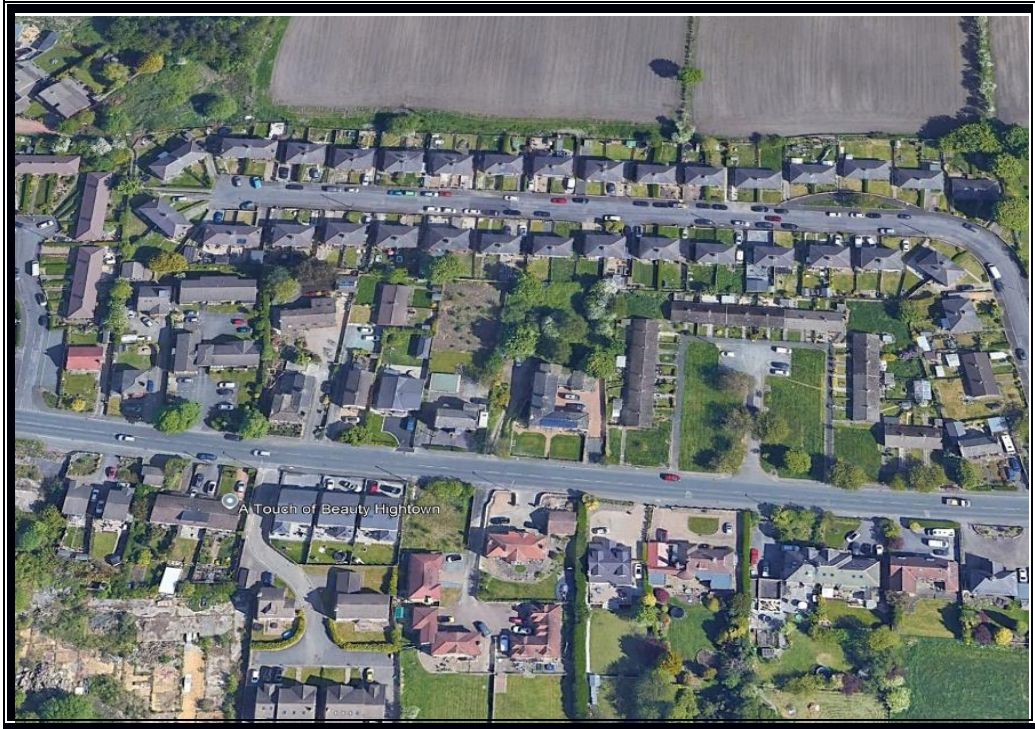


Report No: C723

Date: July 2025

**GEOENVIRONMENTAL APPRAISAL
OF LAND ADJACENT TO
480 HALIFAX ROAD, LIVERSEEDGE, WEST YORKSHIRE**



Prepared for
Barnes Homes Yorkshire Ltd

Prepared by
G&M Consulting Ltd, The Chestnuts, Brackenhill Road, Haxey, Doncaster DN9 2LR





REPORT NUMBER:	C723	REPORT STATUS	Final
REPORT TYPE:	Geoenvironmental Appraisal		
REPORT DATE:	July 2025		
SITE:	Land adjacent to 480 Halifax Road, Liversedge, West Yorkshire		
PREPARED FOR:	Barnes Homes Yorkshire Ltd		
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GEOENVIRONMENTAL APPRAISAL
OF LAND AJACENT TO
480 HALIFAX ROAD, LIVERSEEDGE, WEST YORKSHIRE

1.0 INTRODUCTION.

G&M Consulting Ltd (G&M) was commissioned by Barnes Homes Yorkshire Ltd to undertake a geoenvironmental appraisal of land adjacent to 480 Halifax Road, Liversedge, West Yorkshire.

It is understood that approvals have been granted for the development of the site with three residential dwellings. The proposed development is shown on the drawing prepared by Barnes Architectural Services Ltd, a copy of which is presented in Appendix A of this report. This report has been commissioned in support of the discharge of any contaminated land conditions associated with the approval.

The aims of this investigation are as follows;

- To determine the land use history of the site from an inspection of available historical Ordnance Survey (OS) plans;
- To determine the environmental setting of the site, including the details of the geology, hydrogeology and hydrology;
- To determine the shallow ground conditions beneath the site;
- To determine the nature and degree of any possible near surface ground and groundwater contamination; and,
- To provide recommendations on measures to deal with any contamination present on site, if encountered.

The geoenvironmental appraisal of the site has been undertaken in two phases. The initial phase (Phase 1) was a preliminary investigation (desk study) which was prepared by Rogers Geotechnical Services Ltd in August 2024 (Report Ref C4499/24/E/687). Based on the results of the preliminary investigation, G&M has undertaken an intrusive site investigation (Phase 2), of the proposed area of development.

This report details the results of the intrusive investigation and makes recommendations with regards to the proposed development. This report should be read in conjunction with the desk study, which contains a description of the site, environmental setting and initial conceptual site model (CSM) from which the rationale for the intrusive investigation was derived.

The fieldwork for the intrusive investigation was undertaken on the 23rd June 2025 and comprised the excavation of five trial pits. Following completion of the fieldwork selected soil samples were scheduled for a range of chemical laboratory tests.

1.1 Limitations.

This investigation report, which is designed to meet the requirements of all relevant current guidance, presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the defined objectives.

The comments and opinions presented in this report are based on the findings of a review of available information and ground conditions encountered during the intrusive investigation work. There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation. Any diagram or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and

given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

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2.0 SITE DESCRIPTION.

2.1 Site Location.

The site is located to the north of Halifax Road, and to the rear of the property at No 480, approximately 1.5 km west of Liversedge town centre, at National Grid Reference SE 187 240. A site location plan is shown on Drawing No. C723/1, presented in Appendix A of this report.

2.2 Site Features.

The site comprises the rear garden to the property at No 480 Halifax Road. At the time of the investigation, the site had been stripped onto the underlying soils, in preparation for development,

3.0 GROUND INVESTIGATION.

3.1 Design and Strategy.

The Phase 1 desk study prepared previously, referenced above, was used as the basis for the design of an appropriate intrusive ground investigation. The main findings of the desk study as given in the summary to the report were as follows:

5.1 Site Investigation Philosophy

The information from the Phase 1 Desk Study shows there are limited potential sources of contamination on the site and in the surrounding area. In view of the above, it is not considered necessary to undertake an intrusive geo-environmental investigation.

It is incumbent upon the developer to carefully inspect any exposed soil during the ground-works phase of the contract. Should any contamination become evident or organic made ground be revealed, it is recommended that a pragmatic approach be adopted, with observational techniques being employed at each stage of the work. In the unlikely event that contamination is revealed, work should stop in the affected area and chemical testing be undertaken to evaluate the risk of harm to the receptors. In the event that this occurs it is recommended that the following testing regime be implemented on soil samples:

- **Metals** – Cd, Cr, Cu, Hg, Ni, Pb, Zn, V.
- **Semi Metals and Non-Metals** – As, Se, Free Cyanide and Phenols.
- **Hydrocarbons** – Polycyclic aromatic hydrocarbons (PAH EPA16), Total petroleum hydrocarbons (TPH CWG).
- **Others** – pH, Organic Content.
- **Asbestos**

5.1.1 Ground Gas Assessment

Given the limited sources of ground gas and potential limited potential or made ground it may be possible to undertake a desk based assessment where made ground thickness is less than 1m, and a determination of generation risk of made ground and natural deposits be undertaken in line with the *CL:AIRE, RB17, Pragmatic Approach to Ground Gas Risk Assessment 2012*. Should made ground be encountered which exceeds this thickness then standpipes and a period of ground gas monitoring may be required.

5.2 Geotechnical Assessment - Coal

In light of the potential risks of instability at the site from the working of shallow coal, it cannot be recommended that development takes place without further investigation to conclusively determine the presence of such workings. This work should include physical drilling methods to explore the ground conditions.

General practice is to undertake rotary openhole boreholes at three locations across the site to mitigate against the potential for drilling through intact columns associated with pillar and stall workings. Furthermore, it is normal to investigate the ground to 30m below ground level; any workings below this depth are unlikely to result in significant instability. However, in this case, the risk of instability is due to shallow workings, therefore, drilling to these depths may not be necessary and the objective should be to ensure that the shallow seams are un-worked or have sufficient competent cover. Given that there exists a risk from a single coal seam, the Wheatley Lime, it is recommended that boreholes be commenced to prove/disprove the presence of workings in this coal seam. It is considered that one of the boreholes should penetrate to a depth of 30m and should competent bedrock be proven the other two coal seams could be terminated below the depth of the target coal seam estimated to between 10m and 15m below the surface of the site. In any event, it is considered that approval should be sought with the Local Authority as to the efficacy of this

A copy of the Phase 1 desk study report is presented in Appendix B of this report.

The aim and purpose of the ground investigation was to verify the nature and depth of any shallow made ground, natural soils and groundwater regimes across the site, to allow informed decisions on potential remediation options that might be required in order to break the direct contact exposure pathways.

3.2 Scope of Works.

The scope of the intrusive investigation is detailed below;

Exploratory Hole Type	Purpose
Trial pits	To determine the general nature of shallow soils underlying the site, including the; Nature, distribution and thickness of any potential made ground. Nature, degree and extent of ground contamination. Determination of the presence of shallow underlying natural ground To help identify and inform suitable remedial options

Fieldwork was undertaken on the 23rd June 2025 and comprised;

- Excavation of five trial pits to depths of between 0.8 m and 1.20 m below ground level (bgl).

The exploratory hole positions were set out and the fieldwork supervised by a G&M engineering geologist. The locations of the exploratory holes are shown below;



The location and spatial distribution of the trial pits was considered adequate to suitably characterise the shallow soils present on site.

The investigation was scoped using guidance presented in BS 10175:2011+A2:2017, CIRIA C665:2007, the principals of Land Contamination Risk Management (LCRM) - Environment Agency July 2023 and BS EN 1997:2004 and 2007.

The trial pits were excavated using a 10 tonne rated 360° tracked machine, using a 450mm wide toothed bucket.

A photographic record of the trial pits is shown on the respective logs, presented in Appendix C of this report.

3.3 Strata Description.

Depths and descriptions of strata encountered together with details of the samples recovered are presented on the exploratory hole record sheets presented in Appendix C of this report.

Procedures and principles contained in BS EN ISO 14688-1 (2002), as amplified by BS 5930 (2015), were followed. The depths of strata on the record sheets are recorded from current ground levels at each location.

3.4 Sampling

Small disturbed samples of soil, for chemical analysis, were placed in amber glass jars as appropriate. Between trial pits, equipment was thoroughly cleaned.

In accordance with best practice (BS10175:2011+A2:2017) samples were collected in appropriate containers, kept in a chilled cool box whilst on site, retained in a fridge (below 2°C) until the day of collection, packed in a chilled cool box on the day of collection and transported in this to the laboratory.

3.5 Laboratory Testing

Selected soil samples were tested for a range of potential contaminants, under a sub-contract with Envirolab, a UKAS/MCERTS accredited laboratory. The analytes tested are listed in Section 5.2 of this report. The results of soil analysis, as received from the laboratory, are presented in Appendix D of this report.

4.0 GROUND CONDITIONS AND MATERIAL PROPERTIES

A complete record of all the strata encountered is given on the attached trial pit logs. From these it can be seen that the site is underlain by a locally thin veneer of made ground, overlying cohesive subsoils.

4.1 Made Ground

Made ground was encountered in TP04 and TP05, to depths of between 0.3 m and 0.7 m bgl. In TP04 this material comprised cobbles of sandstone, to 0.5 m bgl, which is considered to have been imported as material for a running surface, during development. This is underlain by a dark brown gravelly clay to 0.7 m bgl. The gravel component was noted as fine to coarse of coal and brick. This gravelly clay made ground was encountered from surface in TP05, to a depth of 0.3 m bgl.

4.2 Natural Subsoils

The made ground materials were underlain by a cohesive subsoil comprising a firm to stiff yellowish brown locally mottled grey fissured clay. The fissures were recorded as extremely closely spaced, randomly orientated. These cohesive subsoils were encountered from surface in TP01, TP02 and TP03.

4.3 Groundwater

No groundwater was encountered during the excavation of the trial pits.

It should be borne in mind that water levels are likely to fluctuate with seasonal rainfall and may therefore be substantially higher at wetter times of year than those found during this investigation.

4.4 Visual / Olfactory Evidence of Contamination

The made ground was found to include varying proportions of coal and brick, which can produce elevated concentrations of certain toxic and phytotoxic contaminants.

No olfactory evidence of any contamination was noted during the fieldwork.

As per BS 10175:2011+A2:2017 samples were field tested using a PID (which is not an accredited sampling technique). This is accepted as a preliminary method for assessing hydrocarbon impacted soils. This should only be used as a guide for selecting which samples 'require more comprehensive laboratory analysis'. No elevated PID readings were recorded during the fieldwork. The results are presented on the respective exploratory hole logs, presented in Appendix C of this report.

5.0 RESULTS OF CHEMICAL TESTING

5.1 General

For this site, measured values were compared to Generic Assessment Criteria (GAC) derived for a residential with plant up take end use.

Chemical analysis was undertaken on representative soil samples recovered from across the site. The determinands were selected to provide information on the distribution of potential contaminants. The general analytical suite was supplemented with additional analysis where former land usage, as determined from the desk study, or visual or olfactory observations suggested the presence of additional contaminants.

The majority of initial screening levels (GAC's) used in the production of this assessment have been taken from the guidelines introduced by:

- DEFRA C4SL's, DEFRA 2015.
- Joint Land Quality Management Ltd (LQM) and Chartered Institute of Environmental Health (CIEH), Generic Assessment Criteria for Human Health Risk Assessment, S4UL's, Land Quality Press 2015.

Usually statistical testing is undertaken for the Planning Scenario by the methods described in CL:AIRE "Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration", September 2020. This statistical testing is undertaken to determine whether there was sufficient evidence that the true mean concentration of each determinand was less than the relevant critical concentration for that component. However, given the fact that a proportion of the sampling was carried out on a targeted basis, detailed statistical assessment of the data has not been conducted, instead individual contaminant concentrations have been compared to their relevant assessment criteria.

5.2 Testing Schedule

Following completion of the fieldwork samples were selected for testing as follows;

Laboratory Analysis	Topsoil/Made Ground	Natural Soils
Total concentrations of arsenic, cadmium, chromium (Hexavalent), copper, lead, nickel, selenium, zinc, mercury	3	4
Water soluble sulphate, pH	1	3
Speciated PAH	3	4
Phenol	2	3
Asbestos	1	2

Considering the site is located within a Coal Measures sequence of underlying soils, calorific value testing was undertaken on selected samples of the made ground and natural soils present on site, to assess the likelihood of combustion, these results are reported in Appendix D of this report and discussed further, below.

5.3 Soil Analysis

The chemical analysis results and screening criteria are summarised below. The results for the made ground and natural soils have been combined for an initial assessment.

Summary of Total Soil Concentrations

Determinand	GAC (1% SOM) (mg/kg, unless otherwise stated)	No. of samples above screening value	No. of samples tested	Maximum concentration above GAC (mg/kg, unless otherwise stated)
Metals/Metalloids				
Arsenic	37 ⁽²⁾	2	7	53 (TP04-0.6m) 39 (TP05-0.2m)
Cadmium	11 ⁽¹⁾	0	7	
Chromium (IV)	21 ⁽²⁾	0	7	
Lead	200 ⁽²⁾	0	7	
Mercury	40 ⁽¹⁾	0	7	
Selenium	250 ⁽¹⁾	0	7	
Copper	2400 ⁽¹⁾	0	7	
Nickel	180 ⁽¹⁾	0	7	
Zinc	3700 ⁽¹⁾	0	7	
Inorganics				
pH	<5	0	4	
Water Soluble Sulphate	0.5 g/l ⁽³⁾	0	4	
Organics				
PAHs				
Acenaphthene	210 ⁽¹⁾	0	7	
Anthracene	2400 ⁽¹⁾	0	7	
Acenaphthylene	170 ⁽¹⁾	0	7	
Benzo(a)anthracene	7.2 ⁽¹⁾	0	7	
Benzo(b)fluoranthene	2.6 ⁽¹⁾	0	7	
Benzo(k)fluoranthene	77 ⁽¹⁾	0	7	
Benzo(g,h,i)perylene	320 ⁽¹⁾	0	7	
Benzo(a)pyrene	5.0 ⁽²⁾	0	7	
Chrysene	15 ⁽¹⁾	0	7	
Dibenz(a,h)anthracene	0.24 ⁽¹⁾	0	7	
Fluoranthene	280 ⁽¹⁾	0	7	
Fluorene	170 ⁽¹⁾	0	7	
Indeno(1,2,3-cd)pyrene	27 ⁽¹⁾	0	7	
Naphthalene	2.3 ⁽¹⁾	0	7	
Pyrene	620 ⁽¹⁾	0	7	
Phenanthrene	95 ⁽¹⁾	0	7	
Other				
Monohydric Phenol	120 ⁽¹⁾	0	5	
Asbestos	Fibres present	0	3	

¹ LQM/CIEH (2015) Generic Assessment Criteria for Human Health Risk Assessment. 2nd Ed. (for a sandy soil with 1% SOM and pH 7.0)² DEFRA C4SL's, DEFRA 2015³ BRE (2005) Special Digest 1, 3rd Edition, Concrete in aggressive ground. Upper limits for DS-1 Design Sulphate Class concrete.

Slightly elevated Arsenic was encountered within two samples of the made ground soil (TP04 at 0.60m and TP05 at 0.20m), recording concentrations of 53mg/kg and 39mg/kg, respectively, against a threshold of 37mg/kg.

No other determinands were found to be in excess of their respective thresholds within either the made ground or the natural soils tested on the site.

No asbestos was encountered in the three samples of soils tested.

Four samples of the made ground and natural soils were tested for calorific value; this testing was undertaken by Normec DETS Ltd, a UKAS and MCERTS accredited laboratory.

The results recorded by the laboratory were all <1.0 MJ/kg.

The publication by ICRCL (1986) Guidance Note 61/84, 2nd Ed, Notes on the fire hazards of contaminated land, states that *'In general, however, it seems likely that materials whose CVs (Calorific Value) exceed 10 MJ/kg are almost certainly combustible, while those with values below 2 MJ/kg are unlikely to burn'*.

Based on the above, the soils tested are unlikely to be combustible.

6.0 QUALITATIVE RISK ASSESSMENT AND REVISED CONCEPTUAL MODEL

Following the ground investigation and results of the chemical testing presented above, the preliminary conceptual site model presented in the Phase 1 desk study has been revised. The revised model has been developed for a potential proposed future land use (residential with plant uptake).

Identified Contaminants of Concern

- Elevated Arsenic encountered in two samples of made ground within TP04 and TP05.
- No other determinands were recorded above their respective thresholds

Summary of Identified Pollutant Linkages

In summary, the revised conceptual site model has identified the following potential pollutant which could result in an unacceptable risk to the proposed end-use, denoted as a moderate or higher potential of significant pollutant linkage on the conceptual site model.

Source	Risk	Potential Contaminants	Exposure Pathway	Primary Receptor/s	Complete Pollutant Linkage
Made Ground on site	Low/Moderate	Arsenic	Skin contact Ingestion	End users of site; construction workers	Yes: Residential properties is likely to have a garden and areas of soft landscaping, clean capping of gardens and areas of soft landscaping will be required

7.0 CONCLUSIONS AND RECOMMENDATIONS.

7.1 General

G&M Consulting Ltd (G&M) was commissioned by Barnes Homes Yorkshire Ltd to undertake a geoenvironmental appraisal of land adjacent to 480 Halifax Road, Liversedge, West Yorkshire.

It is understood that approvals have been granted for the development of the site with three residential dwellings. The proposed development is shown on the drawing prepared by Barnes Architectural Services Ltd, a copy of which is presented in Appendix A of this report. This report has been commissioned in support of the discharge of any contaminated land conditions associated with the approval.

It has been assumed that ground levels will not change significantly from those described in this report, or that the proposed end use of the site will not change from that detailed above. If this is not the case, then amendments to the interpretation and conclusions in this report may be required.

7.2 Contamination Constraints to Development

Risk Evaluation for Proposed Land Use (Residential With Plant Update)

A localised occurrence of Arsenic has been identified within the thin veneer of made ground on the site, located in the area of TP04 and TP05. This occurrence is considered to pose a **Low/Moderate** risk to future site users. Consequently, remedial action is therefore considered necessary to break the potential pollutant linkage.

If made ground is left beneath areas of proposed hardstand (building footprints and car parking etc), it is considered to pose a negligible risk to end users, as pathways are severed due to capping by the hardstanding.

If the existing made ground is left on site in areas of proposed private gardens or soft landscaping to the new development, there will be a need to place clean cover soils. This is to provide a healthy medium for plant growth and to remove any remaining pathways for exposure of end users to residual contaminants. It is recommended that the made ground is removed from these areas and replaced with a thickness of at least 600mm of clean soils.

Chemical results from the underlying natural cohesive subsoils were all below their respective thresholds.

The thickness of clean capping is subject to regulatory approval.

Controlled waters

Considering the fact that the made ground soils will be either removed or capped with hard stand or clean capping soils (thereby effectively eliminating surface water infiltration and leachate generation), it is considered that the soils are considered to pose a **Negligible/** risk to controlled waters and that no further remediation is considered necessary. Furthermore, with the exception of two slightly elevated Arsenic results within the made ground, all of the other determinands tested for, were below their respective thresholds.

This opinion is subject to regulatory approval.

Construction and Maintenance Workers

On the basis of the results obtained, the revised conceptual model confirms potential **Negligible/Low** risk to construction workers from the made ground soils. Risks can be readily adequately mitigated by appropriate PPE and hygiene precautions and good working and soil management practices, including dampening down of soils. It is recommended that procedures outlined in the HSE document 'Protection of Workers and the General Public during Remediation of Contaminated Land' be followed.

This report should be forwarded to any organisation undertaking groundworks in order for them to assess the risk to their own personnel.

Adjacent Site Users

Provided that the natural soils are carefully excavated and standard dust control measures are adopted, including dampening down of soils, during the development works, then it is considered that there is a **Negligible** short-term risk to adjacent site users, should further development/enabling works be proposed.

Utilities

It is recommended that the results of the chemical testing and details of the proposed enabling works are provided to the appropriate utility companies to determine the necessity for service protection.

Buried Concrete.

This assessment of the potential for chemical attack on buried concrete is based on current guidance contained in BRE Special Digest 1 ('SD1', 2005) *Concrete in Aggressive Ground Part 1: Assessing the aggressive chemical environment*. Third Edition.

Water soluble sulphate (SO_4) and pH tests were carried out on four samples of made ground and of the natural soils. These recorded concentrations of SO_4 of between 0.05g/l and 0.06 g/l, together with a pH of between 5.66 and 7.75.

Based on these characteristic values and Table C2 (SD1) for brownfield sites, a Design Sulphate Class for the made ground and natural soils of DS-1 is indicated.

7.3 Watching Brief during any Future Development Works

It is possible that areas of contamination or made ground may be encountered during the development works, which have not been identified by this report. If any areas of noxious, odorous, fibrous or liquid etc. contamination are encountered, then works should stop immediately, the local authority informed and further advice sought from a suitably experienced and qualified consultant. It is recommended that a watching brief be maintained during the development work for this purpose.

7.4 Regulatory Approval

The conclusions and recommendations presented above are considered practical based on the findings of this investigation, however, they cannot be guaranteed to gain regulatory approval, and therefore this report should be submitted to the regulators for their approval as part of any planning process.

The above recommendations comprise a general outline of possible or likely works. A remediation strategy report may be required and agreed with the regulatory authorities prior to development.



APPENDIX A

DRAWINGS



2 x additional dog-hole

MIN. 1m WALKWAY TO SITE PERIMETER

480 OWNERSHIP

478 OWNERSHIP

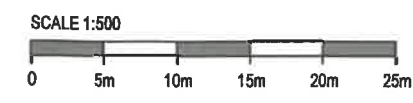
4.5m (15ft) OF THE ENTITLED 18 ft (5.486m)) RIGHT OF WAY. TO BE RESURFACED AND UPDATED TO CURRENT STANDARDS

BIN PICK UP POINT FOR ALL DWELLINGS.

ENTRANCE AS PER ADVANT ENGINEERS DWG. 24066-102 (A) _ Site Access Layout Plan

Proposed Site Plan

1 : 500



CLIENT

Barnes Homes

PROJECT

Land Adj. to 480 Halifax Road
Hightown
Liversedge
WF15 8DX

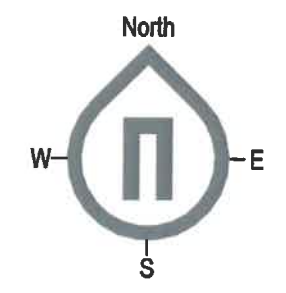
DRAWING TITLE

Proposed Site Plan - Bungalows

STATUS

S4 - Planning

Proj Ref	Origin	Zone	Level	Type	Role	Num	Status	Rev
90097	BAS	00	00	DR	A	00100	S4	6
Sheet	Scale	Issue Date	Drawn by	Clk by				
A3	1 : 500	13-03-23	WD	AB				



P6	Drawing updated	05-11-24	AB
P5	Drawing updated	14-10-24	AB
P4	Drawing updated	08-09-24	AB
P3	Drawing updated	22-08-24	AB
P2	Drawing updated	02-08-24	AB
P1	Drawing updated	30-07-24	AB
P0	First Issue	02-07-24	AB
REV	DESCRIPTION	DATE	ISSUED BY

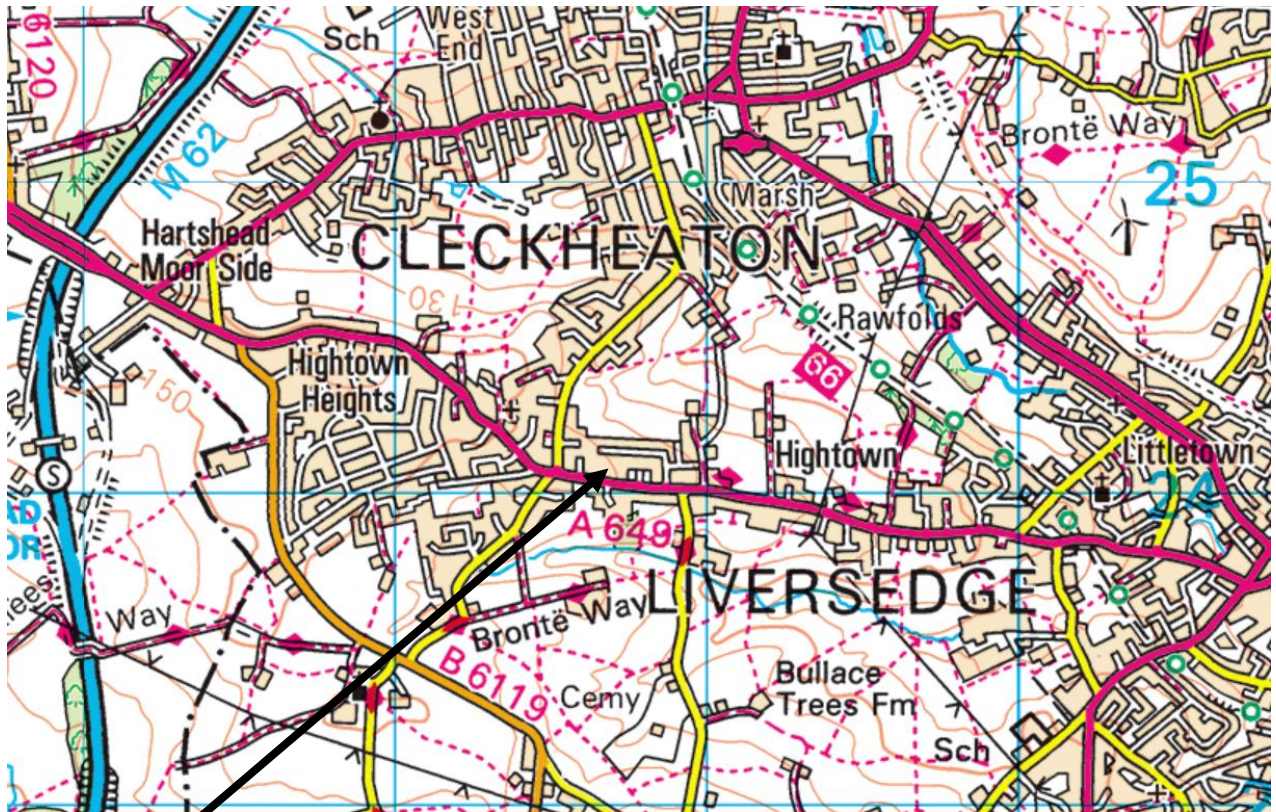
ISSUE/REVISION HISTORY

BARNES
ARCHITECTURAL
SERVICES

Unit 19, Victoria Spring Business Park
Liversedge, West Yorkshire WF15 6BU

NOTES
Do not scale from this drawing. Only figured dimensions are to be taken from this drawing. Contractor must verify all dimensions on site before commencing any work or shop drawings. Report any discrepancies to the architect before commencing work. If this drawing exceeds the quantities taken in any way the architects are to be informed before the work is initiated. Work within the Construction (Design & Management) Regulations 2015 is not to start until a Health and Safety Plan has been produced. This drawing is copyright and must not be reproduced without consent of BARNES ARCHITECTURAL SERVICES.

DRAWING STATUS/TYPE KEY			
S0	Feasibility	S2	Sketch
L	Landscape	D4	Construction
S4	Planning	Z	Marketing
B	Building Survey	B3	As Built
D2	Tender	Z	Tenant
OS	Ordnance Survey		



The Site

Site Location Plan

Drawing No C723/1

Map reproduced from Ordnance Survey. On behalf of the
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APPENDIX B

PREVIOUS INVESTIGATION REPORT

Environmental
Geotechnical
Specialists



PHASE 1 ENVIRONMENTAL DESK STUDY & COAL MINING RISK ASSESSMENT REPORT

job number	C4499/24/E/6873	date	22.08.2024
site address	Land Adjacent 480 Halifax Road, Liversedge, Wakefield, West Yorkshire, WF15 8DX		
written by	S. Hale	checked by	S. Alexander
issued by	S. Hale		



Please consider the environment before printing this report.



Environmental
Geotechnical
Specialists

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☎ 01484 604354 Company No. 5130864

<ENVIRONMENTAL> <GEOTECHNICAL>

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5	Consultants Coal Mining Report



Report on a Phase One Desk Study and Coal Mining Risk Assessment

Location:	Land Adjacent 480 Halifax Road Liversedge, Wakefield, West Yorkshire, WF15 8DX	
For:	Barnes Homes Ltd	
Report No.	C4499/24/E/6873	Report date: August 2024

For and on behalf of **Rogers Geotechnical Services Ltd**

	
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1. Introduction

The site comprises a plot of disused land adjacent to 480 Halifax Road. The site is approximately 0.12 hectares in size and its National Grid reference is centred around 418744 424063.

It is understood that the development proposals currently comprise the construction of three detached, single storey, residential dwellings with associated garden areas and parking. In order to assist with this decision-making process, and any planning and construction aspects of the development, a phase one environmental desk study has been commissioned and is the subject of this report.

In accordance with issued guidance, a site walkover was conducted on the 6th August 2024 and the following observations were made:

General site description/current site use

The site comprises a gravel lane that leads to an area of land heavily vegetated with mature deciduous trees, overgrown shrubs and grasses. The site is currently used as an external garden area to the adjacent house. Access to the site was limited due to the density of the vegetation.

Site boundaries/access

Access can be gained via the gravel track which runs northwards to the west of 474 and east of 482 Halifax Road.

Topography

The site appears to lie flat, however, this was difficult to ascertain due to the overgrown vegetation restricting vision.

Surface cover of site

At the time of the walkover overgrown vegetation covered the majority of the site, restricting vision. A small patio area was observed at the very southern end of the main area of the site.

Visible evidence of contamination/ contaminative sources

No visible evidence of contamination was noted; however, inspection was restricted due to the overgrown vegetation.

Presence of vegetation and wildlife

Overgrown vegetation was present to the majority of the site, including mature trees. This will need to be cleared prior to any site investigation. Vegetation seems to be healthy with no evidence of degradation. There were no obvious signs of invasive flora, fauna, nesting birds, burrowing animals or edible plants observed during the time of the site walkover.

Services

The status of underground services is unknown. There were no overhead services present within the site at the time of the walkover.

Site neighbours

The site is surrounded by residential dwellings.

In order to ensure that the site is fully characterised and to comply with the Environment Act 1995¹, a Phase One Desk Study and Coal Mining Risk Assessment has been commissioned by Barnes Homes Ltd. The desk study is intended to assess the environmental impact of historical, current and future factors on the development. This report will present the data obtained and provide a conceptual ground model and preliminary risk assessment as well as discussing the scope of any intrusive investigation that may be required. This report does not consider ecological impacts (e.g. bats) or botanical risks (e.g. Japanese Knotweed).

2. Review and Summary of Published Data

As a part of this desk study the following data has been considered.

- | | |
|-----------------------------|--------------|
| • Site Plans | - Appendix 1 |
| • Groundsure Reports | - Appendix 2 |
| • Historical maps | - Appendix 3 |
| • Photographs | - Appendix 4 |
| • Consultants Mining Report | - Appendix 5 |

The data obtained from the above-mentioned sources has been summarised below².

¹S57 of the Environment Act 1995 inserted the contaminated land regime into the Environmental Protection Act 1990 (Part 2A). The regime 'provides a risk based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment' See <http://www.environment-agency.gov.uk/research/planning/40405.aspx>. This places a duty on local authorities to inspect their areas for contaminated land and require its remediation using the 'suitable for use' approach. Much of this duty is discharged via the planning regime under the Town and Country Planning Act 1990 as historical land contamination is a 'material planning consideration.' The local authorities are required to secure the removal of unacceptable risks via remediation of the land, to therefore ensure the site is suitable for its new use. This is fulfilled via completion of a Phase One Environmental Desk Study, Phase Two Intrusive Investigation, Phase Three Remediation Strategy and Phase Four Validation Report. Therefore, as a minimum, once a site has been developed it should not be capable of being designated as 'contaminated land' under Part 2A of the Environmental Protection Act 1990, as inserted by the Environment Act 1995 (see also PPS 23 Planning and Pollution Control Section 8)

² This report is a summary only and reference must be made in full to the information provided in the Groundsure Report.

2.1 Historical Land Use

Table 1: Historical Land Use³

HISTORICAL MAPPING SUMMARY		
Map Dates	On site	Within 250m
1854 -1894	The site appears to be part of a field of unknown use.	A residential dwelling called Grange View is present adjacent to the site which remains to the present day. Rayner's Mill – 240m W Clough Beck – 240m S
1907-1922	The site remains unchanged.	Residential property constructed – immediately adjacent to SW. Clough Lane Leather Works and associated chimney – 230m SE
1931 – 1933	The site remains unchanged.	The surrounding land use remains unchanged.
1938 – 1948	The site remains unchanged.	A number of residential properties have been constructed adjacent to the north of the site.
1951 – 1958	A small structure is now present to the centre of the site.	Clough Lane Leather Works is now labelled as 'New Mill (Disused)'.
1966 – 1975	Two more small structures are now present to the centre of the site. A track is also present leading from the structures to Halifax Road.	Garage – 170m E
1985 – 1993	The site remains unchanged.	New Mill (Disused) has now been demolished.
2001 – 2003	The site remains unchanged.	The surrounding land use remains unchanged.
2010 – 2024	The three small structures have been demolished at some point during this period as they were no longer present during the walkover.	The surrounding land use remains unchanged.

NB. All distances given are approximate only.

2.2 Published Geology and Geological Hazards

Table 2: Geological Data for the Site

BGS MAPPING DATA			
Strata Type	Strata Name ⁴	Previous Name ⁴	Description ⁵
Superficial Geology	None	-	-
Solid Geology	Pennine Lower Coal Measures Formation	-	Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part.
GEOLOGICAL FEATURES			
Type	Location	Features	Comments
Mining Activity	On site	Coal mining	The site is located within a coal mining area as defined by the Coal Authority.
Linear Features	35m NE, 110m NE, 134m SW, 150m N, 150m S, 167m S & 233m N	Faults (inferred)	None anticipated to affect the proposed development
	135m SE	Coal seams	Wheatley Lime (WL) coal
	270m NW		Middleton Main (MM) coal

³ See Appendix 3

⁴ Sources: British Geological Survey (NERC) Map Sheets 77; Huddersfield; Solid and Drift Edition, and Geology of Britain Viewer [online resource from www.bgs.ac.uk]

⁵ Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [online resource from www.bgs.ac.uk]

Landslip Deposits	No data	No data	Not indicated to present on site or within the surrounding area.
BGS BOREHOLE DATA			
Reference⁶	Location	Strata Description	Depth
-	-	None within 250m.	-
NATURAL GROUND SUBSIDENCE & HAZARDS⁷			
Type		Risk Rating	
Potential for shrinking or swelling clay ground stability		Negligible to Very Low.	
Potential for running sand ground stability		Negligible.	
Potential for compressible ground stability		Negligible.	
Potential for collapsible ground stability hazards		Very Low.	
Potential for landslide ground stability		Very Low.	
Potential for ground dissolution stability		Negligible.	
Radon		The property is in a lower probability radon area (between 1% and 3% of homes are estimated to be at or above the Action Level). No radon protective measures are necessary.	

2.3 Construction Issues

2.3.1 Foundation Construction

On the basis of the prevailing geology and assuming that there are no areas of significantly filled ground, it is anticipated that shallow strip or spread foundations could be utilised at this site. It should be appreciated that an intrusive investigation will be required to validate this opinion. Moreover, it is possible that undifferentiated strata within the Lower Pennine Coal Measures Formation may include very fine-grained rocks which are likely to have weathered to cohesive soils at or near the surface. Such soils could be sensitive to soil moisture variations and thus be susceptible to desiccation as result of tree root action. In light of this, it is possible that footings within the zone of influence of trees (existing or previously removed), may need to be founded at extended depths in excess of 1m.

2.3.2 Site Won Materials

Where sandstone and residual soils of sandstone outcrop beneath the site these may be suitable for re-use as an engineered material.

Where cohesive soil is present this is likely to be relatively difficult to re-engineer as a construction material. However, depending on the results of laboratory testing, it may be possible to modify/stabilise the soil using lime and/or cement to form a suitable sub-base replacement for pavements and hard standings.

⁶ <http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html>

⁷ See Groundsure report

2.3.3 Disposal of Site Materials

If made ground is present then contamination/WAC testing will be required to establish the nature of the underlying soil before disposal to a licensed landfill site. However, it is anticipated that the naturally occurring soils would not be significantly contaminated, thus would probably be accepted by a waste disposal site catering for inert material.

2.4. Coal Mining

The Groundsure Report states that the site is within an area that may be affected by coal mining. A Coal Authority Mining Report has therefore been obtained that is included in appendix 5 of this report and may be summarised as follows:

Table 3: Summary of the Consultant's Coal Mining Report

Has the report highlighted evidence or potential of:			
Ref	Mining Feature	Yes/No	Comments
1	Underground Coal Mining	Yes	Black Bed coal – 131m depth – Beneath site – Dipping 3.2° S – 0.67m thick – Last mined 1889 Black Bed coal – 145m depth – South east of site – Dipping 2.9° SE – 0.77m thick – Last mined 1897 Black Bed coal – 169m depth – South east of site – Dipping 1.8° S – 0.77m thick – Last mined 1906
2	Probable Unrecorded Shallow Workings	No	-
3	Spine Roadways at Shallow Depth	No	No spine roadway recorded at shallow depth.
4	Mine Entries	No	No mine entries recorded within 100m of the site
5	Abandoned mine plans	Yes	Plans of abandoned mine workings below the site are suggested to be available by the Coal Authority.
6	Outcrops	No	No outcrops recorded.
7	Geological Faults	No	No faults, fissures or breaklines recorded.
8	Opencast Mines	Yes	A large unlicensed opencast site was recorded 410m SW.
9	Coal Authority Managed Tips	No	None recorded within 500 metres of the enquiry boundary.
10	Site Investigations	No	None recorded within 50 metres of the enquiry boundary
11	Remediated Sites	No	None recorded within 50 metres of the enquiry boundary.
12	Coal Mining Subsidence	No	The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31st October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.
13	Mine Gas	No	None recorded within 500 metres of the enquiry boundary.
14	Mine Water Treatment Schemes	No	None recorded within 500 metres of the enquiry boundary.
15	Future underground mining	No	For further information please see section 3 of the Consultant's Coal Mining Report (ref 51003441151001).
16	Coal mining licensing	No	

17	Court orders	No	
18	Section 46 notices	No	
19	Withdrawal of support notices	No	
20	Payments to owners of former copyhold land	No	

2.5 Waste Management and Gas Monitoring

Table 4: Landfill Data and Artificial Ground, Recorded and Anticipated

ENVIRONMENT AGENCY, LOCAL AUTHORITY, BGS & HISTORIC LANDFILLS			
Waste Type	Location	Comments	Monitoring Requirement
Active Landfill	-	None recorded within 250m	-
Historic Landfill	-	None recorded within 250m	-
Historic waste sites	-	None recorded within 250m	-
Licenced waste sites	-	None recorded within 250m	-
Waste Exceptions	-	None recorded within 250m	-
MADE GROUND & INFILLED GROUNDWORKINGS			
Description	Location	Comments	Monitoring Requirement
Records of Potentially Infilled Features	165m NW	Made Ground (Undivided) – Artificial Deposit	No

2.6 Hydrogeology, Hydrology

Table 5: Ground/Controlled Water Sensitivity and Flooding

ENVIRONMENT AGENCY AQUIFER DESIGNATION ⁸		
Strata	Designation	Description
Solid Geology On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
GROUNDWATER SENSITIVITY ⁹		
Description	Location	Details
Source Protection Zone ¹⁰	-	None recorded within 250m.
Abstraction Licences	-	None recorded within 250m.
Discharge Consents	18m S	28 Quaker Lane – Effluent Type: Sewage – Receiving Water: Trib of Spen River.

⁸ See Appendix 2

⁹ See Appendix 2

¹⁰ See Appendix 2

Records of Part A(2) and Part B Activities and Enforcements	133m SW	Arrow Service Station – Process: Waste Oil Burner 0.4 MW – Historical Permit Part B
CONTROLLED WATERS¹⁰		
Description	Location	Details
River Network Entries	240m S	Clough Beck
Surface Water Features	Within 250m	3 recorded within 250m of the site, no further information given.

2.7 Sensitive Land Use

Table 6: Sensitive Land Uses within 250m

REGISTERED SENSITIVE LAND USES¹¹		
Description	Location	Details
None identified within 250m of the proposed development		

2.8 Industrial Land Use and Potential Sources of Contamination

In order for a conceptual site model and preliminary risk assessment to be completed the historical maps and Groundsure data requires analysis to identify any past or present activities on the site and in the area that may have the potential to cause contamination on the site. Guidance has been issued by the Environment Agency, NHBC and Chartered Institute of Environmental Health.¹² Within this document, annex 3 provides examples of important contaminants that are associated with individual uses of land. This data assists in the formulation of any chemical testing regime.

Those that we consider potentially contaminative according to the guidance are given below:

Table 7: Potentially Contaminative Sources

HISTORICAL		
Land Use	Location	Classification
Historical construction	On site	Associated with small structures present on site.
Clough Lane Leather Works/New Mill	230m SE	Unspecified works/factories/features.
Raynor's Mill	240m W	
Garage	170m E	Road vehicle fuelling, service and repair: garages and filling stations.
CURRENT		
Owens Corning Veil UK	240m W	Unspecified works/factories/features.
Union Motors	170m E	Road vehicle fuelling, service and repair: garages and filling stations.

¹³ See Appendix 2

¹⁴ Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D Publication 66: 2008 Volume 1 and 2.

3. Preliminary Qualitative Risk Assessment

The potential of contamination hazards on the land has been identified and the risks associated with them are assessed in the following preliminary risk assessment in accordance with industry practice and the 'suitable for use' approach. This has been conducted using the source-pathway-receptor approach. This method dictates that there must be a risk contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed DEFRA and The Environment Agency state that **'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'**

R&D Publication 66: 2008 states that the groups at risk of harm (receptors) can be identified by the following categorisation:

1. Humans: site personnel, end users, visitors and adjacent land users.
2. The water environment – receptors: groundwater, surface water, coastal waters and artificial drainage.
3. Ecosystems: plants and animals.
4. Construction/building materials/services

In order to complete a conceptual site model and therefore a preliminary risk assessment, an appraisal of the sources of contamination, potential and actual, on and in the area of the site has therefore been completed with reference to this pollution linkage.¹³

¹³This assessment has been based on the information as to the proposed development that has been provided by the client. If the plans should change, the assessment should be re-evaluated.

3.1 Conceptual Ground Model & Preliminary Qualitative Risk Assessment

It is understood that the development proposals currently comprise the construction of three detached, single storey, residential dwellings with associated garden areas and parking. In view of the sensitivity of the end users it is considered that the soil screening values (SSVs) for a residential with plant uptake end use should be employed.

The preliminary risk assessment has been evaluated with reference to the following ratings and definitions:

- | | |
|-------------------|---|
| N/A - | A source-pathway-receptor linkage is not considered to exist and therefore a risk assessment is not required. |
| Low - | A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence. |
| Moderate - | The linkage exists but further field or laboratory data is required to confirm that the contaminant has reached the receptor and the levels of contaminant are harmful. |
| High - | The linkage exists and the available data indicates that significant harm may be caused and remedial action could be necessary. |

Table 8: Conceptual Site Model and Preliminary Qualitative Risk Assessment

CONCEPTUAL SITE MODEL			PRELIMINARY RISK ASSESSMENT	
Pathways	Receptor	Linkage Present?	Risk Rating	Notes
Direct contact/dermal absorption/soil ingestion	Operative	Yes – operatives are likely to come in contact with the soil. However, no credible source likely to be present on site.	Low	Should olfactory evidence be observed on the site, then contamination testing may be required to reach a firm conclusion.
	End User	Yes – end users are likely to come in contact with the soil. However, no credible source likely to be present on site.	Low	
	Neighbours	Yes – residential dwellings are present all around the site. However, no credible source likely to be present on site.	Low	
Inhalation of Dust/Vapours	Operative	Yes – contact with soil likely during works. However, no credible source likely to be present on site.	Low	Dust may be generated during site activity. Should olfactory evidence be observed on the site, then contamination testing may be required to reach a firm conclusion.
	End User	Yes – dust may be produced by the end users. However, no credible source likely to be present on site.	Low	
	Neighbours	Yes – residential dwellings are present all around the site. However, no credible source likely to be present on site.	Low	
Ingestion of fruit/vegetables and/or waters	Operative	No – no edible plants or contained water sources in the area of the proposed new works.	N/A	Should olfactory evidence be observed on the site, then contamination testing may be required to reach a firm conclusion.
	End User	Yes – soft landscaping proposed as part of the new development. However, no credible source likely to be present on site.	Low	
	Neighbours	Yes – residential dwellings are present all around the site. However, no credible source likely to be present on site.	Low	

Migration of hazardous gases via permeable strata	Operative	Yes – no credible source likely to be present on site or in the surrounding area.	Low	Should olfactory evidence be observed on the site, then contamination testing may be required to reach a firm conclusion.
	End User		Low	
	Neighbours	Yes – residential dwellings are present all around the site. However, no credible source likely to be present on site.	Low	
Spillage/loss/run off direct to receiving water	Controlled Waters	Yes – controlled waters within 250m. However, no credible source likely to be present on site.	Low	Should olfactory evidence be observed on the site, then contamination testing may be required to reach a firm conclusion.
Migration via permeable unsaturated strata	Controlled Waters	Yes – Secondary A aquifer present beneath the site. However, no credible source of contamination likely to be present on site.	Low	
Run off via drainage/sewers etc	Controlled Waters	Yes – old services may be present onsite, however no credible source likely to be present on site.	Low	
Direct contact with contaminated soils	Plants	Yes – some soft landscaping areas may be present as part of the proposed development. However, no credible source likely to be present on site.	Low	Should olfactory evidence be observed on the site, then contamination testing may be required to reach a firm conclusion. Presence of suitable growing medium should be investigated.
Uptake via root system			Low	
Direct contact with contaminated soils/	Building Materials	Yes – foundation and service installation materials may be affected by the site soil.	Low	Further testing required to reach a firm conclusion.
Direct contact with contaminated groundwater				

Migration of mine gas via permeable strata	Operative	Yes – the site is located within a reported coal mining area and there is potential for underground workings to be present. Recorded workings are at significant depth and no direct pathways to surface are anticipated. Should shallow unrecorded workings be encountered then hazardous ground gases may be present.	Moderate	Further investigation required to reach a firm conclusion.
	End User			
Exposure to Radon	Operative	Yes – The Site is located in an area where 1% and 3% of properties are at or above the action level.	Low	The publication BR211 states that no protection measures are necessary.
	End User			
Mining Instability	End User	Yes – while the Consultants Coal Mining Report reports no shallow workings, these cannot be ruled out due to the potential presence of the Wheatley Lime (WL) coal seam which is expected to be present without competent overburden.	Moderate	Further investigation required to reach a firm conclusion. See Section 4.
Unexploded Ordnance (UXO) Risk	Operative	Yes – the Zetica ¹⁴ online maps indicate that the site is at low risk from UXO.	Low	Unlikely to be affected by UXO.

Notes:

1. The above data and table is a qualitative assessment of the probable risks identified at this site, based on the information made available to us from the client, third party professional data and walkover survey.
2. Should any additional or new data come to light, the risk assessment should be revisited and any necessary changes made to any recommendations resulting from this study.
3. Where further testing is recommended as part of the risk assessment, this is in order to provide a quantitative assessment of any contamination issues. It should at all times be considered that uncertainties may remain, and therefore any testing regime and ground investigation philosophy should be ready to accommodate any necessary alterations should any data come to light or it become evident that it has not been previously considered.

¹⁴ Pre-desk study assessment [online resource from www.zeticauxo.com].

4. Coal Mining Risk Assessment

4.1 Geological Appraisal

On the basis of the information revealed from the Geology of Britain Viewer¹⁵, it is noted that the site is situated within the Pennine Lower Coal Measures Formation. The regional solid geology shows the nearest dip marker being 3° to the south west, however, it should be appreciated that there is no dip marker present within the same faulted block as the site.

There are two notable coal seams that are shown to outcrop within the local area. Information regarding this seam is summarised as follows:

Table 9: Summary of Coal Seams Within the Vicinity of the Site.

Seam Name	Seam thickness ^{5*}	Outcrop distance from site ^{5*}	Anticipated depth below site
Wheatley Lime Coal (WL)	0.4 – 1.2m	135m SE	Approximately 13m
Middleton Main Coal (MM)	0.2 – 1.8m	270m NW	Not expected to underlie the site.

In this instance, whilst it is not expected that the Middleton Main (MM) coal will be present beneath the site. This is due to the site being topographically lower than the coal outcrop. Stratigraphically, the next seam within the sequence according to the Generalised Vertical Section (GVS) is the Wheatley Lime (WL) coal. This seam was noted to outcrop topographically below the site. Additionally, the site is located approximately 135m Above Ordnance Datum (AOD) and the WL is located 129m AOD. As such, using trigonometry it can be reasoned that the Wheatley Lime may be present approximately 13m beneath the site.

4.2 Risk Assessment

The risk to the stability of the proposed residential development has been evaluated from the data obtained and with reference to the following ratings and definitions:

- Low - The possibility of instability is unlikely therefore no further action is necessary.
- Moderate - The possibility of instability is likely and further investigation or remedial action may be required.
- High - The possibility of instability is highly likely and further investigation or remedial action will be necessary.

Table 10: Development Specific Risk Assessment

Item	Risk attributed to	Coal Seam(s) Considered	Risk Rating
4.3	Shallow coal workings	Wheatley Lime Coal.	Moderate
4.4	Coal workings at depth	Workings from 131m depth.	Low
4.5	Mine gas	Shallow coal workings.	Moderate

4.3 Risks Posed by Shallow Coal Workings

On the basis of all of the information provided above, the Wheatley Lime coal could be present within 30m of the surface at the site. Whilst this seam may be of limited thickness, the possibility of the seam being worked below the site cannot be ruled out. Historic coal mining activity is evident in the nearby area, and therefore it is considered that if coal was known to be close to ground level it could have been removed illicitly via shallow mining methods with relative ease.

It may be noted that guidance available from both the NHBC and the CIRIA publication, SP32 - *construction over abandoned mine workings*, suggests that competent overburden thickness above a coal seam should be greater than 10 times the thickness of a seam plus seam thickness in order that the collapse of workings would pose a low risk to surface structures.

On this basis, assuming a maximum thickness of the coal seams, the table below suggests the thickness of competent overburden required above each seam to mitigate instability at the surface.

Table 11: Required Thickness of Competent Overburden

Seam Name	Seam thickness	Anticipated depth below site	Required thickness of competent overburden
Wheatley Lime (WL) coal	1.2m	Approximately 13m	13.2m

Due to the ambiguity with the projected depth of the seam beneath the site, it is possible that there may not be a sufficient thickness of competent overburden above the shallowest seam in order to prevent the risk of instability posed by the presence of any illicit workings. Therefore, a moderate risk rating has been assigned to this seam, and further investigation is recommended to prove or disprove the presence of illicit mining activity.

4.4 Risks Posed by Coal Workings at Depth

In regard to deeper mining which could affect the site, the worked coal seams are present at significant depths. Indeed, 3 sets of workings are present between 131m to 169m depth, with the greatest extraction thickness measuring 0.77m in thickness. Should collapse occur in these workings, there is significant overburden to prevent surface instability.

4.5 Risks Posed by Mine Gas

This assessment has identified that there is potential for shallow mine workings to be present beneath the proposed development. Whilst the Consultants Coal Mining Report has not reported any incidents of mine gas within the vicinity of the development, shallow mining activity represents a credible source of ground gas. As such, a moderate risk rating has been assigned, and further assessment may be required. Should evidence of workings be proven via further intrusive works, it is strongly recommended that a detailed gas risk assessment is undertaken in accordance with relevant guidance

5. Intrusive Investigation

5.1 Site Investigation Philosophy

The information from the Phase 1 Desk Study shows there are limited potential sources of contamination on the site and in the surrounding area. In view of the above, it is not considered necessary to undertake an intrusive geo-environmental investigation.

It is incumbent upon the developer to carefully inspect any exposed soil during the ground-works phase of the contract. Should any contamination become evident or organic made ground be revealed, it is recommended that a pragmatic approach be adopted, with observational techniques being employed at each stage of the work. In the unlikely event that contamination is revealed, work should stop in the affected area and chemical testing be undertaken to evaluate the risk of harm to the receptors. In the event that this occurs it is recommended that the following testing regime be implemented on soil samples:

- **Metals** – Cd, Cr, Cu, Hg, Ni, Pb, Zn, V.
- **Semi Metals and Non-Metals** – As, Se, Free Cyanide and Phenols.
- **Hydrocarbons** – Polycyclic aromatic hydrocarbons (PAH EPA16), Total petroleum hydrocarbons (TPH CWG).
- **Others** – pH, Organic Content.
- **Asbestos**

5.1.1 Ground Gas Assessment

Given the limited sources of ground gas and potential limited potential or made ground it may be possible to undertake a desk based assessment where made ground thickness is less than 1m, and a determination of generation risk of made ground and natural deposits be undertaken in line with the *CL:AIRE, RB17, Pragmatic Approach to Ground Gas Risk Assessment 2012*. Should made ground be encountered which exceeds this thickness then standpipes and a period of ground gas monitoring may be required.

5.2 Geotechnical Assessment - Coal

In light of the potential risks of instability at the site from the working of shallow coal, it cannot be recommended that development takes place without further investigation to conclusively determine the presence of such workings. This work should include physical drilling methods to explore the ground conditions.

General practice is to undertake rotary openhole boreholes at three locations across the site to mitigate against the potential for drilling through intact columns associated with pillar and stall workings. Furthermore, it is normal to investigate the ground to 30m below ground level; any workings below this depth are unlikely to result in significant instability. However, in this case, the risk of instability is due to shallow workings, therefore, drilling to these depths may not be necessary and the objective should be to ensure that the shallow seams are un-worked or have sufficient competent cover. Given that there exists a risk from a single coal seam, the Wheatley Lime, it is recommended that boreholes be commenced to prove/disprove the presence of workings in this coal seam. It is considered that one of the boreholes should penetrate to a depth of 30m and should competent bedrock be proven the other two coal seams could be terminated below the depth of the target coal seam estimated to between 10m and 15m below the surface of the site. In any event, it is considered that approval should be sought with the Local Authority as to the efficacy of this

approach. Should any shallow workings be encountered then a ground gas risk assessment will become necessary via installation of standpipes.

5.3 Geotechnical Assessment

In any event, it is recommended that a geotechnical ground investigation be completed in order to obtain geotechnical information, as this will facilitate the safe design of the foundations for the proposed development. Such an investigation may be required by planning authorities and insurance providers. The following investigation strategy could be considered:

Sampling Method

It is anticipated that a windowless sampling drilling rig will be able to gain sufficient data in regard to the near surface soils. Moreover, such equipment should be able to undertake Standard Penetration Testing (SPT) and/or Dynamic Probing. If weak ground becomes evident, then the use of light cable percussive drilling will be required.

Soakaway Design

Should soakaway data be required for drainage design, trial pits could be excavated and infiltration tests conducted. Alternatively, these tests could be undertaken within boreholes.

Geotechnical Testing

An allowance for geotechnical testing of the soils should be included in any ground investigation.

Reporting

The above data will need to be formulated into a formal assessment that should include the following:

- Geotechnical recommendations.
- Coal mining legacy investigations.
- Contamination assessment, if required.
- Any recommendations for further work.

As soon is as practicable, and prior to the above, this Phase 1 report should be forwarded to the relevant authorities, in order to ensure they have sufficient time to review and discuss any issues.

It is of note that Rogers Geotechnical Services would be happy to assist in any further intrusive investigation that may be required.

6. References

- British Standards Institution (2015 + A1: 2020), BS 5930: *Code of practice for ground investigations*, B.S.I., London.
- British Standards Institution (2011) +A1:2013, BS 10175: *Investigation of potentially contaminated sites – Code of Practice*, British Standards Institute.
- British Standards Institution (2013), BS 8576 Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds.
- Department for Environment, Food and Rural Affairs and the Environment Agency, DEFRA R&D Publications, Environment Agency, Bristol.
- CLR 2, 1994, *Guidance on preliminary site inspection of contaminated land*, Volume 1.
- CLR 4, 1994, *Sampling Strategies for contaminated land*.
- R&D Publication 66: 2008 Guidance for the Safe Development of Housing on Land Affected by Contamination.
- CIRIA Report C665 (2007), *Assessing risks posed by ground gasses in buildings*.
- The Environment Agency: Groundwater source protection.



APPENDIX C

EXPLORATORY HOLE LOGS



Key to exploratory hole symbols and abbreviations

SAMPLE TYPES

ACM - Asbestos sample
BLK - Block sample
D - Disturbed sample
G - Gas sample
TW - Pushed thin wall sample
W - Water sample

AMAL - Amalgamated sample
C - Core sample
ES - Environmental sample
J - Jar sample
U - Undisturbed sample

B - Bulk disturbed sample
CBR - CBR test sample
EW - Environmental water sample
L - Liner sample
UT - Undisturbed thin wall sample

IN-SITU TESTS

HV - Hand shear vane
PP - Hand penetrometer

HV(r) - Hand shear vane residual
SPT - Standard penetration test

PID - Photo ionisation detector
SPT(C) - SPT using cone

GROUNDWATER



Groundwater strike



Groundwater rest level

ROTARY CORE DETAILS

TCR - Total core recovery (%)
FI - Fracture index

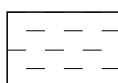
SCR - Solid core recovery (%)
NI - Non-intact core

RQD - Rock quality designation (%)
AZCL - Assumed zone of core loss

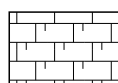
LEGEND



Topsoil



Clay



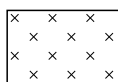
Chalk



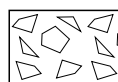
Sand backfill



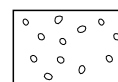
Peat



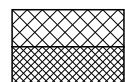
Silt



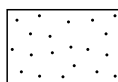
Breccia



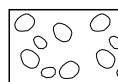
Gravel backfill



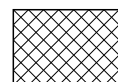
Made ground
[cohesive]



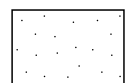
Sand



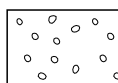
Conglomerate



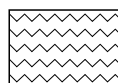
Arisings



Concrete



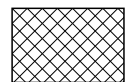
Gravel



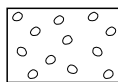
Metamorphic



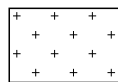
Bentonite



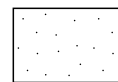
Wood



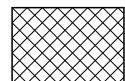
Cobbles



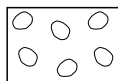
Igneous



Concrete



Brick



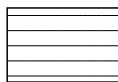
Boulders



Grout



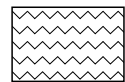
Bituminous
material



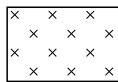
Mudstone



Plain pipe



Gypsum



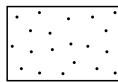
Siltstone



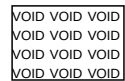
Slotted pipe



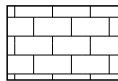
Coal



Sandstone



Void



Limestone

G&M CONSULTING		Trial Pit				TP01			
						Sheet 1 of 1			
		Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25			
Project Name 480 Halifax Road		Project No. C723		Start Date 2025-06-23		End Date 2025-06-23			
Client Barnes Homes		Consultant G&M Consulting		Contractor Barnes Homes					
Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (m)	Strata		
		Depth (m)	Type/ Ref	Results			Legend	Description	
		0.20	PID ES 1	0.00 (ppmv)			— —	Firm to stiff yellowish brown locally mottled grey, fissured CLAY. Fissures are extremely closely spaced randomley orientated	
	0.20				— —				
					— —				
					— —				
					— —				
					— —				
					— —				
					— —				
					— —				
					— —				
					— —				
					— —				
					— —				
					— —				
					— —				
			1.00	End of Trial Pit at 1.00m				1.0	
								1.5	
								2.0	
								2.5	
								3.0	
								3.5	
								4.0	
								4.5	
								5.0	
Remarks Trial Pit Complete							Method, Plant, Stability, Dimensions 0.00 - 1.00m TP Doosan DX85R-7 Stable Inclination: 90° L = 1.60m W = 0.50m		Logger G Swinbourne



Trial Pit

TP01
SUPPLEMENTARY INFO

Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25
Project Name 480 Halifax Road	Project No. C723		Start Date 2025-06-23	End Date 2025-06-23

Client Barnes Homes	Consultant G&M Consulting	Contractor Barnes Homes
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Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		

Remarks Trial Pit Complete	Method, Plant, Stability, Dimensions 0.00 - 1.00m TP Doosan DX85R-7 Stable Inclination: 90° L = 1.60m W = 0.50m	Logger G Swinbourne
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Trial Pit

TP01
PHOTO PAGE

Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25
Project Name 480 Halifax Road	Project No. C723		Start Date 2025-06-23	End Date 2025-06-23

Client Barnes Homes	Consultant G&M Consulting	Contractor Barnes Homes
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Remarks Trial Pit Complete	Method, Plant, Stability, Dimensions 0.00 - 1.00m TP Doosan DX85R-7 Stable Inclination: 90° L = 1.60m W = 0.50m	Logger G Swinbourne
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Trial Pit

TP02

Sheet 1 of 1

Hole Type

TP

Easting

Nothing

Ground Level (m)

Scale

1:25

Project Name

480 Halifax Road

Project No.

C723

Start Date

2025-06-23

End Date

2025-06-23

Client

Client
Barnes Homes

Consultant

G&M Consulting

Contractor

Contractor
Barnes Homes

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata	
		Depth (m)	Type/ Ref	Results			Legend	Description
		0.40	PID ES 1	0.00 (ppmv)		(1.00)	—	Firm to stiff yellowish brown locally mottled grey, fissured CLAY. Fissures are extremely closely spaced randomley orientated
		0.40					—	
						1.00		End of Trial Pit at 1.00m

Remarks

Remarks
Trial Pit Complete

Method. Plant. Stability. Dimensions

0.00 - 1.00m TP Doosan DX85B-7

0.00 - 1.00m
Stable

Inclination: 9

$L = 1.40\text{m}$

$W = 0.50\text{m}$

Logger

G. Swinbourne



Trial Pit

TP02

SUPPLEMENTARY INFO

Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25
Project Name 480 Halifax Road	Project No. C723		Start Date 2025-06-23	End Date 2025-06-23

Client Barnes Homes	Consultant G&M Consulting	Contractor Barnes Homes
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Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		

Remarks Trial Pit Complete	Method, Plant, Stability, Dimensions 0.00 - 1.00m TP Doosan DX85R-7 Stable Inclination: 90° L = 1.40m W = 0.50m	Logger G Swinbourne
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Trial Pit

TP02
PHOTO PAGE

Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25
Project Name 480 Halifax Road	Project No. C723		Start Date 2025-06-23	End Date 2025-06-23

Client
Barnes Homes

Consultant
G&M Consulting

Contractor
Barnes Homes



Remarks
Trial Pit Complete

Method, Plant, Stability, Dimensions

0.00 - 1.00m TP Doosan DX85R-7

Stable
Inclination: 90°

L = 1.40m



W = 0.50m

Logger

G Swinbourne



Trial Pit

TP03

Sheet 1 of 1

Hole Type	TP
-----------	----

Easting

Nothing

Ground Level (m)

Scale
1:25

Project Name
480 Halifax Road

Project No.
C723

Start Date
2025-06-23

End Date	2025-06-23
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Client
Barnes Homes

Consultant
G&M Consulting

Contractor
Barnes Homes

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata	
		Depth (m)	Type/ Ref	Results			Legend	Description
		0.20	PID ES 1	0.00 (ppmv)		(0.80)	—	Firm to stiff yellowish brown locally mottled grey, fissured CLAY. Fissures are extremely closely spaced randomley orientated
		0.20					—	
						0.80	End of Trial Pit at 0.80m	

Remarks	
Trial Pit Complete	

Method, Plant, Stability, Dimensions

Logger

0.00 - 0.80m	TP	Doosan DX85R-7
Stable		

G Swinbourne

Inclination: 90°

 $L = 1.50m$
$$W = 0.50m$$



Trial Pit

TP03

SUPPLEMENTARY INFO

Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25
Project Name 480 Halifax Road	Project No. C723		Start Date 2025-06-23	End Date 2025-06-23

Client Barnes Homes	Consultant G&M Consulting	Contractor Barnes Homes
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Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		

Remarks Trial Pit Complete	Method, Plant, Stability, Dimensions 0.00 - 0.80m TP Doosan DX85R-7 Stable Inclination: 90° L = 1.50m W = 0.50m	Logger G Swinbourne
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Trial Pit

TP03
PHOTO PAGE

Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25
Project Name 480 Halifax Road	Project No. C723		Start Date 2025-06-23	End Date 2025-06-23

Client
Barnes Homes

Consultant
G&M Consulting

Contractor
Barnes Homes



Remarks
Trial Pit Complete

Method, Plant, Stability, Dimensions

0.00 - 0.80m TP Doosan DX85R-7

Stable

Inclination: 90°

L = 1.50m



W = 0.50m

Logger

G Swinbourne

G&M CONSULTING		Trial Pit				TP04			
						Sheet 1 of 1			
		Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25			
Project Name 480 Halifax Road		Project No. C723		Start Date 2025-06-23		End Date 2025-06-23			
Client Barnes Homes		Consultant G&M Consulting		Contractor Barnes Homes					
Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (m)	Strata		
		Depth (m)	Type/ Ref	Results			Legend	Description	
		0.40 0.40	PID ES 1	0.00 (ppmv)		(0.50)		MADE GROUND: Yellowish brown COBBLES of sandstone	0.5
						0.50		MADE GROUND: Dark brown gravelly CLAY. Gravel is subangular to subrounded fine to coarse of coal and brick	
		0.60 0.60	PID ES 2	0.00 (ppmv)		(0.20)		Firm to stiff yellowish brown locally mottled grey, fissured CLAY. Fissures are extremely closely spaced randomley orientated	1.0
						0.70			
		(0.50)		End of Trial Pit at 1.20m		1.5			
		1.20		2.0					
				2.5					
		3.0							
		3.5							
		4.0							
		4.5							
		5.0							
Remarks Trial Pit Complete						Method, Plant, Stability, Dimensions 0.00 - 1.20m TP Doosan DX85R-7 Stable Inclination: 90° L = 1.50m W = 0.50m			Logger G Swinbourne



Trial Pit

TP04

SUPPLEMENTARY INFO

Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25
Project Name 480 Halifax Road	Project No. C723		Start Date 2025-06-23	End Date 2025-06-23

Client Barnes Homes	Consultant G&M Consulting	Contractor Barnes Homes
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Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		
	ES		

Remarks Trial Pit Complete	Method, Plant, Stability, Dimensions 0.00 - 1.20m TP Doosan DX85R-7 Stable Inclination: 90° L = 1.50m W = 0.50m	Logger G Swinbourne
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Trial Pit

TP04
PHOTO PAGE

Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25
Project Name 480 Halifax Road	Project No. C723		Start Date 2025-06-23	End Date 2025-06-23

Client Barnes Homes	Consultant G&M Consulting	Contractor Barnes Homes
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Remarks Trial Pit Complete	Method, Plant, Stability, Dimensions 0.00 - 1.20m TP Doosan DX85R-7 Stable Inclination: 90° L = 1.50m W = 0.50m	Logger G Swinbourne
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Trial Pit

TP05

Sheet 1 of 1

Hole Type

TP

Easting

Nothing

Ground Level (m)

Scale

1:25

Project Name

480 Halifax Road

Project No.

C723

Start Date

2025-06-23

End Date

2025-06-23

Client Barnes Homes	
-------------------------------	--

Consultant
G&M Consulting

Contractor
Barnes Homes

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results			Legend	Description	
		0.20	PID ES 1	0.00 (ppmv)		(0.30)		MADE GROUND: Dark brown gravelly CLAY. Gravel is subangular to subrounded fine to coarse of coal and brick	
		0.20							
		0.60	PID ES 2	0.00 (ppmv)		0.30		Firm to stiff yellowish brown locally mottled grey, fissured CLAY. Fissures are extremely closely spaced randomley orientated	
									
									
									
									
									
			(0.70)						
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									

Remarks

REMARKS
Trial Pit Complete

Method, Plant, Stability, Dimensions

0.00 - 1.00m	TP	Doosan DX85R-7
--------------	----	----------------

Inclination: 90°

 $L = 1.60\text{m}$

$L = 1.00\text{m}$
 $W = 5.00\text{m}$

Logger

G. Swinbourne



Trial Pit

TP05

SUPPLEMENTARY INFO

Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25
Project Name 480 Halifax Road		Project No. C723	Start Date 2025-06-23	End Date 2025-06-23

Client Barnes Homes	Consultant G&M Consulting	Contractor Barnes Homes
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Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		
	ES		

Remarks Trial Pit Complete	Method, Plant, Stability, Dimensions 0.00 - 1.00m TP Doosan DX85R-7 Stable <i>Inclination: 90°</i> <i>L = 1.60m</i> W = 5.00m Logge G Swinbourn
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Trial Pit

TP05
PHOTO PAGE

Hole Type TP	Easting	Northing	Ground Level (m)	Scale 1:25
Project Name 480 Halifax Road	Project No. C723		Start Date 2025-06-23	End Date 2025-06-23

Client Barnes Homes	Consultant G&M Consulting	Contractor Barnes Homes
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Remarks Trial Pit Complete	Method, Plant, Stability, Dimensions 0.00 - 1.00m TP Doosan DX85R-7 Stable Inclination: 90° L = 1.60m W = 5.00m	Logger G Swinbourne
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APPENDIX D

LABORATORY TEST RESULTS

FINAL ANALYTICAL TEST REPORT

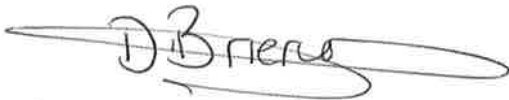
Envirolab Job Number: 25/06805
Issue Number: 1

Date: 08 July, 2025

Client: G&M Consulting Ltd
The Chestnuts, Brackenhill Road
East Lound, Haxey
Doncaster
South Yorkshire
DN9 2LR

Project Manager: Andrew Swinbourne
Project Name: 480 Halifax Road, Liversage
Project Ref: C723
Order No: C723/01/AS
Date Samples Received: 25/06/25
Date Instructions Received: 25/06/25
Date Analysis Completed: 08/07/25

Approved by:



Danielle Brierley
Client Services Supervisor

Envirolab Job Number: 25/06805

Client Project Name: 480 Halifax Road, Liversage

Client Project Ref: C723

Lab Sample ID	25/06805/1	25/06805/2	25/06805/3	25/06805/4	25/06805/5	25/06805/6	25/06805/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	2	1	2			
Client Sample ID	TP01	TP02	TP03	TP04	TP04	TP05	TP05			
Depth to Top	0.20	0.40	0.20	0.40	0.60	0.20	0.60			
Depth To Bottom										
Date Sampled	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	6A	6A	6A	1A	6A	6AE	6A			
% Stones >10mm _A	<0.1	<0.1	<0.1	29.3	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	5.84	5.91	-	7.75	-	-	5.66	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.05	0.06	-	0.05	-	-	0.05	g/l	0.01	A-T-026s
Phenols - Total by HPLC _A	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	mg/kg	0.2	A-T-050s
Arsenic _D ^{M#}	9	7	4	4	53	39	37	mg/kg	1	A-T-024s
Cadmium _D	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-024s
Copper _D ^{M#}	23	24	20	11	40	62	30	mg/kg	1	A-T-024s
Chromium _D ^{M#}	22	22	21	8	24	23	22	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	-	-	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	9	9	7	25	22	100	17	mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	20	21	19	9	8	28	15	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	43	43	41	28	22	389	62	mg/kg	1	A-T-024s
Calorific Value _A [#]	-	-	Appended	Appended	Appended	Appended	-	MJ/kg	1	Subcon DETS

Envirolab Job Number: 25/06805

Client Project Name: 480 Halifax Road, Liversage

Client Project Ref: C723

Lab Sample ID	25/06805/1	25/06805/2	25/06805/3	25/06805/4	25/06805/5	25/06805/6	25/06805/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	2	1	2			
Client Sample ID	TP01	TP02	TP03	TP04	TP04	TP05	TP05			
Depth to Top	0.20	0.40	0.20	0.40	0.60	0.20	0.60			
Depth To Bottom										
Date Sampled	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	6A	6A	6A	1A	6A	6AE	6A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	NAD	-	NAD	-	-	NAD	-			A-T-045
Asbestos Matrix (visual) _D	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope) _D	-	-	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	-	N/A	-	-	N/A	-			A-T-045

Envirolab Job Number: 25/06805

Client Project Name: 480 Halifax Road, Liversage

Client Project Ref: C723

Lab Sample ID	25/06805/1	25/06805/2	25/06805/3	25/06805/4	25/06805/5	25/06805/6	25/06805/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	2	1	2			
Client Sample ID	TP01	TP02	TP03	TP04	TP04	TP05	TP05			
Depth to Top	0.20	0.40	0.20	0.40	0.60	0.20	0.60			
Depth To Bottom										
Date Sampled	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25	23-Jun-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	6A	6A	6A	1A	6A	6AE	6A			
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	<0.01	<0.01	0.03	<0.01	0.02	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02	<0.02	0.07	<0.02	0.07	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	<0.04	<0.04	0.21	<0.04	0.42	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	<0.04	<0.04	0.20	<0.04	0.38	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	<0.05	<0.05	0.28	<0.05	0.56	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	<0.05	<0.05	0.12	<0.05	0.20	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	<0.07	0.11	<0.07	0.19	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	<0.06	<0.06	0.22	<0.06	0.48	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04	0.05	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	<0.08	<0.08	0.48	<0.08	0.84	<0.08	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	<0.01	0.02	<0.01	0.02	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	<0.03	<0.03	0.13	<0.03	0.23	<0.03	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	<0.03	<0.03	0.34	<0.03	0.35	<0.03	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	<0.07	<0.07	0.37	<0.07	0.76	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	<0.08	<0.08	2.58	<0.08	4.57	<0.08	mg/kg	0.01	A-T-019s

Report Notes

General

- This report shall not be reproduced, except in full, without written approval from Envirolab.
- The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client and can affect the validity of results.
- The results reported herein relate only to the material supplied to the laboratory.
- The residue of any samples contained within this report, and any received within the same delivery, will be disposed of **four weeks** after the initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of **six months** after the initial Asbestos testing is completed.
- Analytical results reflect the quality of the sample at the time of analysis only.
- Opinions and Interpretations expressed are outside our scope of accreditation.
- A deviating sample report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
- If a sample is outside of the calibration range or affected by interferences then it may need diluting. This will result in the limit of detection (LOD) being raised.
- Subcontracted Analysis: Please see the appended report for any deviations, current LODs and accreditation status of the test.

Key

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

Asbestos

Identification: Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis

“Trace Asbestos Identified” will be reported if there is not enough present to verify the type.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs

Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.

Soil Chemical Analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as “% stones >10mm”.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any “D” subscripts.

TPH by method A-T-007:

For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.

Results “with Clean up” indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:

EPH CWG results have humics mathematically subtracted through instrument calculation.

Where these humic substances have been identified in any IDs from “TPH CWG with clean up” please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

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

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

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

Envirolab Deviating Samples Report

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: G&M Consulting Ltd, The Chestnuts, Brackenhill Road, East Lound, Haxey,
Doncaster, South Yorkshire, DN9 2LR

Project: 480 Halifax Road, Liversage

Clients Project No: C723

Project No: 25/06805

Date Received: 25/06/2025 (am)

Cool Box Temperatures (°C): 17.4

NO DEVIATIONS IDENTIFIED

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

Envirolab Analysis Dates

Lab Sample ID	25/06805/1	25/06805/2	25/06805/3	25/06805/4	25/06805/5	25/06805/6	25/06805/7
Client Sample No	1	1	1	1	2	1	2
Client Sample ID/Depth	TP01 0.20m	TP02 0.40m	TP03 0.20m	TP04 0.40m	TP04 0.60m	TP05 0.20m	TP05 0.60m
Date Sampled	23/06/25	23/06/25	23/06/25	23/06/25	23/06/25	23/06/25	23/06/25
A-T-019s	07/07/2025	07/07/2025	07/07/2025	07/07/2025	07/07/2025	07/07/2025	07/07/2025
A-T-024s	08/07/2025	08/07/2025	08/07/2025	08/07/2025	08/07/2025	08/07/2025	08/07/2025
A-T-026s	08/07/2025	08/07/2025		08/07/2025			08/07/2025
A-T-031s	08/07/2025	08/07/2025		08/07/2025			08/07/2025
A-T-040s	08/07/2025	08/07/2025			08/07/2025	08/07/2025	08/07/2025
A-T-044	08/07/2025	08/07/2025	08/07/2025	08/07/2025	08/07/2025	08/07/2025	08/07/2025
A-T-045	26/06/2025		26/06/2025			26/06/2025	
A-T-050s	07/07/2025	07/07/2025		07/07/2025	07/07/2025		07/07/2025

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

End of Report

Certificate of Analysis

Certificate Number 25-14845

Issued: 04-Jul-25

Client Envirolab Ltd
Housesteads
Off Stockport Road
Hattersley
SK14 3QU

Our Reference 25-14845

Client Reference ~ 25/06805

Order No ~ P0757318

Contract Title ~ C723

Description 4 Soil samples.

Date Received 01-Jul-25

Date Started 01-Jul-25

Date Completed 04-Jul-25

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

A handwritten signature in black ink, appearing to read "Louise".

Louise Cook
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 25-14845

Client Ref ~ 25/06805

Contract Title ~ C723

Lab No	2531310	2531311	2531312	2531313
Sample ID ~	TP03	TP04	TP04	TP05
Depth ~	0.20	0.40	0.60	0.20
Other ID ~	25/06805/3	25/06805/4	25/06805/5	25/06805/6
Sample Type ~	SOIL	SOIL	SOIL	SOIL
Sampling Date ~	23/06/2025	23/06/2025	23/06/2025	23/06/2025
Sampling Time ~	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Inorganics							
Calorific Value	DETSC 5008	1	MJ/kg	< 1.0	< 1.0	< 1.0	< 1.0

Information in Support of the Analytical Results

Our Ref 25-14845
Client Ref ~ 25/06805
Contract ~ C723

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Incorrect container for tests
2531310	TP03 0.20 SOIL	23/06/25	GJ 250ml		
2531311	TP04 0.40 SOIL	23/06/25	GJ 250ml		
2531312	TP04 0.60 SOIL	23/06/25	GJ 250ml		
2531313	TP05 0.20 SOIL	23/06/25	GJ 250ml		

Key: G-Glass J-Jar

Normec DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 250µm sieve

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Key:

~ Sample details are provided by the client and can affect the validity of the results

* -not accredited.

-MCERTS (accreditation only applies if report carries the MCERTS logo).

\$ -subcontracted.

n/s -not supplied.

I/S -insufficient sample.

U/S -unsuitable sample.

t/f -to follow.

nd -not detected.

End of Report Ver 25.03.07