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

19th July 2019

Ref C300/03/ATS

Dear Simon,

Ref: Shallow Mining Investigation on Land Adjacent to 86A Burton Road, Barnsley South Yorkshire.

1. Introduction

On the instructions of Mr Simon Cooper, Cape Site Services Ltd have carried out an intrusive mining investigation on land adjacent to 86A Burton Road, Barnsley, South Yorkshire. The work was carried out in support of a planning application associated with the development of the site with a single residential dwelling.

Mr S Cooper had obtained a coal mining risk assessment prepared by Silkstone Environmental Ltd (SEL) in June 2017 Ref 17121/CMRA/0 which recommended an intrusive investigation.

The investigation work was undertaken to provide information on the underlying ground conditions and assess the likelihood of historical shallow mine workings affecting the site. G&M Consulting Ltd (G&M) was present on site during the fieldwork, and this report presents the findings of the investigation.

The site is located adjacent to 86A Burton Road in Barnsley, approximately 1km north-east of Barnsley town centre, South Yorkshire and is centred at National Grid Reference SE 354 073. The site lies on the northern side of the valley of the river Dearne. The site was historically undeveloped.

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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. CMRA

The CMRA prepared by SEL should be read in conjunction with this report. A summary of the conclusions from the CMRA are as follows:

- Based on information readily available and reviewed in this CMRA, past unrecorded shallow underground coal mine workings could potentially be present at shallow depths (up to 30m) below the site in the Meltonfield and Two Foot seams. The Coal Authority has therefore identified the site as lying within a "*Development High Risk Area*" (see figure 2), which has the potential for instability or a degree of risk at the surface from legacy coal mining issues.

- Although 1989 site investigations proved no old workings in the Meltonfield (6 locations) and Two Foot (2 locations) seams across part of the review area, the south and eastern sides of the site have no coverage to confirm these trends continue to the east/southeast which lie within an area identified by the Coal Authority as high risk.

- It is recommended that two shallow boreholes be drilled on the eastern side of the site to a target depth of 30m to identify the presence/absence of the shallow old workings which the Coal Authority records as being potentially present on site. These holes should be drilled under a Coal Authority licence utilising water flush methods, with gas monitoring during drilling due to the close proximity of residential properties.

3. Geology

Based on a review of the geological map (Sheet No 87 – 1:50,000) the site is shown to be underlain by strata of the Pennine Middle Coal Measures. The coal measure strata comprises an interbedded sequence of sandstone, siltstone and mudstone with subordinate beds of coal, ironstone and seat earths. A named sandstone the Woolley Edge Sandstone is shown to directly underlie the site.

The Meltonfield (MD) and Two Foot (TF) coal seams are shown to outcrop to the west of the site, in the valley side. The outcrops are shown parallel and generally trending from north-west to south-east.

Where dips are indicated on the geological map, these are locally shown approximately 4° towards the north east, such that these two seams would dip beneath the site and are therefore likely to be present at shallow depth.

Based on the stratigraphic column presented on the geological map the MD varies in thickness between 0 m and 1.4 m and the TF seam between 0.1 m and 2.1 m. The BGS memoir – 'Geology of the country around Barnsley: Explanation of sheet 87 1947' – records the thickness between the MD and TF coal seams to be 35ft (10.60m). The CA interactive map shows adits, presumably associated with these seams in the valley side south of the site.

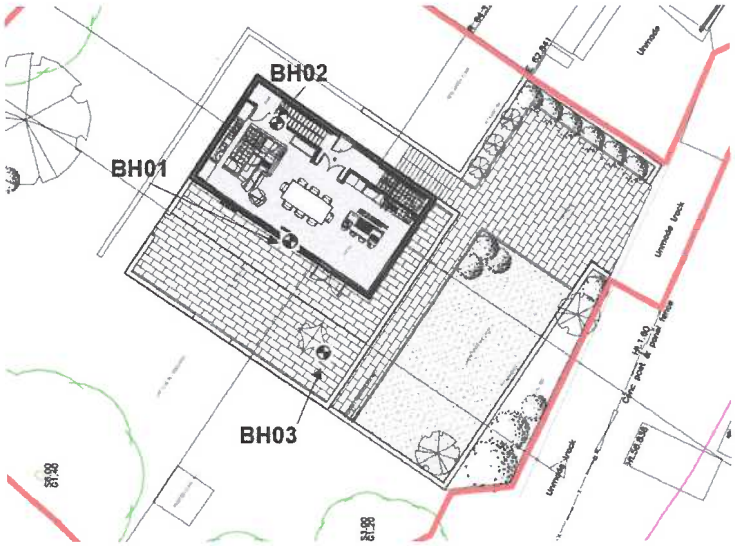
4. Fieldwork

The fieldwork, was carried out on the 27th of June 2019. Three rotary open-holes, referenced BH1 to BH3 were drilled to a maximum depth of 27 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. Drilling was initially progressed using 150mm diameter augers through the superficial soils, and a casing set into the underlying bedrock, to aid flush returns.

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 Coal Authority Permission No 17077, a copy of which is presented in Attachment A of this report.

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

The locations of the exploratory holes are shown below.



5. Ground Conditions

At the time of the investigation a site strip had been carried out with an excavation into the slope to form a bench. The boreholes were drilled on this bench. A coal seam had been exposed in the rear face of the excavation, it was recorded at 1100mm thick. This is presumed to be the Meltonfield Coal. A photograph pf the exposed seam within the face of the excavation is presented in Attachment C of this report.

All the boreholes commenced in brown sandstone, which formed the base of the bench. The sandstone was proved to a depth of between 1.9 m and 2.2 m bgl. It was underlain by a sequence of mudstone with thin sandstone bands and up to three coal seams being proven. The drilling flush was lost at a number of depths in all three holes, The seams and depth of flush lost are summarised in the following table.

Borehole No	Depth to Top of Coal/Loss (m bgl)	Depth to Base of Coal/Loss (m bgl)	Thickness (mm)	Seam/Comment
BH1	11.8	12.9	1.1	Two Foot
	16.7	16.9	0.2	Unnamed
	17.3	17.8	-	(Flush loss)
	19.5	20.0	0.5	Unnamed
	26.5	26.9	-	(Flush loss)
BH2	4.0	4.5		(Flush loss)
	12.3	13.4	1.1	Two Foot
	14.0	16.0	-	(Flush loss)
BH3	3.30	3.50	-	(Flush loss)
	11.2	12.1	0.9	Two Foot
	16.2	16.3	0.1	Unnamed
	19.5	20.0	0.5	Unnamed
	26.9	-	-	(Flush loss)

Intact coal was encountered in all three holes. Flush loss was noted in all three boreholes above one or more of the seams. Also, more notably, flush was lost below the deepest seam in BH1 and BH3. No voids were encountered and no loss of resistance to drilling noted, although fractured ground was recorded at some locations where flush was lost.

The exploratory hole records are presented in Attachment B 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 20.9% and 21.2% were recorded during the works.

6. Conclusions/Recommendations

In accordance with the instructions issued by Mr Simon Cooper, an intrusive mining investigation was carried out, which comprised the drilling of three rotary open-hole boreholes on the site. It is understood that the proposed development of the site is for residential purposes, comprising the construction of a new dwelling.

The drilling works were carried out in accordance with the CA permission 17077.

While flush was lost within the boreholes, no evidence of voided strata was noted during the drilling. Where flush was lost resistance to drilling was still encountered, although fractured ground was recorded by the driller in places associated with the flush loss.

Two thick seams of intact coal were recorded in borehole BH1 and BH3, with one seam recorded in borehole BH2 which was abandoned due to loss of flush.

Based on the geological records it is considered likely that the seam seen to outcrop on the site, and exposed within the excavation face of the bench, is the Meltonfield coal and the shallowest coal seam encountered in the boreholes is probably the Two Foot seam. The thickness of strata recorded between the two seams in the Geological Memoir is 10.6 m. The thickness recorded on site is 11.2 m to 12.3 m. If the shallow seam is the Two Foot then the deeper seams encountered are not recorded in the stratigraphic column and are assumed to be unnamed.

The loss of flush and fractured ground encountered in the boreholes could be due;

- shallow workings within the two (thicker) coal seams (although no voids were noted)
- fractured ground due to deeper workings within the general Barnsley area, or,
- fractured ground due to cambering of the valley sides within the competent rock underlying the site.

The loss of flush at the base of the two deeper boreholes would indicate that the fracturing extends deeper than the 27 m drilled and is most likely due to the latter two above.

If the shallower fractured ground is associated with shallow mine workings then it would be associated with the Two Foot coal seam which is proven in all the boreholes up to 1.1 m thick. As a general rule of thumb (10x seam thickness), a 1.1 m thick seam would need to have 11 m or less of competent rock cover for workings to affect the surface. The seam encountered is at a depth of 11.2 m. The shallowest seam is therefore at the limit of the rule of thumb, which should not be considered a precise tool, and could still be within influencing distance of the surface. Other factors should be taken into account. Sandstone is present beneath the site at shallow depth with a thickness of between 1.9 m and 2.0 m, no voids were encountered and full resistance to drilling was recorded. The presence therefore of any shallow mine workings affecting the development is considered low.

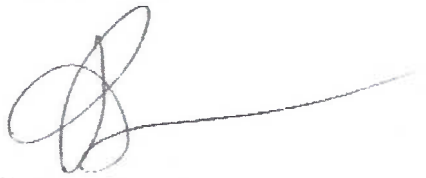
However, given the presence of fractured ground, it is considered prudent to place reinforcement within the foundations such that any zones of weakness can be spanned without any detrimental effect on the property. The foundations should be designed by a suitably qualified structural engineer.

Whilst no mine entries are shown in the area, there is a possibility, although considered to be very low, of a shaft or adit, as the coal is relatively shallow beneath the site. It is therefore recommended that a watching brief is maintained during the development work, and that all natural surfaces exposed during construction of the foundations are examined by a suitably qualified person, for evidence of such entries.

The coal exposed at the rear of the excavated bench should be blinded with concrete to prevent the possibility of spontaneous combustion.

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 local authority for their comment/approval prior to undertaking any development work.

Yours sincerely



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

Attachments

ATTACHMENT A – COAL AUTHORITY PERMIT

The Coal Authority

Permit to Enter or Disturb Coal Authority Mining Interests

Permit Reference Number 17077

Name and Address of Permit Holder:

Simon Cooper
86A Burton Road
Barnsley
S71 2AA

Site Location:

Land at
86A Burton Road
Barnsley
S71 2AA

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

***A ground investigation comprising three boreholes to 30m or as required to determine the presence of shallow mine workings/coal seams and the risk posed to development at the surface as required by national planning policy all* 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: Leigh Sharpe Granted Date: ***05/12/2018***

For and on behalf of The Coal Authority

Nominated Representative: Leigh Sharpe, Permitting Manager;
The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG
Tel: 01623 637229; E-Mail: permissions@coal.gov.uk

ATTACHMENT B – EXPLORATORY HOLE RECORDS

Client: Simon Cooper	Site: 86A Burton Road Barnsley S71 2AA	Cape Site Services Ltd Unit 2, Rear of castle buildings, Carlton Road, Barnsley, South Yorkshire, S71 3HX	
Date: 27/06/2019	METHOD Rotary Water Flush		

Measurements In Meters

BH no	FROM	TO	THICKNESS	Description
1				
	0.0	2.0	2.0	Sandstone brown
	2.0	8.0	6.0	Mudstone grey brown odd sandstone bands
	8.0	11.8	3.8	Mudstone dark grey silty
	11.8	12.9	1.1	Coal
	12.9	13.5	0.6	Mudstone grey silty
	13.5	16.7	3.2	Mudstone dark grey silty
	16.7	16.9	0.2	Coal
	16.9	17.3	0.4	Mudstone dark grey
	17.3	17.8	0.5	Lost water and returns fractured
	17.8	19.0	1.2	Solid no returns
	19.0	19.5	0.5	Mudstone dark grey water back
	19.5	20.0	0.5	Coal
	20.0	27.0	7.0	Mudstone grey fractured at 26.5-26.9m lost water and returns
2				
	0.0	2.2	2.2	Sandstone brown
	2.2	4.0	1.8	Mudstone grey brown odd sandstone bands
	4.0	4.5	0.5	Lost water and returns
	4.5	8.4	3.9	Mudstone grey brown odd sandstone bands
	8.4	12.3	3.9	Mudstone dark grey silty
	12.3	13.4	1.1	Coal
	13.4	14.0	0.6	Mudstone grey silty
	14.0	16.0	2.0	Mudstone dark grey silty lost water stopped
3				
	0.0	1.9	1.9	Sandstone brown
	1.9	3.3	1.4	Mudstone grey brown odd sandstone bands
	3.3	3.5	0.2	Lost water no returns solid
	3.5	7.7	4.2	Mudstone grey brown odd sandstone bands
	7.7	11.2	3.5	Mudstone dark grey silty
	11.2	12.1	0.9	Coal
	12.1	12.5	0.4	Mudstone grey
	12.5	16.2	3.7	Mudstone dark grey silty
	16.2	16.3	0.1	Coal
	16.3	20.0	3.7	Mudstone dark grey fractured at 18.0m some water lost
	20.0	20.5	0.5	Coal
	20.5	27.0	6.5	Mudstone grey fractured at 26.9m lost water and returns

Driller Ian Wiles	Driller's Assistant Simon Fish
Driller's Signature I Wiles	Page ……1…… of ……1……

ATTACHMENT C – PHOTOGRAPH

Exposure of probable Meltonfield Coal seam in excavation face