

Coal Mining Risk Assessment

**PROPOSED NEW UNIT
DAVIES INDUSTRIAL ESTATE
WAKEFIELD ROAD
BARNSELY**

for

Nu Look Flooring Limited/Mr. P. Fletcher

Report Number 4381

May 2024



Michael D Joyce Associates LLP
Geotechnical and Geoenvironmental Consultants

Charnock Court 6 South Parade Wakefield West Yorkshire WF1 1LR UK
T +44(0)1924 360458 **F** +44(0)1924 386535 **E** mdja@geoenvironmental.co.uk **W** www.geoenvironmental.co.uk

Coal Mining Risk Assessment

PROPOSED NEW UNIT, DAVIES INDUSTRIAL ESTATE, WAKEFIELD ROAD, BARNSELY

Contents

- 1.** Introduction
- 2.** The Site
- 3.** Geology and Mining
- 4.** Conclusions and Recommendations

Figures

- Figure 1 Existing Site Plan and Development Proposals

Appendices

- Appendix 1 Consultant's Coal Authority Mining Report
- Appendix 2 Existing BGS Borehole Record
- Standard Appendix A

1 INTRODUCTION

1.1 At the request of Mr. P. Fletcher, acting on behalf of Nu Look Flooring Limited, a Coal Mining Risk Assessment has been carried out on part of Davies Industrial Estate in Barnsley. It is proposed to construct a small industrial unit in the northeastern corner of the estate.

1.2 The assessment has not included other desk study research and no structural or asbestos surveys have been carried out.

2 THE SITE

- 2.1 The site of the proposed industrial unit lies in the northeastern corner of Davies Industrial Estate, just to the west of Wakefield Road, and approximately 2km north of the centre of Barnsley. The Ordnance Survey National Grid Reference is E434935, N408580. Figure 1 shows the location and the proposed development.

3 GEOLOGY AND MINING

3.1 Geology

3.1.1 Maps of the British Geological Survey (BGS), show the site to be underlain by Undifferentiated mudstones, siltstones and sandstones of the Carboniferous Pennine Middle Coal Measures.

3.1.2 There are no drift deposits shown on the geological maps. A geological fault is recorded to the northwest of the site, but it does not affect the site itself.

3.2 Mining

3.2.1 Davies Industrial Estate was originally part of Primrose Main Colliery with the main colliery building originally a short distance to the west. The geological maps show the proposed unit to lie approximately above the outcrop of the Two Foot Coal Seam. This seam is in turn underlain by the Winter (Abdy) Coal and the Beamshaw Coal seams.

3.2.2 As such, the site lies within a “Development High Risk Area” as defined by the Coal Authority. A Consultant’s Coal Mining Report has been obtained from the Coal Authority, and is reproduced in Appendix 1.

3.2.3 According to the geological memoir, “Geology of the Country around Barnsley”, published in 1947, the following applies to these seams.

- 3.2.4 The Two Foot Coal, which as its name implies, was around two feet (0.6m) in thickness. According to the memoir, it was only occasionally worked in the area north of Barnsley.
- 3.2.5 Below the Two Foot Coal is the Winter Coal, also known as the Abdy Coal. To the north of Barnsley, it is recorded to be around 1m in thickness.
- 3.2.6 The Two Foot and Winter are separated by the Abdy Rock (sandstone), which is either absent or very thin in the area, according to the memoir.
- 3.2.7 The Beamshaw Coals underlie the Winter Coal. This typically consists of two seams of coal, namely the Top and Low Beamshaw Coals. The separation between the two varies, but around Royston and Carlton there is a very thin separation. The memoir states that the Low Beamshaw was the more valuable seam with a thickness of between 0.60m and 0.90m.
- 3.2.8 By contrast, the shaft record for the former East Gawber Hall Colliery (just to the northwest of Monk Bretton) records the Top Beamshaw to be 1.20m thick, and 13m below the Winter Coal. The Low Beamshaw is recorded as very thin and worthless here.
- 3.2.9 Clearly, the thickness and quality of the Beamshaw Coal varies considerably in the area, and is in fact recorded to have virtually disappeared in Barnsley itself.
- 3.2.10 The Coal Authority Consultant's Report states that it is probable that shallow unrecorded mineworkings exist below the site. The report records the Winter (Abdy) Coal as outcropping approximately 30m to the west, and dipping below the

site at shallow depth. Older geological maps record the dip to be 11° to the northeast.

3.2.11 This suggests that the Coal Authority consider the Two Foot Coal to lie to the east of the site, such that it does not affect it.

3.2.12 Borehole records held by the British Geological Survey have also been consulted. Borehole R2 was drilled to the opposite side of Wakefield Road in 1987. The full record and location is attached in Appendix 2.

3.2.13 This borehole records a possible very thin band of “broken” coal at 4.50m, and it is possible that either underground working or opencasting of this coal has taken place. “Old workings” are recorded between 18.20m and 18.65m depth, with intact coal between 27.50m and 27.85m, and 28.15m and 28.45m. It is probably that the “old workings” coincide with the Winter Coal, whilst the two deeper seams are the Top and Lower Beamshaw. The upper broken coal would therefore have been the Two Foot Coal.

3.2.14 The Coal Authority Report also record a number of shafts and adits in the vicinity of the site. In particular, two adits are recorded on the outcrop of the Winter Coal, suggesting this seam was worked from the surface via adits.

3.2.15 The nearest adit to the site lies approximately 15m to the north. The nearest shaft lies approximately 20m to the east, under the opposite side of Wakefield Road. As such, these are too distant to affect the study site.

3.2.16 Although no shafts or adits are recorded on the study site, the possibility of unrecorded shafts or adits being present cannot be precluded.

3.2.17 The Coal Authority report recorded none of the following below, or in the immediate vicinity of the site.

- Spine Roads at shallow depth
- Geological faults, fissures or breaklines
- Coal Authority managed tips
- Remediated sites
- Coal Mining subsidence
- Mine Gas
- Minewater Treatment Schemes
- Future underground mining
- Coal Mining Licensing
- Court Orders
- Section 46 Notices
- Withdrawal of Support Notices
- Payments to owners

4 CONCLUSIONS AND RECOMMENDATIONS

- 4.1 It is concluded that the site is underlain by the Winter Coal and Beamshaw Coals at shallow depth. The presence of shallow mineworkings could affect surface stability, and such workings cannot be precluded at present. An intrusive investigation will therefore be required to establish or exclude any workings that are at a sufficiently shallow depth that they could affect surface stability at a later date.
- 4.2 It is therefore recommended that rotary openhole drilling is carried out in respect of any shallow workings and possible opencast workings. It is envisaged that one or two days of drilling will be sufficient at this stage, depending upon the findings. It is recommended that supervision of the drilling is carried out by a Chartered Geologist or Chartered Engineer. It should be noted that a licence will be required from the Coal Authority prior to carrying out this work.

A D Joyce

BSc MSc ARSM CEng CGeol CEnv MICE FGS SiLC SQP

May 2024

This report is subject to the provisions of the Copyright Acts and is for the sole benefit of Nu Look Flooring Limited and Mr. P. Fletcher in respect of a Coal Mining Risk Assessment of the site. The report cannot be assigned to, or relied on, by any other party without prior permission.

Procedure Notes

The desk study and/or ground investigation have been carried out using reasonable skill and care in accordance with the principles of Ground Investigation and Testing", BS5930: 2013 and BS10175:2011+A1:2013, and the terms of the client's brief. The report has been prepared for the specific purposes notified at the time of the initial enquiry.

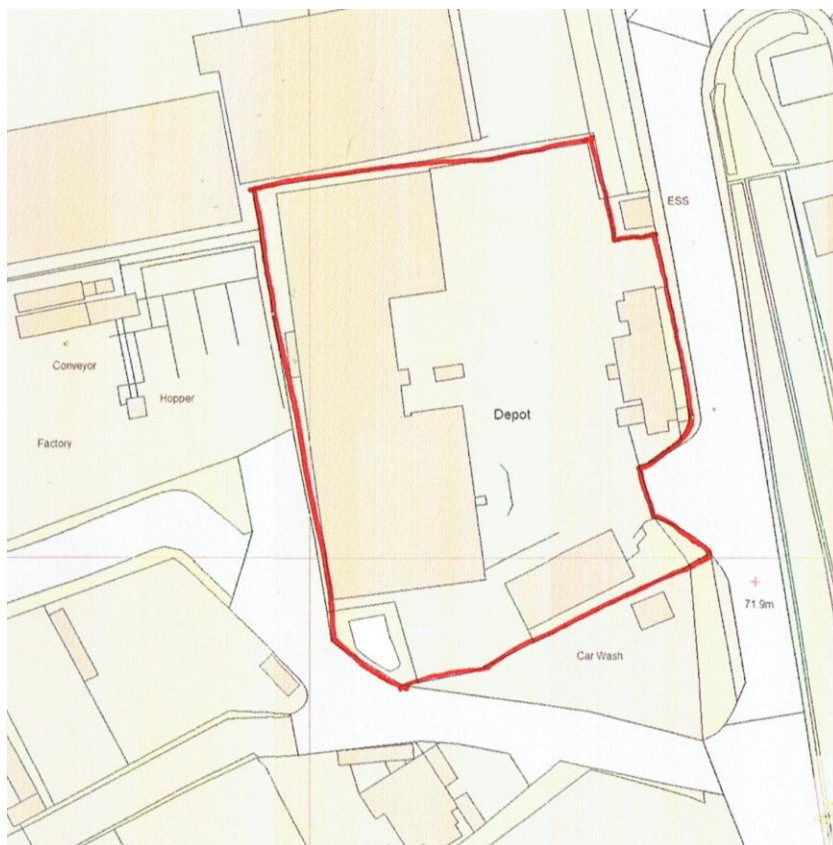
By its very nature any ground investigation only encounters and samples a small percentage of the ground. Consequently changes in ground conditions and soil properties can occur between any two exploratory points, for example local features such as soft ground, pockets of contamination and faults. This is also true of the exploration of mineworkings and such features can extend beneath parts of the site not investigated. Unrecorded bell pits and shafts can also exist between exploratory points. The ground investigation is designed to minimize such risks. Conclusions and recommendations are based on the information presented in this report, but unforeseen features may exist. No liability can be accepted for conditions not revealed by the exploratory holes. Therefore, actual ground conditions should be noted during construction and further advice sought if they differ from those predicted. Michael D. Joyce LLP reserves the right to amend the conclusions and recommendations in the light of further information. Actual methods of construction or alternative designs should be notified to Michael D. Joyce Associates LLP, such that the recommendations made can be reconsidered in the light of any changes.

Further investigation can be carried out to further reduce uncertainty and risk but ultimately these risks cannot be eliminated. Similarly a desk study normally only considers readily available information and further information could be held by other sources. In commissioning further research or investigation the cost/benefit of doing so must be considered.

It is assumed that groundlevels will not change significantly from those at present. The groundwater conditions are based on observations made at the time of the investigation, unless stated otherwise. It should be noted that the observations are subject to the method of the boring or excavation and that groundwater levels will vary due to seasonal or other effects.

Where buildings are present on a site, structural and asbestos surveys have not been carried out, unless specifically stated. An Unexploded Ordnance Survey has not been carried out unless specifically stated. In relevant situations it would be prudent to commission such surveys.

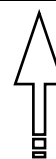
Where information has been obtained from Third Parties, no liability can be accepted for the accuracy or completeness of this information. Where anecdotal evidence or speculations are presented, they must be treated as such and cannot be relied upon.



Davies Industrial Estate, Wakefield Road, Barnsley
 Site Location (Davies Industrial Estate) and Development Proposals

Michael D Joyce Associates LLP
 Geotechnical and Geoenvironmental Consultants

Reproduced from the
 Ordnance Survey Map with
 the permission of the
 controller of Her Majesty's
 Stationery Office. Crown
 copyright reserved.
 Licence No. AL 100004970



Scale: NTS

Figure: 1

APPENDIX 1

Consultant's Coal Authority Mining Report



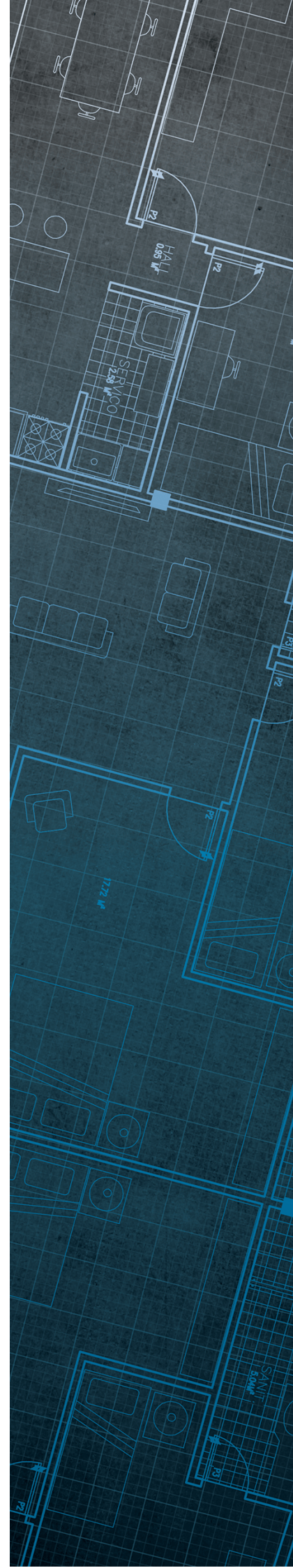
The Coal
Authority

Consultants Coal Mining Report

Wakefield Road, Barnsley
South Yorkshire

Date of enquiry: 13 May 2024
Date enquiry received: 13 May 2024
Issue date: 13 May 2024

Our reference: 51003423855001
Your reference: GS-5Y8-3ND-OTR-DFM



Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

GROUNDSURE LIMITED

Enquiry address

Wakefield Road, Barnsley
South Yorkshire

How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com



 @coalauthority



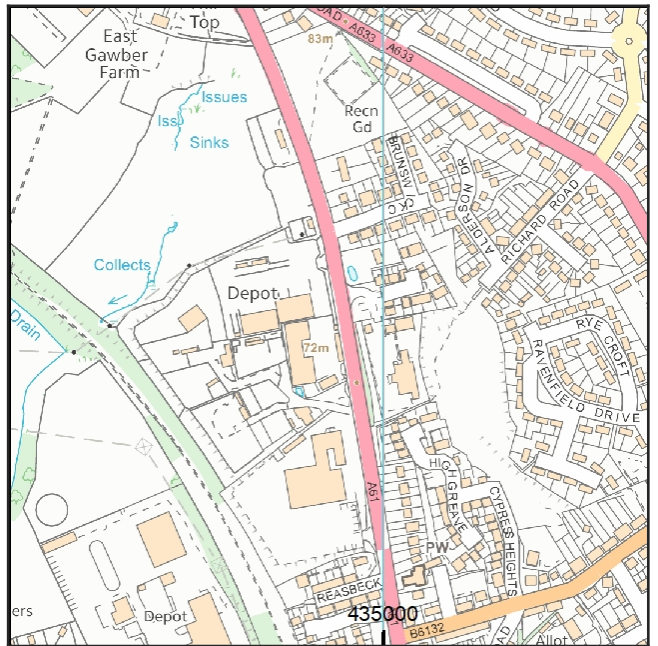
in /company/the-coal-authority



f /thecoalauthority



 /thecoalauthority



Approximate position of property



Reproduced by permission of
Ordnance Survey on behalf of
HMSO. © Crown copyright and
database right 2018. All rights
reserved.

Ordnance Survey Licence number: 100020315

Section 1 – Mining activity and geology

Past underground mining

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	BARNSLEY	Coal	637Q	140	Beneath Property	2.9	North-East	282	1867
unnamed	TOP HAIGH MOOR	Coal	637U	206	Beneath Property	2.0	North-East	84	1927
unnamed	TOP HAIGH MOOR	Coal	637X	206	South-East	2.1	North	84	1930
unnamed	LIDGETT	Coal	6387	238	Beneath Property	2.5	East	81	1950
unnamed	FENTON	Coal	638E	338	Beneath Property	2.9	North-East	145	1963

Probable unrecorded shallow workings

Yes.

Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

Mine entries

Entry type	Reference	Grid reference	Treatment description	Mineral	Conveyancing details
Shaft	434408-004	434902 408580		Coal	
Adit	434408-005	434918 408638		Coal	
Adit	434408-013	434881 408552		Coal	
Adit	434408-014	434887 408534		Coal	
Shaft	434408-015	434967 408563		Coal	
Shaft	434408-016	434986 408530		Coal	
Shaft	434408-019	434875 408601		Coal	
Adit	434408-024	434931 408578		Coal	
Shaft	434408-025	434988 408625	Mine entry removed during development for 205, Wakefield Road.	Coal	
Adit	434408-026	434978 408614	Mine entry removed during development for 205, Wakefield Road.	Coal	
Adit	435408-001	435025 408611	was completely removed by excavation prior to development by Sirius consulting engineers for Portford Homes in 2006	Coal	
Shaft	435408-012	435028 408597	was completely removed by excavation prior to development by Sirius consulting engineers for Portford Homes in 2006	Coal	
Adit	435408-013	435040 408561		Coal	

Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

7396	1659	6190
M253	NE535	M363
NE534	8888	DN45

Our records show we have more plans than those shown above which could affect the enquiry boundary.

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

Seam name	Mineral	Seam workable	Distance to outcrop (m)	Direction to outcrop	Bearing of outcrop
WINTER	Coal	Yes	31.8	South-West	148

Geological faults, fissures and breaklines

No faults, fissures or breaklines recorded.

Opencast mines

Please refer to the “Summary of findings” map (on separate sheet) for details of any opencast areas within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

Distance to site investigation (m)	Direction
30.4	North-East

See Section 4 for further information.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

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 31 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.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

Section 3 – Licensing and future mining activity

Future underground mining

None recorded.

Coal mining licensing

None recorded within 200 metres of the enquiry boundary.

Court orders

None recorded.

Section 46 notices

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Section 4 – Further information

The following potential risks have been identified and as part of your risk assessment should be investigated further.

Future development

If development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply specialist engineering practice required for former mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or coal mines without first obtaining the permission of the Coal Authority.

MINE GAS: Please note, if there are no recorded instances of mine gas within 500m of the enquiry boundary, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded. Developers should be aware that the investigation of coal seams, mine workings or mine entries may have the potential to generate and/or displace underground gases. Associated risks both to the development site and any neighbouring land or properties should be fully considered when undertaking any ground works. The need for effective measures to prevent gases migrating onto any land or into any properties, either during investigation or remediation work, or after development must also be assessed and properly addressed. In these instances, the Coal Authority recommends that a more detailed Gas Risk Assessment is undertaken by a competent assessor.

Development advice

The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.

Site investigations

The site is within an area of previous interest. It is close to where the Coal Authority has received information relating to past site investigations.

The site requires further investigation and may influence how you approach your risk assessment.

For further information on specific site or ground investigations in relation to any issues raised in Section 4, please call us on 0345 762 6848 or email us at groundstability@coal.gov.uk.

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk**.

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission. Please note, if there are no recorded instances of mine gas reported, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded.

Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

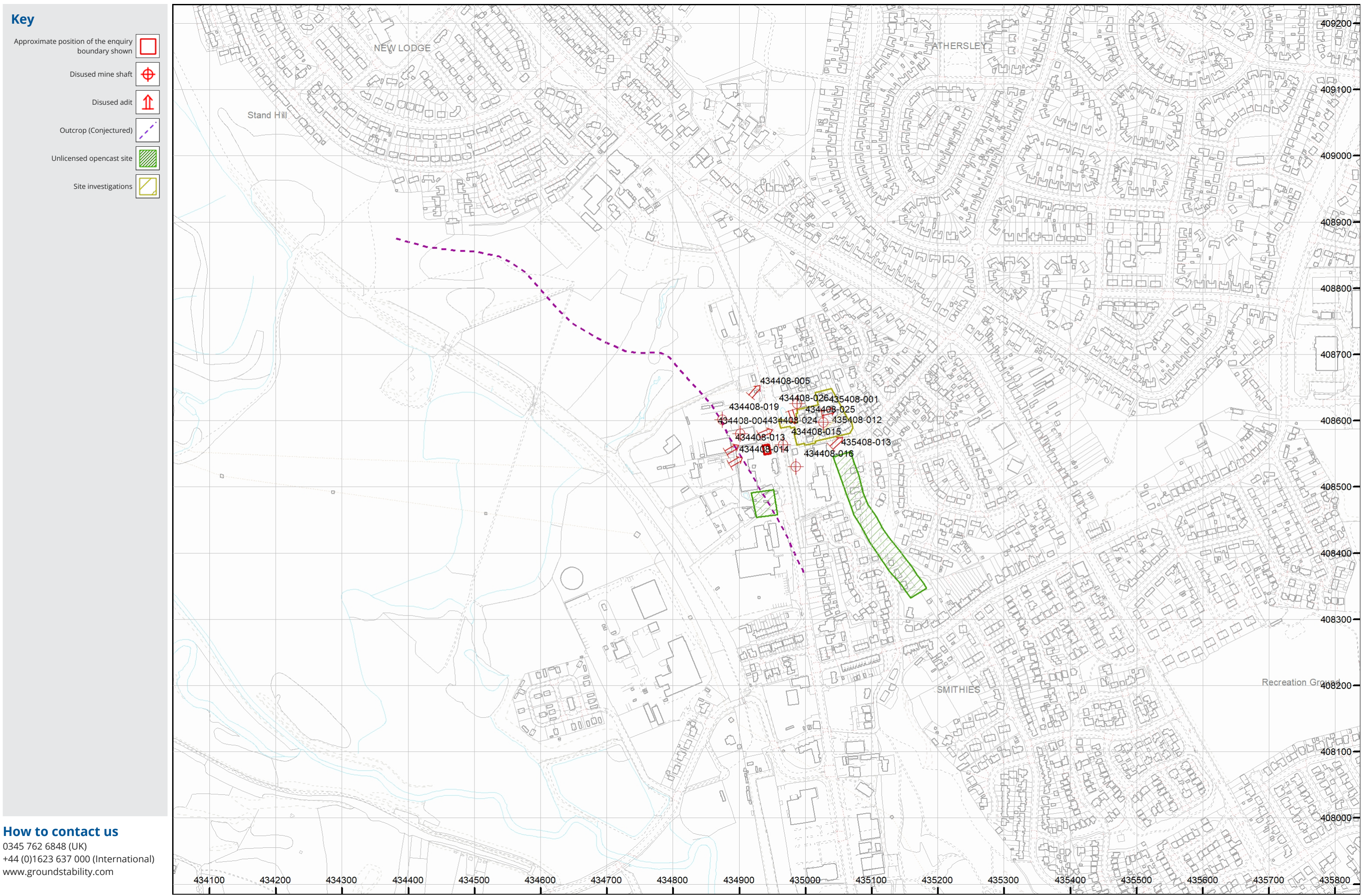
Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

The map highlights any specific surface or subsurface features within or near to the boundary of the site.



APPENDIX 2

Existing BGS Borehole Record

[illegible]



Norwest Holst Soil Engineering Ltd.						Borehole No. R2	
BOREHOLE LOG						NOT SITED	
Contract No. F7637						Sheet 2 of 3	
Location Wakefield Road - Barnsley						Chainage	
Client Kitson & Partners						Ground Level 47.35 m.A.O.D.	
Method of Boring Rotary Core						Date 17/9/87	
Diameter of Borehole 110mm							

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.O.D. %	Daily Progress
Mudstone continued	x				TCR SCR RQD		
Black carbonaceous MUDSTONE, brown Iron cemented bands, bivalves and fish scales. Core very broken.	x	11.00	36.4		10.70		
	x	11.46	35.9		29 0 0		
Grey to light grey, slightly silty shaly MUDSTONE with impersistent bands and laminea of light grey siltstone sporadic near vertical iron-stained joints to 12.50m, mainly closed below	x				11.40		
	x				64 20 10		
	x				12.50		
	x				71 8 0		
	x	13.30	34.1				
Grey, slightly silty slightly shaly massive MUDSTONE, smooth below 15.40m, with bands which crush during drilling closed near vertical joints fairly abundant throughout. Occasional bivalve fragments	x				13.90		
	x				67 10 0		
	x				15.40		
	x				50 0 0		
	x	16.40	31.0				
Grey to dark grey slightly silty, shaly MUDSTONE, numerous open brown iron-stained near vertical joints.	x				16.40		
	x				47 11 0		
OLD WORKINGS fragments of black mudstone grey seatearth mudstone & coal	x						
Grey silty MUDSTONE SEATEARTH crushed at the top.	x	18.20	29.2				
Grey silty MUDSTONE beds with plants and roots.	x	18.65	28.7		18.30		
	x	18.90	28.5		93 33 20		
Grey very silty MUDSTONE interbedded with light grey well cemented leached siltstone. Impersistent slumped bedding.	x	19.20	28.2				
	x				19.80		

Type of Sample Is S.P.T. Undisturbed Ic. C.P.T. X Vane O Jar Δ Water ● Bulk Piezometer	Remarks (Observations of Ground Water etc.) Water levels are subject to seasonal or tidal variations and should not be taken as constant
---	--



Norwest Holst Soil Engineering Ltd.							Borehole No.	
BOREHOLE LOG							R2	
Contract No. F7637							NOT SITED	
Location Wakefield Road - Barnsley							Sheet 3 of 3	
Client Kitson & Partners							Chainage	
Method of Boring Rotary Core							Ground Level 47.35 m.A.O.D.	
Diameter of Borehole 110mm							Date 17/9/87	
Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.Q.D.%	Daily Progress	
Mudstone continued - occasional closed near vertical joints	X				TCR SCR RQD			
	X				83 57 40			
	X							
	X							
	X				22.80			
	X				91 30 14			
	X							
	X							
	X				25.00			
	X				96 25 9			
	X							
	X							
Grey to dark grey MUDSTONE with thin beds of light grey siltstone	X							
COAL, bright, vitrinous	X	27.20	20.2					
Grey massive MUDSTONE SEATEARTH coal laminae listric surfaces		27.50	19.9					
		27.85	19.5					
COAL, bright, vitrinous		28.15	19.2		27.80			
Light grey, compact well cemented MUDSTONE SEATEARTH, beds with a green hue, ironstone nodules, sporadic near vertical closed unstained joints.		28.45	18.9		90 40 18			
		29.80	17.6					
					29.80			

Type of Sample	Remarks (Observations of Ground Water etc.)
Is S.P.T. Undisturbed	
Ic. C.P.T. X Vane	
O Jar Δ Water	
● Bulk Piezometer	

Water levels are subject to seasonal or tidal variations and should not be taken as constant



Norwest Holst Soil Engineering Ltd.						Borehole No. 2	
Contract No. F7637		BOREHOLE LOG		Sheet 1 of 1			
Location Barnsley - Wakefield Road				Chainage			
Client Kitson & Partners				Ground Level 47.35 m.A.O.D.			
Method of Boring Percussion				Date 9/9/87			
Diameter of Borehole 150mm							
Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.O.D.%	Daily Progress
BITUMINOUS SURFACING		0.10	47.3				
CONCRETE		0.50	46.9		0.50	16	
MADE GROUND: Clay and brick rubble					1.50	11	
		2.10	45.3		2.10		
MADE GROUND: Black silty clay with sandstone fragments		2.40	45.4		(150)		
Completely to highly weathered brown and grey clayey MUDSTONE					3.10		
					(150)		
					4.60	No Recovery	
					(150)		
					5.10	94	
		5.60	41.8				

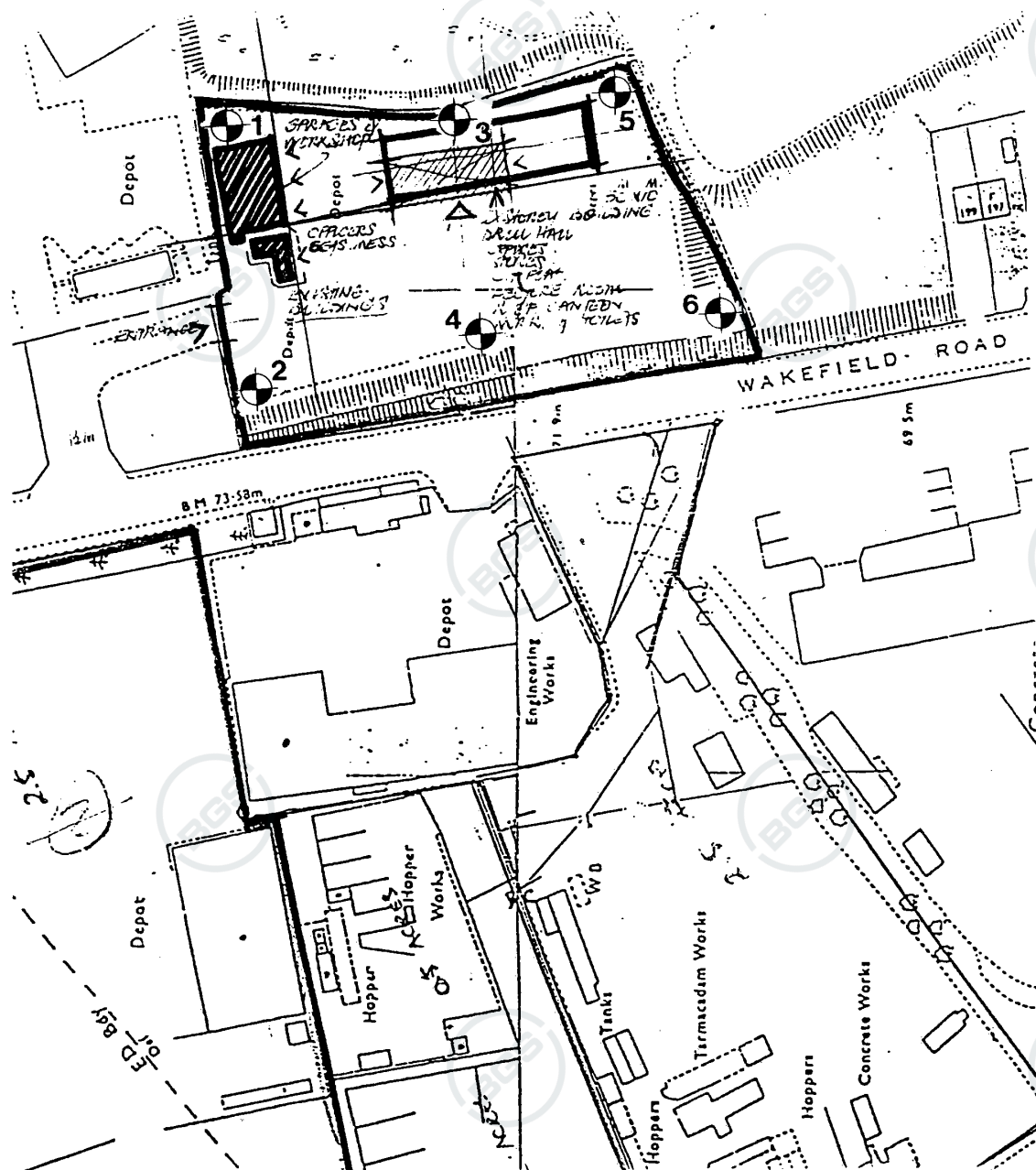
Type of Sample	Remarks (Observations of Ground Water etc.)
☒ S.P.T. ☒ Undisturbed	() - U100 blows
☒ C.P.T. ☒ Vane	Groundwater not encountered
☒ Jar ☒ Water	
☒ Bulk ☒ Piezometer	

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd

Client: KITSON & PARTNERS

Location: WAKEFIELD ROAD, BARNSELY



N.B. Positions of Boreholes and/or Trial Pits are only indicative unless dimensioned.

Contract No, F7637

GROUND INVESTIGATION

Fig No.

BOREHOLE LOCATION PLAN

1

STANDARD APPENDIX A

1. **GENERAL.** The ground investigation has been carried out in accordance with the requirements of BS5930: 2015 and A1: 2020 and BS10175: 2011+A1: 2017. By its very nature, any ground investigation only samples a small percentage of the ground. Consequently, changes in ground conditions and soil properties can occur between any two exploratory points, for example local features such as soft ground, pockets of contamination and faults. This is also true of the exploration of mineworkings and such features can extend beneath parts of the site not investigated. Unrecorded bell pits and shafts can also exist between exploratory points. The ground investigation is designed to minimise such risks but they cannot be eliminated.
2. **GROUND INVESTIGATION.**
 - 2.1 **BOREHOLE AND TRIAL PIT RECORDS.** These illustrate the ground conditions only at the location of the particular borehole or trial pit. Correlation between boreholes is for guidance only and its accuracy cannot be guaranteed.
 - 2.2 **SHELL AND AUGER BORING.** This technique uses a tripod winch and an essentially percussive action using a variety of tools. Disturbed and undisturbed samples can be taken. This is the most suitable method for soft ground investigation, enabling the maximum amount of information to be obtained. However, minor changes in lithology may be overlooked unless continuous undisturbed sampling is used.
 - 2.3 **GROUNDWATER.** Groundwater levels vary seasonally and the details given on the borehole logs relate only to the dates and the conditions described in the borehole records. The rate of boring may not have allowed an equilibrium water level to be established and the use of casing may seal off certain seepages.
 - 2.4 **SAMPLING.** Disturbed samples of soils are taken for identification and classification purposes. In cohesive soils 'undisturbed' samples 100mm in diameter are taken by open drive sampler for laboratory testing of strength, permeability and consolidation characteristics.
 - 2.5 **STANDARD PENETRATION TESTS.** S.P.T tests are used in granular and cohesive materials and in soft or weathered rocks. Difficulties in obtaining true 'N' values mean they must only be used as a guide and not as an absolute value in foundation design.
 - 2.6 **ROTARY DRILLING.** Two main types of rotary drilling are carried out in rock. Rock coring using diamond or tungsten carbide tipped core bits provides samples and information on rock types, fissuring and weathering. Openhole drilling only produces small particles for identification purposes and the information gained is therefore limited. The latter is, however, useful as a quick method for detecting major strata changes and for the location of coal seams and old workings. Water, air, foam or drilling muds may be used as the flushing medium in either case.
 - 2.7 **PERMEABILITY TESTS.** These can be carried out in boreholes or trial pits and gives a good indication of in-situ permeability.
 - 2.8 **TRIAL PITTING.** This enables soil conditions to be closely examined at any specific point and samples taken. It also gives useful information on the stability of excavations and ingress of water.
 - 2.9 **WINDOW SAMPLING.** Window sampling consists of driving a series of 1m-long tubes into the ground using a dropping weight. On completion of each 1m run, the tube is withdrawn. The next tube is then inserted and the process repeated to provide a continuous profile of the ground. On each run the tube diameter is reduced in order to assist in its recovery.
 - 2.10 **GAS MONITORING.** This is routinely carried out in trial pits or probe holes to check for elevated levels of methane and carbon dioxide or oxygen deficiency, particularly since risks can exist from natural gases, landfill sites and rising groundwater levels in mine workings below ground. Longer term monitoring is carried out with gas monitoring standpipes.
3. **SOIL DESCRIPTION.** Samples from borings or trial pits are described as specified in the standard procedure outlined in the British Standards. The description includes colour, consistency, structure, weathering, lithological type, inclusions and origin. All descriptions are based on visual and manual identification.

Fire Soils (Cohesive Soils)

The following field terms are used:

Soil Type	Description
Very soft	Exudes between fingers
Soft	Moulded by light finger pressure
Firm	Cannot be moulded by the fingers but can be rolled in hand to 3mm threads.
Stiff	Crumbles and breaks when rolled to 3mm threads but can be remoulded to a lump.
Very stiff	No longer moulded but crumbles under pressure. Can be indented with thumbs.

The following terms are used in accordance with the results of laboratory and field tests.

Description	Undrained Shear Strength c_u (kPa)
Extremely Low	<10
Very Low	10 - 20
Low	20 - 40
Medium	40 - 75
High	75 - 150
Very High	150 - 300

Fine soils can also be classified according to their sensitivity, which is the ratio between undisturbed and remoulded undrained shear strength.

Sensitivity	Ratio
Low	8
Medium	8 - 30
High	>30
Quick	>50

Granular Soils (Non-Cohesive)

The following descriptions are used for granular soils.

Description	Normalised Blow Count (N_1) 60
Very Loose	0 - 4
Loose	4 - 10
Medium	10 - 30
Dense	30 - 50
Very Dense	>50

- NATURAL OR IN-SITU MOISTURE CONTENT.** The natural or in-situ moisture content of a soil is defined as the weight of water contained in the pore space, expressed as a percentage of the dry weight of solid matter present in the soil. Soil properties are greatly affected by the moisture content and the test can help to give an indication of likely engineering behaviour.
- LIQUID AND PLASTIC LIMITS.** Two simple classification tests are known as the liquid and plastic limits. If a cohesive soil is remoulded with increasing amounts of water, a point will be reached at which it ceases to behave as a plastic material and becomes essentially a viscous fluid. The moisture content corresponding to this change is arbitrarily determined by the liquid limit test. 'Fat' clays, which have high contents of colloidal particles, have high liquid limits; 'lean' clays, having low colloidal particle contents have correspondingly low liquid limits. An increase in the organic content of a clay is reflected by an increase in the liquid and plastic limits.

If a cohesive soil is allowed to dry progressively, a point is reached at which it ceases to behave as a plastic material, which can be moulded in the fingers, and it becomes friable. The moisture content of the soil at this point is known as the 'plastic limit' of the soil.

The range of water content over which a cohesive soil behaves plastically, i.e. the range lying between the liquid and plastic limits, is defined as the plasticity index.

A cohesive soil with a natural water content towards its liquid limit will, in general, be an extremely soft material whereas a cohesive soil with a natural water content below its plastic limit will tend to be a stiff material.

- PARTICLE-SIZE DISTRIBUTION.** A knowledge of particle-size distribution is used to classify soils and to indicate likely engineering behaviour. British Standards define soils in relation to their particle-size as shown below:-

Boulders	>200mm	Coarse Sand	2.0	to	0.63mm
Cobbles	200 to 63mm	Medium Sand	0.63	to	0.2mm
		Fine Sand	0.2	to	0.063mm
Coarse Gravel	63 to 20mm	Coarse Silt	0.063	to	0.02mm
Medium Gravel	20 to 6.3mm	Medium Silt	0.02	to	0.0063mm
Fine Gravel	6.3 to 2mm	Fine Silt	0.0063	to	0.002mm
		Clay	<0.002mm		

- BULK DENSITY.** The bulk density of a material is the weight of that material per unit volume and includes the effects of voids whether filled with air or water. The 'dry density' of a soil is defined as the weight of solids contained in a unit volume of the soil.

8. **PERMEABILITY.** The permeability of a material is defined as the rate at which water flows through it per unit area of soil under unit hydraulic gradient.
9. **CONSOLIDATION CHARACTERISTICS.** When subjected to pressure, a soil tends to consolidate as the air or water in the pore space is forced out and the grains assume a denser state of packing. The decrease in volume per unit of pressure is defined as the 'compressibility' of the soil, and a measure of the rate at which consolidation proceeds is given by the 'coefficient of consolidation' of the soil. These two characteristics M_v and C_v are determined in the consolidation test and the results are used to determine settlement of structures or earthworks.
10. **STRENGTH CHARACTERISTICS.** The strength of geological materials is generally expressed as the maximum resistance that they offer to deformation or fracture by applied shear or compressive stress. The strength characteristics of geological materials depend to an important degree on their previous history and on the conditions under which they will be stressed in practice. Consequently, it is necessary to simulate in the laboratory tests the conditions under which the material will be stressed in the field.

In general, the only test carried out on hard rocks is the determination of their compressive strength but consideration must be given to fissuring, jointing and bedding planes.

The tests at present in use for soils and soft rocks fall into two main categories. Firstly, those in which the material is stressed under conditions of no moisture content change, and secondly those in which full opportunity is permitted for moisture content changes under the applied stresses. Tests in the first category are known as undrained (immediate or quick) tests, while those in the second category are known as drained (slow or equilibrium) tests. The tests are normally carried out in the triaxial compression apparatus but granular materials may be tested in the shear box apparatus.

The undrained triaxial test gives the apparent cohesion C_u and the angle of shearing resistance ϕ_u . In dry sands, $C_u = 0$ and ϕ_u is equal to the angle of internal friction whereas with saturated non-fissured clays ϕ_u tends to 0 and the apparent cohesion C_u is equal to one-half the unconfined compression strength q_u . On site the vane test gives an approximate measure of shear strength.

For some stability problems use is made of a variant of the undrained triaxial test in which the specimen is allowed to consolidate fully under the hydrostatic pressure and is then tested to failure under conditions of no moisture content change. This is known as the consolidated undrained triaxial test. Pore water pressures may be measured during this test or a fully drained test may be carried out. In either case the effective shear strength parameters C' and ϕ' can be obtained which can be used to calculate shear strength at any given pore water pressure.

11. **COMPACTION.** The density at which any soil can be placed in an earth dam, embankment or road depends on its moisture content and on the amount of work which is used in compaction. The influence of these two factors can be studied in compaction tests, which can determine the maximum dry density (MDD) achievable at a certain optimum moisture content (OMC).
12. **CALIFORNIA BEARING RATIO TEST.** In flexible pavement design a knowledge of the bearing capacity of the subgrade is necessary to enable the thickness of pavement for any particular combination of traffic and site conditions to be determined. The quality of the subgrade can be assessed by means of the California Bearing Ratio Test or approximately by the MEXE cone penetrometer.
13. **ROCK DESCRIPTION.** This is based on;

(i) Strength

Term	Field Identification	Unconfined Compressive Strength (MPa)
Extremely Weak ^a	Indented by thumbnail.	Less than 1
Very Weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife.	1 to 5
Weak	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer.	5 to 25
Medium Strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer.	25 to 50
Strong	Specimen required more than one blow of geological hammer to fracture it.	50 to 100
Very Strong	Specimen requires many blows of geological hammer to fracture it.	100 to 250
Extremely Strong	Specimen can only be chipped with geological hammer.	Greater than 250
^a Some extremely weak rocks will behave as soils and should be described as soils.		

(ii) Structure

Thickness Term	Spacing Term	Thickness or spacing
Very thickly	Extremely wide	>6m
Very thickly	Very wide	2m – 6m
Thickly	Wide	600mm – 2m
Medium	Medium	200mm – 600mm
Thinly	Close	60mm – 200mm
Very thinly	Very close	20mm – 60mm
Thickly laminated (Sedimentary)	Extremely close	6mm – 20mm
Narrowly (Metamorphic and Igneous)		
Thinly laminated (Sedimentary)	Extremely close	<6mm
Very narrowly (Metamorphic and Igneous)		

- (iii) Colour
- (iv) Texture
- (v) Grain size

Description	Predominate Grain Size (mm)
Conglomerate	>2
Coarse - grained	2 - 0.63
Medium - grained	0.63 - 0.20
Fine - grained	0.20 - 0.063
Siltstone	0.063 - 0.002
Mudstone	<0.002

- (vi) Rock Name
- (vii) Stability
- (viii) Weathering

Term	Description	Grades
Fresh/unweathered	No visible sign of rock material weathering; perhaps slight discolouration on major discontinuity surfaces.	0
Slightly weathered	Slight discolouration indicates weathering of rock material and discontinuity surfaces.	1
Moderately weathered/Distinctly weathered	Less than half of the rock material is decomposed or disintegrated. Fresh or discoloured rock is present either as a continuous framework or as core stones.	2
Highly weathered/Destructed	More than half of the rock material is decomposed or disintegrated. Fresh or discoloured rock is present either as a continuous framework or as core stones.	3
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still apparent.	4
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soils has not been significantly transported.	5

- (ix) Discontinuities
- (x) Weathered of Rock Mass

14. **CHEMICAL TESTS.** A knowledge of water soluble sulphate content and pH of soils and groundwater is important in determining the protection required for concrete or steel in contact with the ground. Other specialist tests may be carried out on sites suspected of being contaminated (see standard appendix B).

15. **REFERENCES**

BS5930: 2015+A1:2020 British Standard Code of Practice for Site Investigations
BS10175: 2011+A1:2017 British Standard Code of Practice for the Investigation of Potentially Contaminated Sites
BS EN ISO 14688-1: 2018 Geotechnical Investigation and Testing: Identification and Classification of Soil
BS EN ISO 14688-2: 2018 Geotechnical Investigation and Testing: Identification and Classification of Soil



Michael D Joyce Associates LLP

Geotechnical and Geoenvironmental Consultants

Charnock Court 6 South Parade Wakefield West Yorkshire WF1 1LR

Tel: 01924 360458

Web: www.geoenvironmental.co.uk Email: mdja@geoenvironmental.co.uk