



COAL MINING RISK ASSESSMENT
LAND ADJACENT NO. 9 REASBECK TERRACE
BARNSELEY
FOR
ARCHITECTURAL DESIGN CONSULTANT LTD

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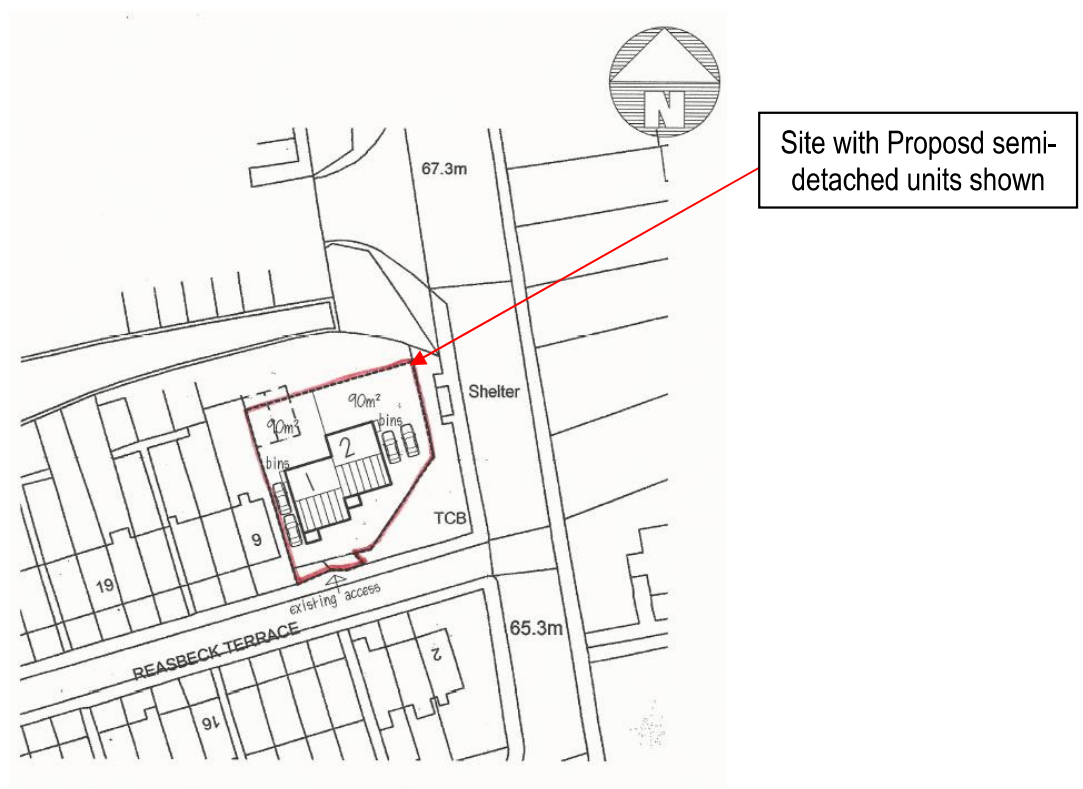
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1.0 INTRODUCTION

Appointment

- 1.1 Earth Environmental & Geotechnical Ltd have been commissioned by Architectural Design Consultant Ltd (the Client) to undertake a Coal Mining Risk Assessment at the site of land adjacent to No. 9 Reasbeck Terrace, Smithies, Barnsley.
- 1.2 It is understood that the existing open car park area and detached garages are to be demolished and replaced with a pair of new two-storey three bedroomed houses with external car parking and garden areas.
- 1.3 An extract from the proposed development is shown in Figure 1 below.
- 1.4 Reference has been made to the Barnsley Metropolitan Borough Council (BMBC) Planning Portal; a historic application for the redevelopment of the site and erection of a single detached property was submitted in October 2008 (Application No: 2008/1673). The Application was for the exact same site. The Planning Portal indicates an invalid Application for the replacement of the garage with the current scheme; it was registered on 14th June 2019 (Application No. 2019/0713/INVALID).
- 1.5 The Coal Authority Interactive Map on-line portal indicates the Site is located within a Development High Risk Area. A Coal Mining Risk Assessment is therefore required to support the Application for planning consent for the proposed development, once it has been made.

Figure 1 Extract from Proposed Development Plan



Objective

- 1.6 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.

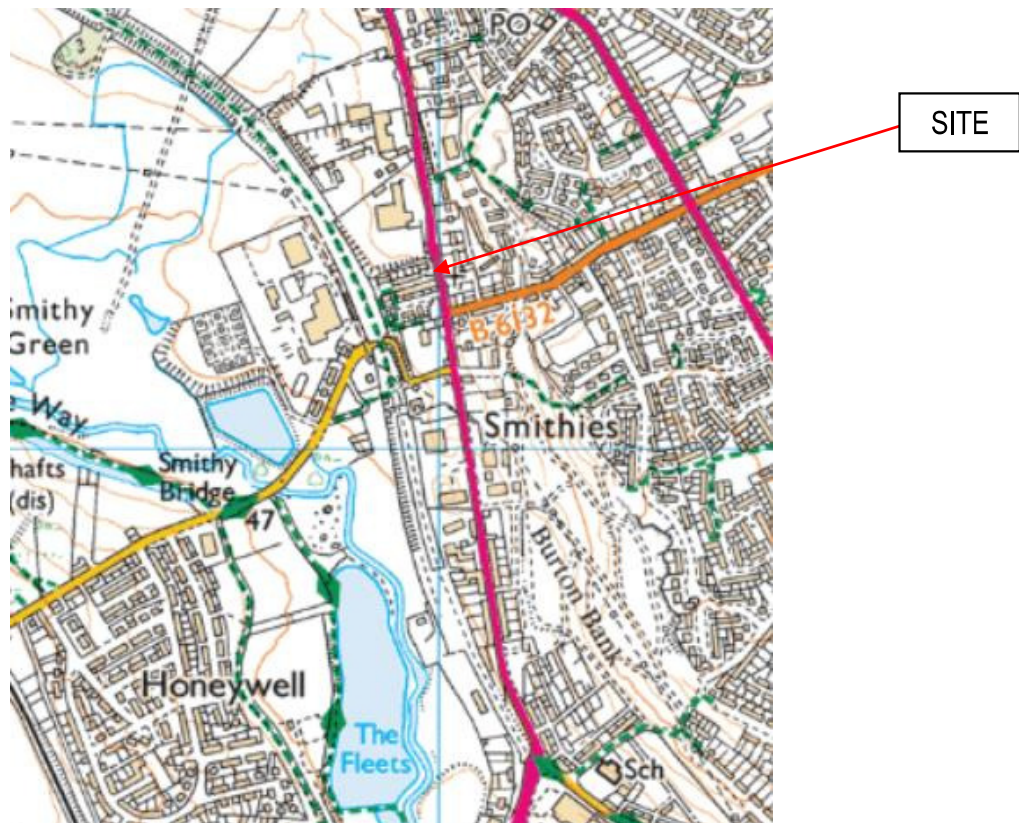
Sources of Information

- 1.7 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, Barnsley (Bedrock & Superficial), Sheet 87, 1: 50,000 scale, edition of 2008.
 - Geological Survey of England, Crookes, Sheet SE30NW, 1:10,000 scale, edition of 2001.
 - Coal Authority Consultants Mining Report, dated 16th July 2019.
 - Coal Authority Interactive Map Viewer.
 - British Geological Survey online borehole records.
 - Sections of Strata of the Coal Measures of Yorkshire, W H Wilcockson, Midland Institute of Mining, 1950. – East Gawber Hall Colliery (sunk 1855).
 - Google Earth imagery.
 - Online Historical Ordnance Survey maps.
 - Barnsley Metropolitan Borough Council planning portal.
 - 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 mineworkings, CIRIA Special Publication 32, 2002.
 - Abandoned Mineworkings, Draft Guidance, CIRIA 758.

2.0 SITE LOCATION AND DESCRIPTION

- 2.1 The site is located in the ward of Smithies, located 1.8km (1.1miles) north of Barnsley town centre. The approximate National Grid Reference for the site of the new-build is SE349083 (434980E 408305N) with the closest postcode being S71 1NW.
- 2.2 The lot of the proposed new-build, adjacent to 9 Reasbeck Terrace is roughly square-shaped, with the south-east corner cut-off. The maximum approximate dimensions 21m by 22m and currently comprises an open tarmac-paved area with single-storey garages on it.
- 2.3 The site is accessed directly off Reasbeck Terrace, which runs along the southern boundary.
- 2.4 Reasbeck Terrace appears to be an Edwardian terraced street. The A61 Wakefield Road runs north-south beyond the eastern boundary and the land to the north is a builder's merchant yard. Reasbeck Terrace slopes west, away and down from Wakefield Road.
- 2.5 A location plan is shown below as Figure 2.

Figure 2 Site Location Plan



- 2.6 A street-view photo of the existing garage building is shown below in Figure 3

Figure 3 Street view photograph of existing site



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, geological memoirs, shaft Sections of former collierys and examination of Coal Authority records.
- 3.2 The BGS states that no superficial deposits underlie the site.
- 3.3 The solid geology beneath the site comprises Pennine Middle Coal Measures Formation (mudstone, siltstone, sandstone and coal seams). The BGS describes the Middle Coal Measures Formation as being:

'Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part.'

- 3.4 The 1:50,000 scale 2008 BGS geological map, Sheet 87 (Barnsley) and 1:10,000 scale 2001 map Sheet SE30NW (Barnsley) have been reviewed. Figure 4 (below) shows an extract from the 1:10,000 scale (Solid) map.

Figure 4 Geological Map Extract (Sheet SE30NW 1:10,000)



- 3.5 Both geological sheets show the site is positioned on the vertical section just below the Top Beamshaw coal (TBE), meaning the Low Beamshaw coal (LBE) seam to be outcropping close to the south-west of the site, dipping beneath the site at probable shallow depth. The vertical geological section indicates the LBE to be between 0.52m to 0.64m thick.

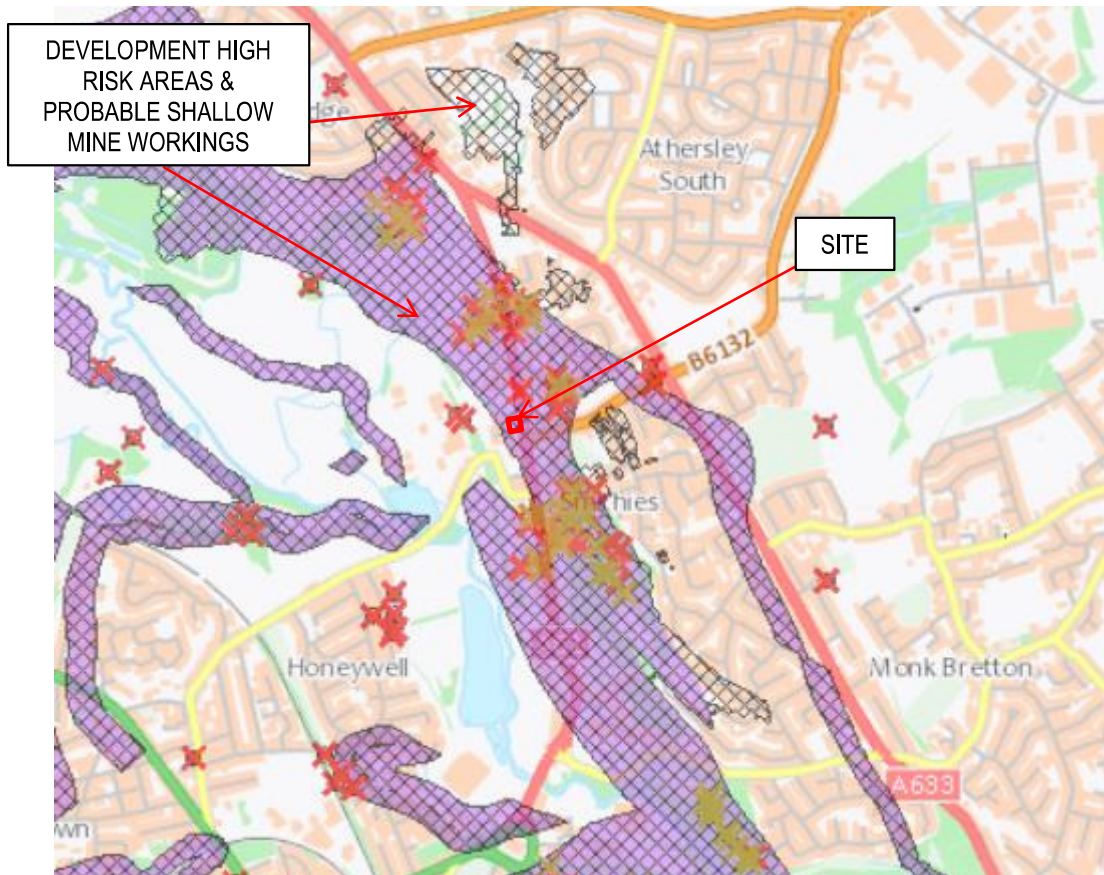
- 3.6 The beds dip at a relatively shallow angle to the north-east. A significant geological fault – the St Helen's Fault – trending north-east/south-west, downthrown to the south-east is indicated a couple of hundred metres to the south of the site. The affect of the fault on the site is unclear, but believed to be minimal.
- 3.7 The thickness of the Low Beamshaw Coal on the geological section of the 1:50,000 map indicates the seam to be between 0m and 1.2m thick; however, the vertical section on the 1:10,000 sheet (SE30NW), supported by colliery sections of nearby former collieries suggest in this part of Barnsley, the Low Beamshaw Coal is significantly thinner; the shaft section of East Gawber Hall Colliery (sunk in 1855), to the north and slight west of the site, recorded 20½" (520mm) of coal.
- 3.8 The shaft section from East Gawber Hall Colliery further indicates the LBE is 6.29m beneath the TBE. The next seam is the Kent's Thin – 0.46m of coal 14.30m below the LBE, separated by a competent named sandstone stratum – the Kent's Rock.
- 3.9 Taking the conjectured outcrop positions of the TBE and LBE from the 1:10,000 geological sheet (SE30NW) and using the vertical separation of the seams from the map key and the old shaft section for East Gawber Hall Colliery, we are able to calculate the beds are dipping at approximately 5° to the north east. Accordingly, using trigonometry, the LBE coal may be expected at an approximate depth of between 4.2 and 6.2m below the site's surface – shallowest on the western (down-slope) side.
- 3.10 There are a number of BGS borehole records available to view online located within a few hundred metres. The boreholes are of limited value in relation to establishing if potential workings are present in the Low Beamshaw on the Site, as it is difficult to correlate stratigraphically with the beds beneath the site. Coal is noted in many of the boreholes and has been worked.

Coal Authority Records

- 3.11 A Coal Authority Consultants Mining Report has been acquired for the Site; it is appended to this report in Appendix 1.
- 3.12 There are past underground workings recorded in four seams beneath the site, the Barnsley Seam, the Top Haigh Moor, Lidgett and the Fenton coal at depths ranging of 118 to 323m. The Report confirms the beds dip at an angle of between 2.1° and 3.8° to the north-east and east.
- 3.13 There are probable unrecorded shallow workings.
- 3.14 There are no underground spine roadways recorded at shallow depth.
- 3.15 There are two mine entries recorded within 100m of the Site; both are approximately 50m north-east of the site, the closest has coordinates 435007E 408360N.
- 3.16 The report does highlight the presence of both the Top and Low Beamshow Coal outcrops; the former on the site (the TBE is indicated just clipping the north-east corner of the site) and the LBE is shown 33.9m to the south-west. Both seams are described as workable.
- 3.17 There are no opencast or CA licensed tips within 500m of the Site.

- 3.18 There is a property within 50m of the site – a house on the south side of Reasbeck Terrace that has a claim for subsidence against the Coal Authority.
- 3.19 There is a one property 331m to the south-east with a mine-gas incident.
- 3.20 The Coal Authority Interactive Map Viewer (Figure 5) shows the site to be located within a Development High Risk Area associated with probable shallow coal mine workings.

Figure 5 Development High Risk Area, Past and Probable Shallow Coal Workings



- 3.21 The Coal Authority Consultant's Report (Appendix 1) includes a detailed plan indicating the site and the two conjectured coal seam outcrops relative to the site; the Top and Low Beamshaw Coal. The plan also shows a claim for subsidence and an area affected by mine gas.
- 3.22 No geological faults or site investigations are recorded at or within close proximity of the site.
- 3.23 There are no future plans for coal working on or near the site.

Historical Records

- 3.24 Historical mapping dating from 1855 has been reviewed.
- 3.25 On the earliest map seen of note, the 1894 sheet (Yorkshire sheet 274 NE (1:10,560)), the housing on Reasbeck Terrace are not yet built; there is a school on the land that is now the southern side of the Terrace. In the wider area there are a number of collieries marked. There

appears to be just fields on the site itself. See Figure 6 below with an extract of the 1894-published map.

Figure 6 Extract of Yorks Sheet 274NE 1:10,560 (published 1894)



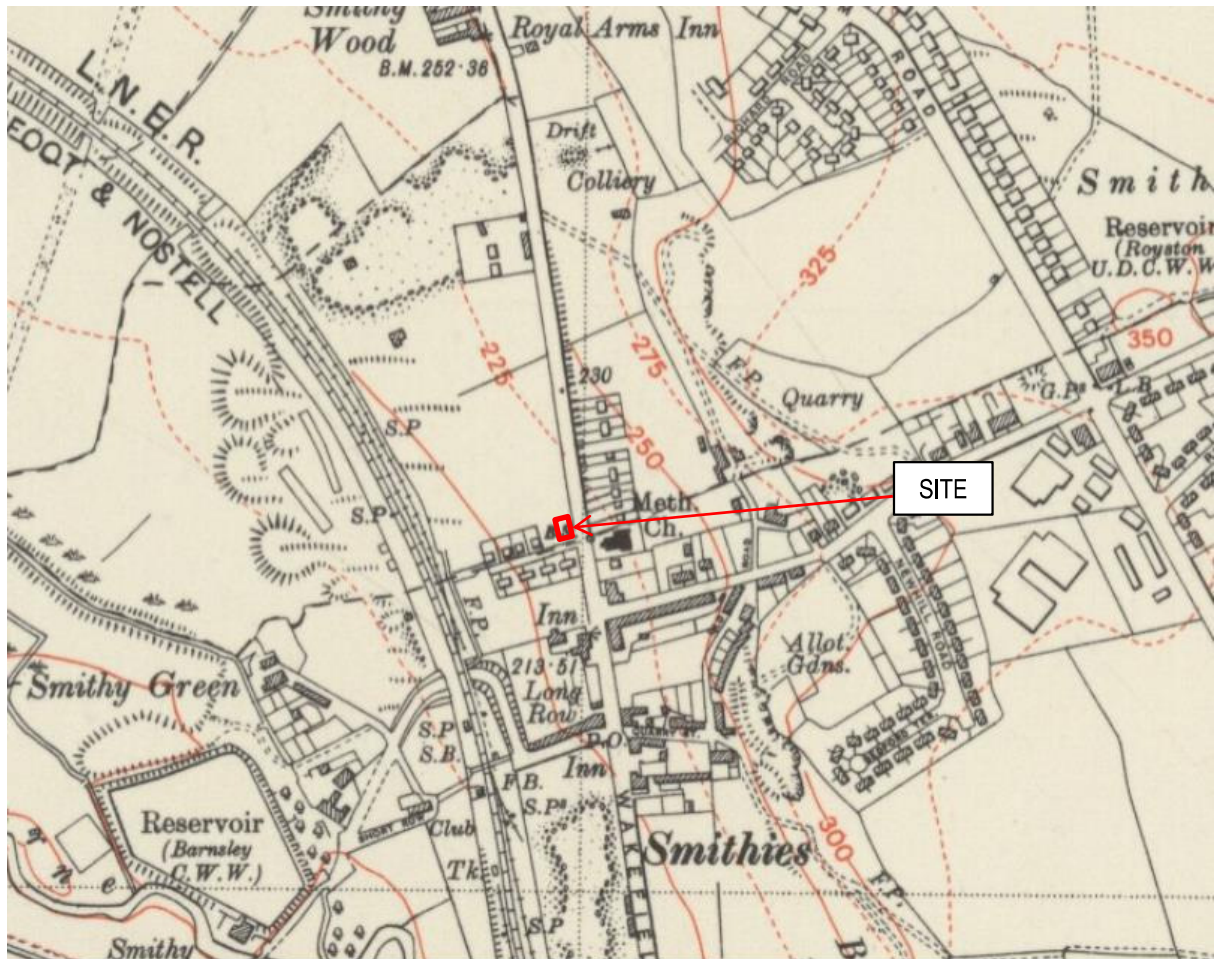
- 3.26 By 1907, the the site appears unchanged – fields; although the surrounding area houses in Smithies have been built off Wakefield Road. Please see below in Figure 7.

Figure 7 Extract of Yorks 274NE 1:10,560 (published 1907)



- 3.27 By 1937, Reasbeck Terrace is built, the former school is gone. There is a vacant plot on the site as it is today. The former Warncliffe Carlton and Primrose Main Collieries shown on previous editions are gone; only mounds and an indication they were once there can be seen. A drift colliery is marked north of the site – in the area of the Coal Authority recorded shafts. Please see below in Figure 8.

Figure 8 Extract of Yorks 274NE 1:10,560 (published 1948)



4.0 COAL MINING RISK ASSESSMENT

Scope of Coal Mining Risk Assessment

- 4.1 The objectives of the Coal Mining Risk Assessment are to provide a desk-based assessment of available geological, historical and mining information relating to the site (and wider area) and to use this information so as to identify real and potential hazards and in turn risks present to the development from the legacy of mining, if present.
- 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. The absence of any recorded working does not necessarily mean there are no workings.
- 4.5 It is also possible that if unrecorded workings are present then similarly unrecorded mine entries may also be present.

Coal Mining Risks

- 4.6 The Hazards associated with coal mining are as follows:
- Collapse of relict workings beneath buildings causing damage to the building fabric and infrastructure. This may include sudden collapse at surface.
 - 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 Hazards and Assessment of Risk

- 4.7 The Site is located within a Development High Risk Area. The Top Beamshaw Coal Seam is inferred?? to outcrop on or close to the eastern boundary, the Low Beamshaw Coal outcrops to the south-west of the site dipping beneath it at a shallow angle and hence is present under the site at shallow depth. The Low Beamshaw Coal is of workable thickness; research has identified the probable thickness of the coal seam as 520mm in the area of the Site.
- 4.8 Our research suggest the beds are dipping at angles between 2.1° to 5° beneath the site; the depth to the Low Beamshaw beneath the site is estimated between 4.2m and 6.2m.
- 4.9 The Coal Authority have no records of past underground workings but they state there are probable unrecorded workings on or near the site. There are no recorded mine entries on or within 20m of the site. There is recorded mine gas within 500m of the site. There is a claim for subsidence within 50m of the site.
- 4.10 Whilst the Coal Authority have no records of past workings, the presence of unknown workings cannot be fully discounted.
- 4.11 The Coal Authority have no records of mine entries on or near the site; however they cannot be discounted. Given the thickness of the Low Beamshaw Coal and the estimated depth beneath the site, if worked it is highly likely the method of working would be via bell-pits or shallow pillar and stall. Bell-pits are vertical shafts excavated to the coal seam and it is then worked radially from the central shaft.
- 4.12 This desk-based assessment cannot provide adequate evidence to discount the risks posed to the development by past coal mining activity. An intrusive ground investigation to satisfy the Coal Authority/Local Planning Authority in relation to potential coal legacy is considered **necessary**.

Proposed Mitigation Strategy

- 4.13 Mitigation works are considered necessary on the site for the proposed construction of the two-storey development.
- 4.14 An intrusive investigation is recommended to prove the depth, thickness and condition of the Low Beamshaw Coal. If bell-pitting has occurred then there may be little continuity of working across the site. A total of four rotary open holing boreholes are recommend which should be drilled to a depth of 15m across the development area.
- 4.15 During drilling mine gas concentrations should be monitored in the borehole annulus when adding drilling rods.
- 4.16 Due to the urban nature of the site, the Coal Authority requires the risk of potential mine gas migration are mitigated by using a water-flushing medium.
- 4.17 Any investigation into coal seams or workings requires permission from the Coal Authority, with the payment of a fee and the development of a risk assessment.

APPENDIX 1

COAL AUTHORITY CONSULTANTS MINING REPORT

APPENDIX 2

REPORT LIMITATIONS

REPORT LIMITATIONS

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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.