BELMONT CASTLE CARE/REST HOME, PORTSDOWN HILL ROAD, HAVANT, PO9 3JY

GROUND CONDITION ASSESSMENT

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Prepared for
Aria Care
Central Support office
The Boynes
Upper Hook Road
Upton upon Severn
Worcestershire
WR8 0SB

Prepared by
Ground Condition Consultants Ltd
10 Waldegrave Close
Southampton
Hampshire
SO19 9RY

ask@groundcc.com
www.groundcc.com

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Prepared by: Antony Platt - Director	Reviewed by: Rasmus Palmgren - Director
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Prepared by: Antony Platt - Director	Reviewed by: Rasmus Palmgren - Director
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Prepared by: David Fall – Geotechnical and Environmental Consulting Ltd	Reviewed by: Antony Platt - Director

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0. EXECUTIVE SUMMARY

Brief	The brief was to undertake a site investigation and assessment to identify any ground contamination issues and geotechnical conditions that may affect the proposed development. This report provides an assessment of the identified and potential ground conditions of the site, with regard to the proposed works in accordance with the Land Contamination Risk Management (LCRM) guidance, published by the Environment Agency. In addition, the geotechnical sections of this report provide a detailed assessment of the materials present beneath the site and present characteristic parameters that should be used in design of all geotechnical facets of the proposed development.
Current Site Status	The site is located at Belmont Castle Care/Rest Home off Portsdown Hill Road, Havant, PO9 3JY. The site/area proposed for the development is located to the rear (north) of the existing care/rest home building on-site and is currently undeveloped and forms part of the extended garden area of the existing care/rest home. The area is sloping down towards the north and there are numerous semi-mature/mature trees and shrubs present.
Site History	Historical map extracts reviewed (1866-2025) indicate that the existing property, Belmont Castle, associated ancillary buildings and potential orchard/plantation have been present on site since at least 1866. A wooded depression is also noted in the centre west of the site. A possible chalk pit depression is shown within the western site boundary on the 1960 and 1969 extracts, which is not evident on the 1973 or later extracts and was shown as a wooded area on earlier maps. The original building on the site was extended to the north during the 1990s, to form the current building layout.
Geology	Reference to the British Geological Survey (BGS) Map indicates the southern part (majority) of the site to directly overlie the bedrock geology of the Portsdown Chalk Formation. Superficial Head Deposits (clay, silt, sand and gravel) are shown to be present in the northern part of site, overlying the bedrock geology of the Portsdown Chalk Formation. Previous archaeology works were undertaken in the area of the proposed new building in 2015 and recorded c. 2.20m of variable made ground in the west of the study area. The Made Ground appears to broadly correlate with the possible former chalk pit depression features shown on the map extracts from the 1960s.
Hydrogeology	The Environment Agency Groundwater Vulnerability Map extracts indicate the northern part of the site to be underlain by a superficial Undifferentiated Secondary Aquifer, interpreted as the Head Deposits over a bedrock Principal Aquifer, interpreted as the Portsdown Chalk Formation. The southern part of the site is shown to be directly underlain by a bedrock Principal Aquifer, interpreted as the Portsdown Chalk Formation. The site is located within Groundwater Source Protection Zone – Inner Zone.
Hydrology	The nearest identified surface water feature is an unnamed inland river, located approximately 100m to the north.
Investigation Scope	The site investigation works were undertaken by GCC on the 20th May 2025 and comprised: • 3no. windowless sample boreholes (WS101-WS103) to a maximum depth of 8.5m bgl in order to allow determination of the ground conditions, undertake in-situ testing and obtain samples for geotechnical and environmental laboratory testing.
Conclusions and Recommendations (Contamination)	The conceptual model, based on information obtained as part of the preliminary risk assessment and intrusive ground investigation, identified the following potential contaminant sources: • Asbestos within the Made Ground associated with fill material in the former chalk pit.

	• Ground gas generation potential of Made Ground associated with fill material in the former chalk pit. It should be noted that additional sources of contamination may become apparent during any future investigation and development of the site. The risks of impact to the proposed development from soil contamination have therefore been assessed to be **low/moderate** if the asbestos contaminated soil remains at ground surface level in areas of soft landscaping. Where buildings and hard standing are to be placed over the Made Ground or the Made Ground is to be removed, this is considered sufficient to break the pollutant linkage by breaking the exposure pathway between the asbestos impacted Made Ground and the site users. Vigilance by the groundworks contractor for asbestos containing material is recommended throughout the development with a discovery strategy in place should any asbestos containing material be encountered. It is good practice for visible suspected asbestos containing materials to be removed from the soil where encountered, even in areas that are to be covered by hard standing, to minimise the overall quantity of asbestos in the ground. The risks from asbestos in Made Ground will need to be mitigated with measures such as source removal and engineered cover system in the soft landscaped areas. A discovery strategy and appropriate PPE are recommended during any redevelopment of the site to address any as yet unidentified contamination that may be identified during the works.
Conclusions and Recommendations (Geotechnical)	Ground conditions at the site of the proposed structure comprise Topsoil over Made Ground (WS102 and 103) in turn overlying Portsdown Chalk Formation to the full depth of the ground investigation. The Made Ground (where present) comprises the unregulated backfill of a historic chalk pit and attains a maximum thickness of 7.50m in WS102. The Portsdown Chalk Formation (Chalk) was encountered immediately beneath the Topsoil in WS101 and beneath the Made Ground at 7.90mbgl in WS102 The Chalk was recovered as Ciria Grade Dc structureless Chalk. It is likely that the Chalk grade improves with depth but the percussive drilling techniques have destroyed the fabric of the Chalk. Groundwater was not encountered during the ground investigation which achieved a maximum depth of 8.50mbgl. The Made Ground is not a suitable founding stratum due to its compositional variation and the apparent unregulated placement of the material as evidenced by the presence of a large concrete boulder at 5.40mbgl (WS102) and the presence of organic material at its base. Therefore, it is recommended that consideration is given to a piled foundation. Detailed pile design will require additional ground investigation works to a minimum depth of 18mbgl which would allow for the design of CFA pile socketed by 5.00m into the Chalk. A preliminary pile socket design has been carried out assuming that geotechnical conditions within the Chalk remain unchanged to the full depth of the pile socket. It must be stressed that the assumptions made would not be acceptable to the Local Authorities or underwriters and are presented herein as a guide only. A suspended floor slab should be adopted given the significant and variable thickness of Made Ground present beneath the proposed structure footprint
This sheet is intended to provide a summary only of the initial indicative assessment study of the site in relation to ground contamination. It does not provide a definitive engineering analysis for the purposes of costing or construction and is subject to the limitation of the agreed brief.	

1. INTRODUCTION

1.1 INSTRUCTION

Ground Condition Consultants Ltd. (GCC) was commissioned by Aria Care in May 2025 to undertake a Ground Investigation and Geotechnical Design Report for a site located at Belmont Castle Care/Rest Home, Portsdown Hill Road, Havant, PO9 3JY.

The brief was to undertake a site investigation and assessment to identify any ground contamination issues and geotechnical conditions that may affect the proposed development. This report provides an assessment of the identified and potential ground conditions of the site, with regard to the proposed works in accordance with the Land Contamination Risk Management (LCRM) guidance, published by the Environment Agency. In addition, the geotechnical sections of this report provide a detailed assessment of the materials present beneath the site and present characteristic parameters that should be used in design of all geotechnical facets of the proposed development.

This report is prepared in line with the agreed brief and is subject to the report conditions shown in Appendix 1.

1.2 LEGAL CONTEXT

Part IIA of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) provides a regime for the control of specific threats to health or the environment from land contamination. In accordance with the Act and the statutory guidance document 'The Contaminated Land (England) Regulations 2000', the definition of contaminated land is intended to embody the concept of risk assessment. Within the meaning of the Act, land is only "contaminated land" where it appears to the Regulatory Authority, by reason of substances within or under the land, that:

- Significant harm is being caused, or there is a significant possibility of such harm being caused; or
- Pollution of controlled waters is being, or is likely to be, caused."

Inherent in this definition is the requirement for contamination risk assessment to be undertaken on a site-specific basis, as the potential for harm is determined by the site's end use and its specific environmental setting.

The guidance defines “risk” as the combination of:

- The probability, or frequency, of occurrence of a defined hazard (for example, exposure of a property to a substance with the potential to cause harm); and
- The magnitude (including the seriousness) of the consequences.

While Part IIA of the Environmental Protection Act provides a risk based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment, the regime does not take into account future uses. New developments are therefore controlled by the planning regime, with reference to the National Planning Policy Framework (NPPF), rather than directly by Part IIA of the Environmental Protection Act.

The NPPF is based on the principal that the site should be suitable for its new use, taking account of ground conditions, including from natural hazards or former activities and states that “Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner”. The NPPF also links the planning and Part IIA regimes by stating that “after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990”. Key components of the Part IIA regime, such as the definition of Contaminated Land and the associated risk-based assessment approach, are therefore considered to also be applicable to the planning regime.

1.3 METHODOLOGY

This report has been prepared in accordance with published Environment Agency guidance (‘Land Contamination Risk Management (LCRM)’). LCRM provides the technical framework for structured decision making about land contamination and builds on previous work carried out under the Contaminated Land Research Programme (of the former Department of the Environment) and the Model Procedures for the Management of Land Contamination – Contaminated Land Report (CLR) 11. LCRM has adopted and refined the well-recognised methodology and terminology that has been used in contaminated land risk assessment for a number of years.

1.3.1. Pollutant linkage concept

In the context of land contamination, there are three essential elements to any risk:

- A **contaminant source** – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters.

- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.
- A **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of contaminant–pathway–receptor is described as a pollutant linkage.

1.3.2. Conceptual model

An important thread throughout the overall process of risk assessment is the need to formulate and develop a **conceptual model** for the site, which supports the identification and assessment of pollutant linkages. A conceptual model represents the characteristics of the site in diagrammatic or written form that shows the possible relationships between contaminants, pathways and receptors (pollutant linkages).

1.3.3. Risk assessment

LCRM advocates a phased approach to risk assessment comprising the following in order, as necessary:

Preliminary Risk Assessment – a desk study consisting of a review of documentary, anecdotal and site walk over evidence.

Generic Quantitative Risk Assessment (GQRA) - comparison of contaminant concentrations obtained from site investigation with generic assessment criteria.

Detailed Quantitative Risk Assessment (DQRA) - comparison of contaminant concentrations obtained from site investigation with site-specific assessment criteria.

This document follows on from the GCC Ground Condition Desk Top Study (Ref: J25-038-R01, dated May 2025) and constitutes a Generic Quantitative Risk Assessment with relevant details from the Preliminary Risk Assessment reproduced for ease of reference. This report also comprises a Ground Investigation Report and Geotechnical Design Report in accordance with Eurocodes.

1.4 PROPOSED USE

It is currently understood that a new/separate building comprising a care/rest home and associated landscaped areas, is proposed for the site. It is further understood that the new building would be partially cut into the existing slope.

A change in the site use from that currently proposed may result in the need for re-assessment of risk criteria and the conclusions and recommendations resulting from the risk assessment could therefore significantly change.

1.5 REPORT SCOPE AND LIMITATIONS

This report is based upon the recent site investigation data detailed herein. The report presents an interpretation of the borehole and laboratory data provided by the GCC ground investigation undertaken on the 20th May 2025. In addition, this report outlines the basic ground conditions encountered in the exploratory holes.

This information has been collated, processed and used to provide an interpretation of the ground conditions, with recommendations for foundation design for the proposed building.

The recommendations and opinions expressed in this report are based on the strata observed in the exploratory holes and the results of the site and laboratory tests. GCC takes no responsibility for conditions that have not been revealed by the exploratory holes, or which occur between them.

Whilst every effort has been made to interpret the conditions between investigation locations, such information is only indicative and liability cannot be accepted for its accuracy. Information provided from other sources is taken in good faith and GCC cannot guarantee its accuracy.

The information contained in this report is intended for the use of Aria Care and GCC can take no responsibility for the use of this information by any other party or for uses other than that described in this report.

2. PRELIMINARY RISK ASSESSMENT

2.1 SITE LOCATION AND DESCRIPTON

The site is located at Belmont Castle Care/Rest Home off Portsdown Hill Road, Havant, PO9 3JY. The site/area proposed for the development is located to the rear (north) of the existing care/rest home building on-site and is currently undeveloped and forms part of the extended garden area of the existing care/rest home. The area is sloping down towards the north and there are numerous semi-mature/mature trees and shrubs present.

Access into the site is from Portsdown Road, which forms the southern site boundary. An electric sub-station is located along Portsdown Road, close to the entrance to the site. Residential dwellings are located across Portsdown Road. A residential dwelling is located to the immediate west of the site. A combined swim school (Tiny Tots) and residential dwelling is located to the immediate east of the site. An area of woodland is located to the north of the site.

2.2 SITE HISTORY

Historical map extracts reviewed (1866-2025) indicate that the existing property, Belmont Castle, associated ancillary buildings and potential orchard/plantation have been present on site since at least 1866. A wooded depression is also noted in the centre west of the site. The 1868 map shows a road defining the southern boundary of the site and two structures just outside of the southwest boundary of the site. The remainder of the site is bound by fields. Several chalk pits are recorded within 100m metres of the site and Belmont Coppice is shown 100m to the north.

The site and surrounding area remain predominantly the same until the 1907 extracts show new residential dwellings to the east of the site, with associated roads, and a school. From 1930 to 1975 the extracts show a steady increase in the urbanisation and infrastructure of the surrounding area. A possible chalk pit depression is shown within the western site boundary on the 1960 and 1969 extracts, which is not evident on the 1973 or later extracts and was shown as a wooded area on earlier maps. Later maps show little change to the site and the immediate surroundings until the 1975 extract, which shows the A3 road running close to the east boundary running in a north south direction. The original building on the site was extended to the north during the 1990s, to form the current building layout. No significant changes are shown on later map extracts.

The Groundsure report makes reference to historical tanks on the site, although these are not apparent from a review of the available historical maps.

2.3 DOCUMENTATED GROUND CONDITIONS

Ground conditions recorded in readily available sources are summarised below.

2.3.1. Geology

Reference to the British Geological Survey (BGS) Map extracts (see Desk Top Study) indicates the southern part (majority) of the site to directly overlie the bedrock geology of the Portsdown Chalk Formation. Superficial Head Deposits (clay, silt, sand and gravel) are shown to be present in the northern part of site, overlying the bedrock geology of the Portsdown Chalk Formation.

Previous archaeology works were undertaken in the area of the proposed new building in 2015 and recorded a simple deposit sequence of a thin topsoil overlying subsoil contacting directly to upper bedrock chalk in the east of the study area and c. 2.20m deep sequence consisting of variable made ground in the west of the study area. The Made Ground appears to broadly correlate with the possible former chalk pit depression features shown on the map extracts from the 1960s.

2.3.2. Hydrogeology

The Environment Agency Groundwater Vulnerability Map extracts (see Desk Top Study) indicate the northern part of the site to be underlain by a superficial Undifferentiated Secondary Aquifer, interpreted as the Head Deposits over a bedrock Principal Aquifer, interpreted as the Portsdown Chalk Formation.

The southern part of the site is shown to be directly underlain by a bedrock Principal Aquifer, interpreted as the Portsdown Chalk Formation.

Secondary Undifferentiated Aquifers are assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non aquifer in different locations due to the variable characteristics of the rock type.

Principal Aquifers are geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers.

The site is located within Groundwater Source Protection Zone – Inner Zone.

2.3.3. Hydrology

The nearest identified surface water feature is an unnamed inland river, located approximately 100m to the north.

2.3.4. Radon

Radon is a naturally occurring radioactive gas which may be harmful to human health. Radon is generally released into the atmosphere in areas underlain by granite and limestone. Harmful concentrations of radon may build up if it becomes trapped in an enclosed space such as a building.

BGS/Public Health England data presented within the Groundsure Report indicates that the percentage of houses exceeding the Action Levels for Radon is less between 1% and 3%. Therefore, the property is in a Radon Affected Area, as defined by the Health Protection Agency (HPA), but radon protection measures are not necessary in new buildings.

2.4 ENVIRONMENTAL DATA SEARCH

A search of an environmental database was undertaken together with information from various other organisations as part of the desk study and is summarised in the following sections. The following summary is generally limited to locations within 250m of the site boundaries unless it is considered that installations or activities beyond that range could potentially have an impact on the site or be affected by the redevelopment of the site.

Table 2.1. Data search results

Discharge consents	There are no recorded discharge consents within 250m of the site.
Pollution incidents	There are no recorded pollution incidents within 250m of the site.
Water abstractions	There are no recorded water abstractions within 500m of the site.
Fuel Stations	There are no recorded fuel stations within 250m of the site.
Landfill Sites	There are no current or historical landfills within 250m of the site.
Environmental Designations	The site has been designated a Nitrate Vulnerable Zone.

2.5 MINING AND NATURAL GROUND HAZARDS

2.5.1. Mining

The site is located in an area where underground chalk mine workings are uncommon, although the geology is similar to that worked elsewhere. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.

However, surface chalk mining is noted to have taken place in the vicinity of the site with a possible chalk pit identified on site on the map extracts from the 1960s. The archaeological investigation from 2015 indicates that this feature may have been infilled with Made Ground.

2.5.2. Natural Ground Hazards

The following ground hazards were identified:

<u>Compressible ground stability hazards – Negligible hazard</u>

BGS Notes: Compressible strata are not thought to occur.

<u>Collapsible ground stability hazards – Very Low hazard</u>

BGS Notes: Deposits with potential to collapse when loaded and saturated are unlikely to be present.

<u>Ground dissolution stability hazards – Negligible to Moderate hazard</u>

BGS Notes: Negligible - Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present. (central part of the site)

BGS Notes: Very Low - Soluble rocks are present within the ground. Few dissolution features are likely to be present. Potential for difficult ground conditions or localised subsidence are at a level where they need not be considered. (southern part of the site)

BGS Notes: Moderate - Soluble rocks are present within the ground. Many dissolution features may be present. Potential for difficult ground conditions are at a level where they should be considered. Potential for subsidence is at a level where it may need to be considered. (northern part of the site)

Natural cavities (solution pipes) have been identified some 293m to the east of the site and correspond to an area near the outcrop boundary between the Lambeth Group and Portsdown Chalk Formation. Similar geology is present in the northern part of the study site.

While the depression shown on site on the historical maps from the 1960s has a similar appearance to the chalk pits shown nearby to the west of the site, the feature is not specifically referenced as such. It is possible that the feature could be the result of dissolution.

Landslide ground stability hazard – Negligible to Low hazard

BGS Notes: Negligible - Slope instability problems are not thought to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered. (associated with the southern majority of the site, directly overlying Chalk)

BGS Notes: Low - Slope instability problems may be present or anticipated. Site investigation should consider specifically the slope stability of the site. (associated with the northern part of the site, overlying Head Deposits)

Shrinking or swelling clay ground stability hazard – Negligible to Very Low hazard

BGS Notes: Negligible - Ground conditions predominantly non-plastic (associated with the southern majority of the site, directly overlying Chalk).

BGS Notes: Very Low - Ground conditions predominantly low plasticity. (associated with the northern part of the site, overlying Head Deposits).

Running sand ground stability hazards – Negligible to Very Low hazard

BGS Notes: Very Low - Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly (associated with the northern part of the site, overlying Head Deposits)

BGS Notes: Negligible - Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions. (associated with the southern majority of the site, directly overlying Chalk)

2.6 DEPARTMENT OF ENVIRONMENT – INDUSTRY PROFILES

The Department of the Environment Industry Profiles do not cover the previous or existing site uses of the site.

2.7 UNEXPLODED ORDNANCE

A Zetica UXO Unexploded Bomb (UXB) Risk Map was obtained for the site and is presented in the Desk Top Study. This map indicates the site to be of Moderate risk of potential UXBs to be present following World War Two (WWII) bombing, due to the sites location within an area of moderate density bombing. Zetica UXO typically recommend that a detailed UXO desk study and risk assessment is undertaken for sites in an area with a moderate or high bombing density.

2.8 CONCLUSIONS OF PRELIMINARY RISK ASSESSMENT

The following potential sources of contamination were identified:

- Potential for generation and migration of ground gas from the on-site infilled possible former chalk pit in the west of the site.
- Potential for reduced quality fill material within the possible former chalk pit in the west of the site.

It should be noted that additional sources of contamination may become apparent during any future investigation and development of the site.

The risks to the health of future site users from contamination, in the context of the proposed care home end use of the site, have been assessed to be low/moderate, primarily driven by the potential for asbestos to be present in the fill material within the possible infilled former depression/chalk pit.

Further investigation of the fill material in the possible infilled former depression/chalk pit is therefore recommended to confirm its composition and potential contaminant content.

The site is situated close to an area with a moderate risk of dissolution features and solution pipes have been identified to the east of the site. While the depression shown on site on the historical maps is shown with the same character as the off-site chalk pits, the feature itself is not labelled and could potentially be a dissolution feature. Investigation of the feature is recommended to understand its character, depth and potentially its origins for foundation design as well as contamination assessment purposes.

3. FIELDWORK SUMMARY OF SCOPE AND RATIONALE

3.1 RATIONALE AND SUMMARY OF SCOPE

The site investigation works were undertaken by GCC on the 20th May 2025. The scope and rationale of the site investigation are presented below.

- 3no. windowless sample boreholes (WS101-WS103) to a maximum depth of 8.5m bgl in order to allow determination of the ground conditions, undertake in-situ testing and obtain samples for geotechnical and environmental laboratory testing.

The layout of the exploratory hole positions is presented in Figure 2.

3.2 SAMPLING

Soil sampling was undertaken at various depths to assess the contamination risks to human health and controlled waters. Soil samples were also taken from various depths in the boreholes for geotechnical testing purposes.

3.3 SITE INVESTIGATION STANDARDS

Methods employed during the site investigation were generally undertaken in accordance with BS10175, BS EN 1997-2 and BS5930.

4. GROUND CONDITIONS ENCOUNTERED

4.1 SOIL CONDITIONS

Ground conditions encountered during the site investigation were in agreement with those presented on the BGS maps and comprised Topsoil and Made Ground, overlying the Portsdown Chalk Formation. Variations in strata thickness are summarised in Table 4.1 and engineering logs are presented in Appendix 2.

Table 4.1. Summary of encountered ground conditions

Location	Topsoil		Made Ground		Portsdown Chalk Formation	
	From (mbgl)	Thickness (m)	From (mbgl)	Thickness (m)	From (mbgl)	Thickness (m)
WS101	GL	0.40	N/E		0.40	>2.60
WS102	GL	0.40	0.40	7.50	7.90	>0.60
WS103	GL	0.40	0.40	1.60	2.00	>1.90

4.1.1. Topsoil

Topsoil was encountered from surface to 0.4m bgl at all locations, comprising soft light brown and grey clayey sandy and gravelly SILT with the gravel generally comprising chalk and flint but with brick fragments also encountered in WS102.

4.1.2. Made Ground

Made Ground was encountered beneath the Topsoil in WS102 and WS103 but was not encountered in WS101.

The Made Ground encountered in WS102 comprised variable fill material used to infill the former gravel pit in the late 1980s/early 1990s. The fill material generally comprised a soft to firm CLAY matrix with variable amounts of silt, sand and gravel. Numerous anthropogenic inclusions were also noted, including brick, metal, clinker and concrete. A notable lump of concrete was encountered at 5.4mbgl to 6.0mbgl and resulted in poor recovery in the associated drilling run. Beneath the concrete lump, from 6.0mbgl to 7.0mbgl, the Made Ground comprised clayey sandy GRAVEL of brick, flint, concrete and chalk. The basal layer of Made Ground was noted to have an organic odour and colouration and potentially represents residual Topsoil and/or vegetation present within the base of the chalk pit when it was infilled. The Made Ground in WS102 extended to 7.9mbgl (approx. 38.6mAOD).

The Made Ground encountered in WS103 comprised predominantly loose flint and chalk GRAVEL with varying quantities of silty and sand and extended to 2.0mbgl (approx. 48mAOD). It is considered likely that this indicates the periphery of the former chalk pit infill.

4.1.3. Portsdown Chalk Formation

The Portsdown Chalk Formation was encountered beneath the Topsoil or Made Ground in all locations, with base not proven at maximum investigation depth of 8.5m bgl. The Portsdown Chalk Formation was generally recovered as off white to white silty chalk clasts with occasional orange staining and flint nodules.

Whilst chalk grades inferred from windowless sample drilling techniques are tentative only, these observations correlate with CIRIA Grade Dc or better and all of the windowless sample boreholes are interpreted to have refused on structured chalk, due to the high SPT N values.

4.2 OBSTRUCTIONS

No obstructions were encountered during the investigation; however, unknown obstructions could be present within the fill material.

4.3 GROUNDWATER CONDITIONS

Groundwater was not encountered during the investigation.

4.4 VISUAL/OLFACTORY EVIDENCE OF CONTAMINATION

No visual or olfactory evidence of contamination was observed in the soil during the investigation.

5. GENERIC RISK ASSESSMENT

5.1 CONTAMINATION ASSESSMENT METHODOLOGY

In order to assess the human health and environmental risks posed by potential contaminants within the underlying soils GCC undertook sampling and subsequent screening of the laboratory results from samples obtained during the investigation using generic assessment criteria. Generic assessment criteria (GAC) are conservative contaminant concentration values used for comparison purposes to assess the risk associated with contaminant concentrations found on site and are derived using non-site-specific information.

5.1.1. Soils

In order to assess the soil analyses results with regard to potential human health risks, GCC has adopted the LQM /CIEH Suitable 4 Use Levels (S4ULs), generic assessment criteria (GACs) derived in accordance with the UK framework set out in the most recent CLR (Contaminated Land Report) documents using the Contaminated Land Exposure Assessment (CLEA) Model.

S4ULs have been published for an extensive suite of contaminants, with assessment criteria derived for each contaminant for four different land use scenarios namely:

- Residential with homegrown produce;
- Residential without homegrown produce
- Allotments; and
- Commercial and industrial.

A full list of the GACs together with an indication of the method used for their derivation is provided in Appendix 3. GACs applicable to residential without homegrown produce end use have been used for the assessment of the site. Contaminant concentrations below the GACs are considered not to warrant further risk assessment. However, concentrations of contaminants above the GACs may require further consideration through statistical analysis, if appropriate, or further detailed assessment using site specific data. Statistical analysis has not been utilised in this assessment, as it is not considered appropriate to the scale and number of samples analysed.

In regard to human health risks by direct contact exposure, contamination is generally assumed to be at or within 1m of the surface. It is considered that at depths greater than 1m, the probability of human exposure via the direct contact pathways are significantly reduced, leaving inhalation of volatile compounds as the dominant pathway with regard to human health risks. Typically, volatile compounds only significantly affect the indoor inhalation pathway. Therefore, data from the top 1.0 to 1.5m is used for assessment of risks to human health via direct contact pathways, dependant on proposed future site levels.

This document does not constitute a Site Assessment Report (SAR) as outlined in the UKWIR Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites (Ref: 10/WM/03/21, 2010). As such, the full generic suite of testing recommended in the UKWIR guidance may not have been undertaken for this site and may be required by some water companies. However, consideration has been given to the 'threshold' concentrations presented in Table 3.1 of the UKWIR guidance, where they are applicable to the analysis undertaken, to provide an indication of the potential risks to buried water supply pipes.

5.1.2. Leachate

Leachate analyses shall be assessed by direct comparison with the freshwater Environmental Quality Standards (EQS) and UK or WHO Drinking Water Standards or other appropriate guidance values. For certain compounds, the EQS is quoted as a range of values based on the alkalinity of the water, where the measured concentration lies within this range, the results are interpreted qualitatively. The guideline values selected as appropriate GACs for each contaminant are presented in Appendix 3.

5.1.3. Ground Gas

The criteria used to assess the ground gas monitoring results, where monitored, have been taken from the following guidance documents:

- Assessing risks posed by ground gases to buildings, CIRIA Report C665, 2007
- Code of practice for the characterisation and remediation from ground gas in affected developments, British Standard BS 8576, 2013
- A Pragmatic Approach to Ground Gas Risk Assessment, CL:AIRE Research Bulletin RB17, 2012

The frequency and period of monitoring is assessed based on the gas generation potential of the source material and the sensitivity of the development, in accordance with Figure 6 of BS8576 and Table 5.5 of CIRIA C665. As BS8576 promotes a risk based approach to ground gas assessment, it recognises that ground gas monitoring might not be necessary if a viable pollutant linkages is not present, e.g. if a 'credible' source with significant ground gas generation potential and/or a 'credible' migration pathway are not present.

The Characteristic Situation for a monitoring location is determined using the worst case gas screening value for methane or carbon dioxide from all of the monitoring rounds at that location. Following the precautionary principle the most stringent of the Characteristic Situations for the monitoring locations within the site is generally used to classify the site as a whole.

5.2 SOIL ASSESSMENT

5.2.1. General

A total of 9no. soil samples collected during the site investigation of soil that could potentially remain or be reused on site at or near surface during the proposed development works were submitted to a UKAS accredited laboratory for analysis for a suite of heavy metals, phenols, speciated polycyclic aromatic hydrocarbons (PAHs), fractionated total petroleum hydrocarbons (TPH) and several inorganic parameters. A full set of all the laboratory test certificates is presented as Appendix 4.

The range of potentially hazardous contaminants present on the site can be wide and varied and the suite has been chosen to reflect both commonly found contaminants and others indicated by research to have a significant risk of being present. It is, however, possible that others may exist for which analyses have not been carried out or which were outside the scope of completed exploratory holes.

The decision to recommend acceptability or a requirement for remediation is based on the evaluation of a number of factors which when combined present a statutory or non-statutory risk that may require remedial action.

5.2.2. Heavy metals

The heavy metals included in the analysis of the samples from across the site were generally identified at concentrations below the relevant GACs, with the exception of a lead exceedance noted in in the shallowest sample of Made Ground in WS103 (0.4-0.6m). Lead was recorded at a concentration of 463mg/kg, which is a marked exceedance of the 310mg/kg GAC. However, the lead concentration in the sample from 0.8-1.0m in the same location was recorded to be <40mg/kg

It is noted that Made Ground was recorded at this location comprised predominantly reworked gravel and silt with minimal anthropogenic inclusions. While there is insufficient data for a meaningful statistical analysis, the arithmetic mean of the lead concentration within the Made Ground at WS103 is 250mg/kg, which falls below the GAC of 310mg/kg. Considering this, the absence of significantly elevated lead concentrations in the other samples of Made Ground tested as part of this investigation and as the GAC is based on the critical receptor being a young child with regular interaction with the soil, rather than older adults who have little interaction with the soil, the identified elevated lead concentration is not considered to represent a significant source of contamination with regard to the proposed use of the site as a care home.

Therefore, heavy metals are not considered to represent a significant source of contamination with regard to future site users, although it is noted that the elevated lead impact in the Made Ground is likely to be removed in the course of construction.

5.2.3. Petroleum hydrocarbons

Total petroleum hydrocarbon (TPH) concentrations were recorded to be well below GACs in the soil samples across the site and predominantly below the laboratory detection limits. TPH is therefore not considered to represent a significant source of contamination with regard to human health.

Concentrations of TPH fractions did not exceed the UKWIR ‘threshold’ values for mineral oil in the majority of the samples. TPH is therefore not considered to represent a significant source of contamination to proposed water supply pipes for the site.

5.2.4. Polycyclic aromatic hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbon (PAH) compound concentrations were recorded to be well below the relevant GACs and below the laboratory detection limits in the majority of soil samples across the site. The samples from 0.4-0.6m in WS103 and 0.1-0.2m in WS102 had slightly higher PAH concentrations than the other samples, potentially associated with localised clinker or ash, but they were below the relevant GACs.

Therefore, PAH compounds are not considered to represent a significant source of contamination with regard to human health or environmental receptors.

5.2.5. Inorganics

The concentrations of free cyanide fell below the GAC in all of the soil samples analysed.

The pH of the soil samples analysed was generally within the 5-9 range, indicating neutral soils.

5.2.6. Asbestos

Asbestos was identified 1no of the 9no samples submitted for testing, WS102 at 0.1-0.2mbgl. The asbestos content of the soil was quantified at 0.077% w/w.

As asbestos was not segregated as hazardous waste at the time the fill material was placed within the former chalk pit on the site and was a common component of demolition materials and as asbestos has been confirmed to be present within the fill, all of the Made Ground on site should be assumed to be impacted with asbestos and treated accordingly.

Asbestos is therefore considered to represent a significant source of contamination with regard to the proposed development.

5.3 CONTROLLED WATERS

5.3.1. General

The desk top study identified the risks to the underlying chalk aquifer from the fill material on site to be very low. However, for confirmation, a sample of Made Ground from the base of the fill material was submitted to a UKAS accredited laboratory for leachate analysis for a suite of heavy metals, phenols, speciated polycyclic aromatic hydrocarbons (PAHs), fractionated total petroleum hydrocarbons (TPH) and several inorganic parameters.

A full set of all the laboratory test certificates is presented as Appendix 4.

The range of potentially hazardous contaminants present on the site can be wide and varied and the suite has been chosen to reflect both commonly found contaminants and others indicated by research to have a significant risk of being present. It is, however, possible that others may exist for which analyses have not been carried out or which were outside the scope of completed exploratory holes.

The decision to recommend acceptability or a requirement for remediation is based on the evaluation of a number of factors which when combined present a statutory or non-statutory risk that may require remedial action.

5.3.2. Heavy metals

The concentrations of leachable heavy metals were generally below the laboratory detection limits and the relevant GACs.

Therefore, heavy metals are not considered to represent significant risk with regard to controlled waters and no further assessment is considered necessary.

5.3.3. Petroleum hydrocarbons

Total petroleum hydrocarbon (TPH) concentrations were reported by the laboratory in mg/kg dry weight. While this does not allow direct comparison with the DWS GACs, it is noted that the concentrations were either below or very close to the laboratory detection limits and are therefore very low. The most notably elevated concentration was related to long chain low mobility aromatic C21-C40 fraction, which is typically rapidly attenuated in soil.

The EQS criteria are more subjective and state that petroleum products must not form a visible film on the surface of the water or form coatings on the beds of watercourses and lakes; impart a detectable ‘hydrocarbon' taste to fish; or produce harmful effects in fish. With no evidence of free product (NAPL) noted and very low recorded leachate concentrations, it is considered highly unlikely that the soil or groundwater at the site would exceed these criteria in the nearby water course receptors.

Therefore, TPH is not considered to represent a significant risk with regard to controlled waters and no further assessment is considered necessary.

5.3.4. Polycyclic aromatic hydrocarbons (PAHs)

Leachable polycyclic aromatic hydrocarbon (PAH) compound concentrations were reported by the laboratory in mg/kg dry weight. While this does not allow direct comparison with the EQS or DWS GACs, it is noted that the concentrations were either below or very close to the laboratory detection limits and are therefore very low.

As the process of leachate testing is an aggressive process to determine worst case, it is considered unlikely that in-situ leaching would result in similar concentrations to the laboratory analysis.

Therefore, PAH compounds are not considered to be a significant source of contamination with regard to controlled waters.

5.3.5. Inorganics

The pH returned from leachate testing is noted to be within the 6-9 GAC range. Cyanide, chloride, and sulphate were also noted to be below the GACs

5.4 GROUND GAS ASSESSMENT

5.4.1. Conceptual Model

The desk top study element of this assessment identified the potential for ground gas generation from Made Ground on site, used to infill the former chalk pit. No other likely sources of significant ground gas generation were identified on or in the vicinity of the site.

Made Ground was encountered in WS102 and WS103 and is interpreted as the material used to infill the former chalk pit. Made Ground was not encountered in WS101.

Made Ground encountered typically comprised reworked silty sandy gravelly clay, with occasional brick, concrete, clinker and metal fragments with a notably organic layer at the base.

5.4.2. Ground Gas Monitoring

Ground gas monitoring was not undertaken as part of the GCC scope of works.

5.4.3. CL:AIRE RB17 Assessment

While CL:AIRE RB17 states that the assessment approach detailed within it is not applicable to Made Ground deposits greater than 5.0m and with an average thickness of greater than 3.0m, the RB17 approach has been used below as an initial assessment of ground gas generation potential.

Made Ground of less than 1.0m thickness is not generally considered to represent a significant source of ground gas generation (Figure 2 Note 4 in RB17). This does not appear to apply to the Made Ground encountered during the investigation, which was encountered to be 2.0-7.9m thick.

As the Made Ground is considered to be reworked Topsoil and natural subsoils with occasional brick, concrete, clinker and metal fragment, this material is considered likely to have a low ground gas generation potential.

The 6no samples tested from the Made Ground used to infill the former chalk pit (WS102 and WS103) recorded total organic carbon (TOC) contents of 0.8-5.8%, with an average of 2.5%. With reference to Table 1 of RB17, this average TOC suggests a Characteristic Situation 2 gas regime, constituting a potential significant source of ground gas generation.

5.4.4. Conclusions

Therefore, based on the conceptual site model and with reference to CIRIA C665, BS8485, BS8576 and CL:AIRE Research Bulletin RB17, the preliminary data indicate that a classification of a Characteristic Situation 2 (CS2) gas regime to be appropriate for the for the site.

Ground gas is therefore considered to potentially represent a significant source of contamination with regard to the proposed development.

A CS2 gas regime would require ground gas protection measures for the proposed building. Alternatively, a programme of ground gas monitoring could be undertaken to confirm if the Made Ground is actually generating significant quantities of ground gas and potentially indicate that a CS1 gas regime is more appropriate, without the need for gas protection measures.

5.5 WASTE CLASSIFICATION

One sample of the fill material in the main body of the backfilled former chalk pit (WS102 at 2.6-2.8mbgl) and one sample of reworked chalk fill (WS103 at 0.8-1.0mbgl) were submitted for waste classification testing, including waste acceptance criteria (WAC) testing.

The HazWasteOnline assessment provided by the laboratory indicates that both samples would be classified as non-hazardous waste and also did not exceed the inert waste landfill WAC, indicating that they could be subclassified as inert waste.

However, while the sample from WS102 at 0.1-0.2m was not submitted for HazWasteOnline assessment, it is noted that the presence of asbestos at less than 0.1% w/w would classify the fill material as non-hazardous. If higher proportion of asbestos are encountered in the fill material (>0.1% w/w) or visible fragments of asbestos containing materials are encountered, the fill would be classified as hazardous waste.

6. CONCEPTUAL SITE MODEL

6.1 SOURCES

The conceptual model, based on information obtained as part of the preliminary risk assessment and intrusive ground investigation, identified the following potential contaminant sources:

- Asbestos within the Made Ground associated with fill material in the former chalk pit.
- Ground gas generation potential of Made Ground associated with fill material in the former chalk pit.

It should be noted that additional sources of contamination may become apparent during any future investigation and development of the site.

6.2 PATHWAYS

The key environmental pathways and exposure routes by which potentially toxic substances can reach the identified receptors are considered to be:

- Inhalation of dust
- Inhalation of gas
- Explosion

6.3 RECEPTORS

Receptors that may be affected by the potential contamination are:

- Future users
- New building

Construction workers have been excluded from this assessment on the basis that the assessment procedure in this report is for long term rather than short term exposure. They are also subject to health and safety at work regulations and are expected to use appropriate personal protective equipment (PPE).

7. RISK ASSESSMENT

7.1 RISK ASSESSMENT PROCEDURE

By considering the sources, pathways and receptors (pollutant linkages), an assessment of the human health/ environmental risks is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source contamination can reach a receptor and hence whether it is of major or minor significance.

The risk assessment has been undertaken with reference to BS10175 and CIRIA Document C552: Contaminated Land Risk assessment 'A Guide to Good Practice'. The risk assessment has been carried out by assessing the severity of the potential consequence, taking into account both the potential magnitude of the hazard and the sensitivity of the target, based on the categories given below.

Table 7.1. Sensitivity of receptor

Category	Examples
High	Residential with gardens/Groundwater Source Protection Zone
Medium	Residential without gardens/Principal (Major) Aquifer/sensitive watercourse
Low	Commercial and industrial use/Secondary (Minor) Aquifer
Very Low	Construction and maintenance workers/non-sensitive watercourse

Table 7.2. Magnitude of impact

Category	Examples
Gross Impact	Heavily contaminated gasworks or industrial site, hazardous waste landfill
Moderate Impact	Major leaks and spills from fuel infrastructure (e.g. petrol stations), domestic waste landfill
Slight Impact	Minor leaks and spills from fuel infrastructure, 'inert' waste landfills
No Impact	No identified or suspected contamination

Table 7.3. Level of severity for potential hazard

	Sensitivity of receptor			
Magnitude of Impact	**High**	**Medium**	**Low**	**Very Low**
Gross Impact	Severe	Medium	Mild	Minor
Moderate Impact	Medium	Mild	Minor	Minor
Slight Impact	Mild	Minor	Minor	Minor
No Impact	Minor	Minor	Minor	Minor

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given below.

Table 7.4. Probability of risk definition

Category	Definition
High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard.

Table 7.5. Level of risk for potential hazard definition

Probability of risk	Potential severity			
	Severe	**Medium**	**Mild**	**Minor**
High Likelihood	Very high	High	Moderate	Low/ Moderate
Likely	High	Moderate	Low/ Moderate	Low
Low likelihood	Moderate	Low/ Moderate	Low	Very low
Unlikely	Low/ Moderate	Low	Very low	Very low

The assessment is discussed below in terms of plausible pollutant linkages. A complete assessment of the pollutant linkages is presented in Table 7.6 overleaf.

A description of these risk classifications and likely action required are given in CIRIA 552 as:

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

High risk – Harm is likely to arise to a designated receptor from an identified hazard. This risk, if realised, is likely to result in substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term.

Moderate risk – It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term.

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

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

7.2 POLLUTANT LINKAGE ASSESSMENT

The following assessment is based on the proposed residential end use scenario.

Table 4.6. Pollutant Linkage Assessment

Source	Pathway	Receptor	Severity	Likelihood	Risk Level
Asbestos containing materials and fibres in localised on-site Made Ground	Inhalation	Future Users	Medium	Low Likelihood	Low/ Moderate
Ground gas generation from Made Ground	Vertical Migration and Accumulation Leading to Inhalation	Future Users	Mild	Low Likelihood	Low
	Vertical Migration and Accumulation Leading to Explosion	New Building	Mild	Low Likelihood	Low

7.2.1. Asbestos in Soil

Asbestos containing materials have been identified in the fill material within the former chalk pit as part of this investigation. Therefore, ACM should be considered to be present in Made Ground across all of the site.

Where buildings and hard standing are to be placed over the Made Ground or the Made Ground is to be removed as part of the development works, this is considered sufficient to break the pollutant linkage by breaking the exposure pathway between the impacted Made Ground and the site users.

The primary risk is therefore in areas where the impacted Made Ground is exposed at surface and is allowed to generate dust that can be inhaled. The most likely scenario for this to occur on the site following development will be in the proposed areas of soft landscaping/gardens that overlie the fill material.

Remediation will therefore be required in the areas of soft landscaping that overlie the residual fill material. It is likely that such a remediation would take the form of a cover system.

The development contractors should treat all Made Ground as potentially containing asbestos as it is not practical to confirm its absence in particular Made Ground, having identified its presence in some of the Made Ground on site.

Vigilance by the groundworks contractor for asbestos containing material is recommended throughout the development with a discovery strategy in place should any asbestos containing material be encountered. It is good practice for visible suspected asbestos containing materials to be removed from the soil where encountered, even in areas that are to be covered by hard standing, to minimise the overall quantity of asbestos in the ground.

7.2.2. Ground Gas in Made Ground

Historical maps indicated that a depression was formerly present in the west of the site and appears to have been infilled. The investigation has confirmed old survey data from before the pit was infilled, indicating that the base of the fill material is approximately 7.9mbgl. The composition of the fill material is predominantly reworked natural clay with anthropogenic inclusions but has a total organic carbon content that indicates that it has the potential to generate ground gas with a potential CS2 gas regime.

Given the elapsed time since the feature appears to have been infilled, it is anticipated that the majority of any ground gas generation from putrescible material within the fill will have taken place, significantly reducing the driver mechanism for ground gas migration into the proposed buildings.

It is anticipated that some of the fill material will be removed as part of the groundworks for the proposed development, which is understood will cut into the existing slope, although it is anticipated that a substantial portion will remain.

The risks to the future site users have therefore been assessed to be low but the current data indicate that a CS2 gas regime should be adopted, with associated ground gas protection measures.

However, a programme of ground gas monitoring may indicate that the gas generation of the material has predominantly ceased, potentially reducing the gas regime classification to CS1, not requiring ground gas protection measures.

8. MATERIAL PROPERTIES

8.1 INTRODUCTION

The geotechnical assessment and the subsequent foundation design recommendations will use the findings of the ground investigation and the results of the in-situ and geotechnical laboratory testing carried out in the boreholes and on representative samples of the material encountered.

8.2 GEOTECHNICAL TESTS

A programme of geotechnical laboratory testing was carried out on representative samples collected from the strata encountered during the ground investigation.

Details of the specific procedure used in each case are shown below in Table 8.1 and the geotechnical test certificates are presented in Appendix 5.

Table 8.1. Summary of geotechnical and chemical testing

Test	Standard (BS1377:1990) unless otherwise indicated	No.
Classification Tests		
Atterberg Limits	Part 2, Clauses 4.4, 4.5 & 5.4	1
Particle Size Distribution – Wet Sieve	Part 2, Clause 9.2	4
Saturation Moisture Content	Part 2, Clause 4.2	2
Chemical Tests		
Sulphate Content 2:1 soil water extract	Part 3, Clause 5.3	2
pH value	Part 3, Clause 9.0	4
BRE SD1	Various	2

8.3 MATERIAL PARAMETERS

This section discusses the key geotechnical characteristics of each encountered stratum as determined from field observations, in-situ and laboratory geotechnical testing.

8.3.1. Topsoil / Made Ground

<u>Topsoil</u>

Topsoil was encountered from ground surface to 0.40mbgl at all 3no WS borehole locations.

Made Ground

Made Ground was encountered beneath the Topsoil in WS102 and WS103 only, where it achieved thicknesses of between 1.60 and 7.50m. The Made Ground is believed to be associated with the backfilling of a relict Chalk Pit, identified on the Site Location Plan (Figure 2) and shown to be approximately 9.00m deep at its centre.

The thickest sequence of Made Ground (WS102) comprised soft to firm Clay with variable amounts of silt, sand and gravel. Anthropogenic inclusions included brick, metal, clinker and concrete. A concrete boulder was recorded at 5.40mbgl and may require further consideration if a piling option is pursued. At ca 6.00mbgl the Made Ground in WS102 was recorded as coarse-grained clayey sandy Gravel of brick, flint, concrete and chalk. At 7.00mbgl the Made Ground was recorded as being organic in nature potentially representing the ground surface at the onset of backfilling. The base of the Made Ground was recorded at 7.90mbg (ca. 38.6mAOD) in WS102. The Made Ground in WS103 comprised loose Flint and Chalk Gravel to ca 2.00mbgl.

In Situ Testing

Standard Penetration Tests were undertaken within the Made Ground encountered in WS102 and WS103. The resultant uncorrected SPT N values are presented in Table 8.2.

Table 8.2. Results of the standard penetration testing – Made Ground

BH No.	Depth (mbgl)	SPT N Value	Coarse / Fine	BH No.	Depth (mbgl)	SPT N Value	Coarse / Fine
WS102	1.00	54	Fine-grained	WS102	5.00	73	Adjacent to concrete
	2.00	6			6.00	39	Coarse – grained
	3.00	9			7.00	35	
	4.00	6		WS103	1.00	7	

The uncorrected SPT N Values are in the range 6 to 73; however, the highest value was adjacent to the concrete boulder reported in WS102. The remaining SPT N values do show some identifiable differences between the fine-grained and coarse-grained Made Ground, although given the constantly varying composition of the Made Ground it is not possible to assign a single characteristic N-Value.

Classification testing

Particle size distribution

Four (4no.) representative samples of the Made Ground underwent particle size distribution analysis using the wet-sieving method. The results of these analyses are presented in Table 8.3 and the laboratory test certificate and grading envelope are located in Appendix 5.

Table 8.3. Results of the particle size distribution analysis – Made Ground

Location	Depth (mbgl)	Granulometric Composition (%)				Uniformity Coefficient	Curvature Coefficient
		Fines	Sand	Gravel	V Coarse		
WS102	2.00	48	18	34	0	Not Calculated	
	4.00	65	24	11	0		
	7.80	46	23	31	0		
WS103	0.60	30	22	48	0		

The results of the particle size distribution testing reveal the range of compositions present within the materials that comprise the Made Ground with fine-grained contents between 30 and 65%.

Consistency limits

One (1no.) representative sample of the Made Ground underwent Atterberg limits testing to determine its consistency limits. The results from this analysis are presented in Table 8.4 and the laboratory test certificates are in Appendix 5.

Table 8.4. Results of the Atterberg Limits Testing – Made Ground

Location	Depth (mbgl)	Liquid Limit w_L (%)	Plastic Limit w_P (%)	Plasticity Index I_P (%)	Passing 425μm Sieve (%)	Corrected Plasticity Index (%)
WS102	6.00-6.30	38	19	19	82	16

The results of the Atterberg limits tests give a plasticity index of 19% and corresponding liquid limit of 38%, which are indicative of an intermediate plasticity clay. After correction, to account for the >425μm content, the corrected plasticity index becomes 16%, which is consistent with a fine-grained material of low volume change potential.

Shear Strength

Given the variability in the Made Ground, as evidenced by the wide range of compositions and the results of the in-situ testing, it is not possible to present any characteristic shear strength values for this material.

8.3.2. Portsdown Chalk Formation

Portsdown Chalk Formation (Chalk), of the White Chalk Sub-Group was encountered directly beneath the Topsoil in WS101 and beneath the Made Ground in WS102 and 103 at depths of between 0.40mbgl (WS101) and 7.90mbg (WS102). The Chalk was recovered as structureless Chalk comprising silty angular to subangular fine to coarse Gravel of medium dense Chalk. The Chalk persisted to the base of the ground investigation at 8.50mbgl.

The Chalk has been described using the CIRIA grading system presented as Table 8.5.

Table 8.5. CIRIA Classification of Chalk

Grade	Description	Suffix	Typical Discontinuity Spacing
A	Discontinuities closed	1	*t* >600mm
B	Typical discontinuity aperture <3mm	2	200< *t* < 600mm
C	Typical discontinuity aperture > 3mm	3	60 < *t* < 200mm
D	Structureless or remoulded melange	4	20 < *t* < 60mm
		5	*t* < 20mm

Subdivision of Grade D Chalk				
Grade	Engineering Behaviour	Dominant Element	Comminuted Chalk Matrix	Coarser Fragments
Dm	Fine soil	Soil matrix	>35%	<65%
Dc	Coarse Soil	Soil clasts	<35%	>65%

In-Situ Testing

Standard Penetration Testing

Standard penetration testing (SPT) was carried out throughout the Chalk. The SPT N values recorded from these tests are presented in Table 8.6.

Table 8.6. Results of the standard penetration testing – Chalk

BH No.	Depth (mbgl)	SPT N Value	CIRIA Grade	BH No.	Depth (mbgl)	SPT N Value	CIRIA Grade
WS101	1.00	33	Grade D_c	WS103	2.00	15	Grade D_c
	2.00	59			3.00	16	
	2.70	68 (225mm)			3.80	62	
WS102	8.00	66 (150mm)					

The standard penetration testing returned a range of N-values of 15 to >50. Although no direct relationship between SPT N value and shear strength is recognised for the Chalk, N values greater than 25 is generally representative of medium and high density Chalk. For Chalk in which N values are lower than 25, it is not possible to distinguish on the basis of SPT alone between low-density, relatively unweathered chalk or medium/high-density chalk with open discontinuities. Given the range of N-values recorded in the Chalk it is likely that the in-situ Chalk can be considered as having a minimum Grade of Dc within the area of the proposed development.

Classification Testing

Intact Dry Density / Saturation Moisture Content

Two (2no.) samples of the Chalk underwent saturation moisture content determination to help determine their intact dry density. The results of these tests are presented in Table 8.7; whilst the laboratory certificates are located in Appendix 5.

Table 8.7. Results of the classification testing on the Chalk

Sample Location	Depth (mbgl)	Saturation Moisture Content (%)	Intact Dry Density (Mg/m^3)
WS101	1.20-1.40	25	1.62
WS103	2.30-2.60	23	1.65

The Intact dry density testing indicates the clasts within the Chalk to be of medium density in accordance with CIRIA C574.

Shear Strength Parameters

Yield Strength

When considering foundation design and in particular allowable bearing pressure in Grade Dc Chalks and better, it is the yield strength, q_y that is more important as exceeding this value will lead to unacceptable settlements. For CIRIA Grade Dc a range of yield strengths of 250 to 500kN/m^2; however, without sufficient knowledge of the intact dry density of the Chalk the lower bound value should be adopted.

Undrained Shear Strength

Based on the relationship between water content and undrained shear strength (Clayton 1977) a lower bound value of 60kN/m^2 is considered appropriate for the range of water contents under consideration.

Drained (Effective) Shear Strength

CIRIA C 574 suggests cohesion should be set at 0kN/m^2 for design purposes. Therefore, characteristic effective shear strength parameters of c'_k = 0kN/m^2 and ϕ'_k = 31° are considered appropriate for the Grade Dc Chalk.

Other Geotechnical Parameters

Short-Term and Long-Term Modulus of Deformation (Ek)

Grade D Chalk can be subject to long-term or creep settlement such that it is common practice to define a long- and short-term modulus of deformation. Based on the values published in CIRIA C574, a long-term modulus of deformation of 150MN/m^2 and short-term modulus of deformation of 75MN/m^2 are considered appropriate for the Grade Dc Chalk.

8.4 AGGRESSIVE GROUND SOIL CHEMISTRY

Chemical testing was scheduled on four (4no.) samples of the encountered materials in accordance with Box C10, BRE Special Digest 1. The results of these test are not available at the time of writing.

8.5 CHARACTERISTIC GEOTECHNICAL PARAMETERS

Based on visual observations and published guidance, characteristic geotechnical parameters, which will be used in the subsequent geotechnical and foundation assessment calculations, are presented in Table 8.8.

Table 8.8. Characteristic geotechnical parameters.

Stratum	Geotechnical Parameter			Notes	Characteristic Value	
Made Ground	Not provided as material too variable					
Portsdown Chalk Formation	Unit Weight γ			CIRIA C574	21kN/m^3	
	Yield Strength		q_y	CIRIA C574	250kN/m^2	
	Shear Strength	Undrained	c_{uk}	CIRIA C574	60kN/m^2	
			ϕ_{uk}		0°	
		Drained	c'_k		0kN/m^2	
			ϕ'_k		31°	
	Deformation Modulus (MN/m^2)			CIRIA C574	Short Term	10
					Long Term	25

9. FOUNDATION AND GROUND ENGINEERING

9.1 INTRODUCTION

The geotechnical assessment below relates to the details of the proposed development, which it is currently understood will comprise the construction of a low rise extension to an existing residential care home.

3no. windowless sample boreholes (WS101 to WS103) were undertaken across the site and indicated ground conditions to comprise Topsoil over Made Ground in turn overlying Portsdown Chalk Formation to the full depth of the ground investigation. Topsoil was present at all locations where it achieved a thickness of 0.40m. Immediately below the Topsoil, Made Ground was identified in WS102 and 103 achieving a maximum thickness of 7.50m in WS102. Figure 2 shows the location of an historic chalk pit, which was backfilled in the late 1970s / early 1980s. The Made Ground identified during the ground investigation is representative of the backfill of this chalk pit.

The basal stratum of the ground investigation comprised the Portsdown Chalk Formation, which was encountered at a depth of between 0.40 and 7.90mbgl. The Portsdown Chalk Formation (Chalk) was recovered as Ciria Grade Dc structureless; although, it is likely that the Chalk grade is better than that recorded but the percussive drilling techniques have destroyed the fabric of the Chalk.

Groundwater was not encountered during the ground investigation in any of the exploratory hole locations.

9.2 FOUNDATIONS

With reference to Figure 2 of this Report it can be seen that a large area of the proposed structure oversteps the infilled chalk pit. NHBC Guidance does allow for the construction of shallow foundations on Engineered Fill provided the material meets the requirements presented in Chapter 4.6.

The backfill to the Chalk Pit is not suitable as a founding material as it is not an engineering fill (i.e. placed in accordance with an earthworks specification) as evidenced by the presence of a concrete boulder. The Made Ground comprises a mixture of material compositions: including; clay, silt and gravel. At the base of the Made Ground in WS102 a strong organic odour was recorded suggesting that the vegetation and organic soil that had formed at the base of the pit was not removed but merely buried; again, in strict contravention to good engineering practice.

For these reasons the Made Ground is not considered an appropriate material to be considered as a founding stratum. Therefore, it is recommended that consideration is given to the adoption of a piled foundation with piles socketed into the underlying Chalk.

9.2.1. Preliminary Pile Design Consideration

To assist in the preliminary design of the foundation, preliminary pile socket capacity calculations have been carried out. It must be stressed that these calculations are preliminary and are based on assumptions that will not be acceptable to the local authority or the insurance underwriter. To carry out the pile design a deeper borehole would be required to confirm the properties to a minimum depth of 18mbgl, which would allow the design of a pile in the area of the chalk pit.

9.2.2. Pile Design

ULS Axial Pile capacity calculations have been carried out in accordance with the UK National Annex to EC7 Design Approach 1, only Combination 2 results are presented within this report as they offer the more conservative values.

9.2.3. Ground Model

The ground model used is based on the ground conditions encountered in WS boreholes (Table 9.1). It should be noted in order to complete the design it has been assumed that the condition of the Chalk remains unchanged to 18mbgl.

Table 9.1. Ground model used in the pile design – Estate Office only

Stratum	From (mbgl)	To (mbgl)	Shear Strength	
			c_k (kN/m^2)	f_k (°)
Topsoil	GL	0.40	Not Used in Pile Design	
Made Ground	0.40	7.90		
Portsdown Chalk Formation	7.90	18.00 (Assumed)	SPT N used in Pile Design	
Groundwater	Not Encountered (Assumed)			

9.2.4. Design Approach

Given the properties of the strata below the site, values for axially loaded piles have been determined using the following relationships:

Characteristic Shaft Resistance – Chalk

$$R_s$$

Where σ_v is the mean vertical stress along the pile shaft (not including the contribution from the Made Ground)

and A_s is the surface area of the pile shaft

Characteristic End Bearing – Chalk

$$R$$

Where N is the characteristic N value at pile base depth

and A_b is the cross-sectional area of the pile base

and the ULS Pile Resistance is

$$R$$

The pile design has been carried out using the UK National Annex to EC7. The design approach and combination of partial factors and their values are presented in Table 9.2.

Table 9.2. Design approach and partial factors used in pile design

CFA Pile								
Combination	**Design Action Load**	γ_G	**Material Factors**	**All Partial Factors**	**Design Resistance**	γ_b	γ_s	γ_{rd}
1	A1	1.35	M1	1.00	R1	1.00	1.00	1.40
2	A2	1.00	M1	1.00	R4	2.00	1.60	1.40

Although higher carrying capacities are often achieved by driven piles, the use of driven piles can cause environmental issues, especially when sited above a principal aquifer. Therefore, the initial axial resistance calculations have been carried out on augered piles.

The ULS axial resistances of a 0.40, 0.60 and 0.80m diameter augered piles socketed into the Chalk by varying lengths have been determined and the pile calculation sheets are located in Appendix 6.

It should be noted that the reference level for the pile calculations is the top of the Chalk has been placed at 0.40mbgl, which represents the worst case with respect to pile socket capacity

Table 9.3. Design pile resistances – augered pile socket into chalk

Length of Socket into Chalk (m)	SPT N Chalk	200N x A_b / γ_b (kN)	$0.45\sigma_v A_s/\gamma_s$ (kN)	ULS Axial Pile Resistance (kN) inc. input from LMBE
400mm dia. CFA Pile				
2.00	20	252	18	246
2.50	20	252	27	253
3.00	20	252	38	261
3.50	20	252	51	270
4.00	20	252	66	281
4.50	20	252	83	292
5.00	20	252	101	306
600mm Dia. CFA Pile				
2.00	20	566	27	498
2.50	20	566	41	508
3.00	20	566	58	520
3.50	20	566	77	533
4.00	20	566	99	549
4.50	20	566	124	567
5.00	20	566	152	587
800mm Dia. CFA Pile				
2.00	20	1007	37	844
2.50	20	1007	55	857
3.00	20	1007	77	873
3.50	20	1007	103	892
4.00	20	1007	133	913
4.50	20	1007	166	936
5.00	20	1007	203	963

It must be stressed that the values presented in Table 9.3 are preliminary values and detailed calculations will be required once ground conditions are known to ca 18mbgl.

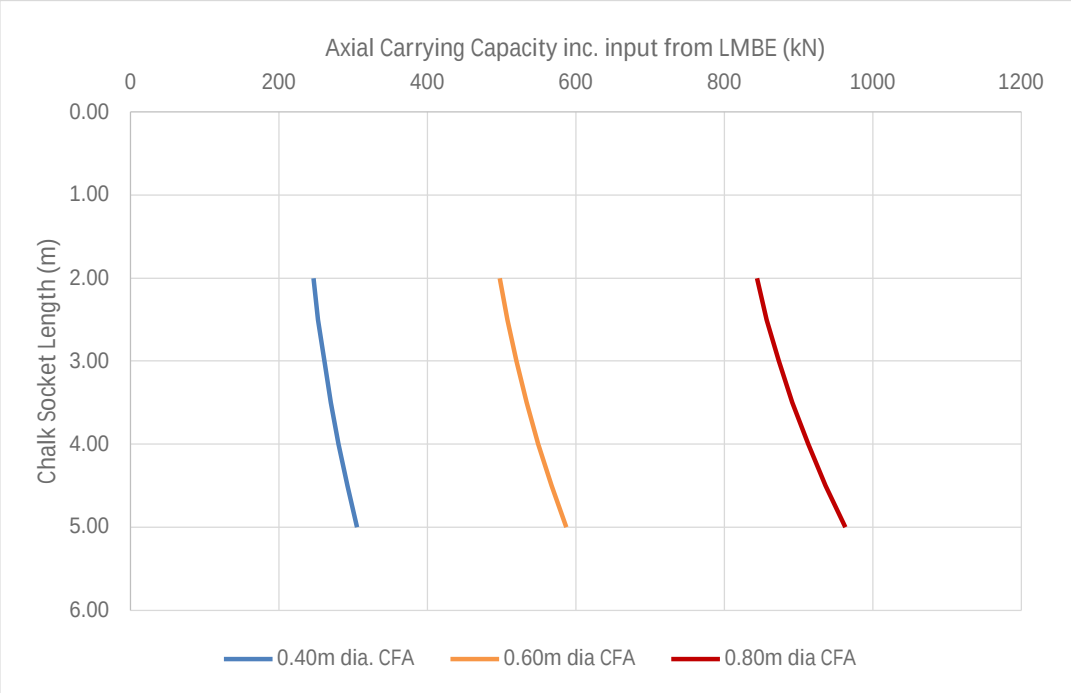


Figure 9.1. Axial carrying capacity of piles socked into Chalk

The full spreadsheet of results is presented within the pile design (Appendix 6) of this report. When determining the required pile length, it is considered appropriate to interpolate between graphed values if intermediate pile sizes are to be used. Applied loads should be factored in accordance with Design Approach 1 Combination 2.

9.3 OTHER FOUNDATION CONSIDERATION

9.3.1. Ground Floor Slabs

A suspended ground floor slab should be adopted due to the presence of a considerable thickness of unregulated backfill. The adoption of a suspended floor slab will also prevent any loading adjacent to the pile caps and negate the need to consider negative shaft resistance.

9.3.2. Dissolution Features and Their Treatment

The susceptibility of the calcium carbonate in the Chalk to dissolution by water containing carbon dioxide can cause dissolution features within the Chalk, which can pose a hazard to foundations.

Careful inspection of the Chalk should be carried out, if exposed during the works, to ensure no solution features are present. There is no need to treat a dissolution feature if it can be shown that the infill is dense. Unless this can be done and the competency of the infill verified, the infill should be assumed to be metastable.

In areas where dissolution features are expected, soakaways should be avoided so as not to induce erosion and thereby trigger a collapse. Local Building Control will be able to advise on appropriate distances for soakaways as this distance varies between Authorities. Water pipes and foul and surface water drains should be constructed with flexible pipes and joints.

9.3.3. Temporary Excavations

Temporary excavations into the Chalk will stand vertically in the short term but may be subject to rapid deterioration if left exposed during the winter months. It is recommended, to ensure their longer term stability that temporary batters do not exceed 1(V) : 1 (H) (45°).

9.4 CHEMICAL ATTACK ON BURIED CONCRETE

Not available at the time of issue

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 CONTAMINATION

The conceptual model, based on information obtained as part of the preliminary risk assessment and intrusive ground investigation, identified the following potential contaminant sources:

- Asbestos within the Made Ground associated with fill material in the former chalk pit.
- Ground gas generation potential of Made Ground associated with fill material in the former chalk pit.

It should be noted that additional sources of contamination may become apparent during any future investigation and development of the site.

The risks of impact to the proposed development from soil contamination have therefore been assessed to be **low/moderate** if the potentially contaminated soil remains at ground surface level in areas of soft landscaping.

Where buildings and hard standing are to be placed over the Made Ground or the Made Ground is to be removed, this is considered sufficient to break the pollutant linkage by breaking the exposure pathway between the potentially asbestos impacted Made Ground and the site users.

Vigilance by the groundworks contractor for asbestos containing material is recommended throughout the development with a discovery strategy in place should any asbestos containing material be encountered. It is good practice for visible suspected asbestos containing materials to be removed from the soil where encountered, even in areas that are to be covered by hard standing, to minimise the overall quantity of asbestos in the ground.

If asbestos is encountered in the ground during the development, the risks will need to be mitigated with measures such as source removal and engineered cover system in the soft landscaped areas.

In the areas of proposed soft landscaping, the soil would be considered to present a potentially significant risk, requiring remediation, due to the lead content. The remediation is likely to take the form of a cover system or removal of the Made Ground/reworked Topsoil to break the pollutant linkage with future users.

As much of the surface soil in the site area where the samples were recovered from is to be removed as part of the development, it is recommended that additional samples are recovered from the curtilage around the proposed building to better understand the average lead concentrations in the soil that will remain around the proposed building.

A discovery strategy and appropriate PPE are recommended during any redevelopment of the site to address any as yet unidentified contamination that may be identified during the works.

10.2 GEOTECHNICAL

10.2.1. Ground Conditions

Ground conditions at the site of the proposed structure comprise Topsoil over Made Ground (WS102 and 103) in turn overlying Portsdown Chalk Formation to the full depth of the ground investigation. The Made Ground (where present) comprises the unregulated backfill of a historic chalk pit and attains a maximum thickness of 7.50m in WS102. The Portsdown Chalk Formation (Chalk) was encountered immediately beneath the Topsoil in WS101 and beneath the Made Ground at 7.90mbgl in WS102. The Chalk was recovered as Ciria Grade Dc structureless Chalk. It is likely that the Chalk grade improves with depth but the percussive drilling techniques have destroyed the fabric of the Chalk.

Groundwater was not encountered during the ground investigation which achieved a maximum depth of 8.50mbgl.

10.2.2. Foundations

The Made Ground is not a suitable founding stratum due to its compositional variation and the apparent unregulated placement of the material as evidenced by the presence of a large concrete boulder at 5.40mbgl (WS102) and the presence of organic material at its base.

Therefore, it is recommended that consideration is given to a piled foundation. Detailed pile design will require additional ground investigation works to a minimum depth of 18mbgl, which would allow for the design of CFA pile socketed by 5.00m into the Chalk.

A preliminary design has been carried out assuming that geotechnical conditions within the Chalk remain unchanged to the full depth of the pile socket. It must be stressed that the assumptions made would not be acceptable to the Local Authorities or underwriters and are presented herein as a guide only.

Axial capacities of a range of socket lengths and pile diameters are presented in Table 9.3 and Figure 9.1.

Suspended floor slabs should be used at this site due to the presence of up to 7.50m of unregulated fill material. In addition, by adopting a suspended floor slab additional loading of the ground adjacent to the piles will not occur and negative shaft resistance can be discounted.

10.2.3. Concrete Aggressivity

Four (4no.) representative samples of the materials encountered beneath the site have been scheduled for chemical testing to determine their design sulphate classifications and an Aggressive Chemical Environment for Concrete (ACEC) Class of the underlying materials.

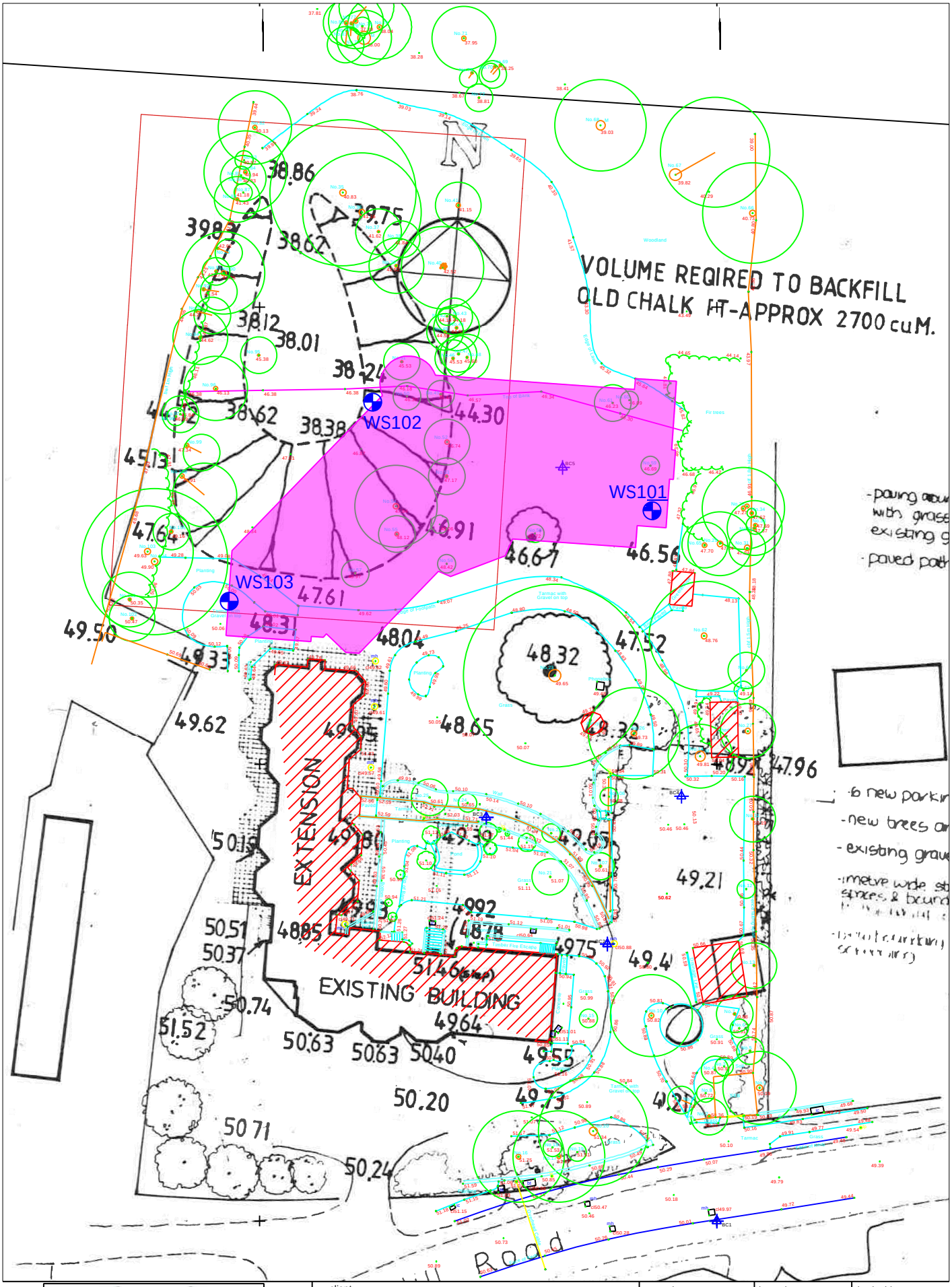
The results of these tests are not available at the time of issue.

FIGURE 1: SITE LOCATION PLAN

Ground Condition Consultants Ltd
10 Waldegrave Close Southampton SO19 9RY
Telephone 07971 450113
ask@groundcc.co.uk www.groundcc.co.uk

client	ARIA CARE	scale	NTS	drawn by AP	checked by RP
site	BELMONT CASTLE, HAVANT	date	29 APR 2025	job no	J25-038
title	SITE LOCATION PLAN	drawing number	FIGURE 1	rev.	-

FIGURE 2: INVESTIGATION LOCATION PLAN



GCC
Ground Condition Consultants Ltd
10 Waldegrave Close Southampton SO19 9RY
Telephone 07971 450113
ask@groundcc.co.uk www.groundcc.co.uk

client	ARIA CARE		
site	BELMONT CASTLE, HAVANT		
title	INVESTIGATION LOCATION PLAN		
scale	NTS	drawn by AP	checked by RP
date	21 MAY 2025	job no	J25-038
drawing number	FIGURE 2	rev.	-

APPENDIX 1: REPORT CONDITIONS

This report is produced solely for the benefit of **Aria Care** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the Site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the Site.

This report is based on a visual Site inspection, study of readily accessible referenced historical records, information supplied by those parties noted in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. Where ground contamination is suspected but no physical Site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to detailed activities related to the Site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, not revealed by this research cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categoric assurances that they will be accepted by Authorities or Funds etc. without question, as such bodies may have unpublished, often more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to Ground Condition Consultants Ltd. In time improved practices or amended legislation may necessitate a re-assessment.

The report is necessarily limited to those aspects of land contamination specifically reported on and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents that may occur. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the Site and adjacent Sites. The report concentrates on the Site as defined in the report and provides an opinion on surrounding Sites. If migrating pollution or contamination (past or present) exists this can only practically be better assessed following extensive on and off Site intrusive investigations and monitoring.

APPENDIX 2: ENGINEERING LOGS

Well

Well

Well

APPENDIX 3: GENERIC ASSESSMENT CRITERIA

SOIL - HUMAN HEALTH SCREENING VALUES

Status	End Use	Issue No	Issue Date
ISSUE	Residential without Homegrown Produce	1	June 2015

Determinand	Units	SOIL ORGANIC MATTER 1%	2.5%	6%	SOURCE
pH		<5, >9			
Asbestos	%	Presence			
HEAVY METALS/METALLOIDS					
Arsenic	mg/kg	40			S4UL
Cadmium	mg/kg	85			S4UL
Chromium (III)	mg/kg	910			S4UL
Chromium (VI)	mg/kg	6			S4UL
Lead	mg/kg	310			C4SL
Mercury (Elemental)	mg/kg	1.2			S4UL
Mercury (Inorganic)	mg/kg	56			S4UL
Mercury (Methyl)	mg/kg	15			S4UL
Nickel	mg/kg	180			S4UL
Selenium	mg/kg	430			S4UL
Berylium	mg/kg	1.7			S4UL
Boron	mg/kg	11000			S4UL
Vanadium	mg/kg	1200			S4UL
Copper	mg/kg	7,100			S4UL
Zinc	mg/kg	40,000			S4UL
GENERAL INORGANICS					
Easily Liberatable Cyanide (free)	mg/kg				Acute effects infant 1 dose 3g soil
US EPA PRIORITY PAHs					
Acenaphthene	mg/kg	3000	4700	6000	S4UL
Acenaphthylene	mg/kg	2900	4600	6000	S4UL
Anthracene	mg/kg	31,000	35,000	37000	S4UL
Benzo(a)Anthracene	mg/kg	11	14	15	S4UL
Benzo(b)fluoranthene	mg/kg	3.9	4	4	S4UL
Benzo(k)fluoranthene	mg/kg	110	110	110.0	S4UL
Benzo(g,h,i)perylene	mg/kg	360	360	360	S4UL
Benzo(a)Pyrene	mg/kg	3.20	3.2	3.2	S4UL
Chrysene	mg/kg	30	31	32.0	S4UL
Di-benzo(a,h)anthracene	mg/kg	0.31	0.32	0.32	S4UL
Fluoranthene	mg/kg	1500	1600	1600	S4UL
Fluorene	mg/kg	2800	3800	4500	S4UL
Indeno(1,2,3-cd)pyrene	mg/kg	45.0	46	46.0	S4UL
Naphthalene	mg/kg	2.3	5.6	13.0	S4UL
Phenanthrene	mg/kg	1300	1500	1500	S4UL
Pyrene	mg/kg	3700	3800	3800	S4UL
Total PAHs	mg/kg	No Sum	No Sum	No Sum	
Chlorinated Solvents					
1,2-Dichloroethane (DCE)	mg/kg	0.0092	0.013	0.023	S4UL
1,1,1-Trichloroethane (111 TCA)	mg/kg	9	18	40	S4UL
1,1,1,2-Tetrachloroethane (1112 PCA)	mg/kg	1.5	3.5	8.20	S4UL
1,1,2,2-Tetrachloroethane (1122 PCA)	mg/kg	3.90	8	17	S4UL
Tetrachloroethene (PCE)	mg/kg	0.18	0.4	0.92	S4UL
Tetrachloromethane (Carbon Tetrachloride)	mg/kg	0.026	0.056	0.13	S4UL
Trichloroethene (TCE)	mg/kg	0.017	0.036	0.08	S4UL
Trichloromethane (Chloroform)	mg/kg	1.2	2.1	4.2	S4UL
Vinyl Chloride	mg/kg	0.00077	0.001	0.0015	S4UL
Chlorobenzene	mg/kg	0.46	1	2.4	S4UL
1,2-Dichlorobenzene	mg/kg	24	57	130	S4UL
1,3-Dichlorobenzene	mg/kg	0.44	1.1	2.5	S4UL
1,4-Dichlorobenzene	mg/kg	61	150	350	S4UL
1,2,3-Trichlorobenzene	mg/kg	1.5	3.7	8.8	S4UL
1,2,4-Trichlorobenzene	mg/kg	2.6	6.4	15	S4UL
1,3,5-Trichlorobenzene	mg/kg	0.33	0.81	1.9	S4UL
1,2,3,4-Tetrachlorobenzene	mg/kg	24	56	120	S4UL
1,2,3,5-Tetrachlorobenzene	mg/kg	0.75	1.9	4.3	S4UL
1,2,4,5-Tetrachlorobenzene	mg/kg	0.73	1.7	3.5	S4UL
Pentachlorobenzene	mg/kg	19	30	38	S4UL
Hexachlorobenzene	mg/kg	4.1	5.7	6.7	S4UL
Carbon Disulphide	mg/kg	0.14	0.29	0.62	S4UL
Hexachlorobutadiene	mg/kg	0.32	0.78	1.8	S4UL
Phenolics					
Phenol	mg/kg	750	1300	2300	S4UL
Chlorophenols	mg/kg	94	150	210	S4UL
Pentachlorophenol	mg/kg	27	29	31	S4UL
Explosives					
2,4,6 Trinitrotoluene (TNT)	mg/kg	65	66	66	S4UL
RDX	mg/kg	13000	13000	13000	S4UL
HMX	mg/kg	6700	6700	6700	S4UL
Insecticides/Herbicides					
Aldrin	mg/kg	7.3	7.4	7.5	S4UL
Dieldrin	mg/kg	7.0	7.3	7.4	S4UL
Atrazine	mg/kg	610.0	620.0	620.0	S4UL
Dichlorvos	mg/kg	6.4	6.5	6.6	S4UL
Alpha-Endosulfan	mg/kg	160	280	410	S4UL
Beta-Endosulfan	mg/kg	190	320	440	S4UL
Alpha-Hexachlorocyclohexane	mg/kg	6.9	9.2	11.0	S4UL
Beta-Hexachlorocyclohexane	mg/kg	3.7	3.8	3.8	S4UL
Gamma-Hexachlorocyclohexanes (Lindane)	mg/kg	2.9	3.3	3.5	S4UL

TPH					
TPH Aliphatic >C5-6	mg/kg	42	78	160	S4UL
TPH Aliphatic >C6-8	mg/kg	100	230	530	S4UL
TPH Aliphatic >C8-10	mg/kg	27	65	150	S4UL
TPH Aliphatic >C10-12	mg/kg	130	330	770	S4UL
TPH Aliphatic >C12-16	mg/kg	1100	2,400	4,400	S4UL
TPH Aliphatic >C16-35	mg/kg	65,000	92,000	110,000	S4UL
TPH Aliphatic >C35-44	mg/kg	65,000	92,000	110,000	S4UL
TPH Aromatic >EC5-7 (Benzene)	mg/kg	370.000	690.00	1400	S4UL
TPH Aromatic >EC7-8	mg/kg	860	1,800	3,900	S4UL
TPH Aromatic >EC8-10	mg/kg	47	110	270	S4UL
TPH Aromatic >EC10-12	mg/kg	250	590	1,200	S4UL
TPH Aromatic >EC12-16	mg/kg	1800	2,300	2,500	S4UL
TPH Aromatic >EC16-21	mg/kg	1900	1,900	1,900	S4UL
TPH Aromatic >EC21-35	mg/kg	1900	1,900	1,900	S4UL
TPH Aromatic >EC35-44	mg/kg	1900	1,900	1,900	S4UL
TPH Aliphatic & Aromatic >EC44-70	mg/kg	1,900	1,900	1,900	S4UL
Total TPH	mg/kg	No Sum	No Sum	No Sum	
BTEX					
Benzene	mg/kg	0.380	0.70	1.4	S4UL
Toluene	mg/kg	880^{vap} (869)	1,900	3900	S4UL
Ethylbenzene	mg/kg	83	190	440	S4UL
m-Xylene	mg/kg	88	210	480	S4UL
o-Xylene	mg/kg	82	190	450	S4UL
p-Xylene	mg/kg	79	180	430	S4UL

NOTES

1) Compare individual samples values against Soil Screening Values (SSV). If exceedences are noted consider further in relation to averaging areas and statistical analysis.

2) These values are for initial screening for potential risk to human health only. They are not remediation thresholds. Screening for other receptors to be done separately as appropriate for the site, e.g. for water, ecology, building materials.

3) Screening criteria denoted with an asterix (*) were capped at the lower vapour/aqueous saturation limits for Tier 1 human health risk assessment purposes and considered conservative. Where concentrations are recorded at levels greater that the SSV, free phase (NAPL) contamination may be present and should be considerwed qualitatively. Further information to support the interpretation of assessment criteria that exceed theoretical soil saturation limits is provided in Section 4.12 of the CLEA Software Handbook (SR4).

4) Screening criteria denoted with hash (#) were capped at 1000000mg/kg. It is noted that aesthetic (e.g. odour) and other site specific factors may also be relevant when providing advice relating to these compounds.

5) LQM/CIEH S4ULs November 2014 - Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3439. All rights reserved.

6) SSVs derived for certain constituents may be low in relation to standard laboratory Limits of Detection (LoD). It is the responsibility of the project engineer to check with the laboratory that appropriate detection limits can be achieved. As a target, an LoD would be no larger than 10% of the SSV, but this is not practicable for some constituents. Clearly an LoD greater than the SSV would prevent use of this SSV screening and/or be interpreted as if all samples exceeded the SSV.

7) Human Health Soil Screening Values (SSV) were calculated using a Soil Organic Matter (SOM) value of 1.0%, 2.5% and 6%. This is equivanet to an Fraction Organic Carbon (FOC) values of approx. 0.6%, 1.45% and 3.5% respectively (For reference FOC = 0.58*SOM). Note that some soils have different SOM/FOC, which may give require more stringent SSVs for organic compounds. It is the responsibility of the project engineer to check the SOM with the site specific conditions.

8) In general, SSVs above 100mg/kg are rounded down to 3 significant figures. Similarly, SSVs below 100mg/kg are rounded down to 2 significant figures

WATER QUALITY STANDARDS

Status	Issue No	Date
ISSUE	3	17/02/2017

Choose water quality standard based on receptors identified at the site.

Eg in groundwater Source Protection Zone or near any drinking water supply, use DWS. If near ecological receptor/river etc, use freshwater EQS, if site is near coast use saline EQS. If more than one applicable use lowest, if in doubt use TSV (defined as lowest of freshwater EQS and UK DWS).

Name of Determinand	TSV freshwater (Tier 1 Screening Value) Defined as most conservative of DWS and freshwater EQS	Origin of TSV	Drinking Water Standards 2000	Fresh water EQS	Marine water EQS
	All units µg/l unless otherwise stated		All units µg/l unless otherwise stated		
PH	6-9	EQS	6.5 - 10	6-9	7-8.5
Dissolved O_2	50% >7-9	Freshwater Fish Directive	-	-	-
Suspended solids	25000	Freshwater Fish Directive	-	-	-
BOD	3000 salmonid, 6000 cyprinid	Freshwater Fish Directive	-	-	-
Abamectin	0.01 (AA)	EQS	-	0.01 (AA)	0.003 (AA)
Acrylamide	0.1	UK Drinking Water Standard	0.1	-	-
Aldrin	0.01 (AA)	EQS	0.03	0.01 (AA)	0.01 (AA)
Aluminium	pH <6.5 then 10 (MAC)	EQS		pH <6.5 then 10 (MAC)	15 (AA)
	> 6.5 then 15 (AA) or 25 (MAC)		200	> 6.5 then 15 (AA) or 25 (MAC)	
Ammonium (NH_4)	300	draft EQS	500	300 (draft wfd report dept on alkalinity & altitude)	-
Anthracene	0.1	EQS	-	0.1 (AA)	0.1 (AA)
Antimony	5	UK Drinking Water Standard	5	-	-
Arsenic	10	UK Drinking Water Standard	10	50 (AA)	25 (AA)
Atrazine	0.6 (AA)	EQS	-	0.6 (AA)	2 (AA)
Azamethiphos	0.02 (AA)	EQS	-	0.02 (AA)	0.02 (AA)
Azinphos-methyl	0.01 (AA)	EQS	-	0.01 (AA)	0.01 (AA)
Barium	100	Surface Water Abstraction Directive - DW1 limit	-	-	-
Bentazone	500 (AA)	EQS	-	500 (AA)	500 (AA)
Benzene	1	UK Drinking Water Standard	1	10 (AA)	8 (AA)
Benzo-a-pyrene	0.01	EQS	0.01	See PAH	See PAH
Biphenyl	25 (AA)	EQS	-	25 (AA)	25 (AA)
Boron	1000	UK Drinking Water Standard	1000	2000 (AA)	7000 (AA)
Bromine	2 (AA)	EQS	-	2 (AA)	10 (MAC)
Bromate	10	UK Drinking Water Standard	10	-	-
Bromoxynil	100 (AA)	EQS	-	100 (AA)	100
Bronopol (Pyceze)	70 (MAC)	SEPA EQS for aquaculture	-	70 (MAC)	-
Cadmium		EQS	5		0.2 (AA)
	0-40mg CaCO3/l 0.08			0-40mg CaCO3/l 0.08	
	40-50mg CaCO3/l 0.08			40-50mg CaCO3/l 0.08	
	50-100mg CaCO3/l 0.09			50-100mg CaCO3/l 0.09	
	100-200mg CaCO3/l 0.15			100-200mg CaCO3/l 0.15	
	>200mg CaCO3/l 0.25			>200mg CaCO3/l 0.25	
Carbendazim	0.1 (AA)	EQS	-	0.15 (AA)	-
Carbon tetrachloride (CT)	12 (AA)	EQS	-	12 (AA)	12 (AA)
Chloride (Water Soluble)	250000 (AA)	EQS	250000	250000 (AA)	-
Chlorine	2 (AA)	EQS	-	2 (AA)	10 (MAC)
Chlorfenvinphos	0.1 (AA)	EQS	-	0.1 (AA)	0.1 (AA)
Chloroform	12 (AA)	EQS	-	12 (AA)	12 (AA)
4-chloro-3-methyl phenol	40 (AA)	EQS	-	40 (AA)	40 (AA)
Chloronitrotoluenes (Total - all isomers)	10 (AA)	EQS	-	10 (AA)	10 (AA)
2-chlorophenol	50 (AA)	EQS	-	50 (AA)	50 (AA)
Chlorpropham	10 (AA)	EQS	-	10 (AA)	10 (AA)
Chlorothalonil	0.1 (AA)	EQS	-	0.1 (AA)	-
Chlorotoluron	2 (AA)	EQS	-	2 (AA)	2 (AA)
Chlorpyrifos	0.1 (AA)	EQS	-	0.1 (AA)	0.03 (AA)
Chromium (III) - dissolved	4.7 (AA)	EQS	50	4.7 (AA)	-
Chromium (VI) - dissolved	3.4 (AA)	EQS	50	3.4 (AA)	0.6 (AA)
Copper	1 (bioavailable) (AA)	EQS	2000	1 (bioavailable) (AA)	3.76 (AA)
Cobalt (dissolved)	3 (AA)	EQS	-	3 (AA)	3 (AA)
Coumaphos	0.03 (AA)	EQS	-	0.03 (AA)	0.03 (AA)
Cyanide	1	EQS	50	1 (AA)	1 (AA)
Cyfluthrin (total)	0.001 (AA)	EQS	-	0.001 (AA)	0.001 (MAC)
Cypermethrin	0.0001 (AA)	EQS	-	0.0001 (AA)	0.0001 (AA)
2,4-D (ester) (In Statutory Instrument not stated that as 'total')	1 (AA)	EQS	-	1 (AA)	1 (AA)
2,4-D (non-ester) (In Statutory Instrument not stated that as 'total')	40 (AA)	EQS	-	40 (AA)	40 (AA)
DDT (Total- all 4 isomers)	0.025 (AA)	EQS	-	0.025 (AA)	0.025 (AA0
ppDDT (total)	0.01 (AA)	EQS	-	0.01 (AA)	0.01 (AA)
Demetons	0.05 (AA)	EQS	-	0.05 (AA)	0.5 (AA)
Diazinon (sheep dip)	0.01 (AA)	EQS	-	0.01 (AA)	0.01 (AA)
Dichlorobenzenes (sum of all isomers)	20 (AA)	EQS	-	20 (AA)	20 (AA)
1,2-dichloroethane (total)	3 (AA)	UK Drinking Water Standard	3	10 (AA)	10 (AA)
Dichloromethane	20 (AA)	EQS	-	20 (AA)	20 (AA)
2,4-dichlorophenol	4.2 (AA)	EQS	-	4.2 (AA)	0.42 (AA)
Dichlorvos	0.001 (AA)	EQS	-	0.001 (AA)	0.04 (AA)
Dieldrin (total)	0.01 (AA)	EQS	0.03	0.01 (AA)	0.01 (AA)
Diflubenzuron	0.001 (AA)	EQS	-	0.001 (AA)	0.005 (AA)
Dimethoate	0.48 (AA)	EQS	-	0.48 (AA)	0.48 (AA)
Diuron	0.2 (AA)	EQS	-	0.2 (AA)	0.2 (AA)
Doramectin	0.001 (AA)	EQS	-	0.001 (AA)	0.001 (AA)
EDTA (ethylenediaminetetraacetic acid)	400 (AA)	EQS	-	400 (AA)	400 (AA)
Emamectin benzoate	0.22 (ng/l) (AA)	SEPA EQS for aquaculture	-	0.22 (ng/l) (AA)	0.763 (AA)
Endosulphan	0.005 (AA)	EQS	-	0.005 (AA)	0.0005 (AA)
Endrin (total)	0.005 (AA)	EQS	-	0.005 (AA)	0.005
Epichlorohydrin	0.1	UK Drinking Water Standard	0.1	-	-
17α-Ethinyloestradiol	0.0001 n(AA)	PNEC	-	0.0001 n(AA)	0.0001 (AA)
Ethylbenzene	20 (AA)	EQS	-	20 (AA)	20 (AA)
Fenchlorphos	0.03 (AA)	EQS	-	0.03 (AA)	0.03 (AA)
Fenitrothion	0.01 (AA)	EQS	-	0.01 (AA)	0.01 (AA)
Flucofuron (total)	0.1	UK Drinking Water Standard	-	1	1 (MAC)
Fluoranthene	0.0063 (AA)	EQS	-	0.0063 (AA)	0.0063 (AA)
Fluoride	<50 mg CaCO3/l = 1000	EQS	1500	<50 mg CaCO3/l = 1000	5000
	>50 mg CaCO3/l = 5000	EQS		>50 mg CaCO3/l = 5000	
Formaldehyde	5 (AA)	EQS	-	5 (AA)	-
Heptachlor	0.03	UK Drinking Water Standard	0.03	-	-
Heptachlor epoxide	0.03	UK Drinking Water Standard	0.03	-	-
Hexachlorobenzene (total)	0.03 (AA)	EQS	-	0.05 (MAC)	0.05 (MAC)
Hexachlorobutadiene (total)	0.1 (AA)	EQS	-	0.6 (MAC)	0.6 (MAC)
Hexachlorocyclohexane (total)	0.2 (AA)	EQS	-	0.2 (AA)	0.002 (AA)
Hydrogen sulphide (Undissociated)	0.25 (AA)	EQS	-	0.25 (AA)	10 (MAC)
Ioxynil (total)	10 (AA)	EQS	-	10 (AA)	10 (AA0
Iron (dissolved)	200	EQS	200	1000 (AA)	1000 (AA)
Isodrin (total)	0.005 (AA)	EQS	-	0.005 (AA)	0.005 (AA)
Isoproturon	0.3 (AA)	EQS	-	0.3 (AA)	0.3 (AA)
Ivermectin	0.0001 (AA)	EQS	-	0.0001 (AA)	0.001 (AA)
Lead (Dissolved)	1.2 (bioavailable) (AA)	EQS	10	1.2 (bioavailable) (AA)	1.3 (AA)

Name of Determinand	TSV freshwater (Tier 1 Screening Value) Defined as most conservative of DWS and freshwater EQS	Origin of TSV	Drinking Water Standards 2000	Fresh water EQS	Marine water EQS
All units µg/l unless otherwise stated			**All units µg/l unless otherwise stated**		
Linuron	0.5 (AA)	EQS	-	0.5 (AA)	2 (AA)
Malathion	0.01 (AA)	EQS	-	0.01 (AA)	0.02 (AA)
Malachite Green	0.5 (AA)	EQS	-	0.5 (AA)	0.5 (AA)
Mancozeb	2 (AA)	EQS	-	2 (AA)	2 (AA)
Manganese (Dissolved)	30 (AA)	EQS	50	123 (AA)	-
Maneb	3 (AA)	EQS	-	3 (AA)	3 (AA)
MCPA (S-ethyl (4-chloro-2-methylphenoxy)ethanethioate)	pH<7 = 12	EQS	-	pH<7 = 12	80 (AA)
	pH>7 = 80	EQS	-	pH>7 = 80	
Mecoprop	18 (AA)	EQS	-	18 (AA)	18 (AA)
Mercury	1 (AA)	EQS	1	-	0.07 (MAC)
Methiocarb	0.01 (AA)	EQS	-	0.01 (AA)	-
Methylphenols (0.3 2-MP, 0.2 3-MP, 1 4-MP) (=cresols)	100 (AA)	EQS	-	100 (AA)	100 (AA)
Mevinphos	0.02 (MAC)	EQS	-	0.02 (MAC)	-
Naphthalene	2 (AA)	EQS	-	2 (AA)	2 (AA)
Nickel (Dissolved)	4 (bioavailable) (AA)	EQS	20	4 (bioavailable) (AA)	8.6 (AA)
Nitrates (NO_3)	50000	Surface Water Abstraction Directive - DW1 limit	50000	-	-
Nitrites (NO_2)	50	UK Drinking Water Standard	50	-	-
Nonyl phenol	0.3 (AA)	EQS	-	0.3 (AA)	0.3 (AA)
NTA (Nitrilotriacetic acid)	1000 (AA)	EQS	-	1000 (AA)	3000 (AA)
Octyl phenol	0.1 (AA)	EQS	-	0.1 (AA)	0.01(AA)
17β-Oestradiol	0.001 (AA)	PNEC	-	-	-
Omethoate	0.01 (AA)	EQS	-	0.01 (AA)	-
PAH: (Sum of: Benzo(b) fluoranthene Benzo(k)fluoranthene Benzo(ghi)perylene Indeno(1,2,3-cd)pyrene - Drinking Water + Benzo(a)pyrene - EQS)	0.1	UK Drinking Water Standard	0.1	0.00017 (AA)	0.00017 (AA)
PCSDs (flucofuron and sulcofuron) (total)	0.05	EQS	-	0.05	0.05 (MAC)
Pendimethalin	0.1	UK Drinking Water Standard	-	0.3 (AA)	1.5 (AA)
Pentabromodiphenylether	0.5	EQS	-	0.5	0.5
Pentachlorophenol	0.1	UK Drinking Water Standard	-	0.4 (AA)	0.4 (AA)
Permethrin (total)	0.01	EQS	-	0.01	0.0002 (AA)
Pesticides (sum of Parathion, g HCH and Dieldrin)	0.5	UK Drinking Water Standard	0.5	-	-
Phenol	7.7	EQS	-	7.7 (AA)	7.7 (AA)
Dimethyl phthalate (DMP)	800 (AA)	EQS	-	800 (AA)	800 (AA)
Diethyl phthalate (DEP)	200 (AA)	EQS	-	200 (AA)	200 (AA)
Di-butyl phthalates (DBPs)	8 (AA)	EQS	-	8 (AA)	8 (AA)
Butylbenzyl phthalate (BBP)	20 (AA)	EQS	-	20 (AA)	20 (AA)
Di-octyl phthalates (DOPs)	20 (AA)	EQS	-	20 (AA)	20 (AA)
di(2ethylhexyl)phthalate	8	WHO DWS	-	-	-
Phthalates	See above, no total, by indivdual phthalate only	WHO DWS	-	-	-
Pirimicarb	1 (AA)	EQS	-	1 (AA)	1 (AA)
Pirimiphos-methyl	0.015 (AA)	EQS	-	0.015 (AA)	0.015 (AA)
Prochloraz	4 (AA)	EQS	-	4 (AA)	4 (AA)
Propetamphos	0.03 (AA)	EQS	-	0.03 (AA)	0.03 (AA)
Propyzamide	100 (AA)	EQS	-	100 (AA)	100 (AA)
Silver (Total dissolved)	0.05 (AA)	EQS	-	0.05 (AA)	0.5 (AA)
Selenium	10 (AA)	Surface Water Abstraction Directive - DW1 limit	10	-	-
Simazine	1 (AA)	EQS	-	1 (AA)	1 (AA)
Sulcofuron (total)	25	EQS	-	25 (MAC)	25 (MAC)
Sulphate	250,000	Surface Water Abstraction Directive	-	400000 (AA)	-
Surfactants	200	Surface Water Abstraction Directive - DW1 limit	-	-	-
Styrene	50 (AA)	EQS	-	50 (AA)	50 (AA)
Tecnazene (Total)	1 (AA)	EQS	-	1 (AA)	1 (AA)
Teflubenzuron (Calicide)	6 (ng/l)	SEPA EQS for aquaculture	-	6 (ng/l)	2
Tetrachloroethylene (PCE)	10 (AA)	EQS	-	10 (AA)	10 (AA)
Tetrachloroethene and Trichloroethene	10	UK Drinking Water Standard	10	-	-
Tetrachloromethane	3	UK Drinking Water Standard	3	-	-
Thiabendazole	5 (AA)	EQS	-	5 (AA)	5 (AA)
Tin	25 (AA)	EQS	-	25 (AA)	10 (AA)
Toluene	74 (AA)	EQS	-	74 (AA)	74 (AA)
TPH:					
Aliphatic EC C5-C6	15000	WHO DWS	15000	-	-
Aliphatic EC>C6-C8	15000	WHO DWS	15000	-	-
Aliphatic EC>C8-C10	300	WHO DWS	300	-	-
Aliphatic EC>C10-C12	300	WHO DWS	300	-	-
Aliphatic EC>C12-C16	300	WHO DWS	300	-	-
Aliphatic EC>C16-C21	-	WHO DWS	-	-	-
Aliphatic EC>C21-C35	-	WHO DWS	-	-	-
Aromatic EC C6-C7	1 (Benzene)	UK Drinking Water Standard	1	10 (AA)	8 (AA)
Aromatic EC>C7-C8	74 (Toluene)	EQS	700	74 (AA)	74 (AA)
Aromatic EC>C8-C10	300 (Ethylbenzene)	WHO DWS	300	-	-
Aromatic EC>C10-C12	90	WHO DWS	90	-	-
Aromatic EC>C12-C16	90	WHO DWS	90	-	-
Aromatic EC>C16-C21	90	WHO DWS	90	-	-
Aromatic EC>C21-C35	90	WHO DWS	90	-	-
Triallate	0.25 (AA)	EQS	-	0.25 (AA)	0.25 (AA)
Triazophos	0.005 (AA)	EQS	-	0.005 (AA)	0.005 (AA)
Tributyltin cmpds	0.0002 (AA)	EQS	-	0.0002 (AA)	0.0002 (AA)
Tributyltin	0.0002 (AA)	EQS	-	0.0002 (AA)	0.0002 (AA)
Tributyl phosphate	50 (AA)	EQS	-	50 (AA)	50 (AA)
Trichlorobenzene	0.4 (AA)	EQS	-	0.4 (AA)	0.4 (AA)
1,1,1-trichloroethane	100 (AA)	EQS	-	100 (AA)	100 (AA)
1,1,2-trichloroethane	400 (AA)	EQS	-	400 (AA)	300 (AA)
Trichloroethene	10 (AA)	EQS	-	10 (AA)	10 (AA)
Trifluralin	0.03 (AA)	EQS	-	0.03 (AA)	0.03 (AA)
Trihalomethanes (sum of chloroform, bromoform, dibromochloromethane and bromodichloromethane)	100	UK Drinking Water Standard	100	2.5 (AA)	2.5 (AA)
Triphenyltin cmpds (Total)	0.02 (MAC)	EQS	-	0.02 (MAC)	0.008 (MAC)
Triphenyltin and its derivatives	0.02 (MAC)	EQS	-	0.02 (MAC)	0.008 (MAC)
Vanadium (Total)			-		100 (AA)
	0 - 200mg CaCO3/l 20	EQS		0 - 200mg CaCO3/l 20	
	>200mg CaCO3 /l 60	EQS		>200mg CaCO3 /l 60	
Vinyl Chloride (VC)	0.5	UK Drinking Water Standard	0.5	-	-
Xylenes	30 (AA)	EQS	-	30 (AA)	30 (AA)
Zinc	10.9 (bioavailable) (AA)	EQS	-	10.9 (bioavailable) (AA)	6.8 (AA)

All units µg/l unless otherwise stated
Use these values for initial assessment of all water and leachate results
AA = Annual Average
MAC = Maximum Concentration
TSVs - Tier 1 Screening Values
TSVs listed above defined as most conservative of DWS and EQS assuming potable water supply and river ecosystems are receptors at site.

References.

EQS (Environmental Quality Standards)
Surface water pollution risk assessment for your environmental permit
https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit#contact

Surface Water Abstraction Directive
UK EA Website
http://www.environment-agency.gov.uk/yourenv/eff/1190084/water/213872/577394/577773/?version=1&lang=_e

Statutory Instruments: 2016 No. 614 Water, England and Wales: The Water Supply (Water Quality) Regulations 2016
http://www.legislation.gov.uk/uksi/2016/614/pdfs/uksi_20160614_en.pdf

Freshwater Fish Directive: UK government webpage
http://www.environment-agency.gov.uk/yourenv/eff/1190084/water/213902/576076/

WHO: World Health Organisation drinking water standards
Petroleum Products in Drinking-water, Background document for development of WHO Guidelines for Drinking-water Quality, WHO (WHO/SDE/WSH/05.08/123)
http://www.who.int/water_sanitation_health/dwq/chemicals/Petroleum%20Productsrev071105.pdf

APPENDIX 4: CHEMICAL LABORATORY TEST CERTIFICATES

Our Ref: 25-48777
Your Ref: J25-038

Analysis Report

Client: Ground Condition Consultants
2 Burrows Lane
Verwood
Dorset
BH31 7PH

Project: Full WAC Testing

Sample Details: 2 soil samples for Waste Acceptance Criteria (WAC) analysis

Date report issued: 2 June 2025 Issue Number: 1

Number of pages (including this one): 8

Accreditation
All analytes marked [M] have been analysed under the scope of our MCERTS accreditation
All analytes marked [U] have been analysed under the scope of our UKAS accreditation
All analytes marked [m] have been subcontracted and analysed under the scope of their MCERTS accreditation
All analytes marked [u] have been subcontracted and analysed under the scope of their UKAS accreditation
All analytes marked [P] currently have their accredition pending

All results labelled with an asterisk (*) are non-conforming due to incorrect sample storage or handling. The result may be invalid.
All comments are beyond the scope of our accrediation.
The results shown in this test report specifically refer to the sample(s) tested as received unless otherwise stated.
This report shall not be reproduced except in full, without written approval of Envirochem.
Unless sampled by Envirochem, all sample details supplied by client.
Uncertainty of measurement is not accounted for in reported results

Signed on behalf of Envirochem by an authorised signatory

[redacted]

Dan Dockree

Authorised Signatory

envirochem analytical laboratories limited
12-14 The Gardens, Broadcut, Fareham, Hampshire. PO16 8SS
t: +44(0)1329 287777 | www.envirochem.co.uk | Reg.No. 2378228
MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

LANDFILL WASTE ACCEPTANCE CRITERIA

Client:	Ground Condition Consultants	Date Sampled:	20 May 2025
Site:	Belmont Castle	Date Received:	21 May 2025
Sample Description:	Soil - Clay	Submitted by:	Courier
Sample Details:	WS102 2.6-2.8m	Date Analysis Started:	21 May 2025
Sampled By:	Client	Date Completed:	2 June 2025

Table 1: parameters determined on whole sample (all results in mg/kg dry wt except where stated)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159052	*Landfill acceptance criteria for Inert waste*	*Stable non-reactive hazardous waste in non-hazardous*	*Hazardous waste landfill*
Mineral oil (C10 - C40) P	6.15	< 10.0	*500*	---	---
Loss on ignition (%)	5.01, 6.09	1.8	---	---	*10 %*
Total Organic Carbon (%)	6.07	0.8	*3 %*	*5 %*	*6 %*
BTEX	6.11	< 1.0	*6*	---	---
PCBs (7 congeners)	6.06	< 1.0	*1*	---	---
PAHs	6.05	< 2.0	*100*	---	---
% water (105ºC)	6.01	20.1	---	---	---
% of material > 4mm	5.01	3.9	---	---	---

Table 2: parameters determined on leachate (all results in mg leached per kg dry material)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159052	*Landfill acceptance criteria for Inert waste*	*Stable non-reactive hazardous waste in non-hazardous*	*Hazardous waste landfill*
Arsenic U	5.04, 6.08	< 0.1	*0.5*	*2*	*25*
Antimony	5.04, 6.08	< 0.06	*0.06*	*0.7*	*5*
Barium U	5.04, 6.08	< 2.0	*20*	*100*	*300*
Cadmium U	5.04, 6.08	< 0.04	*0.04*	*1*	*5*
Chromium (total) U	5.04, 6.08	< 0.5	*0.5*	*10*	*70*
Copper U	5.04, 6.08	< 0.5	*2*	*50*	*100*
Lead U	5.04, 6.08	< 0.5	*0.5*	*10*	*50*
Mercury U	5.04, 6.08	< 0.01	*0.01*	*0.2*	*2*
Molybdenum	5.04, 6.08	< 0.5	*0.5*	*10*	*30*
Nickel U	5.04, 6.08	< 0.2	*0.4*	*10*	*40*
Selenium	5.04, 6.08	< 0.1	*0.1*	*0.5*	*7*
Zinc U	5.04, 6.08	< 2	*4*	*50*	*200*
Sulphate	5.04, 6.02	55.0	*1000*	*20000*	*50000*
Fluoride	5.04, 6.02	< 3.0	*10*	*150*	*500*
Chloride	5.04, 6.02	5.0	*800*	*15000*	*25000*
Phenol index	5.04, 6.19	< 1.0	*1*	---	---
pH (pH units)	5.04, 6.03	7.93	*To be set*	*> 6*	---
Total dissolved solids	5.04, 6.12	1080	*4000*	*60000*	*100000*
Dissolved organic carbon	5.04, 6.07	352	*500*	*800*	*1000*

All analytes marked U have been analysed under the scope of our UKAS accreditation
The limits are taken from BS EN 12457-3 for a liquid:solid ratio of 10:1

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MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

Table 3: parameters determined on aqua regia digest (all results in mg/kg dry weight)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159052	*Soil Guideline Values*		
			Residential	*Allotment*	*Commercial*
Arsenic M	5.18, 6.08	14.9 *	*37†*	*43 †*	*640 †*
Antimony	5.18, 6.08	< 1	—	—	—
Barium	5.18, 6.08	---	---	---	---
Cadmium M	5.18, 6.08	1.4 *	*11†*	*1.9†*	*190†*
Chromium (total) M	5.18, 6.08	76 *	—	—	—
Cobalt	5.18, 6.08	---	—	—	—
Copper M	5.18, 6.08	17 *	*2400†*	*520†*	*68000†*
Mercury M	5.18, 6.08	< 0.2 *	*1.2 †*	*21†*	*25.8†*
Molybdenum	5.18, 6.08	---	---	—	—
Nickel M	5.18, 6.08	66 *	*180 †*	*230 †*	*980 †*
Lead M	5.18, 6.08	< 40 *	*210 ††*	*84 ††*	*1100 ††*
Selenium M	5.18, 6.08	< 1 *	*250 †*	*88 †*	*12000 †*
Thallium	5.18, 6.08	---	—	—	—
Vanadium	5.18, 6.08	---	*410 †*	*91 †*	*9000 †*
Zinc M	5.18, 6.08	414 *	*3700 ††*	*620 ††*	*73000 ††*

All analytes marked M have been analysed under the scope of our UKAS/Mcerts accreditation

Deviating codes if sample is	D	
Percentage of soil >2mm not	5.01	7.8

Limits labelled '†' are LQM/CIEH S4ULs (suitable 4 use levels) taken from The LQM/CIEH S4ULs for Human Risk Assessment published by Land Quality Press 2015

Limits labelled '††' are provisional C4SLs (Category 4 Screeninig Levels) taken from Appendix H Provisional C4SLs for Lead, these are based upon soil giudeline values publised by DEFRA and the HPA Compendium of Chemical Hazards document

Table 4: TPH in soil (all results in mg/kg dry weight)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159052	*Soil Guideline Values*		
			Residential	*Allotment*	*Commercial*
TPH total (C10 - C40) P	6.15	< 10.0	---	---	---
TPH aromatic (C8 - C10)	6.15	< 5.00	*34*	*8.6*	*3500*
TPH aromatic (C10 - C12) P	6.15	< 1.0	*74*	*13*	*16000*
TPH aromatic (C12 - C16) P	6.15	< 1.0	*140*	*23*	*36000*
TPH aromatic (C16 - C21) P	6.15	< 1.0	*260*	*46*	*28000*
TPH aromatic (C21 - C40) P	6.15	5.6	*1100*	*370*	*28000*
TPH aliphatic (C8 - C10)	6.15	< 5.00	*27*	*320*	*2000*
TPH aliphatic (C10 - C12) P	6.15	< 1.0	*130*	*2200*	*9700*
TPH aliphatic (C12 - C16) P	6.15	< 1.0	*1100*	*11000*	*59000*
TPH aliphatic (C16 - C21) P	6.15	< 2.0	*65000*	*260000*	*1600000*
TPH aliphatic (C21 - C40) P	6.15	< 5.0	*65000*	*260000*	*1600000*

Limits are LQM/CIEH S4ULs (suitable 4 use levels) taken from "The LQM/CIEH S4ULs for Human Risk Assessment published by Land Quality Press 2015" and based upon 1% Soil Organic Matter

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Table 5: PAH in soil (all results in mg/kg dry weight)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159052	*Soil Guideline Values*		
			Residential	*Allotment*	*Commercial*
PAH (total)	6.05	< 2.0	---	---	---
Naphthalene	6.05	< 0.10	*2.3*	*4.1*	*190*
Acenaphthylene	6.05	< 0.10	*170*	*28*	*83000*
Acenaphthene	6.05	< 0.10	*210*	*34*	*84000*
Fluorene	6.05	< 0.10	*170*	*27*	*63000*
Phenanthrene	6.05	< 0.10	*95*	*15*	*22000*
Anthracene	6.05	< 0.10	*2400*	*380*	*520000*
Fluoranthene	6.05	< 0.10	*280*	*52*	*23000*
Pyrene	6.05	< 0.10	*620*	*110*	*54000*
Benz(a)anthracene	6.05	< 0.10	*7.2*	*2.9*	*170*
Chrysene	6.05	< 0.10	*15*	*4.1*	*350*
Benzo(b)fluoranthene	6.05	< 0.10	*2.6*	*0.99*	*44*
Benzo(k)fluoranthene	6.05	< 0.10	*77*	*37*	*1200*
Benzo(a)pyrene	6.05	< 0.10	*2.2*	*0.97*	*35*
Dibenz(a,h)anthracene	6.05	< 0.10	*0.24*	*0.14*	*3.5*
Benzo(g,h,i)perylene	6.05	< 0.10	*320*	*290*	*3900*
Indeno(1,2,3-c,d)pyrene	6.05	< 0.10	*27*	*9.5*	*500*

Limits are LQM/CIEH S4ULs (suitable 4 use levels) taken from "The LQM/CIEH S4ULs for Human Risk Assessment published by Land Quality Press 2015" and based upon 1% Soil Organic Matter

Free Cyanide in soil (result in mg/kg dry weight)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159052	*Soil Guideline Values*		
			Residential	*Allotment*	*Commercial*
Cyanide	6.19	< 0.025	---	---	---

Asbestos Presence or absence in soil

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159052	*Soil Guideline Values*		
			Residential	*Allotment*	*Commercial*
Asbestos presence U	2.01	Not detected	---	---	---

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MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

LANDFILL WASTE ACCEPTANCE CRITERIA

Client:	Ground Condition Consultants	Date Sampled:	20 May 2025
Site:	Belmont Castle	Date Received:	21 May 2025
Sample Description:	Soil - Chalk	Submitted by:	Courier
Sample Details:	WS103 0.8-1.0m	Date Analysis Started:	21 May 2025
Sampled By:	Client	Date Completed:	2 June 2025

Table 1: parameters determined on whole sample (all results in mg/kg dry wt except where stated)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159053	*Landfill acceptance criteria for Inert waste*	*Stable non-reactive hazardous waste in non-hazardous*	*Hazardous waste landfill*
Mineral oil (C10 - C40) P	6.15	10.5	*500*	---	---
Loss on ignition (%)	5.01, 6.09	1.0	---	---	*10 %*
Total Organic Carbon (%)	6.07	< 0.1	*3 %*	*5 %*	*6 %*
BTEX	6.11	< 1.0	*6*	---	---
PCBs (7 congeners)	6.06	< 1.0	*1*	---	---
PAHs	6.05	< 2.0	*100*	---	---
% water (105ºC)	6.01	15.6	---	---	---
% of material > 4mm	5.01	4.9	---	---	---

Table 2: parameters determined on leachate (all results in mg leached per kg dry material)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159053	*Landfill acceptance criteria for Inert waste*	*Stable non-reactive hazardous waste in non-hazardous*	*Hazardous waste landfill*
Arsenic U	5.04, 6.08	< 0.1	*0.5*	*2*	*25*
Antimony	5.04, 6.08	< 0.06	*0.06*	*0.7*	*5*
Barium U	5.04, 6.08	< 2.0	*20*	*100*	*300*
Cadmium U	5.04, 6.08	< 0.04	*0.04*	*1*	*5*
Chromium (total) U	5.04, 6.08	< 0.5	*0.5*	*10*	*70*
Copper U	5.04, 6.08	< 0.5	*2*	*50*	*100*
Lead U	5.04, 6.08	< 0.5	*0.5*	*10*	*50*
Mercury U	5.04, 6.08	< 0.01	*0.01*	*0.2*	*2*
Molybdenum	5.04, 6.08	< 0.5	*0.5*	*10*	*30*
Nickel U	5.04, 6.08	< 0.2	*0.4*	*10*	*40*
Selenium	5.04, 6.08	< 0.1	*0.1*	*0.5*	*7*
Zinc U	5.04, 6.08	< 2	*4*	*50*	*200*
Sulphate	5.04, 6.02	< 3.0	*1000*	*20000*	*50000*
Fluoride	5.04, 6.02	< 3.0	*10*	*150*	*500*
Chloride	5.04, 6.02	< 3.0	*800*	*15000*	*25000*
Phenol index	5.04, 6.19	< 1.0	*1*	---	---
pH (pH units)	5.04, 6.03	9.49	*To be set*	*> 6*	---
Total dissolved solids	5.04, 6.12	224	*4000*	*60000*	*100000*
Dissolved organic carbon	5.04, 6.07	109	*500*	*800*	*1000*

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Table 3: parameters determined on aqua regia digest (all results in mg/kg dry weight)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159053	*Soil Guideline Values*		
			Residential	*Allotment*	*Commercial*
Arsenic M	5.18, 6.08	< 4.0 *	*37†*	*43 †*	*640 †*
Antimony	5.18, 6.08	< 1	—	—	—
Barium	5.18, 6.08	---	---	---	---
Cadmium M	5.18, 6.08	0.9 *	*11†*	*1.9†*	*190†*
Chromium (total) M	5.18, 6.08	10 *	—	—	—
Cobalt	5.18, 6.08	---	—	—	—
Copper M	5.18, 6.08	5 *	*2400†*	*520†*	*68000†*
Mercury M	5.18, 6.08	< 0.2 *	*1.2 †*	*21†*	*25.8†*
Molybdenum	5.18, 6.08	---	---	—	—
Nickel M	5.18, 6.08	7 *	*180 †*	*230 †*	*980 †*
Lead M	5.18, 6.08	< 40 *	*210 ††*	*84 ††*	*1100 ††*
Selenium M	5.18, 6.08	< 1 *	*250 †*	*88 †*	*12000 †*
Thallium	5.18, 6.08	---	—	—	—
Vanadium	5.18, 6.08	---	*410 †*	*91 †*	*9000 †*
Zinc M	5.18, 6.08	87 *	*3700 ††*	*620 ††*	*73000 ††*

All analytes marked M have been analysed under the scope of our UKAS/Mcerts accreditation

Deviating codes if sample is	D	
Percentage of soil >2mm not	5.01	8.8

Limits labelled '†' are LQM/CIEH S4ULs (suitable 4 use levels) taken from The LQM/CIEH S4ULs for Human Risk Assessment published by Land Quality Press 2015

Limits labelled '††' are provisional C4SLs (Category 4 Screeninig Levels) taken from Appendix H Provisional C4SLs for Lead, these are based upon soil giudeline values publised by DEFRA and the HPA Compendium of Chemical Hazards document

Table 4: TPH in soil (all results in mg/kg dry weight)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159053	*Soil Guideline Values*		
			Residential	*Allotment*	*Commercial*
TPH total (C10 - C40) P	6.15	10.5	---	---	---
TPH aromatic (C8 - C10)	6.15	< 5.00	*34*	*8.6*	*3500*
TPH aromatic (C10 - C12) P	6.15	1.0	*74*	*13*	*16000*
TPH aromatic (C12 - C16) P	6.15	< 1.0	*140*	*23*	*36000*
TPH aromatic (C16 - C21) P	6.15	< 1.0	*260*	*46*	*28000*
TPH aromatic (C21 - C40) P	6.15	< 5.0	*1100*	*370*	*28000*
TPH aliphatic (C8 - C10)	6.15	< 5.00	*27*	*320*	*2000*
TPH aliphatic (C10 - C12) P	6.15	< 1.0	*130*	*2200*	*9700*
TPH aliphatic (C12 - C16) P	6.15	< 1.0	*1100*	*11000*	*59000*
TPH aliphatic (C16 - C21) P	6.15	< 2.0	*65000*	*260000*	*1600000*
TPH aliphatic (C21 - C40) P	6.15	< 5.0	*65000*	*260000*	*1600000*

Limits are LQM/CIEH S4ULs (suitable 4 use levels) taken from "The LQM/CIEH S4ULs for Human Risk Assessment published by Land Quality Press 2015" and based upon 1% Soil Organic Matter

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Table 5: PAH in soil (all results in mg/kg dry weight)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159053	*Soil Guideline Values*		
			Residential	*Allotment*	*Commercial*
PAH (total)	6.05	< 2.0	---	---	---
Naphthalene	6.05	< 0.10	*2.3*	*4.1*	*190*
Acenaphthylene	6.05	< 0.10	*170*	*28*	*83000*
Acenaphthene	6.05	< 0.10	*210*	*34*	*84000*
Fluorene	6.05	< 0.10	*170*	*27*	*63000*
Phenanthrene	6.05	< 0.10	*95*	*15*	*22000*
Anthracene	6.05	< 0.10	*2400*	*380*	*520000*
Fluoranthene	6.05	< 0.10	*280*	*52*	*23000*
Pyrene	6.05	< 0.10	*620*	*110*	*54000*
Benz(a)anthracene	6.05	< 0.10	*7.2*	*2.9*	*170*
Chrysene	6.05	< 0.10	*15*	*4.1*	*350*
Benzo(b)fluoranthene	6.05	< 0.10	*2.6*	*0.99*	*44*
Benzo(k)fluoranthene	6.05	< 0.10	*77*	*37*	*1200*
Benzo(a)pyrene	6.05	< 0.10	*2.2*	*0.97*	*35*
Dibenz(a,h)anthracene	6.05	< 0.10	*0.24*	*0.14*	*3.5*
Benzo(g,h,i)perylene	6.05	< 0.10	*320*	*290*	*3900*
Indeno(1,2,3-c,d)pyrene	6.05	< 0.10	*27*	*9.5*	*500*

Limits are LQM/CIEH S4ULs (suitable 4 use levels) taken from "The LQM/CIEH S4ULs for Human Risk Assessment published by Land Quality Press 2015" and based upon 1% Soil Organic Matter

Free Cyanide in soil (result in mg/kg dry weight)

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159053	*Soil Guideline Values*		
			Residential	*Allotment*	*Commercial*
Cyanide	6.19	< 0.025	---	---	---

Asbestos Presence or absence in soil

Analyte	Method	Sample Lab Ref: Job: 25-48777 Samp. 159053	*Soil Guideline Values*		
			Residential	*Allotment*	*Commercial*
Asbestos presence U	2.01	Not detected	---	---	---

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Method Summaries:-

5.01 - Soil sample pre-treatment, air-drying, crushing, sieving and subdividing (BS ISO 11464:2006)
5.02 - Solvent extraction (acetone/heptane) of soils for hydrocarbon analyses (BS 16703:2004)
5.04 - Aqueous leaching of soil and waste samples (BS 12457-2:2002)
5.05 - Soil texture classification
5.06 - Aqueous extraction of dried soils/sludges/waste in a ration of 2.5:1 (BS 1377-3:1990 Section 9)
5.18 - Digestion of solid samples in aqua-regia using hot-block for metals analysis (EPA 200.2 rev.2.8)
6.01 - Gravimetric determination of water content of solid samples by oven drying at 105ºC.(BS 7755-3.1:1995)
6.02 - Determination of anions by ion chromatography (EPA 300.1 1999)
6.03 - Determination of pH in aqueous samples and extracts by pH electrode.
6.04 - Determination of petroleum hydrocarbons by Gas chromatography of solvent extracts (FID) (BS 16703:2004)
6.05 - Determination of poly-aromatic- hydrocarbons by gas chromatography linked mass spectrometry (GC-MS)
6.06 - Determination of poly-chlorinated-biphenyls (PCBs) by gas chromatography linked mass spectrometry (GC- MS)
6.07 - Determination of dissolved organic carbon (DOC) and total organic carbon (TOC) by furnace combustion and infra-red detection of carbon dioxide.
6.08 - Determination of metals in digests and leachates by inductively coupled plasma optical emission spectrophotometry (ICP-OES) (EPA 6010C)
6.09 - Determination of loss on ignition by gravimetry and combustion in muffle furnace
6.15 - Analysis of solvent extracts for speciated and banded hydrocarbons using 2 imensional GC with FID detection.
SUBCON - work has been subcontracted

Deviating Codes:

A - No sample date provided
B - No sample time provided (water samples only)
C - Incorrect sample container
D - Incorrect storage temperature
E - Insufficient sample
F - Time from sampling to receipt exceeded
G - Time from sampling to analysis exceeded
N - No temperature recorded

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Our Ref: 25-48778
Your Ref: J25-038

Analysis Report

Client: Ground Condition Consultants
2 Burrows Lane
Verwood
Dorset
BH31 7PH

Sample Details: 7 Samples for Soil Analysis

Date report issued: 4 June 2025 Issue number: 1

Number of pages (including this header): 6

Accreditation
All analytes marked ^{M} have been analysed under the scope of our MCERTS accreditation
All analytes marked ^{U} have been analysed under the scope of our UKAS accreditation
All analytes marked ^{m} have been subcontracted and analysed under the scope of their MCERTS accreditation
All analytes marked ^{u} have been subcontracted and analysed under the scope of their UKAS accreditation

All results labelled with an asterisk (*) are non-conforming due to incorrect sample storage or handling. The result may be invalid.
The results shown in this test report specifically refer to the sample(s) as received unless otherwise stated.
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All comments are beyond the scope of our accreditation.
Unless sampled by Envirochm, all sample details are supplied by the client.
Uncertainty of measurement is not accounted for in reported results

Signed on behalf of Envirochem by an authorised signatory

[redacted]

Dan Dockree

Authorised Signatory

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envirochem

Our Ref: 25-48778
Your Ref: J25-038

Client:	Ground Condition Consultants	Submitted By:	Courier
Site:	Belmont Castle	Date Received:	21 May 2025
Sampled By:	Client	Date Completed:	4 June 2025
Envirochem Job No.	25-48778	Date Issued:	4 June 2025

			Lab Sample No.	159054	159055	159056	159057			
			Deviating codes	D	D	D	D			
			Soil Type	Sandy Loam Stn	Chalk	Clay Loam Stn	Clay Loam			
			Sample Date	20/05/2025	20/05/2025	20/05/2025	20/05/2025			
			Sample Time	NotSupplied	NotSupplied	NotSupplied	NotSupplied			
			Sample Location / Details	WS101 0.2-0.4m	WS101 0.8-1.0m	WS102 0.1-0.2m	WS102 1.0-1.2m			
								Limits (mg/kg)		
Determination	Units	Method	Detection Limit					Resid.	Allot.	Comm.
Asbestos quantification	%	2.01	-	-----	-----	0.077	-----	---	---	---
Particle size > 2mm	%	5.01	-	16.0	1.2	23.4	18.6	---	---	---
Asbestos identification		2.01	-	Not detected U	Not detected U	detected U	Not detected U	---	---	---
water content 105C	%	6.01	1.0	14.7	18.6	16.1	16.6	---	---	---
Total carbon (TC)	%	6.07	0.10	8.21	11.4	5.07	2.55	---	---	---
% water , air dried(<30º)	%	5.01	1.00	13.4	17.5	15.4	16.1	---	---	---
Total inorganic carbon (TIC)	%	6.07	0.10	6.15	11.4	0.72	0.45	---	---	---
Total organic carbon (TOC)	%	6.07	0.1	2.1	< 0.1	4.3	2.1	---	---	---
Soil organic matter %	%	6.07	-	3.5	0.0	7.5	3.6	---	---	---
phenol index soil	mg/kg	6.19	0.25	< 0.25	< 0.25	< 0.25	< 0.25	1100+	280+	3200+
pH	pH Units	5.06, 6.03	1.00	8.16 M*	9.06 M*	8.16 M*	8.26 M*	---	---	---
Cyanide (free)	mg/kg	6.19	0.025	< 0.025	< 0.025	< 0.025	0.050	---	---	---
arsenic	mg/kg (dry	5.18, 6.08	4.0	6.6 M*	15.3 M*	10.2 M*	11.7 M*	37+	43+	640+
cadmium	mg/kg (dry	5.18, 6.08	0.5	1.2 M*	1.1 M*	0.9 M*	2.0 M*	11+	1.9+	190+
Chromium VI	mg/kg	6.19	0.05	< 0.05	< 0.05	< 0.05	< 0.05	6+	1.8+	33+
chromium	mg/kg (dry	5.18, 6.08	2	16 M*	4 M*	28 M*	33 M*	---	---	---
copper	mg/kg (dry	5.18, 6.08	2	13 M*	3 M*	26 M*	22 M*	2400+	520+	68000+
mercury	mg/kg (dry	5.18, 6.08	0.2	< 0.2 M*	< 0.2 M*	< 0.2 M*	< 0.2 M*	1.2+	21+	25.8+
nickel	mg/kg (dry	5.18, 6.08	3	12 M*	19 M*	22 M*	50 M*	180+	230+	980+
lead	mg/kg (dry	5.18, 6.08	40	151 M*	< 40 M*	121 M*	62 M*	210++	84++	1100++
antimony	mg/kg (dry	5.18, 6.08	1	< 1	< 1	< 1	< 1	---	---	---
selenium	mg/kg (dry	5.18, 6.08	1	< 1 M*	< 1 M*	1 M*	2 M*	250+	88+	12000+
zinc	mg/kg (dry	5.18, 6.08	15	127 M*	44 M*	144 M*	151 M*	3700+	620+	73000
total TPH (C10 - C40)	mg/kg (dry	6.15	10.0	12.0 P	< 10.0 P	36.2 P	33.6 P	---	---	---
TPH Aliphatic (C8-C10)	mg/kg (dry	6.15	5.00	< 5.00	< 5.00	< 5.00	< 5.00	27+	320+	2000+
TPH Aliphatic (C10-C12)	mg/kg (dry	6.15	1.0	< 1.0 P	< 1.0 P	< 1.0 P	< 1.0 P	130+	2200+	9700+
TPH Aliphatic (C12-C16)	mg/kg (dry	6.15	1.0	< 1.0 P	< 1.0 P	1.3 P	< 1.0 P	1100+	11000+	59000+
TPH Aliphatic (C16-C21)	mg/kg (dry	6.15	2.0	< 2.0 P	< 2.0 P	< 2.0 P	< 2.0 P	65000+	26000	16000
TPH Aliphatic (C21-C40)	mg/kg (dry	6.15	5.0	< 5.0	< 5.0	< 5.0	< 5.0	65000+	26000	16000
TPH Aromatic (C8-C10)	mg/kg (dry	6.15	5.00	< 5.00	< 5.00	< 5.00	< 5.00	34+	8.6+	3500+
TPH Aromatic (C10-C12)	mg/kg (dry	6.15	1.0	< 1.0 P	1.2 P	1.0 P	< 1.0 P	74+	13+	16000+
TPH Aromatic (C12-C16)	mg/kg (dry	6.15	1.0	< 1.0 P	< 1.0 P	< 1.0 P	< 1.0 P	140+	23+	36000+

Limits labelled '+' are S4ULs (Suitable for Use Levels) taken from The LQM/CIEH S4ULs for Human Health Risk Assessment soil guideline values published by Land Quality Ltd. 2015
Limits labelled '++' are C4SLs Category 4 Screening levels from Appendix H provisional C4SLs for lead and based upon Soil Guideline Values

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MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

Our Ref: 25-48778
Your Ref: J25-038

Client:	Ground Condition Consultants	Submitted By:	Courier
Site:	Belmont Castle	Date Received:	21 May 2025
Sampled By:	Client	Date Completed:	4 June 2025
Envirochem Job No.	25-48778	Date Issued:	4 June 2025

			Lab Sample No.	159054	159055	159056	159057			
			Deviating codes	D	D	D	D			
			Soil Type	Sandy Loam Stn	Chalk	Clay Loam Stn	Clay Loam			
			Sample Date	20/05/2025	20/05/2025	20/05/2025	20/05/2025			
			Sample Time	NotSupplied	NotSupplied	NotSupplied	NotSupplied			
			Sample Location / Details	WS101 0.2-0.4m	WS101 0.8-1.0m	WS102 0.1-0.2m	WS102 1.0-1.2m			
								Limits (mg/kg)		
Determination	Units	Method	Detection Limit					Resid.	Allot.	Comm.
TPH Aromatic (C16-C21)	mg/kg (dry	6.15	1.0	< 1.0 P	< 1.0 P	3.9 P	1.3 P	260+	46+	28000+
TPH Aromatic (C21-C40)	mg/kg (dry	6.15	5.0	9.2	< 5.0	28.4	24.4	1100+	370+	28000+
total PAHs	mg/kg	6.05	2.0	< 2.0	< 2.0	9.9	< 2.0	---	---	---
PAH Napthalene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10	< 0.10	2.3+	4.1+	190+
PAH Acenaphthylene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10	< 0.10	170+	28+	83000+
PAH Acenaphthene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10	< 0.10	210+	34+	84000+
PAH Fluorene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10	< 0.10	170+	27+	63000+
PAH Anthracene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.53	< 0.10	2400+	380+	52000
PAH Phenanthrene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10	< 0.10	95+	15+	22000+
PAH Fluoranthene	mg/kg	6.05	0.10	< 0.10	< 0.10	1.37	< 0.10	280+	52+	23000+
PAH Pyrene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.96	< 0.10	620+	110+	54000+
PAH Benz(a)anthracene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.43	< 0.10	7.2+	2.9+	170+
PAH Chrysene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.94	< 0.10	15+	4.1+	350+
PAH Benzo(b)fluoranthene	mg/kg	6.05	0.10	0.22	< 0.10	2.23	< 0.10	2.6+	0.99+	44+
PAH Benzo(k)fluoranthene	mg/kg	6.05	0.10	< 0.10	< 0.10	1.84	< 0.10	77+	37+	1200+
PAH Benzo(a)pyrene	mg/kg	6.05	0.10	< 0.10	< 0.10	1.55	< 0.10	2.2+	0.97+	35+
PAH Indeno(1,2,3-c,d)pyrene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.68	< 0.10	27+	9.5+	500+
PAH Dibenzo(a,h)anthracene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.24+	0.14+	3.5+
PAH Benzo(g,h,i)perylene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.88	< 0.10	320+	290+	3900+

Limits labelled '+' are S4ULs (Suitable for Use Levels) taken from The LQM/CIEH S4ULs for Human Health Risk Assessment soil guideline values published by Land Quality Ltd. 2015
Limits labelled '++' are C4SLs Category 4 Screening levels from Appendix H provisional C4SLs for lead and based upon Soil Guideline Values

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MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

Our Ref: 25-48778
Your Ref: J25-038

Client:	Ground Condition Consultants	Submitted By:	Courier
Site:	Belmont Castle	Date Received:	21 May 2025
Sampled By:	Client	Date Completed:	4 June 2025
Envirochem Job No.	25-48778	Date Issued:	4 June 2025

			Lab Sample No.	159058	159059	159061				
			Deviating codes	D	D	D				
			Soil Type	Clay	Clay	Clay Loam				
			Sample Date	20/05/2025	20/05/2025	20/05/2025				
			Sample Time	NotSupplied	NotSupplied	NotSupplied				
			Sample Location / Details	WS102 4.5-4.7m	WS102 5.5-5.7m	WS103 0.4-0.6m				
Determination	Units	Method	Detection Limit					Limits (mg/kg)		
								Resid.	Allot.	Comm.
Asbestos quantification	%	2.01	-	-----	-----	-----		---	---	---
Particle size > 2mm	%	5.01	-	7.1	9.5	30.6		---	---	---
Asbestos identification		2.01	-	Not detected	Not detected U	Not detected U		---	---	---
water content 105C	%	6.01	1.0	19.7	17.7	14.2		---	---	---
Total carbon (TC)	%	6.07	0.10	1.48	1.27	9.20		---	---	---
% water , air dried(<30º)	%	5.01	1.00	17.9	16.8	13.5		---	---	---
Total inorganic carbon (TIC)	%	6.07	0.10	0.33	0.41	3.36		---	---	---
Total organic carbon (TOC)	%	6.07	0.1	1.1	0.9	5.8		---	---	---
Soil organic matter %	%	6.07	-	2.0	1.5	10.0		---	---	---
phenol index soil	mg/kg	6.19	0.25	< 0.25	< 0.25	< 0.25		1100+	280+	3200+
pH	pH Units	5.06, 6.03	1.00	7.63 M*	7.68 M*	7.61 M*		---	---	---
Cyanide (free)	mg/kg	6.19	0.025	0.135	0.083	< 0.025		---	---	---
arsenic	mg/kg (dry	5.18, 6.08	4.0	9.7 M*	11.2 M*	8.0 M*		37+	43+	640+
cadmium	mg/kg (dry	5.18, 6.08	0.5	1.0 M*	0.9 M*	0.9 M*		11+	1.9+	190+
Chromium VI	mg/kg	6.19	0.05	< 0.05	< 0.05	< 0.05		6+	1.8+	33+
chromium	mg/kg (dry	5.18, 6.08	2	33 M*	34 M*	14 M*		---	---	---
copper	mg/kg (dry	5.18, 6.08	2	13 M*	15 M*	28 M*		2400+	520+	68000+
mercury	mg/kg (dry	5.18, 6.08	0.2	< 0.2 M*	< 0.2 M*	< 0.2 M*		1.2+	21+	25.8+
nickel	mg/kg (dry	5.18, 6.08	3	32 M*	35 M*	13 M*		180+	230+	980+
lead	mg/kg (dry	5.18, 6.08	40	< 40 M*	< 40 M*	463 M*		210++	84++	1100++
antimony	mg/kg (dry	5.18, 6.08	1	< 1	< 1	< 1		---	---	---
selenium	mg/kg (dry	5.18, 6.08	1	1 M*	1 M*	< 1 M*		250+	88+	12000+
zinc	mg/kg (dry	5.18, 6.08	15	123 M*	95 M*	170 M*		3700+	620+	73000
total TPH (C10 - C40)	mg/kg (dry	6.15	10.0	< 10.0 P	16.2 P	56.5 P		---	---	---
TPH Aliphatic (C8-C10)	mg/kg (dry	6.15	5.00	< 5.00	< 5.00	< 5.00		27+	320+	2000+
TPH Aliphatic (C10-C12)	mg/kg (dry	6.15	1.0	< 1.0 P	< 1.0 P	< 1.0 P		130+	2200+	9700+
TPH Aliphatic (C12-C16)	mg/kg (dry	6.15	1.0	< 1.0 P	< 1.0 P	1.2 P		1100+	11000+	59000+
TPH Aliphatic (C16-C21)	mg/kg (dry	6.15	2.0	< 2.0 P	< 2.0 P	2.4 P		65000+	26000	16000
TPH Aliphatic (C21-C40)	mg/kg (dry	6.15	5.0	< 5.0	8.4	< 5.0		65000+	26000	16000
TPH Aromatic (C8-C10)	mg/kg (dry	6.15	5.00	< 5.00	< 5.00	< 5.00		34+	8.6+	3500+
TPH Aromatic (C10-C12)	mg/kg (dry	6.15	1.0	< 1.0 P	1.4 P	1.4 P		74+	13+	16000+

Limits labelled '+' are S4ULs (Suitable for Use Levels) taken from The LQM/CIEH S4ULs for Human Health Risk Assessment soil guideline values published by Land Quality Ltd. 2015
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MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

Our Ref: 25-48778
Your Ref: J25-038

Client:	Ground Condition Consultants	Submitted By:	Courier
Site:	Belmont Castle	Date Received:	21 May 2025
Sampled By:	Client	Date Completed:	4 June 2025
Envirochem Job No.	25-48778	Date Issued:	4 June 2025

			Lab Sample No.	159058	159059	159061				
			Deviating codes	D	D	D				
			Soil Type	Clay	Clay	Clay Loam				
			Sample Date	20/05/2025	20/05/2025	20/05/2025				
			Sample Time	NotSupplied	NotSupplied	NotSupplied				
			Sample Location / Details	WS102 4.5-4.7m	WS102 5.5-5.7m	WS103 0.4-0.6m				
Determination	Units	Method	Detection Limit					Limits (mg/kg)		
								Resid.	Allot.	Comm.
TPH Aromatic (C12-C16)	mg/kg (dry	6.15	1.0	< 1.0 P	< 1.0 P	1.3 P		140+	23+	36000+
TPH Aromatic (C16-C21)	mg/kg (dry	6.15	1.0	< 1.0 P	< 1.0 P	4.8 P		260+	46+	28000+
TPH Aromatic (C21-C40)	mg/kg (dry	6.15	5.0	< 5.0	< 5.0	41.2		1100+	370+	28000+
total PAHs	mg/kg	6.05	2.0	< 2.0	< 2.0	6.0		---	---	---
PAH Napthalene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10		2.3+	4.1+	190+
PAH Acenaphthylene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10		170+	28+	83000+
PAH Acenaphthene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10		210+	34+	84000+
PAH Fluorene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10		170+	27+	63000+
PAH Anthracene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.63		2400+	380+	52000
PAH Phenanthrene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10		95+	15+	22000+
PAH Fluoranthene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.83		280+	52+	23000+
PAH Pyrene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.61		620+	110+	54000+
PAH Benz(a)anthracene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.27		7.2+	2.9+	170+
PAH Chrysene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.53		15+	4.1+	350+
PAH Benzo(b)fluoranthene	mg/kg	6.05	0.10	< 0.10	< 0.10	1.20		2.6+	0.99+	44+
PAH Benzo(k)fluoranthene	mg/kg	6.05	0.10	< 0.10	< 0.10	1.02		77+	37+	1200+
PAH Benzo(a)pyrene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.85		2.2+	0.97+	35+
PAH Indeno(1,2,3-c,d)pyrene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.35		27+	9.5+	500+
PAH Dibenzo(a,h)anthracene	mg/kg	6.05	0.10	< 0.10	< 0.10	< 0.10		0.24+	0.14+	3.5+
PAH Benzo(g,h,i)perylene	mg/kg	6.05	0.10	< 0.10	< 0.10	0.69		320+	290+	3900+

Limits labelled '+' are S4ULs (Suitable for Use Levels) taken from The LQM/CIEH S4ULs for Human Health Risk Assessment soil guideline values published by Land Quality Ltd. 2015
Limits labelled '++' are C4SLs Category 4 Screening levels from Appendix H provisional C4SLs for lead and based upon Soil Guideline Values

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MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

Method Summaries:-

5.01 - Soil sample pre-treatment, air-drying, crushing, sieving and subdividing
5.02 - Solvent extraction (acetone/heptane) of soils for hydrocarbon analyses
5.04 - Aqueous leaching of soil and waste samples
5.05 - Soil texture classification
5.06 - Aqueous extraction of dried soils/sludges/waste in a ration of 2.5:1
5.18 - Digestion of solid samples in aqua-regia using hot-block for metals analysis
6.01 - Gravimetric determination of water content of solid samples by oven drying at 105ºC.
6.02 - Determination of anions by ion chromatography
6.03 - Determination of pH in aqueous samples and extracts by pH electrode.
6.04 - Determination of petroleum hydrocarbons by Gas chromatography of solvent extracts (FID)
6.05 - Determination of poly-aromatic- hydrocarbons by gas chromatography linked mass spectrometry (GC-MS)
6.06 - Determination of poly-chlorinated-biphenyls (PCBs) by gas chromatography linked mass spectrometry (GC-MS)
6.07 - Determination of dissolved organic carbon (DOC) and total organic carbon (TOC) by furnace combustion and infra-red detection of carbon dioxide.
6.08 - Determination of metals in digests and leachates by inductively coupled plasma optical emission spectrophotometry (ICP- OES)
6.09 - Determination of loss on ignition by gravimetry and combustion in muffle furnace
6.15 - Determination of speciated extractable petroleum hydrocarbons (EPH) by GCxGC analysis and FID

Deviating Codes:

A - No sample date provided
B - No sample time provided (water samples only)
C - Incorrect sample container
D - Incorrect storage temperature
E - Insufficient sample
F - Time from sampling to receipt exceeded
G - Time from sampling to analysis exceeded
P - No sample preservative (for bacti samples only)
N - No temperature recorded
I - Insufficiant paint supplied(<0.1g)

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MICROBIOLOGICAL TESTING
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UKAS TESTING 1227

Our Ref: 25-48864
Your Ref: J25-038

Analysis Report

Client: Ground Condition Consultants
2 Burrows Lane
Verwood
Dorset
BH31 7PH

Sample Details: 1 Sample for Leachate

Date report issued: 2 June 2025 Issue number: 2
Date report re-issued: 12 June 2025
Report re-issue reason: Clinet requested raw leachate concentrations

Number of pages (including this header): 4

Accreditation

All analytes marked M have been analysed under the scope of our MCERTS accreditation
All analytes marked U have been analysed under the scope of our UKAS accreditation
All analytes marked m have been subcontracted and analysed under the scope of their MCERTS accreditation
All analytes marked u have been subcontracted and analysed under the scope of their UKAS accreditation
All results labelled with an asterisk (*) are non-conforming due to incorrect sample storage or handling. The result may be invalid.
The results shown in this test report specifically refer to the sample(s) as received unless otherwise stated.
The report shall not be reproduced except in full, without the written approval of Envirochem.
All comments are beyond the scope of our accreditation.
Unless sampled by Envirochem, all sample details are suppliend by the client.
Uncertainty of measurement is not accounted for in reported results.

Signed on behalf of Envirochem by an authorised signatory

[redacted]

Dr Duncan Russell

Authorised Signatory

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MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

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UKAS TESTING 1227

Our Ref: 25-48864
Your Ref: J25-038

Client: Ground Condition Consultants
Site: Belmont Castle
Sampled By: Client
Envirochem Job No. 25-48864

Submitted By: Courier
Date Received: 21 May 2025
Date Completed: 2 June 2025
Date Issued: 2 June 2025

			Lab Sample No.	159060				
			Deviating Codes	D				
			Type	Clay Loam Stn				
			Sample Date	20/05/2025				
			Sample Time	NotSupplied				
				WS102 7.0-7.5m				
Determination	Units	Method	Detection Limit					
Particle size > 2mm	%	5.01	-	15.2				
Particle size > 4mm	%	5.01	-	8.4				
water content 105C	%	6.01	1.0	19.0				
% water , air dried(<30º)	%	5.01	1.00	17.4				
Alkalinity	%	6.13	0.04	629				
pH	pH Units	5.06, 6.03	1.00	7.98 M*				
Ammonia	mg/kg	6.19	1.25	< 1.25				
Amm Nitrogen	%	6.19	0.10	< 0.10				
Arsenic in leachate	mg/kg	5.04,6.08	0.1	< 0.1 U				
Raw As in leachate	mg/l	6.08	0.010	< 0.010				
Antimony in leachate	mg/kg	5.04,6.08	0.06	< 0.06				
Raw Sb in leachate	mg/l	6.08	0.006	< 0.006				
Boron	mg/kg	6.08	0.10	1.10				
Barium in leachate	mg/kg	5.04,6.08	2.0	< 2.0 U				
Raw Ba in leachate	mg/l	6.08	0.200	< 0.200				
Cadmium in leachate	mg/kg	5.04,6.08	0.04	< 0.04 U				
Raw Cd in leachate	mg/l	6.08	0.004	< 0.004				
Chromium in leachate	mg/kg	5.04,6.08	0.5	< 0.5 U				
Raw Cr in leachate	mg/l	6.08	0.050	< 0.050				
Copper in leachate	mg/kg	5.04,6.08	0.5	< 0.5 U				
Raw Cu in leachate	mg/l	6.08	0.050	< 0.050				
Mercury in leachate	mg/kg	5.04,6.08	0.01	< 0.01 U				
Raw Hg in leachate	mg/l	6.08	0.001	< 0.001				
Lead in leachate	mg/kg	5.04,6.08	0.5	< 0.5 U				
Raw Pb in leachate	mg/l	6.08	0.050	< 0.050				
Nickel in leachate	mg/kg	5.04,6.08	0.2	< 0.2 U				
Raw Ni in leachate	mg/l	6.08	0.020	< 0.020 U				
Selenium in leachate	mg/kg	5.04, 6.08	0.1	< 0.1				
Raw Se in leachate	mg/l	6.08	0.010	< 0.010				
Zinc in leachate	mg/kg	5.04,6.08	2	< 2 U				
Raw Zn in leachate	mg/l	6.08	0.200	< 0.200				
Raw chloride in leachate	mg/l	6.02	-	2.1680				
Phenol in leachate	mg/kg	6.19/6.26	1.0	< 1.0				
Chloride in leachate	mg/kg	6.02/6.26	3.0	21.7				

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MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

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UKAS TESTING 1227

Our Ref: 25-48864
Your Ref: J25-038

Client: Ground Condition Consultants
Site: Belmont Castle
Sampled By: Client
Envirochem Job No. 25-48864

Submitted By: Courier
Date Received: 21 May 2025
Date Completed: 2 June 2025
Date Issued: 2 June 2025

			Lab Sample No.	159060				
			Deviating Codes	D				
			Type	Clay Loam Stn				
			Sample Date	20/05/2025				
			Sample Time	NotSupplied				
				WS102 7.0-7.5m				
Determination	Units	Method	Detection Limit					
Phenol in leachate Raw	mg/l	6.19	1.00	< 1.00				
Nitrate in leachate	mg/kg	6.02	3.0	3.3				
Sulphate in leachate	mg/kg	6.02	3.0	3.9				
Cyanide (total) in leachate	mg/kg	6.19	1.00	< 1.00				
Cyanide (total) in leachate Raw	mg/l	6.19	1.00	< 1.00				
total TPH (C10 - C40)	mg/kg (dry	6.15	10.0	53.4 P				
TPH Aliphatic (C8-C10)	mg/kg (dry	6.15	5.00	< 5.00				
TPH Aliphatic (C10-C12)	mg/kg (dry	6.15	1.0	< 1.0 P				
TPH Aliphatic (C12-C16)	mg/kg (dry	6.15	1.0	1.1 P				
TPH Aliphatic (C16-C21)	mg/kg (dry	6.15	2.0	2.5 P				
TPH Aliphatic (C21-C40)	mg/kg (dry	6.15	5.0	< 5.0				
TPH Aromatic (C8-C10)	mg/kg (dry	6.15	5.00	< 5.00				
TPH Aromatic (C10-C12)	mg/kg (dry	6.15	1.0	< 1.0 P				
TPH Aromatic (C12-C16)	mg/kg (dry	6.15	1.0	1.1 P				
TPH Aromatic (C16-C21)	mg/kg (dry	6.15	1.0	3.8 P				
TPH Aromatic (C21-C40)	mg/kg (dry	6.15	5.0	41.3				
total PAHs	mg/kg	6.05	2.0	< 2.0				
PAH Napthalene	mg/kg	6.05	0.10	< 0.10				
PAH Acenaphthylene	mg/kg	6.05	0.10	< 0.10				
PAH Acenaphthene	mg/kg	6.05	0.10	< 0.10				
PAH Fluorene	mg/kg	6.05	0.10	< 0.10				
PAH Anthracene	mg/kg	6.05	0.10	< 0.10				
PAH Phenanthrene	mg/kg	6.05	0.10	< 0.10				
PAH Fluoranthene	mg/kg	6.05	0.10	0.36				
PAH Pyrene	mg/kg	6.05	0.10	0.26				
PAH Benz(a)anthracene	mg/kg	6.05	0.10	0.10				
PAH Chrysene	mg/kg	6.05	0.10	0.25				
PAH Benzo(b)fluoranthene	mg/kg	6.05	0.10	0.53				
PAH Benzo(k)fluoranthene	mg/kg	6.05	0.10	< 0.10				
PAH Benzo(a)pyrene	mg/kg	6.05	0.10	< 0.10				
PAH Indeno(1,2,3-c,d)pyrene	mg/kg	6.05	0.10	0.13				
PAH Dibenzo(a,h)anthracene	mg/kg	6.05	0.10	< 0.10				
PAH Benzo(g,h,i)perylene	mg/kg	6.05	0.10	< 0.10				

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MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

Method Summaries:-

Method Summaries (Soils/ sludges/ solid wastes)
5.01 - Soil sample pre-treatment, air-drying, crushing, sieving and subdividing (BS ISO 11464:2006)
5.02 - Solvent extraction (acetone/heptane) of soils for hydrocarbon analyses (BS ISO 16703:2004)
5.04 - Aqueous leaching of soil and waste samples (BS EN 12457-2:2002)
5.05 - Soil texture classification
5.06 - Aqueous extraction of dried soils/sludges/waste in a ration of 2.5:1 (BS 1377-3:1990)
5.18 - Digestion of solid samples in aqua-regia using hot-block for metals analysis (EPA 200.2 rev 2.8)
6.01 - Gravimetric determination of water content of solid samples by oven drying at 105ºC. (BS 7755-3.1:1995 (ISO 11464:1993)
6.02 - Determination of anions by ion chromatography (EPA 300.1 1999)
6.03 - Determination of pH in aqueous samples and extracts by pH electrode.
6.04 - Determination of petroleum hydrocarbons by Gas chromatography of solvent extracts (FID)
6.05 - Determination of poly-aromatic- hydrocarbons by gas chromatography linked mass spectrometry (GC-MS)
6.06 - Determination of poly-chlorinated-biphenyls (PCBs) by gas chromatography linked mass spectrometry (GC-MS)
6.07 - Determination of dissolved organic carbon (DOC) and total organic carbon (TOC) by furnace combustion and infra-red detection of carbon dioxide.
6.08 - Determination of metals in digests and leachates by inductively coupled plasma optical emission spectrophotometry (ICP- OES)
6.09 - Determination of loss on ignition by gravimetry and combustion in muffle furnace
6.11 - Determination of BTEX by headspace GC analysis

Method Summaries (water sample)
5.07 - Pretreatment of water samples prior to metals analysis, including acidification
5.09 - Solvent extraction (acetone/heptane) of waters for hydrocarbons analyses
6.02 - Determination of anions by ion chromatography
6.03 - Determination of pH in aqueous samples and extracts by pH electrode.
6.04 - Determination of TPH by Gas chromatography of solvent extracts (FID)
6.05 - Determination of poly-aromatic- hydrocarbons by gas chromatography linked mass spectrometry (GC-MS)
6.06 - Determination of poly-chlorinated-biphenyls (PCBs) by gas chromatography linked mass spectrometry (GC-MS)
6.07 - Determination of dissolved organic carbon (DOC) by furnace combustion and infra-red detection of carbon dioxide.
6.08 - Determination of metals in solution by inductively coupled plasma optical emission spectrophotometry (ICP-OES)
6.10 - Determination of suspended solids by filtration, drying at 103ºC and gravimetry.
6.19 - Colorimetric tests

Deviating Codes
A - No sample date provided
B - No sample time provided (water samples only)
C - Incorrect sample container
D - Not received in cooled state
E - Insufficient sample
F - Exceeds storage time (sampling to receipt)
G - Exceeds storage time (receipt to analysis)
P - No sample preservative (for bacti samples only)
N - No sample temperature
I - Insufficient paint sample supplied (<0.1g)

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MICROBIOLOGICAL TESTING
ASBESTOS SERVICES
CHEMICAL TESTING
OCCUPATIONAL HYGIENE

Our Ref: J320071 FI: 2
Your Ref: J25-038
Date: 30/05/2025

Asbestos Fibre Identification Report

Client:	Ground Condition Consultants 2 Burrows Lane, Verwood, Dorset., BH31 7PH
Site Address:	Belmont Castle, -
Sampled By:	Ground Condition Consultants
Date sampled/received:	22nd May 2025
Date analysed:	30th May 2025
Analyst/s:	Raphael Mirzaians
Analysis Location:	12 The Gardens, Broadcut, Fareham, Hampshire, PO16 8SS

ANALYTICAL PROCEDURE

Fibre identification was carried out in accordance with the documented `in-house' method (2.01) based on the HSE Guidance Note HSG 248. These employed stereo microscopy, polarized microscopy and dispersion staining techniques.

RESULTS

Sample No.	Sample Ref.	Location	Asbestos Detected	Asbestos Type
WS102	BS1060125	1.6-2.8M, Clay	No	
WS103	BS1060126	0.8-1.0m, Chalk	No	

NOTES:
1. Sample(s) were examined for the presence of 6 types of asbestos fibres: crocidolite (blue), amosite (brown), chrysotile (white), anthophyllite, actinolite and tremolite.
2. The results shown in this test report refer to the sample(s) tested as received unless otherwise stated and samples collected by the client are evaluated using the information provided by the client (clients details, site address, sampled by and location), Envirochem disclaims responsibility for its accuracy and validity. For sample(s) collected by the client the date of receipt is deemed as date sampled.
3. Envirochem is a UKAS accredited testing laboratory No. 1227 for sampling and identification of asbestos containing materials.
4. Comments, observations and opinions are outside the scope of UKAS accreditation.
5. The analytical method in the HSG248 does not quantify the amount of asbestos present, therefore UKAS accreditation does not permit quantification.
6. If, during fibre identification, only 1 or 2 fibres are seen and identified as asbestos, then the term 'trace asbestos identified' is used.
7. This report shall not be reproduced except in full, without written approval of Envirochem.
8. Samples are retained for 6 months, report kept for 5 years from the date of authorisation of this report.

SIGNATURE: [redacted] Authorised signatory PRINT NAME: Raphael Mirzaians

DATE AUTHORISED: 30/05/2025

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UKAS TESTING
1227

Ref No: J320149
Sample No: Sample 3

DETERMINATION OF ASBESTOS IN SOIL REPORT

Fibre Identification, Stages 1 - 2

CLIENT AND ADDRESS:	Ground Condition Consultants, 2 Burrows Lane, Verwood, Dorset., BH31 7PH		
SITE ADDRESS:	Belmont Castle		
DATE SAMPLED/RECEIVED:	23.05.2025	DATE ANALYSED:	03.06.2025
SAMPLED BY:	Client	ANALYST:	EKP

ANALYTICAL PROCEDURE

Fibre identification was carried out in accordance with the documented `in-house' procedures 2.01 and 2.04 and based on the HSE Guidance Note HSG 248. These employed stereo microscopy, polarized microscopy and dispersion staining techniques.

Wet Weight of sample / g:	790.89	Dry Weight of sample / g:	745.48
Weight of material (>10 mm) removed / g:	118.91	Dry Weight used for calculations / g:	626.57

RESULTS

Sample No.	Sample Product Type	Asbestos Detected	Asbestos Type
Sample 3	Asbestos Cement	Y	Chrysotile
Total weight of asbestos from stages 1 and 2 in sample / g		[redacted]	0.4825
Percentage of asbestos from stages 1 and 2 in sample / %		[redacted]	0.07700656

NOTES: Sample(s) were examined for the presence of 6 types of asbestos fibre: crocidolite (blue), amosite (brown), chrysotile (white), anthophyllite, actinolite and tremolite.

	Due to the sample containing greater than 0.1% asbestos, stage 3 examination (loose fibres) was not carried out, as sample deemed as hazardous waste
	The sample contained greater than 0.1% asbestos, stage 3 was examined at the request of the client.
	Stage 3 was not performed for loose fibres at the request of the client
Y	Stage 3 was examined for loose fibres at the request of the client

Fibre counting of Stage 3

ANALYST: EKP DATE ANALYSED: 03.06.2025

ANALYTICAL PROCEDURE

Fibre counting was carried out in accordance with the documented `in-house' procedures 2.04 and based on the SCA Guidance Note, The determination of Asbestos in Soil and Associated Materials. This employed phase contrast microscopy.

RESULTS

Sample No.	Asbestos Fibres Observed	Asbestos Type	Weight of asbestos fibres in sample / g
Sample 3	NAD	NAD	0
Total weight of asbestos from stages 1, 2 and 3 in sample / g			0.4825
Percentage of asbestos from stages 1,2 and 3 in sample / %			0.07700656

NOTES:

1. Weights and % are expressed on a dry weight basis, with stones , building materials >10 mm removed
2. Comments or interpretations are outside the scope of our accreditation
3. The results within this report relate to the sample analysed only and our uncertainty of weight of asbestos is +/- 13.82%
4. This report shall not be reproduced except in full, without written approval of Envirochem
5. Samples collected by the client are evaluated using information provided by the client (site address), as received, Envirochem disclaims responsibility for its accuracy and validity
6. Samples kept for 6 months, reports kept for 5 years from the date of authorisation of this report

SIGNATURE: [redacted] Print name: E Kowalczyk Pariyar Date authorised: 03.06.2025

(On behalf of Envirochem by an authorised signatory)

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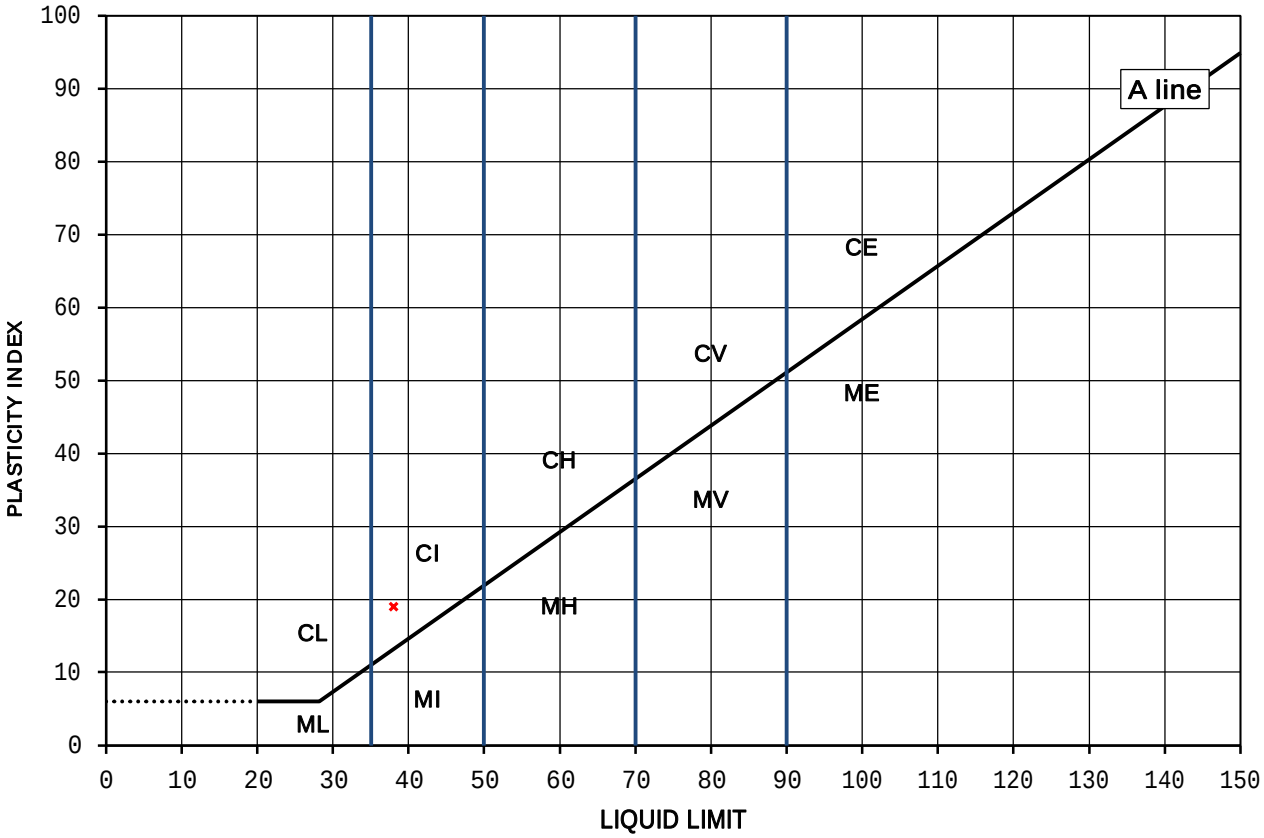
MICROBIOLOGICAL TESTING ASBESTOS SERVICES CHEMICAL TESTING OCCUPATIONAL HYGIENE

APPENDIX 5: GEOTECHNICAL TEST CERTIFICATES

Plasticity (A-line) Chart

Project No.	Project Name
J312901	Belmont Castle



Legend, based on BS 5930:1999 +A2: 2010 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Notes	Date Printed	Approved By	Table
Classifications vary between countries and codes of practice. Laboratory tests to ISO 17892-12 include 4pt and 1 pt tests, see individual results for more details. 'A' line derivation above PI of 6, PI = 0.73(LL-20)	19/06/2025		1 sheet 1

GFQ-008-74
Issue 02 - Nov 23

Summary of Classification Test Results

Project No.
J312901

Project Name
Belmont Castle

Hole No.	Sample				Soil Description	Density		*w*	Passing 425µm	LL	If 1 Point Test			PL	PI	Particle density	Remarks
	Ref	Top	Base	Type		bulk	dry				Pen 1	Pen 2	CF				
						Mg/m^3		%	%	%				%	%	Mg/m^3	
WS102		6.00	6.30	B	Brown slightly sandy slightly gravelly CLAY				82-w	38-4pt-i				19	19		

Key

Density tests:
Linear measurement unless :
wd - water displacement
wi - immersion in water

w - water content

Atterberg:
4pt cone unless :
cas - Casagrande method
1pt - single point test
CF - Correlation Factor
Liquid limit test: i - increasing moisture content, d - decreasing moisture content
Atterberg sample prep: n - Natural, HP - Hand Picked, w - Washed

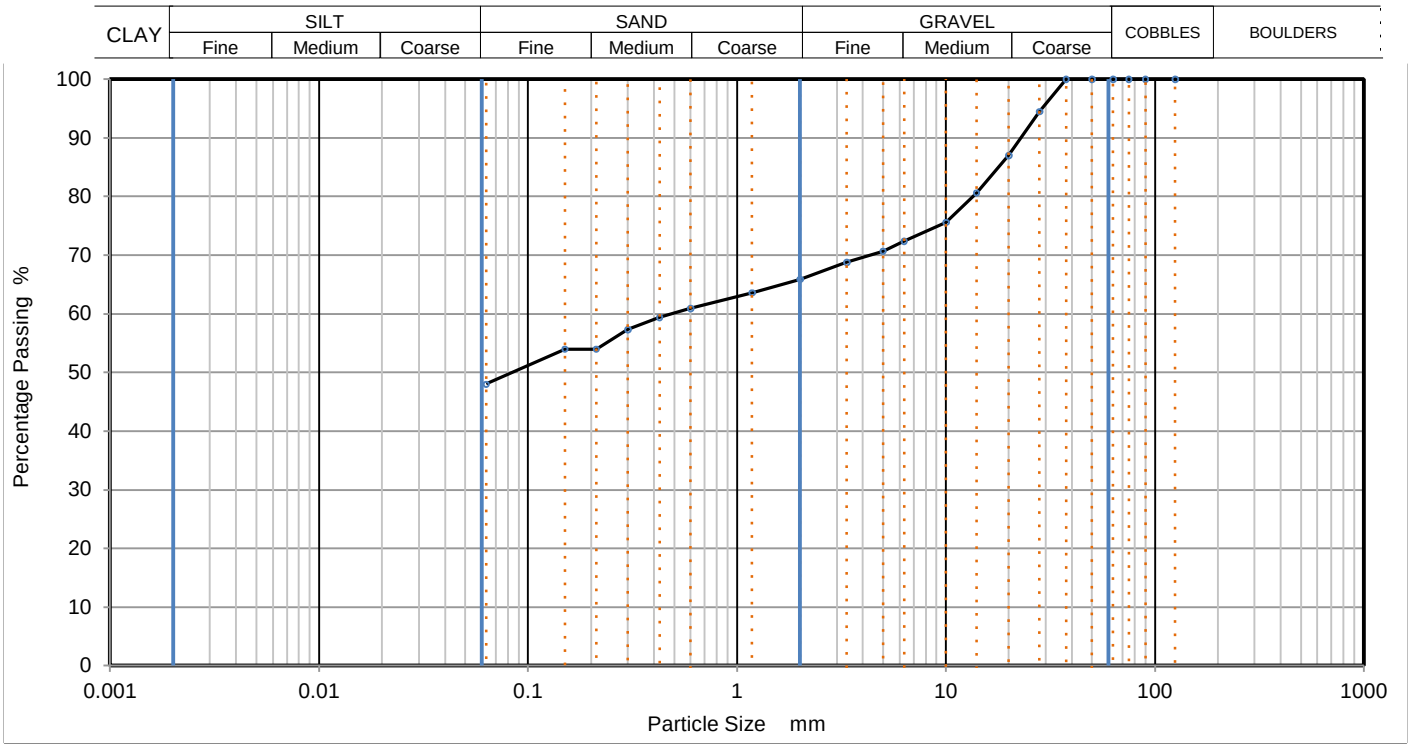
Particle density:
sp - fluid pycnometer

Test Standards:
Bulk Density Tests - BS EN ISO 17892-2:2014
Water Content - BS EN ISO 17892-1:2014+A1:2022
Liquid & Plastic Limits - BS EN ISO 17892-12:2018+A2:2022
Particle Density - BS EN ISO 17892-3:2015

Date Printed:
19/06/2025

ISO INDX

GFQ-008-77 Issue 02 - Nov 23	**Determination of Particle Size Distribution (ISO 17892-4:2016)**			Job Ref	**J312901**
				Borehole/Pit No.	WS102
Project Name	Belmont Castle			Sample No.	
Soil Description	Brown slightly sandy slightly gravelly CLAY			Depth, m	2.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	ISO 17892 -4, by sieving on pre-dried or dry sample			KeyLAB ID	TTLP2025060325



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	87		
14	81		
10	76		
6.3	72		
5	71		
3.35	69		
2	66		
1.18	64		
0.6	61		
0.425	59		
0.3	57		
0.212	54		
0.15	54		
0.063	48		

Dry Mass of sample, g	1424

Sample Proportions	% dry mass
Very coarse	0
Gravel	34
Sand	18
Fines <0.063mm	48

Grading Analysis		
D100	mm	37.5
D60	mm	0.485
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		
Pretreatment Method (If Applicable)		

Remarks

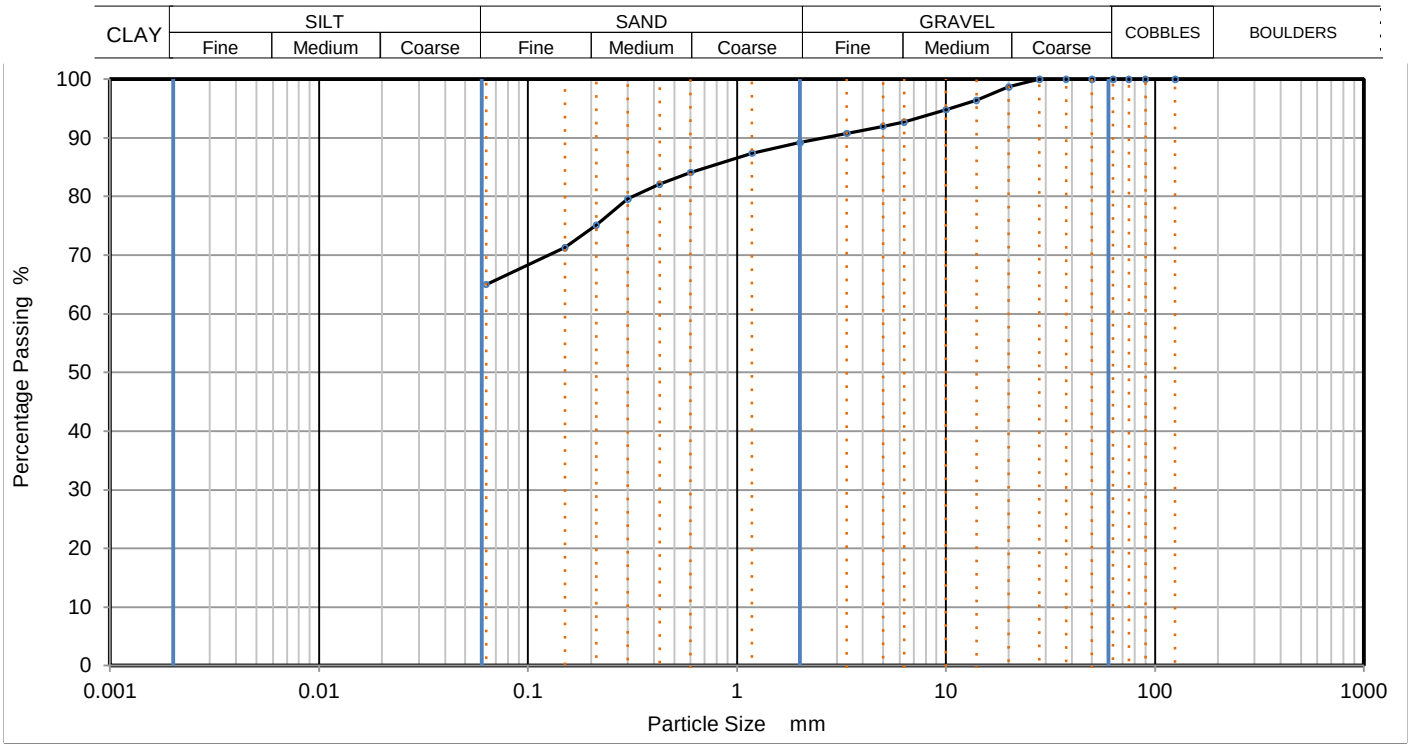
Preparation and testing performed to BS EN ISO 17892-4 unless noted below

Date Printed:

19/06/2025

ISO PSD

GFQ-008-77 Issue 02 - Nov 23	**Determination of Particle Size Distribution (ISO 17892-4:2016)**			Job Ref	**J312901**
				Borehole/Pit No.	WS102
Project Name	Belmont Castle			Sample No.	
Soil Description	Brown slightly sandy slightly gravelly CLAY			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	ISO 17892 -4, by sieving on pre-dried or dry sample			KeyLAB ID	TTLP2025060326



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	99		
14	96		
10	95		
6.3	93		
5	92		
3.35	91		
2	89		
1.18	87		
0.6	84		
0.425	82		
0.3	80		
0.212	75		
0.15	71		
0.063	65		

Dry Mass of sample, g	1269

Sample Proportions	% dry mass
Very coarse	0
Gravel	11
Sand	24
Fines <0.063mm	65

Grading Analysis		
D100	mm	28
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		
Pretreatment Method (If Applicable)		

Remarks

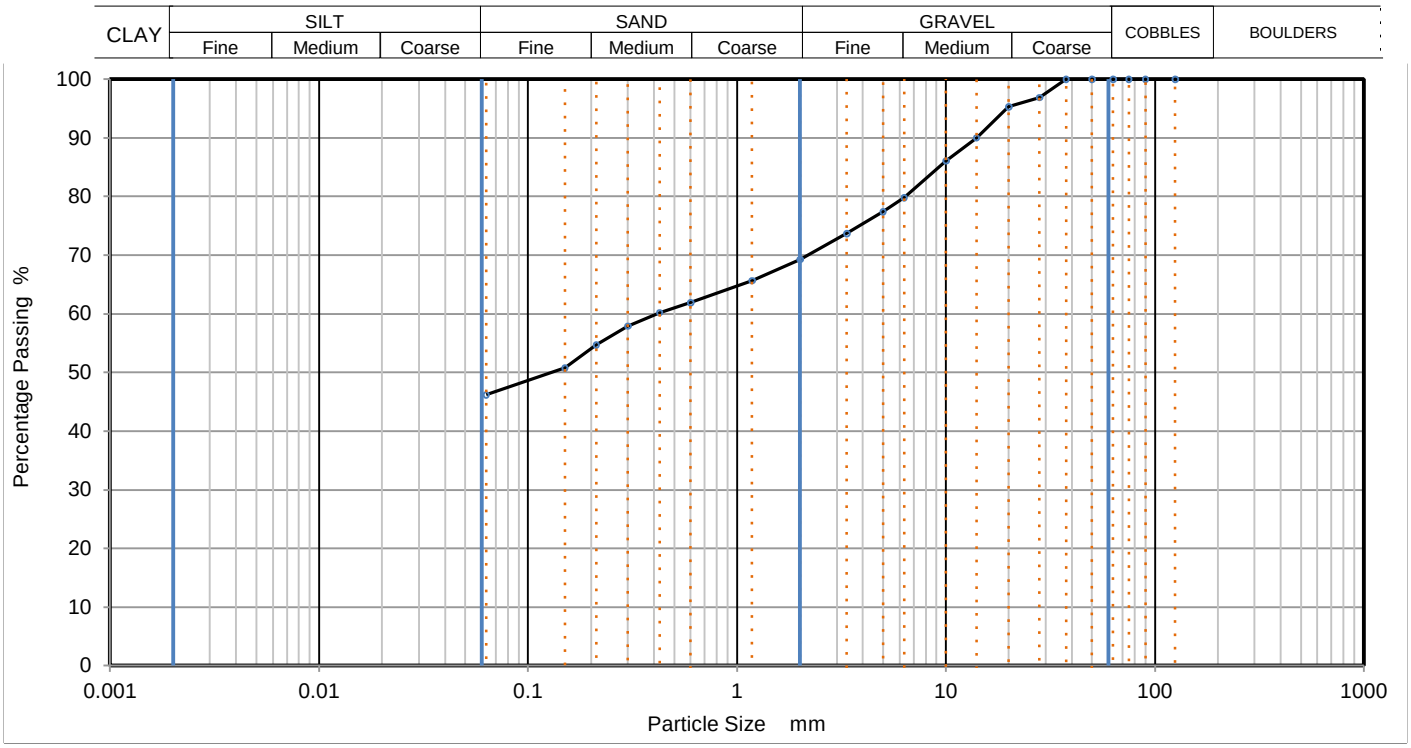
Preparation and testing performed to BS EN ISO 17892-4 unless noted below

Date Printed:

19/06/2025

ISO PSD

GFQ-008-77 Issue 02 - Nov 23	**Determination of Particle Size Distribution (ISO 17892-4:2016)**			Job Ref	**J312901**
				Borehole/Pit No.	WS102
Project Name	Belmont Castle			Sample No.	
Soil Description	Multicoloured slightly sandy slightly gravelly CLAY			Depth, m	7.80
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	ISO 17892 -4, by sieving on pre-dried or dry sample			KeyLAB ID	TTLP2025060328



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	97		
20	95		
14	90		
10	86		
6.3	80		
5	77		
3.35	74		
2	69		
1.18	66		
0.6	62		
0.425	60		
0.3	58		
0.212	55		
0.15	51		
0.063	46		

Dry Mass of sample, g	1698

Sample Proportions	% dry mass
Very coarse	0
Gravel	31
Sand	23
Fines <0.063mm	46

Grading Analysis		
D100	mm	37.5
D60	mm	0.409
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		
Pretreatment Method (If Applicable)		

Remarks

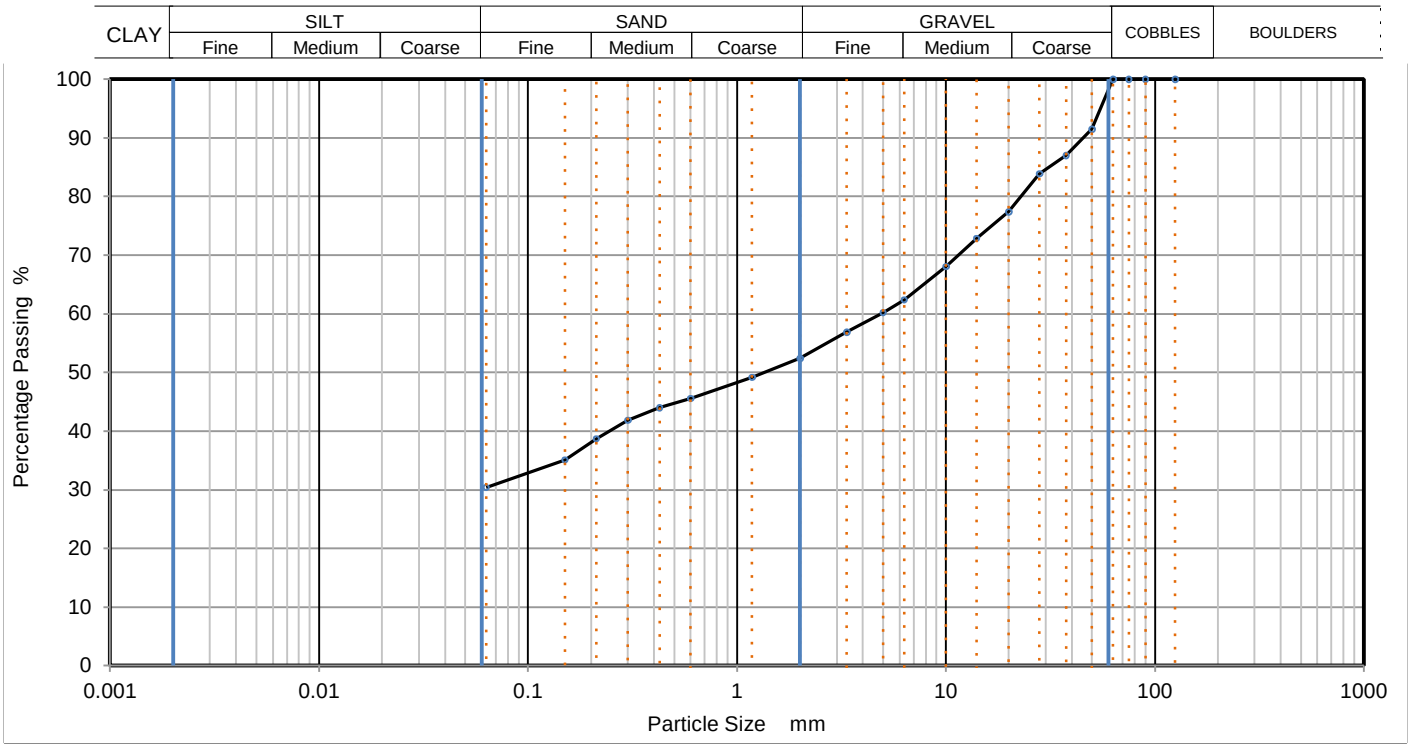
Preparation and testing performed to BS EN ISO 17892-4 unless noted below

Date Printed:

19/06/2025

ISO PSD

GFQ-008-77 Issue 02 - Nov 23	**Determination of Particle Size Distribution (ISO 17892-4:2016)**			Job Ref	**J312901**
				Borehole/Pit No.	WS103
Project Name	Belmont Castle			Sample No.	
Soil Description	Dark brown slightly sandy gravelly CLAY			Depth, m	0.60
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	ISO 17892 -4, by sieving on pre-dried or dry sample			KeyLAB ID	TTLP2025060329



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	92		
37.5	87		
28	84		
20	77		
14	73		
10	68		
6.3	62		
5	60		
3.35	57		
2	52		
1.18	49		
0.6	46		
0.425	44		
0.3	42		
0.212	39		
0.15	35		
0.063	30		

Dry Mass of sample, g	3610

Sample Proportions	% dry mass
Very coarse	0
Gravel	48
Sand	22
Fines <0.063mm	30

Grading Analysis		
D100	mm	63
D60	mm	4.86
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		
Pretreatment Method (If Applicable)		

Remarks

Preparation and testing performed to BS EN ISO 17892-4 unless noted below

Date Printed: 19/06/2025		**ISO PSD**

Saturation Water Content - Summary of Results

Project No.	Project Name
J312901	Belmont Castle

Hole No.	Sample Ref	Sample Top	Sample Base	Sample Type	Spec Ref.	Visual description	SMC %	Bulk Density Mg/m³	Dry Density Mg/m³	Remarks
WS101		1.20	1.40	C		Cream CHALK composed of silt	25	1.97	1.62	
WS103		2.30	2.60	B		Cream CHALK composed of silt and gravel	23	2.01	1.65	

Key

Tested in accordance with BS EN ISO 17892-2:2014 and claculated in accordance with BS1377 : Part 2 : 2022, clause 4.2 unless annotated otherwise.

Date Printed	19/06/2025

UKAS TESTING 7758

TTL

SMC SUM

APPENDIX 6: PILE SOCKET CALCULATIONS

CFA Pile Sockets into Chalk

Length of Socket into Chalk (m)	SPT N Value	Base Resistance (kN)			Shaft Resistance (kN)				Design Axial Resistance (kN) Inc LMBE		
		0.40m dia	0.60m dia	0.80m dia	Average Overburden (kN/m^2)	0.40m dia	0.60m dia	0.80m dia	0.40m dia	0.60m dia	0.80m dia
		0.126	0.283	0.504		1.25	1.88	2.51			
2.00	20	252	566	1007	26	18	27	37	246	498	844
2.50	20	252	566	1007	31	27	41	55	253	508	857
3.00	20	252	566	1007	37	38	58	77	261	520	873
3.50	20	252	566	1007	42	51	77	103	270	533	892
4.00	20	252	566	1007	47	66	99	133	281	549	913
4.50	20	252	566	1007	52	83	124	166	292	567	936
5.00	20	252	566	1007	58	101	152	203	306	587	963

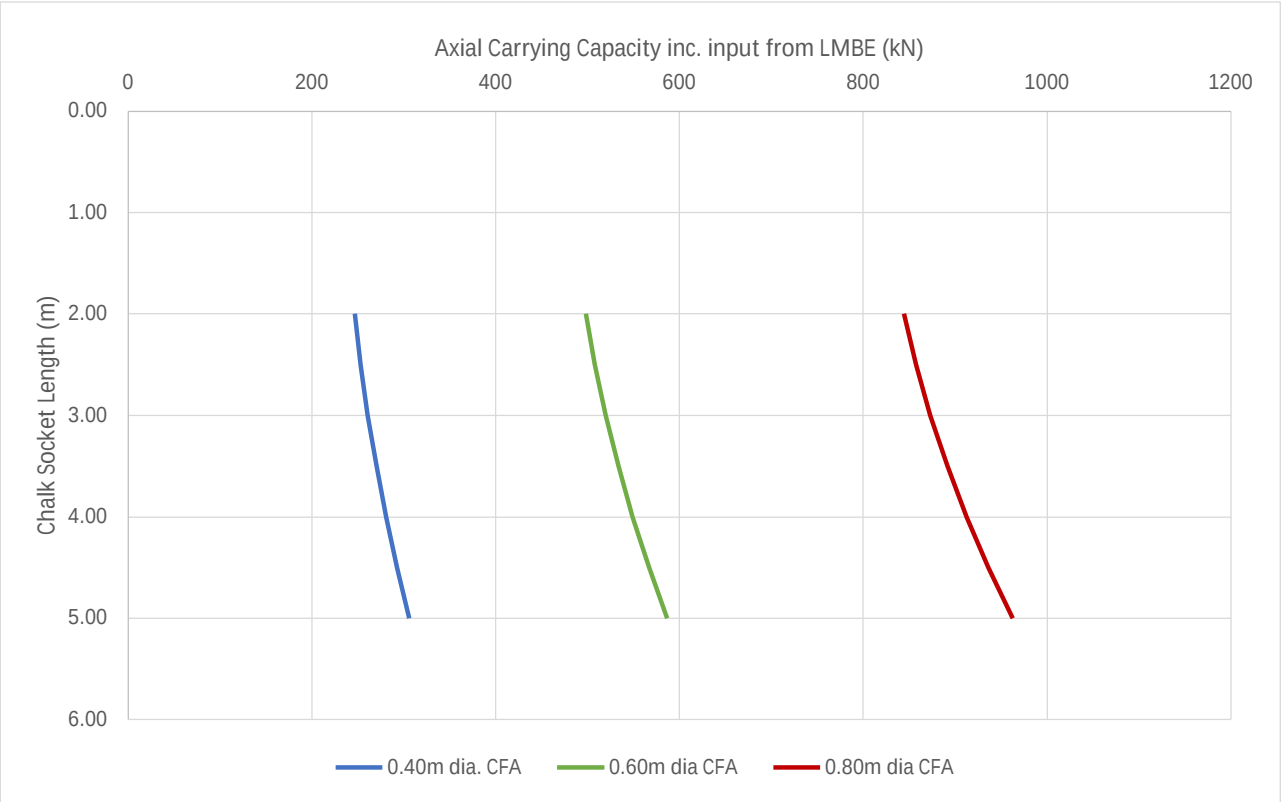
SPT N = 20 (Assumed Value)

Unit Weight (kN/m^3) 21

Design Approch 1 Combination 2

Base Resistance $_B$ 2

Shaft Resistance $_S$ 1.6

Model Resistance $_{RD}$ 1.4

CFA Pile Sockets into Chalk