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Innovative Land Development Solutions

GEOENVIRONMENTAL ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT
WOODSIDE CONFERENCE CENTRE
CREWE LANE, KENILWORTH

Report No: 20256/3
Date: June 2022

Prepared for

CREWE LANE KENILWORTH JV LLP

PROJECT QUALITY ASSURANCE
INFORMATION SHEET

GEOENVIRONMENTAL ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT
WOODSIDE CONFERENCE CENTRE
CREWE LANE, KENILWORTH

Report Status:	**Final**
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Georisk Management Limited has been commissioned to carry out a geoenvironmental assessment of the above site which is being considered for residential redevelopment.

Phase I	Comments
The Site	The site is situated off Glasshouse Lane to the east of the town of Kenilworth in Warwickshire and can be located approximately by National Grid Reference 430766, 271931. Access to the site is via two access roads from Glasshouse Lane to the west. It is an irregularly shaped parcel of land covering an area of approximately 1.8 hectares and comprises a former conference centre and hotel complex with a number of associated outbuildings. A pond is present in the north-east of the site, noted to be heavily overgrown at the time of the walkover. Four above ground fuel storage tanks are present on the site, two located within a brick bund adjacent to the northern boundary of the site and two present within a brick bund on the southern boundary of the site. Slight hydrocarbon staining was noted within the base of the bunds, however, no evidence of significant contamination was noted around the fuel tank or in any other areas of the site during the site walkover. Surrounding land use in all directions is predominantly agricultural.
Site History	Historical maps indicate that the site comprised a large residential property known as "Woodside" from the earliest mapping reviewed (1886). This remained until 2002 mapping that identifies the site as "Woodside Management training centre".
Geology	The geology of the site is anticipated to comprise weathered mudstone and sandstone of the Ashow Formation of Permian age. Superficial deposits are not recorded on the site.
Coal Mining	The site is not in an area affected by past shallow coal mining activities.
Hydrology	The nearest surface watercourse to the site is an unnamed stream, recorded approximately 150 m to the north/north-east of the site. The EA has no record of licensed surface water abstractions or licensed discharge consents within 250 m of the site.
Flood Risk	Based on current information provided by the EA and included within the Landmark Envirocheck Report, the site is not in an area likely to be at risk from river flooding.
Hydrogeology	The Ashow Formation is classified by the EA as a 'Principal' Aquifer. The EA has no records of any licensed groundwater abstractions within 250 m of the site and the site is not mapped by the EA to be within a Source Protection Zone (SPZ).
Landfills	The EA has no records of any active licensed waste management facilities (landfills) within 250 m of the site. The EA and Local Authority (LA) have no records of any historic landfills within 250 m of the site. The Envirocheck Report includes no records of any potentially infilled land within 250 m of the site.
Pollution	The EA has no records of any significant or major pollution incidents to controlled waters within 250 m of the site. The Envirocheck Report does not identify any sites within 250 m of the study area that are potential pollution hazards/potential sources of industrial pollution and regulated under the EC Integrated Pollution Prevention or any significant/major pollution incidents to controlled waters.
Radon	Radon protection measures are not required for a residential development at the site.

Phase II	Comments
Ground Conditions	Topsoil was encountered in WS03 to WS05 and generally comprised light brown slightly clayey sand from surface level to depths of between 0.05 and 0.30 m begl. Made Ground was encountered in WS01, WS02 and WS06 as either tarmac hardstanding overlying limestone chippings in a dark grey/reddish brown sandy clay/clayey sand matrix\to a maximum depth of 0.4 m begl or dark grey very gravelly sand with frequent limestone chippings, quartzite, brick and concrete to a maximum depth of 0.3 m begl. Ashow Formation was encountered at depths of between 0.05 and 0.40 m begl and was proved to a maximum penetrated depth of 3.0 m begl. It comprised firm to stiff reddish brown variably sandy/silty clay generally becoming friable from approximately 2.0 m depth. The results of 16 No. SPT carried out in the Ashow Formation at depths of between 1.0 and 3.0 m begl returned 'N' values of between 7 and 50.
Contamination	No visual/olfactory evidence of potential significant contamination was recorded during the fieldwork.
Groundwater	During the fieldwork, groundwater was not recorded in any of the exploratory holes. Subsequent monitoring of standpipes constructed in WS02, WS03 and WS05 has recorded standing water levels of between 1.46 and 2.92 m begl.
Soil-Gas	Steady state carbon dioxide levels across the site ranged from 0.3 to 3.7 % v/v. No methane or significant positive gas flow rates have been recorded during the monitoring programme and ambient atmospheric pressures ranged from 1001 to 1008 mb.
Environmental Assessment	Comments
Soil Contamination	All test results for the potential contaminants of concern at the site are below the relevant assessment criteria (S4UL/C4SL/SSV). All samples were screened for the presence of asbestos. Asbestos was not identified in any of the samples analysed.
Risk Evaluation: Human Health	On the basis of the ground investigation and chemical test results, no significant remedial action in respect of risk to human health is considered necessary for the proposed development at the site.
Risk Evaluation: Soil-Gas	From the monitoring results for carbon dioxide, a maximum GSV of 0.0037 l/hr has been calculated, which is below the GSV of 0.07 l/hr for a CS1 classification. A GSV has not been calculated for methane due to the absence of recorded gas. The monitoring validates the previous assessment of the wider site in this location and a 'Characteristic Situation 1' is considered appropriate for the site – gas protection is not required for a 'Characteristic Situation 1' classification. This is supported by the established ground conditions and environmental setting.
Statutory Consultation	If required to satisfy planning or land quality conditions, the gas protection strategy should be agreed with the Local Authority and/or NHBC/warranty provider in advance of development works starting on site.
Geotechnical Assessment	Comments
Foundations	This ground investigation has recorded topsoil and nominal thicknesses of Made Ground overlying firm to stiff clay of the Ashow Formation. The proposed new built development is to comprise traditional low-rise housing, therefore, based on the ground conditions encountered, it is considered that conventional strip/trench fill foundations deepened through any Made Ground and/or demolition disturbed material and bearing onto competent natural soil should be viable for the proposed development. Geotechnical testing of the near-surface soil indicates the near-surface soils should be classified as a shrinkable soil of medium volume change potential and; therefore, a minimum founding depth of 0.9 m would need to be adopted, in line with NHBC Standards, providing at least 300 mm penetration into competent natural materials is achieved. For strip/trench fill foundations placed in competent firm to stiff clay an allowable bearing capacity of 125 kN/m^2 is considered appropriate for these materials. Total settlements would not be anticipated to exceed 25 mm. Foundations near any existing trees and/or hedgerows to be removed/retained would need to be deepened and heave protection measures adopted in accordance with NHBC Standards Chapter 4.2 'Building Near Trees'. Where foundation depths exceed 2.5 m due to tree influence, the NHBC require a design by an Engineer to demonstrate that potential heave uplift forces can be resisted by the foundation and this usually entails the use of a piled foundation. These aspects should be considered further at detailed design stage and a detailed tree/hedgerow survey will be required to assist with foundation design – further ground investigation may be required tailored to a specific layout or for pile design (if necessary). Care should be taken to limit the exposure of any excavation prepared to receive concrete, which may cause deterioration and a reduction in bearing capacity. Foundation excavations should be inspected by qualified personnel and if any soft/loose material is encountered at formation level, foundations would need to be deepened further into competent material and replaced with lean-mix concrete.

Geotechnical Assessment	Comments
Floor Slabs	Given the presence of shrinkable soils, it is recommended that a suspended floor slab design (cast in situ or 'beam and block' with underfloor void) is adopted in accordance with NHBC Standards.
Buried Concrete	For the near-surface soils, water soluble sulphate testing results (expressed as SO_4 in a 2:1 water:soil extract) range from <0.01 to 0.05 g/l with pH values of 5.5 to 9.4. Following the guidance given in the BRE Special Digest (2005) and assuming 'mobile' groundwater conditions for a 'brownfield' site, the Aggressive Chemical Environment (ACEC) classification has been determined. These indicate a Design Sulphate Class of DS-1 and an ACEC class of AC-2z apply at the site.
Pavement Design	For preliminary design purposes, the following long term equilibrium CBR values could be assumed for the various near-surface material present at the site (based on average construction conditions): • Made Ground: 2%; • Ashow Formation: 3%. he proposed formation should be proof rolled and caution must be exercised to ensure that any soft/loose areas identified within the formation are excavated and filled with suitably compacted granular fill. In situ CBR tests should be undertaken to allow detailed design of pavement/road formations to be made.
Dewatering	The findings of this investigation indicate that groundwater ingress is unlikely to occur in temporary excavations; however, it is envisaged that any ingress should be controllable by sump pumping.
Excavations	Conventional mechanical excavation should be readily achievable in the near-surface soil to depths of at least 3 m begl. Shallow excavations should remain stable in the short-term; however, instability may occur in excavations left open for extended periods of time. Support should be provided in any excavations requiring man entry. Care should be taken to limit the exposure of any excavation prepared to receive concrete, which may cause deterioration and a reduction in bearing capacity. All foundation excavations should be inspected by qualified personnel and any soft or loose materials that are encountered should be removed and replaced with lean mix concrete.
Soakaways	The near-surface geology comprises generally cohesive clay soil and; therefore, it is considered unlikely to be suitable for the use of soakaway drainage.
Additional Work	Comments
Various	If required to satisfy planning and/or land quality conditions, this report should be submitted to the Local Authority and/or warranty provider as appropriate for approval and discharge of any such planning or land quality conditions before any development works start on site.

The above summary is intended for reference purposes only and specific details should be obtained by reading the entire report.

FOREWORD

This report has been prepared for the sole internal use and reliance of the Client(s) named on the Project Quality Assurance Information Sheet. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Georisk Management Ltd (Georisk). If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The report should be read in its entirety, including all associated drawings and appendices. Georisk 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 are based on information obtained from a variety of sources as detailed within this report and which Georisk believes is reliable. All reasonable care and skill has been applied in examining the information obtained, nevertheless, Georisk 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 geoenvironmental consultants. Georisk does not provide legal advice and the advice of lawyers may also be required.

Any recommendations made or opinions expressed in the Report are based on the exploratory hole records, an examination of samples and the results of the site and laboratory tests. No liability can be accepted for conditions not revealed by the exploratory holes particularly between positions. Whilst every effort is made to ensure accuracy of data supplied any opinion expressed as to the possible configuration of strata between or below investigation locations is for guidance only and no responsibility is accepted as to its accuracy.

Unless otherwise specifically stated, this report assumes that ground levels will not change significantly from those existing at present and that the proposed development will be of two to three storey construction. If this is not to be the case, some modifications to this report may be required.

The groundwater conditions entered on the borehole records and from any monitoring programme are those observed at the time of the investigation. Groundwater levels are susceptible to seasonal fluctuations and may be higher during wetter periods than those encountered during this investigation.

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

Georisk reserves the right to amend the conclusions and recommendations made in this report in the light of any further or more detailed information that may become available.

GEOENVIRONMENTAL ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT
WOODSIDE CONFERENCE CENTRE
CREWE LANE, KENILWORTH

1. INTRODUCTION

1.1 Georisk Management Limited (Georisk) has been instructed by Vistry Partnerships West Midlands (Vistry), acting on behalf of Crewe Lane Kenilworth JV LLP to carry out a geoenvironmental assessment of a parcel of land known as Woodside Conference Centre, located off Crewe Lane to the east of the town of Kenilworth in Warwickshire. The work was carried out in accordance with Georisk's email offer dated 17 March 2022.

1.2 The land parcel occupied by the former Woodside Conference Centre lies within a larger site area that is presently being prepared for development. The wider site area was previously investigated by GRM Development Solutions Limited (GRM) as detailed in the following reports (which should be referenced for background and supporting information):

- "Phase I Site Appraisal (Desk Study) – Land East of Kenilworth (Crewe Lane and Woodside Training Centre)" prepared by GRM Development Solutions Limited (GRM) ref. GRM/P8151/DS.1 dated October 2017;
- "Phase II Site Appraisal – Land East of Kenilworth (Crewe Lane and Woodside Training Centre)" prepared by GRM ref. GRM/P8151/F.1 dated November 2018;
- "Gas Addendum Letter for Land East of Kenilworth" prepared by GRM ref. P8151/GAL dated November 2020.

1.3 The site is to be developed for a residential use and; therefore, the principal aims of this investigation are as follows:

- to carry out Phase I hazard identification and assessment summary utilising the existing Phase I Site Appraisal for the wider site area, including determination of an initial conceptual model based on 'source-pathway-target' principles;
- to determine the prevalent ground and groundwater conditions at the site;
- to provide an assessment of the concentrations of a range of potential contaminants of concern within the near-surface soils, including Phase II evaluation of risk to human health and environmental receptors;
- to identify any potential geoenvironmental constraints or opportunities associated with the development of the site for a residential end use;
- to provide general geotechnical design recommendations for the proposed development scheme.

1.4 This report presents the factual data obtained from the programme of fieldwork, monitoring and laboratory testing implemented by Georisk, together with an assessment of the contamination status of the near-surface soils and general engineering considerations for the proposed development scheme.

2. INFORMATION SOURCES

2.1 The information sources used in the production of this report were as follows:

- "Phase I Site Appraisal (Desk Study) – Land East of Kenilworth (Crewe Lane and Woodside Training Centre)" prepared by GRM ref. GRM/P8151/DS.1 dated October 2017;
- "Phase II Site Appraisal – Land East of Kenilworth (Crewe Lane and Woodside Training Centre)" prepared by GRM ref. GRM/P8151/F.1 dated November 2018;
- "Gas Addendum Letter for Land East of Kenilworth" prepared by GRM ref. P8151/GAL dated November 2020.
- site walkover to appraise current layout and conditions;
- review of British Geological Survey (BGS) maps and publications;
- information gained with respect to the ground and groundwater conditions established in the programme of fieldwork and monitoring carried out by Georisk;
- appraisal of laboratory data resulting from chemical and geotechnical testing scheduled by Georisk;
- "Woodside Complex, Crewe Ln, Kenilworth – Appraisal Layout" by Vistry Partnerships reference WSK-101-10 dated 18/01/2022.

3. REFERENCE SOURCES

3.1 This report has been prepared regarding the following sources of reference and guidance, supplemented with experience of similar sites:

- Investigation of Potentially Contaminated Sites – Code of Practice. British Standards Institute BS10175 (2011+A2:2017);
- Code of Practice for Site Investigations. BS5930 (2015+A1:2020);
- Human health toxicological assessment of contaminants in soil. Science Report SC050021/SR2 EA (2009);
- The LQM/CIEH S4ULs for Human Health Risk Assessment. LQM 2015;
- Updated technical background to the CLEA Model. Science Report SC050021/SR3 EA (2009);
- Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. SP1010 DEFRA/CL:AIRE (2014);
- Land Contamination Risk Management. EA (2020);
- Guidance on Comparing Soil Contamination Data with a Critical Concentration. CIEH and CL:AIRE (2008);
- Guidance for the Safe Development of Housing on Land Affected by Contamination. R & D Publication 66, NHBC, Environment Agency and CIEH (2008);
- Concrete in Aggressive Ground. BRE Special Digest 1: Part 1 Assessing the aggressive chemical environment. Building Research Establishment (2005);
- Radon: guidance on protective measures for new dwellings. BRE Report BR211 (2015);
- Code of practice for design of protective measures for methane and carbon dioxide ground gases for new buildings. BS8485 (2015+A1:2019);
- Guidance on Evaluation of Development Proposals on sites where Methane and Carbon Dioxide are Present. NHBC report Edition No. 4 (2007);
- Assessing Risks Posed by Hazardous Ground Gases to Buildings. CIRIA Report C665 (2006);
- Passive venting of soil gases beneath buildings. DETR/ARUP Environmental PIT Research Report (1997);
- Protective measures for housing on gas-contaminated land. BRE/EA Report BR414 (2001);
- Site preparation and resistance to moisture. The Building Regulations 2000 Approved Document C (2004 edition);
- Specification for Topsoil and Requirements for Use. BS3882 (2015);
- NHBC Standards (2017).

4. THE SITE

4.1 Site Location and Description

4.1.1 The site is situated off Glasshouse Lane to the east of the town of Kenilworth in Warwickshire and can be located approximately by National Grid Reference 430766, 271931. Access to the site is via two access roads from Glasshouse Lane to the west.

4.1.2 It is an irregularly shaped parcel of land covering an area of approximately 1.8 hectares and comprises a former conference centre and hotel complex with a number of associated outbuildings. A pond is present in the north-east of the site, noted to be heavily overgrown at the time of the walkover.

4.1.3 Four above ground fuel storage tanks are present on the site, two located within a brick bund adjacent to the northern boundary of the site and two present within a brick bund on the southern boundary of the site. Slight hydrocarbon staining was noted within the base of the bunds, however, no evidence of significant contamination was noted around the fuel tank or in any other areas of the site during the site walkover.

4.1.4 Surrounding land use in all directions is predominantly agricultural.

4.2 Environmental Setting

4.2.1 GRM produced a Phase I site appraisal for surrounding farmland entirely encapsulating the subject site. The GRM report has been utilised as a preliminary source of desk study information to inform the conceptual site model for this assessment.

4.2.2 Based on the GRM Desk Study the environmental setting of the site can be summarised as follows:

- historical maps indicate that the site comprised a large residential property known as "Woodside" from the earliest mapping reviewed (1886). This remained until 2002 mapping that identifies the site as "Woodside Management training centre";
- the geology of the site is anticipated to comprise weathered mudstone and sandstone of the Ashow Formation of Permian age;
- superficial deposits are not recorded on the site;
- the site is not in an area affected by past shallow coal mining activities;
- the nearest surface watercourse to the site is an unnamed stream, recorded approximately 150 m to the north/north-east of the site;
- the EA has no record of licensed surface water abstractions within 250 m of the site;
- the EA has no record of licensed discharge consents within 250 m of the site;
- based on current information provided by the EA and included within the Landmark Envirocheck Report, the site is not in an area likely to be at risk from river flooding;
- the Ashow Formation is classified by the EA as a 'Principal' Aquifer;
- the EA has no records of any licensed groundwater abstractions within 250 m of the site;
- the site is not mapped by the EA to be within a Source Protection Zone (SPZ);
- the EA has no records of any active licensed waste management facilities (landfills) within 250 m of the site;
- the EA and Local Authority (LA) have no records of any historic landfills within 250 m of the site;
- the Envirocheck Report includes no records of any potentially infilled land within 250 m of the site;
- the EA has no records of any significant or major pollution incidents to controlled waters within 250 m of the site;
- the Envirocheck Report does not identify any sites within 250 m of the study area that are potential pollution hazards or potential sources of industrial pollution and regulated under the EC Integrated Pollution Prevention and Control Directive (IPPC);

- the EA has no records of any significant or major pollution incidents to controlled waters within 250 m of the site;
- radon protection measures are not required for a residential development at the site.

5. INITIAL CONCEPUTAL SITE MODEL AND PRELIMINARY RISK ASSESSMENT

5.1 General

5.1.1 The initial conceptual site model and preliminary risk assessment are based on information derived from the desk study to provide a qualitative assessment of risk posed to human health and environmental receptors from potential on and off-site sources of contamination as defined within Part IIA of the Environmental Protection Act (1990). For a significant risk to exist, it must be established that contamination has the potential to cause harm to susceptible targets. This is known as "pollutant linkage" and requires three criteria to be identified at a significant level:

- the presence of substances that may cause harm (SOURCE);
- the presence of a receptor which may be harmed (TARGET);
- the existence of a plausible pollutant linkage between the source and the target (PATHWAY).

5.1.2 EA R&D66 (2008) includes a risk classification system based on classification of consequence and probability. Table 1 shows a risk matrix, in which the likelihood or probability of each pollutant linkage being realised is ranked against the severity of the consequences. The result is the risk classification, based upon which risk management actions can be implemented. The individual sources, pathways and receptors identified are assessed against this risk matrix; potential pollutant linkages and associated risks are recorded.

		Severity of Consequence			
		Severe	Medium	Mild	Minor
	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 1: Risk Matrix

5.1.3 Definitions of risk terminology are as follows.

5.1.4 Very high risk: there is a probability that severe harm could arise to a designated receptor from an identified source, or there is evidence that severe harm to a designated receptor is currently occurring.

5.1.5 High risk: harm is likely to arise to a designated receptor from an identified source.

5.1.6 Moderate risk: it is possible that harm could arise to a designated receptor from an identified source. 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.

5.1.7 Low risk: it is possible that harm could arise to a designated receptor from an identified source, but it is likely that this harm, if realised, would at worst normally be mild.

5.1.8 Very low risk: there is a low possibility that harm could arise to the receptor. In the event of such harm being realised it is not likely to be severe.

5.1.9 Professional judgement and experience has been used to estimate the combination of probability and consequence of the harm posed by the pollutant linkages identified. This allows the risk to be evaluated on a qualitative basis. The risk category is used to prioritise/target the site investigation. Using this matrix and the available screening limits it has been possible to carry out a semi-quantitative risk assessment for the sources, pathways and receptors which have been identified at the site.

5.1.10 The initial conceptual model also illustrates the contaminants of concern identified from the contamination assessment and demonstrates the potential pathways and receptors which are considered likely to exist at the site.

5.1.11 Risk is based on a consideration of both:

- the likelihood of an event (probability); and
- the severity of the potential consequences.

5.1.12 A pollutant linkage must be established before tests for probability and consequence are applied. If there is no pollutant linkage then there is no potential risk and there is no need to apply tests for probability and consequence. The risk assessment needs to include a logical and transparent system to define categories of severity of consequence and probability of occurrence. The initial conceptual model and preliminary risk assessment are discussed below.

5.2 Proposed Development

5.2.1 The site is to be developed with housing, together with private gardens, access roads and areas of public open space.

5.3 Potential On-Site Sources of Contamination

5.3.1 Based on information derived from the Phase I Desk Study, it is considered that the above ground fuel storage tanks recorded on the site represent potential sources of hydrocarbon contamination and asbestos may be present due to the age of buildings on the site. Nominal Made Ground associated with the previous use of the site should be anticipated.

5.3.2 No other potential significant on-site sources of contamination have been identified that could affect the proposed development; therefore, as the site is to be developed for a sensitive end use, routine chemical testing including targeted hydrocarbon testing, asbestos screening and appropriate risk assessment should form part of a Phase II investigation.

5.3.3 No potential significant sources of soil-gas have been identified that could affect the proposed development. However, as Made Ground may be present, it is considered prudent to undertake some soil-gas monitoring as part of a Phase II investigation primarily to validate the findings of the GRM ground gas risk assessment developed for the wider site area.

5.4 Potential Off-Site Sources of Contamination

5.4.1 Based on information derived from the Phase I Desk Study, no potential significant off-site sources of contamination have been identified that could affect the proposed development.

5.5 Targets/Receptors

5.5.1 The following site-specific targets are potentially feasible:

- site workers – construction personnel involved in development works;
- long term site users – residents;
- plant life – garden or landscaped areas;
- building fabric and foundations;
- controlled waters – Principal Aquifer and unnamed stream approximately 150 m north/north-east of the site.

5.6 Pathways

5.6.1 The potential pathways that are considered relevant to this site are as follows:

- direct contact with and/or incidental ingestion of any contaminated soils or dusts derived from contaminated soil;
- consumption of home-grown produce;
- inhalation of dust derived from any contaminated soil;
- direct contact between contaminated soils and building substructures;
- vertical/lateral migration of mobile contaminants into controlled water receptors.

5.7 Pollutant Linkages

5.7.1 Based on the 'source-pathway-target' information presented above, the following potential pollutant linkages have been identified at the site:

Source	Pathway	Target	Consequence	Probability	Risk
Possible asbestos, PAH and metals contamination within near-surface soils. Possible hydrocarbon contamination from above ground fuel storage tanks. Possible soil-gas generation within on-site Made Ground	Dermal contact	Site user: female child 0-6 years	Medium	Unlikely	Low
		Site construction worker	Mild	Unlikely	Very low
	Ingestion	Site user: female child 0-6 years	Medium	Unlikely	Low
		Site construction worker	Mild	Unlikely	Very low
	Consumption of home-grown vegetables	Site user: female child 0-6 years	Medium	Unlikely	Low
	Ingestion of soil attached to home-grown vegetables	Site user: female child 0-6 years	Medium	Unlikely	Low
	Dermal contact with dust derived from contaminated soil	Site user: female child 0-6 years	Medium	Unlikely	Low
		Site construction worker	Mild	Unlikely	Very low
	Ingestion of dust derived from contaminated soil	Site user: female child 0-6 years	Medium	Unlikely	Low
		Site construction worker	Mild	Unlikely	Very low
	Inhalation of dust/vapours derived from contaminated soil	Site user: female child 0-6 years	Medium	Unlikely	Low
		Site construction worker	Mild	Unlikely	Very low
	Ground gas migration into buildings via services/foundations	Site user: female child 0-6	Medium	Unlikely	Low
	Direct contact	Buildings	Minor	Unlikely	Very low
	Direct contact	Water supply pipework	Minor	Unlikely	Very low
	Contaminant migration	Controlled waters	Medium	Unlikely	Low

Table 2: Pollutant Linkages

5.7.2 Based on the known previous land usage of the site and surrounding area, the identified pollutant linkages and geological setting, it is considered that the site represents a low risk to controlled waters. No further assessment of risk to controlled waters is considered necessary unless significant contamination is identified at the site.

5.7.3 Based on the proposed residential end use of the site, the site is considered to represent a low risk to human health, which should be assessed through a programme of chemical testing and risk assessment in accordance with current guidance (CLEA).

5.8 Contaminants of Concern

5.8.1 The following potential contaminants of concern are considered appropriate for the assessment of this site:

- selected toxic and phytotoxic metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc);
- speciated polyaromatic hydrocarbons (PAH);
- Total Petroleum Hydrocarbons (TPH);
- pH;
- cyanide;
- phenol;
- sulphate;
- asbestos.

5.9 Investigation Strategy

5.9.1 Based on the information presented above, the strategy for the proposed ground investigation is shown in Table 3.

Exploratory Holes	Purpose
All exploratory holes: dynamic percussive boreholes	To determine prevalent ground and groundwater conditions across site, including: • nature and extent of any Made Ground; • nature and extent of any soil contamination; • suitability of the ground for foundations and pavement design.
All dynamic percussive boreholes	Undertake in situ Standard Penetration Tests (SPT) to determine a geotechnical strength profile.
Selected dynamic percussive boreholes: WS02, WS03 and WS05	Construction of groundwater and soil-gas monitoring installations to facilitate assessment of risk posed by any hazardous soil-gases and establish standing water levels.
Selected dynamic percussive boreholes: WS02 and WS06	Targeted locations adjacent to existing above ground fuel storage tanks, selected samples to be tested for the presence of TPH.

Table 3: Investigation Strategy

6. FIELDWORK, MONITORING AND LABORATORY TESTING

6.1 Fieldwork

6.1.1 The fieldwork was carried out on 11 April 2022 and comprised the following elements:

- 6 No. dynamic percussive boreholes, designated WS01 to WS06, formed to a maximum depth of 3.0 m below existing ground level (begl);
- in situ Standard Penetration Tests (SPT) at 1 m intervals in WS01 to WS06;

- installation of 50 mm diameter groundwater and soil-gas monitoring installations in WS02, WS03 and WS05.

6.1.2 The positions of the exploratory holes were set out by Georisk and the locations are shown on the Exploratory Hole Location Plan included as Drawing No. 20256/4 in Appendix A.

6.1.3 The fieldwork was supervised by Georisk. All soil description and sample logging was carried out in general accordance with BS 5930 (2015+A1:2020) and the exploratory hole records are presented in Appendix B.

6.1.4 Small disturbed samples were recovered from the exploratory holes as necessary to facilitate sample description and for subsequent laboratory testing.

6.1.5 Observations of groundwater encountered during the fieldwork are included on the relevant exploratory hole records included in Appendix B.

6.2 Soil-Gas and Groundwater Monitoring

6.2.1 Combined soil-gas and groundwater monitoring installations were constructed in WS02, WS03 and WS05 as shown on the borehole records included in Appendix B and monitoring has been carried out on two occasions; 17 April 2022 and 31 May 2022. The results of the monitoring are included in Appendix C with the following measurements having been taken in sequence:

- atmospheric pressure (mb);
- relative pressure (mb);
- flow monitoring (l/hr);
- measurement of CO_2, CH_4 and O_2 gas concentrations (% by volume; % v/v);
- groundwater level (m begl).

6.3 Chemical Testing

6.3.1 A programme of chemical testing was scheduled by Georisk on selected soil samples retrieved from the exploratory holes. The testing was carried out at an independent UKAS accredited laboratory for the contaminants of concern as indicated in Section 5. The chemical test results are presented in Appendix D.

6.4 Geotechnical Testing

6.4.1 Routine geotechnical testing comprising moisture content and Atterberg Limits was carried out on selected samples. The testing was carried out in accordance with BS1377 (1990) at an independent UKAS accredited laboratory and the results are presented in Appendix E.

7. GROUND AND GROUNDWATER CONDITIONS

7.1 General

7.1.1 Full details of the ground conditions encountered by Georisk are presented on the exploratory hole records included in Appendix B.

7.2 Topsoil and Made Ground

7.2.1 Topsoil was encountered in WS03 to WS05 and generally comprised light brown slightly clayey sand from surface level to depths of between 0.05 and 0.30 m begl.

7.2.2 Made Ground was encountered in WS01, WS02 and WS06 as either tarmac hardstanding overlying limestone chippings in a dark grey/reddish brown sandy clay/clayey sand matrix\to a maximum depth of 0.4 m begl or dark grey very gravelly sand with frequent limestone chippings, quartzite, brick and concrete to a maximum depth of 0.3 m begl.

7.3 Ashow Formation

7.3.1 Weathered Ashow Formation was encountered at depths of between 0.05 and 0.40 m begl and was proved to a maximum penetrated depth of 3.0 m begl. It comprised firm to stiff reddish brown variably sandy/silty clay generally becoming friable from approximately 2.0 m depth.

7.3.2 The results of 16 No. SPT carried out in the Ashow Formation at depths of between 1.0 and 3.0 m begl returned 'N' values of between 7 and 50, which are summarised in Table 4.

Depth (m begl)	Minimum SPT 'N' value	Maximum SPT 'N' value	Material Description
1.0	7	15	Firm to stiff CLAY
2.0	25	50	Firm to stiff/stiff CLAY
2.8 – 3.0	50	-	Firm to stiff CLAY

Table 4: Summary of SPT 'N' Values in Ashow Formation

7.3.3 Four samples of Ashow Formation were scheduled for Atterberg Limit determinations and natural moisture content tests. One sample was taken from a sandy pocket in WS03 at 0.9 m and was confirmed as non-plastic. The tests on the remaining samples are summarised in Table 5. The test results are included in Appendix E together with a Plasticity Chart included as Drawing 20256/5.

Test	Minimum (%)	Maximum (%)
Liquid Limit	27	43
Plastic Limit	18	22
Plasticity Index	9	21
Moisture Content	17	20
Volume Change Potential	Low	Medium

Table 5: Summary of Atterberg Limit Test Results on Ashow Formation

7.4 Evidence of Potential Contamination

7.4.1 No visual/olfactory evidence of potential significant contamination was recorded during the fieldwork.

7.5 Groundwater

7.5.1 During the fieldwork, groundwater was not recorded in any of the exploratory holes.

7.5.2 Groundwater monitoring standpipes were installed in WS02, WS03 and WS05 and have been monitored on two occasions; 17 April and 31 May 2022. The results of the groundwater monitoring are included in Appendix C and summarised in Table 6.

Exploratory Hole	Standing Groundwater Levels (m begl)	
	Shallowest	Deepest
WS02	1.46	1.72
WS03	1.77	2.92
WS05	2.92	Dry

Table 6: Summary of Groundwater Level Monitoring Results

7.6 Development of Conceptual Site Model

7.6.1 Based on the ground and groundwater conditions revealed by the geoenvironmental investigation carried out and detailed above, the initial conceptual site model described in Section 5 is considered to be representative of the actual site conditions in relation to the proposed development.

8. HUMAN HEALTH RISK ASSESSMENT

8.1 General

8.1.1 The UK approach to the assessment of contaminated land is based upon the principles of risk assessment, which is founded on the use of "source-pathway-target" principles to establish the potential presence of "pollutant linkage". The main legislative driver for dealing with historical land affected by contamination is Part 2A of the Environmental Protection Act 1990. Under Part 2A, land is contaminated if it is determined that there is a 'Significant Possibility of Significant Harm' (SPOSH) to human health.

8.1.2 Georisk adopts a tiered approach to risk assessment in accordance with current UK guidance and good practice. The initial step of this process, known as Tier 1, is the comparison of site-derived data with relevant guideline levels.

8.1.3 Should the adopted criteria be exceeded then two courses of action are available. The first is to break the pollutant linkage by undertaking remedial works such as removing or treating the contaminated soil. Alternatively, a more detailed risk assessment can be carried out to determine whether a contamination risk exists.

8.1.4 The UK approach to the assessment of human health risk from contaminated land is set out in the CLEA (Contaminated Land Exposure Assessment) framework, which was first published in 2002 by the Department for Environment, Food and Rural Affairs (DEFRA) and the EA. The original guidance was withdrawn and revised guidance issued in 2009, which is set out in the following documents published by the EA:

- Human health toxicological assessment of contaminants in soil. Science Report SC050021/SR2;
- Updated technical background to the CLEA Model. Science Report SC050021/SR3.

8.1.5 The CLEA model uses generic assumptions about the fate and transport of chemicals in the environment and a generic conceptual model for site conditions together with human behaviour to estimate long term human exposure to soil contaminants.

8.1.6 Soil Guideline Values (SGV) were derived using the CLEA Model by comparing estimated exposure with 'Health Criteria Values' (HCV) that represent a tolerable risk to health from chronic exposure. SGVs are scientifically based 'generic assessment criteria' that can be used to simplify the assessment of risk to human health from chronic exposure to contaminants in soil. SGVs are a screening tool for the 'generic quantitative risk assessment' of land contamination.

8.1.7 Since revised SGVs were developed in 2009, revised Part 2A statutory guidance was then published in 2012. The revised Part 2A statutory guidance introduces a four-category system for classifying land under Part 2A for cases of SPOSH to human health. Category 4 applies to land where the level of risk posed is acceptably low. DEFRA appointed CL:AIRE to develop 'Category 4 Screening Levels' (C4SL), which would provide a simple test for deciding when land is suitable for use and definitely not contaminated. In March 2014, C4SLs were published for a limited number of contaminants.

8.1.8 Further to this, Suitable for Use Levels (S4UL) published by the Chartered Institute of Environmental Health (CIEH) and Land Quality Management (LQM) were issued in January 2015. These provide a comprehensive update of previous GAC published by CIEH. The S4UL are derived from the CLEA software produced by the EA and are based upon the concept of either 'tolerable' risk (where the relevant health criteria value is a tolerable daily intake), or 'minimal' risk (where the health criteria is an index dose).

8.1.9 The following hierarchy has been adopted by Georisk for determining which assessment criteria to be followed:

- Suitable 4 Use Levels (S4UL) developed by LQM/CIEH (2015);
- C4SL (in the absence of other assessment criteria);
- Soil Screening Values developed by Atkins ATRISKsoil (in the absence of other assessment criteria).

8.2 Human Health Risk Assessment Design

Proposed Development

8.2.1 The site is to be developed with housing, together with private gardens, access roads and areas of public open space.

Assessment Criteria

8.2.2 The assessment criteria used for the screening of contaminants is summarised in Table 7.

Contaminant Group	Determinands	Assessment Criteria Selected
ORGANIC CONTAMINANTS		
Non-halogenated hydrocarbons	Phenol	LQM/CIEH S4UL
	Total Petroleum Hydrocarbons (TPH)	LQM/CIEH S4UL
Polyaromatic Hydrocarbons (PAH)	USEPA 16 priority compounds	LQM/CIEH S4UL
INORGANIC CONTAMINANTS		
Metals	Lead	C4SL
	Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Selenium, Zinc	LQM/CIEH S4UL
Non-metals	Cyanide	Atkins AtRisk Soil Screening Value (SSV)

Table 7: Human Health Risk Assessment Criteria

8.2.3 It should be noted that there is no S4UL for lead and that the SGV for lead has been withdrawn. As such, the only available authoritative published criteria for lead is the DEFRA C4SL. The C4SL for lead is considerably more conservative than the former SGV and is therefore considered appropriate for use.

End Use

8.2.4 In view of the proposed development, a 'residential with plant uptake' end use conceptual model is considered the most appropriate for this assessment.

8.2.5 Considering the possibility of double digging in gardens and/or installation of garden features, it is considered that the top 1 m of soil will need to be considered within the risk assessment, as the critical receptor (i.e. occupiers of the residential dwelling) is most likely to be exposed to these materials.

Statistical Analysis

8.2.6 Given the unbiased nature of the sampling and previous use of the site, it is considered appropriate to assess contaminant levels by comparing test results with the relevant S4UL, C4SL or SSV rather than carrying out statistical analysis.

Contaminants of Concern

8.2.7 The potential contaminants of concern are detailed in Section 5 and these contaminants have subsequently been targeted for chemical analysis.

8.3 Generic Quantitative Human Health Risk Assessment

8.3.1 The results of the chemical testing from the site can be summarised in Table 8.

Contaminant of Concern	Measured Concentration*		Critical Concentration (S4UL/C4SL/SSV*)	Number of test results above S4UL/C4SL/SSV
	Min	Max		
Arsenic	<1.0	9.6	37	0 (6)
Cadmium	<0.1	-	11	0 (6)
Chromium	7.5	44	910	0 (6)
Copper	2.3	31	2400	0 (6)
Cyanide	<0.5	0.6	34	0 (6)
Lead	4	96	200	0 (6)
Mercury	<0.1	-	40	0 (6)
Nickel	7.5	33	130	0 (6)
Phenol	<0.1	-	120	0 (6)
Selenium	<0.2	-	250	0 (6)
Zinc	12	53	3700	0 (6)
PAH Compounds				
Acenaphthene	<0.1	-	210	0 (6)
Acenaphthylene	<0.1	-	170	0 (6)
Anthracene	<0.1	-	2400	0 (6)
Benzo(a)anthracene	<0.1	-	7.2	0 (6)
Benzo(a)pyrene	<0.1	-	2.2	0 (6)
Benzo(b)fluoranthene	<0.1	-	2.6	0 (6)
Benzo(ghi)perylene	<0.1	-	320	0 (6)
Benzo(k)fluoranthene	<0.1	-	77	0 (6)
Chrysene	<0.1	-	15	0 (6)
Dibenz(ah)anthracene	<0.1	-	0.24	0 (6)
Fluoranthene	<0.1	0.98	280	0 (6)
Fluorene	<0.1	-	170	0 (6)
Indeno(123-cd)pyrene	<0.1	-	27	0 (6)
Naphthalene	<0.1	-	2.3	0 (6)
Phenanthrene	<0.1	-	95	0 (6)
Pyrene	<0.1	0.98	620	0 (6)

TPH Aliphatic Fraction				
C_5-C_6	<1	-	42	0 (3)
>C_6-C_8	<1	-	100	0 (3)
>C_8-C_{10}	<1	-	27	0 (3)
>C_{10}-C_{12}	<1	-	130	0 (3)
>C_{12}-C_{16}	<1	12	1100	0 (3)
>C_{16}-C_{21}	<1	4.9	65000	0 (3)
>C_{21}-C_{35}	<1	-	65000	0 (3)
TPH Aromatic Fraction				
C_5-C_7 (benzene)	<1	-	70	0 (3)
>C_7-C_8 (toluene)	<1	-	130	0 (3)
>C_8-C_{10}	<1	-	34	0 (3)
>C_{10}-C_{12}	<1	-	74	0 (3)
>C_{12}-C_{16}	<1	-	140	0 (3)
>C_{16}-C_{21}	<1	-	260	0 (3)
>C_{21}-C_{35}	<1	95	1100	0 (3)
* Concentration expressed in mg/kg except where stated. Assumption of 1 % soil organic matter.				

Table 8: Summary of Chemical Test Results

8.3.2 All test results for the potential contaminants of concern at the site are below the relevant assessment criteria (S4UL/C4SL/SSV).

8.3.3 All samples were screened for the presence of asbestos. Asbestos was not identified in any of the samples analysed.

8.3.4 On the basis of the ground investigation and chemical test results presented above, no significant remedial action in respect of risk to human health is considered necessary for the proposed development at the site.

8.3.5 Clean topsoil should be provided in all gardens and areas of public open space to act as a suitable growing medium.

8.3.6 Should any areas of previously unidentified potentially contaminated soil be encountered during construction works, we would recommend consultation with Georisk to ensure that our recommendations continue to apply. Any potentially contaminated soils should be left in situ pending further assessment.

8.3.7 During the redevelopment of the site, construction workers are likely to be in direct contact with the near surface soils and appropriate Health and Safety measures will need to be implemented based on the findings of this investigation.

8.3.8 Based on the findings of this investigation, it is considered that standard PE/PVC pipe laid in trenches with clean gravel surround should be suitable for use at the site; however, it is recommended that a copy of this report is supplied to utility companies and that their recommendations relating to appropriate supply pipes are adhered to.

8.3.9 If necessary to satisfy planning or land quality conditions, this report should be submitted to the Local Authority and/or NHBC/warranty provider for approval in advance of any development works starting on site. Further detailed investigation of development land parcels may be required to satisfy regulatory requirements.

9 SOIL-GAS RISK ASSESSMENT

9.1 Risk Assessment Protocol

9.1.1 Current best practice for the assessment of soil-gas risk to development is provided in CIRIA Report C665 'Assessing Risked Posed by Hazardous Ground Gases to Buildings' (2007) and BS8485 (2015+A1:2019) 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.

9.1.2 C665 sets out a semi-quantitative procedure to estimate gas risk, which was proposed by Wilson & Card (1999) and is a development of a procedure given in CIRIA 149 (1995). This method also uses both gas concentrations and borehole flow rates to define a Characteristic Situation for a site based on the limiting gas volume flow for methane and carbon dioxide. For a given Characteristic Situation, a set of remedial measures can be applied to the development.

9.2 Previous Assessment

9.2.1 As part of the previous assessment of the wider area completed by GRM, a programme of gas monitoring was carried out on a fortnightly basis over a three-month period from October 2018 to January 2019.

9.2.2 The ground gas risk assessment completed by GRM identified that the natural strata surrounding the study site may be assessed as characteristic Situation 1 (very low hazard potential) as outlined in Table 2 of BS8485 (2015+A1:2019), for which gas protection measures are not required.

9.3 Monitoring Results

9.3.1 Soil-gas monitoring installations were constructed in WS02, WS03 and WS05 as shown on the borehole records included in Appendix B and monitoring has been carried out on two occasion, on 17 April and 31 May 2022.

9.3.2 The results of the soil-gas monitoring are presented in Appendix C and are summarised in Table 9 (in terms of maximum gas concentrations for methane and steady-state concentrations for carbon dioxide):

Well	Methane (% v/v)	Carbon Dioxide (% v/v)	Positive Flow Rate (l/hr)	Methane GSV (l/hr)	Carbon Dioxide GSV (l/hr)	Characteristic Situation: BS8485 (2015+A1:2019)	
						CH_4	CO_2
WS02	0.0	0.3 – 3.7	0.0	n/a	0.0037	CS1	CS1
WS03	0.0	1.9	0.1	n/a	0.0019	CS1	CS1
WS05	0.0	1.2 – 1.3	0.0	n/a	0.0013	CS1	CS1

Table 9: Summary of Soil-Gas Monitoring Results

9.3.3 No methane was recorded during the monitoring programme.

9.3.4 Steady state carbon dioxide levels ranged from 0.3 to 3.7 % by volume (v/v) during the monitoring programme.

9.3.5 A maximum positive gas flow of 0.1 l/hr has been recorded and ambient atmospheric pressures ranged from 1001 to 1008 mb during the monitoring programme.

9.4 Risk Assessment and Protection Strategy Recommendations

9.4.1 For a 'Characteristic Situation 1' (CS1) classification, the 'Typical Maximum Concentration' for methane (1 % v/v) and carbon dioxide (5 % v/v) have not been exceeded during the monitoring programme.

9.4.2 To provide a further detailed level of assessment, Gas Screening Values (GSV) have also been determined (see Table 9). The GSV is calculated by multiplying the maximum gas concentration recorded in a particular borehole and the maximum borehole flow rate recorded across the site and is then used to determine the level of gas protection necessary to protect future users of the proposed development.

9.4.3 From the monitoring results for carbon dioxide, a maximum GSV of 0.0037 l/hr has been calculated, which is below the GSV of 0.07 l/hr for a CS1 classification. A GSV has not been calculated for methane due to the absence of recorded gas.

9.4.4 On this basis, the monitoring validates the previous assessment of the wider site in this location and a 'Characteristic Situation 1' is considered appropriate for the site – gas protection is not required for a 'Characteristic Situation 1' classification. This is supported by the established ground conditions and environmental setting.

9.4.5 Radon protection is not required for the proposed development at the site.

9.4.6 If required to satisfy planning or land quality conditions, the gas protection strategy should be agreed with the Local Authority and/or NHBC/warranty provider in advance of development works starting on site.

10. ENGINEERING CONSIDERATIONS

10.1 Foundation Design

10.1.1 This ground investigation has recorded topsoil and nominal thicknesses of Made Ground overlying firm to stiff clay of the Ashow Formation.

10.1.2 The proposed new built development is to comprise traditional low-rise housing, therefore, based on the ground conditions encountered, it is considered that conventional strip/trench fill foundations deepened through any Made Ground and/or demolition disturbed material and bearing onto competent natural soil should be viable for the proposed development.

10.1.3 Geotechnical testing of the near-surface soil indicates the near-surface soils should be classified as a shrinkable soil of medium volume change potential and; therefore, a minimum founding depth of 0.9 m would need to be adopted, in line with NHBC Standards, providing at least 300 mm penetration into competent natural materials is achieved.

10.1.4 For strip/trench fill foundations placed in competent firm to stiff clay an allowable bearing capacity of 125 kN/m^2 is considered appropriate for these materials. Total settlements would not be anticipated to exceed 25 mm.

10.1.5 Foundations near any existing trees and/or hedgerows to be removed/retained would need to be deepened and heave protection measures adopted in accordance with NHBC Standards Chapter 4.2 'Building Near Trees'. Where foundation depths exceed 2.5 m due to tree influence, the NHBC require a design by an Engineer to demonstrate that potential heave uplift forces can be resisted by the foundation and this usually entails the use of a piled foundation. These aspects should be considered further at detailed design stage and a detailed tree/hedgerow survey will be required to assist with foundation design – further ground investigation may be required tailored to a specific layout or for pile design (if necessary).

10.1.6 Care should be taken to limit the exposure of any excavation prepared to receive concrete, which may cause deterioration and a reduction in bearing capacity. Foundation excavations should be inspected by qualified personnel and if any soft/loose material is encountered at formation level, foundations would need to be deepened further into competent material and replaced with lean-mix concrete.

10.2 Floor Slabs

10.2.1 Given the presence of shrinkable soils, it is recommended that a suspended floor slab design (cast in situ or 'beam and block' with underfloor void) is adopted in accordance with NHBC Standards.

10.3 Buried Concrete Requirements

10.3.1 For the near-surface soils, water soluble sulphate testing results (expressed as SO_4 in a 2:1 water:soil extract) range from <0.01 to 0.05 g/l with pH values of 5.5 to 9.4. Following the guidance given in the BRE Special Digest (2005) and assuming 'mobile' groundwater conditions for a 'brownfield' site, the Aggressive Chemical Environment (ACEC) classification has been determined. These indicate a Design Sulphate Class of DS-1 and an ACEC class of AC-2z apply at the site.

10.4 Road/Pavement Design

10.4.1 For preliminary design purposes, the following long term equilibrium CBR values could be assumed for the various near-surface material present at the site (based on average construction conditions):

- Made Ground: 2%;
- Ashow Formation: 3%.

10.4.2 he proposed formation should be proof rolled and caution must be exercised to ensure that any soft/loose areas identified within the formation are excavated and filled with suitably compacted granular fill. In situ CBR tests should be undertaken to allow detailed design of pavement/road formations to be made.

10.5 Excavations

10.5.1 Conventional mechanical excavation should be readily achievable in the near-surface soil to depths of at least 3 m begl.

10.5.2 Shallow excavations should remain stable in the short-term; however, instability may occur in excavations left open for extended periods of time. Support should be provided in any excavations requiring man entry.

10.5.3 Care should be taken to limit the exposure of any excavation prepared to receive concrete, which may cause deterioration and a reduction in bearing capacity. All foundation excavations should be inspected by qualified personnel and any soft or loose materials that are encountered should be removed and replaced with lean mix concrete.

10.5.4 The findings of this investigation indicate that groundwater ingress is unlikely to occur in temporary excavations; however, it is envisaged that any ingress should be controllable by sump pumping.

10.6 Soakaways

10.6.1 The near-surface geology comprises generally cohesive clay soil and; therefore, it is considered unlikely to be suitable for the use of soakaway drainage.

APPENDIX A
DRAWING

Drawing No.	Drawing Title
20256/4	Exploratory Hole Location Plan
20256/5	Plasticity Chart – Ashow Formation

GRID NORTH

ETP2

WS05

WS06

WS04

WS01

WS03

WS02

ETP5

Pond

Notes

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This drawing is to be read in conjunction with all development drawings, and designers risk assessments.

This drawing must not be scaled. Work to figured dimensions only.

KEY

ETP1 — Trial Pit (Earthworks Sampling; 2022)

WS01 — Dynamic Percussive Sampling Borehole (Georisk; 2022)

Rev	Date	Description	Initials

Client

VISTRY PARTNERSHIPS
WEST MIDLANDS

georisk MANAGEMENT

Summit Point, Summit Crescent, Smethwick, Birmingham B66 1BT
t. 0121 553 4044, f. 0121 553 1112
www.georisk-uk.com, email. enquiries@georisk-uk.com

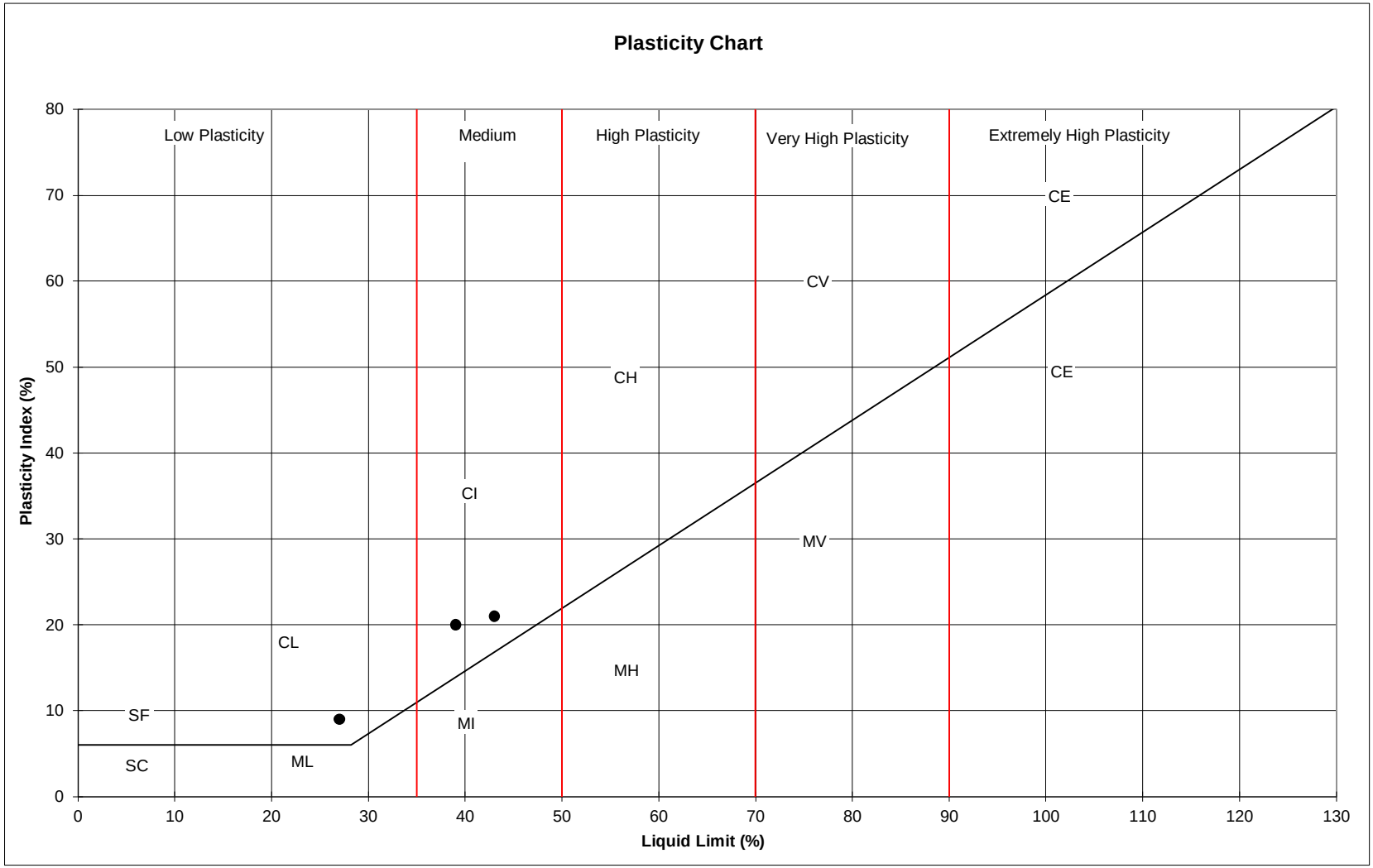
Contract

CREWE LANE, KENILWORTH
WOODSIDE CONFERENCE CENTRE

Drawing Title

EXPLORATORY HOLE LOCATION PLAN

Drawing Status	FINAL		
Drawn By	AIB	Date	30/05/22
Checked/Approved	AIB	Date	30/05/22
Scale	NTS	Drawing Number	20256/4



georisk MANAGEMENT	Drawing Title: Plasticity Chart - Ashow Formation	Job Title: Wodside Conference Centre, Kenilworth
	Drawing Number: 20256/5	Client: Vistry Partnerships West Midlands

APPENDIX B
EXPLORATORY HOLE RECORDS


Well


Well


Well


Well


Well


Well

APPENDIX C
SOIL-GAS AND GROUNDWATER MONITORING RESULTS

Soil-Gas and Groundwater Monitoring Results

Monitoring Visit No.	**1**	Date	17/04/22			Barometric Pressure (mb) -					1008		
Weather Conditions:		Clear				Equipment Used -							
Surface Ground Conditions:		Damp				**GA5000 Gas Analyser and Solinst Dip Meter**							
Ambient Concentration (% Volume):		**Bal:**		**CH_4:**		**CO_2:**		0.1			**O_2:**	20.7	
Monitoring Point		Gas Concentration										Gas Flow	
		Highest					Steady				(Lowest)	Gas Flow	Relative Pressure
Ref:	**GWL**	**CH_4**		**CO_2**	**CO**	**H_2S**	**CH_4**		**CO_2**	**CO**	**H_2S**	**O_2**	Rate
	(m) bgl	**% lel**	**% v/v**	**(%)**	**ppm**	**ppm**	**% lel**	**% v/v**	**(%)**	**ppm**	**ppm**	**(%)**	**litre/hr**	**mb**
WS02	1.46	0	0	0.3	0	0	0	0	0.1	0	0	20.0	0.0	0.26
WS03	1.77	0	0	1.9	0	0	0	0	1.9	0	0	19.3	0.1	0.14
WS05	Dry	0	0	1.2	1	0	0	0	1.2	0	0	19.5	0.0	-0.12

Monitoring Visit No.	**2**	Date	31/05/22			Barometric Pressure (mb) -					1001		
Weather Conditions:		Cloudy				Equipment Used -							
Surface Ground Conditions:		Damp				**GA5000 Gas Analyser and Solinst Dip Meter**							
Ambient Concentration (% Volume):		**Bal:**	78.9	**CH_4:**	0.0	**CO_2:**		0.1			**O_2:**	21.1	
Monitoring Point		Gas Concentration										Gas Flow	
		Highest					Steady				(Lowest)	Gas Flow	Relative Pressure
Ref:	**GWL**	**CH_4**		**CO_2**	**CO**	**H_2S**	**CH_4**		**CO_2**	**CO**	**H_2S**	**O_2**	Rate
	(m) bgl	**% lel**	**% v/v**	**(%)**	**ppm**	**ppm**	**% lel**	**% v/v**	**(%)**	**ppm**	**ppm**	**(%)**	**litre/hr**	**mb**
WS02	1.72	0	0	3.7	0	0	0	0	3.7	0	0	20.0	0.0	0.17
WS03	2.92	0	0	2.3	0	0	0	0	1.9	0	0	10.4	0.0	0.1
WS05	2.92	0	0	1.3	1	0	0	0	1.3	0	0	17.6	0.0	0.00

Equipment Used: Geotechnical Instruments (GI) and Solinst	**Notes**
GI - GA2000 Gas Concentration/Atmospheric Pressure GI - GA2000 Borehole Gas Flow Rate/Borehole Pressure Solinst combined dip meter and interface meter - Groundwater Level (GWL)	(m) bgl - metres below ground level

	Job Title:	**Job No:**
georisk MANAGEMENT	Crewe Lane, Kenilworth	20256
	Client:	**Table Number:**
	Vistry Partnerships Limited	1

APPENDIX D
CHEMICAL TEST RESULTS

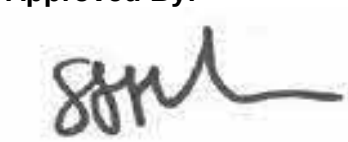
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	22-13966-1
Initial Date of Issue:	22-Apr-2022
Client	Georisk Management Limited
Client Address:	Varney House 91 Spon Lane West Bromwich B70 6AB
Contact(s):	Alex Bichard Ashley Copestake Mark Gill
Project	20256 Crewe Lane, Kenilworth

Quotation No.:		**Date Received:**	13-Apr-2022
Order No.:	20256	**Date Instructed:**	13-Apr-2022
No. of Samples:	10		
Turnaround (Wkdays):	6	**Results Due:**	22-Apr-2022
Date Approved:	22-Apr-2022		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 20256 Crewe Lane, Kenilworth

Client: Georisk Management Limited		**Chemtest Job No.:**			22-13966	22-13966	22-13966	22-13966	22-13966	22-13966	22-13966	22-13966
Quotation No.:		**Chemtest Sample ID.:**			1410887	1410888	1410889	1410890	1410891	1410892	1410893	1410894
			Sample Location:		WS01	WS02	WS03	WS04	WS05	WS01	WS03	WS04
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.10	0.30	0.50	0.05	0.20	0.90	0.90	0.80
			Date Sampled:		11-Apr-2022	11-Apr-2022	11-Apr-2022	11-Apr-2022	11-Apr-2022	11-Apr-2022	11-Apr-2022	11-Apr-2022
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY			
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type	U	2192		N/A	-	-	-	-	-			
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected			
Moisture	N	2030	%	0.020	9.0	17	16	30	24	16	15	17
Stones and Removed Materials	N	2030	%	0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020			
pH	U	2010		4.0	9.4	8.0	7.3	7.4	5.5	8.2	5.9	8.1
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40	< 0.40	0.68	0.49	< 0.40			
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.050	0.013	0.010	< 0.010	< 0.010	< 0.010	0.018	< 0.010
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	0.60	0.60	< 0.50			
Arsenic	U	2450	mg/kg	1.0	9.6	4.4	8.4	6.2	< 1.0			
Cadmium	U	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Chromium	U	2450	mg/kg	1.0	44	16	20	12	7.5			
Copper	U	2450	mg/kg	0.50	31	12	13	5.4	2.3			
Mercury	U	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Nickel	U	2450	mg/kg	0.50	33	16	17	11	7.5			
Lead	U	2450	mg/kg	0.50	96	11	41	16	4.5			
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
Zinc	U	2450	mg/kg	0.50	50	31	53	27	12			
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0						
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0						
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0						
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0						
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0						
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0						
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0						
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0						
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0						
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0						
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0						
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0						
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0						
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0						
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0						
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0						
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0						
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0						
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10						
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			

Results - Soil

Project: 20256 Crewe Lane, Kenilworth

Client: Georisk Management Limited		**Chemtest Job No.:**			22-13966	22-13966	22-13966	22-13966	22-13966	22-13966	22-13966	22-13966
Quotation No.:		**Chemtest Sample ID.:**			1410887	1410888	1410889	1410890	1410891	1410892	1410893	1410894
			Sample Location:		WS01	WS02	WS03	WS04	WS05	WS01	WS03	WS04
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.10	0.30	0.50	0.05	0.20	0.90	0.90	0.80
			Date Sampled:		11-Apr-2022	11-Apr-2022	11-Apr-2022	11-Apr-2022	11-Apr-2022	11-Apr-2022	11-Apr-2022	11-Apr-2022
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY			
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Phenanthrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Fluoranthene	U	2700	mg/kg	0.10	0.98	< 0.10	< 0.10	< 0.10	< 0.10			
Pyrene	U	2700	mg/kg	0.10	0.98	< 0.10	< 0.10	< 0.10	< 0.10			
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Chrysene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Total Of 16 PAH's	U	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
Total Phenols	U	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			

Results - Soil

Project: 20256 Crewe Lane, Kenilworth

Client: Georisk Management Limited			**Chemtest Job No.:**		22-13966	22-13966
Quotation No.:			**Chemtest Sample ID.:**		1410895	1410896
			Sample Location:		WS06	WS06
			Sample Type:		SOIL	SOIL
			Top Depth (m):		1.20	0.30
			Date Sampled:		11-Apr-2022	11-Apr-2022
			Asbestos Lab:			NEW-ASB
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A		-
Asbestos Identification	U	2192		N/A		No Asbestos Detected
Moisture	N	2030	%	0.020	20	5.3
Stones and Removed Materials	N	2030	%	0.020		< 0.020
pH	U	2010		4.0	7.8	8.9
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.016	0.025
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50
Arsenic	U	2450	mg/kg	1.0		3.0
Cadmium	U	2450	mg/kg	0.10		< 0.10
Chromium	U	2450	mg/kg	1.0		7.6
Copper	U	2450	mg/kg	0.50		22
Mercury	U	2450	mg/kg	0.10		< 0.10
Nickel	U	2450	mg/kg	0.50		7.9
Lead	U	2450	mg/kg	0.50		4.0
Selenium	U	2450	mg/kg	0.20		< 0.20
Zinc	U	2450	mg/kg	0.50		36
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		12
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		4.9
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		17
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0		95
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		95
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		110
Naphthalene	U	2700	mg/kg	0.10		< 0.10
Acenaphthylene	U	2700	mg/kg	0.10		< 0.10

Results - Soil

Project: 20256 Crewe Lane, Kenilworth

Client: Georisk Management Limited			**Chemtest Job No.:**		22-13966	22-13966
Quotation No.:			**Chemtest Sample ID.:**		1410895	1410896
			Sample Location:		WS06	WS06
			Sample Type:		SOIL	SOIL
			Top Depth (m):		1.20	0.30
			Date Sampled:		11-Apr-2022	11-Apr-2022
			Asbestos Lab:			NEW-ASB
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Acenaphthene	U	2700	mg/kg	0.10		< 0.10
Fluorene	U	2700	mg/kg	0.10		< 0.10
Phenanthrene	U	2700	mg/kg	0.10		< 0.10
Anthracene	U	2700	mg/kg	0.10		< 0.10
Fluoranthene	U	2700	mg/kg	0.10		< 0.10
Pyrene	U	2700	mg/kg	0.10		< 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10		< 0.10
Chrysene	U	2700	mg/kg	0.10		< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10		< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10		< 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10		< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10		< 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10		< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10		< 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0		< 2.0
Total Phenols	U	2920	mg/kg	0.10		< 0.10

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

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

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

APPENDIX E
GEOTECHNICAL TEST RESULTS

SOCOTEC UK Limited
SOCOTEC Central
Leofric Business Park
Progress Close
Coventry
West Midlands
CV3 2TF
Telephone: +44(0) 2475 310700

SOCOTEC

UKAS TESTING
0001

TEST REPORT

Liquid and Plastic Limits and Plasticity Indices

Report No:	**DAM0086350/770/M1**	**Report Date:**	**26 April 2022**
		Our Contract Ref:	51068246
Client:	GEORISK MANAGEMENT	Tested By:	SOCOTEC Central
Address:	Varney House 91 Spon Lane West Bromwich B70 6AB GB	Date Sampled:	11 Apr 2022
		Date Received:	20 Apr 2022
Client Contact:	Not Advised	Date Tested:	21 Apr 2022
Site:	20256 - Crewe Lane, Kenilworth		
		Sample Type:	TUB
Material Supplier:	Client	Sampling Certificate:	Not Received
Material Source:	Site	Samples Submitted by:	Client
Method of preparation:	BS1377-1:1990 7.4.3 & BS 1377-2:1990 4.2	Sampled by:	Client

Results:

Sample Reference	Client's Ref	Location	Description	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	% Passing on 425 µm
45403767	Sample 1	WS01 @ 0.9m	Brown Sandy Slighlt Silty CLAY	19	27	18	9	**100
45403768	Sample 2	WS03 @ 0.9m	Red/Brown Silty Slightly Clayey SAND	17	33	Non Plastic	N/A	**100
45403769	Sample 3	WS04 @ 0.8m	Red/Brown Slightly Silty Sandy CLAY	20	39	19	20	**100
45403770	Sample 4	WS06 @ 1.2m	Red/Brown Silty CLAY	20	43	22	21	**100

*** Washed over 425µm BS Test Sieve**
**** As received, coarse particles removed by hand prior to test**

Certified that the Liquid and Plastic Limits and Plasticity Indices were determined in accordance with BS1377-2:1990 Clauses 4.4, 5.0 and 5.4 respectively
Certified that the Moisture Content was determined in accordance with BS1377-2:1990 3.2

Signed: [redacted]

Darren Berrill - General Manager
for and on behalf of SOCOTEC UK Limited

Form S1 v9 7/06

SOCOTEC UK Limited
SOCOTEC Central
Leofric Business Park
Progress Close
Coventry
West Midlands
CV3 2TF
Telephone: +44(0) 2475 310700

SOCOTEC

UKAS TESTING
0001

TEST REPORT

Moisture Content

Report No:	**DAM0086350/770/M2**	**Report Date:**	**26 April 2022**
		Our Contract Ref:	51068246
Client:	GEORISK MANAGEMENT	Tested By:	SOCOTEC Central
Address:	Varney House 91 Spon Lane West Bromwich B70 6AB GB	Date Sampled:	11 Apr 2022
		Date Received:	20 Apr 2022
Client Contact:	Not Advised	Date Tested:	20 Apr 2022
Site:	**20256 - Crewe Lane, Kenilworth**		
		Sampling Certificate:	Not Received
Material Supplier:	Client	Samples Submitted by:	Client
Material Source:	Site	Sampled by:	Client
Method of preparation:	BS1377-1:1990 7.4.2		

Results:

Sample Reference	Clients Reference	Location	Moisture Content(%)	Sample Type	Description
45403767	Sample 1	WS01 @ 0.9m	19	Tub	Brown Sandy Slighlt Silty CLAY
45403768	Sample 2	WS03 @ 0.9m	17	Tub	Red/Brown Silty Slightly Clayey SAND
45403769	Sample 3	WS04 @ 0.8m	20	Tub	Red/Brown Slightly Silty Sandy CLAY
45403770	Sample 4	WS06 @ 1.2m	20	Tub	Red/Brown Silty CLAY

Certified that the Moisture Content were determined in accordance with BS1377-2:1990 3.2

Signed: [redacted]

Darren Berrill - General Manager
for and on behalf of SOCOTEC UK Limited

Form S23 ver8 08/16