



- Contaminated Land Appraisals
- Brownfield Remediation Solutions
- Site Investigation Services
- Earthworks Design and Control
- Flood Risk Assessments

Cape Site Services Ltd
Unit 2
Rear of Castle Buildings
Carlton Road
Carlton
Barnsley
S71 3HX

21st January 2019

Ref C311/02/GS

Dear Simon,

Ref: Shallow Mining Investigation on land adjacent to Glebe Farm, Barnsley Road, Silkstone, near Barnsley.

1. Introduction

On the instructions of Mr John Wooller, Cape Site Services Ltd (Cape) have carried out an intrusive mining investigation on land adjacent to Glebe Farm, Barnsley Road, Silkstone, near Barnsley. The work was carried out in support of the discharge of Condition No 12 of Barnsley Metropolitan Borough Council Planning Approval No 2017/1164. The proposed layout comprises three detached dwellings, as shown on Drawing No 0001-0001, dated 25th August 2017, prepared by Spawforths; a copy of which is presented in Attachment A of this report.

This investigation work was undertaken to provide information on the underlying ground conditions and assess the likelihood of historical shallow mine workings affecting the area of the dwelling. This report presents the findings of the investigation.

The site has been subject to a coal mining risk assessment (CMRA), prepared by ARP Geotechnical Ltd, details of which are summarised in Section 2 of this report and a full copy is presented in Attachment A. A review of the Coal Authority (CA) Interactive Map (<http://mapaps2.bgs.co.uk/coalauthority/home.html>), shows the site to lie within a 'development high risk area', however the same map only shows 'probable shallow coal mine workings' extending up to, but not beneath, the southern boundary of the site

The site is located to the north of Barnsley Road, on land adjacent to Glebe Farm, Silkstone, approximately 5km west of Barnsley town centre, South Yorkshire and is centred at National Grid Reference SE 292 059. The area under investigation currently comprises primarily agricultural land. The main fall in ground level is from west to east, also with a slight rise to the north. In general the increase in ground level across the site is about 3m. Barnsley Road runs to the south of the site, residences to the west, Glebe Farm to the north, and open fields to the east.

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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.

2. Background Information

2.1 Coal Mining Risk Assessment

The site, as a whole, has been subject to a coal mining risk assessment, Ref LCF/01/EGH, prepared by ARP Ltd, dated 28th July 2017. A brief summary of the CMRA is given below;

'The maps show the solid strata below the site to comprise sandstone of the Silkstone Rock, as part of the wider Pennine Lower Coal Measures Formation, which comprises undifferentiated sedimentary strata (mudstone, siltstone and minor sandstone), with no drift cover.'

'A northeast trending coal seam (Silkstone Coal) outcrops approximately 187m to the south-southeast of the site (91.4m AOD), but curves around as you move westwards for approximately half a kilometre, finishing up with a northwest trend. The general dip of the strata in the area is indicated to be 1 in 9 (6.5 degrees) to 1 in 12 (4.8 degrees) to the north-northeast, but could also be to a northwest direction; as a result the Silkstone Coal seam should underlie the site at a depth of between 15.8m (around 75.5m AOD) to 20.2m (71.2m AOD). The site lies at an elevation of approximately 91.4m to 94.5m AOD (similar elevation to the closest indicated Silkstone Coal outcrop, at the west of Silkstone Beck). The seam is indicated to be between 1.01m and 1.8m thick, and is known to have been extensively worked in the area.'

'The generalised Vertical Section on the geological map indicates that the next shallowest significant seam below the Silkstone Coal is the Blackband Coal, around 59m below. At such a depth, the Blackband Coal is not of concern for ground stability'

The CMRA states within the final section of the report that;

'It is a generally accepted that unless there is at least 10 times the seam thickness of rock cover above any workings, they have the potential to adversely affect ground stability on the site. Therefore, based on the indicated position of the Silkstone Coal seam outcrop and the site, and assuming a worst-case scenario seam dip of 1 in 12 (approximately 4.8 degrees) between the outcrop and the site, any mine workings present in the maximum 1.8m thick seam would occur around 16m depth. As a consequence, any such workings pose a risk to ground stability, as there is less than the required 18m thickness of competent rock above'

'It is therefore concluded that a rotary drilling investigation should be carried out to confirm the depth and thickness of the seam beneath the site, and any potential workings present'

According to the CA report which accompanied the risk assessment the site is within the zone of likely influence from recorded workings in two seams of coal at shallow to 70m depth and last worked in 1970. According to the CMRA, it was concluded that this comment refers to the Silkstone Coal and Blackband seams.

The CA has no knowledge of any mine entries within the site, or within 20m of the boundary of the property. However, it is acknowledged that their records may be incomplete and that there may exist in the local area, mine entries of which they have no record.

3. Fieldwork

The fieldwork, was carried out on the 15th and 16th January 2019. Three rotary open holes, referenced BH1 to BH3 were drilled to a maximum depth of 23.0 m below ground level (bgl), to allow logging of the soils and solid strata through examination of flush returns and rate of penetration of the drill bit.

The drilling works were undertaken by Cape using a Beretta T25 tracked rotary drilling rig and carried out under the Terms and Conditions of the CA Permission No 17174, a copy of which is presented in Attachment B of this report.

Drilling was initially progressed using 150mm diameter augers through the superficial soils, and cased into the underlying bedrock, to aid flush returns.

Drilling was undertaken using water flush. In accordance with the CA permission, the boreholes were monitored at surface for gases, during their advancement. The boreholes were backfilled on completion.

Selected photographs showing fieldwork progress are presented in Attachment D of this report.

The locations of the exploratory holes are shown below.



4. Ground Conditions

Topsoil up to 1.5m thick overlaid subsoils comprising 'clay brown/orange some sandstone lumps' (driller's description) which was recorded in all of the boreholes to depths of between 2.3 m and 3.5 m bgl. The subsoil was immediately underlain by a bedrock sequence, which predominantly comprised sandstone, with interlayers of mudstone encountered to the base of the boreholes. The driller recorded that the sandstone was 'very hard'. This stratum is recorded as a single continuous layer in BH2 and BH3 of between 12.1 m and 12.7 m in thickness. In BH1 the sandstone is recorded as 9.6 m in thickness, with an interbed of mudstone of 2.9 m thickness.

A single coal seam was encountered within the sequence, the drilling records indicate it to be of poor quality, as follows;

BH No	Depth (m)	Depth to Top of Bed (m bgl)	Thickness (mm)	Probable Seam
1	23	16.5	1200	Silkstone Coal
2	20	17.3	1200	Silkstone Coal
3	20	17.6	1200	Silkstone Coal

The exploratory hole records are presented in Attachment C of this report.

During the drilling, monitoring of methane, carbon monoxide, hydrogen sulphide and oxygen was undertaken at the borehole surface. No significant concentrations of methane, carbon monoxide or hydrogen sulphide were recorded, as detailed on the attached logs. Oxygen concentrations of between 21.2% and 21.8% were recorded during the works.

5. Conclusions/Recommendations

In accordance with the instructions issued by Mr John Wooller, an intrusive investigation has been carried out to investigate the possible mining legacy in the area of a proposed development of the site with three residential dwellings. The work was carried out in support of the discharge of Condition No 12 of Barnsley Metropolitan Borough Council Planning Approval No 2017/1164. The investigation comprised the drilling of three rotary open-hole boreholes, to a maximum depth of 23 m bgl.

The drilling works were carried out in accordance with the CA permission 17174.

The boreholes encountered subsoils up to a maximum thickness of 3.5 m bgl. A single seam of coal was encountered in all of the boreholes, at depths varying between 16.5 m and 17.6 m bgl, which is likely to represent the Silkstone Coal, within a sequence of predominantly overlying sandstone bedrock (shown on the geological maps as the Silkstone Rock). The thickness of coal was recorded as 1200 mm in each of the boreholes.

No evidence of soft (backfilled) or voided strata was recorded. Some loss of flush was noted during the drilling of borehole BH2, with losses being recorded at 9.5 m and 17.0 m bgl, however in both instances these were regained as drilling continued.

The driller records the coal as '*coal shale mix hard*' or '*coal some shale hard*', which may be representative of a poor quality coal.

Based on the evidence of the three boreholes drilled it does not appear that the site is adversely affected by shallow mine workings within 23 m of the ground surface of the locations investigated, that would warrant any further ground treatment.

Notwithstanding the above, for typical Coal Measures strata it is generally accepted that there is a risk of surface instability where the thickness of competent bedrock above any worked seam is less than ten times the seam thickness. Although it does not appear that any workings are present beneath the site, at the locations drilled, applying this rule in this instance then the predominantly sandstone bedrock above the coal is approximately 12 times seam thickness in all of the boreholes.

We trust this report and the attachments meet with your approval and are sufficient for your present needs. Your client should submit this document to the relevant regulatory bodies for their comment/approval prior to undertaking any development work.

Yours sincerely



Graeme Swinbourne

For and on behalf of **G&M Consulting Ltd**

Attachments



ATTACHMENT A – CMRA



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East Ardsley
Leeds
WF3 2AB

BY E-MAIL

Our Ref: LCF/01/EGH

28th July 2017

-- Dear Gavin

Barnsley Road, Silkstone
Coal Mining Stability Risk Assessment

In accordance with our commission, we are pleased to provide an assessment of the stability of the site with regard to coal mining. The site is located to the north of Barnsley Road, on the east side of the village of Silkstone, and the approximate site boundary is shown on the geological sketch and proposed development plans attached. It is proposed to construct three residential dwellings with private gardens.

Geology

The 1:10,560 scale geological map (Sheet SE20NW, Silkstone, Dodworth), and the latest British Geological Survey (BGS) electronic data at 1:50,000 scale, which is public sector information licensed under the Open Government Licence v2.0, have been used to assess the geology of the local area. The maps show the solid strata below the site to comprise sandstone of the Silkstone Rock, as part of the wider Pennine Lower Coal Measures Formation, which comprises undifferentiated sedimentary strata (mudstone, siltstone and minor sandstone), with no drift cover.

A fault is indicated approximately 17m to the southeast of the site, trending north-northeast – south-southwest, with the downthrow to the south-southeast. The fault may affect the site locally, around the south and southeastern corner. The proposed location for the plots may not be affected by the fault. According to the geological map, the general dip in the area is indicated to be 1 in 10 (approximately 5.74 degrees) to the northeast.

A northeast trending coal seam (Silkstone Coal) outcrops approximately 187m to the south-southeast of the site (91.4m AOD), but curves around as you move westwards for approximately half a kilometre, finishing up with a northwest trend. The general dip of the strata in the area is indicated to be 1 in 9 (6.5 degrees) to 1 in 12 (4.8 degrees) to the north-northeast, but could also be to a northwest direction; as a result the Silkstone Coal seam should underlie the site at a depth of between 15.8m (around 75.5m AOD) to 20.2m (71.2m AOD). The site lies at an elevation of approximately 91.4m to 94.5m AOD (similar elevation to the closest indicated Silkstone Coal outcrop, at the west of Silkstone Beck). The seam is indicated to be between 1.01m and 1.8m



thick, and is known to have been extensively worked in the area. An adit is shown to enter the Silkstone Coal, at 165m to the south-southeast of the site. Other adits and shafts are shown to enter the Silkstone Coal, and other coal seams, in the surrounding area. The Generalised Vertical Section on the geological map indicates that the next shallowest significant seam below the Silkstone Coal is the Blackband Coal, around 59m below. At such a depth, the Blackband Coal is not of concern for ground stability.

A second coal seam (Fourfoot Coal) is conjectured to outcrop at approximately 135m to the north of the site, curving from southeast to northwest trending, from 91.4m to 100m AOD. The general dip of the Fourfoot Coal is shown, in an adjacent fault block to the east, to be 1 in 5 (approximately 11.2 degrees) to the northeast. This direction is away from the property, and as a result the Fourfoot Coal should not underlie the site.

Coal Mining Stability and Coal Recovery

A Coal Mining Report (attached) was obtained from The Coal Authority. The Report is attached, and states that the property is in a surface area that could be affected by underground mining in two seams of coal at shallow to 70m depth, and last worked in 1970. This comment is concluded to refer to the Silkstone Coal and Blackband Coal seams identified earlier, which are likely to be present around 16m depth and 75m depth, beneath the site.

The property is not in an area which could be affected by present underground mining. The property is not in an area likely to be affected from any planned future underground coal mining. The report refers to reserves of coal which exist in the local area which could be worked at some time in the future.

There are no known coal mine entries, within, or within 20m of, the boundary of the property. However, there may be mine entries/additional mine entries in the local area which the Coal Authority has no knowledge of.

The site is not affected by any past, present, or future proposed, opencast coal mining. There are no known subsidence claims on or near the site.

Assessment of Coal Mining Instability - Conclusions

It is a generally accepted rule of thumb that unless there is at least 10 times the seam thickness of rock cover above any workings, they have the potential to adversely affect ground stability on the site. Therefore, based on the indicated position of the Silkstone Coal seam outcrop and the site, and assuming a worst-case scenario seam dip of 1 in 12 (approximately 4.8 degrees) between the outcrop and the site, any mine workings present in the maximum 1.8m thick seam would occur around 16m depth. As a consequence, any such workings pose a risk to ground stability, as there is less than the required 18m thickness of competent rock above.



Moreover, publically available local BGS borehole records (in the adjacent fault block to the east) indicate rockhead at between 2.6m (SE20NE116, thin band of brown weathered sandstone) and >6.55m (SE20NE111, dark grey ironstained weathered shaly mudstone); intact rock beneath the site will be reduced by these thicknesses.

It is, therefore, concluded that a rotary drilling investigation should be carried out to confirm the depth and thickness of the seam beneath the site, and any potential workings present. Such borehole investigations are usually carried out following the grant of planning permission, but before commencement of development. The planning permission will usually include a condition relating to the investigation and possible future treatment of mine workings.

The presence of underground workings is not a significant obstacle to development, and there are economical engineering solutions available. ARP provides advice on and designs such treatment solutions on a regular basis.

Coal is unlikely to be encountered within foundation excavations on the site and it is unlikely to be viable to remove any coal from the site by excavation prior to development.

There is a slight risk of unrecorded mine entries on the site. In our view, this does not require any investigative work to be carried out, but any suspect features uncovered during site clearance or excavations on the site, should be inspected by a Geotechnical Engineer.

We trust the above information is sufficient for your purposes, but if you have any queries, please do not hesitate to contact us, at your convenience.

Yours sincerely
for ARP GEOTECHNICAL LTD

E G Heatherington

Encs



Borehole BH1



Borehole BH3



ATTACHMENT B – COAL AUTHORITY PERMIT



The Coal
Authority

Permit to Enter or Disturb Coal Authority Mining Interests

Permit Reference Number 17174

Name and Address of Permit Holder:

*Hall Royd Homes Ltd
Hall Royd Lane
Silkstone Common
Barnsley
S75 4PP*

Site Location:

*Glebe Farm
Barnsley Road
Silkstone
Barnsley
S75 4JU*

This certificate hereby grants the above named Permit Holder a Permit to carry out:-

Ground investigation by four boreholes to 30m

within the Authority's mining interests at the identified site location for the period of 12 months from the granted date shown below. The granting of this Permit does not constitute advice given by the Authority in relation to the proposed operations. It is the Applicant's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.

Signed: *Helen Day* Granted Date: *21st December 2018*

For and on behalf of The Coal Authority

*Nominated Representative: Helen Day, Permitting Assistant Manager;
The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG
Tel: 01623 637339; E-Mail: permissions@coal.gov.uk*



ATTACHMENT C – DRILLING RECORDS



ATTACHMENT D – PHOTOGRAPHS



Borehole BH1



Borehole BH3