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CWM BRWYNO MINE
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Cwmbrwyno Mine, Summary of Findings.

Lying in the Silurian rocks of the Plynlimon foothills, 11 kilometres east of Aberystwyth in Mid Wales, around NGR: SN 713.805 or Long. 30 53' 35" Lat. 52° 24' 33", at between 220 and 320 metres above sea level, are the remains of the Cwm Brwyno Mine. Discovered during the mid 18th century, it produced about 7000 tons of lead & zinc ores prior to 1900. At times also known, or referred to, as the Cefn Brwyno, Cefn Cwm Brwyno, or Cardigan United Mine and I have even encountered Cefn Cwm Brwyno and Cwm Bruno as incorrect synonyms.

Literary references are scant and difficult to access, no contemporary photographs have been seen although a late 19th century one is reputed to exist. Two underground plans survive, but there are none of the surface; whilst the first edition of the Ordnance Survey 1:2500 plans appear to be detailed, it would be presumptuous to assume that it is accurate or definitive. Also, the survey was undertaken when the mine was close to being abandoned and when earlier features had been obscured.

It would therefore be remarkably easy to condemn the remains as insignificant and unworthy of further investigation or preservation. David Bick's series on "The Old Metal Mines of Mid Wales" (II.18) dismisses the site in half a page of text and two illustrations; The brevity of this account is not representative of the extent or importance of the remains.

Despite the early discoveries which are recorded in Lewis Morris's survey of the mines, surprisingly little happened until the mid 1840's when it was let by the Ryases of Gogerdan to the Evanses. Having produced about 200 tons of lead ore in four years, with little in the way of machinery, the mine was sold to John Taylor & Son. In 1850. The day to day management of the works were entrusted to James and John Paul, the sons a Devonish family who had settled in Goginan to manage Taylor's interests there.

Taylor's surface works were initially based below the mouth of Evans's Adit and to the east, where there are old tailings dumps. However, there is strong circumstantial evidence to suggest that Taylor later built a new mill, below the Middle Adit, which was mostly salvaged before the site was used for the dumping of development rock. The Ore Slides and the Lower Crusher appear to be constructed during this 1858 to 1862 phase. Further research on the Mining Journal and John Taylor's Reports would undoubtedly clarify the situation.

Believing that it had been abandoned prematurely, and that there were still good profits to be made out of the mine, it was taken up in 1867 by J. H. Murchison & Co. with the backing of the Ryse Estate, various private investors and mine agents, principally the Paul family of Goginan and Cwmbrwyno. Whilst Murchison's Cefn Brwyno Mining Co. was fairly short lived, unproductive, and was liquidated in 1875, the Pauls

retained their involvement until 1881 by taking a partnership with the Williamses - suppliers of mining stores, powder & candle merchants, sawmill & foundry owners, now based in Aberystwyth but who formerly ran a store in Goginan. When the mine failed to break even, a gentleman entrepreneur from Devon financed the operations for a further four years, but both the mine and the mill were obviously worn out. Taylor's old managers, the Pauls, unfortunately withdrew at this time. Hoping to make the mine pay its way, George Green the proprietor of Green's Cambrian Foundry in Aberystwyth, only sold £165 worth of concentrates during his three year tenure before abandoning the mine. Labour costs alone must have been in the order of £400 for this period, and merchants bills could easily have doubled the costs.

It is a mystery why the unknown Henry Jenks thought that he would fare any better between 1886 - 1913, firstly with the Cardigan United Mines, and then the Cwm Brwyno Blende & Lead Co. Ltd. There is virtually no documentation to cover this period and it is probable that he considered there were easily worked reserves of zinc blende on the North Lode above the deep adit which could be worked at a small profit; certainly sufficient to balance the operating costs until the price of lead improved.

It was the hope of improved prices that was the usual modus operandi for mines in the locality at that time. The mine was officially abandoned in 1913 but it must have been inactive or suspended for some time, on the 1905 edition of the 1:2500 OS. plans it is marked as being disused.

During and after the Great War, labour costs escalated way out of proportion to mineral values and no further interest is recorded after 1917 when the wartime Department for the Development of Mineral Resources in the UK, inspected the site. This inspection was driven by the wartime demand for metals which had inflated the value of base metal concentrates, but the better prices were a shortlived phenomenon.

I examined the area whilst in the employ of Cambrian Exploration Ltd., a Vancouver based mineral exploration company, in the summer of 1968 whilst metal prices were buoyant and there were other incentives offered to stimulate the industry. Whilst anomalous base metal values were discovered over supposed strike extensions of the Lode, VLF, EM, traverses proved disappointing and no further phases were undertaken. It is worth mentioning that the latter method is particularly good for detecting conductive minerals such as galena and pyrite, but is ineffective when searching for sphalerite. Geological modelling and diamond drilling would be necessary to ascertain if there were viable reserves at deeper levels, but this is unlikely to take place with the current cost of labour, value of minerals and tough planning constraints.

located within the reclamation area are :-

Ore slides: At SN: 7125.8055. These appear to be contemporary with the tramway which ran from the intermediate or Middle Adit. They are clearly shown on the 1887 Ordnance Plan, and appear to be in use at that date; However, by the time of the 1905 revision, the slides appears to be obsolete and unroofed and the tramway had been lifted. The 1905 plan also confirms that many of the earlier developments had been obscured beneath the later dumps. Whilst the slides appear to be contemporary with the driving of the Middle Adit, by John Taylor & Son around 1850, this cannot be confirmed and they may date from ten years later. It would be very poor practice for Taylor's to construct the slides well below the level of the crusher in what is a totally illogical position. However, as an unwieldy method which involves double handling, Taylor's ore could have been sorted and spalled at these slides by women and boys with the waste being conveyed to the dumps, and the lesser volume of upgraded and enriched material being carted back up the hill to the crusher. There is a well used track from the slides to the original dressing area, but this passes below Taylor's old crusher. Why there was such a large volume of waste rock above the spalling & cobbling floor, and above the level of the tramway from the Middle Adit, defies logical explanation.

These slides, or bins, were in a rather poor and ruinous condition, the front skin of the facade had partly collapsed prior to May 1967, and subsequently appears to have been robbed for stone. Through the two openings would have been wooden chutes to convey the coarse ore onto a spalling & cobbling floor. There was no indication that this floor had either survived or been destroyed before an access road was laid across it in November 1998.

The western compartment is still in a reasonable state and its function would have been more apparent if it had been given a little attention and the edges were better delineated. However, instead of following this course of action, an access ramp was constructed through the eastern compartment. This excavation was not shown on any of the plans which I was provided with, nor was I not notified that it was under threat. The damage was then presented as a fait accompli. I have no doubt that the contractors were not to blame and were instructed to construct the ramp through these remains; The site agents found the situation hilarious and I failed to get the consultant engineers to take the matter seriously.

Photographs; 4, 16, 17, 18, 24, 27 show the condition of this bin prior to the construction of the ramp through the feature. Photographs; 45, 53, 57, 58, 64, 65, 66, 67, 161, 162, and 166, show the damage to this part of the site.

Back wall of yard: At SN: 7030.8052. A 6.00 metre section of wall was exposed during the construction of the ramp into the cell on 15:12:98 and appeared to be an isolated remnant of one of the pre 1887 structures, possibly part of an old wall dating from the 1860's, not recorded, and largely demolished at the time of the 1870 refit. Only the upper 1.50 metres of the wall were exposed during the excavation of the cell, and its full height could not be ascertained. No floor level was discernable in the sides of

the cell. The main fabric of the wall was of rather poor and shaley rock laid horizontally, but capped by a single row of better rock which had been set on edge; that is vertically.

A section cut across the northwestern end of the wall showed that the material held behind the wall was of the same nature as that lying in front and over it. The 1887, 1st Edition of the 1:2500 Ordnance Survey plan, suggests that this wall had already been buried beneath dumps, and it must therefore date from an earlier phase of working. It would seem likely that it is contemporary with the ore slides, viz. between 1850 and 1870. There was no necessity to remove this wall, and it was buried during the restoration phase.

Photographs; 52, 53, 54, 55, 57, 58, 64, 65, 66, 67, 151, 160 & 162 show this feature and its position.

Small wheelpit & building: At SN: 7127.8052. Was long since abandoned and appears to date

from the 1860's. Internally, the wheelpit is 6.85 metres long by 1.50 metres wide thus suggesting that it accommodated a 20 - 22 foot by 4' 6" wheel, probably backshot. This pit is shown on both the 1887 OS. plan, and the 1905 revision, in identical form. Neither edition show a wheel in this pit. However, the adjoining building, on the northern end, had later been reduced to about half of its original length according to the 1905 edition. All that now remains of the smaller version is an oval depression 4.50 metres long by 2.00 metres wide. Whatever was housed in this adjoining building, it discharged water into the wheelpit through a 1.50 metre long 100 mm. square box launder. This area was excluded to the contractor and remains in its pre-restoration condition. The area was examined for signs of the tailrace from this wheelpit, but none were found. I am inclined to think that this wheel drove a small crushing plant but there are no remaining indications that there was a crusher house annexed to this wheelpit, and the building which adjoins it on the northern end is in the wrong position.

Photographs: 3, 4, 24, 27, 57, 58, 127, 128, 130, 160, 161 & 166 show this feature, before, during and after the completion of the works

Around SN: 7122.8052. To the west of the above site lies an area which has been disturbed and is sparsely vegetated. Upon examination, there appear to be shallow patches of waste and it seems that some hand dressing has taken place here, thus suggesting that it represents an early, pre mechanised phase, possibly 1840 - 1850. The 1887 plan shows a small square shed on this site, but it has been removed by the time of the 1905 revision. This may be the pre 1872 magazine. The northern part of this area lay under the main haul road and was soiled over during restoration. Whilst this has altered the character of the ground, any remains will survive in situ. Further west, is :-

Cutting for large wheel: At SN: 7120.8051. Located 25.80 metres to the west of the small wheelpit, there is a 15 x 2 metre cutting which is certainly not a prospecting trench. As it is parallel to the other wheelpit, and is more or less aligned towards Taylor's Engine

Shaft, it is possible that this cutting was investigated as a site for a 40' + waterwheel, probably for increased pumping power. No firm date can be ascribed apart from between 1840 and 1870. The temporary haul road passed beyond the northern end of this cutting and it has survived the works.

Photographs:- 24, 28, 29, 30, 37, 38, 39, 40, 57, 58, 66, 67, 83, 85, 87, 101, 102, 113, 127, 128, 133, 134, 160, 161 & 166.

Masonry Portal: At SN: 7129.8051. Set at the end of a short cutting into the top of the development to be a culvert to carry water to the new crusher house dating from the early 1870's, but this has now been identified. Its apparent course does not line up with the sluice, but does line up with the leat which runs from the mouth of the Middle Add; its internal dimensions, and construction, are far larger than is necessary for a water culvert, nor does its style match the other culvert.

I am now inclined to think that it was constructed to carry ore to the new crusher house of the 1870's. Whilst there are no references or plans to confirm this hypothesis; The culvert may only have been 20 or 30 metres long, and could have either carried ore from a hopper set in the floors in front of the ore slides, or the wagons from the Middle Addit may have been tipped onto a chute to convey the ore into wagons destined for the new crusher house, thus bypassing the slides. If the hopper, or chute, was later destroyed, we are left with the present enigma regarding this culvert. Its position, size and datum is more conducive to the carriage of ore rather than water. On the 1887 plan it is marked as a "Level" from which a tramway runs to the back of the crusher house. It is not shown on the 1905 revision.

The portal was contained within the exclusion zone and remains in the same condition as it was before the scheme. The ramp into the cell will therefore have passed over any extension of this culvert or tunnel, and the loadings to which the masonry lining was subjected may have caused its failure. This area was continually monitored by myself, but no subsidence was observed at any time, nor were there any indications that the tunnel ran close to the surface. It may have completely collapsed, or been subject to stone robbing many years ago, with the portal and three metre length which survives being the sole remnants.

Photographs: 3, 4, 7, 12, 24 & 27.

New Crusher, Jigger and wheelpit: At SN: 7125.8050. Built by the Cefn Brywno Co. in the late 1860's or early '70's and, although ruinous, the outline of the building is still discernable as sprawling collapsed masonry covering an eight metre square, immediately below the main development dumps on the north bank of the stream. The wheelpit has started to bow quite badly under ground pressure, and it can only be a matter of a few years before it collapses. Some ground movement of the northern end has occurred during the last year and an ash tree has taken a firm hold in the western wall. The tailrace is now buried by

agricultural waste dumped into the wheelpit.

With internal dimensions of the pit being 11.50 x 1.40 metres, this suggests that the wheel was 36' diameter by 4' breast. An unusual, if not unique, feature of this wheelpit, is that at its northern end, an arch has been built to prevent ground movement. It would appear that at some time, the launder carrying water to the wheel has been damaged and the resulting deluge has washed the bank away into the wheelpit. This is the only logical explanation for the construction of the retaining wall across this wash out, and for the arch to have been built. It is unlikely that it was built to allow the installation of a larger wheel as was previously thought to be the case. This is not the old 36' pumping, winding and crushing wheel, as both are shown on both the OS. plans. By studying and comparing archival data with the present day remains, there was obviously a substantial piece of masonry along the western wall of the wheelpit. It is visible in photographs #2 + 3 and appears to be the upper part of the three storey Crusher House which collapsed in on itself in the late 1960's; and the back wall of the Crusher House where the ore was delivered in wagons. Whilst no documentary evidence exists, it would be extraordinary if the crusher was not located in the 6 x 4 metre ruin on the eastern end of the axle, immediately below the end of the tramway. The back wall of the crusher house, which now extends into the more recent development dump, may be earlier than the wheelpit, thus possibly dating from the 1860's.

Sorting and sizing would have been performed by trommels before the products were sent for separation to the 11 x 8 metre jigger shed, set at a lower level. The jig tailings were then conveyed to the dump on the south bank of the river. The jig tailings lying above this level must be derived from an earlier mill, located to the south of the ore slides, only fragments of which survive today. The whole of the new mill complex was excluded to the contractor and remains in the same condition as it was before the restoration scheme.

Photographs: 3, 5, 6, 24, 26, 37, 38, 39, 40, 57, 58, 127, 128, 156, 157, 160, 161 & 166.

Office and stores: At SN: 7121.8050. A ruin of 13.40 x 6.20 metres externally, with 60 cm. walls, shown on both the 1887 and 1905 survey. Whilst being measured up, it was noticed that the greater part of the masonry was held together with lime mortar. However, there were portions which had been repaired with Portland cement which suggests that it was repaired after about 1890 when its use became more frequent in mid Wales. There is no certainty that this building was not used residually after the abandonment of the mine. It may also be hypothesised that this building was used as a smithy which survived after the mine closed; there are fragments of iron and burned coals in the vicinity, the origin of which has not been traced. The mine smithy has not been positively identified. This building was largely destroyed in the late 1960's when a new track was constructed across the site to haul away the jig tailings. The blocks of masonry lying below the track represent the front wall with various openings for doors and windows. This building was also contained within the area excluded to the

contractors and remains in an undisturbed state.
Photographs: 2, 3, 23, 37, 38, 39, 40, 83, 101, 102, 113, 117, 127, 128, & 144.

Culvert: Visible at SN: 7124.8049. Where it is exposed in the north bank of the new stream course. Originally carrying water under the development dums from the new mill wheelpit to the old crusher. To the south of the stream, it was mostly destroyed, during mid January, but remnants exist in the north bank of the stream and where it emerges from beneath the development dump into the sluice and overflow. This is visible in photograph # 81 following the fence line across the grassy patch between the bucket of the excavator and the toe of the development dump. On the morning of the 15th January I was told that due to the quantity of jig tailings behind this culvert, that it would have to be partly removed. If they were not retrieved and buried, the whole integrity of the scheme would be compromised. By the 20th of January, 27.25 metres of the culvert had been removed in order to gain access to an area which had been excluded from the scheme. Further work then took place on the 21st, the day on which I received my brief for the project; Roughly built of randomly sized poor local stone and lime mortar on a clay base; Externally, the average dimensions were 110 cms. high by 90 cms. wide with the stonework being 20 - 30 cms. thick; At the wheelpit it measured 140 cms. wide internally, but near the outfall it had tapered down to 45 wide by 60 cms. high.

Photos: 6, 68, 74, 75, 76, 77, 78, 79, 80, 81, 82, 84, 95, 96, 101, 104, 105, 106, 107, 109, 111, 112, 118, 119, 120, & 155.
By insisting that the site boundary was moved, on 16-12-'98, prior to the commencement of the main phase of the reclamation scheme, it was possible to preserve all six buddle pits, in an excluded area, and without disturbance.

The lowest or westernmost buddle: Lying at SN: 7119.8049, was particularly endangered prior to this move, as it lay within a badly polluted area which was subsequently removed down to original ground level. On 19:11:98 a fence had been erected which placed this buddle, and parts of the others, within the area to be reclaimed. This directly contravened my advice, and it was only with the greatest difficulty that I managed to get the fence realigned. During the course of getting these remains within the excluded area, I was sent on a fool's errand and also suffered verbal abuse for being insistent on this point.

This continues to be, visually, the best preserved and most intact of the buddle sites. Whilst under threat, it was investigated with a small trial pit to ascertain its state of preservation. At 30 cms. below the surface, the bottom of the kerb stones were found to be lying on undisturbed soil, with no sign of any of the characteristic wedge shaped, pitch pine, buddle boards. The remains of the frame carrying the gearing, tormentor, feeder cones, and sweep arms protrude 25 cms. above the surface, and were obviously sawn off when the mine was

abandoned. The remains of the centre post also survives, but the pit had obviously been disturbed, and the kerb was now elliptical, it was concluded that this buddle had probably been salvaged when the mine was finally abandoned. This buddle is not shown on the 1887 plan, but is shown on the 1905 revision suggesting that it is one of the latest features of the site. Between 19:10:98 and 16:12:98, animal bones were dumped within this feature, for my benefit as site archaeologist, but no harm was done. However, for no apparent reason, the desire to remove, or damage, these remains, persisted throughout the duration of the works.

Photographs: 1, 15, 23, 25, 41, 42, 59, 83, 84, 89, 101, 102, 108, 113, 116, 135, 145, 148, 149 & 153.

Two new buddle sites were observed lying alongside each other, at SN: 7119.8050, eleven metres north of the western buddle, after snowfall in January. These are no more than circular depressions set in the oldest of the fines dumps and may very well date from John Taylor & Son's tenure of the site between 1850 and 1870. As they were not endangered, they were not excavated, but their position was noted, and they were photographed.

Photographs: 23, 41, 42, 59, 84, 89, 103 & 116. In particular, # 89 of 17:01:99 and # 103 of 19:01:99. Sections of the old fines dumps are shown in # 90 & # 91.

Another trial hole was carefully dug into the easternmost buddle, at SN: 7123.8049, but at 30 cms., no boards had been observed, and the hole was backfilled. No investigations were undertaken on the buddle lying alongside the easternmost as it was probable that it was in a similar condition. Only the back wall is shown in 1887, with the buddles being added on the 1905 edition. Some broken fragments of buddle boards were seen in the fines dumps close to the eastern buddles, but none were complete or intact, and their provenance unknown.

Photographs: 2, 26, 37, 38, 39, 40, 57, 101, 113 & 152.

For 30 years prior to the commencement of the works, the unusually curved back wall of the middle buddle, at SN: 7122.8049, was intact. At the start of August, its condition was unaltered and stable, but by 27:8:98 a section had collapsed. The previously sound condition of the masonry and mortar leads me to conclude that this was purposely damaged in order to devalue the remains. Without greater resources, it was impossible to undertake any form of investigation, or delineation, of this buddle. As this feature is not shown on either the 1887 or 1905 editions, and no excavations were undertaken, it cannot even be confirmed that there is a buddle at this location, and the curved wall appears to be the only indication of such a structure. However, as it was possible to include the site within the exclusion zone, it has not been further disturbed.

Photographs: 15, 23, 25, 41, 42, 83, 101, 102, 113, 116 & 144.

All the boulders appear to be ordinary Cardiganshire Boulders of about 4.80 to 5.20 metres internal diameter with kerbs of 30 cms. wide by 40 cms. high. Where exact measurements could be taken on account of exposed kerbs, they were :-

Western Boulder: N-S 4.70 m. E-W 4.90 m. Kerb: 25 - 30 cms.
Eastern Boulder: N-S 5.00 m. Kerb: 30 cms.

Tramway to Lower crusher: At SN: 7121.8048. This was uncovered on 20th January 1999, during the removal of the boulder fines (deemed "Area C"), recorded, and then covered with soil as part of the restoration of the site, leaving a flat strip to emulate the course of the tramway. Of 25.5" (64.7 cm.) gauge, 25 lb/yd I section rail, in 12' (3.65 m.) lengths, chaired to 125 mm. square pitching sleepers. A very sturdy rail of the type used by John Taylor & Son, at Goginan and Level Newydd. It would appear to originally date from either the 1850's or 60's, certainly no later than 1865.

Laid at a level where it passes under the tailrace culvert from the new mill, it must therefore pre-date the circa 1870 culvert, and was presumably used by Taylor's company either for the conveyance of ore to the Lower Crusher, or the disposal of waste. I am inclined to think that it was purpose was to convey ore to the Lower Crusher, it would have been better routed along the opposite bank of the stream, and it is probable that the purpose of this tramway was for the disposal of mill wastes into the stream. This backs up the theory that there was a post 1850 and pre 1870 millsite which was destroyed by the time of the 1887 survey.

However this tramway does raise a chicken and egg problem in the dating of the lower crusher; if the culvert is contemporary with the construction of the new mill, then so is the lower crusher. If the tramway serves the Lower Crusher, it pre-dates the new mill.

Photographs: 101, 102, 108, 109, 110, 111, 112, 113, 116, 117, 125 & 155.

Lower Crusher: At SN: 7119.8043. This was partly hidden under the jig tailings, which were carried away for encapsulation within the cell. On Friday the 15th. of January 1999, I gave explicit instruction that no work was to be done in this area without supervision. Later that afternoon, or on the following morning, a pit was dug behind the wheelpit. Compare photograph # 63 with # 92 & 93.

I was then assured that this work would not continue without supervision, that the area would be fenced off, and that a small excavator would be made available to expose the back of the wheelpit. On Monday the 25th. of January, an unsupervised large excavator dug a further substantial chunk out of the back of the wheelpit. This additional damage is shown in photographs # 123 & 124, and in # 136 & 137.

The attention to detail in the engineering survey is

abominable, a poor chain of command, lack of co-operation from
surly agents and other factors, led to the eastern end of the
wheelpit being damaged and it was therefore impossible to
measure its length precisely. Between 6.00 and 7.00 metres was
all that could be ascertained. The pit is 1.50 metres wide and
is therefore, approximately the same size as the small
wheelpit which lies 20 metres south of the ore slides. The
wheel is likely to have been 20' x 4'6" and backshot. It
cannot be ruled out that the wheel which was housed near the
ore slides was later moved into this pit.

After having the eastern end exposed for measuring, drawing,
and to be photographed, it was buried by fresh soil laid to
its original profile. This also served to cover up the damaged
section, and it can be seen that there is little visible
difference between photographs # 59 & # 153, or # 63 and #
145.

The water to turn this wheel was fed along the tailrace
culvert, from the new mill, to a sluice, from where it could
either be turned over the wheel or sent, via the overflow, to
the weir and leat to turn the Ellis's pumping wheel. The
tailrace of the old crusher discharged just above the weir for
the Ellis's wheel. The outfall of the culvert, sluice for the
lower crusher wheel, and overflow can be seen in photograph #
81 just above the excavator's bucket. Whilst this building is
referred to as the lower or old crusher, there are no
indications that it predates the new mill buildings 80 metres
to the northeast. Twenty metres to the south of the wheelpit,
at the toe of the development dump, traces of the sluice and
overflow were discovered during the works, and possibly only
survived as their location was not divulged to the agents.

Whilst these remains are described herein as the lower
crusher, there is no evidence that it was ever fitted with any
such machinery. I have no doubt whatsoever that it post dates
Taylor's original crusher of 1850 and that it pre dates
Murchison's new mill of 1870. It was dysfunctional by the
time of the 1887 survey, and in a similar condition at the
time of the 1905 revision. That the wheelpit is quite small
suggests that it performed a much lighter duty than the
primary crusher and it is possible that it was set below the
new plant of the early 1860's to treat halvans in one of the
many patent ore saving devices of the time. The Taylor's were
becoming aware of inefficiencies in the early 1860's and
started introducing measures to reduce mill losses.

Photographs: 1, 3, 15, 41, 42, 59, 60, 63, 71, 83, 89, 92, 93,
94, 108, 110, 123, 124, 129, 136, 137, 138, 139, 140, 141,
142, 143, 144, 145, 153 & 154.

Weir & leat: At SN: 7115.8043. This feature is only just about
visible, as a 5.70 metre angled wall, in the bed
of the stream, and on the stream banks, 20 metres downstream
of the old crusher wheelpit. The leat has been virtually
destroyed by ploughing and its course to the New Pumping
wheel, both constructed in 1871, is only traceable across the

field as a slight break of slope. It runs from just below the meeting of the overflow from the culvert, and the tailrace culvert which carries the water from the lower crushing mill. Whilst this was within the reclamation area, and located just below the haul road, it was pointed out to the contractors, who avoided damaging the structure.

Photographs: 1, 15, 41, 42, 146 & 154.

48' Pumping wheel: At SN: 7105.8044. Constructed between October 1870 and January 1872 by M. Ellis & Son - Eagle Foundry, Northgate Street, Aberystwyth as a £ 210 contract. In 1868, it is recorded that the 80W had cut into a vugh which made a great quantity of water, and the situation appears to have been just as bad in the 92. By using the old wheel, which also drove the winding machine, the Engine Shaft was sunk from the 92 to the 104 in 1869 to develop some good grades seen going down in the soles of Taylor's old stopes. As the existing 36' wheel was barely able to cope with the load at the 80, it was inevitable that if the mine was to be sunk any deeper, a larger wheel would have to be dedicated to pumping.

The construction of the pit and lobby proved to be a more difficult job than had been estimated due to the local stone being too small and shaley for the purpose. Part of the old mill may have been robbed as a convenient, and cheap, source of stone. Some of the building stone appears to have been derived from the cutting of the pit. Its driving water was caught by a weir across Nant Brynno and diverted to run along an 80 metre lead, where it was turned onto a 50 metre long wooden launder which delivered it over the wheel. On its western side, a balance box kept the rods taught - 390 metres according to the Ordnance Survey which tallies well with the 215 fathoms according to contemporary reports.

These rods were reciprocated by a crank fixed to the western side of the axle and thus the motion was delivered to the tee bob at the mouth of the shaft. This new line of rods did not oust the original 120 metre run between the 36' wheel and Taylor's Shaft but appears to have supplemented it according to the 1887 OS. plan. By 1905, this 120 metre rod had been removed.

At 140 metres northeast of the wheelpit, where the rods crossed the road, are four substantial bolts set into a masonry plinth. These held the bottom bearing of a rocking King Post, or fend off beam, the top of which would have a junction of two rods at a change of slope. This would also allow the passage of traffic beneath the rods. Until the late 1960's there were several rods abandoned on the hillside above the road, they were manufactured from approximately 20' lengths of 2" - 50 mm. wrought iron rod with forged couplings on the ends.

Also, on the hillside above the King Post foundation, a shallow cutting can be seen running through some rocky ground, towards the top of the slope. This gully was cut to accommodate the rods, and to prevent them touching the ground,

it is probable that there was, at one time, another King Post above this gully.

Usually, on long runs of rods, they were supported on H shaped frames, set into the ground and carrying an appropriately shaped roller, or dolly wheel, set into the upper part of the frame. There is no sign of this run of dollies.

It must not be inferred that this large wheel was installed to allow the shaft to be sunk deeper. Taylor's Shaft was sunk to give a sump below the 104 using the old 36' wheel, and the 48' wheel was later erected to permit the development of grades, thought to be workable, seen in the 80, 92 and 104 Fm. levels.

For the duration of the works, a sturdy fence was erected around the wheelpit and the whole area excluded to the contractors. Consequently, no damage took place. A regular watch was kept on the area around the wheelpit, where accumulated fines needed to be carried away, but nothing else appears to have been built on this part of the site.

The tailrace from the wheelpit must have discharged into Nant Brwyno, but appears to have been well buried by the jig tailings which have been washed down over the years. Both the 1st. and 2nd. editions of the 1:2500 Ordnance Survey plans show the tailrace emerging on the north bank of Nant Brwyno 30 metres below the wheelpit.

Photographs of the wheelpit, line of the rods, king post foundation, and tee box: 1, 4, 11, 14, 15, 35, 41, 42, 49, 50, 146, 163, 164 & 165.

Outside the reclamation area :-

These remains have not been surveyed under the present works as they are not within the study area, and never under any threat of disturbance. However, in order to fully understand the function of many of the features within the study area, it is necessary to describe them as an annexe to this report.

Prospecting trenches: Around NGR. SN. 716.809. To the east of the mine, and north of Blaen Brwyno are several trenches which have been dug to ascertain the course and value of the lode. They are not particularly noticeable under normal conditions, and a century of agricultural improvements have taken their toll. Whilst the only record of trenching in this area is made by Morris in 1747, it would be dangerous to infer that these are the works to which he refers. No trenches are shown on his manorial map. It was most fortunate that the site had a light dusting of snow on two occasions during the course of the works, which highlighted these features and allowed them to be recorded.

Photographs: 87 & 88.

Shafts & outcrop workings: From NGR. SN. 7093.8068 to 7141.8082 there are a line of shafts, crown failures, grubblings, costeans and opencuts along the course of

the lode, which strikes from the southwest to the northeast, and dips to the south. The shafts are unusual in that they have Scots Pines growing around their mouths, and are therefore easily identified from a distance.

The three principal shafts are :-

Western Shaft: At NGR. SN: 7093.8068. and app. 290 metres aod. It was sunk in 1851 or '52 to a depth of 24 fms., or 68 metres, in order to communicate with, and ventilate the Deep Adit or 56 fms. level. An exploratory drift was driven 100 metres east at about 10 fms. above the 56, but failed to find the ore shoot seen in the back of the DA. I have also heard this shaft being called the Chapel Shaft on account of it lying 70 metres east of the Cwm Brynno Wesleyan Methodist Chapel. Over the past 30 years it has been filled with dead sheep, rolls of old wire, and bags of rubbish. All the leachate will run out of the Deep Adit.

Taylor's Shaft: At NGR. SN. 7136.8079. and approximately at 332 metres aod., it was probably the Engine Shaft used by Evans in the late 1840's at which time it was sunk to the 20 fms. level. This would suggest that it was a relic of the Gogerdan Co. / Williams Bros. tenure before the shallow Adit was driven by Evans. Under Taylor's regime, a slightly deeper cross cut, the Intermediate or Middle Adit, was driven in 1850 or '51 to drain these shallow workings whilst the shaft was being sunk to the 32 and deeper; This adit also served to facilitate the carriage of ore to the slides, development rock to the dumps, and pump water to the reservoir near the portal. By 1865, the shaft had been sunk to the 80 fms. level, but the ore was to be found to be poorer & patchy at this horizon. Drainage of the deeper workings would have been considerably easier after the Deep Adit, also known as Taylor's or the 56 fms. level, was completed in the mid 1850's; This probably robbed the surface works of some much needed water. The Cefn Brynno Co. rapidly sunk to the 92 fms. level in the late 1860's, but initially did little development at this level. By October 1870 they had sunk to the 104 but development at that level was deferred, probably on account of the falling off in value of the ore body at depth combined with the greater influx of water. The final depth of Taylor's Shaft was therefore below the 104 level in order to allow the pumping column to dip into a sump. It was not uncommon for shafts to be sunk an extra interval, in this case 12 fms., to allow rapid development if necessary; The bottom of the sump may therefore lie at a point suitable for the commencement of the 116 fms. level; About 212 metres below the surface would therefore be a reasonable estimate of its ultimate depth. The shaft was sunk on the lode, from its outcrop to the 44 fms. level, but below this, the lode dips at a considerably shallower angle; that is, the lode flattens and veers away from the shaft by about 3 fms. in every 12. In order to ease the situation, the shaft was sunk below the 44 cuts were driven south to cut the lode, the 104 fms. crosscut was driven about 30 metres south from the bottom of Taylor's Shaft to cut the lode. The mouth of the shaft is shown on both the 1887 and 1905 OS. plans. A shaft of this depth ought

to have had a capstan & 12 fm. shears for maintaining the pumps, but nothing of these survive nor are they shown on the OS. 1:2500 plans. There has been sufficient ground movement around the collar as to swallow up any such remains. The degree of instability can be seen in photograph # 11, showing the pumping bob jammed in the mouth of the shaft in April 1970. It was not ascertained if this shaft was ever fitted with a skipway during the major refit of 1871 - '72.

Photographs: 4, 11, 18, 32 & 33.

Eastern Shaft: Located at NGR. SN. 7141.8082, at about 336 metres aod. It was probably started in the 1830's by the Williams Bros., and appears to be slightly earlier or contemporary with the development of what was then the Engine Shaft, later known as Taylor's Shaft. The Eastern Shaft was probably previously known as the Whim Shaft, though no remains of such a superstructure survive. It is worth noting that the early development of this shaft took place in 10 fm. increments where Taylor favoured 12. Because its collar was located in the easternmost end of the ore shoot, it soon passed out of this and into unproductive ground about 5 fms. below the surface. It was never recorded as being sunk any deeper than the 20 fm. level, - the Middle Adit driven by Taylor's in the early 1850's. Curiously, it is shown on the 1861 and 1883 mine plans but not on the 1887 OS. 1:2500 surface plan. However, the 1905 OS. plan, which shows the mine as being disused, marks the position of the Eastern Shaft. On this point, I am inclined to think that the surveyors failed to notice this feature in 1887, or that it was concealed beneath a timber cap which collapsed at a later date. As it only lies a matter of 70 metres northeast of Taylor's Shaft it is also visible in photographs 18, 32 & 33.

Adits: There are three adits which served to access the mine and drain the water, in addition to three short drives to assess small ore shoots at their outcrop.

The Shallow Adit: At NGR. SN 7126.8070. By computation it ought to lie at 313.7 but extrapolation of OS. data suggests about 315 metres aod. This is also known as Evans's, or the 10 fm. level. on account of it cutting the lode at about 10 fathoms below its outcrop, near Taylor's Shaft, and appears to have been driven whilst the mine was under the tenure of the Evanses in the late 1840's. Its mouth lies on the hillside about a hundred metres north of the road and the discharge water originally appears to have been used to supplement the leat which was led into a shallow reservoir and was used to feed the Old 36' Pumping, Winding & Crushing wheel. The ore to feed the old upper crushing mill must have come out of the mine by this route. Had it been brought to surface via the Middle Adit, about 10 fms. deeper, it would have to be carted up the hill to be crushed. John Taylor & Son were too efficient a company to permit such poor practice. It is not marked on the 1883 mine section and presumably, beyond the end of the crosscut, it had become inaccessible. The crosscut had been carried forward by about 34 metres beyond the Main Lode and appears to have cut a parallel structure.

Photographs: 4, 18, 33, 58, 85, 134, & 166.

The Intermediate: At NGR. SN. 7137.8060. By computation ought to lie at 295.4 metres aod., which tallies with the OS. data. Also known as the Middle Adit, Upper Adit, or the 20 fm. level. I have refrained from using Upper Adit, as it is easy to infer that it is the uppermost adit, thus causing confusion with the Shallow Adit, which became obsolete in later years. Its masonry portal lies on the north shore of the surviving mine reservoir. This adit was driven by John Taylor & Son as a 150 metre crosscut north coming in 10 fms. below Evans' s Adit in the early 1850's, but it is at the wrong elevation to convey ore directly to the Taylor's old upper crushing mill. The crosscut was continued for about 170 metres beyond the shaft, where drifts were driven along a promising structure. By 1883, it appears that the old 20 fm. drifts had become obsolete and unusable and the sole function of the cross cut was to give access to a new station at Taylor's Shaft. The remains of a 100 metre long tramway runs from its portal to the ore slides which appear to be contemporary, or possibly slightly later. It is possible that the Shallow Adit was used for the conveyance of ore and that the Middle Adit was initially used for the disposal of the development rock with the ore slides being added at a later date. Under severe weather conditions, with the reservoir close to overflowing, it is possible that water could enter the old mine workings through this adit.

Photographs: 8 & 158.

The Deep Adit: Lies at NGR. SN. 7079.8058. at 227 metres aod., according to both O.T. Jones and the OS. data. Its development was contemporary with driving the Intermediate Adit in the early 1850's. This is also referred to as the 56 fm. level, or Taylor's Adit. The fine dressed masonry portal of this main drainage adit emerges above a large development dump on the north bank of the stream, 300 metres downstream of the New Pumping Wheel. The masonry portal was never keyed into the rock which has resulted in a run of ground at this weak point. Access beyond the portal has therefore been impossible for well over 30 years. At 192 metres inbye of the portal it meets the foot of the Western Shaft, sunk on the lode. The adit is then driven as a drift along the Main Lode and rises at 1:35 and consequently meets Taylor's Shaft at about 237.7 metres aod. at 380 metres beyond Western Shaft. The normal gradient is between 1:50 and 1:100 and there is no explanation for such a steep gradient being used. To the east of Taylor's Shaft, the adit was continued as a drift for a further 160 metres before passing out of the orebody.

Photograph: 13.

Cwmbrwynno Mine House: NGR. SN: 7136.8066. Captain Paul's house, which is now in a ruinous state. This appears to have been built by the Taylor's between the taking of the censuses in 1851 and 1861, when nine inhabitants and a visitor are recorded in the returns. It was once a classic example of the style of substantial abodes built by Taylor, as being befitting for their " Resident Captain ". It

was roofless 30 years ago, and a date of abandonment has not

been found, probably prior to 1940. Behind the house there is an impressively cut rock face into which has been sunk a well. In front of the house, and south facing, there are the remains of the gardens surrounded by a blackthorn hedge; this enclosure extends to 0.272 acres according to the OS. data. The eastern part of this plot is now used as a sheep pen, whilst the frontage of the remainder is comprised by a small run of ground into the gap between the masonry portal and the Middle Level. It is difficult to comprehend why a house with such a pleasant disposition was ever abandoned.

Photographs: 4, 8, 19, 34, 134 & 158.

Old Pumping & Crushing Wheel: Located at NGR. SN: 7132.8063. A substantial block of masonry

lying immediately above the road. The southern end has been totally destroyed to permit the removal of the waterwheel. This appears to have housed the 36' pumping and crushing wheel, installed in the early 1850's and described by Phillips & Darlington in 1857. The width is not cited but appears to be about 8 or 9', an unusually wide wheel. Only East Darren boasted a larger wheel on their crusher. Its pumping duty was eased in late 1871 when the 48' Ellis's wheel was connected into the pumping system, and its use as a pumping wheel ceased sometime after 1887. The 13x20" crushing rolls, which operated at 2 tpm, were probably removed soon after 1871, when the New Mill was commissioned. Whilst over 20 years old, the 36' wheel was far from abandoned in 1871 as it was still perfectly adequate to turn the machinery for drawing ore in Taylor's Shaft, and could also assist with the pumping in times of need. The wheelpit is shown in similar form on both the 1887 and 1905 plans, though the launder and rods had been removed by the time of the revision, and there are modifications to the building in which the crusher had been housed.

Photographs: 4, 18, 33, 51, 57, 58, 66, 79, 80, 115, 134, 158, 160, 162 & 166.

Old Mill Area: At NGR. SN: 7145.8071. There is an area of

old tailings set in front of a small quarry. As it lies on the same terrace as the old 36' wheel and crusher reported upon in 1857 by Phillips & Darlington, and due to the quantity of tailings, this would appear to be the location of Taylor's original mill built in the early 1850's. Whatever buildings were ever erected on this part of the site, they appear to have been entirely reclaimed; probably on account of the poor quality of the local building stone, and it is likely that were incorporated into later structures.

Photographs: 4, 18, 19, 20, 30, 34 & 162.

Leats and reservoirs:

The 4 km. (2.5 miles) leat, from Melindwr Pond (SN: 7155.8360), via Nant yr Arian, was constructed around 1850 to overcome a regular water shortage in the Brynno Valley. The cost of maintaining this leat must have been burdensome in later years, and it is surprising that a small steam engine was never

used. It is also worth noting that Melindwr was built by John Taylor & Son, on land owned by the Gogerddan Estate. It is improbable that Evans would have been permitted to draw water from Melindwr; this would have been a considerable obstacle to the development of the mine, thus keeping its value low. In W.J. Lewis's "Lead Mining in Wales", he quotes a price of £22 per mile as the average cost of cutting a lead. The course of the lead is fairly easy to follow and gently falls from 430 metres aod. at Melindwr, to 316 metres aod. at Cwmbrwyno; or 1:35. Across the fields, to the south of Nant yr Arian its course is endangered by agricultural improvements. At Nant yr Arian, several hundred metres and a siphon, were destroyed by road improvements during the mid 1970's. Beyond Nant yr Arian, the Forestry Commission have constructed a footpath along much of its course. This has proved to be a very popular and easy walk, which gives access to some outstandingly beautiful countryside.

Photographs: 28, 30, 37, 49, 57, 66, 85, 87, 127, 133, 159 & 165 show the last 400 metres of the lead above the mine.

The Upper Reservoir: At NGR. SN. 7130.8071. Close to the mouth of Evans's, or the Shallow Adit. It has now dried up and no traces remain. It lay at about 316 metres aod. and was about 40 metres long by 8 wide. According to the Ordnance plans, it appears to have been erased between 1887 and 1905.

Photographs: 32 & 33 show the area in which it was located.

The Lower Reservoir: At NGR. SN. 7137.8053 with the surface of the water lying at about 290 metres aod. It lies directly in front of Cwmbrwyno Mine House and the portal of the Middle Adit, and is not usually much more than a boggy area since the sluice was badly damaged circa 1913. According to the 1905 plan, the sluice was located in the northwestern corner. The normal construction of these was a tapered wooden plug fitted into an appropriately shaped thick plank. The board was built into the back of a culvert under the dam wall. The plug was raised or lowered into this board according to demand. It was little more than a primitive needle valve.

Detonating the remaining contents of the magazine in the reservoir has probably caused the failure of the culvert and wooden sluice gear.

After a particularly heavy period of rain on 4-3-99, the reservoir filled up to the brim and overflowed into the development dumps, due to the course of the original overflow having now been destroyed. With such particularly high levels, the reservoir will not only irrigate the containment cell, but will run back up the Middle Adit and could discharge into Taylor's Shaft.

Photographs: 20, 21, 22, 34, 38, 66, 86, 87, 88, 115, 134 & 166.

Powder Magazine: At NGR. SN: 7125.8070. Is shown on both the 1887 and 1905 plans, above the mouth of Evans's Adit, but has now virtually disappeared. From a distance, it can be seen that there is a rocky patch with poor and patchy grass in this area. I suspect that this was built in order to comply with the new regulations governing the storage of explosives which were introduced in 1872.

Before the new regulations, I suspect that the small square building, located by a path across the gruffy ground above the New Mill, may have been a magazine. This is shown on the 1887 OS. plan but not the 1905 edition, by which time the path is also omitted.

Photographs: 18, 32 & 33.

Industrial Archaeology of Cwm Brwyno Mine.

The remains of Cwm Brwyno Mine (NGR: SN 713.805) (Long. 3 53' 35" : Lat. 52 24' 33") lie hidden away at the head of a short valley in the parish of Mellindwr, some 15 km east of Aberystwyth, Ceredigion, Wales. Also properly known as the Cefn Brwyno, Cefn Cwm Brwyno, or Cardigan United Mine, (I have even encountered Cefn Cwm Brwyno and Cwm Brwyno), literary references are scant and difficult to access, no contemporary photographs are known to exist and it would be remarkably easy to condemn the remains as insignificant without further investigation. David Bick's series on "The Old Metal Mines of Mid Wales" (II.18) deals with the site in half a page of text and two illustrations; the brevity of this account is not representative of the extent, or importance, of the remains.

The shafts are mostly located on a hilltop (around SN: 7132.8078 at 320 - 325m aod.) along a vein, or lode, which runs from the northeast to the southwest. These mineral veins are described by Lewis Morris in 1747 as part of his survey of the Manor of Ferretth. To the south of the shafts, and therefore lower down the hillside, three adits have been driven for access and drainage. The upper adit, driven in the 1840's and also known as Evans's Level, SN: 7127.8068, supposedly at 1060' / 323.08m aod. according to Jones, but close to 310 according to the OS. Below its mouth lie crumbling masonry remains and extensive rock dumps. It was known that there were mineral veins in this locality as early as 1747 and it seems, according to archival data, that limited development was taking place in the 1760's. Photographs 85 to 88, inclusive, show the shadows of these prospects. However, it was not until the 1840's that significant mineral was discovered, by Evans, to justify deeper development and mechanisation by Taylor in the 1850's.

According to O.T. Jones's analysis of the Mineral Statistics, some 80 % of the total production was achieved between 1850 and 1866 whilst the mine was being run as Cwmbrwyno by John Taylor & Son.

As soon as they had secured their tenure of the property, they set about driving the Intermediate Adit, or 20 fm. Level, about 50' below the earlier Shallow Adit, also known as Evans's or the 10 fm. Level. OT Jones suggests that the portal of the Intermediate lies at 1010' / 307.84 aod. but the Ordnance Survey suggest that 290m is closer. Contemporary reports suggest that Evans had worked down from the surface to 10 fathoms below the Shallow Adit, and that the Intermediate Adit served to drain the bottom of the existing mine as well as transporting ore to the surface.

The Taylors also set about driving a Long Deep Adit at about 721' / 220m aod. according to the OS. but about 745' / 227.07m according to OT Jones. Jones also comments that the floor of this Deep Adit, or 56 fm. Level, rises at 1:50 or about 35' in slightly less than 300 fms. The normal gradient required for clearing water is about 1:100; However, the steeper than

necessary 1:50 gradient would permit easy tramping of waste but compromises the easy return of the empty wagons.

In 1863, the principal of the firm died, followed by 1866 being a particularly bad year for mining due to a financial crisis in the City of London, and the loss of their local agent. Coupled to the fact that they had extracted the easily gotten ore, it was a wise time to withdraw from the venture. J.H. Murchison's Cefn Brwyno Mining Co. were the next lessees, who commenced their tenure with an expensive re-fit but were liquidated in 1875 after which a series of short lived companies tried to revive the mine until 1913; none of them fared well.

Most of the remains on the site can be dated either from Taylor's initial mechanisation of around 1850, or the Murchison re-fit of about 1870.

I first visited the site on the 14th of May 1967 and during my visits in August and September 1998, I found it difficult to orientate myself with what had previously existed and the degree of decay that had taken place over the years. However, much of this was due to natural decay and erosion. Whilst there had been limited stone robbing and fly dumping, the site had not been as badly damaged as many of the mines in this area. Furthermore, many features, such as the rod guiley between the Ellis's wheel to Taylor's shaft, were less pronounced than they had been, due to ploughing; Compare photographs 14 and 163.

The purpose of the land reclamation scheme was to improve the environment by reducing the quantity of base metals leaching into Nant Brwyno, a tributary of the Afon Melindwr which flows west into the Rhedol at Capel Bangor. The method adopted to achieve this objective was that the tailings and fines were removed, and buried within a cell, thus preventing their erosion by surface run off, and the stream. The problem was largely been caused by a lack of maintenance of the watercourses and it was initially difficult to work out why the stream now emerges from the toe of the development dumps, just above the site of the former slimes and jig dumps.

There can be little doubt that the stream originates from the old mine reservoir at the head of the valley. The 1887 and 1904 Ordnance 1:2500 plans clearly show the sluice (SN: 7133.8056), and it was learned, during the course of the works, that this was damaged just before the Great War, when a case of explosives was detonated in the pool to stun the fish. This act apparently damaged the sluice, culvert, and clay lining, so badly, that the reservoir has leaked ever since. After several days of torrential rain at the start of March 1999, the reservoir filled to its original level, and ran down the old overflow into the cell, but then resumed its normal level after a few days.

During the application for Planning Consent, there were initial fears that the few surviving remains would be damaged, or demolished, particularly those between the wheelpit at SN: 7125.8051, and the lower crusher at SN: 7118.8043. These were wellfounded, and had there not been constant supervision of the works, I have no doubt that most of the buddles would not have survived. Whilst most of the structures have been retained in their original form, the loss of the culvert to the Lower Crusher, and damage to the Lower Crusher wheelpit, was misdirected and totally avoidable. In mitigation, neither feature was visible at the commencement of the project.

However, the short section of tramway which was exposed on the northern bank of the stream, was an unexpected discovery, and it was possible to leave an indentation in the final ground profile to represent its course. This tramway would not have been exposed if the scheme had not been undertaken.

FOLLOWED BY THE SUMMARY OF FINDINGS - CWMBRNO/FNLREPT.

150 metres below the mine dumps, on the north side of Nant Brwyno, are the remains of a wheel pit which once housed a 48' overshot waterwheel, sweep rod, crank and balance bob (SN: 7105.8044). This drove a long line of rods which terminated at the bob set into the collar of Taylor's Shaft (SN: 7132.8078 @ 322 M. aod.) This was the deepest shaft at the mine with its sump below the 104 fathom level, some 624' or 190.2 metres below the surface at this point.

Once Taylor's Deep Adit (SN: 7079.8058 @ 220 M. aod.) communicated with the shaft, at 56 fms. below the surface, the pumps would have discharged at that level, this then resulted in water shortages during periods of drought which caused the deeper levels of the mine to flood. The deep adit is easy to locate as it is responsible for the large development dump about 100 metres upstream from Cwm Brwyno Bridge. There is no water discharged from the portal and access to the workings is blocked by a fall at the joint of the masonry to the rock, a common problem. According to the landowner, the drainage water is carried beneath this fall in a box launder, and then by pipe to the stream. The area surrounding the portal is remarkably dry and there is no sign of there being any head of water being impounded by the fall.

To the north of the mine track from the hamlet of Cwm Brwyno, overlooking the reservoir, are further remains which are the remnants of an earlier phase of working. The derelict mine offices with a quarter acre garden adjoin the road (SN: 7138.8063), the subsidence hole in the garden has been caused

by the failure of the masonry arching in the Intermediate Adit or 20 fathom level.

Immediately to the west of the garden is another substantial jump of masonry (SN: 7133.8064) which is all that remains of another wheelpit which drove a second set of pump rods, of 110 metres, to Taylor's Shaft and turned the drawing, or winding, machine for that shaft.

It also appears that it housed a 36' waterwheel which ran the 20" roll crusher in the 1850's when the drawing of the ore was performed by a horse wheel. This, shorter, second pump rod, and an adjoining building, were removed between 1887 and 1905. The water supply for this wheel may originally have been supplied by the discharge from the pumps into Evans's Level (SN: 7127.8068) and from there to a reservoir just to the south of its portal. After 1850, a long lead was cut from the Melindwr reservoir (SN: 715.835) , via Nant yr Arian, to feed this tiny reservoir, with the overflow being impounded in the small reservoir to the south of the mine offices.

On the 1887 and 1905 Ordnance plans, the powder magazine is shown to the north-west of the upper waterwheel, near to the mouth of the Shallow Adit, or Evans's Level, driven about 1848 by Morris Evans of Llanbadarn.

There are only two mine plans available, one dated 1861 and the other 1883, after which very little work was done. Three shafts are shown: the Western, or Air Shaft, located behind the remains of Capel Horeb (SN: 7095.8068) . This was sunk to the deep adit only and failed to find economic ore. Taylor's Shaft, sunk to 104 fathoms, is well defined on the hillside above the mine and the Eastern Shaft (SN: 7140.8080) lies about 75 metres to the east of Taylor's and is sunk 20 fathoms to the Intermediate Adit.

The Western and Taylor's Shaft are shown on the 1887 Ordnance plan, but the Eastern is not. In addition to these, two sets of old workings are shown at 50 and 100 metres west of Taylor's. These are obviously crown failures in the shallow stopes, and the mine sections confirm this. Recent discussions with various colleagues has suggested that there are substantial stopes which are inadequately supported, and it is likely that there will be further failure and subsidence along the course of the lode.

The 1905 Ordnance plan shows Western, Taylor's, and Eastern Shaft, the two crown failures to the west of Taylor's Shaft (SN: 7118.8071) and another crown failure (SN: 7135.8078) between Taylor's and Eastern Shaft. From my examinations of the workings in the early 1970's it was obvious that a great deal of ground had been removed, virtually to surface, without adequate support or backfilling. These crown failures may be the opencuts which David Black refers to in his " Old Metal Mines " Vol II. p51.

There were several active prospects at Cwm Brwyno in the 1740's but no serious mining appears to have taken place until at least the late 1830's. The bulk, about 80 %, of the 6000 tons of lead ore which were produced, was raised between 1852 and 1866 after which the mine was increasingly worked on a hand to mouth basis until about 1910 when it appears that most of the machinery was either scrapped or possibly salvaged and taken to Bryn yr Atr Mine near Nant y Moch. The final act of abandonment appears to have been the dumping of the remaining explosives into the reservoir circa 1914 according to local oral tradition.

The majority of the remains on the site appear to date from between 1850 and 1870.

SJSH. 14:8:99.

1 1887 Ordnance Survey Plan of Cwm Brwyno Mine at 1:2500.

Note the two driving rods which serve Taylor's Shaft

with the longer one running to the 48' Ellis's Wheel and the shorter one running to the Old 36' Crusher Wheel. Throughout its long life this old wheel also turned the drawing machine and, at one time a roll crusher. However, at Taylor's Shaft only one bob pit is shown and it is quite possible that the surveyor has misrepresented the winding cable and old driving rod. The mouth of the 20 Fm. level lies close to the right hand margin, above the mine pond, a tramway runs from the level to the ore slides which are rather poorly defined on this edition. The level which is shown in front of the ore slides is actually the mouth of a Culvert, from which a short tramway runs to the back of the Crusher House on the New Mill site dating from the early 1870's. The overflow from the mine pond runs along the contour to the south of the mine dumps and discharges into a gully to the south of the Lower Crusher. Twenty metres south of the Lower Crusher, the tailrace from the New Mill emerges from the Culvert under the dumps and runs into the stream above the weir. Note that there is no sluice, launder or aqueduct to serve the Lower Crusher, neither is there any representation of a wheel within the pit thus suggesting that it had been long abandoned prior to this date. Upon close examination only the wheels by Ellis (48'), the New Mill (36'), and the Old Crusher (36') are represented in working condition along with their launders. Ellis's wheelpit also shows the balance bob, crank and kingpost foundation. The Old Crusher discharges from the east side of the wheelpit and the tailrace carries the water past the 20 Fm. level, the lead lies between the tramway and the pond; It is shown between the Ore Slides and the road before being turned towards the New Mill. The course of the stream is not apparent on this plan, nor is there representation of any boulders.

2 1905 Ordnance Survey Plan of Cwm Brwyno Mine at 1:2500.

Note that apart from a change of style and font, there

are many differences in the twenty years since the publication of the First Edition in 1887. viz:- There is only one Driving Rod running to Taylor's Shaft and that the Old Crusher building has been substantially modified since 1887, also that the wheel is shown as still being in the pit. The southern end appears to have been damaged when the wheel was removed, after 1905, and the present day remains verify this. The course of the tailrace does not differ from the earlier survey but the tramway from the 20 Fm. level has been lifted at sometime between the surveys. A sluice is shown in the western corner of the pond and the Ore Slides are far better defined than previously. Several small buildings around the New Mill appear to have been demolished. Unlike the earlier survey, the two Eastern Buddies and the Western Buddie are clearly represented on this edition. Note that the portal of the Culvert is not represented, nor is there a tramway to carry the ore into the back of the New Mill Crusher House, and the trees to the west of the mine house are not shown in this edition. Below the mine works, it would appear that a tramway has been laid into the Deep Adit, near Cwm-brwyno Bridge, which may signify that some work had been undertaken after 1887. Most of the mine

appears to be somewhat derelict, railways and launders have been removed and it is confirmed that the mine is now disused. The outline of the mine dumps is a near match to the first edition of this plan, and is a sad testimony to the amount of work undertaken between 1887 and 1905.

3 Longitudinal Section along the lode at Cwm Brwyno Mine, after O.T. Jones, at 1:2500, showing the shafts and crown holes on the back of the shallow stopes, adits, levels and winzes, with the stoped area indicated by shading. According to the text, this section is based on a copy of the 1861 plan & section by Parry, and was then redrawn and updated by the Geological Survey's draughtsmen to incorporate data gained about the sinking of Taylor's Shaft below the 80 fm. level. The 92 fm. level is omitted in error, probably by limited access to the archival data. The mine section is accompanied by his description of Cwm Brwyno Mine - being page 86 of "Lead & Zinc". Note that the 1883 plan & section, drawn by Butler, was not available to Jones during the course of the survey. Curiously, the 1861 Parry plan & section has now been mislaid, but the 1883 Butler survey is now available in the Gogerdan Collection at the National Library of Wales at Aberystwyth. Neither survey appears to show the position of the North lode in the Deep Adit. It is also known that another plan & section of Cwm Brwyno Mine, dated 1878, was held by Captain Henry Francis of Aberystwyth but this appears to have been destroyed, along with most of his other mining papers, shortly after his death in 1928. Note that Jones uses the archaic stratigraphical unit of Ffrongoch which is now represented by the Devil's Bridge Formation. It must also be mentioned that any minerals raised prior to 1845 were not recorded in the Mineral Statistics; the quantity is unlikely to exceed a few hundred tons. In error, Jones underestimated the total stoped area as about 7500 sq. fms. from which 6095 tons of lead concentrate was obtained; thus the yield is expressed as "nearly one ton per square fathom". In modern terms, bulk sampling would show 4 or 5 % of the lode being mineralised, on average maybe 3.0 % Pb over 1.50 metres or about one quarter of what would form an economic deposit at today's prices and costs.

4 Transverse section through Taylor's Shaft at Cwm Brwyno Mine, drawn at 1:2500 from archival data. Note how the dip of the lode flattens by 150 below the 44 fm. level, but that Taylor's Shaft is sunk on the projection of the steeper part of the lode. The decrease in dip meant that at the 56 fm. level (Deep Adit), and on all levels below that, cross cuts had to be driven south from Taylor's Shaft so as to intersect the lode. It is probable that the change of dip is due to refraction as the lode passes from the Upper Devil's Bridge mudstones into the Cwmymlog Formation (formerly the Ffrongoch Formation), with its basal beds being the highly disruptive green mudstone and Sedgwickian shales (formerly straddling the Ffrongoch - Gwestyn interface). The impoverished ground, caused by these shales, varied generally from 40 to 100 metres thick in the other mines of this area; in some mines, the grades improved below the Sedgwickian Shales. Despite being sunk to over 200 metres below the surface, deep seated mineralisation appears not to have been

Investigated at the Cwm Brwyno Mine As could be expected, the lode on the western flank of an anticline and is also largely confined to the UDB & Cwmymlog Formations between two fold axes. Stringers of mineral were also found in two cross cuts to the north of the Main Lode in both the 10 and 20 Fm. levels, but neither appear to have been of any consequence. It has not been ascertained if it was one of these which is the extension of the North Lode which was discovered in the Deep Adit prior to 1867, with the 20 XCN. being driven during the following couple of years. It was extended by 34 Fms. in 1869 but had still not cut anything of consequence. Great hopes appear to have been placed on this new discovery being the salvation of the old mine, but by 1874 it was becoming obvious that this was never to be. Like Jones, it has not been possible to ascertain the position of the North Lode in the 56 Fm. level, or Deep Adit, despite an intensive archival search.

5 Longitudinal section of the Cwm Brwyno Mine circa 1845. Drawings Nos. 3 to 7 inclusive are all drawn at 1:2500 scale. At this date the upper level is drained by the cross cut adit driven by Evans, marked x, with a drift driven along the lode at 10 Fms. below. Considering that Evans brought the mine into production so rapidly, it must be considered that he simply drove the adit to extend the work already started by the Williams Bros. in the 1820's or 1830's. It would appear that it was in this state when Messrs. John Taylor & Sons took over the management and running of the mine. They immediately set about driving the Deep Adit, sinking the Engine Shaft and driving a new cross cut adit to communicate with and drain the 20 Fm. level, this is shown in drawing #6. At this time the two principal shafts appear to have been known as the Engine Shaft (left) and Whim Shaft (right) with the crown hole (extreme left) possibly being utilised as a manway and ventilation hole. The Engine Shaft was later named Taylor's Shaft, and eventually sunk to the 80 Fm. level under their regime; Meanwhile, the Whim Shaft became the Eastern Shaft. Taylor also increased the interval between the levels from 10 Fms. to 12 Fms. in order to increase the tonnage of the ore contained within the blocked out ground. The block above the 44, west of Taylor's Shaft is amongst the largest and richest at 540 square fathoms, archival data suggests that the lode was four feet wide and was estimated to yield two tons per square fathom; The block therefore contained about 5000 tons of ground and 1080 tons of lead concentrates, a very respectable yield of 17.7% concentrate, which equates to 13.3% Pb over 1.25 metres. The richest parts of the mine yielded 3 tpf. or 19.5% Pb over 1.25 metres. Further away from the small core of rich ground, the yields are recorded as falling to as little as 12 Cwts. per square fathom or about 3.2% Pb over 1.50 metres.

6 Longitudinal section of the Cwm Brwyno Mine at 1:2500, circa 1868, showing the state of development when abandoned by John Taylor & Sons. This drawing was produced by removing O.T. Jones's additions to the 1861 Parry section. The extent of the stopping undertaken since 1845 becomes

7 Longitudinal section of the Cwm Brynno Mine at 1:2500, showing the post 1868 development at the 92 and 106 fm. levels, with a new stopes on the back of the 68, and 80 in extensions to Taylor's workings. The 92 and 104 are post 1868 developments and evidently only discovered patches of ore, the extent of the post 1868 development, particularly the driving of the drifts along the 92 and 104 fm. levels. At the end of his first paragraph, Jones uses Taylor's developments to set the context and then states that " subsequent developments are not likely to have been extensive ", which is not strictly true and the facts warrant further examination. Between 1869 and 1888, somewhere about 600 to 625 square fathoms of the lode have been stoped from which 1145.5 tons of lead concentrates were recovered, thus giving a yield of 36.6 Cwts. per square fathom. This is a considerably higher yield than under John Taylor & Sons, who obtained 4950 tons of concentrates from about 7500 square fathoms of shallower ground thus suggesting that their yield was about 13 Cwts. per square fathom rather than the " about one ton per square fathom. " as stated by O.T. Jones. Statistically, it is most curious that an 8% increase in the stoped area gave an extra 23% of concentrates, particularly from an area which had been deemed to be poor ground. Jones appears to attribute the aggregated output of 6095 tons to Taylor's 7500 square fathoms of stoping to arrive at a value of about 17 Cwts. per square fathom, or near enough to one ton after allowing for mining & milling losses. However, this does not take account of halving working and assumes that the lode is of a uniform width and yield throughout the mine. Some of the richest

apparent by comparison with the previous section, whilst comparison with drawing #3 reveals the detail which was added by Jones to create an updated version for publication. Note that four stopes on the back of the 68 fm. level have holed through into the sole of the 56 fm. level or Deep Adit. On the 80 fm. level, development was restricted to a cross cut driven south into the lode with short drifts driven to both the east and west. Below this lay the sump. The area stoped by Taylor appears to be around 7500 square fathoms, or about 103000 tonnes provided that the lode averages 1.50 metres wide, from which 4950 tons of concentrates were recovered. A yield of 107 lbs. of mineral per ton of ground mined. Note that between the mouth of the airshaft, Western Shaft or Chapel Shaft and the main workings clustered around Taylor's Shaft, that a pit and two drifts have been driven into shallow pods of ore, and that at the airshaft was sunk through another pod. Also, that the Deep Adit, between the airshaft and the main shoot, passed through a further three pods, but these were of limited extent and were not intersected by the drift off the airshaft some 10 fathoms above. This drift was, almost certainly driven within the Sedgwickian Shales. It would also appear that none were of sufficient interest to warrant the sinking of a winze to examine the pods at depth, despite this showing possibly being the top on a deeper ore shoot. A 10 or 12 fm. winze would certainly have been justified at the mid point of the 35 metre intersection, or possibly as a continuation of the airshaft below the 56 to an arbitrary projection of the 68 West of Taylor's Shaft.

stopes yielded as much as three tons per square fathom whilst others ran at 12 Cwts. per square fathom, or lower, and were probably worked at a loss.

8 Schematic section of the post 1870 pumping system. The 48 foot waterwheel has a crank affixed to the axle, to which sweep rods are attached. These represent the connecting rods. One sweep rod is fixed to the kingpost of the balance bob which allows the system to work under tension, whilst the other sweep rod is connected to the main driving rod and held in a horizontal position by another kingpost. The rotative action of the wheel is thus converted to a reciprocating action in the driving rods. These are also referred to as pumping rods or flat rods; at Cwmbrwynno, heavy wrought iron rods were used. As long as the system was kept under tension, chain, wire or timber could be used. To maintain sufficient clearance as the rods cross the road, a kingpost is used as shown in photograph #164. At the mouth of the shaft, a tee bob of pitch pine, heavily braced, transfers the reciprocating action of the drive rods through 900 and operates the iron braced wooden pump rods running down the shaft to the pumps. A tee bob is similar in construction to a balance bob, but lacks the counterweight. They were sometimes used at the mouth of the shaft, or located underground. The counterweight was usually obtained by filling a large box with the desired quantity of stone or scrap iron. The pumps were manufactured from heavy iron castings and needed specialist pitmen with capstans and shears to continually maintain and repair them. At Cwm Brwynno, they would typically have used a bucket pump to draw water from the sump into a water lodge from where it would feed a plunger pole or ram pump to force the water up to its discharge point, at the 56 fm. adit. With 3 to 5 strokes per minute available, and probably using a 6' stroke in 12" pumps, delivery would be between 90 and 150 gallons per minute. Much of the weight of the water in the cast iron rising main would be balanced by the weight of the pump rod. To avoid confusion, the earlier 36' winding, pumping & crushing wheel is omitted.

9 Copy of part of 1998 engineering plan 2096/13 by RMA. and at 1:500, and showing how the surveyor has chosen to ignore some of the archaeological features which were in the way of the engineering works. The accompanying drawing shows the missing sections in a pale outline, and they are best dealt with under a single heading. viz :-

A) The Ore Slides are shown as a triangle of masonry with a facade of 4.5 metres, a far cry from the 17 metre facade that was partly destroyed to construct the access ramp. I was never advised that major works were to be undertaken in this area and the damage was presented as a fait accompli. It is inadequately represented as being one of the larger features.

B) The Culvert for the tailrace from the New Mill to the Lower Crusher is only represented by a slight thickening of

some lines and no attempt has been made to show that it is a masonry structure. Had it been better represented on this plan, it may have been better noticed and damaged less.

C) Similarly, the buddles are poorly represented and become minimised alongside the multitude of contours. A test pit is given greater priority, shown above the Middle Buddle and near to an old budding area but is not identified as anything.

D) The old boundary is shown as a triple dotted line and short dash with the new boundary shown with a long dash. This 3002 metre amendment was not made to the working plans and the poorly shown buddles were still under threat at the commencement of the scheme when the fence was re-aligned.

9 & 10 Continued

E) Whilst not within the reclamation area, the attention given to the New Mill is less than scant. The survey shows a few disjointed masonry walls picked out from a 25 x 15 metre complex. If the surveyors are unable to differentiate between mine waste and masonry, they ought to have been accompanied by a competent person.

F) Also outside the reclamation area, the remains of the building which appears to have been a bothy or storehouse are not even recognised, despite there being masonry and standing walls covering an area of 5 x 11 metres.

G) The Lower Crusher has been minimised to approximately half of its actual size by not showing anything within the reclamation area; That is, to the east of the boundary line which cuts diagonally through the structure. This poor representation was partly instrumental in causing damage to the fabric of the building, despite assurances that the boundary fence would be moved so as to prevent such damage taking place.

11 Plan of Ellis's wheelpit at 1:100 with the plinth for the kingpost. The pale outlines which about the western wall and southern end, represent the balance bob pit and the crank cover. The masonry plinth on the northwestern corner carried the bearing for the kingpost; all of which are shown on both the 1st. and 2nd. Editions of the 1:2500 Ordnance Plans. There is probably three, or four metres of sand and rubble lying on the floor of this wheelpit and the remaining walls mostly stand three or four metres above the filled pit. Some bowing and distortion has taken place due to ground pressure, particularly the long side walls which are 170 centimetres apart at the south end, 195 at the mid point, and 180 at the north end. The diameter of the wheel is known to have been 14.63 metres, shown in a pale marking, but the end walls are 16.20 metres apart suggesting that a 50 or even a 52

foot wheel could have been accommodated in the pit. Most of the southern end wall has been destroyed, and is shown as a dotted line and there is severe damage to the mid points of both the longer walls; this appears to have happened during the removal of the wheel. Whilst the general condition of the installation is ruinous, it is still recognisable as a large diameter pumping wheelpit aligned with Taylor's Shaft.

12 Plan, at 1:200 scale, of the area around the southside of the Lower Crusher showing the relationship between the end of the culvert from the New Mill, shown as a dashed line, to the sluice and wooden launder to the 20' waterwheel at the Lower Crusher. The tailrace culvert and wooden launder for this wheelpit are drawn in a pale outline. Beyond the sluice, water from the New Mill runs along a short overflow leat before meeting the gully to carry the overflow from the pond. Both overflows then run together in a gully, which discharges into a small quarry on a strike ridge, and flows into Nant Brynno just above the weir. This short weir diverts the waters into the leat running along the north bank of the stream to feed the 48' Ellis's Waterwheel. During the survey, two old pitch pine posts were observed protruding from the stream bed; now silted up to the top of the weir. The northernmost of these appears to mark the probable position of the tailrace from the 20' waterwheel. The purpose of neither post could be properly ascertained.

13 Plan of the Lower Crusher wheelpit, at a scale of 1:100. This appears to have housed a 20 foot waterwheel, and been built about 1860; that is, about ten years after the Old Crusher, driven by a 36' wheel which also operated the original pumping and only winding system; and before the New Mill, with its integral crusher house, also operated by a 36' waterwheel. As such it appears to be a relic of Taylor's second mill, most of which has now disappeared. At 6.10 metres, is slightly shorter than the wheelpit near the Ore Slides. Built largely of double skinned, rubble filled, masonry walls bonded with lime mortar but later repaired with Portland cement. The doorway is quite apparent in the western wall, and the small opening in the northern wall, overlooking the stream, is aligned with the axle on what appears to be a 20 foot overshot waterwheel. The wheelpit has become filled to the brim with jig tailings, possibly three metres deep, which have also presumably filled the hidden tailrace. It would also appear that whilst the wheelpit walls have been slightly reduced in height, the adjoining Crusher House may have been reduced by as much as three metres. The toppled masonry certainly didn't fall into the building and none of any consequence was discovered during the excavation. Maybe the upper part of the building was used in the construction of another, and the reduced Crusher House was repaired and used as a storehouse? Had the installation been unaltered, I would have expected to have found (a) the sockets for the substantial timber bearers (b) the slots for the counterweight arms (c) the opening in the wall above the level of the crusher through which the ore was conveyed. From studying the available plans, it would appear that when this part of the

plant was being built, the stream had ceased to flow down this section of the valley since the mine pond was built, and all water was diverted through the plant as required. It would also appear that the stream reverted to its original course when the sluice was damaged circa 1914.

14 Plan and Section of the lower crusher wheelpit and building, at the larger scale of 1:50, which are convenient to describe together; being the result of the excavation, and measurement of the east end of the installation. Reference should also be made to photographs #136 - #140 inclusive, which were taken whilst this work was being undertaken. Note that the wheelpit is backfilled with jig tailings, these were not disturbed and the side walls are therefore projected in broken lines.

Despite clear instruction being given on several occasions, two attempts were made to further delineate this building without supervision which resulted in sub surface damage to the eastern side of the structure. After recording the remains, the land profile was restored to its original level and the damage was thus hidden. Compare what is visible in photographs #41 and 42 Etc. with 142 to 145; there is none. The examination revealed nothing which was not already known.

16 Plan of the lowest, westernmost buddle and the adjacent masonry plinth at a scale of 1:50, which is most conveniently described along with the other Buddles, and drawn at similar scales :-

17 Plan of the area around the Middle buddle, 1:50 scale, and semi circular retaining wall in front of the New Mill.

18 Plan of the highest, Easternmost buddle at a scale of 1:50, showing the retaining wall in front of the New Mill.

19 Plan of the area around the Easternmost buddle at 1:100 scale, showing its relationship to the retaining wall and the New Mill.

Round Buddles, Common Buddles and Cardiganshire Buddles are effectively the same device which was apparently invented at the Cwmawr Mine by John Buddle in the late 1830's as an improved method for separating and cleaning galena from the mineralised pulp. It is curious that there were earlier ore separating devices known as buddles and it may have been the invention of John the Buddler. The earliest description of the Cardiganshire Buddle is by Robert Hunt, as an appendix to his "Notices of the History of Mining in Cardiganshire." In the Memoirs of the Geological Survey of 1848.

20 Plan of the building which may have been a storehouse,

There are certainly timbers visible within the Crusher House,

21 & 22 Continued.

the axle.
the long axis of the driving wheel, but about a metre below
maybe 12" x 18" (30 x 45 cms.), which would run parallel to
weight, are usually supported on substantial pitch pine beams,
and geared up from the axle. The rolls, due to their great
and directly clutched to the axle, or of a smaller diameter
rolls. These rolls would either have been of large diameter
into a hopper located on strong beams above the crushing
the crusher in wagons pushed along the tramway and tipped
portal of the culvert. The ore would have been delivered to
accessible at the back by a tramway, on trestles, from the
to the eaves on the facade with the upper storey being
stood at least three storeys high, probably about 6.5 metres
ascertain exact heights. The complex would appear to have
little of the structure remaining, it is difficult to
which the side and back walls have collapsed inwards. With so
is clearly visible, in part, in photographs #2 & #3, since
the late 1960's, the Crusher House was considerably taller and
account of repair and modification of the original pit. Until
permit the installation of a 37' 6" waterwheel, possibly on
wheel at 11.30 x 1.50 metres. It is sufficiently oversize to
slightly larger than that built for the 36 foot Old Crusher
the building. At 11.50 metres x 1.40, this wheel is
the appropriate jigger on the ground floor, at the front of
oversize being recirculated, and the undersize being fed into
rolls, and the product being classified through a trommel; the
x 4' overshoot waterwheel driving a set of Cornish
are more conveniently described together: With a 36'
22
and
21 Plan of the New Mill, at a scale of 1:100, also:
Section of the New Mill, at a scale of 1:100. Which

or bothy, at a scale of 1:100. The facade was detached
from the main part of the structure circa 1970, and is
represented by the masonry buttresses lying on the ground in
front of the building. The state of the ruins prior to this
event can be clearly seen in photographs #2 & 3. Also, since
those photographs were taken, a trackway has been constructed
through the building resulting in the loss of the greater part
of both gable ends, the back wall has been reduced by natural
erosion. The portion which was destroyed is drawn in a broken
line. Despite being in such a ruinous condition, it is still
possible to see that it had internal dimensions of 12.20 x
5.00 metres (40 x 16') with no dividing wall, there are
signs of repair using portland cement thus suggesting that it
was probably in use up to the time that the mine closed.
Despite a fairly vigilant search in this area, there was no
sign of smelting slag, nor does there appear to have been any
chimneys. The site of the smithy has still not been located.
On both the Ordnance Survey 1st. and 2nd. Editions of the
1:2500 plans, the building is shown in a less substantial form
than those around it; maybe it was roofed with corrugated iron
or bracken thatch. This building was completely ignored by the
surveyors as can be seen by reference to drawings #9 & 10.

as can be seen in photographs # 6 & 157, but without proper excavation, their exact purpose is difficult to ascertain. Also, they are aligned on an inappropriate axis. The heavy rolls are pressed together by long arms, or levers, with an external weight hung so as to increase the pressure between the faces of the rolls; of this mechanism nothing survives. Beneath the rolls, the crushed product would pass through a series of inclined rotating trommel sieves with the oversize being delivered back to the upper feed hopper by a raft wheel, possibly up to eight metres in diameter. The various trommel products were fed into the jiggers located on the ground floor and driven by line shaft, pulley and belts. The finest products would have been cleaned in the buddles, set outside and at a lower level so that the fine pulp could be transported by means of a launder.

Over the past 30 years, this structure has been for dumping and is now so neglected that I cannot believe it will last another 30. The wheelpit is bowing badly under ground pressure and root heave from a firmly established ash tree. It would have been beneficial to have dumped some rock into this pit, during the course of the works, to prevent its collapse.

23 Plan, at a scale of 1:100, of the old, 22' x 4', upper wheelpit and the neighbouring features. Probably a relic of Taylor's second mill of circa 1860, and originally intended to drive a small crusher for reducing the product of the neighbouring spalling floors. At 6.85 metres long, it is about half a metre longer than the lower crusher wheelpit, and approximately the same width +/- 10 cms. These pits may be contemporary and both were abandoned prior to 1887. There is an oval depression at one end of the wheelpit which appears to have been contained within a shed at one time. The position of this shed is shown in a pale outline. Note that a small launder discharged from the shed into the wheelpit. The cutting immediately to the west of the wheelpit marks the point where the lead was fed through a sluice and into a wooden launder to be carried over the 36 foot wheel on the side of the New Mill. It is by no means certain that this 22 x 4' wheelpit did not discharge sideways into the sluice for the 36' wheel; particularly as there is no sign of a tailrace on the bank behind the New Mill, and it would have been far more convenient to employ a side discharging pit, as was done with the pit for the 36' wheel which drove the Old Crusher & Winding Machinery. It is curious that as this pit was probably abandoned in the early 1870's, that more of the walls were not robbed for building stone during the following 20 years when the mine was still marginally active.

24 Plan of the Ore Slides, spalling floor, and tramway to the 20 fm. level at a scale of 1:100. This was amongst the largest of the remains at 17 x 3 metres, possibly contemporary with the completion of the crosscut addit, to connect with the existing 20 fm. drift, but probably built a little later to serve a plant which has now largely disappeared. Whilst the facade of the slides was in a ruinous condition, the construction of an access ramp through the eastern compartment has reduced its value even further.

Unfortunately, this construction took place before the structure had been fully measured up and the dotted lines represent the damaged areas. Compare photograph #4 prior to the scheme with #16, 53 & 65, taken during the works. Immediately in front, and below the Ore Slides, a cobbled spalling floor would have been laid. The extent of the survival of these floors was never investigated. The tramway appears to have been modified during the early 1870's refit, thus rendering the slides obsolete after this time. Behind, and on the western side of the slides, are the remains of the least system for carrying water to the 36 foot wheel which drove the New Mill. Drawing #9 also deals with this matter. The surviving compartment is of classic construction with each course of masonry being laid at a uniformly increasing diameter so as to form a half cone set above a small doorway through the facade so as to allow the contents to be drawn down onto the spalling floors. Photographs #16 & 17 further illustrate the form of this slide.

25 Plan of Cwm Brwyno Mine House, showing the outhouse and well at a scale of 1:100. This was built during the

1850's by John Taylor & Sons and accommodated Captain Paul's family who appear to have managed the mine from this house, possibly as a satellite of the nearby Goginan mine. It would appear to have comprised of a parlour, kitchen and scullery on the ground floor possibly with three bedrooms upstairs and a maid's loft above the scullery. On the left hand side of the substantial chimney breast in the kitchen, is a doorway long since filled up, there is another fireplace in the back wall of the scullery, and no doubt another existed in the parlour as there are bricks visibly mixed in with the collapsed masonry gable end. In the surviving walls, the joists are set at a good distance above the floor, but their exact height cannot be determined without first establishing floor level, between 2.30 and 2.50 metres by estimate. Upstairs, the bedrooms could have had walls of 1.75 metres to the eaves with a ceiling above that. There is sufficient room above the scullery to have provided some basic accommodation, and knowing that a domestic servant lived in suggests a possible usage. The stone built outhouse is of a robust character and more likely to have been a coal store than a privy, particularly as it is located in such close proximity to the well. It is probable that their privy was an earth, or ash pit, covered with simple structure of planks, or corrugated iron, laid over a wooden frame, and of a temporary nature which would not have survived for long after abandonment.

26 Combined Plan & Section of the remains of the wheelpit for the Old Crusher with adjoining annexe for the drawing machine, at a scale of 1:100. This wheel also operated the pumps in Taylor's Shaft prior to the 48' Ellis's wheel being commissioned. Note that the pit for the 36 foot wheel is constructed to be wider at the axle than at the circumference; whilst this is not usual practice, it is not unknown and results in a more robust structure which resists being buffeted by high winds. A necessary feature at this high and exposed location. At 11.30 x 1.50 metres, this wheelpit is

slightly smaller than that which was built to house the New Mill waterwheel and is also showing signs of ground movement. The southern end was demolished to remove the wheel but it is still possible to see the arch where the water was discharged through the side of the wall and into a steep lead leading to the mine pond. Alongside this damaged section, a wall has been removed, this is shown as a dotted line in the drawing. This annexe has joist sockets 2.40 metres above floor level. The adjoining intact annexe obviously contained the drawing or winding engine clutched onto the eastern end of the axle. There is probably about two metres of debris on the floor which also hides an archway communicating with the adjoining damaged annexe, but now blocked up. There is a substantial beam buried under the debris, which obviously pre-dates the drawing engine but its use is not apparent. It is obvious that the usage has been changed since it was constructed, possibly on two occasions. There are no indications of what had once been alongside the western wall of this pit and I suspect that some of the building stone may have been robbed for use elsewhere. In examining the Ordnance plans, it would appear that there were several buildings here enclosing a crushing plant, drawing engine, crank and sweeprod. The crushing plant would be driven by one end of the axle, whilst the other drove the winding and pumping machinery.

27 Plan of Surface of Cwm Brywno Mine at a scale of 1:200, Showing the layout and relationship between the Lower Crusher with 20' wheelpit, Buddles, New Mill with 36' Waterwheel alongside Crusher House and Jigger Shed, Bothy & Storehouse, Old 22 x 4 foot wheelpit, Portal of the Culvert, and the Trial Cutting, all of which are shown in greater detail in the preceding drawings.

Survey of the surface remains at Cwm Brwyno Mine.

This survey was commissioned by Messrs Richards, Moorehead & Laid of Ruthin, Denbighshire, as engineers to Ceredigion County Council for the proposed land reclamation and environmental improvement scheme at the abandoned Cwmbrwyno Mine, some 10 km. east of Aberystwyth.

I surveyed parts of the site, partly by triangulation with a tape, and partly by offsets using an optical square between the 19th and 21st October 1998, with the first prints being drawn up, at 1:200. Since then further detail has been added, and also more of the outlying structures have been included. The accuracy is generally in the order of ± 10 cms. in 50 metres, or better.

No levels were taken due to the urgency in preparing the survey, but these can easily be added at a later date if deemed necessary. The only other work not undertaken was a comprehensive retrieval of the information contained in the Mining Journal. All references to this weekly have been gleaned from work already undertaken, and filed in my office.

The individual buildings, or associated groups of buildings, have been drawn up at the standard metric scales of either 1:200, 1:100 or 1:50, whilst the mine sections have been produced at a uniform scale of 1:2500 the match the OS. plans.

The detail regarding the position of the temporary haul roads, pipe bridge and boundaries of the material to be moved have been lifted from the 1:500 site plan supplied. The detail and representation of the remains in the engineers survey is so poor as to be of little value and is misleading in places. This situation is further analysed in section nine of the drawings. Few remains lay within the area to be disturbed; initially only the buddles were under threat from the scheme and despite their being saved, other damage was done elsewhere.

Many of the distances have largely been obtained from measurements, or datum points published by the Ordnance Survey in their 1:2500 plans of 1887 & 1905, and from other editions. Quantities have often been expressed in archaic units, but there is usually a metric equivalent. e.g. Cwts. per square fathom is frequently quoted and then converted to percentage values, dependant on the prevailing conditions.

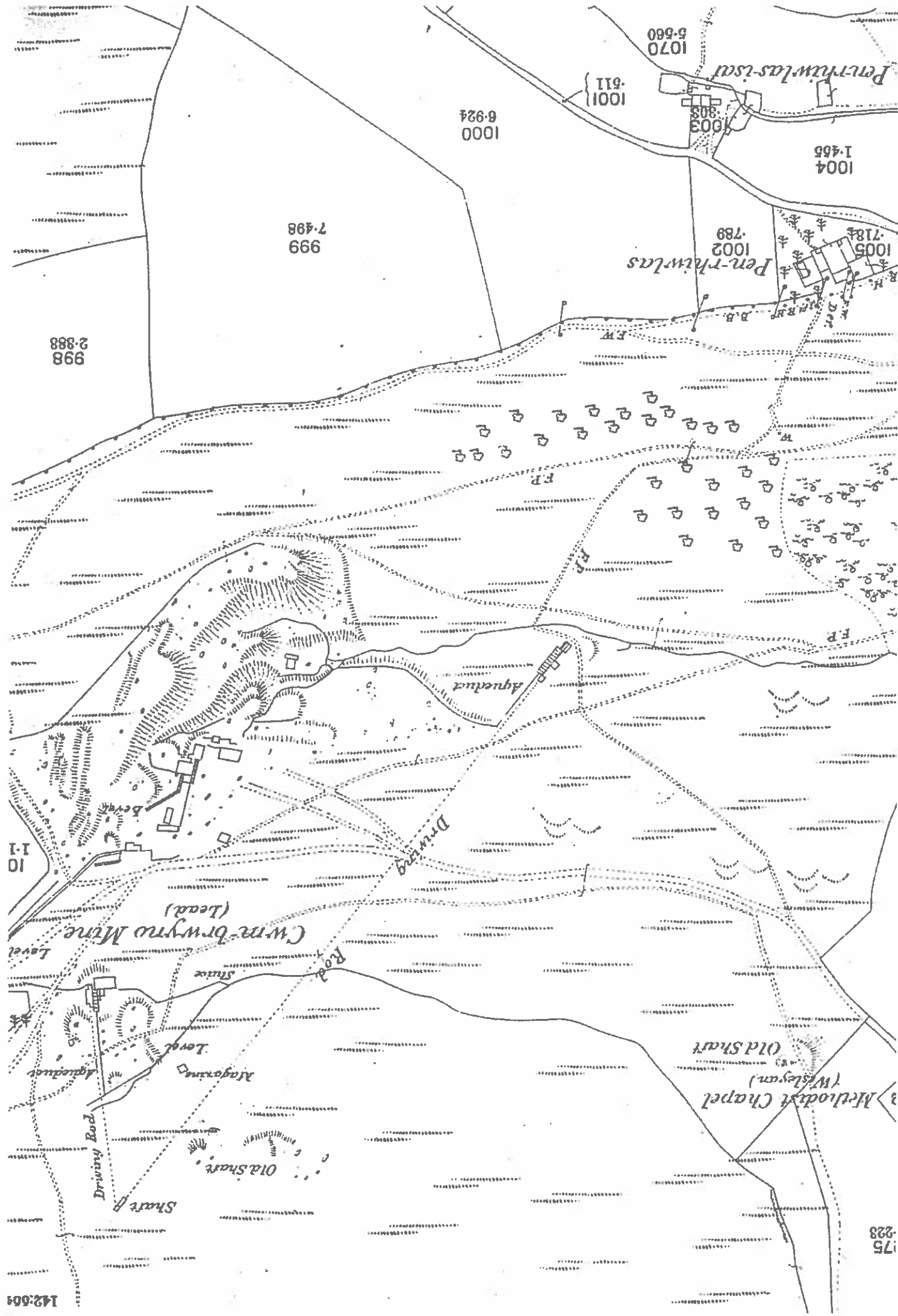
The Old Crusher installation and Cwm Brwyno Mine House, whilst being outside the site, are therefore included as it is impossible to separate them from the history of the chronology of building development.

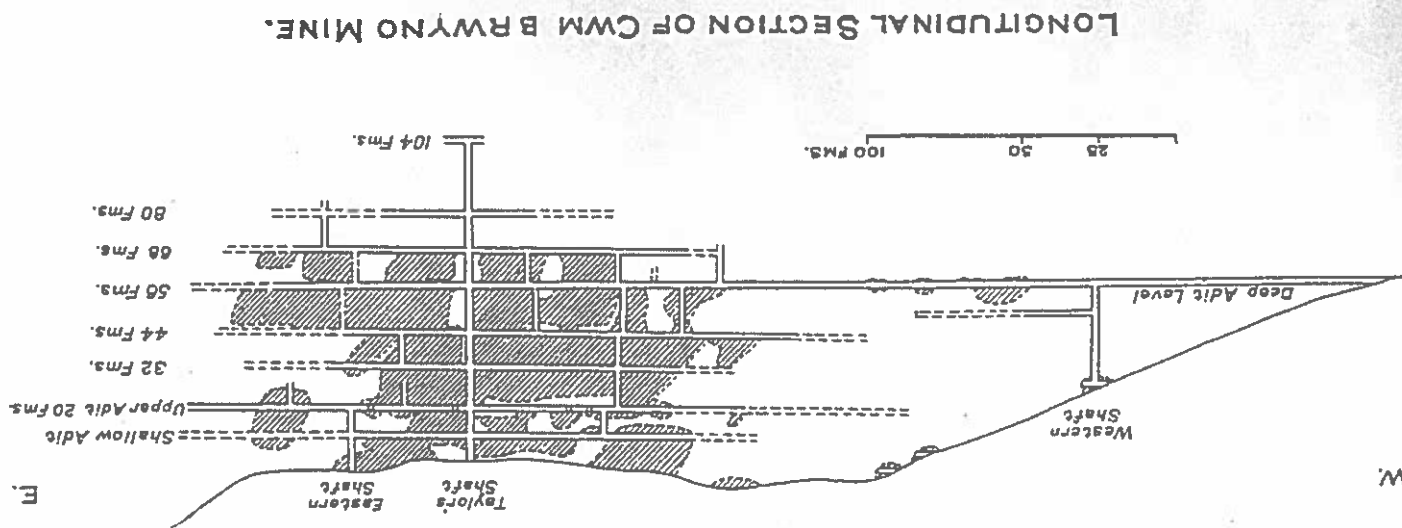
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Plans & Drawings with Schedule.

SJSJ. 16 x11 99.





(6 in. Shear, Card. 7 S.W., Long. 3° 53' 35", Lat. 52° 24' 33").

ОУМБАРВУНО.

This mine lies on Cefn Brynno hill, half a mile east of the Aberystwyth-Llanidloes main road and about 9 miles by road from Aberystwyth. It appears to have been discovered about 1840, but only produced ore in any quantity 12 years later. It was worked by Messrs Taylor & Sons for many years until 1866, and the only available plan and section of the workings probably dates from about that period, but as four-fifths of its total output had been produced by that time, subsequent developments are not likely to have been extensive.

The lode dips to the south at about 55° and trends on the average west-south-west, but in the neighbourhood of the main workings it exhibits a characteristic sverve, which not improbably was favourable to the deposition of the ore.

The mine was, at one time, drained by shallow adits, one about 1060 O.D. and an upper adit or 20-fm. level about 1010 O.D. Later a deep adit or 56-fm. level was driven eastward by Messrs Taylor from near the Aberystwyth main road. It intersected the lode near the western shaft, which is sunk to about 745 O.D., but it rises considerably and at the main shaft it is about 780 O.D. (Pl. XV.).

Taylor's shaft, from which most of the workings were carried out, was sunk on the lode to the 44-fm. level; below that depth the lode lies south of the shaft at a distance which increases with the depth, and is reached by cross-cuts, that at the 80 fms. being over 10 fms. in length. Levels were driven at each 12 fms. below the 20-fm. or upper adit. After Messrs Taylor relinquished the mine, Taylor's shaft was deepened to about 104 fms.

The mine lies in the lower part of the Ironstone formation and is approximately midway between two well-marked anti-clinal axes. The ore-body is about 120 to 160 fms. in length

in each of the levels down to 68 fms.; some ore was found also at the surface and in the adit as far as the western shaft, about 120 fms. west of the main body. Although the ore is fairly continuous, there is some indication on the section of shoots dipping steeply westward.

The average yield of the part of the mine worked by Messrs. Taylor was nearly one ton per square fathom.

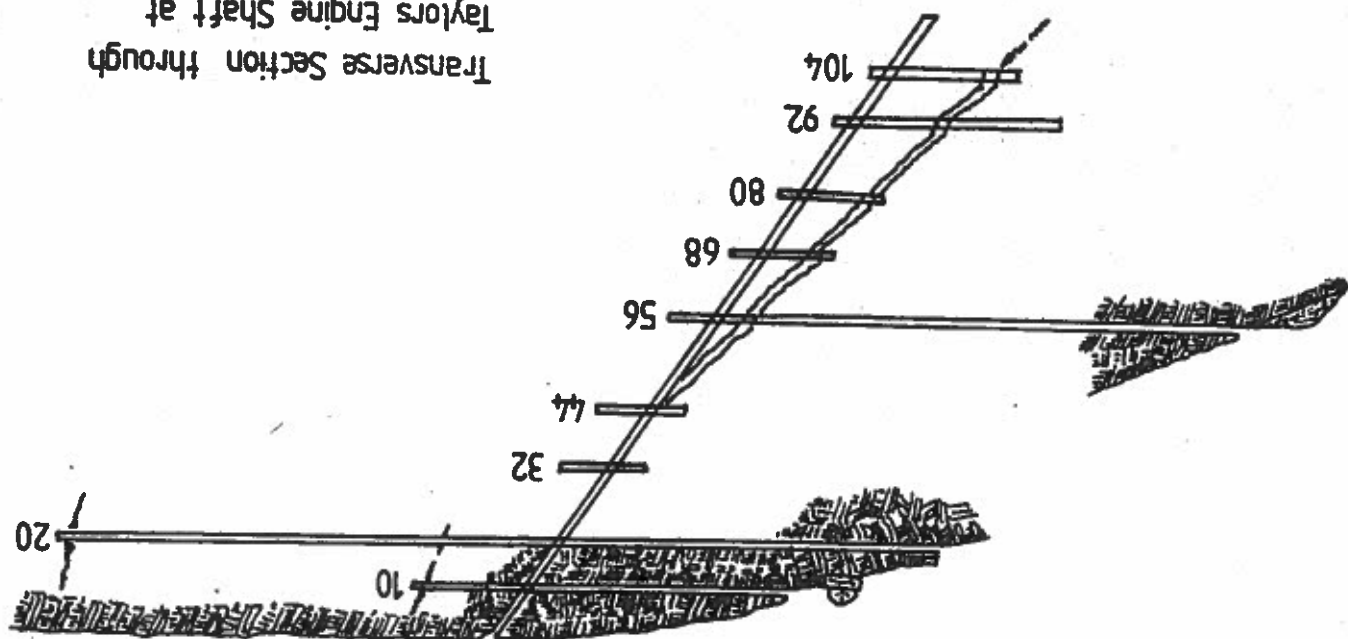
Output.

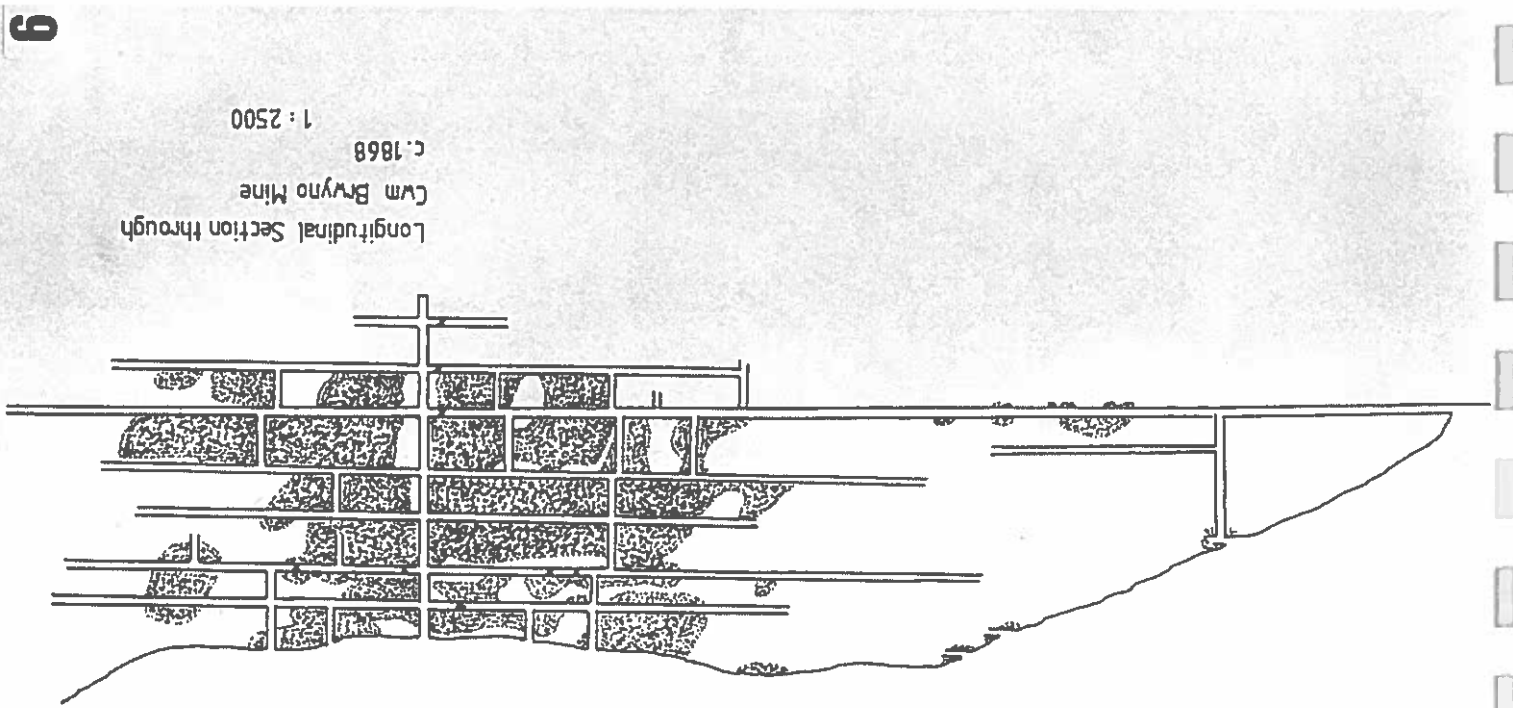
Lead-ore was returned in the years 1845-1878, 1880-82, 1888:—

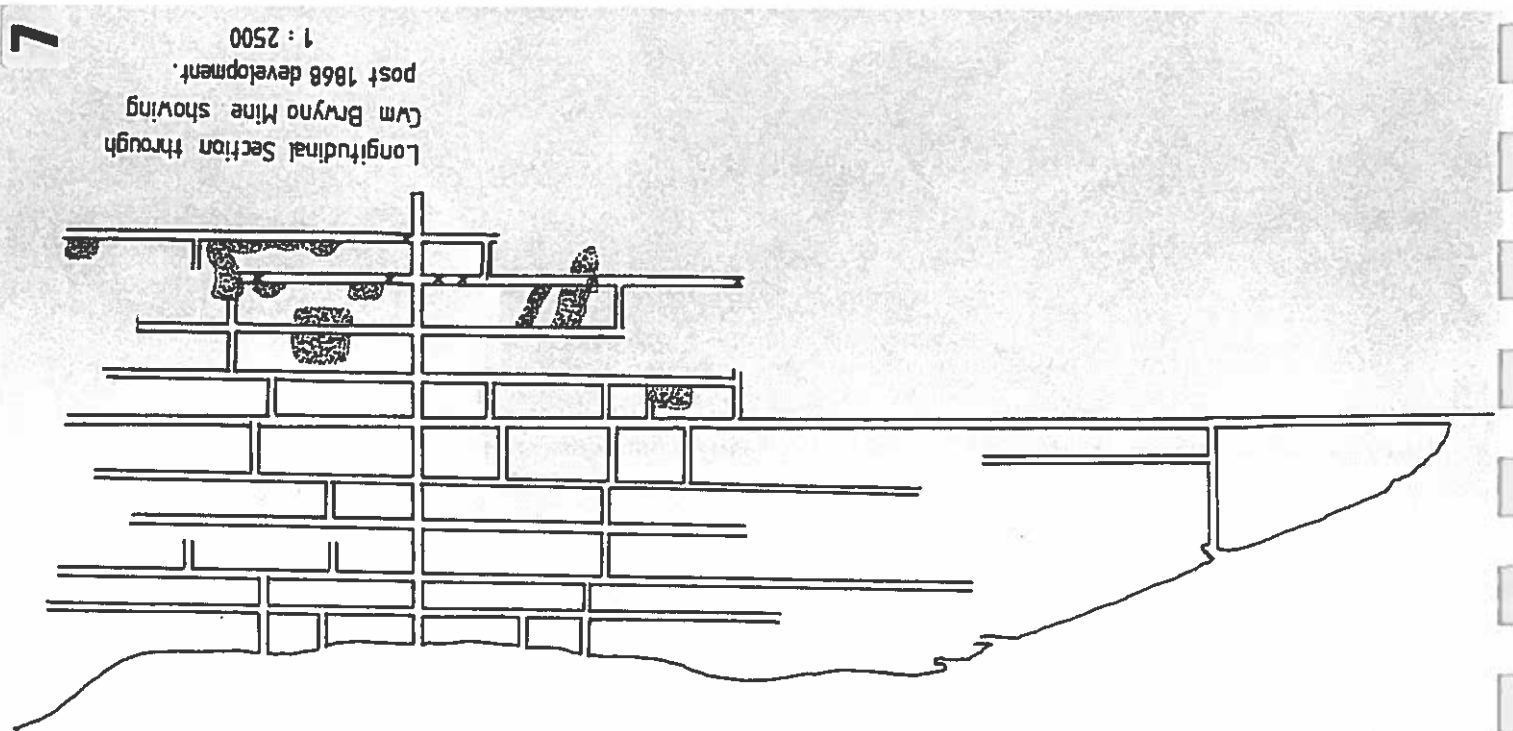
Lead-ore.	Lead.	Ratio.	Silver.	Silver per ton of Ore.	Silver of Lead.
Tons.	Tons.	%	Oz.	Oz.	Oz.
6,096	4,562½	74.7	7,383	2½	3

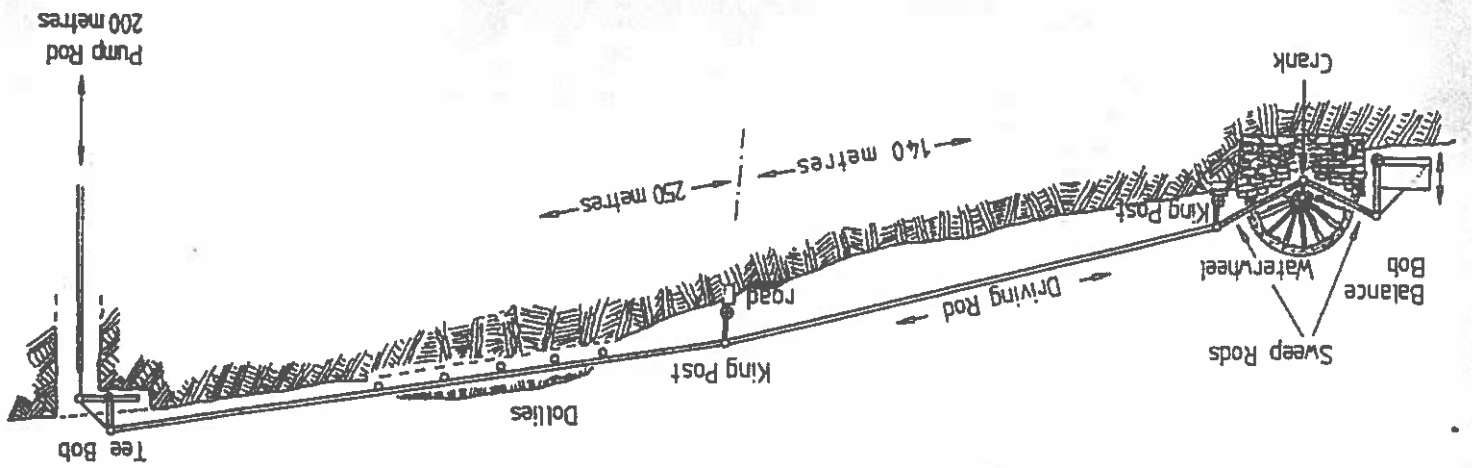
Blende was returned in the years 1854-60, 1861, 1865, 1866, 1870-73, 1882, 1888, 1892. Total, 796 tons.

It is doubtful if such a low yield of silver in the ore may be estimated. With these values the total amount of silver would be estimated as 13,000 oz.

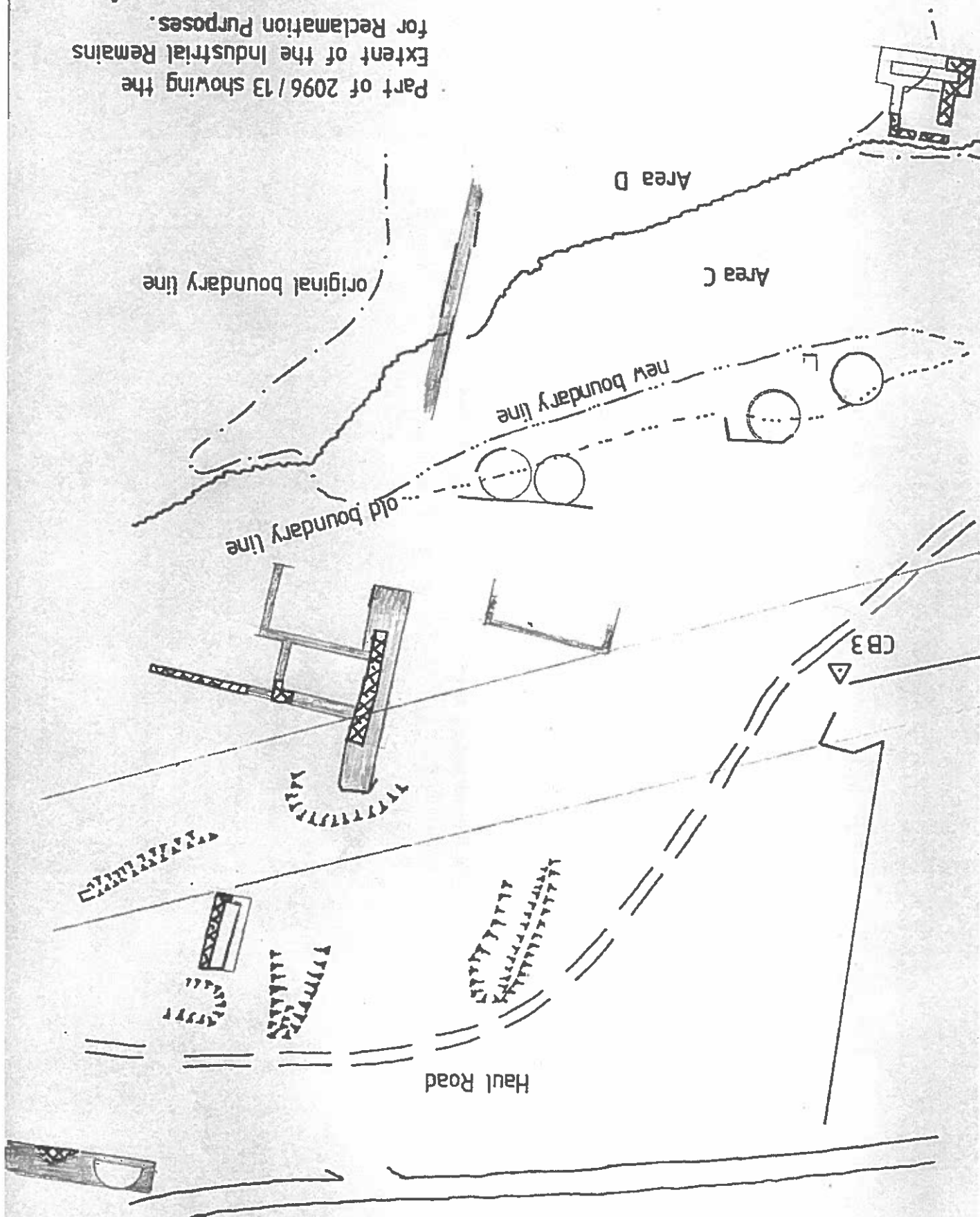








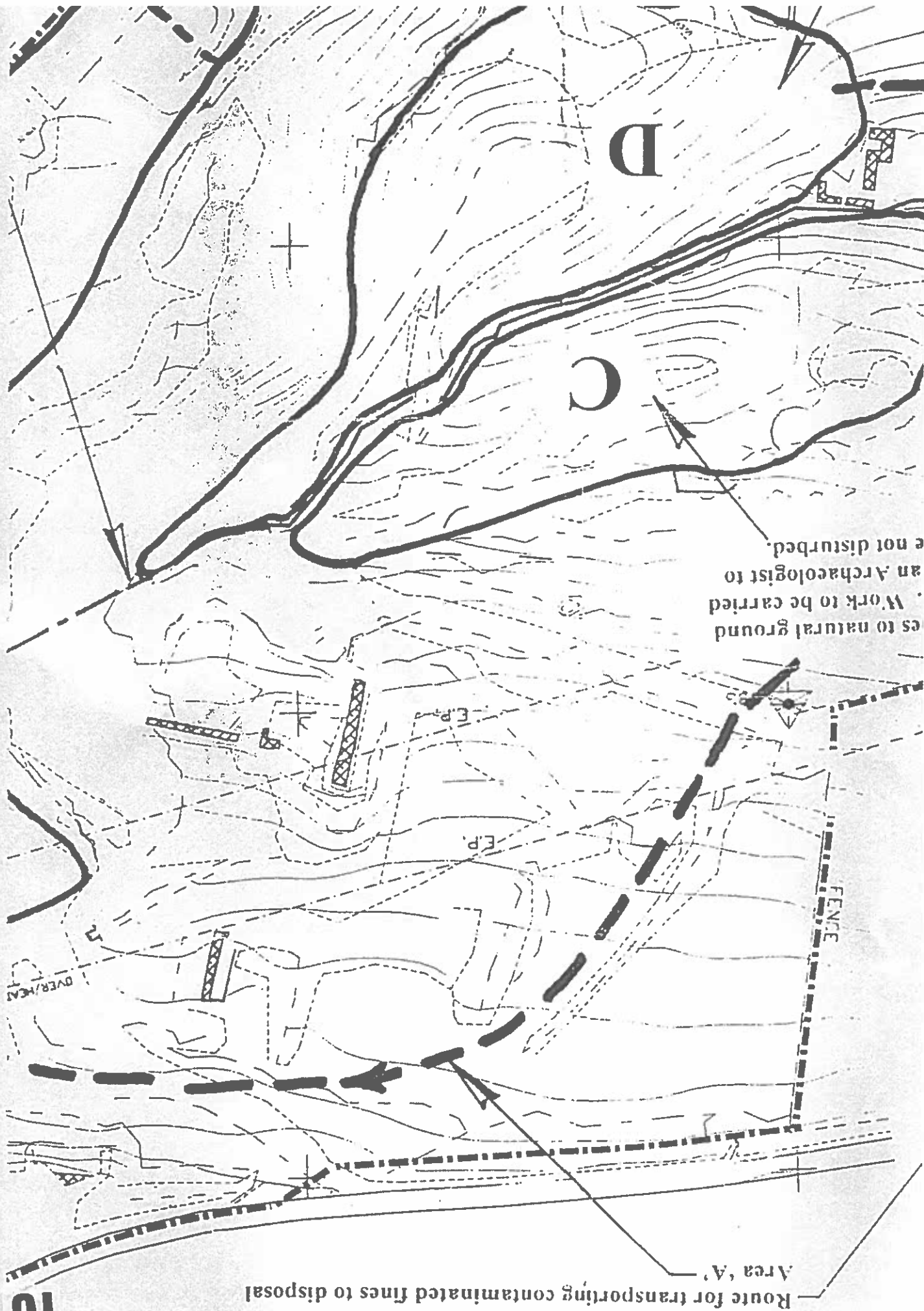
Schematic section through
ELLISS 48' WHEELPIT AND
TAYLOR'S SHAFT.
NOT TO SCALE



Part of 2096 / 13 showing the
Extent of the Industrial Remains
for Reclamation Purposes.

1:500



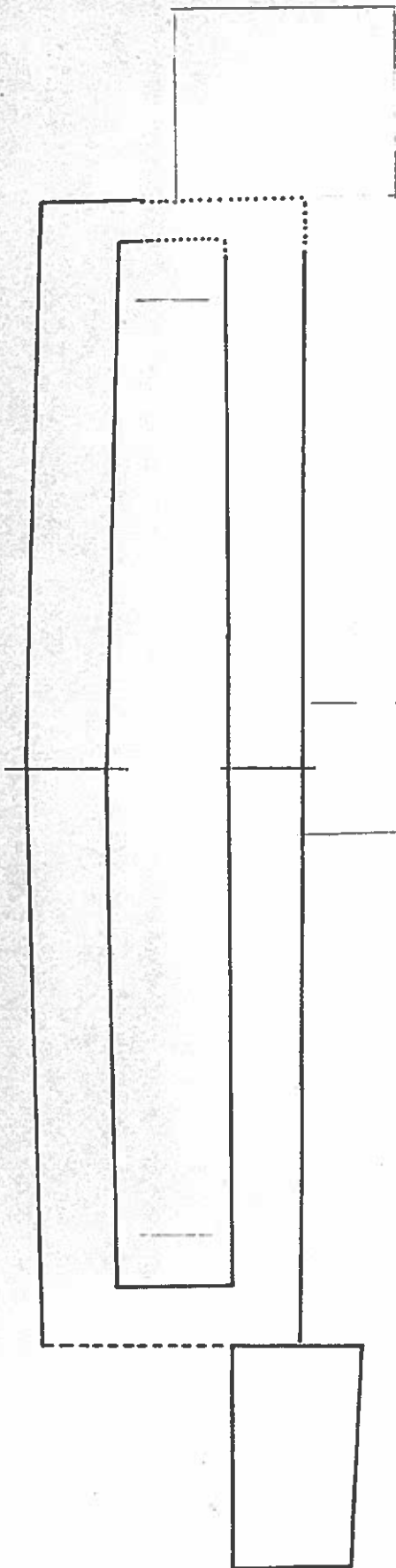


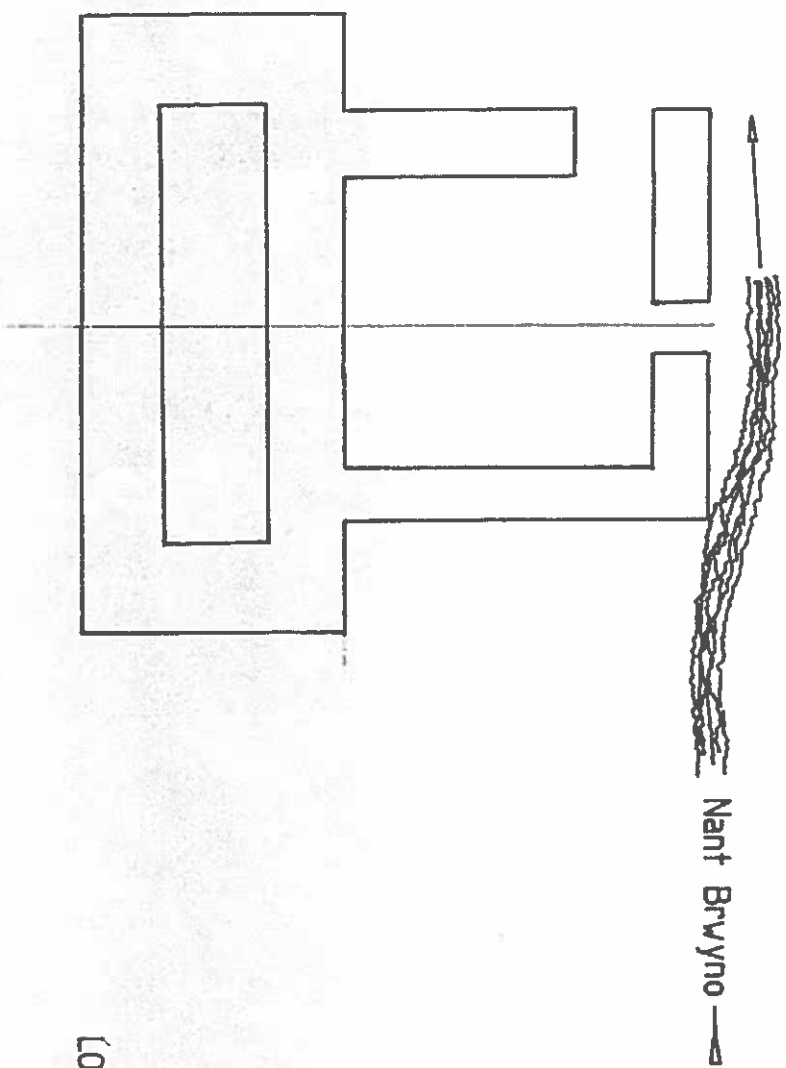
ELLIS'S 48' WHEELPIT

1:100



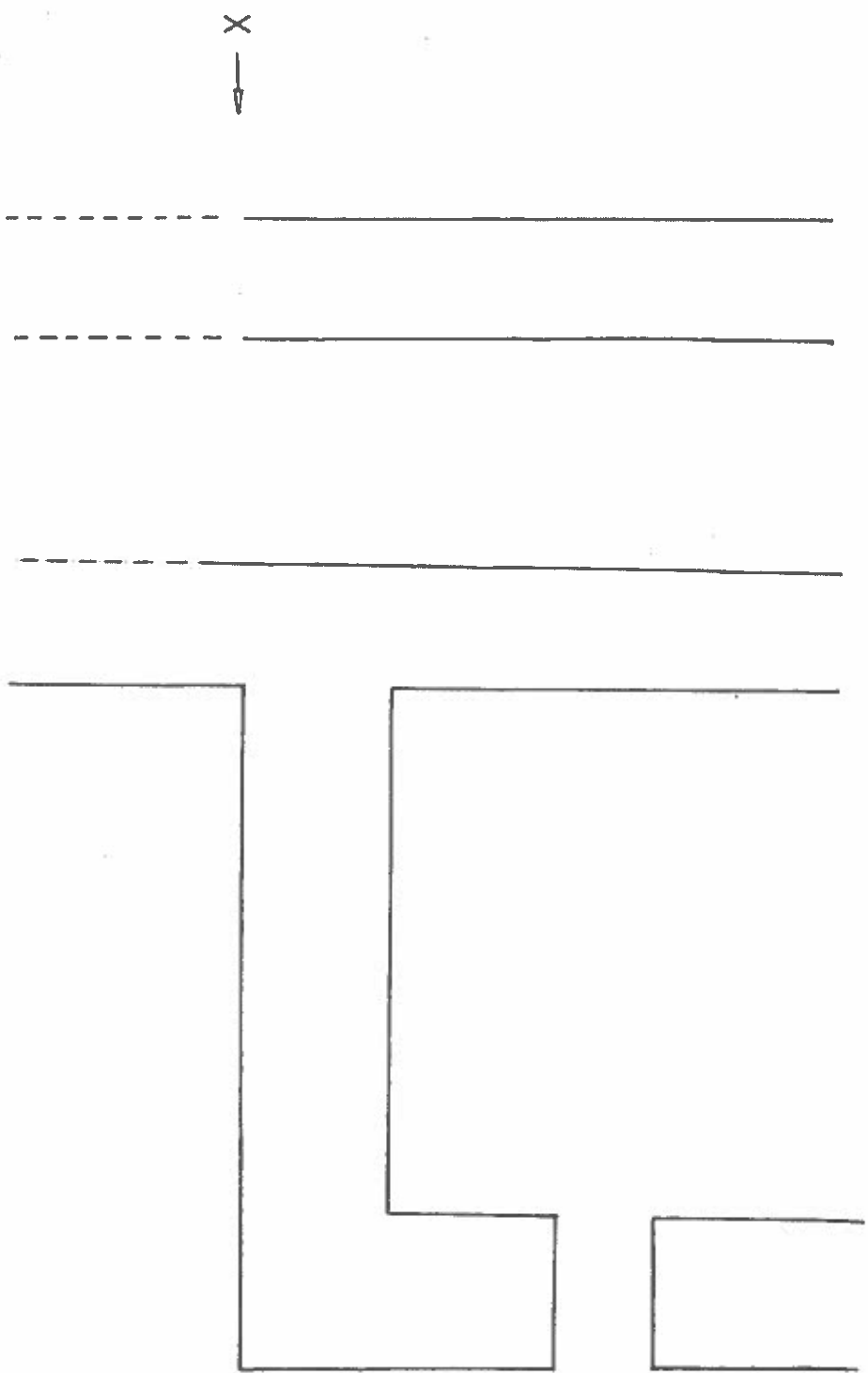
11





LOWER CRUSHER
1:100

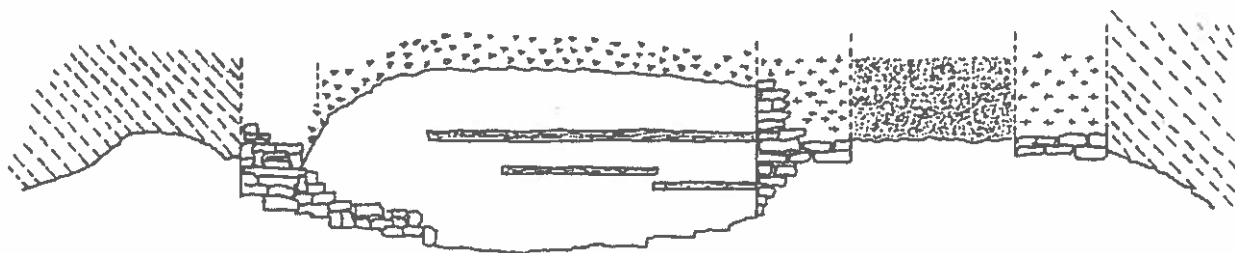




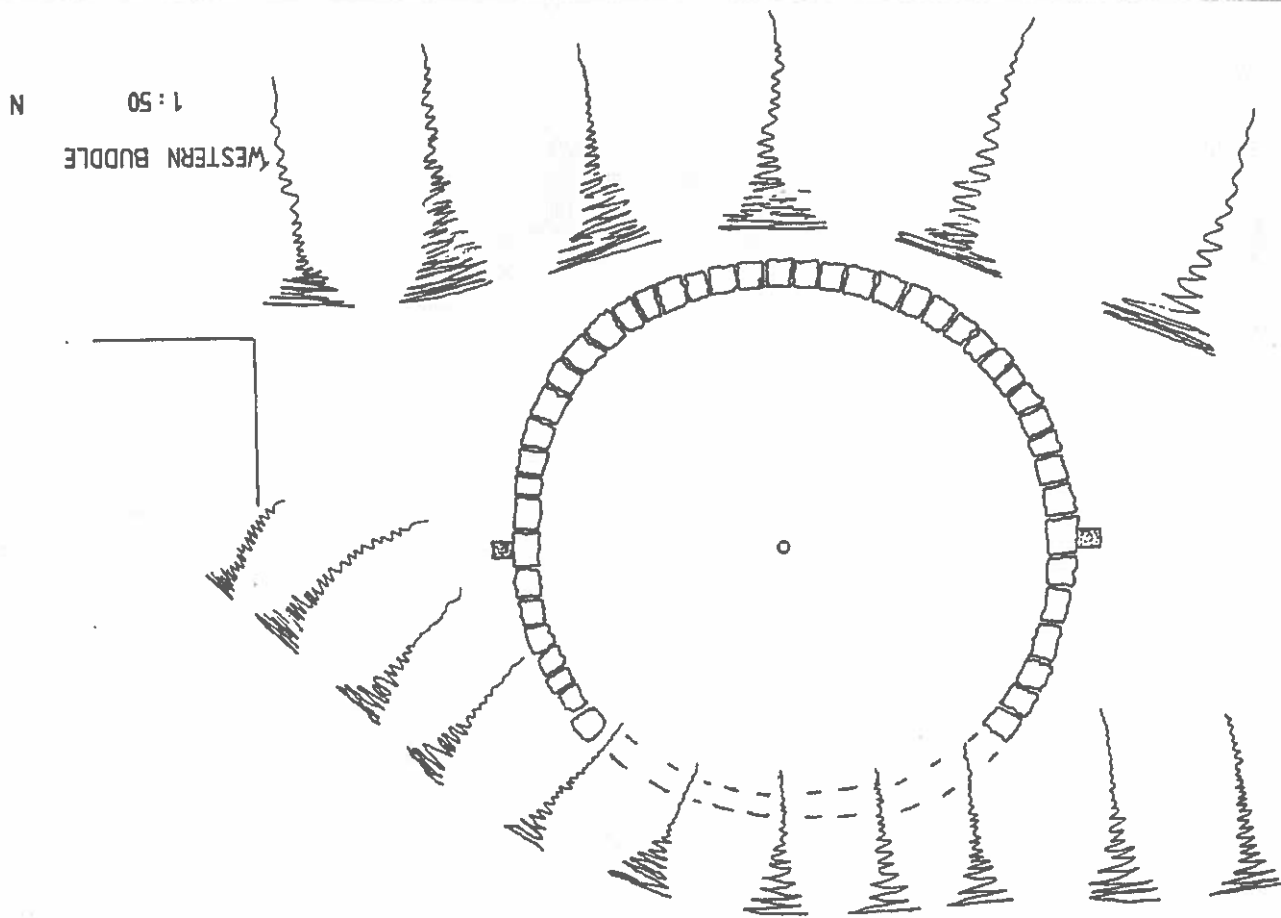
LOWER CRUSHER - EAST END.
Showing section line X - X.

1:50





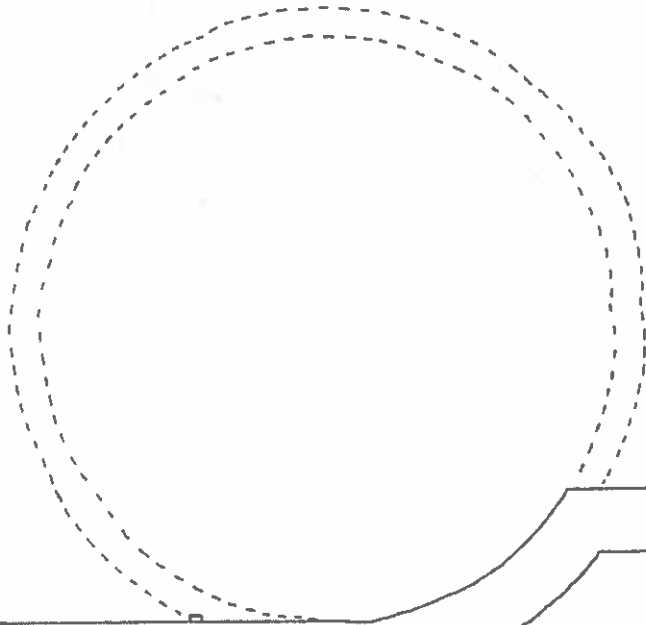
LOWER CRUSHER - EAST END
Section X - X facing west.
1 : 50

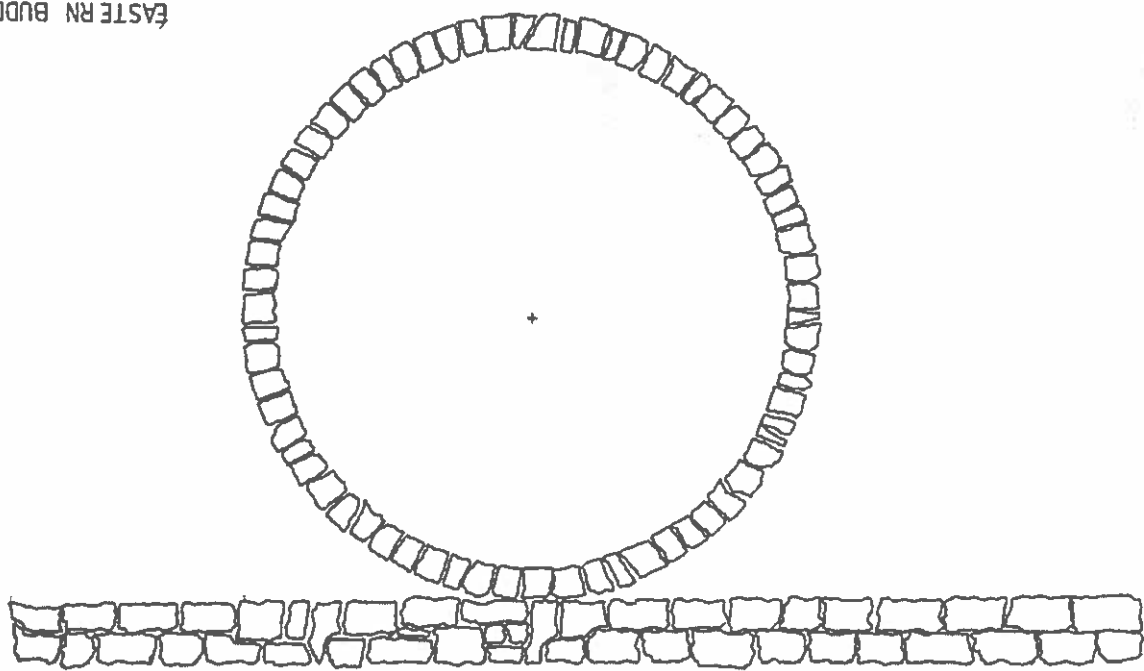


MIDDLE BUDDLE
1:50

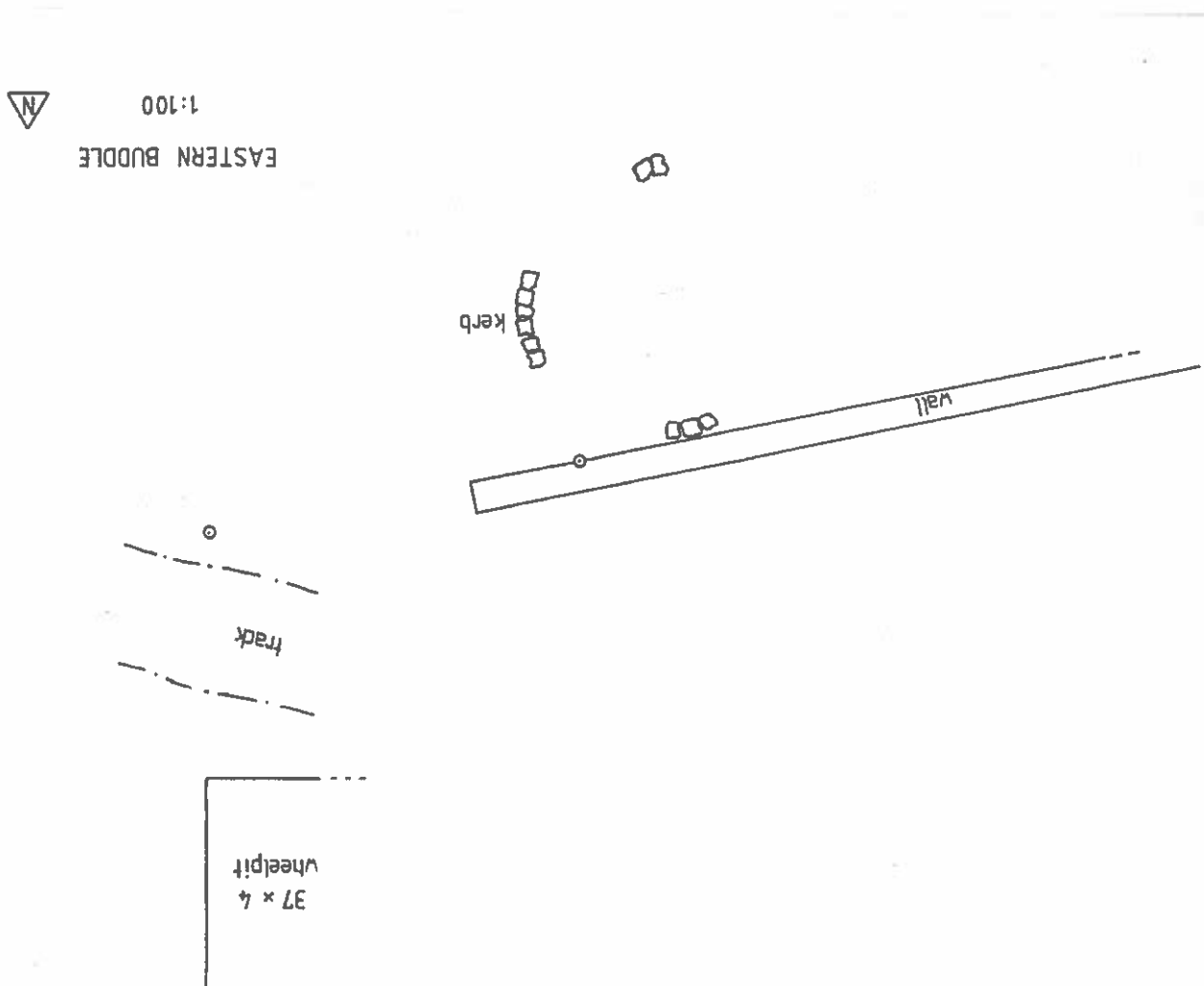


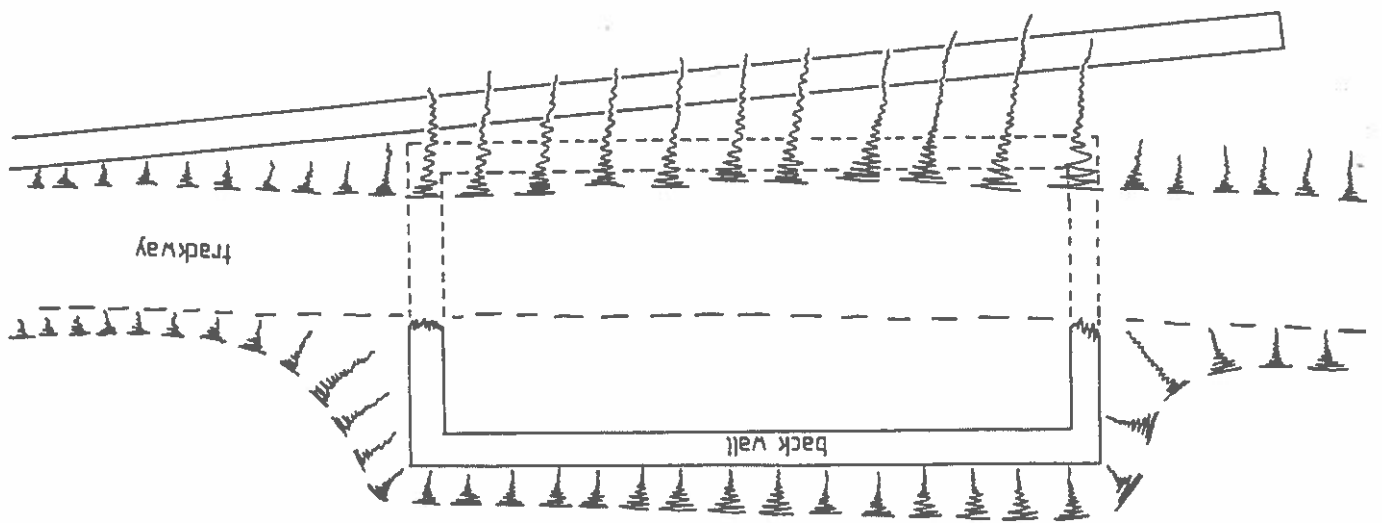
box lauder





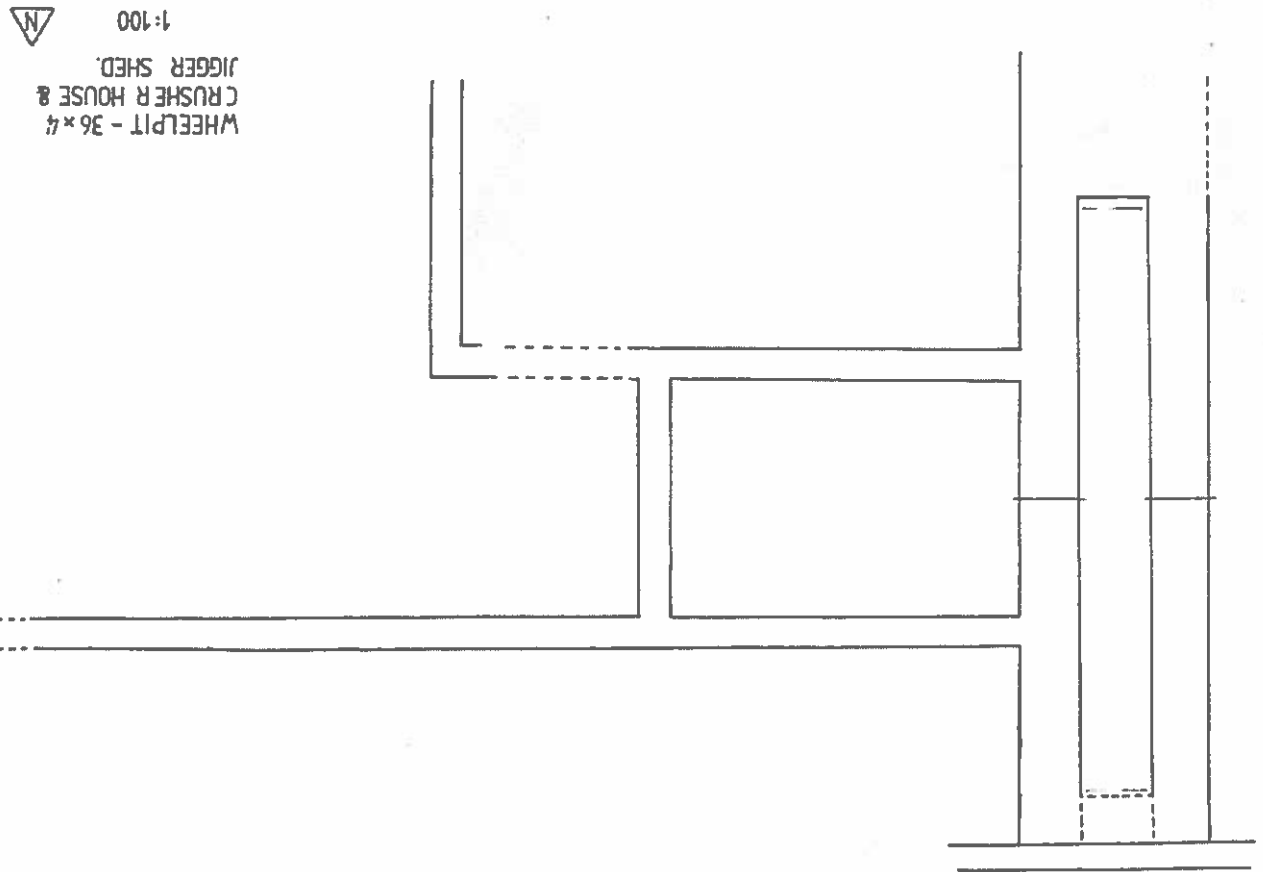
EASTERN BUDDLE
1:50
N





BOTHY - STORE
1:100





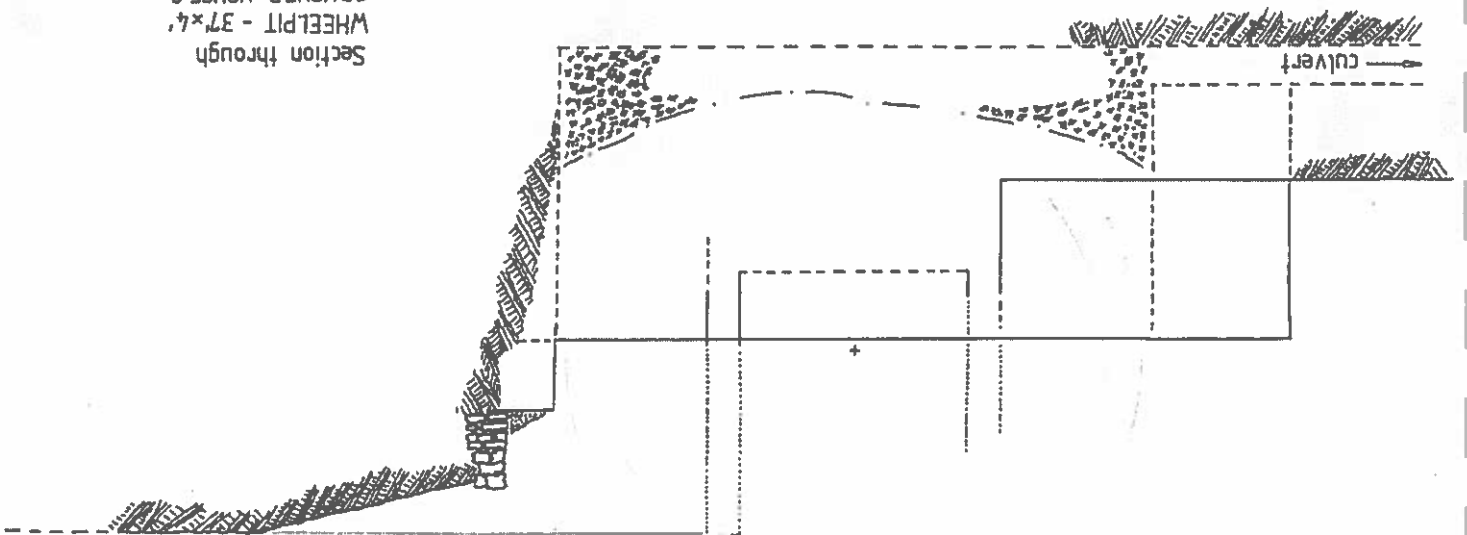
WHEELPIT - 36'x4'
CRUSHER HOUSE &
JIGGER SHED.

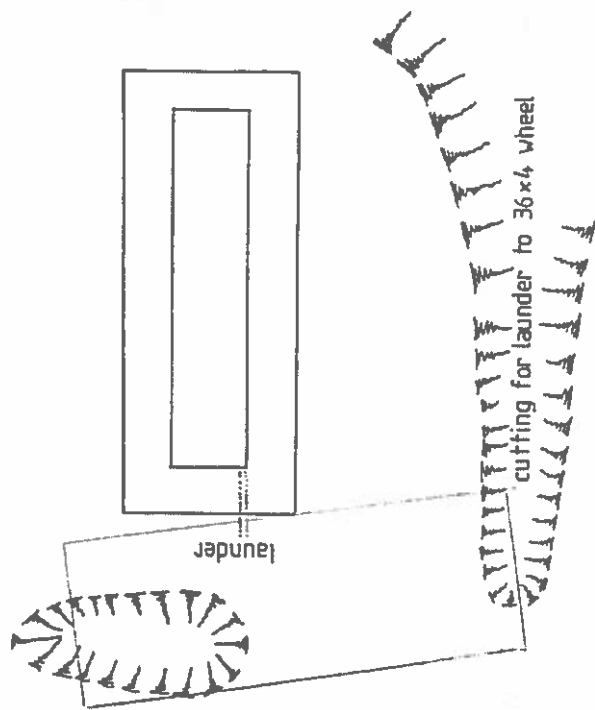
1:100



22

Section through
WHEELPIT - 37'x4'
CRUSHER HOUSE &
JIGGER SHED.
1:100

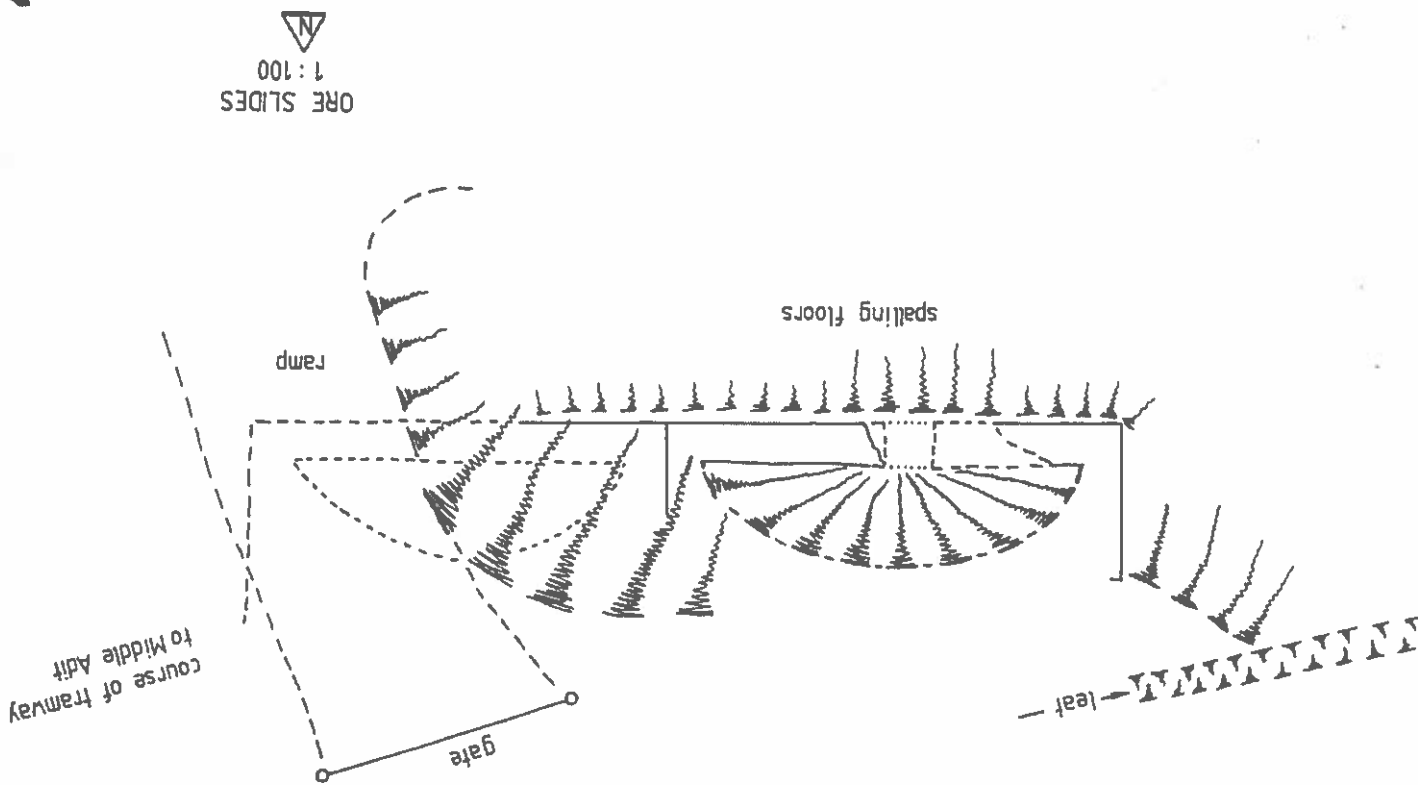




SMALL WHEELPIT & CUTTING
1 : 100



23

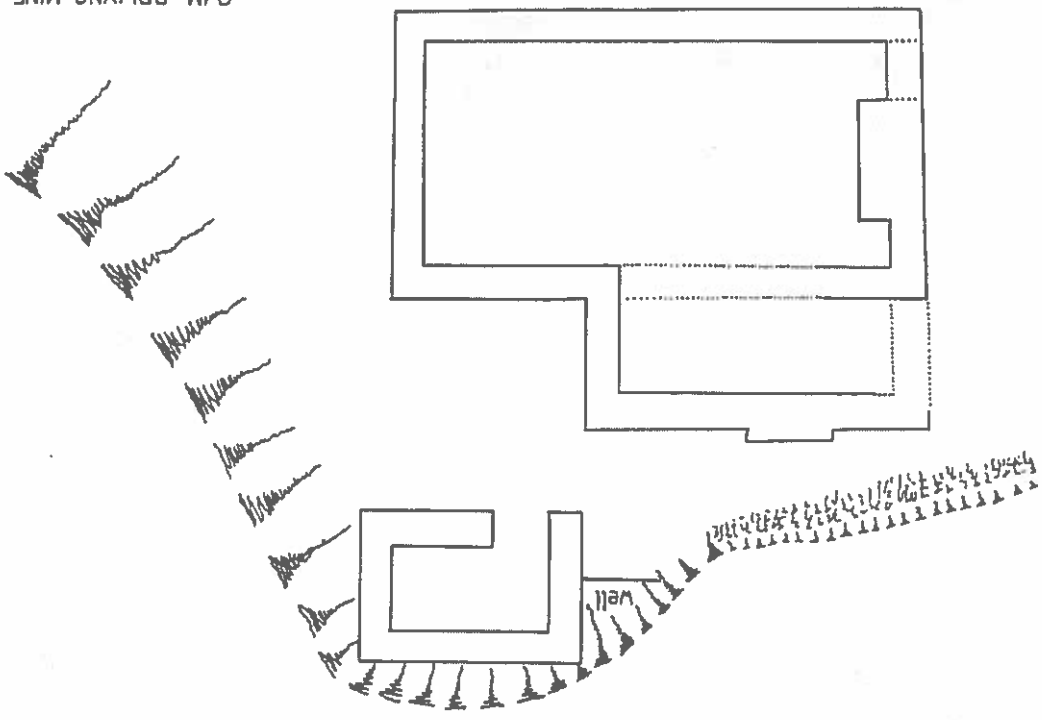


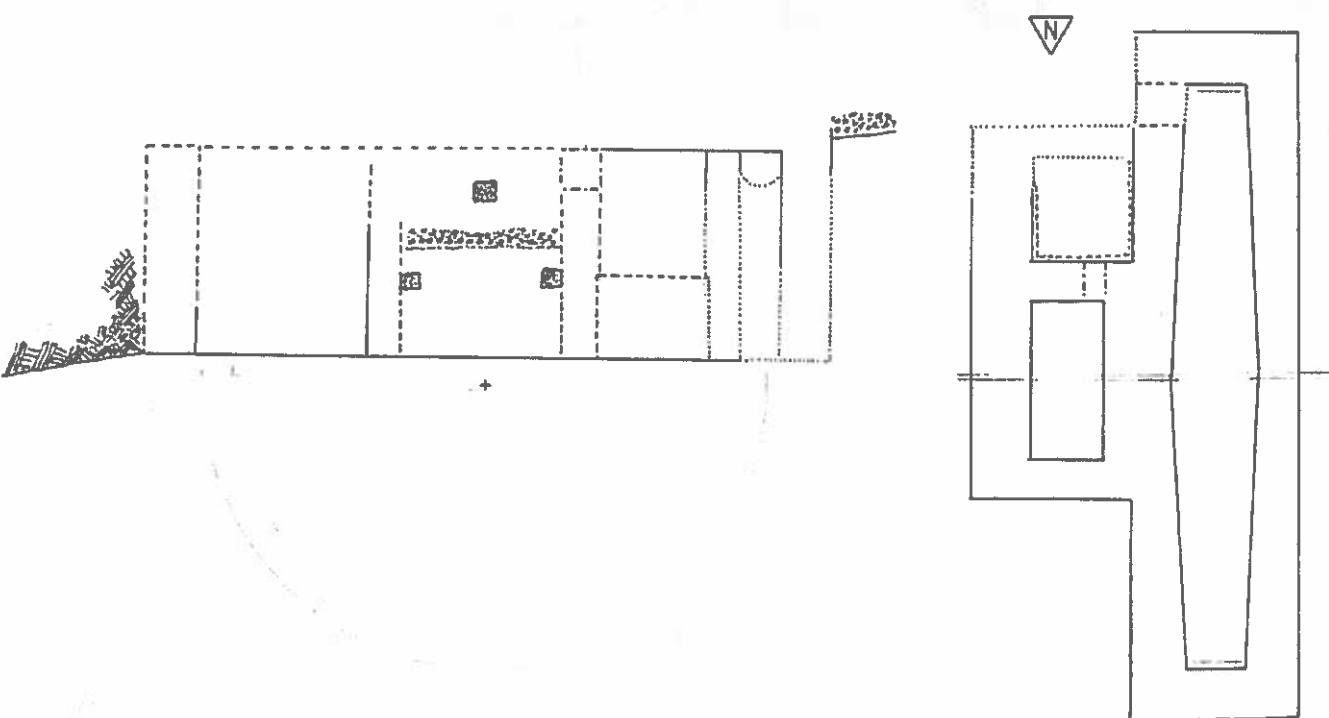
25



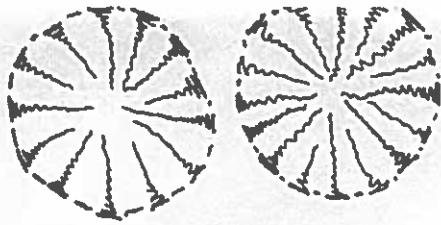
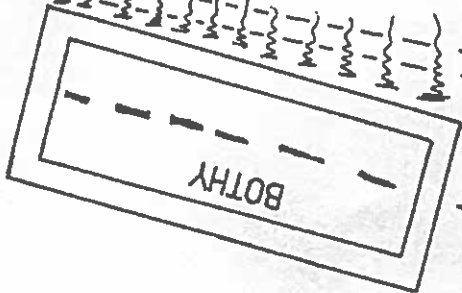
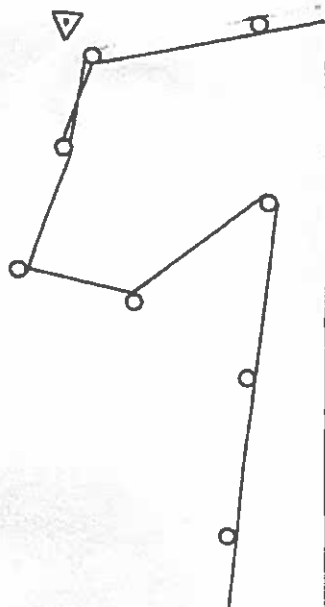
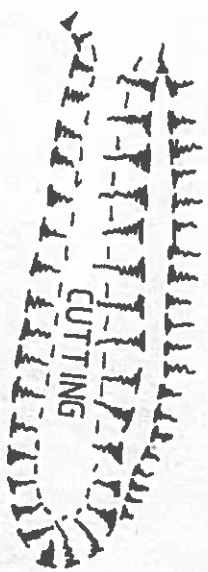
1 : 100

CWM BRWYNNO MINE HOUSE

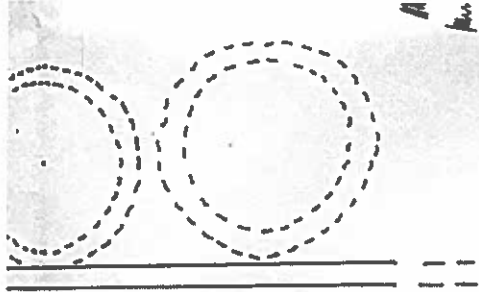


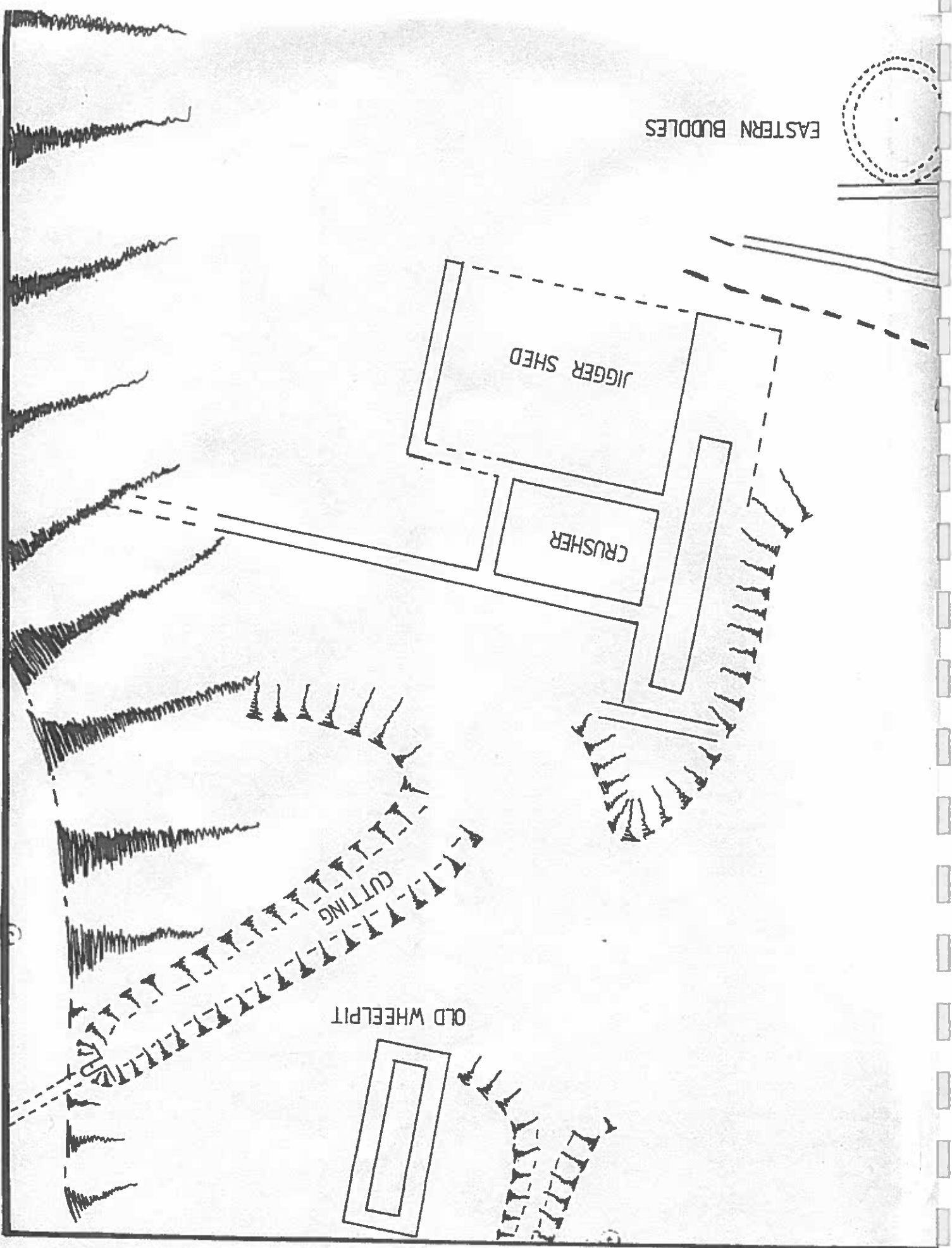


WINDING WHEEL & OLD CRUSHER
Plan and Section. 1:100



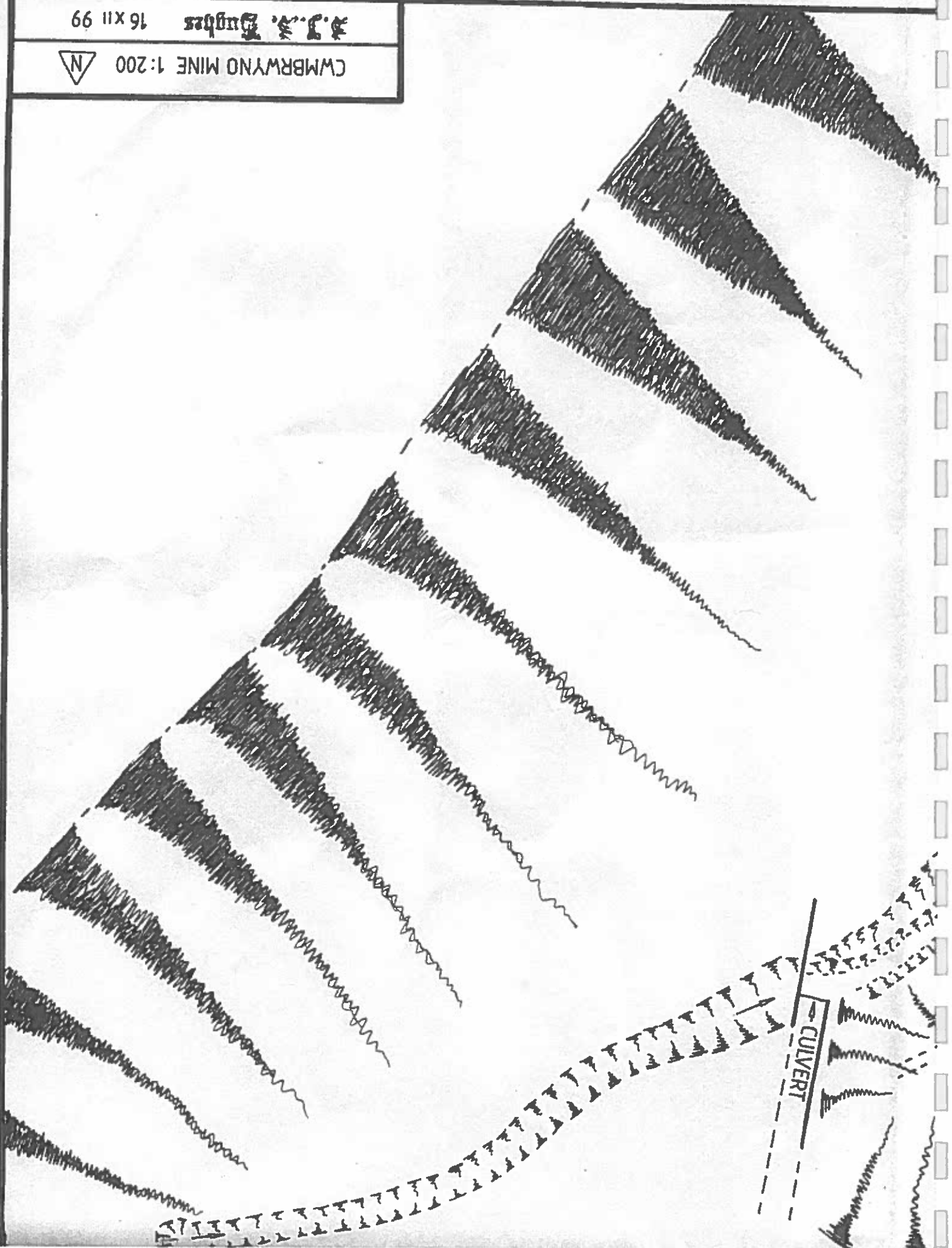
OLD BUDDLES

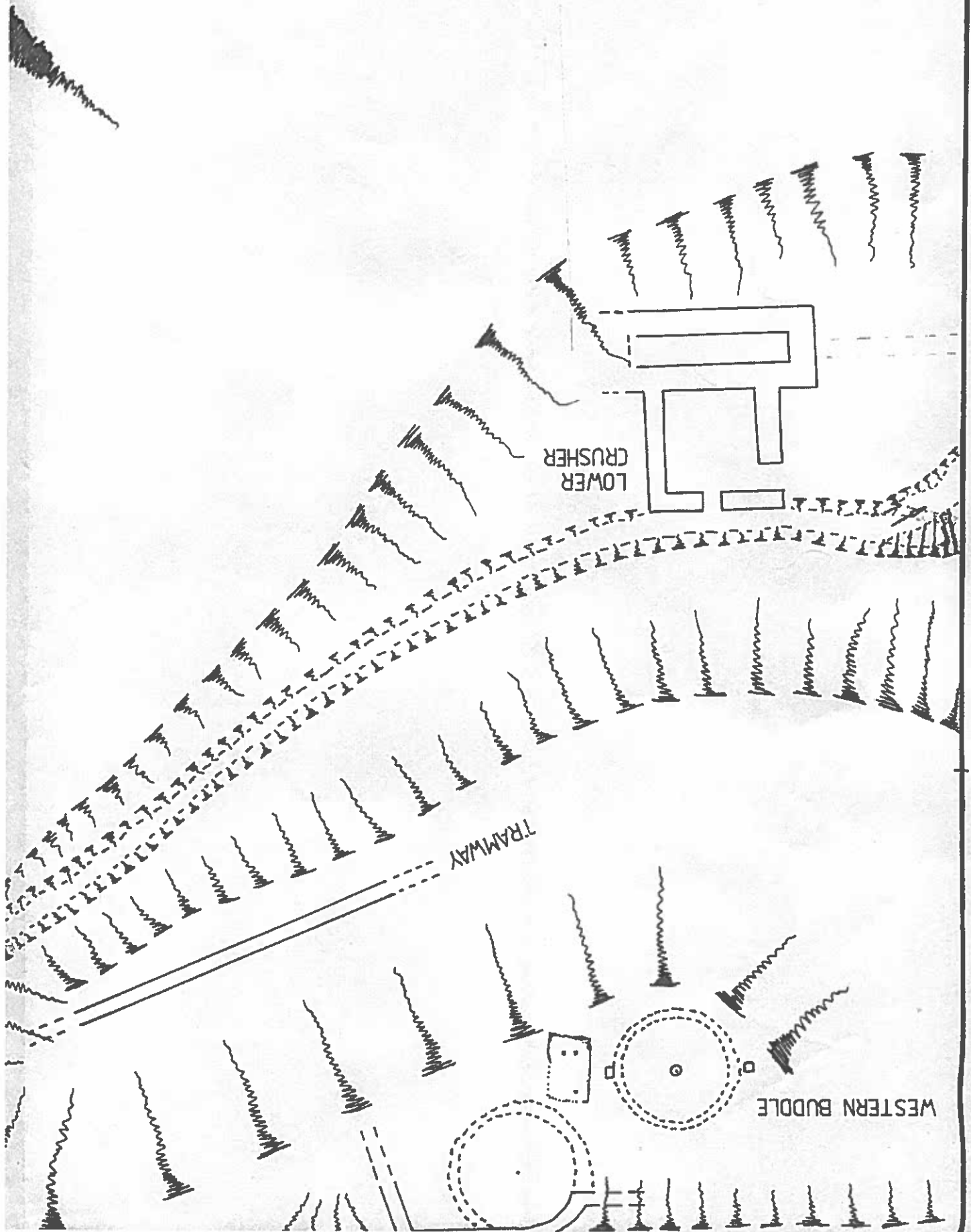


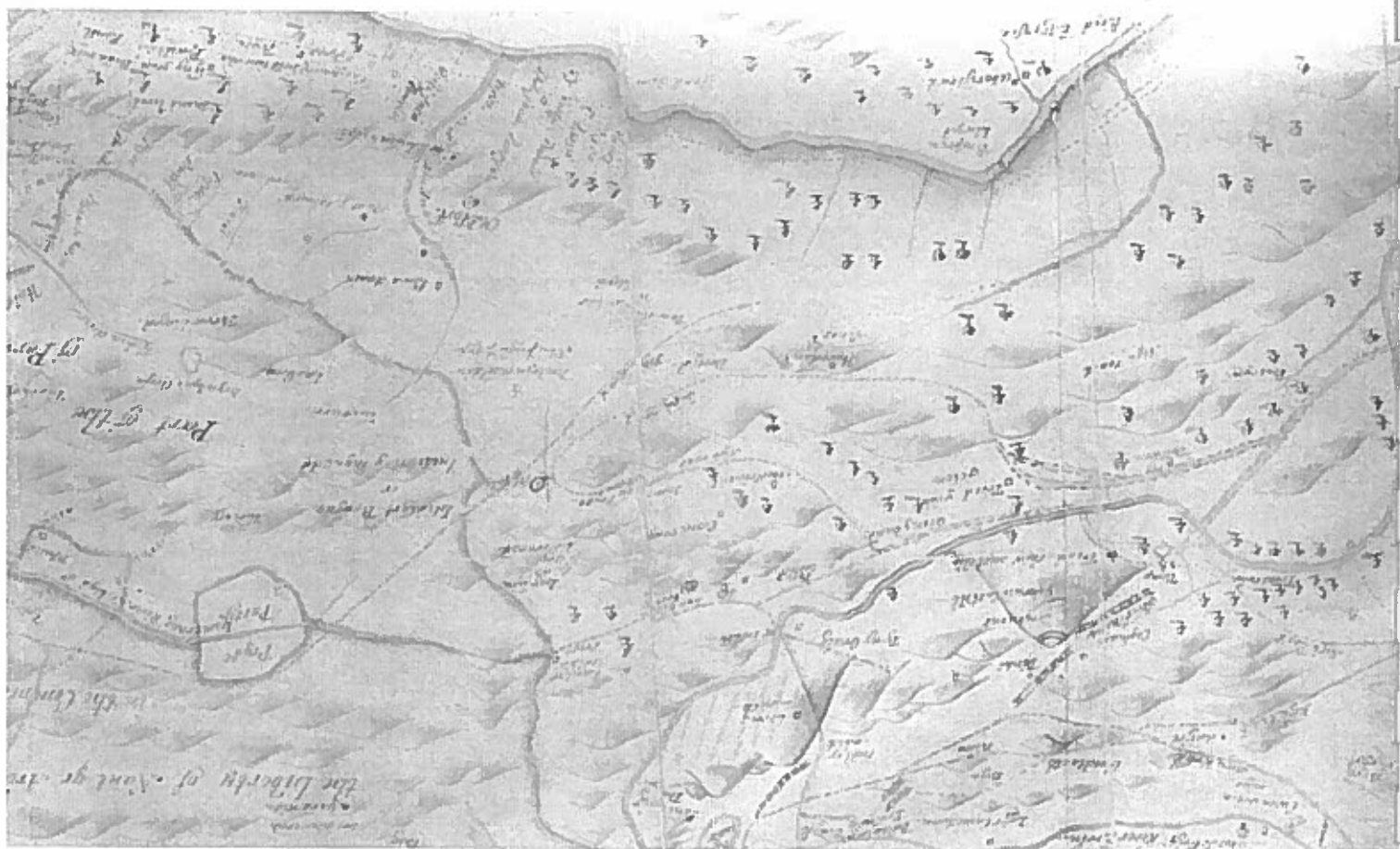


D. J. Hughes 16 x 11 99

CWMBRWYNO MINE 1:200
N







Survey of the surface remains at Cwm Brwyno Mine.

This survey was commissioned by Messrs Richards, Moorehead & Laid of Ruthin, Denbighshire, as engineers to Ceredigion County Council for the proposed land reclamation and environmental improvement scheme at the abandoned Cwmbrwyno Mine, some 10 km. east of Aberystwyth.

I surveyed parts of the site, partly by triangulation with a tape, and partly by offsets using an optical square between the 19th and 21st October 1998, with the first prints being drawn up, at 1:200. Since then further detail has been added, and also more of the outlying structures have been included. The accuracy is generally in the order of +/- 10 cms. in 50 metres, or better.

No levels were taken due to the urgency in preparing the survey, but these can easily be added at a later date if deemed necessary. The only other work not undertaken was a comprehensive retrieval of the information contained in the Mining Journal. All references to this weekly have been gleaned from work already undertaken, and filed in my office. The individual buildings, or associated groups of buildings, have been drawn up at the standard metric scales of either 1:200, 1:100 or 1:50, whilst the mine sections have been produced at a uniform scale of 1:2500 the match the OS. plans.

The detail regarding the position of the temporary haul roads, pipe bridge and boundaries of the material to be moved have been lifted from the 1:500 site plan supplied. The detail and representation of the remains in the engineers survey is so poor as to be of little value and is misleading in places. This situation is further analysed in section nine of the drawings. Few remains lay within the area to be disturbed; initially only the buddles were under threat from the scheme and despite their being saved, other damage was done elsewhere.

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SJSJ. 16 x 11 99.

Schedule of photographs of Cwm Brwyno

#	Date and Description.
1967 May 14. Eight monochrome prints taken with an Ilford Sportsman fitted with a 45 mm. f 3.5 lens using 35 mm. film, probably Ilford HP 4 rated at 100 ASA.	
1	14-5-67: Facing west, along the course of Nant Brwyno, showing the Ellis's wheelpit just above the centre, the lower crusher to the left of centre, and the lower buddle on the right margin. The shadows in the foreground may have been the remains of slime pits, but had been totally eroded away at the commencement of the scheme.
2	14-5-67: Facing northwest, with Nant Brwyno in the foreground. To the left of centre are the ruins of the old office, or bothy, which were destroyed shortly after this photograph was taken. On the right hand side of the frame is a high wall which appears to be an extension of the Crusher House wall at the New Mill. Note the sockets suggesting that it stood two storeys high. The two bare patches, between the stream and the wall, mark the position of buddle circles, the kerb of the one on the right continuing to be visible.
3	14-5-67: Facing southwest from above the portal of the culvert. On the right side of the frame can be seen the walls of the old 20' wheelpit. Behind the electricity post are the ruins of the office / bothy and to their left are the tall Crusher House walls, associated with the New Mill & 36' wheel; they obscure the view of the Lower Crusher. Apart from the 20' wheelpit, most of these features have now disappeared. On the left margin of the print, the jig tailings dump can be seen protruding from beneath the development dumps.
4	14-5-67: Facing north, from the development dump, and showing part of the new mill in the lower left of the frame. Above this are the remains of the old wheelpit, to its right, and higher are the ore slides. Above these can be seen the dump from the Shallow Adit or Evans's Level, further to the right are the ruins of the old pumping and crushing wheel with trees marking the position of shafts on the skyline.
5	14-5-67: Facing north, from the southern end of the wheelpit for the new mill, showing the masonry arch and retaining wall. Note the bulge in the wall, and the sapling which has now developed into a tree.
6	14-5-67: Facing south, from the northern end of the wheelpit for the new mill, showing the end of the tailrace culvert used to carry the waste water underneath the jig tailings dumps to the lower crusher.
7	14-5-67: Facing northeast, being a close up of the portal of the culvert.
8	14-5-67: Facing northeast showing the portal of the 20

fathom level, Middle Adit, with Cwm Brwyno house and garden in the background. Whilst the back of the portal is still visible, the cutting and surrounding gruffly ground has been subject to fly tipping and has largely been lost.

1970 April 2. Five colour transparencies taken with an Ilford Sportsman fitted with a 45 mm. f 3.5 lens and using 35 mm. Kodachrome 100 ASA. Film. Printed using a Cannon laser copier. The suffixes refer to the film number and duplicates deposited at the National Library of Wales at Aberystwyth in 1987

9 02-4-70: Facing north, from the outcrop of the lode, showing Pencraigddu and Level yr Uch. [4]

10 02-4-70: Facing west, from the outcrop of the lode, with outcrop workings in the foreground. A rather dark and dismal slide. [5][8/a+b6]

11 02-4-70: Facing northwest, and showing Taylor's Shaft with the disconnected pumping bob having been pulled through 900 into the mouth of the shaft. This was dismantled and taken to the Llywernog Mining Museum in the summer of 1978 but has not yet been re-built. [6][8/c+d7]

12 02-4-70: Facing east, and showing the portal of the culvert some 20 metres to the south of the ore slides. Compare this view with # 6 and XXXXX. [7][8/c+d4]

13 02-4-70: Facing north, and showing the rather fine masonry portal of the Deep Adit, Taylor's or the 56 fm. level. Due to a poor bond between the masonry and rock, the back of the portal has failed about four metres inbye thus preventing access. [8][8/c+d6]

1978 Spring. Otherwise undated. Taken with a Seagull DF SLR camera, being a Minolta clone fitted with a Halou 58 mm. f 2.0 lens and using 35 mm. Agfa CT-21 colour transparency film rated at 21 DIN. / 100 ASA. Printed using a Cannon laser copier.

14 1978. N/D. 58 mm. Facing southeast, and showing the tailings and development dumps. Compare with # 163 taken with a 35 mm., wider angle, lens in 1999. [3/a+b1]

1998 August 27. 21 prints on Kodak 200 ASA. Film in an X 300 Minolta SLR. Bright & sunny with patchy cloud, mostly f 11 or f 16 at 1/125th.

15 27-8-98: with 28 mm. lens facing west down Nant

Brwyno showing jig tailings in left foreground, slimes in right foreground, ruins of lower crusher and Ellis's wheel are visible further downstream.

16 27-8-98: 28 mm. Facing northeast, showing the damaged front of the ore slides.

17 27-8-98: 28 mm. Facing west, showing the form of the ore slides as seen from the level of the tramway.

18 27-8-98: 28 mm. Facing north northeast showing the area in which the containment cell was constructed. Above the centre is the ruin of the old pumping and winding wheel, to its right is the remains of the house and garden, to its left and lower can be seen the remains of the ore slides.

On the skyline, the trees mark the position of the workings along the course of the lode. The dump from Evans's Adit can be seen above the weelpit and to its left.

19 27-8-98: 28 mm. Facing northeast, showing the gable end of the house and its garden on the right hand side.

20 27-8-98: 28 mm. Facing north northeast showing the wall of the reservoir in the foreground, the garden and old mill dump in the background on the left.

21 27-8-98: 28 mm. Facing southwest showing the reservoir with the quarry for the original construction located at its southern end. The course of the overflow channel can be seen leading from the reservoir, above the development dumps, to the right edge of the print.

22 27-8-98: 28 mm. Facing southwest showing the reservoir with the collapse caused by the failure of the masonry lining of the 20 fm. level in the nettlebed in the foreground. The portal of this adit emerges on the south side of the road.

23 27-8-98: 200 mm. Facing west showing detail of the old buddle slimes dump on the north bank of the stream. To the left of centre, the three posts indicate the position of the westernmost buddle. The ruins, straddling the track, in the upper right half of the frame, mark the position of a bothy which stood until about 1968.

24 27-8-98: 200 mm. Facing northwest, from the same point as # 23, to which it adjoins. This frame shows the new mill area comprising of the weelpit, crusher house and jigger shed which have now collapsed and are in a ruinous state. Immediately above this, and slightly to the right, are the remains of a weelpit. Slightly higher again, and further right, the remains of the ore slides can be seen.

25 27-8-98: 200 mm. Facing northwest, taken from a point further west than in # 23 and 24. A rather flat and monochromatic elevated view of the western buddle and the

slimes dumps.

26 27-8-98: 200 mm. Facing north, taken from the same point as # 25, and adjoining it. Showing the new mill area, the wheelpit is visible as the dark gash just left of centre.

27 27-8-98: 200 mm. Facing north, taken from the same point as # 25 and 26, and adjoining the latter. The building in the bottom left hand side is the old wheelpit, to its right, and below the ore slides, is the portal of the culvert leading to the back of the crusher house of the new mill complex.

28 27-8-98: 28 mm. Facing north from the old high road to Ponterwyd. Too distant to show any detail.

29 27-8-98: 28 mm. Facing northeast from the same point as # 28. Too distant to show any detail.

30 27-8-98: 28 mm. Facing northeast. A duplicate of the above but with better detail and contrast. The gully for the pumping rod can be seen below the lead.

31 27-8-98: 28 mm. Facing northeast. A duplicate of # 30, but rather washed out and faded with poor resolution of the mine area.

32 27-8-98: 200 mm. Facing north from the old high road, with Nant yr Arian woods in the background, showing Evans's Adit with Taylor's and Eastern Shafts in the middle distance.

33 27-8-98: 200 mm. Facing north from the high road, more or less the same view as # 32, but without a skyline and including the old pumping and winding wheelpit.

34 27-8-98: 200 mm. Facing north from the high road this frame adjoins the right side of # 33 and shows the old house and garden with the old tailings dump on the hillside behind. The tailrace from the old pumping and winding wheel is particularly prominent in this view.

35 27-8-98: 200 mm. Facing northeast, from the high road, showing the remains of the pit for the Ellis's waterwheel lying on the north bank of the stream. Good detail and colour.

36 27-8-98: 200 mm. Facing west, a clear and sharply lit distant view of the development dumps created by the driving of the deep adit, with the A44 trunk road and Cwm Brynno bridge in the background.

1998 October 17. 6 prints on Minolta X 300 SLR. with Kodak

200 ASA. film. A rather overcast day which resulted in poor depth of field, generally f 8 at 1/60th. or f 5.6 at 1/125th.

37 17-10-98: 28 mm. facing north northwest and showing the new mill, wheelpit with the remains of the office and storehouse to its left.

38 17-10-98: duplicate of # 37 with smaller aperture.

39 17-10-98: duplicate of # 37.

40 17-10-98: duplicate of # 37.

41 17-10-98: 28 mm. facing west and showing the view down the valley with mill tailings on either bank of the stream, the old crusher house, and the Ellis's wheelpit in the background.

42 17-10-98: duplicate of # 41 with smaller aperture and better resolution. Both # 41 and # 42 add join # 37 to give a panoramic view.

1998 December 16. 6 prints on Minolta X 300 SLR.; 7 on Chinon Bel-Ami compact with a 35 mm. f 2.8 lens. Both using Kodak 200 ASA. film. A bright and breezy winters day, with occasional flurries of light rain and low cloud giving exposure values of 1/30th. to 1/60th. at f 4 or f 5.6 with a 28 mm. wide angle lens. Note that wind movement of lighter structures has caused blurring due to the slow shutter speeds and large aperture.

43 16-12-98: 28 mm. facing northwest, a rather flat and blurred photograph showing a section of the wall which was exposed during the construction of the ramp down into the containment cell.

44 16-12-98: 28 mm. facing northwest, a portrait format photograph showing the relationship of the wall to the neighbouring ore slides.

45 16-12-98: 28 mm. facing northwest, a duplicate of # 44 but with better lighting and contrast.

46 16-12-98: 28 mm. facing east, the excavation of the development dump to create a cell in which the tailings can be contained.

47 16-12-98: 28 mm. facing southwest, the excavation for the containment of the tailings. Note the overflow from the reservoir running along the hillside above the excavation. Compare this with # 72, taken on 14-01-99.

48 16-12-98: 28 mm. facing east, a view of that part of the wall which was exposed during the excavation of the ramp into the cell.

49 16-12-98: 28 mm. Facing northwest from the high road, showing the haul road which has been constructed to the tailings dumps, and the Ellis's wheelpit. Poorly lit and rather flat.

50 16-12-98: 35 mm. Facing northwest from the high road, the left hand side of a panoramic scene continued in print # 51. The pipe has now been laid and the haul road constructed over it, to the jig tailing dumps.

51 16-12-98: 35 mm. Facing northeast from the high road, the right hand side of a panoramic scene continued in print # 50. This print of the upper part of the site shows the extent of the cell, the temporary rock dumps, haulage roads, and secure compound with offices etc.

52 16-12-98: 35 mm. Facing southeast, a view of the wall exposed during the cutting of the ramp into the cell. This photograph has better colour and contrast than # 48.

53 16-12-98: 35 mm. Facing northwest, a portrait format view of the wall exposed whilst cutting the ramp into the cell. This photograph has better colour and contrast than # 44, 45 & 55.

54 16-12-98: 35 mm. Facing northeast. Duplicate of # 52. showing the wall exposed whilst cutting the ramp.

55 16-12-98: 35 mm. Facing northwest, a portrait format view showing the wall exposed during the construction of the ramp. Better than # 43, 44, 45 and a poorer duplicate in colour and contrast to # 53.

56 16-12-98: 35 mm. Facing southeast, a view along the cell being cut into the development dumps.

December 29, 1998. 2 photographs taken with Minolta X 300 SLR. using Kodak 200 ASA. film. A bright day with snow still lying on north facing slopes and exposure values around f 8 at 1/60th. with a 28 mm. lens.

57 29-12-98: 28 mm. Facing north from the high road with the cell in an advanced stage of construction.

58 29-12-98: 28 mm. Facing north a paler duplicate of #57.

January 3, 1999. 2 photographs taken with a Minolta X 300 SLR. using Kodak 200 ASA. film. A dull day with exposure values of f 5.6 at 1/60th. with a 28 mm. lens.

59 3-01-99: 28 mm. Facing south from the haul road showing the western buddle and lower crusher with new fence lines now adopted. Note the overflow channel from the mine

reservoir. landscape format.

60 3-01-99: 28 mm. Facing south, a poor duplicate of # 59 in portrait format.

January 11, 1999. 5 prints taken on Minolta X 300 SLR. with Kodak 200 ASA. film. Bright but watery sunlight with light cloud allowing exposure values of f 8 to f 11 at 1/60th. with a 28 mm. lens.

61 11-01-99: 28 mm. Facing north from the high road giving a general view of the site, east of the lower crusher.

62 11-01-99: 28 mm. Facing north from the high road being a paler duplicate of # 61.

63 11-01-99: 200 mm. Facing north northwest from the high road showing the proximity of the haul road to the lower crusher, and the fence erected to ward off machinery.

64 11-01-99: 200 mm. Facing north from the high road showing the access ramp into the cell, the ore slides being on the left, and the wall lies on the right. Note how the ore slide has fallen victim to the construction of the site access.

65 11-01-99: 200 mm. Facing north from the high road being a duplicate of # 64 with slightly poorer resolution.

January 14, 1999. 4 photographs taken with Minolta X 300 SLR. with a 28 mm. lens, and 4 with an Olympus XA 2 compact with 35 mm. len, both using Kodak 200 ASA. film. Four additional shots were so dark and shakey that they were of no value. A wet and overcast day, at times one of the worst during the duration of the contract, with very poor exposure values, some at less than f 5.6 at 1/60th. with a wide angle 28 mm. lens.

66 14-01-99: 28 mm. Facing north from the high road, a wide angle view showing the present state of the site. Note that the cell has now been fully lined with clay, and the excavator moving the jig tailings from the bottom left of the frame.

67 14-01-99: 28 mm. Facing north from the high road, a pale duplicate of # 66.

68 14-01-99: 28 mm. Facing south showing the course of the culvert where it has been exposed during the removal of the jig tailings. Note the close proximity of the fence.

69 14-01-99: 28 mm. Facing south and showing the original ground profile lying beneath the jig tailings. The culvert can be seen in the background, and also that the

development dump overlies the jig tailings. Emrys driving the Hitachi EX 320 CH with a bucket capacity of about 1.25 cubic metres.

70 14-01-99: 35 mm. Facing south, a similar view to # 69, but with the stream in the foreground. Whilst lighter than # 69, the resolution is poorer.

71 14-01-99: 35 mm. Facing south showing the lower crusher in the foreground with one of the Leyland Constructors lorries are filled with jig tailings in the background. Poor resolution, rather flat and washed out.

72 14-01-99: 35 mm. Facing southwest and showing the clay lining of the empty cell. Compare with # 47 of 16-12-98.

73 14-01-99: 35 mm. Facing north and showing the filling of the cell with jig tailings.

January 15, 1999. 11 prints. Minolta X 300 SLR. using Kodak 200 ASA. film, a very dark and dismal day with exposure values down to f 2.8 @ 1/30th. with a 28 mm. lens.

74 15-01-99: 28 mm. Facing southeast showing the external construction of the culvert under the jig tailings dump. Note that the masonry lies on the old surface showing that it was built before the deposition of the tailings, also its rough external form with virtually no mortar having been used. Scale bars are 25 cms. in 5 cm. increments

75 15-01-99: 28 mm. f 5.6 at 1/60th. Facing southeast. A duplicate of # 72 but using a Cannon Cobra 150 S Autoflash to illuminate the foreground. Scale bars are 25 cms. in 5 cm. increments.

76 15-01-99: 28 mm. f 5.6 at 1/60th. with Cannon Cobra 150 S to illuminate the foreground. Facing northeast. The culvert on the south side of the stream with part of the new wall in the background. Note how the external finish of the culvert deteriorates in the part which was buried beneath the jig tailings. Scale bars are 25 cms. in 5 cm. increments.

77 15-01-99: 28 mm. f 5.6 at 1/60th. with Cannon Cobra 150 S to illuminate the foreground. Portrait format. Facing east and showing the culvert lying on orangey soil with jig tailings covering both. Note the poor construction and quality of the stonework with very little mortar having been used. Scale bars are 25 cms. in 5 cm. increments.

78 15-01-99: 28 mm. Facing south showing the culvert where it has been exposed by the removal of the jig tailings. * This is where the major earthmoving ought to have ceased on this part of the site.*

79 15-01-99: 28 mm. Facing north showing the course of the culvert where it has been exposed by the removal of the

jig tailings. It was at this point that instruction was given to remove the culvert.

80 15-01-99: 28 mm. Facing north showing the culvert being ripped out.

81 15-01-99: 28 mm. Facing southwest showing the removal of the culvert. Note fence line and tension cracks in the foreground.

82 15-01-99: 28 mm. Facing southwest, a similar view to # 79 but with the machine at work with the culvert still intact beneath the tailings.

83 15-01-99: 28 mm. Facing north showing the construction of the haul road into the bubble fines.

84 15-01-99: 28 mm. Facing south showing where the culvert has been removed. Note that part remaining which is visible below, and to the right, of the notice board. Also that the haul road for the bubble fines has now been built. The nature of the weather may be gauged by the spray being blown off the stream, and the scudding mist.

January 17, 1999. 10 prints on Minolta X 300 using 200 ASA. film. Snowed during the night with a few centimetres still lying on the higher, or north facing hills and with dark skies for most of the day with exposure values of f 5.6 at 1/60th. two duplicates were too poor to reproduce.

85 17-01-99: 28 mm. Facing north from the high road with the extent of removing tailings, and the filling of the cell being apparent. Note that the haul road to the bubble fines is now ready for use. Just below the skyline on the right hand edge of the print, remnants of a trench and several pits show up in the snow.

86 17-01-99: 28 mm. Facing northeast from the high road with the cell visible in the bottom left corner and forming the right hand side of a panoramic pair with # 85. On the hillside, above the reservoir, a prospecting trench shows up clearly where the snow lies a little deeper.

87 17-01-99: 28 mm. Facing north, a duplicate of # 85 but a little darker and forms the left side of a panoramic pair with # 88.

88 17-01-99: 28 mm. Facing northeast, a duplicate of # 86 but a little darker. This print forms the right side of a panoramic pair with # 87.

89 17-01-99: 28 mm. Facing south and showing the extent of the removal of the jig tailings. Note how the bubble site in the foreground is superbly delineated as a wet patch surrounded by a circle of snow. This lies within the area excluded from reclamation.

90 17-01-99: 28 mm. Facing east and showing the old slimes dump which was intersected by one of the haul roads. Scale bar is 25 cms. in 5 cm. increments.

91 17-01-99: 28 mm. Facing east, a duplicate of # 90 but in portrait format and slightly darker. Scale bar is 25 cms. in 5 cm. increments.

92 17-01-99: 28 mm. Facing west and showing the back of the lower crusher following unsupervised excavation.

93 17-01-99: 28 mm. Facing north and showing the back of the lower crusher following unsupervised excavation.

94 17-01-99: 28 mm. Facing southeast and showing the extent of the work around the lower crusher and jig tailings.

January 18, 1999. No photographs were taken today due to rain, mist, low cloud, and poor light needing exposure values of less than 1/30th. of a second at f 2.8 with a 28 mm. lens and 200 ASA. film.

January 19, 1999. 9 prints on Minolta X 300 using Kodak 200 ASA. film. Whilst better than yesterday, it was still a poor day for photography with exposure values as low as f 2.8 at 1/30th. with a wide angle 28 mm. lens.

95 19-01-99: 28 mm. Facing south along the course of the culvert. Portrait format. Note that the exclusion fence runs along the edge of the round buddle in the foreground. Also, that the fence around the development dump has been moved and replaced with orange flagging. Compare with # 68, 69, 78, and 84.

96 19-01-99: 28 mm. Facing south along the course of the culvert. Portrait format. A similar view to # 95 but taken from a point closer to the stream. compare with 21-01-99

97 19-01-99: 28 mm. Facing south, and showing a section of the buddle fines in the foreground with the culvert and the remaining jig tailings visible in the background. Note the new fence line encroaching onto the development dump.

98 19-01-99: 28 mm. Facing east, showing a section across the buddle fines during their excavation. Note that there appears to have been a contemporary attempt to stabilise the southern (right) side of the dump from erosion by the stream, by dumping shale over the fines. Also that the dump is a mixture of buddle fines with jig tailing.

99 19-01-99: 28 mm. Facing southeast, in portrait format.

A general view of the excavation of the buddle fines from the north bank of the stream. The flagging in the foreground runs around the edge of the westernmost buddle.

100 19-01-99: 28 mm. Facing southeast in landscape format. Almost a duplicate of # 99 but a little paler. The old fence line is visible as demarking the disturbed area from the undisturbed area, about two metres downslope of the new fence line.

101 19-01-99: 28 mm. Facing north, and showing the advance of the haul road as the dump becomes depleted. Note the close proximity of the work to the fence line and flagging around the western buddle, visible just above the lorry.

102 19-01-99: 28 mm. Facing north being a slightly closer view than # 101, without the lorry.

103 19-01-99: 28 mm. Facing east with a wet depression in the foreground probably being the site of another buddle which was exposed by snow on 17-01-99 and first recorded in print # 89. I suspect that there may have been at least two, and maybe three, round buddles located in this area. The textures and stratification shown in section in prints # 90 & 91 also suggests that there were buddles in this area.

January 20, 1999. 10 prints on Minolta X 300 with 200 ASA. Kodak film. Occasional light rain but mostly bright and occasionally sunny with exposure values of f 5.6 to f 8 at 1/60th. to 1/125th. of a second with 28 mm. wide angle lens.

104 20-01-99: 28 mm. f 5.6 at 1/60th. with Cannon Cobra 150 S Autoflash. A portrait format view down the culvert facing southwest, beyond the bend at 28 metres south of the stream, which thwarted the video survey in August 1998, showing detail of the masonry and in particular, that no mortar appears to have been used between the lower courses. Note that the timber bearers have given way to "I" section rail in this part of the culvert. From this point it heads under the jig tailings and re-emerges in the edge of the development dump some 20 metres further to the southwest. This part of the culvert was buried intact but is now inaccessible.

105 20-01-99: 28 mm. f 8 at 1/60th. with Cannon Cobra 150 S Autoflash. A darker duplicate of # 104 also in portrait format.

106 20-01-99: 28 mm. Facing south, along the line of the culvert showing the extent of the removal of the buddle fines and jig tailings on the south bank of the stream. The remaining section of the culvert can be seen just left of centre; it emerges from beneath the dump at the right hand end of the newly placed orange mesh where it ran in a channel to a sluice, behind the white noticeboard, from where it could be directed to either the lower crusher wheel or to the Ellis's

pumping wheel via the overflow.

107 20-01-99: 28 mm. Facing south, along the line of the culvert, a paler duplicate of # 106 and more clearly showing the mark left along the course of the old fence to the west of the recently erected one.

108 20-01-99: 28 mm. Facing west, down the stream, showing the tramway which lay under the buddle fines, and how most of the jig tailings on the south bank have now been removed except around the lower crusher.

109 20-01-99: 28 mm. Facing southeast showing the section of the culvert which was removed in the background with the tramway which lay beneath the buddle fines in the foreground.

110 20-01-99: 28 mm. Facing southwest and looking down on the partially uncovered tramway.

111 20-01-99: 28mm. Facing east along the tramway with the culvert in the background. Scale bars are 25 cms. in 5 cm. increments. This type of rail is a transition between the modified plateways of the 1820's, through patent improvements of the 1830's, before the advent of rolled bridge rail which became popular in the 1860's.

112 20-01-99: 28 mm. A darker duplicate of # 111.

113 20-01-99: 28 mm. Facing northwest showing the position and extent of the tramway in relation to the culvert and buddle area.

January 21, 1999. 9 prints on Minolta X 300 with Kodak 200 ASA. film. A bright, sunny and clear start to the day with exposure values of 1/125th. at f 16. but becoming overcast and falling to 1/60th. at f 8 by the end of the day.

114 21-01-99: 28 mm. Facing north, from the high road with work in progress around the Ellis's wheelpit and on the remaining jig tailings. This forms the left hand part of a panoramic pair with # 115. High contrast and poor resolution.

115 21-01-99: 28 mm. Facing north, from the high road with work in progress on the remaining jig tailings and in the cell. This forms the right hand part of a panoramic pair with # 114. High contrast and poor resolution.

116 21-01-99: 200 mm. Facing north from the high road and showing how the buddle slimes have been removed from around the western buddle. A rather poor and washed out photograph, it forms the left hand part of a panoramic pair with # 117.

117 21-01-99: 200 mm. Facing north from the high road and showing how the buddle fines have been removed and exposed a tramway. A rather poor and washed out photograph, it

forms the right hand side of a panoramic pair with # 116.

118 21-01-99: 28 mm. Facing east, and showing how part of the northern section of the culvert has been exposed and that the orange mesh fence has now been extended to join the original fence line. Compare with # 109.

119 21-01-99: 28 mm. Facing southeast, a close up of # 118 showing the fabric of the culvert immediately north of where it has been damaged by the stream.

120 21-01-99: 28 mm. Facing southwest, the large excavator straddles the culvert to cut a high face immediately below the new fence line. Note lumps of masonry protruding from jig tailings in the foreground.

121 21-01-99: 28 mm. Facing southwest, and showing how the development rock starts moving as soon as the face starts to fail. Note that several of the fence posts have already skewed over.

122 21-01-99: 28 mm. Also facing southwest, a duplicate of # 121 but a little paler.

January 29, 1999. 3 prints on Olympus XA 2 compact using Kodak 200 ASA. film. Whilst the day started bright and sunny, it became very misty during the morning with exposure values falling to f 5.6 at 1/60th. with visibility of less than 50 metres.

123 29-01-99: 35 mm. Portrait format. Facing west, and showing the pit which was dug behind the lower crusher on 25-01-99 without supervision and contrary to instruction. Note lime mortar, smashed masonry and splintered timbers.

124 29-01-99: 35 mm. Facing west, and showing the pit which was dug behind the lower crusher, a duplicate of # 123 but with better resolution and in landscape format.

125 29-01-99: 35 mm. Facing west, down Nant Brwyno, showing the length of tramway exposed on the northern bank and the thickness of the mist and low cloud.

February 8, 1999. 7 prints on Minolta X 300 with Kodak 200 ASA. film. It snowed heavily last night with 8 to 10 cms. covering most of the site. Exposure values of 1/30th. to 1/125th. at f 16 using a 28 mm. wide angle lens.

126 8-02-99: 28 mm. Facing southwest, with the newly laid geomembrane being visible in the centre of the frame where no snow has settled. Note that the area needing

stabilisation has now run halfway up the development dump, where the fence has slumped and recent ground movement has run over the snow. The advance of this fence can be followed by comparing frames 68 & 69, 78, 89, 106 & 107. Slightly flared on the top margin.

127 8-02-99: 28 mm. Facing northwest, and showing the new crusher house and the surrounding area with the haul road in the background.

128 8-02-99: 28 mm. Facing northwest, and showing the new crusher house, buddle floors, and the extent to which the jig tailings and buddle fines have been carried away. Note the ground movement in the foreground where the fence has toppled over.

129 8-02-99: 28 mm. Facing west, in portrait format and showing the lowest buddle with the lower crusher house in the centre of the frame. Note that the fence has collapsed on the left margin of the frame.

130 8-02-99: 28 mm. Facing southwest, almost a duplicate of print 126 but with the old wheelpit in the foreground, no flare and consequently better resolution.

131 8-02-99: 28 mm. Facing south, and being the left hand frame of a panoramic pair, with # 132 forming the right hand side. This print has better detail of the area of slippage than # 130.

132 8-02-99: 28 mm. Facing south, and being the right hand frame of a panoramic pair, with # 131 forming the left hand side.

February 9, 1999. 3 prints on Minolta X 300 with Kodak 200 ASA. film. 2 prints on Chinon Bel Ami also using Kodak 200. A bright sunny day with patchy light cloud and about 10 cms. of snow covering most of the site with late afternoon exposure values of f 8 to f 11 at 1/60th.

133 9-02-99: 28 mm. Facing northwest, from the high road being the left hand half of a panoramic pair with # 134 adjoining it on the right and showing the state and extent of the lower part of the reclamation works.

134 9-02-99: 28 mm. Facing northeast, from the high road being the right hand half of a panoramic pair, the left side being # 133., and showing the extent and state of the upper part of the reclamation works.

135 9-02-99: 28 mm. Facing southeast with bright sunlight on snow causing flaring through internal reflection. The lowest buddle posts can be seen projecting from the snow immediately to the left of the excavator and the lower crusher to its right. Compare with # 131 and note that further ground movement has taken place, during the previous 24 hours, above the left side of the upper strip of geomembrane, where the fence has been totally buried.

136 9-02-99: 35 mm. facing northwest, showing the lower crusher. This print forms the left hand side of a panoramic pair with # 137.

137 9-02-99: 35 mm. facing northwest, showing the lower crusher. This print forms the right hand side of a panoramic pair with # 136. Nant Brwyno can be seen in the background, behind a pit which has been excavated between the eastern wall of the lower crusher house and its wheelpit. Note that the fence post is now hanging and that the bottom of the pit is over a metre below the bed of the stream.

February 10, 1999. 4 prints on Minolta X 300 using Kodak 200 ASA. film taken on a bright, snowy and frosty morning with exposure values of f 8 at 1/60th.

138 10-02-99: 28 mm. facing west, in portrait format and showing the eastern wall of the lower crusher house where it joins the northern wall of the wheelpit. Scale bar is 25 cms. in 5 cm. increments. Note the damage to the brace the rather poor masonry. Note the damage to the wheelpit, on the left, which ought to have been included within the fence.

139 10-02-99: 28 mm. facing west being a close up of # 138 also in portrait format but showing greater detail. Note how the outer skin of the wheelpit has been damaged. Scale bar is 25 cms. in 5 cm. increments

140 10-02-99: 28 mm. facing west being a duplicate of 139 but in landscape format. Scale bar is 25 cms. in 5 cm. increments.

141 10-02-99: 28 mm. facing southwest, and showing buddle fines being cleared from alongside the north bank of Nant Brwyno with the lower crusher house in the background.

February 15, 1999. 6 prints taken on Minolta X 300 with Kodak 200 ASA. film on a misty and overcast afternoon with exposure values of f 4 or f 5.6 at 1/60th. using a 28 mm. wide angle lens.

142 15-02-99: 28 mm. facing south, from beside the lowest buddle showing the repair to the damaged development dump and the restored area around the lower crusher.

143 15-02-99: 28 mm. facing south with Nant Brwyno running across the foreground and showing the final ground profile around the lower crusher. Compare this and 144 & 145 with numbers 15, 41, 59, 63, 71.

144 15-02-99: 28 mm. facing east, showing the final ground profile around the front and side of the lower crusher.

This matches the original ground profile very closely.

145 15-02-99: 28 mm. Facing north, showing the back of the lower crusher house. Compare this with # 63 at the commencement, and # 137 at the height of the works. Note that the ground profile within the fence blends in with the imported soil outside the fence and the stream bed.

146 15-02-99: 28 mm. Facing west along the course of Nant Brynno towards the Ellis's pumping wheel and showing how the fines have been removed along the course of the stream.

147 15-02-99: 28 mm. Facing southeast being a closer view of the repair to the development dump which is also visible in # 142., with darker unoxidised rock.

February 20, 1999. 4 prints taken on Minolta X 300 using Kodak 200 ASA. film with exposure values of f 8 at 1/60th.

148 20-02-99: 28 mm. Facing east, in portrait format, a close up view of the trial pit dug inside the east side of the kerb showing that the buddle boards have been removed. Note the leg of the buddle frame outside the kerb. Scale bar is 25 cms. in 5 cm. increments.

149 20-02-99: 28 mm. Facing east, in portrait format, a more distant duplicate of # 148. Scale bar is 25 cms. in 5 cm. increments

150 20-02-99: 28 mm. Facing southeast, showing the facade and section of the wall discovered during excavations to create the cell. Scale bar is 25 cms. in 5 cm. increments.

151 20-02-99: 28 mm. Facing southeast, showing the facade and section of the wall as in # 150, but a closer view.

March 12, 1999. 7 prints on Minolta X 300 using Kodak 200 ASA. film. And; 4 prints on Olympus XA 2, also using Kodak 200 ASA. film. A dry day with bright intervals and occasionally sunny with exposure values of f 8 to f 11 at 1/60th. with a 28 mm. wide angle lens.

152 12-03-99: 28 mm. Facing southwest, with the new mill in the right foreground, showing how the tailings and fines have been removed and replaced with rock or soil as deemed appropriate. The Y shape, between the development dump and the lower crusher, marks where cut off drains have been installed.

153 12-03-99: 28 mm. Facing south, with the lower buddle in the foreground, and the lower crusher in front of the development dump. Again, the Y shape of the cut off drain

is a prominent feature. Note that the haul road has now been removed and its course restored.

154 12-03-99: 28 mm. Facing southeast, showing the area around the lower crusher after removal of the haul road and pipe bridge after the restoration of the site.

155 12-03-99: 28 mm. Facing southeast, showing the area around where the stream cuts the culvert which had previously been used to dump big tailings and buddle fines.

156 12-03-99: 28 mm. Facing north, in portrait format and looking along the new mill wheelpit showing the bulges which are appearing in the walls. Note that the wall has collapsed at the far end, below the arch.

157 12-03-99: 28 mm. Facing north, in portrait format and showing the masonry arch, built to support the retaining wall intended to prevent further ground movement in this area. Note the slumped area that lies behind this wall.

158 12-03-99: 28 mm. Facing north, showing the portal of the 20 fathom adit with the old pumping and crushing wheel on the left hand skyline.

159 12-03-99: 35 mm. Facing north showing the western end of the works, and the extent of the soil covering applied to the site of the tailings dumps and haul roads.

160 12-03-99: 35 mm. Facing north showing the eastern end of the works, and the filled cell.

161 12-03-99: 35 mm. Facing north showing the central part of the site where the tailings have been removed and the area covered with soil. Note that the westernmost buddle has not been disturbed.

162 12-03-99: 35 mm. Facing northeast showing the cell, now almost filled.

March 30, 1999. A cloudy and overcast day with occasional showers of rain and exposure values of 1/60th. to 1/125th. at f 8 with a 35 mm. lens. 4 shots on XA 2 Olympus with Kodak 200 ASA film.

163 30-03-99: 28 mm. Facing southwest, with the development dumps in distance. Compare with # 14 taken in 1978 from the same position but with a 58 mm. lens.

164 30-03-99: 28 mm. Facing northeast showing the king post foundations alongside the road.

165 30-03-99: 28 mm. western side of a panoramic pair, with #166 facing north.

166 30-03-99: 28 mm. eastern side of a panoramic pair, with #165 facing north.

June 15, 1999. A cloudy but bright day with exposure values of 1/60th. to 1/125th. at f 11 with a 35 mm. lens on an XA 2 Olympus; 3 frames using Fujicolor 200 ASA film.

167 15-06-99: 35 mm. Northfacing view of the mine dumps from the old high road, showing the main area of reclamation. Compare with # 57, 66, 85, 133, 160.

168 15-06-99: 35 mm. Showing the greater part of the coarser development dump following the removal and reseeded to the old jig tailings dump - Area D. Compare with # 152.

169 15-06-99: 35 mm. The area to the west of the reservoir, used to site the portakabins and contractor's yard for the duration of the contract. Compare with # 21.

October 6, 1999. A bright and sunny day autumnal day with light cloud and strong shadow. 5 shots with exposure values of 1/125th. at f 16 with a 35 mm. lens fitted to an Olympus XA 2 with Fujicolor 200 ASA. film.

170 6-10-99: 35 mm. A view of the Lower Crusher facing east, with the site of the jig tailings - Area D - in the background beneath the patched up development dumps. Note that the grass is now well established, and that the overflow and weir have survived undamaged. Compare with photographs # 94, 144, & 154.

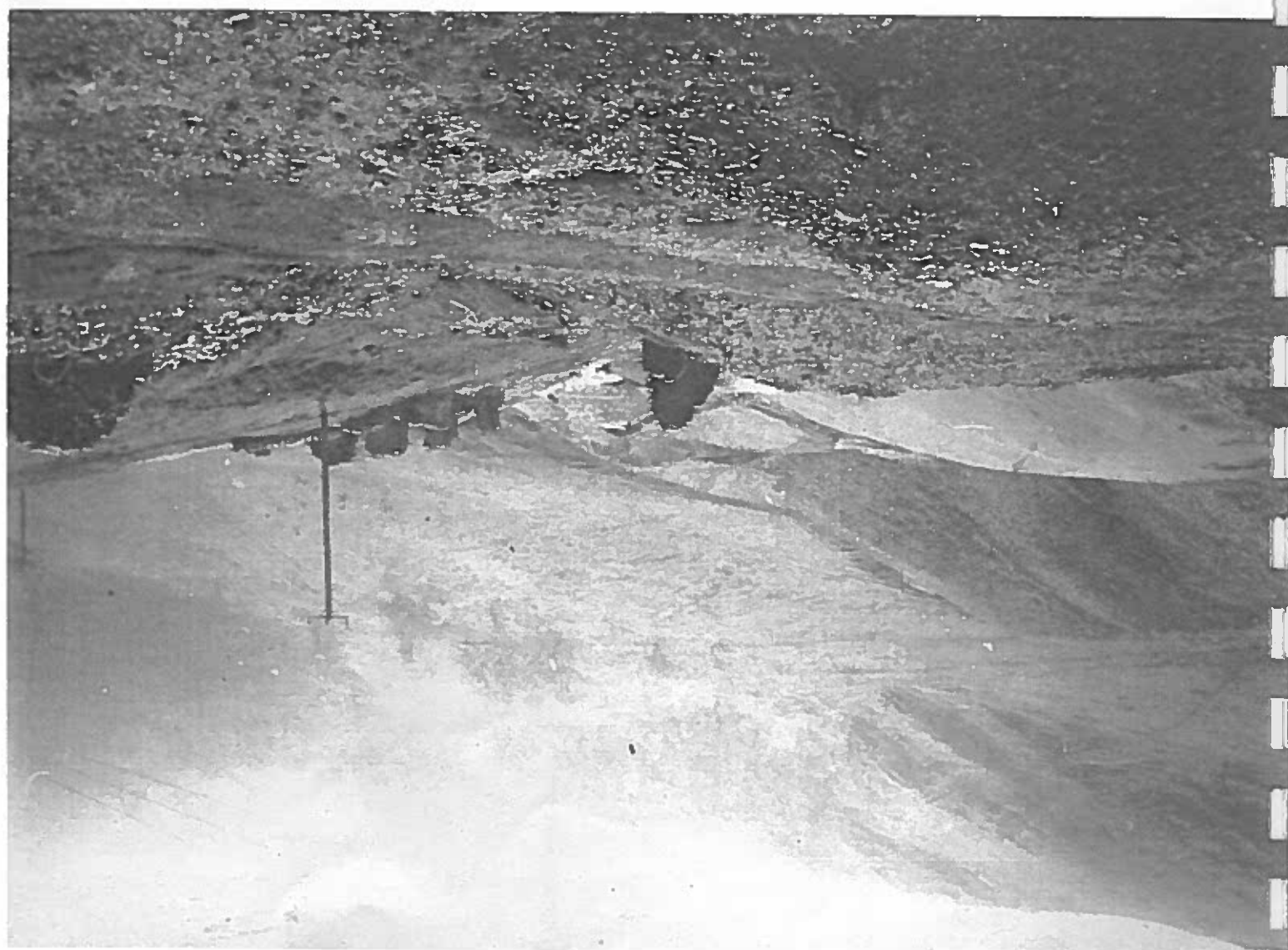
171 6-10-99: 35 mm. Ellis's wheelpit, facing south from the northern end. The end of the pit was probably demolished when the wheel was removed. Since then, between four and five metres of this pit have been buried by jig tailings washed down during floods. Photograph # 35 is complementary.

172 6-10-99: 35 mm. Northfacing view, from the south end of Ellis's Pumping wheel, with the rod guiley just about visible as a nick in the skyline. Note the masonry plinth, on the left and just beyond the pit, which probably carried the bearing for the kingpost which carried the sweep rod to the wrought iron driving rods.

173 6-10-99: 35 mm. Facing up Nant Brwyno with the Ellis's wheelpit in the foreground. Note the poor stone used in its construction. The indentations mark the position of the axle and were probably created when the bosses were removed, suggesting that the wheel was scrapped.

174 6-10-99: 35 mm. More or less a duplicate of # 172, but taken from the top of the western wall, the plinth for the kingpost bearing is more clearly defined than in # 172.







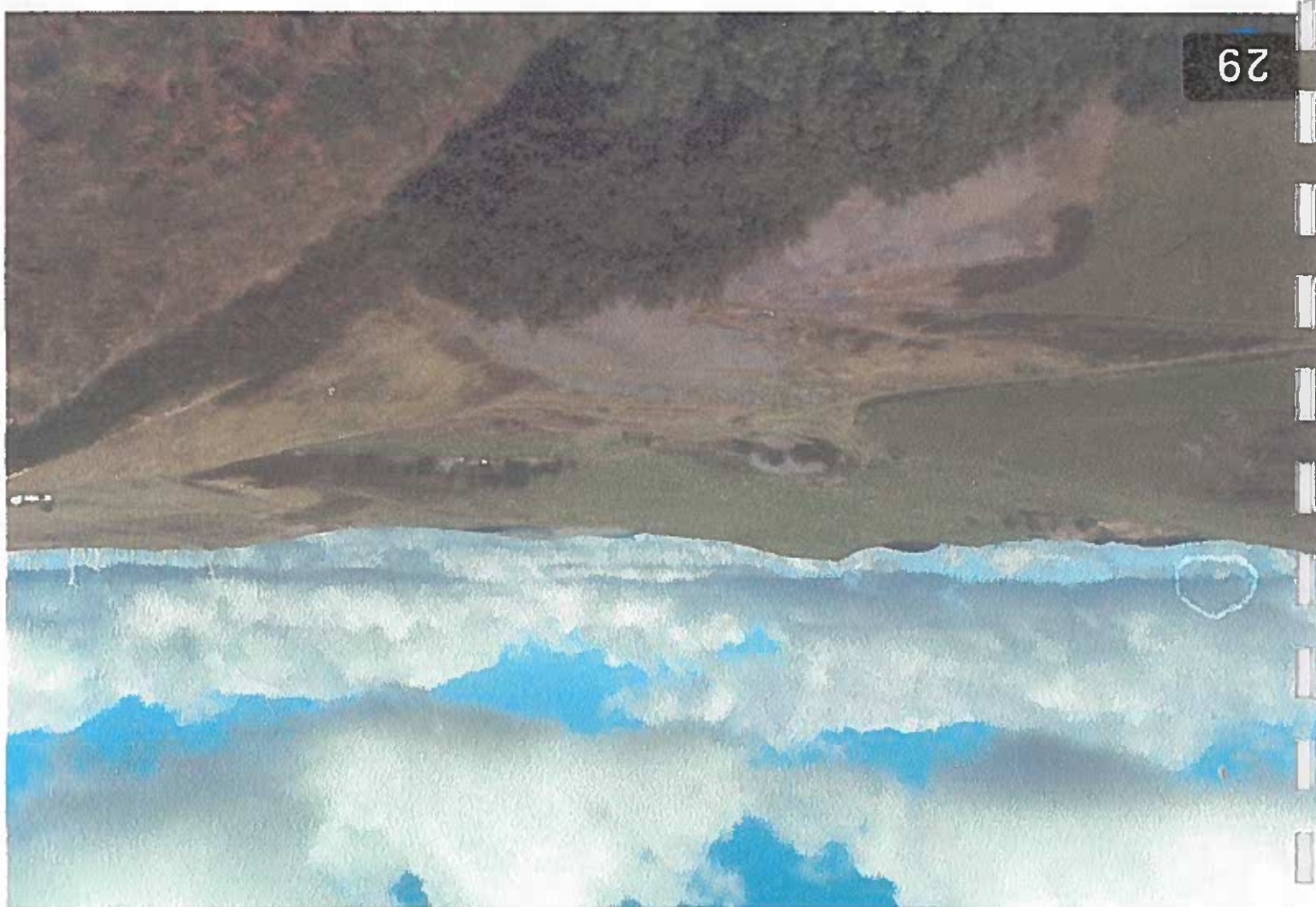








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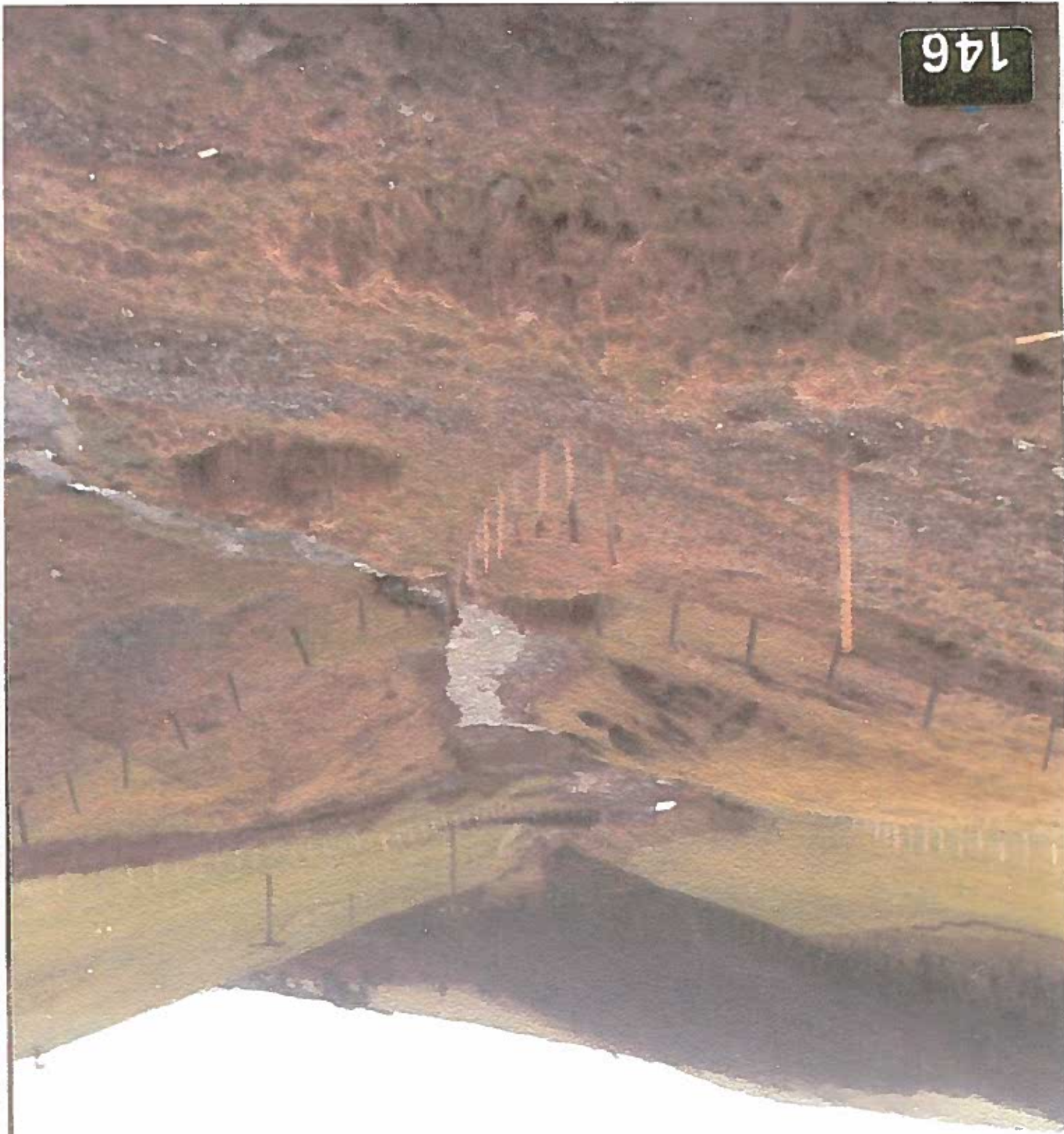


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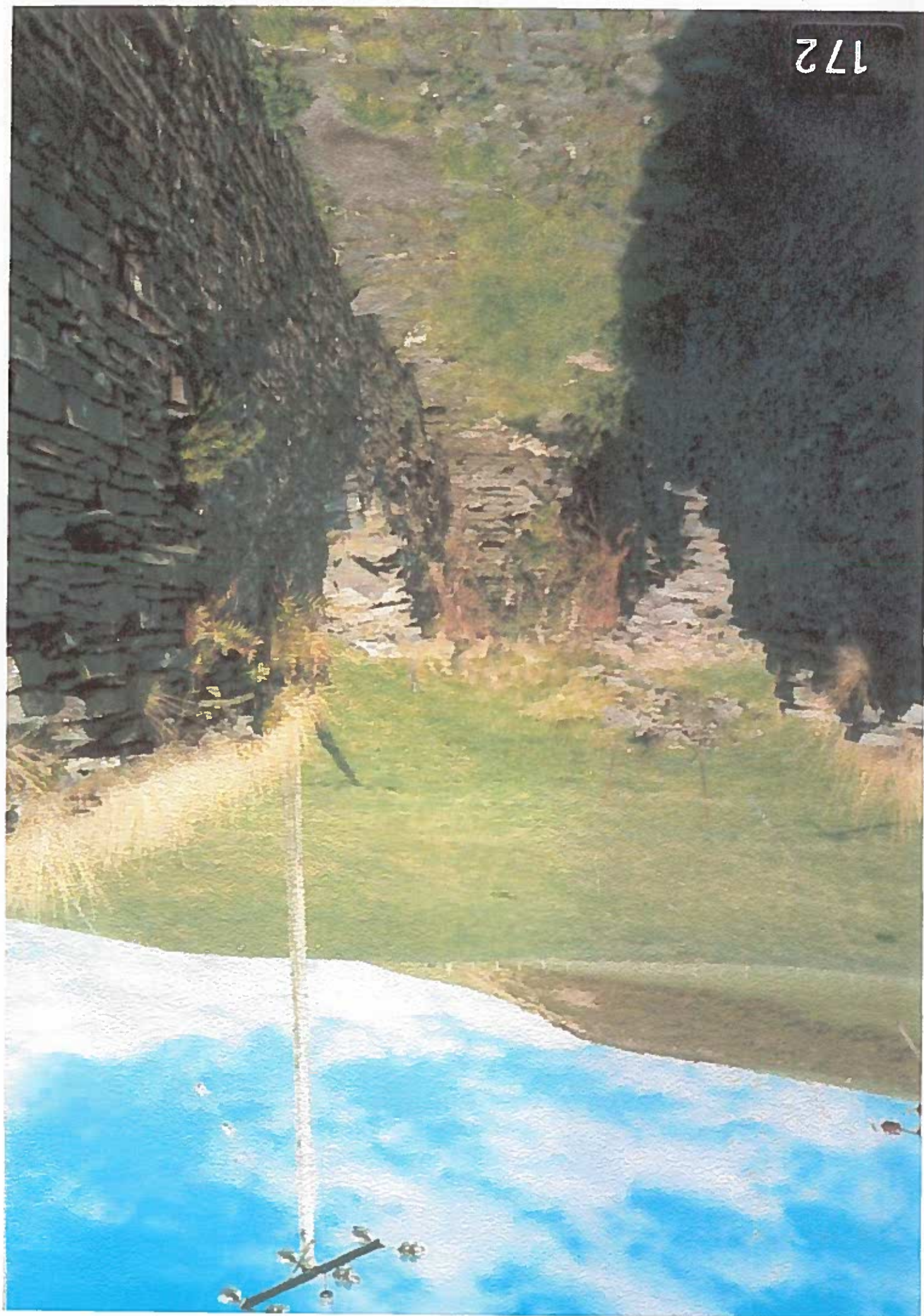
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161





Cwm Brwyno Mine.

There are no records of the mine prior to the mid 18th century when it would appear that the lode had not long since been discovered. Nor are there any suggestions of earlier development or production from this area....

1747 The Cwm Brwyno area is shown on Morris's map of the Manor of Perveth as belonging to the infant John Pugh Pryse, heir of the late Thomas Pryse of Gogerddan. There are workings shown on a vein at Pen y Lan fawr, this is annotated "Ore discovered here".

Some 400 metres to the south is a house called Pen bryn Moelddu, also the property of John Pugh Pryse. 300 metres to the southwest lies Pen rhwlas; then the property of W Lloyd. The name Pen y Lan fawr has fallen into disuse and appears to have been replaced by Bryn Bugail (SN. 720.810), whilst Pen - bryn Moelddu retains its name (SN. 718.805), as does Pen rhwlas (SN. 709.803). The text which accompanies the map, is more expansive and mentions five mineral occurrences in this area :-

"A large body of ore seen by David James of Mafode at Penrhwlas, in a meadow, the land of Gruffyth John Gruffyth."

"The same veins on Penbryn Moelddu, John Pugh Pryse."

"A vein and ore discovered at Penylanfawr, near Cwmbrwyno, the lands of John Pugh Pryse: tried."

"In a bog a little to the eastward of Quarrel Glas on the common of Nant yr Arian, a large body of ore is said to be discovered by one Morris Harry in cutting turf in the bog. This is on the range of a vein discovered at Pen y Lan fawr."

"The veins of Ty Llwyd and Ddol fawr upon the hill above Llidiaert Brwyno."

1762 Lease of lead, and other mines, under Cwmbrwyno and Abercwmbrwyno, otherwise Blaen y Dyffryn, in the parish of Llanbadarn fawr, for 21 years from John Pugh Pryse of Gogerddan to Lewis Morris of Penbryn. Gog:2004.

1765 Death of Lewis Morris of Penbryn.

1789 Lease of lead, and other mines, under Cwmbrwyno, Nant yr Arian and Llywerneg, for 21 years, from Margaret Pryse of Woodstock, widow, to Pierce, Poole & Jones. Gog:2019.

1815 Walter Davies in "The Agriculture of South Wales" makes no mention of Cwm Brwyno mine.

1828 Further Lease & Counterpart, of lead and other mines, under Kefincwmbrwyno, Geltaes Etc. in the parish of Llanbadarn fawr, from Pryse Pryse of Gogerddan to Michael & William Williams of Scorrier House. Gog:2021 - 2.

- 1836 Sept 28: Surrender of the 1828 Lease. Gog:2023.
- 1836 Sept 29: Lease for 14 years of lead, and other mines, under Kefnrcwmbrwyno, Gefies, Craignant Etc. all in the parish of Llanbadarn Fawr, from Pryse of Gogerddan to Michael & William Williams of Scorrier House. Gog:2024.
- 1839 Absalom Francis reckons that Cwm Brwyno was included in those worked as the Gogerddan Mine, at this time, with Bog, Darren and Cwmsymlog. It was then relinquished to the Evanses before being taken up by Taylor again in 1850.
- 1842 Cwmbrwyno is not included in the broad, 21 year lease granted by Pryse Pryse to John Taylor & Son. Gog:2025.
- 1843 Cwmbrwyno Mine: As two men were at work in this mine, a large heap of rubble fell and buried them; one was extricated comparatively unhurt, but the other one died on the spot. MJ. p243. This must have been under Williamses tenure.
- 1845 Warrington Smythe lists the Cefn Brwyno Lode, # 65, as producing 72 tons of ore in 1845 and 32 tons in 1846 by the labour of 10 men. p682. However, Hunt's figures agree for 1845 but show that 75 tons were produced in the following year. p705. Minstats record 72 tons for '45 and 75 tons for '46.
- 1846 Conflict of records regarding output; 75 tons appears to be probable. Minstats.
- 1847 March 25: Lease & Counterpart, for lead and other mines under Cefn cwm brwyno, from Pryse Pryse of Gogerddan. Mr. to Morris Evans, tanner & Winifred Evans, spinster, both late of Aberystwyth but now of Llanbadarnfawr. Gog: 2005/2031. * Morris would appear to be the Evans after whom the shallow adit is named. BM41: RvA; makes mention of the Evans Bros. but this must be a mistake. It is not known if it was Morris Evans was involved with Evans's coal & lead yard in Trefechan, later sold to Griffith Williams of Goginan; or if they were related to Thomas & Evan Evans, Tanners, recorded in the 1851 census of Llanbadarn. Continued
- 1847 Continued: Also, Evans of the Ponterwyd Hotel purchased the Goginan Mine in the 1820's, but later sold it to Matthew Francis for the sum of £ 20. EGB.201. & CM.#752. BM35.21.
- 1847 36 tons of lead ore produced. Minstats.
- 1848 Hunt's RSOM. p423. states that the Cefn-cwm-brwyno Mine produced 36 tons of lead ore from which 24 tons of metal were smelted. Minstats agree.
- 1849 D. Bick. II.18 Reckons that the mine was taken up by Taylor at about this time, and that the leat was built from Melindwr to supply the new dressing floors near the mouth of the 10 fm. shallow adit level (Evans's). An intermediate Adit or 20 fm. level, and a long deep adit were later driven.
- 1849 Hunt's RSOM. p432. states that the Cefn-cwm-brwyno Mine

- produced 10 tons of 70 & lead ore. Minstats agree.
- 1850 Draft Lease for 21 years, of lead and other mines under Cefn Cwm Brwyno, from Pryse Loveden of Gogerddan to John Taylor & Son. (Draft Copy). Gog:2054.
- 1850 Cefnbrwyno £ 6 share, now worth £ 40. WJL.180 + MJ.570
- 1850 Hunt's RSOM. p443. states that the Cefn-cwm-brwyno Mine produced 13 tons of lead ore. Minstats agree.
- 1850 Mining Journal extracts: At Cefn Cwm Brwyno, the Engine Shaft and western end (the 20) have passed into famous ore. The lode in the whim shaft is 4' wide, now yielding 2 tons per fathom. The lode in the adit west has not been taken down since the last report. The lode is expected to be cut by the deep cross cut in about six or eight weeks. MJ
- The lode in the whim shaft is 3' wide and yielding 3 tpf. The lode in the adit level is 2' wide and yielding some stones of ore. The deep adit (Taylor's Level) is pushing on with all speed. MJ
- At Cefn Bruno, good ore has been cut in the adit level east. MJ.
- The lode in the whim shaft is 4' wide, yielding 30 cpf. The lode in the adit level west is 2' wide and yielding 15 cpf. with a very promising appearance. Taylor's deep adit level is in a good course for driving, as a good rail road is laid down to the present end. MJ.
- The mine has improved since the last report. The lode in the whim shaft is now 4' wide, composed of spar and blende with a fine bunch of ore now yielding 3 tpf. The lode in the adit level west is 3' wide, composed of spar and jack, with good bunches of ore now yielding 12 cpf. MJ.
- The lode in the whim shaft is 3 - 4' wide with a very promising appearance, now yielding 3 tons of lead ore per fm. The shaft is down 25 fms. below the adit level, 12 fms. of which is sunk through a good lode, averaging more than 2 tpf. The lode in the adit level west is 2' wide, good saving work.
- 1851 February 17: Lease & Counterpart for 21 years of lead & other mines under Cefn cwm brwyno, being part of Blaendyffrynucha' in the parish of Llanbadarnfawr, from Pryse Loveden of Gogerddan MP. to John Taylor & Son. Gog:2006 - 7.
- 1851 Royalty Returns commence and run through to 1861. Gog:
- 1851 Hunt's RSOM. p455. states that the Cefn-cwm-brwyno Mine produced 13 tons and 19 Cwts. of lead ore. Minstats show 13.90 tons.
- 1852 Cefn Cwm Brwyne ? MJ. p222.
- 1852 Hunt's RSOM. p470. states that the Cefn-cwm-brwyno Mine produced 190 tons of lead ore from which 143 tons of lead were smelted. No silver yield is given.
- 1853 314 tons of ore produced, which yields 450 Tr. Ozs. of silver. Arbitrary value ? Minstats.
- 1854 - 1856 Cwm Brwyno Mine; Ore weighing tickets. Gog:2994.

1854 630 tons of 70.79 & lead ore, and 21 tons of zinc blende produced this year. Minstats.

1855 433 tons of 78.52 & lead ore, containing 1000 Tr. Ozs. of silver, and 46.7 tons of zinc blende produced this year. Arbitrary silver value ? Minstats.

1856 429.5 tons of 76.13 & lead ore, containing 961 Tr. Ozs. of silver, and 94.5 tons of zinc blende produced this year. Minstats.

1857 Specification of the Cwm Brwyno crushing and sizing plant. 20" x 13" rolls, directly coupled to a 36" wheel @ 5 RPM, with 27.5 RPM. to a 16 hole per sq. "trommel, and 16" raft wheel. Phillips & Darlington quoted in Bick II. p50.

1857 380.1 tons of 74.24 & lead ore, containing 900 Tr. Ozs. of silver ?, and 160.1 tons of zinc blende produced this year. Minstats.

1858 362 tons of 79.55 & lead ore, containing 919 Tr. Ozs. of silver, and 52 tons of zinc blende produced this year. Minstats.

1859 Royalty Return. Gog:

1859 Chief Agent: James Paul. 267 tons of 74.9 & lead ore and 52.5 tons of zinc blende produced this year. Minstats.

1860 Chief Agent: John Paul. 396 tons of 71.21 & lead ore, containing 1415 Tr. Ozs. of silver, and 45.9 tons of zinc blende produced this year. Minstats.

1861 Plan and Section of Cwmbrwyno Mine, showing old and new workings, crosscuts, Etc., by R Parry at 10 fathoms to one inch. (1:720) Gog:VIISW. RMB.97. argoll.

1861 Census Returns: Melindwr District: Occupants of the Cwmbrwyno Mine House are listed as :-

John Paul, Mine Agent aged 36, born at Mary Tavy in Devon.
 Mary Paul, wife, aged 37, born at Llanfihangel Genau'r Glyn.
 William Paul, aged 9, born at Llanbadarn Fawr.
 James Paul, aged 7, born at Llanbadarn Fawr.
 John Paul, aged 6, born " "
 Thomas Paul, aged 5, born " "
 Richd. Paul, aged 3, born " "
 Maria Paul, aged 1, born " "
 Margt. Jones, Servant, aged 26, born at Llanfihangel Gg.

1861 Census Data: In the previous census of 1851, John & Mary Paul lived in Talybont with their daughter Betsy Ann (b.1850 & d.>1861), his occupation is given as Mine Agent. Another son, Josiah, was born in 1865. In 1871 John & Mary's son - James Paul, now 17, gave his occupation as Miner;

Another James Paul lived at Melindwr Cottage, born at Mary Tavy in 1813 and described as a Lead Mine Agent, he appears to be the brother of John Paul of Cwmbrwyno Mine House, and therefore an uncle of the James Paul mentioned above. John &

James Paul had 14 children between them, and there were other members of the family living at Agents Row, English Row and Rose Cottage at Goginan.

1861 Royalty Returns cease.
 1861 Chief Agent: James Paul. 288 tons of 77.08 & lead ore produced this year. No data regarding silver and zinc. Minstats.
 1862 - 1865. Chief Agent: John Paul. Minstats.

1862 326 tons of 78.83 & lead ore, supposedly containing 500 Tr. Ozs. of silver, and 29.2 tons of zinc blende, produced this year. Minstats.

1863 Gogerdan Royalty Return.

1863 236 tons of 81.35 & lead ore, containing 384 Tr. Ozs. of silver, produced this year. Minstats.

1864 38.2 tons of 56.5 & lead ore, and 48.8 tons of zinc blende, produced this year. Minstats.

1865 John Taylor's tenure ceases. 163.6 tons of 73.34 & lead ore, and 42.2 tons of zinc blende produced this year. Minstats.

1866 Taylor relinquishes the mine. 4/5ths of its output was produced by this company, mostly after 1852. The deep adit of 56 fm. level was driven during Taylor's tenure. The main shaft, Taylor's, was sunk to 80 fms at this time and only later deepened to the 104 fm. level. The average yield of the mine under Taylor was nearly one ton per square fathom. OTJ.86 David Bick, II.19, is mistaken in his reckoning that the mine was down to 92 fathoms when abandoned by Taylor (qv. 1868). Murchison refers to workings on the 92 fm. level in 1870. See also the MJ extracts for 1869 regarding work on the 92 fm. level. Also the entries from BM41 in the early 1870's.

1866 140 tons of 74.28 & lead ore, and 68.4 tons of zinc blende, produced this year. Minstats.

1867 J.H. Murchison & Co. are registered owners. Minstats.

1867 Bick II.19: The Cefn Bryno Mining Co. floated by J.H. Murchison with £ 15,000 capital and James Paul of Goginan as the Captain. The main objective appears to have been to work the North Lode which had been discovered in the Deep Adit.

1867 Royalty Return. Gog:

1867 Lease, for 25 years, of lead and other mines, under Cefn cwmbrwyno, being part of Blaendytyn-uchaf in the parish of Llanbadarnfawr, from Sir Pryse Pryse of Gogerdan to James Paul of Goginan and John Paul of Llangollen, mining agents. Gog:2063. NB: Sir Pryse Pryse was Grand Master of James Paul's Lodge in Aberystwyth in 1870. XWD.III.115. James Paul's daughter married the son of a fellow Freemason. At this time, John Paul may have been at the Great Orme

inspecting the Old Mine after their lease expired, or examining the plant being disposed of by the New Mine. He does not appear to have taken an active role in the running of the Llandudno copper mines. GOCM. Smith. John Paul appears not to take part in the management of Cwmbwyno until 1876, possibly due to his brother James's now being 63 years old. The Census returns of 1871 show James as being resident at Goginan, and John at Cwmbwyno.

1867 Manager: James Paul. 80 tons of 78.12 & lead ore, containing 190 Tr. Ozs. of silver. Minstats.

1868 - 1881. Chief Agent: James Paul. Minstats.

1868 February: BM41 - Cwmbwyno Mine. R v Arx. The new company, Cefn Brynno Mining Co., started under the chairmanship of Thomas Staunton and Captain James Paul. The purchase price was £ 6000, half of which was paid by the granting of 600, fully paid up, £ 5 shares.

1868 Mining Journal extracts: James Paul reporting on the Cefn Brynno mine fortnightly. Taylor's shaft is now at the 92 fathom level which makes much water, ventilation is poor in parts of the mine, and water appears to be scarce in the summer months. The 80W has cut into a large fissure which is letting out a great quantity of water. Setting lists for the 92E & W, the 80E & W, the 56E, the XCS @ 56 to cut the South Lode, ventilation rise from the 80 to the 56, and the XCN @ 20 to cut the North Lode. The 56 or deep adit, east of the engine shaft has fallen into disrepair but repairs are now in hand throughout the mine. The cross cut north from the 20, or intermediate adit, had failed to cut the North Lode by August.

1868 20 tons of 72.5 & lead ore produced this year. Minstats

1869 February 25: BM41. Paul's report states that the mine costs for the past year ran at £ 135 per month (£ 1620) but that the liabilities stood at £ 758. Rent of water course for the year £ 50; London expenses £ 607; Director's salaries £ 98; secretary and office rent £ 172: During the past year - work had been undertaken on the 92 east of the engine shaft which was driven 32 fms. through a lode worth 20 cwt. for the first 5 fms. and slightly less for the remainder; the 92 west was extended 14 fms. but encountered little of value; a winze was sunk from the 68 to the 80 to aid ventilation; the 80 was driven 25 fms. east through poor ore; and westwards by 19 fms. through ground worth 14 cwt.; the 56 east of the engine shaft was repaired and extended 24 fms. on a very kindly lode; a winze was put down 6 fms. below the 56 and a rise put up 3 fms over it; the communication was effected 95 fms. east of the engine shaft which aided ventilation and permitted attle to be stowed away in the old stopes; the XCN on the 20, east of the engine shaft was driven 34 fms. but cut nothing of value: RvA.

1869 March 27: BM41. Paul to Murchison: The 92E now worth 15 cwt.; winze below the 80E is worth 20 cwt.; the 80W is worth 14 cwt. for lead and a great deal of blende; and the 56E 30 cwt. in virgin ground: RvA.

1869 August 11: BM41. Paul reports that the 92E is extended

11.5 fms.; the winze sunk from the 80 to the 92 has two
 slopes commenced upon it and a third will start when the water
 is out; the 56E has been extended 13 fms.; the 20W extended
 13.5 fms. beyond the XCN; pumping has been hindered for two
 months by a long dry spell during which, water has accumulated
 in the bottom of the mine: RVA.

1869 J.H. Murchison's guide to the mines refers to the mine
 as "Cefn Brwyno" divided into 3,000 shares of £ 5
 each. The present company began operations at the beginning of
 1868 and have opened some good ground, none of which is yet
 taken away. The 92E is worth 15 to 20 cwt per fm., the winze
 below the 80 is worth 20 cwt., the 80W is worth 13 cwt.
 besides a large quantity of blende, the end of the 56E (deep
 adit) is 70 fms. below the surface is worth 32 cwt. There is
 also a North lode, lately intersected, now being driven on. On
 2,400 shares; £ 2.75 is called up, and 600 are fully paid.
 Thus £ 9,600 called up with £ 5,400 in reserve.

1869 89.2 tons of 75 % lead ore and 49.6 tons of zinc blende
 produced this year. Minstats.

1870 Liscombe & Co. devote one line to Cefn Brwyno ; whilst
 Thomas Spargo fails to include it in his volume on the
 " Mines of Wales " .

1870 March 4: BM41: General Meeting: Staunton informs the
 shareholders that the costs for the preceding year ran
 to £ 2499 against returns of £ 1808. The shortfall of £ 691
 was blamed on drought and frost. £ 3 on 2400 shares have now
 been called. Sales amounted to 144 tons of lead concentrate
 to The Bury Port Co. for £ 1704, and 24 tons of blende to The
 Bagillt Co. for £ 90, royalty due to Sir Pryse Pryse was £ 120

1870 October: BM41: Paul to Murchison: The engine shaft
 was now sunk to 104 fms. and a cross cut south would
 soon be commenced at that depth; the 92W was passing through
 ground worth 30 to 40 cwt. over a length of some 30 fathoms;
 the 80W is in good ore; the slope over the 56E is now up 6
 fms.; a new waterwheel is to be erected: RVA.

1870 188 tons of 76.06 % lead ore and 29 tons of zinc blende
 produced this year. Minstats.

1871 192 tons of 76.04 % lead ore and 60 tons of zinc blende
 produced this year. Minstats.

1872 January 6: BM41: Paul to Murchison: The new 48' wheel
 is now in operation; most of the lobby had to be cut
 out of the rock and the building stones were very small and
 difficult to get; a great deal of timber was required for the
 launders; the new rods extend 215 fms. to the shaft; the
 water rose to the 80 whilst the old rods were being removed
 and the bob pit built; the engine shaft was retimbered down to
 the 104 and a new lift fixed in place: RVA.

1872 April 4: BM41: Ordinary General Meeting: The death of
 William Tuxford, merchant of London, and shareholder in
 the Cefn Brwyno company is announced; Sales of 190 tons of
 lead concentrates to Sims, Williams & Co. and 82.5 tons of zinc
 concentrate to Dilwyn & Co. yields £ 2508, with £ 167 due in

royalties; the 48' waterwheel had been erected at a cost of £ 210 by contract with M. Ellis & Son (Eagle Foundry) * ; A call of £ 1 had been made on 2400 shares whilst arrears ran to £ 1183; mine costs for the year amounted to £ 4230 which resulted in a loss of £ 1722; RVA.

* The business of Ellis's Eagle Foundry was later taken over by Green's Cambrian Foundry, who had taken most of their trade. The remains later became Thomas's Northgate Garage before being demolished in the early 1970's to allow the construction of the new Social Security and Customs & Excise offices.

1872 195 tons of 74.97 % Lead ore and 25 tons of zinc blende produced this year. Minstats.

1873 Cefn Brwyno mine, lead, 9 miles from Aberystwyth, run by Murchison & Co. with James Paul as the chief agent. Annual List of Mines.

1873 March 11: BM41: Paul to Murchison: Setting list :- driving the 104 west of the winze by six men at 190/- per fathom, this ground is worth 25 cpl.; driving the 104 east of the engine shaft to six men at 165/- per fm., this ground is worth 30 cpl.; the stope over the 104 east of the shaft is let to six men at 67/6 per fm. and is worth 18 cpl.; the stope over the 104 about 5 fms. east of the shaft is let to four men at 65/- per fm., this ground is worth 12 cpl.; the XCS near the end of the 92W is let to six men at 170/- per fathom; the stope over the 80 for 20 fms. west of the XCN is let to four men at at 67/6 per fm., this ground is worth 18 cpl.; the stope over the 80 about 55 fms. west of the shaft is let to four men at 100/- per fm., and is worth 16 cpl.; the winze below the 80W is let to 4 men at 220/- per fm.; the stope over the 56E is let to four men at 72/6 per fm., and is worth 18 cpl.; We have over 40 men working on their bargains at the same time: RVA.

1873 170.1 tons of 74.36 % Lead ore, containing 400 Tr. Ozs. of silver, and 22.6 tons of zinc blende, produced this year. Assumed silver value ? Minstats.

1874 Absalom Francis, in his " History of the Cardiganshire Mines, p38, states that :- Cwmbrwyno was one of those worked as the Gogerddan Mine by John Taylor about 1839. Some time after this, on account of their not working this part of the grant, it was let to Mr. Evans of Llanbadarn Fawr who made a good discovery of lead ore near the surface, drove an adit level, and worked it successfully for some years. After this, Messrs Taylor purchased the mine from Mr. Evans, and worked it profitably for many years, up to about 1870, when they disposed of it to a company formed by Mr. Murchison who has continued to work it on a spirited scale, and spent a great deal of money, by increasing the machinery, which is now adequate for some years to come.

1874 116.6 tons of 74.61 % Lead ore produced. Minstats

1875 BM41: The Cefn Brwyno Mining Co. is liquidated. RVA.

1875 5 tons of 70 % Lead ore produced this year. Minstats.

1876 June 24: Lease, for 21 years, of lead and other mines, under that part of Blaenddyfryn ucha called Cefnwmbrwyno, from Sir Pryse of Gogerddan to Griffith * & Evan Williams of Baker Street, Aberystwyth, merchants, and John Paul of Cwmbrwyno, mine agent. Gog:2078.

* Griffith Williams was an Anglsey Man who had fallen foul of the Marquis of Anglesey and settled down in Goginan as a general dealer, and prospered. He started a timber business on the site of the Evans's coal & lead store in Trefechan, Aberystwyth, and an ironmongers in Baker Street in partnership with White. The Williams & White partnership supplied powder to many of the mines from their large magazine above Bryn y Mor and were also purveyors of mining tools, fuzes, etc. In 1889 Griffith Williams, timber merchant, was elected as mayor of Aberystwyth. The ironmongers business was sold to Tom Old and the timber business to John Lloyd in 1897. Some years later the Lloyd's also acquired the timber yard. Both concerns ran under the name of J.D. Lloyd until it was sold to the Powell Dyfryn group in the mid 1970's. CM.#752. & CL.19. Williams's Central Foundry and the Williams & Metcalfe's Rhedol Foundry, both of Park Avenue in Aberystwyth, appear to be associated with Griffith Williams. BM34.p13. but there is virtually no documentation to confirm this.

The Central Foundry originally specialised in Marine castings and only later produced mining work. An example of one of their self acting jigs, probably originally supplied to the Llysborne Mines in 1909, is preserved at the Llysborne Museum. BM.34. p13. Thomas & Williams's Central Foundry supplied the machinery for the Llysborne Co.'s Davey Shaft + new mill in 1909. XWD.422. due to Green's Cambrian Foundry having burned down in 1908, and the work being passed to Central. BM.34. p14. Williams & White manhole covers and black iron ranges are not uncommon in the Aberystwyth area. There is a Williams & White powder flask from Nant y Creiau preserved at the Llysborne Museum. In 1892 Griffith Williams was granted a 75 year lease, at £ 5 p/a., for the erection of a place of worship in Loveden Road. Aber' Boro' Records. Also; Williams & Metcalfe's Central Foundry was commenced in 1874, ran until the 1930's, and was only demolished in 1981. The Williams & Jenkins Rhedol Foundry was commenced about 1874 and was later taken over by GWR. This may be the M&M. Apparently it ran until 1910 and part of it still survives. RCAM.CD/88/20.

1876 Registered to Williams, Williams & Paul. 26 tons of 75 % lead ore and 14 tons of zinc blende produced this year. Minstats.

1876 Cwm Brwyno mine, lead & zinc, 9 miles from Aberystwyth, run by G. & E.J. Williams and J. Paul with James Paul as chief agent. Annual List of Mines.

1877 September 17: Assignment of the 1876 Lease from Messrs Williams, Williams & Paul, to F.S.M. Underwood of Devon, gent. Gog:2079.

1877 Registered to George Underwood. Employment statistics commence; 2 underground, 7 at surface. 14.4 tons of 75% lead ore, sold for £ 12.54 per ton. Minstats.

1877 Cwm Brwyno mine, lead & zinc, 9 miles from Aberystwyth, run by George Underwood with James Paul as chief agent Annual List of Mines. Inspector Thomas Fanning Evans.

1878 Registered to Herbert E. Underwood. None employed at surface or underground. 13.1 tons of poor grade - 57.25 £ - lead ore sold for £ 9.38 per ton. Minstats.

1879 First year that ore was not sold since 1845. No workers on surface or underground. Minstats.

1879 Cwm Brwyno mine, lead & zinc, 9 miles from Aberystwyth, run by Herbert E. Underwood with James Paul as the chief agent. Annual List of Mines. Inspector CLN. Foster.

1879 Black II.21: The Cwm Brwyno Lead Mining Co. formed with £ 30,000 capital. The mine has two crushing mills, four large waterwheels (inc. 48') and five small waterwheels at the dressing floors. According to a contemporary manuscript, the machinery was worn out and the mine had suffered from poor management for many years.

1880 16 underground & 17 at surface; produced 53.2 tons of 64.47 £ lead ore, containing 75 Tr. Ozs. of silver, and no zinc blende produced. Minstats.

1881 James Paul, now aged 68, ceases to be Chief Agent. 12 men underground & 6 at surface. 50 tons of 70.0 £ lead ore, containing 75 Tr. Ozs. of silver. sold. Minstats.

1882 Registered to George Green. Robert Uren as Chief Agent. 7 underground & 2 at surface. 15 tons of 80.6 £ lead ore and 15 tons of blende sold. Minstats.

1883 - 1884. Royalty Return.

1883 - 1884. Chief Agent: John Davis. 3 underground. No ore is sold during this period. Minstats.

1883 Plan & Section of Cwmbrwyno Mine by Ernest Butler at a scale of 1 chain to the inch (1:792). Showing fairly extensive development on the 92 & 104E. New & Old 20 levels, lodes at 37 and 183 yds. north, 32 stoped away and the 80 as inaccessible. Postdates OTJ. Gog:VIISW. now Gog:332. RMB.96

1884 - 1885 Royalty Return.

1884 Abandoned in April. 4 underground. No production is recorded during this year. Minstats.

1885 No owner or agent registered. No sales. None employed. Minstats.

1886 Registered to Cardigan United Mines Ltd. 8 underground and 10 at surface. No production. Minstats.

1886 - 1889. Chief Agent: A.H. Jenks. Minstats.

1887 1st Edition of the 1:2500 Ordnance Plans. Cards.VII.14. This is partly reproduced in Black II.20.

1887 12 underground, 8 at surface, no production. Minstas.
1888 Last year of lead production. 18 tons of 72.2 % lead ore, containing 114 Tr. Ozs. of silver, and 12 tons of 33 % blende sold. 6 underground and 9 at surface. Minstas.
1889 Cardigan United Mines relinquishes tenure. Minstas.
1889 Suspended. 1 surface worker. No production. Minstas.
1890 No employment. No production. Minstas.
1891 " " " " " " " ". Minstas.
1892 Cwm Bryno Blende & Lead Co. Ltd. commences. 12 underground and 5 at surface. 10 tons of 30 % blende. Minstas.
1892 - 1894. Suspended. Minstas.
1892 - 1894. Chief Agent: A.H. Jenks. Minstas.
1893 No employees registered. Minstas.
1894 CB&L Co. ceases. Minstas.
1896 Cwm Bryno is not listed in the Annual List of Mines.
1905 May 29: Memorandum of Agreement between William Bebb of Blaendfryn and John Owen, mine agent of Cwmbrwyno, granting a five year licence from 1st November 1902, to obtain copper, lead, Etc., from Blaendfryn. This may be Cwmbrwyno or Nant yr Arian ? BGS:A1989/65.
1905 Henry Jenks registered as owner. 2 underground workers registered until 1911. Minstas.
1905 - 1910. Chief Agent: Scottish John Mitchell. Minstas.
1911 Last year of employment. 2 underground. Minstas.
1912 - 1913. Idle. No production. No employment. Minstas.
1913 Henry Jenks relinquishes ownership. Minstas.
1914 It would appear that at about this time, the contents of the magazine were detonated in the reservoir to get the fish, and in the process, so badly damaged the sluice and lining that the reservoir never recovered.
Oral Trad via Mr Bebb, Blaendfryn; and ??? Penrhylas, who's father was involved in this incident.
1917 October 27: Cwmbrwyno Lead mine is inspected by J. W. Astley on behalf of the Department for the Development of Mineral Resources in the UK. Appendix 2 # 23.
1921 O.T. Jones's "Lead & Zinc". SRMRGB XX. p86. et seq. This is the usual authority to be quoted on the geotechnical aspects of the mine, often taken as a primary reference. Much of Jones's description is fairly accurate but his section is poor and he fails to show the 92 Fm. level, the

stopped area below the 68, crown holes on the back of the stopes above the 10, crosscuts other than on the 20; nor does he deal with workings on the North and South Lodes. This appears to be based on RMB:97, not the later RMB:96. qv.

1935 In the Mining Records Office catalogue: Cefn Bruno - see Cefn-cwm-brwyno: Cefn-cwm-brwyno - see Cwm-brwyno: Cefn-cwm-brwyno, parish of Melindwr, worked for lead ore, details held by John Tattor & Sons EC4, OS. 6" map of 1906 - 7SW, Cwm Brwyno (Cefn-cwm-brwyno) parish of Melindwr, worked for lead zinc & silver ores in 1878, details held by Henry Francis of Aberystwyth, OS. 6" map of 1906 - 7SW. Neither of these ever found their way to the MRO, HSE, or County Archive. They be amongst the Taylor papers purchased by Goldfields.

1967 May 14: Photographic session. 6 x B & W prints

1968 July 18: Soil geochemistry survey. ppm. Values of 2100 Pb, 1800 Zn, and 65 Cu, on uncontaminated land over the course of the lode west of the Deep Adit portal.

1970 April 2: Photographic session. 5 x colour transparencies.

1970 April 11: Examination of Shallow Adit - Evans's Level.

1971 February 22: Geological surveying.

1972 April 29: Examination of Shallow & Intermediate Levels, Taylor's Shaft, and stopes.

1978 Undated: 1 x colour slide of lower dumps facing SSE.

1978 Pumping Bob at Taylor's Shaft taken to Llywernog Mining Museum.

1994 Roy Fellows's exploration and placing of rockbolts.

1995 R. Fellows descends from Evans's Adit, via Intermediate Adit or 20 fm., to below the 32 fm. level." Stopes big enough to fly a helicopter through ! " Perscom.

1998 August: Commencement of Land Reclamation Study.

SJSH. 26:8:99.

1998 August 27: Series of 22 colour prints taken of the mill and dump area.

1998 September 3: Video inspection by Plynllymon, and Test pit by Eirian driving for TMP.

1998 September 10: Submission of Cwmbrwyno / INDARCH with 2 plans and updated section to Huw Litter - Jones at Richards, Moorehead & Laing, 55 Well Street, Ruthin. **** 3 days @ ? + 30 miles + £ 10 printing and copying. ****

1998 October 5: Attending site meeting with CDC., RML., NRA. etc. 1/4 day + 25 miles.

1998 October 12: Attending site meeting with CDC., RML., and Louise Austin of Dyfed Archaeological Trust. 1/4 + 25m.

1998 October 15: Examination of the site, with the existing data, to familiarise myself with the layout and to establish what is left of the remains visible in the 1967 photographs. 1/4 day + 25m.

1998 October 17: Measuring up middle wheelpit & crusher and jigger shed, top boulders and bottom wheelpit & crusher house. 1/2 day + 25m.

1998 October 18: Drawing up the above data. 1/2 day.

1998 October 19: Measuring up area around boulders. 1/2 day + 25m.

1998 October 20: Drawing up the above data. 1/2 day.

1998 October 21: Affirming the positions and alignments and checking draft survey. Drawing up the checked survey at 1:200 and a brief, 3 page summary of the remains delineated during the previous week's work. 1 day + 25m.

1998 October 22: Five x A2 photocopies and printout of the summary sent to Huw at RML's Ruthin office. 1/4 day + 14m. + £ 2.00.

Charges on this project to date (26.X.98.) :-

(1) 3 days + 30 miles + £ 10 costs & (11) 4 days + 164 miles + £ 2.00 costs: Tot = 7 days, 194 miles & £ 12 costs - say,

1998 October 28: 'Phoned by Hugh Littler - Jones to request a re-writing of the three page report, to accompany the 1:200 survey, so that it includes categorisation as requested by Louise Austin of Cambria Archaeology in her letter to Jon Wilkes of CCC. of 13.X.98 which was sent to me, with a slip, by HLJ, on the 14th. To be sent by Saturday 31st.

1998 November 2: 'Phoned by HLJ to request modification to the report of 28.X.98 regarding the references to boundaries around boulders. Confirmed details by fax, re written and submitted by fax and hardcopy posted on 3.XI.98.

1998 November 11: Preparation for submission of Friday 13th.

1998 November 12: Received " Brief for Archaeological Inv. " prepared for Ceredigion County Council by Cambria Archaeology. Sent by fax by Louise Austin.

1998 November 13: EA - CCC - RML Bebb - CCM - DAT - Afan Etc Meeting of Interested Parties prior to taking possession of the site on Monday 16th November as a 12 week contract.

1998 November 16: Redraw parts of the survey at 1:100 and re examined files.

1998 November 17: spoke to David Evans @ RML, as HLU was on holiday, re the Archaeological Brief, but he has heard nothing from Cambria Archaeology on this matter.

1998 November 19: Site visit. Establishing site offices and fencing off protected areas.

1998 November 30: Site Visit. Constructing and topping haul road and silt - trap. Fencing and establishment now appears to be completed. The lower line of the fence has been put through the buddle area. I pointed this out to the foreman who said that he was merely following orders and that he would be happy to move it if instructed to do so.

1998 December 3: Site Visit. Fence line not moved around the buddles.

1998 December 11: Spoke to Hannah Wilkinson of the NRA on a number of points. Goginan, Esqair Mwyn Etc. She mentioned that Steve Chambers was not happy about certain points and I explained the problem with the fence line. If I did not get any satisfaction, I could try complaining to either Richard Dunstone, the project officer, or herself, as the client's representative.

1998 December 11: Phoned by HLU @ RML. Re the submission of my account. Discussed the line of the fence around the buddles which needs moving pretty quickly, next week

preferably. HLU did not seem to be aware of the implications of PPG 16 and that AJD didn't give a damn about the IA which was going to prejudice further jobs of this nature. Phone him back on the morning of the 15th.

1998 December 13: Account to date for 9 days @ £ 100, + 300 miles @ 25p = £ 75 and £ 25 printing & sundry expenses.

1998 December 15 : Nudge HLU @ RML about the fence line. HLU has gone to Italy for the week ! Back in the office on Monday 21 December. Is this taking the piss or wot ? Ivor is standing in for him. Spoke to Ivor, Jon, Hannah & Richard about the matter, all of whom apparently agreed with the need to move the fence line so as to avoid damaging the eastern buddles and for the smooth running of this, and future schemes.

1998 December 16: Site meeting. Ivor & Alan for RML, Jon & Vince for CDC, Wynn Evans for Afan, and Richard Dunstone for EA. It was agreed to move the fence line so that the two eastern buddles are excluded from the scheme and that the western buddle is staked out and flagged so that no vehicles are driven across the area and that excavation is undertaken by a small machine under my scrutiny. AJD was not pleased by this move and bitching like hell despite it not creating any extra work or inconvenience. " 20 years ago we'd

have driven a dozer straight through it ; ". I'm sure he would

December 29: Called to see if anyone was working on the site; However, it appeared that there may have been a break in as the security fence was down. Reported this to HLU @ RML who suggested that I contact Vince at home but I refused to disturb him and suggested that Wynn Evans of Afan would be a better bet. Left a message on the answering machine at 01974 282671 at about 4:30 pm.

January 3: Called to see how the work had progressed if at all since my last visit. The security fence by the cabins had been righted but many others had been damaged. It appeared that there were several more large excavators (20t+) on the site, and that the cell was now ready for lining with clay. Several of the height restrictors had been damaged, possibly by the recent gales. There is now no difficulty in just walking onto the site. There was also a line of poles and flagging, to the south of the boundary, around the western buddle, to prevent machinery straying onto the buddle whilst the slimes are being removed.

January 5: Phoned by HLU regarding the working policy as required by Cambria. Draft supposed to be faxed by close of business, amended and returned by tomorrow ;

January 11: Called at about 4:00 to examine the progress of the works. Elyn reckons that they will start moving the tailings on the 13th or 14th.

January 14: Paged by Vince Morgan at 11:00 to contact him. They started moving the tailings yesterday afternoon.

January 15: The culvert is now partly uncovered by Emyr and Tony is building an access track across the buddle fines. Told both drivers about the walls behind the wheelpit. A very dark day and poor for photography, most shots were taken at f. 2.8 @ 1/30th with 200 ASA. film. Was assured that no more work will be done until the 17th.

January 17: Snowed last night. 21 metres of the culvert has now been exposed. It would appear that between my leaving on Friday, and this morning, that the Hitachi 320 has dug a large hole behind the wheelpit. Whilst this has caused some damage, it has not wrecked the site, but it is not a good state of affairs either.

January 18: A very dark day with sleet and snow and not conducive to photography. Most of the day spent watching tailings being loaded into wagons.

January 19: A slightly better day with some occasional bright spells during which some photos at better than 2.8 @ 1/30th were taken. Tony has now removed most of the buddle fines. There materialised to be predominantly jig tailings and shale with buddle fines dumped over the top.

January 20: Occasional light rain, but mostly bright &

sometimes sunny. Tramway, of 25.5" gauge, uncovered beneath the buddle fines and at a level that it must pre-date the culvert.

1999 January 21:

1999 January 27:

1999 January 29: Damp and misty. Met Louise Austin and had a discussion with Vince about what had been happening on the site and why the back of the wheelpit had been dragged out to well over a metre below the level of the stream despite my continually requesting that only a small machine be used under my supervision.

1999 February 1: Site meeting with CCW, Ceredigion and the Environment Agency. Vince on a pre booked vacation.

SJSH: 12 Aug '99.