

Report No. BC/MB/08.19.04.

Geo-Environmental Report: Land at Colliers Row, Brondeg, Merthyr Tydfil.

Prepared on behalf of:

Maxiom Developments Ltd.

By:



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Geo-Environmental Report: Land at Colliers Row/Brondeg, Merthyr Tydfil.

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Appendix

Copy of The Coal Authority's Report, reference no. 51000874376001.

Geo-Environmental Report: Land at Colliery Row/Brondeg, Merthyr Tydfil.

1 Introduction

This report has been prepared on behalf of our client:

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and relates to land lying to the east of Brondeg and to the north of Colliers Row in Merthyr Tydfil. It is proposed to develop the land for housing. This report discusses the geology and mining history of the Site and the immediately surrounding area as they may affect the proposed development and discusses the risk from past mining operations. The report also discusses the industrial history of the locality and is a Tier 1 (Desk Study) Risk Assessment for contaminated land. Recommendations are made for exploratory boreholes to examine in greater detail and, where appropriate, stabilise any shallow mine workings that may underlie the Site and also recommends intrusive ground investigation to assess in more detail the risk of contamination in the soils.

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) The findings of The Coal Authority's report, reference no. 51001019337002;*
- iv) The Coal Authority's interactive map, accessed 21st August 2019;*
- v) The findings of Envirocheck report no.178575776_1_1 and*
- vi) the archive records of Blandford Consulting.*

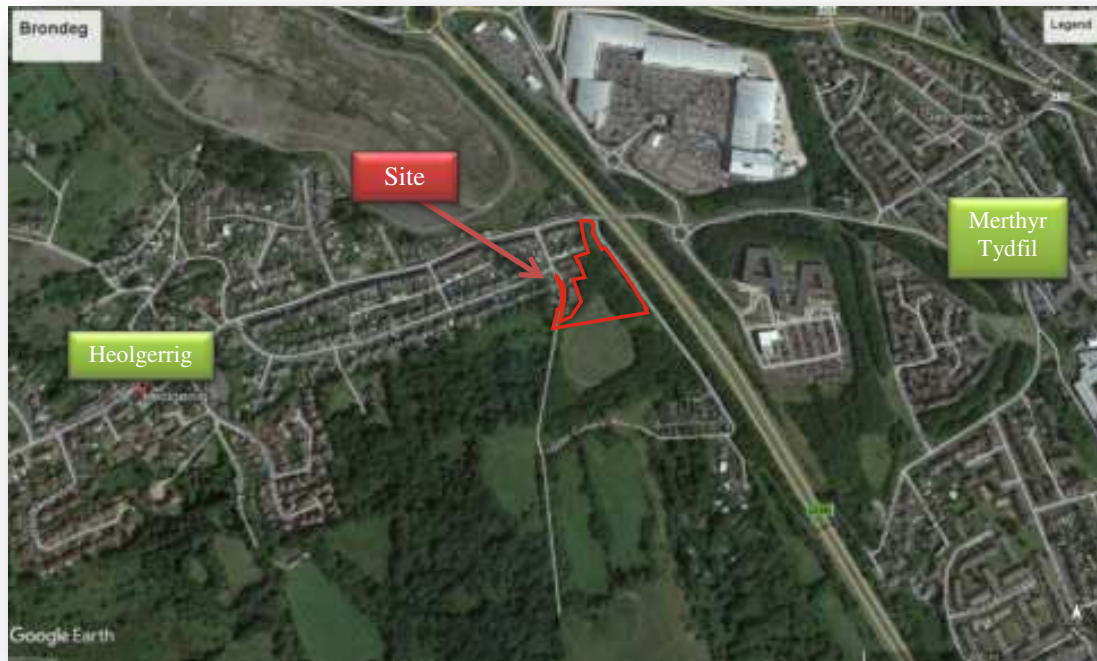
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The findings of this report are necessarily based upon the data used in its compilation and may be amended in the future in the light of additional material information. The report must only be used in its entirety for its stated purpose.

2 Brief Description of the Site

The plot of land that is the subject of this report, 'the Site' is located on the western fringes of Merthyr Tydfil, approximately 700m west of the town centre; it is irregular in outline and occupies an area of approximately 0.82 hectares (see Figure 1 and *General Location Plan, drawing no. BC/MB/08.19.04.01*). The Site is located in a residential area on the fringes of the town and is bounded on its western side by residential dwellings and a lane; to the north is Aberdare Road and beyond it the Trago Mills retail site; to the east is the public highway serving Colliers Row, beyond which is the A 470 (T), and to the south there are a mixture of agricultural enclosures and open countryside.

Figure 1
Aerial View of the Site



/Cont....

The northern two thirds or so of the site is overgrown with immature trees and saplings and the southern part is an enclosure with what appears to be a trotting track on it. The Site is situated close to the floor of the Taff Valley.

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 Garw Seam to pass through the Site (see *Geology Plan, drawing no. BC/MB/08.19.04.02*). However, mining records indicate that the outcrops are south-east of the positions shown on the published geological sheet such that the outcrop of the Five Feet/Gellideg Seam passes through the south-west corner of the Site (see *Plan of Old Workings in the Five Feet/Gellideg Seam, drawing no. BC/MB/08.19.04.04*). A number of ironstone bands are present within the coal measures, occurring above and below the Garw Seam (see Figure 2, Part of the Stratigraphic Column).

In the Brondeg area the regional dip of the coal measures is 1 in 12 towards the south, with the result that the coal measures underlying the Site at shallow depths is the sequence containing the five ironstone veins and the Garw Seam.

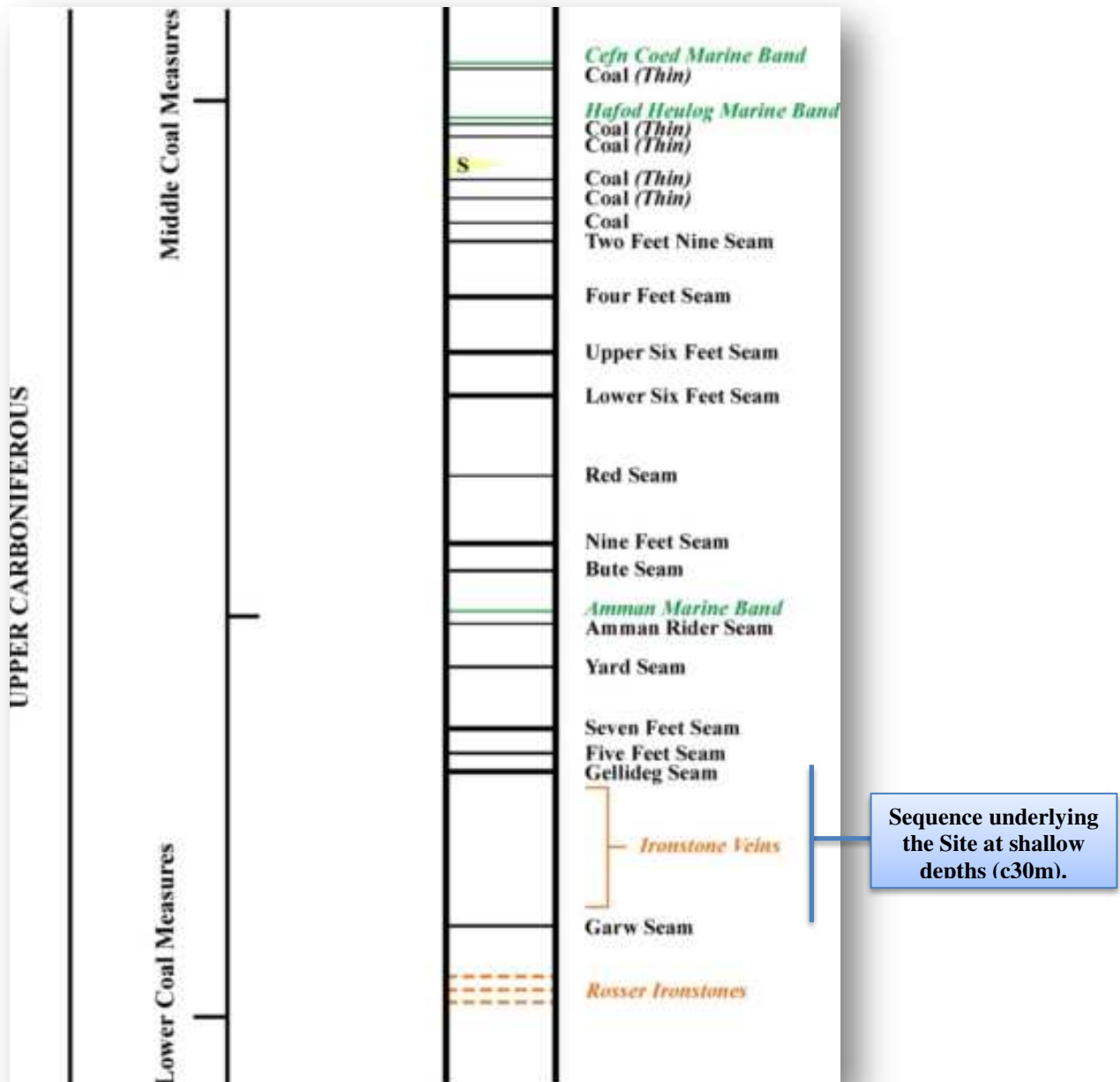
The coal measures of the South Wales Coalfield have been affected by large faults. In the Brondeg area these large faults have a slightly sinuous trace at the surface and an average trend towards the north-west. The published geological sheet indicates that the Site is not affected by large scale faulting.

The published geological sheet indicates that locally the coal measures are overlain with deposits of glacial till, Boulder Clay; we have no detailed information regarding the thickness and engineering properties of the Boulder Clay in the vicinity of the Site. Published geological records indicate that the Site is not affected by landslip.

/Cont....

Figure 2
Part of the Stratigraphic Column.

Scale: Not to Scale.



4 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

/Cont....

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 (see *Plan of Disused Mine Entries, drawing no. BC/MB/08.19.04.05*). Air shafts were also sunk in order to provide ventilation to the underground mining operations.

The extensive coal mining operations that have taken place in the vicinity of the Site all lie to the west and south-west of the Site. The Five Feet Gellideg Seam is the lowest coal seam in the geological sequence that has been widely mined and the old workings in the Seam do not underlie the Site. The Coal Authority's mining report covers a larger area than the Site but does not include the finger of land along the lane at the western side of the Site. However, the report is broadly applicable to the Site and identifies that there are no shallow coal workings that may affect the Site and there is no disused mine entry within the confines of the Site or within 20m of its boundary. Further, the Site has not been part of an opencast coal site. An inspection of The Coal Authority's interactive map identifies that the inclusion of the finger of land along the lane does not alter any of the findings of The Coal Authority's report.

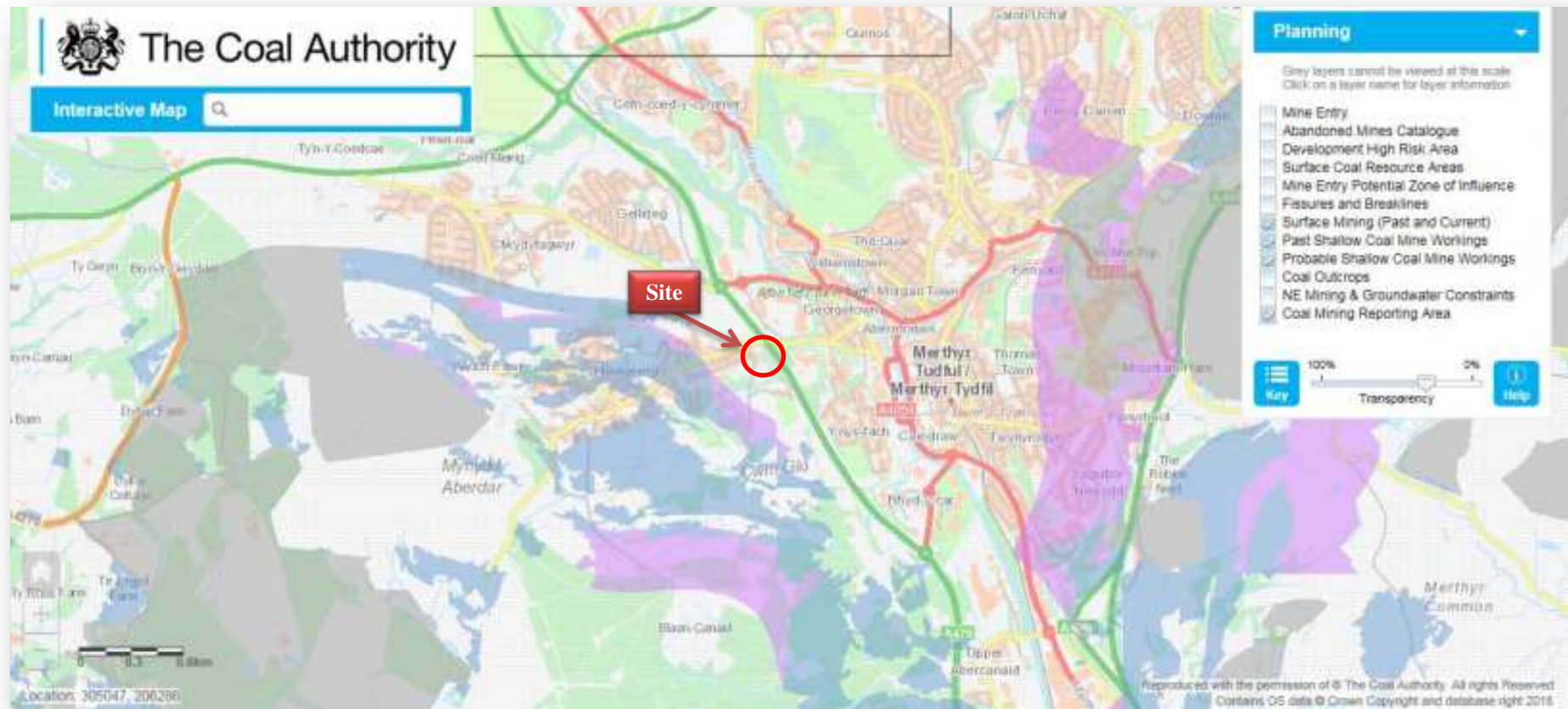
From the early 1800s extensive underground mining operations took place in the five ironstone veins present above the Garw Seam, together with the Rosser Ironstone Veins. The workings were prosecuted from a number of drift mine entries and shafts that were interconnected and stretched from Clwydyfagwyr at the north end of the Borough southwards to Abercanaid. The Rhydycar Pit, 500m south-east of the Site, was an important part of this extensive mining operation. The underground mining operations for the ironstone veins extend across the area in which the Site is situated. In the Brondeg area the Garw Seam is too thin to have been mined underground as a coal operation but the Seam was often mined together with the overlying ironstone vein and the coal used in the smelting operations.

The records held by The Coal Authority are not a complete record of past coal mining activities and the presence of unrecorded disused mine entry within the confines of the Site cannot be entirely dismissed, particularly in this area where extensive underground mining operations began before comprehensive records were being kept.

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.

/Cont....

Figure 3
Print from The Coal Authority's Interactive Map
(accessed 21st August 2019)



/Cont....

5 Mine Gases

When coal is mined methane gas is released and may accumulate with other mine gases in the mining voids. A number of studies of the old workings around Merthyr Tydfil and dating back to the mid to late twentieth century have shown that there is little risk from mine gases. 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. There are no recorded shallow coal workings underlying the Site that could act as a source of mine gases and The Coal Authority has no record of an emission of gas at the Site that has required action.

6 Radon Gas

The risk to a residential development on the land from Radon gas has been assessed by referring to Public Health England's interactive map. The map shows that the Site lies within an area where the maximum radon potential is 5-10%. The risk from Radon gas should be assessed in greater detail by obtaining a report from the British Geological Survey.

7 Hydrogeology and Hydrology

7.1 Hydrology

The Site lies within the Taff catchment and there are no drains or streams crossing the Site and there are no bodies of standing water on the Site. The site is not within a designated surface water, river or coastal flood risk zone (see *Risk of Flooding from Rivers Map*, drawing no. BC/MB/08.19.04.05). There is no risk of surface flooding (see *Risk of Surface Flooding*, drawing no. BC/MB/08.19.04.06) and a potential for groundwater flooding at the Site (see *Risk of Groundwater Flooding*, drawing no. BC/MB/08.19.04.07).

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7.2 Hydrogeology

The Groundwater Vulnerability Map for Gwent, South and Mid Glamorgan (Sheet 36), published jointly by the Environment Agency, British Geological Survey and the Soil Survey and Land Research Centre, identifies the local geology as a minor aquifer having a high permeability (see *Groundwater Vulnerability Map, drawing no. BC/MB/08.19.04.08*).

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

- The site is not within a Groundwater Source Protection Zone.
- The superficial aquifer designation at the Site is ‘unproductive strata’ (see *Superficial Aquifer Designation Map, drawing no. BC/MB/08.19.04.09*).
- The site is defined as a Secondary A Bedrock Aquifer (see *Bedrock Aquifer Designation Map, drawing no. BC/MB/08.19.04.10*).
- The site is not within a designated Drinking Water Safeguard Zone.
- There are no abstraction licences located within the Site or downstream of the Site along the Nant Cwm-pant-bach.

8 History of the Site and Surrounding Area

8.1 1879 - 1880 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 1879 - 1880 Edition shows the Site to have been situated within a fairly industrial landscape of collieries with their associated tramways and spoil heaps (see *Extract from Ordnance Survey Sheet 1875-1881, drawing no. BC/MB/08.19.04.11*). The collieries variously mined coal, ironstone or both. A mainline railway was present along the eastern boundary of the Site, within 30m of it at its closest point. Local railways and tramways associated with the coal mining operations ran along both the western and eastern boundaries of the Site. A large area of cinder tip

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associated with the Cyfarthfa Ironworks was present to the east of the Site and was within 60m at its closest. Aberdare Road formed the northern boundary of the Site with railway and tramway features immediately to the east. A large area of colliery spoil occupied the area to the south; it extended across almost the entire area of the Site itself. The finger of land that is the western part of the Site was a tramway. Beyond which there were agricultural enclosures and woodland. Pen-yr-heolgerrig Quarry was present 150m north-west of the Site.

8.2 1919 Edition

This Edition shows the Site and the main features of the immediately surrounding area to have been largely unchanged from the previous edition (see *Extract from Ordnance Survey Sheet 1919, drawing no. BC/MB/08.19.04.12*). It is not evident from this edition whether the nearby collieries were still operating, but it is thought that they had all closed by this time. The Pen-yr-heolgerrig Quarry is identified on this edition. A series of terraced dwellings were present along Aberdare Road immediately to the west of the Site.

8.3 1958-1964 Edition

This Edition shows the Site and the main industrial features of the immediately surrounding area to have been largely unchanged from the previous edition (see *Extract from Ordnance Survey Sheet 1919, drawing no. BC/MB/08.19.04.13*). The Pen-yr-heolgerrig Quarry is identified on this edition, but it appears that it has stopped operating and at least part of it is identified as a refuse site. The area of dwellings along Aberdare Road had expanded substantially as a ribbon development with the Brondeg housing Estate of semi-detached houses to the south of the road. A large, unspecified 'works' was present 120m north-west of the Site. The land to the west of the Site is shown to still be a mixture of agricultural enclosures and woodland.

8.4 1979-1990 Edition

The Site itself is unchanged since the previous edition and is shown to be occupied by an area of colliery spoil (see *Extract from Ordnance Survey Sheet 1979-1990, drawing no. BC/MB/08.19.04.14*). The land to the west of the Site is shown to be still an area of

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agricultural enclosure and woodland. A chapel and a detached dwelling had been built on the western boundary of the Site. The works to the north of the Site were, at this period of time, a brickworks. A small retail park had been developed on part of the cinder tip to the north-east of the Site.

8.5 1994-1995 Edition

The Site and the immediately surrounding area were largely unchanged from what was evident on the previous edition (see *Extract from Ordnance Survey Sheet 1994-1995, drawing no. BC/MB/08.19.04.14*). The brickworks had closed.

8.6 2000 Aerial Photograph

The photograph shows many of the features evident on the 1994-1995 Edition to still be present (see *Historical Aerial Photograph, 2000, drawing no BC/MB/08.19.04.15*). The disused brickworks to the north and the small retail park to the north-east are both still evident. The railway line running close to the eastern boundary of the Site had been redeveloped into a dual carriageway, the A470(T). Road construction works to serve a new retail park were taking place immediately to the east of the A470(T). The northern part of the Site is covered with trees and the southern part is under grass.

8.7 Present

The former brickworks site has been remediated and is now a large retail outlet, Trago Mills. The former small retail park to the north-east of the Site is now the larger Cyfarthfa Retail Park. A large medical facility has been built on that part of the cinder tip lying to the east of the Site. Otherwise, the Site and the immediately surrounding area are little changed since 2000.

9 Environmental Issues

No part of the Site lies within an area designated as having a sensitive land use, including designated landscape areas. The Cwm Glo a Glyndyrys SSSI occupies the land to the south of the Site; it is approximately 120m from the Site at its closest.

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The Site itself is shown to have been ‘infilled’, a reference to the colliery spoil that has been deposited on the majority of the Site. The ‘infilled’ area extends southwards from the Site and is one of several large areas of colliery spoil; the Trago Mills site is a further example. The former cinder tip occupies an extensive area to the east of the Site. At least part of the former Pen-yr-heolgerrig Quarry is shown to have been used for a period of time as a refuse site. 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.

10 Risk Assessment – Tier 1

A conceptual model (see diagram) was developed in order to provide a basis for the Risk Assessment; it was based on the source-pathway-receptor approach. The extensive coal and ironstone mining operations that have taken place in a large area around the Site, including the colliery spoil on the Site, itself, are one main source of potential contamination. The former Pen-yr-heolgerrig Quarry and the refuse site on the same land are another potential source. The former brick-making operations on land to the north are a third potential source of soil contamination.

Conceptual Model

Source	Pathway	Receptor	Probability & Consequence	Risk
Soil Tip material/ colliery spoil /Brick works hydrocarbons, metals, inorganic compounds	Ingestion/ Dermal Contact	Future on-site users (residential)	Likely/moderate	Moderate
		Construction workers Maintenance workers	Unlikely/mild	Low (assumes the use of PPE)
		Adjacent commercial/ residential land users	Unlikely/mild	Low
	Permeation	Subsurface plastic water pipes	Likely/moderate	Moderate
	Vertical Groundwater Migration	Minor aquifer	Unlikely/Mild	Low
Gas Refuse tip	No preferred pathway. Site is at lower elevation than tip and is 200m distant	Future on-site users (residential)	Unlikely/Mild	Low

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With regards to landfill gas, there are no identified on-site sources. The refuse tip identified as lying approximately 200m distant from the Site ceased operations more than 50 years ago. The material placed in this tip is of unknown provenance. Given the distance from the tip to the Site, the time elapsed since the tip ceased operation, the higher elevation of the tip than the Site, and the fact that the 2 features are separated by a small water course, it is considered that the risk in this respect is negligible. Guidance laid out in CIRIA C665 would attribute a low risk to a new landfill site being within 50m of a site such as this. Given the above factors, it is considered that the risk from gas to the Site and its future end users can be classed as extremely low.

11 Mining Risk Assessment: Discussion and Recommendations

11.1 Solid Geology

There are no features associated with the solid geology of the Site that would require any particular measures to be included in the design and construction of the foundations for the proposed development. It is recommended that no further action is required in this respect.

11.2 Mining History

11.2.1 Shallow Mine Workings

The area has been subject to extensive underground mining operations since at least the earliest part of the nineteenth century. The inferred position of the outcrop for the Five Feet/Gellideg Seam passes through the south-west corner of the Site; if the inferred position is reasonably accurate then the outcrops passes through the Site with a north-westerly trend and the seam does not underlie the overwhelming majority of the Site. Our searches found no record of old coal workings underlying the Site.

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Beneath the Gellideg Seam there are five ironstone veins that have been mined extensively throughout this area. The old workings extend beneath the area of the Site and at least some of the workings will be at very shallow depths.

Shallow old ironstone workings are likely to underlie the Site at more than one horizon and the workings are likely to be at sufficiently shallow depths whereby there is a significant risk that they may collapse to the surface and induce surface subsidence. It is recommended that rotary percussive boreholes are drilled to determine the details of the shallow geology and any old workings found to be present are stabilised by means of a drilling and grouting operation.

11.2.2 Mine Entries

Our searches found no record of disused mine entries within the bounds of the Site or 20m of its boundaries. Although the presence of an unrecorded entry cannot be entirely dismissed, there are mining records of local underground mine workings and these identify no mine entries within the confines of the Site. The situation should be monitored during site clearance works and further advice sought if any suspicious features are observed.

11.2.3 Mine Gases

Various studies of the shallow old workings in the Heolgerrig area have found no particular risk from mine gases. Whilst there are no shallow coal mine workings underlying the Site that could act as a source of mine gases, the shallow old ironstone workings likely to underlie the Site may be connected underground to old coal workings. There is a low risk that gases from the coal workings could migrate into the ironstone workings, posing a risk to any development at the Site. It would be prudent to monitor any exploratory boreholes for evidence of mine gases.

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11.3 Summary of Mining Risk Assessment

There is a significant risk of shallow mine workings being present beneath the Site in one or more ironstone vein with the old workings at shallow enough depths to pose a risk of surface subsidence. There is a low risk of mine gases from old coal working migrating into ironstone workings through underground mining passages and posing a risk to any development at the Site.

11.4 Recommendations

The risk resulting from the mining heritage at the Site should be explored with exploratory boreholes. It would be prudent to include in any exploration programme monitoring to assess the presence or otherwise of mine gases. If shallow old workings are found to be present the risk to surface developments from those mining relics should be reduced by means of drilling and grouting.

The recommended site investigation and any subsequent works will require a permit from The Coal Authority accompanied by a risk assessment and should be designed and supervised by a Chartered Geologist or other competent person.

12 Environmental Assessment: Discussion and Recommendations

12.1 Hydrology and Hydrogeology

There are no drains crossing the Site, and there are no bodies of standing water on the Site. The Site is not prone to flooding from rivers or surface water; however there is a potential risk of flooding at the surface from groundwater.

The Site is underlain with strata classified as a 'minor aquifer' with high permeability and the bedrock is designated as a Secondary A Aquifer with unproductive strata. The superficial deposits are designated as unproductive. There are identified on-Site sources of contamination however the pathway to any sensitive water receptor is extremely

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limited, so it is considered that there is a negligible risk to a recognised groundwater resource from this development.

12.2 Contaminated Soils

The industrial history of the immediately surrounding area presents a moderate risk of the soils having been contaminated. It is recommended that the physical and chemical nature of the soils be investigated in order to assess the risk posed to end users of the Site.

12.3 Landfill Gas

There are no identified sources of gas underneath the Site, however there is a recorded refuse tip (disused) situated approximately 200m to the east of it. When considered in context with the topography and the hydrogeology/hydrology of the area, the risk posed from this source is considered to be negligible and that no further action need be taken in this respect.



David Blandford,
Environmental Consultant.



Dr Malcolm Blandford,
Chartered Geologist.

Report Date: 22nd August 2019.

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PLANS



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BLANDFORD CONSULTING

Geologists Working With The Environment...

Study on Land at Colliers Row, Brondeg, Merthyr Tydfil.

General Location Plan.

Plan Scale: 1:50,000.

Key to Symbols:



Approximate Position of Site.

Note:

North is at top of plan.

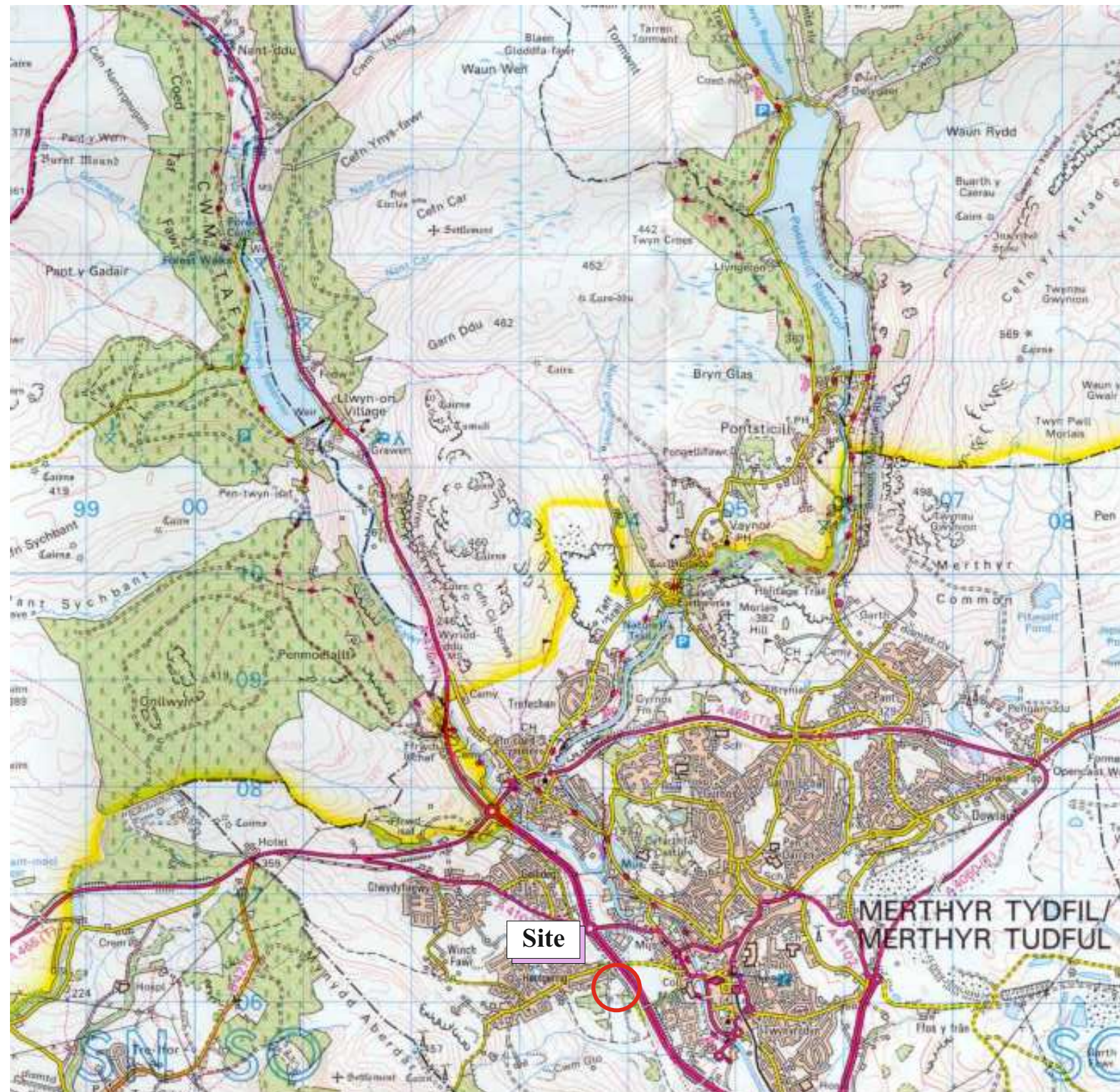
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Drawing No: BC/MB/08.19.04.01.



Geology Plan.

Plan Scale: 1:10,560.

Key to Symbols:

— Approximate Site Boundary.

Note:
North is at top of plan.

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Study on Land at Colliers Row, Brondeg, Merthyr Tydfil.

Detailed Location Plan.

Plan Scale: 1:2,500.

Key to Symbols:

— Approximate Site Boundary.

Note:

North is at top of plan.

*Drawing extracted from documents
provided by client.*

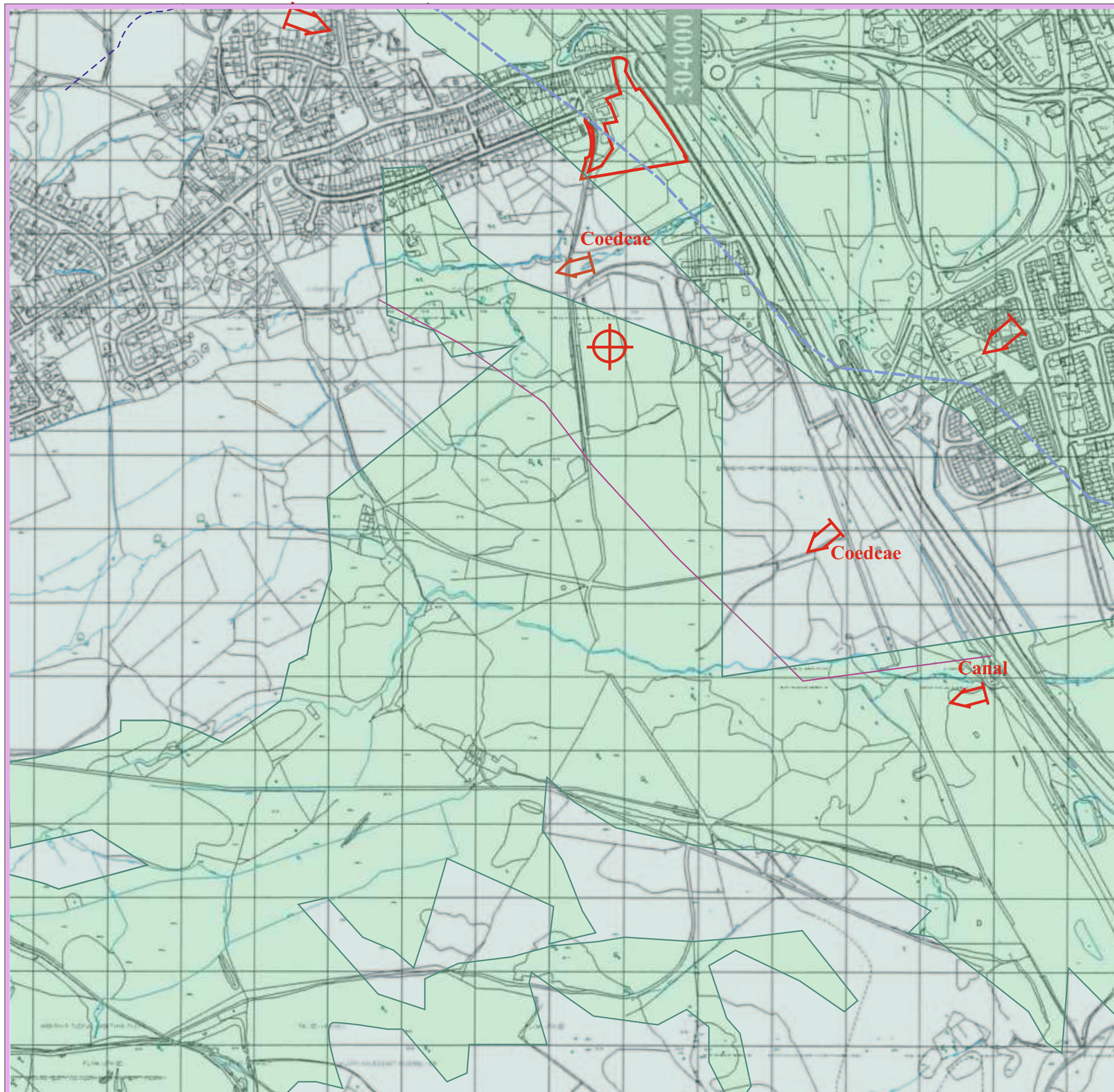
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Study on Land at Colliers Row, Brondeg, Merthyr Tydfil.

***Plan of Old Workings in the
Five Feet/Gellideg Seam.***

Plan Scale: 1:5,000.

Key to Symbols:

-  **Approximate Site Boundary.**
-  **Approximate Position of Disused Shaft.**
-  **Approximate Position of Disused Adit.**
-  **Approximate Position of Outcrop of Five Feet/Gellideg Seam.**
-  **Approximate Extent of Old Workings.**

Note:

*North is at top of plan.
Plan is for identification only, do not
scale from this plan.
Additional Mine Entries may be
present in the area.*

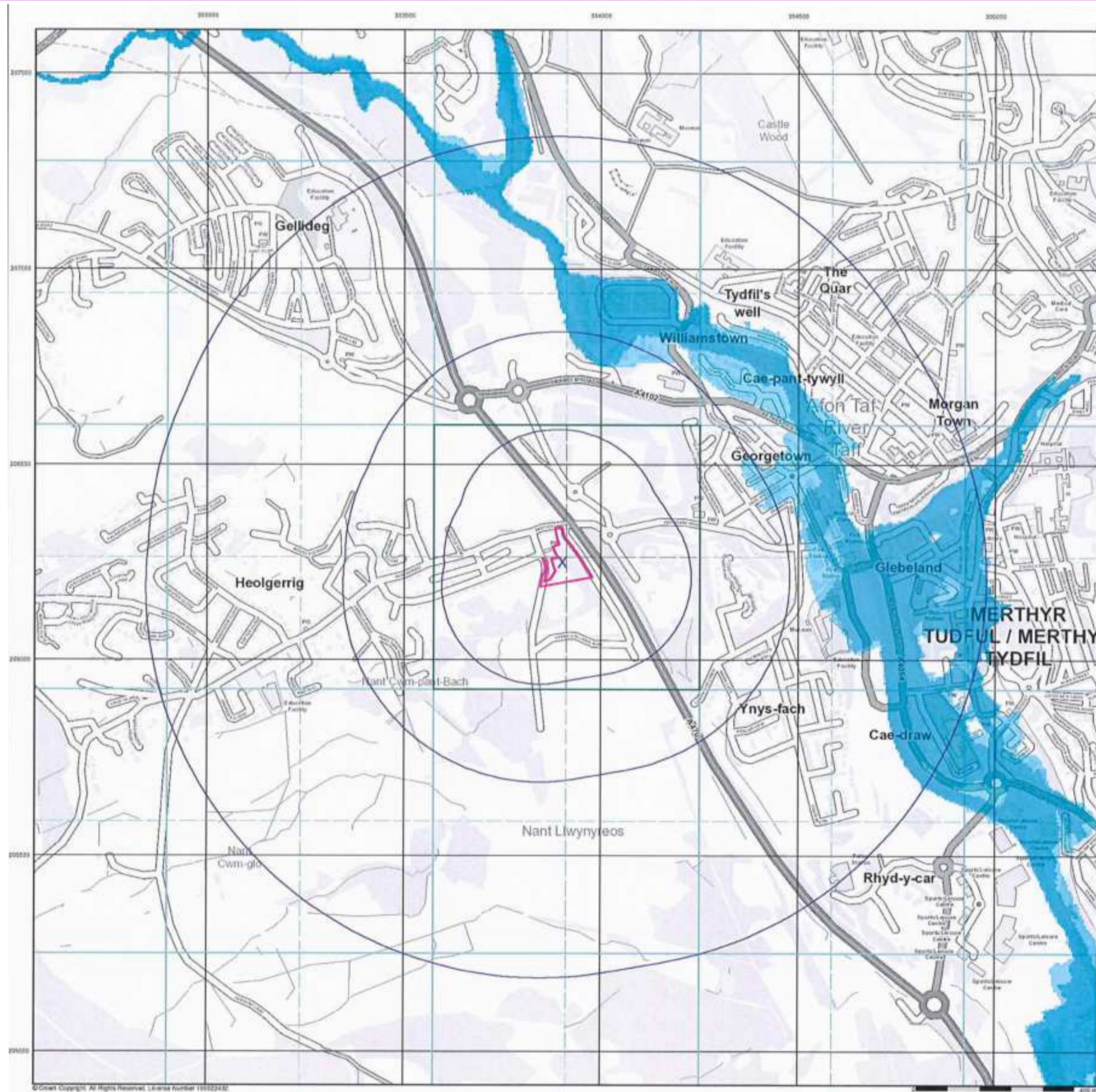
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Drawing No: BC/MB/08.19.04.04.



Study on Land at Colliers Row, Brondeg, Merthyr Tydfil.

Risk of Flooding from Rivers.

Plan Scale: See Drawing.

Key to Symbols:

General	
	Specified Site
	Specified Buffer(s)
	Beering Reference Point
Agency and Hydrological (Flood)	
	Extreme Flooding from Rivers or Sea without Defences (Zone 2)
	Flooding from Rivers or Sea without Defences (Zone 3)
	Area Benefiting from Flood Defence
	Flood Water Storage Areas
	Flood Defence

Notes:

North is at top of plan.

Locations are approximate and should not be scaled.

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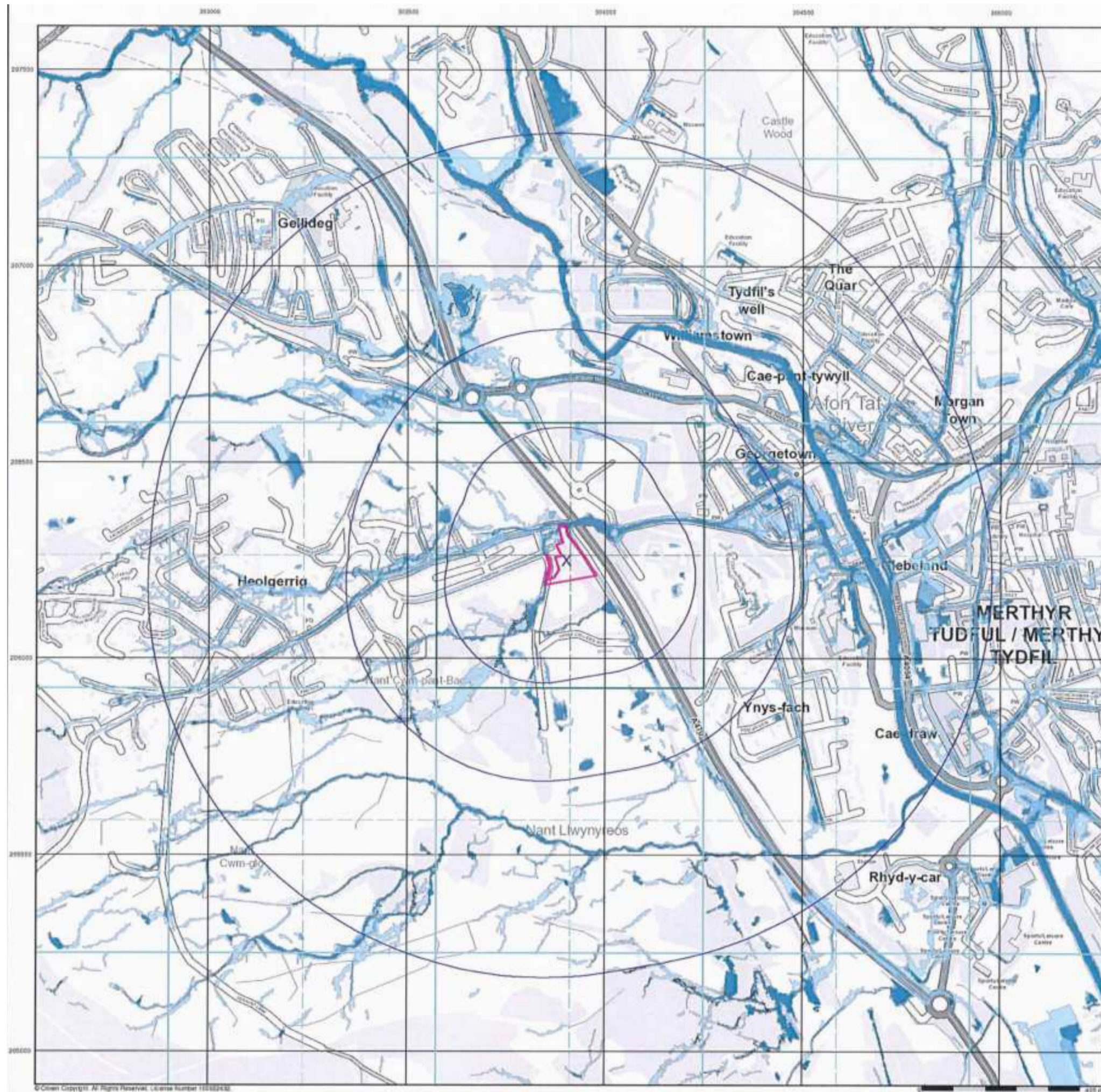


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Study on Land at Colliers Row, Brondeg, Merthyr Tydfil.

Risk of Surface Flooding.

Plan Scale: See Drawing.

Key to Symbols:



Notes:

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Study on Land at Colliers Row, Brondeg, Merthyr Tydfil.

Risk of Groundwater Flooding.

Plan Scale: See Drawing.

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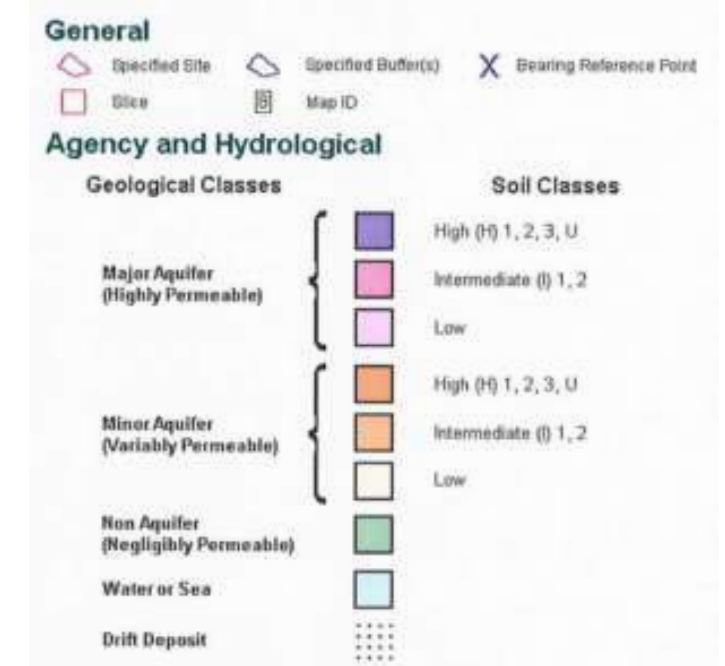
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Study on Land at Colliers Row, Brondeg, Merthyr Tydfil.

Groundwater Vulnerability Map.

Plan Scale: See Drawing.

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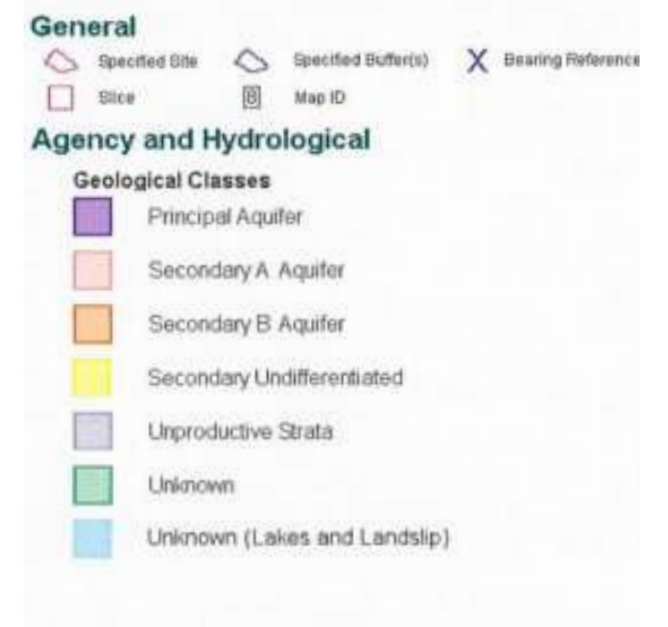
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Study on Land at Colliers Row, Brondeg, Merthyr Tydfil.

Superficial Aquifer Designation Map.

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