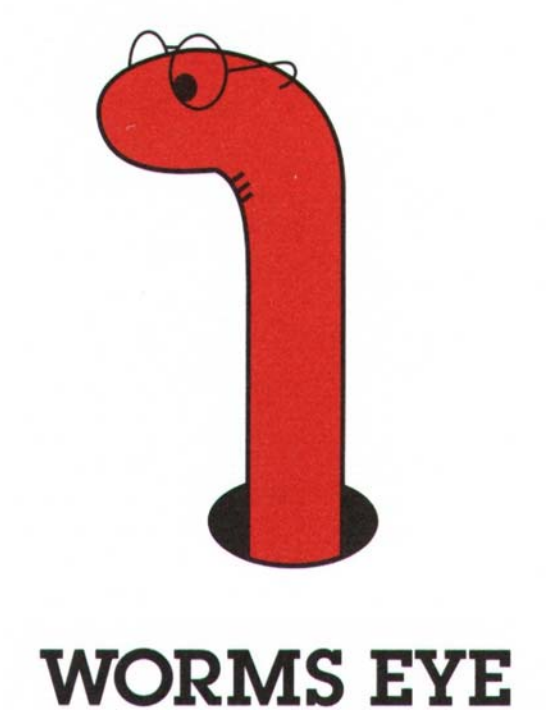
Electronic Report



Worms Eye Limited
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BB9 4HS

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Our Ref: Stanley Way / WN8 8EA / 2023
Date: 24 August 2023

Stuart Rawcliffe
JB Rawcliffe & Sons Ltd.
Blaguegate Works
Stanley Way
Skelmersdale
Lancashire
WN8 8EA

Email: stuart@jbrawcliffe.com

STANLEY WAY, STANLEY INDUSTRIAL ESTATE, SKELMERSDALE, WN8 8EA
COAL MINING INTRUSIVE REPORT

INTRODUCTION

A commercial development is proposed. Following a Preliminary Risk Assessment (PRA 15/5/23) instructions were to carry out boreholes to investigate potential risks from shallow mining.

SITE LOCATION

JB Rawcliffe and Sons are located to the northwest of Stanley Way in Skelmersdale and at OS Grid Reference 347020, 407600. The area of the proposed development, referred to as the site, is about 35m by 60m at the northeast of the complex. The site comprises a mostly hardcore surfaced yard, used to store vehicles and equipment, with a narrow concrete strip at the northeast and a concrete yard to the southeast between the site and the existing building.

The area slopes down to the northeast. The existing building is to the southeast, to the southwest is a yard and there is a wooded area with mature trees to the northwest and northeast (this is not an accurate arboricultural survey).

PROPOSED DEVELOPMENT

It is proposed to build a warehouse, which fills the site. Details have not been finalised.

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PRELIMINARY RISK ASSESSMENT

Worms Eye carried out a PRA dated 15/5/23 the salient points relating to coal mining were:

Geology of Site

The geological map indicates that the underlying solid rocks are mudstone beneath the northwest of site, and sandstone below the southeast, both in the Pennine Lower Coal Measures Formation, dipping to the southeast at 6 - 8°.

Surface drift is shown as sand of the Shirley Hill Sand Formation and natural subsidence hazards are shown as low (running sand) to no hazard.

Shallow Underground Mining – unrecorded/probable/possible

The findings suggests there are four shallow coal seams.

Seam	Likely Depth Below Rock (m)	Thickness (m)	Worked	Rock/Thickness (intact rock above)	Rock/Thickness (between seams)	Sufficient Cover
Wigan Four Feet	8 – 13	1	Y	8 – 13	-	N
Wigan Two Feet	13 – 18 (5*)	0.6	Y	30 – 38	8 (between seams)	N
Trencherbone	18 – 23 (5*)	0.6	Y	60 – 68	8 (between seams)	N
Peacock	36 – 41 (18*)	1.14	Y	31 – 36	15	Y

* Distance between seams

The findings indicate that there are three shallow coal seams of concern. The shallowest seam (Wigan Four Feet) has insufficient rock cover to minimise damage to the building if workings were to collapse. The next two seams (Wigan Two Feet and Trencherbone) may also have insufficient rock cover, depending on overlying workings, but the deeper Peacock seam has sufficient rock cover.

There is a need to confirm the depth of the seams, thickness of working an thickness of rock cover. It is recommended that 3 rotary boreholes are drilled to 25m below rock (about 45m deep).

Mine Gas

There are four shallow, worked, coal seams below limited rock cover, and overlying sand and gravel. These are a potential gas risk to the site and a moderate gas risk may be present. The nearby mine entries may also allow an easy migration route for gases to migrate to the surface, and through surface soils to the proposed building.

Furthermore, the site is likely underlain by filled ground (probably mine waste) which extends to the northwest, east and southwest and demolition rubble may be present from the previous building. These are potential sources of ground gases from which a low gas generation potential may be expected which could present a low risk to the development.

PRA Re-Cap Continued

Mine Shaft

The nearest mine shaft (347407-008) is 17m southeast, and has not been treated. Allowing for:

- 10m departure for mapping error (CA Interactive Map).
- 2.5m diameter shaft (CA Interactive Map).
- Approximately 14m to rock.
- 45° angle of repose to rockhead following collapse.

This suggests a zone of influence (ZOI) of about 26m radius around the plotted position, extending onto the site by about 9m.

The next nearest shaft (347407-007) is 22m southeast, and has not been treated. Allowing for:

- 5m departure.
- 4.2m diameter.
- About 14m to rock.
- 45° angle of repose to rockhead following collapse.

This suggests a zone of influence of about 21m around the plotted position, suggesting the zone of influence may extend up to the site boundary.

The next shaft (346407-007) is 33m southwest and filled, but to an unknown specification. However, the zone of influence is about 21m which will not pose a risk to the site.

Whilst the findings show the shafts are not present on-site, the potential zone of influence of the nearest shaft, should it collapse, could extend onto the site and cause significant damage to the proposed building. The zone of influence around a second shaft may extend close to the site and further details are required on the depth of rock to assess potential risks further.

Deeper Seams

Normally seams below 30 metres which have been worked in historical times, are considered to be no longer a risk after decades, and the most recent workings were 1933. In this case about 10m of coal has been extracted, which will have created fractured, looser, strata and future difficulties might not be ruled out in these circumstances. This situation applies to very many areas of Wigan Coalfield.

End of PRA Re-Cap

GROUND INVESTIGATIONS

A series of three boreholes were drilled using a water flush rotary open hole technique. Details are given on the enclosed location plan and borehole logs.

The findings show similar conditions having made ground (colliery waste) to between 6.0m and 7.0m overlying sandstone.

BHA had an intact coal seam with mudstone partings from 28.0 to 30.0m deep. Whereas BHB and BHC had a 1.0m thick coal seam with mudstone traces at 27.0m and 29.0m respectively, underlain by a band of mudstone before another coal seam was found at 28.8 to 29.5m (BHB) and 33.0 to 34.0m (BHC).

In all three boreholes the coal seams were underlain by sandstone which continued to the base of the borehole at 45.0m deep.

There were no voids, broken strata or loss of flush.

The following approximates to a section looking northwest.

Findings	BHA (m)	BHB (m)	BHC (m)
Made ground (colliery waste)	0.0 – 6.5	0.0 – 6.0	0.0 – 7.0
Sandstone	6.5 – 28.0	6.0 – 27.0	7.0 – 29.9
Coal with mudstone traces/partings (intact)	28.0 – 30.0	27.0 – 28.0	29.0 – 30.0
Mudstone	-	28.0 – 28.8	30.0 – 33.0
Coal (intact)	-	28.8 – 29.5	33.0 – 34.0
Sandstone	30.0 – 45.0	29.5 – 45.0	34.0 – 45.0
Gas	No	No	No
Voids	No	No	No
Broken Strata	No	No	No
Loss of Flush	No	No	No

DISCUSSION

Shallow Mining

The boreholes confirm the site is underlain by shallow coal seams. However, these were found to be intact, with no voids or broken strata encountered and there was no loss of flush.

The findings show there is at least 21m of rock cover, or 21 times the seam thickness over the shallowest seam, and at least 26 times the seam thickness of rock cover over the deeper seam.

There are no shallow seams, no shallow workings and, therefore, no risk from shallow coal mining.

Mine Gas

There are no shallow workings and, with over 35m of rock over any deeper seams it is considered this will impede migration of gases towards the surface from deeper seams. There is no mine gas risk to the development.

However, there is about 6.0 to 7.0m of colliery waste below the site and it is considered this has potential for ground gas generation and a low ground gas risk is possible.

Mine Shafts

The boreholes show rock is present at 6.0 to 7.0m below the site.

The nearest mine shaft (347407-008) is 17m southeast, and has not been treated. Allowing for:

- 10m departure for mapping error (CA Interactive Map).
- 2.5m diameter shaft (CA Interactive Map).
- 7m to rock.
- 45° angle of repose to rockhead following collapse.

This suggests a ZOI of about 19m radius around the plotted position, extending onto the site by about 2m.

The next nearest shaft (347407-007) is 22m southeast, and has not been treated. Allowing for:

- 5m departure.
- 4.2m diameter.
- 7m to rock.
- 45° angle of repose to rockhead following collapse.

This suggests a ZOI of about 15m, indicating the ZOI will not extend onto the site.

Whilst the findings show the shafts are not present on-site, the potential ZOI of shaft 347407-008, should it collapse, could extend onto the site by about 2m, posing a potential risk to the proposed building if it lies within this area and remedial works would be required.

One option is to design the building to be outside the zone of influence from the nearby mine shaft and, ensure any concrete apron or car park is suitably thickened and reinforced within the ZOI.

An alternative is to construct the building using a piled footing, down to about 7m deep, which will go below the potential zone of influence were the shaft to collapse. The floor slab, and any concrete apron or car park will also need to be suitably thickened and reinforced within the ZOI.

CONCLUSION

Shallow Mining

The findings show no shallow coal seams, no shallow workings and, therefore, no risk from shallow coal mining. No further action is required.

Mine Gas

The findings suggest no mine gas risk to the development. However, there is about 6.0 to 7.0m of colliery waste below the site which may pose a low ground gas risk.

A period of gas monitoring, appropriate for a low risk to a commercial building, is required.

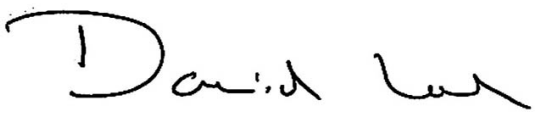
Mine Shafts

The findings suggest the ZOI from the nearest mine shaft may extend onto the site by about 2m, posing a potential risk and the following are suggested.

Design the building to be outside the ZOI from the nearby mine shaft and, ensure any concrete apron or car park is suitably thickened and reinforced within the ZOI.

Construct the building using a piled footing, down to about 7m deep, and ensuring the floor slab, and any concrete apron or car park is suitably thickened and reinforced within the ZOI.

Yours faithfully
on behalf of Worms Eye Ltd



David Lord
BSc (Hons)
FGS, MIEnvSc, AIEMA

STANLEY WAY, STANLEY INDUSTRIAL ESTATE, SKELMERSDALE, WN8 8EA

List of Appendices – Coal Mining Intrusive Report

List of Acronyms

Existing site plan – showing borehole locations

Existing site plan – showing zone of influence around mine shafts

Rotary Borehole Logs

CONTAMINATION TEST UNITS

Conversion factor	Name	Symbol	Numerical Value	Alternative description	Commonly used for:
	per cent	%	1 in 100 (10^2)		total sulphur, hazardous waste
% x10	parts per thousand	‰	1 in 1000 (10^3)	g/l (grams per litre)	water soluble sulphate test
‰ x 1,000	parts per million	ppm	1 in 1,000,000 (10^6)	mg/kg (milligrams per kilogram)	most soil tests
				mg/l (milligrams per litre)	water tests
ppm x 1,000	parts per billion	ppb	1 in 1,000,000,000 (10^9)	μg/kg (micrograms per kilogram)	PAH soil tests
				μg/l (micrograms per litre)	water/leachate tests
ppb x 1,000	parts per trillion	ppt	1 in 1,000,000,000,000 (10^{12})	ng/kg (nanograms per kilogram)	PAH soil tests
				ng/l (nanograms per litre)	water/leachate tests

ABBREVIATIONS

Chemical	BAP	Benzo(a)pyrene
	BTEX	Benzene, toluene, ethylbenzene, xylene
	DAHA	Dibenzo(ah)anthracene
	MTBE	Methyl tertiaryt-butyl ether (additive to petrol)
	EPH	Extractable petroleum hydrocarbons (formerly diesel range organics – DRO)
	NFD	No fibres detected (asbestos test)
	PAH	Polycyclic aromatic hydrocarbons
	PCB	Polychlorinated biphenyls
	PCE	Perchloroethylene or tetrachloroethylene
	PID	Photo ionisation detector (screen for VOC)
	PRO/GRO	Petrol range organics/gasoline range organics
	SVOC	Semi-volatile organic compounds
	TCE	Trichloroethylene
	TPH	Total petroleum hydrocarbons
	VOC	Volatile organic compounds
Other	AGS	Association of Geotechnical Specialists
	BGS	British Geological Survey
	BRE	Building Research Establishment
	CBR	California Bearing Ratio
	CIEH	Chartered Institute of Environmental Health
	CIRIA	Construction Industry Research and Information Association
	CLEA	Contaminated Land Exposure Assessment (Environment Agency/DEFRA)
	CLR 8	Contaminated Land Research Report 8 (Environment Agency/DEFRA)
	DWQ	Drinking water quality
	EA	Environment Agency
	EQS	Environmental quality standards (for rivers etc.)
	ICRCL	Inter-departmental Commission for the Reclamation of Contaminated Land
	LQM	Land Quality Management Ltd (Land and Environmental Consultancy).
	NHBC	National House Builders Council
	SGV	Soil Guideline Values
	SPT	Standard penetration test

TPHWG TPH Working Group

1. This report should be considered in relation to the objectives agreed between Worms Eye and the Client, outlined in the introduction.

2. For the work, reliance has been placed on publicly available data, obtained from the sources identified in the report. The information is not exhaustive and further information may be available from other sources. When using the information it has been assumed it is correct, and no attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and guidelines, for land and groundwater contamination, enforced by the Local Authority and the Environment Agency.

4. During the site walkover, reasonable effort was made to obtain an overview of the site. However, no attempt was made to enter areas that are unsafe, a risk to health and safety, locked, barricaded, overgrown, or areas not made accessible.

5. Access, the presence of services and activities on the site, limited locations where sampling could be carried out and the techniques that could be used.

6. Assessments are based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. The conclusions and recommendations provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

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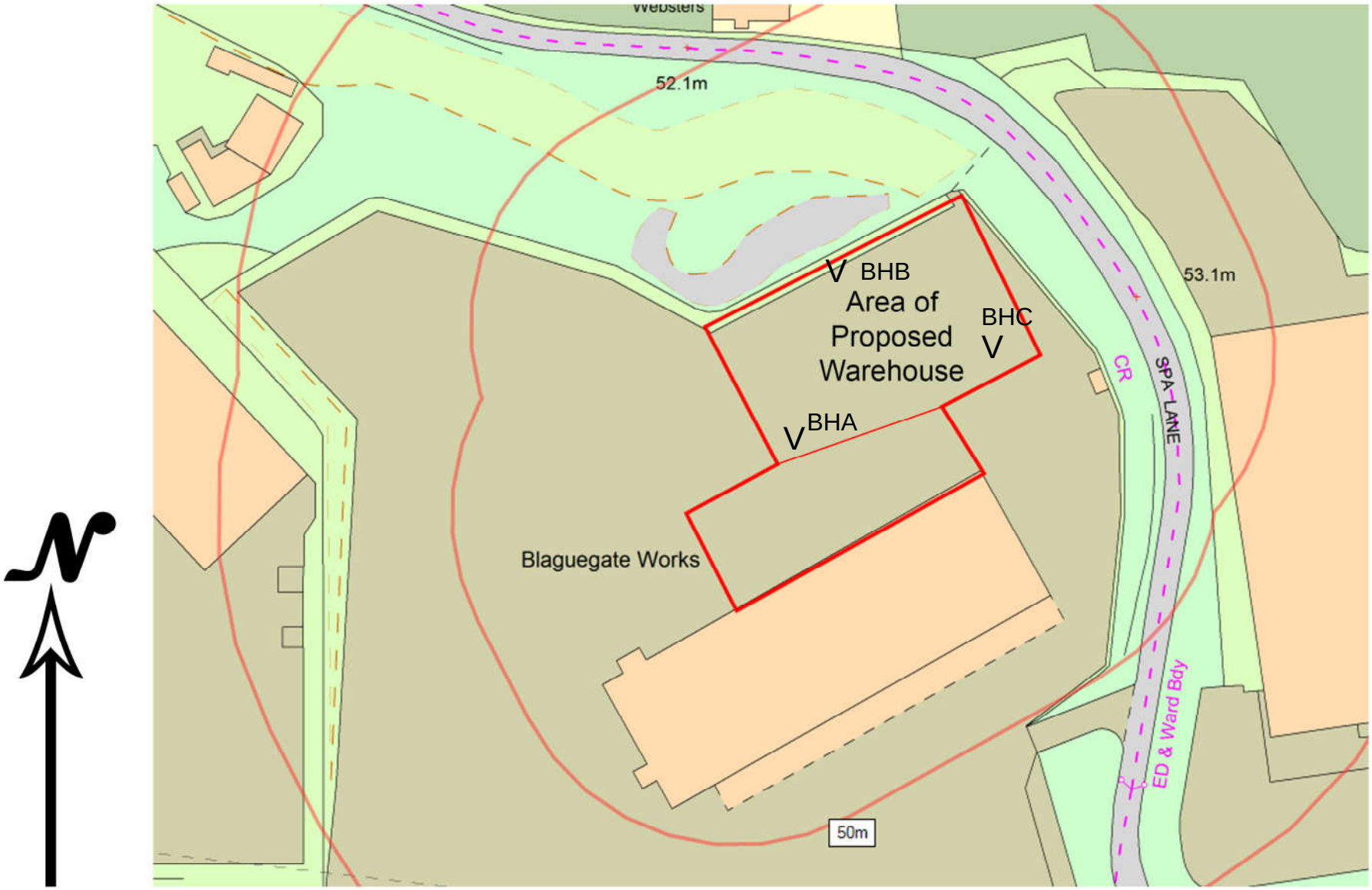
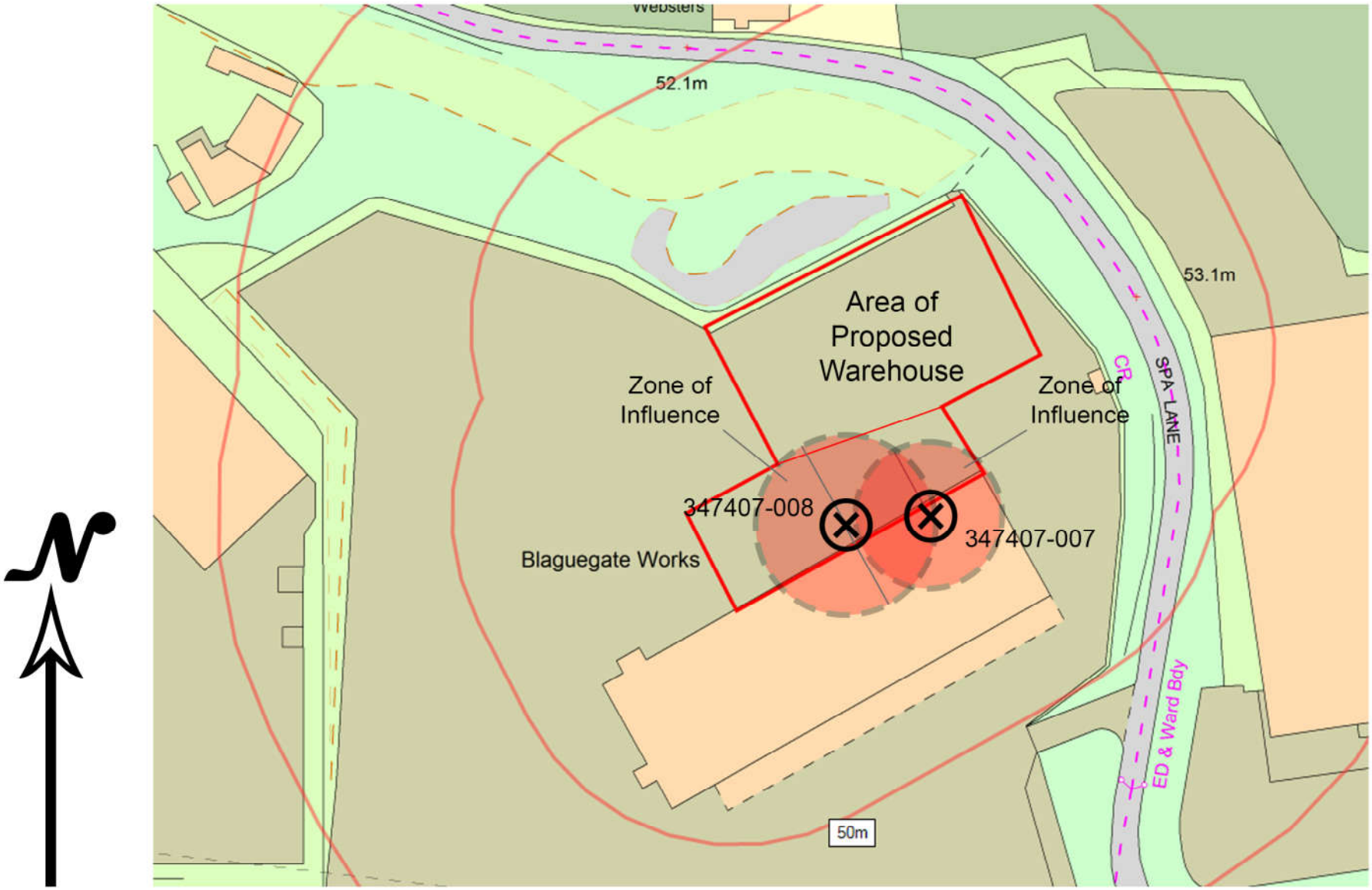
9. New information, revised practices, or changes in legislation, may necessitate the re-interpretation of the report, in whole or in part.

STANLEY WAY, STANLEY INDUSTRIAL ESTATE, SKELMERSDALE, WN8 8EA
Existing Plan
Not to Scale



STANLEY WAY, STANLEY INDUSTRIAL ESTATE, SKELMERSDALE, WN8 8EA
Existing Plan - Showing Zone of Influence Around Mine Shafts
Not to Scale



Worms Eye Limited

PO Box 1157
COLNE, BB9 4HS

Site
JB Rawcliffe & Sons Ltd., Blaguegate Works, Stanley Way, Skelmersdale

Borehole Number
BHA

Machine :
Flush : Water
Core Dia : 70 mm
Method : Rotary Cored

Casing Diameter

Ground Level (mOD)

Client

Job Number
WN8 8EA

Location
Southwest corner

Dates
17/08/2023

Project Contractor
Worms Eye Ltd.

Sheet
1/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(6.50)	Soft to firm colliery spoil.		
							6.50	Hard red/brown sandstone.		
							(21.50)			
							28.00	Coal with mudstone partings (intact).		
							(2.00)			
							30.00	Hard grey sandstone with occasional grey mudstone bands.		
							(15.00)			

Remarks
No loss of flush.
No broken strata.
No voids.
No loss of flush.

Scale (approx)
1:200

Logged By
EW

Figure No.
WN8 8EA.BHA

Worms Eye Limited

PO Box 1157
COLNE, BB9 4HS

Site
JB Rawcliffe & Sons Ltd., Blaguegate Works, Stanley Way, Skelmersdale

Borehole Number
BHA

Machine :
Flush : Water
Core Dia: 70 mm
Method : Rotary Cored

Casing Diameter

Ground Level (mOD)

Client

Job Number
WN8 8EA

Location
Southwest corner

Dates
17/08/2023

Project Contractor
Worms Eye Ltd.

Sheet
2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							45.00	Complete at 45.00m		

Remarks
No broken strata.
No voids.

Scale (approx)
1:200

Logged By
EW

Figure No.
WN8 8EA.BHA

Worms Eye Limited

PO Box 1157
COLNE, BB9 4HS

Site
JB Rawcliffe & Sons Ltd., Blaguegate Works, Stanley Way, Skelmersdale

Borehole Number
BHB

Machine :
Flush : Water
Core Dia : 70 mm
Method : Rotary Cored

Casing Diameter

Ground Level (mOD)

Client

Job Number
WN8 8EA

Location
Northwest middle

Dates
17/08/2023

Project Contractor
Worms Eye Ltd.

Sheet
1/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(6.00)	Soft to firm colliery spoil.		
							6.00	Hard red/brown sandstone.		
							(21.00)			
							27.00	Coal with mudstone traces (intract).		
							(1.00)			
							28.00	Firm grey mudstone.		
							(0.80)			
							28.80	Coal (intact).		
							(0.70)			
							29.50	Hard grey sandstone with occasional grey mudstone bands.		
							(15.50)			

Remarks
No loss of flush.
No broken strata.
No voids.
No loss of flush.

Scale (approx)
1:200

Logged By
EW

Figure No.
WN8 8EA.BHB

Worms Eye Limited

PO Box 1157
COLNE, BB9 4HS

Site
JB Rawcliffe & Sons Ltd., Blaguegate Works, Stanley Way, Skelmersdale

Borehole Number
BHB

Machine :
Flush : Water
Core Dia: 70 mm
Method : Rotary Cored

Casing Diameter

Ground Level (mOD)

Client

Job Number
WN8 8EA

Location
Northwest middle

Dates
17/08/2023

Project Contractor
Worms Eye Ltd.

Sheet
2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							45.00	Complete at 45.00m		

Remarks
No broken strata.
No voids.

Scale (approx)
1:200

Logged By
EW

Figure No.
WN8 8EA.BHB

Worms Eye Limited

PO Box 1157
COLNE, BB9 4HS

Site
JB Rawcliffe & Sons Ltd., Blaguegate Works, Stanley Way, Skelmersdale

Borehole Number
BHC

Machine :
Flush : Water
Core Dia : 70 mm
Method : Rotary Cored

Casing Diameter

Ground Level (mOD)

Client

Job Number
WN8 8EA

Location
Southeast corner

Dates
18/08/2023

Project Contractor
Worms Eye Ltd.

Sheet
1/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(7.00)	Soft to firm colliery spoil.		
							7.00	Hard red/brown sandstone.		
							(22.00)			
							29.00	Coal/mudstone traces (intact).		
							(1.00)			
							30.00	Firm grey mudstone.		
							(3.00)			
							33.00	Coal/mudstone traces (intact).		
							(1.00)			
							34.00	Hard grey sandstone with occasional grey mudstone bands.		
							(11.00)			

Remarks
No loss of flush.
No broken strata.
No voids.
No loss of flush.

Scale (approx)
1:200

Logged By
EW

Figure No.
WN8 8EA.BHC

Worms Eye Limited

PO Box 1157
COLNE, BB9 4HS

Site
JB Rawcliffe & Sons Ltd., Blaguegate Works, Stanley Way, Skelmersdale

Borehole Number
BHC

Machine :
Flush : Water
Core Dia: 70 mm
Method : Rotary Cored

Casing Diameter

Ground Level (mOD)

Client

Job Number
WN8 8EA

Location
Southeast corner

Dates
18/08/2023

Project Contractor
Worms Eye Ltd.

Sheet
2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							45.00	Complete at 45.00m		

Remarks
No broken strata.
No voids.

Scale (approx)
1:200

Logged By
EW

Figure No.
WN8 8EA.BHC