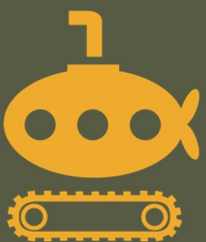


Hopkins Solar Farm, Ty Croes, Carmarthenshire. Coal Mining Risk Assessment

**A REPORT FOR SPRING
DECEMBER 2019**



Document Control

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Hopkins Solar Farm, Ty Croes, Carmarthenshire. Coal Mining Risk Assessment

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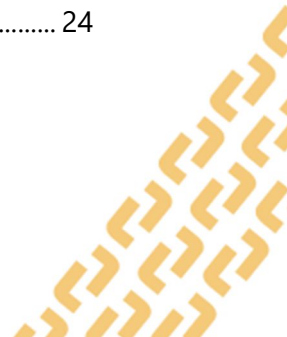
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1 Introduction

1.1 CONTEXT

Renplan has submitted a pre-application enquiry to Carmarthenshire County Council (Ref. PA/16871) for the proposed installation of ground mounted PV solar panels on land east of the A48 and land South West of Tycroes, adjacent to Clawdd Ddu Solar Farm, Tycroes (the Site) on behalf of the developer, Spring Dev 02 Ltd (the Client).

Yellow Sub Geo Limited (Yellow Sub) has been commissioned to prepare a Coal Mining Risk Assessment Report of the proposed development site, in order to provide the Local Planning Authority with information on coal mining and an assessment of its impact on land stability.

On 17th September 2019 the Coal Authority contacted the planning department at Carmarthenshire County Council in response to their request for the Coal Authority's view on the development. The letter noted the following potential hazards associated with historic mining at the site:

- Parts of the site fall within areas defined as 'Development High Risk Area'.
- Records indicate the two recorded mine entries (shafts) to be present within, or within 20m of the planning boundary.
- The site is likely to have been subject to historic unrecorded underground coal mining at shallow depth associated with thick coal outcrops.

The Coal Authority have stated that *'in considering the nature of the development proposed, and on the basis that parts of the site are within the defined Development High Risk Area, the planning application should be supported by a Coal Mining Risk Assessment, or equivalent, which will assess the risk to the development from coal mining legacy.'*

The purpose of this report is to meet with the above request from The Coal Authority.

1.2 SITE LOCATION

The Site under consideration for development is spread over three areas to the south and west of Tycroes approximately 5km south west of the town of Ammanford, Carmarthenshire.

Two of the areas are located approximately 1.5-2km south west of Tycroes to the south of the A483. The third area is located approximately 3-3.5m WSW of Tycroes on the northwestern side of the A483. The three areas are to be connected by cables, the route of which, where possible, follows field boundaries. A section of the cable route passes along the carriageway of the A483.

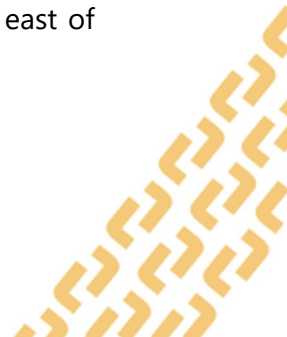
The site location is shown on Drawing 19158_R1_01 and the areas identified on Drawing 19158_R1_02.

The areas are situated at the following locations:

- Area 1 - SN59990955, Postcode SA18 3SW
- Area 2 - SN59230950, Postcode SA18 3RF
- Area 3 - SN57470946, Postcode SA4 0FS

1.3 DESCRIPTION AND LAYOUT OF PROPOSED DEVELOPMENT

The site currently comprises open fields used for agriculture. Areas 1 and 2, in the east of the site, lie in the vicinity of the Clawdd-du solar farm.



The Site splits into three main areas as detailed in Table 1-1. It is intended to develop these areas as a solar farm with the installation of solar panels and associated infrastructure buildings and cabling. The three areas are linked by cables which are to be buried at around 1.2m depth. A section of the cable is to run along the northern side of the A483. Two areas of horizontal directional drilling are proposed. One in the east where the cable crosses the A483, the other in the west of the route near Area 3 where the cable route crosses beneath the Afon Gwili. The HDD has yet to be designed, but the depth of drilling has been estimated to be around 5-10 mbgl.

Table 1-1 Summary of site areas

Area	Location	NGR	Description
Area 1	Approximately 1.5km south west of Tycroes. To south of A483	SN59990955	Approximately 22ha of open field land. Crossed by a track. Localised drains
Area 2	Approximately 2km south west of Tycroes. To south of A483	SN59230950	Approximately 2.1ha of open fields. Crossed by an overhead electricity cable.
Area 3	Approximately 3.5km WSW of Tycroes. To north west of A483, and east of A48	SN57470946	Approximately 21.7 ha of open fields. Includes a separate smaller area to the east adjacent to the Afon Gwili. Main area spans the access track to Ty-lsaf farm house

1.4 SCOPE OF THE COAL MINING RISK ASSESSMENT

The purpose of this Coal Mining Risk Assessment Report is to;

- present a desk-based review of all available information on the coal mining issues which are relevant to the application site;
- use that information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues;
- set out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/ or demonstrate how coal mining issues have influenced the proposed development and;
- demonstrate to the Local Planning Authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.



2 Sources of information

2.1 INTRODUCTION

This report is based on data obtained from the following sources:

- The Coal Authority Interactive Map Viewer.
- Coal Authority guidance document 'Risk Based Approach to Development Management, Guidance for Developers, Version 4 2017'.
- Consultants Coal Mining Report 'Ty Croes Solar Farm, Clawdd Du, Carmarthenshire', Report Ref 51002198295001, dated 9th December 2019.
- Consultants Coal Mining Report 'Ty Croes Solar Farm, Land East Of A48 Carmarthenshire', Report Ref 51002202952001, dated 9th December 2019.
- Consultants Coal Mining Report Ty Croes Solar Farm, Cable Run Carmarthenshire', Report Ref 51002203778001, dated 13th December 2019.
- Coal Mining Subsidence Claims History, 'Land and Llettynewydd Farm, Tycroes, Ammanford, Carmarthenshire, Report Ref 51002203860001, dated 16th December 2019.
- BGS 1:50 000 geological mapping, Sheet 230, Ammanford solid (1977) and drift (1977).
- Historic geological mapping, Sheet 230, Ammanford drift (1907) scale 1:63 360.
- Historic geological mapping, Sheet 41, North Western Part of the South Wales Coal Field scale 1:63 360 (1845 and 1854).
- BGS 1:10 560 geological mapping, sheets SN50NE and SN60NW.
- Historical mapping – accessed online.
- Geological Memoir – The Geology of the South Wales Coal Field Part VII the country around Ammanford, The Memoirs of the Geological Survey of England and Wales (1907).
- Geological Memoir - The geology of the South Wales Coalfield Special Memoir, The Upper Carboniferous and later formations of the Gwendraeth Valley and adjoining areas in parts of the Carmarthen (229) Ammanford (230) and Worms Head (246) sheets (1968).



3 Data review

3.1 COAL AUTHORITY INTERACTIVE VIEWER

The Coal Authority Interactive Viewer (accessed on 10th December 2019) identifies the whole site to lie in a 'Coal Mining Reporting Area'.

The majority of the site is identified as lying in a 'Development Low Risk Area'. However discrete parts of the site are indicated to lie within 'Development High Risk Areas'. These areas appear to be associated with mine entries and coal outcrops.

Three mine entries are indicated to be within or in the general vicinity of the site. One is located in the northwest of Area 3 and the other two lie close to the cable route, to the north of the junction of the A483 and the B4297.

Regions of coal subcrop are identified in three areas:

- Multiple NE/ SW trending coal seams (4) are noted in the east of Area 1.
- An arcuate coal seam crosses cable route at Cem Gwili (western end of A483).
- A NW-SW trending coal seam crosses east of Area 3, close to the Afon Gwili, and also could be in proximity to the proposed western area of horizontal directional drilling.

3.2 COAL AUTHORITY GUIDANCE FOR DEVELOPERS

The Coal Authority's guidance document 'Risk Based Approach to Development Management, Guidance for Developers' notes:

'The overall process aims to provide a consistent approach to assessing development proposals across the coalfields. It is recognised that flexibility and discretion is a necessary part of the planning system and as such there may be exemptions to the requirement for an applicant to submit a desk based Coal Mining Risk Assessment in support of a development proposal within the Development High Risk Area.'

The exceptions list is noted to fall into two parts based on the Type of Application (eg householder development, heritage consent) and Nature of Development (eg change of use, non-permanent works with no ground works).

The explanation for Nature of Development exemptions note:

*'There may also be exemptions made for the nature of development, **where the building and/or engineering operations are minimal and therefore would not require the applicant to obtain a Coal Authority Permit** for ground works that intersect coal/ workings.'*

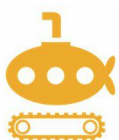
It should be noted that one of the examples given as an example of a Nature of Development exemption for a 'non-permanent works with no groundworks' is a solar array. The justification for this exemption is noted to be 'no significant ground works'.

The proposed development does include some groundworks in the form of shallow cable burial and limited deeper HDD. It may be for this reason the Coal Authority requested a Coal Mining Risk Assessment.

Given the comparatively low risk nature of the proposed development, this report focusses on those areas of the site identified as lying in the 'High Risk Development Area' only.

3.3 GEOLOGICAL ASSESSMENT

The 1:63,360 scale historical geological mapping (Sheet 41), dated 1845 and 1854 show bedrock at the site to comprise Coal Measures, however no coal subcrops are denoted in the



region of and around the site. Known seams have been mapped on this Sheet elsewhere however, as evidenced by a number of coal seams that are shown in the Ammanford area (north and east of the current area of interest).

The 1:63,360 scale historical geological mapping (Sheet 230), dated 1907 shows drift deposits to be thin, or absent across most of the site. Where present it is denoted to comprise 'Boulder Clay'. A region of Alluvium is noted in the valley of the Afon Gwili. A sandstone bed identified as 'Cockshot' is noted in the area around the site. This bed is displaced by a number of NW/ SE trending fault across the site. The sandstone encroaches onto the site at three locations, to the east of Clawdd-du in the east of the site; near the road crossing at Greynor Isaf; and in the west of the cable route, between Cefn Gwili and the Afon Gwili. Two possible subcrops identified as 'mine' are noted to the east of Area 1. An unnamed seam is indicated to the south of Cefn Gwili (which appears on the 1977 BGS map labelled as the Red Seam).

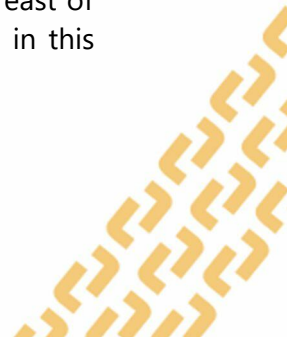
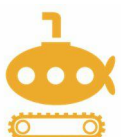
The current 1:50 000 geological mapping (Sheet 230) shows much of the site to be draped in Glacial Till, with only localised areas of the site shown to have little or no superficial deposits. Bedrock at the site is indicated to span the Middle and Upper Carboniferous Coal Measures. A number of northwest/southeast orientated faults cross the overall site, these are all downthrown to the west. The Glyn-Wallis Fault is indicated to cross the cable route in the area of Cefn Gwili. An unnamed coal seam is shown to cross the cable route in the area of Cefn Gwili. The dip and orientation of dip of the strata in the general area of the development is variable, possibly due to the faulting. The recorded dips range from 13 to 35° and range in orientation from south to south east.

The 1:106560 geology mapping shows the strata at the site to be faulted sequence from the Middle and Upper Coal Measures.

Superficial deposits are indicated to be thin or absent across some of Area 1. Where present, they are indicated to comprise Glacial Till. Bedrock in the area is shown as the Upper Coal Measures Llynfi Beds, locally with sandstones, Area 1 is crossed by the northwest-south east trending Hendre fault which is down thrown to the west. This fault bifurcates close to the site boundary and crosses the site as two distinct faults. An area of 'small old quarries in quartzitic sandstone' is identified in the south of Area 1.

Superficial deposits are indicated to be thin or absent across most of Area 2. Where present, superficial deposits are indicated to comprise Glacial Till. Bedrock is indicated to comprise the Upper Coal Measures Llynfi Beds, with sandstone present in the southern portion. An unnamed NNE/SSW oriented fault, downthrown to the west is present crossing the west of the site.

Superficial deposits in Area 3 are indicated to comprise Glacial Till. Small ribbons of Alluvium present in the valley of the Afon Gwili in the east of the area and associated with an unnamed watercourse to the west of Area 3. Bedrock is indicated to comprise undifferentiated Middle Coal Measures below the Upper Cwmgorse Marine Band dipping to the southeast at around 25° with no coal seams shown. The western edge of Area 3 spans the NW/ SE orientated Bryn Gwili fault which is downthrown to the west. West of the fault bedrock comprises sandstone. The majority of Area 3 lies between the Glyn-Wallis Fault (east) and the Bryn Gwili fault (west). The stratigraphic section, and mapping to the east of the Glyn-Wallis Fault suggest that coal seams (Red and Carway Fawr) may subcrop in this area.



Superficial Deposits along the route linking Area 2 and Area 3 are indicated to comprise Glacial Till. A narrow ribbon of Alluvium is shown along the valley of the Afon Gwili. Locally the Glacial Till is indicated to be thin or absent. Bedrock along the route comprises Upper and Lower Coal Measures bedrock. The route crosses the Glyn-Wallis fault in the area of Cefn Gwili. The fault is NW/ SE orientated and downthrown to the west. East of the fault bedrock comprises Middle Coal Measures, whilst to the west it comprises Upper Coal Measures of the Llynfi Beds, becoming Lower Coal Measures to the west. An unnamed coal seam is indicated to sub-crop immediately west of Cefn Gwili.

3.4 COAL AUTHORITY REPORTS

Three Consultants Coal Mining Reports have been obtained from the Coal Authority for the site. These focus on areas identified as being at high risk on the interactive viewer. These reports are:

- Ty Croes Solar Farm, Clawdd Du, Reference 51002198295001 – covers areas 1 and 2
- Ty Croes Solar Farm, Land East Of A48 Carmarthenshire, Reference 51002202952001 – covers Area 3
- Ty Croes Solar Farm, Cable Run Carmarthenshire, Reference 51002203778001, covers cable run along A483, to proposed HDD east of Area 3.

3.4.1 Ty Croes Solar Farm, Clawdd Du,

This report is dated 9th December 2019 and covers Area 1, 2 and the cable route to the A483 crossing.

3.4.1.1 Recorded Mine Workings

The report notes workings in five seams of coal, at depths ranging from 93 and 394 mbgl, worked in the period 1921 and 1965. Worked seams include:

- Four Foot
- Lower 4 Foot
- Upper 6 ft Rider
- Upper 9 ft
- Lower 9 ft.

Probable unrecorded shallow workings are not anticipated in the area and no mine entries are recorded within 100m of the enquiry boundary.

No spine roadways are recorded at shallow depth.

3.4.1.2 Coal Seam Subcrops and Geological Features

Six coal seams are noted to subcrop beneath the enquiry area:

- Clement,
- Haford
- 4 unnamed seams.

These all subcrop in the east of Area 1 on the eastern side of a NE/SE trending fault. These seams are not shown on the 1:10,560 geological mapping.

Three faults are indicated on the plan, two cross Area 1 in a NW/ SE orientation, whilst the third, orientated NNE/ SSW crosses the western end of Area 2.

3.4.1.3 Additional information

A large area of unlicensed opencast mining is denoted to the north of the A483, but does not encroach onto the site.



A damage notice or claim for alleged subsidence damage was made in March 2007 for land at Llettynewydd Farm, Ty Croes, Ammanford, Carmarthenshire (in the east of Area 1). However, the claim was rejected (see section 3.5).

The investigated area is in an area where notices to withdraw support were given in 1959, 1976 and 1977. 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.

3.4.2 Ty Croes Solar Farm, Land East Of A48 Carmarthenshire,

This report is dated 9th December 2019 and covers Area 3 and the section of cable route for the HDD crossing of the Gwili valley.

3.4.2.1 Recorded Mine Workings

The report notes workings in two seams of coal, at depths ranging from 167 and 293mbgl, worked in the period 1968 and 1978. Worked seams include:

- Big Vein (Upper)
- Upper 9 ft

The CA report states that probable unrecorded shallow workings are not anticipated in the area, despite the presence of the shaft.

No spine roadways are recorded at shallow depth.

A single recorded mine entry is noted to be present in the north west of Area 3. The shaft details are presented in Table 3-1.

Table 3-1 Summary Mine entry information – Area 3

Shaft Number	NGR	Comments
257209-001	257333 209569	Located in north west of Area 3.

3.4.2.2 Coal Seam Subcrops and Geological Features

The Abergorchi coal seam is noted to subcrop beneath the enquiry area. This subcrop trends in a NE/ SW orientation and is located in the east of Area 3, near the Gwili Valley. This seam is not shown on the 1:10,560 mapping. It is conjectured that the Abergorchi is an alternative name for the Red Vein.

A single NW/ SE orientated fault is noted to be present crossing the western end of Area 3 near Ty-isaf.

3.4.2.3 Additional information

The investigated area is in an area where notices to withdraw support were given in 1976 and 1992. 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.

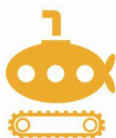
3.4.3 Ty Croes Solar Farm, Cable Run, Carmarthenshire

This report is dated 13th December 2019 and includes the cable route along the A483 and the fields to the west of Cefn Gwili.

3.4.3.1 Recorded Mine Workings

There is no recorded underground working in this area.

Probable unrecorded shallow workings are not anticipated in the area.



No spine roadways are recorded at shallow depth.

Three recorded mine entries are noted to be present at, or in the vicinity of the route. The shaft details are presented in Table 3-2:

Table 3-2 Summary Mine entry information – Cable Route

Shaft Number	NGR	Treatment details	Comments
258209-003	258621 209398	None	Located on northern side of the A483.
258209-004	258639 209377	None	Located within the carriageway of the A483.
258209-005	258871 209396	Filled to an unknown specification	Located in a field approximately 100m south east of route.

3.4.3.2 Coal Seam Subcrops and Geological Features

One unnamed coal seam is noted to subcrop beneath the enquiry area. This is located immediately west of Cefn Gwili.

This seam is shown on the 1:10,560 and 1:50,000 geological mapping.

One fault is indicated on the plan. The fault is located close to Cefn Gwili and is NW-SE orientated.

3.5 COAL MINING SUBSIDENCE CLAIMS HISTORY,

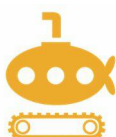
The Consultants Coal Mining Report for Areas 1 and 2 identified an area on the eastern boundary of Area 1 which had been subject to a coal mining subsidence investigation. A coal mining subsidence claims history report was obtained for the area titled 'Land at Llettynewydd Farm, Tycroes, Ammanford, Carmarthenshire', Reference No 51002203860001.

The claim was made in 2007 as a result of holes opening in a field, first noted in March 2007. The Coal Authority investigation identified workings in eight seams beneath the area worked between 1940 and 1961 at depths ranging from 211 to 279mbgl. A shallow coal outcrop was noted to be present in the area, however possible unrecorded shallow workings were not anticipated. No mine entries, faults fissures or break-lines were noted to be present.

A trial excavation carried out in March 2008 identified the cause of the land failure to be the failure of old stone-filled land drains. In March 2008 a letter was sent to the claimant's land agent noting that the Coal Authority does not agree that it has a remedial obligation in respect of the whole or any part of the damage specified in the damage notice.

3.6 HISTORICAL MAPPING

The earliest Ordnance Survey mapping, dated 1888 shows the site to comprise open farm land. Many of the farmsteads present today are already established and can be used as geographic reference points. The eastern end of the current A483 is already established roughly following its current route, however as it passes west, the old road curves to the south following the present day route of the B4297. A number of mining features are shown in the general area around the site including an old quarry south of the A483 and a number of Coal Pits and Old Coal Pits. Of particular note are two 'old coal pits' shown due east of Llyn-Cae Bryn. These lie close to the present day junction of the A483 and B4297 and feature on the Coal Authority records (shafts 258209-003 and 258209-004). A third shaft



denoted as a 'Coal Pit' is shown in the north west of Area 3. This also features in the Coal Authority records (shaft 257209-001). A number of 'Old Coal Pits' are shown to the west of Greynor-isaf, although not on the route, these pits are of note as they are mentioned in the 1907 geological memoir.

By the time of the 1907 mapping the three coal pits at or close to the site are no longer noted to be present, although the shafts to the east of Greynor-isaf still feature. All mining features in the area immediately around the site are indicated as 'old shafts'.

The area immediately surrounding the site remains relatively unchanged, until the mapping of the 1980s when the eastern section of the current A483 was constructed.

No new features associated with coal mining are shown in area immediately surrounding the site.

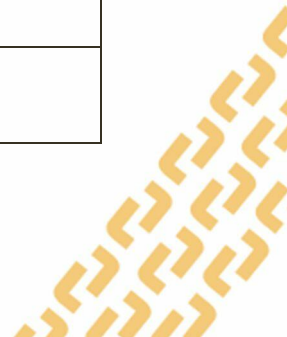
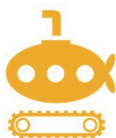
3.7 BGS ON-LINE BOREHOLE DATA

A number of historical BGS boreholes are present in the vicinity of the site. The majority of these are relatively shallow and associated with the construction of the A48 and the A483 extension. However there are some very deep holes drilled in the 1960s to establish the depth to the coal seams.

The following exploratory holes were selected based on their proximity to the route. These logs and associated BH location plan are presented as Appendix **

Table 3-3 Summary of Historical BGS borehole information

BGS BH number	BH name	Location on site	Strata encountered
SN50NE103	PONTARDULAI BY-PASS. 501	Cable route. South side of A483, to east of 'new' section of road.	GL-0.15: Organic topsoil 0.15-2.0: Very soft clay 2.0-3.0 Highly weathered laminated siltstone.
SN50NE104	PONTARDULAI BY-PASS. 502	Cable route. South side of A483, to eastern end of 'new' section of road.	GL-0.15: Topsoil 0.15-2.0: Glacial Till (Firm sandy stony clay) 3.0-3.8: Glacial Till (Hard sandy stony clay) 3.8-5.0: Highly weathered shaley mudstone.
SN50NE105	PONTARDULAI BY-PASS. 503	Cable route. South side of A483, 'new' section of road.	GL-0.3: Topsoil 0.3-1.45: Glacial Till (Very stiff sandy clay) 1.45-2.5: Highly weathered clayey sandstone 2.5-5.0: Interbedded hard mudstone and stiff very weathered mudstone.
SN50NE106	PONTARDULAI BY-PASS. 504	Cable route. South side of A483, 'new' section of road.	GL-0.15: Topsoil 0.15-2.5: Glacial Till (Soft silty sandy clay) 2.5-7.9: Hard mudstone, locally weathered, locally with ironstone staining.
SN50NE107	PONTARDULAI BY-PASS. 505	South side of A483, 'new'	GL-0.3: Topsoil 0.3-1.8: Glacial Till (Firm sandy clay)



BGS BH number	BH name	Location on site	Strata encountered
		section of road, south west of Cefn Gwili	1.8-4.2: Highly weathered sandstone 4.2-4.5: Poor shaley coal 4.5-14.6: Mudstone 14.6-14.85: Coal 14.85-15.84: Mudstone
SN50NE108	PONTARDULAI BY-PASS. 506	South side of A483 'new' section of road, south west of Cefn Gwili	GL-0.15: Topsoil 0.15-1.6: Sandstone 1.6-2.13: Dry Clay 2.13-9.14: Mudstone 9.14-9.44: Coal 9.44-10.05: Mudstone
SN50NE128	CWMGWILI 3	Centre of Area 3	GL-24.13: Glacial Till 24.13 onwards: mudstone locally with sandstone and siltstone bands. coal bands- 30.48-30.52, 30.78-30.84, 63.35-63.45 (deeper coals also present.)
SN50NE153	A68, LONDON-FISHGUARD. TRENCH. B	To west of southern end of Area 3.	GL-0.2m:Topsoil 0.2-2.3 Glacial Till (Stiff silty clay with gravel and cobbles)
SN50NE154	A68, LONDON-FISHGUARD. TRENCH. A	To west of centre of Area 3.	GL-0.1m:Topsoil 0.1-3.5 Glacial Till (Stiff silty clay with gravel and cobbles)
SN50NE156	A68, LONDON-FISHGUARD. 8	To northwest of Area 3	GL-0.42m:Topsoil 0.1-4.4m: Glacial Till (Firm becoming stiff and very stiff silty clay with gravel and occasional boulders) 4.4-9.0m: slightly weathered siltstone with occasional thin partings of coal

The historical boreholes confirm the geology at the site to be as suggested by the geological mapping. It comprises topsoil overlying a variable thickness of glacial till and then bedrock, which in places is shallow. Bedrock appears to comprise predominantly mudstone, locally with beds of sandstone and siltstone. Locally thin coals are noted, but rarely, if ever, of workable thickness.

3.8 GEOLOGICAL MEMOIRS

3.8.1 1907 Memoir

The 1907 geological memoir includes a section discussing the geology in the area around the site. Long standing farmsteads such as Clawdd-du, Cefn Gwili and Ty- Isaf are referred to, and provide geographical reference points. This memoir presumably accompanies the 1907 1:63 360 geological map discussed previously.

The memoir provides a detailed description of the outcrop of the Cockshot sandstone, which is identified by its similarity to 'cockshot'. The Red Vein Coal is noted to occur 100-120 yards

below this sandstone and is assumed to subcrop to the north of the Cockshot sandstone subcrop.

At Clawdd-du (east of the site near Area 1) the cockshot rock is displaced by the Hendre fault and subcrops south of Greynor (near the A483). The authors comment that the Red Vein can be assumed to lie somewhere between Greynor Isaf and Gelli-Beraidd (775m to the north west). The memoir notes that a number of old pits are present about a quarter of a mile to the west of Greynor Isaf which 'were said to have got a bad coal 2 ½ feet thick'.

At Cefn Gwili the measures are displaced west again, this time by the Glyn Wallis Fault. The authors observe that the Red Vein horizon must be carried down under the boulder clay of the Gwili Valley where it is obscured.

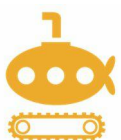
A thin coal is noted to be present stratigraphically above the Cockshot Rock. This was observed in the area south of Cefn-gwili and to the west of Clawdd-du.

A coal seam was noted to have been observed at the top of sandstones visible in the banks of the Gwili valley south of the site at Plas-Newydd Mill. This was estimated to be 1350 feet above the Cockshot Rock.

It should be noted that the memoir includes a narrative description of the geology of the surrounding region. This narrative includes comments on mining features such as shafts and crop workings where observed or present.

3.8.2 1968 Memoir

Examination of the 1968 Geological Memoir identified that the area covered by the memoir only includes the eastern portion of Sheet 230, and does not extend as far west as the site.



4 Assessment of data obtained

4.1.1 Evidence of Coal Mining Activities

The available information suggests that the region around the site has been subject to coal mining over at least 3 phases.

- Historic mining - 19th Century
- Deep mining - 20th Century
- Open cast workings (north of current site).

The evidence for the historic mining is taken from the notes in the 1907 geological memoir and the coal pits noted on the historical mapping. The age of this coal working is such that they may predate the legal requirement to maintain records (1850) and to register mine abandonment plans with the Secretary of State (1872). Any mine-workings associated with these features are likely to be unrecorded, and have the potential to be at shallow depth.

The deep mining of the 20th Century has been recorded and the records retained by the Coal Authority. It would appear these seams have been accessed from mine entrances away from the site. These workings are at sufficient depth not to be a hazard to the development.

Opencast workings are indicated in the Coal Authority Consultants report for Area 1 and Area 2. These workings do not encroach onto the site and are considered to not pose a hazard to the development.

4.1.2 Recorded Mine Entries

The Coal Authority has identified three recorded mine entries at, or in the vicinity of the Site (one in Area 3 and two in the vicinity of the cable route near the junction of the A483 and B4297). A fourth mine entry was also identified approximately 100m south east of the cable route. This latter mine entry is considered to be sufficiently far from the cable route not to be a hazard.

The three mine entries identified as being on site, or in the immediate vicinity of the site also feature on the 1876 OS mapping of the area as coal pits, or old coal pits, suggesting they are credible features.

The historical geological mapping and accompanying memoir suggest that at that time (mid 19th C to early 20th C) the sequence of coal seams in the area was not fully understood or mapped. Although the memoir provides a narrative explanation of mining in the general area around the site, including highlighting mining features such as crop workings in a valley east of Area 1 and coal pits to the west of Greynor-isaf, no mention is made of mining activities at the site or the three historical shafts at and near the site.

The memoir provides a detailed outline of the geology present in the area around the current site, including details of fault locations. No reference is made in the memoirs to coal workings at the site.

Historical ground investigation in the area around the site identified shallow bedrock locally. Coal seams were noted in the exploratory holes, however these were rarely, if ever, of workable thickness.

The present 1:10,560 mapping does not show any coal seams sub-cropping in the vicinity of the three shafts present at and in the vicinity of the site and the seams worked (if any) remain unclear.



4.1.2.1 Shaft 257209-001

Bedrock in the region around Area 3 is indicated to comprise undifferentiated Middle Coal Measures with no coal seams indicated. Comparison of the strata in Area 3 with that to the east of the Glyn-Wallis fault suggests that the Red Vein and possibly the Carway Fawr seam should subcrop in this region. The Coal Authority Consultant's report notes the Abergorchi seam to subcrop in the valley of the Afon Gwili. This would correspond to the likely location of the subcrop of the Red Vein. The Carway Fawr seam, or a deeper coal, may subcrop in the general area around shaft 257209-001 in Area 3.

There are a number of possibilities regarding shaft 257209-001:

- The 'coal pit' was a trial bore seeking coal seams which were suspected to sub-crop in that area
- The 'coal pit' denotes shallow crop workings.
- The 'coal pit' was an operating mine, and any associated workings are unrecorded.

4.1.2.2 Shaft 258209-003 and 258209-004

Recorded mine entries 258209-003 and 258209-004 are noted to be present in the vicinity of the cable route near the A483. The 1:10 560 mapping does not show any coal seams to subcrop in the immediate vicinity of the shafts. These shafts could have been sunk to find and work the Red Vein Coal which was known to subcrop 250m to the north. However an assessment of the geological mapping indicates this seam would be at a depth of around 80 mbgl at the shaft locations. Given the age of the shafts, it is considered unlikely that workings associated with them extend to the Red Vein seam.

There are a number of possibilities regarding shafts 258209-003 and 258209-004:

- The 'coal pits' were trial bores seeking the Red Vein Coal which was known to subcrop to the north, and failed due to the depth of the seam.
- The 'coal pits' were shallow crop workings working an unidentified sub-cropping coal.
- The 'coal pits' were operating mines working an unknown seam, and any associated workings are unrecorded.

4.1.3 Shallow Mine Workings.

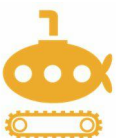
Both the BGS mapping and the Coal Authority plans have identified a number of coal seams to sub-crop beneath the site. These seams sub-crop in the east of Area 1, and also at discrete locations along the cable route.

There is no evidence to suggest that surface working of coal has taken place at the site. Aside from the three shafts discussed above, probable shallow working of coal has not been identified as a risk in the Coal Authority's report and has not been reported in the BGS memoir.

There remains a potential for unrecorded shallow workings to be present associated with the three recorded mine entries at or near the site.

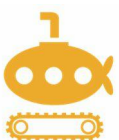
4.1.4 Stability

There is no evidence to suggest there is any mining induced instability at the site. The subsidence claim made to the Coal Authority at Llettynewydd Farm was proven to be unfounded and due to collapse of shallow stone drainage features.



4.1.5 Faulting

A number of faults are noted to cross the site, both within Areas 1 to 3 and along the cable route. There is evidence of deep mining in multiple seams locally beneath the site. The proximity of the mining to the faults has not been investigated.

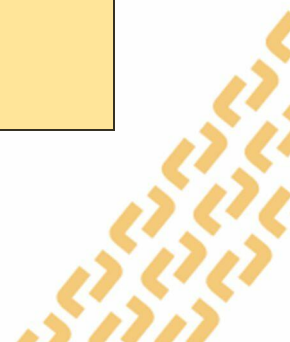
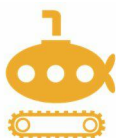


5 Identification and assessment of site specific coal mining

The table below summarises the potential risks associated with the coal mining legacy for the proposed development site, identified from the sources of information discussed in Section 2.

Table 5-1 Coal Mining Risk Assessment

Coal mining Issue	Present beneath site	Risk Assessment	Risk rating
Underground coal mining (recorded at shallow depths)	No	<p>The Coal Authority has no records of shallow coal mining at the site.</p> <p>The proposed development is considered to be at negligible risk of being affected by recorded shallow coal mining.</p>	Negligible
Underground coal mining (probable at shallow depths)	No	<p>Although the Coal Authority have not identified probable unrecorded working to be present at the site, it should be noted that three recorded mine entries have been reported at or close to the site, and there remains the potential for shallow unrecorded workings to be present associated with these features. The depth of any such workings remains unknown, but is anticipated to be shallow due to the age of the mine entries.</p> <p>The proposed development is for a solar farm/ array and, outside of the areas of HDD, will require the minimum of groundworks or loading. The loading associated with the solar arrays are unlikely to induce loading on any shallow unrecorded workings which may be present beneath site.</p> <p>Excavations for the cable route are anticipated to be shallow (<1.5m deep). Loadings associated with the laying of the cable will be temporary and likely to be confined to operational plant. Loading of the ground sufficient to induce collapse of shallow workings during cable laying is not anticipated.</p> <p>The proposed development is considered to be at low risk of being affected by unrecorded shallow coal mining.</p>	Low
Mine entries (shafts and adits)	Yes	<p>Three mine entries have been identified on or in close proximity to the site. The seams worked by these shafts have not been identified, and geological mapping suggests that shallow coal of workable thickness is not present in the vicinity of the shaft locations.</p> <p>All three mine entries are shown on the 1879 OS mapping suggesting they are credible features, although the potential for them being short term crop workings or trial bores cannot be discounted.</p> <p>Mine Entry 257209-001 lies in Area 3, within the area of the</p>	Moderate



Coal mining Issue	Present beneath site	Risk Assessment	Risk rating
		<p>solar array. Although loading from the solar arrays are low, the mine entry is noted to be at least 140 years old and there is no evidence of any treatment. This mine entry remains a potential risk to the development.</p> <p>For reasons of health and safety it may be prudent to locate or isolate mine entry 257209-001 in the north west of Area 3 and avoid placing infrastructure in the vicinity of this feature.</p> <p>Mine Entries 258209-003 and 258209-004, lie in close proximity to the cable route, with 258209-004 appearing to lie within the carriageway of the A483. These mine entries appear to be over 140 years old, and there are no records of any treatment of the shafts. Although loading associated with the laying of the cable are likely to be temporary, the overall stability of the mine entries remain a potential risk to the cable installation.</p> <p>It should be noted that the proximity of these shafts to the A483 is probably a greater risk to their stability than the risk associated with the installation of the cable.</p> <p>It may be prudent to route the cable such that it avoids the location of shafts 258209-003 and 258209-004.</p>	
Coal mining geology (fissures)	No	<p>The site is located in an area crossed by multiple faults and known to be subject to deep underground mining. In addition the site is located in an area where notices have been given to withdraw support.</p> <p>The above features increase the risk of coal mining fissures occurring at surface, however there are a number of factors which mitigate the likelihood of this occurring at the site. Deep underground mining at the site ceased over 40 years ago, and any associated ground movement associated with the mining is anticipated to have ceased. The latest consent to withdraw support was over 25 years ago and there has been no requirement to revoke the consent, suggesting there are no concerns about risk of ground movement.</p> <p>The proposed development is considered to be at negligible risk of being affected by coal mining geology (fissures).</p>	Negligible
Record of past mine gas emissions or potential	No	<p>There is no evidence of past mine gas emissions or potential mine gas emissions at the site. This is based on the absence of evidence of extensive coal deposits at the site. However it should be noted that the available historical data suggests the potential for mine gas emissions has never been investigated.</p> <p>The proposed development is considered to be at negligible risk of being affected by past or potential mine gas emissions.</p>	Negligible

Coal mining Issue	Present beneath site	Risk Assessment	Risk rating
Recorded coal mining surface hazard	No	<p>Whilst the Coal Authority report has identified the presence of coal sub-crops at the site these are not noted to be associated with recorded or probable shallow mine workings.</p> <p>The Abergorchi (Red) coal Seam is noted to sub-crop in the Gwili Valley. There is an increased potential for the exploitation of seam sub-crops within river valleys via mine adits at exposed sub-crops. The fact sub-crop is not shown on geological mapping suggests this sub-crop is not visible in the valley and hence is less likely to have been exploited. In addition, the 1907 memoir noted that the seam sub-crop was likely to be obscured by the boulder clay in the Gwili Valley.</p> <p>The location of the unnamed coal seam at Cefn Gwili appears to be well established, however there is no evidence in the 1907 memoir to suggest it has ever been exploited.</p> <p>A number of coal seams are indicated to sub-crop in the east of Area 1. There is no evidence in the 1907 memoir to suggest these seams have ever been exploited.</p> <p>Outside of the recorded mine entry in Area 3 and the two recorded mine entries along the cable route, the majority of the proposed development is considered to be at negligible risk of being affected by recorded coal mining surface hazard.</p>	Negligible
Surface mining (opencast workings)	No	<p>There is no evidence of opencast workings at the site.</p> <p>The proposed development is considered to be at negligible risk of being affected by surface (opencast) mining.</p>	Negligible

6 Proposed Mitigation Strategy

In their letter to Carmarthen County Council the Coal Authority identified a number of potential risks at the site associated with the exploration of coal. Namely;

- parts of the site fall within areas defined as 'Development High Risk Area';
- records indicate the two recorded mine entries (shafts) to be present within, or within 20m of the planning boundary and;
- the site is likely to have been subject to historic unrecorded underground coal mining at shallow depth associated with thick coal outcrops.

The parts of the site identified as lying in 'Development High Risk' areas are associated with the recorded mine entries at the site, and the region of the sub-cropping coal seams.

The Consultant's Coal Mining Reports obtained for the site do not identify any potential for historic unrecorded coal mining at shallow depth associated with thick coal outcrops.

The available evidence does not suggest that shallow workings associated with coal sub-crops have taken place at the site. The proposed development comprises the placement of a number of solar arrays and the installation of associated cabling. This will result in a negligible change of loading at the site. The impact of shallow workings associated with coal sub-crops are not considered to be a significant risk to the development and mitigation measures are not required.

The main hazards associated with the development are noted to be the three mine entries located at or in the immediate vicinity of the site.

6.1 MITIGATION OF MINE ENTRIES

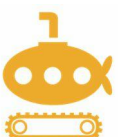
Three recorded mine entries are noted to be present at or in the vicinity of the site. One is located in the northwest of Area 3, the remaining two are situated close to the cable route along the A843.

6.1.1.1 Mine Entry 257209-001

A recorded mine entry (257209-001) is noted to be present in the northwest of Area 3. This mine entry is noted on the 1879 OS mapping and should be treated as a credible feature, and hence a potential hazard to the development. The coal seam worked by this shaft remains unclear and any associated workings are presumed to be at shallow depth and unrecorded. The 1:10 560 geological mapping for this particular area has not identified the presence of coal seams in the vicinity of the shaft, however this does not necessarily mean that the coal seams are absent. The proposed development comprises the placement of a number of solar arrays and the installation of associated cabling. This will result in a negligible change of loading in the area, consequently shallow workings associated with the mine shaft are not considered to be a risk to the development and mitigation measures are not required. However the shaft itself is considered to be a potential risk to the development.

The risks associated with shaft 257209-001 in the north west of Area 3 require mitigation. At present the depth and thickness of any seams worked by the mine entry remain unknown. A staged mitigation process is recommended.

In the first stage the site should be visited and examined for any evidence of a mine entry (localised depression, areas of Made Ground or spoil). Observation of aerial photography suggests that the shaft location is situated in a corner of the field which has been left



unfarmed and is now heavily vegetated by trees. This may be a normal field margin development, or an area which had deliberately left unused. Consultation with the farmer is recommended to establish whether that area has been deliberately left unfarmed due to knowledge of the shaft or poor ground conditions.

Depending on the findings of the site, there are a number of options for the second stage of investigation:

- Investigation of suspicious features identified during the site visit
- Location of the mine shaft by trenching or geophysical means
- Sinking of a borehole in the general vicinity of the shaft to establish whether there is a seam of workable thickness in this area.

A number of long term mitigation measures can be adopted for this potential mine entry. The mitigation measures adopted may be influenced by practicality and overall costs relative to benefits. These are shown in Table 6-1:

Table 6-1 Potential mitigation measures mine entry 257209-001

Potential solution	Positives	Negatives	Observations
Location and remediation of the shaft	Removal of risk associated with the shaft	Costs associated with location of shaft. Costs associated with remediation of mine entry. May not be able to place plant within a certain proximity of shaft even if remediated.	Expensive and potentially unnecessary for the scale of development (light weight structures with minimal human attendance).
Location of the shaft and establishment an exclusion area for staff and equipment	No costs associated with the remediation of the shaft. Establishment of exclusion zone can be relatively cheap.	Costs associated with location of shaft. Shaft remains a residual risk. Potential loss of income from panels which can't be installed.	Establishment and use of an exclusion zone likely to be significantly cheaper than remediation of the mine entry.
Establish an exclusion area for staff and equipment based on Coal Authority location	No costs associated with the remediation of the shaft. No costs associated with location of shaft. Establishment of exclusion zone can be relatively cheap.	May require a larger exclusion zone than if shaft location confirmed. Shaft remains a residual risk. Potential loss of income from panels which can't be installed.	Establishment and use of an exclusion zone likely to be significantly cheaper than remediation of the mine entry.

6.1.1.2 Mine Entries 258209-003 and 258209-004

Two recorded mine entries (258209-003 and 258209-004) are noted to be present in the immediate vicinity of the cable route north of the junction of the A483 and the B4297. Mine entry 258209-004 is located within the carriageway of the A483 whilst mine entry 258209-003 is located immediately north of the A483, close to the access road to Cefn Gwili.



These mine entries are noted on the 1879 OS mapping and should be treated as credible features, and hence a potential hazard to the development. As previously discussed, the coal seam(s) worked by these shafts remain unclear and any associated workings are presumed to be at shallow depth and unrecorded due to the shafts' age. The Red Vein seam is known to sub-crop approximately 250m north west of the shaft locations. Initial estimations of the depth of this seam at the shaft locations using the data on the 1:10,560 geological mapping suggests it to be in the order of 80m. Given their age, it is unlikely that these shafts would have been working a seam at that depth. The BGS mapping does not identify the presence of any other coal seams within this part of the Coal Measures Sequence, although the presence of localised unnamed seams cannot be discounted.

The proposed development in this area comprises the installation of a cable at a depth of about 1.2m using standard excavation plant. This will result in a short-term temporary load associated with the installation of the cable with a negligible change of loading in the long term. Consequently, shallow workings associated with the mine shafts are not considered to be a risk to the development and mitigation measures are not required. However the shafts themselves are considered to be a potential risk to the development.

The risks associated with mine entry 258209-003 and 258209-004 require mitigation. It is likely that the main risk associated with these shafts is their proximity of the A483, especially 258209-004 which is indicated to be located within the carriageway.

The scale of the works required (shallow excavation followed by backfilling), along with the proximity of the mine entries to existing carriageways means that location, and mitigation of the shafts would not be practical, or proportionate to the proposed land use.

A mitigation strategy minimising impact and interaction with the potential mine entry locations during construction is suggested.

In the first stage, the site should be visited and examined for any evidence of mine entries (localised depressions, areas of Made Ground or spoil). This may be of limited practical use given the current proximity of the mine entries to road junctions and carriageways which post-date the mining activities.

Depending on the findings of the site visit, there are a number of options for the second stage of investigation:

- Investigation of features of interest identified during the site visit by excavation or geophysics.
- Sinking of a borehole in the general vicinity of the shafts to establish whether there is a shallow seam of workable thickness in this area.

A number of long term mitigation measures can be adopted for these potential mine entries. The mitigation measures adopted may be influenced by practicality and overall costs relative to benefits. These are shown on Table 6-2.



Table 6-2 Potential mitigation measures mine entry 258209-003 and 258209-004

Potential solution	Positives	Negatives	Observations
Location of the shafts and routing of cable route to avoid them	Avoidance of risk associated with the shaft	Costs associated with location of shafts. Potential land ownership constraints associated with re-routing cable. Potential closure of the A483 to locate entry 258209-004	Use of expensive drilling or significant excavation techniques may be disproportionate given that main beneficiary would be A483.
Establishment an exclusion area for staff and equipment based on Coal Authority location. Use of precautionary digging techniques in the exclusion area.	No costs associated with the remediation of the shaft. No costs associated with location of shaft.	May require a larger exclusion zone than if shaft locations are confirmed. Increased costs of cable installation (e.g. using scaffold frames for excavators etc.)	Would be more cost effective to move the cable route than remediate a mine entry. May require the use of scaffolding frames in areas potentially at risk from the shaft to protect shaft of personnel installing the cable.

7 Planning considerations

This report provides a summary of a desk-based coal mining risk assessment for the proposed solar farm and associated cable route. The risk posed to the proposed development by known or potential shallow coal mining is generally assessed to be of a LOW to NEGLIGIBLE order, with no further assessment work required, with the exception of the presence of three historic shafts:

7.1.1 Mine Entries 258209-003 and 258209-004

Two historic shafts are shown by Coal Authority and Ordnance Survey mapping to be present in the vicinity of the proposed cable route adjacent to the A483 north of the junction of the A483 and the B4297. These shafts are not considered to pose significant risk to the cables once placed. However, there is a potential risk associated with the use of heavy plant (excavator) during the cable installation works. Further investigation, assessment and if necessary mitigation is recommended to satisfactorily control any risks posed by these shafts during the construction phase of the development.

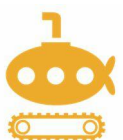
It is anticipated that these works can be prescribed through use of a pre-commencement planning condition to any permission granted.

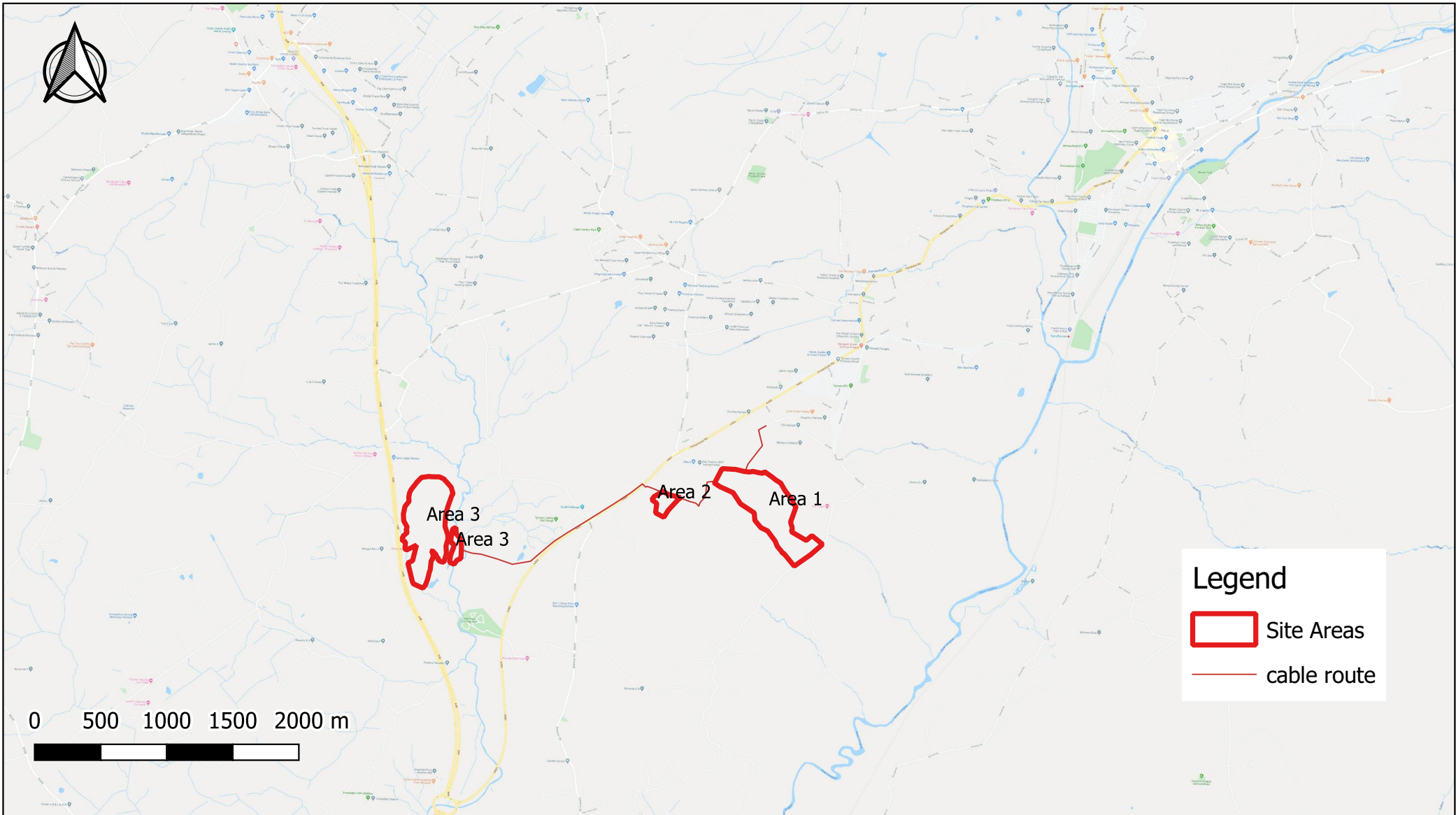
7.1.2 Mine Entry 257209-001

A further historic shaft is shown by Coal Authority and Ordnance Survey mapping to be present in the south-west corner of the north-westernmost field in Area 3. It is considered probable that this feature is located within a small overgrown field margin visible in this area on aerial photography. If this is the case, it lies outside of the footprint of the proposed development. However, it is recommended that this feature be the subject of further investigation, assessment and if necessary mitigation in order to satisfactorily control any risks posed by these shafts during the construction phase of the development. Risks during the subsequent operational phase are considered to be limited by the nature of development.

It is anticipated that these works can also be prescribed through use of a pre-commencement planning condition to any permission granted.

Figures





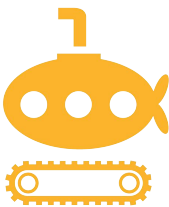
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		Project Number	Hopkins Solar Farm, Ty Croes			
	19158					

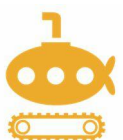




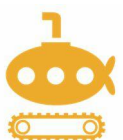
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		Drawing Number	Scale	Checked
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Project Number	Original	1		
19158	A4	Hopkins Solar Farm, Ty Croes		



Appendices



Appendix A: Report Conditions



Report Conditions

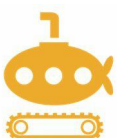
This report has been prepared by Yellow Sub Geo Ltd. (Yellow Sub Geo) in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client, and is provided by Yellow Sub Geo solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Yellow Sub Geo at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

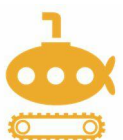
Where necessary and appropriate, the report represents and relies on published information from third party, publicly and commercially available sources which is used in good faith of its accuracy and efficacy. Yellow Sub Geo cannot accept responsibility for the work of others.

Site investigation results necessarily rely on tests and observations within exploratory holes only. The inherent variation in ground conditions mean that the results may not be representative of ground conditions between exploratory holes. Yellow Sub Geo take no responsibility for variation in ground conditions between exploratory positions.

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Appendix B: Consultant's Coal Mining Reports





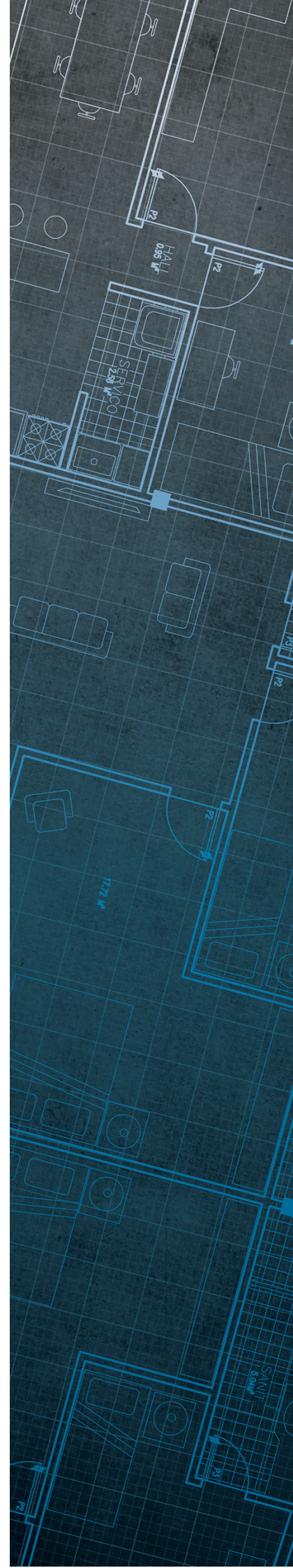
The Coal
Authority

Consultants Coal Mining Report

Ty Croes Solar Farm, Clawdd Du
Carmarthenshire

Date of enquiry: 9 December 2019
Date enquiry received: 9 December 2019
Issue date: 9 December 2019

Our reference: 51002198295001
Your reference: Ty Croes 2



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

Jacob Brotherton

Enquiry address

Ty Croes Solar Farm, Clawdd Du
Carmarthenshire


How to contact us

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

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

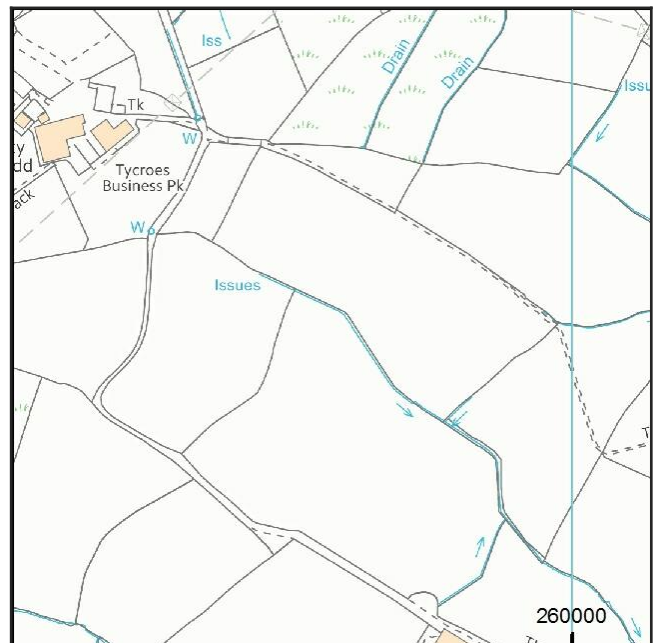
www.groundstability.com

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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
unnamed	FOUR FOOT	Coal	4HFI	93	Beneath Property	15.3	South-East	114	1926
unnamed	LOWER FOUR FOOT	Coal	4HFK	94	North	13.7	South-East	104	1924
unnamed	FOUR FOOT	Coal	4HGX	96	Beneath Property	20.3	South-East	157	1921
unnamed	LOWER FOUR FOOT	Coal	I010	116	South-East	14.2	South-East	2	1922
unnamed	FOUR FOOT	Coal	4HFD	138	Beneath Property	23.6	South	107	1959
unnamed	FOUR FOOT	Coal	4HGL	144	Beneath Property	22.6	South	119	1961
unnamed	UPPER 6FT RIDER	Coal	4HFL	147	Beneath Property	14.4	South	119	1925
unnamed	UPPER 6FT RIDER	Coal	4HH4	150	Beneath Property	15.1	South-East	87	1949
unnamed	UPPER 6FT RIDER	Coal	4HFC	162	Beneath Property	24.3	South	112	1926
unnamed	LOWER FOUR FOOT	Coal	4HGB	174	South-East	16.9	South-East	69	1940
unnamed	UPPER 6FT RIDER	Coal	4HGF	182	Beneath Property	22.4	South	121	1960
unnamed	UPPER NINE FOOT	Coal	4HHP	182	Beneath Property	17.9	South-East	227	1940
unnamed	UPPER 6FT RIDER	Coal	4HFB	185	Beneath Property	24.8	South	112	1961
unnamed	UPPER NINE FOOT	Coal	4HFG	193	Beneath Property	20.4	South-East	135	1961
PANTYFFYNNON	LOWER NINE FOOT	Coal	4HHG	194	Beneath Property	12.9	South-East	76	1930
unnamed	LOWER NINE FOOT	Coal	4HFJ	197	Beneath Property	18.8	South	66	1932
unnamed	UPPER NINE FOOT	Coal	4HHQ	199	East	18.1	South-East	227	1940
unnamed	UPPER NINE FOOT	Coal	4HFA	226	Beneath Property	19.0	South-East	320	1961
unnamed	UPPER NINE FOOT	Coal	4HGI	228	Beneath Property	20.3	South-East	260	1961
unnamed	LOWER FOUR FOOT	Coal	4HGA	244	North-East	24.4	South	69	1960
unnamed	FOUR FOOT	Coal	4HGN	375	North-East	10.9	South	159	1962
unnamed	FOUR FOOT	Coal	4HGO	394	North-East	11.5	South	159	1965

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:

SWA1079	SWA4056	SW187
SWR1457	SWA4032	SW543
SWA4044	SWR1462	SW542

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
CLEMENT	Coal	Yes	Within	N/A	75
HAFOD	Coal	No	Within	N/A	80
UNNAMED	Coal	No	Within	N/A	52
UNNAMED	Coal	Yes	Within	N/A	54
UNNAMED	Coal	No	Within	N/A	68
UNNAMED	Coal	No	Within	N/A	70
UNNAMED	Coal	No	Within	N/A	75
UNNAMED	Coal	Yes	Within	N/A	78

Geological faults, fissures and breaklines

Please refer to the 'Summary of findings' map (on separate sheet) for details of any geological faults, fissures or breaklines either within or intersecting the enquiry boundary.

Faults under or close to the property 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

None recorded within 50 metres of the enquiry boundary.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

A damage notice or claim for alleged subsidence damage was made in March 2007 for LAND AT LLETTYNEWYDD FARM, TYCROES, AMMANFORD, CARMARTHENSHIRE. However, the claim was rejected.

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.

If further subsidence damage claims information is required, please visit www.groundstability.com.

See Section 4 for further information.

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 in an area where notices to withdraw support were given in 1959, 1976 and 1977.

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.

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.

Coal mining subsidence

The site is within an area of previous interest. It is close to where the Coal Authority or licensed mine operator has investigated and where necessary remediated issues relating to coal mining subsidence.

The site requires further investigation and may influence your risk assessment. We recommend that you order the appropriate **Coal Authority Subsidence Claims Report**, which will include more information about the hazard.

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.

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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VAT receipt

Issued by	The Coal Authority 200 Lichfield Lane Mansfield Nottinghamshire NG18 4RG
Tax point date	09 December 2019
Issued to	JACOB BROTHERTON NEPTUNE COURT VANGUARD WAY SPLOTT CARDIFF CF24 5PJ
Property search for	TY CROES SOLAR FARM, CLAWDD DU CARMARTHENSHIRE
Reference number	51002198295001
Date of issue	09 December 2019
Cost	£224.26
VAT @ 20%	£44.85
Total received	£269.11
VAT registration	598 5850 68



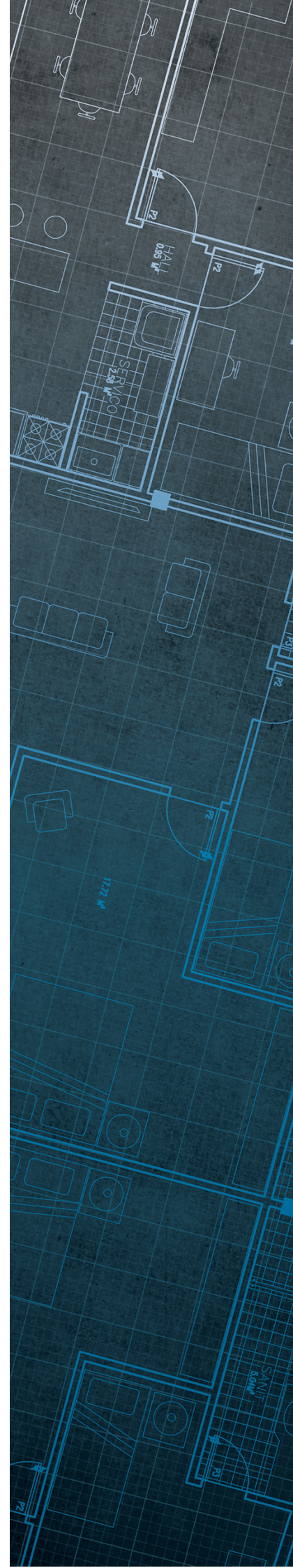
The Coal
Authority

Consultants Coal Mining Report

Ty Croes Solar Farm, Land East Of
A48
Carmarthenshire

Date of enquiry: 9 December 2019
Date enquiry received: 9 December 2019
Issue date: 9 December 2019

Our reference: 51002202952001
Your reference: Ty Croes 1



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

Jacob Brotherton

Enquiry address

Ty Croes Solar Farm, Land East Of A48
Carmarthenshire


How to contact us

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+44 (0)1623 637 000 (International)

200 Lichfield Lane
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NG18 4RG

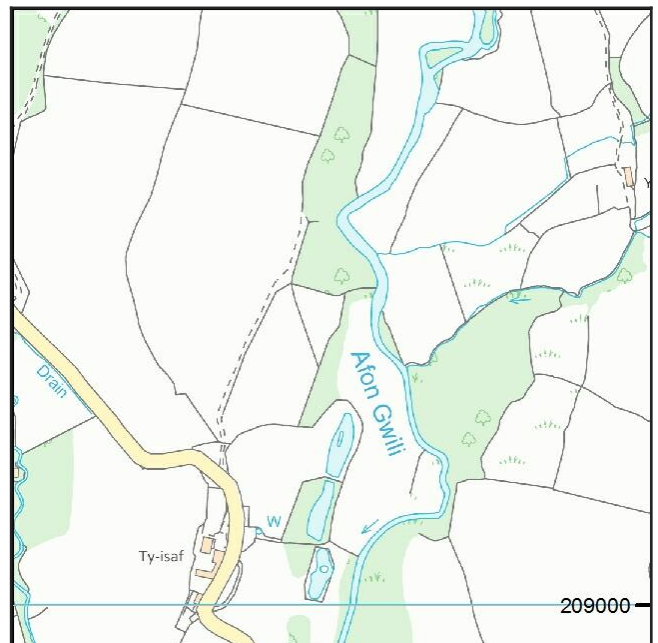
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Approximate position of property



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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
CWMGWILI	BIG VEIN (UPPER)	Coal	7ACO	167	Beneath Property	6.3	South-East	290	1968
unnamed	UPPER NINE FOOT	Coal	4ZBB	222	Beneath Property	5.6	South-East	320	1970
unnamed	UPPER NINE FOOT	Coal	4ZB9	224	North-East	8.8	South-East	320	1977
unnamed	UPPER NINE FOOT	Coal	4ZBA	228	Beneath Property	10.8	South	320	1976
unnamed	UPPER NINE FOOT	Coal	4YOQ	280	Beneath Property	32.0	South	320	1978
unnamed	UPPER NINE FOOT	Coal	4ZBC	293	Beneath Property	17.4	South-East	320	1970

Probable unrecorded shallow workings

None.

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	257209-001	257333 209569		Coal	

Abandoned mine plan catalogue numbers

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

16798	SWA2379	
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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
ABERGORCHI	Coal	Yes	Within	N/A	202

Geological faults, fissures and breaklines

Please refer to the 'Summary of findings' map (on separate sheet) for details of any geological faults, fissures or breaklines either within or intersecting the enquiry boundary.

Faults under or close to the property 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.

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.

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 in an area where notices to withdraw support were given in 1976 and 1992.

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.

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.

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.

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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VAT receipt

Issued by	The Coal Authority 200 Lichfield Lane Mansfield Nottinghamshire NG18 4RG
Tax point date	09 December 2019
Issued to	JACOB BROTHERTON NEPTUNE COURT VANGUARD WAY SPLOTT CARDIFF CF24 5PJ
Property search for	TY CROES SOLAR FARM, LAND EAST OF A48 CARMARTHENSHIRE
Reference number	51002202952001
Date of issue	09 December 2019
Cost	£112.13
VAT @ 20%	£22.43
Total received	£134.56
VAT registration	598 5850 68



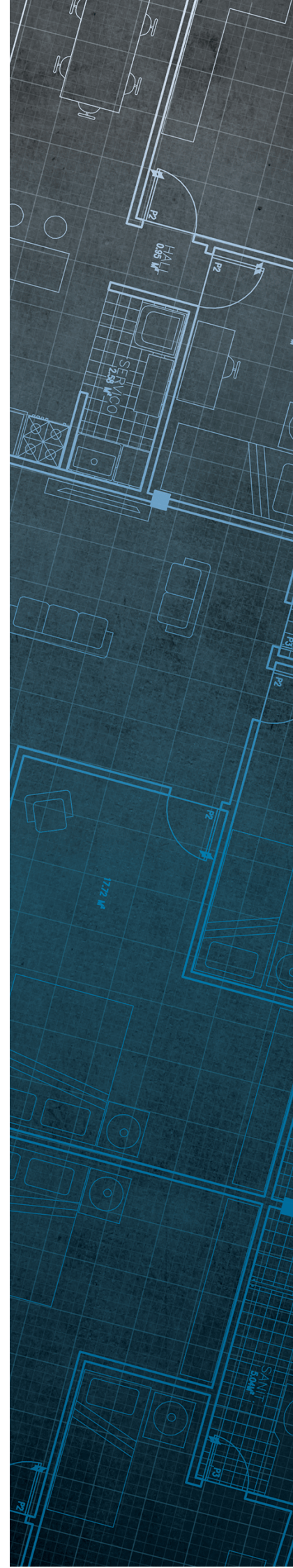
The Coal
Authority

Consultants Coal Mining Report

Ty Croes Solar Farm, Cable Run
Carmarthenshire

Date of enquiry: 13 December 2019
Date enquiry received: 13 December 2019
Issue date: 13 December 2019

Our reference: 51002203778001
Your reference: Ty Croes 3



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

Jacob Brotherton

Enquiry address

Ty Croes Solar Farm, Cable Run
Carmarthenshire


How to contact us

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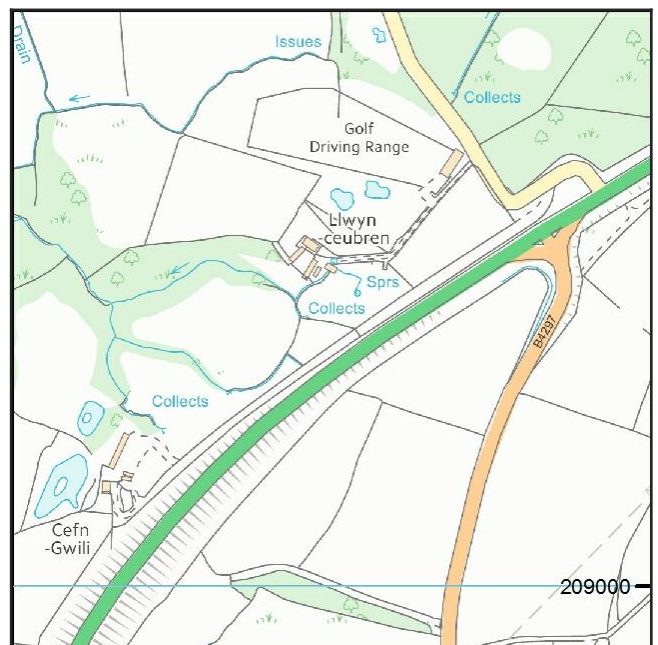
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Approximate position of property



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Section 1 – Mining activity and geology

Past underground mining

No past mining recorded.

Probable unrecorded shallow workings

None.

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	258209-003	258621 209398		Coal	
Shaft	258209-004	258639 209377		Coal	
Shaft	258209-005	258871 209396	Filled to an unknown specification	Coal	

Abandoned mine plan catalogue numbers

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

SWA2379	PO0	
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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
UNNAMED	Coal	Yes	Within	N/A	17

Geological faults, fissures and breaklines

Please refer to the 'Summary of findings' map (on separate sheet) for details of any geological faults, fissures or breaklines either within or intersecting the enquiry boundary.

Fault under or close to the property 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.

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.

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 in an area where a notice to withdraw support was given in 1976.

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

Based on the responses in this report, no further information has been highlighted.

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.

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

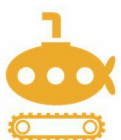
Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

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VAT receipt

Issued by	The Coal Authority 200 Lichfield Lane Mansfield Nottinghamshire NG18 4RG
Tax point date	13 December 2019
Issued to	JACOB BROTHERTON NEPTUNE COURT VANGUARD WAY SPLOTT CARDIFF CF24 5PJ
Property search for	TY CROES SOLAR FARM, CABLE RUN CARMARTHENSHIRE
Reference number	51002203778001
Date of issue	13 December 2019
Cost	£112.13
VAT @ 20%	£22.43
Total received	£134.56
VAT registration	598 5850 68

Appendix C: Coal Authority Stability History Report



COAL MINING SUBSIDENCE ACT 1991
(AS AMENDED BY THE COAL INDUSTRY ACT 1994)
DAMAGE NOTICE

For Office Use Only

102485

SUBSIDENCE
16 MAR 2007

SECTION 1

To be completed in all cases

1. Claimant's Name [Redacted]
Address Llety Newydd, 1 yrwaes
Ammanford, Carm's
Post Code SA183RD
Tel. Nos. [Redacted]

If you are representing the claimant and completing this form on his or her behalf, please give your name and address

2. Name Iwan Jones
Address B-S.P. Land Agents
Llanmas St, Carmarthen
Carm's
Post Code _____
Tel. Nos 01267236363, 07970162962
Are you a professional agent authorised to represent the claimant? (Please tick box) Yes No

SECTION 2

DAMAGE TO DWELLING HOUSES (To be completed only when damage occurs to a dwelling house or to a building or structure being part of a dwelling house e.g. garages or outbuildings) For damage to property other than dwelling houses, see Section 3

3. Address of Damaged Property _____

4. Nature of Property (Please tick box)

House:	Detached	<input type="checkbox"/>	Flats:	Purpose Built	<input type="checkbox"/>
	Semi-detached	<input type="checkbox"/>		Conversion	<input type="checkbox"/>
	Terraced	<input type="checkbox"/>		House/Flat above a shop	<input type="checkbox"/>
Bungalow:	Detached	<input type="checkbox"/>		Other	<input type="checkbox"/>
	Semi-detached	<input type="checkbox"/>		Please give details	_____
	Terraced	<input type="checkbox"/>			

SECTION 3

DAMAGE TO PROPERTY OTHER THAN DWELLING HOUSES (To be completed in all cases when damage occurs to any property other than a dwelling house used exclusively for residential purposes or structures being part of a dwelling house)

5. Postal address of property or locality of damaged property.
As no 1

6. Please describe the nature of the property and the purposes for which it is normally used.
Farmland

NB. If the claim relates to land or fields please quote the standard four digit O/S reference number for each field affected or enclose a map clearly showing the area affected.

7. Will the repair of the damage fall within a Statutory Duty in connection with the maintenance of Public Services imposed on a Government Department, Local Authority, or Statutory Undertaker? Yes No

SECTION 4

To be completed in all cases

8. Date when damage was first recognised (approximate date if appropriate).
12-03-07

9. Brief description of damage.
Holes appearing in field

Please reply to all the following questions and sign at the bottom of the page

10. Particulars of the claimant's legal interest in the damaged property.

Are you the owner of the freehold? Yes No

Are you a tenant and liable for repairs? Yes No

Other, please give details

11. Give full particulars of any other persons having an interest in the property e.g. Landlord, Tenant, Building Society or other provider of a mortgage.

Name _____

Nature of interest _____

Full address _____

12. Please give approximate dates of construction of the property or if constructed at different times, the dates for each part of the property (if known).

13. Please give details of how an inspector may gain access to inspect the property stating days and times (mornings or afternoons).

Via owner or Agent

14. ANCIENT MONUMENTS/LISTED BUILDINGS

Is the property or any part of it specified as an Ancient Monument or Listed Building? Yes No

If YES, please give details _____

15. ECCLESIASTICAL/RELIGIOUS PROPERTY

Is the property used or otherwise held as ecclesiastical property for religious purposes? Yes No

If YES, please give details _____

16. Prior to the property being damaged, did the claimant pay to have an independent surveyor carry out a full pre-mining survey? Yes No

If YES, please give brief details including the date of the report and who prepared it _____

17. DECLARATION

I/WE declare that to the best of my/our knowledge and belief the above information is true.

Signed _____

Date 14-3-07

This form covers claims for damage to real property only. It does not cover damage to moveable property, claims for personal injury or claims for consequential loss. A separate claim must be submitted for these items.

SUBSIDENCE DAMAGE REPORT

PARTICULARS OF CLAIM

RRUID:	001.00047515180001	REPORT SENT DATE:	19-MAR-07
CLAIM REF:	102485	OUR REFERENCE:	00026074-07
YOUR REF:	102485	DATE OF DAMAGE:	
ADDRESS:	LAND AT LLETTYNEWYDD FARM, TYCROES, AMMANFORD, DYFED		
GRID REF:	26016947 20965789 21176 (RAD)	TYPE OF CLAIM:	Coal Mining Subsidence Act 1991

PAST UNDERGROUND MINING

COLLIERY	SEAM	MINERAL	PANEL	DEPTH m	DIR.	DISP.	EXTR. THICK.	FINANCIAL YEAR
UNNAMED	Lower Four Foot	COAL	4HGB	217	NE	0.3	69	1940
UNNAMED	Four Foot	COAL	4HFD	211	E	0.0	107	1959
UNNAMED	Upper 6Ft Rider	COAL	4HGF	241	W	0.0	121	1960
UNNAMED	Lower Four Foot	COAL	4HGA	256	NE	0.0	69	1960
UNNAMED	Upper Nine Foot	COAL	4HFA	218	N	0.6	320	1961
UNNAMED	Upper 6Ft Rider	COAL	4HFB	246	W	0.0	112	1961
UNNAMED	Four Foot	COAL	4HGL	216	W	0.0	119	1961

COLLIERY	SEAM	MINERAL	PANEL	DEPTH m	DIR.	DISP.	EXTR. THICK.	FINANCIAL YEAR
UNNAMED	Upper Nine Foot	COAL	4HGI	279	NE	0.3	260	1961

Possible Unrecorded Shallow Workings

None

Outcrops

Outcrops are present in this locality

An Outcrop is present beneath the Property running E

Spine Roadways at Shallow Depth

None

FUTURE UNDERGROUND MINING

No Future Mining

LICENCE DETAILS (AOR)

No AOR Present

LICENCE DETAILS (S.36)

No S36 Licences Present

SECTION 46 NOTICES

No current notification

GEOLOGY

No faults, fissures, or breaklines present

MINE ENTRIES

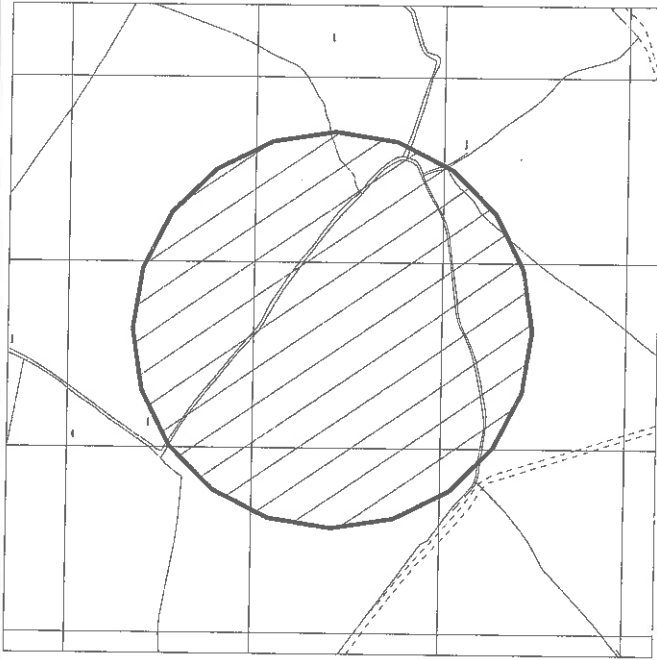
No Mine Entries

COURT ORDERS

None

WORKED OUT OPENCASST SITES

None



Crown Copyright.

PLAN NOT TO SCALE

This map is reproduced from the Ordnance Survey material by The Cad Authority [or division thereof] with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number: AL59694000.

This is a plan of the boundaries of the property in respect of which this report has been prepared. It is the responsibility of the user to ensure that the boundaries shown correspond with those of the property.

APPROXIMATE POSITION OF ENQUIRY BOUNDARY SHOWN



The
COAL
AUTHORITY



200 Lichfield Lane
Berry Hill
Mansfield
Notts
NG18 4RG

Tel 01623 637 232 (Direct)
01623 637 000 (Switchboard)
Fax 01623 637 398
Email: robpilmore@coal.gov.uk
Web: www.coal.gov.uk

Bob Jones-Prytherch & Co
Chartered Surveyors
104 Lammas Street
Carmarthen
SA31 3AP

Our Ref: 102485RAP

Your Ref: IARJ/LP

27th March 2008

Dear Sirs

Coal Mining Subsidence Act 1991

Re: Collapse in Field at Lletty Newydd Farm, Tycroes, Ammanford.

I refer to your Damage Notice received on the 16th March 2007.

The responsible person for your claim as defined by the Coal Industry Act 1994 is The Coal Authority.

Having investigated the claim, I must advise you that The Coal Authority does not agree that it has a remedial obligation in respect of the whole or any part of the damage specified in your damage notice of the 14th March 2007.

A trial excavation carried out on Wednesday 26th March 2008 confirmed that the collapse was caused by failure of the old stone filled land drains. The further depressions down the field are in line with the drain which discharges into a brook on the field edge. Mr Richards viewed the excavation prior to it being backfilled with the Authority's Mr Bryant.

If you wish to dispute this decision, you have the right to seek arbitration and details of the Chartered Institute of Arbitrators Scheme are enclosed.

I regret that we cannot be of assistance in this particular case.

Yours faithfully

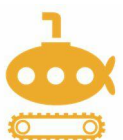
A handwritten signature in black ink, appearing to read "R A Pilmore".

COPY

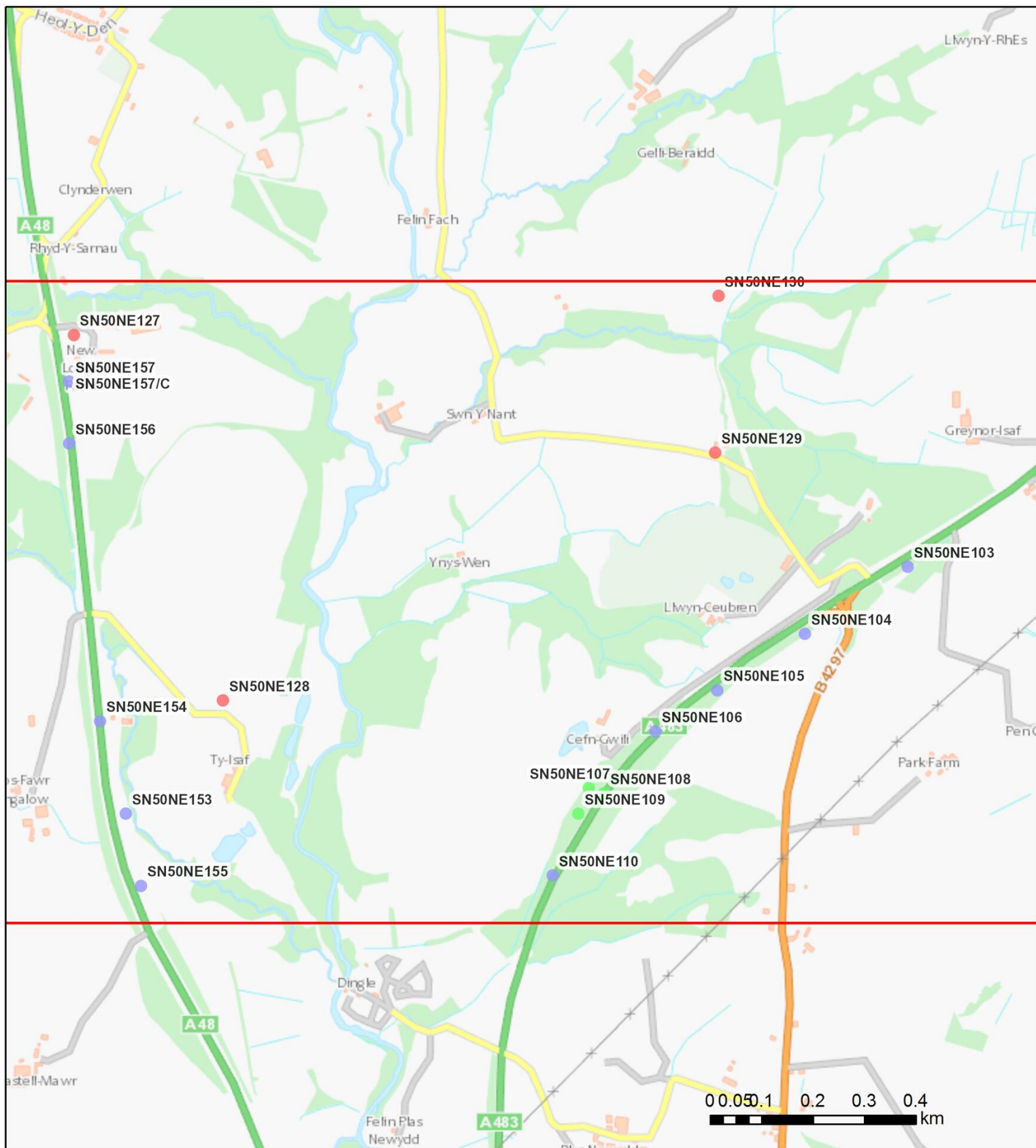
R A PILMORE
SUBSIDENCE MANAGER

c.c. [REDACTED] Lletty Newydd Farm, Tycroes, Ammanford, SA18 3RD

Appendix D: Historic BGS Borehole records



BGS Boreholes Hopkins



Map Key

Borehole scans

- Unknown Length
- Confidential
- 0 - 10m
- 10 - 30m
- 30m+

Selection Results

Borehole scans

Record	Reference	Name	Length (m)	Date	Easting	Northing
Scan	SN50NE155	A68, LONDON-FISHGUARD. HA.1	1	null	257310	208820
Scan	SN50NE110	PONTARDULAI S BY-PASS. 508	1.6	null	258110	208840
Scan	SN50NE109	PONTARDULAI S BY-PASS. 507	13.41	null	258160	208960
Scan	SN50NE153	A68, LONDON-FISHGUARD. TRENCH. B	2.3000000000000003	null	257280	208960
Scan	SN50NE108	PONTARDULAI S BY-PASS. 506	10.5	null	258210	209000
Scan	SN50NE107	PONTARDULAI S BY-PASS. 505	15.84	null	258180	209010
Scan	SN50NE106	PONTARDULAI S BY-PASS. 504	7.9	null	258310	209120
Scan	SN50NE154	A68, LONDON-FISHGUARD. TRENCH. A	3.5	null	257230	209140
Scan	SN50NE128	CWIMGWILI 3	230.12	null	257469	209180
Scan	SN50NE105	PONTARDULAI S BY-PASS. 503	5	null	258430	209200
Scan	SN50NE104	PONTARDULAI S BY-PASS. 502	5	null	258600	209310
Scan	SN50NE103	PONTARDULAI S BY-PASS. 501	5	null	258800	209440
Scan	SN50NE129	CWIMGWILI 4	359.66	null	258426	209662
Scan not currently available in GeoIndex – try GeoRecords Plus+.	SN50NE157/A	A68, LONDON-FISHGUARD. 10	10	null	257170	209800
Scan	SN50NE157	A68, LONDON-FISHGUARD. 9	8	null	257170	209800
Scan not currently available in GeoIndex – try GeoRecords Plus+.	SN50NE157/B	A68, LONDON-FISHGUARD. 11	8	null	257170	209800
Scan not currently available in GeoIndex – try GeoRecords Plus+.	SN50NE157/C	A68, LONDON-FISHGUARD. TP.1	1.9000000000000001	null	257170	209800
Scan	SN50NE127	CWIMGWILI 2	162.15	null	257179	209891

Scan	SN50NE130	CWMGWILI 5	337.11	null	258432	209967
Scan	SN50NE156	A68, LONDON- FISHGUARD. 8	9	null	257170	209680

SN 50 NE 103

5880.0944

1" : 230

GEO - RESEARCH LTD.

B/H No. 501

CONTRACT M4 PONTARDULAIS BY - PASS				SHEET No. 1			
LOCATION PONTARDULAIS (SITE R21)				No. of sheets 1.			
CLIENT WELSH OFFICE ROADS DIVISION				CASING Size to. Size to. 0,200 5,000		Ground Level chainage 135,08m 1130	
Weather FINE				Committed 2/4/71.		Completed 3/4/71.	
STRATUM. (Scale: 20mm to 1 metre)		Blow Count (N) LL/PL/PI		M.C. % Core Rec. %		TRIAXIAL TEST	
1. Thickness	Depth 2. m	Sample No.		6.	7.	8 Results of any other Tests	
Dark brown highly silty CLAY.	0.15						
Very soft brown/blue silty CLAY.	1.50	B1	39, 23, 16. (CI)	17.6	5.49	pH 6.00	
Highly weathered laminated grey iron stained SILTSTONE.	2.50	P1	75 for 0,300 total	6.9			
	3.00	B3					
	3.50	P2	75 for 0,250 total				
	4.00	B4					
	4.50	P3	75 for 0,230 total				
	3.00						
BOREHOLE				COMPLETED			

WS @ 1,000
SWL 1,000
W1 - 1,000

2/4/71
PH @ 4.00
cus @ 4.00
SWL @ 4.00
2/4/71
Water Standin @ Ground L
OC @ 5.00
cus @ 5.00
Water Standin @ Ground L
OC @ 5.00

REMARKS: • organic TOPSOIL.	Sample Depth m	M.C. % D.W.	C. B. R.				Value	B.S. 1377 No.	COMPACTION
			Air Voids	Type	TOP	BOTTOM			
					0.1 0.2	0.1 0.2			

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For other symbols used see overleaf

SN 50 NE/105

GEO - RESEARCH LTD. 5843.0920 B/H No. 503

CONTRACT M4 PONTARDULAIS BY - PASS					SHEET No. 1										
LOCATION PONTARDULAIS (SITE R21)					No. of sheets 1.										
CLIENT WELSH OFFICE ROADS DIVISION					CASING Size to. Size to. 0.200 4.570										
Weather FINE					Ground Level 125.53 m										
STRATUM. (Scale: 20mm to 1 metre)					Chainage 1540										
1. Thickness					Completed 6/4/71										
Depth		Sample No.	Blow Count (N)	Percussion	M.C. %	Type	Grading % Passing Sieve			TRIAXIAL TEST			WATER		
2. #		3.	LL/PL/P1	U D B	Core Rec. %	of Test	75 mm	40 mm	20 mm	10 mm	5 mm	Bulk Density Kg/m³	Dev. Stress kN/m²	Unconf. Com. Stron. kN/m²	REMARKS
1.		2. #	3.	5. Legend	6.	7.	8 Results of any other Tests			10.					

TOPSOIL	0.30	0.30											
Very stiff light brown sandy CLAY	0.45	D1											
	0.60	B1											
	1.00	U1	26,18.8. (CL)		12.3						2200	248	140
	1.15	1.45	(29)		11.4	TAQ					2160	619	280
					13.2						2020	287	410
Highly weathered claybound SANDSTONE	1.50	P1	24,16.8. (GL)		5.0								192/0°
	2.00	B2	75 for 0.080 total										
	1.05	2.50											
Hard brown MUDSTONE	3.00	P2	75 for 0.130 total		6.4								
	0.70	3.20											
Stiff very weathered brown/blue MUDSTONE	3.50	B3											
	4.00	P3*	8,8,9,10. (35)		7.7								
	1.10	4.30											
Hard brown MUDSTONE	4.50	P4	75 for 0.080 total										
	0.70	5.00											
			BOREHOLE	COMPLETED									

REMARKS: * P3 classification : 26,14,12. (CL)	C. B. R.										COMPACTION					
	Sample Depth #	M.C. % D.W.	Air Voids	Type	TOP				BOTTOM				Value	B.S. 1377 No.	Max. Dry Density	Optm. M.C.
					0.1	0.2	0.1	0.2	0.1	0.2						

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GEO - RESEARCH LTD.

SN 50 NE106
5831.0912

1" 230

B/H No. 504

CONTRACT M4 PONTARDULAI BY - PASS				SHEET No. 1																																																																																																																
LOCATION PONTARDULAI (SITE R21)				No. of sheets 1.																																																																																																																
CLIENT WELSH OFFICE ROADS DIVISION				Ground Level 120.17m																																																																																																																
				Chainage 1680																																																																																																																
				Commenced 6/4/71																																																																																																																
				Completed 7/4/71																																																																																																																
Weather FINE/SHOWERS				TRIAXIAL TEST																																																																																																																
STRATUM. (Scale: 20mm to 1 metre)				WATER																																																																																																																
				REMARKS																																																																																																																
1.	Thickness	Depth 2^m	Sample No.	Blow Count (N) LL/PL/PI	5 Legend																																																																																																															
<table border="1"> <tr> <td>TOPSOIL</td> <td>0.15</td> <td>0.15</td> <td></td> <td></td> <td>X X X</td> </tr> <tr> <td rowspan="3">Soft light brown/grey silty sandy CLAY</td> <td>0.30</td> <td>D1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>0.50</td> <td>B1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>1.00</td> <td>U1</td> <td>28.20.8. (CL) (15)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>2.35</td> <td>2.50</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="5">Brown laminated MUDSTONE</td> <td>3.00</td> <td>P1*</td> <td>0.13.14.18 (55)</td> <td></td> <td></td> </tr> <tr> <td>3.50</td> <td>B3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4.00</td> <td>P2</td> <td>75 for 0.230 total</td> <td></td> <td></td> </tr> <tr> <td>4.50</td> <td>B4</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2.30</td> <td>4.80</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Grey/blue hard ironstained MUDSTONE</td> <td>5.00</td> <td>P3**</td> <td>75 for 0.180 total</td> <td></td> <td></td> </tr> <tr> <td>5.50</td> <td>B5</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>1.20</td> <td>6.00</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Soft blue highly weathered</td> <td>0.30</td> <td>6.30</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Hard grey/blue MUDSTONE</td> <td>6.40</td> <td>P4****</td> <td>75 for 0.230 total</td> <td></td> <td></td> </tr> <tr> <td>0.50</td> <td>6.80</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Very hard laminated dark grey MUDSTONE (Slightly ironstained)</td> <td>7.00</td> <td>B7</td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.50</td> <td>P5</td> <td>75 for 0.130 total 31.16.15. (CL)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>1.10</td> <td>7.90</td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="4"></td> <td colspan="2">BOREHOLE COMPLETED</td> </tr> </table>						TOPSOIL	0.15	0.15			X X X	Soft light brown/grey silty sandy CLAY	0.30	D1				0.50	B1				1.00	U1	28.20.8. (CL) (15)				2.35	2.50				Brown laminated MUDSTONE	3.00	P1*	0.13.14.18 (55)			3.50	B3				4.00	P2	75 for 0.230 total			4.50	B4				2.30	4.80				Grey/blue hard ironstained MUDSTONE	5.00	P3**	75 for 0.180 total			5.50	B5					1.20	6.00				Soft blue highly weathered	0.30	6.30				Hard grey/blue MUDSTONE	6.40	P4****	75 for 0.230 total			0.50	6.80				Very hard laminated dark grey MUDSTONE (Slightly ironstained)	7.00	B7				7.50	P5	75 for 0.130 total 31.16.15. (CL)				1.10	7.90								BOREHOLE COMPLETED	
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<p>WS @ 1.500 SWL 0.600 W1 - 1.500 6/4/71 BH @ 2.500 cas @ 2.500 SWL 0.600 7/4/71 SWL 0.600</p> <p>OCB @ 7.900 cas @ 6.100 SWL 0.600 OWC B.H. Back-filled.</p>																																																																																																																				

REMARKS:
 * P1 Classification : 29.19.10. (CL)
 ** P3 Classification : 32.17.15. (CL)
 *** weathered MUDSTONE.
 **** P4 Classification : 31.18.13. (CL)

Sample Depth m	M.C. % D.W.	C. B. R.				COMPACTION				
		Air Voids	Type	TOP		BOTTOM		B.S. 1377 No.	Max. Dry Density	Optm. M.C.
				0.1	0.2	0.1	0.2			

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For other symbols used see overleaf

GEO - RESEARCH LTD. SN 50 NE/107 5818.0901 1" 230										B/H No. 505													
CONTRACT M4 PONTARDULAIS BY - PASS							SHEET No. 1																
LOCATION PONTARDULAIS (SITE R21)							No. of sheets 2.																
CLIENT WELSH OFFICE ROADS DIVISION				Percussion U D B		CASING Size to. Size to. 0.200 4.570 H.I. 6.000			Ground Level 110.82m Chainage 1840 Commenced 3/4/71 Completed 16/4/71.														
Weather FINE				Rotary Cored runs		M.C. % Core Rec. %		Grading % Passing Sieve			TRIAxIAL TEST												
STRATUM. (Scale: 20mm to 1 metre)				Blow Count (N) LL/PL/PI		Type of Test		75 40 20 10 5 mm μm μm μm μm			Bulk Density Dev. Stress Lat. U.C.T. kN/m ³ kN/m ² kN/m ² Shear/τ kN/m ²												
1. Thickness		2. Depth		3. Sample No.		5. Legend		6. Results of any other Tests			10. REMARKS												
TOPSOIL		0.30	0.30																				
Firm light brown sandy CLAY		0.45 0.60 1.00 1.50	0.30 0.45 1.00 1.80	D1 B1 U1	27.19.8r (CL) (58)		21.0 12.3	TAQ			2380	125	140 63°										
Light brown highly weathered SANDSTONE		2.00 3.00 4.00 2.40	1.80 3.00 4.20 4.20	B2 P1 P2 P3	75 for 0.180 total 75 for 0.100 total 13.13.14.7 (47) 31.18.11. (CL)		5.4 6.0	80.3	6.0	pH 5.49													
Poor shaley COAL		0.30	4.50	B3																			
Highly weathered laminated grey iron-stained MUDSTONE		5.00 5.50 6.00 1.63	4.50 5.50 6.13	P4 B4 P5	75 for 0.180 total 75 for 0.130 total		5.7 4.8						WS @ 5.000 SWL 2.000										
Shattered black SHALE		0.57	6.70										OC Boring @ 6.130 cas @ 4.570 SWL 2.000 WL - 2.000										
Grey/black MUDSTONE		2.30	9.00										Rotary commene 10/4/71.										
Continued on Sheet 2.																							
REMARKS:				Sample Depth		M.C. % O.W.		C. B. R.				COMPACTION											
Copyright Reserved				m				Air Voids		Type		TOP		BOTTOM		Value		B.S. 1377 No.		Max. Dry Density		Optm. M.C.	
												0.1 0.2		0.1 0.2									
For other symbols used see overleaf																							

SN 50 NE/107
5818.0901
1:230

GEO - RESEARCH LTD. B/H No. 505

CONTRACT M4 PONTARDULAIS BY-PASS SHEET No. 2

LOCATION PONTARDULAIS (SITE R21) No. of sheets 2.

CLIENT WELSH OFFICE ROADS DIVISION

CASING Size to. Size to. Ground Level 110.82m

SPT 0,200 4,570 Chainage 1840

H.I. 6,000 Commenced 3/4/71.

Completed 16/4/71.

Weather FINE

Rotary M.C. Type Grading % Passing Sieve **TRIAxIAL TEST**

Cored runs Core Rec. % of Test

O/H Legend

1.	Thickness	Depth 2. ■	Sample No.	Blow Count (N) LL/PL/PI	5	6.	7.	8					10.
								Results of any other Tests					
Grey/black MUDSTONE		9.00											
		5.60	14.60										
COAL	0.25	14.85											
MUDSTONE	0.99	15.84											
BOREHOLE					COMPLETED								

REMARKS:

Sample	Depth ■	M.C. % D.W.	C. B. R.				COMPACTION						
			Air Voids	Type	TOP		BOTTOM		B.S. 1377 No.	Max. Dry Density	Optm. M.C.		
					0.1	0.2	0.1	0.2				Value	

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GEO - RESEARCH LTD.				<u>SN 50 NE/108</u> 5821.0900 1:230				B/H No. 506																	
CONTRACT M4 PONTARDULAIS BY-PASS								SHEET No. 1																	
LOCATION PONTARDULAIS (SITE R21)								No. of sheets 2.																	
CLIENT WELSH OFFICE ROADS DIVISION				Percussion U D SPT B				CASING Size to. Size to. N11																	
Weather FINE WITH SHOWERS				Rotary Cored runs O/H Legend				TRIAXIAL TEST																	
STRATUM. (Scale: 20mm to 1 metre)				M.C. %				Grading % Passing Sieve																	
		Blow Count (N)		% Core Rec.		Type		mm		mm		mm		mm		mm		Bulk Density		Dev. Stress		Lat. U.C.T. Pres. Stron.		WATER	
1. Thickness		Depth 2. m		Sample No.		LL/PL/PI		2.40		600		210		150		75		Kg/m³		kN/m²		kN/m²		REMARKS	
6. 7. 8 Results of any other Tests																								10.	
TOPSOIL		0.15		0.15				XXX																	
Light brown claybound laminated SANDSTONE		0.45		0.30		D1 E1				39.9															
Brown hard SANDSTONE		1.00		P1		75 for 0.080 total				50 W		3.43		pH 7.0										WS @ 0.600 SWL 0.600 V1 - 0.600	
Dry brown CLAY		1.00		1.60																				OC Boring @ 1.600 Cas N11 SWL 0.600	
Grey/black MUDSTONE		0.53		2.13																				Rotary comment 19/4/71.	
		7.01		9.14																					

REMARKS:		Sample Depth		M.C. %		C. B. R.						COMPACTION					
		m		D.W.		Air Voids		Type		TOP		BOTTOM		Value	B.S. 1377 No.	Max. Dry Density	Optm. M.C.
										0.1 0.2		0.1 0.2					

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For other symbols used see overleaf

SN 50 NE/108 5821.0900 1:230		GEO - RESEARCH LTD.		B/H No. 506	
CONTRACT M4 PONTARDULAIS BY - PASS				SHEET No. 2	
LOCATION PONTARDULAIS (SITE R21)				No. of sheets 2.	
CLIENT WELSH OFFICE ROADS DIVISION		Percussion U D SPT B		CASING Size to. Size to. R11	
Weather FINE WITH SHOWERS		Rotary Cored runs O/H Legend		M.C. Core Rec. % Type of Test	
STRATUM. (Scale: 20mm to 1 metre)		Blow Count (N) LL/PL/PI		Grading % Passing Sieve mm mm mm mm mm 75 40 20 10 5 mm μm μm μm μm 2.40 600 210 150 75	
1. Thickness		Depth 2. Sample No.		TRIAXIAL TEST Bulk Density Dev. Stress Lat. U.C.T. Pres. Stron. Shear ²	
9.14 9.44		2. 9.14 9.44		kN/m ³ kN/m ² kN/m ² kN/m ²	
COAL 0.30		10.05		WATER REMARKS	
MUDSTONE 0.61		BOREHOLE		COMPLETED	
REMARKS:		M.C. % Sample Depth D.W.		C. B. F. TOP BOTTOM Air Voids Type 0.1 0.2 0.1 0.2 Value	
Copyright Reserved		B.S. 1377 No.		Max. Dry Density Optm. M.C.	

For other symbols used see overleaf

Received 17/3/65 BK

SN 50 NE/128

British Geological Survey

British Geological Survey

6-inch Map
B/W Regd. No
Carnegie 48 SW
(County, Sheet and Qtr.)

SECTION OF Cwmgwilli No. 3 Borehole.

SN 50 NE 128
(Nat. Grid, Sheet and Qtr.)

PURPOSE To prove Big and Green Veins

Attach tracing from a map or sketch map if possible

EXACT SITE E 257.469
N 209.180

LEVEL AT WHICH ~~shaft~~ ~~bore~~ COMMENCED RELATIVE TO O.D. 10258.17 A.D.
(3126.69m)

DATE OF SINKING OR BORTING February, 1963.

SINKER OR BORER Foraky Ltd.

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		FEET	IN.	FEET	IN.
	ROCK BIT:- Boulder Clay (Driller's Report).	34	10	34	10
	CORES START: Boulder Clay, grey, laminated in part. Cobbles & pebbles of Pennant Quartzite, Old Red Sandstone and greenish Lower Palaeozoic grits, chert and coal measure mudstone and coal.			(10.62m)	
	Mudstone, silty, rooty. Core broken from top to base.	44	4	79	2
	Mudstone, slightly silty, rooty. Broken and slickensided at 82/9.	3	1	82	3
Dip 45° @ 84/-	Mudstone, slightly silty, silty in parts ? <u>Estheria</u> at 85/2. Finely micaceous. Core broken. Wormy in parts. Rootlets die out at 87/-, <u>Estheria</u> at 87/11. c.f. <u>Planolites</u> small at 88/-	1	9	84	0
Dip 43° @ 90/2	Mudstone, slightly silty in parts. Faintly wormy. <u>Estheria</u> at 90/6. Some plant debris. Core broken from 91/- to 92/7	6	4	90	4
	Mudstone, wormy, c.f. <u>Planolites</u> small at 93/3 and 93/7. Core badly broken (fragmented) from 94/- to 99/- and enclosed in Boulder Clay (cavings). c.f. <u>Planolites</u> small and <u>C. carbonaria</u> at 99/4. Core fragmented & cemented in Boulder Clay from 99/5 to base. Sheared at base.	2	7	92	11
	COAL. with thin shale partings. Seatearth, dark, some coal streaks in basal 5".	7	1	100	0
Dip 16° @ 101/-	COAL. inferior (Part core) Seatearth, dark, coal streaks down to 101/9 Becomes silty with some sandy wisps below 101/9.	1 1/2		100	1 1/2
	Mudstone, silty, rootlets. Irregular sandy bands (Marsh lamination) to 106/6. Rootlets die out and plants appear with finer bedding from 106/6 Slickensided at base.	10 1/2		101	0
Dip 17° @ 107/-	Seatearth, silty, slickensided & contorted at top.	2		101	2
	Mudstone, silty with rootlets. Sandstone, quartzitic, broken. Siltstone, some rootlets, sandy whorls at 117/-.	1	10	103	0
	(cont'd).	8	0	111	0
		1	0	112	0
		1	11	113	11
		5		114	4

F621T-OM

British Geological Survey
SECTION OF **Cwmgwilli No. 3 B.H.** British Geological Survey

8-inch Map

B/H

CARMS 48 SW

4

SN 50 NE/128

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		FEET	IN.	FEET	IN.
	B/F.			114 ^(34.5)	4
	and at 116/6.	2	8	117	0
	Sandstone, wispy bedded. Micaceous partings & scattered plant fragments. Core broken from 118/- to 119/-.			(35.66m)	
	Quartzitic in places. 3" silty mudstone band at 120/4. 2" silty mudstone band at 122/10.	6	6	123 ^(37.64)	6
	Striped Beds, comminuted plants.	1	6	125 ^(38.10)	0
	Mudstone, silty, plant debris.		6	125	6
	Siltstone, hard, almost a dirty sandstone. Jointed.		6	126	0
	Sandstone, dirty, jointed. Core broken from top to 129/8. Silty wisps with plant debris from 130/6 to 137/- and in basal 9".	7	5	134 ^(40.72)	5
Dip 20° @ 135/-.	Mudstone, silty, plant debris.		10	135 ^(41.22)	3
	Striped Beds, plant debris.	2	4	137	7
	Mudstone, silty, plant debris. Sandy whorls from 141/4 to 142/1.			(41.44m)	
	Slickensided from 142/5 to 144/7. Sandy wisps from 145/- to 146/3 and from 148/11 to 152/-.				
Dip 17° @ 153/-.	Core broken from 152/- to 153/-. Faintly wormy at 153/6. Worms scattered below 155/6.				
	Core broken below 158/- to base.	21	5	159	0
	Mudstone, slightly silty, some plant debris. Core broken from top to 162/-.			(48.46m)	
	Finely micaceous and faintly wormy in parts.	3	0	162	0
	Mudstone, silty, sandy wisps. Wormy in parts. Core broken & jointed from 164/- to 166/-. <u>G. carbonaria</u> at 167/-.			(49.38m)	
	Mudstone, slightly silty, wormy. Scattered <u>G. carbonaria</u> below 168/6. Jointed from top to 170/3. Scattered plant debris. Silty in parts below 171/-.				
Dip 20° @ 176/-.	Jointed from 171/- to 175/-. <u>Planolites</u> at 176/-.			177	6
	Mudstone, slightly silty in parts, wormy, <u>Planolites</u> small at 178/2. A few plants from 179/3 to 189/9. Sheared from top to 181/3. <u>Planolites</u> small at 179/3 & scattered below to 180/-.			(54.92m)	
Dip 18° @ 181/-.	Ironstone at 181/2. Jointed from 182/6 to base.				
	<u>Estheria</u> and <u>Planolites</u> at 186/6. <u>B. kochi</u> 189/6. <u>s.f. Planolites</u> small 191/7. <u>Estheria</u> at 192/8. Core jointed & broken from 193/- to 196/4. Shell fragments at 194/3. <u>Estheria</u> 195/4. <u>B. kochi</u> at 196/9. <u>Estheria</u> at 198/10, & 199/5. Sheared at base.	22	6	200	0
Dip 20° @ 189/-.	Mudstone, slightly silty, dark <u>Estheria</u> fragments at 200/10, 201/1, 201/2 and scattered below. Slickensided at 204/-. Slightly sheared at 204/6 & 205/-.			(60.96m)	
	Pyrite blebs from 206/-.				

P6225-OM

SECTION OF

Cwmgwilli No. 3 Borehole.

8-Inch Map

B/H

Camme 48 SW

4

SW SO NE / 128

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		FEET	IN.	FEET	IN.
	B/F.			200	0
CEPN COED MARINE BAND.	Small <u>Lingula</u> 206/1.			(60.96m)	
	<u>Orbiculoidea</u> s at 206/2. Small <u>Lingula</u> at 206/4.				
	<u>Gasteropod</u> 206/10. <u>Lingula</u> 206/5.				
	<u>Crinoid stem</u> 207/1, <u>Gasteropod</u> 207/1. <u>Gasteropods</u> , <u>Marine brachiopods</u> . <u>Crinoids</u> at 207/5, 207/6, 207/7, 207/8.			207	(63.32m)
	Mudstone, slightly sheared	1		207	(63.32m)
	<u>COAL</u> (fragments)	4		208	(63.45m)
	Seatearth, slightly silty, 6" sandy band at 210/2. Silty below 212/-.	4	10	213	(64.92m)
	Mudstone, silty, rootlets.	3	0	216	(65.84m)
	Mudstone, slightly silty in parts.	4	0	220	(67.06m)
	Mudstone, silty, with patches of sphaerosiderite to 222/-				
Thin pyrite bands 225/8.	9	0	229	(70.00m)	
Mudstone, scattered <u>B. kochi</u> to 232/-, faint <u>Planolites</u> at top. <u>Mussel</u> & ironstone nodule with pyrite centre 232/2. <u>Planolites</u> small at 231/9. <u>Mussel</u> at 233/0.	6	0	235	(71.63m)	
Mudstone, slightly silty, faintly wormy, a little plant debris.	1	0	236	(71.93m)	
Mudstone, silty, dark, carbonaceous plant debris. <u>Mussels</u> from 237/- to base.	1	9	237	(72.47m)	
Shale, black, carbonaceous, many coal streaks.	3 1/2		238	(72.55m)	
<u>COAL</u> (core). inferior.	6 1/2		238	(72.72m)	
Seatearth, dark with pyrite lenses in top two inches.	11		239	(73.00m)	
Mudstone with rootlets.	8		240	(73.20m)	
Mudstone, silty, a few rootlets. Rootlets die out & plant debris appears at 242/-.					
Sandy wisps & bands from 242/2 to 244/6. A few sandy wisps below 247/- to 250/-.	9	10	250	(76.20m)	
Wormy at base. Mudstone, sheared at 251/-.					
<u>B. kochi</u> at 252/-, 252/6, 253/5. Jointed from top to base. <u>Mussels</u> at 258/3, 259/-.					
A few faint worms below 259/3. <u>Mussels</u> from 259/6 to 260/-.	10	5	260	(79.31m)	
<u>COAL</u> (fragments).	2		260	(79.43m)	
Seatearth, silty, occasional patches of sphaerosiderite from 265/- to base. Slickensided at base.	5	2	265	(81.00m)	
Mudstone, silty with rootlets. Slickensided & sheared from 267/- to 269/3. Jointed below 270/-.					
Sandy wisps from 274/9 to base.	12	3	278	(84.73m)	
Mudstone, slightly silty in parts. <u>Planolites ophthalmoides</u> at 278/1 and 278/3; wormy in parts. <u>Planolites ophthalmoides</u> at 281/- & 281/1.	3	6	281	(85.50m)	
Mudstone, slightly silty; 1" gauge 282/-, 1" ironstone band 282/1. <u>Planolites</u> (5 mm). at 284/-.					
Jointed from top to base. <u>Planolites</u> at 286/- & scattered below, & wormy below 286/-.					
Core broken from 291/6 to 293/-.					
Slight shearing at 292/3. Pyrite nodule at 293/6.			294	(89.61m)	

Dip 19° @ 216/-

Dip 19° @ 254/-

DRAP VEIN.

Dip 21° @ 286/-

PG227-04

SECTION OF

Cwmgwili No. 3 Borehole.

6-inch Map
 Cairns 48 SW
 B/H
 4
 SN50 NE/128

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		FEET	IN.	FEET	IN.
TRIMSARAN MARINE BAND.	Mudstone, dark with pyrite blebs at 294/6 <u>Plagiolites</u> at 294/8, 294/9, 294/10 & below. Sheared from 295/3 to 295/6. Rare pyrite blebs below 295/6. <u>Foraminifera</u> at 295/9, 1" of gauge at 296/-.			294 (59.64)	0
	Mudstone, slightly silty, dark with small pyrite nodules. Plant debris in basal 2".	2	0	296 (90.22)	0
	<u>COAL</u> (fragments)		5	296 (90.35)	5
	Seatearth, sandy.	3	8	296 (90.52)	11
	Sandstone, dirty.	1	4	300 (91.42)	7
	Striped beds, finely striped with comminuted plants. Core broken from 304/- to 305/-. Jointed from 302/6 to 305/-.			301 (92.02)	11
	Mudstone, silty, some thin sandy wisps, plant debris. Wisps die out at 310/4 Few sandy wisps from 316/1 to base.	4	1	306 (93.27)	0
	Mudstone, slightly silty, faintly wormy. <u>B. kechi</u> at 322/7. <u>G. carbonaria</u> at 325/7. Mussels 325/9 & 325/10. Pyrite nodule 325/7. <u>Planolites</u> at 327/- and scattered below to 337/-. Sheared from 332/- to 333/-. <u>G. carbonaria</u> at 334/-. Becomes darker below 338/1.	15	3	321 (97.92)	3
	Mudstone, silty, dark with thin sandy wisps, plant debris. Sandy wisps die out at 344/0. Few coaly plants, at 350/8. ? Mussel 350/11.	18	9	339 (103.33)	0
	Seatearth, bastard.	12	0	351 (106.98)	0
Mudstone, silty, plant debris, slickensided	5	0	356 (108.51)	0	
<u>COAL</u> and Dirt (Core)	1	9 1/2	357 (109.65)	9 1/2	
<u>COAL</u> (Part core and fragments) } inferior.		3	358 (109.13)	0 1/2	
Seatearth, dark, carbonaceous.		9	358 (109.36)	9 1/2	
Seatearth, silty.		2 1/2	359 (109.42)	0	
Mudstone, silty, some rootlets, sphaerosiderite from top to 362/10.	2	0	361 (110.03)	0	
Mudstone, with rootlets.	6	0	367 (111.86)	0	
Mudstone, silty, with rootlets, thin sandy bands from top.	1	1	368 (112.19)	1	
Sandstone, wispy bedded.	6	2	374 (114.07)	3	
Mudstone, silty, 6 inch sandstone band at 376/2.	1	2	375 (114.43)	5	
Sandstone, dirty, quartzitic in parts. Core broken 382/3 to 383/-. Contorted silty mudstone bands from 384/6 to 385/10.	3	4	378 (115.44)	9	
Mudstone silty, plant debris, sandy bands at top. Sandy whorls from 394/- to 395/-.	7	8	386 (117.78)	5	
Striped Beds, plant debris.	8	7	395 (120.40)	0	
Mudstone, slightly silty, wormy, <u>G. carbonaria</u> at 400/8, and scattered below.	1	8	396 (120.90)	8	
Mudstone, wormy, with <u>G. carbonaria</u> .			398 (121.31)	0	
Mudstone, slightly silty, wormy, some <u>G. carbonaria</u> . Small <u>Planolites</u> at 403/9. Worms & <u>G. Carbonaria</u> die out and plant debris comes in at 405/11.	1	4	398 (121.31)	0	
Mudstone, slightly silty in parts, Wormy,	3	5	401 (122.35)	5	
	2	3	403 (123.04)	8	
	3	4	407 (124.05)	0	

Dip 23° @ 309/-.

Dip 38° @ 345/-.

Dip 21° at 397/-

PG22T-OM

British Geological Survey
SECTION OF

Cwmgwili No. 3 Borehole.

8-inch Map
Carmarthen SW
SN 50 NE/128
B/H
4

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		FEET	IN.	FEET	IN.
	B/F.			407	0
	Mudstone, slightly silty in parts, wormy, <u>G. carbonaria</u> in places. Small <u>Planolites</u> at 407/2. Solid mussels at 408/7, & 409/-.			(124.05m)	
	1/2" wormy ironstone at 409/1. Slickenside at 409/9. 3" sheared at 410/7.	4	4	411	4
	Mudstone, slightly silty, dark solid mussel at 411/6.			(125.37m)	
Dip 20° @ 412/-	Mudstone, wormy, solid mussels at 413/-, 413/6, 413/7, 413/9, 414/7. Signs of strain-slip below 412/-.			411	9
	3" ironstone band at 415/-. Sheared from 415/6 to 416/2. 3" ironstone band at 416/5.	4	8	416	5
	Mudstone, slightly silty, dark, a few worms and one <u>Planolite</u> in top 3". Plant fragments below 416/8.			(126.92m)	
GRAIGOG RIDER	<u>COAL</u> (Fragments).			417	3
	Seatearth, dark at top, silty, ironstone nodules.			418	2
		2	4	420	6
	Mudstone, silty, rootlets. A little sphaerosiderite from 421/- to 423/-. Scattered ironstone nodules down to 426/-. Sandy wisps from 426/- to base. Rootlets die out below 430/-			(128.17m)	
Dip 22° at 432/-	Mudstone, slightly silty, dark, jointed from top to 434/3. Sheared from 434/3 to 434/8. Mussel fragments at 435/-. Wormy at 435/1. Mussel "ghosts" at 435/4. Jointed from 436/-. Mussel fragment at 437/-. Mussel "ghost" at 437/8.	12	6	433	0
				(131.98m)	
	Mudstone, silty, mussel "ghosts" at 441/8 & 442/-.	5	5	438	5
	Mudstone, slightly silty, mussel "ghosts" at 442/1, 443/6 and scattered below. Mussel fragments at 443/9, 446/-, 446/7.	4	4	442	9
Dip 22° at 445/-	<u>COAL</u> (Part core & fragments).			447	5
	<u>COAL</u> (Core)			447	10
	<u>COAL</u> (Fragments).			448	8
GRAIGOG	Shale, dark, carbonaceous, listric surfaces, (Rashings).			448	10
	<u>COAL</u> (Part core & fragments).			449	0 1/2
	Seatearth, silty, sandy in places.	1	4 1/2	450	5
	Mudstone, silty, rootlets. Rootlets die out below 457/-. Plant debris, below 458/-.	4	7	455	0
Dip 27° at 458/-	Sandstone, dirty with some convolute bedding.			(138.68m)	
	Mudstone, silty, plant debris. 7" dirty sandstone band at 462/3. Sandy wisps & thin bands from 462/8 to 465/-	4	6	459	6
	Mudstone, slightly silty	1	1	460	7
	Mudstone, mussel at 468/9. Mussel fragments at 469/- and at 469/6 and 469/7. Sheared from 469/7 to 469/9. Gouge from 469/9 to base.			(140.06m)	
	<u>COAL</u> (Part core & fragments).	1	5	470	0
UPPER SOAP	Seatearth, slickensided in places.	1	5	471	5
Dip 22° at 476/-	Mudstone, silty with rootlets. Sandy wisps from 474/-. Rootlets die out below 478/-. Jointed from 478/- to base. Sandy wisps to base. Plant debris in basal 4".	1	5	472	10
				(144.12m)	
		7	5	480	3
				(146.58m)	

P8225-ON

SECTION OF **Cwmgwili No. 3 Borehole.**

6-inch Map
Cwm 48 SW
SN 50 NE/128
 B/H
4

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		FEET	IN.	FEET	IN.
	B/F. Sandstone, dirty, a few silty wisps.			480	(146.323) 3
	Mudstone, silty, plant debris. Sandy wisps & bands.	1	3	481	(146.412) 0
	Sandstone, dirty, jointed, some silty wisps	2	3	482	(146.493) 3
	Mudstone, silty, plant debris, core broken with some cavings.			484	(147.622) 6
	Mudstone, highly sheared.			485	(147.851) 1
	Shale, black, carbonaceous, intercolated with COAL streaks, sheared.			485	(147.932) 4
LOWER SOAP	Seatearth, silty.			486	(148.161) 1
Dip 22° at 491/-	Mudstone, silty, planty, sandy wisps. Faintly wormy in parts. Slightly silty in parts from 492/4.			486	(148.242) 11
	<u>G. carbonaria</u> at 492/7.	7	5	494	(150.671) 4
Dip 15° at 496/-	Gauge Mudstone, silty, sandy wisps & thin stripes. Slickensided at 496/10 and 497/3. Slightly silty & faintly wormy in parts from 497/9. -/1 sheared at 499/8. Jointed from 497/- to base			495	(150.752) 3
	Mudstone, slightly silty in parts. Jointed from top to 502/-. Faintly wormy in parts. -/1 sheared at 502/4, frequent slickensides below 502/4.	4	5	499	(152.302) 8
Dip 38° at 501/-	<u>G. carbonaria</u> at 504/9. <u>B. kochi</u> at 505/10. -/1 sheared at 506/2. <u>Planolites</u> sp. (8 mm) at 507/1. Quartz veined ironstone nodule at 507/11; highly slickensided above and below. <u>B. kochi</u> and c.f. <u>Planolites</u> small at 508/5.			508	(154.492) 6
Dip 30° at 509/-	Mudstone, wormy. Jointed. Scattered <u>B. kochi</u> and c.f. <u>Planolites</u> small. Scattered ironstone nodules. ? ostracods at 509/3. Sheared at 509/6. Large ironstone nodule with calcite veins at 510/-. Sheared from 510/3 to base. Mussel at 511/-. Gouge, with large ironstone nodule at 512/6.	8	10	508	(154.492) 6
Angle of shear 60° at 511/-	Mudstone, core broken, sheared in places.	3	6	512	(156.062) 0
	Gouge, with large ironstone nodule at 512/6.	1	8	513	(156.572) 8
	Mudstone, dark, ? mussel fragment, sheared			513	(156.572) 9
HORIZON OF UPPER PENNYPIECES	Shale, black, carbonaceous, coal streaks sheared (Rashings).			514	(156.742) 3
	Seatearth, dark at top, sheared from 514/3 to 515/-. Silty below 515/-.	6		514	(156.742) 3
	Scattered ironstone nodules. Slickenside from 516/6 to 518/-.	3	9	518	(157.892) 0
	Mudstone, with rootlets, sheared. -/6 sandy wisps at base.	1	7	519	(158.372) 7
	Sandstone, dirty.	2		519	(158.422) 9
	Mudstone, dark, ? mussel fragment, sheared	1		519	(158.422) 10
HORIZON OF LOWER PENNYPIECES	Clay, with minute COAL particles.	2		520	(158.502) 0
	Seatearth, sheared. Silty below 520/6. Shearing stops at 520/7.	1	6	521	(158.952) 6
	Mudstone, silty with rootlets. 4" sandy band at 522/8.	3	9	525	(160.102) 3
Dip 20° at 523/-	Mudstone, sheared, rootlets, plant fragments.	1	9	527	(160.632) 0
	Seatearth, sheared in parts, some sphaerosiderite.	2	11	529	(161.522) 11
	Mudstone, silty, rooty at top, slacken-sided at 531/4. Becoming finely micaceous below 535/-. Scattered plant debris below 537/-.			531	(163.522) 4
Dip 19° at 537/-					

F6221-OM

British Geological Survey
SECTION OF

Cwmgwilli No. 3 Borehole.

8-inch Map

B/H

Cwm 48 SW

4

SN50 NE/128

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		FEET	IN.	FEET	IN.
	B/F. Scattered sandy wisps from 538/- to base.			529 (161.52m)	11
	Striped Beds, fine. (Flaser).	10	7	540 (164.76m)	6
	Sandstone, fine grained, quartzitic, slightly dirty. Silty wisps from top to 548/-.	2	3	542 (165.43m)	9
	2" silty mudstone band at 545/4. Jointed from top to base. Core broken from 547/- to base.	18	1	550 (167.84m)	10
	Mudstone, silty, sandy wisps, slightly micaceous. Plant debris. Jointed from top to 553/- . Slickensided at 553/9. 1" sheared at 554/-.	3	2	554 (168.86m)	0
	Sandstone, fine grained, quartzitic. Slightly dirty. Jointed & core broken from top to 557/- . Quartz veins in parts of jointing. Irregular mudstone pellet at 557/8 Sandstone cleaner below 558/- Wispy bedded. Core broken from 568/9 to 569/6. Slickensided at 580/- and 572/8.	21	6	575 (175.41m)	6
	Mudstone, silty, plant debris. Ironstone nodule at top. 1" sheared at base.	1	6	577 (175.87m)	0
	Sandstone, fine grained, quartzitic. Broken from top to 578/2. Jointed with quartz veining in parts from top to 584/6. Irregular mudstone pellets, coaly streaks at 580/11. Broken from 582/- to 583/6, & from 586/- to 587/- . Becoming dirty below 583/- with occasional coal streaks.	11	2	588 (179.27m)	2
Dip 19° at 592/-	Mudstone, silty, a few plants fragments. Slickenside at 590/- . Ironstone nodule at 593/2. Slickenside at 595/6. 1" sheared at 596/3.	8	10	597 (181.96m)	0
	Mudstone, plant debris, faintly wormy. <u>G. carbonaria</u> at 597/1.		6	597 (182.12m)	6
	Mudstone, slightly silty, slightly micaceous. Rare plant debris. Jointed from 599/3 to 600/6. 3" ironstone band at 601/7.	4	9	602 (183.57m)	3
	Mudstone, wormy, c.f. <u>Planolites</u> small at 602/4. Plant debris. Arrowhead plant at 604/- . Mussel fragments at 604/2 & 604/3. Many plants in basal -/1.	2	2	604 (184.23m)	5
	Shale, carbonaceous, black, coal streaks. Highly sheared.		3	604 (184.30m)	8
	Shale, intercalated with coal partings.		2	604 (184.35m)	10
	Mudstone, dark, carbonaceous. Few coal streaks.		5	605 (184.53m)	3
	Seatearth, slickensided at top.		9	606 (184.71m)	10
	Mudstone, silty, rooty.		4	606 (184.81m)	4
	Mudstone, slightly silty.		3	606 (184.89m)	7
	Mudstone, silty, rooty. Plants replace rootlets at 607/- . Good plants below 611/- . Fewer plants below 620/- . 3" band of sandy wisps at 624/- . Sandy from 628/- to 629/- . 1" sheared at 629/7. Sandy wisps at 633/- .				

P6227-0M

Dip 18° at 635/6

SECTION OF **Cwmgwilli No. 3 Borehole.**

6-inch Map
Cams 48 SW
SN 50 NE/128

B/H
4

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		FEET	IN.	FEET	IN.
	B/P.			714	9
	Sandstone, dirty, wispy-bedded with silty mudstone partings.	2	9	(217.86m)	
Dip 27° at 723/-	Mudstone, silty with sandy wherls in top 1/-. Thin ironstone band at 721/5. Micaceous from 722/-.	5	10	717 (218.69m)	6
	Mudstone, slightly silty, silty in parts, finely micaceous. <i>B. kochi</i> at 723/8. Scattered plant debris in silty parts. Worms in less silty parts. <i>G. carbonaria</i> at 724/2. Jointed from 724/8 to 726/-.			723	4
	c.f. <i>Planolites</i> small at 726/4. Thin ironstone at 726/6 & at 727/6.	4	2	(220.47m)	
	Mudstone, silty, jointed from top to 730/6. Scattered plant debris from top to 730/-.			727	6
	Ironstone band at 730/10.	3	5	(221.74m)	
Dip 28° at 735/-	Mudstone, slightly silty, faintly wormy. <i>B. kochi</i> at 732/4. 2" sheared at base.	1	11	731 (223.09m)	11
	Mudstone, faintly wormy, finely micaceous, plant debris. Mussel at 734/9.	1	2	733 (223.67m)	10
	Mudstone, finely micaceous, carbonaceous, plant debris - some coalified. Sheared in parts. Seatearth texture in part.	1	2	735 (224.25m)	0
GREEN VEIN.	COAL, inferior (fragments).	3	8 1/2	736 (224.82m)	3 1/2
	COAL (part core and fragments).			740 (225.56m)	0
	Shale, carbonaceous, sheared (rashes).			740 (225.56m)	0 1/2
	Seatearth, becoming silty below 740/3.	1	11 1/2	742 (226.16m)	0
	Mudstone, silty, rooty. Passing to Sandstone, fine-grained, dirty. Jointed with quartz from 744/2 to 745/4.	1	1	743 (226.99m)	1
	Mudstone, slightly silty, some plant debris. -/5 ironstone band at 746/8. Silty in parts down to 748/7.	2	6	745 (227.25m)	7
Dip 25° at 754/-	Mudstone, wormy. Ironstone at 751/1. Jointed from top to 753/-.	3	5	749 (228.29m)	0
	Mussels at 751/9 & 753/2. Slightly silty in parts. <i>B. kochi</i> at 753/11. Thin ironstone at 754/11.	6	2	755 (230.17m)	2
	BOTTOM OF HOLE.				
	Hole sealed to surface with 6 tons Cement. April 1963.				

FO221-04

British Geological Survey

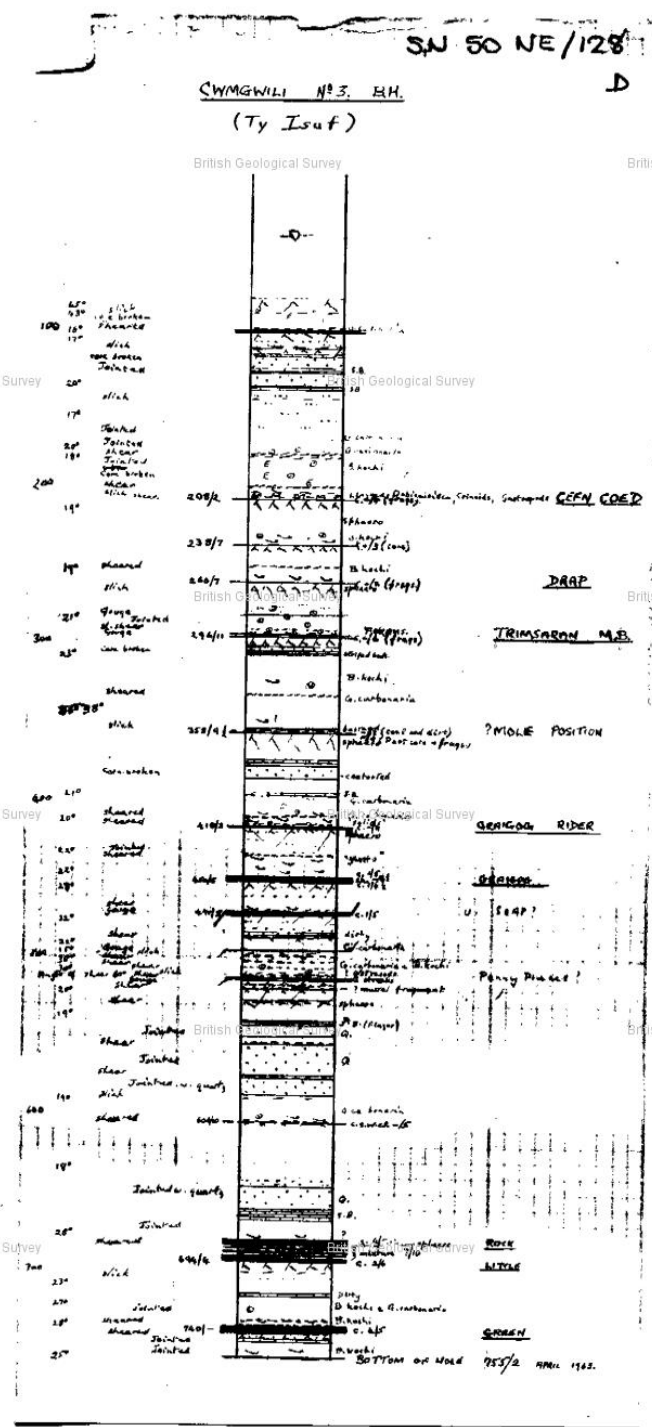
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MONK
 SITE INVESTIGATION
 CLIENT

TRIAL PIT RECORD

SN 50 NE/153
 5728-0896

TRENCH
B

SITE
 A48 Trunk Road, Pont Abraham-Cwmgwilli


Sheet 1 of 1
 Job Ref. SI.1594

daily progress	water levels	Samples or Tests Depth		Type	Depth	Description of Strata	Level	Legend
		From	To					
27.2.78					0.20	TOPSOIL	73.90	
					1.20	Stiff light brown and grey mottled silty CLAY with rounded and sub-angular fine medium and coarse gravel and cobbles.	73.70	<p>GLACIAL DEPOSITS</p>
		1.20	2.30	B	1.20	(SF/CL)	72.70	
					2.30	Stiff greyish brown silty CLAY with rounded and sub-angular fine medium and coarse gravel and cobbles.	71.60	
					END			

Method of excavation:
 Mechanical Excavator

Remarks: Trench dry during excavation
 Dimensions:- length = 3.0m up cut slope
 v.b. Dimensions given above are on the vertical plane. Long axis 90° to C/L road. Trench cut in existing road cut slope which is at 4:1 (0.93 H : 1V)

Logged by: [Signature] Scale: 1 : 20



TRIAL PIT RECORD

SN50 NE/154

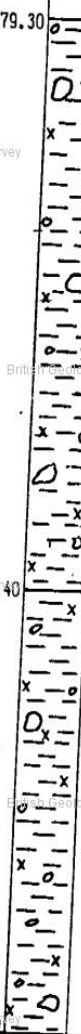
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TRIAL PIT No.
TRENCH
A

CLIENT
Welsh Office

SITE
A48 Trunk Road, Pont Abraham-Cwmgwili

Sheet 1 of 1
Job Ref. SI.1594

Daily Progress	Water Level	Samples or Tests		Depth	Description of Strata	Level	Legend
		From	To				
17.2.78				0.10	TOPSOIL	79.40	
				2.00	Stiff light brown and grey mottled silty CLAY with rounded and sub-angular fine medium and coarse gravel and cobbles. (GF/CL)	79.30	 <p>GLACIAL DEPOSITS</p>
		2.00	3.50	B	Stiff greyish brown silty CLAY with rounded and sub-angular fine medium and coarse gravel and cobbles. (GF/CL)	77.40	
				3.50	(GF/CL)	75.90	
				END			

Method of excavation:
Mechanical Excavator

Remarks: Trench dry during excavation.
Dimensions:- length = 4.8m up cut slope
N.B. Dimensions above are on the vertical plane.
Long axis 90° to C/L road. Trench cut in existing road cut slope which is at 47° (0.93 H :1V)

Logged by: GHJ

Scale: 1 : 20

Monk

BOREHOLE RECORD

SN 50NE/157

BOREHOLE No.

8

Investigation

9717-0988

Office

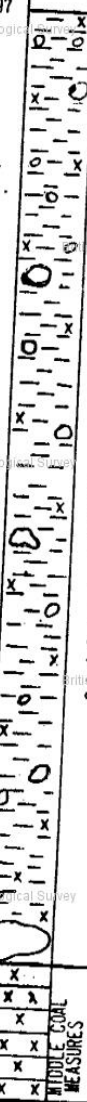
SITE

A48 Trunk Road Pont Abraham - Cwngwllt

Sheet 1 of 2

Job Ref. S1 1594


Water Level	Samples in situ tests and coring runs		N Value or Core Recov.	Depth	Description of Strata	Reduced Level	Legend
	Depth From	To					
					Metres Ordnance Datum	96.39	
				0.42	TOPSOIL	95.97	
11.1.	0.45	0.95	D		Firm becoming stiff brown and grey mottled sandy silty CLAY with rounded and sub-angular fine medium and coarse gravel, roots above about 1.9m, and rare coal fragments. Becomes stiff to very stiff and grey below about 2.35m. Sandstone boulder 4.2m - 4.4m. (GF/Cl) becoming (GF/CL)		
11.1.	0.50	1.40	U				
	1.00		D				
	1.45		D				
	1.50	1.85	U				
	1.90	2.90	B				
	2.00		D				
	2.35	2.85	U				
	2.90		D				
	3.00	3.45	SD	47			
	3.00	3.50	B				
	3.50	3.95	U				
	4.00		D				
	4.20	4.237	S	75#			
	4.250	4.302	S	130#			
	4.400	4.458	S	100#			
	4.46	4.80		4.40			
			100% (0%)				
	4.80	4.95		5.00			
			100% (0%)				



GLACIAL DEPOSITS

Percussion 150mm
 Rotary H size
 HNAF core
 Pendant attachment
 (Hands-England 4.95 - 9.00m)

Remarks: Water struck at 4m. - see separate sheet for measurements.
 Standing at 0.72m on 18th, 19th, 0.73m on 20th, 0.7m on 21st Jan,
 at 0.6m on 9th and 10th March 78. Coring attempted at 4.2m -
 no progress. Rock roller used 4.2m-4.25m. Chiselled thr 4.25m -
 4.4m. Rotary coring recommenced at 4.46m. No recovery 4.2m - 4.46m.
 open hole 4.95m - 5.3m - descriptions based on driller's
 observations.
 Planimeter installed



BOREHOLE RECORD

SN50NE156

BOREHOLE No. **8**

Investigation

Site: A48 Trunk Road, Pont Abraham-Cwngwill

Sheet 2 of 2

Job Ref. SI.1594

Water Level	Samples in situ tests and coring runs		N Value or Core Recov.	Depth	Description of Strata	Reduced Level	Legend	
	From	To						Depth
	5.00			5.00		91.39		
	6.40	6.40	73% (0%)		Fresh grey well cemented laminated moderately strong and moderately weak SILTSTONE and MUDSTONE with occasional silty fine sandstone. Clayey shale layer at 8.0m and highly broken very weak zone from 8.1m - 8.3m. Bedding dips at approx. 10°		xxx	
								xxx
								xxx
								xxx
								xxx
								xxx
								xxx
								xxx
								xxx
								xxx
	6.40	8.08	89% (26%)				xxx	
	8.08	9.00	71% (0%)				xxx	
				9.00		87.39		
END					Joints observed:- Above 5m - 80° brown and rough 5m - 6m - 2 at 70° one curved, 60°, 20° rough and fresh 6m - 7m - 20° curved, 25°, 50°, 2 at 90° rough and fresh. 7m - 8m - 2 at 30°, 60°, 4 at 70° one set intersecting other at 40°, 80°, 2 at 90° rough and fresh occasionally closed 8m - 9m - 30°, 60°, 70°, 2 at 80° one curved, 90° rough and fresh			

Remarks:-

See sheet 1.

MIDDLE COAL MEASURES

Scale:- 1 : 25

GHJ