

Cwmbryno Mine Leat

Archaeological Watching Brief

**Report No. 101
August 1999**

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Report commissioned by Forest Enterprise: Canolbarth District

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1. Introduction

1.1 Cwmbryno Mine Leat was constructed mid-19th century to convey upland water to Cwmbryno Mine (*SH 71208060*), to provide a steady source of power for the waterwheel. The course of the southern section of the leat can be traced from Pond Syfidrin (*SH 72128472*), running south through Forest Enterprise land, as far as the A44 trunk road (*Fig. 1*). In compartments Nos 5329 and 5327, the course of the leat has been utilised since the 1970s as a way-marked recreational walk, laid out as red and yellow routes by Forest Enterprise (*Fig. 2 & Plate 1*).

1.2 The footpath was designed to walk the base of the leat, but since this had been constructed as a watercourse, its natural collection of water, particularly during winter months, has made it impassable. Consequently walkers have trod the top of the outer bank, causing erosion to the earthwork and damage to the original profile of the leat. The erosion of the outer bank in parts has made the footpath dangerous resulting in the possible closure of the routes.

1.3 To avert closure of the way-marked routes, the following programme of work was planned following pre-commencement site meetings:

i. To improve drainage by cleaning out existing cut-offs and excavating new cut-offs, which will be hand-dug. Following the cutting of the drainage channels, plastic drainage pipes are to be placed in situ and soil replaced on top to restore the profile of the outer bank of the leat.

ii. To remove overburden of soil from the floor of the leat to encourage the public to walk on the leat floor; work to be undertaken by mini-excavator. Following removal of the overburden, the floor of the leat is to be stoned with chippings.

Due to the enormity of the work, it was decided to concentrate work from a point to the north of the visitors centre, where the yellow and red routes are co-incidental, as far north as the steps and divergence of these two routes (*Fig. 2*).

1.4 Following recommendations from Cambria Archaeology and in accordance with '*Forest and Archaeology guidelines for Forest Enterprise Wales*' (1998, pp 4-6), an archaeological watching brief was required during these repairs.

1.5 In August 1999, the author was contracted by Michelle Bromley, acting on behalf of Forest Enterprise, to undertake the watching brief, in accordance with *Schedule and Agreement No. CSM010:08/99*. The work was undertaken on August 9th and 10th 1999 and the results form the basis of this report.



Plate 1 Course of Cwmbryno Leat, view to south. On the left, the leat is cut through the bedrock and utilised for the Forestry Red and Yellow Routes; the precipitous nature of the route can be seen by the construction of the wooden barrier, at a point where the leat falls steeply down to the Nant-yr-Arian valley.

In the background, the leat can be traced as it follows the c.320m contour, above the A44 trunk road. The leat can be seen curving south around Cefn Cwmbryno, to Cwmbryno Mine Site, south of the hill.

2. Location, Topography, and Geology

2.1 Location

Nant yr Arian Forestry Centre is located on the north side of the A44 trunk road *c.3 km* west of Ponterwyd and *c.15 km* east of Aberystwyth (*SH 71858130*). The way-marked route/course of leat extends north from the Visitors Centre through forestry given over to recreational use.

2.2 Topography

The leat contours the west facing slopes above Nant Cwm y Graig through mixed broadleaf, unplanted areas and conifer crop. Prior to planting by the Forestry Commission in 1929, in an area now known as Rheidol Forest, the uplands were used for moorland sheep grazing and the only tree cover were coppiced broadleaf.

2.3 Geology

Nant-yr-Arian mining landscape is part of the North Cardiganshire Mining District, where the solid geology are the Silurian rocks of the Frongoch Formation; identified grey and greenish shales, flagstones and mudstones (*Jones 1922, 3*), which are clearly visible on spoil tips in the locality. Documentary references record the mineral veins being worked extensively in North Cardiganshire from at least the 17th century. The veins follow a general north-east/south-west trend and produced large quantities of lead, silver, copper and zinc.

3. Historical and Archaeological Background

3.1 Cwmbwyno Mine is recorded by the Geological Survey of 1922 (*Jones, 86*) as being discovered *c.1840*, with mineral returns being made in 1852. The Cwmbryno Leat was presumably constructed sometime in the 1850s, when the mine was worked intensely by John Taylor & Sons, until 1866. Workings after this appear to have been on a smaller scale. No further mineral returns were made for Cwmbryno after 1892, when the mine and presumably the leat fell into disuse.

3.2 John Taylor & Sons undertook considerable feats of engineering both at Cwmbryno and other mines in the immediate area, constructing long leat systems and deep drainage levels. The Plynlimon Dome is an area of notoriously high rainfall and an ideal source of water power, which resulted in the construction of numerous long leat systems assumed to have been constructed *c.1830s-1850s*. The leats are clearly visible clinging to the sides of the valleys on undeveloped agricultural land, where they can be followed to the storage reservoirs, which remain virtually unaltered after *c.150* years including the dam walls and sluices, some of which retain their timber and metal work. The leat systems survive as substantial earthworks running through the crops on Forest Enterprise lands.

3.3 Mining leats/water courses are evident in Wales from at least Roman Times, but, prior to the 19th century, these watercourses were only needed to supply water for ore dressing. The advanced technology achieved by the 19th century, included the development of pumping rod systems which facilitated deeper mining, thus demanding a steady supply of water to power the wheels for winding, pumping and crushing ore.

3.4 Cwmbryno Mine Leat

Taylor collected the headwaters of the Rheidol from the isolated uplands above Ponterwyd and discharged them into Pond Syfydrin to feed Cwmbryno and Goginan Mine Leats, which run south from this reservoir. The course of these two leats and others in the area can be clearly traced on 1st and 2nd edition OS maps *c.*1880s – 1906. Fig. 1 shows the course of Cwmbryno Leat as it is sluiced from Pond Syfydrin; conveying water along the course of its earthworks and in sections by launders and aqueducts. The leat terminates at Cwmbryno Mine, south of the A 44 (*see Plate 1*). The length of the leat from Pond Syfydrin to the mine is an estimated 4.75 km and the actual source of water is a possible 12 km north-east of the reservoir, as the course of the leat would have run.

3.5 The earthworks of Cwmbryno and the Goginan leats can be clearly seen following the contours of the hillsides as they progress south on either side of the Nant Cwm y Graig valley, south of Llyn Melindwr, which may have supplemented their water supply by launders. In both instances their construction involved cutting channels through solid rock (*Plate 2, below*) and the building of numerous launders, sluices and masonry aqueducts (*Figs 1 & 2, PRN 26557*).



Plate 2.

View to South of
rock cut section
of leat.

Course of leat has
been through the
N/S dipping shales
(as indicated by
scales). The steep
rock cut on the
east side rises to
*c.*2m and the
shales on the
western embanked
side are *c.*0.15m
above the 1m wide
leat section. The
western shales
rock cut is
surmounted by a
made-up earth and
stone bank, now
grass covered.

This section of the
leat path was
undisturbed during
the present works.

3.6 During road widening operations on the A44 in 1975, the cast iron pipe that conveyed the leat under the turnpike road was revealed (*Fig. 1*). The feature was recorded as **PRN 209, Cwmbryno Leat Siphon**; a cast iron pipe, which it was assumed descended from wooden launders on the north and south sides of the road. The leat is clearly visible in the landscape as it contours in a south-west direction, south of the present A44 (*Plate 1*).

4. The Watching Brief

4.1 The watching brief was conducted according to the Schedule *CSM010:09/99*), which required:

- i an archaeological presence during repairs to existing sections of the leat
- ii guidance to contractors and Forest Enterprise staff
- iii production of a report to include scaled drawings and photographic record, as necessary.

4.2 The clearance of overburden by mini-excavator along *c.0.75 km* of leat path was monitored in a south to north direction over the 2-day period. The clearance of existent drainage channels uncovered during the programme of work and the excavation of new hand-dug channels was also monitored.

4.3 On the southernmost section of the path, as it leaves the Forestry Offices, the leat is almost entirely rock-cut (*Plate 2*); this section was undisturbed during the present works, apart from the clearing out of existent drainage gulleys to *c.0.3m* max. width, which all showed evidence of the leat being cut through the bedrock. As illustrated in *Plate 2*, the floor of the leat is cut to bedrock surviving *1m* wide and the outer bank of bedrock shales stands *c. 0.15m* above the leat floor. The bank is composed of earth and stone matrix above the bedrock shales, under grass cover. The steep rock face drops west below the outer bank down to the Nant-yr-Arian valley.

4.4 Clearance of the overburden on the leat began north of the rock cuts, and north of the wooden barricade, where access could be gained by the mini-excavator. It was immediately apparent that the base of the leat was easily defined by its bedrock base, which was left entirely undisturbed during the present works. It was considered sufficient to remove the overburden of silt, which had collected both as a result of constant use of the footpath, and as an accumulation of run-off from the west facing slopes above the east cut for the leat, particularly in the areas not defined by the steep rock face. Throughout the present work programme, the course of the leat was mostly defined by its bedrock base *c.1m* wide with an outer bank *c.0.2m* above the base of the leat. The outer bank varied in width, but a width of *c.1.6m* prior to any disturbance seems likely.

4.5 The material removed from the course of the leat was a matrix of loose light brown soil with much root content. It was considered inadvisable to add this material to the outer bank, as it would only wash in again; it was therefore deposited on the western slopes beyond the outer bank. As the works progressed and a more stoney matrix was encountered, this was used to infill gaps in the outer bank.

4.6 Along the course of the leat footpath, buried plastic drainage pipes were uncovered intermittently, showing earlier attempts to drain the leat path, which had included cutting gulleys c.0.3m wide through the outer bank. These pipes were choked with soil and only a few were re-usable. The new pipes will be placed in the existent cuts and the minimum amount of new gulleys were cut.

4.7 It became evident that the leat had been previously stoned along certain sections. It seems likely that this layering with stone and the cutting of drainage gulleys may have been undertaken c.1970s.

4.8 During the removal of overburden and the uncovering of the base of the leat along certain sections, it became apparent that the outer bank had spread inwards over half of the leat's width. In parts of the section through the conifers crop, only c.0.5m of the real floor of the leat was uncovered, while the remaining 0.5m presumably lay under the flattened outer bank (*Plates 3 & 4, overleaf*). Along this section, the east side of the leat is cut into a loose shale bank, which has already been much disturbed.

4.9 The rock cut base of the leat was not always encountered in the section through the conifer crop. This section may have been disturbed during planting of the conifer crop sometime in the past; but due to the looseness of the subsoil and shales visible on the hillslopes, it seems likely that the leat was already naturally becoming infilled by wash, when it went out of use. The outer bank is extremely widespread along this section and has lost most of its form. A considerable amount of root content was removed from the floor of the leat path.

Cast-iron launder

4.10 Towards the north side of the section through the conifer crop, parallel sections of an iron "launder" were uncovered c.0.15m below the footpath. The cast iron sections were presumably inserted against the east side cut and the outer bank of the leat to prevent silting up from the looseness of the sides. The ironwork had been bent-over and flattened presumably during the establishment of the footpath or earlier forestry management. The bent-over sections (*Plate 6*) broke away immediately from their base which remained in situ (*Plates 5 & 6*).

4.11 The ironwork survived c.0.16m deep by 1.22m in length, being an imperial measurement of 4ft. The parallel sides enclosed a channel 0.765m wide, being an imperial measurement of 2ft 6". The cast ironwork measured 50mm thick and the mutilated sides appear to have been c.0.34m deep.

4.12 Due to the fragile nature of the ironwork, the in situ metalwork was only excavated to verify that it formed a parallel revetment to the leat as opposed to an iron launder box to convey the water. Having partially excavated the metalwork, the feature was photographed and fully recorded by scaled drawings (*Plates 5 & 6; Archive Plan & Section*), then the in situ metalwork was re-buried under a matrix of loose brown loamy soil and shales. The mangled pieces of metalwork were removed for safety.



Plate 3 Section through conifer crop showing much disturbed section of leat, prior to work being undertaken. The spread of the outer bank inwards has included total removal of the topsoil and the leat is seen to be extremely silted-up.



Plate 4 Section through conifer crop as Plate 3, following excavation. Ranging pole marks distinction between true surface of the leat c.0.5m wide; remainder presumably survives under spread of bank. The width of the footpath has been delineated by removing the overburden from against the east bank, which in this section is not the true cut for the leat.



Plate 5 Sections of Iron "launder" .

The base of the "launder" is visible in situ in the background, and the mangled sides, which broke away have been replaced on leat path for photographic purposes only.

Following recording of the feature, the ironwork was reburied and the mangled metalwork removed for safety.

4.13 The base of the leat as it was conveyed through the metalwork comprised loose layers of shale, similar composition to the subsoil of the east section (*Plate 6, below*). The east section of the leat at this juncture showed signs of iron staining caused by the metalwork (*Deposited Archive Section Drawing*).



4.14 To the north of this section, in the section between the marker post and the steps that define the divergence of the yellow from the red route, the leat curves in a "S" shape. Part of the leat is unused as the footpath in this section, while the footpath is maintained close to the present east bank. In this section entire rock cuts are encountered (*Plate 7; Deposited Archive Section Drawing*) and the base of the leat is again cut to bedrock.



Plate 7 Rock-cut section following removal of overburden and clearance of the drainage gully. View from north, as recorded in Archive Section (*Fig. 3*).

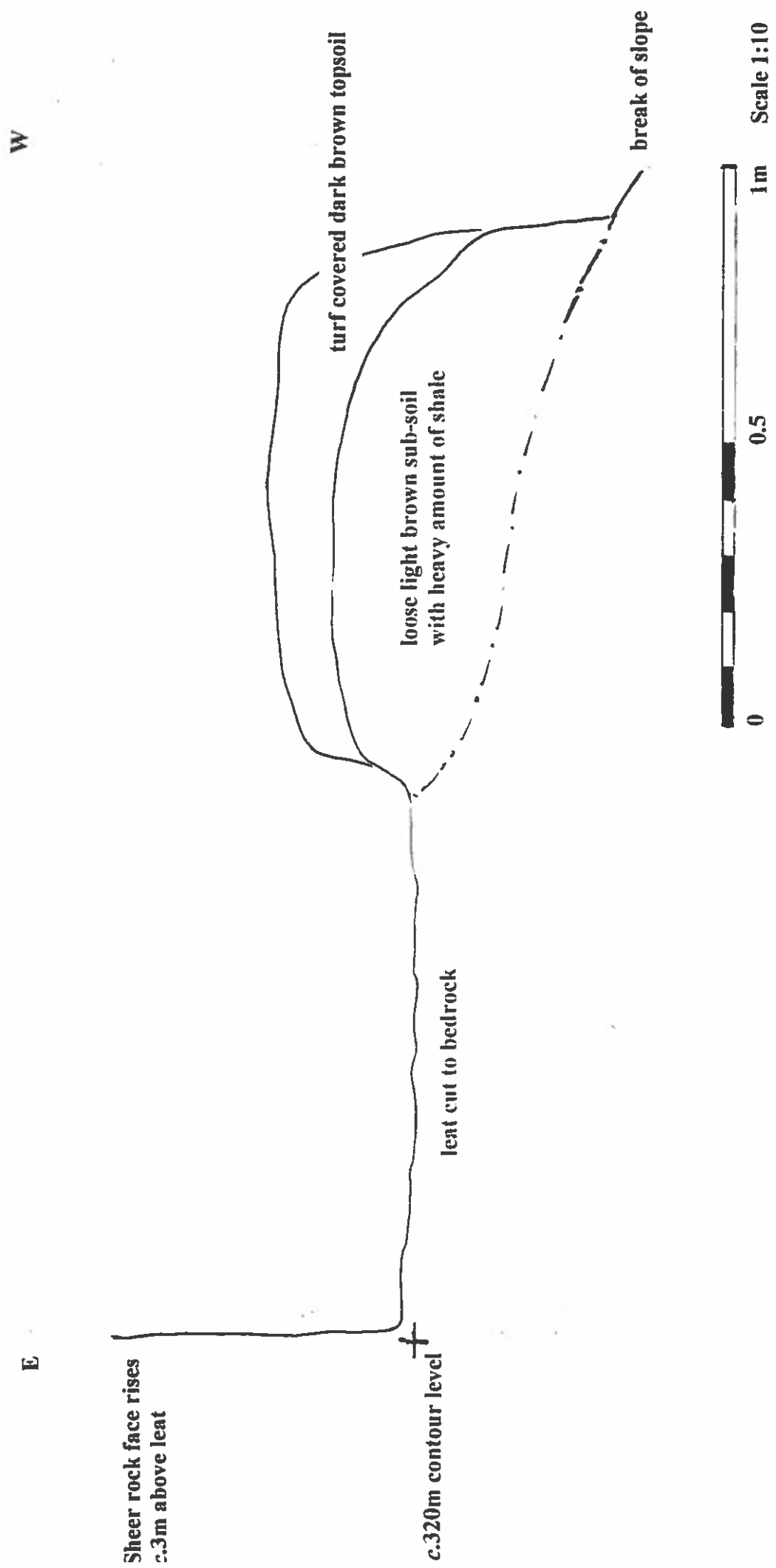


Fig. 3 Sample East/West section through Cwmbryno Leat, facilitated by cutting of drainage gully, during improvements to Forest Walks.

Section shows steep rock face cut on east side, leat cut along c.320m contour embanked on the outer west side by a matrix of shale and light brown sub-soil. The outer bank has been relatively undisturbed along this section.

5. Conclusions

5.1 The Cwmbryno Leat (as indeed are all the other long leats in this mining area) is a awesome feat of engineering, considering its surveying could only be done with the simplest of tools and its construction would be entirely by pick and shovel method.

Archaeology of the Cwmbryno Leat

5.2 During the programme of work, the watching brief enabled several observations on the construction of the leat. The diversity of its construction is displayed along the path of the red/yellow routes. The channel appears to be cut to c. 1m wide; this measurement was fairly consistent, despite the fact that a linear measurement of 36" was expected. The channel may have been cut 0.6 deep, being an imperial measurement of 2ft.

5.3 Sections are cut either entirely through the bedrock, or by cutting into the west facing slopes on the east side and building up an outer embankment on the west side to retain the water. Tunnelling appears to have been avoided entirely, but evidence of water being conveyed by aqueducts is visible on the red route, north of the present works (*Figs 1 & 2; PRN 26557*).

Alterations in the Leat Profile

5.4 It was apparent along several sections of the leat path, during the present programme of work, that the profile of the leat had altered due to natural silting up following disuse, as well as the more recent damage caused by Forestry Planting or recreational use.

5.5 It was also evident that what appeared to be the base of the leat, during the walk-over discussions prior to commencement of the present works, was not entirely accurate. In certain sections part of the base of the leat survived beneath the spread of the bank and elsewhere there was little evidence of the true base of the leat at all, particularly in the conifer plated section.

5.6 The author is satisfied that no further damage to the leat was caused during the present works. The base of the leat, where it survived, remained entirely undisturbed; the bank profile has been retained, where possible and the course of the leat is preserved and will be suitably interpreted for posterity.

6. Acknowledgements

6.1 The author would like to thank the staff of Forest Enterprise, who were involved in the project, and in particular Michelle Bromley; Llewellyn Jones, the groundwork contractor, all of whom were extremely co-operative on site.

7. Sources

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Cartographic Sources:

1906 2nd edition Ordnance Survey map sheets 7NW, NE, SW, SE

Appendix I: Archive Sheet

Site Name:	Cwmbryno Leat, Nant-yr-Arian Forest Walks
Site Code:	Report No.101
PRN:	26559
NPRN:	126, 203
SAM:	N/A
Other Ref No:	N/A
NGR:	SJ22550735
Site Type:	Industrial
Project Type:	Watching Brief
Project Dates:	August 1999
Categories Present:	Industrial
Location of Original Archive:	Dyfed Archaeological Trust
Location of duplicate Archives:	Forest Enterprise
Number of Finds Boxes:	0
Location of Finds:	N/A
Museum Reference:	N/A
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