GEOLOGICAL
GEOTECHNICAL
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DATA ACQUISITION
CONSULTANCY

Rotary Borehole Site Investigation Report

LOCATION	Heator Lane, Cumberworth, Huddersfield HD8 8XH
ISSUE DATE	17 August 2023
FOR	Chris Hitchens
CLIENT REF.	
OUR REF.	G23200 Rev 1

Prepared by

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1. Introduction

In accordance with your instruction, Geoinvestigate Ltd carried out an intrusive rotary borehole site investigation at Heator Lane, Cumberworth HD8 8XH. The approximate site centre is E 443398, N 352613.

Site elevation ranges from about 235m aOD at the northern main road entrance rising to around 239m mid platform level within the property and 240m at the south boundary wall. The site occupies a platform formed in recent years on hillside rising to the south with reasonably flat farmland below steep north bank. A recently formed 4m to 5m high steep bank leading down to farmland is present on the north side of the property while an earth mound/spoil heap is present along the sites east boundary screening the road. Site images are provided in Appendix 1.

It is proposed to erect a single detached dwelling at the location with an undercroft/basement level providing views over lower ground to the north. It is understood that excavation of the existing platform to a depth of some 3.50m or 4.00m is required to install the basement. Architectural images and a site layout plan are provided in Appendix 2.

2. Site History

In the late 1800s/early 1900s the site was occupied by the Blue Slate (woollen?) Mill comprising a small mill building and two small reservoirs, the former located in the north-east corner of the property. The reservoirs were perhaps fed by a spring located on the slope to the south of the site. Today the spring appears long dried-up perhaps because of deep sandstone quarrying activity on the same hillside to the west of the property or mine working in 1924 below the property. An historical OS map site overlay showing the mill layout is provided in Appendix 3. Today there is no visible surface evidence of the mill save for its old stone perimeter walls and perhaps a small water inlet (shown in the Appendix 4) through the south wall from the hillside spring above. Chris Hitchens the site owner mentioned that previously very large sandstone foundation blocks had been excavated towards the roadside margin of the property.

Between 1922 and 1924 the site was partially undermined at very shallow depth (ie < 10m) by underground coal workings, entered from a Day Hole/mine adit located in the old northern boundary wall of the property. Historical coal mining beneath the property is discussed further in section 5 of this report.

It is understood, from Chris Hitchens who has owned the site for approximately 25 years, that during his stewardship the east site area, where the new building is to be located, has been subject to several phases of excavation and infilling up to 4m depth - associated with the processing of stone and road construction activity. According to Chris, the bottom of the excavation, which had exposed weathered rubbly bedrock approaching the site entrance, was subject to disturbance and loading by heavy construction plant and a stone crusher etc. Chris reported excavation reached 1m below external Rowgate Road level, at (235m aOD) at the main lower site entrance and 4m below current mid platform height (239m aOD), as well as approaching the level of the top of the old stone north boundary wall (234.5m aOD) and perhaps below it.

Various other alterations have occurred to the site including raising the steep north bank, the formation of the existing roadside spoil heap within the property, removal of the smaller east reservoir and infilling of the larger reservoir on the west side the latter believed to approach 3m depth at its higher banked north end. Overall, the original slope has been excavated, infilled and raised, creating the more level platform and steeper north bank seen today.

Though the current site surface appears compact comprising soil, with smaller and larger brick, concrete and sandstone constituents the nature of the infill/made ground deposits at depth are unknown, though they are perhaps likely to be reasonably compact as they have been trafficked over the years by heavy plant. This however is speculation.

Chris Hitchens recounted conversations he had had many years ago with a very elderly local man who had told him that after closure of the coal mine in 1924 Upper Cumberworth villagers used the same day hole entrance to take coal from under the site perhaps up to end of WW2 in 1945. Such interwar ad-hoc, uncontrolled/illegal mining activity was not uncommon during this economically very difficult period which included the Great Depression 1929 – 1939, labour strikes and world war.

3. CMRA Findings

In preparing the scope of the current drilling investigation Geoinvestigate reviewed the 2021 Phase 1 Environmental Desk Study by Rogers Geotechnical Services (Report C1819/21/2801) including a Coal Mining Risk Assessment (CMRA). The 2021 document is not included in Geoinvestigate's 2023 drilling report.

The earlier CMRA identified known very shallow and possible further shallow coal mining within 30m depth from surface, as well as mine entries and mine gas risks to building development. Regarding mine workings, the CMRA's Consultants Coal Mining Report identified known/recorded mine working in the Whinmoor Coal (aka Cumberworth Thick) at a depth of 3m beneath the property having 205cms extraction thickness, dip 7.5 degrees South and last mined in 1924. The earlier CMRA did not include nor recommend obtaining mining abandonment plans for the development area.

4. BGS Geology Maps

Extracts of the BGS 1:50000 Solid Geology map edition, Sheet 86 Glossop and the vertical geology column are provided in Appendix 5 together with the 1:10000 Solid & Drift edition Sheet SE20NW.

The tentative elevation of the site is shown on the geological column minus drift/superficial cover. According to the mapping, site bedrock comprises sandstone, underlain by the Whinmoor Coal in turn underlain by the Penistone Sandstone - with the Cumberland Thin Coal and the Penistone Green Coals expected at depths of around 14m and 56m respectively below the Whinmoor. The Thin Coal is 0.0m – 0.4m thick and owing to its limited thickness is unlikely to have been worked beneath the property.

The Holme Fault is present close by to the south of the site. The vertical displacement of this geological fault is 170 to 192 metres on its south down thrown side.

The 1:10000 map shows ancient landslip and a spring on the hillside to the south-west and south of the site respectively. The spring appears to have dried-up a long while ago. This map also identifies the west embanked reservoir and infilled ground at the site locality. The east reservoir is no longer shown.

An image of the landslip is provided in Appendix 6. There is no evidence of recent movement of this feature, and it does not impact the current development area which lies to the east of it. The old stone boundary wall at the foot of the slip, suggests this feature has probably remained stable for over 100 years.

5. Coal Mining Abandonment Plans

The mining abandonment plans for workings in the Whinmoor Coal (purchased from the CA by Geoinvestigate) are provided in Appendix 7. The enlarged plan shows the Day Hole/adit entry through the boundary wall at the north end of the site, connecting with a network of development mining tunnels within the Whinmoor coal seam, while the RED area shows total extraction mining (which removed coal seam left between the tunnels and ultimately removed the tunnels themselves) causing the roof - presumably in sandstone - everywhere in the RED area, to collapse on to the mine floor. Collapse is likely to have occurred soon after mining.

The BLANK area beneath the Mill building (and its yard in the north-east corner of the site between the dashed coal outcrop line and the RED worked area) is assumed to be 'coal pillar' left in place unmined to provide support to the mill. Both reservoirs were however undermined in the 1920s and are assumed to have become unused by this date, while the mill building remained of importance hence it was not undermined. The mine plan indicates the mill is 2/3rds underlain by undisturbed drift/soil and 1/3rd underlain by 'undisturbed' coal pillar. However, the pillar may have been subsequently robbed post mine closure in 1924 perhaps by local miners who originally may have worked at the Blue Slate Colliery and knew where the coal pillar lay entering the new pillar workings by unblocking the original Day Hole.

The area to the north of the outcrop line is in drift/soil, indicating that several metres length of the Day Hole tunnel entrance was excavated in soil before this tunnel continues southward in rock. The Day Hole tunnel and the tunnel network in the coal seam are about 1.6 to 1.8m wide. In Geoinvestigate's opinion the Day Hole tunnel in its soil section is likely to have been supported with timber and may have remained open while the connecting tunnels, in rock (in the RED mined area) are expected to have collapsed on the completion of mining in 1924.

The Whinmoor Coal 'Section' (bottom left corner of the mine plan) shows a 6.5 foot/1.98m thick horizon comprising three separate layers of coal in this seam.

Although the CA report identifies workings at 3m depth, the recent drilling investigation is considered to have encountered the floor of the mine workings at 6m to 8m depth in the middle part of the site. This difference in in working depth is perhaps explained by the original slope surface, prior to infilling and platform construction, perhaps being some 3m to 4m lower than it is today.

No obvious visible surface evidence was seen within the site of mining subsidence caused by the extensive removal of 2m thickness of Whinmoor Coal seam within very shallow depth i.e., < 10m. There is, however, possible evidence of subsidence of the stone wall on the far side of Rowgate Road opposite the main site entrance as shown in Appendix 8. If subsidence has occurred here, it is perhaps due to illicit mining as the mine plan suggests this surface feature occurs above BLANK coal pillar. However, this is speculation.

There is a problem with the 1924 survey heights shown on the mine plan which, in Geoinvestigate's opinion, should be around 10 feet lower reducing the Day Hole entrance from 781.1 feet OD/238.1m to 235m to better correspond with the recently surveyed top of the north boundary wall at around 234.5m aOD or so. However, the plans dip of 8 degrees is correct. The error is of little significance and does not detract from the high quality of the 1924 survey plan.

The feint outline of the 'L' shaped footprint of the new house is shown on the 4th mining plan in Appendix 7. This pre-drilling information shows the house straddling mined/collapsed ground and unmined coal pillar and the northern end of the building underlain by the Day Hole entrance in collapsed bedrock strata rather than drift/soil which occurs on the north side of the dashed/approximate outcrop line. The main parking area and part of the driveway are over coal pillar.

The pre-drilling plan indicates the new house is underlain by mined and unmined bedrock rock whereas drilling has subsequently indicated that the far north end underlain by deep drift because the coal sub crop lies several metres further south than shown on the plan assuming the borehole positions are accurate.

Acquisition of the mining abandonment plans has been vital in targeting the recent drilling works to investigate of areas of suspected mine working collapse, remnant coal pillar and the Day Hole/adit entrance.

6. Day Hole Entrance

Using garden shears and a lopper to remove heavily overgrown vegetation at the foot of the north bank, Geoinvestigate uncovered the 'Day Hole' entrance some 21m along the stone boundary wall from the nearside of the pavement on Rowgate/Heator Road. Images of the Day Hole are provided in Appendix 9. The hole was made through old stone wall and is today blocked with a pile of boulders. The entrance is 1.80m wide.

Looking from the slope above the Day Hole entrance, its alignment was traced into the site allowing nearby borehole RH8 to be targeted with reasonable confidence to intercept this tunnel below the northeast corner of the new building. In this respect, the white safety helmet shown in amongst bushes (including Japanese Knotweed) shows the location of the tunnel entrance at the foot of the north bank.

7. Drilling Investigation and Ground Conditions Encountered

A drilling investigation was carried out at the site on the 20 & 23 June 2023 to provide further information on the coal mining geology below the new building. The investigation comprised the following components:

- Obtain CA drill permit.
- Sinking of 2 Microdrill® holes RH1 & RH2 each to 40m depth on 20 June 2023.
- Inspection of the site and setting out of the building footprint and the Day Hole alignment by Ross Nicolson on 22nd and again on 23rd June 2023.
- 8 additional Microdrill® holes (RH3 – RH10) sunk to depths of 10 and 11m on 23 June 2023.
- Further geotechnical site inspection and search for the Day Hole entrance on 23 June 2023.

The setting out the building footprint was made difficult by the absence of recognisable surface features within the site, but in our opinion was achieved with reasonable accuracy using the intersection of the south boundary wall with a neighbouring old fence line shown on OS maps.

The boreholes were rapidly driven to depth using Geoinvestigate's proprietary, safe, environmentally friendly high-speed, water flush Microdrilling® system with supervision and logging carried out by an experienced competent Geotechnician driller with an experienced mining specialist also in attendance on 2 of the 3 site days.

Microdrill's small volume water injection system offers a safer method of investigating coal mine workings minimising the risk of combustion or explosion of coal and mine gases and the migration of large volumes of hazardous gases into nearby buildings.

Gas monitoring was carried out during drilling measuring concentrations of oxygen (O_2) and potentially toxic and explosive levels of carbon dioxide (CO_2), methane (CH_4) & carbon monoxide (CO) in the ground. No hazardous gases were noted during this short-term monitoring exercise.

CA drill permit 26793 is provided in Appendix 10. Originally it was intended to drill a line of 10 or more closely spaced probe holes to locate the Day Hole tunnel (along the northern boundary) however instead only one hole was required to locate this feature, as subsequently the entrance was located close to the new building. It is Geoinvestigate's opinion that the revised drilling layout of 2 x 40m deep holes and 8 x 10/11m holes is broadly in line with the scope of the original permit.

Site drilling images are provided in Appendix 11.

Borehole plans and borehole logs are provided in Appendix 12. The ground conditions encountered in the boreholes (as described by the driller) are shown on the borehole logs.

The YELLOW excavation limits and depths shown on the second plan are approximate - based on discussions with Chris Hitchens and his recollections. In this respect it is understood that there are no plans showing previous excavation and infilling activity within the site. Google Satellite images in Appendix 1 provide some indication of the surface disturbance which has occurred in recent years.

The condition of the ground regarding strength and rock type was assessed by an experienced driller Andrew Witham of Geoinvestigate using variation in drilling progress, drilling flush pressure, "feel", and the nature of the arisings (drill debris) returned to surface in the water flush and whether the flush itself was returned. No rock core samples were recovered from the boreholes/probe holes.

The primary purpose of the probe holes in this investigation was to identify variations in rock strength and rock type and to highlight possible geotechnical hazards such as voids or broken/weak strata indicative of mine working disturbance and/or upward void migration. Probing is also used to identify the change from drift/soil to competent rockhead though this change may not be recognised if the bedrock is very weak.

Drill flush was quickly lost within the upper 2m or 3m of each of the drill holes, either in the drift horizon or in what is presumed to be fractured sandstone strata below it (either collapsed by mine working and highly disturbed or collapsed and less disturbed). While the identification of coal seam becomes more difficult without the return of 'black/coaly' water flush to the surface its recognition is with experience achievable using Microdrills® water and drill pressure gauges as indicators.

As no samples were recovered from the boreholes little is known about the several metres depth of made ground and natural soils covering the site other than the surface condition of the most recent fill materials.

Two natural scale conceptual ground hazard models/cross-sections are shown in Appendix 13 looking East and West through the middle of the site along line A-B which passes through the Day Hole entrance and steeper north slope. The models are based on Chris Hitchens anecdotal recollections on recent excavation activity within the property, the mining abandonment plan, geotechnical site inspection and the results of limited probe drilling without sample recovery. Consequently, particularly with respect to the latter, additional intrusive ground investigation is likely to be required to confirm the model, particularly with respect to reliably establishing soil/bedrock depth and to check for the presence of ground contamination within the overlying made ground deposits.

The sections assume that coal pillar should be found under the northeast corner of the site as inferred (but not expressly stated) in the mining plan and that total extraction of the Whinmoor Coal has occurred in the RED area shown on the plan causing roof collapse everywhere above the mine floor.

In several holes (BHs 7, 6, 9, 2 & 1) drilling located rockhead corresponding with the floor of the mine workings increasing from 6m to 8m depth from north to south across the site or falling from 232m to 230.5m aOD in this direction giving an apparent dip of 6 degrees SSW in section line with the true dip of 8 degrees due South as shown on the mine plan. As the drilling of these holes did not recognise the top of the subsided rock strata, expected to occur above the mine floor as 'rockhead' Geoinvestigate has described this zone as 'Broken' to the mine floor, in comparison to holes BH5 and BH10, which identified drilling rockhead several metres higher (around 235m aOD) - suggesting that the 'Collapsed Rock' here is more competent hence it is described as such rather than 'Broken'.

Though BH5 and BH10 passed through the mine floor at 230m and 229m aOD respectively, drilling did not identify this horizon nor recognise mining disturbance above it, suggesting that the roof strata here may have subsided onto the floor largely intact. This, however, is speculation.

It is considered that the poorer condition of the rock described as 'BROKEN' may be due to its mining collapse, its shallower depth, weathering and/or the effect of disturbance caused by the movement of heavy construction plant across the base of the previous deep excavations here. It is also considered that recent deep excavation and plant movement could have caved the drift section of Day Hole tunnel north of the coal outcrop - assuming its presumed timber support had not deteriorated and collapsed earlier.

While Geoinvestigate doubts the survey levels on the mine plan, with respect to their accuracy to Ordnance Datum, the height difference between the Day Hole and the south mining limit of 15 feet/4.57m is reliable, as is dip of 8 degrees.

The models suggest that the outcrop line of the Whinmoor Coal lies at, or very close to, BH8 rather than as shown on the mine plan several metres north. BH8 records rockhead at 8.5m depth the drift horizon above this comprising 'very weak' material interpreted by Geoinvestigate as recent fill and caved tunnel deposit underlain by weak natural drift before bedrock is reached.

The driller identified BH8 on the line of the Day Hole tunnel as exhibiting much weaker ground conditions than elsewhere on the site, though no tunnel void was encountered, suggesting this structure has collapsed.

No coal or mine voids/cavities were encountered in 7 of the 10 holes located within the RED worked out area of the mine plan. This corresponds with Geoinvestigate's expectation of complete collapse of the mine roof strata and tunnels resulting from total coal seam extraction.

The mine plan suggests undisturbed soil and coal pillar was left under the old mill building and its yard to protect this property from mining subsidence, though there is no reference on the mine plan to a coal pillar reserve at this location. The two mill reservoirs were, however, undermined possibly because they were no longer in use by 1922, the coal was more valuable and furthermore perhaps this mining activity may have dried-up the hillside spring which originally supplied the mill ponds. This however is speculation/

Based on the 1924 abandonment plan the COAL PILLAR presumed left below the mill and its yard was expected to comprise unmined coal seam. However, this does not seem to be the case as holes BH3 and BH4 in the pillar perhaps indicate partial extraction/robbing of the seam perhaps in the upper one or two layers shown in the coal section provided in Appendix 7. Whether the total extraction of the seam in BH9 is due to its closeness to a tunnel or subsequent pillar robbing is uncertain. Whether remnant coal is present in BH3 and BH4 above the bottom of the seam/mine floor, is unknown as there was no drill water return, and owing to the complexity of the ground conditions, the driller could not distinguish coal in this instance from dial pressure and water readings.

Based on the conditions found in BH3 and BH4 together with Chris Hitchens' account of his discussions with a local "old timer", it is assumed that the coal pillar has been extensively robbed by ad-hoc uncontrolled mining activity post mine closure from 1924 to 1945. Illegal mining may also have extended under Rowgate/ Heator Lane east of the site, perhaps explaining the subsidence of the wall here as shown in Appendix 8. The locals (some perhaps former miners at Blue Slate Colliery/Mill) could have known where coal was to be found in the abandoned pillar. This later period of working would perhaps have been more haphazard, possibly using smaller tunnels, so were anything to remain of the pillar today, it might be honeycombed with smaller openings - though recent deep excavation and heavy plant movement in this area may have led to the general collapse of mine voids within it. The latter is possibly evidenced by the presence of mining disturbance rather than voids/cavities in boreholes 3 and 4, in the pillar.

While the drilling of further holes in the pillar may provide a clearer picture of its condition, this information is considered unlikely to significantly affect the outcome of this drilling report, either with respect to consideration of the current planning application, or to mine working remediation – which, in our opinion are both viable based on the information obtained so far. Additional ground investigation to include gas monitoring and contamination testing would be required only to assist in the final design phase and soil/excavation waste classification for disposal or reuse within the site.

The ground models show excavation to 3.5m to 4m depth, to install the undercroft of the new L shaped building (annotated H1, H2 & H3 on the sections) to be underlain by thin infill giving way southward to several metres of natural drift at H3, in turn underlain by collapsed broken and less broken bedrock at H2. The weakest and most variable ground being present between H2 and H1, where the north end of the building straddles haphazard coal pillar working/robbing, totally collapsed historical mine working, and very weak deep drift/soil, including caved Day Hole
tunnel and recently placed unconsolidated additional slope/bank infill above the tunnel.

8. Ground & Mine Working Stability Mitigation

In summary the ground conditions are complex beneath the proposed footprint position of the house including very weak soil, weaker and stronger collapsed bedrock, remnant coal and unpredictable very shallow workings in coal pillar and more recent deep infill of unknown composition.

Based on the results of the investigation, it is considered that the **poorest and most unpredictable ground conditions occur between H2 and H1 - the latter approaching the crest of the north bank/slope** including underlying collapsed and loosened soil section of Day Hole tunnel and the abrupt change from founding on bedrock to soil. However, as the north end of the building could be supported on pile foundations this localised problem would not in Geoinvestigate's opinion warrant planning refusal though it makes for more complex and expensive foundation design.

The remainder and larger portion of the building footprint is underlain by worked/robbed coal pillar and variably fractured/disturbed collapsed sandstone strata. Both pillar and collapsed workings would require further mitigation to remove the risk of mining subsidence arising from the collapse of possible remnant mining cavities and consolidation of collapsed/broken ground though the later seems unlikely as the site has been subject to heavy plant trafficking and there will be benefit from the removal of 3.50m to 4.00m of surcharge/preload in the building footprint area to install the undercroft.

Mitigation measures for consideration include ground improvement by craned/high fall/high energy **dynamic compaction**, reduced energy **rapid impact compaction (RIC)** to both to proof test and collapse voids, **bulk excavation, and replacement** both to remove residual pillar coal and workings within it as well as removing collapsed/broken ground down to mine floor level or lastly treatment of the pillar and collapsed strata by **drilling and injection grouting + adoption of reinforced foundations**.

In Geoinvestigate's opinion, given the proximity of the Rowgate Road, a nearby ancient landslip and a nearby neighbour, high energy dynamic compaction is unlikely to be acceptable in this instance, though perhaps RIC might be, leaving excavation or grouting or a combination of both with perhaps the latter most suited to treat and stabilise a large area including building, car park and access road into the site and excavation best suited to remedying the building footprint particularly if a 2nd below ground level floor were to be added further enhancing the value of this bespoke luxury housing development.

9. Conclusions & Recommendations

Ground stability mitigation is required both beneath the building footprint, the carpark and access road owing to the presence of several metres of infilled ground, underlain by several metres of mining disturbed/collapsed bedrock strata and suspected residual coal pillar working, with mining disturbance extending to depths of 6m to 8.5m below existing site level.

As the installation of the below ground level section of the building to a depth of 3.50m or 4.00m will mostly remove the drift/soil/made ground horizon, mitigation is required only of the mining disturbed bedrock horizon below the building's footprint. In Geoinvestigate's opinion mitigation of the building footprint could be achieved by excavation and replacement or drilling and grouting + special foundation design while grouting may be suitable approaching the main road to avoid instability arising from deep excavation here.

If a second below ground level floor level was added to the building excavation would almost entirely remove the mine working problem and grouting would no longer be appropriate within the building footprint and its margins.

While further ground investigation may provide a clearer picture of the conceptual site model it is considered unlikely to significantly affect the outcome of the current drilling report with respect to **mine working mitigation and consideration of the current planning application which in our opinion are both viable regarding coal mining legacy issues based on the information obtained so far**. Additional ground investigation including gas and ground water monitoring and contamination testing is required only to assist in the final design phase and the classification of excavated waste/soil for disposal or reuse within the site.

In conclusion, it is Geoinvestigate's opinion this drilling report adequately identifies the coal mining legacy hazards impacting this site as well as outlining the appropriate ground stability mitigation measures needed to make the proposed housing development safe.

While additional intrusive site investigation, site monitoring and chemical soil analysis are required to establish the ground water, ground gas and contamination regimes at the property to enable final design, there is no reason why planning permission should not in the interim be granted with respect to coal mining legacy issues, conditional upon further routine SI work being carried out at a future date but prior to commencement of development including the initial groundworks phase.

In Geoinvestigate's opinion, as there is no mine shaft stability hazard at this site and the ground and mining stability problems identified in this report can be remedied by routine engineering solutions there is no reason to why planning permission should not be granted for the current scheme regarding coal mining legacy issues.

END OF REPORT

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APPENDIX 1

Site Images

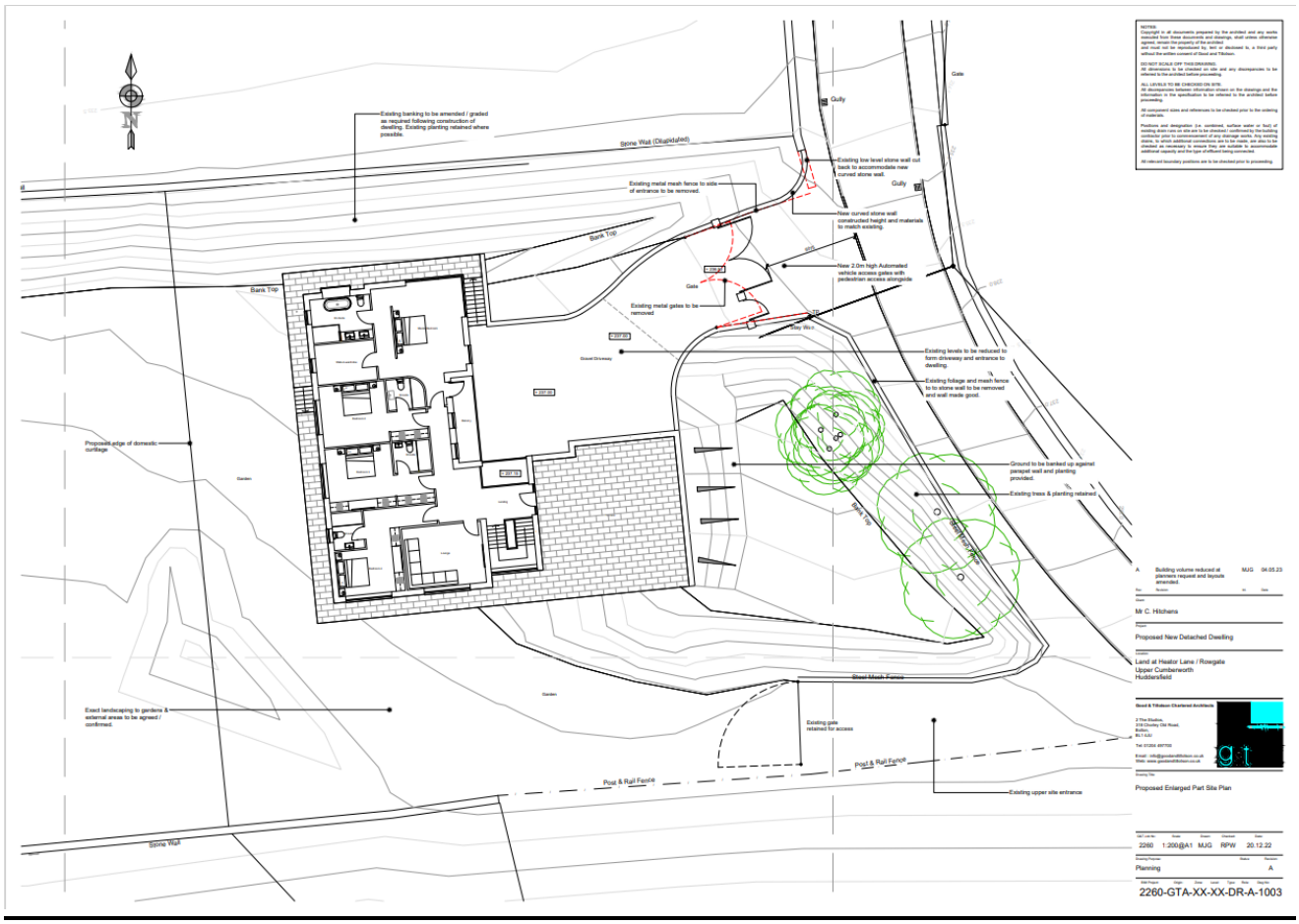

A635
Rowgate


Rowgate
Public Footpath


Rowgate
Public Footpath

APPENDIX 2

Development Layout & Design



3D Entrance High Level
1 : 1

A Building volume reduced at planners request and layouts amended MJG 03.05.23

Proposed New Detached Dwelling

Land at Heator Lane / Rowgate
Upper Cumberworth
Huddersfield

Mr C. Hitchens

Good & Tillotson Chartered Architects
2 The Studios,
318 Chorley Old Road,
Bolton.
BL1 4JJ
Tel: 01204 497700
Email : info@goodandtillotson.co.uk
Web: www.goodandtillotson.co.uk

Proposed 3D / Isometric Images
Sheet 1

Ref/Job No.	Scale	Drawn	Checked	Date
2260	1:50@A1 1:100@A3	MJG	RPW	20.12.22

Drawing Purpose: Planning — Status: A — Revision: A

BIM Project | Origin | Zone | Level | Type | Role | Drawing No.
2260-GTA-XX-XX-DR-A-1009

Proposed East Elevation
1 : 50

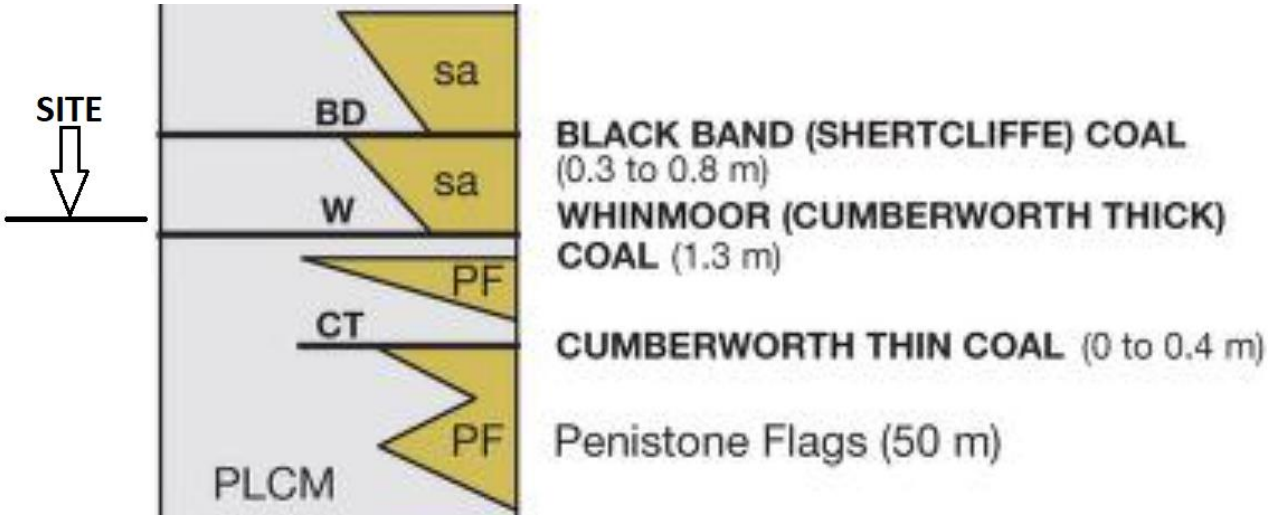
APPENDIX 3

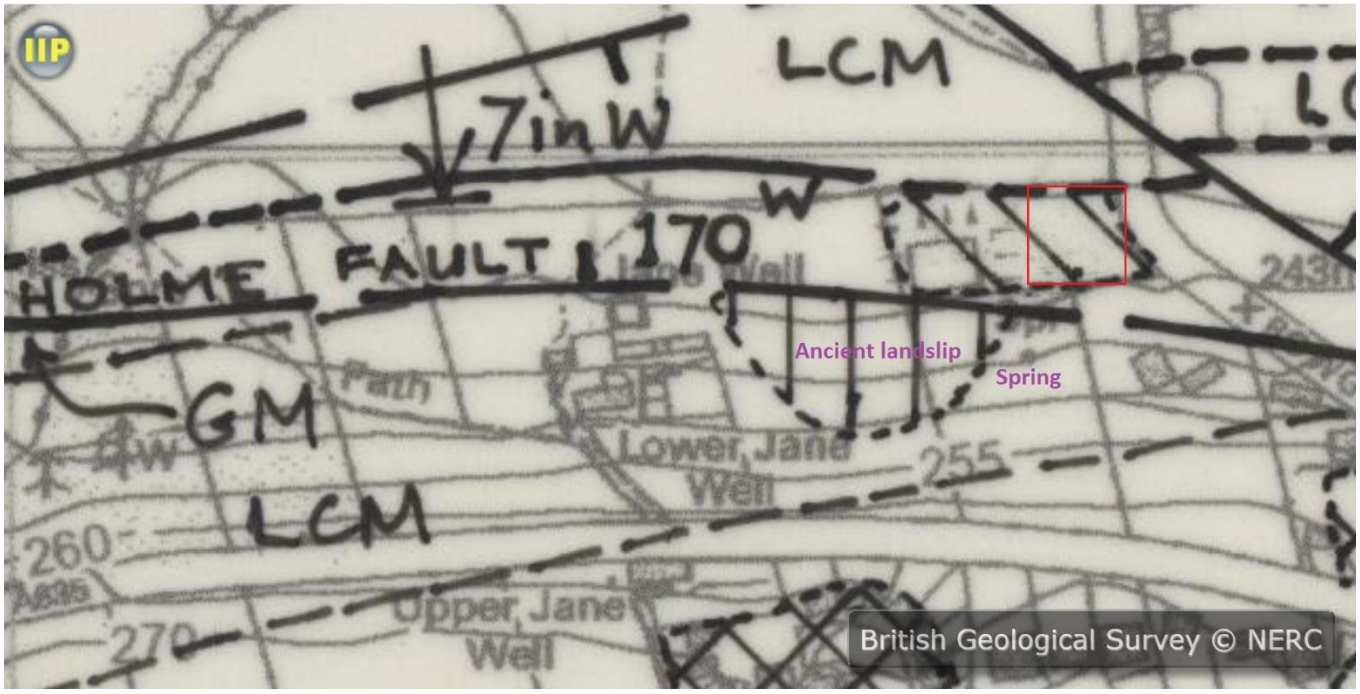
Historical OS Map Overlay


409000
408950
420400
420450
N
610
916
609
128
0 10 20 m

APPENDIX 4
Spring Water Inlet?

APPENDIX 5
BGS Geology Maps

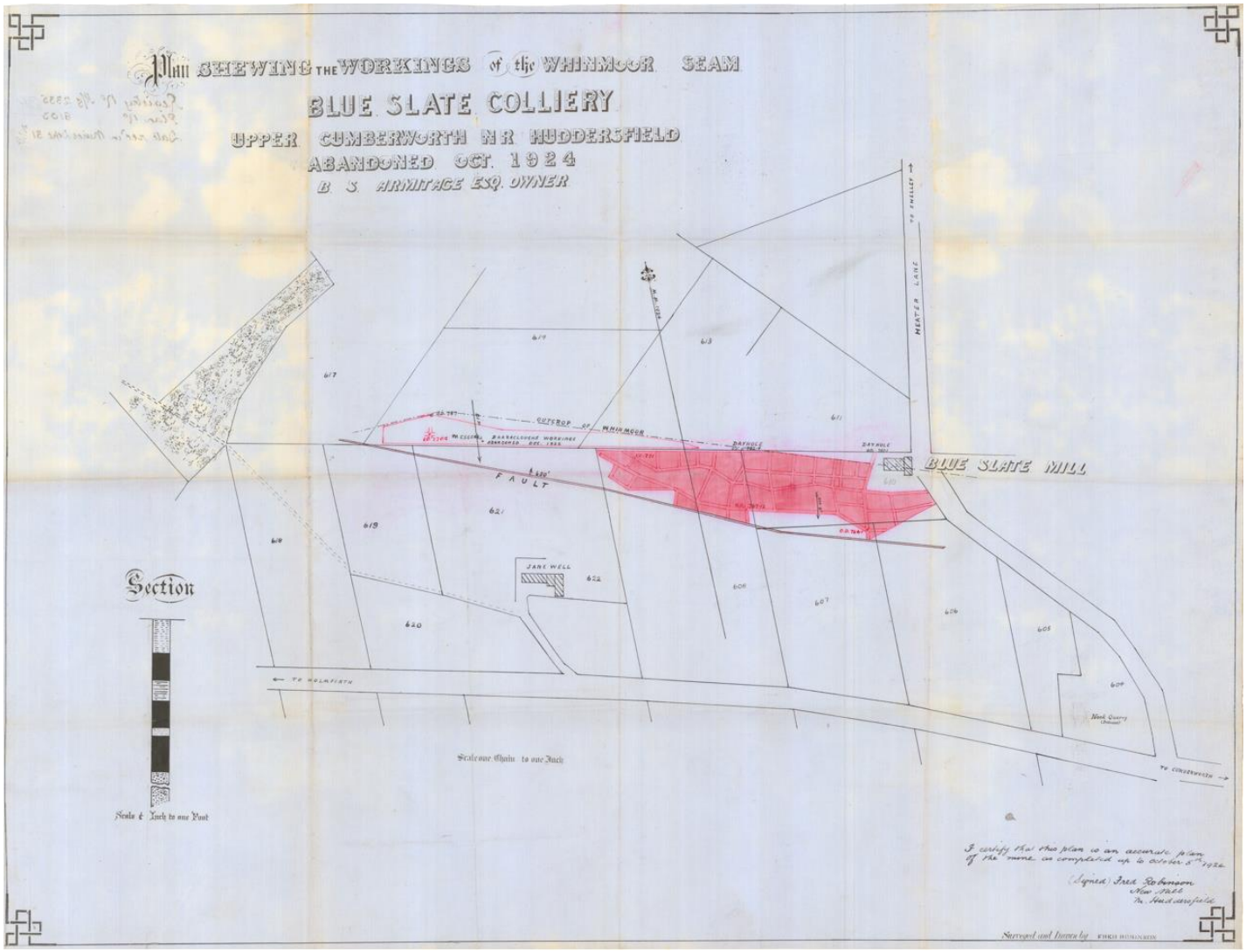


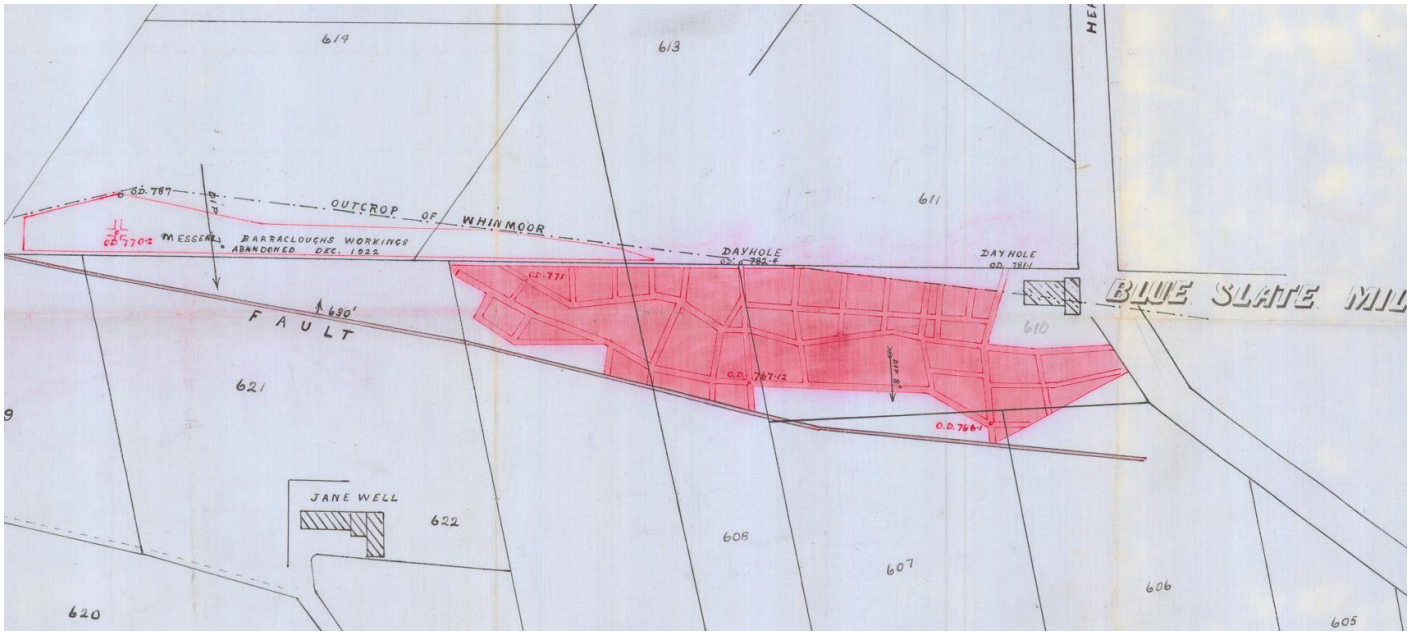

LCM
7inW
HOLME
FAULT
170
W
Ancient landslip
Spring
GM
Path
Lower Jane Well
255
LCM
260
Upper Jane Well
270
British Geological Survey © NERC

APPENDIX 6

West Landslip Feature

APPENDIX 7
Mining Abandonment Plan




619
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611
610
621
622
608
607
606
605
620
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DAYHOLE
DAYHOLE
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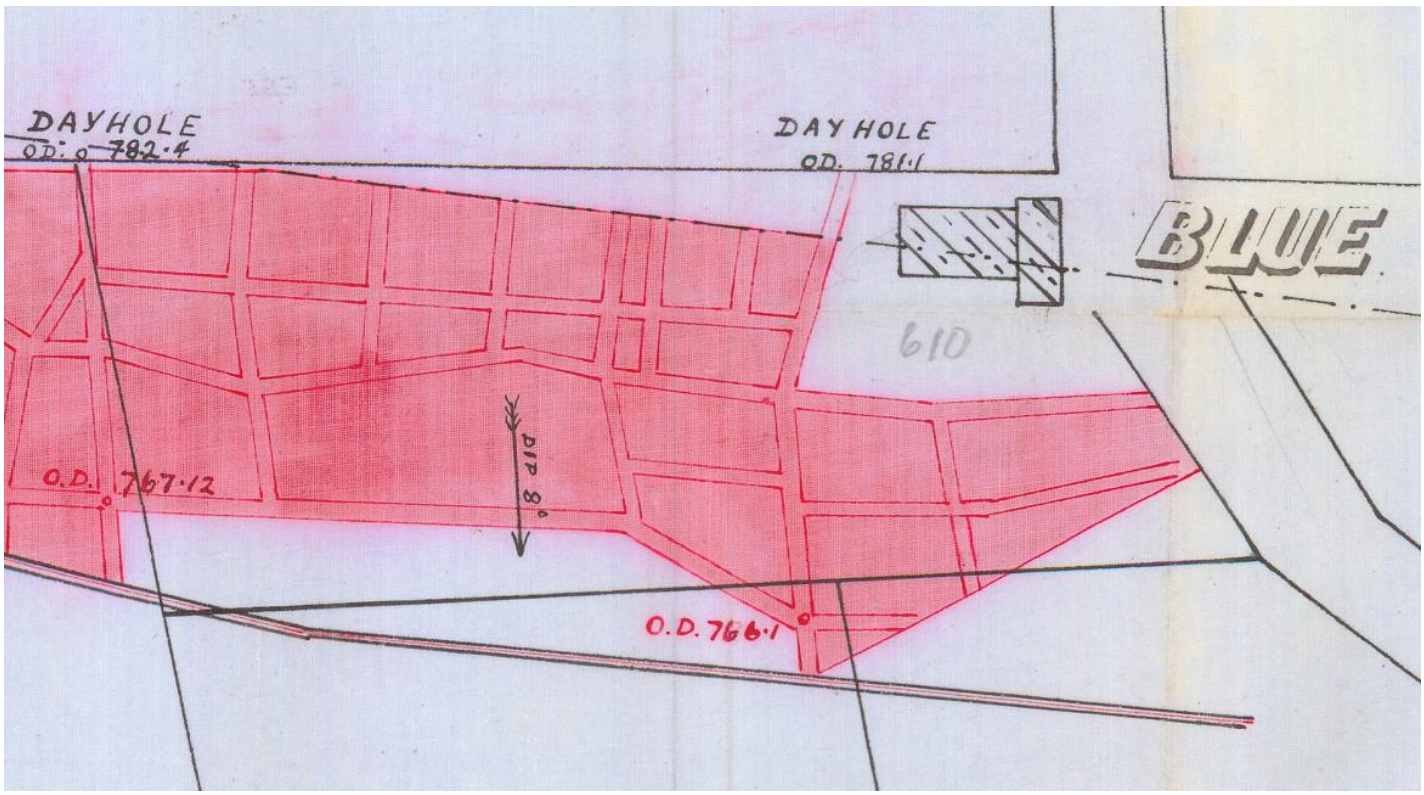
FAULT
JANE WELL
O.D. 767·12
O.D. 766·1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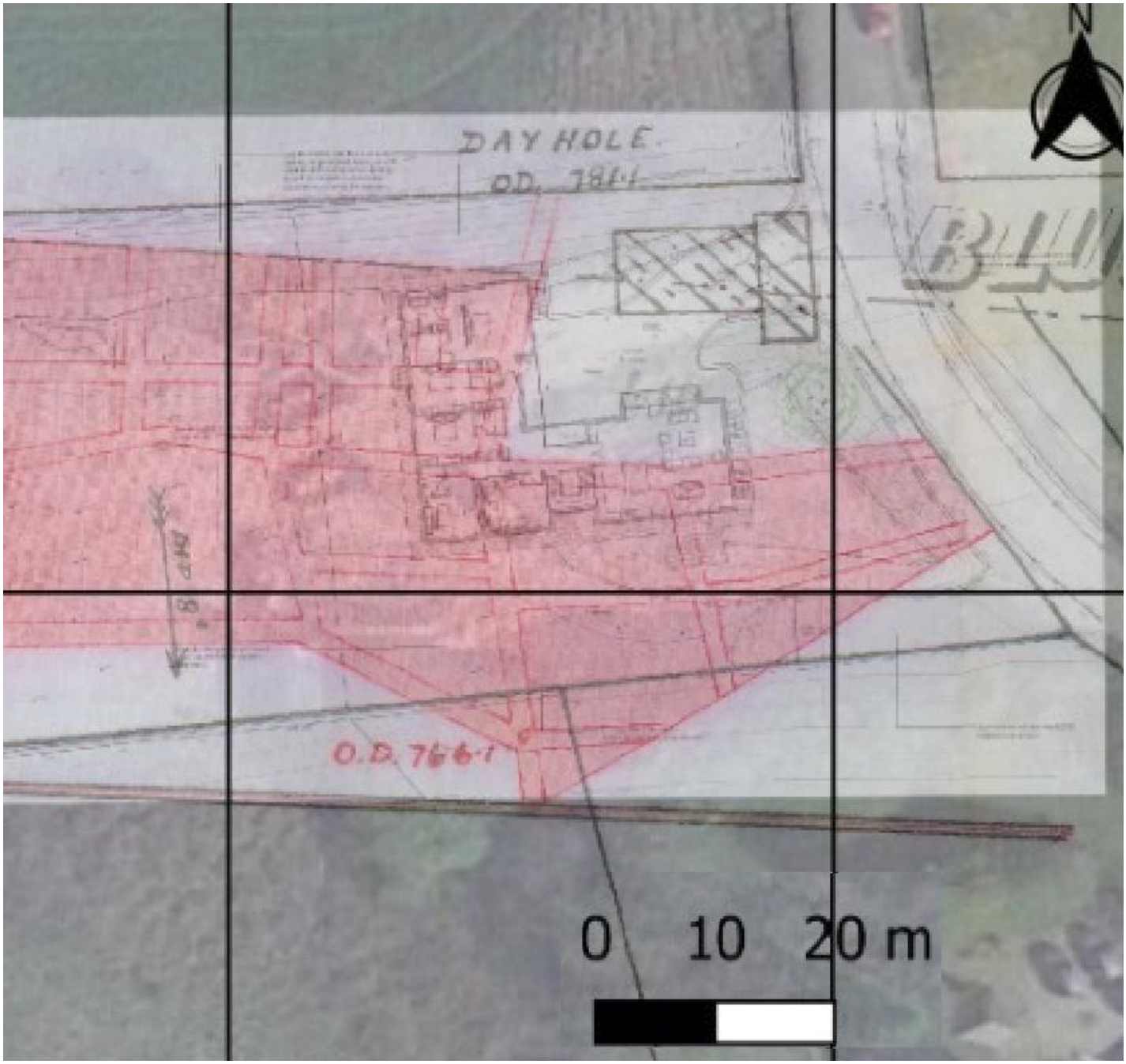
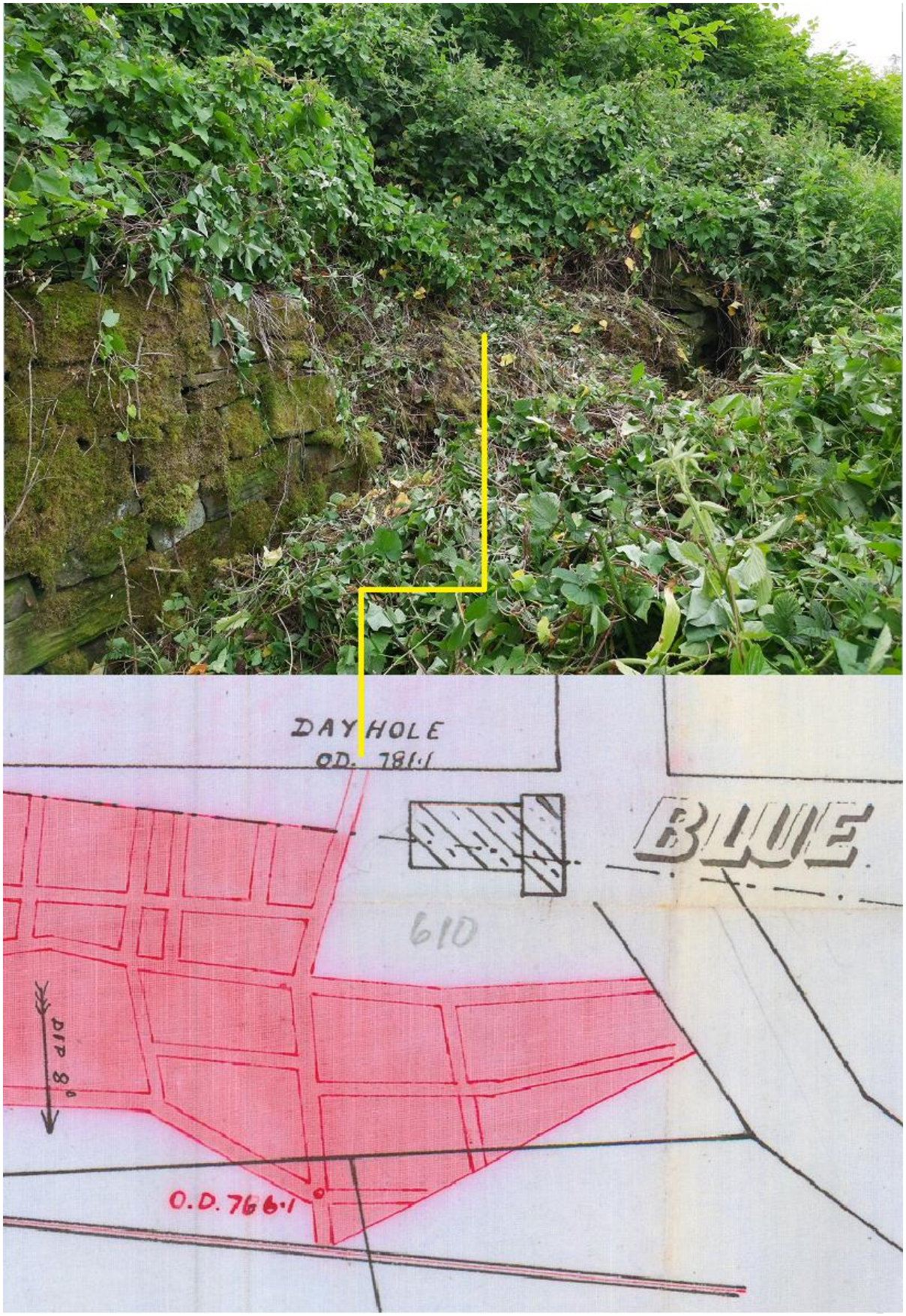

DAY HOLE
O.D. 784
O.D. 766
N
0 10 20 m

APPENDIX 8
Nearby Mining Subsidence?

APPENDIX 9

Day Hole Entrance


DAY HOLE
O.D. 781·1
BLUE
610
DIP 8°
O.D. 766·1

APPENDIX 10

Drill Permit

The Coal Authority

Permit to Enter or Disturb Coal Authority Interests

Permit 26793

Name and Address of Permit Holder:

C G Hitchens
Birdsnest Farm
Birdsnest Lane
Upper Cumberworth

HD8 8YF

Site Location:

Land at
Heator Lane
Cumberworth
Huddersfield

HD8 8XH

This certificate hereby grants the above named Permit Holder a Permit to carry out:-

Ground investigation by three boreholes to 30m, investigation of one mine entry by probe drilling within the Authority's interests at the identified site location above as shown on the Grant Permit Boundary (overleaf) for the period of **12 months** from the granted date shown below. *The granting of this Permit does not constitute advice given by the Authority in relation to the proposed operations. It is the Permit Holder's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.*

Conditions:

- *Manned entry (i.e.) into mine entries/workings) is strictly prohibited.*
- *Water flush*
- *Gas Monitoring CO, CH_4, CO_2, O_2, H_2S at borehole and rig*
- *Operators undertaking the work must be in possession of this certificate and the Permit boundary plan at the time of works*
- *Appropriate borehole sealing without delay and to withstand site level changes*

Signed: _____ Granted Date: ***06/06/2023***

For and on behalf of The Coal Authority

Nominated Representative: Jake Morris, Permitting Manager;
The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG
Tel: 01623 637450; E-Mail: permissions@coal.gov.uk

The Coal Authority

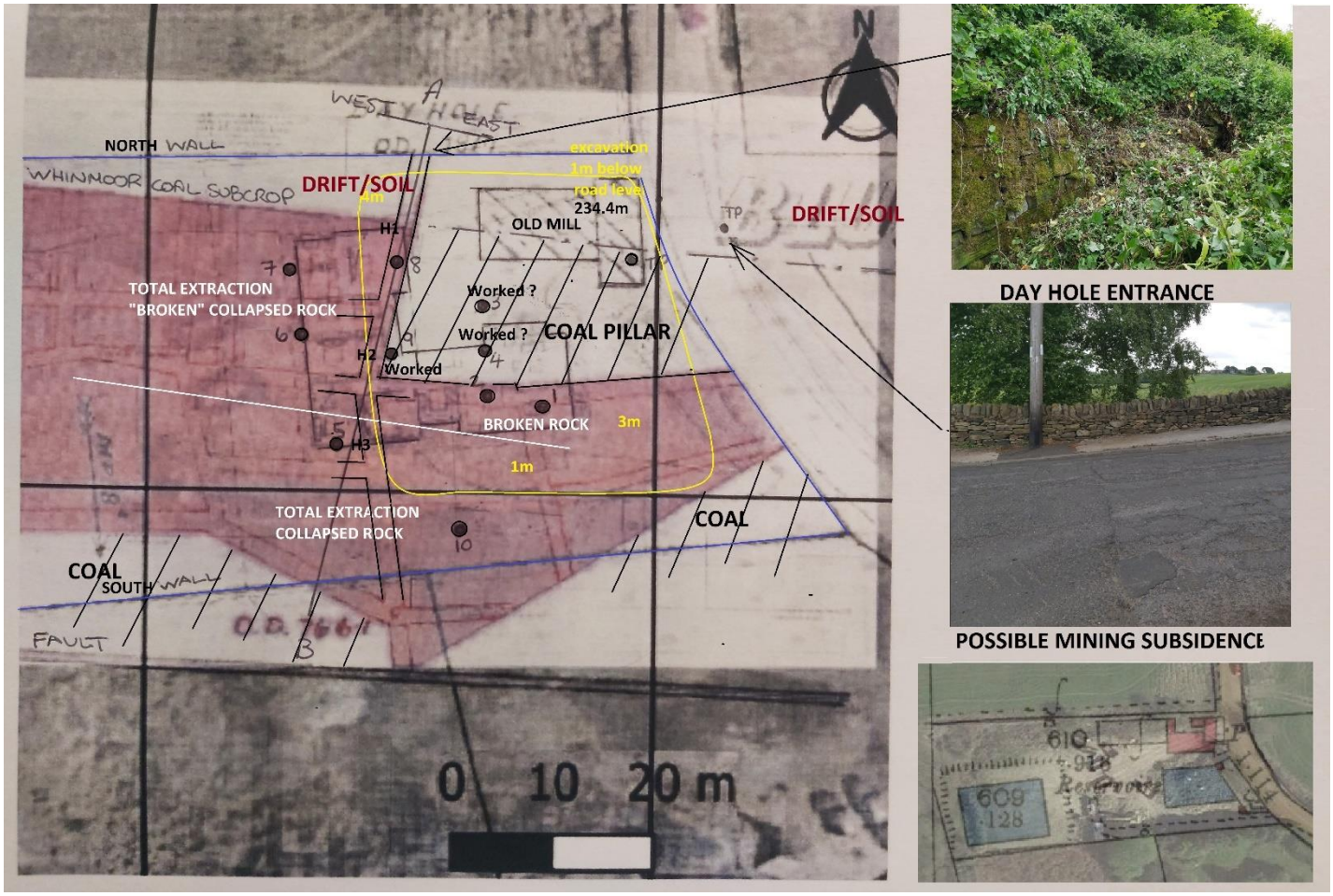
Granted Permit Boundary

Permit Ref: 26793

Permit Boundary:

APPENDIX 11
Drilling Photos

APPENDIX 12
Borehole Plans & Logs


NORTH WALL
WHINMOOR COAL SUBCROP
DRIFT/SOIL
4m
excavation
1m below
road level
234.4m
OLD MILL
H1
H2
H3
TP
DRIFT/SOIL
TOTAL EXTRACTION
"BROKEN" COLLAPSED ROCK
Worked ?
Worked ?
COAL PILLAR
Worked
BROKEN ROCK
3m
1m
TOTAL EXTRACTION
COLLAPSED ROCK
COAL
COAL
SOUTH WALL
FAULT
0 10 20 m
DAY HOLE ENTRANCE
POSSIBLE MINING SUBSIDENCE

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.1** **Sheet No. 1 of 2**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 20/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	Brown DRIFT								
							Flush lost at 3.00m		2.50
		8400							5.00
									7.50
8.40									
	SANDSTONE.								10.00
									12.50
	>Occasional MUDSTONE inclusions from 12.80m to 16.90m								15.00
		31600							17.50
									20.00
									22.50
	Rotary hole continued on page 2								25.00

Remarks: Casing to 2.00m
Microdrill rotary open hole borehole to 40m
No cores recovered from borehole
No gas detected from borehole on completion
Flush lost at 3.00m. No voids encountered.

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH1

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.1** **Sheet No. 2 of 2**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 20/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	SANDSTONE.								27.50
									30.00
		31600							32.50
									35.00
									37.50
40.0									40.00
	Rotary hole terminated at 40.00m								

Remarks: Casing to 3.00m
Microdrill rotary open hole borehole to 40m
No cores recovered from borehole
No gas detected from borehole on completion
Flush lost at 3.00m. No voids encountered.

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH1

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.2** **Sheet No. 1 of 2**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 20/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	Brown DRIFT.	8200					Flush lost at 2.50m		2.50 5.00 7.50
8.20	SANDSTONE. >Occasional MUDSTONE inclusions from 13.00m to 15.00m	31800							10.00 12.50 15.00 17.50 20.00 22.50
	Rotary hole continued on page 2								25.00

Remarks: Casing to 2.00m
Microdrill rotary open hole borehole to 40m
No cores recovered from borehole
No gas detected from borehole on completion
Flush lost at 2.50m. No voids encountered.

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH2

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.2** **Sheet No. 2 of 2**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 20/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	SANDSTONE.								27.50
									30.00
		31800							32.50
									35.00
									37.50
40.0									40.00
	Rotary hole terminated at 40.00m								

Remarks: Casing to 2.00m
Microdrill rotary open hole borehole to 40m
No cores recovered from borehole
No gas detected from borehole on completion
Flush lost at 2.50m. No voids encountered.

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH2

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.3** **Sheet No. 1 of 1**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 23/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	DRIFT	5600							2.50
5.60									5.00
	SANDSTONE.	5400							7.50
11.0									10.00
	Rotary hole terminated at 11.00m								11.00

Remarks: No Casing
Microdrill rotary open hole borehole to 11m
No cores recovered from borehole
No gas detected from borehole on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH3

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.4** **Sheet No. 1 of 1**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 23/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	DRIFT.	6900							2.50 5.00
6.90	SANDSTONE.	4100							7.50 10.00
11.0	Rotary hole terminated at 11.00m								11.00

Remarks: No Casing
Microdrill rotary open hole borehole to 11m
No cores recovered from borehole
No gas detected from borehole on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH4

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.5** **Sheet No. 1 of 1**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 23/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	DRIFT.	3800							2.50
3.80	SANDSTONE.	6200							5.00 7.50
10.0	Rotary hole terminated at 10.00m								10.00

Remarks: No Casing
Microdrill rotary open hole borehole to 10m
No cores recovered from borehole
No gas detected from borehole on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH5

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.6** **Sheet No. 1 of 1**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 23/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	DRIFT.	8500							2.50 5.00 7.50
8.50									
	SANDSTONE.	2000							10.00
10.5									10.50
	Rotary hole terminated at 10.50m								

Remarks: No Casing
Microdrill rotary open hole borehole to 10.50m
No cores recovered from borehole
No gas detected from borehole on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH6

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.7** **Sheet No. 1 of 1**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 23/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	DRIFT.	6100							2.50 5.00
6.10	SANDSTONE.	4400							7.50 10.00
10.5	Rotary hole terminated at 10.50m								10.50

Remarks: No Casing
Microdrill rotary open hole borehole to 10m
No cores recovered from borehole
No gas detected from borehole on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH7

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.8** **Sheet No. 1 of 1**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 23/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	Weak DRIFT.	8500							2.50 5.00 7.50
8.50									
10.0	SANDSTONE.	1500							10.00
	Rotary hole terminated at 10.00m								

Remarks: No Casing
Microdrill rotary open hole borehole to 10m
No cores recovered from borehole
No gas detected from borehole on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH8

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.9** **Sheet No. 1 of 1**
Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 23/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	Weak DRIFT.	7600							2.50 5.00
7.60	SANDSTONE.	2400							7.50
10.0	Rotary hole terminated at 10.00m								10.00

Remarks: No Casing
Microdrill rotary open hole borehole to 9m
No cores recovered from borehole
No gas detected from borehole on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

RH9

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G23200 **RH No.10 Sheet No. 1 of 1**

Location: Heator Lane, Cumberworth, Huddersfield HD8 8XH **DATE**: 23/06/23

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
	Weak DRIFT.	4000							2.50
4.00									
	SANDSTONE.	7000							5.00
									7.50
									10.00
11.0									11.00
	Rotary hole terminated at 11.00m								

Remarks: No Casing
Microdrill rotary open hole borehole to 11m
No cores recovered from borehole
No gas detected from borehole on completion

Key:

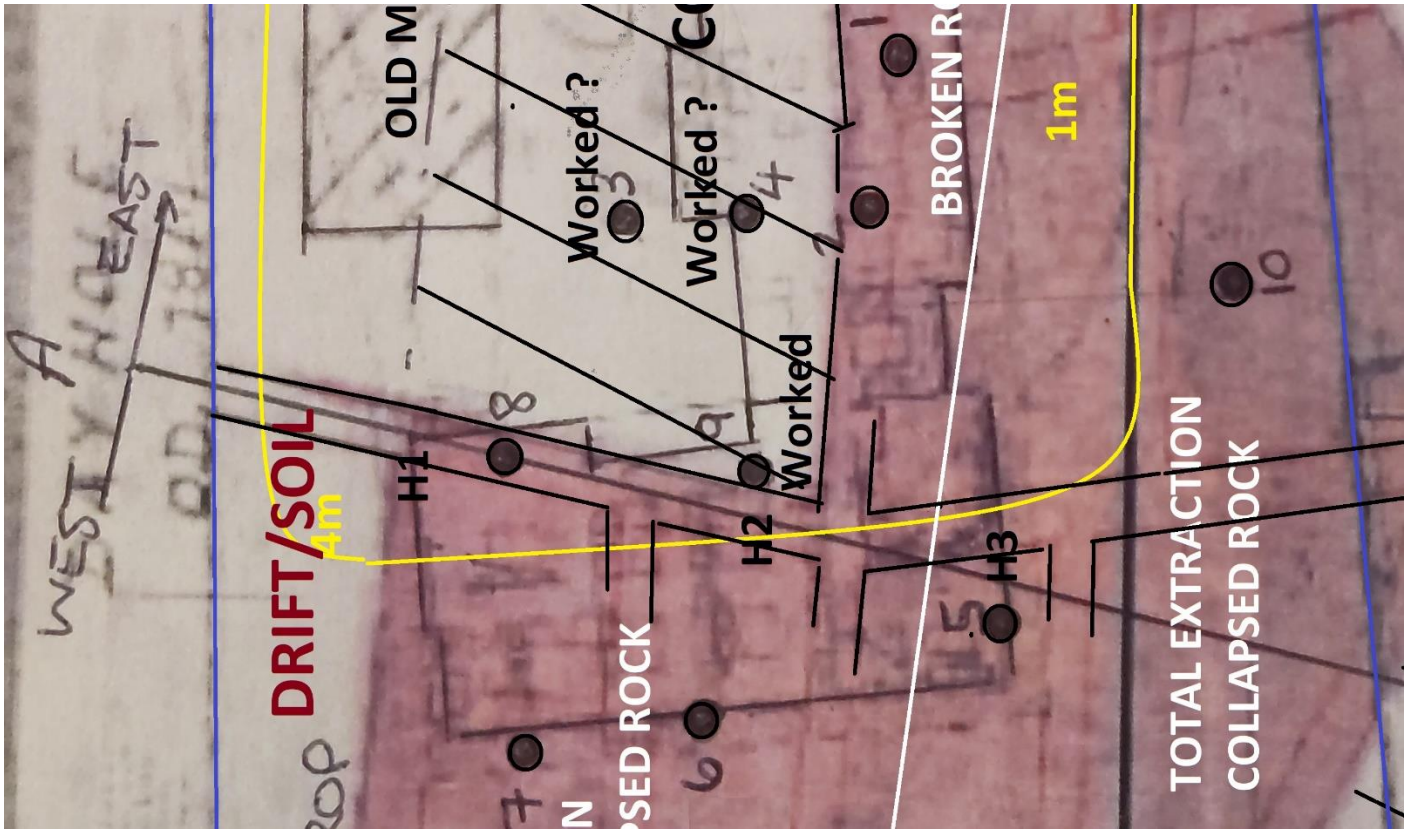
- Slotted Pipe
- Plain Pipe
- Bentonite
- Gravel Filter

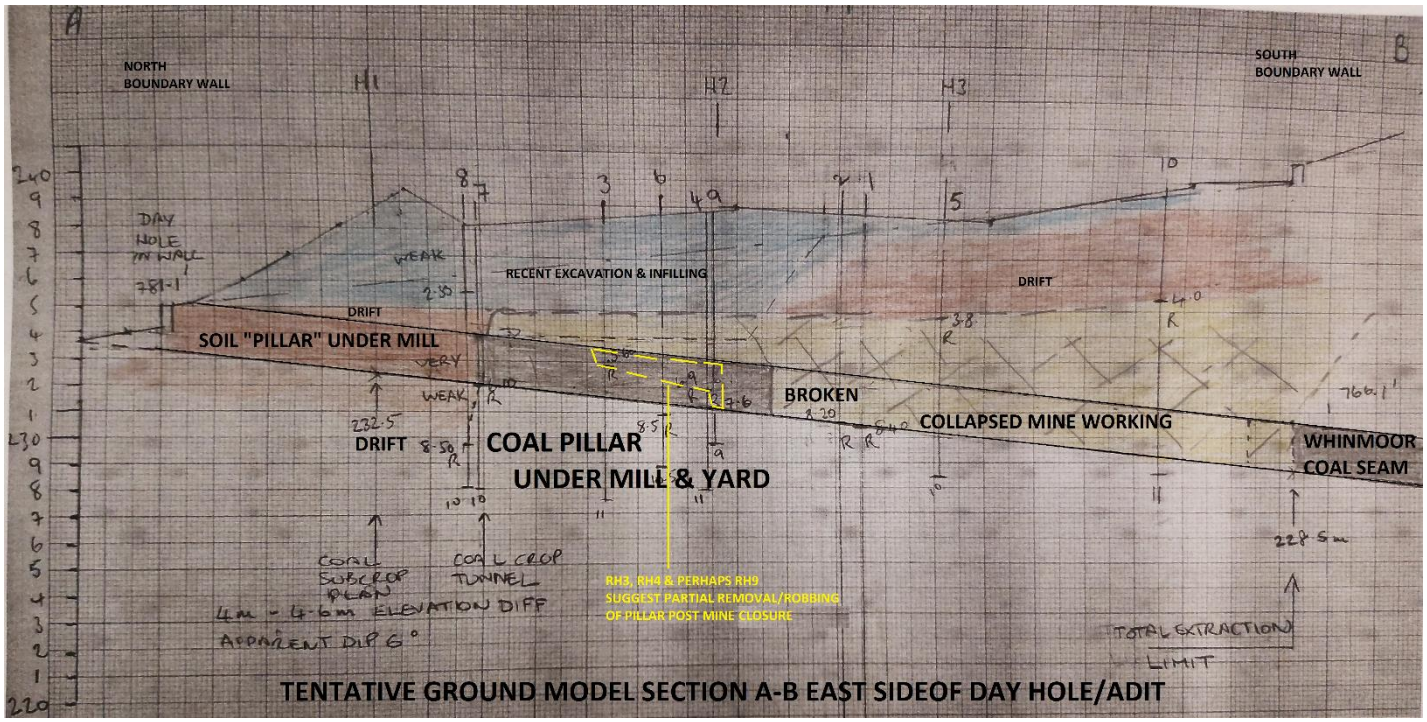
O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

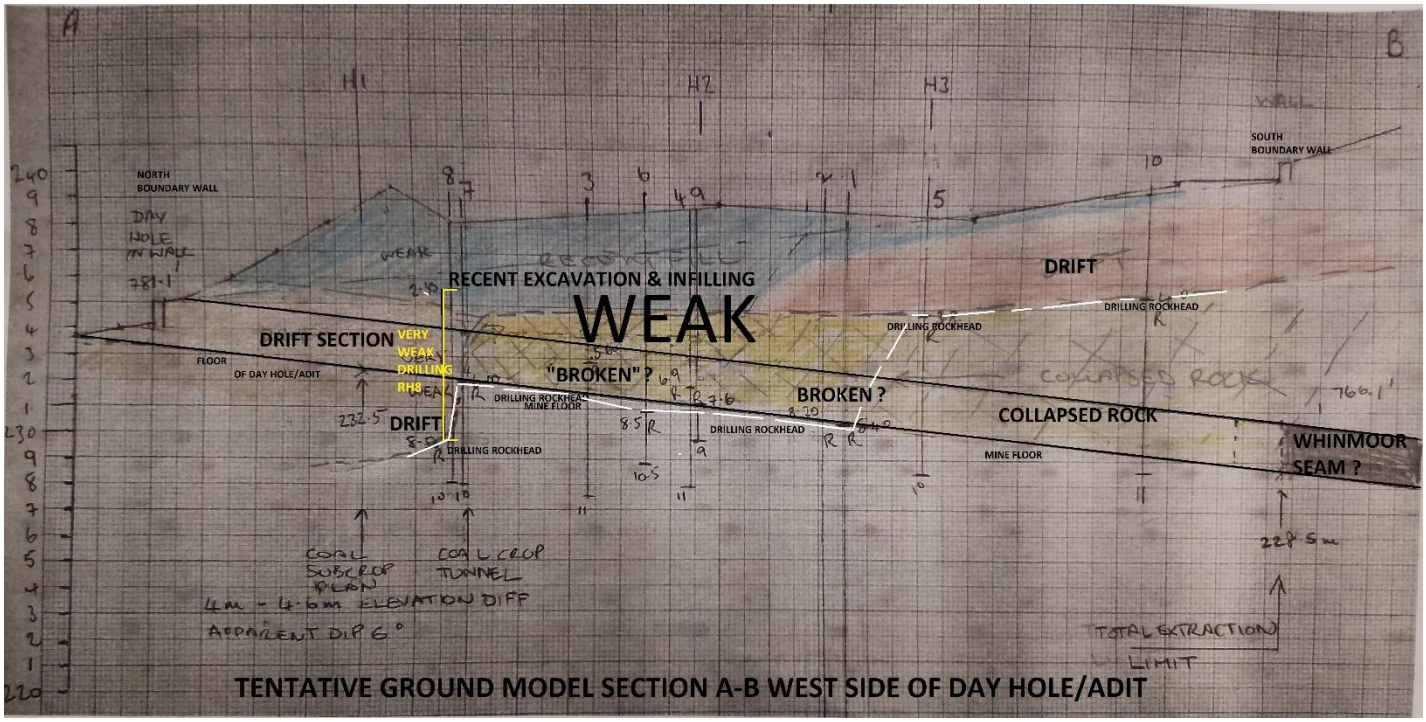
RH10

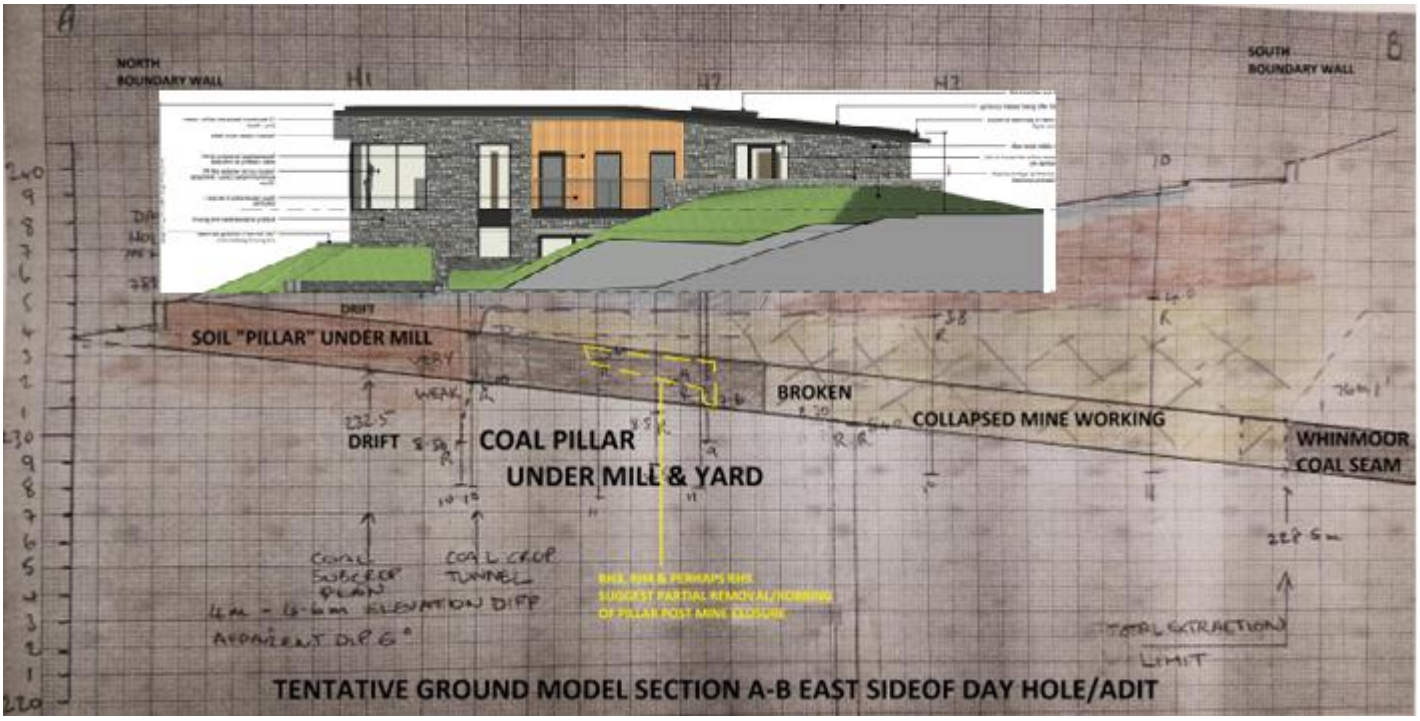
APPENDIX 13

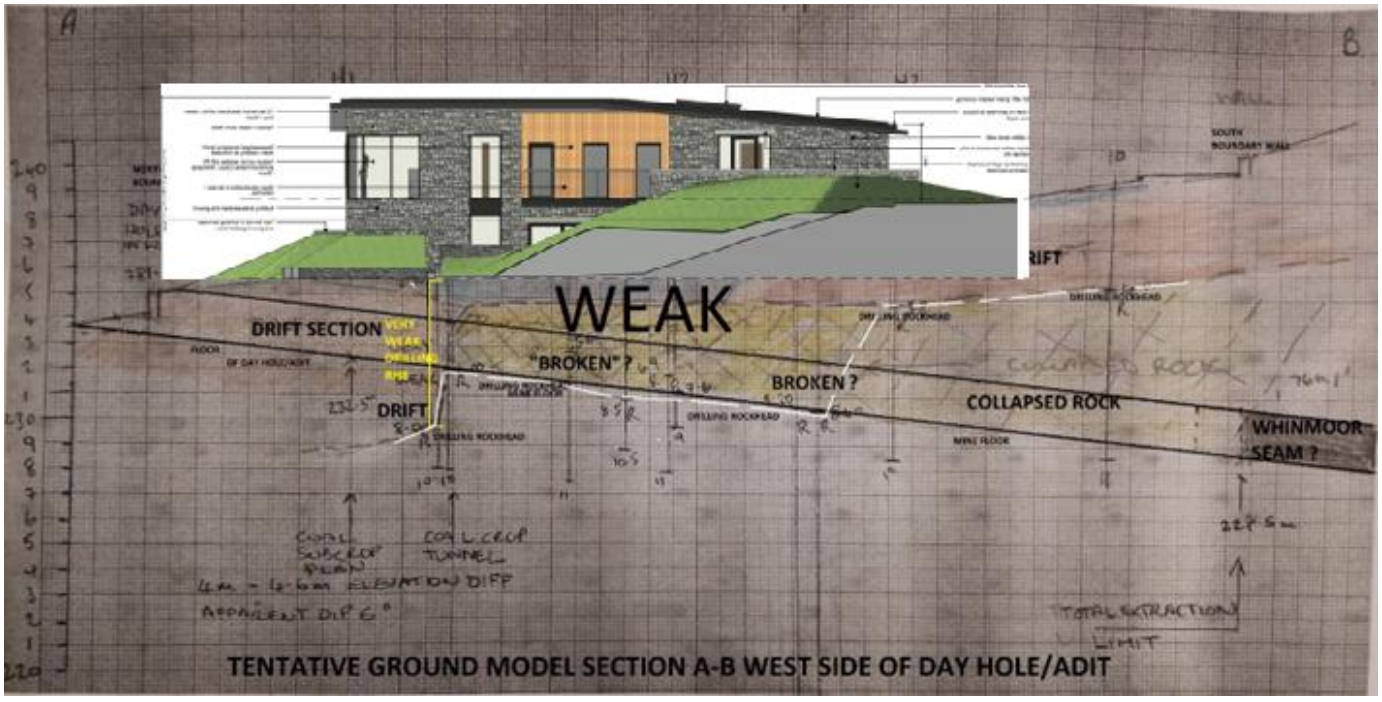
Conceptual Ground Model Sections






A
B
H1
H2
H3
NORTH BOUNDARY WALL
SOUTH BOUNDARY WALL
DAY HOLE IN WALL
RECENT EXCAVATION & INFILLING
WEAK
DRIFT SECTION
VERY WEAK DRILLING RH8
FLOOR OF DAY HOLE/ADIT
DRIFT
DRILLING ROCKHEAD
MINE FLOOR
"BROKEN" ?
BROKEN ?
COLLAPSED ROCK
WHINMOOR SEAM ?
COAL SUBCROP PLAN
COAL CROP TUNNEL
4m - 4·6m ELEVATION DIFF
APPARENT DIP 6°
TOTAL EXTRACTION LIMIT
TENTATIVE GROUND MODEL SECTION A-B WEST SIDE OF DAY HOLE/ADIT


NORTH BOUNDARY WALL
SOUTH BOUNDARY WALL
SOIL "PILLAR" UNDER MILL
DRIFT
COAL PILLAR UNDER MILL & YARD
BROKEN
COLLAPSED MINE WORKING
WHINMOOR COAL SEAM
TENTATIVE GROUND MODEL SECTION A-B EAST SIDEOF DAY HOLE/ADIT


WEAK
DRIFT SECTION
"BROKEN"?
BROKEN?
DRIFT
COLLAPSED ROCK
WHINMOOR SEAM?
TENTATIVE GROUND MODEL SECTION A-B WEST SIDE OF DAY HOLE/ADIT