CONFLICTS IN THE RECLAMATION OF ABANDONED METALLIFEROUS MINE SITES IN THE UK[1]

by

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Abstract. Abandoned metalliferous mine sites are sources of heavy metal pollution and are also landscape scars. A large number of these sites are to be found in Wales and are becoming the latest focus of attention in a long running programme of reclamation of industrial dereliction. Interest in the sites is growing however because of their ecological and historical value and reclamation schemes are having to be designed to take account of the views of these special interest groups.

Additional Key Words: ecology, industrial archaeology, interpretation.

"The grass, forerunner of life has gone,
But plants that spring in ruins and shards
Attend until your dream is done":

Gordon Bottomley
To ironfounders and others.

Introduction

Wales was a major centre of metal mining in the United Kingdom, producing about 25% of the UK's lead and 40% of its zinc between 1845 and 1930 (Lewis 1967). Copper was also a major product and silver and gold were produced in smaller quantities. Many mines were small. The old County of Cardiganshire in Wales which accounted for between 7 and 9% of the UK's production of lead between 1840 and 1880 had over 200 small mines (Burt et al 1987). There were however some large mines in Wales. Parys Mountain, worked for copper since Roman times by open pit and deep mining methods, is estimated to have produced 130,000 tons of copper metal from around 3 million tons of ore (Williams 1980).

The mine is however by no means exhausted. In 1989 a shaft is being sunk by Anglesey Mining, a subsidiary of Imperial Metal Corporation of Vancouver, to prove an orebody and hopefully herald the start of a new era of mining at this site.

Site characteristics

Water power was the major means of driving machinery in the metal mines of Wales and although coal-fired engine houses were introduced at many

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sites during the nineteenth century they were not always a success. Poor communications with coal producing areas were probably a significant factor in the case of many of these failures to take advantage of technological advance. The large scale use and reliance on water resulted in ore processing facilities being sited near rivers. Considerable skill, ingenuity and effort was required to construct leats, dams and tunnels in order to link catchments and control water flow. Legal disputes over water rights must have been as fierce as those over mineral rights. Because of all this work the mines affected a much greater area of land than the actual site of extraction and processing.

The fortunes of the mines were forever fluctuating in response to world metal prices and as a result mine structures were continually being adapted, abandoned or renovated. Spoil disposal always has been a problem, and on cramped sites mine spoil and process waste were often deposited on previously used areas, obliterating shafts, buildings and many other features. As a result there is a legacy in Wales, which is repeated elsewhere in the UK, of:

* evidence of pre-christian working at many sites.
* substantial remains of seventeenth and eighteenth century working at some sites.
* remains of nineteenth and early twentieth century workings at most sites which were worked in this period.
* artefacts left underground - some substantial pieces of machinery such as water wheels.
* artefacts above ground, some covered by waste, other not so covered. Some of these would be of biodegradable material such as wood or leather.
* open shafts and partly filled or covered shafts.
* surface features in the surrounding areas, packhorse trails, tramways, railways, leats and so on.

A further important feature of these sites is that having been abandoned eventually, and lying in remote areas, that is remote in UK terms, they have provided opportunities for refuge for wildlife when surrounding land was being used for agriculture, forestry or development. In addition these sites contained materials with unusual properties, high or low pH and high levels of metals for example, and these conditions, coupled with little or no disturbance, created situations where rare plants would become established. Heavy metal tolerators are a particularly important group of such plants, other rare higher and lower plants can be found in the sites, expecially in limestone areas.

Open shafts and mine workings in the UK have also become colonised by bats which are now a protected species, and hence have to be given special consideration and accommodated in any proposal which could involve their disturbance or changes in their environment. Closing of shafts and adits can change air flows in mine workings for example.

Areas of conflict

Abandoned metalliferous mines are obviously a cause for concern because they can be dangerous and are a ready source of heavy metals which will degrade the environment. Because the processes used at the oldest mines were particularly inefficient it is not unusual to find amongst their waste dumps tailings containing as much as 5% of lead and 12% of zinc. Quite small mines, occupying say 5.0 hectares or less can therefore be significant sources of pollution locally and should be reclaimed on this account. Yet it is these small sites that are frequently found to be the most interesting on archaeological and ecological grounds. Of course the larger more modern sites of the twentieth century pose the bigger threat in terms of pollution overall, but unless they have had a long history of working, the conflict between the "reclamation brigade" and

the conservationists is nothing like as intense as in the other category when a reclamation scheme is being considered.

Conflicts between these opposing groups can occur at different levels and for different reasons. The main purpose in carrying out a reclamation scheme is public protection, that is;

* removal of a source of pollution,
* reduction in the risk of personal injury to uninformed or chance visitors,
* landscape improvement.

To achieve these aims site regrading, control of surface and perhaps underground waterflows, demolition of unsafe structures, shaft and adit treatment and finally stabilisation by means of surface capping and vegetation all figure to a greater or lesser extent in a reclamation proposal. Clearly a straightforward, no nonsense, wipe it all away approach has some appeal - speed and probably economy - but is insensitive to other interests, for example:

* earthmoving and drainage works in areas of high wildlife value,
* earthmoving and drainage works in areas of high industrial archaeological value,
* shaft capping where bats are involved,
* shaft capping where the shafts are of industrial archaeological importance,
* demolition of insecure but interesting structures,
* introducing a stable but bland vegetation cover.

Interestingly further conflicts then arise between the parties involved:

* underground workings are attractive to cavers who see industrial archaeology as an added bonus, but they disturb the bats,
* industrial archaeologists wish to see remains stabilised, walls repointed (using the correct mortar of course) shaft collars repaired and so on, but frequently these featues support the rare plants which are of interest to the ecologist. The situation becomes even more complicated when lime tolerant plants establish themselves in the mortar of old mine buildings in Mid-Wales where acidic rocks and soils predominate.
* Some schools of thought would have nothing done at all at these sites, others view the sites as assets to be interpreted and developed as areas of historical interest for the benefit of the general public.

In order to resolve these conflicts it is clear that the reclamation design team needs to have a detailed knowledge of the site. It is common now for the site investigation teams to include an industrial archaeologist, ecologists, soil scientists, engineers and landscape architects, much the same sort of team as would be assembled for the assessment of a new mine.

At the preliminary design stage this same team, ideally, would also be advised on the appropriate level of afteruse for the reclaimed area. New people bringing to the team expertise in tourism, so that a detailed brief can be prepared for subsequent stages of reclamation, interpretation and possible development.

Our philosophy at RML is that at the end of the day every interested party has to "come away" with something, the alternative is an impasse, non-cooporation by one or more groups, and a final design which is forced through by authority after long delays. The design team therefore has to be innovative, constantly positive in its approach, long suffering and above all patient.

Minera Lead Mines

The reclamation of Minera Lead Mines near Wrexham in North Wales,Figure 1, contains all the elements and factors mentioned earlier, especially prolonged use,

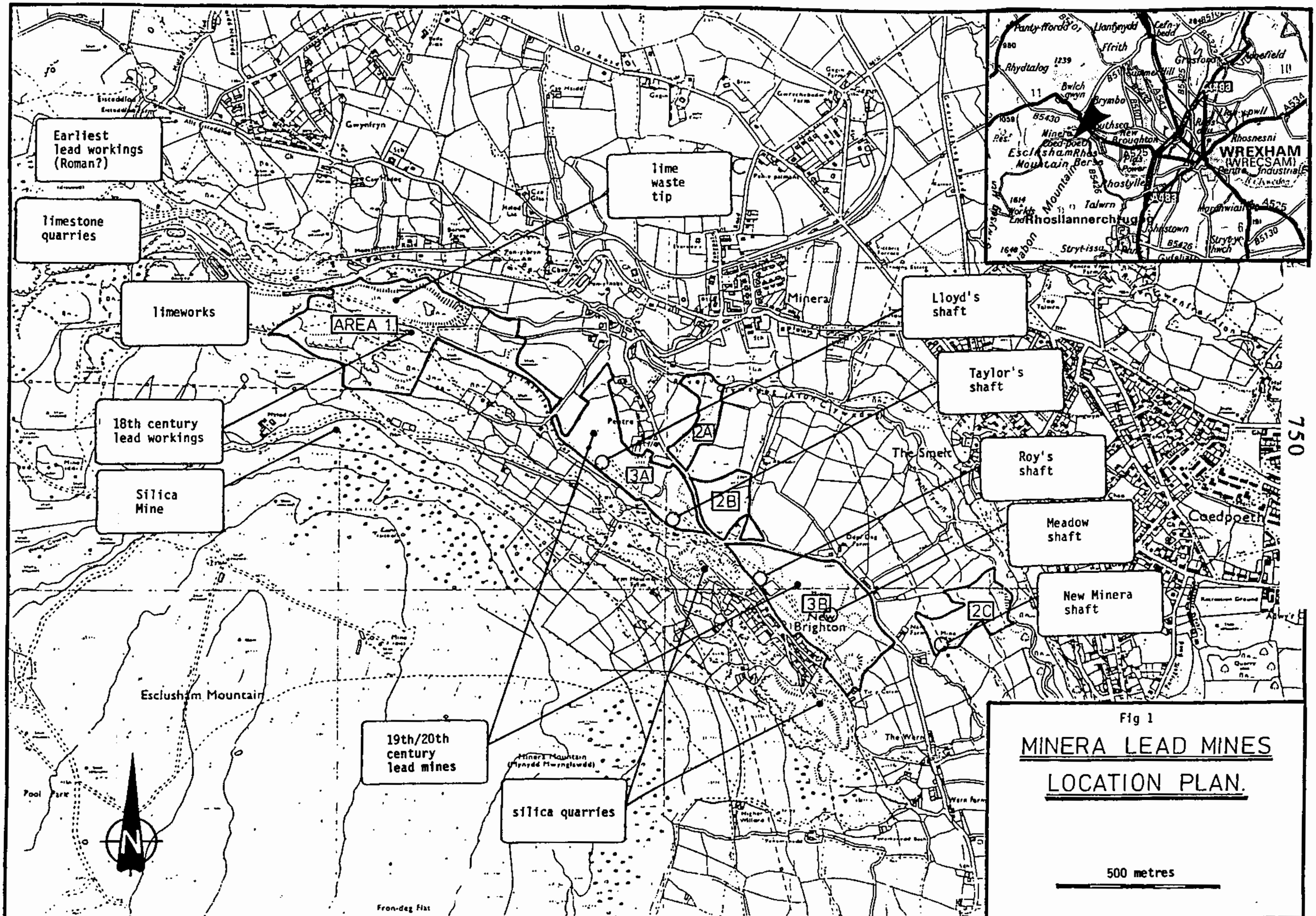


Fig 1

MINERA LEAD MINES

LOCATION PLAN.

since the Roman occupation, and a great deal of covering-over in successive periods of activity from the 14th Century onwards.The district has been extensively worked for lead, zinc, limestone and silica. The value of lead extracted alone has amounted to some £60,000,000 at current prices.

Consideration of a reclamation scheme at Minera began in the early 1970's, progress was slow, pending the results of vegetation trials, land acquisition by the local authority, Wrexham Maelor Borough Council, and most importantly, the inclusion of metalliferous mines in the Welsh Development Agency's programme of reclamation of derelict land.

During these years knowledge of metal tolerance in plants and related topics grew, and an increasingly more sensitive approach was looked for in the design of reclamation schemes. In many respects it was fortuitious that the reclamation scheme at Minera did not go ahead in the early years, much of what we now regard as of value and interest would have been lost. In 1986, design work was preceded by a very detailed site investigation, an assessment of the ecological and landscape value of the site and the likely level of industrial archaeological interest. The total scheme was divided into 2 phases with the areas which were the worst "polluters" and (hopefully) the least complicated archaeologically dealt with first. In the event, during the phase 1 works, the remains of an interesting halvans plant were found beneath tailings, figures 2 and 3. As a result of this and other finds, careful digging in the phase 2 area, where many more finds were expected, confirmed the positions and levels of buildings and other features. Figure 4 shows the difference in detail contained in Ordnance Survey maps for 1899 and 1966, and can be compared with our scheme survey of the same area, originally at 1:500 scale, figure 5.

This level of information was used in the design of the phase 2

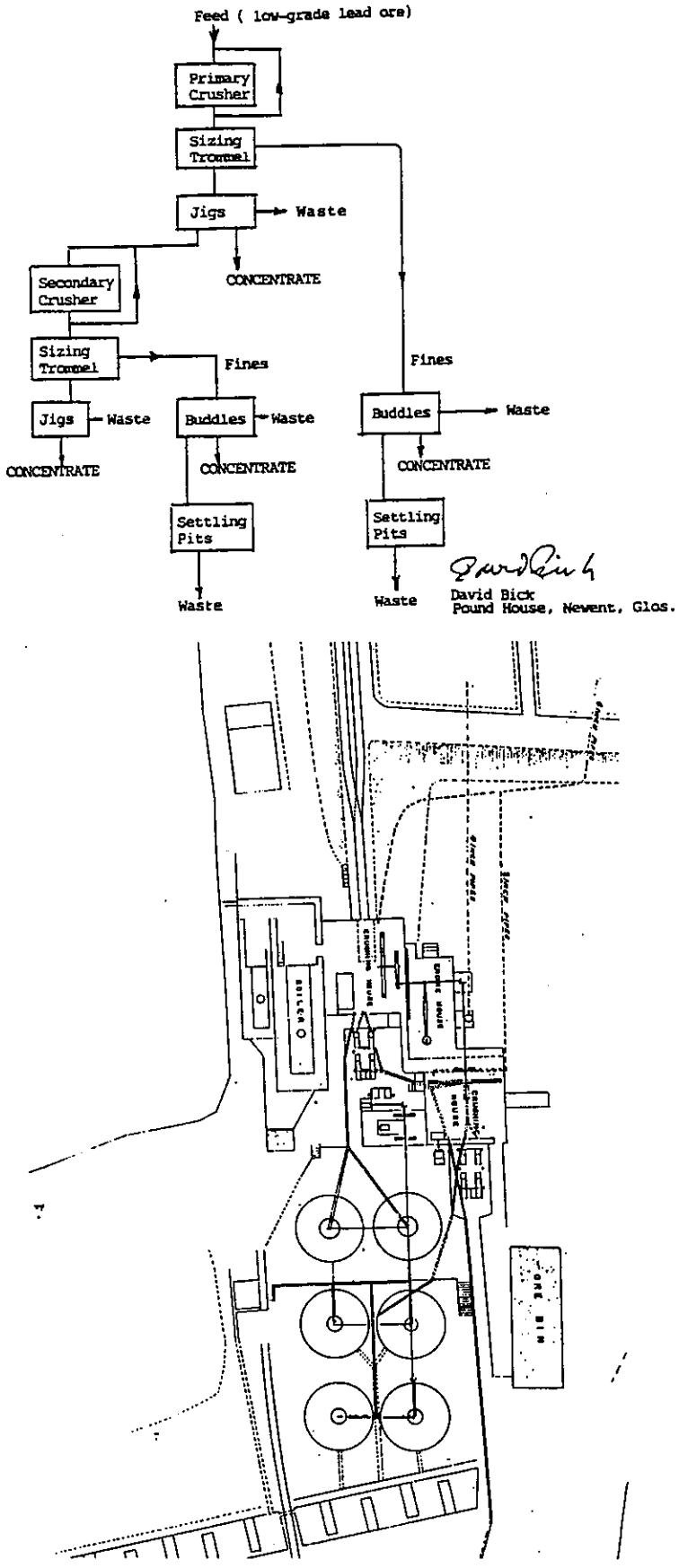


Figure 2. Minera halvans plant. Interpretation of 1988 excavations by David Bick (above) based on 1874 layout (below)

Figure 3. Minera halvans plant.
1988 excavations, looking towards the waste heaps which ran down into the valley bottom, these were cleared back to original soil in the reclamation scheme.
Remains of timber frames, channels etc. were widespread, possibly because the toxic metalliferous wastes inhibited bacteriological action.

earthmoving and drainage works which of necessity are far more complicated than those normally encountered in a reclamation scheme. Other novel features of the scheme were;

* areas of wildlife interest, particularly damp willow woodland with a rich ground flora, including orchids, were protected by excluding all civil engineering plant,
* cuttings of metal tolerant willows were taken for planting in the final stages of the scheme,
* the metal rich tailings were brought together in selected areas and sealed against ingress by downward percolating rainwater by using polythene sheeting (phase 1) and sheeting or bentonite slurry in a thin colliery spoil layer (phase 2).
* colliery spoil from a nearby derelict coalmine was used as capping material except in steeply sloping areas (phase 1) where sites were cleaned down to uncontaminated original ground.
* detailed instructions were prepared for the benefit of site supervisors and contractor's staff on the methods to be adopted in excavating around industrial remains.
* the land drainage system was designed to make the best use of old featues such as leats, channels and reservoirs, so that interpretation of the industrial remains would be easier.
* a special study was carried out into methods of accommodating the competing interests involved around shafts. 43 known shafts lie within the scheme boundaries, we believe the actual member could be double that. Figure 6 and 7 show a few pages from our "design manual" dealing with the treatment of disused mine shafts, which has been well received by environmental bodies and industrial archaeologists.
* a master plan was prepared to ensure that the brief for the reclamation scheme fitted the overall concept of creating at least a country park with

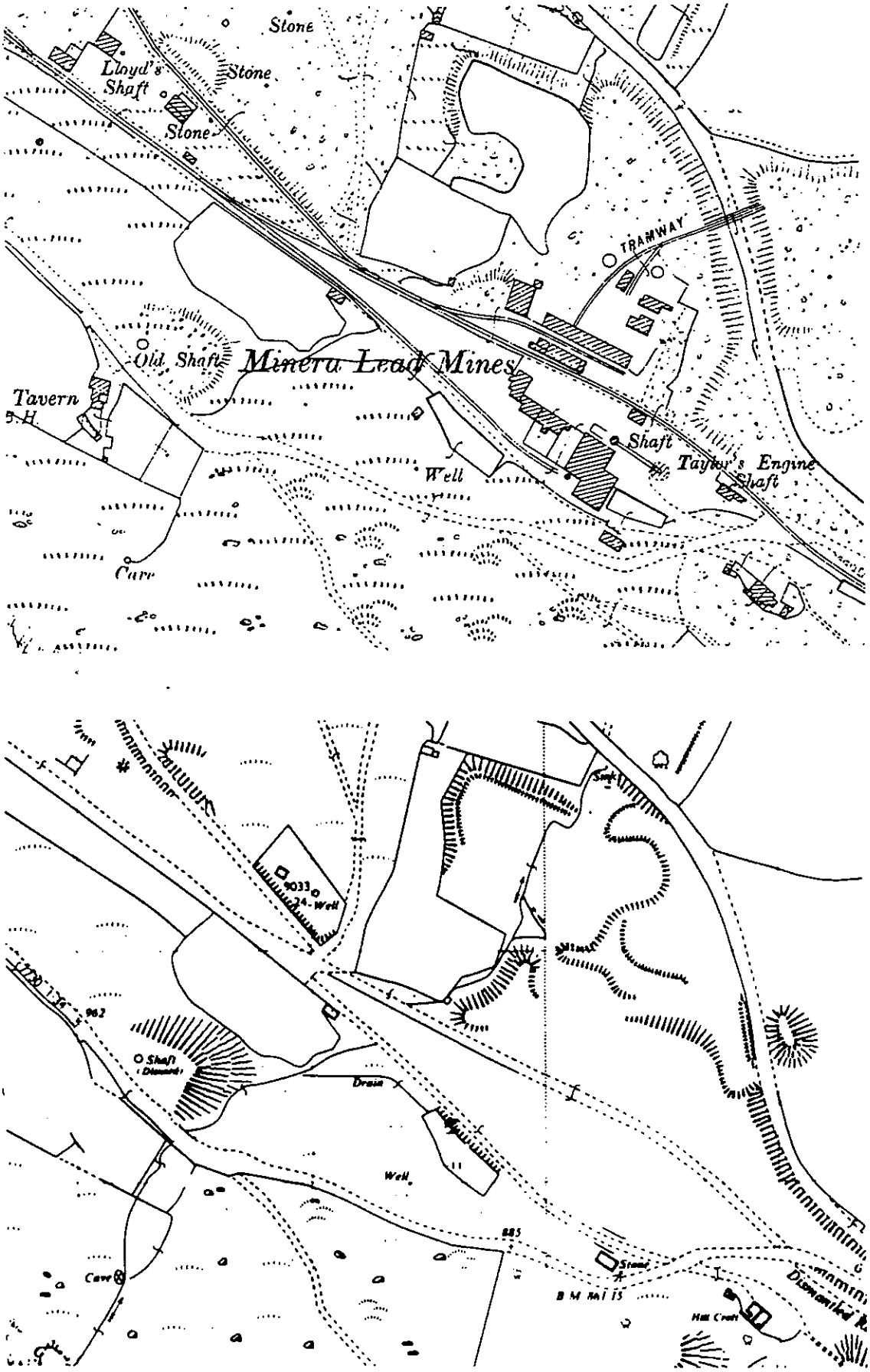


Figure 4. Taylor's Shaft area of Minera, as recorded by the Ordnance Survey in 1899 (above) and 1966 (below).

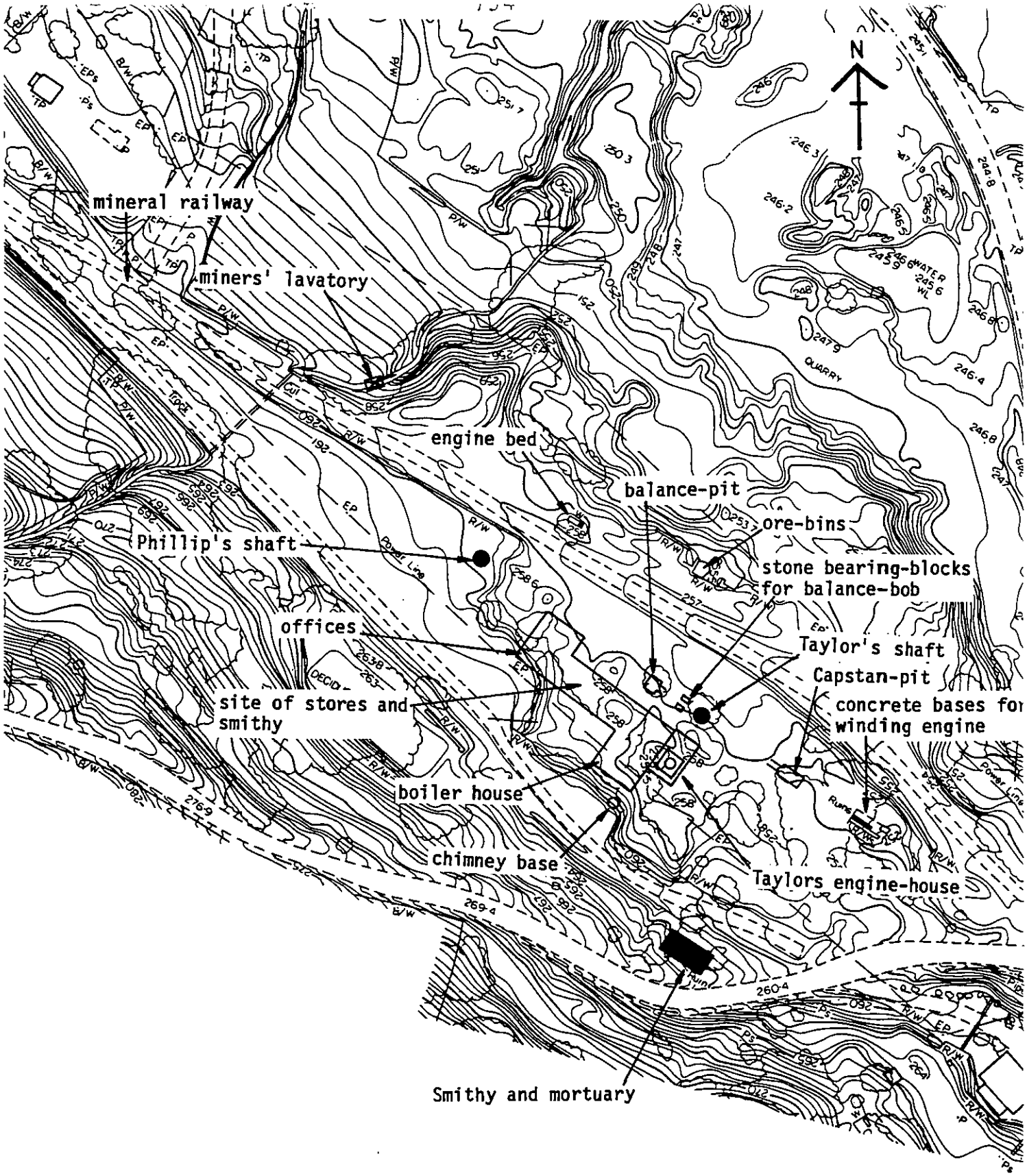


Figure 5. Engineering survey of the Taylor's Shaft area marked up with features of interest.

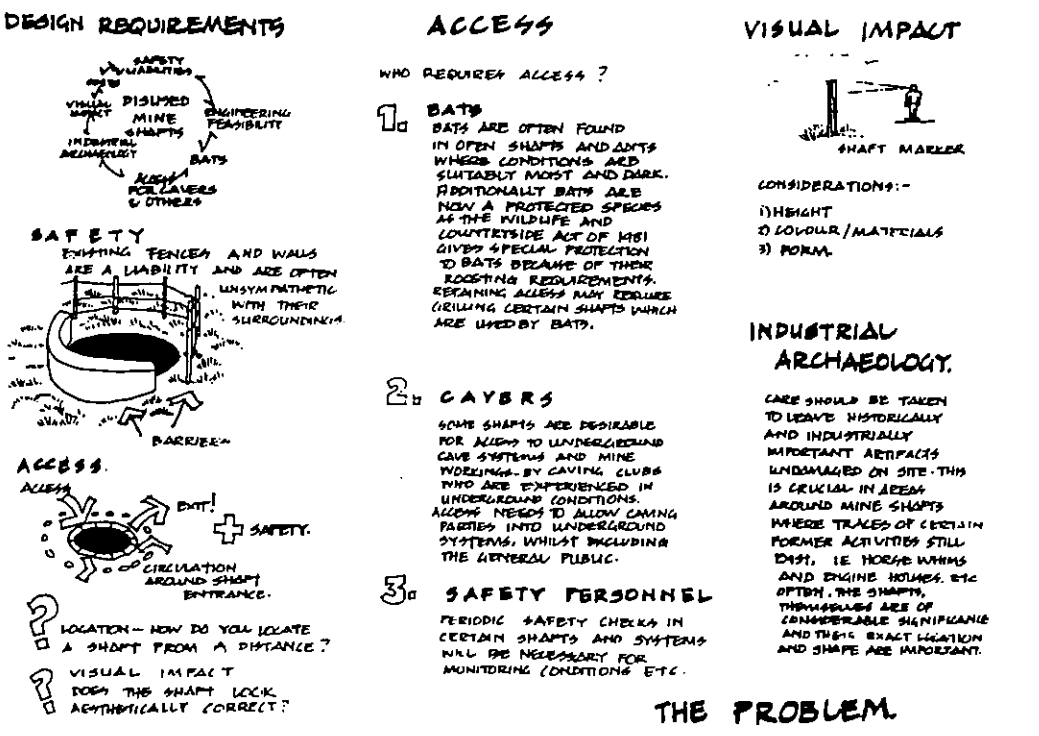
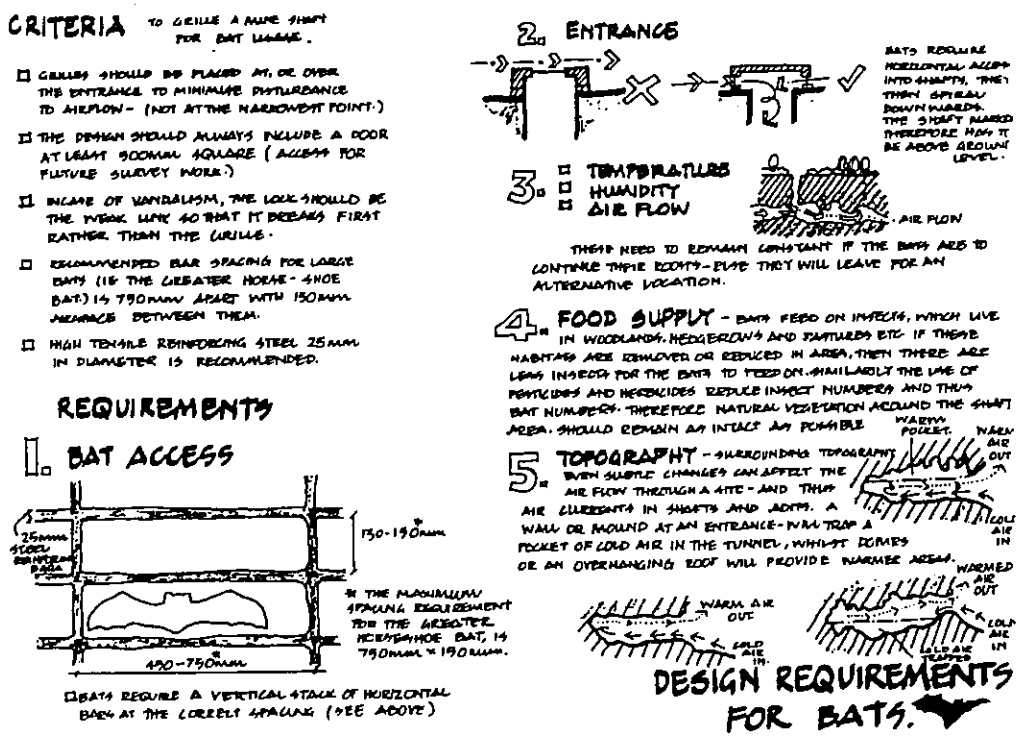


Figure 6. Disused mine shafts 'The problem' and 'Design principles'.



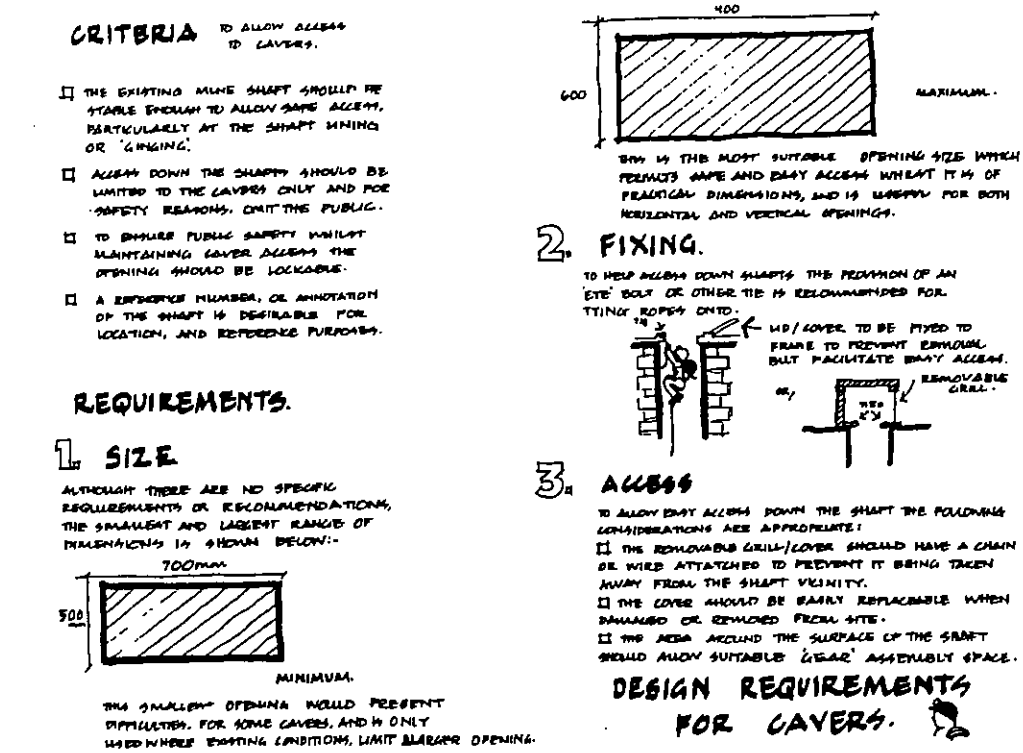


Figure 7. Disused mine shafts 'Design requirements for bats' and 'Design requirements for cavers'.

metalliferous mining as its major theme, and if funds permit, a major outdoor mining museum.

Phase 1 engineering works were completed in 1988 at a cost of £600,000. Planting of the reclaimed area is in hand in the winter of 1988/89. Phase 2 engineering works estimated to cost in excess of£1,000,00 will be carried on in 1989 with final planting to follow. Both grass and trees will be maintained for 3 years as part of the reclamation scheme, funded by the Welsh Development Agency, and will then become the responsibility of the Borough Council. Final figures on the costs involved in accommodating the special interests of the preservationists and conservationists will probably not exceed 4% of the cost of works, £65,000. The cost of providing advice over and above engineering and landscape design, costing about 8%, is a further 1%, £16,000.

Conclusion

It is important that abandoned metalliferous sites are reclaimedsince they can create serious environmental problems, however competing interests can make the task of reclamation difficult. A multi-disciplinary approach, careful reseach and a clear indication of the likely level of afteruse can produce a worhwhile and sometimes exciting result for a modest increase in cost.

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