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Haywood Engineering Services
Unit 9A
Mapplewell Business Park
Mapplewell Drive
Mapplewell
Barnsley
S75 6BP

CAPE SITE SERVICES
COAL MINING & GEOTECHNICAL
CONSULTANCY



Date: 20th May 2020
Your ref: (S75 6BP)
My Ref: SI 00224

FOR THE ATTENTION OF MR AIDEN MILNES

Dear Sir,

**COAL MINING RISK INTERPRETATION REPORT – FOLLOWING THE SITE
INVESTIGATION FOR A PROPOSED INDUSTRIAL UNIT DEVELOPMENT AT UNIT 9A,
MAPPLEWELL BUSINESS PARK, MAPPLEWELL DRIVE, BARNSELEY S75 6BP**

I am pleased to supply the following report for the above named project and trust that this satisfies your requirements. Please do not hesitate to contact myself at any time for further clarification or advice.

Yours Sincerely,



M. Lyons
Consultant Mining Engineer
BSc CSci MIMMM

THIS REPORT IS BASED ON AND LIMITED TO THE INFORMATION IN MY RECORD AT THE TIME THE ENQUIRY IS ANSWERED. It is based on my professional opinion in line with the guidelines set out in CIRIA Special Publication 32 - "Construction Over Abandoned Mine Workings. Copyright in this report belongs to M.A.Lyons. All rights are reserved and unauthorised use is prohibited. Copyright is not transferred to external parties by possession of this report, however, those for whom the report is compiled have the right to use it. If any unauthorised third party comes into possession of this report, they rely upon it entirely at their own risk and the author does not owe them any Duty of Care or Skill.

Contents	Page No.
1. Introduction	3
2. Scope of the Report	3
3. Site Investigation	4
3.1 Methodology	4
3.2 Interpretation of Findings	4
4. Conclusions and Recommendations	5
5. Appendix	7
5.1 References	7
5.2 Coal Authority Permit	8
5.3 Borehole Location Plan	9
5.4 Drilling Log Sheet	10
5.5 Site Investigation Process	11
5.6 O.S. Sheet SE 3309 (1960 Edition)	12
5.7 1960's Aerial Photograph	13
5.8 Photograph A	14
5.9 Photograph B	15

1. Introduction

Planning permission is being considered for the development of a single industrial unit to house 7 workshops at the above location subject to the mining legacy risks been fully realised and mitigated from on site, if necessary – in line with the Coal Mining Risk Assessment prepared by Matrix Consulting Engineers ref: 19-092-REP-001 dated 19/09/19. Cape Site Services has now undertaken this work via an intrusive site investigation of 4 boreholes, the location of which is outlined on plan no. 00224/B – as illustrated in appendix 5.2. The site owner also carried out two trenches within the made ground; details of which are also utilised within this report.

2. Scope of the Report

The mining legacy risks to the development are as follows:

- Instability from shallow coal workings in either the Kents Thin or Kents Thick coal seams
- The former North Gawber No.1 Adit recorded beneath the site
- Colliery spoil / made ground / associated contamination
- Other ‘uncharted’ mine entries
- Fugitive gas emissions

As such, these risks need to be properly determined to ensure sound stability for the development. A borehole investigation consisting of 3 holes was deemed a reasonable level of investigation in the outset regarding potential void migration given the scale and nature of development combined with the available geological and mining information as detailed in the Coal Mining Risk Assessment as detailed above.

It should be noted that this investigation is focused mainly on determining stability from potential shallow historic coal workings and will only provide limited information regarding the risks of uncharted mine entries. A good level of detail should be obtained to provide a more informed opinion as to fugitive gas risks and the potential for colliery spoil and/or contamination.

The works were undertaken under the Coal Authority permit ref: 19672.1 – as detailed in appendix 5.2. Considering the risk assessment detail, along with regulatory requirements, both the Kents Thin and Kents Thick coal seams were deemed necessary to be checked. The nature and depth of the former North Gawber No. 1 Adit is also required to be determined.

It should be noted that the details of this report should be presented to suitably qualified design/structural engineers to use the information provided in order to arrive at an agreed foundational solution with the regulators and Coal Authority prior to any further works taking place.

3. Site Investigation

3.1 Methodology

Prior to the intrusive site investigation a search for utilities was undertaken both via online data providers and physically on site using a Cable Avoidance Tool (CAT). Boreholes were marked out with tape measure from boundary and building lines as illustrated on plan no. 00224/B outlined in appendix 5.3, where boreholes to investigate the coal seam are marked as 'BH'. As part of the mine entry watching brief, a pre survey was undertaken with no visible evidence of any uncharted mine entries. The process for the intrusive coal seam investigation is outlined via the system chart in appendix 5.5.

An investigation utilising a tracked Baretta Rotary Drill Rig equipped with 2m long 70mm diameter drill rods and 100mm drill bit was deemed appropriate in this instance along with water flush technique to analyse returns and minimise any risks associated with mine gas emissions and spontaneous combustion. Initial percussive air/mist casing was required in order to case through the made ground and make water flush feasible. Gas monitoring equipment would be employed during works for risks associated with Methane, Carbon Monoxide, Oxygen and Carbon Dioxide. Any boreholes emitting a dangerous level of methane would be terminated and sealed immediately. All holes to be filled and sealed as soon as possible with bentonite upon termination. Prior agreement had been secured for these works from the Coal Authority.

The works were to be supervised by the Drilling Engineers Mr. S. Fish and Mr I. Wiles, and overseen by the Principal Engineer Mr. M. Lyons.

3.2 Interpretation of Findings

The made ground of a varying consistency ranges in thickness (across these borehole locations only) of between 4.5m and 2.5m. Below this lies a sandstone band, with yellow clay experienced on top of it in borehole 2. The Kents Thin coal seam/horizon is considered to be present beneath this sandstone as recorded in borehole 1 at 5.5m deep / 700mm thickness, and in borehole 3 at 5.5m deep / 600mm thickness. This seam thickness is consistent with that anticipated for the Kents Thin seam. Boreholes 1 and 2 both lost flush around this seam horizon, with hole 2 recording soft ground and no indications of coal. Borehole 3 indicated soft coal. The loss of flush and softness is thought to indicate some degree of old historic (prior to the Colliery complex) underground working of this coal. At such a depth and considering the made ground and heavy industrial former use, it is considered unlikely that any substantial voids will remain around this horizon, although it is likely to be badly broken across the majority of the site. Below this horizon holes 1 and 2 recorded firm but occasionally broken ground to depths of 10.5m and 12m respectively, which had to be terminated due to loss of water flush. The broken ground did not appear related to void migration considering the firmness of the strata. It may be related to the past heavy mining industry in such close proximity causing stress fracturing along bedding planes and joints. Borehole 3 maintained flush to enable the depth to be extended to the Kents Thick seam horizon which was proved voided/worked. This hole proved an interval of around 20m

between the Kents Thin seam and Kents Thick, which is consistent with that anticipated. The occasional broken ground within this section of strata did not appear related to void migration. Borehole number 4 proved made ground to 3.6m deep at which very hard re-enforced concrete or steel was encountered in relation to either the base of the adit or its concrete plug. According to the Coal Authority details the precise location of this plug, installed by the NCB in the 1980's, is not known. The adit can be mapped very well however given the 1960 OS Sheet SE3309 as detailed in appendix 5.6. The buildings from this plan have been extrapolated onto the site investigation plan as shown in blue. An old 1960's aerial photograph from a local history group, as shown in appendix 5.7, shows the colliery infrastructure and which correlates very well to the OS plan of 1960. The line of the adit is just visible, which suggests that the small building at the adit entrance would have been an access/haulage room, and that the adit, extending to the north-east (41 degrees), was above ground initially and extending beneath the surface at a rate of 1 in 9 (11 degrees). Given this information, the concrete plug itself may therefore be somewhat further to the north-east at the adit portal where it became totally underground. It should be noted however that the land has since been raised by the made ground. This is illustrated in Photograph B (appendix 5.9) within a trench dug through the made ground to 3m deep indicating what is considered to be the inside of the adit haulage room wall (at approximately 433127/409828) - the line of which is consistent with the bearing of around 41 degrees. A second trench was carried out at approximately 433138/409834, which indicated a concrete hardstanding at 2m deep – thought to be the former base of the adjacent colliery building to the adit.

Monitoring at each borehole and trench indicted no dangerous levels of gas.

4. CONCLUSIONS AND RECOMMENDATIONS

(Based on CIRIA C758D – abandoned mine workings manual)

- 1) With regard to the deeper Kents Thick coal seam which is likely to be worked throughout most of this area, the guidelines suggest that there will be enough natural strata above this horizon for the development not to be affected by potential void migration – more than ten times the seam thickness (1.1m as detailed on abandoned mine plans and confirmed in borehole 3) which equates to 11m or more. Even if a piled foundation was to extend to around 10m deep this would still provide adequate cover. No further works would be deemed necessary regarding this coal seam horizon.
- 2) The Kents Thin coal seam appears to have been historically worked and although no major voids would be anticipated some associated instability is very likely as a result of the badly broken ground around this horizon and to some degree in the underlying sandstone to around 10m deep. Drilling and grouting may be an option, but it is unlikely that a sufficient grout take would be achieved to make it worthwhile, rendering it unfeasible from both an engineering and cost aspect. Piled foundations and/or a strengthened raft, designed to span a 3m soft spot and cantilever 1.5m for instance, seem to be a more pragmatic solution. If a re-enforced raft is considered alone then re-engineering the made ground would most likely be required (such as compacting back in 300mm layers) to achieve the required bearing capacities.

- 3) With regard to the North Gawber No. 1 Adit there will be virtually no risk of catastrophic failure of the plug (as opposed to a mine shaft plug for instance), therefore building over the feature would be thought acceptable given an appropriate foundation design to ensure the integrity of the plug (if present) is not compromised. It is possible however, that the actual plug is located further to the north-east, in that the only obstructions below this part are in relation to the base of the adit haulage room. Either way, such obstructions are very likely to make piling unfeasible. Re-enforced raft design could be utilised and/or piled foundations either side of the adit with a beam between (i.e. spanning the adit), may be an option. Pile depths (if decided upon) would likely to be on an average of around 10m deep across the site.
- 4) No signs of any unrecorded mine entries were observed during the investigation, however some risks are always present within the exposed coalfield for discovering such features, particularly when shallow coal workings are present. Watching briefs should be undertaken during future ground works (in areas not covered by this investigation) for any associated signs of either an old mine shaft or adit. The Coal Authority should be notified where any such feature is suspected.
- 5) Although no fugitive gases were encountered, gas protection (such as a methane membrane and positive ventilation) should be factored into the foundation throughout the extent of the building considering the potential pathway of mine gases from the adit through the fill material.
- 6) It should be noted that another Permit will be required from the Coal Authority for any further works that will intersect their interests (coal/coal workings), such as piled foundations and/or drilling and grouting, in order to gain permission, understand their requirements and design the works accordingly.

NOTE: This report and future development proposals should be submitted to the regulators for their approval prior to any works taking place.

I trust that this satisfies your requirements, however please do not hesitate to contact myself at any time for further clarification or advice.

Yours Sincerely,



M. Lyons
Consultant Mining Engineer
BSc CSci MIMMM

Enc.

THIS SITE INVESTIGATION INTERPRETATIVE REPORT IS BASED ON AND LIMITED TO THE INFORMATION IN MY RECORD AT THE TIME THE ENQUIRY IS ANSWERED. It is based on my professional opinion in line with the guidelines set out in CIRIA Special Publication 32 - "Construction Over Abandoned Mine Workings." The opinion may be overruled by Government Authorities based on other information not in my record. Further site investigations may be undertaken which would supersede the factual findings of this investigation. Copyright in this report belongs to M.A.Lyons. All rights are reserved and unauthorised use is prohibited. Copyright is not transferred to external parties by possession of this report, however, those for whom the report is compiled have the right to use it. If any unauthorised third party comes into possession of this report, they rely upon it entirely at their own risk and the author does not owe them any Duty of Care or Skill.

5 Appendix

5.1 References

- 5.1.1 CIRIA Special Publication No 32 'Construction Over Abandoned Mine Workings'.
- 5.1.2 British Standards Institution: BS 5930:2015 'Code of practice for ground investigations' BSI 2015.
- 5.1.3 British Standards Institution: BS EN ISO 14688-1: 2002 + A1 2013 'Geotechnical Investigation and Testing - Identification and Classification of Soil - Part 1 - Identification and Description. BSI 2013.
- 5.1.4 British Standards Institution: BS EN ISO 14689-1: 2003 'Geotechnical Investigation and Testing – Identification and Classification of Rock – Part 1 – Identification and Description. BSI 2003. Incorporating Corrigendum No. 1 February 2007.
- 5.1.5 British Standards Institution: BS 10175 'The Investigation of Potentially Contaminated Sites. Codes of Practice'. BSI 2011+A1 2013.
- 5.1.6 British Standards Institution: BS EN ISO 22476-3: 2005 + A1 2011 'Geological Investigating and Testing. Field Testing. Standard Penetration Test'.
- 5.1.7 British Standard 1377:1990 Parts 1-9 'Methods of Test for Soils for Civil Engineering Purposes'.

5.2 Coal Authority Permit



The Coal
Authority

Permit to Enter or Disturb Coal Authority Interests

Permit 19672

Name and Address of Permit Holder:

Lyons CMC
44 Grange Road
Woodlands
Doncaster
S. Yorkshire
DN6 7PZ

Site Location:

Unit 9A
Mapplewell Business Park
Blacker Road
Mapplewell
Barnsley
S75 6BP

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

Ground Investigation by 12 boreholes to 30m to determine possible shallow mine workings and investigation of a known adit and mine roadways

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:

- *Water flush*
- *Gas Monitoring CO, CH₄, CO₂, O₂, H₂S 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*

Signed: _____ Granted Date: 11/03/2020

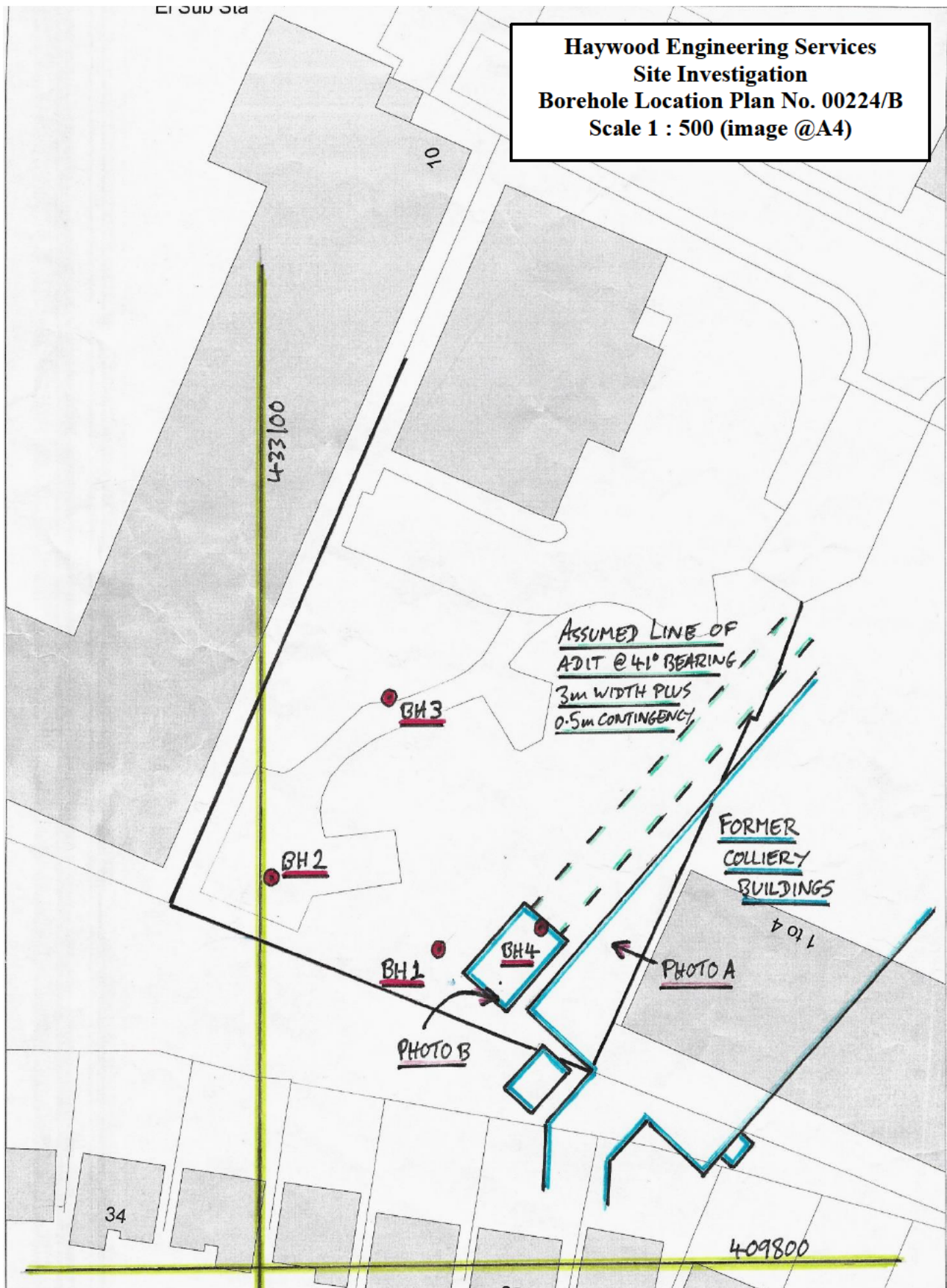
For and on behalf of The Coal Authority

Nominated Representative: Stuart Brown, Permitting Manager;

The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG

Tel: 01623 637450; E-Mail: permissions@coal.gov.uk

5.3 Borehole Location Plan –



5.4 Drilling Log Sheet

Client: Haywood Engineering	Site: Unit 9 a Mapplewell Business Park Mapplewell S75 6BP	Cape Site Services Ltd Unit 2, Rear of castle buildings, Carlton Road, Barnsley, South Yorkshire, S71 3HX	
Date: 13-14/05/2020	METHOD Rotary Water flush		

Measurements In Meters

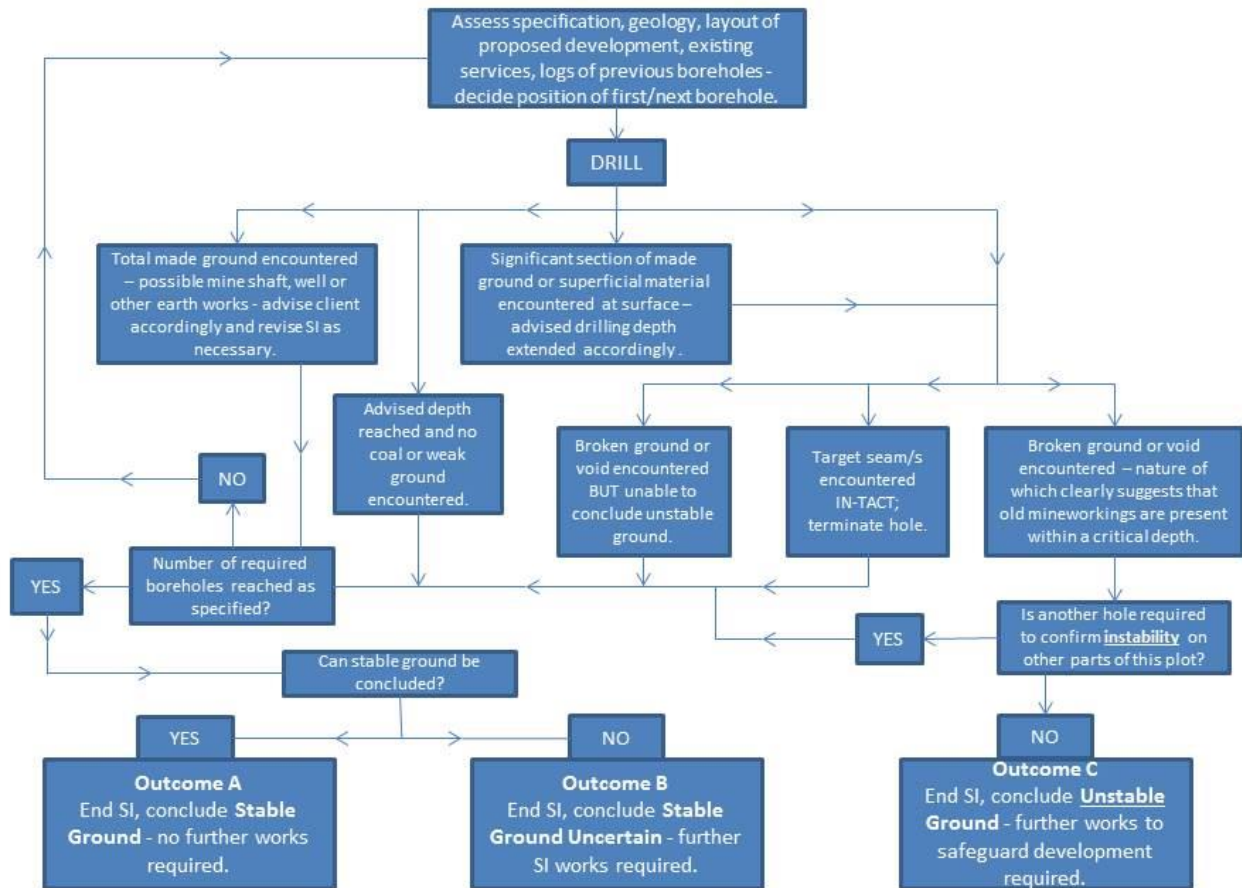
BH no	FROM	TO	THICKNESS	Description
1				
	0.0	4.5	4.5	Fill
	4.5	5.5	1.0	Sandstone brown silty soft
	5.5	6.2	0.7	Coal soft
	6.2	6.5	0.3	Sandstone brown silty
	6.5	10.5	4.0	Lost flush no returns broken
				Cased to 4.8m No gases recorded
2				
	0.0	4.5	4.5	Fill
	4.5	4.8	0.3	Clay yellow
	4.8	5.0	0.2	Sandstone silty brown broken
	5.0	6.5	1.5	Lost water no returns
	6.5	7.0	0.5	Sandstone brown lost flush no returns
	7.0	12.0	5.0	Kept losing water no returns badly broken 8.0-9.5m
				Cased to 4.8m then 6.8m No gases recorded
3				
	0.0	2.5	2.5	Fill
	2.5	5.5	3.0	Sandstone brown silty soft
	5.5	6.1	0.6	Coal soft
	6.1	10.5	4.4	Sandstone brown grey silty
	10.5	26.7	16.2	Mudstone grey silty with odd sandstone band broken in places
	26.7	27.8	1.1	Voided worked out lost returns and flush
				Cased to 3.0m No gases recorded
4				
	0.0	3.6	3.6	Fill stopped dead possible steel
				Cased to depth No gases recorded

Driller I Wiles	Driller's Assistant S Fish & R Hawkins
Driller's Signature 	Page ...1..... of 1.....

5.5 Site Investigation Process

Borehole Site Investigation (SI) Process Guide (Shallow Underground Coal Workings)

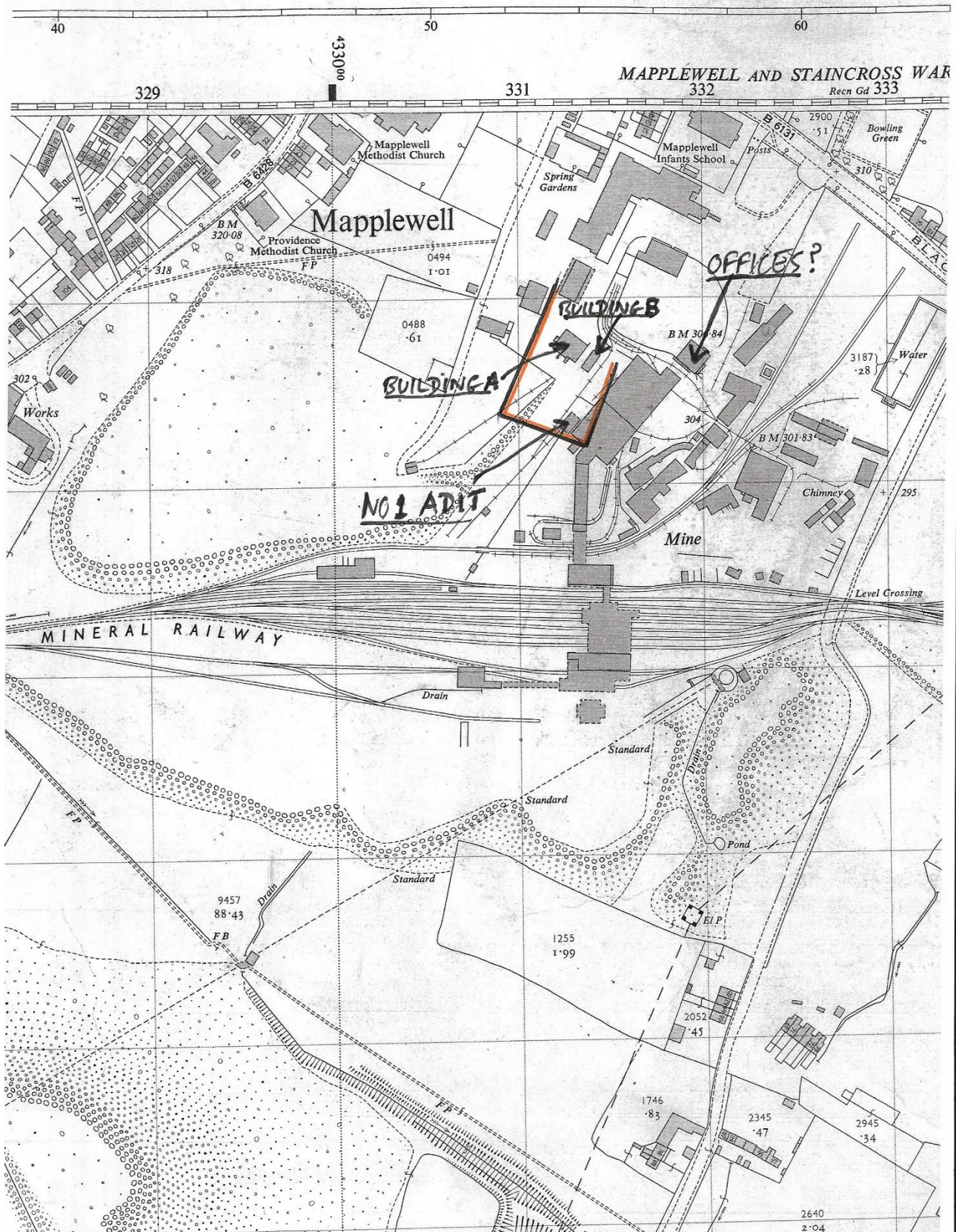
© M.A.Lyons - Jan 2016



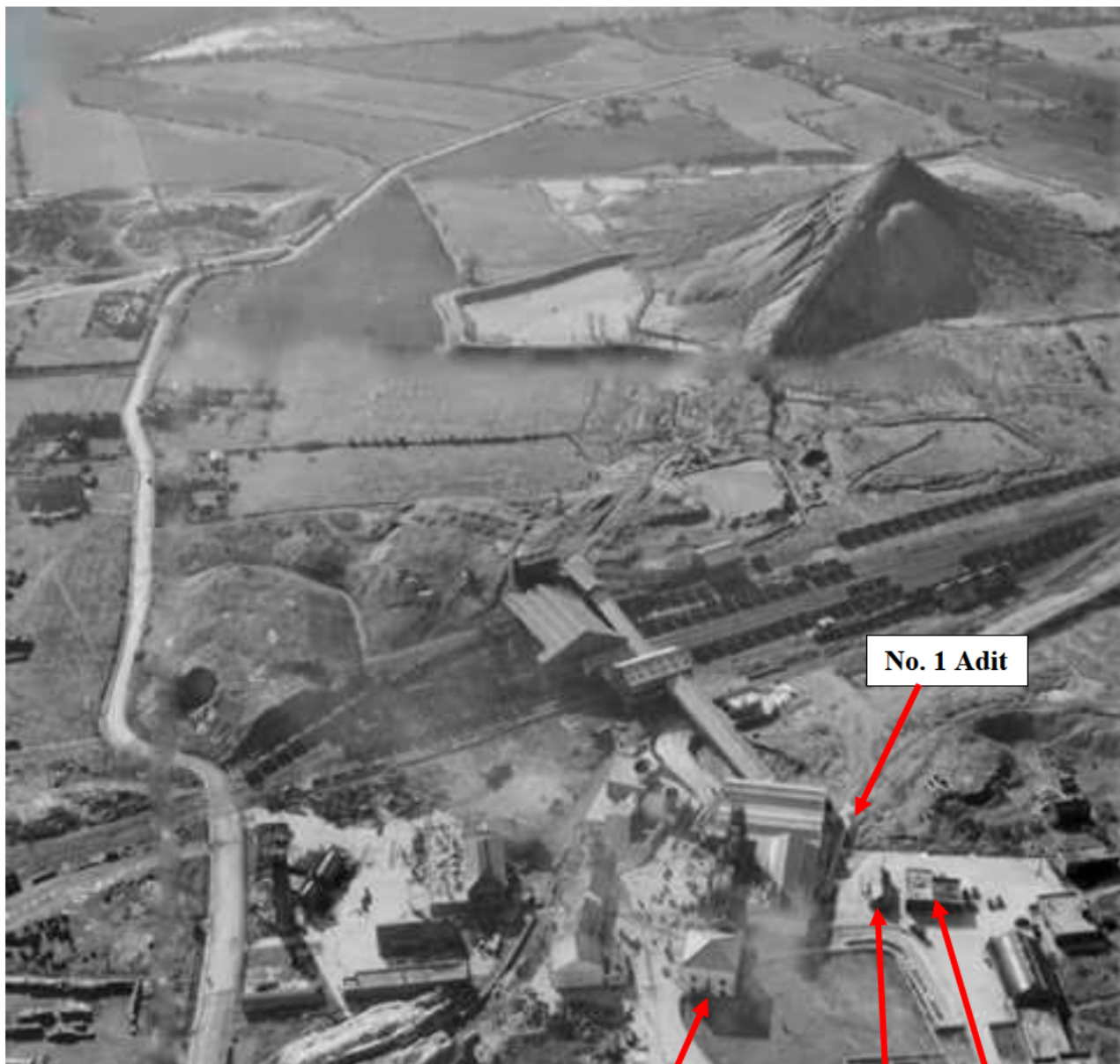
5.6 OS Sheet SE 3309 (1960 Edition)

Scale: 1:2500 or 25·344 inches to 1 Mile

Levelled



5.7 1960's AERIAL PHOTO



Offices?

Building B

Building A

5.8 Photograph A



5.9 Photograph B

