

**EARTH ENVIRONMENTAL
& GEOTECHNICAL**

Coal Mining Risk Assessment

Former Air Products Site

Acrefair

Wrexham

December 2019

On behalf of

GAROB Acrefair Ltd

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ACREFAIR

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1.0 INTRODUCTION

Appointment

- 1.1 Earth Environmental & Geotechnical Ltd have been commissioned by GAROB Acrefair (the Client) to undertake a Coal Mining Risk Assessment for the former Air Products Engineering site, Llangollen Road in Acrefair, near Wrexham.
- 1.2 The Client intends to develop the site for a commercial end use. At the time of writing there was no development plan for the site, although it is understood that development proposals could include a large retail store with associated car-parking.
- 1.3 This Coal Mining Risk Assessment is required to support a future planning application to Wrexham County Borough Council.

Objective

- 1.4 The purpose of the Coal Mining Risk Assessment is to collate available geological, mining and historical data in order to assess the potential for the site to be affected by underground mining. This report has been drafted in accordance with the Coal Authority Coal Mining Risk Assessment Template, January 2011.

Sources of Information

- 1.5 The Coal Mining Risk Assessment comprises of a review of the following information sources:
 - Online British Geological Survey maps and data.
 - Geological Survey of England & Wales, Wrexham, Sheet 121, 1: 50,000 scale, edition of 1993.
 - Geological Survey of England & Wales, Denbighshire 35SW, six-inch to one-mile scale, edition of 1925.
 - Coal Authority Consultants Mining Report, dated 3rd December 2019.
 - Coal Authority Interactive Map Viewer.
 - British Geological Survey online borehole records.
 - Google Earth imagery.
 - Online Historical Ordnance Survey maps.
 - Site Investigations in Areas of Mining Subsidence, FG Bell, 1975.
 - The threat of abandoned mines on the stability of urban areas, Barry Clarke, IAEG2006 Paper Number 379, The Geological Society of London, 2006.
 - The collapse of shallow coal mine workings, Durham theses, Durham University, Garrard, 1981.
 - Construction over abandoned mineworking's, CIRIA Special Publication 32, 2002.
 - Abandoned Mineworking's, Guidance, CIRIA 758D, 2019
 - UK Coal Resource for New Exploitation Technologies Final Report Sustainable Energy & Geophysical Surveys Programme Commissioned Report CR/04/015N, British Geological Survey, 2004.
 - Profile of a Welsh county coalfield-the Denbighshire coalfield 1850-1914.

- Applied Geological Mapping in the Wrexham area: geology and land-use planning, British Geological Survey, Technical Report WA/91/4.

Previous Site Investigation Reports

- Phase 1 Environmental Site Assessment, Parsons Brickerhoff, May 2010
- Phase II Assessment, WSP, July 2011
- Phase 1 Mining Investigation Report, NKC Geotech Ltd, March 2015. This report relates to land adjacent to the southern boundary.
- Extended Phase I Habitat Survey, Whitcher Wildlife Ltd, January 2017.
- Phase 2 Geotechnical and GeoEnvironmental Site Investigation, Eastwood & Partners, July 2015.

2.0 SITE LOCATION AND DESCRIPTION

- 2.1 The site is located approximately 11km south west of Wrexham town centre and 16km north of Oswestry. The approximate National Grid Reference for the centre of the site is 328163 343180 with the closest postcode being LL14 3HW.
- 2.2 The site formed part (where site offices and car parking areas were located) of the former Air Products Engineering site, which closed in 2009. The site is located off the south eastern side of A593 Ruabon to Llangollen Road.
- 2.3 Residential properties border the site to the west and east with a bowling green to the north. To the south there is a large area of vacant land that once formed part of the main Air Products Engineering facility. It is understood that that the site was cleared of all structures in 2015 with the crushed demolition rubble left spread across the site. Ground slabs and foundations were broken up and removed.
- 2.4 The site is separated from the bowling green by a large stone built retaining wall, that is structurally distressed.
- 2.5 Old kilns/furnaces are set into the eastern tree lined embankment.
- 2.6 Site levels fall by approximately from 140mAOD on the northern boundary to 135mAOD on the southern boundary.
- 2.7 A location plan is shown below as Figure 1, with Figure 2 showing a photograph of the site.

Figure 1 Site Location Plan



Figure 2 Site Photograph



3.0 ASSESSMENT OF DATA

Geological Information

- 3.1 The geology of the site has been determined from acquisition of geological maps for the area and examination of Coal Authority records.
- 3.2 The British Geological Survey (BGS) states that the site is underlain by superficial deposits consisting of Devensian Till, commonly known as Boulder Clay.
- 3.3 The solid geology beneath the site comprises the Pennine Lower Coal Measures Formation (PLCM) consisting of coal seams, mudstone and siltstone.
- 3.4 Figure 3, below, shows an extract from the geological map.

Figure 3 Geological Map Extract



- 3.5 There are no BGS borehole records which allow for further interpretation of the local coal geology or coal mining regime.
- 3.6 A site investigation on the site confirms a shallow bedrock horizon at a depth of 0.3m in WSP borehole BH01. At this location a weathered mudstone horizon was proved to 4m, at the base of the borehole.
- 3.7 The geological map shows the conjectured outcrop of the Main coal seam and the Quaker coal seams on the site, with a dip direction of 16 degrees to the south east. The Quaker coal seam is 0.7m to 1.9m thick, underlain by the Black Bed coal seam (0.5m) and the Main coal seam (1.1m to 4m thick).

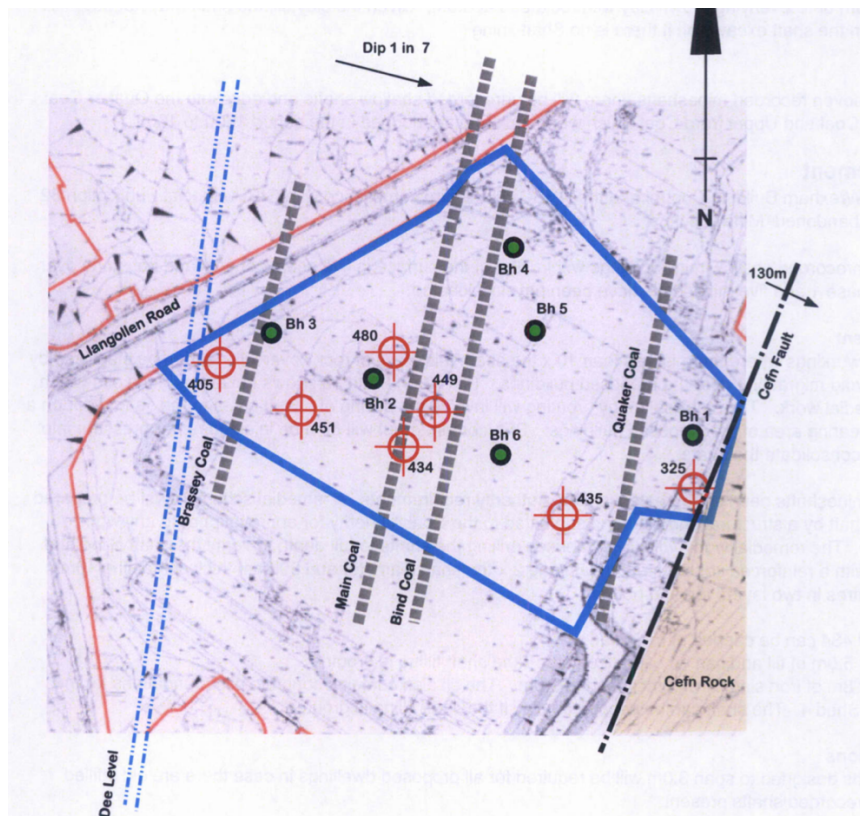
3.17 The coal seams within the shaft, relevant to the stratigraphy, at the site are as follows:

Table 1 Summary of Coal Seams at Nearby Shaft

Coal Seam	Thickness (m)
Quaker	1.6
Intervening Strata	18m
Bind Coal & Ironstone Seam	0.6
Intervening Strata	6m
Main Coal	2.9
Intervening Strata	9m
Brassey	1.0

3.18 Six rotary open were drilled in order to investigate the prevailing coal mining regime. The boreholes intercepted the Brassey Coal, Main Coal, Bind Coal and Quaker coal seams.

Figure 5 Extract from NKC Geotech Mining Report



3.19 Voiding, soft drilling and collapsed mineworking's were observed in all the coal seams, with a dip of strata of 1 in 7 (eight degrees) to the east. This angle of dip is less than that shown on the geological map (sixteen degrees) but does accord with Wynnstay mineplans.

4.0 COAL MINING RISK ASSESSMENT

Scope of Coal Mining Risk Assessment

- 4.1 Objectives of the coal mining risk assessment are to provide a desk based assessment of available geological and mining information relating to the site (and wider area) and to use this information so as to identify risks present to the development from the legacy of mining.
- 4.2 As part of the risk assessment potential mitigation measures (if required) should be considered, including any necessary remedial works.
- 4.3 The outcome of the risk assessment should demonstrate to the Local Authority that the proposed development is, or can be made safe (and stable) to meet the requirements of the National Planning Policy Framework (NPPF).

Data Limitations

- 4.4 It should be appreciated that it did not become a legal requirement to deposit coal mining abandonment plans until the 1870s and that this requirement was not rigorously enforced for some time after. Many shallow coal seams were worked prior to the introduction of first edition Ordnance Survey Maps and information on these workings is often not available. Therefore, if coal seams were accessible then invariably they could have been worked by formal or informal means.
- 4.5 It is also possible that if unrecorded workings are present then unrecorded mine entries may be present.

Coal Mining Risks

- 4.6 The risks associated with coal mining are as follows:
 - Collapse of relict workings beneath buildings causing damage to the building fabric and infrastructure.
 - Migration of mine gases from old mine works and mine entries resulting in build-up of flammable and asphyxiating gases in confined areas.
 - Consolidation of relict workings and overlying strata causing structural defects in building fabric and infrastructure.
 - Failure of mine entries causing loss of ground beneath building and external areas.
 - Spontaneous combustion of old mineworkings.

Summary of Risk

- 4.7 The site lies within a Coal Authority Development High Risk Area due to the outcrop of three coal seams and an ironstone coal seam.

Proposed Mitigation Strategy

- 4.8 It would be prudent to drill a total of six open hole boreholes across the site in order to assess the potential for shallow coal and ironstone mineworking's.
- 4.9 The boreholes should be drilled to a depth of 30m below ground level.
- 4.10 The coal mine shaft located along the eastern boundary of the site lies outside of the development area. This feature does therefore not need investigating.
- 4.11 The drilling of boreholes will require a permit for the Coal Authority with the development of the Method Statement and Risk Assessment.
- 4.12 It is highly likely that the site will require grouting across the development area.
- 4.13 This report should allow for planning permission to be granted, with conditions applied for a future shallow mining site investigation.

APPENDIX 1

COAL AUTHORITY MINING REPORT

APPENDIX 2

REPORT LIMITATIONS

REPORT LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget and staff resources allocated to the project.

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The report was written in 2019 and should be read in light of any subsequent changes in legislation, statutory requirements and industry best practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

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The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified.

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Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.