NKC Geotech Ltd
engineering geologist specialising in the investigation and treatment of disused mineworkings

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Coal Mining Investigation



Proposed storage unit at Pen-y-cae Scout Hut, LL14 2RL

1st Pen-y-Cae Scout Group
Bryn-y-Barcut
Pen-y-Cae
Wrexham
LL14 2RL

2410
24 June 2024



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Site

A site for a storage unit at Pen-y-Cae Scout Hut, Pen-y-cae, Wrexham.

Risk Assessment by
Neil Catlow B.Sc F.G.S Engineering geologist.

Summary of relevant mining information
CIRIA Special Publication C758D 'Abandoned Mineworkings Manual
Coal Authority Report 51003409010001 dated 4th March 2024
Ordnance Survey 1:2500 First Edition 1875
Geological Survey 1:10560 plans
Mineplan 14885 Christionydd Colliery
Nkc Geotech CMRA

Nkc Geotech Ltd investigations with relevance to this site:
2020 Bryn Issa, Pence
2009 Plas Bennion Farm, Pen-y-Cae
1420 Pen-y-Cae CP School
0425 Plas Bennion, Pen-y-Cae
0033 Plas Bennion
9422 Plas Bennion
9101 Pen-y-Cae CP School
8922 Nant Hyfryd, Plas Bennion
8850 Penycae Scout Hut
8915 Yr Enys, Plas Bennion

Assessment of risk that coal mining poses to the proposed development

Geology
The site lies on Carboniferous Bettisfield Formation rocks that form the Wrexham Coalfield, dipping to the east at 1 in 8. These rocks are predominantly shales and sandstones laid down in a tropical delta environment when Europe lay on the equator as part of the continent of Pangea between 310M and 320M years ago. The Bettisfield Formation strata varies between 230m and 520m in thickness depending on locality and contains seams of coal upto 4.5m in thickness at vertical intervals typically varying from 4.0m to 20.0m. Those coal seams which were of economic importance were given an identity when they were of sufficient quality and thickness to justify extraction by mining. Typical names for local coal seams reflect primarily on quality and thickness, for example Main Coal, Yard Coal and Wall & Bench Coal.

The Coal Authority Report states that the site may be underlain at shallow depth by workings in an unidentified coal seam of workable thickness. The current 1996 Geological Survey edition identifies this coal seam as the Red Coal. In addition a deeper group of closely interbedded coal seams seams known locally as the Fireclay Series lies 10m below the Red Coal.

Past underground coal mining
Coal mining in Pen-y-Cae is recorded in 1410 in the western part of the area, most probably in the Wall & Bench Coal and the Nant Coal east of Lambpit Street, 500m north-west of the site, when the area was part of the medieval Bersham Waste, ie common land. Industrial mining deeper than the outcrop workings and simple bell pits of the 'cole farms' in the Waste dates from the 16th century. My previous investigations in Plas Bennion have shown that there is upto 12m thick boulder clay cover to rockhead which would have precluded very early surface mining but exploratory boring would certainly have been possible after the 16th century and revealed the presence of shallow coal and deeper seams.



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There are only royalty plans of past mining activity under the site of workings abandoned in 1868, pre-dating the 1887 Coal Mine Regulations which required colliery owners to keep and preserve accurate plans of their workings. The coal seams deeper than the Main Coal were principally worked in the 19th century to supply the New British Iron Company furnaces at Acrefair, and horse drawn tramways connected the collieries. One such tramway terminates at a pair of mineshafts of Christionydd Colliery, 328345-016 and -017. These shafts were sunk to the Wall & Bench Coal at a depth of 140m. The shafts lie within the site but 80m south-west of the proposed storage unit and a large overgrown spoil heap is visible south of the shafts.

The deepest worked coal seam is the Wall & Bench Coal at 143m below the site, but there are four shallower coal seams known to have been mined here. The coal seams between the Red Coal and the Wall & Bench Coal are, in descending order, the Fireclay Series of coals (closely interbedded Stone Coal, Firedamp Coal and Half Yard Coal seams), the Nant Coal and the Yard Coal. The shallowest mined seam for which there are records is the Wall & Bench Coal, 1.0m thick at a depth of 142m, mined in 1866.

My investigation work on nearby sites in Pen-y-Cae encountered unrecorded shallow mineworkings in both the Red Coal and the Fireclay Series of thin seams. I investigated the existing Scout Hut in 1989 and proved the Red Coal to be unworked at 7.0m depth, and the underlying Stone Coal at 17.0m, by drilling 13 holes in total in anticipation of grouting mineworkings in the seam. No evidence of past mining activity was encountered. The nearest site with Red Coal workings was at Pen-y-Cae CP School, 50m East of the site, in 1991 and here the shallow workings under proposed classroom extensions were stabilised by grouting. The risk to any proposed development here would be subsidence caused by the collapse of shallow mining tunnels upto 1.5m high where the coal seams lie at depths shallower than 20m.

Current intrusive investigation

Three rotary water-flush boreholes were drilled to determine the extent of any past mining activity here in the Red Coal or the Stone Coal under Coal Authority Permit 28496. Bh A was drilled to 30m to confirm the stratigraphy proved in the 1989 investigation. Bhs B and C were drilled to 15m to encounter the Red Coal. These 3 holes confirm the ground conditions proved in my previous investigation of 1989 and solid coal was encountered in all the holes with no evidence of any historical mining activity. Rockhead was proved at depths of 2.8m to 3.6m, overlain by brown sandy clay, with no evidence of any fill in the holes.

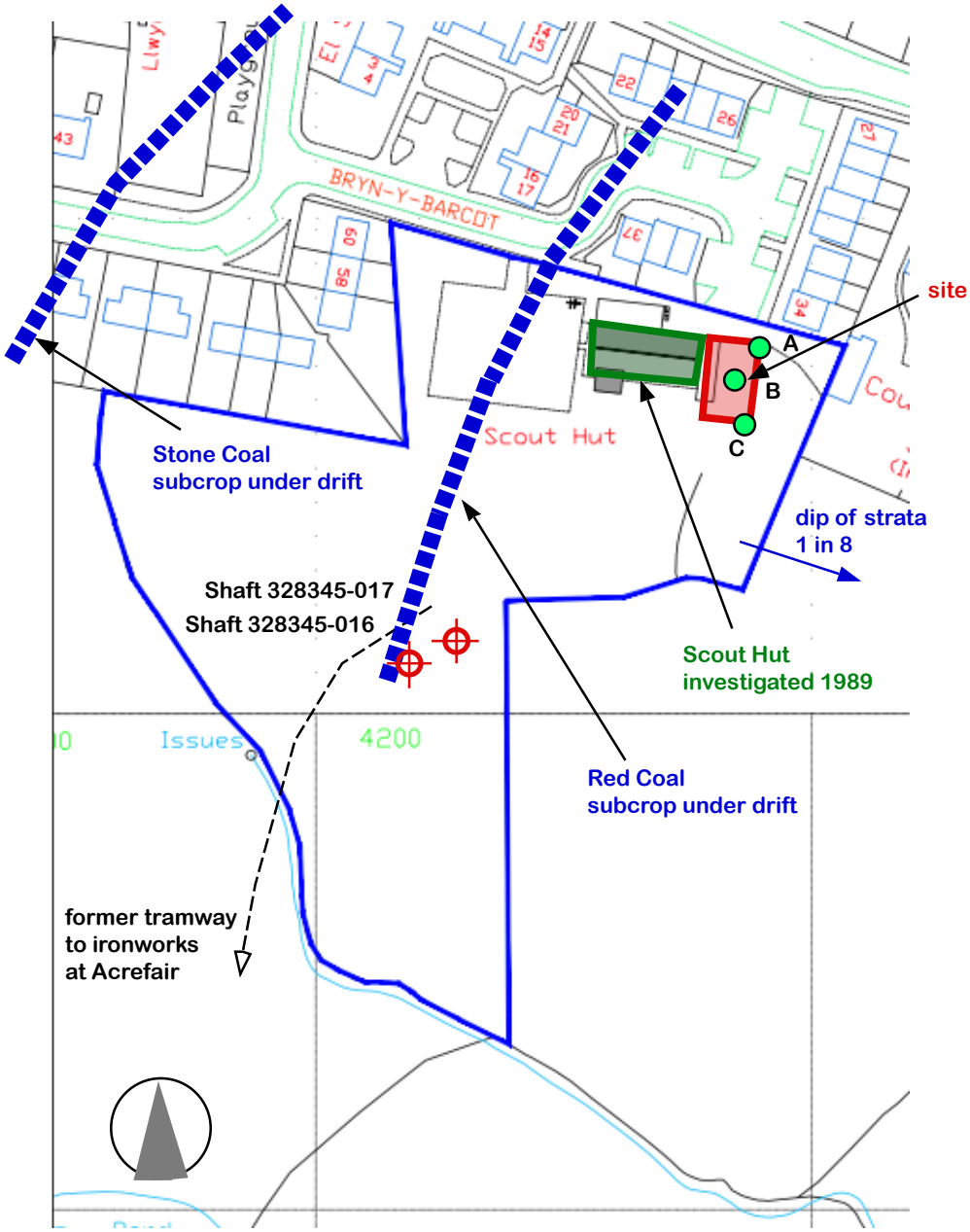
In the absence of shallow mineworkings there is no necessity to take structural precautions or remedial works against mining subsidence. Conventional foundations can be used for the proposed building.

For Nkc Geotech Ltd

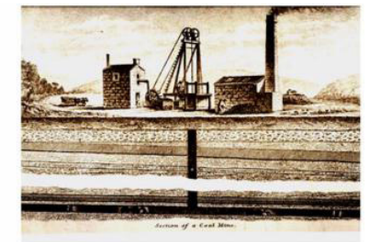
Neil Catlow, B.Sc, F.G.S

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Geological plan of the locality
Scale 1:2000 @ A4



Nkc boreholes 2024



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Bh A

REF	2410	**SITE**	Penycae Scout Hut store	**PRINTOUT**	19 June 2024
Bh	A	**CLIENT**	1st Penycae Scout Group	**SCALE**	1:200
				GL AOD	
		TITLE		**RIG**	Montabert Hydrofore
				ORIENTATION	vertical
		ORIGIN	printout direct from rig on site	**FLUSH**	mains water supply
			drilled & logged by Neil Catlow	**BIT**	75mm T/C

	DEPTH	STRATA	GRAPHIC	DESCRIPTION	SPT N value	INTERPRETATION
0.0	0.0	clay		brown, sandy, soft	not taken	ground level
0.5				with sand layers		
1.0						
1.5						
2.0						
2.5						
3.0						
3.5	3.6	shale		dark grey, firm drilling		rockhead
4.0						
4.5						
5.0	5.2	shale		black, firm drilling		
5.5						
6.0						
6.5						
7.0						
7.5						
8.0						
8.5	8.5	coal		black, firm drilling		Red Coal
9.0						
9.5	9.2	shale		dark grey, firm drilling		
10.0						
10.5	10.6	mudstone		grey, firm drilling		
11.0						
11.5						
12.0						
12.5						
13.0						
13.5						
14.0						
14.5						
15.0	15.5	shale		dark grey, firm drilling		
15.5						
16.0						
16.5						
17.0						
17.5						
18.0						
18.5						
19.0	19.1	coal		black, firm drilling		Stone Coal
19.5						
20.0	20.3	mudstone		grey, firm drilling		
20.5						
21.0						
21.5						
22.0						
22.5						
23.0						
23.5						
24.0						
24.5						
25.0						
25.5						
26.0						
26.5						
27.0						
27.5						
28.0						
28.5						
29.0						
29.5						
30.0	30.0			bottom of hole		

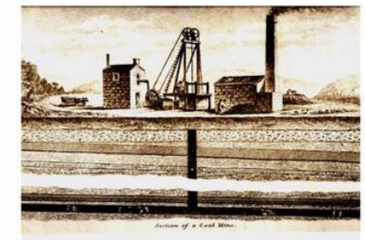
IN HOLE GAS TESTING

%	O2	20.6
%	CH4	0.0
%	CO2	0.0
%	LEL	0.0
ppm	H2S	0.0
ppm	CO	0.0



drilled and logged by
Neil Catlow B.Sc FGS

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Bh B

REF	2410	**SITE**	Penycae Scout Hut store	**PRINTOUT**	19 June 2024
Bh	B	**CLIENT**	1st Penycae Scout Group	**SCALE**	1:200
				GL AOD	
		TITLE		**RIG**	Montabert Hydrofore
				ORIENTATION	vertical
		ORIGIN	printout direct from rig on site	**FLUSH**	mains water supply
			drilled & logged by Neil Catlow	**BIT**	75mm T/C

	DEPTH	STRATA	GRAPHIC	DESCRIPTION	SPT N value	INTERPRETATION
0.0	0.0	clay		brown, sandy, soft with sand layers	not taken	ground level
0.5						
1.0						
1.5						
2.0						
2.5						
3.0	2.9	shale		dark grey, firm drilling		rockhead
3.5						
4.0						
4.5						
5.0						
5.5						
6.0	6.1	shale		black, firm drilling		
6.5						
7.0						
7.5						
8.0	8.2	coal		black, firm drilling		Red Coal
8.5						
9.0	9.0	shale		dark grey, firm drilling		
9.5						
10.0						
10.5						
11.0						
11.5	11.7	mudstone		grey, firm drilling		
12.0						
12.5						
13.0						
13.5						
14.0						
14.5						
15.0	15.0			bottom of hole		
15.5						
16.0						
16.5						
17.0						
17.5						
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18.5						
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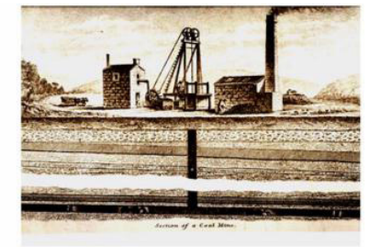
IN HOLE GAS TESTING

%	O2	20.6
%	CH4	0.0
%	CO2	0.0
%	LEL	0.0
ppm	H2S	0.0
ppm	CO	0.0



drilled and logged by
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Bh C

REF	2410	**SITE**	Penycae Scout Hut store	**PRINTOUT**	20 June 2024
Bh	C	**CLIENT**	1st Penycae Scout Group	**SCALE**	1:200
				GL AOD	
		TITLE		**RIG**	Montabert Hydrofore
				ORIENTATION	vertical
		ORIGIN	printout direct from rig on site	**FLUSH**	mains water supply
			drilled & logged by Neil Catlow	**BIT**	75mm T/C

	DEPTH	STRATA	GRAPHIC	DESCRIPTION	SPT N value	INTERPRETATION
0.0	0.0	clay		brown, sandy, soft	not taken	ground level
0.5				with sand layers		
1.0						
1.5						
2.0						
2.5	2.6	shale		dark grey, firm drilling		rockhead
3.0						
3.5						
4.0						
4.5						
5.0						
5.5						
6.0	6.2	shale		black, firm drilling		
6.5						
7.0						
7.5						
8.0	7.9	coal		black, firm drilling		Red Coal
8.5						
9.0	9.0	shale		dark grey, firm drilling		
9.5						
10.0						
10.5						
11.0						
11.5						
12.0	11.8	mudstone		grey, firm drilling		
12.5						
13.0						
13.5						
14.0						
14.5						
15.0	15.0			bottom of hole		
15.5						
16.0						
16.5						
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28.0						
28.5						
29.0						
29.5						
30.0	30.0			bottom of hole		

IN HOLE GAS TESTING

%	O2	20.6
%	CH4	0.0
%	CO2	0.0
%	LEL	0.0
ppm	H2S	0.0
ppm	CO	0.0



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