

Report No. BC/MB/07.22.04.

Geo-Environmental Report: Land at The Wern Sports Ground, Ynysfach, Merthyr Tydfil.

Prepared on behalf of:

Merthyr Rugby Club.

By:



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Stage 1 Site Condition Report: Land at The Wern Sports Ground, Ynysfach, Merthyr Tydfil.

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<i>BC/MB/07.22.04.15.</i>	<i>Summary of Mining Findings Plan.</i>	<i>See Drawing.</i>

Appendices

<i>Appendix I:</i>	<i>Copy of Coal Authority Mining Report, reference no. 51003326224001.</i>
<i>Appendix II:</i>	<i>Copy of Public Health England's Radon Report.</i>
<i>Appendix III</i>	<i>Graphic Borehole Logs.</i>
<i>Appendix IV:</i>	<i>Geotechnical Logs and Photographs of Trial Pits.</i>

Geo-Environmental Report: Land at The Wern Sports Ground, Ynysfach, Merthyr Tydfil.

1 Introduction

This report has been prepared on behalf of our client:

***Merthyr Rugby Club,
Club House,
St Tydfil's Bridge,
Merthyr Tydfil,
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and relates to a parcel of land at the Wern Sports Ground, Cae'r-Wen, Ynys Fach Estate, Merthyr Tydfil, where it is proposed to construct a new changing room building ('the Site'). This report is a Coal Mining Risk Assessment and a Stage 1 (Desk Study) Land Condition Assessment that discusses the geology, mining history, and environmental setting of the Site and supports a planning application for the new changing rooms.

The following sources of data were used in the compilation of this report:

- i) Research of published geological records;*
- ii) Research of mining records held at The Coal Authority's archive in Mansfield;*
- iii) Research of The Coal Authority's interactive map, accessed on the 21st November 2022;*
- iv) The findings of The Coal Authority's mining report, reference no. 51003326224001;*
- v) The findings of Envirocheck report, reference no. 303915119_1_1;*
- vi) The findings of Public Health England's Radon report and*
- vii) the archive records of Blandford Consulting.*

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The findings of this report are necessarily based upon the data used in its compilation and may be amended in the future in the light of additional material information. The report must only be used in its entirety for its stated purpose.

2 Brief Description of the Site

The Wern Sports Ground is located on the western fringes of Merthyr Tydfil, approximately 600m south-west of the town centre; it is irregular in outline and occupies an area of approximately 0.26 hectares (see Figure 1 and *General Location Plan, drawing no. BC/MB/07.22.04.01*). The plot of land that is the subject of this report, 'the Site' is a rectangular area located fairly centrally within the Wern Sports Ground; it has approximate maximum dimensions of 25m by 6m. The Wern Sports Ground is located in a residential area on the fringes of the town and is bounded on its western side by the A 470 (T), beyond which is open countryside. It is situated close to the floor of the Taff Valley and the Site is at an approximate elevation of 187m aod.

Figure 1
Aerial View of the Wern Sports Ground



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3 Geology of the Site

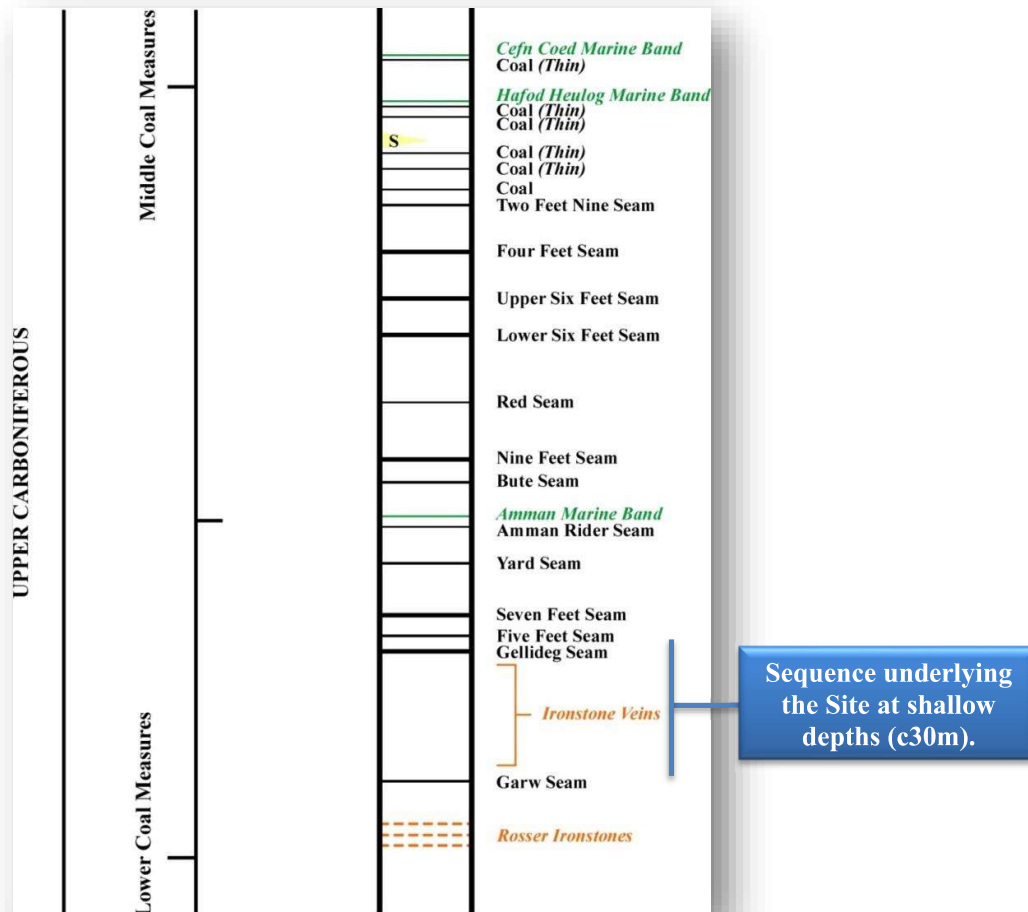
The Site is situated near the northern margin of the South Wales Coalfield and is underlain at shallow depths by strata assigned to the Lower Coal Measures, a sub-division of the Upper Carboniferous Period. The most recently published geological sheet at 1:10,560 scale (SO 00 NW) shows the inferred positions of the outcrop of the Five Feet and Gellideg Seams to be present beyond the south-west corner of the Site (see *Geology Plan, drawing no. BC/MB/07.22.04.02*). The next seam below the Gellideg Seam in the geological sequence is the Garw Seam; the interval between the two is approximately 30m. There are a number of ironstone bands within the coal measures lying between the two seams with two further ironstone bands, the Rosser Veins, present below the Garw Seam. The regional dip of the coal measures around the Wern is south-westwards with the result that the published geology sheet would indicate that the Five Feet and Gellideg Seams do not underlie the Site. However, earlier ground investigation carried out at the Wern indicates that the actual outcrop positions are slightly further to the north-east than are shown on the published geological sheet with the result that the Gellideg Seam underlies the Site. The shallow coal measures underlying the Site are the Gellideg Seam and the measures down to the Garw Seam, including the five ironstone bands. Both the Gellideg and the Garw Seams are thin in the area.

The coal measures of the South Wales Coalfield have been affected by large faults. In the Ynys Fach area these large faults have a slightly sinuous trace at the surface and an average trend towards the north-west. The published geological sheet indicates that the Site is not affected by large scale faulting.

The published geological sheet indicates that locally the coal measures are overlain with deposits of glacial boulder clay. Other ground investigations at the Sports Ground have identified the presence of Made Ground across much of the area. Published geological records indicate that the Site is not affected by landslip.

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Figure 2
Part of the Stratigraphic Column
 (After BGS SN 70 NE)



4 Hydrology and Hydrogeology

4.1 Hydrology

There are no bodies of standing water on the Site and there are no land drains nor streams crossing the Site.

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4.2 Hydrogeology

Groundwater Protection Policy (GP3) and the Water Framework Directive (WFD) Maps are managed by Natural Resources Wales (NRW) and an inspection of these maps indicated the following:

- The Site is not within a designated river or coastal flood risk zone (see *Flood Risk Map: Rivers*, drawing no. BC/MB/07.22.04.04). Land assessed as having a low risk of flooding is present along a limited length of the A4109 adjacent to the Site.
- There is a predicted variously low to high risk of flooding from surface water affecting the adjacent Penlan View and Cae'r Wern. The predicted flooding does not affect the Site (see *Flood Risk Map: Surface Water*, drawing no. BC/MB/07.22.04.05).
- The Site is not within a Groundwater Source Protection Zone.
- The Superficial Aquifer designation for the Site is Low Vulnerability Secondary Undifferentiated.
- The Bedrock Aquifer designation for the Site is Low Vulnerability Secondary A.
- The Site is not within a designated Drinking Water Safeguard Zone.
- There are no designated Water Abstraction Licences within influencing distance.

5 Previous Site Investigations

Previously, this practice has undertaken a number of site investigations at the Wern Sports Ground in relation to other developments there.

‘Site Investigation Report: Sports Barn, Merthyr Rugby Club Ground’, report no. BC/MB/04.15.04/3;

‘Site Investigation Report: Proposed New Clubhouse’, report no BC/MB/04.19.04/2;

‘Drilling and Grouting Report: Proposed New Clubhouse’ report no. BC/MB/04.19.04/3.

Between them, the reports identified the details of the shallow geology underlying the Sports Ground, including the disposition of coal seams and ironstone veins, and the nature of shallow ironstone workings. The reports also identified the presence of Made Ground across the

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Sports Ground, the provenance of the Made Ground is unknown, but anecdotal evidence suggests that it may be domestic ash. The locations of the previous boreholes and Trial Pits are shown on the *Site Investigation Plan, drawing no. BC/MB/07.22.04.14*, Graphic Logs of the Boreholes are included at Appendix III and Geotechnical Logs and Photographs of the Trial Pits are included at Appendix IV.

6 History of the Site

6.1 1876 Edition

A review of the history of the Site has been undertaken by means of research of the various editions of Ordnance Survey maps. The 1876 Edition shows the Site to have been situated within an industrial landscape, located amongst railways, ironstone mines and spoil heaps, with the Site itself being part of an agricultural enclosure (see *Extract from Ordnance Survey Sheet 1876, drawing no. BC/MB/07.22.04.06*). Railway lines were present 120m west and 30m east of the Site. Amongst others, an ironstone drift mine was present 140m north of the Site and a large area of colliery spoil was present to the east of the Site, 30m distant from it at its closest. A slightly elevated track ran along the western boundary of the Site.

6.2 1900 Edition

This Edition shows no material change to the Site and the two railway lines and area of colliery spoil are all shown as still being present (see *Extract from Ordnance Survey Sheet 1900, drawing no. BC/MB/07.22.04.07*). The engine house at the ironstone drift is annotated as ‘old’, *i.e.* disused, it is reasonable to assume that the drift mine was then also disused. The plan shows coke ovens to have been present 100m north of the Site.

6.3 1919 Edition

There had been no material changes to the Site 1900 (see *Extract from Ordnance Survey Sheet 1919, drawing no. BC/MB/07.22.04.08*). The coke ovens are annotated as ‘old’, *i.e.*

/Cont....

disused. A coal drift mine had been opened 180m south-west of the Site and an area of colliery spoil from its companion drift approached to within 160m of the Site.

6.4 1958 Edition

By 1958 the Ynys Fach Estate of detached dwellings had been constructed on the area of colliery waste lying to the east of the Site (see *Extract from Ordnance Survey Sheet 1958, drawing no. BC/MB/07.22.04.09*). The drift mine to the south-west of the Site was no longer present, but the spoil heap associated with the mine was still present. There is no visible evidence of the former railway line that previously ran along the eastern boundary of the Site. The Site was partially used as a sports field by this time.

6.5 1972-1984 Edition

By 1972-1984 Penylan Close, a development of semi-detached dwellings had been constructed north of the Wern Sports Field (see *Extract from Ordnance Survey Sheet 1972-1984, drawing no. BC/MB/07.22.04.10*). A series of industrial looking buildings were present approximately 180m north-west of the Site, they were glass houses. The two agricultural enclosures that now form the Wern Sports Ground are annotated as 'Rugby Football Ground'. The previously slightly elevated track along the western boundary of the Site is no longer evident and there is anecdotal evidence that the area now occupied by the rugby fields was previously a hollow and was raised using household ash.

6.6 1993 Edition

By 1993 the Ynys Fach residential estate had been redeveloped as Cae'r Wern. The Site itself is used entirely as a sports field by this time (see *Extract from Ordnance Survey Sheet 1993, drawing no. BC/MB/07.22.04.11*).

6.7 2000 Edition

There had been no material change to the Site since 1993 (see *Historical Aerial Photograph, 2000, drawing no. BC/MB/07.22.04.12*).

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6.8 Present

A substantial amount of redevelopment has taken place since 2000; all of it as leisure facilities for the rugby football ground. These include spectator stands and a training barn and a new club house.

7 Environmental Issues

No part of the Site lies within an area designated as having a sensitive land use, including designated landscape areas. There are no Control of Major Incident Sites (COMAH), explosive sites, Notification of Installations Handling Hazardous Substances status (NIHHS) or planning hazardous substance consents within 250m of the Site.

There are no registered landfill sites within a radius of 250m as shown on the Environmental Review Plan (see *Environmental Review Plan, drawing no. BC/MB/07.22.04.13*), although there are large swathes of land annotated as being potentially infilled (non-water); which is in accordance with the historical nature of the area (*e.g.* colliery waste).

8 Mining History

The area has been subject to extensive mining operations for both coal and ironstone dating back to the earliest part of the nineteenth century. Coal seams and ironstone veins were accessed by adits driven into the mining horizons near their outcrops and by shafts sunk into the deeper coal seams and ironstone veins; there are a large number of disused shafts and adits in the locality. Air shafts were also sunk in order to provide ventilation to the underground mining operations. Both the Five Feet Seam and the Gellideg Seam were mined underground in the immediate vicinity of the Site, although our search of coal mining records identified no record of old coal workings underlying the Site. Nor is there a likelihood of 'probable' mine workings, *i.e.* coal mining for which The Coal Authority holds no plan records.

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Figure 3
Print-out of The Coal Authority's Interactive Map
 (Accessed 21st November 2022)

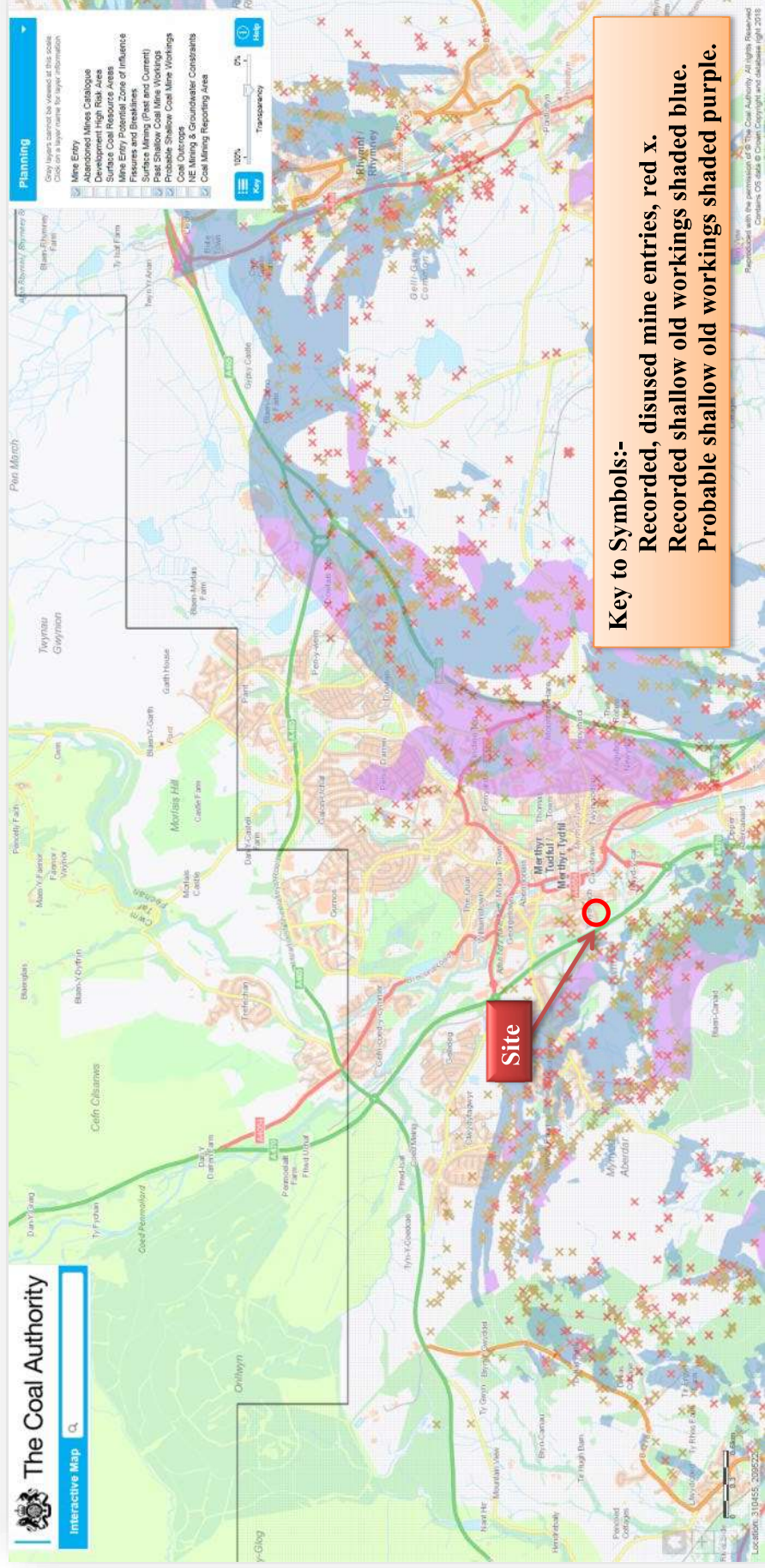
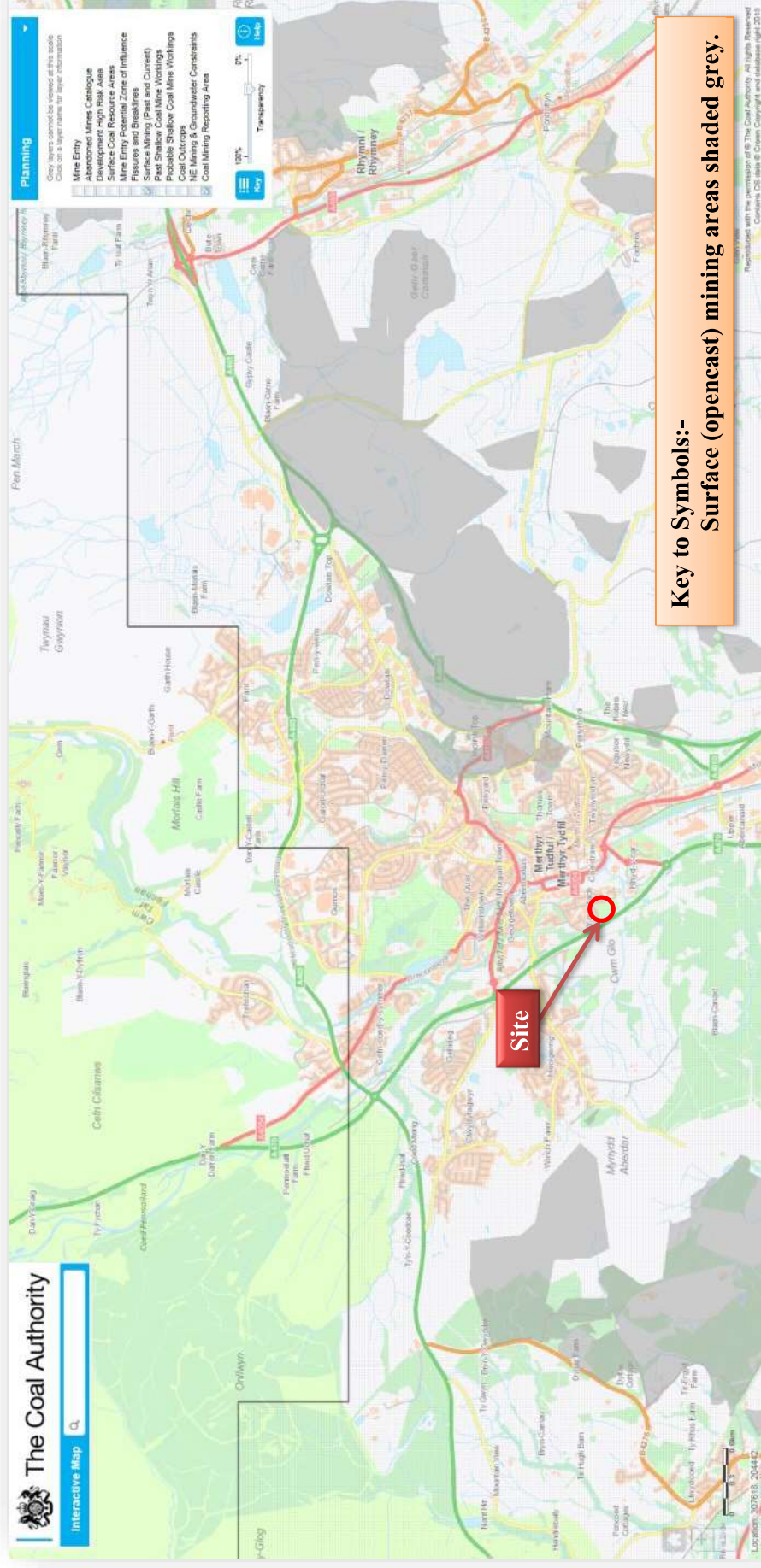


Figure 4
Print-out of The Coal Authority's Interactive Map
(Accessed 21st November 2022)



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Since the early 1800s extensive underground mining operations took place in the five ironstone veins present between the Gellideg Seam and the Garw Seam together with the Rosser Veins. The workings were prosecuted from a number of drift mine entries and shafts that were interconnected and stretched from Clwydyfagwyr southwards to Abercanaid. The Rhydycar Pit, approximately 200m south-east of the Site, was an important part of this extensive mining operation; the underground mining operations for the ironstone veins extended across the area of the Site.

Otherwise, there are no active coal mines in the locality, either deep mines or opencast, that would affect the structural integrity of the proposed development and the Site has not previously been part of an opencast coal site.

Our searches found no record of a disused shaft or adit within the confines of the Site or within 100m of its boundary, a situation confirmed by The Coal Authority *report no. 51003326224001*. The risk of an unrecorded mine entry being present within the Site cannot be entirely discounted. The Site has not been part of an opencast coal site, and there have been no opencast mining operations close enough to the Site to affect the structural integrity of the proposed development. There are no operating collieries within influencing distance of the Site.

9 Radon Gas

The risk from Radon to the proposed changing rooms has been assessed by obtaining a Radon gas report from Public Health England. The Radon gas report was obtained for 24 Penlan View, which is the closest property to the position of the proposed club house. The shallow geology underlying 24 Penlan View and the location of the proposed changing rooms is the same so that the findings of the Radon report are applicable to the proposed club house. The report states the location is not in a Radon affected area.

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10 Risk Assessment – Tier 1

10.1 Conceptual Model, Environmental

A conceptual model (see diagram below) was developed in order to provide a basis for the Risk Assessment; it was based on the source-pathway-receptor approach.

Conceptual Model

Source	Pathway/Linkage	Receptor	Probability & Consequence	Risk
Soil Railway Land and Colliery Spoil (windborne) and Made Ground	Ingestion/ Dermal Contact	Future on-site users (commercial)	Unlikely/mild	Low <i>No pathway when development is complete</i>
		Construction workers	Unlikely/mild	Very Low (assumes the use of PPE)
		Maintenance workers		
		Adjacent commercial/ residential land users	Unlikely/mild	Very Low
	Permeation	Subsurface plastic water pipes	Unlikely/mild	Very Low
	Vertical Groundwater Migration	Minor aquifer	Unlikely/Mild	Very Low <i>Boulder clay underlying the Site and large areas of contamination around the Site</i>
Gas None	Horizontal movement through bedrock/soils	Future on-site users (commercial)	Unlikely/Mild	Very Low

The end use of the Site is classed as commercial as the development is for a light building to house changing rooms; therefore, there will be no pathway between the soils underlying the Site and any end-user. The Site itself has no confirmed history of industrial use, however it does lie within an area of past industrial use. There is a moderate probability of windborne contaminants, originating from the railway land and colliery features, having

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reached the soils at the Site; these would include heavy metals, inorganic compounds and possibly hydrocarbons. Previous site investigations carried out on the Wern Sports Ground in the vicinity of the Site proved the presence of between 2.5m and 4.5m of Made Ground of unknown provenance. Unconfirmed anecdotal evidence suggests that the Site was once part of an area used as a landfill site for domestic ash.

The entire area surrounding the Site was involved with industry whilst the development site is extremely small in comparison. Previous site investigations carried out on the Wern Sports Ground found Made Ground to be present across the area of the Sports Field. When considering the locality as a whole, there are large swathes of colliery spoil deposited across the area, and whilst the Site contains some Made Ground, it could ever only be a small contributory factor when devising a conceptual model for the risk to sensitive water resources. The geology of the area includes Boulder Clay that underlies the Site and its environs, which acts as a natural barrier to the vertical percolation of contaminants downwards. Given the size of the Site, the nature of the surrounding soils and the underlying geology, it is considered that the risk to sensitive water receptors in this respect is very low. In the respect of ground gas, there are no identified potential sources of gas; the Made Ground on the Site is not likely to be putrescible, therefore it is considered that the risk in this respect is very low. However, if during the development the nature of the Made Ground underlying the Site is found to differ from the conditions expected, then this practice should be informed immediately so that the conceptual model can be updated and the development adjusted accordingly.

10.2 Hydrology and Hydrogeology

The strata beneath the Site are classed as low vulnerability with secondary A aquifer. Boulder Clay is present across the Site and will tend to inhibit the downward passage of any contaminants that might be present in near surface soils.

10.3 Contaminated Soils

There are recognised sources of contamination in close proximity to the Site and the presence on the Site of Made Ground of unknown provenance. There is also the possibility

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that windborne contaminants may have been deposited on the Site at some point in the past and could persist therein.

10.4 Landfill Gases

There are no identified sources of landfill gas site within influencing distance, either on-site or off-site.

10.5 Radon Gas

A Radon report obtained from Public Health England identifies that the Site is within an area where there is no risk from Radon. The appropriate response for building control purposes is NONE.

10.6 Mine Gas

An assessment of the risk from mine gases has been carried out based on an assessment of geological and mining data that is available in the public domain and broadly following the guidance offered in CL:AIRE. The non-statutory CL:AIRE document offers useful advice based on the views of the authors, although it does not have the benefit of input from The Coal Authority and does not specifically address in detail the effect of coals being of low rank such as those coal seams that are present in South Wales and that underlie this Site.

When coal is mined methane is released and may accumulate in the voids left by the mining operations, other mine gases (carbon dioxide, carbon monoxide and depleted oxygen) may subsequently accumulate in mining voids as a result of various chemical processes. These gases may later vent to atmosphere or be displaced by mine water flooding the mining voids and forced to the surface. Mine gases may, in certain circumstances, accumulate within dwellings and pose a risk of asphyxiation, fire or explosion.

The principal release of methane occurs when the coal is cut with a decreasing quantity of methane venting over time. The process declines over a number of decades and tends to have ceased within 50 years of the coal being cut. The coal seams present across the South

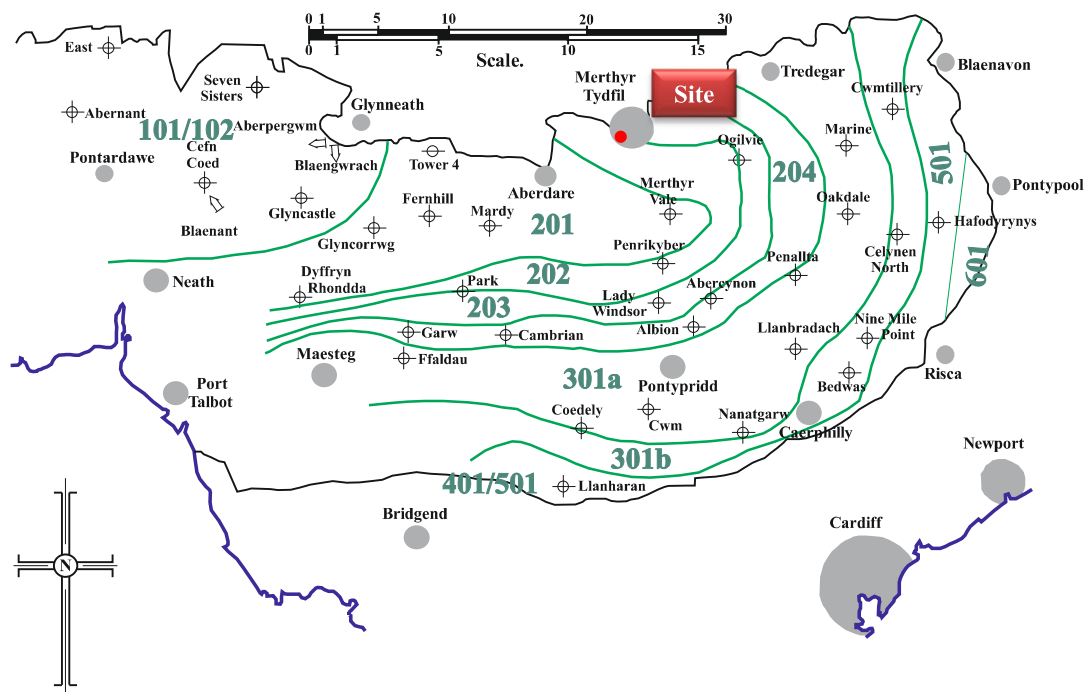
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Wales Coalfield have a poorly developed cleat that inhibits the lateral passage of methane gas through the body of the coal and may be a contributing factor to the absence of mine gases noted in site investigations carried out across South Wales.

Carbon monoxide may accumulate in mine workings as a result of spontaneous combustion that may be triggered, for example, by the use of air flush when drilling boreholes into old workings. The Coal Authority has published a list of coal seams that are prone to spontaneous combustion, none of the coal seams found on the South Wales Coalfield appear on the list.

A number of site investigations of old workings across South Wales and dating back to the mid to late twentieth century have shown that there is little risk from mine gases, although some risk may be present. This may be as a result of the nature of the coal seams or because the shallow old workings have vented most of the mine gases to atmosphere or is as a result of the combination of the two.

Figure 4
The Variation of Coal Rank Across The South Wales Coalfield.
- Based on the Nine Feet Seam -
(Blandford 1986.)

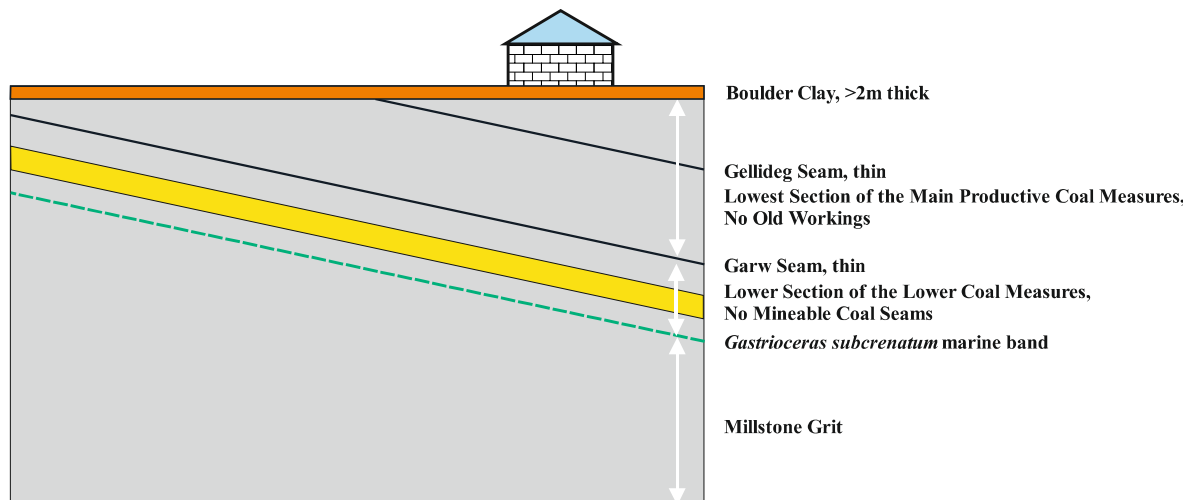


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The Site is situated towards the northern margins of the former South Wales Coalfield where the coal seams underlying the Site are of low coal rank (202), such coal seams offer a low risk of generating a number of mine gases as a consequence of their low volatile content.

A conceptual model has been prepared for the development. The published geological sheet identifies that the superficial deposits across the Site are of glacial till, Boulder Clay. Boulder Clay significantly impairs the passage of mine gases. The Coal Authority's mining report identifies the presence of no old coal workings underlying the Site and no probable coal workings.

Figure 5
Conceptual Model



There are no recorded opencast mine workings within 500m of the Site.

The old ironstone workings are not in hydraulic continuity with coal seams that are generating acid mine water.

There are no disused mine entries within 100m of the Site.

The Site is not within influencing distance of active opencast workings and there are no operating collieries in the area.

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Previous site investigation undertaken at the Wern Sports Ground have proved the presence of Boulder Clay deposits that are in excess of 2m thick.

There is a low risk of mine gases affecting the proposed changing rooms and no further action is required in respect of mine gases.

11 Contaminated Land Assessment

11.1 Soil

The desk study risk assessment of the Site has identified historic sources of off-site potential contamination and the presence of Made Ground of unknown provenance on the Site; however, given the nature of the development, *i.e.* commercial with no pathway between source and receptor once the development is complete, it is concluded that there is limited risk of harm. It would be prudent to carry out excavations on the development site in order to ascertain the physical nature of the soils for engineering purposes, and also to collect limited soil samples to determine their chemical nature and the risk they may pose to end-users therein.

11.2 Water Resources

The geology beneath the Site, when taken in context with the hydrology and hydrogeology, means that there is only a limited potential for any contamination that might be present to reach a sensitive water receptor. The Site is underlain with Boulder Clay which is impermeable to the vertical migration downwards of water and waterborne contaminants.

11.3 Landfill Gas

No sources of landfill gas have been identified within influencing distance of the Site and so it is deemed to have a very low risk to receptors at the Site (Commercial). The Made Ground that is present on the Site is expected to be non-putrescible and so does not present a significant risk with regards to landfill gas. If, however, during the site investigations/excavations this is found not to be the case, and that putrescible materials

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are indeed found, then this practice should be informed immediately so that adjustments can be made to the both the conceptual model and the nature of the development.

12 Environmental Assessment: Discussion and Recommendations

12.1 Hydrology and Hydrogeology

There are no bodies of standing water on the Site and no drains or streams crossing it.

12.2 Contaminated Soils

The industrial history of the immediately surrounding area presents a small risk of the soils having been contaminated. Soil samples should be collected and tested at a suitably accredited laboratory in order to determine the risk posed to sensitive receptors (end-users) at the Site. Additionally, if during any future development of the Site, conditions are found to differ from those discussed in this report, then further advice should be sought so that the conceptual model can be updated, appropriate measures can be taken, and the Local Authority informed.

12.3 Landfill Gas

There are no identified sources of gas beneath or within influencing distance of the Site; therefore, it is concluded that the risk in this respect is very low. If, during any future development of the Site, conditions are found to differ from those discussed in this report, then further advice should be sought so that the conceptual model can be updated, appropriate measures can be taken, and the Local Authority informed.

12.4 Mine Gases

An assessment broadly following the advice in CL:AIRE categorised the risk from mine gases as low, requiring no further action.

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12.5 Flood Risk

There is no predicted flood risk on the Site. There is variously a low to high risk of flooding from surface waters along the adjacent Penlan View and Cae'r Wern.

12.6 Foundation Options

It is likely that the Made Ground present on the Site is not suitable to act as a founding medium, it is recommended that the nature of the soils is assessed using appropriate intrusive site investigation methods.

13 Qualifications of Authors of the Report

Dr Malcolm Blandford is a Consultant Geologist and Fellow of the Geological Society of London and has over 40 years' experience of studying the geology of and mining operations across South Wales. Dr Blandford worked in the coal mining industry for 16 years before entering private practice where, amongst other matters, he was responsible for the exploration for opencast sites, colliery extensions and proposed new collieries, for assessing methane emissions from coal seams, methane transmission through strata and the potential for in situ coal seam combustion. Dr Blandford has advised on Coal Bed Methane licence applications and has extensive experience of exploration practice, of interpreting coal mining records, and of assessing the occurrence and movement of coal mine gases. Dr Blandford has variously undertaken and/or project managed a large number of site investigation programmes and environmental assessments and has provided expert witness evidence in court proceedings involving contaminated land issues.

David Blandford has a Master's degree in Environmental Risk Management and a Bachelor's degree in applied industrial science with particular regard to the environmental implications of the paper making processes. Since graduating with his Master's degree, David Blandford has been employed full time undertaking environmental assessments and the related site investigation and remediation works.

/Cont....



**David Blandford,
Environmental Consultant.**



**Dr Malcolm Blandford,
Chartered Geologist.**

Report Date 28th November 2022.

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