



GEOLOGICAL
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DATA AQUISITION
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Coal Mining Risk Assessment

LOCATION	Crynallt Road, Cimla, Neath, Port Talbot SA11 3RN
ISSUE DATE	9 th October 2017
FOR	Mr M Evans
CLIENT REF.	
OUR REF.	G17405

Prepared by

A handwritten signature in black ink, appearing to read "Ross Nicolson".

Ross Nicolson BSc (Hons) MSc (Eng) CEng MIMMM Principal Geotechnical Engineer

1. INTRODUCTION

Name of Applicant: Mr M Evans

Issuing Company: Geoinvestigate Ltd, Units 4 & 5, Terry Dicken Industrial Estate, Stokesley, North Yorkshire TS9 7AE

Competent Person: Ross Nicolson BSc (Hons.) Eng. Geol., MSc Eng., CEng IOM³ - Principal Geotechnical Engineer

Site Location and Description:

The boundary shown in red on the Coal Authority report provided in Appendix A corresponds with the planning application. National Grid Reference E 276580, N 195979 denotes the approximate centre of the plot. The plot is a strip of land of some 45m x 8m adjacent to an existing detached house called "Ty Derwen".

Google Satellite and Street View imagery shows the site comprises a roughly overgrown side garden with trees to the rear. The garden is initially gently sloping adjacent to the road becoming steeper hillside at the rear (western end) of the property.

Ground level at the front of the side adjacent to Crynallt Road is about 122m AOD reducing to 116m or 117m at the rear. Ground level rises to a hill top to the east of the site.

A review of historical OS maps dating back to 1878 shows quarries to the northeast of the site with possible small coal heaps and mine shafts downslope of the site to the southwest and northwest. Ty Derwen house was established sometime between 1910 and 1919. A long trench or bank like feature is shown on the map of 1919 on the west side of the house. The purpose of this feature is unknown however it may be an embankment to enable the construction of the house on this steeper section of slope. Alternatively it is speculated that this feature might even have been a coal exploration trench or a mine adit though this is considered less likely than an embankment. An extract of the 1919 OS map is included in Appendix B. The map shows coal pits to the south of the site.

The map record provides no evidence that the development site has been subject to surface mining activity though historical coal mine working has occurred near to the site.

Description & Layout of Proposed Development:

It is proposed to erect a single new detached house on the plot.

Risk Methodology Applied

This document and the risk assessment methodology adopted herein is based on CA publication RISK BASED APPROACH TO DEVELOPMENT MANAGEMENT - GUIDANCE FOR DEVELOPERS Version 3, 2014 and Version 4 - 2017. The template contained therein is adopted with minor amendments made by Geoinvestigate Limited.

Scope of the Coal Mining Risk Assessment

The purpose of this Coal Mining Risk Assessment Report is to:

- Present a desk-based review of selected items of available information reviewed on the coal mining issues which are relevant to the application site;
- Use that information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues;

- Set out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary further intrusive site investigation works and/or remedial works and/or demonstrate how coal mining issues have influenced the proposed development;
- Demonstrate to the Local Planning Authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

2. SOURCES OF INFORMATION USED TO INFORM THIS REPORT

The following sources of information have been used and form the basis of the risk assessment of coal mining issues provided in this report. Relevant reports/extracts have been appended.

- An up-to-date Coal Mining Report from the CA dated 2nd October 2017 referenced 51001633003001.
- Geological information on the bedrock and superficial geology obtained from the British Geological Survey (BGS) Sheet 247 Swansea at 1:50000 scale.
- The Coal Authority's online interactive map viewer.
- A site history based on limited Ordnance Survey map records of the area dating back to 1878.
- Historic borehole logs obtained from the BGS archive.
- Google Street View and Satellite images.

3. IDENTIFICATION AND ASSESSMENT OF SITE SPECIFIC COAL MINING ISSUES

The table below summarises the potential risks associated with coal mining legacy for the proposed development site, identified from list sources of information.

Coal Mining Issues	Yes	No	Risk Assessment/Remarks
Past underground coal mining	Yes		<i>The CA report in Appendix A lists mine workings in 1 seam of coal at a depth of 137m NOT beneath the property but to the southwest of it. This working is in the Westernmoor (Wm) coal seam.</i>
Probable unrecorded shallow workings	Yes		<i>The CAs interactive map viewer shows the site falls within a DHRA or development high risk area with regard to coal mining legacy</i> <i>The CAs interactive map viewer confirms that the site falls within an area of "probable shallow coal mine working".</i> <i>The CA define Probable Workings as underground workings for which no recorded plan exists but where IT IS LIKELY that workable coal at shallow depths HAS BEEN MINED before records were kept.</i> <i>Consequently the possible occurrence of shallow coal mine working beneath the development requires further consideration in this report.</i>
Outcrops		No	<i>None recorded. The CAs interactive map viewer and BGS geology map show Wm coal outcrop some 80m to the SW of the site.</i>
Spine roadways at shallow depth		No	<i>None recorded</i>
Future underground mining		No	<i>None recorded</i>
License details (AOR)		No	<i>None recorded</i>
Section 46 notices		No	<i>None recorded</i>
Geology		No	<i>No faults, fissures or breaklines recorded within the site. Geological faulting is present further afield both to the W and E of the site.</i>
Mine entries		No	<i>None recorded within development site or within 20m of it.</i>
Court orders		No	<i>None recorded</i>
Worked out opencast sites		No	<i>None recorded.</i>
Coal mining related hazards		No	<i>None recorded</i>

Coal mining subsidence		No	The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31 October 1994 There is no current stop notice delaying the start of remedial works or repairs to the property The Coal Authority is not aware of any request having been made to carry out preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.
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Note For those coal mining issues above identified as "yes" a more detailed discussion and assessment should be made of the risks, both individually and cumulatively, to the application site and the proposed development.

DETAILED DISCUSSION & ASSESSMENT RESPONSE

1. The Coal Authority's interactive map viewer shows the site falls within a Development High Risk Area (DHRA) raising serious concern about ground instability arising from mine workings and hazardous mine gases as well as other potential coal legacy hazards.
2. The CA report in Appendix A states that the site is underlain by probable unrecorded shallow workings
3. The CAs interactive map viewer shows the site falls within an area where there has been PROBABLE shallow coal mine working.
4. *The CA define Probable Workings as underground workings for which no recorded plan exists but where **IT IS LIKELY** that workable coal at shallow depths **HAS BEEN MINED** before records were kept.*
5. The location of the site is shown on the extract of CA interactive map viewer shown in Appendix C
6. The location of the site is shown on the extract of BGS geology map Sheet 247 Swansea presented in Appendix D.
7. The tentative elevation of the site relative to the vertical geology column is shown on the map inset.
8. CA mining panel information in the vicinity of the site records dip and dip direction of 9.5 degs to dir. 043 or NE. 2 dip arrows on the map record 12 degs NE and 20 degs NNE.
9. The positions of 2 boreholes located some 140m to the S of the site (SS79NE 136) and 90m to the SE (SS79NE 141) are shown on the geology map. The logs of both are included as Appendix E
10. Drift was encountered in these and nearby boreholes to depths between 1.60m and 2.70m followed by Hughes Sandstone bedrock.
11. Drift depth at the development site may be similar but has yet to be confirmed by intrusive investigation.
12. Coal Identified as the (Westernmoor coal seam) was encountered in Borehole 136 between depths of 12m to 13.4m and in Borehole 141 between 8.6m and 9.9m while a partially infilled cavity/mine working was encountered in 141 between 12m and 13.2m.
13. Other boreholes in the vicinity encountered only sandstone without coal or workings or the Wm coal seam at 23.9m depth. Geological faulting may explain the difference in coal seam occurrence and depth in these boreholes.
14. Based on a dip of 9.5 degs NE the Wm coal seam and any mine working within it would be expected to underlie the development site at a depth of 13m to 16m and perhaps shallower.
15. Because of the uncertainty in coal seam depth beneath the site drilling is required to confirm bedrock depth and the depth of coal and mine working.
16. Hazardous gases associated with coal seams and underground coal workings are unlikely to pose a significant risk to the development in this instance because firstly typically across the UK coalfields gas is rarely a problem, secondly with regard to this property there is no record of a site specific gas problem and thirdly according to the CA there is no geological faulting below the site.
17. However because workings may exist in coal at very shallow or shallow depth below the site and geological faulting occurs in the vicinity and the bedrock is sandstone it is our opinion that in this instance the risk should be raised from Low to Moderate until proven otherwise by drilling and gas monitoring.
18. No mine entries are recorded by the CA within an influencing distance of the development site.
19. The risk of additional or other mine entries occurring within the site is considered by us to be LOW but not negligible. If an additional mine entry/s are found during subsequent investigations of the site or during

construction groundworks the appropriate remedial action can be taken then including notifying the Coal Authority.

20. In light of the foregoing this CMRA desk study has shown that there are potentially significant coal mining stability and mine gas hazards to the proposed development.
21. Consequently further exploratory coal legacy drilling and gas monitoring and perhaps other mitigation measures may be required to properly assess the safety of this site and make it safe.

4. MITIGATION STRATEGY PROPOSED

Notes This section is the key part of the Coal Mining Risk Assessment Report. It should explain how the coal mining issues have influenced the proposed layout and design of the development. The mitigation strategy will set out and illustrate with plans where necessary how the on-site issues identified in section 3 will be dealt with to ensure safety and stability of the development. This should include the assessment of mine gas and the necessary mitigation measures required as necessary. You may wish to refer to the Construction Industry Research and Information Association (CIRIA) publication Special Publication 32 "Construction over Abandoned Mine Workings"

Where the desk-based assessment cannot conclude with certainty the extent of the coal mining risks on the site; details of further proposed on-site intrusive investigation works should be set out.

However, it is of paramount importance that this does not simply evade the issue and therefore place the Local Planning Authority in a position where it cannot be satisfied that coal mining legacy could give rise to some doubt that planning permission could not be granted.

MITIGATION RESPONSE

1. To properly determine the coal mining risk at this site it is proposed to drill boreholes to target depths up to 30m (but not necessarily reaching 30m) to locate possible coal mine workings beneath the development site.
2. Borehole depths will be subject to adjustment by the supervising Competent Person on-site and depending on the geological conditions encountered (namely depth to rockhead, seam thickness and ratio of rock cover to seam thickness) found during drilling and therefore may be terminated less than 30m.
3. A minimum of 2 or 3 boreholes is required in the vicinity of the new building.
4. The main purpose of the borehole investigation is to confirm the possible presence shallow coal seams beneath the site and if present to establish whether these seams contain mine workings.
5. If mine shafts are found during the intrusive site exploration works or during the subsequent construction groundworks the appropriate remedial action can be taken then. In addition the CA should be notified.
6. If mine workings are clearly confirmed to be absent, or beyond an influencing depth of the surface development it is unlikely that ground treatment/stabilisation by injection grouting or special foundation design measures will be required in respect of coal mining legacy.
7. The requirement for gas protection measures and the level of gas protection will be determined by a risk assessment based on a source - pathway - receptor model. This will depend on the gas concentrations found during coal legacy drilling together with the configuration of the site geology - particularly the nature and thickness of the drift/soil cover and the presence (or potential) for fissures or other pathways to exist.
8. A **Coal Authority Permit** must be obtained prior to the commencement of drilling at this site.
9. A risk assessment has been carried out in the section below (**The Coal Authority Permit**) for the exploratory site drilling works. In accordance with the RA drilling must be carried out using **small volume water injection flush** as this carries Low or Negligible risk of causing explosion or creating, releasing or causing hazardous gases to move upwards into nearby occupied housing and buildings. Gas monitoring must be carried out during drilling and boreholes must be sealed at the end of drilling.
10. The drilling flush used at this site MUST be that that stated in this CMRA - namely WATER and no other.

11. The drilling contractor/site manager should be warned that the CA operate permit compliance checks on drill sites and that a change in drilling fluid may be a breach of contract and may be liable to prosecution.
12. A 2nd specialist report will required on the findings of the coal drilling investigation finalising the scope of the mitigation measures needed (if any) to safeguard the development from coal mining related ground instability and hazardous gases.
13. **On the basis of the work to date, we are of the opinion that the mining stability risks posed by the strata beneath this site from coal mining legacy can be mitigated by routinely adopted measures and should not preclude the planning permission being registered.**

The Coal Authority Permit

Note The report should state whether enquiries have been made or will be made; whether a permit application has been submitted or if a permit has already been obtained from the Coal Authority for the mitigation and/or further site investigation works.

RESPONSE

A Coal Authority Permit needs to be obtained for further intrusive exploratory drilling works (as recommended above) which will disturb or enter any coal seams or coal mine workings present beneath the site.

Drilling Risk Assessment

In order to obtain a permit a coal drilling risk assessment has been carried out in accordance with Section 6 of CA publication: "Guidance on Managing the Risk of Hazardous Gases when Drilling, or Piling near Coal" which deals with the risks posed by various drill flushing mediums and different drilling Scenarios or Situations.

Situation Assessed: The site has been assessed to fall within "Unworked coal or coal workings; High or UNKNOWN risk of hazardous gases being created/ generated; Occupied property within risk area". Therefore it is concluded that an Undetermined/Unknown hazardous gas risk exists at this site. In accordance with Table 6.2.7 Water Flush falls within Low risk while Air, Mist and Foam flush all fall within High & High to Medium risk categories respectively. In this situation water flush is by far the safest drilling medium available and should ONLY be used.

6.2.7 Table of Risks for Different Drilling Scenarios						
Situation	Air flush	Mist flush	Foam flush	Water flush	Mud flush	Additional controls
- Unworked coal or coal workings - High or unknown risk of hazardous gases being present / created - Occupied property within risk area	HIGH	HIGH / MED'M	HIGH / MED'M	LOW	LOW	- Monitoring at rig and other open holes. - Seal boreholes as soon as possible.

Air, Mist and Foam flush are much less safe than water or mud.

Outcome: For safer drilling small volume water injection drill flush is should ONLY be used. The stipulation in this instance of water flush only for exploratory drilling accords with the CA's own internally managed and licensed safe exploratory coal drilling protocol.

Drill Flush to be used when drilling: Permit application must state WATER only, as mud though safe is too messy.

Other precautions: Gas monitoring to be carried out during drilling. Boreholes to be sealed as soon as possible.

5. CONCLUSION

Notes The Coal Authority would expect the Coal Mining Risk Assessment Report to conclude with a brief summary of risks and the remedial measures required for the proposed development site. The report should demonstrate a clear strategy for addressing the coal mining legacy and how the requirements of national planning policy with regard to development on unstable land have been addressed.

OUR RESPONSE

The Coal Authority have identified this site as falling within a Development High Risk Area (DHRA) where there is potentially a serious risk to surface development from mining related ground instability and hazardous mine gases arising from past coal mining legacy.

The site is identified by the Coal Authority as one where there is PROBABLE shallow coal mine working.

The CA define Probable Workings as underground workings for which no recorded plan exists but where **IT IS LIKELY** that workable coal at shallow depths **HAS BEEN MINED** before records were kept.

This CMRA has indicated that 1 coal seam containing mine workings at shallow depth or perhaps very shallow depth may occur beneath the development site.

Therefore potentially coal mining legacy poses significant risk to surface stability in the proposed development area requiring further assessment.

Because of this exploratory drilling is required to establish the depth of the coal seam beneath the site and whether this seam contains mine workings and hazardous mine gases.

The boreholes will also establish bedrock depth below the property this being an important factor in evaluating the impact of mine working depth on surface stability.

Gas monitoring must be carried out during drilling.

Notwithstanding, on the basis of the work to date, we are of the opinion that the coal mining legacy risks posed by this site can be mitigated by routinely adopted engineering/design measures (as outlined in our mitigation proposal above) and therefore should not preclude the planning permission being registered.

In order to finalise what (**if any**) mitigation measures are required it will be necessary to carry out further intrusive borehole investigations into the geological sequence to establish this sequence beneath this site and particularly the presence or absence of coal and workings in coal and hazardous ground gases.

The sinking of exploratory boreholes will be required at the site to do this.

A safe method of sinking boreholes which will reduce the risk to drill operators and the public has been proposed. A Coal Authority Permit will be required before drilling takes place. This must state that only water flush will be used for drilling.

Depending on the outcome of the additional coal mining legacy investigation it may be necessary to stabilise these seams/workings using routine drilling and grouting techniques and/or adopt special foundations design measures and perhaps install gas protection measures.

In conclusion we see no reason why Planning Permission should not be granted in the interim and that these works form a condition on the planning approval.

Appendices:

- A. CA Report ref 51001633003001 dated 2nd October 2017.
- B. Extract of 1919 OS map
- C. Extract of CA map viewer
- D. Extract of BGS bedrock geology map Sheet 247 Swansea at 1:50000 scale
- E. BGS Borehole logs 136 and 141

Other historical OS maps, borehole logs, site images and photographs have not been included because it was considered that they did not provide significant useful additional information.