ARENA GEO

Phase 2 Ground Investigation Report

Caretakers House, Bank End Primary School

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CONTENTS

FIGURES

APPENDICES

1 INTRODUCTION

1.1 Terms of Reference

Arena Geo Limited was appointed by Barker Associates Limited to complete a Phase 2 ground investigation at the caretakers house for Worsbrough Bank End Primary School, Underwood Avenue, Worsbrough Dale, Barnsley S70 4AZ. Planning approval is being sought for the demolition of the existing building to make way for a new play area and additional car parking spaces.

1.2 Scope of Work Undertaken

This work follows on from the recommendations made in the following report and reference should be made to this document for Phase 1 data and interpretation:

- Arena Geo Limited – Phase 1 Desk Study & Coal Mining Risk Assessment Doc. No. 251012/1, dated April 2025.

The scope of work undertaken during this geotechnical assessment included the following:

- Design and undertake a ground investigation based on recommendations made in the Phase 1 desk study;
- Report the findings of the ground investigation including for pavement design;
- Update the conceptual site model and recommend a remediation strategy for contaminated land if required.

1.3 Limitations

This report is subject to the limitations presented in Appendix A.

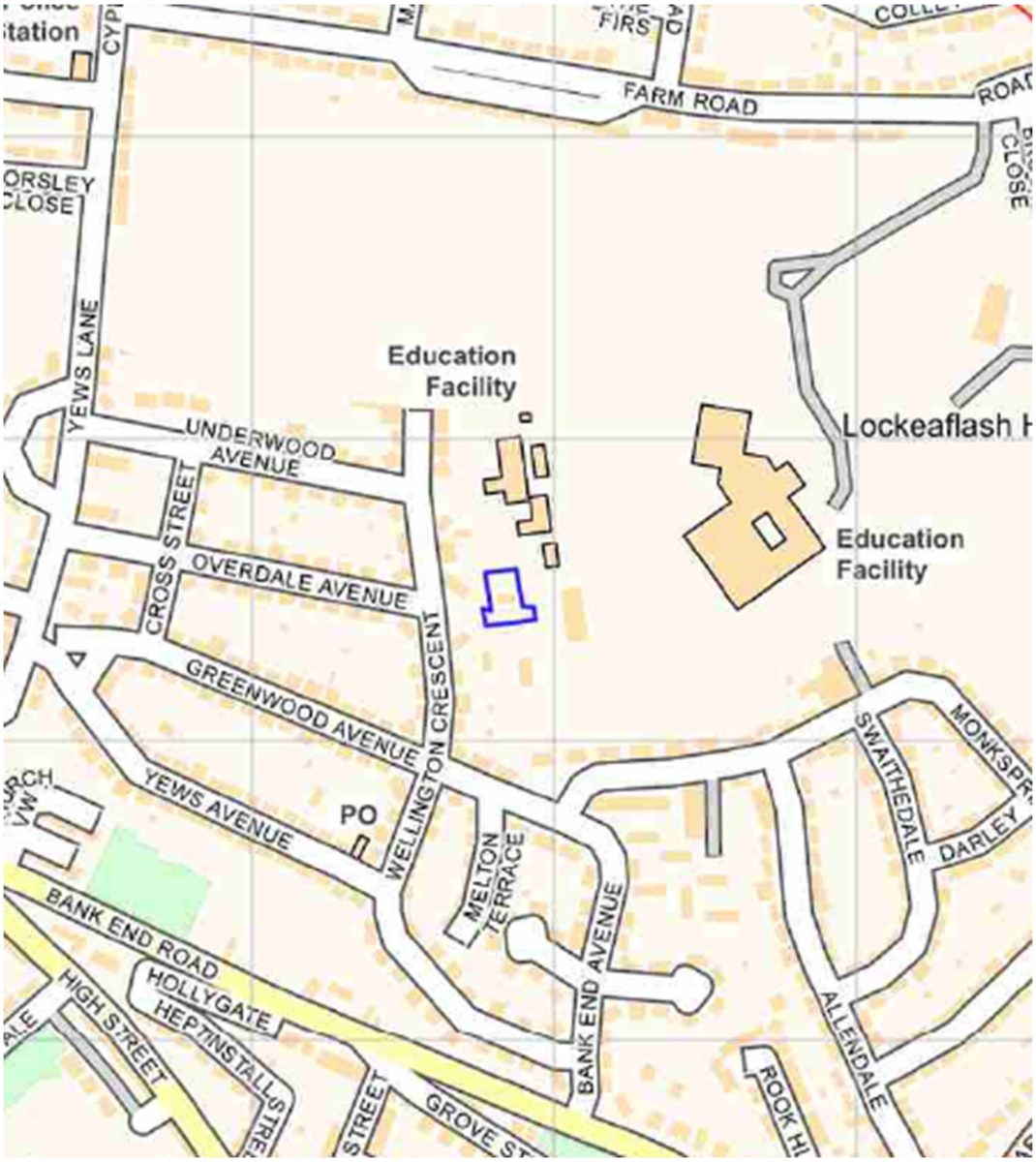
2 SITE DESCRIPTION

Table 2.1 outlines the site location, topography and current site use, as determined from Ordnance Survey mapping. The site location is also shown in Figure 2.1.

Table 2.1 - Site Details

Data	Information	
Address:	Caretakers house, Worsbrough Bank End Primary School, Underwood Avenue, Worsbrough Dale, Barnsley S70 4AZ	
Area:	Approximately 0.08ha.	
Current Site Use:	Caretakers house for adjacent primary school.	
Grid Reference:	Centre of site is located approximately at NGR 436168,404493	
Topography:	Unknown.	
Elevation:	Approximately 113m AOD.	
Surrounding Land Use	North	Playground of Worsborough Bank End Primary School
	East	Day care centre
	South	Car park
	West	Residential – Wellington Close

Figure 2.1 Site Location



3 SITE WORK

3.1 General

Fieldwork was generally carried out, where relevant, in accordance with BS EN 1997-2:2007 'Eurocode 7. Geotechnical Design. Ground Investigation and Testing'; BS10175 Investigation of Potentially Contaminated Sites; the Association of Geotechnical and Geo-environmental Specialists Guidelines for Good Practice in Site Investigations (August 1998); and supervised by a Chartered Engineering Geologist.

The locations of the exploratory holes were selected by and set out on site by Arena Geo Limited, see Figure 3.1 below. The sampling strategy for the exploratory hole locations was to best investigate the ground and contamination conditions across the site, and with reference to the findings of the desk study. As the investigation took place prior to any demolition, no exploratory holes were undertaken beneath the footprint of the existing caretaker house.

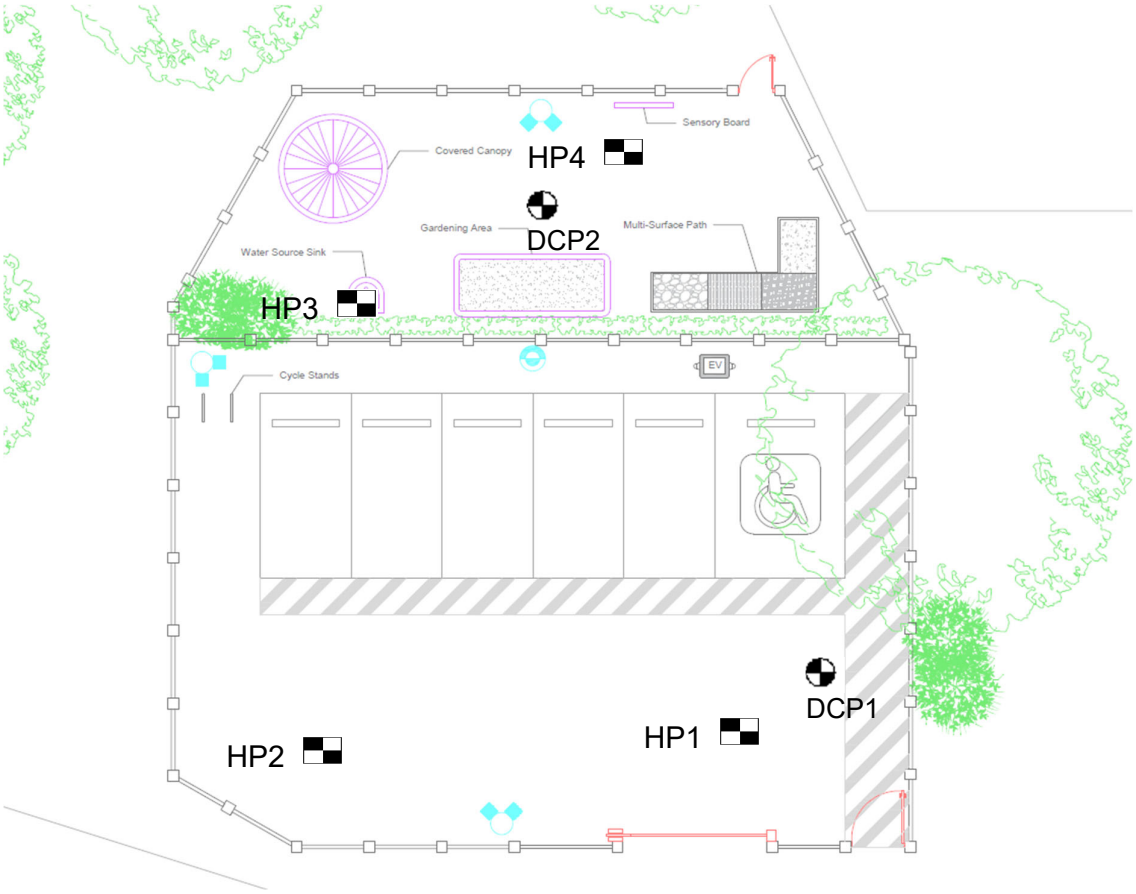
Prior to commencement on site, available statutory services plans were obtained by Arena Geo. All of the exploratory holes were set out to avoid the locations of any buried utilities that cross the site. Prior to excavation, locations were scanned with a cable avoidance tool (CAT).

The fieldwork was undertaken on the 29th May 2025 and supervised by an experienced Chartered Engineering Geologist, with samples obtained and logged to BS5930:2015 + A1:2020. Descriptions and depths of the various strata recovered are presented on the exploratory hole records reproduced in Appendix A, together with sample depths, the results of in-situ testing, comments on groundwater inflows and any other pertinent information. Disturbed plastic pot and glass amber jar samples were recovered from the various strata and stored and transported in cool boxes, where relevant, for possible future chemical laboratory testing.

3.2 Hand Pits

Four (4No.) hand dug trial pits were excavated down to a maximum depth of 0.75m below ground level (bgl). Initially these were scheduled to be progressed using hand auger methods, however shallow bedrock prevented deeper excavation. Details of the strata encountered, and groundwater strikes are presented on the individual hand pit records presented in Appendix C of this report, with a geological cross-section in Appendix D.

Figure 3.1 – Trial pit location plan



3.3 Geotechnical Testing

As no structures are proposed, no geotechnical laboratory testing was requested as part of this investigation.

3.4 Dynamic Cone Penetrometer Testing

Two Transport Research Laboratory (TRL) dynamic cone penetrometer (DCP) tests in accordance with DMRB CS 229 (Data for Pavement Assessment) standard were undertaken on shallow soils across the site. The DCP test provides a measure of a materials in-situ

resistance to penetration by driving a metal cone into the ground by repeated striking with an 8kg weight dropped from a distance of 575mm and recording the rate of penetration per blow.

The locations of the DCP tests are presented in Figure 3.1 and the test results are presented in Appendix E.

3.5 Chemical Testing

Four representative samples were selected and scheduled for a suite of chemical analysis at the UKAS and MCERTS accredited laboratories of Eurofins Chemtest. All soil samples were analysed for a suite of contaminants considered appropriate to the past history of the site from the desk study.

The number of samples tested was designed to be enough to form an initial assessment of the contamination potential of the site, considering its known history and the materials encountered in the investigation. Hence, it falls in line with the general requirements of BS10175 'Investigation of Potentially Contaminated Sites'. MCERTS accredited methods, in accordance with Environment Agency recommendations, were specified where available. The samples tested appeared to be representative of the soils present upon the site. In view of the history of the site and the findings of the exploratory holes, the suite of soil testing has included the following suite of contaminants:

- Arsenic
- Cadmium
- Chromium (total)
- Chromium (hexavalent)
- Copper
- Lead
- Mercury
- Nickel
- Zinc
- Asbestos
- Cyanide
- pH
- Polycyclic Aromatic Hydrocarbons (speciated)
- Selenium
- Total Petroleum Hydrocarbons
- PCB
- Phenols

Eurofins Chemtest Certificate of Analysis No. 25-14635 (in Appendix F) contain the results of analyses carried out upon samples of the shallow soils collected from the hand pits.

3.6 Headspace screening

As the site is near an existing car repair garage, representative samples of soil were screened using a photo-ion detector (PID) with 10.6eV lamp by headspace analysis. Headspace vapour analysis was undertaken using “sealy” bags half-filled with soil and analysed for approximately 10minutes. The PID was recently calibrated and hired from Environmental Science and Technology Limited. The test is dependent on temperature and soil type but is a useful indicator for the presence of VOCs. The headspace screening results are presented on the individual logs in Appendix C.

4 RESULTS OF THE INVESTIGATION

4.1 Ground conditions encountered

Based on published geological information obtained in the Phase 1 desk study, it was anticipated that the ground conditions would comprise residual granular soils formed by weathering of the Woolley Edge Rock which would grade into weak sandstone at depth. Localised areas of made ground were expected associated with the site's building.

The ground investigation encountered a veneer of made ground underlain by buff coloured sand with much gravel and cobbles of sandstone, interpreted as weathered Woolley Edge Rock.

Descriptions of the various deposits present beneath the site are given below and summarised in the geological cross-section in Appendix D.

4.1.1 Topsoil

Topsoil was only encountered in hand pit HP1 to 0.1m below ground level (bgl).

4.1.1 Made ground

Made ground was encountered in all hand pits to depths of between 0.20m and 0.60m bgl. It should be noted that investigation locations did not include the area of the building or driveway footprint, where a thicker veneer of made ground may be present.

4.1.2 Weathered Woolley Edge Rock.

Dense sand with gravel and cobbles of sandstone formed by weathering of the Woolley Edge Rock (WER) was encountered directly beneath the made ground to completion depths in all of the hand dug pits. It was not possible to progress the excavation using hand tools or augers due to the presence of sandstone cobbles.

4.2 Groundwater

Groundwater was not encountered in any of the trial pits.

4.3 DCP Testing

In order to inform design of the car park hardstanding, 2No. dynamic cone penetrometer tests were undertaken at the site. The locations of the tests are shown in Figure 3.1.

The test results are presented in Appendix E and summarised in Table 4.1. Note both test results refused at shallow depths due to shallow bedrock. It is recommended that the individual test results are consulted if used for pavement design.

Table 4.1 – Equivalent CBR values from DCPs

Location	Geology	Equivalent CBR value (%)
DCP1	MADE GROUND	17.3
	SAND (Weathered WER)	Refusal at 0.40m bgl
DCP2	MADE GROUND	5.2
	SAND (Weathered WER)	Refusal at 0.73m bgl

4.4 Headspace screening

No elevated or trace readings of hydrocarbon impacted soils were recorded from any of the PID headspace screens.

5 COMMENTS AND RECOMMENDATIONS: ASSESSMENT OF CONTAMINATION

5.1 Assessment Criteria Overview

The contamination test data for the soils have been compared against published 'Tier 1' generic assessment criteria (GAC), for a 'residential with home grown produce' land use.

The Tier 1 GAC's adopted in the first instance comprise the LQM/CIEH S4ULs (Suitable For Use Screening Levels) for Human Health Risk Assessment (Publication No. S4UL3429).

The S4ULs currently exclude Lead, hence the Defra approved Category 4 Screening Levels1 (C4SLs) have been adopted. For the proposed development, the C4SL for a 'residential with home grown produce' land use is relevant, for which 200 mg/kg is considered acceptable for total Lead in soil.

In 2021, the Environment Agency updated their Land Contamination Risk Management (LCRM) guidance, advising that the C4SLs are suitable for the assessment of land contamination under the planning regime, as well as for Part 2A assessments. They also state that where there is a Soil Guideline Value (SGV) and a C4SL value for a determinands, the C4SL value should be adopted for the assessment.

The S4ULs are more conservative than the C4SLs, and have been adopted in the first instance, as a conservative screening tool to identify potential contaminants of concern. Where a S4UL is exceeded, the C4SL value is consulted to establish if remedial works may be necessary, or further detailed site-specific risk assessment to derive a development specific assessment criterion.

Where a determinand exceeds one or more GAC, further consideration of the risk is required to establish if remedial works are required. This can include statistical analysis of the soils, supported by further sampling and analysis where appropriate.

5.2 Soil Chemical Contamination Test Results

The soil chemical test results are summarised in Appendix G, which includes the generic assessment criteria (GACs) for the proposed land use of 'residential with home grown produce'. Should the proposed development at the site change the potential risk posed by the identified contamination should be reviewed. Laboratory data at the site recorded an average result of approximately 5.1% for soil organic matter calculated using fraction of organic carbon and total organic carbon result. Given the sensitive receptor, the GAC for the site are conservatively calculated assuming 2.5% SOM.

The table shows that there were no exceedances of GACs for metals, metalloids or petroleum hydrocarbons. However, exceedances were recorded for the following polycyclic aromatic hydrocarbons (PAHs):

- Benzo(b)fluoranthene (two samples – HP2 and HP4);
- Benzo(a)pyrene (two samples – HP2 and HP4); and
- Dibenzo(g,h,i)perylene (two samples – HP2 and HP4).

All three PAHs are formed by the incomplete combustion of organic material and considered as potential carcinogens in humans.

No traces of polychlorinated biphenyls were found in the soil sample tested near the electricity sub-station.

No asbestos fibres were found.

5.3 Revised Conceptual Site Model

In accordance with Environment Agency (EA) Land Contamination Risk Management (LCRM) guidance (2020) should be updated at all stages.

Following the site investigation information in this report, the revised findings can be summarised below:

- Made ground was encountered in all hand pits to a maximum depth of 0.60m bgl;

- No obvious contamination (visual or olfactory) was identified during fieldworks;
- No trace of hydrocarbons or VOCs from headspace screen testing;
- Exceedances of GACs were recorded for three PAHs in two samples out of four;
- No traces of polychlorinated biphenyls were recorded;
- No traces of asbestos fibres;
- No elevated sulphate or high pH results for concrete attack assessment;
- The site has a very low ground gas risk, including radon;
- Groundwater was not recorded in any of the exploratory holes; and
- The development is to comprise soft landscaping for a children's play area with a new car park area to the south.

The findings of the ground investigation generally concur with the desk study findings and the preliminary conceptual site model, with some further assessment discussed below.

5.4 Contamination Assessment

5.4.1 Human Health Risk Assessment (Soil)

The site is be developed as a children's playground and car park. Therefore, this assessment focuses on potential risks to future users and in-ground construction workers. In the absence of any ground investigation data, based on the site setting history, the Preliminary Conceptual Site Model assessed there was a Moderate /Low risk to future site users from any potential on or off-site sources of contaminants.

Following the results of chemical analysis on representative soil samples, based on the increased probability of encountering contaminated soils, the risk that on-site contaminants presents to human health is revised to **Moderate**.

The risk from encountering PCBs associated with the adjacent substation, or hydrocarbons from the nearby garage are dismissed based on the contamination test results and headspace screening.

5.4.2 Construction Workers Risk Assessment

Construction workers have a much shorter exposure time and as such the GAC used to assess the long-term exposure risk to end-users are considered overly conservative. Under current health and safety legislation, construction and maintenance workers are required to carry out appropriate risk assessments and instigate appropriate mitigating measures to protect themselves, other human receptors and the environment from contamination which may be present. Such risks must be adequately mitigated by the measures required under current legislation, specifically the Construction Design Management (CDM) Regulations which requires that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk. On this basis, it been assumed that personal protective equipment (PPE) and health and safety best practices will be adopted during the construction works and acute risks to construction workers / site visitors have therefore not been considered as part of this assessment.

5.4.3 Controlled Waters Risk Assessment

It is the remit of the Environment Agency to protect 'Controlled Waters', which includes groundwater and surface waters. The Agency are also statutory consultees in the planning process. Given the findings of the investigation and chemical analyses, the risk that the site poses to Controlled Waters remains from the Preliminary Conceptual Site model as Low.

The site is not near any watercourse and groundwater is unlikely to be encountered during the development based on the findings of this investigation. No visual or olfactory evidence of contamination was noted within the exploratory holes. It is unlikely that the site and the proposed development poses a significant risk to Controlled Waters and further consideration is unlikely to be required by the Environment Agency.

5.4.4 Structures Assessment

The results of Total Sulphate and pH tests carried out on soil samples indicate that the site falls within the DS-1 category as defined in BRE special digest 'Concrete in aggressive ground' and

is considered to represent a low risk to any concrete foundations. Based upon pH values for the soil, an appropriate ACEC class for the site would be AC-1.

5.4.5 Ground Gases Risk Assessment

The site is in a coal mining area and an area where between 3% and 5% of properties are above the Radon gas Action level. However, the Preliminary Conceptual Site Model assessed there was a Low risk to future users from any hazardous ground gases, and dismissed the risk as the site proposals do not include confined spaces.

Therefore no ground gas protection measures are required. Should site proposals change and include confined spaces then this risk will require re-evaluation.

It should be appreciated that these recommendations have not been made with the agreement of the Local Authority who will need to be satisfied that the potential ground gas risk has been adequately addressed.

5.5 Remediation Strategy

The site does not present a risk to controlled waters or hazardous ground gases but does present a Moderate risk of contaminated soils to future users (children). Based on the ground investigation findings, a remediation strategy is considered necessary for this site particularly as the site will be used by sensitive receptors with a feasible pathway to the PAH contaminants.

There are two options to break the pollutant linkage and make the site suitable for the proposed development:

- Source removal – strip all the existing made ground to natural ground and remove off-site.
- Break pathway - remove the made ground to a depth of 600mm below proposed finished top of topsoil level in the playground area and replace the clean imported cover soil material with 450mm of sub-soil and 150mm of topsoil cover above. Alternatively, this could be reduced to 300mm thickness if a high visibility geotextile warning/barrier layer

is placed at the base to prevent landscape workers from over-excavating into contaminated soils.

Note that neither option is required beneath the car park as the hardstanding will act as a physical barrier to break any pathway.

The preferred option would largely be based upon final proposed levels. As the second option of imported cover soils requires either 300mm or 600mm thickness to be stripped off, and that the Woolley Edge Rock is likely to be encountered at these depths, full made ground (and hence source) removal is likely to be the most suitable remediation strategy.

In addition, the site does not provide any opportunity for site won topsoil. New imported topsoil will be required for the landscaping areas. Imported soil for soft landscaping will need to be chemically validated to ensure it is suitable for residential end-use. Landscaping proposals are unknown at this stage, but topsoil thickness would need to be sufficient to comply with NHBC or similar requirements for sustainable plant growth and must conform to the requirements of British Standard BS 3882:2015 “Specification of topsoil and requirements for use”, free from any residual soil contamination. The imported soils should be from a licenced source and be accompanied by certification to confirm the soils are suitable for use. The topsoil layer placement should be independently validated by a geo-environmental consultant.

It should be appreciated that as a large part of the site has not been fully investigated there remains the possibility of the presence of unidentified areas of contamination. Although likely to be low risk, should unanticipated deposits of made ground be encountered during the excavation works, or visual / olfactory evidence of contamination be observed, works should be ceased whilst an assessment of contamination is undertaken. A watching brief should be imposed should any works be carried out onsite to validate any areas of potential gross contamination and ensure any unidentified impacts can be characterised and treated appropriately. This is more likely to affect groundworkers based on the current site proposals. All groundworkers should wear appropriate personal protective equipment (PPE) combined with good hygiene practices and adhere to the watching brief method statement.

These recommendations have not been made with the agreement of the Local Authority who will need to review and approve this geo-environmental assessment before construction commences.

5.6 Disposal of Soil Arisings Off-site

The Government's aim of reducing reliance on landfill as a disposal option and minimising the impacts of landfills on the environment and human health has meant the introduction of more stringent regulatory procedures. In accordance with the Landfill Regulations (2005) and Waste Framework Directive (WFD) (2008/98/EC), it is a statutory requirement that a waste is characterised prior to disposal at a landfill site. The waste producer has a Duty of Care to ensure that the waste is characterised, and the landfill operator must also be satisfied that a Basic Characterisation, is properly completed before the waste is accepted.

If arisings from constructions works or other waste materials are intended for disposal then there is a requirement to determine prior to disposal whether these would classify as:

- Hazardous
- Non-Hazardous

The Environment Agency's technical guidance 'Waste Classification (WM3, 1st edition 2015)' which came into force on 1st July 2015, sets out the requirement for the classification. It also provides the basis for the methodology to employ in order to ensure compliance with the regulations.

The classification assesses the composition of the material and determines the concentrations of the hazardous substances in the material. The assessment of contaminated soil (excavated soil) to determine whether it is hazardous waste is dependent on the presence of "hazardous substances" exceeding particular thresholds.

The basic characterisation requires solids testing for potential contaminants, derived from the knowledge of the site history (in the case of contaminated soil) or product safety data sheet (in the case of other waste products).

The characterisation also determines the most appropriate List of Waste (LoW) code(s) for the waste. The List of Wastes (England) Regulations 2005 shows those wastes that are absolute entries (hazardous waste regardless of their concentration) and mirror entries (hazardous waste only if dangerous substances are present above threshold concentrations).

All waste soils should be sorted to prevent mixtures of waste types. Where possible, any waste soil should be recycled and the volume of soil to be disposed of should be minimised. Initially, Basic Characterisation of the waste is required whereby the material should be described and its source of origin recorded (a site plan, exploratory hole records and the certificates of chemical analysis in this report should be included). This should also include data on its composition and leaching behaviour, its European Waste Catalogue (EWC) code, and where relevant any hazardous properties according to Annex III of Directive 91/689/EEC. This information should be provided to the licensed waste contractor.

Whilst the site investigation identified two samples exceeded their screening value for future site users, it is expected that the arisings from the soils at the site would fall within the **Non-Hazardous** waste 17 05 04; soil and stones category. Therefore, it is considered that this material may be accepted at permitted non-hazardous waste landfill. WAC testing is not required for Non-hazardous Waste; however, the receiving landfill site should be provided with the Eurofins Chemtest testing certification in Appendix F demonstrating its chemical properties.

5.7 Buried Services

Water supply pipework can be affected by contaminants or aggressive materials within the ground, hence the results of the contamination testing in relation to the possible effects on any supply pipes should be considered. To fully assess the possible effects on these items consultation should be undertaken with the local Water Authority and reference made to the following document:

- UK Water Industries Research (UKWIR) Report Ref. 10/WM/03/21. Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, 2010.

This site investigation report is not intended to be used as a Site Assessment Report (SAR) as required by the above referenced document. However, the results of the desk study and chemical testing may provide useful information.

The results of the chemical testing undertaken have been compared to the threshold concentrations presented within Table 3.1 of the UKWIR Guidance Document and indicate that no restrictions on water pipe material selection are required; although not all of the suggested chemical analyses were undertaken as part of this investigation.

6 REFERENCES

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APPENDIX A - LIMITATIONS STATEMENT

1. The observations described in this report were made under the conditions stated herein. The conclusions were based solely upon the services described and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by the client.

2. The findings, conclusions and recommendations in this report are based on information concerning the site made available to Arena Geo Limited. Conditions in many of the areas reviewed are subject to change, so the environmental status at any given time could differ from the status at the time of our evaluation.

3. In preparing this report, Arena Geo Limited has relied on certain information provided by Government or local officials and other third parties referenced herein, and on information contained in the files of local agencies available at the time of our review. We did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of the study.

4. The purpose of this study was to render an opinion as to the presence of potential contamination with regard to the setting of the site, within the limits of the scope of work outlined in our proposal. We did not attempt to assess the compliance of present or past owners or operations at the site with all laws and regulations, environmental or otherwise.

5. Where analyses have been conducted by an outside laboratory, Arena Geo Limited has relied on the data provided and has not conducted an independent evaluation of the reliability of these data.

6. We did not undertake any specific ecological survey as part of this report. Except when noted in the text of this report, no information is offered about the ecological value of the site, or about species present on or near the site.

7. The groundwater and ground gas conditions entered on the various records are those observed during subsequent monitoring. Groundwater is subject to seasonal variation or changes in local drainage conditions. Ground gas levels may vary depending on variations in weather conditions particularly barometric pressure. Rates of decomposition / degradation of organic matter in the underlying soils can also affect the generation of ground gases.

8. The opinions expressed in this report are based on the ground conditions revealed by investigation, together with an assessment of the site and of laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are only for guidance and no liability can be accepted for their accuracy

9. The content of this report represents the professional opinion of experienced geotechnical and environmental specialists. Arena Geo Limited does not provide associated legal advice and appropriate legal advice should be sought if required.

10. The lack of evidence of the presence of hazardous materials, voids or obstructive features at the subject property does not guarantee the absence of such materials/features, rather it indicates only that none was found as a result of the services provided.

11. This report is for the exclusive use of Barker Associates Limited, and their exclusive agents. No warranties or guarantees are expressed or should be inferred by any third parties. Any such party relies upon the report at their risk.

APPENDIX B – SEVERITY AND PROBABILITY OF RISK IN CONCEPTUAL SITE MODELS (after CIRIA552, Tables 6.3 to 6.5)

This report draws on guidance presented in CIRIA report 552, "Contaminated Land Risk Assessment, A Guide for Good Practice", wherein the "severity" term in the Conceptual Site Model is classified with reference to the sensitivity of the hazard and the receptor, as follows:

Severity Category	Description	Examples
Severe	Acute risk to human health likely to result in "significant harm" as defined in EPA90, catastrophic damage to buildings or property, acute risk of major pollution of controlled waters, acute risk of harm to ecosystems (as defined in Contaminated Land Regulations 2006)	High cyanide concentrations at the surface of a recreation area Major spillage into controlled waters Explosion, causing building collapse
Medium	Chronic risk to human health likely to result in "significant harm" as defined in EPA90, chronic pollution of sensitive controlled waters, significant change at a sensitive ecosystems or species, significant damage to buildings or structures	Contaminant concentrations at a site in excess of SGVs, GAC or similar screening values Leaching of contaminants to sensitive aquifer Death of a species within a nature reserve
Mild	Pollution of non-sensitive waters, significant damage to buildings, structures, services or crops, damage to sensitive buildings, structures, services or the environment, which nonetheless result in "significant harm"	Pollution to (former) non-aquifer or to non-controlled surface watercourse. Damage to building rendering it unsafe to occupy (e.g. foundation or structural damage)
Minor	Harm, not necessarily resulting in "significant harm" but probably requiring expenditure to resolve or financial loss. Non-permanent risks to human health that are easily mitigated, e.g. by wearing PPE. Easily-repairable damage to structures or services	Contaminant concentrations requiring the wearing of PPE during site work, but no other long-term mitigation. Discolouration of concrete

The likelihood of an event (probability) considers both the presence of hazard and receptor and the integrity of the pathway between hazard and receptor, and is assessed as follows:

Category	There is a pollution linkage and:
High	Event is likely in the short term and almost inevitable over the long term. Or there is evidence of actual harm at/to the receptor
Likely	Event is possible in the short term and likely over the long term
Low	Event is unlikely in the short term and possible over the long term
Unlikely	Event is unlikely, even in the long term

Potential severity and probability have been assessed in the following matrix, to give an overall risk rating:

	Severity			
Probability	Severe	Medium	Mild	Minor
High	Very high	High	Moderate	Moderate/low
Likely	High	Moderate	Moderate/low	Low
Low	Moderate	Moderate/low	Low	Very low
Unlikely	Moderate/low	Low	Very low	Very low

The above risk categories are likely to result in the following actions:

- Very high: urgent intervention / investigation needed; remediation likely to be required
- High: urgent intervention / investigation needed, remediation possibly required in short term and probably required in long term
- Moderate: investigation needed to clarify and refine risk; remediation may be required over the long term
- Low: it is possible that harm could arise to a receptor, but if realised, such harm is likely to be, at worst, mild
- Very low: it is possible that harm could arise to a receptor, but if realised, such harm is unlikely to be severe.

APPENDIX C – EXPLORATORY HOLE LOGS

ARENA GEO

Key to exploratory hole symbols and abbreviations

SAMPLE TYPES

ACM - Asbestos sample
AMAL - Amalgamated sample
B - Bulk disturbed sample
BLK - Block sample
C - Core sample
CBR - CBR test sample
D - Disturbed sample
ES - Environmental sample
EW - Environmental water sample
G - Gas sample
J - Jar sample
L - Liner sample
TW - Pushed thin wall sample
U - Undisturbed sample
UT - Undisturbed thin wall sample
W - Water sample

IN-SITU TESTS

HV - Hand shear vane
HV(r) - Hand shear vane residual
PID - Photo ionisation detector
PP - Hand penetrometer
SPT - Standard penetration test
SPT(C) - SPT using cone

GROUNDWATER

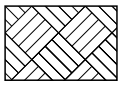

Groundwater strike


Groundwater rest level

ROTARY CORE DETAILS

TCR - Total core recovery (%)
SCR - Solid core recovery (%)
RQD - Rock quality designation (%)
FI - Fracture index
NI - Non-intact core
AZCL - Assumed zone of core loss

LEGEND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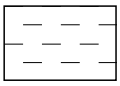
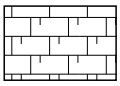
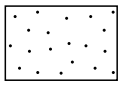
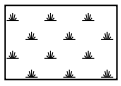

Clay


Chalk


Sand backfill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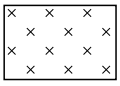
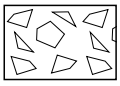
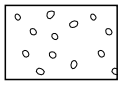
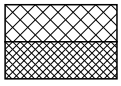
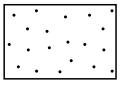
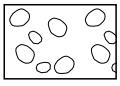

Silt

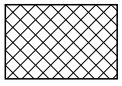

Breccia

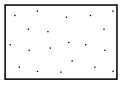

Gravel backfill

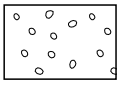

Made ground [cohesive]


Sand


Conglomerate


Arisings


Concrete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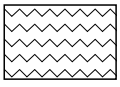
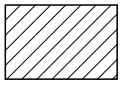
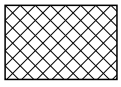
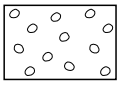
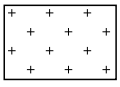
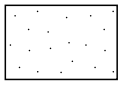

Metamorphic

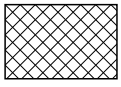

Bentonite


Wood


Cobbles


Igneous


Concrete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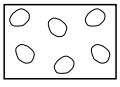
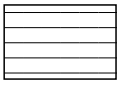
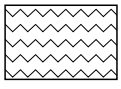

Boulders

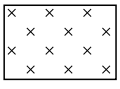

Grout


Bituminous material

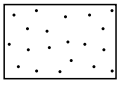

Mudstone


Plain pipe

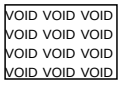

Gypsum


Siltstone

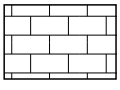

Coal


Sandstone


Slotted pipe



Void


Limestone

Hand Pit

HP1

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436176.00	404491.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(0.10) 0.10		TOPSOIL
		0.30	PID	0.00		(0.50)		MADE GROUND: (Brown slightly silty sandy gravel sized fragments of brick, ash, concrete, clinker and slag)
		0.50	PID	0.00				
		0.50	J 1			0.60		
		0.60	PID	0.00		(0.15) 0.75		Dense buff fine to coarse SAND with much fine to coarse angular gravel and cobbles of sandstone (lithorelicts) [Weathered WOOLLEY EDGE ROCK]
								End of Trial Pit at 0.75m

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.75m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

ARENA GEO

Hand Pit

HP1

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436176.00	404491.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Water Strike - Details

Struck (m)	Rose To (m)	Time (mins)	Remarks
			Groundwater was not encountered

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	J		

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.75m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

ARENA GEO

Hand Pit

HP1

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436176.00	404491.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.75m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

Hand Pit

HP2

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436161.00	404491.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
		0.25 0.25	PID J 2	0.00		(0.45)		MADE GROUND: (Brown slightly silty sandy gravel sized fragments of brick, ash, concrete, clinker and slag)
		0.50	PID	0.00		0.45 (0.15) 0.60		Dense buff fine to coarse SAND with much fine to coarse angular gravel and cobbles of sandstone (lithorelicts) [Weathered WOOLLEY EDGE ROCK] *End of Trial Pit at 0.60m*

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.60m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

ARENA GEO

Hand Pit

HP2

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436161.00	404491.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Water Strike - Details

Struck (m)	Rose To (m)	Time (mins)	Remarks
			Groundwater was not encountered

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	J		

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.60m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

Hand Pit

HP2

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436161.00	404491.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.60m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

Hand Pit

HP3

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436161.00	404500.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
		0.20 0.20	PID J 3	0.00		(0.40)		MADE GROUND: (Brown slightly silty sand with some gravel sized fragments of brick and concrete)
		0.40	PID	0.00		0.40 (0.20)		Dense buff fine to coarse SAND with much fine to coarse angular gravel and cobbles of sandstone (lithorelicts) [Weathered WOOLLEY EDGE ROCK]
						0.60		*End of Trial Pit at 0.60m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.60m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

ARENA GEO

Hand Pit

HP3

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436161.00	404500.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Water Strike - Details

Struck (m)	Rose To (m)	Time (mins)	Remarks
			Groundwater was not encountered

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	J		

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.60m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

Hand Pit

HP3

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436161.00	404500.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.60m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

Hand Pit

HP4

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436170.00	404505.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.10 0.10	PID J 4	0.00		(0.20) 0.20		MADE GROUND: (Brown slightly silty sand with some gravel sized fragments of brick and concrete)
		0.30	PID	0.00		(0.20) 0.40		Dense buff fine to coarse SAND with much fine to coarse angular gravel and cobbles of sandstone (lithorelicts) [Weathered WOOLLEY EDGE ROCK]
								End of Trial Pit at 0.40m

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.40m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

ARENA GEO

Hand Pit

HP4

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436170.00	404505.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Water Strike - Details

Struck (m)	Rose To (m)	Time (mins)	Remarks
			Groundwater was not encountered

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	J		

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.40m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

ARENA GEO

Hand Pit

HP4

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
HP	436170.00	404505.00		1:25

Project Name	Project No.	Start Date	End Date
Caretakers House Bank End Primary School	251012	2025-05-29	2025-05-29

Client
Barker Associates Limited

Consultant

Contractor

Remarks
Terminated due to an obstruction

Method, Plant, Stability, Dimensions
0.00 - 0.40m HP Hand dug
Stable

Logger
D Treanor

Checked By: CT **Approved By:** DT

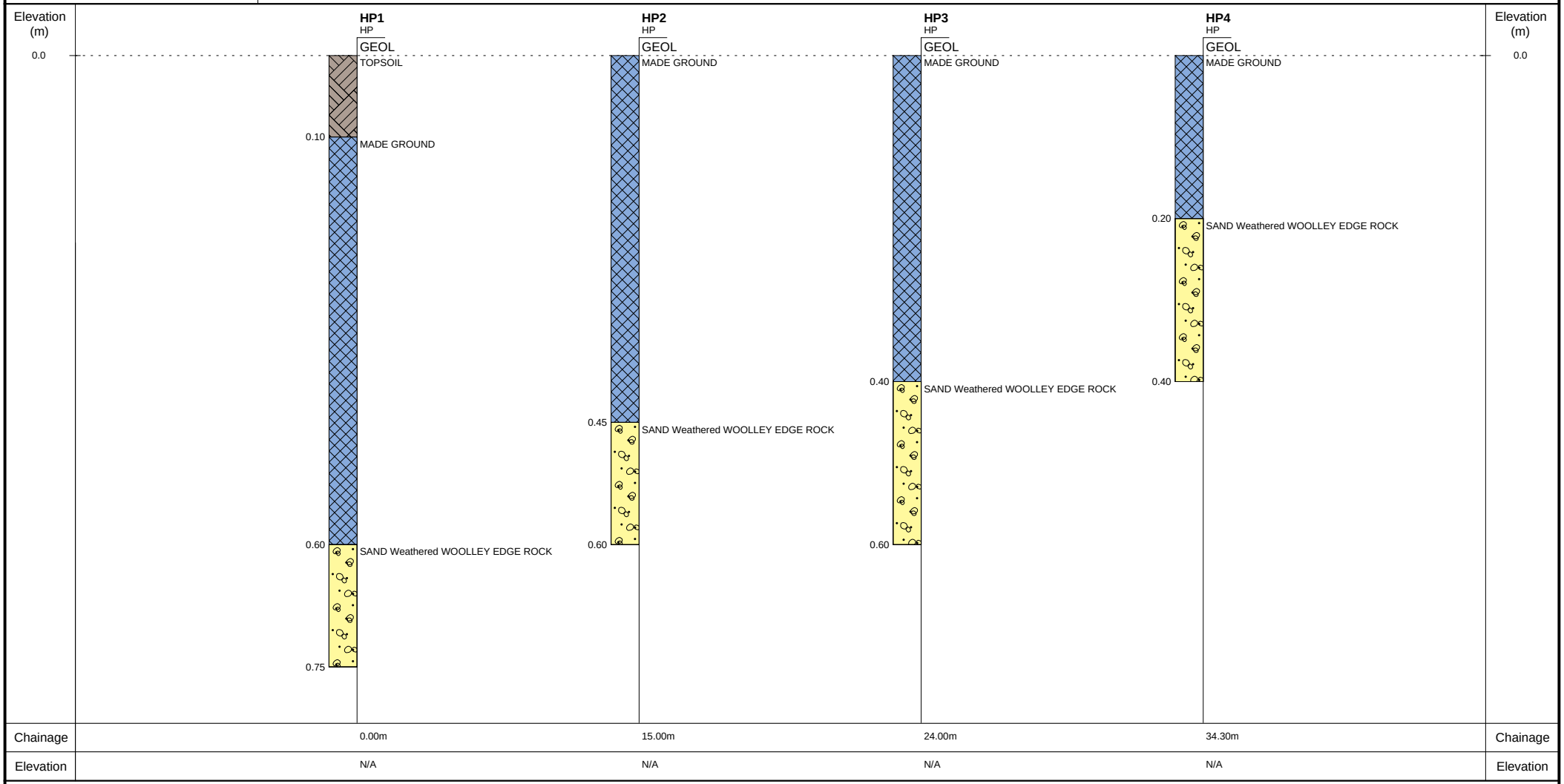
APPENDIX D – GEOLOGICAL CROSS-SECTION

251012 Geo Summary

ARENA GEO

Project Name	Project No.	Vertical Scale	Horizontal Scale
Caretakers House Bank End Primary School	251012	1:7	NOT SCALED

Client	Consultant	Contractor
		Barker Associates Limited



TOPSOIL MADE GROUND SAND

WATER LEVELS

REST

STRIKE

Checked By: CT **Approved By:** DT

Pipe / Installation Details Omitted

Created using Pebble Geo

APPENDIX E – DCP TESTING RESULTS

Test	DCP1
Date	29/05/2025
Technician	DT
Zero Error (mm)	45
Soil type	Made Ground
Weather	Dry

Notes

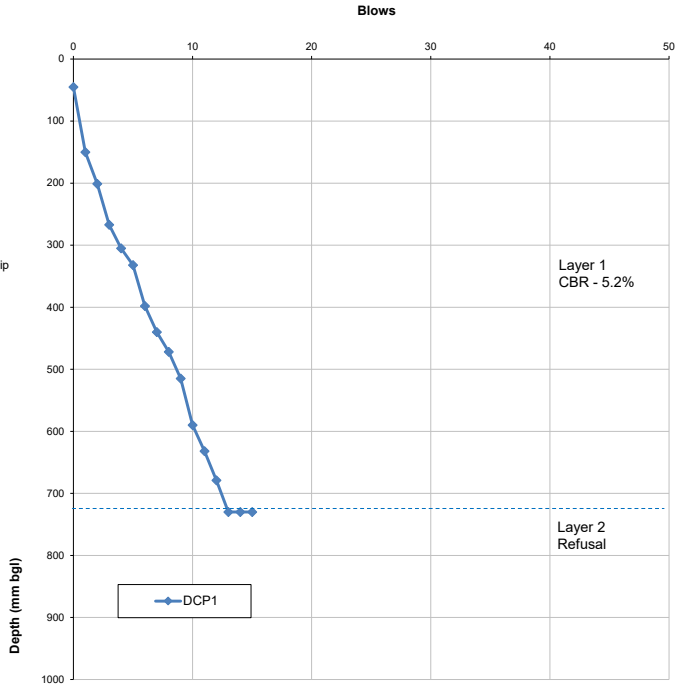
1. CBR values based on Equation 6.39.3 TRRL CBR DCP relationship

   $CBR = 10^{(2.45-1.057 \times Log10P)}$

   where P = Penetration rate in mm per blow

2. Refusal CBR values are ignored

3. Test completes at refusal or end of shaft length (1000mm)



DCP scale reading (mm)	No. of blows	Penetration per blow *P* (mm)	Cumulative Penetration (mm)	$Log_{10}P$	CBR Value (%)	Layer thickness (mm)	Average CBR (%)
45	0						
150	1	105	105	2.0	2.2		
201	2	51	156	1.7	4.7		
267	3	66	222	1.8	3.6		
305	4	38	260	1.6	6.5		
332	5	27	287	1.4	9.3		
398	6	66	353	1.8	3.6		
440	7	42	395	1.6	5.8	730	5.2
472	8	32	427	1.5	7.7		
515	9	43	470	1.6	5.7		
590	10	75	545	1.9	3.1		
632	11	42	587	1.6	5.8		
679	12	47	634	1.7	5.2		
730	13	51	685	1.7	4.7		
730	14	0	685			Refusal	
730	15	0	685				

Test	DCP2
Date	29/05/2025
Technician	DT
Zero Error (mm)	62
Soil type	Made Ground
Weather	Dry

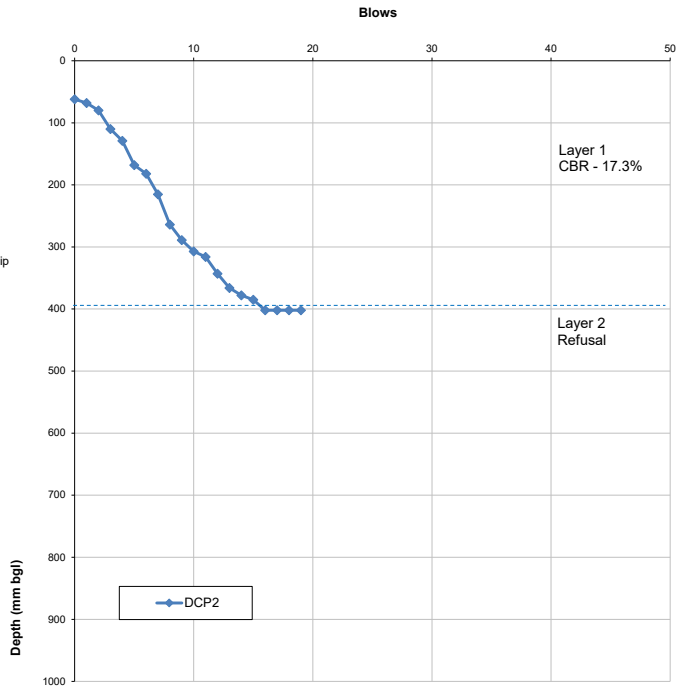
Notes

1. CBR values based on Equation 6.39.3 TRRL CBR DCP relationship

   $CBR = 10^{(2.45-1.057 \times \mathrm{Log}10P)}$

   where P = Penetration rate in mm per blow

2. Refusal CBR values are ignored
3. Test completes at refusal or end of shaft length (1000mm)



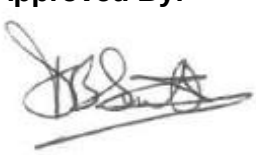
DCP scale reading (mm)	No. of blows	Penetration per blow *P* (mm)	Cumulative Penetration (mm)	$Log_{10}P$	CBR Value (%)	Layer thickness (mm)	Average CBR (%)
62	0						
68	1	6	6	0.8	45.4		
80	2	12	18	1.1	21.8		
110	3	30	48	1.5	8.3		
129	4	19	67	1.3	13.4		
168	5	39	106	1.6	6.3		
182	6	14	120	1.1	18.6		
215	7	33	153	1.5	7.5		
264	8	49	202	1.7	4.9	402.0	17.3
289	9	25	227	1.4	10.1		
307	10	18	245	1.3	14.2		
316	11	9	254	1.0	29.6		
343	12	27	281	1.4	9.3		
366	13	23	304	1.4	11.0		
378	14	12	316	1.1	21.8		
385	15	7	323	0.8	38.6		
402	16	17	340	1.2	15.1		
402	17	0	340			Refusal	
402	18	0	340				
402	19	0	340				

APPENDIX F - LABORATORY GEOTECHNICAL TESTING

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

Final Report

Report No.:	25-18349-1
Initial Date of Issue:	18-Jun-2025
Re-Issue Details:	
Client	*Arena Geo Limited*
Client Address:	*35 Purnells Way* *Knowle* *Solihull* *B93 9JN*
Contact(s):	*Des Treanor*
Project	*251012-1 Bnak End Primary School*
Quotation No.:	*Q24-34974*
Order No.:	251012-1
No. of Samples:	*4*
Turnaround (Wkdays):	5
Date Approved:	18-Jun-2025
Approved By:	



Date Received:	03-Jun-2025		
Date Instructed:	03-Jun-2025		
Results Due:	09-Jun-2025		

Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 251012-1 Bnak End Primary School

Client: Arena Geo Limited				**Chemtest Job No.:**		25-18349	25-18349	25-18349	25-18349
Quotation No.: Q24-34974				**Chemtest Sample ID.:**		1981633	1981634	1981635	1981636
				Client Sample ID.:		*J1*	*J2*	*J3*	*J4*
				Client Reference:		*HP1*	*HP2*	*HP3*	*HP4*
				Sample Type:		*SOIL*	*SOIL*	*SOIL*	*SOIL*
				Top Depth (m):		*0.50*	*0.25*	*0.20*	*0.10*
				Date Sampled:		*29-May-2025*	*29-May-2025*	*29-May-2025*	*29-May-2025*
				Asbestos Lab:		NEW-ASB	DURHAM	NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type		N	2192		N/A	-	-	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	10	9.0	13	9.1
Soil Colour		N	2030		N/A	Brown	Brown	Brown	Brown
Other Material		N	2030		N/A	Stones, Roots and	Stones, Roots and	Stones, Roots and	Stones, Roots and
Soil Texture		N	2030		N/A	Sand	Sand	Loam	Sand
pH at 20C		M	2010		4.0	6.9	7.6	7.7	8.1
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	0.79	1.0	< 0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Cyanide (Total)		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	11	7.6	14	9.8
Arsenic		M	2455	mg/kg	0.5	5.5	3.8	3.2	3.8
Cadmium		M	2455	mg/kg	0.10	< 0.10	0.11	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	6.1	5.7	5.4	5.6
Copper		M	2455	mg/kg	0.50	8.7	12	5.3	15
Mercury		M	2455	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel		M	2455	mg/kg	0.50	8.0	7.9	8.5	9.4
Lead		M	2455	mg/kg	0.50	17	23	7.8	16
Selenium		M	2455	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25
Zinc		M	2455	mg/kg	0.50	26	44	19	30
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	< 2.0	< 2.0	< 2.0
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	< 2.0	< 2.0	2.9
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	6.8	10	7.0	6.0
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	< 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	9.0	13	7.0	10
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	13	< 10	10
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05

Results - Soil

Project: 251012-1 Bnak End Primary School

Client: Arena Geo Limited			**Chemtest Job No.:**			25-18349	25-18349	25-18349	25-18349
Quotation No.: Q24-34974			**Chemtest Sample ID.:**			1981633	1981634	1981635	1981636
			Client Sample ID.:			*J1*	*J2*	*J3*	*J4*
			Client Reference:			*HP1*	*HP2*	*HP3*	*HP4*
			Sample Type:			*SOIL*	*SOIL*	*SOIL*	*SOIL*
			Top Depth (m):			*0.50*	*0.25*	*0.20*	*0.10*
			Date Sampled:			*29-May-2025*	*29-May-2025*	*29-May-2025*	*29-May-2025*
			Asbestos Lab:			NEW-ASB	DURHAM	NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	8.6	< 1.0	18
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	< 2.0	65	< 2.0	140
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	7.5	130	12	220
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	< 1.0	8.7	< 1.0	20
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	8.0	200	13	370
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	< 10	210	13	390
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	17	210	20	380
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	17	220	20	400
Organic Matter		M	2625	%	0.40	5.2	6.7	3.3	5.2
Benzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene		M	2800	mg/kg	0.10	0.25	0.32	< 0.10	0.33
Acenaphthylene		N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.13
Acenaphthene		M	2800	mg/kg	0.10	< 0.10	0.38	< 0.10	2.2
Fluorene		M	2800	mg/kg	0.10	< 0.10	0.32	< 0.10	1.8
Phenanthrene		M	2800	mg/kg	0.10	0.46	4.7	0.14	17
Anthracene		M	2800	mg/kg	0.10	< 0.10	1.2	< 0.10	4.4
Fluoranthene		M	2800	mg/kg	0.10	0.70	9.3	0.27	20
Pyrene		M	2800	mg/kg	0.10	0.63	7.8	0.22	16
Benzo[a]anthracene		M	2800	mg/kg	0.10	0.38	3.8	< 0.10	7.1
Chrysene		M	2800	mg/kg	0.10	0.53	4.2	< 0.10	7.2
Benzo[b]fluoranthene		M	2800	mg/kg	0.10	< 0.10	5.4	< 0.10	7.4
Benzo[k]fluoranthene		M	2800	mg/kg	0.10	< 0.10	2.0	< 0.10	3.0
Benzo[a]pyrene		M	2800	mg/kg	0.10	< 0.10	4.0	< 0.10	6.1
Indeno(1,2,3-c,d)Pyrene		M	2800	mg/kg	0.10	< 0.10	2.8	< 0.10	3.4
Dibenz(a,h)Anthracene		N	2800	mg/kg	0.10	< 0.10	0.50	< 0.10	0.65
Benzo[g,h,i]perylene		M	2800	mg/kg	0.10	< 0.10	2.6	< 0.10	3.4
Total Of 16 PAH's		N	2800	mg/kg	2.0	3.0	49	< 2.0	100
PCB 28		U	2815	mg/kg	0.010			< 0.010	
PCB 52		U	2815	mg/kg	0.010			< 0.010	
PCB 101		U	2815	mg/kg	0.010			< 0.010	
PCB 118		U	2815	mg/kg	0.010			< 0.010	

Results - Soil

Project: 251012-1 Bnak End Primary School

Client: Arena Geo Limited				**Chemtest Job No.:**		25-18349	25-18349	25-18349	25-18349
Quotation No.: Q24-34974				**Chemtest Sample ID.:**		1981633	1981634	1981635	1981636
				Client Sample ID.:		*J1*	*J2*	*J3*	*J4*
				Client Reference:		*HP1*	*HP2*	*HP3*	*HP4*
				Sample Type:		*SOIL*	*SOIL*	*SOIL*	*SOIL*
				Top Depth (m):		*0.50*	*0.25*	*0.20*	*0.10*
				Date Sampled:		*29-May-2025*	*29-May-2025*	*29-May-2025*	*29-May-2025*
				Asbestos Lab:		NEW-ASB	DURHAM	NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
PCB 153		U	2815	mg/kg	0.010			< 0.010	
PCB 138		U	2815	mg/kg	0.010			< 0.010	
PCB 180		U	2815	mg/kg	0.010			< 0.010	
Total PCBs (7 Congeners)		N	2815	mg/kg	0.10			< 0.10	
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	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 <30°C.	
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.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	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.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS. Reported PCB 101 results may contain contributions from PCB 90 due to inseparable chromatography.	
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
Text example	All items indicated in italic font represent customer-supplied information that may not be independently verified by the laboratory

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.

Any comments or interpretations are outside the scope of UKAS accreditation.

The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.

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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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.

NEW_ASB	Eurofins Chemtest Limited, 11 Depot Road, Newmarket, CB8 0AL
DURHAM	Eurofins Chemtest Limited, Unit A North Wing, Prospect Business Park, Crookhall Lane, Consett, Co Durham, DH8 7PW

Sample Deviation Codes

As a result of any of the below deviations applying, the test results may be unreliable

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 - The required amount of sample for analysis was not received

H - Appropriate cooling measures were not taken for sample transportation

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.

Report Information

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable
PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

Asbestos Tests LOD = LOQ

Limit of Detection = Limit of Quantification for asbestos results only

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

APPENDIX G - GENERIC ASSESSMENT CRITERIA

Determinand	Max	Mean	No. of tests	*SV	SV - Max	Residential with homegrown produce				Risk
						1%	2.5%	6%	Source	
Metals										
Arsenic	5.50	4.08	4	32	26.5	32			CLEA SGV	NO
Boron, Water Soluble	1.00	0.90	4	290	289.0	290			S4UL	NO
Cadmium	0.11	< 0.10	4	10	9.9	10			CLEA SGV	NO
Chromium	6.10	5.70	4	910	903.9	910			S4UL	NO
Copper	15.00	10.25	4	2400	2385.0	2400			S4UL	NO
Lead	23.00	15.95	4	200	177.0	200			C4SL	NO
Mercury	0.00	< 0.05	4	170	170.0	170			CLEA SGV	NO
Nickel	9.40	8.45	4	130	120.6	130			CLEA SGV	NO
Selenium	0.00	< 0.25	4	350	350.0	350			CLEA SGV	NO
Zinc	44.00	29.75	4	3700	3656.0	3700			S4UL	NO
Inorganics										
pH	8.10	7.58	4	-		-				NO
Cyanide, Total	0.00	< 0.50	4	610	610.0	610			WRAS	NO
Organic matter	6.70	5.10	4	-						NO
Sulphide	14.00	10.60	4	-						NO
Sulphate as SO4, Total	0.00	< 0.010	4	-						NO
Petroleum Hydrocarbons										
Aliphatic C5-C6	0.00	< 0.05	4	76	76.00	42	76	160	S4UL	NO
Aliphatic C6-C8	0.00	< 0.10	4	230	230.00	100	230	530	S4UL	NO
Aliphatic C8-C10	0.00	< 0.05	4	65	65.00	27	65	150	S4UL	NO
Aliphatic C10-C12	0.00	< 2.0	4	118	118.00	48	118	283	S4UL	NO
Aliphatic C12-C16	3.00	3.00	4	59	56.00	24	59	142	S4UL	NO
Aliphatic C16-C21	0.00	< 2.0	4	6500	6490.00	6500	6500	6500	S4UL	NO
Aliphatic C21-C35	10.00	7.45	4							NO
Aliphatic C10-C35	13.00	9.75	4							
Aromatic C5-C7	0.00	< 0.05	4	140	140	70	140	300	S4UL	NO
Aromatic C7-C8	0.00	< 0.05	4	190	190	130	190	660	S4UL	NO
Aromatic C8-C10	0.00	< 0.05	4	83	83	34	83	190	S4UL	NO
Aromatic C10-C12	0.00	< 1.0	4	180	180	74	180	380	S4UL	NO
Aromatic C12-C16	18.00	< 1.0	4	330	312	140	330	660	S4UL	NO
Aromatic C16-C21	140.00	< 2.0	4	540	400	260	540	930	S4UL	NO
Aromatic C21-C35	220.00	118.90	4	1500	1280	1100	1500	1700	S4UL	NO
Aromatic C10-C35	390.00	199.07	4							
Benzene	0.00	< 1.0	4	0.17	0.17	0.087	0.17	0.33	1% & 2.5% SOM S4UL; 6% SOM SGV	NO
Toulene	0.00	< 1.0	4	110	110.0	47	110	350		NO
Ethylbenzene	0.00	< 1.0	4	290	290.0	130	290	610		NO
Xylene	0.00	< 1.0	4	42	42	42	42	42	SGV	NO
PAHs										
Naphthalene	0.33	0.30	4	5.6	5.3	2.3	5.6	13	S4UL	NO
Acenaphthylene	0.13	0.13	4	420	419.9	170	420	920	S4UL	NO
Acenaphthene	2.20	1.29	4	510	507.8	210	510	1100	S4UL	NO
Fluorene	1.80	1.06	4	400	398.2	170	400	860	S4UL	NO
Phenanthrene	17.00	5.58	4	220	203.0	95	220	440	S4UL	NO
Anthracene	4.40	2.80	4	5400	5395.6	2400	5400	11000	S4UL	NO
Fluoranthene	20.00	7.57	4	560	540.0	280	560	890	S4UL	NO
Pyrene	16.00	6.16	4	1200	1184.0	620	1200	2000	S4UL	NO
Benzo(a)anthracene	7.10	3.76	4	11	3.9	7.2	11	13	S4UL	NO
Chrysene	7.20	3.98	4	22	14.8	15	22	27	S4UL	NO
Benzo(b)fluoranthene	7.40	6.40	4	3.3	-4.1	2.6	3.3	3.7	S4UL	YES
Benzo(k)fluoranthene	3.00	2.50	4	93	90.0	77	93	100	S4UL	NO
Benzo(a)pyrene	6.10	5.05	4	2.7	-3.4	2.2	2.7	3	S4UL	YES
Indeno(1,2,3-c,d)pyrene	3.40	3.10	4	36	32.6	27	36	41	S4UL	NO
Dibenzo(a,h)anthracene	0.65	0.58	4	0.28	-0.4	0.24	0.28	0.3	S4UL	YES
Benzo(g,h,i)perylene	3.40	3.00	4	340	336.6	320	340	350	S4UL	NO
PAH Total	100.00	50.67	4	275	175.0					
Phenols										
Phenol - Monohydric	0.00	< 0.10	4	550	280	280	550	420	as Benzene	NO

Notes

All Soil SGVs / GACs units are mg/kg. Shown to two significant figures

Concentrations measured below these screening values may be considered to represent 'uncontaminated conditions' which pose a 'LOW' risk to human health. Concentrations measured in excess of these values indicate a potential risk which require further, site specific risk assessment.

C4SL - Defra Category 4 Screening value based on Low Level of Toxicological Risk

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009 - where not superseded by C4SL

S4UL - LQM/CIEH Suitable for use Level (2015) based on 'minimal' level of risk

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