Medieval & Post-Medieval Industry Scheduling Enhancement 2011-12

Part 01: Report & Gazetteer

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

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Part 01: Report & Gazetteer

Project No. G2156

Report No. 1052

Prepared for: Cadw

April 2012

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Cover Image: Llanengen Windmill (site 21)

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Published by Gwynedd Archaeological Trust
Gwynedd Archaeological Trust
Craig Beuno, Garth Road,
Bangor, Gwynedd, LL57 2RT

Contents

Figures and plates

ARCHAEOLOGY OF INDUSTRY 1000CE TO 1750CE IN GWYNEDD

Introduction

Cadw has grant-aided Gwynedd Archaeological Trust to carry out a desk-top study of the archaeological evidence for industrial sites in Gwynedd within the period 1000CE to 1750CE, excluding transport.

Acknowledgements
The work has been undertaken by David Gwyn of Govanon and Andrew Davidson of Gwynedd Archaeological Trust. The authors are very grateful to Peter and Elizabeth Crew for all there help identifying ironworking sites within Gwynedd.

Methodology
Sites were identified in the Historic Environment Record held by Gwynedd Archaeological Trust, and the National Monuments Record held by Royal Commission on Ancient and Historical Monuments in Wales. This was supplemented by a review of the secondary literature, which provided a context for the sites, and led to the identification of additional sites.

A gazetteer of sites was created, and sites were then assessed for archaeological significance according to the criteria used for scheduling ancient monuments. The more significant of the sites were visited to assess their condition on the ground. The assessment has been based on the above ground remains and known below ground remains. The potential for buried archaeology has not been taken into account, as this is largely unknown, and would require intensive evaluation to ascertain.

Historical context

Gwynedd is rich in minerals and useful earths, and has a long, if exposed, coastline. These factors ensured that it saw some industrial exploitation in Prehistory and in the Roman period, and were crucial to its remarkable entry into the global economy in the 19th century. In the medieval period, there were fewer factors to encourage investment in the area; demand for copper was not high, demand for lead could be met by areas such as north-east Wales, which was situated significantly nearer to the merchant capital and military organisation of Chester. Gwynedd's market towns were small and remote from each other, and from the 13th century to the late 15th, political conditions were unstable.

The passage of the Laws in Wales acts in the 1530s and the rise to prominence of a native-born gentry class who were also at home in England and who were able to make their way in parliament, commerce and the church, made it possible to attract investment and specialist knowledge. Even so, the changes were neither considerable nor sudden. Leland in the 16th century describes Gwynedd as a marginal economy; he occasionally comments on timber resources, and observes that Edeirnion is a good place for horse-breeding (78) but is dismissive of the fairs and markets of Gwynedd - Dolgellau is 'the best village in this commote' (77), Bala a 'little poore market (78), Bangor 'hath ii fayres a yere, but skant a market every weke' (80-81), Pwllheli 'a poore market' (88). In *Henry VIII*, written in 1613, Shakespeare refers to Caernarvonshire as the meanest of all the king's lands (Act 2 sc. 3, l. 48).

The 'old dissent' of the Quakers also provided both capital and expertise for the iron industry of Merioneth, and it is likely that the industrial history of Gwynedd would have been very different had not many members of the Society of Friends from Gwynedd emigrated to America (Rees 317-328).

Existing studies of the process of industrialisation in Gwynedd have stressed both the suddenness of the industrial 'take-off' in the late 18th century and also the *longue durée* which contributed to it. Dodd (1951) considers North Wales as a whole, the former counties of Anglesey, Caernarvonshire, Merioneth, Denbighshire, Flintshire and Montgomeryshire, and describes the period between the coronation of Elizabeth I in 1559 and the accession of George III in 1760 as the 'old order', which had neither seen nor promoted significant change. Gwyn 2006 analyses a more restricted area, the north-west quadrant of Wales, where he concludes that the level of change from the mid-18th century onwards was truly revolutionary in terms of scale, in terms of the area's entry into world-markets and in terms of its acquisition of new technology and different types of capital formation, but did not mark a complete departure from existing traditions of working the landscape.

Archaeological studies of pre-18th century industry in other marginal areas have suggested that the 'industrial revolution' of the Hanoverian and Victorian periods did indeed have deep roots. The series of studies of the Tameside area produced by the University of Manchester Archaeological Unit have stressed that the industrialisation of textile production in the north-west of England in the 19th century is the culmination of a long process in which environmental factors such as rainfall were important but that social factors such as the weakness of Manchester's guilds were also significant. Rynne 2009 outlines the small-scale pattern of mineral exploration and exploitation in Ireland under both the Gaelic lords and the Anglo-Normans before the Tudor re-conquest, and the effects wrought by the introduction of the blast-furnace to Ireland *c.* 1590.

However, 'industry' in the sense of a commercial activity funded by liquid capital and distinct from the agricultural economy does not make much impact in Gwynedd before 1750. Bob Owen notes

> The farmer was also the quarryman and used to go to fetch a car llusg-full of rock from the farm exactly as if it were a load of marl or gravel ... They dug a hole here or a hole there, and worked without considering the whole lie of the rock (Owen 54-5).

Sources

By the second millenium CE, documentary evidence becomes available. Sources include monastic charters with rights of mine, and royal records. Travellers' accounts become available from the 16th century onwards.

Existing archaeological studies

Whilst there is an abundant corpus of medieval archaeological studies in Wales, the emphasis hitherto has been strongly on high-status sites and the agricultural economy of the countryside. Other than the work of Crew, Davidson and Gwyn (see bibliography), there have been few attempts to consider other forms of economy, relating to, for instance, mineral extraction, textile production and transport.

In addition, considerably less work has been carried out on the period from (very roughly) the Glyndwr rebellion to the 18th century, other than on churches, *plasdai* and the larger farm-houses. This period is arguably the least researched in Welsh archaeology, and as a result understanding the context of the slow growth in industrial capacity from the 15th century onwards is made the more problematic by the fact that comparatively little is known about the growth of towns, about links with England and elsewhere, about trading patterns.

Stone and Slate Quarrying

The archaeology of quarrying in the medieval period has been little researched, and it is not clear on present knowledge what should be sought in a potential site. There is also the likelihood that quarries will have been re-reworked in post-medieval times. A possible indicator of early date is the lack of evidence for blasting.

Quarrying for building stone

The building projects that followed the Edwardian conquest required building stone on a significant scale; in later years, repairs to castles and town walls caused quarries to be opened or revived.

At Conwy it seems probable that the hard Silurian grit of which the castle walls and some of the older buildings in the town are built was quarried locally; Neaverson discounts the possibility that it was boated from Deganwy (Neaverson 45). A map of 1776 shows 'an old stone quarry' at SH 774782 (Bangor ms 2383). One face is visible, at SH 7768 7717 but the quarry floor is now occupied by modern buildings.

Upstream, and on the basis of excavation carried out in 1963, LAS Butler suggests that Maenan Abbey was largely built from the shale deposits to the east of the site (Butler 1965). Later exploration suggested that some stones were imported – some robbed from Kanovium, and sandstone brought in from either Cheshire or Benllech (Butler and Evans 1980). Maenan abbey itself became a source of stone on its dissolution.

The same fate befell Llanfaes. Accounts prepared for the repair to Beaumaris town walls in the 1530s indicate that some of the stones came from the 'priory', then recently dissolved and two quarries, one possibly at Porthaethwy, the other at Nant y Porth (Knoop and Jones 1935, 59-79).

Caernarfon castle is mainly built of carboniferous limestone, with some Carboniferous sandstone and a lesser amount of grey grit. Documentary sources confirm that it was supplied by water from three sources in 1305, a 'black stone' (*petra niger*) quarry, a freestone quarry and a quarry for lime-burning stone, and that in 1316-1317 masons were receiving stone from three quarries, one *ad finem ville*, one near Bangor at 'aberputh' or 'Pont Meney' (the temporary wooden bridge over the straits) and one in Anglesey (Taylor 91, 94). Greenly believed the limestone came from Penmon, given the scale of construction, and the sandstone from Penmon or from any one of a number of places along the Menai Strait, since:

> about half-a-mile west of the Tubular Railway Bridge, it occurs on both sides of the Strait. On the Anglesey side, at Pwll-fanogle, a little way up the stream, which is suggestive of 'Aber-pwll,' though a place of that name is mentioned as in 'Bangor maenol'. On the Caernarvonshire side, between the Bridge and Vaynol Park, which would appear to be 'Vaynol near Bangor'. Thence north-eastwards, almost anywhere on the Caernarvon side, as far as Gored-y-gut, Bangor, but not further.

The grit Greenly suggests came from Twthill, though he also indicates ancient quarrying on the hill at Coed Helen; both, as he points out could be considered *ad finem ville*. Of the town walls, he considered that the limestone came from the Vaynol cliffs, west of the Britannia bridge, and a single block from the olivine-dolerite which runs into the sea at Llanfair-isgaer (Greenly 50-53).

Beaumaris castle is also built of Carboniferous sandstone from Penmon and carboniferous limestone, possibly from Penmon, though Greenly favours a site north of Benllech. Metamorphic

rocks may have come from a quarry at Pen y Parc (Greenly 53-55). The freestone which arrived at Beaumaris seems to have come from the same source as Caernarfon (Taylor 110).

For Harlech, limestone came from Anglesey and Caernarfon, freestone was quarried at Egryn, and some of the building stone may have come from the rock-cut castle ditch (Taylor 66-67).

Outside the bastide towns, it is unlikely that later building work required significant quarry working. Evidence suggests that most dwellings were timbered on a stone first floor, as at Aberconwy house. The Glyndwr rebellion and the civil wars depressed construction into the 15th century. High status structures from the later revival of the area's fortunes such as Holyhead church make use of locally-dug stones or fieldstones, or local schist. Bangor cathedral seems to be built of conglomerate from Menai Strait and from stones brought in as ballast.

The older houses in Bala and Dolgellau and Merionethshire generally seem for the most part to use undressed field stones obtained locally. There is little likelihood of establishing quarry sites in the southern part of Gwynedd.

In Merioneth, two quarries are believed to have been worked for freestone in the medieval period, Egryn (SH 609 207 C) and Byrdir (SH 596 243). These, it has been suggested, supplied stone as far north as Llanarmon in Llŷn and as far south as Llanbadarn in Ceredigion (Palmer 2007).

Millstone and burrstone quarrying

It is clear that in several locations in Anglesey and one in Nantconwy, stone was worked to produce both segmented millstones (which are cemented together with plaster and bound in an iron band) and monolithic millstones. These quarries were to be found in eastern Anglesey, mainly from the sandstones around Benllech, and on Conwy mountain. They continued to be used well after the medieval period.

Millstone quarrying in Anglesey at least predates the medieval period since it is evident in later Prehistoric times when it was used to manufacture quern stones. A flourishing millstone industry was well established by the 14th century, from when records survive. Leland asserts that 'There be very good mille stones of white redde blew and grene girths, especially in Tyndaythoy commote' (Smith 1906, 134). These quarries lay within the Carboniferous Limestone belt of eastern Anglesey, stretching from Red Wharf Bay to Llangefni, with a smaller area at Penmon. Millstone quarries were found in both areas, the latter controlled by the Augustinian priory at Penmon. The quarries around Red Wharf Bay and Benllech lay within the townships of Mathafarn Wion, Mathafarn Eithaf and Castell Bwlchgwyn. In 1303 a new windmill built in Newborough was fitted with stones from Mathafarn, whilst in 1325-6 stones for Melin y Bont, Dindryfwl, Bryn Gwyded and Cemais, all Crown mills, were supplied by Einion Felyn from Castell Bwlchgwyn.

Anglesey millstones were exported well beyond the Island, including Dublin, Barmouth, and Chester. The high cost of transport to Chester, at £6 10/-, was slightly greater than the value of the millstones, and indicates the scarcity of sources. The records of the Court of Exchequer contain a number of cases relating to intrusion into millstone quarries. At the end of the 16th century Richard Gwyn, the Crown farmer of the Anglesey millstone quarries, claimed that William Lewys had illegally 'cut and and marked with his own private mark, nine millstones' at Park Elleth on Anglesey (Jones EG 1939, 24).

The stones were extracted in a single piece by hand. A description of how this was achieved reports 'a yard and a half circle was drawn with one edge of the circle touching the exposed vertical face of

the rock mass. This was then worked by hand with chisel and heavy hammer to a depth of 18 inches. Next a hole of chisel size was made in the centre of the circle to the same depth. Now the exposed rock mass was attached on its side face at a point 18 inches from the top and a horizontal slit was worked for a short distance. A heavy iron bar was driven into the centre hole and four men would pull and vibrate it until a rough and total fracture took place at the 18 inch depth level. The crudely shaped stone was then taken to a dressing shed, where it was shaped into a perfect circle' (Davies DL 1997, 118).

Anglesey millstones were relatively soft, and though suited to barley and oats, were less suited to the grinding of wheat. There are records for the replacement of stones at Bodronyn mill and Dulas mill after three years (Carr 2011, 75). French burr stones were found to be ideal for wheat-grinding, and came to be imported in great numbers.

The earliest documentary evidence for millstone quarrying at Conwy dates from 1283, when a millstone was shipped from Conwy to the king's new mill at Caernarfon (NA: E101/351/9 para 47). This is unlikely to be an onward shipping from another source (letter from Dr AJ Taylor to Dr D Gwyn), and it is more likely that this came from a site exploited from the late 18th century onwards on Mynydd y Dre at SH 7698 7786 (Malaws 1990).

It has been suggested, on not entirely convincing evidence, that the Welsh millstone (*uno molendari Wallensi*) delivered to Dublin castle in 1314, was from Anglesey, since it could have come from several sources. A poem written in 1550 requests an Anglesey millstone and there is every reason to believe that there was a recognised industry producing such stones based around Penmon.

Documentary sources rarely make it clear where quarries were located. In 1591 Elizabeth I granted quarries of millstone in Anglesey, Caernarvonshire and Merioneth to Richard Gwynne and by him to Sir William Maurice, which led Sir Richard Bulkeley to re-take possession. Confirmed sites on the evidence of the ensuing law-suit are Fedw Fawr (SH 600 810), Rhos Fawr (SH 4937 8276), Moelfre (SH 510 860), Penrhos near Mynydd Bodafon (SH 48 86), Penmon (SH 637 810) and Pwllfanogle (SH 530 710). Other than Rhos Fawr (see below), these have not been identified archaeologically. Some of them have probably been quarried for other stones as well, such as Fedw Fawr, Moelfre and Penmon, or have been made unrecognisable by subsequent developments such as Pwllfanogle. Sites that have not so far been identified from place-name evidence are Penkraige, Aberypwll, Bottandrecke/Botunderricke, 'Maynoll Bangor', 'Tregarneth', 'Bryan vynydd', Treborth and Bryn Adda (Ward 1990 20-24, 37). Aberypwll may be cognate with Pwllfanogle, Tregarneth is presumably Tregarnedd, and therefore likely to be in the vicinity of SH 474 751. Bryn Adda may be in Benllech and may be Bwlch Gwyn quarry (see below) or Bangor (SH 561 705).

Four sites can be identified archaeologically.

At Rhos Fawr (also known as Penrallt and Brynteg) on Anglesey, the site of the quarry is barely apparent, but it appears to have consisted of shallow workings on a small north-south ridge at SH 4937 8276. It has evidently seen much change since Tucker described it in 1980 as showing 'the most extensive hollowing.'

Nearby at Bwlch Gwyn (also known as Graig and as Ynys), to the east of Benllech, a series of single faces are evident on the south-eastern side of a shallow ridge. The site is now a caravan park. The clearest of the quarry faces is at SH 5088 8194, approximately 3m high. A number of millstones are preserved as features on the site, and a 19th century dwelling 'Millstone cottage', formerly 'Chwarel', was identified at SH 5073 8189.

Another is situated at Gors Goch (SH 4942 8091, also known as Llyn Cadarn and Tan'rallt), where a face has evidently been quarried and there are traces of dressing immediately down-slope. This was operational until around 1910, and it has been suggested that millstones here were made by shaping them while still attached to the rock (Tucker 1980). Greenly states that by 1919 these two larger quarries were seeing little use (1919, 860). Millstone rough-outs were noted at both of them.

The fourth is on Conwy Mountain (SH 774 782) in Nantconwy, which is probably to be identified as the source of the stone sent to Caernarfon in 1283. However, this site was re-worked in the late 18th and early 19th century when war with revolutionary and Napoleonic France made it impossible to import stones from la Ferté sous Jouarre in the Marne valley.

Slate Quarrying

It is clear from documentary sources that the Gwynedd slate industry, which had been active in the Roman period, was revived in the early second millennium CE. Slates have been recovered from princely *llys* sites at Newborough and Abergwyngregyn.

The industry is likely to have been given a boost by the Anglo-Plantagenet conquest. The massive programme of castle-building in Wales initiated by King Edward I from 1277 onwards made considerable use of slate; of the bastide towns established once his campaigns were over, Conwy struck a French visitor in 1399 as remarkable for its use of roofing slate (Taylor 1986; Lambeth Palace Library: ms 598, fol. 79r/17r).

Slates from Wales also came to be exported to the western counties of England – Cheshire, Shropshire, and the hinterland of the port of Bristol, as far as the borders of Berkshire and Wiltshire – and to Ireland, through Dublin and Carrickfergus, Carlingford Lough, Ardglass and Strangford Lough. It is not clear to what extent Gwynedd dominated the market, as there is evidence not only that the Pembrokeshire quarries were also active but that Welsh slate also had to compete with those of Cornwall and Devon (Lorigan 5-6). These quarries seem mainly to have supplied the south coast of England and even exported to Normandy, though Belgian and Breton quarries also added to the mix. Stone slates from Peterborough were extensively used in the east of England, though Collyweston (Northamptonshire) slates are often specified. Otherwise, building accounts rarely specify a source, describing them only as (for instance) *sclatston*, or 'tiles called sklates of blue colour' (Jope and Dunning 1954, 209-17, Salzman 1952, 232-5).

In rural Wales, even within what later became major slate-producing areas, slate roofs only spread below the social level of an *uchelwr* in the sixteenth century. The distinctive sub-medieval farmhouses of Snowdonia from this period seem – many of them – to have been slated from the start, though a slated house was a rarity even in the parish of Ffestiniog in the 1570s (NA: SC12/30/24, f. 167). There is evidence that the trade increases significantly in the early 18th century, doubtless reflecting the more settled times after 1688-1690 and the phenomenal growth of Dublin and other Irish towns (Jones 1997 chapter 1).

Locating early quarries is problematic. Very many sites have been swallowed up by later workings, and pre-1750 quarries were probably for the most part only worked on an as-needed basis. Aberllefenni quarry claims a tradition of extraction to the 14th century and histories speak of the quarry as 'operating' when Plas Aberllefenni was re-roofed in 1500 but it is highly unlikely that this refers to more than an occasional use from a known source. As an example, documentation refers to the purchase of 1,500 slates at Llechan in Dyffryn Conwy in 1687-8. The name, which is attested in the 15th century, implies that that it had long been recognised as a source of slate, and it is quite possible that at various times it provided part-time work for a few men (BU: Baron Hill 4725).

'Quarries of slate and stone' are mentioned in the will of William Vaughan in 1677, possibly the small quarry operated at Trefri on the Dyfi estuary which was active in the 19th century (NLW: Peniarth DA383).

The political settlement and the years of peace that followed 1690 led to significant urban growth throughout British territories. Quarrying at Chwarel Fawr, near the present Dinorwic quarry, is recorded around 1700 (BU: Bangor ms 8277). By 1738 it is clear that the Cilgwyn quarrymen in Nantlle had developed very effective marketing techniques through trusted factors in Dublin ('for the Small Slates') and London, to the exclusion of Ogwen valley slates (BU Penrhyn 1703). The name *cloddfa Limerick* ('Limerick digging') for a Cilgwyn pit *c.* 1790 suggests that it was well used to supplying the Shannon area and the west of Ireland by this stage (NLW Glynllifon ms 84, ff56v-96v).

The sites of early quarries are sometimes recorded in documentary sources such as parish records, but it is highly unlikely that much evidence will survive of pre-1750 quarrying techniques, given the massive expansion of the industry thereafter.

Metalliferous mining

One of the challenges of interpreting historic metalliferous mining sites in Europe is that in many cases their archaeology sees little change from Roman times to the 18th century; features such as coffin levels are to be found over a very wide time-frame, and fire-setting was used from the time of Diodorus (1st century BC) to the 1890s (Timberlake 1989, 49; Cranstone 1994). Even characteristic industrial-era features such as mine railways, it is now clear, may be a legacy of Roman technology, though technologies such as blasting or the use of flat-rods are known to be distinctive of the period from the 16th century onwards. There is documentary evidence to suggest mining and open-casting to extract ore-bearing rock at a number of locations in Gwynedd within the period 1000-1750CE, but short of finding a worked-out level which can confidently be dated to this period, it is unlikely that rapid field inspection will reveal much that is new.

Lead and silver mining

There is evidence for lead-mining on a significant scale in north-east Wales and in Cardiganshire in the medieval period, but much less for lead-mining in Gwynedd (Lewis 29). It has been suggested that workings at Bwlch y Plwm (SH 627 415) and nearby at Pant y Wrach (SH 617 4902) on the shores of the Traeth Mawr, are of 'great antiquity', and possibly Roman (Bick 13, Coflein 33960), though the proximity of both to the early church at Llanfrothen might suggest that they were exploited in the medieval period.

The Edwardian conquest created a need for lead for roofing and guttering. In 1284 one Reginald of Ludlow was granted rights in Snowdonia for three years, reserving for the king one-seventh plus of the remainder 'as much as he shall need for his works in Wales' (Taylor 115). Within the study area, lead mines were opened, or revived, in two areas – on the western bank of the Conwy valley, and around Llanengan on Penrhyn Llŷn in the 13th (Bennett and Vernon).

The Gwydir ore-field in Nantconwy was revived in the 17th century. Sir John Wynn invited Thomas Harriot, the mathematician and savant, to assay ores from one of his mines in 1618, which seems to have led to workings at Cilcenus two years later, under the management of Thomas Jones, who had experience of smelting in the Halkyn area, and who recommended a foot-blast (Gwyn 1996). The established centres for lead-ore processing lay in north-east Wales, where in 1703-4 the London Lead Company had constructed a smelter at Gadlys on the Dee estuary, and it was to here that the

ore was shipped (Ellis 1998 24-5). Sir Owen Wynn of Gwydir sent a miner to inspect lands for traces of copper and lead near Pengwern in Ffestiniog in 1655; if he took out a lease, the sites may be represented by tips at SH 735436, 743443 and 729433 (*Calendar of Wynn Papers*, 2079, 2084; Bick, 102-40). However, the estate showed minimal interest in its mineral possibilities from when control passed to Ancaster, until the mid-18th century, though there are hints of operation at Coedmawr (SH 772 577 – Bennett and Vernon 1 and 5). Cae Mawr (SH 7550 5743) and Cae'r Hegle (SH 7655 6329) may have early origins (Bennett and Vernon 1 and 5). Further to the north, the Pyllau Cochion or Trecastell workings may be medieval or Roman (Bennett and Vernon 7 59).

By the 13th century, the monks of Cymer abbey were working mines at Penrhyn Du on Llŷn (Timberlake 133-43). The mines were in lease again from 1654 to 1663, when they closed because of the opposition of the landowners, Lord Herbert of Chirbury, Lady Tyrington and Mr Knightley (Rees 474).

Copper-mining

There is strong documentary evidence for late medieval copper mining in several areas of Gwynedd – Mynydd Parys on Anglesey and its immediate vicinity; Beddgelert; Drws y Coed in Nantlle; the Great Orme. However, as the GAT *Gwynedd Metal Mines Survey* points out, 'Pre-Modern mining remains a little-understood area, and constitutes a priority for future work' (GAT report 291, 19). Attempts were made to interest German miners in North Wales' copper resources in 1561 and the Company of Mines Royal were granted rights in North Wales in the late 16th century but seem not to have made use of them (Donald 1994, 96, 362).

It is possible that the Llanberis copper mines were exploited in the 16th century, in that the boat discovered in Llyn Peris in 1979, dendrochronologically dated to 1547-9CE, was found to have traces of charcoal, probably from Cwm y Glo (SH 550 628 C - modern Welsh = 'valley of the coal') which may have been intended for a smelter (McElvogue 1999, 7-8).

Sir John Wynn is known to have carried out trials at Parys. The bog north of Rhosybol (SH 427 895) contains important geochemical and palaeo-environmental information relating to mining and associated pollution (Timberlake, work in progress). A plan of 1764 shows that some working had already taken place (Hawarden RO: D/KK/534, Keen and Kelly mss).

Within the vicinity of Beddgelert, it is possible that the establishment of the priory church may reflect the need to control and manage mineral resources. Until the Traeth began to silt up, perhaps in the sixteenth century, Beddgelert would have been easily accessible by sea. Bick suggests late medieval working at Bryn y Felin, where a long drainage adit is evident, reminiscent of those associated with Sir Thomas Bushell (1594-1674) in Cardiganshire. This site had a dressing plant and stamps, and 20 men at work underground in the 1760s Bick suggests that mining began at Nantmor/Cwmbychan (SH 602 472) in the 1720s. In Nant Gwynant the first known record of mining dates from 1762 (Bick 51, 56, 69).

By the 19th century, there were abundant small scale workings in and around this area, extending as far south as the point where the Afon Glaslyn joins the Traeth Mawr.

Drws y Coed was reputedly worked in the 13th century, and was the site of speculation by the Earl of Powis in the early 18th century (Bick 33, 51, 56).

Sir Thomas Mostyn took out a lease on the lands of Edward Thomas Prees of mines at Maes y Facrell on Creuddyn in 1692, and may have been mining on his own lands as well. Three years later, his son

Sir Roger Mostyn leased existing mines described as 'olde worke' on the Mostyn estate at the south east end of 'Llandudno Mountain' to the London-based Welsh Copper Company and in 1738 the Bishop of Bangor leased mines to Richard Manley and William Manley of Chester and London respectively. Lewis Morris refers to a 'great copper mine at Llandudno ... which now lies under the water' (Williams C, 14).

Another possible area of early mining is Glasdir, north of Dolgellau, where it has been suggested that the footpath, Precipice Walk, is made up of two leats starting from a common point but going in opposite directions, and that they are possibly of Roman origin (Bick 37-40); this view is challenged by Peter Crew. Gwynfynydd mine may have been worked by Cymer Abbey (SH 732 284 – Williams D, 302).

Iron-mining

Rees mentions that Abraham Darby of Coalbrookdale used iron-ore obtained from near Dolgellau, in fact the Tir Stent mine near Cross Foxes, worked until the 20th century. The Quaker network here also established Dolgun furnace and extended to Wrexham, the Ceiriog valley and to the Severn (Rees 320). It is likely that much of the iron-ore used in bloomeries and blast-furnaces in the period 1000CE to 1750CE was obtained from bog sources rather than mining.

Copperas and vitriol

Sir John Wynne of Gwydir explored the mine at Cae Coch in Dyffryn Conwy at SH 775 654 for copperas and vitriol in 1607 (Gwyn 1996).

Ore-processing

The processing of metallic ore into a commercially useful product is one of the few areas of the industrial archaeology of Gwynedd where there are evident links between the archaeology of the later medieval period and the period from 1750 onwards.

Bloomeries

Ten bloomery sites have been identified in the northern part of Coed y Brenin, the lands to the north of the tidal limit of the Mawddach, which historical records, excavation and radio-carbon slag-analysis confirmed were exploited from 1357 and 1399. Records give details of the rents paid to the Crown, and confirm bloomeries at Penmachno (precise location unknown), on the slopes of y Garn in the parish of Dolbenmaen (NPRN 302513, SH 5156 6432), at Bedd Coedwr, Dol Geifeilau, Dol y Clochydd and possibly at Pandyddwyryd in Trawsfynydd. Of these, Dol Geifeilau is under the course of a road and Pandyddwyryd is under the waters of the reservoir.

One, at Llwyn Du (SH 7240 2780), was surveyed and partly excavated in 1997 and 2001, yielding evidence for a large furnace with clay superstructure and a refining hearth within a 15m by 4.5m building, a tank made from sloping stones sealed with clay, perhaps for temporary storage of hot charcoal, and the remains of structural timbers.

The activities of the metal-workers who farmed these sites are set out in documents dating from 1356 to 1419; the records are most detailed for the Dolbenmaen bloomery, and indicate the uncertain economic and political conditions in Wales before and after the Glyndŵr uprising (Crew and Crew 1995).

It is likely, on the analogy of Swedish iron-working landscapes, that smaller bloomery sites remain to be discovered, and it is possible that evidence will emerge for the smelting of iron, lead and copper in the vicinity of other Gwynedd mines where there is a possibility of work having taken place in the later medieval period. However, the phosphorus-rich ores of Gwynedd would have limited the size of blooms which could be made, and after the uprising, they would have become uneconomic. A water-powered bloomery at Dol y Clochydd in Coed y Brenin (SH 734 219), established in 1588, was soon replaced by a blast furnace (Crew and Crew 1995).

This is situated on a narrow shelf on the east bank of the Afon Mawddach under a steep slope. There is no evident sign of the wheel-pit, but its location may be inferred from the blowing arch and the charging platform. A block of haematite, probably from Glamorganshire, has been identified on the site, and there is a scatter of bloomery slag. The furnace itself is 6.5m square. It was only in blast for about eight years, and as such provides unique evidence for a late 16th century blast-furnace (Crew and Williams 1984, Crew 2009).

The next furnace in chronological order was erected by Abraham Darby I, and others of the Quaker ironworking fraternity not far away, at Dolgun to the east of Dolgellau (SH 751 187) in 1717. It was blown out in 1734. Darby had already succeeded in using coke instead of charcoal to smelt iron in his blast furnace at Coalbrookdale. It has been suggested (Cranstone 1989) that a structure adjacent to Dolgun furnace is a coke-oven and that this reflects Darby's involvement here. Without archaeological evidence for stratified coke debris, this cannot be confirmed.

The earliest blast furnaces were developed in Sweden and Germany in the 12th century, and spread to northern France and the Low Countries around the end of the 15th. They were introduced to the heavily-wooded areas of the south-east England in the 1490s. They required substantial investment. Because of their size compared to a bloomery, and because they remained in blast for months at a time, they needed sufficient supplies of iron ore and charcoal, as well as a dependable water supply to operate the bellows, and an organised workforce, a state of affairs which Dolgun exemplifies well. The farm on which it was built was the home of the first effective yearly meeting of the Society of Friends in Wales, and the centre of a network of local Quaker families with access to timber resources and iron ore on their freeholds. The furnace structure partly survives, having been consolidated by the Snowdonia National Park in the 1980s, with the pit for the wheel which operated the bellows (Williams 1978-9; Riden 1993; Thomas 1981-4).

The third blast-furnace, again charcoal-fired and water-blown, has left no known above-ground remains; this was at Eglwysbach in the Conwy valley, built about 1748-50 and abandoned by the early 1770s. As with Dolgun, there were abundant supplies of timber available locally, but the ore that it smelted was Furness haematite. It was situated in what is now Bodnant gardens, though its exact location is unknown – possibly on the site of the later ornamental corn-mill (SH 79- 72-). 'Furnace' survives as the name of a nearby farm. In all probability, it resembled the slightly later Dyfi furnace in Cardiganshire (SN 685 951), now conserved and interpreted by Cadw. Both Egwlysbach and Dyfi were in the hands of the Kendall family, dissenting entrepreneurs who also ran furnaces in Shropshire, Yorkshire, Furness and Cheshire before making the transition from charcoal to coke production by building the Beaufort Furnace in Ebbw Vale in 1779, thereby setting the South Wales iron industry on its path to greatness. It has been suggested (Dinn 1988, 133) that Dyfi, Eglwysbach and Craleckan in Argyll were all built to the same design and by the same labour force. Eglwysbach was built to take advantage of competitively-priced charcoal at a location to which haematite could be easily delivered.

Iron forges

A related site within this part of Gwynedd for which only artistic and scanty documentary evidence survives is a water-driven forge observed by Paul Sandby in the 1770s (Sandby 1776). Riden dates it to around 1720 (Riden 68-9). It is likely to have been situated on the Afon Cwm Mynach (approx. SH 689 193), a tributary of the Mawddach on the evidence of topography and of the Llanelltyd parish census of 1851, which lists a dwelling 'Forge' between Penbryn Melyn and Tai Newyddion (PRO: Llanelltyd parish 1851 census, HO107/2511 Folio 409).

Coal mining

Coal production in Gwynedd has been confined to Anglesey, where the coal-field has been archaeologically examined (Gwyn 2001). It has an attested history of production from 1441. Here, the seams of coal constitute a syncline longitudinally bisected by a boundary fault known as the Malltraeth marsh or Cors Ddygái. In the medieval period this was a long arm of the sea that extended from the present village of Malltraeth to near Llangefni, a distance of 16km, but it was beginning to silt up even before a major water-control system was constructed in the late 18th century. The coal seams run in the same general direction – north-east to south-west – but cross from one side of the inlet to the other and become progressively deeper towards the sea. The earliest evident workings are situated where they were shallowest, at the north-east, whereas the most recent are at the south-west, and in one case actually appear to extend under the sea-bed (Greenly 1919, 812; Williams EA 1927, 38). From the mid-fifteenth century, scattered references to mining appear in estate documents. One specifies that 'no pitt shall be dug in a cornfield, without warning the tenant before the corn is sown', suggesting minimal capitalisation and seasonal work. In 1610 some of the low-lying shafts were flooded as part of a quarrel between two local magnates.

By the early 18th century the area's landowners were becoming more actively involved. Penrhyn Mawr (SH 468 728) was actively exploited by Sir Nicholas Bayly, owner of the Penrhyn Du lead mines on Penrhyn Llŷn as well as of the Parys copper mines elsewhere on Anglesey and collieries in Staffordshire. However, it is not until the late 18th century drainage of the Malltraeth marsh that the industry could develop to any extent.

Because the mines are very low-lying, it is likely that they all have long flooded and there can be little hope of recovering archaeological evidence of the underground workings themselves. Surface features give us some idea what form they might have taken. Near the north-eastern limit of the Anglesey coal-field various trenches and mounds are evident (SH 475 736). The most prominent trench corresponds with where one of the seams outcropped on the surface and may therefore represent the site of a shallow open digging. Nearby are several doughnut-shaped mounds, generally no more than 1m high, which correspond to where the seams of coal lie near the surface. These are likely to be the upcasts of shallow shafts which would be wound by hand-windlass, and may well be the site of the pits flooded in 1610. Archaeologists have too often assumed that shafts such as these are bell-pits – self-contained single workings worked out from the foot of the shaft until the whole excavation threatened to collapse, at which stage another shaft would be sunk nearby. This may be the case here, but it is significant that at the one pre-Modern coal mining site in Britain which has been archaeologically recorded, Coleorton in Leicestershire, active from 1450 to 1600 AD, an extensive surface network of shafts, some as deep as 30m (100'), gave access to interconnected pillar and stall mining. Archaeological evidence of coal-mining techniques from other coal-fields confirms that collieries in the late medieval period had progressed far beyond primitive bell-pits, and that timber-lined shafts up to 30m deep accessing pillar-and-stall working were commonplace by the 15th century. On the evidence of Leicestershire mines, longwall working, traditionally stated to have

begun in Staffordshire in the late 17th century, may date to the Elizabethan period (Hartley 1994, 91-101). George Owen's account of work in Pembrokeshire coal-mines, written in 1602-3, records windlass shafts being sunk to a depth of 20 fathoms (36m – 120') and providing work for 11 underground men (three diggers, seven bearers and one filler) as well as six surface workers (four winders and two riddlers) (Owen 1994, 91-3). This suggests that even a peripheral coal-field had moved well beyond the primitive bell pit system by the early 17th century.

Other upcasts nearby are much more substantial, and are probably the result of winding by horse-whim, a technology first recorded in the region at Penrhyn Mawr colliery in 1744 (UWB: Plas Newydd mss IV 8484). These upcasts are typically 70m or more apart.

Charcoal

Charcoal was the main industrial fossil fuel until well into the 18th century. Timber was burnt for charcoal near where it was cut, as charcoal is easier to move than wood. Typically, hardwood billets were closely stacked on a level floor of earth and ashes to form a conical or domed mound perhaps about 5-12m in diameter and 2.7m high with a central vent for firing (Jenkins 1976, 79-80). Although though no post-medieval charcoal platforms or pits have so far been identified in the region, it is a strong probability that this is only because they have not so far been sought. On the analogy of recent work in Cumbria and Argyll, it is likely that study would yield evidence of charcoal burning (Peter Crew, pers. comm.)

The place-name Cwm y Glo (SH 550 628 C - modern Welsh = 'valley of the coal') indicates charcoal burning, rather than knowledge of coal seams, and it is possible that this may have been to smelt the copper mined at Llanberis, at the other end of the two long lakes, Llyn Padarn and Llyn Peris. A boat discovered in Llyn Peris in 1979, dendrochronologically dated to 1547-9CE, was found to have traces of charcoal (McElvogue ?).

Gloddaeth (SH 803 806 C) also preserves the *glo*-element (Linnard 94).

Woollens and textiles

J. Geraint Jenkins observes that throughout Wales from the medieval period to the 19th century, the woollen industry was the most important industry in Wales (Jenkins 1976, xvii). The introduction of water-power to cloth production begins with the fulling mill in the 13th century, and the place-name element *pandy* is densest in Gwynedd (Jenkins 101-3). It is often said that it arrived in South Wales with Flemish weavers, and Jenkins states that did not reach the north until 1546, when Garthgynfor *pandy* was built in Merionethshire (Jenkins 108). However, Aberconwy Abbey operated fulling mills at Ardda-Darlâs (SH 773 633) and Foelas (SH 873 516) as well as possibly at SH 446 643 around Rhedynog Felen, and Cymer Abbey had a fulling mill at SH 734 192 (Williams 300-1).

A considerable number of possible and probable fulling-mill sites have been identified in Merionethshire from the mid-16th century onwards (Parkinson 1984), but no equivalent comprehensive study, based on place name and documentary evidence, has so far been carried out for Anglesey or Caenarvonshire. Merioneth was second only to Montgomeryshire as a centre of the woollen industry from the 16th century to the 19th, though the development of anything resembling a factory system lies after 1750. The town of Dolgellau was a centre of textile production, and its urban growth in the period pre-1750 may reflect this. Some of its houses seem to include storage space for cloth.

Ship-wrighting

The ship-wrighting creeks where small wooden sailing vessels were fabricated are elusive in the archaeological record, even when they are comparatively well-documented. Leland describes Aberpwll as 'a litle cumming yn for boates by entering of it ynto Meney' (85), and in 1565 a government survey found only one ship registered in present-day Gwynedd, at Conwy.

Milling

Mills – machines for grinding cereal crops so that they may become a food source – have been powered variously by water and by wind in the period 1000-1750CE. The water-mill seems to have arrived in Gwynedd perhaps no earlier than the 12th century, since there is as yet no evidence for earlier mills, unlike Ireland, where mills from the 6th century have been identified (Rynne forthcoming). The horizontal mill was unknown in Gwynedd region, at least in post-medieval times – Lewis Morris (1701-1765), born and bred in Anglesey, who was very well informed indeed in technical matters, was clearly unaware of the technology when he saw one at Douglas in the Isle of Man – NLW Add. Ms 67a, p. 183.

Tide mills functioned at several locations – the earliest known reference seems to be from 1524, to a mill at Tre'r Gof in Anglesey. A *felin heli* (= 'salt mill', signifying a tide mill) is recorded adjacent to Conwy castle and another one has given its name to a settlement on the mainland side of the Menai straits (Williams R, 81). So far only those of Anglesey have benefited from any detailed study, which confirms that they were mainly very small structures using 2m diameter wheels to operate a single pair of stones but that they made effective use of a large tidal range and in one case continued to operate into the late 19th century (Davidson 2000, 29-50).

Otherwise, no water-mill sites from the period 1400 to 1700 have been excavated, but documentary evidence occasionally provides some hints as to how they were constructed and rebuilt. Surviving water-mills are nearly always of 19th century construction, even where there is documentary evidence of a much older mill on the site.

A specification for a post-windmill at Newborough in Anglesey dated 1303 is one of the earliest known in Britain (Salmon 1940), though the evidence is sketchy for later medieval wind-mills. Perhaps as a result of a series of particularly dry summers in the mid-18th century, construction seems to have resumed around 1735 and went on for about a hundred years, giving Anglesey the highest concentration in Wales. A published gazetteer and history identifies the visible remains of 28 wind-corn mills in the island, all of them tower mills, of which one also had an integral water-wheel (Guise and Lees 1992).

Two wind-mill towers from before 1750 survive on Creuddyn. Hen Dwr, also known as Melin Gloddaith (SH 8040 8115) is probably the 'windie milne' built by Sir Roger Mostyn between 1617 and 1642 (Dibble nd). Nearby Glanwydden windmill (SH 8169 8047) preserves a lintel marked 'SRM/068/1704' – presumably 'Sir Roger Mostyn ? 1704'. The remains of tower mills also survive in Penrhyn Llŷn and Eifionydd, though it is not clear how old they are. One is at SH 3060 3209, and was working in 1809-1811 (Hyde Hall 1956, 290). Melin Lleiniau in Llanbedrog parish (SH 3202 3190) is marked on the 1838 tithe map (piece 321); a wind-mill at Nefyn (SH 307- 405-) is attested in 1795 (Pritchard nd, 28).

The mills of Anglesey were assessed in 2001 (Davidson 2001), and an assessment of the mills of Caernarfonshire has been the subject of a separate report in 2012 (GAT Report No. 1042).

Forestry

Leland comments on the timber of Talybont and Penllyn (77, 78) and praises especially the timber of the Lledr valley, Glyn Llugwy, Capel Curig, Llanberis, 'aboute Conwey Abbey' (presumably Dolgarrog and Maenan), and Coed y Parc and Coetmor in the Ogwen valley. In 1739 we first hear of the felling of woods in the parishes along the Afon Dwyryd – Llandecwyn, Maentwrog, Ffestiniog and Llanfrothen (BU: Maenan 419). Thereafter, documentary references indicate an active process of woodland management in coastal or estuarine Merioneth, in the Conwy valley and on the great Arfon estates and on Baron Hill (Thomas C 1971, 303-10; Matts 1977). There is however, no known evidence for mechanical timber sawing in Gwynedd before the turn of the 18th and 19th centuries.

CONCLUSIONS

A review of existing secondary literature and research notes has so far identified a number of possible sites associated with coal-mining, slate-quarrying and millstone-quarrying and quarrying for building stones, as well as with metal-processing, in the period 1000CE to 1750CE. These preliminary investigations so far suggest that such industrial archaeology as is evident in Gwynedd in this period reflects a number of several factors

- mineral extraction that forms part of the agricultural economy
- industrial activity that reflects the Anglo-Plantagenet invasion and the castle- and town-building programmes of the 13th and 14th centuries
- industrial activity that reflects the activities of the religious houses pre-1535
- industrial activity that reflects the role of the gentry and of fluid/banking capital post 1535
- industrial activity that reflects the role of miner-quarryman-entrepreneurs.

However, it is also noted here that medieval industrial exploitation does not always lend itself to the discreet site approach which underlies scheduling as an Ancient Monument, and which is appropriate for large-scale industrial sites from the 18th-20th centuries. On the basis of what is currently understood, medieval industrial sites can in many instances best be understood in terms of a broader landscape context.

Examples might be:

The blast-furnace at Dolgun can be understood in the context of the neighbouring Quaker dwelling, the stream which not only provided the power for the furnace but was also a favourite resort of the local Quakers, and the woods and iron-stone resources which were also owned by members of the Society of Friends.

The Merionethshire woollen industry should be seen in the context of the growth of Dolgellau as a town, its markets and its dwellings, some of which seem to include storage space for cloth.

Monastic industry in terms of the broader landscape owned and managed by the religious houses.

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APPENDIX 1: List of sites

Stone and slate quarrying

34745 Egryn freestone quarry

Stone Quarry Significance: AS

A quarry which is believed to have supplied stone as far north as Llanarmon in Llŷn and as far south as Llanbadarn in Ceredigion. This site is scheduled as part of the Egryn prehisoric and medieval complex of monuments.
Sources: Palmer T 2007: 'Egryn Stone: a forgotten freestone', Arch Camb 156, 149-60.

260880 320650

34751 Stone Quarry, Conwy

Stone Quarry Significance: B

Stone quarry 700m SW of castle. Possible source of stone for medieval town walls. Houses now occupy interior of quarry, but high quarry faces can be seen around three sides. Marked as 'Quarry' on 1900 OS map.

277694 377217

5578 medieval Millstone Quarry (Possible) Pant Glas

Millstone Quarry Significance: B

Also known as Llyn Cadarn and Tan'rallt. The site of the millstone quarry is evident as a quarried face, and in small pits 2m - 5m diameter. The quarry was operational until around 1910, and it has been suggested that millstones here were made by shaping them while still attached to the rock (Tucker 1980). Greenly states that by 1919 this quarry was seeing little use (1919, 860). Millstone rough-outs were noted here.
Sources: Tucker G 1980: Wind and Water Mills (Birmingham: Midland Wind and Water Mills Group)

249420 380910

34753 Millstone Quarry, Bwlch Gwyn, Benllech

Millstone Quarry Significance: B

Also known as Graig and as Ynys. The site of the millstone quarry is evident as a series of single faces on the south-eastern side of a shallow ridge. The site is now a caravan park. The clearest of the quarry faces is at SH 5088 8194, approximately 3m high. A number of millstones rough-outs are preserved as

features on the site, and a 19th century dwelling 'Millstone cottage', formerly 'Chwarel', was identified at SH 5073 8189. Greenly states that by 1919 this quarry was seeing little use (1919, 860)
Sources: Tucker G 1980: Wind and Water Mills (Birmingham: Midland Wind and Water Mills Group)

250880 381940

34754 Rhos Fawr Millstone Quarry, Brynteg, Anglesey

Millstone Quarry Significance: B

Also known as Penrallt and Brynteg. The site of the millstone quarry is barely apparent, but it appears to have consisted of shallow workings on a small north-south ridge. It has evidently seen much change since Tucker described it in 1980 as showing 'the most extensive hollowing.'
Sources: Tucker G 1980: Wind and Water Mills (Birmingham: Midland Wind and Water Mills Group)

249370 382760

34752 Millstone quarry, Mynydd y Dref, Conwy

Millstone Quarry Significance: A

A large open cut quarry, probably to be identified as the source of a millstone sent to Caernarfon in 1283. However, this site was re-worked in the late 18th and early 19th century when war with revolutionary and Napoleonic France made it impossible to import stones from la Ferté sous Jouarre in the Marne valley.
Sources: Malaws B 1990: 'A Quarry Rediscovered', Melin 6, 41-2

249420 380910

21055 Quarry, Llechwedd

Slate Quarry Significance: B

A small single face slate quarry attested from the 17th century. The rock is only suitable for producing small and badly-jointed rock, but the face is of interest as showing no evident traces of blasting. However, a possible drainage and access tunnel (for rail operation?) suggest that the quarry may have been worked in the late 18th or early 19th centuries.
Sources: BU Baron Hill mss 4725.

275700 375500

Metalliferous mining

37756 Bwlch y Plwm Lead Mine, Llanfrothen

Lead mine Significance: B

An extensive series of lead adits worked in the Modern and Industrial period, and possibly of pre-medieval origin. Their proximity to the early Christian church at Llanfrothen might suggest that they were exploited in the medieval period.
Sources: Gwyn D 1998: Gwynedd Metalliferous Mines (for Cadw; GAT report 291)

262700 341500

37757 Pengwern Lead Mine Trials, Ffestiniog

Lead mine Significance: B

Possible lead mine site worked by the Wynn estate in 1655, now only evident as tips.
Sources: Calendar of Wynn Papers, 2079, 2084; Bick D 1985: The Old Copper mines of Snowdonia (Newent; Pound House), 102-40

273500 344600

8834 Coed Mawr Deep Pool Adit

Lead mine Significance: AS

A lead mine in which there may be evidence for working in the period 1000CE to 1750CE. Scheduled site.
Sources: Bennett and Vernon 1 and 5 Mines of the Gwydyr Forest (Cuddington: Gwydyr Mines publications, 1989-97) – Part 1 Llanrwst Mine and its Neighbours (1989); Part 5 Coed Mawr Pool Cyffty (1993).

277200 357700

21554 Cae Mawr Lead Mine

Lead mine Significance: B

A lead mine in which there may be evidence for working in the period 1000CE to 1750CE.
Sources: Bennett and Vernon 1 and 5 Mines of the Gwydyr Forest (Cuddington: Gwydyr Mines publications, 1989-97) – Part 1 Llanrwst Mine and its Neighbours (1989); Part 5 Coed Mawr Pool Cyffty (1993).

275500 357430

21501 Trecastell Mine

Lead mine Significance: B

Lead mines which may be medieval or Roman.
Sources: Bennett and Vernon 7 59 Mines of the Gwydyr Forest (Cuddington: Gwydyr Mines publications, 1989-97) Part 7 Coed Gwydyr and Cae Coch .. Llangelynin and Derwen Deg (1997), 59

276020 374600

4729 Lead Mine, Penrhyn Du

Lead mine Significance: B

By the 13th century, the monks of Cymer abbey were working mines at Penrhyn Du on Llŷn (). The mines were in lease again from 1654 to 1663, when they closed because of the opposition of the landowners, Lord Herbert of Chirbury, Lady Tyrington and Mr Knightley
Sources: Rees W 1968: Industry before the Industrial Revolution (Cardiff UWP), 474; Timberlake S 1994: 'Archaeological and Circumstantial Evidence for Early Mining in Wales', Mining Before Powder 133-143.

232300 326300

37758 Llanberis Copper Mine

Lead/Copper mine Significance: B

Mines which were probably exploited in the 16th century, in that the boat discovered in Llyn Peris in 1979, dendrochronologically dated to 1547-9CE, was found to have traces of charcoal, probably from Cwm y Glo which may have been intended for a smelter. The mines were exploited from the 18th century onwards, and possibly in Prehistory.
Sources: Bick D 1985: The Old Copper mines of Snowdonia (Newent; Pound House); Vaynol papers

257000 360000

21116 Lead Shaft, Coed Cilcennus

Lead mine Significance: B

Small lead mine known to have been worked in 1620 by the Gwydir estate.
Sources: Gwyn D 1996: 'Early Mineral Assaying in Dyffryn Conwy', Gwynedd Diwydiannol/Industrial Gwynedd 1, 22-25.

280900 350200

20527 Copper Mine, Bryn y Felin

Copper mine Significance: B

A complex copper mine site consisting of three parallel deep worked-out lodes with associated shafts. A long drainage adit into the Afon Glaslyn may be evidence for 17th century working, as it is allegedly similar to the associated with Sir Thomas Bushell (1594-1674) in Cardiganshire. There are signs of other structures associated with the site, notably a horse whim circle, a settling tank and a dressing floor. There is a powder store within a wood to the east of the main workings. There is also an associated leat that provided water to a now destroyed machine house at the mine. This site had a dressing plant and stamps, and 20 men at work underground in the 1760s.
Source: Bick D 1985: The Old Copper mines of Snowdonia (Newent; Pound House)

258900 347200

20673 Copper mine, Pant yr Wrach

Copper mine Significance: B

A series of adits near the shores of the Traeth Mawr, worked in the Modern and Industrial period, and possibly of pre-medieval origin. Their proximity to the early Christian church at Llanfrothen might suggest that they were exploited in the medieval period.
Sources: Gwyn D 1998: Gwynedd Metalliferous Mines (for Cadw; GAT report 291)

261700 340300

3792 Cwm Bychan Copper Mine

Copper mine Significance: B

Mining has been recorded since 1720 although the most prominent remains are of the 1920s aerial cableway, which is 1.37 kilometres long and drops 168 metres. The main areas where the ore was extracted now consists of at least one adit approx. 50m long that once connected to various other unexplored areas underground. Below this main adit there is a huge mineral stained spoil tip with the remains of a roughly built structure (possibly a shelter) built onto it as well as a more solidly built hut. The site has been consolidated by the National Trust.
Source: Bick D 1985: The Old Copper mines of Snowdonia (Newent; Pound House)

260300 347600

20535 Drws y Coed Copper Mine

Copper mine Significance: AS

Drws-y-coed is believed to have been worked since medieval times and it is believed that there were rich copper workings in the area at the time of Edward I in 1284. It was the site of speculation by the Earl of Powis in the early 18th century and was revived by the Vaynol estate in the 1760s. The mine is marked as disused on the first edition Ordnance Survey 25 inch map of 1889 although it is known to have been worked by Simdde Dylluan until 1911 under lease to a German firm. The remains include various buildings, levels and several wheel-pits. The site was powered by leats from Llyn y Dywarchen, a natural lake. Source: Bick D 1985: The Old Copper mines of Snowdonia (Newent; Pound House); Vaynol papers

254600 353420

1694 Great Orme Copper Mine

Copper mine Significance: AS

The Great Orme Copper Mines above Llandudno have an extensive complex of surface and underground workings exploiting copper ores in soft, easily worked strata. The true extent of mining operations here is unknown but it is believed to exceed 24,000 square metres, incorporating passages totalling more than five kilometres and penetrating a depth of seventy metres.

Archaeological evidence from the fill of the galleries include well-preserved bone tools and broken hammer stones. Charcoal was also found and radio-carbon dates from it have led to suggestions of Bronze Age beginnings for mining at this location. Spoil dumps and capped shafts are visible, dating from the nineteenth century. There is documentary evidence but as yet no material evidence for mining 100CE to 1750CE; archives suggest operations at Maes y Facrell in 1692, and at existing mines in 1695 described as 'olde worke' on the Mostyn estate at the south east end of 'Llandudno Mountain'. Lewis Morris refers to a 'great copper mine at Llandudno … which now lies under the water'. Sources: Williams CJ 1995: Great Orme Mines: British Mining History No. 52 (Keighley: Northern Mine Research monograph)

277070 383080

5517 Gold Mine, Gwyn-fynydd

Copper mine Significance: A

This mine may have been worked for copper by Cymer Abbey (Williams D, 302). The earthwork remains include shafts, levels, open cuts and stopes. There are

also remains of the associated transport network including tramways and inclines. Surviving buildings include the winding houses and other associated buildings and structures. The processing mill was some 700 metres due south (NPRN 34130). The Number 6 deep level (NPRN 33978) was the last operational area, closing in 1999.
Sources: Gwyn D 1998: Gwynedd Metalliferous Mines (for Cadw; GAT report 291); Williams DH 2001: The Welsh Cistercians (Gracewing, Leominster); Timberlake S 1994: 'Archaeological and Circumstantial Evidence for Early Mining in Wales', Mining Before Powder 133-143

273500 328200

20871 Copper/Gold Mine, Glasdir

Copper mine Significance: AS
A possible area of early mining, where it has been suggested that the footpath, Precipice Walk, is made up of two leats starting from a common point but going in opposite directions.
Sources: Bick D 1994: 'Early Mining Leats and Ponds in Wales' in Ford TD and Willies L: Mining Before Powder (Peak District Mines Historical Society 12 3, and Historical Metallurgy Society Special Publication), 37-40

273900 322500

3558 Parys Mountain Copper Mines (Roman)

Copper mine Significance: AS

An extensive mine and open working exploited in Prehistory, probably also in the Roman period and in the later medieval period. Extensive workings in the Industrial/Modern period may have obliterated evidence of working in the period 1000CE to 1750CE.
Sources: Hawarden RO: D/KK/534, Keen and Kelly mss

244200 390300

20869 Iron Ore Mine, Cross Foxes

Ironstone mine Significance: B

Tir Stent Iron Ore Mine may be associated with Dolgun Furnace (NPRN 34128) which dates from the eighteenth century, although the precise age of the mine is unknown. Messrs Townsend and Warner were known to be working here by 1861. Between 1908 and 1913 the Brymbo Steel Co worked 12,000 tons here before the mine was closed. There are remains of a one foot six inch (45 centimetres) gauge tramway and the adits have been obscured by forestry. There is no known archaeological evidence of working in the period 1000CE to 1750CE.
Sources: Gwyn D 1998: Gwynedd Metalliferous Mines (for Cadw; GAT report 291)
276100 316400

21033 Pyrites Mine, Cae Coch

Ironstone mine Significance: B

Mine worked for copperas and vitriol in 1607.
Sources: Gwyn D 1996: 'Early Mineral Assaying in Dyffryn Conwy', Gwynedd Diwydiannol/Industrial Gwynedd 1, 22-25; Bennett J and RW Vernon RW : Mines of the Gwydyr Forest (Cuddington: Gwydyr Mines publications) – Part 7 Coed Gwydyr and Cae Coch .. Llangelynin and Derwen Deg (1997)

277500 365400

31,700 Bedd y Coedwr Ironworking Site

Blast Furnace Significance: B

Now visible as a moss-grown area on a south-east facing slope above the Afon Mawddach, on land which until the dissolution formed part of the estate of Cymmer Abbey. The size of the area suggests that it was worked for some years. Slag can also be found on the eastern face of the stream gully to the west. A platform house (PRN 29515) is evident 20m upslope from the bloomer site.
Source: Smith K 1995: 'Iron-Working in North-west Wales in the Late Fourteenth Century' in Archaeological Journal 152, 246-290.

274274 328369

5498 Dolgun Blast Furnace

Blast Furnace Significance: A

A charcoal-fired and water-blown blast-furnace, erected by Abraham Darby I, and others of the Quaker ironworking fraternity at Dolgun to the east of Dolgellau in 1717. It was blown out in 1734. Darby had already succeeded in using coke instead of charcoal to smelt iron in his blast furnace at Coalbrookdale. It has been suggested (Cranstone 1989) that a structure adjacent to Dolgun furnace is a coke-oven and that this reflects Darby's involvement here. Without archaeological evidence for stratified coke debris, this cannot be confirmed. The farm on which it was built was the home of the first effective yearly meeting of the Society of Friends in Wales, and the centre of a network of local Quaker families with access to timber resources and iron ore on their freeholds. The furnace structure partly survives, having been consolidated by the Snowdonia National Park in the 1980s, with the pit for the wheel which operated the bellows.
Riden P 1993: A Gazetteer of Charcoal fired Blast Furnaces in Great Britain in use since 1660 (Cardiff, Merton Priory Press); Cranstone D 1989: 'Early Coke Ovens: a note', Historical Metallurgy 23.2, 120-22.

275080 318780

4748 Forge – remains of – Dol y Clochydd

Blast Furnace Significance: A

A water-powered bloomery in Coed y Brenin established in 1588, soon replaced by a blast furnace. The bloomery is situated on a narrow shelf on the east bank of the Afon Mawddach under a steep slope. A charcoal-fired and water-blown blast-furnace was established adjacent to the bloomery. There is no evident sign of the wheel-pit, but its location may be inferred from the blowing arch and the charging platform. A block of haematite, probably from Glamorganshire, has been identified on the site, and there is a scatter of bloomery slag. The furnace itself is 6.5m square. It was only in blast for about eight years, and as such provides unique evidence for a late 16th century blast-furnace.
Source: Riden P 1993: A Gazetteer of Charcoal fired Blast Furnaces in Great Britain in use since 1660 (Cardiff, Merton Priory Press); Crew P and MC Williams 1985: 'Dol y Clochydd', Archaeology in Wales 25; Crew P and MC Williams 1986: 'Dol y Clochydd', Archaeology in Wales 26; Parry BR 1963: 'A Sixteenth Century Merioneth Iron Works', Journal of the Merioneth Historical and Record Society 4(3), 209-11; Smith K 1995: 'Iron-Working in North-west Wales in the Late Fourteenth Century' in Archaeological Journal 152, 246-290.

273380 321970

162 medieval bloomery (furnace), Hendre Ddu Quarries

Bloomery Significance: A

A slag-mound approximately 20m by 15m on an east-facing slope preserving the remains of a furnace, adjacent to an area of medieval dwellings and cultivation ridges.
Source: Davies O 1948. 'An iron-smelting furnace at Bryn y Gefeiliau near Caernarvonshire', Archaeologia Cambrensis 100, 90-93; Smith K 1995: 'Iron-Working in North-west Wales in the Late Fourteenth Century' in Archaeological Journal 152, 246-290.

251560 344320

5514 Dol Gefeilau Bloomery

Bloomery Significance: D

This site is buried under the course of a road. It was traditionally the site of a shoeing forge. Both tap slags and smithing slags were recovered by Peter Crew before the site was destroyed by road-building in 1979. The mound was 2m high.
Source: Smith K 1995: 'Iron-Working in North-west Wales in the Late Fourteenth Century' in Archaeological Journal 152, 246-290.

274280 328360

8611 Llwyn Du Bloomery Platform

Bloomery Significance: B

A bloomery site surveyed and partly excavated in 1997 and 2001, yielding evidence for a large furnace with clay superstructure and a refining hearth within a 15m by 4.5m building, a tank made from sloping stones sealed with clay, perhaps for temporary storage of hot charcoal, and the remains of structural timbers. It has now been partly reconstructed and consolidated for public view. One or two furnaces were set within a rectangular timber building whose south-east end had been buried in a slag heap up to 2.0m high. To the south-west is a stone walled horseshoe shaped charcoal store. Seven ostensibly similar sites (one of which is known as Tap Mawr [SH 7219 2772] another as Cae Cyrach [SH 7253 2750] others, badly damaged, at Gelli Goch [SH 7173 2890 , 7168 2877, 7169 2869) have been recorded in the immediate vicinity, though these were observed to have been obscured by forestry or to be inaccessible due to tree-felling. The iron ore (bog ore) was brought in from a distance as it was the charcoal from Coed-y-Brenin that was at a premium. The Llwyn Du bloomeries are thought to have been peripatetic iron works, occupying a site for perhaps a decade before moving on in search of charcoal across the wood.
Source: Smith K 1995: 'Iron-Working in North-west Wales in the Late Fourteenth Century' in Archaeological Journal 152, 246-290; Source: Crew and Crew in Archaeology in Wales 41 (2001), 83-7

272400 327910

22002 Tyddyn Mawr Colliery

Coal mine Significance: A

Various trenches and mounds are evident ear the north-eastern limit of the Anglesey coal-field. The most prominent trench corresponds with where one of the seams outcropped on the surface and may therefore represent the site of a shallow open digging. Nearby are several doughnut-shaped mounds, generally no more than 1m high, which correspond to where the seams of coal lie near the surface. These are likely to be the upcasts of shallow shafts which would be wound by hand-windlass, and may be the site of the pits flooded in 1610.
Sources: Gwyn D 2001: Anglesey Coal Mines Archaeological Assessment (for Cadw; GAT report 408).

247330 373350

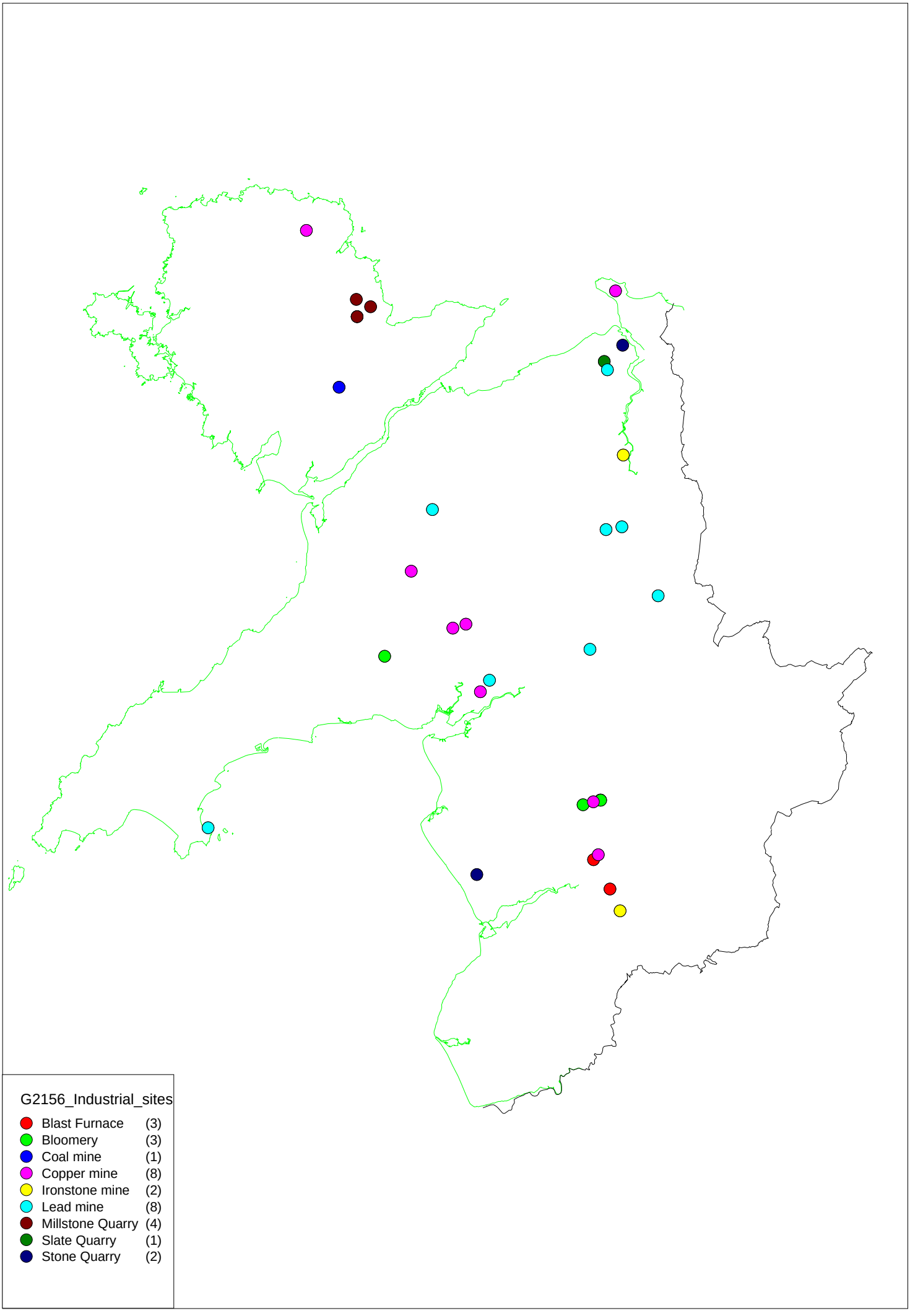

Figure 1: Distribution map of sites

Plate 01: Rough-out millstones from the quarry at Bwlchgwyn (PRN 34753)

Plate 02: Burrstone Quarry, Conwy Mountain (PRN 34752)

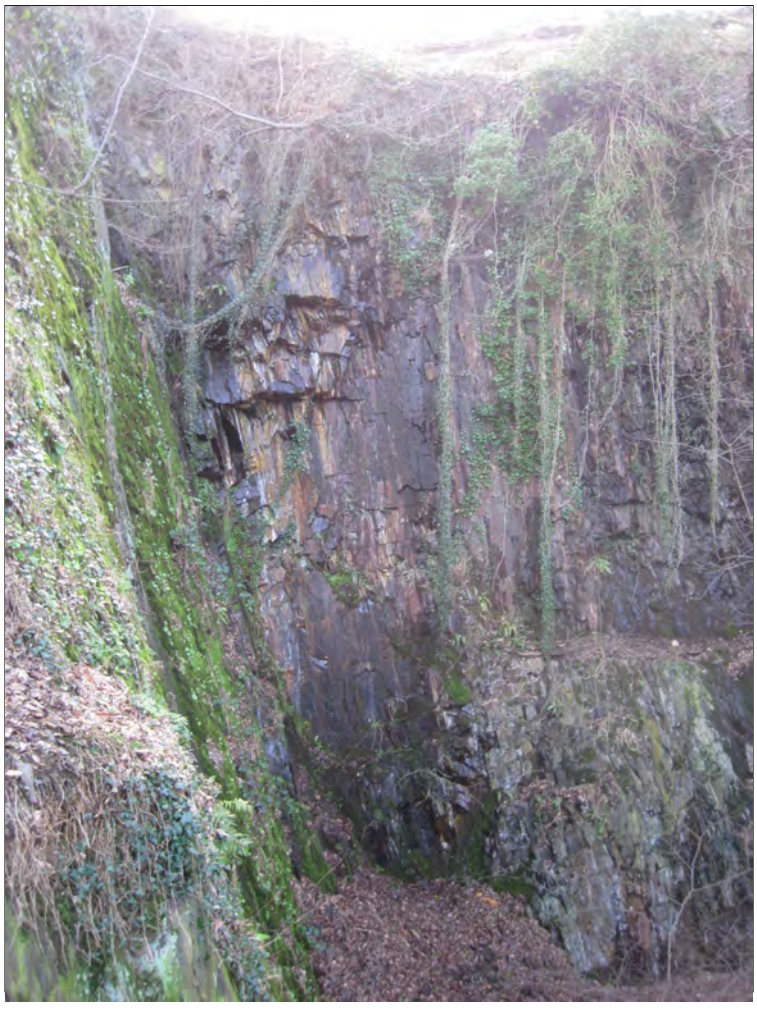

Plate 03: Llechen Slate Quarry, Conwy (PRN 21055)

Plate 04: Bwlch y Plwm, Llanforthen (PRN 37756)

Plate 05: Bedd y Coedwr Ironworking site (PRN 31700)

Plate 06: Platform house above Bedd y Coedwr (PRN 29515)

Plate 07: Llwyndu Bloomery (PRN 8611)

Plate 08: Dolgun Blast Furnace (PRN 5498)

Plate 09: Dol y Clochydd Blast Furnace (PRN 4748)

Plate 10: Charging platform, Dol y Clochydd (PRN 4748)

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