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Project title	Mynydd Isa	Job number	602496-80
cc	Neil Cutting	File reference	4-50
Prepared by	Tim Wilkinson	Date	3 December 2020
Subject	Coal Mining Risk Assessment		

1 Project

The site is located in Mynydd Isa, a village in Flintshire. The site comprises the existing Argoed High School and associated playing fields.

A Phase 1¹ and Phase 2² Geo-environmental Desk Study and Assessment Reports have been prepared by HSP Consulting. The information reviewed in the preparation of the report shows that the site lies within a coal mining reporting area and the reports highlighted the need for a Coal Mining Risk Assessment (CMRA).

This note presents a CMRA for the future development of the site based on the reviews of available information relating to mining beneath the site.

In addition to the Phase 1 and Phase 2 reports, the following information has been reviewed:

- Historical borehole records available from the British Geological Survey (BGS).
- BGS 1:10,000 geological map Sheet SJ 26 SE, 1985.
- BGS 1:50,000 geological map, Sheet 108, 1999.
- British Geological Survey Memoir, Geology of the country around Flint, Hawarden, and Caergwrle. Explanation of sheet 108 (with contributions by GW Lamplugh, HH Thomas, WC Simmons and TC Cantrill), 1924.
- Historical plans dating from 1869 - 2020 (Groundsure report appended to the Phase 1 report¹).
- Abandoned mine plan (ref. 7132).
- Shaft records (ref. 326364-288, 326364-315 and 326364-317).
- The Coal Authority interactive viewer.
- The Coal Authority, consultants coal mining report, 51002284189001, 11 May 2020 (appended to the Phase 1 Geo-Environmental Desk Study Report¹).

¹ Phase 1 Geo-Environmental Desk Study Report. Argoed High School. HSP Consulting. June 2020

² Phase 1 Geo-Environmental Assessment Report. Argoed High School. HSP Consulting. November 2020

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2 Geology

The geological maps show the site to be overlain by superficial deposits of Glacial Till. Made ground materials are recorded in the area occupied by the school. The superficial deposits are shown to be underlain by strata of the Pennine Lower Coal Measures Formation comprising mudstone, siltstone and sandstone. Figure 1 shows an extract from the 1:10,000 geological map and the location of borehole logs obtained from the BGS website. Figure 2 shows the 1:50,000 scale geological map.

The 1:10,000 scale map shows the following coal seams to outcrop within the site:

- Lower Red (Cannel (c))
- Stone (Wall and Bench (WB))
- Nant (N)

Figure 3 presents illustrative sections through the site showing the location of coal seams. The location of the cross-section lines is shown on Figure 1.

The site is impacted by a number of faults, see Figure 1.

3 Recorded Mining

3.1 Recorded mine workings

The Coal Authority, consultants coal mining report, states that there is no past mining recorded within the site, however, abandoned mine plan 7132 is stated to intersect some, or all, of the enquiry boundary. This abandonment plan has been purchased from the Coal Authority. Review of the plan shows that the workings recorded on the plan are to the north of the site and there are no recorded workings that would pose a risk to development of the site. The outline of recorded workings is shown on Figure 2.

The Groundsure report, appended to Phase 1 Geo-Environmental Desk Study Report¹, indicates that ironstone mining may have taken place on the site (“Iron Ore (Bedded) - Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered”) however, the geological memoir³ indicates that ironstones were “little used in the district”.

The earliest historical mapping included within the Groundsure report, from 1869, shows a large pond adjacent to the Western Boundary of the site. The Groundsure report notes this feature as potential evidence of “surface ground working”. The pond is located close to the outcrop position of the Yard coal seam as shown on Figure 1. The 1975 borehole at this location (Drillhole No.22) did not record any backfill material or evidence of coal.

³ British Geological Survey, Geology of the country around Flint, Hawarden, and Caergwre. Explanation of sheet 108 (with contributions by GW Lamplugh, HH Thomas, WC Simmons and TC Cantrill) Memoir 1924.

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3.2 Recorded mine entries

The Coal Authority have records of three mine entries (shafts) in the south east of the site. Two of the mine entries are recorded close together and it is possible that these two records relate to the same shaft, (i.e. given that no other obvious source data for a second shaft in this area has been identified). The location of the recorded shafts is shown on Figure 2. Mine entry data sheets purchased from the Coal Authority are presented in Appendix A. This information is summarised in Table 1 below.

Table 1 – Summary of mine entry data

Coal Authority Reference	Grid Reference	Source	Shaft depth
326364-288	326498 364560	Located during site investigations	14.6
326364-315	326488 364560	Located during site investigations	Not stated
326364-317	326429 364491	Other: Located during site investigations in 1975	Not stated

There are no records of any treatment of the shafts.

3.3 Ground Investigations

A ground investigation appears to have been undertaken in 1975 with 28No. open hole borehole records being available from the BGS website. The approximate location of the boreholes is shown on Figure 1. The boreholes were generally between 5 and 25m deep extended into bedrock.

The investigation records coal seams in several holes. Where coal is encountered, all but one hole records the coal to be intact.

One hole (Drillhole No. 2), records “Very soft drilling, presumed old workings” at 8.5-9.2m below ground level.

Drillhole 1A records “Black shale with ironstone layers, hard drilling” between 11.9 and 12.8m depth. Drillhole No. 7 records “soft drilling with frequent layers of ironstone up to 300mm in thickness” between 3.6 and 8.2m depth. Ironstone is not noted in any of the other boreholes on the site.

Drillhole No. 18 records “Very soft drilling, presumed fill” from ground level to 14.6m before encountering what is presumed to be bedrock. The remarks recorded on the borehole log state “Shaft filling subsided by 0.9m upon completion of hole, area fenced off. Presumed shaft or well.” This borehole corresponds with one of Coal Authority recorded shaft locations and is probably the source of the Coal Authorities information.

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Further ground investigations were undertaken by HSP Consulting in 2020. These investigations used window sampling techniques and therefore only penetrated to small depth into the bedrock beneath the site. One hole (WS07) encountered “Black friable dull saturated coal” at 1.7m depth.

4 Risk Assessment

The Coal Authority do not hold abandonment plans showing recorded workings beneath the site, although three shafts are recorded. Apart from the shafts, the Coal Authority do not identify the site to within a development high risk area. Coal exists at shallow depths within the site and therefore there is the potential for historical unrecorded workings to have taken place.

There is some potential evidence of shallow mine workings across the site, in the form of shafts and possible workings at one location (BH2), but generally intact coal has been encountered.

Given the absence of recorded workings and lack of evidence in the 1975 ground investigation for workings it is considered unlikely that extensive unrecorded workings exist beneath the site. However, it is recommended that further investigation be undertaken in the area of the recorded “very soft drilling” in BH2.

There is a residual risk of localised workings around the shaft locations. There are no records of the shafts being capped and the records from Drillhole No. 18 suggest that the shaft was loosely backfilled. There is a risk that development near to or over the shafts may result in unacceptable ground movements. If possible, it would be prudent to avoid development over the recorded shaft locations. There is also a risk of future ground movement / collapse associated with shafts that are located outside the developed area but in accessible location e.g. playing fields. The shaft locations should be investigated to assess the need for remedial works.

The standard Coal Authority recommendation is to assume a 20m ‘zone of influence’ around the recorded shaft locations. Given that the precise location is not known, a 20m radius around the suspected location is sensible, and it should not be necessary to increase this. If it is not possible to avoid building over the shaft locations, they will need to be capped /treated.

A number of coal seams outcrop and faults are shown on the geological map within the site. Coal seams or broken/soft spots associated with faults may need to be over excavated and backfilled with lean mix concrete if present at foundation formations. Covering of exposed coal seams may also be necessary to manage the risk of combustion.

5 Recommendations

We recommend an additional cored borehole adjacent to the hole that encountered ‘suspected workings’. If voids are confirmed at this location, as a risk mitigation measure, it may be appropriate to consider the use of a reinforced concrete raft foundation (designed to span/cantilever over say a 3m void). If there are no voids encountered at this location, given that no other evidence of shallow mine workings has been recorded standard shallow strip and pad foundations should be feasible.

Whilst shaft reference 326364-288 was positively identified and its depth confirmed during the 1975 investigation, the other two suspected shaft locations were not. Should the layout of the proposed development encroach on the recorded shaft locations (i.e. within the 20m buffer zone), it

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is recommended that the precise location and depth of shafts be positively identified and appropriate shaft treatment/capping be undertaken as necessary. Where shafts are suspected in areas outside the main development but in areas of the that are accessible, e.g. playing fields, it is recommended that the shafts are also positively located and the need for remedial measures assessed.

The use geophysical methods or trial trenches to identify disturbed ground could be considered to identify the precise location of shafts, and probeholes could be used to confirm the depth of any features identified.

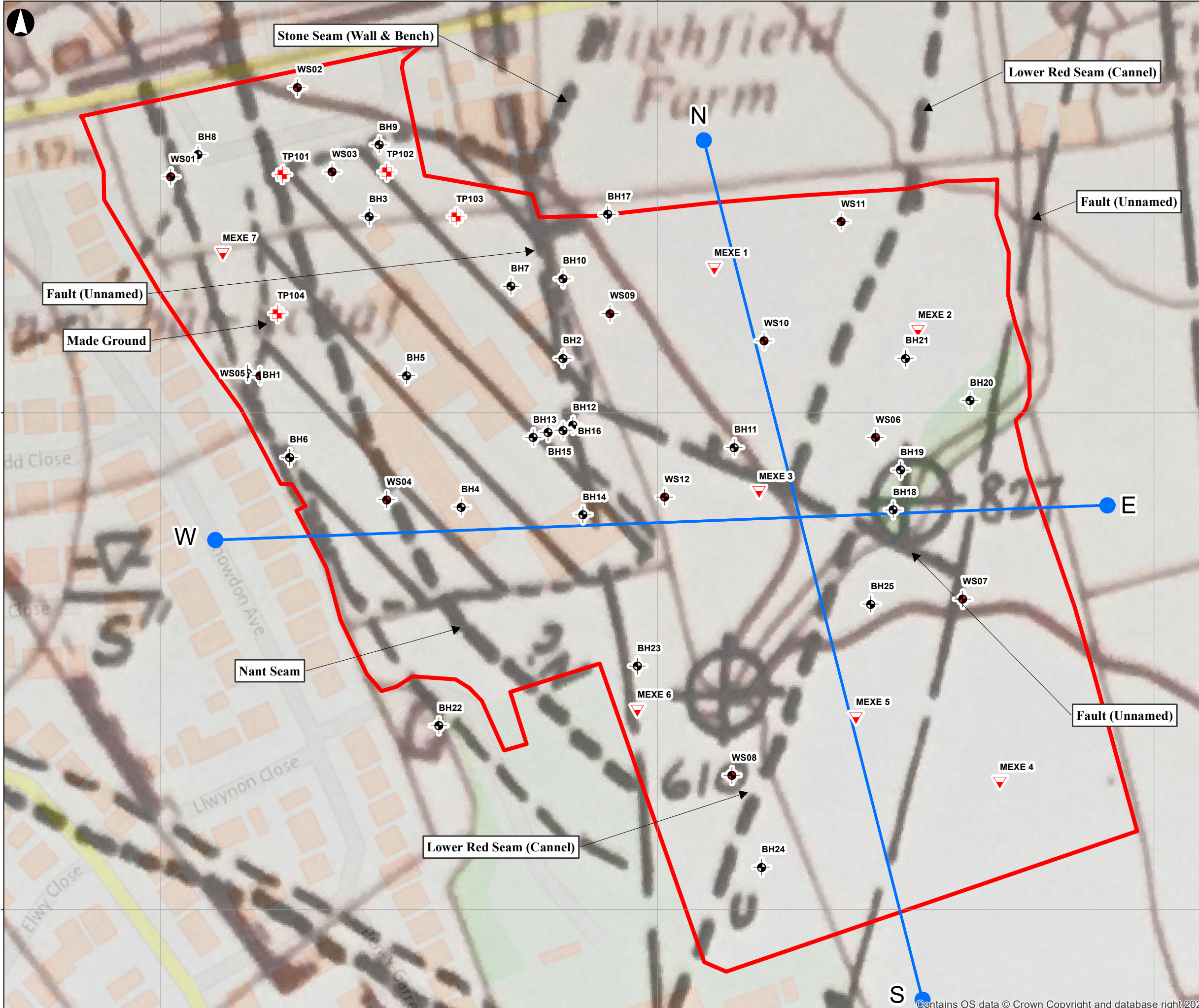
Appropriate risk assessment and safe methods of working should be considered for any works in the vicinity of the recorded mine shaft locations, e.g. use of a long reach excavators located in a position of safety. It is noted that the presence of the shafts was encountered during historical ground investigation, and there is no evidence of these shafts on other historical evidence reviewed.

Given this, it is possible that other unrecorded shafts/mine entries may be present within the site area. There is the potential for other shafts to be identified during the works at the site, and this should be clearly communicated to all operatives on the site and suitable methods of working and protocols to manage this risk incorporated into method statements.

It is recommended that during construction a suitably qualified engineering geologist inspect and formations for the building and access roads/hardstandings to confirm that there is no ground disturbance which may be associated with unrecorded workings/mine entries. It is recommended that the foundation excavations are extended to the competent in-situ material below the made ground.

It may be necessary for shaft treatment to be considered for the site, if any shafts are identified which could present a risk to the proposed structures or site users. For shafts identified to pose a risk, but are away from structures, it may be feasible to provide appropriate measures to prevent members of the public from accessing the vicinity of the shafts, such as palisade fencing.

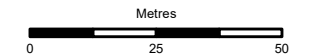
Any ground investigation or treatment proposed for known or suspected mine entries/workings will require prior agreement and permits to be obtained from the Coal Authority.



Legend

- Site Boundary
- 1975 Ground Investigation
- Window Sampler
- Trial Pit
- Mexecone
- Cross Sections

Coordinate System: British National Grid
 Contains British Geological Survey materials © UKRI 2020



P01	23-11-2020	JC	TBW	DR
Rev	Date	By	Chkd	Appd

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Client
MIM WEP | Flintshire County Council

Project Title
Mynydd Isa Campus

Drawing Title
1:10,000 Geological Plan and Previous Ground Investigations

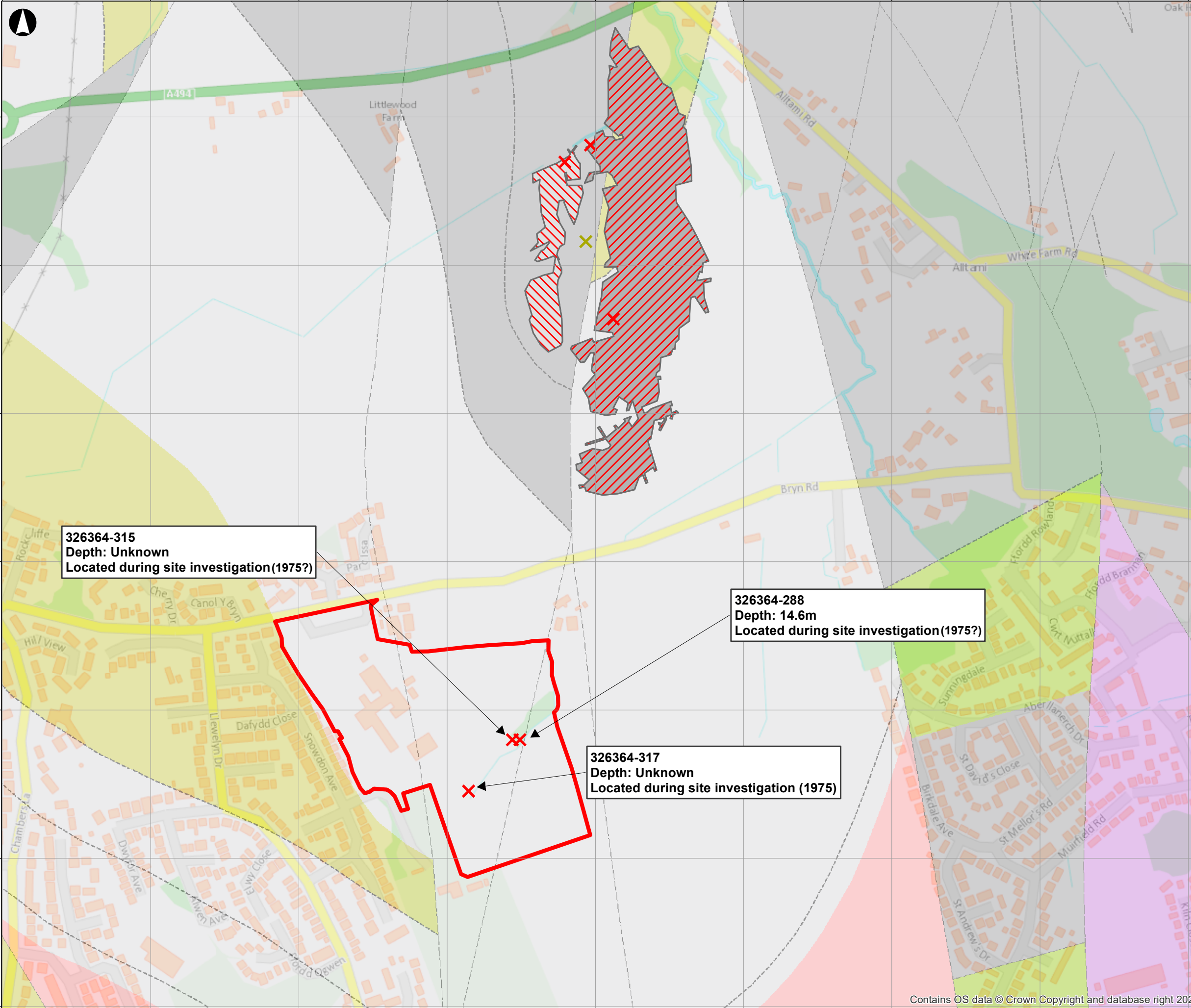
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Role
Geotechnical

Suitability
For Information

Arup Job No 602496	Rev P01
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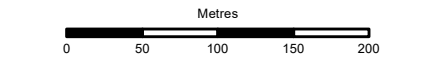
Name
Figure 1



Legend

- Site Boundary
- Yard Seam Workings
- Main Seam Workings
- Solid Geology, BGS**
- Pennine Middle Coal Measures Formation - Mudstone, Siltstone and Sandstone
- Pennine Lower Coal Measures Formation - Mudstone, Siltstone and Sandstone
- Pennine Lower Coal Measures Formation - Sandstone
- Gwespvr Sandstone - Sandstone and Argillaceous Rocks Interbedded
- Linear Features, BGS**
- Coal Seam, inferred
- Fault, inferred
- Mine Entries**
- X Adit
- X Shaft

Coordinate System: British National Grid
 Contains British Geological Survey materials © UKRI 2020



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Client
MIM WEP | Flintshire County Council

Project Title
Mynydd Isa Campus

Drawing Title
Recorded Underground Working and Mine Entry Plan

Scale at A3
1:5,000

Role
Geotechnical

Suitability
For Information

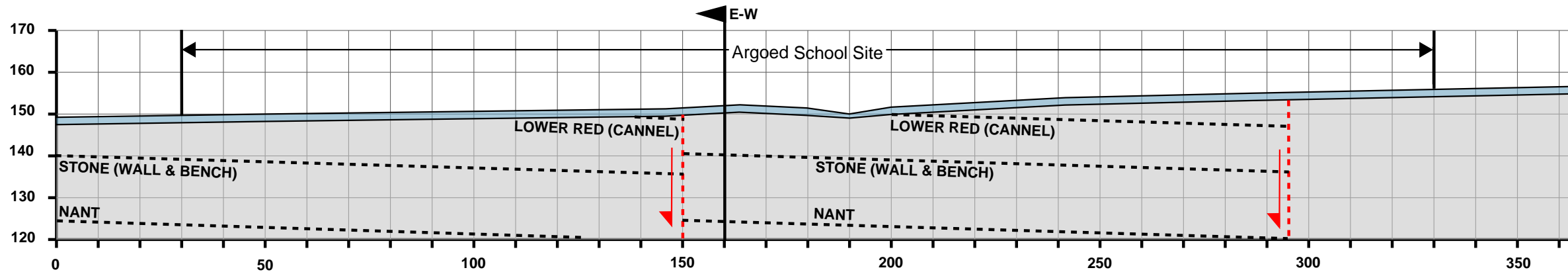
Arup Job No 602496	Rev P01
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Name
Figure 2

Legend

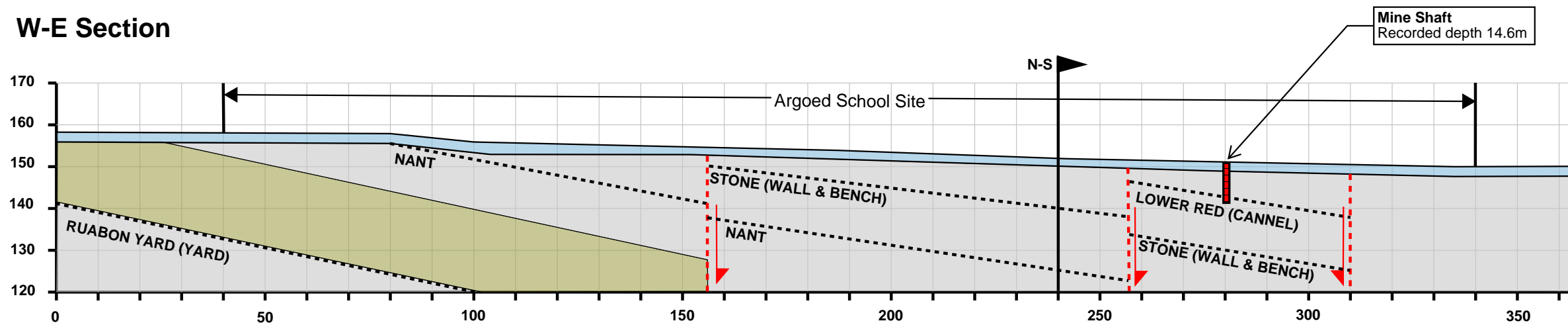
- Till
- Pennine Lower Coal Measures Formation - Mudstones, Siltstones and Sandstones
- Pennine Lower Coal Measures Formation - Sandstone
- Fault, Inferred
- Coal Seam, Inferred

N-S Section



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W-E Section



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Client
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Project Title
Mynydd Isa Campus

Drawing Title
Illustrative Geological Sections

Scale at A3
NOT TO SCALE

Role
Geotechnical

Suitability
For Information

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Figure 3

Appendix A - Mine entry data sheets



The Coal
Authority

Issued by:

The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG
Website: www.groundstability.com Phone: 0345 762 6848

**OVE ARUP AND PARTNERS
INTERNATIONAL LTD
4 PIERHEAD STREET
BUTETOWN
CARDIFF
CF10 4QP**

Our reference:	51002329451001
Your reference:	602496
Date of your enquiry:	16 November 2020
Date we received your enquiry:	16 November 2020
Date of issue:	16 November 2020

This report is for the property described in the address below and the attached plan.

Shaft Plan and Data Sheets

ARGOED HIGH SCHOOL, BRYN ROAD, BRYN Y BAAL, FLINTSHIRE, CH7 6RY

I refer to the enquiry dated 16 November 2020, received 16 November 2020, in connection with the above.

As requested I enclose the mine entry data sheet(s) held for the mine entry/entries referred to.

Mine Entry Data

Shaft/adit:	Shaft
Reference:	326364-317
Source:	Other: Located during site investigations in 1975.
Colliery name:	Unknown
Entry name:	Unknown
Date abandoned:	Unknown
Depth of superficial deposits (m):	Unknown
Depth of shaft (m):	Unknown
Diameter of shaft (m):	Unknown
Probable adit azimuth:	Not Applicable
Treatment details:	Unknown
Conveyance:	Not Applicable
Easting:	326429
Northing:	364491
Other information:	Yes

Mine Entry Data (continued)

Shaft/adit:	Shaft
Reference:	326364-288
Source:	Other: Located during site investigations.
Colliery name:	Unknown
Entry name:	Unknown
Date abandoned:	Unknown
Depth of superficial deposits (m):	Unknown
Depth of shaft (m):	14.6
Diameter of shaft (m):	Unknown
Probable adit azimuth:	Not Applicable
Treatment details:	Unknown
Conveyance:	Not Applicable
Easting:	326498
Northing:	364560
Other information:	Yes

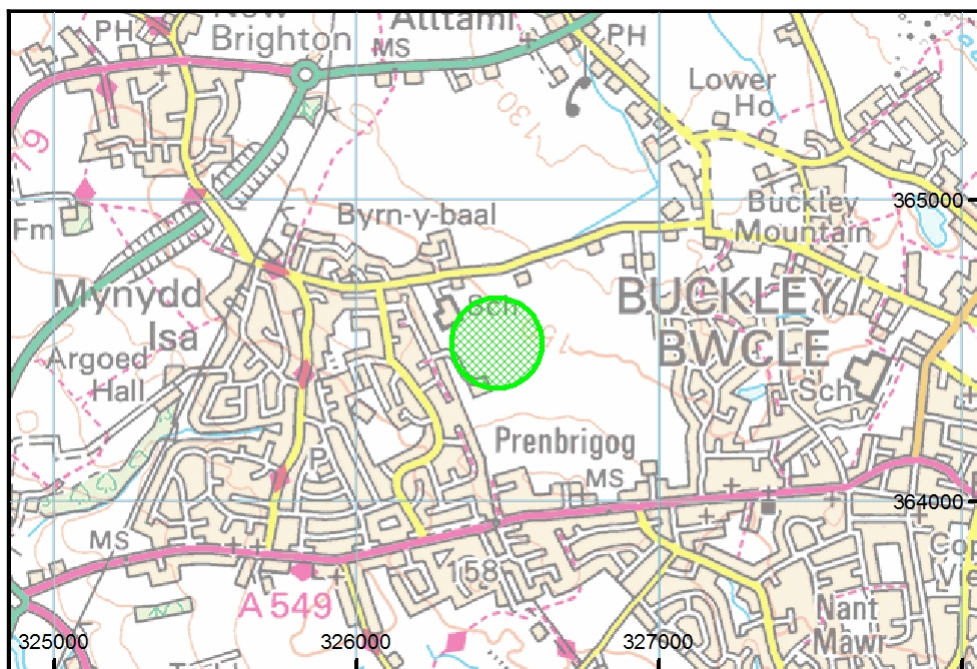
Mine Entry Data (continued)

Shaft/adit:	Shaft
Reference:	326364-315
Source:	Other: Located during site investigations.
Colliery name:	Unknown
Entry name:	Unknown
Date abandoned:	Unknown
Depth of superficial deposits (m):	Unknown
Depth of shaft (m):	Unknown
Diameter of shaft (m):	Unknown
Probable adit azimuth:	Not Applicable
Treatment details:	Unknown
Conveyance:	Not Applicable
Easting:	326488
Northing:	364560
Other information:	Yes

Issued by:	The Coal Authority, 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG
Tax Point Date:	16 November 2020
Issued to:	OVE ARUP AND PARTNERS INTERNATIONAL LTD 4 PIERHEAD STREET BUTETOWN CARDIFF CF10 4QP
Property Search for:	ARGOED HIGH SCHOOL, BRYN ROAD, BRYN Y BAAL, FLINTSHIRE, CH7 6RY
Reference Number:	51002329451001
Date of Issue:	16 November 2020
Cost:	£55.56
VAT @ 20%:	£11.11
Total Received:	£66.67
VAT Registration	598 5850 68

Location map

Approximate position of enquiry



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This plan shows the approximate location of the disused mine entry / entries referred to in the attached mining report. For reasons of clarity, mine entry symbols may not be drawn to the same scale as the plan.

Property owners have the benefit of statutory protection (under the Coal Mining Subsidence Act 1991). This contains provision for the making good, to the reasonable satisfaction of the owner, of physical damage from disused coal mine workings including disused coal mine entries. A leaflet setting out the rights and obligations of either the Coal Authority or other responsible persons under the 1991 Act can be obtained by visiting www.groundstability.com.

If you wish to discuss the relevance of any of the information contained in this report, you should seek the advice of a qualified mining engineer or surveyor. If you or your advisor wish to examine the source plans from which the information has been taken, these are available to view, free of charge, at our Head Office in Mansfield. To book an appointment please ring 01623 637225. Should you or your advisor wish to carry out a physical investigation that may enter, disturb or interfere with any disused mine entry, prior permission of the owner must be sought. For coal mine entries, the owner will normally be the Coal Authority.

The Coal Authority, regardless of responsibility and in conjunction with other public bodies, provide an emergency call out facility in coalfield areas to assess the public safety implications of mining features (including disused mine entries).

Our emergency telephone number is 01623 646333.

Key

Disused Adit or Mineshaft

