

Appendix 4B

Coal Mining Risk Assessment



Pennant Walters

FOEL TRAWSNANT GRID CONNECTION

Coal Mining Risk Assessment



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Coal Mining Risk Assessment

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CONTENTS

1	INTRODUCTION	3
2	SITE BACKGROUND INFORMATION	6
3	GEOLOGY	7
4	MINING REMEDIATION AUTHORITY DATA	9
5	SITE SPECIFIC UNDERGROUND MINING RISKS	12
6	RECOMMENDATIONS	21

TABLES

Table 1-1 – Site details summary	4
Table 2-1 – Summary of BGS Borehole records for the Site Area	7
Table 4-1 – Mining Remediation Authority CCMR summary	9
Table 5-1 – Summary of mine entries (shafts) within 100m of Site	12
Table 5-2 –mine adits within 100m of Site	13
Table 6-1 – Mining Risk Assessment Summary	21
Table 6-2 – summary of proposed mitigation	24

ANNEXES

ANNEX A

DRAWINGS

ANNEX B

NOTES AND LIMITATIONS

ANNEX C



MINING REMEDIATION AUTHORITY CONSULTANTS COAL MINING REPORTS

ANNEX D

HISTORICAL BGS BOREHOLE RECORDS

1 INTRODUCTION

1.1 AUTHORISATION AND SCOPE

- 1.1.1. Pennant Walters commissioned WSP UK Limited (WSP) to produce a Coal Mining Risk Assessment (CMRA) for the proposed construction of a National Grid connection of a combination of overhead and underground cables. The proposed general arrangement is shown within **Figure 4.1 of the EIA Report (Volume 2 – Figures)**.
- 1.1.2. This report provides a Coal Mining Risk Assessment of the land within the Project red line boundary, as illustrated in **Figure 4-1 of the EIA Report**.
- 1.1.3. The Project is located in an area of historical coal mining activity and classified by the Mining Remediation Authority (MRA) as a 'Coal Mining Reporting Area'.
- 1.1.4. This CMRA has been prepared with reference to the following guidance documents:
 - The Mining Remediation Authority – '*Coal Mining Risk Assessment model report template and associated guidance notes*', dated January 2017; and
 - CIRIA C758D – '*Abandoned mine workings manual*'.
- 1.1.5. The CMRA should also be read in conjunction with the following supporting documents:
 - **Annex A** – Figures;
 - **Annex B** – Notes and Limitations;
 - **Annex C** – Mining Remediation Authority Consultants Coal Mining Reports; and
 - **Annex D** – Historical BGS Borehole Records.

1.2 LIMITATIONS

This report is addressed to and may be relied upon by the following parties:

- Pennant Walters (PW); and
 - National Grid Electricity Distribution (NGED).
- 1.2.1. This report shall not be relied upon or transferred to any other or unnamed parties without the express written authorisation of WSP. No responsibility will be accepted where this report is used in its entirety or in part, by any other party.
 - 1.2.2. This report summarises information provided from a number of external sources. WSP cannot offer any guarantees or warranties for the completeness or accuracy of information relied upon herein, which is taken in good faith as being accurate. WSP cannot accept liability for any deficiencies in third party information.
 - 1.2.3. This report is specifically limited to an assessment of mining risks. A copy of the notes and limitations are included as **Annex B**.

1.3 SITE LOCATION

- 1.3.1. The site location and approximate redline boundary are illustrated in **Figure 4-1** of the EIA Report (**Volume 2 – Figures**), with pertinent site details summarised in **Table 1-1**.

Table 1-1 – Site details summary

Aspect	Details
National Grid Reference	Approximately SS842935 to SS840875
Current site use	The land is currently a series of agricultural fields on a hilly landscape.
Topography	Using topographic information from Google Earth, it was identified that the site and surrounding area varies highly in elevation. The elevation of the site ranges from 358mAOD in the north to 185mAOD in the centre of the site and 325mAOD in the south.

1.4 PROJECT DESCRIPTION

- 1.4.1. The current proposed works comprise 9.5km of 66kV Cu Cable; 4.4km will be overhead line (OHL) supported by wooden H-poles of between 11m and 15m above ground level and 5.1km will be below ground.

1.5 SCOPE OF COAL MINING RISK ASSESSMENT

- 1.5.1. The purpose of this Coal Mining Risk Assessment is to:
- Present a desk-based review of readily available information on ground conditions and mining issues which are relevant to the Project;
 - Use that information to identify and assess the risks to the Project from the mining legacy, including cumulative impact of issues;
 - Assess the impact of the Project on the existing mining legacy risk; and
 - Set out appropriate mitigation measures to address any identified mining legacy issues affecting the site, including any necessary remedial works and / or demonstrate how mining issues may affect the Project.
- 1.5.2. Whilst this report primarily considers coal mining risk, where the records provided by the MRA also reference Ironstone or Fireclay mining incidental to coal mining activity this has also been highlighted and discussed. Other forms of mineral mining are not considered in this report.
- 1.5.3. Note that for the purposes of this report, the term 'shallow mining' or 'shallow mine workings' generally refers to mining within 30m of ground level or 30m below rockhead level, consistent with the MRA definition. Mining at depths greater than this would be referred to as deep mine workings. For a Project of this nature deep mine workings are not expected to present a risk of surface instability and as such this report focusses primarily on risks from any shallow mine workings, along with risks from mine entries or surface mining, where recorded or suspected.

1.6 SOURCES OF INFORMATION

READILY AVAILABLE SOURCES

- 1.6.1. The following sources of readily available information have been reviewed and interpreted as part of this CMRA:
- Published geological maps:
 - BGS 1:50,000 Sheet Number 248, Pontypridd, Bedrock (1963) Series; and

- BGS Online Geological Map Viewer (1:50,000), accessed through <https://geologyviewer.bgs.ac.uk/>.
- Mining Remediation Authority online database (interactive map viewer) accessed through <http://mapapps2.bgs.ac.uk/coalauthority/home>;
- British Geological Survey (BGS) online Geology Viewer, information and datasets (including historical borehole logs) accessed through <http://mapapps2.bgs.ac.uk/geoindex/home.html>;

1.7 REPORTS

- 1.7.1. The following reports which provide a factual summary of mining records held by the Mining Remediation Authority have been obtained and reviewed (included as **Annex C**), with pertinent findings forming part of this assessment:
- The Mining Remediation Authority: *Consultants Coal Mining Reports*, CA refs: 51003478139001 and 51003478150001, 7 February 2025.

2 SITE BACKGROUND INFORMATION

2.1 HYDROLOGY

The site crosses four rivers named Nant y Ffyllon, Nant Sychbant, Nant Llest-wen, Nant y Castell.

2.2 SITE HISTORY

- 2.2.1. A review of historic Ordnance Survey (OS) mapping for the Site indicates the following in relation to mining history:
- From earliest mapping 1876: Collieries identified to the north of the Site with a 'trial shaft' approximately 500m from the Site. Several other mine entries are also identified to the east and west of the Site where it passes Dyffryn, possibly adits. Possible spoil heaps and coke ovens identified around this area as well. Railway running parallel to the site to the east through Dyffryn. Old gravel pit identified to the south of the Site.
 - Mapping dated around 1884: Old quarries identified to the south.
 - Mapping dated around 1897: Old quarries identified to the south, west and east of the Site especially around Dyffryn village. Old mine entries identified surrounding the Site in the north, east and west especially surrounding Dyffryn village. Dyffryn colliery identified to the north of the Site with associated tramways. Port Talbot railway line running through the centre of the Site. Quarries Identified to the west of the northern portion of the Site.
 - Mapping dated around 1914: Tramway running through the Site in the south. Old gravel pit identified approximately 400m to the south of the Site. All old quarries, old mine entries and collieries still identified.
 - Mapping dated around 1921: No significant change on or around the Site.
 - Mapping dated around 1938: No significant change on or around the Site.
 - Mapping dated around 1947: The tramway running through the Site is now identified as a pathway. The old quarries are no longer identified around the Site.
 - Mapping dated around 1970: No significant change on or around the Site.
 - Mapping dated around 1985: No significant change on or around the Site.
 - Mapping dated around 1995: The Port Talbot railway is now identified as a dismantled railway.
 - Mapping dated around 2001: The quarries and old mine entries are no longer identified.
 - Mapping dated around 2010: No significant change on or around the Site.
 - Mapping up to 2025: No significant change on or around the Site.

3 GEOLOGY

3.1 SUPERFICIAL AND SOLID GEOLOGY

- 3.1.1. No Made Ground deposits are recorded within the site geological mapping. Made Ground deposits may be present in the north of the Site associated with construction of residential areas and roads in Maesteg.
- 3.1.2. BGS 1:50,000 and 1:10,560 mapping indicates superficial deposits are absent across most of the site, with sections of Glacial Till (described by the BGS as Diamicton) in the centre and south of the Site (see **Figure 4B.1, Annex A**). Alluvium is also recorded to the east of the Site and may be present beneath sections of the centre of the Site associated with the various rivers.
- 3.1.3. The bedrock beneath the site is recorded as the Llynfi Member and the Rhondda Member in the far north, the South Wales Upper and Middle Coal Measures Formation in the north central area, and the Rhondda Member in the centre and south section.
- 3.1.4. Several coal seams are recorded on the mapping to outcrop across the site across the full route area. An extract of the BGS solid geology mapping for the areas in the north of the route affected by recorded shallow coal mining is included in **Figure 4B.2 of Annex A**, and within **section 5.3** to support interpretation.

3.2 RECORDED FAULTS AND FISSURES

- 3.2.1. Several faults are recorded approximately crossing the site in a north-south direction. No fissures are recorded within the vicinity of site.

3.3 HISTORIC BOREHOLES

- 3.3.1. The British Geological Survey (BGS) holds records of a large number of accessible historical borehole records that were considered relevant to the site. These historical boreholes broadly confirm the stratigraphic sequence outlined in the mapping and some encountered substantially thick Made Ground.
- 3.3.2. **Table 2-1** provides a summary of pertinent data from the nearby available borehole records. The locations of these boreholes are shown **Figure 4B.3 of Annex A**. Copies of selected borehole logs are presented as **Annex D**. Reference should be made to the BGS Geoindex to identify locations of included borehole records.

Table 2-1 – Summary of BGS Borehole records for the Site Area

Stratum	Depth to Base (m bgl) (mean)	Thickness Range (m) (mean)	General Description	BGS Log Locations Recorded
Made Ground	0.35 – 18.75 (3.6)	0.35 – 18.75 (3.6)	Colliery Waste Fill Dark brown clay with gravel Workings spoil	373310 373302 15949275 373313

Stratum	Depth to Base (m bgl) (mean)	Thickness Range (m) (mean)	General Description	BGS Log Locations Recorded
				15949280 15949279 15949278 373303
Glacial Till	0.2 – 10.0 (3.7)	0.15 – 10.0 (3.0)	Very stiff gravelly sandy SILT with frequent cobbles and boulders. Stiff grey gravelly CLAY Stiff shaly CLAY Soft to firm gravelly CLAY Firm grey CLAY Firm silty sandy CLAY	373302 373305 15949278 15949273 373313 15949272 373301 373312 373315 373316 373314 373317
South Wales Coal Measures	Not proven	Not proven	Dark grey laminated shaly MUDSTONE Old workings Sandy SILTSTONE Weathered MUDSTONE Carbonaceous SHALE Thinly bedded SANDSTONE Thinly bedded MUDSTONE Carbonaceous SHALE Weak COAL Laminated MUDSTONE	373310 373302 373305 15949273 373301 15949272 373313
Evidence of mine workings	-	-	Old workings (no recovery) at 11.2 - 12.8mbgl. (373302) Probable collapsed/backstowed workings at 6.7 – 8.0mbgl. (373300) Colliery spoil at ground level to 10.3mbgl. (373308, 373310, 373311)	373300 373302 373308 373310 373311

4 MINING REMEDIATION AUTHORITY DATA

4.1 MINING REMEDIATION AUTHORITY INTERACTIVE MAPPING

- 4.1.1. The Mining Remediation Authority (MRA) online interactive map, accessed in February 2025, identifies that the site is within a 'Coal Mining Reporting Area' and within a 'Coalfield Consultation Area'.
- 4.1.2. **Figure 4B.4** through to **Figure 4B.9 (Annex A)** show different screen shots from the MRA viewer to show:
- Outcrops;
 - Past shallow coal mining;
 - Probable unrecorded shallow mining;
 - Mine entries, and
 - Surface mining.
- 4.1.3. There is one small areas of past shallow coal mining below the Site in the north and also within the surrounding area.
- 4.1.4. There are two areas of probable shallow coal mining underneath parts of the north of the Site.
- 4.1.5. The MRA online viewer identifies 22 mine entries within approximately 100m of the Site. Of these, 17 are adits (inclined tunnels into underground workings - shown as brown crosses) and 5 are shafts (vertical shafts into mine workings - shown as red crosses). More accurate plots of these mine entries are included in the plans in the CCMRs discussed in **section 4.2**.
- 4.1.6. There is recorded opencast coal mining to the east of the southern section of the Site and in the centre of the town of Maesteg to the west of the central section of the Site. None of these affect the proposed cable route.

4.2 CONSULTANTS COAL MINING REPORTS

- 4.2.1. Two MRA Consultants Coal Mining Report (CCMR) (MRA references: 51003478139001 and 51003478150001) have been obtained for the extents of the Project and are included within **Annex C**. A summary of the reports is presented within **Table 4-1**. Recorded past or probable shallow coal mining (<30m bgl) highlighted bold for clarity.

Table 4-1 – Mining Remediation Authority CCMR summary

Mining Remediation Authority Data		February 2025
Section 1 – Mining activity and geology	Past underground mining (on site)	Two Foot Nine coal seam worked at depths of 21m, 38m, 40m, 40m 46m, 49m and 58m deep, dipping 29.1° south, 3.7°, 12.5°, 4.3°, 9.4°, 2.3° and 9.4° north, extraction thickness 100cm, last mined 1870.
		Four Foot Seam, 45m, 46m, 66m and 95m deep, dipping 10° and 26.6° north, and 7.3° south, extraction thickness 224cm and 100cm, last mined 1870.
		Upper Six Feet Seam, 62m, 68m, 69m, 96m, 117m, 132m, 373m, 375m, 520m and 524m deep, dipping 21.8°, 10.5°, 22.1°, 11.3°, 12° and 3.7° north and 10.5° south, extraction thickness 100cm, 200cm, 234cm, 270cm, 292cm last mined 1967.

Mining Remediation Authority Data		February 2025
		No. 2 Rhondda Seam, 63m deep, dipping 12.5° north, extraction thickness 67cm, last mined 1888.
		Caerau Seam, 75m, 78m, 97m, 100m and 120m deep, dipping 11° south, 25.7°, 3.8°, 26.2° north, extraction thickness 100cm and 188cm, last mined 1879.
		Lower Six Feet Seam, 96m and 232m deep, dipping 10° north, extraction thickness 100cm, last mined 1900.
		Lower Nine Foot Seam, 103m and 444m deep, dipping 7° west and 0° east, extraction thickness 122cm and 211cm, last mined 1980.
		Unnamed Seams, 41m and 291m deep, dipping 12.8° north and 7° west, extraction thickness 100cm, last mined 1900.
		Bute Seam, 606m and 607m deep, dipping 1.6° and 7° north, extraction thickness 137cm and 145cm, last mined 1976.
		No. 3 Rhondda Seam, 652m, 659m, 674m, 712m and 724m deep, dipping 9.3°, 12.9°, 8.2° and 4.7° north and 5.8° south, extraction thicknesses 92cm, 100cm and 120cm, last mined 1948.
	Probable unrecorded shallow workings	Yes.
	Spine roadways recorded at shallow depth	Six spine roadways recorded at shallow depth beneath site. Four additional spin roadways recorded at shallow depth within 10m of the site.
	Mine Entries	22 recorded within 100m of the site boundary.
Section 2 – Investigative or remedial activity	Seam outcrops	17 outcrops recorded within the site boundary.
	Geological faults, fissures and breaklines	No fissures or breaklines recorded. The CCMR records 6 faults beneath the site.
	Opencast mines	One unlicensed opencast is recorded approximately 150m to the east of the southern part of the site
	Mining Remediation Authority managed tips	None recorded within 500m of boundary.
	Site Investigations	One site investigation has been identified 8.8m south of the enquiry boundary.
	Remediated sites	One remediated site is recorded 34.1m to the east of the northern part of the site.
	Coal mining subsidence	Two damage claims notices were made within 50m of the site in October 2010, both claims were rejected. No current stop notices. No requests to carry out preventative works before coal is worked are known of.
	Mine gas	None recorded within 500m of site boundary.
	Mine water treatment schemes	None recorded within 500m of site boundary.

Mining Remediation Authority Data		February 2025
Section 3 – Licensing and future mining activity	Future underground mining	None recorded.
	Coal mining licencing	None recorded within 200m of boundary.
	Court Order	None recorded
	Section 46 notices (land at risk of subsidence)	No notices given.
	Withdrawal of support notices	Not in an area where notice has been published.
	Payments to owners of former copyhold land	Not in an area where notice has been published.

ABANDONMENT PLANS

- 4.2.2. Due to the small areas of recorded shallow mine workings beneath the site in the north (<30m bgl), it was considered appropriate to obtain or review the abandonment plans from the MRA. However, in correspondence with the MRA it was identified that they unable to locate the abandonment plans identified within the CCMR to be <30m below the Site.

MINE ENTRIES

- 4.2.3. The CCMR reports indicate that there are 22 recorded mine entries within 50m of the Site. These mine entries are all located in the northern part of the site. Five of the mine entries were recorded as shafts and the other seventeen recorded as adits. Due to the long history of mining in this area it is also possible that unrecorded mine entries are present in the vicinity of the Site.

SURFACE MINING

- 4.2.4. The CCMR states that there is one Unlicensed Opencast site within 250m of the Site, located to the east of the southern section of the site.

MRA MANAGED TIPS

- 4.2.5. The CCMR states that there are none recorded within 500m of the Site.

SPINE ROADWAYS

- 4.2.6. The CCMR identifies six spine roadways at shallow depth (<30m bgl) beneath the site, and a further four spine roadways at shallow depth within 10m of the Site. Spine roadways are underground tunnels connecting different areas of mine workings and may be within larger areas of seam workings or between separate areas of workings. Their positions are not indicated in the plans provided by the MRA within the CCMRs. It is possible that the spine roadways represent the below ground extension of the various adit tunnels which may pass below the site leading to deeper workings. These are discussed further in **Section 5.4**.

5 SITE SPECIFIC UNDERGROUND MINING RISKS

5.1 RECORDED MINE ENTRIES (MINE SHAFTS)

5.1.1. The MRA records indicate five mine shafts within approximately 100m of the Site boundary, as indicated on the figures within the CCMR reports and summarised in **Table 5-1** below. The risks associated with mine shafts are assessed by considering the potential zone of influence (Zol), the zone where ground subsidence may reasonably be expected to occur in the event of a shaft failure, collapse or settlement of any infill. This Zol has a radius defined as:

■ $R = \text{shaft diameter} / 2 + \text{departure distance} + \text{depth to rockhead}$

5.1.2. The 'departure distance' is a measure of the likely degree of positional accuracy attributed to the mine entry by the MRA. Depth to rock head is conservatively assumed at 10m bgl at this stage.

Table 5-1 – Summary of mine entries (shafts) within 100m of Site

Shaft reference	Approximate co-ordinates	Departure distance (m)	Zone of Influence (Zol) radius (m)	Treatment details
284192-024	284815, 191976	5m	$(2.5/2 + 5 + 10) = 16.25\text{m}$	no records of treatment
284192-047	284789, 192054	5m	$(3.5/2 + 5 + 10) = 16.75\text{m}$	treated and remediated
284192-048	284795, 192052	5m	$(3.5/2 + 5 + 10) = 16.75\text{m}$	treated and remediated
284192-052	284699, 192280	8m	$(2.5/2 + 8 + 10) = 19.25\text{m}$	no records of treatment
284192-079	284763, 192015	10m	$(2.5/2 + 10 + 10) = 21.25\text{m}$	no records of treatment

5.1.3. The co-ordinates and Zol should be used to determine the affected areas in proximity to the planned cable route. These Zol should ideally be avoided by the proposed underground cable or overhead section. Where the underground cable route or overhead section cannot be adjusted to avoid building over these zones, consultation with the MRA will be required to agree permission and any special precautions that may be required.

5.1.4. Note that based on the current proposal, all these mine shafts are in the section proposed for underground cabling only.

5.2 RECORDED MINE ENTRIES (ADITS)

5.2.1. The MRA records indicate seventeen mine adits within 100m of the Site, as indicated on the figures within the CCMR reports and summarised in **Table 5-2** below. The MRA does not have any record of treatment for any of these adits. The five adits which are oriented towards the proposed cable route, and hence expected to be present passing below the site are indicated **bold**.

Table 5-2 –mine adits within 100m of Site

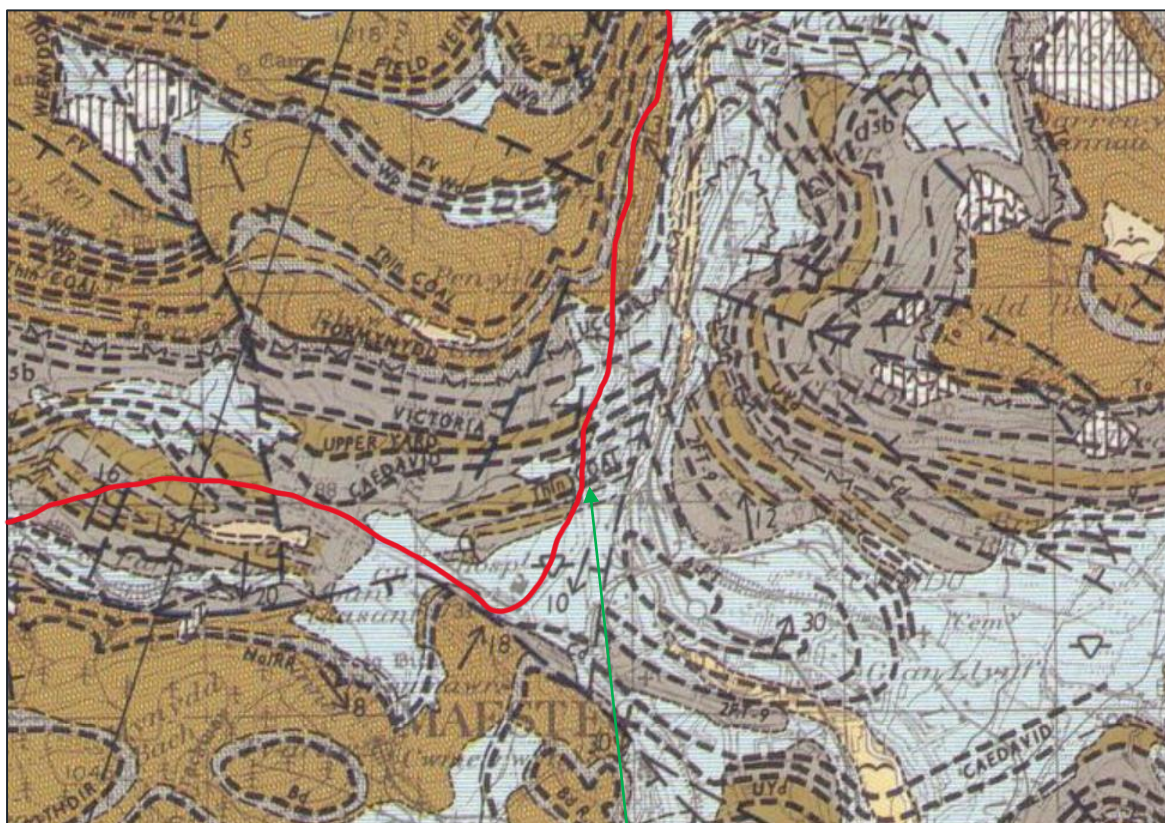
Adit reference	Approximate co-ordinates	Orientation direction	Orientation (towards or away from site)	Expected below site (Y/N)
284190-001	284625, 190834	S	Towards	Y
284190-014	284388, 190422	N	Towards	Y
284191-004	284461, 191347	SW	Towards	Y
284191-008	284733, 191936	W	Away	N
284191-024	284815, 191976	WNW	Towards	Y
284192-015	284728, 192351	W	Away	N
284192-016	284798, 192357	NW	Away	N
284192-017	284830, 192435	NW	Away	N
284192-021	284718, 192871	WNW	Away	N
284192-022	284879, 192738	NW	Away	N
284192-023	284883, 192560	NW	Away	N
284192-066	284766, 192776	W	Away	N
284192-069	284714, 192261	NNW	Away	N
284192-080	284993, 192609	NW	Towards	Y
284193-008	284659, 193568	NW	Away	N
284193-009	284659, 193168	WNW	Away	N
284193-010	284648, 193143	WNW	Away	N

- 5.2.2. The five recorded adits which are indicated to pass below the site may pose a risk due to potential instability of the entrance and possible shallow workings related to the adit tunnel. The co-ordinates and alignment of these adits should be used to determine the affected areas in proximity to the planned cable route. These areas should ideally be avoided by the proposed overhead section. Where the underground cable routes or overhead section cannot be adjusted to avoid building over these zones, consultation with the MRA will be required to agree permission and any special precautions that may be required.
- 5.2.3. Note that based on the current proposal, all these mine adits are in the section proposed for underground cabling only.

5.3 RECORDED UNDERGROUND MINE WORKINGS (SHALLOW <30M BGL)

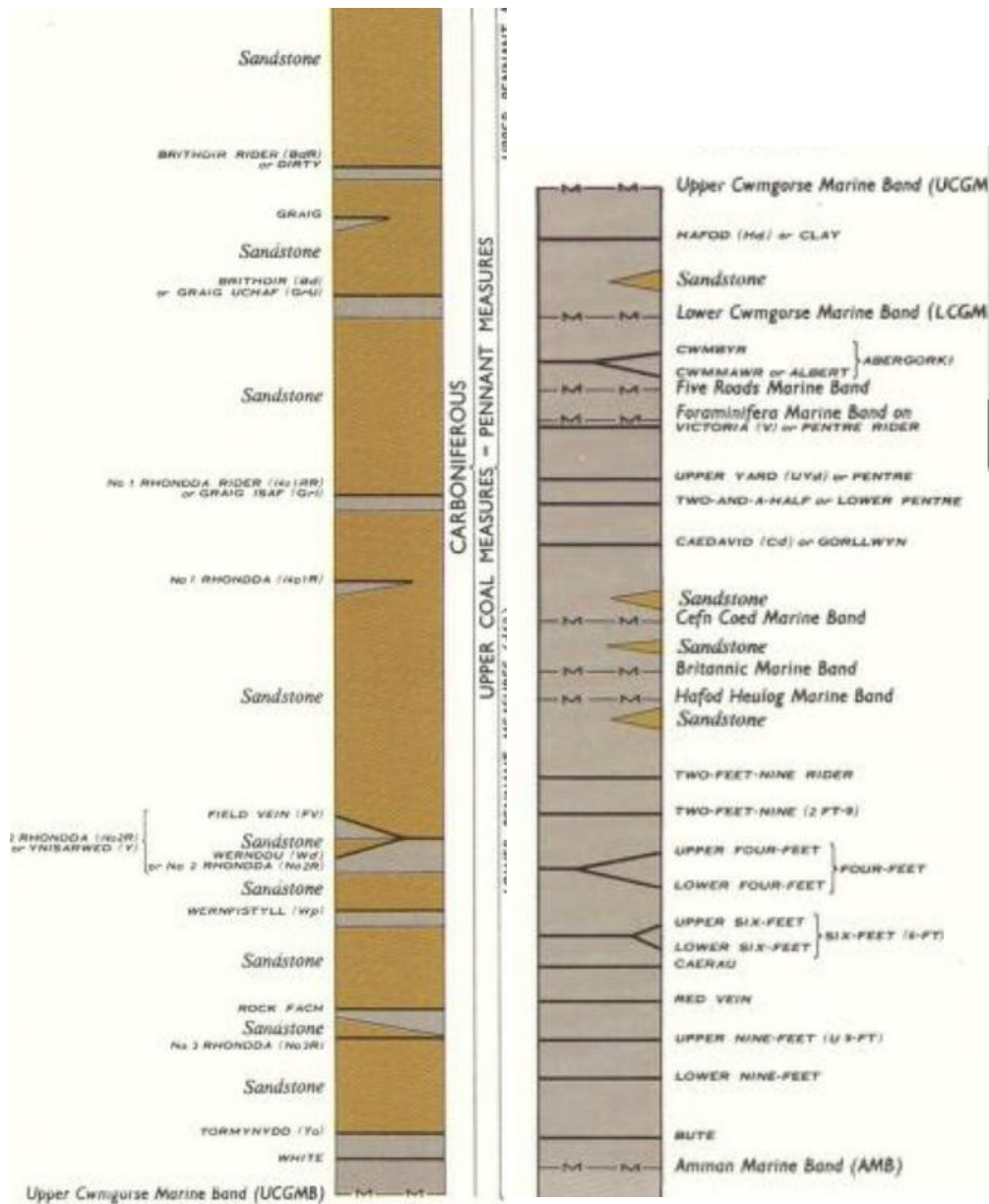
- 5.3.1. The CCMR records states that past shallow underground mining has occurred beneath part of the site in the Two Foot Nine seam at a shallowest depth of 21mbgl. This seam was last worked in 1863 at an extraction thickness of 100cm.
- 5.3.2. A section from the 1:50,000 BGS bedrock map for the area and the correlating stratigraphic column is presented below in **Figures 4B.10** and **4B.11** displaying the coal seams identified by the BGS in the area.

Figure 4B.10 – Extract of BGS map 248 Pontypridd bedrock geology



Possible Two-Foot-Nine coal

Figure 4B.11 – BGS map 248 Pontypridd bedrock geology stratigraphic columns



- 5.3.3. The BGS mapping does not identify the Two Foot Nine coal seam, that is recorded to be worked at the shallowest depth beneath the Site. The Two Foot Nine seam is stratigraphically the next seam below the Caedavid coal seam. By reference to the sequence of coal seams beneath the Site and surrounding area and the location of the area of recorded shallow workings from the MRA online viewer (see **Figure 4B.5**), it is considered that the subcrop of the two-foot-nine seam is that identified as 'thin coal' on the BGS mapping (as identified on **Figure 4B.10** above).
- 5.3.4. The extent of the recorded shallow mine workings are indicated approximately on the MRA online viewer (as summarised in **Figures 4B.4** and **4B.2** of **Annex A**), in the northern parts of the Site. Attempts to more accurately determine the extent by reference to abandonment plan records held

5.4 RECORDED SHALLOW SPINE ROADWAYS

- 5.4.1. The MRA have provided screenshots of their data polygons for the shallow spine roadways (<30m bgo) referenced in the CCMR reports and these are provided below as **Figures 4B.13 to 4B.14**. These are highlighted in green circles on the images below.
- 5.4.2. Shallow spine roadway potentially under the Site, likely relating to adit 284193-035.
- 5.4.3. Shallow spine roadway originating from adit 284192-024 (central one indicated in image above) beneath site and two further adits heading away from the Site.
- 5.4.4. One shallow spine roadway likely originating from 284191-024 under the Site. One further shallow spine roadway potentially originating from adit 284191-044 (>100m from Site boundary, adit direction NW) to beneath Site or gin pit 284191-023.
- 5.4.5. These features may represent an area of potential surface instability, depending on depth, roadway void height and thickness of rock cover above. It is noted that in many cases these features coincide with the associated recorded nearby adit. These locations should be referenced to the planned cable route and it is noted that these all occur in the section of the route proposed for underground cable routing.

Figure 4B.13 – Spine roadways

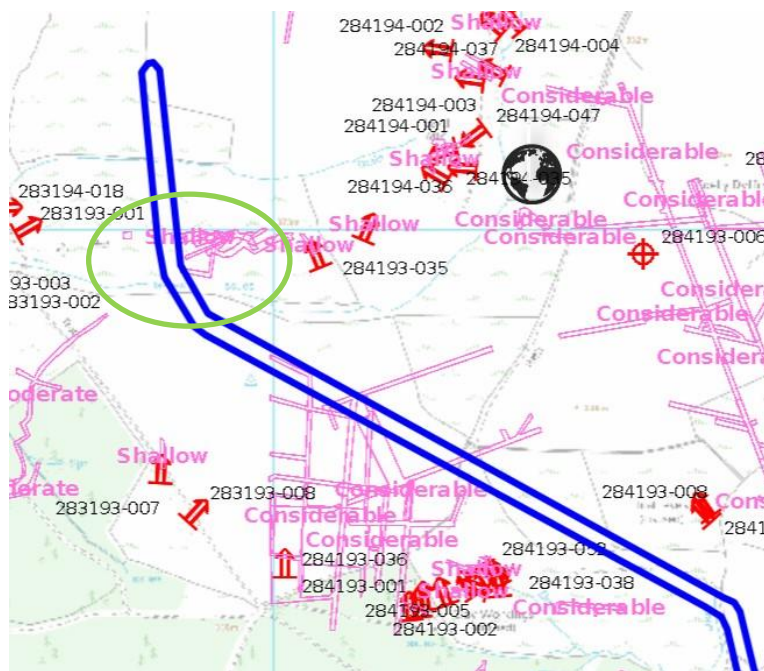
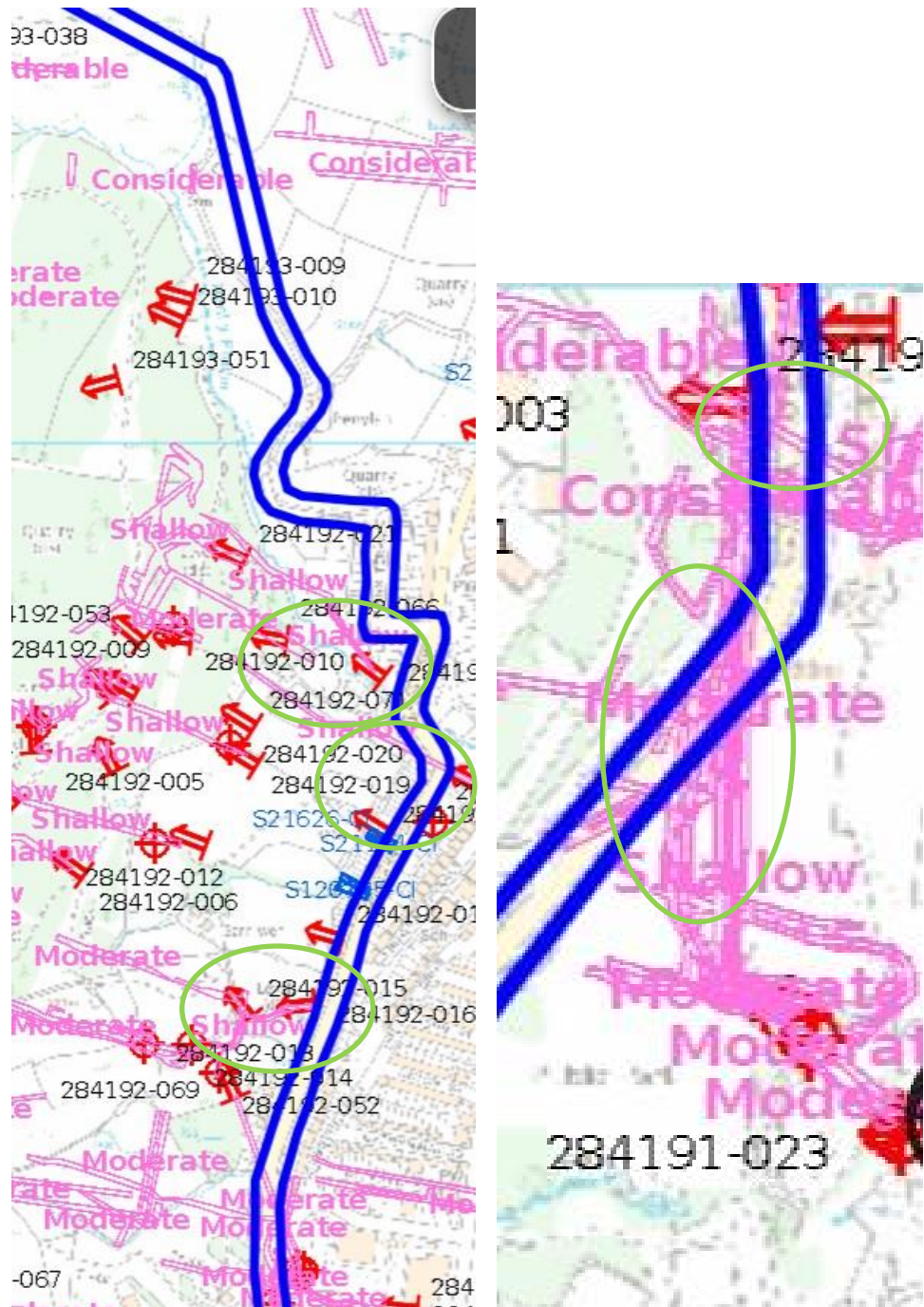


Figure 4B.14 – Spine roadways



5.5 RECORDED UNDERGROUND MINE WORKINGS (DEEP >30M BGL)

- 5.5.1. The CCMR records indicate deep working (>30m bgl) in numerous coal seams below other parts of the site, at depths between 42m bgl and in excess of 200m bgl. These workings are at sufficient depth that they are not expected to present a risk of surface instability that could affect the Project and need not be considered further.

5.6 PROBABLE UNRECORDED SHALLOW MINE WORKINGS

- 5.6.1. The Site area is characterised by several areas of sub-cropping coal seams and coal seams are therefore expected to be present at or close to ground level across these parts of the Site. In most cases the MRA designate these sub-crop zones as a '*development high risk zone*' but do not designate them as areas of '*probable shallow unrecorded coal mine workings*'. It is conjectured that the MRA have reason to believe that those sub cropping seams are typically not affected by unrecorded shallow working in this areas, possible due to the low quality or thickness of those coal seams.
- 5.6.2. Several areas of the Site are however designated by the MRA as affected by '*probable shallow unrecorded coal mine workings*'. In these areas it is possible that shallow coal workings may be present and if present these may present a risk of surface instability, depending on depth, thickness and rock cover.

5.7 INTERPRETATION OF RECORDED AND UNRECORDED UNDERGROUND MINE WORKINGS RISK

- 5.7.1. Current guidance on risks associated with underground mineworkings is outline in detail in *CIRIA C758D Abandoned Mineworkings Manual*. That describes the ratio between the solid cover thickness above mine workings and the thickness of the mining voids, referred to as the 't' value. It is a well-established conservative consideration that greater than 10t is usually required to provide stability in relation to upward migration of mining voids, although under certain geological or mining conditions greater or lesser than 10t values may be appropriate.

RECORDED SHALLOW WORKINGS

- 5.7.2. The MRA Consultants Report identifies the Two Foot Nine coal seams to be worked beneath one very small area of the Site in the north at a depth of 21mbgl with an extraction thickness of 100cm. In the area of the Site where the Two Foot Nine coal seam working are present at shallow depth, the BGS records indicate depth to rock head in the order of 1-9m bgl. In this area it is expected that there would be in excess of 10m of rock cover above the recorded 1.0m thick workings at 21m bgl (i.e. in excess of 10t).
- 5.7.3. On this basis the shallowest recorded workings at the site would have sufficient solid rock cover to provide surface stability and as such the recorded workings beneath the site are not considered to present a risk of instability to the Project and no mitigation of these seam workings is considered to be required.

RECORDED SHALLOW SPINE ROADWAYS

- 5.7.4. The several shallow spine roadways recorded all occur in the section of the route proposed for underground cable routeing. As such it is not considered that these features would represent a risk to the Project.

UNRECORDED SHALLOW WORKINGS

- 5.7.5. There is some historical borehole evidence of unrecorded workings at very shallow depth in parts of the north of the Site, in a similar area to the recorded shallow workings in the Two Foot Nine coal seam discussed above. This area is also close to an area indicated on the MRA viewer as an area of '*probable shallow unrecorded coal workings*' and as indicated approximately in the **Figure 4B.5** (Annex A). In these areas it is possible that shallow unrecorded mine workings may be present which may have less than 10t rock cover and as such there may be a potential risk of surface instability in the event of a collapsed and upward migration of any shallow mining voids.
- 5.7.6. This area of the Site is currently heavily developed with the road and many structures and the Project currently includes for undergrounding of the cable in this areas. Accordingly, the Project is not considered to be at particular risk from ground surface instability, any more or less than the other existing structures or infrastructure in this area. As such it is not considered proportionate to recommend mitigation of this risk by intrusive investigation or remedial stabilisation works if any unrecorded shallow mine workings were present in this areas. However, this risk should be acknowledged in the project risk register and if any particular evidence for collapse of shallow mine workings or instability is recorded during construction, further advice should be sought.

5.8 UNRECORDED MINE ENTRIES

- 5.8.1. Records held by the MRA are incomplete and as such the presence of unrecorded mine entries within the Project extents cannot be discounted. Any evidence of unrecorded mine entries encountered during any subsequent ground investigation or any future construction works should be specifically assessed and the MRA updated accordingly.

5.9 WORKING AND PROPOSED UNDERGROUND MINES

- 5.9.1. The CCMR states that there are no recorded coal mining licences within 200m of the Project and no recorded future underground mining within the Project extents. The risk to the Project from current or future mining is considered to be very low.

5.10 MINE GAS EMISSION RISK

- 5.10.1. The MRA report states that there have been no gas incidents or remediation within 500m of the Site. However, parts of the Site are underlain by shallow mining and coal bearing strata within 50m of the Site surface. The risks related to mine gas affecting the Project is therefore considered to be moderate. This risk should be included in the Project risk register and shall be considered if any intrusive ground investigation is planned or prior to any entry into any confined spaces or excavations.

6 RECOMMENDATIONS

6.1 SUMMARY OF MINING RISK ASSESSMENT

6.1.1. On the basis of the data sources reviewed, **Table 6-1** provides a summary of the mining risks identified specific to the Project. This is intended to highlight those mining issues which may impact the proposed works and to support further consideration of these risks/potential mitigation measures. In this context, the term 'shallow' refers to within 30m of ground level, consistent with the MRA terminology.

Table 6-1 – Mining Risk Assessment Summary

Coal Mining Issue	Risk of affecting the Project	Commentary
Recorded shallow underground coal mining (<30m bgl)	Low	One small area in the north of the Site, where underground cabling is proposed, is underlain by recorded shallow mine workings in the Two Foot Nine Coal seam. In this location the workings are expected to have in excess of 10t rock cover and as such are not considered to present risk of instability.
Unrecorded shallow underground coal mining (<30m bgl)	Moderate	Localised areas in the north of the Site, where underground cabling is proposed, are identified as potentially underlain by unrecorded shallow coal workings. In these areas it is possible that ground instability may occur should any unrecorded shallow workings with insufficient rock cover collapse, although this is not likely to significantly impact the proposed underground cabling.
Recorded deep underground mining (>30m bgl)	Low	Deep mineworkings are recorded below many parts of the site at depths of between 38mbgl and 724mbgl. There is considered to be sufficient rock cover above these deeper workings to prevent instability affecting the project.
Mine entries (shafts)	Moderate	Several mine shafts are recorded within close proximity of the site in the area proposed for underground cabling. The Zone of Influence (ZOI) for

Coal Mining Issue	Risk of affecting the Project	Commentary
		some of these mine entries may encroach onto the Site boundary. There remains a possibility of unrecorded mine entries at the site.
Mine entries (adits)	Moderate	Several mine adits are recorded passing below localised areas in the north of the site, where underground cabling is proposed. In these areas it is possible that ground instability may occur should any adit with insufficient rock cover collapse, although this is not likely to significantly impact the proposed underground cabling should it occur.
Recorded shallow spine roadways (<30m bgl)	Moderate	Several shallow spine roadways are recorded passing below localised areas in the north of the site, where underground cabling is proposed. In each case these are considered to relate to the surface adits to which these connect. In these areas it is possible that ground instability may occur should any shallow spine roadway with insufficient rock cover collapse, although this is not likely to significantly impact the Project should it occur.
Surface mining (opencast workings)	Low	None recorded by the MRA on site. There is one unlicensed opencast mine recorded approximately 150m to the east of the Site but there is no evidence of it encroaching into the Project area.
Coal mining geology (fissures)	Very Low	There are no recorded mining fissures or breaklines in the vicinity of the Site.
Recorded coal mining surface hazard	Very Low	There are no recorded coal mining surface hazards in the vicinity of the Site.
Record of past mine gas emissions or potential	Moderate	There are no recorded past mine gas emissions in the vicinity of the Site. However

Coal Mining Issue	Risk of affecting the Project	Commentary
		shallow and deep coal workings, shallow coal seams and several mine entries are present in the vicinity of the Site and the risk of mine gas emission cannot be ruled out.

6.2 PROPOSED MITIGATION

6.2.1. For those issues identified in **Table 6-1** as other than *very low* or *low* risk, the following mitigation is proposed in **Table 6-2**.

Table 6-2 – summary of proposed mitigation

Coal Mining Issue	Proposed Mitigation
Unrecorded shallow underground coal mining (<30m bgl)	During construction if any evidence of possible ground instability related to collapse of unrecorded shallow mine workings is identified, additional advice should be sought and further investigation may be warranted to assess site stability.
Mine entries (shafts)	<p>The proposed cable route should be amended to avoid the Zol of these shafts wherever practical. If this is not possible further consultation with the MRA may be required to agree cable installation within the Zol.</p> <p>There remains a possibility of unrecorded mine shafts at the site. Any unexpected features which may indicate unrecorded mine entries if encountered during construction should be subject to further assessment.</p>
Mine entries (adits)	During construction if any evidence of possible ground instability related to collapse of unrecorded mine adits is identified, additional advice should be sought and further investigation may be warranted to assess site stability.
Recorded shallow spine roadways (<30m bgl)	During construction if any evidence of possible ground instability related to collapse of shallow spine roadways is identified, additional advice should be sought and further investigation may be warranted to assess site stability.
Record of past mine gas emissions or potential	This risk should be included in the project risk register and shall be further considered if any intrusive ground investigation is planned or prior to any entry into any confined spaces or excavations.