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**AN INITIAL SURVEY OF BOOZE WOOD LEVEL,
ARKENGARThDALE, NORTH YORKSHIRE,
JULY 2003**

By Alan Mills, with Paul Dollery,
Malcolm Needham and Richard Platt

Introduction

The survey of Booze Wood Level was carried out on Sunday 27th July 2003 by

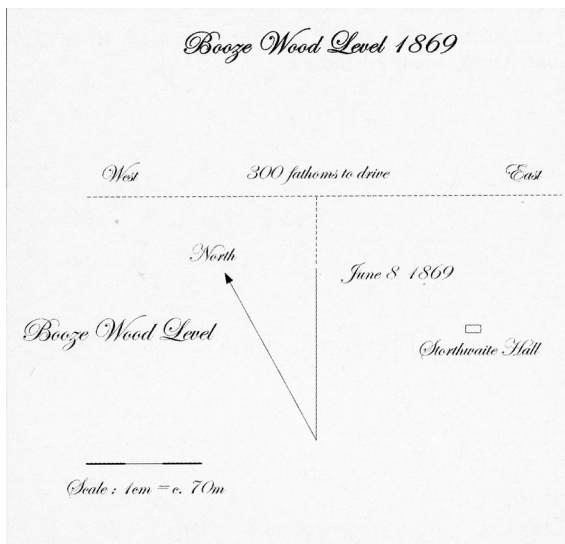
Paul Dollery

Alan Mills

Malcolm Needham

Richard Platt

The survey report which forms the basis of this paper was produced by Alan Mills. The survey was intended to produce a plan of the level and accessible workings, measuring not only distances between stations but also the width and height of the level and accessible workings. In addition, it was intended to note in outline the visible geology and any artefacts. Subsequently, the objective of relating the airshaft in the hamlet of Booze to the underground workings was added. The objectives, equivalent to a NAMHO level 2 survey¹, were largely achieved.



Booze Wood Level

Booze Wood was a 19th Century lead mine, later used as a source of building stone. The mine is located in the Yorkshire Dales National Park, approximately 1km south-east of the hamlet of Lanthwaite, on the north side of the Arkle Beck. The level's portal is at NGR NZ 01426 01984, at an altitude of approximately 238m² (Plate 1).

Work was started on the level soon after 1869.

It was driven almost due north (bearing 5° magnetic - July 2003)

Figure 1. Booze Wood level plan (1869, redrawn)

and was apparently intended to try the Booze (Fell End) vein in the Fourth (Five Yard) Limestone.⁴ Progress seems to have been rather slow.

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The plan of the level in 1869 (Figure 1) shows that the level had only been driven approximately 320m at a bearing of approximately $25^{\circ}.5$. This apparent difference in the direction of the level is presumably as a result of the change in the position of magnetic north over the period. Currently, magnetic north is moving east at approximately $1/2^{\circ}$ every 4 years. The current bearing and that of 1869 are consistent with this rate of change.

The same plan also shows that the intention was to drive the main level for approximately 500m and then drive both east and west, presumably along the assumed line of the vein. The survey (Figures 2, 3 and 4) shows that first major drive off the main level, apart from that for later stone-working, is approximately 450m from the portal, heading west (station 16). With the next drive easterly some 20m beyond (station 17). These workings relate well to the assumed line of the Booze vein, as can be seen from the map relating the underground workings, as surveyed, to the surface features (Figure 7).



Plate 1. Booze Wood Level portal.

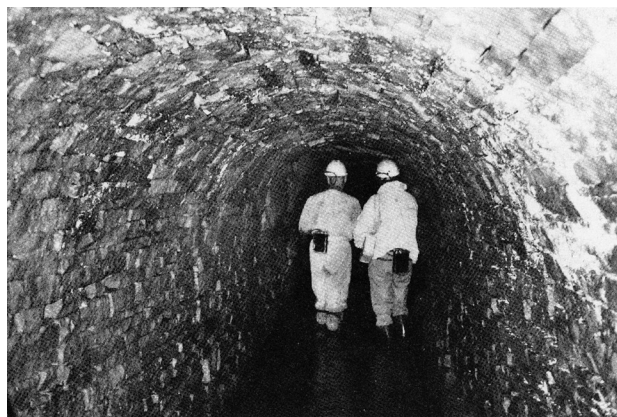


Plate 2. Surveyors between stations 3 and 4

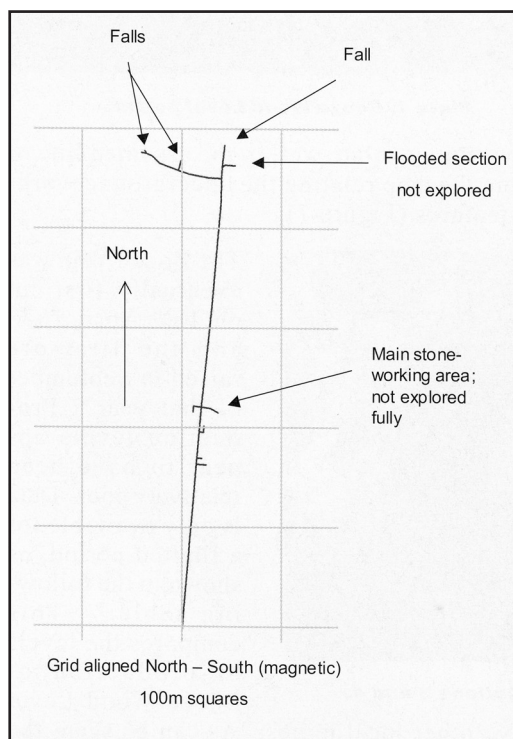
The Booze Vein was eventually first cut on 18th April 1872 and the first ore raised in September of that year.⁶ Production levels appear to have been relatively poor. Data is only available for a limited period, as shown in the following table.⁷ This compares the levels of production of Booze Wood Level (including

Cramer Rake) with five other local mines. As can be seen, the average annual production of lead ore, at 67 tons per year, is low, particularly in comparison with Swinnnergill and Faggergill and hardly seems sufficient to

justify the construction of the crushing mill, the remains of which are evident some 200m or so east, on the banks of the Arkle Beck.

Output of Lead Ore (tons)

	Booze Wood	Danby	Moulds	Swinnergill	Turf Moor	Faggergill
1873	27.45	11.10	40.85	1.00	5.35	729.00
1874	83.20	5.15	10.85	36.25	5.70	994.10
1875	190.55		2.05	12.85	1.70	1262.10
1876	80.70		3.80	86.85	0.30	1196.65
1877	90.05		3.35	41.00	0.90	1239.15
1878	137.25		4.70	732.30		1427.25
1879	55.60		4.10	766.70		1297.85
1880	66.50		58.40	934.80		1121.30
1881	35.00		31.95	577.90	12.95	896.25
1884	29.25	577.80	38.00		2.95	369.70
1885	10.90	97.25	7.05		1.05	485.80
1886	1.45	32.75	15.10		0.45	569.15
Average	67.83	144.81	18.35	354.41	3.48	965.69



The air in Booze Wood Level was poor.⁸ At an as yet unknown date, an air-shaft was sunk from the hamlet of Booze.⁹ This shaft is located at NZ 01456 02457 at an altitude of approximately 323m. All that remains on the surface is a large depression, approx 4m across, on the left approximately 40m before the gate into Town Farm, Booze (previously known as Manor Farm¹⁰), opposite the gate to Maple Cottage.¹¹ Approximately 40-50 years ago the top of the shaft was apparently covered with old corrugated iron. Miss Harker of Town Farm, stated that her father, who farmed Town Farm at that time, put an old door on top; since then local people have tipped garden rubbish on it; it is presumably very dangerous.¹²

Figure 2. Overview plan of underground workings

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Methodology

The survey team divided up roles as follows:

Richard Platt — measured distance, width and height at each station using a Bosch DLE 150 Laser;

Malcolm Needham took compass bearings using a Suunto compass;

Paul Dollery recorded the geology and noted any artefacts;

Alan Mills recorded the readings for later input into the Compass cave mapping software.

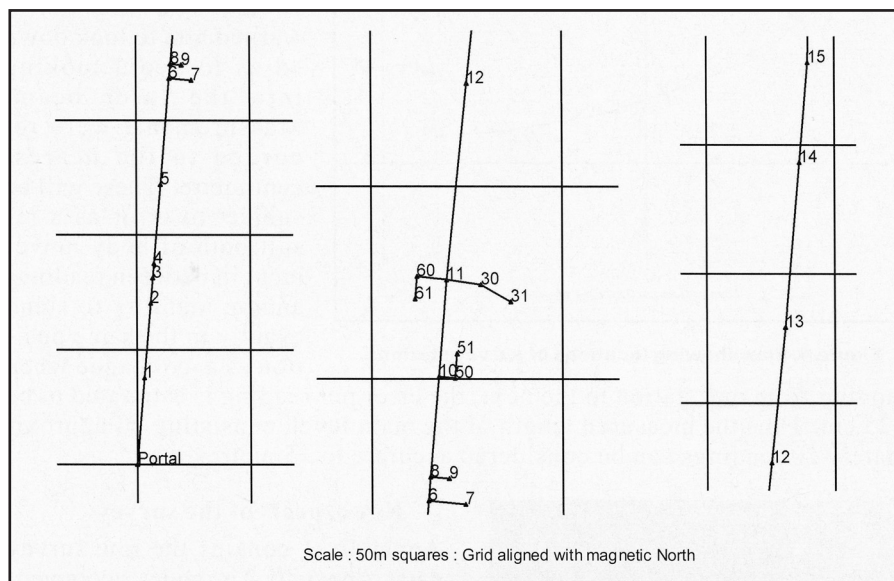


Figure 3. Booze Wood Level plans showing locations of survey stations.

The main level was surveyed from the portal into the mine, together with minor side-workings. Crosscuts and the major stone side-workings (i.e. at station 11) were surveyed on the way back.

The major stone-workings at station 11 and beyond were not surveyed accurately other than as shown on the hand drawn plan in Figure 5. These workings are both complex and dan-



Plate 3. Iron pegs holding up rail.

gerous. Further, the level beyond station 19 was not surveyed since it was flooded to at least Waist high.

Compass bearings were taken by focussing upon the camp lamp of a colleague; these readings are considered to be accurate to $\pm\frac{1}{2}^\circ$.

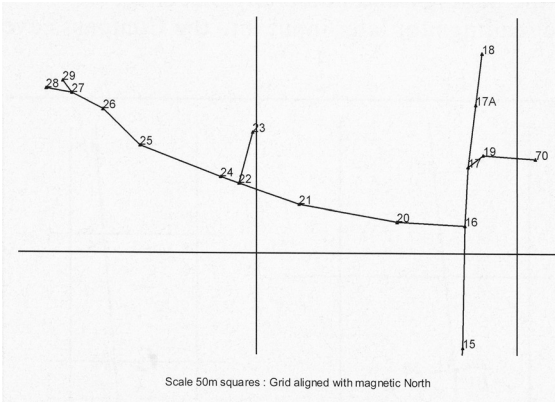


Figure 4. Plan showing locations of survey stations.

Measurements along the level were taken by using a colleague's body as the focus, having first warned him to look down so as to avoid looking into the laser beam. Measurements were recorded to the nearest centimetre. These will be subject to error as a result both of body movement in between readings and an inability to stand exactly in the same position as a colleague when moving from one station to the next; the error per reading is estimated to be ± 25 cm. Thus the measured length of the main level, consisting of approximately 20 readings can be considered accurate to ± 5 metres.

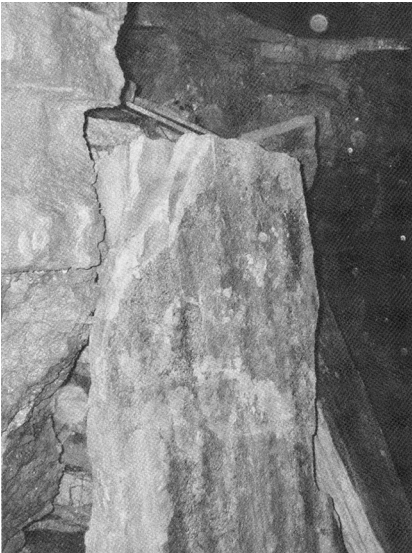


Plate 4. Ripple stone near station 8.

Key aspects of the survey

Appendix 1 contains the raw survey data. Appendix 2 provides a commentary on the geology, structure and artefacts of Booze Wood Level. Figures 2, 3 and 4 show the plans of the level as surveyed, with station numbers identified.

As previously stated the level is driven at a bearing of 5° magnetic. The level is fully lined with dry-stone arching for the first 40m (Plate 2). It then enters sandstone and thin shale beds; this is the predominant geology for the currently accessible parts of the mine. Thereafter there is a mixture of no arching, full arching and half-arching supported on pegs and rails (Plate 3).

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Although originally a lead mine, the level was worked for building stone in the early 1900s.¹³ The first evidence of this is encountered approximately 170m into the mine, where there is a small side-working for stone off to the right (station 6). There is evidence of further stone working at station 8 (right), where there are also good examples of rippled sandstone (Plate 4). More substantial stone—working is to be found at stations 10 (right) and 11 (left); a sketch map of these latter two workings is provided in Figure 6.

The major workings for stone are off to the right (east) at station 11. At this station there are rails in-situ and further rails stacked against the wall (Plate 5). These major workings were not fully surveyed. They are complex with few straight sections. There are a

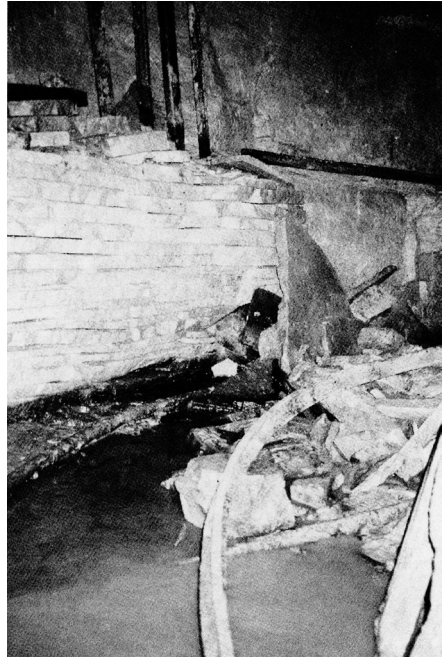


Plate 5. Survey station 11.



Plate 6. Station 11 workings.

number of small falls from the unstable roof of sandstone beds. The whole section is potentially quite dangerous. A brief investigation into the workings identified a forehead which appears to illustrate the method of working. Plate 6 shows a flagstone approximately 10cm thick, which seems to have been separated from the main block of sandstone above. The flagstone is supported by a vertical iron bar, prior to completing its removal. Plate 7 shows a roughly worked wooden prop supporting the roof; its position is marked on the sketch plan of the stone working area investigated (Figure 5).

At station 11 the main level, still heading north, now at 6° magnetic, is partially obstructed by a low wall,

approximately 1m high. This was presumably put in place to signify that the old workings were "out-of-bounds" once the focus of mine changed to extracting stone rather than lead. Beyond station 11 the level continues through sandstone principally, with thin shale beds. There are several wooden pegs in the wall between stations 13 and 14 (Plate 8), the purpose of which is unknown.

Approximately 230m from station 11 is a side passage off to the left (west), at station 16. Approximately 45m along this passage is a passage off to the right (north), at station 22. This northerly passage extends for a further 10m where it is blocked by a calcited fall.

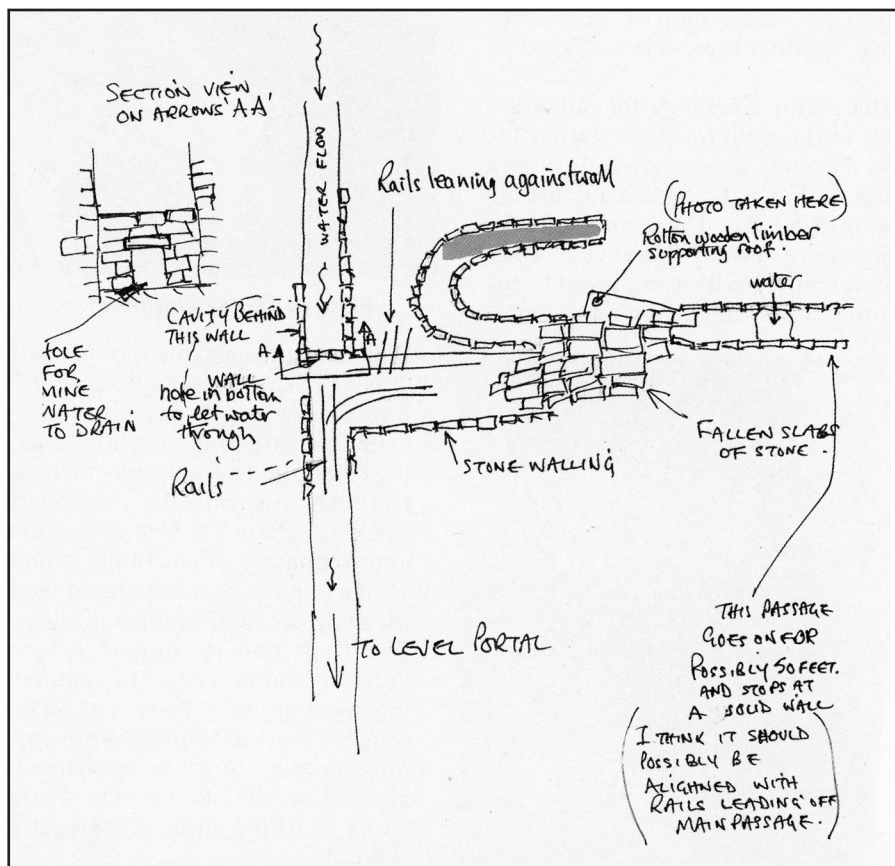


Figure 5. Freehand drawing by Malcolm Needham of the stone quarry section to right (east) of station 11. Note: drawing not to scale; the shaded straight section is approximately 12m long, 1.5m high and 0.8m wide, bearing 115°. It leads to a forehead where the roof is supported by a single iron bar (Plate 6).

Returning to station 22, the passage continues westerly, entering a section where the dry-stone arching is initially supported by rails on pegs (station 24) and which then turns into full drystone arching beyond station 25; the arching becomes compressed on the left as the dry-stone arched junction (station 27) is approached (Plate 9).

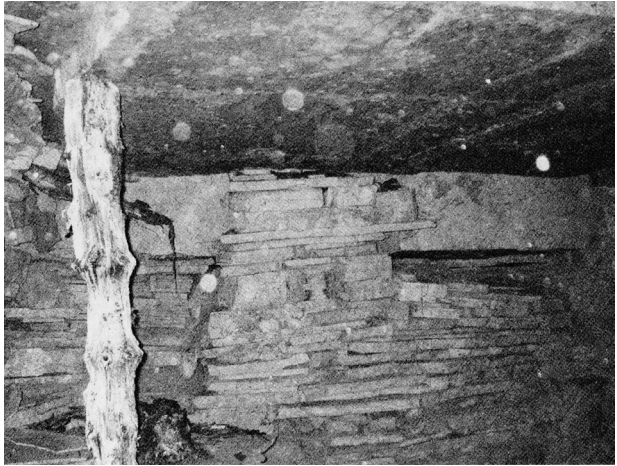


Plate 7. Roughly worked roof support.

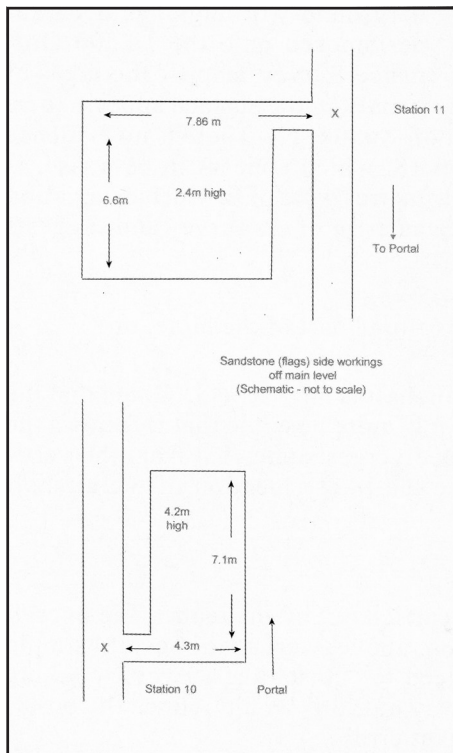


Figure 6. Plan of minor stone workings.

The left hand passage heads west (bearing 280°) for only 5m where it is blocked by a large fall, mostly of stone. The right hand passage (bearing 323°) is blocked by a fall of shale after only 3m.

Returning to station 16, the level continues northerly for 11m to an arched junction at station 17 (Plate 10). The right-hand passage has full dry-stone arching and curves away to the right, with a rising floor leading into deep water. This section was investigated no further since by this time the survey team was cold and the water was approximately 1m deep (and cold!). Apparently Booze Wood Level once connected with Scotts Level,¹⁴ also known as Roger Level,¹⁵ in Sleil Gill. On 31st August 1883, George Stones entered into an agreement with the Arkengarthdale Mining Company to “raise ore in R Scotts old level Booze....and.... for opening level to Booze Wood so their work may be dressed at Booze Wood dressings”.¹⁶ It is possible



Plate 8. Wooden peg.

that this section, beyond station 19, led to those workings in Sleil Gill.

North of station 17 the level continues for 22m to a substantial ochreous fall. This short section contains the only obvious evidence that this was once a lead mine, with a small vein in the sandstone roof and a small rise, possibly a stope, approximately midway between station 17 and the fall.

A cursory inspection of the substantial ochreous fall (station 18) suggests that this is at a rise. It is possible that this is the airshaft referred to above. In order to test this hypothesis the plan of the underground workings has been superimposed onto the 1:2500 Ordnance Survey map of the area,

of 1912 (Figure 7). It can be seen that the airshaft on the surface appears to be vertically above, and slightly to the east of, station 17. There is no evidence of this underground. The fall at station 18, which appears to be a rise, is approximately 20 metres north and a few metres west of the surface location of the airshaft. This is beyond the expected error of the survey and suggests one of three things:

- (i) the survey is in error
- (ii) the airshaft is in an as yet unexplored part of the mine, or
- (m) the shaft is not vertical.

The most likely explanation is that the airshaft is not vertical. Given that the shaft is on the assumed line of the vein it is quite possible that it follows the vein downwards at some point and thus diverges somewhat from the vertical. The fall at station 18 seems to be the likely location of the airshaft underground.

Conclusions

This was the first underground survey carried out by the team. The overall objectives referred to in the Introduction, above, were met. Several simple lessons have been learnt such as the need to “close” the survey by taking measurements on both the way in and way out; this would reduce the possibility of the survey having any significant error.

Despite its now limited size, Booze Wood Level is nonetheless an interesting mine. The underground quarrying activity merits further study and in par-

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ticular the workings to the east of station 11 could be surveyed in more detail. The wet section beyond station 19 would benefit from a detailed survey which might so help determine how Booze Wood Level connected with Roger/ Scotts Level at the foot of Sleil Gill.

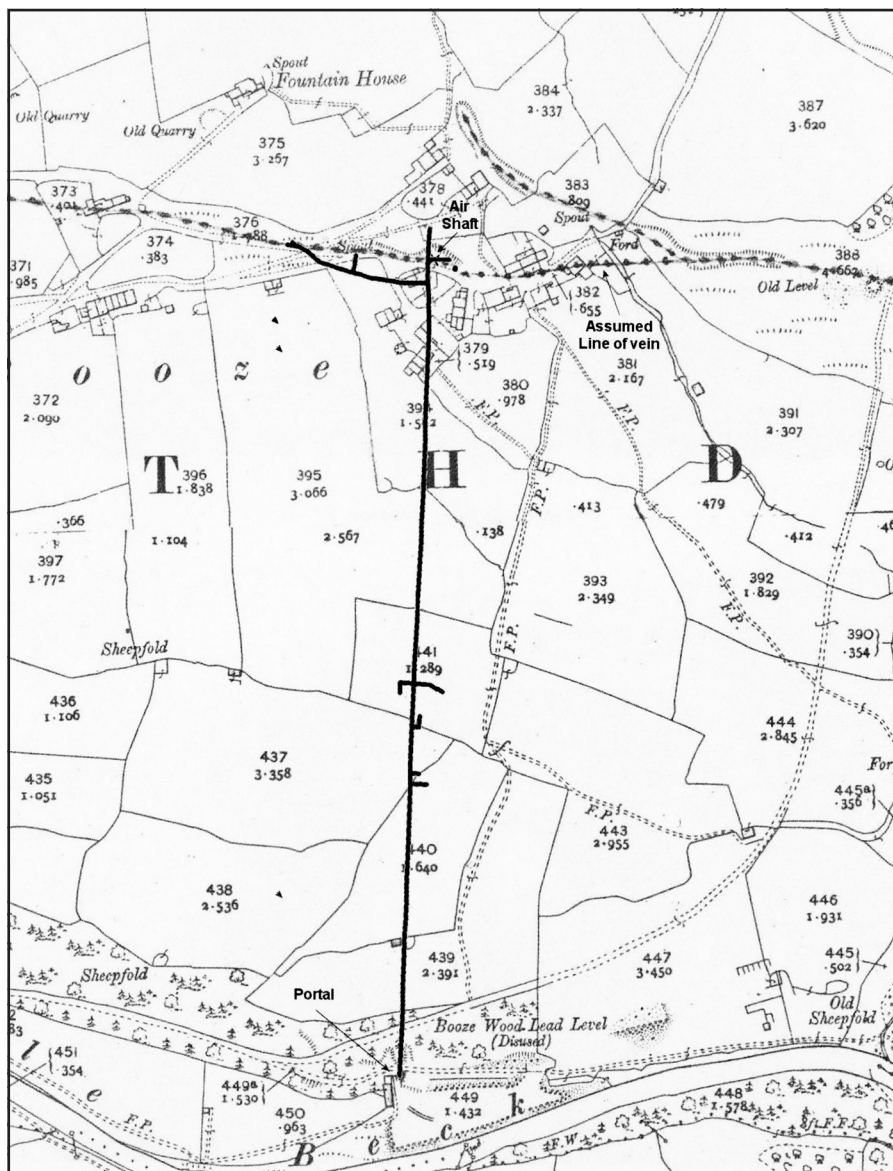


Figure 7. Location of Booze Wood level and assumed position of vein superimposed on 1:2500 Ordnance Survey map of 1912



Plate 9. Survey station 27.



Plate 10. Survey station 17.

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Further work underground might help determine the location of the airshaft, and finally, the remains of the associated crushing mill to the east, along Arkle Beck, would also benefit from further study.

Acknowledgements

Thanks are due to David Carlisle, Mike Gill, Ramsay Hutchinson, Hazel Harker, John Hunter, Martin Roe, Ian Spensley and to the members of the survey team: Paul Dollery, Malcolm Needham and Richard Platt. Any errors or omissions are entirely mine.

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Paper received 20 October, 2003

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Appendix 1. Survey Details

Mine Name: Booze Wood Level
 Survey Date: 27/07/2003
 Survey Team: Alan Mills, Malcolm Needham, Richard Platt, Paul Dollery
 Survey Declination: 0°
 Compass Correction: 0°
 Inclination: 0°
 Tape Correction: 0.0m.

Shot Units:
 Compass: Degrees
 Length: Meters
 Inclination: Degrees
 Up,Down,Right,Left: Meters

Shot #	From	To	Length	Azimuth	Inc	Left	Right	Up	Down	Comment
0	Portal	1	37.9	5	0	0.7	0.7	1.5	0	End of arching at station 1; slight fall on right
1	1	2	32.6	5	0	1	1	2.4	0	
2	2	3	11.1	5	0	0.7	0.7	2	0	Full arching begins again at 3
3	3	4	6.2	5	0	0.7	0.7	2	0	Full arching ends at 4
4	4	5	34.6	5	0	0.7	0.7	2	0	Rails holding up dry stone walling c 1m above level
5	5	6	46.6	5	0	0.9	0.9	2.2	0	
6	6	7	9.8	95	0	0.5	0.5	1.9	0	Side passage to stone working
7	7	7	0	95	0	0.5	0.5	1.9	0	
8	6	8	6.3	5	0	0.9	0.9	2.2	0	
9	8	9	4.9	95	0	0.6	0.6	1.4	0	Side passage to stone working
10	9	9	0	95	0	0.6	0.6	1.4	0	
11	8	10	26.2	5	0	0.9	0.9	2.2	0	
12	10	11	25.2	5	0	0.6	0.6	1.9	0	Full arching starts again at 10; ends at 11
13	11	12	51.3	6	0	0.9	0.9	1.8	0	
14	11	60	7.9	276	0	0.7	0.7	2.4	0	
15	60	61	5.8	185	0	6.9	0	2.4	0	Side passage to pillar and stall stone working
16	61	61	0	185	0	6.9	0	2.4	0	
17	12	13	52.9	6	0	0.9	0.9	2	0	
18	13	14	64	5	0	0.9	0.9	2.1	0	
19	10	50	4.3	95	0	0.7	0.7	5.1	0	Side working for stone

Appendix 2. A commentary on the geology, structure and artefacts of Booze Wood level.

Stn No.	Geology	Comments
P		Full Drystone Arching.
1	Sandstone & thin Shale beds	End of full drystone arching. Strata dipping inwards & left to right, (c. 20 deg.).
1 - 2	Sandstone & thin Shale beds	2 wooden props on right.
2	Sandstone & thin Shale beds	Cross fissure at c. 90 deg. Start of drystone packwall on left.
2 - 3	Sandstone & thin Shale beds	Packwall on left on pegs & rails for last 4m. Plus roof arching on pegs & rails on right for last 2m.
3		Full Drystone Arching.
4	Thin beds of Sandstone & Shale	End of full drystone arching. Strata dipping inwards & left to right, (c. 20 deg.).
4 - 5	Thin beds of Sandstone & Shale	Various sections of drystone packwalling. Lower sections on shelf, plus some higher sections on pegs & rails.
4 - 5	Thin beds of Sandstone & Shale	2 cross temples of rail in roof.
5	Thin beds of Sandstone & Shale	Full height packwall on left.
6	Thin beds of Sandstone & Shale	RH side passage to stoneworkings. Packwalls after side passage on right.
7	Thin beds of Sandstone & Shale	End of side passage.
6 - 8	Thin beds of Sandstone & Shale	Clay filled cross fissure in roof after c. 2m.
8	Sandstone & thin Shale beds	RH side passage to "Pillar & Stall" stoneworkings. LH Chamber backfilled with "Flags".
8	Sandstone & thin Shale beds	Packwalls both sides.
9	Sandstone & thin Shale beds	Sandstone stratum in roof has pronounced "Ripple Marks", also evident on fallen Flags.
8 - 10	Sandstone & thin Shale beds	End of side passage.
10		Start of rails in situ.
11	Sandstone & thin Shale beds	Full Dry Stone Arching. Hole up to Chamber above right.
11		End of drystone arching. RH side passage to "Pillar & Stall" stoneworkings. Rails & points on floor, also stacked up.
11		Packwall on left with stoneworks chamber above and behind. Packwall in front. New Section: RH Passage.
11 - 12	Sandstone only. L - R dip shallower.	Gypsum crystals on roof. Sleeper stacked on right. Wooden pegs in RH wall.
12	Sandstone + 1 V. thin Shale bed	Sleeper stacked on right
13	Sandstone + 4 thin Shale beds	Slight widening of passage.
13 - 14	Sandstone + 4 thin Shale beds	Sleeper stacked on right. Wooden pegs in RH wall.
14	Sandstone + V. thin Shale beds	Widening of passage, on right then left.
15	Sandstone + V. thin Shale beds	Cross fissure at c. 90 deg.

Shot #	From	To	Length	Azimuth	Inc	Left	Right	Up	Down	Comment
20	50	51	6.3	5	0	3.3	0	5.1	0	
21	51	51	0	5	0	3.3	0	5.1	0	
22	14	15	38.9	5	0	0.8	0.8	1.9	0	Small fissure across level at 15
23	15	16	23.3	1	0	1.1	1.1	2	0	Junction off to left at 16
24	16	17	11.2	3	0	0.9	0.9	1.8	0	Fork off to left at 17
25	17	17A	12	7	0	0.6	0.6	1.9	0	17-18 arched; substantial fall at 18
26	17A	18	9.9	7	0	0.6	0.6	1.9	0	Rise at 17A
27	17A	17UP	5.2	7	90	0.6	0.6	0.7	0	Rise; 5.2m h x 1.2 m across level x 0.7m along
28	18	18	0	7	0	0.6	0.6	1.9	0	1.2m wide in arch
29	17	19	3.7	52	0	0.6	0.6	2	0	Arched
30	19	70	10	94	0	0.6	0.6	2	0	Not surveyed; passage curving away to right; waist deep + water
31	16	20	13.1	273	0	1	1	2	0	
32	20	21	19.1	280	0	1.1	1.1	2	0	
33	21	22	12.2	289	0	0.9	0.9	2.1	0	
34	22	23	10.1	15	0	0.8	0.8	2.3	0	Fall at 23
35	23	23	0	15	0	0.8	0.8	2.3	0	
36	22	24	3.7	289	0	0.7	0.7	2.4	0	Arching starts at 24
37	24	25	16.6	291	0	0.6	0.7	2	0	
38	25	26	9.9	314	0	0.7	0.7	2	0	
39	26	27	6.7	297	0	0.5	0.5	2	0	
40	27	28	5	280	0	0.6	0.6	1.7	0	
41	28	28	0	280	0	0.6	0.6	1.7	0	28 is left fall
42	27	29	2.9	323	0	0.5	0.5	0.9	0	29 is right fall
43	29	29	0	323	0	0.5	0.5	0.9	0	
44	11	30	9	98	0	1	1	3.7	0	Rails in situ + rails stacked at wall; leads into major stone working
45	30	31	9	120	0	0.5	0.5	2.9	0	