

# THE SILVER RIG, PIBBLE AND WOODHEAD METAL MINES, GALLOWAY, SCOTLAND.

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**Summary:** Between October and December 2002 CFA Archaeology Ltd carried out topographical surveys at three lead mines within Dumfries and Galloway, south-west Scotland. The mines examined were Pibble Mine near Creetown, Silver Rig, north of Newton Stewart, and the Woodhead Mine near Carsphairn. (Fig. 1). The study aimed to provide an audit of the physical remains at each of the sites and to assess what action should be taken to prevent ongoing damage to the principal surviving features. A series of recommendations was made based on these results. Copies of the full report, including condition reports and recommendations for conservation and management, have been deposited with the National Monuments Record of Scotland (NMRS), Dumfries and Galloway Sites and Monuments Record (SMR) and Stranraer Museum. This paper presents the archaeological evidence from the three sites.

## Geological setting

Numerous metalliferous veins were exploited in south-west Galloway, centred on the edges of the Criffel, Cairnsmore and Merrick granite masses. The study sites (Fig. 1) are situated in an area of Silurian age rocks consisting essentially of greywacke, shales and flagstone of the Llandoverly-Tarrannon series which are underlain by black shales of the Birkhill Series (Wilson 1921). The whole area has been intensively folded and the axes of the folds have a general north-east and east-south-east trend. Lead, zinc and copper mineralisation has occurred along these faults. The Cairnsmore lead/zinc complex, of which Pibble and Silver Rig are considered to be an extension, was originally documented by Wilson (1921) who recorded the presence of galena, sphalerite and chalcopryrite set in a gangue of calcite, dolomite, barite and quartz. At Woodhead there are two main ore-bearing veins, the Woodhead and Garryhorn veins. Both of these veins trend north-east and are assumed to follow part of an extensive

north-north-west trending series of faults which delineate the valley of the Glenkens between New Galloway and Loch Doon. The country rock at Woodhead is predominantly greywacke belonging to the Kirkcolm Formation with lesser strings and patches of calcite, dolomite and quartz in addition to lead, zinc and copper ores.

## Mining History

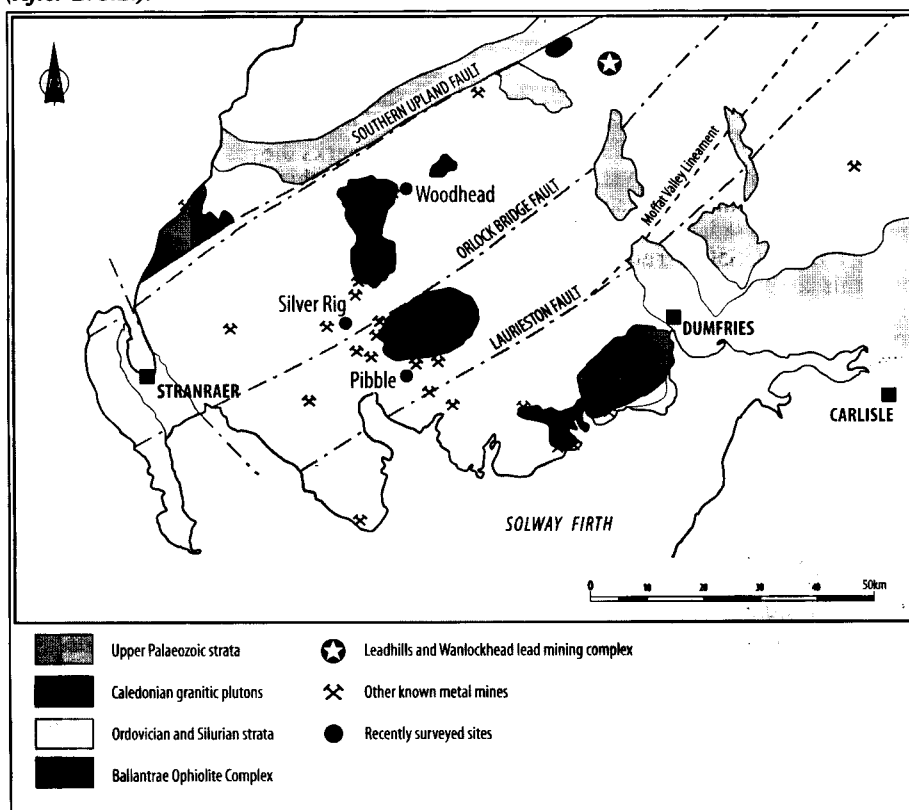
The history of metal mining in Galloway has been summarised by Dönnachie (1971) and short accounts of individual mines are included in Wilson (1921) and Foster-Smith (1967). Mining on a large scale only began during the second half of the 18<sup>th</sup> century and was linked to the economic development of the region's private estates. Enterprises dating from this period include the Stair Estate's Knockibae lead mines at New Luce, the Tonderghie copper mine on the Stewart's Glasserton estate and the Blackcraig lead mines developed on the Machermore and Heron estates at Minnigaff. A second phase

of mining took place during the mid 19<sup>th</sup> century and was characterised by the development of new capital-intensive workings such as the Pibble and Woodhead lead mines, the Cairnsmore lead mines at Palnure, the copper mines at Gatehouse of Fleet as well as the reopening of older mines like Blackcraig. Small-scale operations continued into the 20<sup>th</sup> century and included the reworking of the Blackcraig and Cree Valley mines for zinc during the First World War and the development of the copper and barite deposits at Barlocco and Auchinleck in the 1950s.

**The aims and objectives of the survey**  
The aims of the project were to record and interpret the three mining landscapes, assess appropriate conservation needs and suggest future management options.

A desk-based assessment was carried out using Ordnance Survey maps and previous survey work undertaken by the Royal Commission on Ancient and Historical Monuments of Scotland (RCAHMS). Other historical information was obtained from the National Archive of Scotland, the Dumfries Archive Centre and the

Fig. 1. Geological setting of the Galloway Region and the principal sites of investigation. (After B.G.S.).



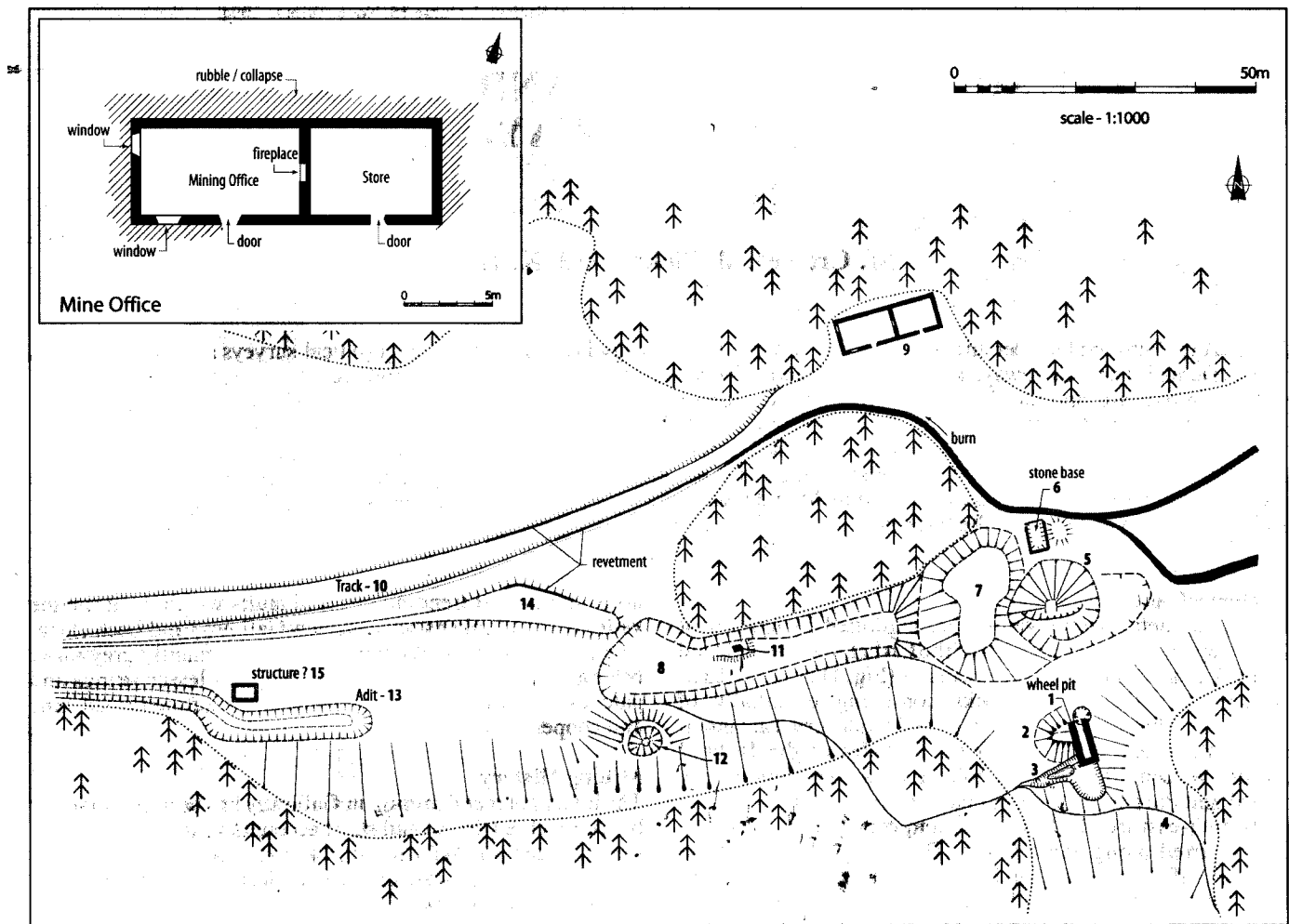


Fig. 2. Survey plan of Silver Rig Mine.

Carsphairn Heritage Centre. Aerial photographs from 1946 showing the landscape before it was planted for forestry were examined to plot the position of features lost through afforestation.

Field recording was carried out at five levels: annotated survey based on OS 1:25,000 map sheets for each site; survey at 1:500 of selected areas at each site; survey at 1:100 of selected features and buildings at each site; photographic recording of principal features and buildings at each site; and Level 2/3 standing building survey as defined by RCHME (1996).

A condition assessment at both site and individual monument level was undertaken to assess the types of conservation and consolidation required to maintain standing structures in a safe condition. Field recording was carried out using a Leica GS50 GPS system with sub-metre accuracy. Where this equipment could not be used owing to the density of forest cover (Silver Rig) then the mapping work was carried out using industry standard electronic surveying equipment (total station).

## SILVER RIG LEAD MINE (NX 377 728)

### Introduction

The Silver Rig mine is approximately 1km north-east of the farm of Cordorcan in the Cree Valley. It lies in an enclosure within a commercial plantation of Sitka spruce. The route of the former mine track can still be followed from Cordorcan through coppiced oak woods and more recent conifer plantations to the mine. The site forms part of Glentroot Forest Park and is managed by Forest Enterprise.

The vein trends east-west, is 1.1m wide at surface and dips steeply to the north. The bedrock is greywacke and slate and

galena, calcite and blende with lesser amounts of chalcopyrite and pyrite noted on the mine tips.

The early history of the mine is poorly documented but the Ordnance Survey Name Book states that the site, known locally as Silver Mine, was abandoned for the second time in 1836. Two shafts were open at the time of the 1850 OS visit and the First Edition OS map, printed in 1854, marks 'Silver Mine (Lead)' and depicts two shafts and a ruined building. The Second Edition of 1894 shows the mine as disused and marks all the features (building, waterwheel housing, opencut and shafts) visible today. It also marks the reservoir known now as Silver Rig Loch, indicating that this and the waterwheel were constructed between the compilation of the two maps. Wilson (1921) describes Silver Rig as an 'old mine' and refers to 'the ruins of workmen's houses and a waterwheel'. Robertson refers to an open-cast working near the site of an old shaft, outcrop workings with a shallow level, old stopes breaking to the surface and a waterwheel chamber close to the main shaft. Both Wilson and Robertson give the depth of the workings as 90ft (30m).

### Surviving features (Fig. 2)

The remains at Silver Rig are exceptionally well preserved considering the potential impact that forest planting can have on archaeological sites (Cressey 1996). Perhaps owing to the remoteness of the site, very little dump material appears to have been robbed from the mine and most of the features shown on the 19<sup>th</sup> century Ordnance Survey 6 inch maps still survive.

At the south-east of the site is a water-wheel housing (1). Built of random rubble, it is 8.7m long, 3.25m wide and has an estimated maximum depth of 4.5-5m. A small rubble tip (2) against the west face appears to act as a buttress and a channel

(3) leading from the south-west corner marks the line of the tail race. A lade (4) cut into the slope south of the wheel pit brought water from a reservoir some 300m to the east; the reservoir was not included in the recent survey.

North of the wheel housing is the infilled main shaft (5). The top is conical in shape, 13m in diameter and 4m deep with bedrock exposed on its south face. Immediately to the north is a rectangular stone platform (6) measuring 1m by 2.5m and built from waste. The shaft is surrounded by tip material (7) with some evidence of dressed and graded material on the eastern side. An opencast feature (8), 53m long by 10m wide and some 2m deep, has been excavated on the line of the vein west of the main shaft. It is infilled at its eastern end with waste from tip feature 7 and there is an open stope or rock-cut shaft (11) at the west end. The western extension of the vein is marked by an infilled shaft mound (12) and the collapsed entrance to an adit (13).

North of the main shaft are the remains of a mine office (9). A two-unit plan, built of roughly dressed greywacke measuring 17m by 5m (Fig. 2 inset). The western compartment has a central door and a window in the south and west wall. A fireplace has been built into the central dividing wall. The eastern compartment is windowless, with a central door on its southern wall.

Other features on site include the cart track (10) from Cordorchan, revetments (14) carrying the track over the burn and the foundations of a small rectangular building (15) close to the level entrance.

### Interpretation

The surviving evidence suggests at least three main phases of mining.

Phase 1 is characterised by the large opencast (8) excavated directly onto the surface outcrop of the lead vein. The now-diverted burn appears to have originally followed the line of the vein and stream action would have exposed the ore body and aided initial prospecting. Phase 1 is undated but could be 18<sup>th</sup> century or earlier.

Phase 2 relates to the first period of underground mining as surveyed by the OS in 1850. This appears to have been an attempt to follow the vein at depth, an episode that included the sinking of the main shaft (5) and shaft 11.

Phase 3 was a period of technical innovation and investment represented by the construction of the Silver Rig Loch reservoir and lade, the waterwheel (1), platform (6), mine office (9) and probably adit (13); this phase can be dated to some time between 1850 and the publication of the Second Edition OS sheet in 1894. Phase 3 was an attempt to

explore the vein below the local water table and was also the period when the mine reached its maximum depth of 90 feet (c.30m). The waterwheel probably worked a flat-rod pumping system, an interpretation supported by the discovery close to the shaft of a cast iron support for one of the dolly-wheels or roller-heads used to support the flat-rods. A rectangular hollow directly south of the wheel-pit would have housed a counterweight or balance-box associated with the same pumping system. Water was pumped from the lower workings to the level of adit 13 and taken from there by an open channel to the burn. Platform 6 on the north side of the shaft may have been the base for a hand-winch used for haulage in the main shaft (there are no cinders or coal waste to indicate the presence of a steam winch). Building 9 is best interpreted as a multipurpose structure with the western compartment providing shelter and office accommodation and the eastern cell being a general store or workshop. There is no evidence for a smithy in building 9 and repair and maintenance of tools and equipment was probably carried out off-site. Phase 3 probably relates to the activities of the South of Scotland Mining Company which reopened Silver Rig and the nearby Coldstream Burn mine between 1851 and 1854 (Foster-Smith 1967, 6). Despite the mine's remote location there is no evidence for workers' accommodation and it must be assumed that the miners came from or lodged at the surrounding farms.

### PIBBLE MINE (NX 528604)

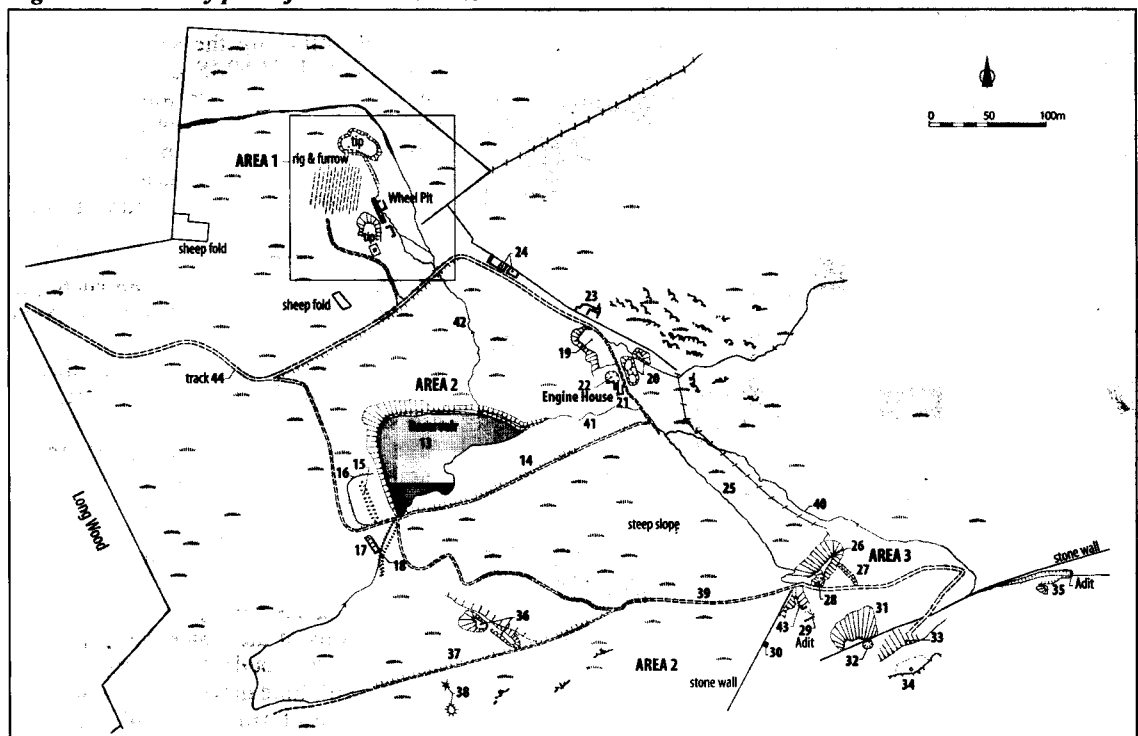
#### Introduction

The Pibble mine is located on the north-west slope of Pibble Hill at 200m O.D. and some 5km north-east of Creetown. Most of the surrounding ground is rough grazing with open moorland on Pibble Hill. The mine is a Scheduled Ancient Monument and a Site of Special Scientific Interest.

The vein trends roughly east-west in greywacke country rock. It is about 3.30m wide and the vein filling is quartz and barite with ribs and lenses of galena, sphalerite and chalcopyrite (Foster-Smith 1967); secondary copper and lead minerals occur in the higher parts of the mine.

The Old Statistical Account for the parish of Kirkmabreck (1790-1791) mentions "the appearance of lead mines in several places of the parish, but which have yet not been attempted with success" and the 1845 New Statistical Account states that:

Fig. 3. GPS. Survey plan of Pibble Lead Mine.



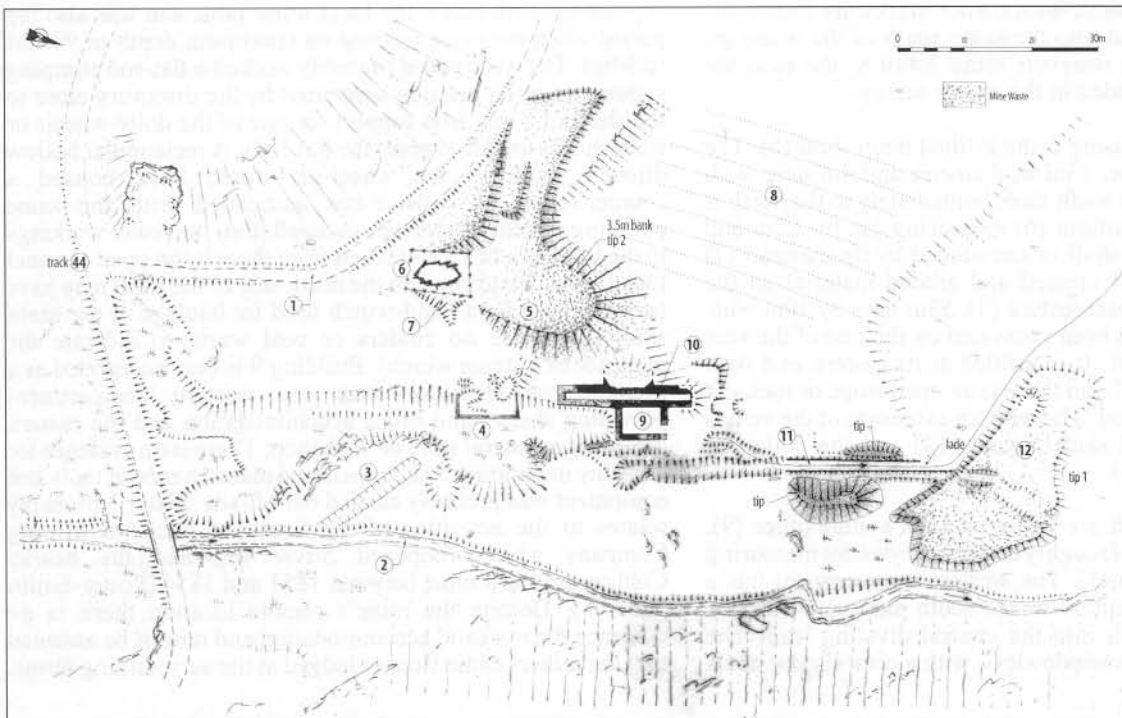


Fig. 4. Plan of Area 1 - Pibble Mine, water-wheel pit and related features (Source RCAHMS).

lead has been discovered in different parts of the parish, particularly at Blair-wood, Drumore, Glen and Mark

These references indicate that lead had been discovered in the immediate area but do not necessarily relate to Pibble. The mine was certainly worked between 1849 and 1855 by the Creetown Copper and Lead Mining Company, whose London business address was also used by the Kirkcudbrightshire Mining Company which operated the nearby Cairnsmore mine at Strathmaddie (Foster-Smith 1967). Cutland (undated) gives

Plate 1. Pibble Mine Cornish Engine House during the 1950s showing the collapsed bob wall and large cracks on the west elevation. (Source Creetown Local History Museum).



survey are shown on the Second Edition OS map of 1894 on which the mine is marked as disused. Wilson (1921) noted the remains of the old washing and dressing plant near the adit level mouth and Robertson described these and other surface features, all of which survive today, in more detail:

*Just west of the collapsed portal of the adit is the housing of an old water wheel which must have been close upon 60 feet in diameter. South-west of the adit portal and about 70 feet from it is an old shaft with a dump of about 600 tons showing some blende with galena and siderite and traces of chalcopyrite in a quartz gangue. About 750 feet south east of the adit portal and at an elevation of about 60 feet above it is a large Cornish pumping engine house immediately beside what appears to have been the main shaft area. There is no available information of a definite character as to the depth of the shaft or in the veins, which have been attacked from it. The dump is not large and consists of probably less than 600 tons although some of the material taken from the shaft and the workings connected with it may have been used to build the barrage of the reservoir to the east of the shaft.*

In 1992, following the scheduling of the site as an ancient monument, RCAHMS conducted a survey of the Cornish engine house and the remains of the water-wheel pit. The work included detailed topographical survey, elevation drawings and cross-sections supported by black and white photographs. A general plan of the site was also produced showing the relative positions of the key architectural features.

### Surviving features (Fig. 3)

For the purposes of surveying such a large area the site was divided into three individual units, Areas 1-3 respectively:

Area 1 was confined to the northern part of the site and encompassed the water-wheel pit, a shaft, spoil tips and dressing floor;

Area 2 formed the central area and included the Cornish engine house, the reservoir, watercourses, and trackways leading to the engine house and the south side of the reservoir;

Area 3 comprised the upland area of the site with components recorded included trials, adits, shafts and spoil tips.

### Area 1 (Figs. 3 and 4)

The remains of the water-wheel pit (10) and adjoining gear-house (9) are built from rough-dressed greywacke stone, bonded with lime mortar. The wheel-pit is roughly 20m long, 4.5m deep and 1m wide, with a tailrace situated at its north

Pibble's output between 1850 and 1855 as 214¼ tons of copper ore concentrate, 29 tons of lead with 40 oz silver per ton of lead.

Personnel employed at the mine in 1851 included 36 men, nine boys and three women.

The First Edition OS map of 1854, surveyed in 1850, marks three shafts on the hillside (corresponding to Area 3 below) but no other mining features are shown. All the features recorded during the recent

end. The 20m pit-opening would have accommodated an 18m-diameter wheel. The wheel itself was mounted on four crossbeams recessed in slots below the wall heads. The slots are 0.4m wide and housed the substantial squared timbers necessary to carry the considerable weight of the cast-iron and timber wheel. Two similar sized timbers would have been fixed by bolts at right angles to the cross-beams holding the central shaft-bearing of the wheel. The central drive-shaft would have continued into the gear house where a series of ancillary take-off wheels operated rollers or stamps for crushing ore. The gable on the north-east side of the gear-house survives to a height of about 4-5m. The gear-house is approximately 6m by 4m (internally) with a rubble-strewn interior.

Water supply to the wheel was from the reservoir (13) via a lade (42). Just north of the track a series of pillar bases (3) and a stone abutment (4) mark the line of a raised launder that had fed the wheel.

Immediately north of the wheelpit is a run-in level (11) and a linear, stone-walled trench leads from the level's entrance to an area of unmineralised tip (12). Other mining features in Area 1 include an open shaft (6) with an associated tip (5), a small box-drain (7) leading back into shaft 6 and a length of canalised, rock-cut burn (2). This area also contains a section of cart track (44) and some broad rig cultivation (8).

### Area 2 (Fig. 3)

The principal features in Area 2 are the Cornish engine house (21) and the reservoir (13).

The engine house was built for a Cornish pumping engine manufactured in 1852 by Hodges at the St Austell Foundry (Landlass 1993). The building is rectangular in plan, measuring 9m by 6m with walls 0.8m thick, and constructed of coursed greywacke with Creetown granite quoins. The granite is exceptionally micaceous and its light colour contrasts with the main fabric of the building. The boiler house is built against the east wall and immediately north is the run-in cone of the engine shaft (22) with the balance bob plinth on its western side (Fig. 5).

The side walls and rear walls of the engine house still stand to their original height but the bob wall has collapsed and lies in the shaft. A photograph taken in the 1950s (Plate 1) shows the bob wall intact but a large crack can be seen running from the wall-head to below the base of the lower left window. According to the landowner the wall collapsed into the shaft during the early 1960s and, since then, other fragments of the east and west elevations have fallen away.

The east elevation was surveyed (Fig. 6). The south corner with its granite quoins is intact to the wall-head but the northern section of the wall has collapsed. Surviving elements include a segmented arched window and the surrounds of a second window at first floor level, and the joist-sockets for the pitched roof of the boiler house. A rectangular opening below the line of the joists is the boiler house door and probably included the steam pipe opening. The west wall of the boiler house is keyed into the south-east corner of the engine house and a rectangular

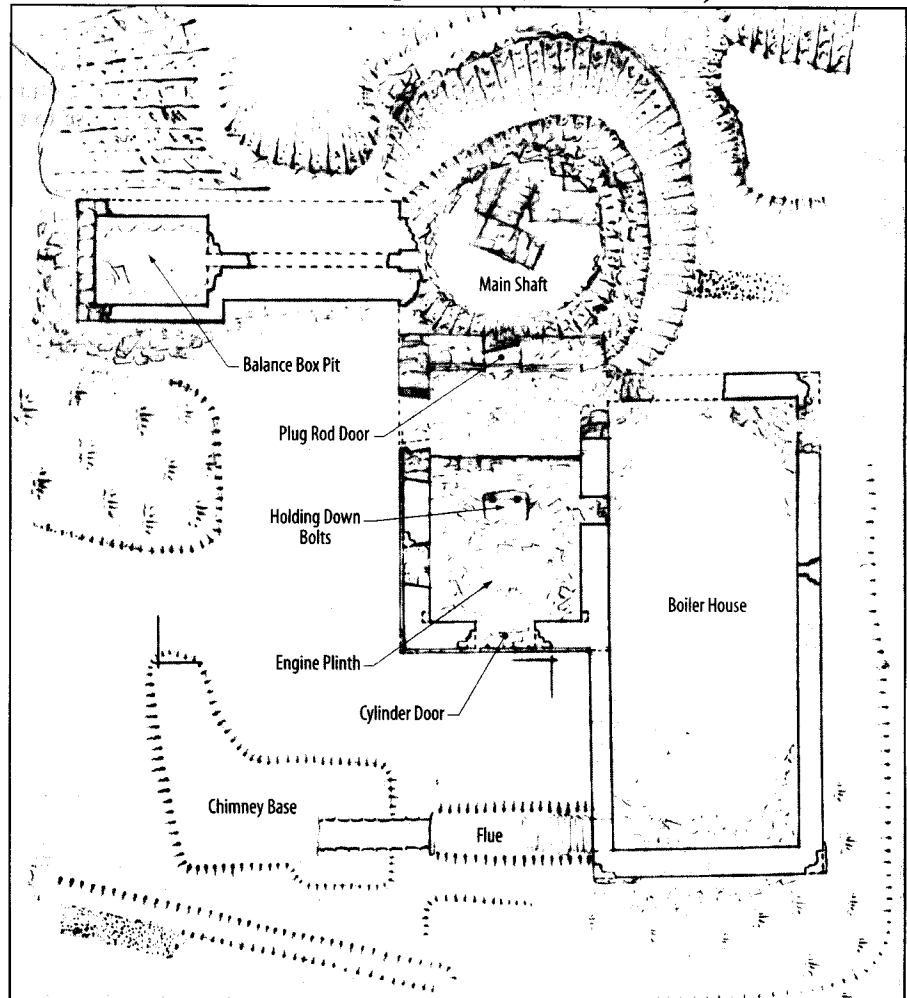
opening with a massive stone lintel marks the flue to the chimney.

The south elevation was also surveyed (Fig. 7). It stands to the original height of 15.8m and the pitched roofline is complete. There are two arched openings. The top opening is the bob loft window and immediately below are two blocked sockets for the spring beams which ran the full length of the building and projected beyond the bob wall. The lower, larger opening is the cylinder arch through which the engine cylinder and other parts were brought into the building during construction. The sill of the cylinder arch is 1.8m above ground level but nothing survives of the cylinder ramp or any associated access structure. The granite side quoins of the cylinder arch are missing, presumably robbed for reuse, as are the quoins at the base of the west corner. The survey drawing also shows the southern (rear) wall of the boiler house which stands to a height of 3m and has a central window opening.

The west elevation was surveyed by RCAHMS. It stands to its full height only at its southern end and has two arched, centrally aligned windows at the level of the driving floor and first floor; the ashlar sides of two corresponding windows survive at the northern end but the rest of the wall has collapsed. The lower section of the bob wall, complete with the arched opening to the plug door, lies in the shaft hollow in front of the engine house. Internally, the building has a stepped profile with the engine bed at the level of the cylinder doorsill and a rubble-filled cataract pit to the north.

The stone pit for the balance box is substantially complete (Fig. 5) but the plinth for the balance box beam survives only as a foundation course and its eastern end has been destroyed by the collapse of the shaft collar. Unusually, there are no foundations for a chimney although a flue from the boiler house suggests a

Fig. 5. Plan of the Pibble Cornish Engine House. (Source RCAHMS).



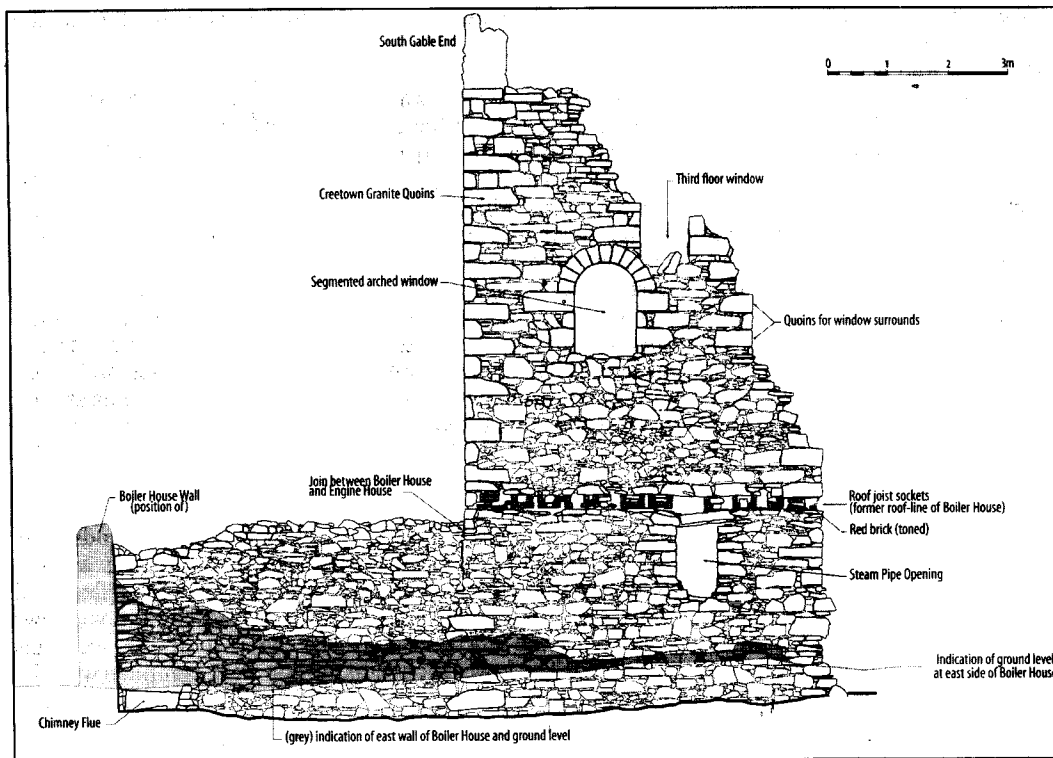


Fig. 6. East elevation of the Pibble Mine Cornish Engine House.

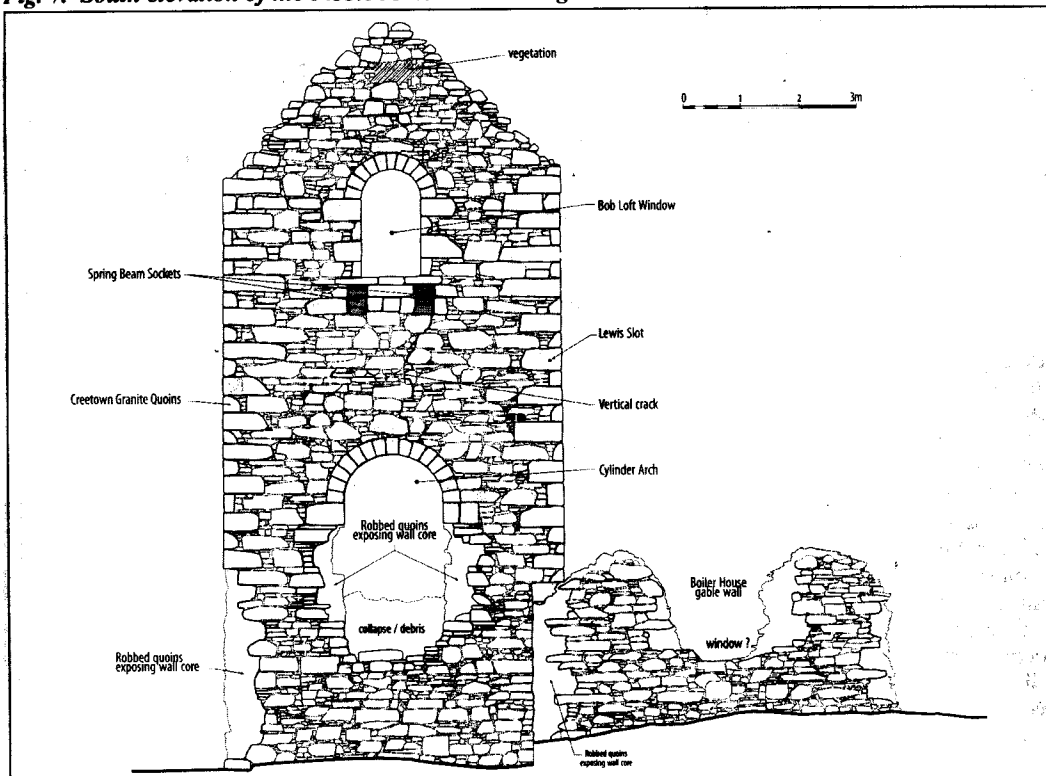
free-standing stack south-west of the engine house.

Immediately in front of the engine house is a substantial spoil tip (19) derived from the sinking of the engine shaft. It is composed of massive angular stones with no evidence for mineralisation. Another area of spoil (20) appears to be associated with a collapsed level driven south-east into the hill slope.

The reservoir (13) is triangular in shape with earthwork embankments on its north and west sides. On the south side of the reservoir, the gradient of the hill meets the shoreline. The embankments stand to a height of about 3m and are fairly

disturbance and spoil tips (36 & 38) on the hill slope south of the reservoir probably mark trial workings on the western extension of the Pibble vein and features 14 and 39 are part of a network of well-defined trackways linking various parts of the mine. Other features could have an agricultural function and include a double-celled building with a single-celled structure adjoining (24) situated close to the track leading to the engine house, and a rectangular five-celled structure (17) at the south-western end of the reservoir. The latter appears to be associated with a banked enclosure (15 & 16) to the north. Another agricultural feature is the sheep pen (23) built against the dyke close to the engine house; this is shown on the 1894 OS map.

Fig. 7. South elevation of the Pibble Mine Cornish Engine House.



uniform at the north-east end of the reservoir. The banks are noticeably larger at the north-west where the corner has been buttressed by larger dumps of material. The main water inlet (41) is at the north-east corner and taps the natural stream (40) running down slope from Area 3. There is another inlet (18) at the south-west corner and this appears to be associated with a contour lade (37). The main outlet is situated in the eastern half of the north face and a leat (42) leads from there to the wheel pit and dressing floor in Area 1.

There are a number of other mining-related features in Area 2. East of the engine house is an area of disturbed tips and the run-in entrance to a level (20). Ground

### Area 3

Area 3 has a series of levels and associated spoil tips associated with the working of the upper sections of Pibble vein.

An open, rock-cut level (29) is the principal adit entrance to the mine's upper workings. Close to the entrance is a small stone-built hopper or ore-bin (43) with the remains of a cobbled floor below. North-east of the level is a massive spoil tip (26), approximately 60m long and 20m wide; this is the largest surviving tip on site and appears little altered. Close to the tip and partly masked by spoil are the vestigial remains of a stone structure (28) with one wall revetted into the hill slope. Further up slope is a collapsed shaft (32) and

associated spoil tip (31) and higher still is an open shaft or stope (34) with a spoil tip (33). An isolated rock-cut level (35) 120m to the east appears to be a trial on a small unnamed vein. Other features in Area 3 include the turf-covered foundations of a 5m by 5m square structure (30) and a linear ditched feature (27) that runs under tip 26.

### Interpretation

The results of the survey indicate two periods of industrial activity at Pibble.

The first phase was concerned with working the upper part of the vein above the water table. This involved the driving of a drainage level (20) into the base of the hill and a second level (29) approximately half way up the hill. This second level appears to have been the principal access level and would have connected with the Pibble Vein after approximately 80m; from this point stopes were developed on the vein and feature 34 marks the point where one of these stopes – and also the vein – is exposed on the surface of the hill. The small ore bin and cobbled surface (43) outside level 29 are the remains of a dressing floor where the ore was broken and separated from the waste; there is no evidence for any machine housings here and it can be assumed that dressing was done by hand. The massive size of spoil tip 26 indicates the relative size of the mining operations accessed through level 29. The small rectangular structure 30 south-west of level 29 is believed to be the powder magazine (pers. comm. Ian Park). An ore washing area is likely to have been located at the lowest part of the mine, probably close to level 20 but all appears to have been destroyed by the construction of the later engine house and engine shaft and the removal during the 20<sup>th</sup> century of mine waste. It is also likely that material from this area was used in the construction of the phase 2 reservoir embankments.

The second phase relates to the mechanisation of the mine and involved the sinking of the engine shaft (22), the construction of the Cornish engine house (21), the reservoir (13) and water-powered crushing mill (9 & 10), and the driving of the bottom drainage and haulage level (11).

In most respects the engine house follows typical Cornish design, including the aesthetic use of arch-headed windows and contrasting stone types (Sharpe 1996, 22). The size of the engine is not known but has the appearance of being in the range 30 to 48 inches diameter and most likely around 36 inches. This would have been a small to medium sized pumping engine and not one expected to work either to particularly great depths or to have to deal with a constantly wet mine (Sharpe pers. comm.). The presence of the cylinder base stone and bolts indicates that the engine was not sold on (the base stone being treated as part of the engine). The chimney, or rather the lack of one, presents a problem. A flue from the boiler house leads to a small circular depression but there is no evidence for the stone foundations of a chimney. Given the substantial building techniques used in the engine house, some evidence for a chimney would be expected to survive.

Phase 2 was a capital intensive operation which aimed to work the vein below the water table. The remains from this second period of mining have all the hallmarks of a well-planned, integrated mining operation but there are some indications that the work was never completed. One example of this is the apparent absence of an engine house chimney. Similarly, the spoil tip (12) outside the bottom level is comparatively small and composed only of the sort of angular, unmineralised rock derived from driving through dead ground. Coupled with this is the absence of broken or crushed material close to the crushing mill and the lack of any tailings deposits derived from ore dressing and washing. The archaeological evidence suggests that the mine closed before full underground operations had started, possibly even before a connection had been made between the engine shaft and the bottom drainage

level. The absence of a chimney also suggests that the pumping engine was never actually installed in the engine house.

Pibble appears to be the only mine in Galloway where steam pumping was used (or at least intended to be used) and it is hard to account for the presence of a Cornish engine in an area where waterpower was the norm. During the 19<sup>th</sup> century there was an active trade between Galloway's ports and Cumbria, Lancashire and North Wales, and coal was a major import. The ready availability of coal could have been one of the reasons for a steam engine at Pibble but does not explain the complete absence of this technology elsewhere in the region. Is it possible instead that Pibble's engine house was constructed primarily as a lure for inward investment? Victorian mining companies vied with each other to attract shareholders and the appearance or promise of state-of-the-art technology, generally accompanied by over-enthusiastic accounts of a mine's economic potential in the pages of the 'Mining Journal', was often enough to attract financial support. Could the appearance of a Cornish engine house on a remote Galloway hill have been part of a similar scheme?

There is no evidence for a smelt mill at Pibble and ore must have been treated elsewhere. The nearby lead mines at Blackcraig and Cairnsmore shipped ore from Palnure harbour to Deeside and Flintshire for smelting and the Enrick mine at Gatehouse of Fleet sent copper ore to Swansea. It is likely that Pibble also used Wales for smelting.

It appears that both phases of mining took place over a comparatively short period, perhaps between 1849 and 1855 when the mine was being worked by the Creetown Copper and Lead Company. The initial development phase might have finished by 1851 when the pumping engine was purchased.

## WOODHEAD MINE (NX 528 940)

### Introduction

The remains of Woodhead lead mine are situated in an area of rough grazing north-west of the village of Carsphairn. The mine, which is situated at 1,000 feet (330m) OD, is reached by a track from Garryhorn Farm.

The geology has been summarised by Wilson (1921). The mine worked two near parallel veins, the Woodhead Vein and the Garryhorn Vein. Both veins carry zinc-blende, galena and chalcopryrite with strings of calcite, dolomite and quartz. The country rock is a fine-grained greywacke.

The history of Woodhead Mine has been well researched (Campbell 1994; Sassoon 1969). In summary, the mine was worked between 1838 and 1873 by the local landowner, Colonel MacAdam Cathcart. He developed a fully integrated mining complex which included washing and dressing floors and a smelt mill. He also established a purpose-built village at the mine for the workforce together with a school and library. The men were mainly skilled miners from Wanlockhead and Leadhills and by 1851 there was a population of 301 at the new village. Unlike the other Galloway metal mines, Woodhead was well positioned to take advantage of cheap Ayrshire coal and lime reserves for smelting. There was also a good road to Dalmellington, where the finished lead was stored before being taken to Ayr for sale and shipment.

The Woodhead abandonment plans (BGS R215B) include a plan and section of the workings, and the position of the Woodhead lead vein in relation to the Garryhorn vein is also shown (Fig 8a-b). Six shafts are shown on the Woodhead vein and a single shaft is marked on the Garryhorn vein (Fig. 8c). Hand-written notes at the base of the plan state that the mine was discovered in 1838 by men 'raising stones on the surface'. At first the mines were dug by opencast methods, then three adits were driven from the south to de-water the mine to a

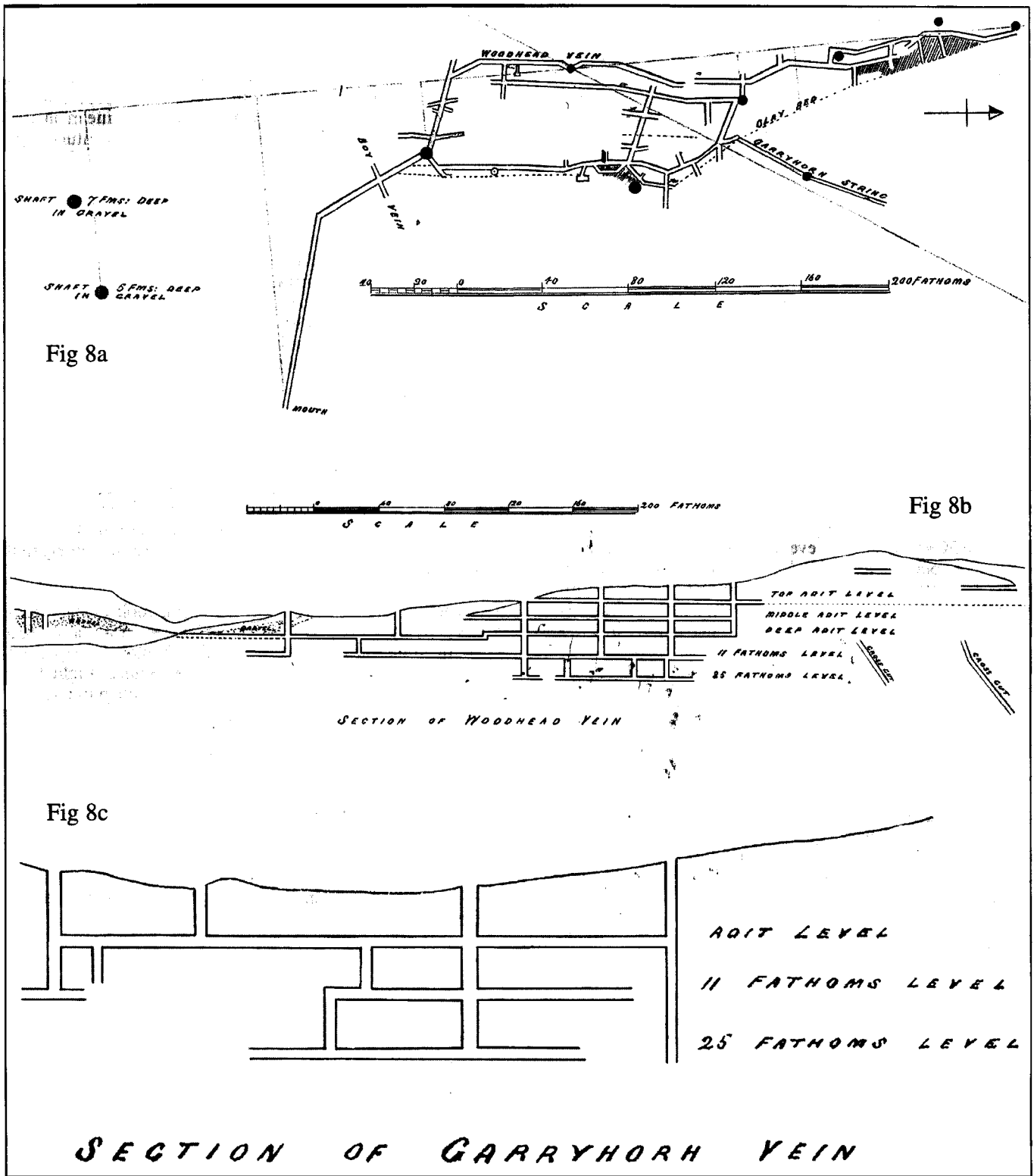


Fig. 8a-c. Plan and sections of the Woodhead mineral vein workings. (Source: British Geological Survey),

depth of 31 fathoms (c. 56m). A near surface vein, probably the one worked opencast, is mentioned as being 14m wide and up to 80m in length. It appears that a level was driven within the open cast at a depth of 11m which effectively allowed the workings to progress to a depth of 88m. Five named levels are depicted in the Woodhead section; these are named the Top, Middle and Deep adit below which are the 11 fathom level (22m) and 25 fathom level (50m).

Output statistics (Wilson 1921) show lead production rising to a maximum of 905 tons within a few years of the mine opening. By 1873, the year the mine closed, production had dropped to 12 tons in 1873 (Table 1).

Extracts from a diary kept by Peter Wilson, the Woodhead manager, provide more details on output and production (see Table 2).

The output statistics provided by Wilson for the year 1852 reflect the variations in price of lead per ton. The income from 5700 tons of lead, produced to the end of 1852, when the cost of smelting is deducted, provides a sum of £88,065. If this sum is averaged over 12 years between 1840-1852, it provides a yearly income of £7300. It is likely that this amount would have been higher due to the additional profits, gained from the extraction of silver. Wilson's diary entry (Sheet 2) mentions that in 1851, 18oz of silver was present in one ton of lead.

Unfortunately there is no mention of the price of an ounce of silver for that year. 1852 appears to mark a watershed according to the output statistics shown in Table 1. During the following years, output fell dramatically and never recovered to that during the first 12 years of operation.

**Table 1. Lead Output statistics for Woodhead Mine after Wilson (1921).**

Year	Tons	Year	Tons
1840	340	1857	72
1841	495	1858	63
1842	905	1859	45
1843	850	1860	59
1844	638	1861	61
1845	416	1862	51
1846	362	1863	42
1847	354	1864	41
1848	301	1865	35
1849	263	1866	29
1850	290	1867	20
1851	302	1868	—
1852	194	1869	30
1853	93	1870	61
1854	50	1871	63
1855	56	1872	34
1856	85	1873	12

**Table 2. Output statistics for Woodhead in the year 1852 and gross earnings over 12 years.**

Woodhead Lead Crop 1852			
80 tons sold	@	£17 per/ton	1360
56 tons sold	@	£18 per/ton	925
70 tons Sold	@	£24 per ton	1680
Total Earnings			<b>£3965</b>

**Woodhead output between 1840-1852**

5700 tons of lead raised up to the end of 1852 sold @ £16 per/ton	£91,200
Cost of smelting 11/- per ton inc. fuel	£3,135
<b>Total Earnings</b>	<b>£88,065</b>

Two photographs survive of Woodhead, soon after abandonment. The first (Plate 2) is taken from a 19<sup>th</sup> century postcard and shows the site from the east. The smelt mill buildings can be seen in the foreground, beyond are the dressing floors and the waterwheel operating the crushing mill and in the distance, below the hill, are the powder magazine and the whitewashed school, cottages and manager's house. The second photograph (Plate 3), is taken from a similar viewpoint but only shows one of the smelt mill buildings. Near-contemporary photographs of Galloway mines are exceedingly rare and these two views provide unique information on the operation and appearance of Woodhead.

The mine was opened again between 1917 and 1920 by Ore Supply Limited of Newton Stewart, the same company which had reopened the Blackcraig and Wood of Cree mines (Foster-Smith 1967); little work appears have to been done and this may have been nothing more than an exploratory episode. During the 1950s and 1960s the main spoil tips were removed for use as road aggregate and most of the dressing and washing floors were destroyed in the process.

**Surviving remains**

Woodhead is a large and complex site and the remains are described under the following headings: the mine, the dressing and washing floors, the smelt mill, and housing and related buildings.

**The mine (Fig. 9)**

The mine worked two parallel veins using a combination of shafts and levels. A collapsed portal (5) at the south-east end of the site is the entrance to the bottom drainage level, Deep Adit. Water still flows from the level into the burn which is partly embanked with spoil (4). Three shafts (8, 9 & 11), each surrounded with a mound of spoil, have been sunk onto the drainage level. There are two open shafts (43 & 46) in the centre of the site and close by an open trench (42) leading to a linear collapse feature marks the position of the Middle Adit. West of Middle Adit a tip and building remains (40 and 41) mark the site of a now completely infilled shaft. Further up slope to the north-west are a series of shaft hollows (27, 28, 29 & 30) or, more probably, subsidence cones. Above these is a large opencast, 60m long, up to 50m wide and some 3.5m deep, with a truncated level exposed on the south, dipslope face. An open, rock-cut shaft (24) is the highest mining feature on the site. An isolated level and tip (34) on the north face of the hill mark a probable trial.

**The dressing and washing floors**

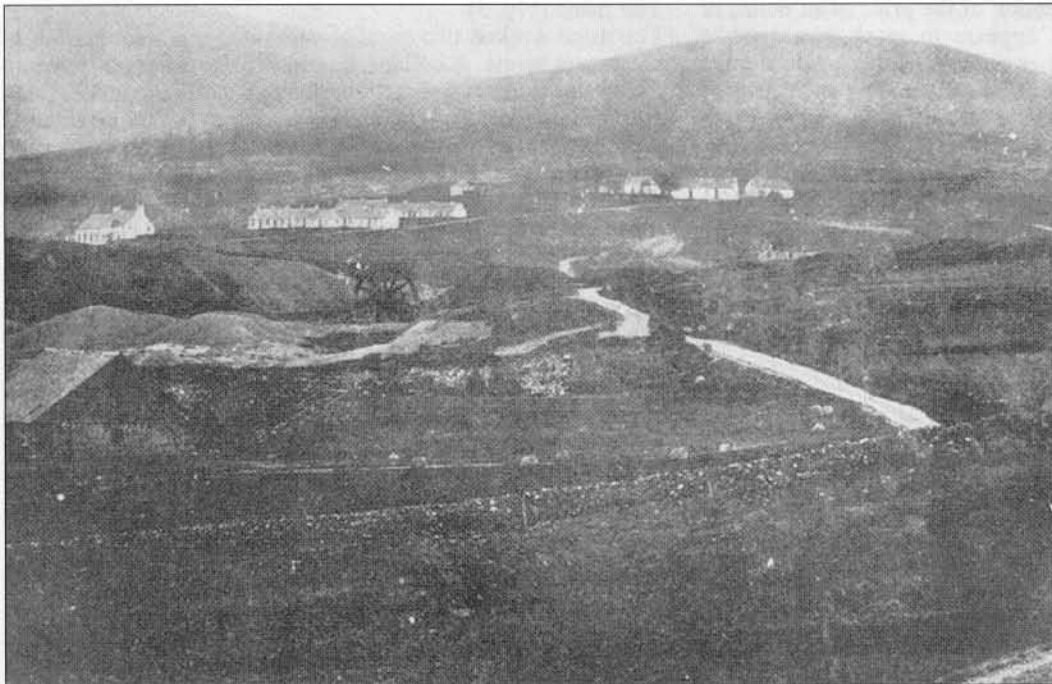
The dressing and washing floors occupy the central part of the site. Much of this area was reworked for road material in the post-war period and many of the features have been damaged or destroyed. The principal surviving feature is an earthwork ramp (47) for a waterwheel and an associated stone structure (48). The wheel was supplied via a contour lade system from a rectangular, embanked reservoir (10) marked as 'Weaver's Dam' on the 1854 OS map. East of the waterwheel ramp are the remains of a 15m by 6m stone structure (49) and an area of cut timber, launder fragments, dressing waste and tailings; these features must be part of the dressing floors. Further east is a large tip of graded spoil (50). The dressing and washing floors were served by a complex system of lades that requires further investigation and survey. Much of the water supply came from reservoir 10 with a hilltop reservoir north of the site - outside the survey area - providing additional supply. Another lade (7) runs east and north from the Garryhorn Burn towards the dressing floors and may also have been used to power the wheel at the smelt mill.

**The smelt mill (Fig. 10)**

The smelt mill (54) is a complex of buildings built around three sides of a central courtyard; the individual structures are described in more detail under 'Interpretation' below. Two stone flues (52 & 53), capped with massive flagstones, run up slope from the northern block of buildings to two square chimneys (59 & 60). The southern chimney stands to a height of 15m and is buttressed at its base. The other chimney has partially collapsed and survives to a height of 4.5m. A double-vaulted brick-lined flue (51) runs east and then north from the southern block of buildings. It may connect with, or possibly be blocked by, flue 52.

**Housing and related buildings**

The only roofed structure is a much-altered 35m by 6m three-cottage row (1) known as 'Mill Row'. To the east is a lazy bed (3) enclosed by a fieldbank and boundary wall. The main building group is at the west end of the site and comprises the 27m by 7m School House (12), the seven compartment Low Row (13), the five compartment High Row (14), the four compartment terrace and outhouse of Office Row (20 & 21) and an unnamed two compartment structure to the north (22); all these buildings are substantial ruins with the west gable of Low Row still complete and the walls of Office Row and the School House standing between 4m and 6m. Forming part of the same group are the remains of the 4m square powder magazine (18) and two parcels of lazy beds (15 & 16). A second group of buildings is located in the northern part of the site close to the main mine track (57). These structures, which have been heavily robbed and survive only as foundations, comprise a rectangular building platform (33), two rectangular buildings (35 & 36) and a four compartment row (37) attached to a stone walled enclosure (38); lazy beds (32) are associated



*Plate 2. Woodhead Lead Mine c.1890s, looking north-west. Note the smelter in the foreground with the water-wheel and waste tips in the middle ground. (Source Carsphairn Heritage Centre).*

with these structures. Buildings 35 and 37 were cottage rows known as Bones Row and Weir Row.

### Interpretation

Building platform 33 and structure 36, the remains perhaps of a small upland farming-mining activity at Woodhead. A number of clearance cairns – not marked on the survey – could be related or be part of an even earlier, possibly prehistoric, agricultural phase. Ainslie's Kirkcudbrightshire map of 1797 marks the adjacent farm at Garryhorn but shows nothing in the area of the later Woodhead Mine.

The earliest documented phase of mining was an open working on the vein and this must have been at opencast 26. By 1840, two years after the initial discovery, underground mining had commenced and the abandonment plans (Figures 8a-b) allow

*Plate 3. Woodhead Lead Mine c.1890s showing the waterwheel and extensive waste tips. Taken from the east. (Source Carsphairn Heritage Centre).*



on the 1895 OS map. An account in the 1860s describes water pumped from the mine 'by the beautiful balance-machine first invented by Brindley and ore raised on the same principle' (Campbell 1972). This engine, presumably a water-powered bucket engine similar to the example still surviving at Straitsteps mine, Wanlockhead, might have been located at shaft 40 and the 1890s photograph (Plate 2) shows an interesting but enigmatic wooden structure at this location. More detailed survey around shaft 40 might help to establish the type of engine in use.

The two mineral veins have a generally north-south course. Woodhead vein is marked at the surface by shafts 11, 24, shafts/subsidence cones 27, 28, 29 and 30 and opencast 26. Shafts 43, 45 and trial 34 mark the line of Garryhorn Vein.

Little survives of the dressing and washing floors. The principal features (47 and 48) relate to a large water wheel and associated crushing mill: the wheel is shown clearly in the centre of the 1890s photograph and appears to be breast-shot. Immediately east is the site of the washing floors marked by buildings 49 and tip 50. There are some indications here of timber structures buried beneath spoil and tailings waste and this area, despite the initial appearance of total destruction, may have good archaeological potential.

The final group of structures belong to the smelt mill. Peter Wilson's diary contains the only contemporary description of the mill

and is a major aid to the interpretation of the remains. The entry, written in 1851 or later (diary sheet 6), states:

*Length of new or E smelt mills for two hearths, outside walls 2ft, width 33ft length 20ft. Engine House 33ft wide by 27ft. Waterwheel is 24ft diameter. The house containing 2 roasting furnaces is 46ft in length by 25ft long outside.*

These dimensions appear to correspond with those of buildings D and E (Fig. 10). Building D is divided into three cells and it is likely that the central cell housed the blowing engine which in turn powered a single ore hearth in each of the side cells or, alternatively, one ore-hearth and one slag hearth (another entry on sheet 6 of the diary refers to slag lead and must refer to the use of a slag hearth at the mill). The arched dividing walls formed the backs of the two hearths and also carried high-level flues out of the building to the main flues A and B. No features survive that can be associated with a waterwheel but it could have been housed parallel to the north wall of building D. Building E must have housed the two roasting furnaces described in the Diary is a suggestion supported by the presence in the rubble of a large amount of refractory brick. The layout of Buildings D and E is fairly similar to the mid-19<sup>th</sup> century Surrender Mill, North Yorkshire which had a central wheel operating ore and slag hearths with a reverberatory furnace in an annexe (Cranstone 1990). Associated with this group is building C, a rectangular structure built into the natural slope; the 1890s photograph shows this building with an angled roof line and two internal divisions. It was presumably a store of some type and may have been filled from above. A similar sized structure could have stood in the rectangular area immediately west of Flue B where the remains survive of a stone retaining wall. Building C and its postulated twin are best interpreted as ore and fuel stores.

If Buildings D and E are Wilson's 'new mill' then it is likely that Buildings F and G were constructed as part of the earlier, pre-1851 mill. Some support for this interpretation can be seen in Flue I which connects with both buildings but appears to have been destroyed to the north by the construction of Building E. It is also possible that Buildings F and G, which are shown as intact and roofed on the 1890s

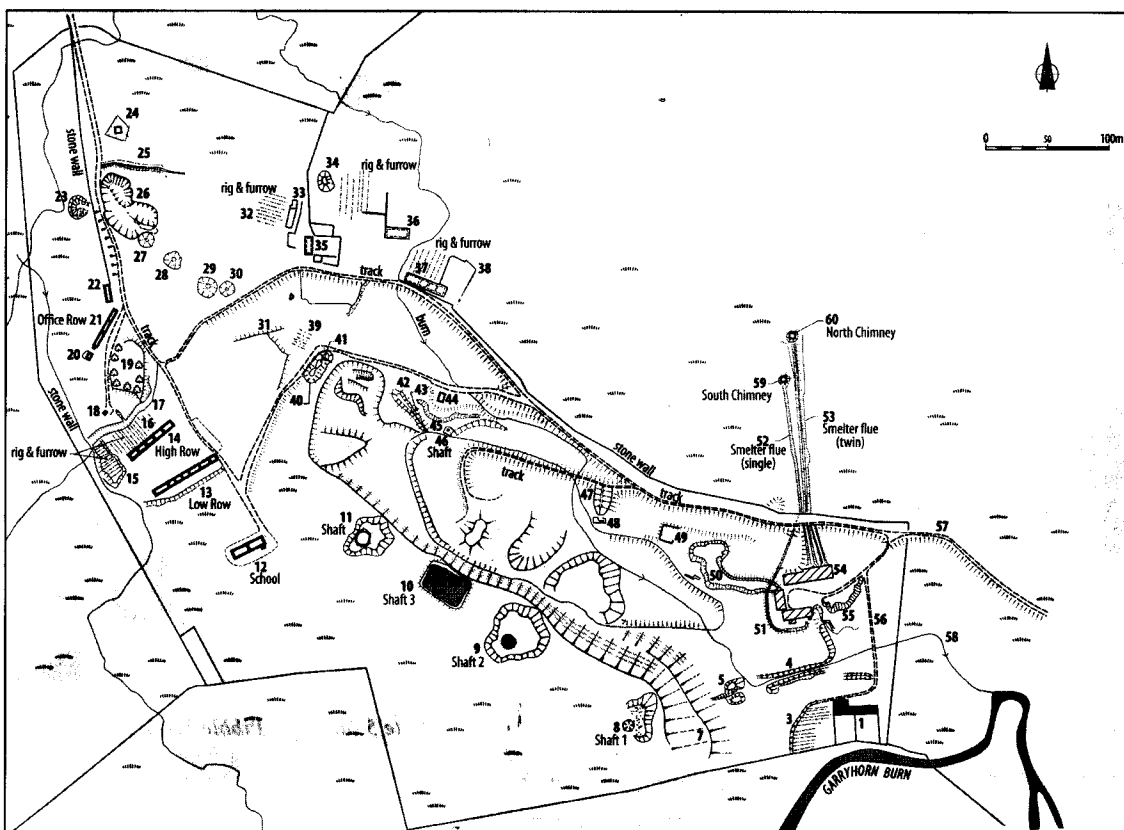
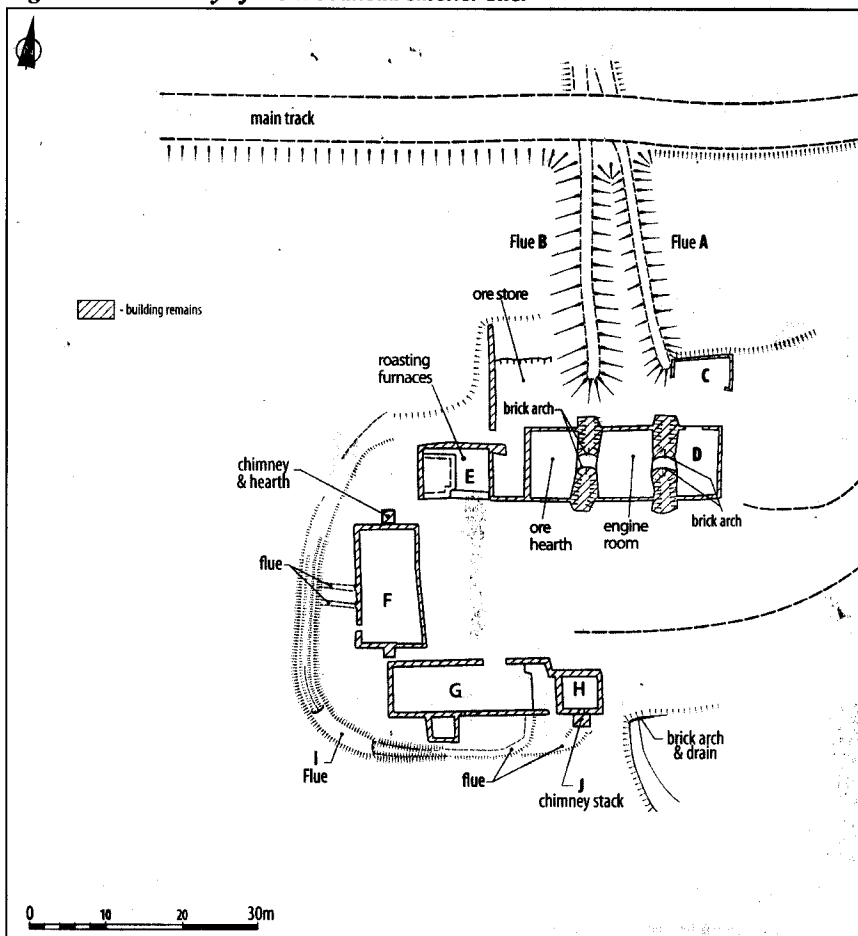


Fig. 9. GPS survey of the Woodhead Mine.

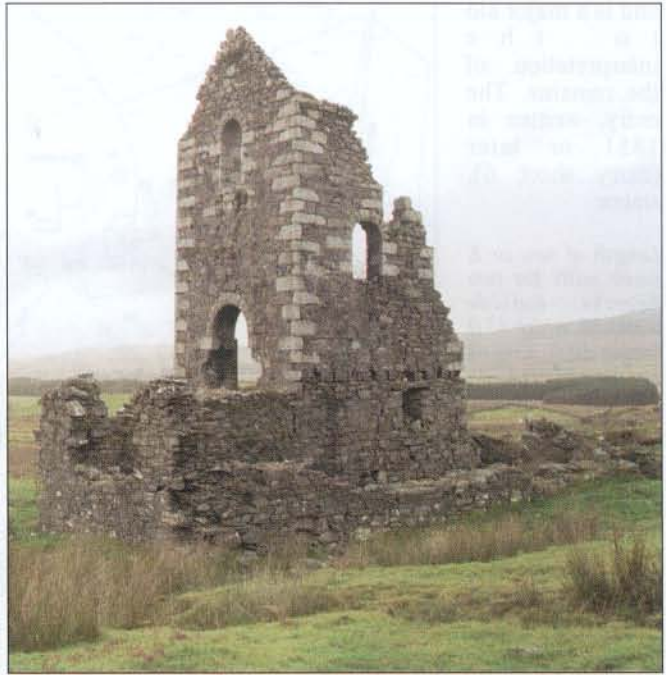
photograph, operated alongside the new mill and were used for assaying and silver refining. Neither assaying nor cupellation required long flue systems and stack H is similar to the single square chimney in the assay house at the Nenthead Mill, Cumbria and the Old Gang Smelt Mill, North Yorkshire.

Fig. 10. EDM survey of the Woodhead smelter site.





*Plate 4 (above). Pibble Mine Cornish engine-house.*



*Plate 5 (above). Pibble Mine Cornish engine-house.*

*Plate 6 (below). Woodhead Mine smelter flue with chimney.*



*Plate 7 (below). Woodhead south smelter chimney and flue.*



One puzzling feature is the use of two chimneys at such a comparatively small mill. Multiple flue systems are common, especially in the North Pennines, but they normally join together at a single stack. The twin chimneys at Woodhead may echo the two phases of mill construction, with the south chimney being built as part of the early mill and then reused with a new flue system during the operation of the new mill. Alternatively, and perhaps uniquely, the two chimneys could both belong to the new mill, with one being used for the slag mill and the other for the ore-hearth.

Three other buildings had a direct mining function. Structure 18 was the powder magazine and its square shape is found at other mines in southern Scotland such as Glencrief, Wanlockhead and Wood of Cree, Minigaff. The magazine can be seen on the 1890's photograph and has a hipped roof. For obvious reasons, explosives were normally kept at some distance from other structures so it is surprising to find the Woodhead magazine within a mere 35m of the cottages at High Row. The large rectangular building 22 was the main smithy and workshop and another smaller smithy (44) was built close to the entrance to the Middle Adit.

The housing at Woodhead is a fine example of company-built accommodation and High Row, Low Row, Mill Row, Bones Row and Weir Row have much in common with the planned colliery housing built around the same time at nearby Dalmellington and the other new villages in the Ayrshire coalfield. At other isolated British metal mines, especially in Mid Wales and the North Pennines, accommodation was provided for single miners during the week in barracks or lodging shops. At Woodhead, however, the plan from the start was to attract miners and their families to a permanent settlement complete with allotments, school and library. To a certain degree this demonstrates the paternalism and economic confidence of Macadam Cathcart. It may also reflect the aspirations of the miners themselves, most of whom were recruited as skilled workers from the lead mining villages at Leadhills and Wanlockhead where, despite the relative isolation, there was a well developed social infrastructure based on family housing, universal schooling, miners' libraries and mutual support groups.

The location of the housing at Woodhead is interesting and reinforces the social hierarchy of the time. At the highest point is the management block Office Row (21), complete with a walled garden and trees (19), which dominates the site and looks down over the mine and mill. Below and in its shadow are High Row, Low Row and the school and, to the north-east, Bones Row and Weir Row. The end cottage in Low Row was bigger than the others and may have been allocated to one of the mine's foremen or supervisors, a practice which is also seen in some contemporary workers' housing in the South Wales coalfield (Lowe 1977). Curiously, Mill Row is some distance from the other housing and positioned directly opposite the smelt mill; was this to allow the smelters easy access to their workplace or does it suggest a difference in social status between the smelters and the other family groups at the mine?

### Conclusion

The three mines illustrate different aspects of the archaeology of metal mining in Galloway. Silver Rig is a comparatively small multi-period mine and most of the surface remains belong to the mid-19<sup>th</sup> century. With the exception of the nearby Coldstream Burn mine, there are few local parallels for Silver Rig's layout and its similarities lie more with the small water-powered mines of mid Wales such as Nantyeira and Nantyrarian in Powys. Silver Rig's importance lies in the fact that it is one of the few Galloway metal mines with evidence for more than one episode of working and the opencast, which may well be of some antiquity, is particularly interesting. Small-scale excavation and sampling for dating purposes has been employed with success at a number of English and Welsh

mines (Timberlake 2003) and could be usefully applied here. Future work might also look at the problem of smelting at Silver Rig and other potentially early mines in Galloway. A number of charcoal platforms survive in the northern part of the Wood of the Cree (NX 3771), which is only 1km from Silver Rig. Do these charcoal-making sites relate to a period of medieval or early modern bale-hearth lead smelting or were they producing charcoal for the late 18<sup>th</sup> century ore-hearth smelt mill at Craigton near Newton Stewart? Again, excavation and sampling could help with relative dating. Most of the remains at Silver Rig are in a stable condition and there are no immediate plans for consolidation.

Pibble is a very good example of a medium to large capital intensive mine and in terms of surface layout is probably one of the most complete mining sites in Scotland. The Cornish engine house is particularly important. It is unique in Galloway and one of only two surviving examples in Scotland, the other being at Mulreesh on Islay, Argyll. A technical inspection of the site by Historic Scotland in 2003 indicated that both the engine house and the wheel pit could be consolidated. It is to be hoped that a support can now be found for a conservation and interpretation project at Pibble.

Woodhead is unique. There is nowhere else in Scotland with the remains of a planned village, metal mine and smelt mill, and this site, with its combination of social and industrial archaeology, may be the country's only example of an industrial 'ghost town'. The recent survey has produced an outline description and interpretation of what survives but there is scope for further research. There is an extensive and complicated network of lades and fieldwork combined with a study of existing aerial photographs could establish the extent and sequence of water supply at the mine. The site of the balance engine would also repay further investigation and a detailed survey of the earthworks around shaft 40 might provide information on the type and operation of the engine. With the exception of the example at Wanlockhead there has been little research on the use of water-balance engines in Scottish mining and Woodhead, which appears to have used a water-balance for both pumping and winding, could be an important site. The Woodhead smelt mill is also important and with Meadowfoot at Wanlockhead, is one of only two examples of a mid 19<sup>th</sup> century mill in Scotland. Detailed survey and building recording of the mill site would aid interpretation and help in our understanding of Scottish lead smelting practices. An initial structural survey at Woodhead suggests that most of the standing remains, including the smelt mill chimneys, are in too poor a condition to warrant consolidation.

Most mining historians associate Scotland's metal mining archaeology with the remains at Wanlockhead and Leadhills. The CFA survey has demonstrated that Galloway also contains regionally and nationally important metal mining sites. There is a need now to examine and evaluate Galloway's other mines and to incorporate the results within a survey of mining sites elsewhere in Scotland. This would provide essential data on the condition and relative importance of all the sites and provide a national assessment of the country's often-neglected metal mining heritage.

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## Maps

- Ordnance Survey 1854 1<sup>st</sup> Edition *Kirkcubrightshire* Sheet 16  
Ordnance Survey 1894 2<sup>nd</sup> Edition *Kirkcubrightshire* Sheet VII.10  
Ordnance Survey 1909 3<sup>rd</sup> Edition *Kirkcubrightshire* Sheet VII.10  
Ordnance Survey 1907 2<sup>nd</sup> Edition *Kirkcubrightshire* Sheet 16

## Drawings and other documents in the NMRS

- |           |  |
|-----------|--|
| MS/744/73 | Letter from Anna Campbell listing contents of diary sheets |
| DC 17335  | Digital copy of large afforestation survey by CFA          |
| MS/744/73 | (3x A4 sheets) Extract of Peter Wilson's Diary             |
| MS/744/73 | 1850 plan of Woodhead Mine Ordnance Survey 1850            |
|           | Kirkcubrightshire Sheets No V and IV                       |
| MS/744/73 | Annotated plan   |
| MS/744/73 | Ordnance Survey 1909 Kirkcubrightshire Sheet No VII        |
| MS/744/73 | Woodhead Lead Mine   |

Aerial Photographs: Plates B70362-B70374

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