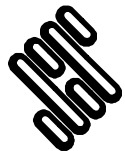
584505



SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Description of Sample
WS103	21041761	B	1.00	13	NP	NP	NP	87	Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY
WS104	21041762	B	0.80	18	38	21	17	80	Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY
WS106	21041763	B	0.50	14	35	18	17	66	Brown occasionally mottled grey and orange slightly gravelly slightly sandy silty CLAY



**STRUCTURAL
SOILS LTD**

Contract:

Cables Way Prescott

Contract Ref:

584505



GINT_LIBRARY_V10_01.GLB LibVersion: v8_07_001 PrjVersion: v8_07 | Graph L - ALINE STANDARD - AAP | 584505-CABLES-WAY-PRESCOT-ENVIROLAB-2104176.GPJ - v10_01.
Structural Soils Ltd, Branch Office - Hemel Hempstead, 18 Frogmore Road, Hemel Hempstead, Hertfordshire, HP3 9RT. Tel: 01442 262323, Fax: 01442 262663, Web: www.soils.co.uk, Email: ask@soils.co.uk, | 100521 - 14:17 | SCI |

PARTICLE SIZE DISTRIBUTION TEST

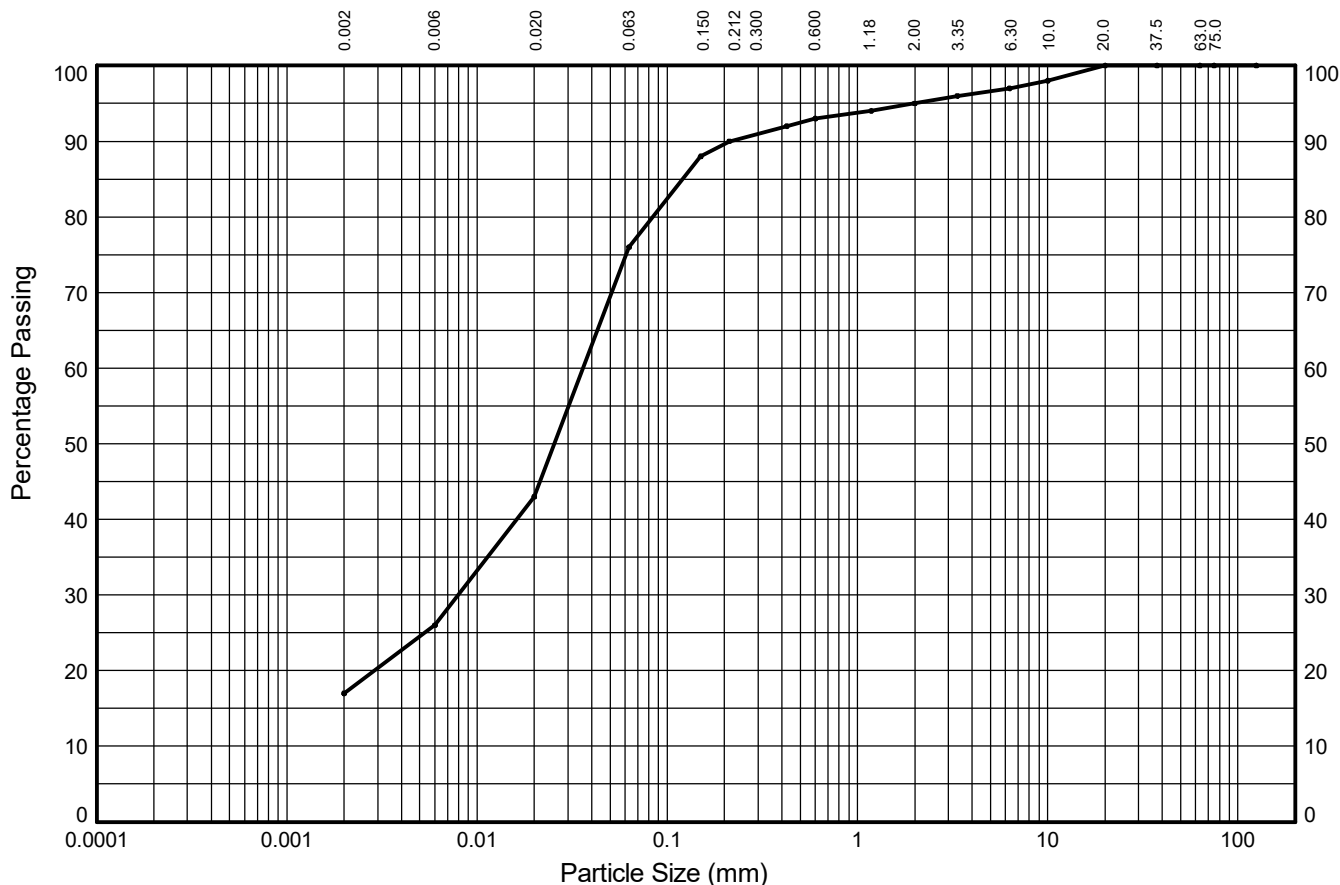
In accordance with clauses 9.2, 9.4 of BS1377:Part 2:1990

Window Sample: **WS103**

Sample Ref: **21041761**

Sample Type: **B**

Depth (m): **1.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	9%	17%	33%	14%	3%	2%	2%	3%	0%	
	SILT			SAND			GRAVEL			
17%	59%			19%			5%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	98
6.30	97
3.35	96
2.00	95
1.18	94
0.600	93
0.425	92
0.212	90
0.150	88
0.063	76

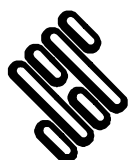
Particle Diameter (mm)	Percent Passing (%)
0.02	43
0.006	26
0.002	17
Sedimentation sample was not pre-treated	

Coefficients	
D ₁₀ (mm)	NA
D ₁₅ (mm)	NA
D ₃₀ (mm)	0.008
D ₅₀ (mm)	0.026
D ₆₀ (mm)	0.036
D ₈₅ (mm)	0.121
D ₉₀ (mm)	0.212
C _U	NA
C _C	NA

Soil Description:

Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2



STRUCTURAL SOILS
Anerley Court
Half Moon Lane
Hildenborough
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Cables Way Prescott

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PARTICLE SIZE DISTRIBUTION TEST

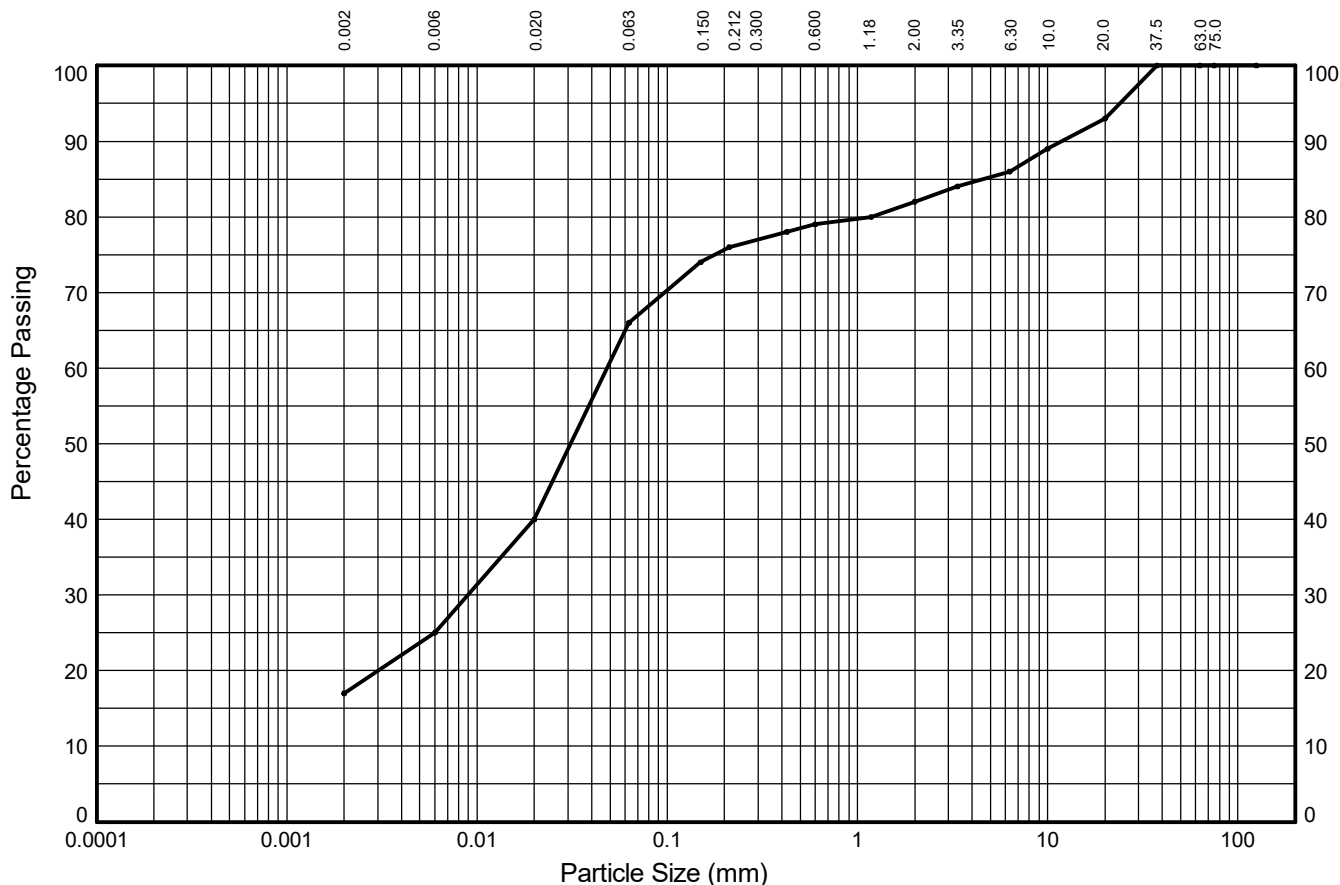
In accordance with clauses 9.2, 9.4 of BS1377:Part 2:1990

Window Sample: **WS104**

Sample Ref: **21041762**

Sample Type: **B**

Depth (m): **0.80**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	8%	15%	26%	10%	3%	3%	4%	7%	7%	
	SILT			SAND			GRAVEL			
17%	49%			16%			18%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	93
10.0	89
6.30	86
3.35	84
2.00	82
1.18	80
0.600	79
0.425	78
0.212	76
0.150	74
0.063	66

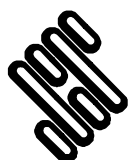
Particle Diameter (mm)	Percent Passing (%)
0.02	40
0.006	25
0.002	17
Sedimentation sample was not pre-treated	

Coefficients	
D ₁₀ (mm)	NA
D ₁₅ (mm)	NA
D ₃₀ (mm)	0.009
D ₅₀ (mm)	0.031
D ₆₀ (mm)	0.048
D ₈₅ (mm)	4.594
D ₉₀ (mm)	11.892
C _U	NA
C _C	NA

Soil Description:

Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2



STRUCTURAL SOILS
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PARTICLE SIZE DISTRIBUTION TEST

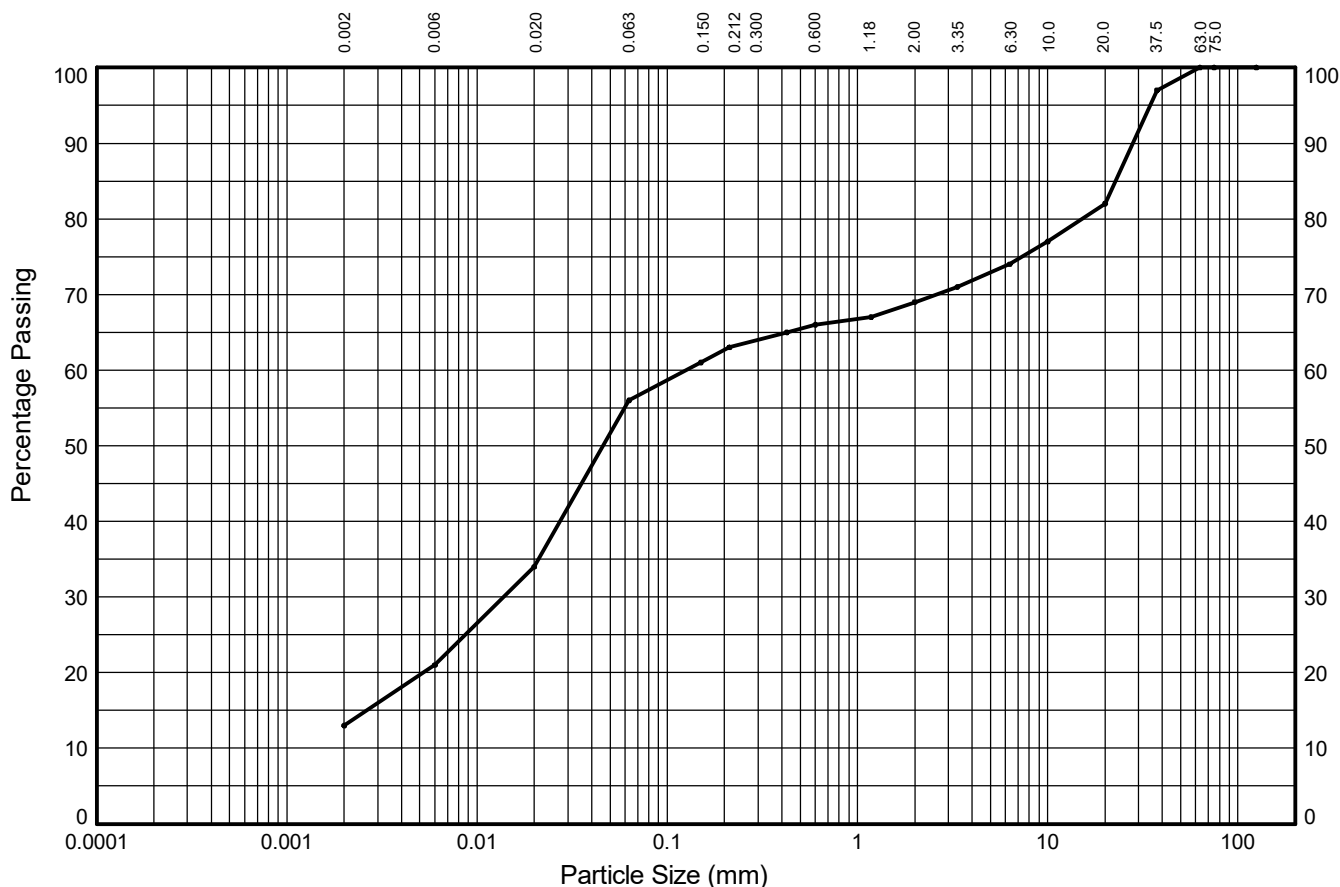
In accordance with clauses 9.2, 9.4 of BS1377:Part 2:1990

Window Sample: **WS106**

Sample Ref: **21041763**

Sample Type: **B**

Depth (m): **0.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	8%	13%	22%	7%	3%	3%	5%	8%	18%	
	SILT			SAND			GRAVEL			
13%	43%			13%			31%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	97
20.0	82
10.0	77
6.30	74
3.35	71
2.00	69
1.18	67
0.600	66
0.425	65
0.212	63
0.150	61
0.063	56

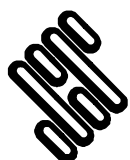
Particle Diameter (mm)	Percent Passing (%)
0.02	34
0.006	21
0.002	13
Sedimentation sample was not pre-treated	

Coefficients	
D ₁₀ (mm)	NA
D ₁₅ (mm)	0.003
D ₃₀ (mm)	0.014
D ₅₀ (mm)	0.046
D ₆₀ (mm)	0.126
D ₈₅ (mm)	22.679
D ₉₀ (mm)	27.966
C _U	NA
C _C	NA

Soil Description:

Brown occasionally mottled grey and orange slightly gravelly slightly sandy silty CLAY

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2



STRUCTURAL SOILS
Anerley Court
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10/05/21

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Contract Ref:

Cables Way Prescot

584505



Appendix G – Contamination Assessment Tables



Job Number:	30259
Job Name:	Cables Way, Prescot
Proposed Land Use:	Commercial / Industrial
S.O.M.	6

	Below Limit of Detection
	Above Threshold
n/t	Not Tested
NAD	No Asbestos Detected

n/t		Not Tested		Sample ID		WS101	WS104	TP101	TP102	TP103	TP104	TP105	TP106	TP107	TP108	WS105	WS106	WS107	WS108	WS109
NAD		No Asbestos Detected		Depth Top		0.20	0.40	0.05	0.00	0.45	0.20	0.55	0.00	0.00	0.00	0.20	0.20	0.20	0.20	0.20
				Depth Bottom		0.60	0.80	0.40	0.50	0.70	0.50	0.80	0.20	0.30	0.40	0.60	0.60	0.60	0.60	0.60
				Date Sampled		29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	29-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21	31-Mar-21
Contaminant		Units		Threshold																
Arsenic (Total)		mg/kg	640	16	12	1	3	7	<1	10	4	2	<1	4	<1	2	8	4		
Boron (Soluble)		mg/kg	240000	<1.0	<1.0	1.9	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Cadmium (Total)		mg/kg	190	14.6	2.3	0.8	0.8	5.4	0.9	5.8	1.2	0.7	<0.5	1.8	1.7	1.2	1.7	0.8		
Chromium III		mg/kg	8600	18	23	16	14	24	18	23	12	6	7	17	20	18	20	13		
Chromium VI		mg/kg	33	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Copper (Total)		mg/kg	68000	845	118	30	75	258	47	407	276	47	7	108	103	107	414	75		
Lead (Total)		mg/kg	2330	292	63	78	31	121	23	238	120	25	21	80	29	66	97	140		
Mercury (Total)		mg/kg	1100	<0.17	<0.17	1.72	3.91	0.75	3.02	0.72	0.94	0.76	4.27	1.66	<0.17	0.63	0.39	0.4		
Nickel (Total)		mg/kg	980	18	20	11	5	20	12	24	19	6	3	15	33	22	19	12		
Selenium (Total)		mg/kg	12000	<1	1	<1	1	1	1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1
Zinc (Total)		mg/kg	730000	114	69	209	117	142	47	185	82	49	25	61	87	119	96	122		
Cyanide (Total)		mg/kg	34	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenols (Total)		mg/kg	3200	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Organic matter		%	N/A	8.7	21.5	1.6	8.9	8.5	3.1	10.8	2.2	1	1.6	3.3	2.9	2.5	2.2	4.8		
Sulphate (Acid Soluble)		mg/kg	N/A	400	830	3800	320	230	1600	570	720	310	<200	650	<200	1100	610	790		
Sulphate as Water Soluble		g/l	N/A	0.04	0.01	0.35	0.02	<0.01	0.21	<0.01	0.06	0.05	<0.01	0.05	<0.01	0.04	0.06	0.02		
Sulphide		mg/kg	N/A	<5	<5	10	<5	<5	<5	8	<5	6	<5	<5	7	<5	<5	10		
pH		pH units	N/A	7.75	7.08	10.27	9.54	7.82	10.56	8.53	9.18	9.65	9.56	8.53	7.22	9.93	9	8.45		
Sulphur (Elemental)		mg/kg	N/A	19	25	<5	<5	9	<5	<5	<5	<5	<5	<5	20	<5	<5	<5	<5	<5
Asbestos																				
Asbestos in soil		N/A	N/A	NAD	Chrysotile	NAD	NAD	Chrysotile	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	Chrysotile	NAD	NAD	NAD
Asbestos Matrix (microscope)		N/A	N/A	-	Loose Fibres	-	-	Loose Fibres	-	-	-	-	-	-	-	-	Loose Fibres	-	-	-
ACM - Suitable for Water Absorption Test?		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asbestos in soil % composition		% w/w	0.001	n/t	0.002	n/t	n/t	<0.001	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	0.006	n/t	n/t	n/t
TPH Suite																				
TPH (Total)		mg/kg	N/A	33	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Aliphatic		mg/kg	N/A	15	166	439	40	519	78	248	88	70	2	57	<1	239	42	76		
>C5 to C6 aliphatic		mg/kg	12000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<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	40000	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<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	11000	<1	1	<10	<0.1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
>C10 to C12 aliphatic		mg/kg	47000	<1	<1	<10	<5	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
>C12 to C16 aliphatic		mg/kg	90000	<1	1	<10	<5	5	2	2	<1	<1	<1	<1	<1	8	<1	1		
>C16 to C35 aliphatic		mg/kg	1800000	14	126	236	n/t	311	54	164	53	47	2	33	<1	112	26	40		
>C35 to C44 aliphatic		mg/kg	1800000	1	38	193	11	203	19	82	35	23	<1	24	<1	119	15	34		
Total Aromatic		mg/kg	N/A	18	165	387	28	331	54	292	123	43	3	546	<1	173	44	80		
>C5 to C7 aromatic(Benzene)		mg/kg	86000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<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	180000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<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	17000	1	4	14	<5	2	2	2	2	<1	<1	<1	<1	2	<1	1		
>C10 to C12 aromatic		mg/kg	34000	<1	7	25	<5	17	4	7	<5	<1	<1	2	<1	2	<1	<1	<1	<1
>C12 to C16 aromatic		mg/kg	38000	4	13	53	<5	78	7	19	6	2	1	46	<1	10	6	3		
>C16 to C21 aromatic		mg/kg	28000	4	100	142	19	105	29	163	15	4	<1	184	<1	25	9	11		
>C21 to C35 aromatic		mg/kg	28000	7	39	145	9	125	10	99	70	23	2	296	<1	68	21	43		
>C35 to C44 aromatic		mg/kg	28000	2	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t
Aliphatic + Aromatic EC >44-70		mg/kg	N/a	n/t	n/t	n/t	n/t	n/t	n/t	n/t	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	90	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
toluene		mg/kg	180000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ethylbenzene		mg/kg	27000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<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	30000	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
O-Xylene		mg/kg	33000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<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	1100	<0.03	0.05	0.2	<0.03	<0.03	<0.03	0.39	<0.03	<0.03	<0.03	<0.03	<0.03	0.26	<0.03	<0.03	<0.03	<0.03
acenaphthylene		mg/kg	100000	<0.01	<0.01	0.02	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
acenaphthene		mg/kg	100000	<0.01	0.08	0.43	<0.01	<0.01	0.01	0.45	0.02	0.02	<0.01	0.04	<0.01	0.38	0.04	0.07		
fluorene		mg/kg	71000	<0.01	0.06	0.32	<0.01	<0.01	0.01	0.25	<0.01	0.02	<0.01	0.03	<0.01	0.27	0.02	0.05		
phenanthrene		mg/kg	23000	0.05	0.54	2.24	<0.03	0.12	0.11	1.07	0.18	0.12	0.07	0.24	<0.03	2.57	0.32	0.64		
anthracene		mg/kg	540000	<0.02	0.12	0.56	<0.02	<0.02	0.02	0.24	0.05	0.03	0.02	0.06	<0.02	0.63	0.09	0.16		
fluoranthene		mg/kg	23000	<0.08	0.59	2.64	<0.08	0.18	0.15	1.13	0.39	0.2	0.17	0.41	<0.08	4.61	0.8	1.58		
pyrene		mg/kg	54000	<0.07	0.55	2.43	<0.07	0.17	0.13	1.01	0.39	0.2	0.13	0.39	<0.07	4.92	0.8	1.55		
benzo(a)anthracene		mg/kg	180	<0.04	0.27	1.21	<0.04	0.08	0.06	0.48	0.19	0.12	0.07	0.17	<0.04	2.01	0.4	0.81		
chrysene		mg/kg	350	<0.06	0.36	1.11	<0.06	0.13	0.09	0.56	0.23	0.14	0.08	0.23	<0.06	2.22	0.47	0.9		
benzo(b)fluoranthene		mg/kg	45	<0.05	0.27	1	<0.05	0.12	0.06	0.49	0.2	0.17	0.05	0.23	<0.05	2.08	0.52	0.87		
benzo(k)fluoranthene		mg/kg	1200	<0.07	0.13	0.36	<0.07	<0.07	<0.07	0.17	<0.07	<0.07	<0.07	0.1	<0.07	0.79	0.19	0.36		
benzo(a)pyrene		mg/kg	35	0.06	0.31	1.25	<0.04	0.12	0.06	0.52	0.24.									

	Below Limit of Detection
	Above EQS Threshold
	Above UK DWS Threshold
	Above all Thresholds
n/t	Not tested

		Sample ID		WS106	WS108	WS109
		Depth Top		0.50	0.20	0.20
		Depth Bottom		1.00	0.60	0.60
		Date Sampled		31-Mar-21	31-Mar-21	31-Mar-21
Determinand Name	Units	Threshold				
Leachate Prep (10:1 Std NRA)*		EQS	UK DWS			
Arsenic (Soluble)*	µg/l	50	10	<1	<1	19
Boron (Soluble)	µg/l	1000	1000	<10	<10	33
Cadmium (Soluble)	µg/l	0.45 - 1.5	5	<1	<1	<1
Chromium Trivalent (Soluble)	µg/l	4.7	50	<0.10	<0.10	<0.10
Chromium Hexavalent (Soluble)	µg/l	3.4	50	<0.10	<0.10	<0.10
Copper (Soluble)	µg/l	1	2000	8	3	33
Lead (Soluble)	µg/l	14	10	1	2	14
Mercury (Soluble)	µg/l	0.07	1	<0.1	<0.1	<0.1
Nickel (Soluble)	µg/l	34	20	<1	2	<1
Selenium (Soluble)*	µg/l	n/a	10	<1	<1	<1
Sulphur (Free)	mg/l	n/a	n/a	<0.1	<0.1	<0.1
Zinc (Soluble)	µg/l	10.9	5000	6	4	9
Cyanide (Total)*	mg/l	1	50	<0.005	<0.005	<0.005
Phenols (Total)	µg/l	7.7	n/a	<0.01	<0.01	<0.01
Sulphate as SO3	mg/l	400	250	4.41	8.29	4.29
Sulphide as S	µg/l	0.25	n/a	<0.1	<0.1	<0.1
pH	pH units	n/a	n/a	7.3	6.57	8.44
TPH Total C6-C40 (leachable)		n/a	n/a	<80	254	<80
PAH Suite						
naphthalene*	µg/l	130	n/a	0.1	0.05	0.15
acenaphthylene*	µg/l	n/a	n/a	<0.01	<0.01	<0.01
acenaphthene*	µg/l	n/a	n/a	<0.01	<0.01	0.06
fluorene*	µg/l	n/a	n/a	<0.01	<0.01	<0.01
phenanthrene*	µg/l	n/a	n/a	<0.01	<0.01	<0.01
anthracene*	µg/l	0.1	n/a	<0.01	<0.01	<0.01
fluoranthene*	µg/l	0.12	n/a	<0.01	<0.01	<0.01
pyrene*	µg/l	n/a	n/a	<0.01	<0.01	<0.01
benzo(a)anthracene*	µg/l	n/a	n/a	<0.01	<0.01	<0.01
chrysene*	µg/l	n/a	n/a	<0.01	<0.01	<0.01
benzo(b)fluoranthene*	µg/l	0.017	n/a	<0.01	<0.01	<0.01
benzo(k)fluoranthene*	µg/l	0.017	n/a	<0.01	<0.01	<0.01
benzo(a)pyrene*	µg/l	0.27	0.01	<0.01	<0.01	<0.01
dibenzo(ah)anthracene*	µg/l	n/a	n/a	<0.01	<0.01	<0.01
benzo(ghi)perylene*	µg/l	0.0082	n/a	<0.01	<0.01	<0.01
indeno(123cd)pyrene*	µg/l	0.002	n/a	<0.01	<0.01	<0.01



Concrete Classification Data Sheet (Soil)

Job Number:	30259	Maximum Water Soluble Sulphate:	350
Job Name:	Cables Way, Prescott	Minimum pH:	7.1
Site Class:	Brownfield	Design Sulphate Class:	DS-1
Water Table:	Static	ACEC Class:	AC-1s
Intended Working Life:	50 Years	Design Chemical Class:	DC-1

Sample ID	Depth Top	Depth Bottom	Date Sampled	Water Soluble Sulphate (mg/l)	pH
WS101	0.20	0.60	29-Mar-21	40	7.8
WS101	0.30	0.80	29-Mar-21	-	-
WS104	0.40	0.80	29-Mar-21	10	7.1
TP101	0.05	0.40	29-Mar-21	350	10.3
TP102	0.00	0.50	29-Mar-21	20	9.5
TP103	0.45	0.70	29-Mar-21	<10	7.8
TP104	0.20	0.50	29-Mar-21	210	10.6
TP105	0.55	0.80	29-Mar-21	<10	8.5
TP105	0.30	0.80	29-Mar-21	-	-
TP106	0.00	0.20	29-Mar-21	60	9.2
TP107	0.00	0.30	29-Mar-21	50	9.7
TP108	0.00	0.40	29-Mar-21	<10	9.6
TP108	0.50	1.00	29-Mar-21	-	-
WS105	0.20	0.60	31-Mar-21	50	8.5
WS105	0.50	1.00	31-Mar-21	-	-
WS106	0.20	0.60	31-Mar-21	<10	7.2
WS106	0.50	1.00	31-Mar-21	-	-
WS107	0.20	0.60	31-Mar-21	40	9.9
WS108	0.20	0.60	31-Mar-21	60	9.0
WS109	0.20	0.60	31-Mar-21	20	8.5

Figure 3: Preliminary Conceptual Model

Preliminary Conceptual Site Model (CSM)

Site Plan

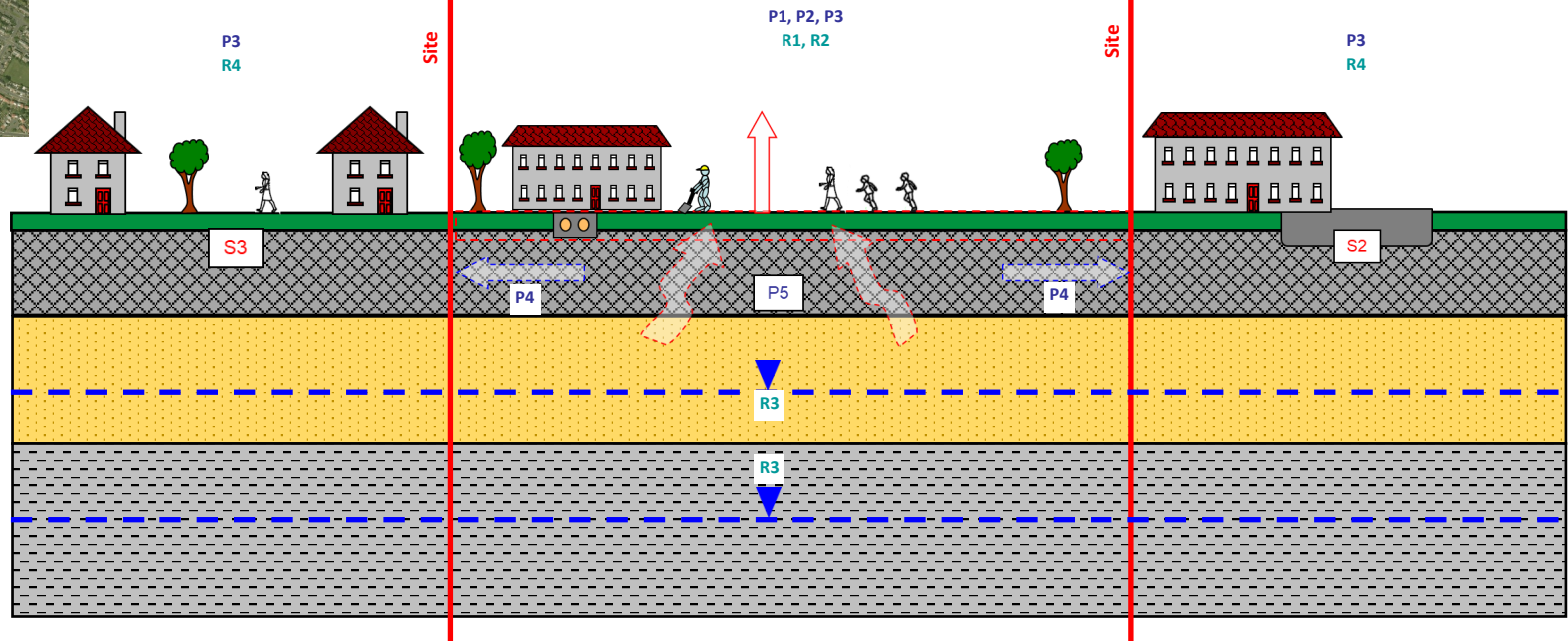


Adjacent Site users
RESIDENTIAL

Site users
COMMERCIAL

Adjacent Site users
COMMERCIAL

Stratum	Aquifer
MADE GROUND	N/A
TILL, DEVENSIAN	SECONDARY UNDIFFERENTIATED
PENNINE LOWER COAL MEASURES	SECONDARY A



Contamination Source	
S1	Potentially Contaminated Soil—Onsite
S2	Infilled Land x6
S3	Previously adjacent cable works

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

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

 Sutcliffe	Client: John F Beesley		
	Project: Cables Way, Prescott		
	Title: Preliminary Conceptual Site Model (CSM)		
	Reference: 30259-SUT-ZZ-00-RP-G-701-0001		
Purpose: Report	Draft	1	Scale (at A3): Not to scale
	Issue	1	
Issuing Office: Liverpool	Drawing number: 1		Version: A
Telephone: 0151 227 3155			

Figure 6: Revised Conceptual Model

Revised Conceptual Site Model (CSM)

Site Plan

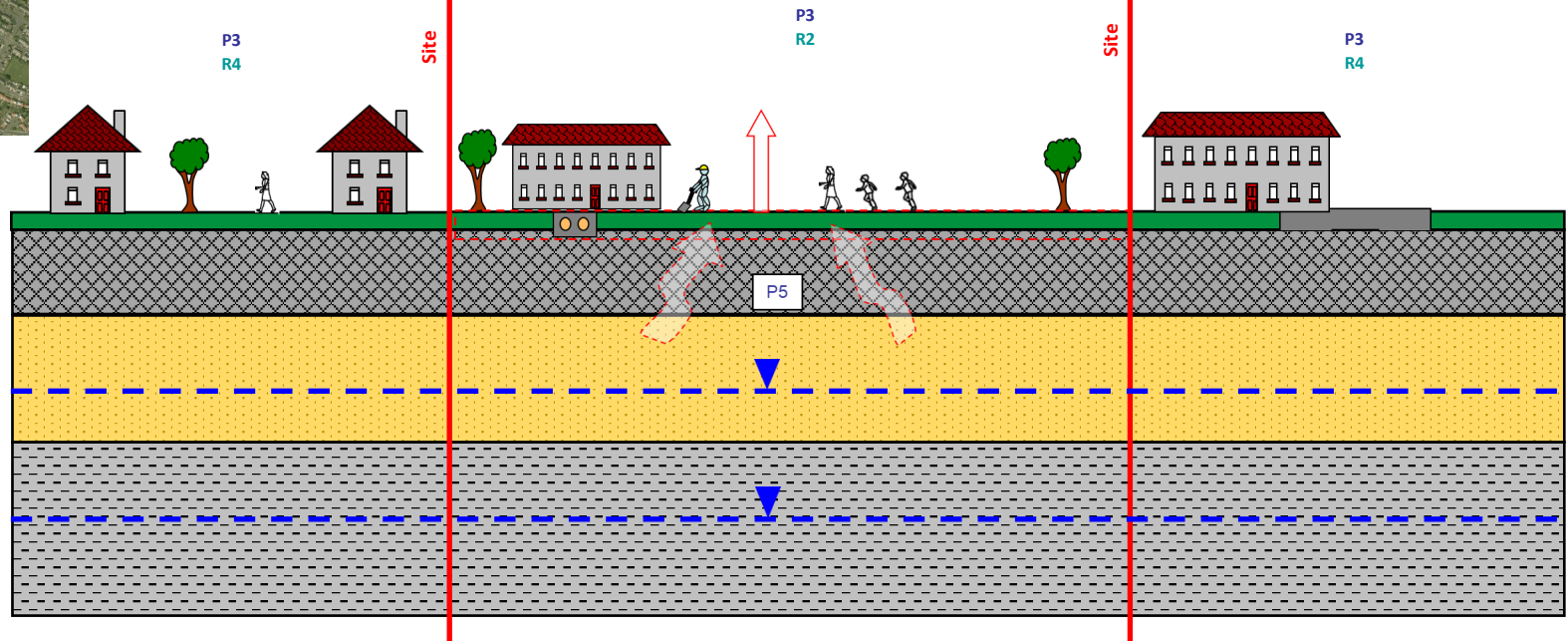


Adjacent Site users
RESIDENTIAL

Site users
COMMERCIAL

Adjacent Site users
COMMERCIAL

Stratum	Aquifer
MADE GROUND	N/A
TILL, DEVENSIAN	SECONDARY UNDIFFERENTIATED
PENNINE LOWER COAL MEASURES	SECONDARY A



Contamination Source	
S1	Potentially Contaminated Soil—Onsite

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

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



Purpose: Report

Issuing Office: Liverpool

Telephone: 0151 227 3155

Client: John F Beesley

Project: Cables Way, Prescott (Site 2)

Title: Revised Conceptual Site Model (CSM)

Reference: 30259-SUT-ZZ-00-RP-G-701-0001

Draft

1

Scale (at A3): Not to scale

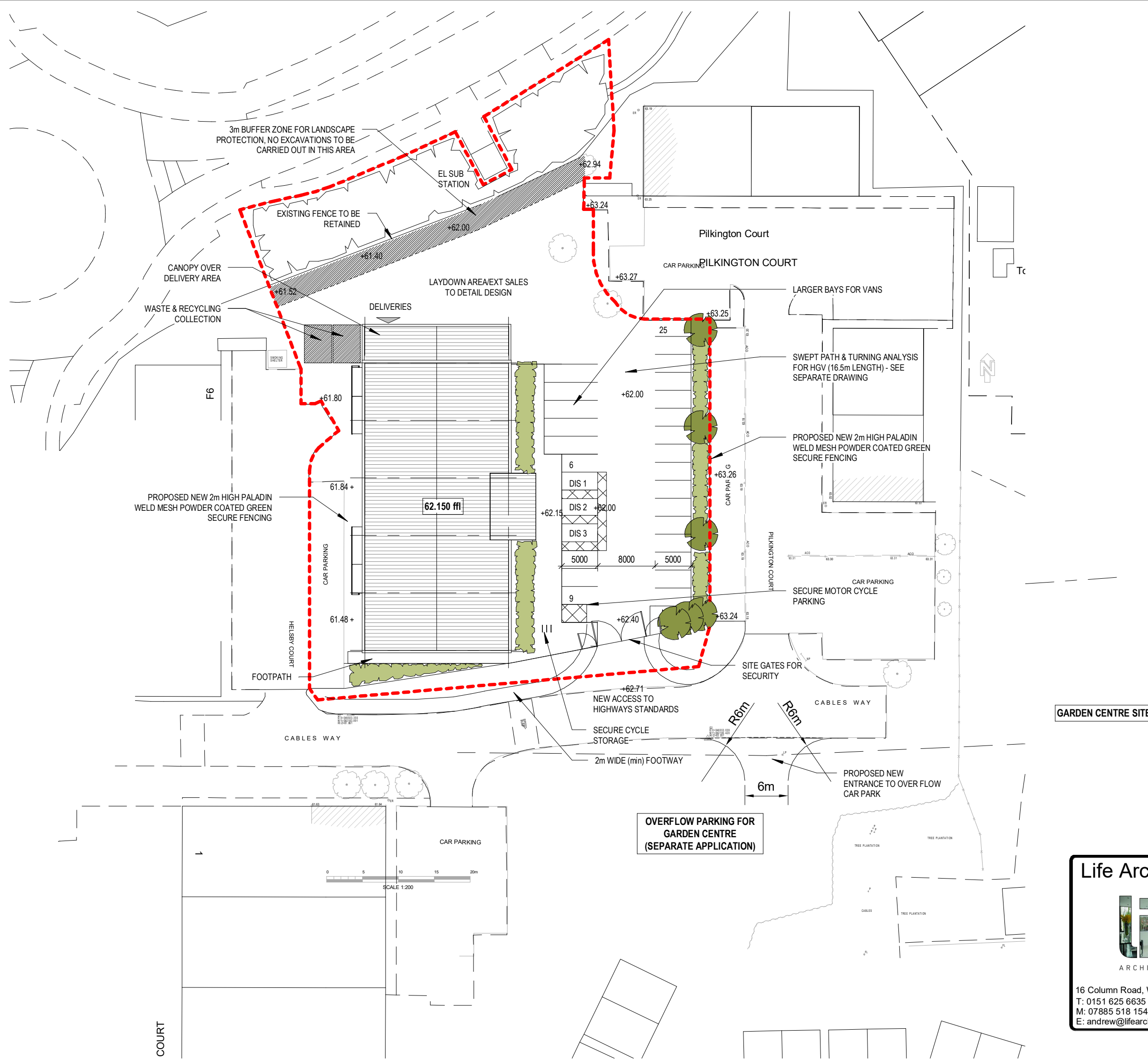
Issue

1

Drawing number: 1

Version: A

Drawing No 201a (Site Plan as Proposed - Home Improvement Centre)



GARDEN CENTRE SITE

A - UPDATES FOR PLANING 11/11/20

Life Architecture Ltd



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E: andrew@lifearchitecture.co.uk

Client: Beesley & Fildes			
Job Title: Proposed new Home Improvement Centre, Cables Way, Prescott			
Drawing Title: Site Plan as Proposed			
Date:	Scale:	Rev:	Dwg No:
Apr 2020	1 : 500		201

Drawing No 201e (Site Plan as Proposed - Garden Centre)

Drawing No 30259-SUT-ZZ-00-RP-G-702-0001 (Home Improvement Centre)





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Drawing Status

FOR INFORMATION

Client

JOHN F BEESLEY

Project

CABLES WAY PRESCOT
HOME IMPROVEMENT CENTRE

Drawing Title

SITE INVESTIGATION LOCATIONS
ON PROPOSED PLAN

P01 PRELIMINARY DRAWING		04/21	AT	DB
Rev	Description	Date	By	Chkd
Date	Drawn By	Checked By		
APR 2021	A TOSH	WGB		
Scale at A3 NTS		Project Number 30259LG		
Sheet Number			Revision	
30259-SUT-ZZ-00-DR-G-720-0001			P01	

Drawing No 30259-SUT-ZZ-00-RP-G-702-0002 (Garden Centre)





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Client
JOHN F BEESLEY

Project
**CABLE WAY PRESCOT
GARDEN CENTRE**

Drawing Title
**SITE INVESTIGATION LOCATIONS
ON EXISTING PLAN**

P01	PRELIMINARY DRAWING	04/21	AT	WB
Rev	Description	Date	By	Chkd
Date	Drawn By	Checked By		
APR 2021	A TOSH	WGB		
Scale at A3 NTS		Project Number 30259LG		
Sheet Number 30259-SUT-ZZ-00-DR-G-720-0002				Revision P01

Drawing Status

FOR INFORMATION