Dulas

Hafod Road Solar Site, Wrexham

Desk Based Coal Mining Risk Assessment (CMRA)

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Hafod Road Solar Site, Wrexham

Desk Based Coal Mining Risk Assessment (CMRA)

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A	June 2025	Updated following Client comments and updated proposed development plan			
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Report Liability Date: October 2024					

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- Coal Authority – Consultants Coal Mining Report (Report No. 51003455764001)

EXECUTIVE SUMMARY

This report presents the findings of the desk-based Coal Mining Risk Assessment undertaken at the site to determine if there are any coal mining risks associated with the proposed redevelopment of the site. Pertinent information and conclusions are summarised below.

SITE INFORMATION	• The site is an area of undeveloped agricultural farmland near Wrexham in North Wales. • The proposed development is understood to comprise the construction of a new solar farm and associated infrastructure.
GEOLOGY	• British Geological Survey (BGS) mapping suggest the site is underlain by superficial Till and bedrock of the Etruria Formation, which is in turn underlain by the Pennine Coal Measures Group. • Available nearby borehole logs suggest that the Etruria Formation extends to approximately 170m below ground level.
HISTORICAL MAPPING	• Earliest available mapping (circa 1879) depicts the site as undeveloped farmland, with no notable changes until the present day. • Hafod-y-bwch colliery is recorded on mapping dating up to 1962 approximately 700m north of site whilst, Vauxhall colliery is mapped 800m southwest and listed as disused from 1954.
COAL MINING CONSULTANTS REPORT	• Coal Authority records indicate that several coal seams have historically been worked underneath the site area, the shallowest of which is 390mbgl which had an extraction thickness of 80 - 90cm. • The Coal Authority records indicate that the last seam to be worked was in the 435m deep Quaker seam in 1968. • The Coal Authority have no records of any mine entries or shafts within 100m of the site. • There are no recorded opencast workings within the vicinity of the enquiry boundary, and the Coal Authority records indicated there to be no probable unrecorded shallow workings on or in proximity to the site. • There are no recorded cases of coal mining subsidence in proximity to the site, nor any records of mine gas emissions, mine water treatment schemes of Coal Authority managed tips.
CONCLUSIONS	• It is considered that given the depth and limited extracted thicknesses, that historical mining of the deep coal seams is unlikely to impact the proposed development. • Given the Coal Authority records and the likely thickness of the Etruria Formation overlying the Pennine Coal Measures Group, the risk from shallow/surface mining is also considered to be low.
RECOMMENDATIONS	• It would be recommended that a careful watch is maintained during any excavations or ground works at the site to assess for any evidence of disturbed ground.

The above summary should not form the basis for key decisions associated with the proposed development and a full review of the information contained within this report is recommended.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 TEC has been appointed by Dulas to undertake a Coal Mining Risk Assessment of the Hafod Road Solar Site, Wrexham. All works were undertaken in accordance with our proposal letter dated 20th June 2024 and referenced RVE.2310008.001a.

1.2 Background

1.2.1 The site is a National Trust site located near Wrexham in North Wales and understood to be approximately 4.26 hectares. The centre of the site is situated about National Grid Reference 331314, 345925 and the nearest available postcode is LL14 6ET (Figure 1).

1.2.2 The proposed development is understood to comprise the construction of a new solar farm with associated infrastructure on the currently undeveloped agricultural farmland (see Dulas Ltd Drawing *"Hafod Road Solar, Wrexham: Proposed Layout*", prepared for National Trust. Drawing Ref.: E05797, Rev. A).

1.2.3 The aim of these works is to provide a Coal Mining Risk Assessment for the above-mentioned site, which will ascertain potential coal mining related risks and constraints associated with the site with regards to the proposed development.

1.3 Site Objectives

1.3.1 The site objectives and subsequent scope of works undertaken as part of this report are presented below:

- **Coal Mining Risk Assessment:**
  - Desk based review of available information on the coal mining issues which are relevant to the proposed site.
  - Identification and assessment of the potential risks to the proposed development from coal mining legacy.
  - Review of appropriate mitigation or remedial measures required to address any identified risks and demonstrate that the proposed site is, or can be, made safe and stable as required by national planning policy.

1.3.2 The above scope of work has been undertaken in accordance with current guidance provided by the Coal Authority as outlined in *'Risk based approach to development management – Guidance for developers', Version 4, 2017* and *CIRIA 758D 'Abandoned Mine Workings manual'.*

2 BACKGROUND INFORMATION

2.1 Sources of Information

2.1.1 The following sources of information have been used to provide the basis of this risk assessment.

- British Geological Survey (BGS) Wrexham. Sheet No. 121. Solid and Drift 1:50 000.
- BGS Online Viewer (including available BGS Borehole records – "Contains British Geological Survey materials ©UKRI 2023")
- The Coal Authority – Consultants Coal Mining Report (Dated 10th October, Referenced: 51003455764001)
- Online Research – including current and historical Ordnance Survey maps (National Library of Scotland - maps.nls.uk)

2.2 Site Setting

2.2.1 At the time of writing, a site reconnaissance survey has not been undertaken by TEC.

2.2.2 The site currently comprises of two large irregularly shaped agricultural fields surrounded in all cardinal directions by hedgerows and mature deciduous trees. A small area of woodland is present just off the eastern boundary of the larger field.

2.2.3 Available ordnance survey mapping indicates that the site very gently slopes from approximately 103m above ordnance datum (AOD) along the western boundary down to 101m AOD along the eastern boundary.

2.2.4 The site is located within a predominantly rural area, with arable farmland surrounding the site to the north, east and south. The Aberderfyn Nature Reserve is located off the western boundary. Notably the Harod Quarry Landfill Site is located approximately 200m southwest of the sites southwestern most corner.

2.3 Site History

2.3.1 Details of the history of the site and surrounding area, pertinent to this coal mining risk assessment, were obtained by a review of information provided by the Coal Authority and the review of freely available historical Ordnance Survey mapping and aerial photography.

2.3.2 The earliest available mapping, circa 1879, depicts the site as large open farmland with no notable changes to the site's layout until mapping dating to the present day.

2.3.3 All of the available OS mapping records from 1898 to 1962 detail several large clay pits in the fields immediately adjacent to the southwest of the site. Further to the southwest, approximately 800m from site, Vauxhall colliery is mapped between 1879 and 1914 and listed as disused on mapping from 1954.

2.3.4 To the north, Hafod Red Brick Works is detailed on mapping up to 1954 approximately 350m from the site, after which it is listed as 'works'. Further north, approximately 700m from site the Hafod-y-bwch colliery is recorded on mapping up until 1962. Information available online suggests that the colliery closed in 1968.

2.4 Geology

British Geological Survey Mapping

2.4.1 The geology for the area is recorded on British Geological Survey (BGS), 1:50 000 Series, England and Wales Sheet 121, Wrexham, Solid and Drift. This mapping indicates that the site is underlain by superficial Devensian Till overlying bedrock geology of Etruria Formation (typically up to 300m thick and formerly named the Ruabon Marl Formation) which is described by the BGS as '*Red, purple, brown, ochreous, green, grey and commonly mottled mudstone, with lenticular sandstones and conglomerates referred to as 'espleys'. Common pedogenic horizons, but coal seams are rare. Subordinate, lenticular sandstones and conglomerates commonly consist mostly of volcanic and lithic clasts. Intrusions of dolerite sills and dykes and extrusion of a small volume of volcaniclastic rocks are present in south Staffordshire and south Nottinghamshire'.*

2.4.2 The Etruria Formation is reported to be underlain by the Pennine Coal Measures Group (formerly the Bettisfield Formation) which comprises '*cyclothems of alternating sandstone, siltstone and grey mudstone, with frequent coal seams, ironstone nodules or beds and seatearth (palaeosol) horizons.'*

2.4.3 Within the coal measures in the Denbighshire Coalfield, several coal seams are named and include, in sequence: Bersham Yard Group, Upper Stinking (locally known as Cefn), Warras, Lower Stinking, Powell, Hollin, Crank, Quaker, Main, Crown, Upper Red, Lower Red, Fireclay Group, Nant, Ruabon Yard, Premier, LLwyneinion Half Yard and Chwarelau.

2.4.4 Adjacent to the southwest corner of the site, the superficial deposits are recorded as Devensian Glaciofluvial deposits, which is described as '*mostly coarse-grained sediments (i.e. sand and gravel) with some finer-grained layers (i.e. clay and silt).* Above these deposits, made ground is also reported to be present which is defined by the BGS as '*an area where the pre-existing (natural or artificial) land surface is raised by artificial deposits.* This area corresponds to the operational Harod Quarry Landfill Site.

2.4.5 Areas of made ground are also recorded just off site along the eastern boundary, likely corresponding to the embankment that forms the Johnstown Interchange connecting the B5426 and the A483. In addition, the area associated with the former Hafod-y-bwch colliery is also recorded as made ground, with the mapped extent extending down to the south along the north-south trending railway line.

2.4.6 There are several faults in the nearby area, most of which appear to be north-south trending although there are also some younger broadly east-west trending faults present as well. The closest fault to the site runs north-south underneath the Hafod Brick Works, approximately 350m to the north.

Available Nearby Borehole Logs

2.4.7 There are a large number of BGS borehole records in proximity to the site, a selection of the more pertinent records are enclosed within Appendix A and briefly summarised below in Table 2.1.

Table 2.1: BGS Borehole Records

BGS Reference	Distance/ Direction	Depth	Recorded Strata
SJ34NW320	On site (eastern boundary)	1.9m	Stiff red brown sandy silty CLAY with a little fine and medium assorted gravel. (GLACIAL TILL)
		8.6m	Firm to stiff becoming stiff brown and grey brown silty occasionally sandy CLAY with trace of fine and medium assorted gravel and occasional cobbles and boulders. (GLACIAL TILL)
		10m	Dense fine to coarse assorted SAND and GRAVEL. (GLACIAL SAND and GRAVEL)
SJ34NW283	On site (northern boundary)	0.4m	Topsoil
		4.0m	Generally stiff, brown and red-brown slightly sandy silty CLAY with a trace to a little fine to coarse assorted gravel and occasional silt parting towards base. (GLACIAL TILL)
		7.5m	Grey, silty, fine to coarse SAND and fine to coarse assorted GRAVEL with bands of sandy, very silty clay with a little fine to coarse assorted gravel. (GLACIAL SAND and GRAVEL)
		11.8m	Stiff to very stiff, brown becoming red-brown, sandy, silty CLAY with a little fine to coarse assorted gravel. (GLACIAL TILL)
		13.9m	Light brown, slightly silty fine SAND. (GLACIAL SAND)
		16.0m	Stiff reddish brown, sandy, silty CLAY with a little fine to coarse assorted gravel and occasional boulders. (GLACIAL TILL)
		31.5m	Stiff to very stiff, dark red-brown, poorly thinly laminated, slightly silty CLAY with occasional very weak lithorelics, becoming at approximately 20.0m highly weathered thinly laminated slightly silty generally weak MUDSTONE reduced in part to clay with occasional lithorelics. (Ruabon Marl)

BGS Reference	Distance/ Direction	Depth	Recorded Strata
SJ34NW52	~1000m northeast	~4.3m	Clay.
		~33.5m	Sand.
		~222.5m	Dark grey marl with coal seams at: ~195m, ~205m, ~212m, and ~216m.
		~259m	Dark grey mudstone with coal seam at 271m.
		~274.3m	Light grey sandstone.
		~280m	Medium dark to dark mudstone with ~0.6m coal seam at base.
		~286.5m	Medium dark siltstone.
		~310.8m	Interbedded fine-grained sandstone, dark grey siltstones and dark to medium grey mudstones.
		~311.2m	Interbedded coal and mudstone.
		~322.8m	Grey mudstone.
		~326.7m	Interbedded coal and mudstone.
		~376.9m	Interbedded medium to dark grey mudstone, medium to dark grey siltstone and medium grained sandstone with coal seams at ~332m, ~342.6m, ~351.4m, ~365.8m and ~375.5m.

2.4.8 Within the nearby BGS borehole SJ34NW52, the thin sequence of coal seams encountered starting from approximately 195m below ground level has been interpreted to represent the Bersham Yard Group of coal seams. Similarly, the interbedded mudstone and coal seams encountered from approximately 326.7m were interpreted to represent the Cefn (Upper Stinking) coal seams.

2.5 Coal Authority Consultants Coal Mining Report

2.5.1 A Consultants Mining Report was obtained from The Coal Authority for the site as enclosed in Appendix B, with the relevant information summarised in the below sections of this report.

Past underground mining

2.5.2 A total of 46No. past underground mining entries have been recorded on or in close proximity to the site. Records of underground mining specifically beneath the site are summarised as follows, with additional records of nearby underground mining presented within the attached Coal Authority Report:

Table 2.2: Underground Mining Records

Coal Seam	Depth Beneath Site (m)	Worked Coal Seam Dip/Direction	Extraction Thickness (cm)	Year Last Mined
Smiths (Hafod Colliery)	390m	4.2˚ south-east	80cm	1923
		5.2˚ east	90cm	1933
Powell	402m	5.5˚ east	110cm	1941
	403m	5.0˚ east	110cm	1951
Quaker	435m	6.3˚ east	110cm	1968
	437m	2.3˚ north-east	110cm	1912
Main	460m	4.0˚ east	210cm	1946
	477m	4.0˚ east	210cm	1946
Pin	489m	10.7˚ north-east	90cm	1924
	499m	8.1˚ east	80cm	1932
Crown	516m	2.6˚ south-east	80cm	1933

Coal Seam	Depth Beneath Site (m)	Worked Coal Seam Dip/Direction	Extraction Thickness (cm)	Year Last Mined
Ruabon Yard (Soft 5 Qtrs.)	528m	4.6˚ south-east	90cm	1877
	549m	5.0˚ east	90cm	1877
	557m	6.0˚ east	90cm	1886
	622m	6.0˚ east	90cm	1896
Half Yard / Queen	541m	4.9˚ south-east	130cm	1892
	564m	5.0˚ east	130cm	1879
	570m	2.6˚ west	120cm	1892

Probable unrecorded shallow workings

2.5.3 There are no probable unrecorded shallow workings beneath the site.

Spine roadways at shallow depth

2.5.4 There are no spine roadways recorded at shallow depth.

Mine entries

2.5.5 There are no recorded mine entries within 100m of the site boundary.

Abandoned mine plan catalogue numbers

2.5.6 There are 9No. abandoned mine plan catalogue numbers recorded to intersect some or all of the site.

Coal outcrops

2.5.7 There are no coal seams reported to outcrop within the site boundary.

Geological faults, fissures and breaklines

2.5.8 No faults, fissures or breaklines are recorded within influence of the site.

Opencast mines

2.5.9 There are no recorded opencast mines located within 500m of the site boundary.

Coal Authority managed tips

2.5.10 No Coal Authority managed tips are noted within 500m of the site boundary, although it should be noted tat the landfill site to the southwest would not be managed by the Coal Authority.

Site investigations

2.5.11 None are recorded within 50m of the site boundary.

Remediated sites

2.5.12 None are recorded within 50m of the site boundary.

Coal mining subsidence

2.5.13 No damage notices or claims for the property or within 50m of the property have been received since 1994, and there are no current Stop Notices delaying the start of any remedial works or property repairs.

2.5.14 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

2.5.15 No mine gas emissions have been recorded within 500m of the site boundary.

Mine water treatment schemes

2.5.16 No mine water treatment schemes are recorded within 500m of the site boundary.

Future underground mining

2.5.17 No records are held of proposed future underground mining schemes.

Coal mining licensing

2.5.18 No records are noted within 200m of the site boundary.

Court orders

2.5.19 None recorded.

Section 46 notices

2.5.20 No notices have been given, stating that the land is at risk of subsidence.

Withdrawal of support notices

2.5.21 The site is not within an area where a notice to withdraw support has been given, nor is the site in an area where relevant notice has been given under section 41 of the Coal Industry Act 1994.

Payments to owners of former copyhold land

2.5.22 The site is not within an area where relevant notice has been published under the Coal Industry Act 1975 / Coal Industry Act 1994.

2.6 Identification and Assessment of Site-Specific Coal Mining

2.6.1 A summary of the potential risks associated with past coal mining at the site, based on the available information is presented below in Table 2.3.

Table 2.3: Coal Mining Risk Assessment

Coal Mining Issue	Yes	No	Risk Assessments / Comments
Coal seams & underground coal mining		X	A review of the BGS mapping suggest that several coal seams associated with the Pennine Coal Measures are likely present beneath the site. A review of the Coal Authority records indicates that it is likely that several of these seams have historically been worked with an extraction thickness typically between 80cm to 210cm. Coal Authority records suggest that the shallowest of these was the Smiths seam at 390m, which had an extraction thickness of 80-90cm and was last worked in 1933. Further, the available records suggest that the last of these seams to be worked was the 435m deep Quaker seam in 1968. It is considered that the historical mining of these deep seams would not adversely affect the proposed scheme, which is understood to comprise the construction of solar panels and associated infrastructure. It is assumed that these panels would likely be installed using screw piles or shallow concrete foundations.
Mine entries (shafts and adits)		X	The Coal Authority hold no records suggesting there to be mine entries, shafts or adits located within 100m of the site boundary. Further, a review of geological and historical mapping suggests that the nearest mine entry would either be the Vauxhall Colliery to the southwest or the Hafod-y-bwch Colliery to the northwest, both of which are located in excess of 600m away.

Coal Mining Issue	Yes	No	Risk Assessments / Comments
Coal mining geology (faults/fissures & breaklines)		X	Superficial Devensian till deposits have been recorded to be present across the site area, and where present, these deposits are likely to conceal bedrock fissures if present. However, detailed review of the geological mapping indicates that significant depths of superficial deposits are unlikely. In support of this conclusion, the Coal Authority report records no faults, fissures or breaklines within influence of the site. Whilst the potential for unrecorded faults cannot be discounted, the nearest recorded fault on the geological mapping is located approximately 350m to the north of the site.
Mine gas emissions or potential		X	The Coal Authority holds no records of mine gas emissions within 500m of the site.
Surface mining (opencast mining) & Probable unrecorded shallow workings		X	There are no former opencast workings noted by the Coal Authority within the enquiry boundary. The Coal Authority records indicate there to be no probable unrecorded shallow working in vicinity to the site. In addition, the site is reported to be underlain by bedrock geology of the Etruria Formation, with nearby BGS borehole logs suggesting extends to a depth of approximately 173mbgl. Whilst the typical description of the Etruria Formation does suggest the presence of rare coal seams, there is no historical evidence suggesting that these have been worked or extracted. As such, the risk from surface mining is considered to be low.
Spine roadways at shallow depth		X	No spine roadways at shallow depth have been recorded by the Coal Authority within proximity to the site.
Coal Authority managed tips		X	No Coal Authority managed tips have been recorded within proximity of the site.
Coal mining subsidence		X	No cases of coal mining subsidence have been reported within proximity of the site.
Mine water treatment schemes		X	There are currently no records of mine water treatment schemes within proximity of the site.

3 CONCLUSIONS AND RECOMMENDATIONS

3.1.1 It is understood that it is proposed to create a new solar farm and associated infrastructure on the currently undeveloped arable farmland.

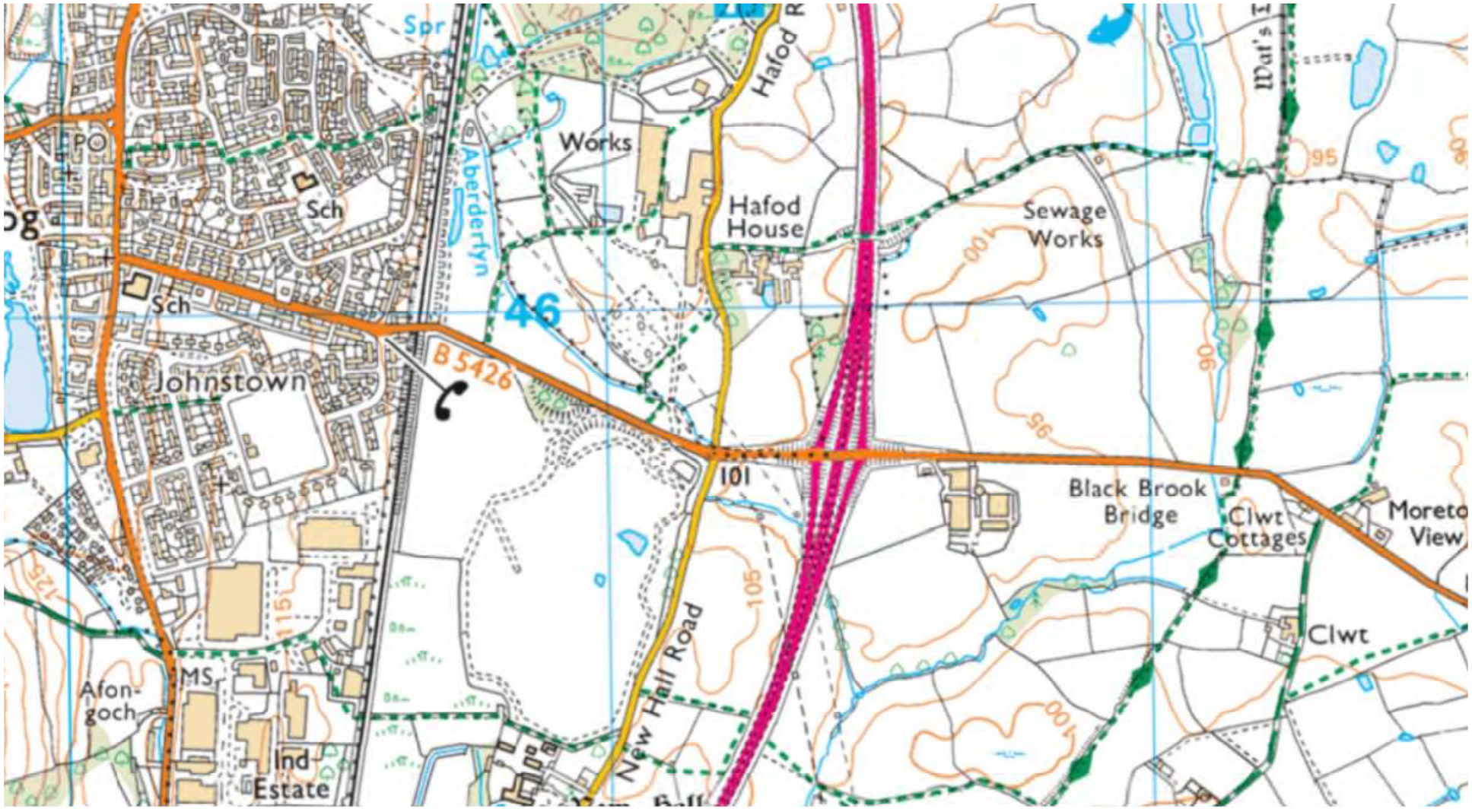
3.1.2 This Coal Mining Risk Assessment has been prepared to assess the potential risks to the ground stability and proposed development from previous coal mining activities within the site and surrounding area, and to review suitable mitigation measures where applicable.

3.1.3 This assessment has identified that potential risks to the development from previous coal mining activities are unlikely. The Coal Authority hold no records of any opencast or shallow mine working on site or in the surrounding areas, and whilst records do suggest that underground coal mining has taken place beneath the site boundary, the shallowest worked seam is reported to be 390m which is unlikely to have any impact on the proposed solar panel installations.

3.1.4 Notwithstanding this, it would be prudent to maintain a careful watch during any ground works or intrusive activities at the site and ensure that any conventional foundations utilised are inspected during formation to assess for evidence of any disturbed ground, ensuring that they are formed on competent strata.

TEC

Figures and Drawings



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LOCATION PLAN



Hafod Road Solar Site, Wrexham

Site Location Plan

DATE: June 2025		
SCALE: N/A	DRN: MT	CHKD: RE
PROJECT No: 2310008.001	DATE: 03/2025	DATE: 03/2025
DRAWING No. Report Figure 1 - Site Location Plan		Rev: A

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Legend

- Planning Boundary
- Survey
- Fence
- Solar
- Temporary Compound
- Access Track
- DNO Substation
- Onsite Substation

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0 20 40 60 metres

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CLIENT: National Trust
PROJECT: Hafod Road Solar
LOCATION: Wrexham

PROJECT No.: E05797
SCALE: 1:1,503 (A3)

DRAWING TITLE: Figure 2 - Site Layout

DRAWING No.:
SHEET: 0
REVISION: A

Appendix A

BGS Borehole Records

British Geological Survey

BGS ID: 153712 ; BGS Reference: SJ34NW320
British National Grid (27700) : 331380,345860

Soil Mechanics

Borehole No. 218
Sheet 1 of 2

Equipment & Methods
Cable tool percussion rig at 200mm diameter from ground level to base

Location No. 7557 SJ 34 NW/320
RUABON BYPASS 3138 4586

Carried out for
WELSH OFFICE

Ground Level
97.37m.N.D

Chainage
2610m

Date
11th October 1977

Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests: Depth	Sample: Type	Sample: No.	Test	Field Records
Brown silty TOPSOIL with numerous rootlets	97.17		0.20	0.20	D	1		No of blows using cown the hole hammer
clayey sand Stiff red brown sandy silty CLAY with a little fine and medium assorted gravel (Glacial Till)			(1.70)	0.50-0.95	U	2		34
				1.30	D	3		
	95.47		1.90	1.50-1.95	U	4		10
soft with plant remains				2.20 2.30	W D	17 5		
some fine and medium gravel				2.65-2.95	D	6	S N:5	
clayey gravel				3.30	D	7		
				3.65-3.95	D	8	S N:20	
sand and gravel with cobbles				4.30	B	9		
Firm to stiff becoming stiff brown and grey brown silty occasionally sandy CLAY with a trace of fine and medium assorted gravel and occasional cobbles and boulders (Glacial Till)			(6.70)	4.65-4.95	D	10	S N:8	
				5.00-5.50	B	11		
				5.50-5.95	U	12		55
				6.00-7.50	B	13		
				7.50-7.95	U	14		70
	86.87		8.60					Water encountered
Dense fine to coarse assorted SAND and GRAVEL (Glacial Sand and Gravel)			(1.40) penetrated	8.60-9.50	B	15		
BOREHOLE COMPLETE AT 10.00m.	85.47		10.00	9.65-9.95	D	16	S N:45	

SPT: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (not N - Value).

Depths: All depths and reduced levels in metres. Thicknesses given in brackets in depth column.

Water: Water level observations during boring are [illegible]

Sample/Test Key:
D Disturbed Sample
B Bulk Sample
W Water Sample
U Piston (Pi Tube (U) or core sample. Length to scale
S Standard Penetration Test
V Vane Test
C [illegible]
P [illegible]

Remarks

Logged by J.A.S.
Scale 1:50
Fig. 93

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 153712 : BGS Reference: SJ34NW320
British National Grid (27700) : 331380,345860

Soil Mechanics

SJ34NW/320

Borehole No. 218

Sheet 2 of 2

Equipment & Methods: As sheet one

Location No. 7557

RUABON BYPASS

Carried out for: WELSH OFFICE

Ground Level | Coordinates: As sheet one | Date

Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests: Depth	Sample: Type	Sample: No	Test	Field Records

Water Level Observations During Boring

Date	Time	Depth of Hole m	Depth of Casing m	Depth to Water m	Remarks
11.10.77	18.00	10.00	9.50	3.40	
12.10.77	08.00	10.00	9.50	2.20	

BOREHOLE CASED TO 9.50m

SPT: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (not N-value).

Depths: All depths and reduced levels in metres. Thicknesses given in brackets in depth column.

Water: Water level observations during boring are given on last sheet of log.

Sample/Test Key.
D Disturbed Sample
B Bulk Sample
W Water Sample
U Piston (P), Tube (U) or Core Sample (with % to scale)
S Standard Penetration Test
V Vane Test
C Core recovery (%)
R RQD (Total length/ designation)

Remarks

Logged by J.A.S.

Scale

Fig. 93

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 153675 ; BGS Reference: SJ34NW283
British National Grid (27700) : 331420,346100

Soil Mechanics

Borehole No. 6
Sheet 1 of 4

Equipment & Methods
Cable tool percussion rig, 600 mm diameter from ground level to 20.00m then rotary core drilling, water flush, producing 81mm diameter core to base.

Location No. 7557 SJ 34 NW 283
RUABON BY-PASS 3142 4610

Carried out for
WELSH OFFICE

Ground Level
99.13m N.D.

Chainage
2360m

Date
5-14 July 1977

Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests: Depth	Sample: Type	Sample: No.	Test	Field Records
TOPSOIL (Foreman's description)	99.13		0.00					No. of blows using down-the-hole hammer
	98.73		0.40					
Generally stiff, brown and red-brown, slightly sandy, silty CLAY with a trace to a little fine to coarse assorted gravel and occasional silt partings towards base (Glacial Till)			(3.60)	0.50 - 0.95	U	1		Spoil Backfill
				1.05	D	2		
				1.50 - 1.95	U	3		
				2.10	D	4		
slightly clayey silt				2.50 - 2.95	U	5		
				3.10	D	6		
				3.50 - 3.95	U	7		
	95.13		4.00	4.10	D	8		
clay band								Bentonite Seal
Grey, silty, fine to coarse SAND and fine to coarse assorted GRAVEL with bands of sandy, very silty clay with a little fine to coarse assorted gravel (Glacial Sand and Gravel)			(3.50)	4.50 - 5.00	B	9		
				5.30	D	10		Gravel filter
								Tip at 6.00m
				6.00 - 6.50	B	11		
clay band				6.90	D	12		
clay band				7.00 - 7.45	U	13		Bentonite 80 Seal
	91.63		7.50	7.55	D	14		
Stiff to very stiff, brown becoming red-brown, sandy, silty CLAY with a little fine to coarse assorted gravel (Glacial Till)			(4.30)					Spoil Backfill to base
				9.00	W	19		water encountered sealed off at 9.10m
				9.00 - 9.45	U	15		95
				9.60	D	16		
	(89.13)		(10.00)					

SPT: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (not N – value).

Depths: All depths and reduced levels in metres. Thicknesses given in brackets in depth column.

Water: Water level observations during boring are given on last sheet of log.

Sample/Test Key.
D Disturbed Sample
B Bulk Sample
W Water Sample
U Piston (P) Tube (U) or core sample : Length to scale
S Standard Penetration Test
V Vane Test
C Core Recovery (%)
r Rock Quality Designation

Remarks

Logged by A.P.D.

Scale 1:50

Fig. 9

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 153675 : BGS Reference: SJ34NW283
British National Grid (27700) : 331420,346100

Soil Mechanics

SJ34NW 283

Borehole No. 6

Sheet 2 of 4

Equipment & Methods: As sheet 1

Location No. 7557
RUABON BY-PASS

Carried out for: WELSH OFFICE

Ground Level | Coordinates: As sheet 1 | Date

Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
Stiff to very stiff CLAY (As sheet 1)	(89.13)		(0.00)	10.00-10.45	U	17		70
				10.50	D	18		water encountered
			(4.30)	11.40	D	20		
	87.33		11.80					Ubor attempted, recovery due to boulder
Light brown, slightly silty, fine SAND (Glacial Sand)			(2.10)	12.50-12.95	D	21		75
				13.05	D	22		
	85.13		13.90	13.75-14.05	D	23	S N=87	water sealed off
Stiff, reddish brown, sandy, silty CLAY with a little fine to coarse assorted gravel and occasional boulders. (Glacial Till)				14.00-14.45	U	24		110
				14.60	D	25		
			(2.10)	15.50-15.95	U	26		160
MAIN / DETAIL	85.03		16.00	16.10	D	27		
Stiff to very stiff, dark red-brown, poorly thinly laminated, slightly silty CLAY with occasional very weak lithorelics, becoming at approximately 20.00m highly weathered, thinly laminated, slightly silty, generally weak MUDSTONE reduced in part to clay with occasional lithorelics. (Ruabon Marl)				17.50-17.95	U	28		145
				18.10	D	29		
			(15.50m penetrated)	19.00-19.30	U	30		150
				19.35	D	31		
				19.55	D	32		
	(79.13)		(20.00)	19.70-20.00	B	33		

SPT: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (not N - value).

Depths: All depths and reduced levels in metres. Thicknesses given in brackets in depth column.

Water: Water level observations during boring are given on last sheet of log.

Sample/Test Key:
D Disturbed Sample
B Bulk Sample
W Water Sample
! Piston (P) Tube (U) or core sample: Length to scale
S Standard Penetration Test
V Vane Test
C Cone resistance (kPa)
r Rock Quality Designation (ROD - %)

Remarks

Logged by A.P.D.

Scale 1:50

Fig. 9

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Soil Mechanics

SJ34NW/283

Borehole No. 6
Sheet 3 of 4

Equipment & Methods: As sheet 1

Location No. 7557
RUABON BY-PASS

Carried out for: WELSH OFFICE

Ground Level | Coordinates: As sheet 1 | Date

Description MAIN	Description DETAIL	Reduced Level	Legend	Depth & Thickness	Samples/Tests: Depth	Sample: Type	Sample: No.	Test	Field Records
		(79.13)		(20.00)	20.00-20.10		D 34	S (80)	initial penetratio only
Generally weak MUDSTONE (As sheet 2)	Broken zone				20.00-21.70	68			
	softer, reduced in part to clay								
	subvertical, curved, tight joint								
	60°, planar, tight joint								
	softer, reduced in part to clay				21.70-22.50	97			
	softer zone with very weak to weak lithorelics								
					22.50-23.90	100			
	softer zone reduced in part to clay								
	intersecting 75° tight joint and (S) subhorizontal discontinuities						N.A.	N.A.	
	softer broken zone								
					23.90-25.30	93			
	softer zone								
	softer zone, reduced in main to clay with lithorelics			(15.50m penetrated)					
					25.30-26.60	96			
	broken zone								
	60° planar, tight joint								
	softer zone, reduced in main to clay				26.60-27.50	94			
	intersecting, 60° planar, tight joint and subhorizontal discontinuities								
	softer zone reduced in part to clay with lithorelics								
					27.50-29.00	95			
	broken zone								
					29.00-30.50	83			
	softer zone reduced in part to clay with lithorelics	(69.13)		(30.00)					

	C	r	If
Remarks			

1. N.A. indicates not applicable
2. If is the Fracture Spacing Index in mm

SPT: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (not N - value).

Depths: All depths and indicated levels in metres. Thicknesses given in brackets in depth column.

Water: Water level observations during boring are given on last sheet of log.

Sample/Test Key
D Disturbed Sample
B Bulk Sample
W Water Sample
U Piston (P) Tube (U) or core sample: Length to scale
S Standard Penetration Test
V Vane Test
C Compressometer (C)
r Rock Strength (Irregular)

Logged by R.P.D.
Scale 1:50
Fig. 9

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British Geological Survey

BGS ID: 153443 ; BGS Reference: SJ34NW52
British National Grid (27700) : 332270,346500

FORM P 70
SERIES 680

CONFIDENTIAL

Section of BROOKFIELD BOREHOLE
(for Bersham Colliery)

Purpose To Prove Cefn Seam

Exact Site Middle Sontley, Hafod, Nr.Wrexham.

N.G.Co-ords:
~~E.332200.5m; N.346346.0m~~ 3227 4650

Level at which ~~shaft~~ bore ~~drift~~ commenced relative to O.D. 93.49 m or ~~ft~~

Date of sinking or boring 19th April to 16th June 1983

Sinker or borer National Coal Board, Western Area.

6 INCH MAP (County, Sheet and Qtr.)	B/H REGD.No.
SJ 34 NW/52 (Nat. Grid, Sheet & Qtr.)	547

Attach tracing from a map or sketch map if possible

1" 121

*Delete as appropriate

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m or ft*	THICKNESS cm or in*	DEPTH m or ft*	DEPTH cm or in*
	Clay - Yellow, red.			14	0
	Sand, white some red, black, fine grains, well rounded			40	0
	Sand, multicoloured-white, yellow, coal fragments, 1mm to 10mm. Sub-round to sub-angular			110	0
FROM ELEC-LOGS					
Water Level 105Ft	Marl, brownish red, common. Green some white Quartz fragments. Limestones at 192',234' &274'			274	0
Bersham Yard	Marl, grey/green, common red			324	0
C 47" at 640'3"					
C 27" at 673'6"	Marl, multidoloured-50%grey, brown, red, yellow, black			570	0
	BASE OF RUABON MARLS				
C 23" at 698'10	Marl, medium-darkgrey. Some red,yellow, black. Occ. pebble fragments. Limestone at 678			680	0
C 35"					
D 35"					
C 60" at 710'7"	Marl, dark grey with about 5% coal specks, occ. red fragment. Ab. coal 695- to			730	0
	Mudstone, dark grey, flakey. Becoming lighter from 785'.Occ coal fragment			820	0
	Mudstone, grey. Some sand peices			850	0
C 43" at 892'5"	Sandstone, light grey speckled with carbon and mica. Occ coal fragment (2%)			900	0

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British National Grid (27700) : 332270,346500

FORM P 71
SERIES 680

C

6-INCH MAP	B/H
SJ 34 NW/52	

*Delete as appropriate

• Section of Brookfield Borehole

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		ft or ft*	in or in*	ft or ft*	in or in*
	Cores start			900	0
	Siltstone/seatearth, dark, coarse grained Ironstone pellets. Ab. carbonised plant debris, mica on partings	1	4	901	4
	Siltstone, dark, carbonaceous partings. Increase in sand laminae to 901'10. 2" band of sandstone, strong with plant debris at base		8	902	0
	Mudstone, medium dark, slightly silty. Occ. carbonised plant debris. ½" sand to 902'1½". Becoming more silty below 902'4". ½" sand to 902'6". LEVEL. Carbonaceous laminae from 902'9". Darker from 903'8" Ironstone nodule from 904'. Smooth from 904'1" Mussel fragment at 904'7". Thin ironstone ribs from 904'10". Mussels from 905'2 to 905'5" Becoming slightly silty from 906'8" Ironstone ribs continue. Mussel debris at 908'0. Ironstone ½" at base	6	2	908	2
	Mudstone, smooth, dark. Occ. ironst. ribs. Mussel debris at 909'1½" ½" ironstone at 909'2"	1	5	909	7
	Lost core to			921	3
	COAL (missing) by electric log	2	0	921	3
	Seatearth, weak. Ironstone pellets and ab. carbonaceous material. Roots, listric surfaces. Grey/green		8	921	11
	Marly seatearth. Pale green/grey. Ab. carb. plant material. Firm and sandy from 921'9"	1	5	923	4
	Sitstone, medium dark. Firm. Fine carbonaceous debris. Ironst. nod. 922'10"		8	924	0
	Lost core to			940	7
	Sandstone, fine grain, laminated. Medium/dark grey with fine white laminae. Mica on partings. Finely disseminated plant debris. Regular Dip 07°	2	1	942	8
	Siltstone, laminated. Medium/dark grey Sparce plant debris	2	1	944	9

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FORM P 71
SERIES 680

• Section of Brookfield Borehole

6-INCH MAP	B/H
SJ 34 NW/52	

*Delete as appropriate

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS ft	THICKNESS in	DEPTH ft	DEPTH in
				944	9
	Mudstone/Sandstone finely interlaminated. Mudsts dark, sandsts light. Micaceous. Complex from 945'6" with increasing sand	1	6	946	3
	Sandstone, strong, medium grained. Ripple marked with mud laminae & mica	2	1	948	4
	Mudstone, silty complex interlaminated with sand. Fairly strong. Sands micaceous and finely laminated. High Angle Joint at 950'5 & 950'10. Very occ. plant frond & comminuted material on partings. H.A.J. @ 956'3. Sands becoming thinly bedded bands of about ⅛" fine white from 958'4". Slip plane at 959'2"	11	11	960	3
	Sandstone, complex laminae		4	960	7
	Siltstone, dark grey, micaceous with fine sand laminae. H.A Slip planes poss. small scale faulting	1	5	962	0
	Mudstone silty, dark to medium grey. Micaceous. Comminuted plant debris. DIP 02°. Coarsening downwards to:	1	9	963	9
	Siltstone laminated. Medium grey. Occ. comminuted plant debris. Increasing sand laminae from 964'10"	2	0	965	9
	Sand/Silt complex interlaminated	4	10	970	7
	Sandstone, ripple marked	1	9	972	4
	Silt/Sand complex interlaminated. Strong		11	973	3
	Missing core to			977	7
	Sandstone grey, complex fine laminae	2	7	980	2
	Sandsone, very fine laminae. Occ. micaceous parting below 980'10"	1	10	982	0
	Sandstone ripple marked. Fine/medium grain. 1½" ferruginaous at top. Abundant dark micaceous laminae with comminuted plant debris from 987'3" H.A.Slip at 987'10". Fining at base	12	7	994	7
	Mudstone silty, dark grey. Mica on bedding planes. Carbonaceous material. Sandst. laminae. Strong. LEVEL. Slurry bedded 1" to 996'6" with sandstone interbedded below	2	8	997	3

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FORM P 71
SERIES 680

Section of Brookfield Borehole

6-INCH MAP	B/H
SJ 34 NW/52	

*Delete as appropriate

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		m or ft*	m or in*	m or ft*	m or in*
				997	3
	Sandstone fine grained. Calamites stems. Micaceous. H.A.Slip planes at 1005'4" Sand laminae from 1005'4"to 1006'2" DIP 02°. Highly slumped from 1007'8" Faulted base	3	11	1008	5
	Mudstone breccia		9	1009	2
	Mudstone seatearth, weak, flakey with listric surfaces. Stronger from 1010' with abundant roots. Slip plane at 1002'	4	10	1014	0
	Missing core			1015	4
	Mudstone/Seatearth strong. Roots. Slightly silty with ironstone pellets from 1016'6"	2	5	1017	9
	Mudstone/Seatearth weak, roots. Abundant listric surfaces. Slip at base	2	3	1020	0
	Mudstone, laminated weak		11	1020	11
	Coal, inferior		2		
	COAL		4		
	Mudstone		1		
	COAL		4		
	Cannel		0½	1021	10½
	Mudstone, strong. Ab. roots and plants. Ironstone nodules. DIP 04°	2	6½	1024	5
	Mudstone, dark, strong. Ab.plants and roots. H.A.Joint at 1026' listric. Ironst.nodule at 1026'4". Dip increases to 15° from 1026'8" to 1027'6" with broken core	3	8	1028	1
	Mudstone slightly silty. DIP 04°. Grey laminated. Sand whisps and laminae from 1028'10". Mica and comminuted plants on bedding. ½" ironst. 1029'7	2	7	1030	8
	Mudstone, medium dark grey. Smooth. Occ. plant debris. 1" ironstone at 1031'9"	3	2	1033	10
	Mudstone, smooth, dark. Occ. thin ironstone bands. Fucoid at 1034'11". Ostracods MUSSEL fragments from 1035'5". Conodant at 1035'6"	1	8	1035	6
	Siltstone, strong		7	1036	1

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FORM P 71
SERIES 680

C

Section of Brookfield Borehole

6-INCH MAP	B/H
SJ 34 NW/52	

*Delete as appropriate

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		~~ft~~ or ft*	~~m~~ or in*	~~ft~~ or ft*	~~cm~~ or in*
				1036	1
	Mudstone grey, weak. MUSSEL fragments abundant. Stronger from 1036'9. MUSSELS abundant. Ostracod bed 1037'2" to 1037'9". MUSSEL at 1038' with fragments. Ostracods continue. H.A.Slip plane at 1038'6". MUSSELS sparce to 1040'4 then a band of crushed fragments. Ostracods scattered on layers. MUSSELS isolated on layers below 1042'. Ironst. band 1" at 1044'9"	8	11	1045	0
	Mudstone grey, smooth. Occ. Ostracods and patch of Forams? at 1045'3" Ironstone nodules. Pyrite infilled burrow 1047'8" Layer MUSSEL fragments 1048'8" and 1048'10". Abundant thin ironstone ribs from 1049'. Ironstone pellets, nodules and Guillemites below 1050'. Darker with occ. plant debris from 1054'. DIP 04°. Occ. ironstone band of about 1"	14	0	1059	5
	COAL, pyrite at top	2	2		
	Mudstone, carbonaceous		6½		
	COAL		5½		
	Mudstone, carbonaceous		6		
	Inferior coal		10		
CEFN	COAL		6½		
	Inferior coal		5½		
	COAL	1	7		
	Mudstone, carbonaceous		2		
	Inferior coal		3½	1067	00
	Mudstone, carbonaceous		6		
	Mudstone/Seatearth, weak		4		
	Mudstone, laminate, carbonaceous. DIP 05°	2	9		
	COAL		3	1070	10
	Mudstone, seatearth. Ab. roots. Listric	1	9	1072	7
	Siltstone seatearth., laminated	1	5	1074	0
	Sand/Silt finely interlaminated. Micaceous. Comminuted carbonised material	1	10	1075	10
	Sand/Silt, finely laminated, mica & plant debris on partings		6	1076	4
	Sandstone medium grained. Strong. Isolated carbonised plant debris.	1	4	1077	8
	Mudstone, slightly silty. Med-dark grey. Occ. sand laminae. Ab. plant debris on partings. 1" ironst. @ 1082'6" Finer grain from 1083'. Plant debris sparcer from 1084'6. ½"ironst @ 1085'	7	9	1085	5

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FORM P 71
SERIES 650

C

6-INCH MAP	B/H
SJ 34 NW/52	

*Delete as appropriate

Section of Brookfield Borehole

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m or ft*	THICKNESS cm or in*	DEPTH m or ft*	DEPTH cm or in*
				1085	5
	Mudstone, grey, occ. plant debris. Weak. 1"ironst. @ 1086'4";½"@1086'11". Worm trails from 1087'8"	2	9	1088	2
	Mudstone, medium-dark grey. Smooth. ½"ironstone at base		4	1088	6
	Mudstone, dark grey, smooth, carbonaceous. Occ. listric surface. Fish debris		11	1089	5
	COAL	1	0	1090	5
	Mudstone/seatearth, fawny, ab. listric surfaces. Roots. Weak & swollen from 1091'6"	2	8	1093	1
	Seatearth, sphaerosideritic		7	1093	8
	Siltstone/seatearth, roots		5	1094	1
	Sandstone/seatearth. Strong with roots		9	1094	10
	Mudstone/seatearth. Abundant roots		7	1095	5
	Mudstone, dark grey.Laminated.Occ. fish debris, Sandstone band 3" at base DIP 05°	1	9	1097	2
	Mudstone, dark grey.Smooth, laminated	1	3	1098	5
	Mudstone/seatearth, roots, ab. listric surfaces. Ab. large ironstone nodules from 1099'10". Silty from 1100'8"	2	6	1100	11
	Mudstone, medium to dark grey. Ab. plant debris. Ferruginous patches. Calamites stems. Banded ironstone nodules from 1102' to 1102'4"	1	10	1102	9
	Siltstone, fine grain, med-dark grey. Plant debris. Laminated. Increasing sandstone from 1105'10"	3	8	1106	5
	Sandstone, med.grey.Laminated. Micaceous	1	4	1107	9
	Siltstone, dark grey, abundant carbonised plant debris. Occ. sand whisps	1	2	1108	11
	Mudstone, silty.Laminated. Ab. plant debris	1	6	1110	5
	Sandstone, finely laminated. Micaceous Plant debris	2	5	1112	10
	Mudstone. Occ.plant debris. Poorly laminate Plants increasing from 1112'6"	1	2	1114	0

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FORM P 71
SERIES 680

C

6-INCH MAP	B/H
SJ 34 NW/52	

*Delete as appropriate

* Section of Brookfield Borehole

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS ft*	THICKNESS in*	DEPTH ft*	DEPTH in*
				1114	0
	Mudstone, silty, fairly strong. Isolated plant debris	4	0	1118	0
	Siltstone, med-dark grey. Ab. plant debris		6	1118	6
	Siltstone/Mudstone interbanded	1	10	1120	4
	Mudstone, smooth, weak. Grey becoming dark grey, carbonaceous at 1121'3"	1	10	1122	2
	COAL	2	2	1124	4
	Mudstone/Seatearth, weak, roots. Iron.nods	2	8	1127	0
	Sandstone/Seatearth.Strong, roots		9	1127	9
	Mudstone/Seatearth, roots.Ab.ironst.nods	4	0	1131	9
	Mudstone, ferruginaous patches.Nodules. Plant debris. Laminated.DIP 01°	6	11	1138	8
	Mudstone, dark, laminated.Plant debris	1	0	1139	8
	Interlaminated Sand/Silt. Sluury bedded from 1140'6"	1	0	1140	8
	Mudstone, dark grey		4	1141	0
	Sandstone		5	1141	5
	Sand/Silt, finely interlaminated. Mica	4	11	1146	4
	Mudstone, dark grey. Laminated. Sand laminae to 1146'10.Ab. plant debris to 1149'. Carbonaceous from 1151'6".Occ.fish	4	7	1151	11
	COAL	1	3	1153	2
	Mudstone, canneloid with pyritised roots		2	1153	4
	Seatearth, mudstone, carbonaceous with abundant ironstone nodules		6	1153	10
	Mudstone, grey. laminated. Roots. Ironst. pellets	1	0	1154	10
	Sandstone, slumry bedded. Fine grained	1	0	1155	10
	Sandstone/mudstone finely interlaminated. Plant debris. Sand fine grained	3	0	1158	10
	Mudstone, grey.Haminated.Plant debris		9	1159	7
	Sandstone, fine grain. Fine laminae		7	1160	2

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FORM P 71
SERIES 680

Section of Brookfield Borehole

6-INCH MAP	B/H
SJ 34 NW/52	

*Delete as appropriate

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		~~X~~ or ft*	~~X~~ or in*	~~X~~ or ft*	~~X~~ or in*
				1160	2
	Siltstone, finely laminated. Plant debris. Occ. ferruginous band	1	4	1161	6
	Mudstone, light grey. 1"ironst. @1163'3". & 1163'8". H.A.Slip 1164'8". Thin ironstone ribs. Ironstone 1"@1170'6, 1171'6", 1172'4"; 2"band @ 1173'9"; 1" band @ 1174'10". Becoming finer grained with fissile laminae from 1179'. LEVEL	23	11	1185	5
	Mudstone, carbonaceous. Laminated. Occ. thin ironstones. Isolated fish debris from 1188'6"	4	4	1189	9
	Mudstone, dark grey to black. Smooth. Sticky partings	4	11	1194	8
	Mudstone, silty, very dark to black. Sticky laminae. DIP 01°. Ab. pinhead burrows. Occ. MUSSEL fragment from 1197'6". Goniatite 1197'3". Pyrite blebs from 1197'6". Ostracods at 1198'. Ab. carbonised plant debris (comminuted) from 1198'6"	3	1	1198	8
	COAL	2	1	1200	9
	Mudstone/Seatearth, weak		9	1201	6
	Mudstone/Seatearth, carbonaceous		4	1201	10
	Mudstone/Seatearth, weak, flakey	1	3	1203	1
	Fine grained siltstone seatearth		8	1203	9
	Mudstone, poorly bedded. Roots & plants. Occ. ironst. nodule becoming large and abundant from 1206'9"	4	1	1207	10
	Mudstone, slightly silty. Laminated. DIP 01°. Plant debris. ½"COAL at 1212'1". Thin sand laminae from 1213'6"	6	8	1214	6
	Mudstone, laminated, weak easy partings. Smooth. Stronger from 1216'. Isolated plant debris. ½"ironstone at 1219'4" 1"ironstone at 1221'9" Abundent trails and bio-turbulance from 1222' 2"ironstone at 1225'7" Weak and broken with High Angle Joints from 1227'3" to 1228'5" probable				
	...cont....				

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 153443 : BGS Reference: SJ34NW52
British National Grid (27700) : 332270,346500

FORM P 71
SERIES 680

Section of Brookfield Borehole

6-INCH MAP	B/H
SJ 34 NW/52	

*Delete as appropriate

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS yd or ft*	THICKNESS cm or in*	DEPTH yd or ft*	DEPTH cm or in*
				1214	6
	compaction on underlying ironstones. (carbonaceous in this length). 2"ironstone at 1229' 2"ironstone at 1231'	17	9	1232	3
	COAL		4	1232	7
	Sandstone/Seatearth, fairly strong		9	1235	4
	Sandstone, sphaerosideritic	1	3	1236	7
	TOTAL DEPTH 1236FEET 7INCHES				
	Borehole sealed in accordance with P.I. 1977/9 with 11.34 Tonnes Shallow Oil Well Cement (A.P.I. Class B).				

Contact BGS: ngdc@bgs.ac.uk

Appendix B

Regulatory Correspondence

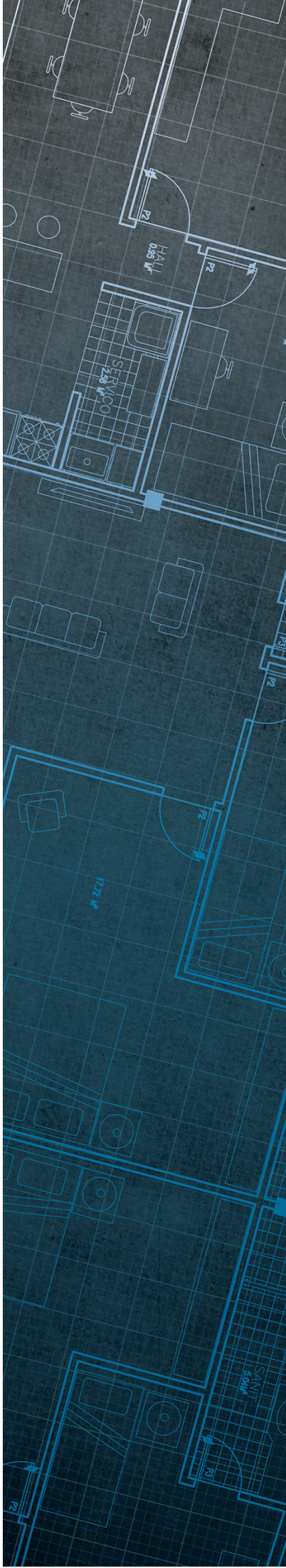
The Coal Authority

Consultants

Coal Mining Report

Hafod Road Solar Farm
Hafod Road
Ruabon
Wrexham
LL14 6HF

Date of enquiry:	**10 October 2024**
Date enquiry received:	**10 October 2024**
Issue date:	**10 October 2024**
Our reference:	**51003455764001**
Your reference:	**2310008.001**



Consultants
Coal Mining Report

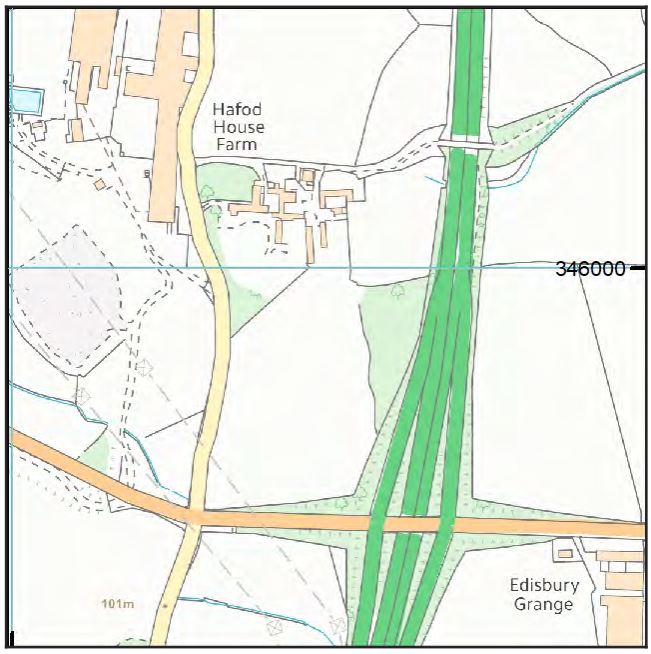
This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

TWEEDIE EVANS CONSULTING LTD

Enquiry address

Hafod Road Solar Farm
Hafod Road
Ruabon
Wrexham
LL14 6HF



Approximate position of property

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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
HAFOD	SMITHS	Coal	381N	366	South-East	5.2	East	80	1944
HAFOD	SMITHS	Coal	381V	367	South-East	5.2	East	90	1955
unnamed	POWELL	Coal	381Z	380	North-East	4.2	South-East	110	1948
unnamed	POWELL	Coal	3829	381	East	5.6	South-East	110	1963
unnamed	POWELL	Coal	381Y	381	East	4.9	South-East	110	1957
HAFOD	SMITHS	Coal	381U	390	Beneath Property	5.2	East	90	1933
HAFOD	SMITHS	Coal	4JSC	390	Beneath Property	4.2	South-East	80	1923
unnamed	SMITHS	Coal	4JSD	390	North	4.2	South-East	80	1923
unnamed	LOWER STINKING	Coal	381J	396	North	4.8	East	140	1925
unnamed	LOWER STINKING	Coal	381H	398	North-West	8.3	South-East	140	1940
unnamed	LOWER STINKING	Coal	3811	401	North	8.0	South	140	1924
unnamed	POWELL	Coal	381X	402	Beneath Property	5.5	East	110	1941
unnamed	LOWER STINKING	Coal	381K	402	North	4.2	South-East	140	1924
unnamed	POWELL	Coal	3828	403	Beneath Property	5.0	East	110	1951
unnamed	TWO YARD	Coal	382J	414	West	9.4	South-East	160	1957
unnamed	QUAKER	Coal	38U5	415	East	4.1	East	110	1940
unnamed	QUAKER	Coal	3ACG	416	East	6.1	East	110	1908
unnamed	TWO YARD	Coal	382X	417	West	9.5	South-East	110	1959
unnamed	QUAKER	Coal	38U3	426	North-East	3.0	South-East	110	1968
unnamed	MAIN	Coal	38RP	434	East	4.0	East	210	1946
unnamed	QUAKER	Coal	38UB	435	Beneath Property	6.3	East	110	1968
unnamed	MAIN	Coal	38S7	435	South-East	5.0	South-East	210	1946

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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	QUAKER	Coal	3ACF	437	Beneath Property	2.3	North-East	110	1912
unnamed	MAIN	Coal	38RQ	444	North-East	4.0	South-East	150	1946
unnamed	CROWN	Coal	38UP	448	East	15.2	South	80	1939
unnamed	MAIN	Coal	38RN	449	North-West	2.3	East	220	1946
unnamed	MAIN	Coal	38S2	449	West	10.0	East	220	1946
unnamed	MAIN	Coal	38RO	460	Beneath Property	4.0	East	210	1946
HAFOD	CROWN	Coal	38US	466	South-East	7.0	South-East	80	1929
unnamed	PIN	Coal	79E6	476	North-East	3.5	South-East	90	1925
unnamed	MAIN	Coal	38S3	477	Beneath Property	4.0	East	210	1946
unnamed	CROWN	Coal	38UO	477	North-East	3.3	South-East	80	1938
unnamed	PIN	Coal	79EA	485	North-West	10.6	North-East	90	1923
unnamed	PIN	Coal	79E9	489	Beneath Property	10.7	North-East	90	1924
unnamed	PIN	Coal	79EB	489	North-West	10.3	North-East	90	1874
unnamed	PIN	Coal	3846	499	Beneath Property	8.1	East	80	1932
unnamed	CROWN	Coal	38UR	516	Beneath Property	2.6	South-East	80	1933
unnamed	CROWN	Coal	38UQ	518	North-West	5.3	East	80	1920
unnamed	RUABON YARD (SOFT 5 QTRS)	Coal	4JS3	528	Beneath Property	4.6	South-East	90	1877
unnamed	HALF YARD / QUEEN	Coal	383H	541	Beneath Property	4.9	South-East	130	1892
unnamed	RUABON YARD (SOFT 5 QTRS)	Coal	4JS2	549	Beneath Property	5.0	East	90	1877
unnamed	RUABON YARD (SOFT 5 QTRS)	Coal	4JRR	557	Beneath Property	6.0	East	90	1886
unnamed	HALF YARD / QUEEN	Coal	383F	564	Beneath Property	5.0	East	130	1879
unnamed	HALF YARD / QUEEN	Coal	383M	570	Beneath Property	2.6	West	120	1892
unnamed	RUABON YARD (SOFT 5 QTRS)	Coal	4JRS	594	West	6.0	East	90	1900
unnamed	RUABON YARD (SOFT 5 QTRS)	Coal	4JRQ	622	Beneath Property	6.0	East	90	1896

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Probable unrecorded shallow workings
None.

Spine roadways at shallow depth
No spine roadway recorded at shallow depth.

Mine entries
None recorded within 100 metres of the enquiry boundary.

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

NW1396	NW619	11390
NW525	14509	14508
14476	11510	NW617

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
No outcrops recorded.

Geological faults, fissures and breaklines
No faults, fissures or breaklines recorded.

Opencast mines
None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips
None recorded within 500 metres of the enquiry boundary.

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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
None recorded within 50 metres of the enquiry boundary.

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.

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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.

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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.

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.

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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.

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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.

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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.

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The Coal Authority

Summary of findings

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

Key

Approximate position of the enquiry boundary shown



How to contact us
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www.groundstability.com