Industrial Recording:
Parys Mountain

GAT Project No. 2015
Report No. 743
June 2008

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust
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Archaeological Assessment

Report No. 743

Prepared for
CADW

June 2008

By
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INDUSTRIAL RECORDING: PARYS MOUNTAIN, AMLWCH, YNYS MÔN

ARCHAEOLOGICAL ASSESSMENT (G2015)

SUMMARY

An archaeological assessment has been carried out by the Gwynedd Archaeological Trust on behalf of Cadw as the first phase of a four phase work programmeme focussing on the currently non-scheduled upstanding remains located at the Parys Mountain mining complex, Amlwch, Ynys Môn. Parys Mountain contains numerous examples of non-scheduled structures that are abandoned and ruinous, which are vulnerable to erosion from weathering, vandalsim and general decay. The archaeological remains on the mountain reveal evidence for extraction (quarrying, mining and precipitation), initial ore processing (cobbing floors), calcining kilns, smelting, wind and steam power, wheeled transport systems and ancillary structures including smithies, stables and offices.

The assessment has focussed on the upstanding sites that are located outside the scheduled areas. All identified sites have been incorporated into a site gazetteer presented in the report and have been assessed according to current guidelines so that appropriate management recommendations can be made. This project has been designed to supplement an HLF funded survey project of the designated scheduled areas by surveying monuments associated with those within the scheduled areas and those monuments that are in greatest threat. This assessment will take into account the management recommendations laid out in the previous Gwynedd Archaeological Trust assessment of Parys Mountain (GAT Report 292) and is designed to be used in conjunction with that report.

1.0 INTRODUCTION

Gwynedd Archaeological Trust has been asked by Cadw, to carry out an archaeological assessment of non-scheduled upstanding remains within the Parys Mountaiin mining complex, Amlwch, Ynys Môn (located between NGR SH90603390 and SH89303250; Figure 01). The proposed work will be divided into four phases:

- Assessment
- Survey
- Final Drawings
- Final Report

The current report incorporates the primary assessment phase. The report will utilise previous work undertaken on the mountain, in particular the assessment undertaken in 1998 by the Gwynedd Archaeological Trust (GAT Report 292) and the Conservation Management Plan undertaken in 2005. Those monuments lying outside scheduled areas will be assessed *according to current guidelines so that appropriate management recommendations can be made* This project is to supplement a survey project of the scheduled areas undertaken as part of a HLF funded project. Whilst the HLF funded project concentrates upon detailed survey of scheduled areas, this current project supplements the HLF by surveying monuments close to and related to the existing scheduled areas and by assessing the remains for schedule monument enhancement.

1.1 Location

Mynydd Parys, known in English as Parys Mountain, and formerly also referred to as Mynydd Trysglwyn, lies two kilometres due south of the town of Amlwch in the community, formerly the civil parish, of Amlwch on Anglesey (Ynys Môn). It is situated between the A5025 and the B5111 roads, the latter of which runs across the north-west side of the mountain. The mountain is approximately two kilometres long and nearly one kilometre wide, the long axis running nearly north-east to south-west. The highest point is

147 metres above Ordnance Datum, whilst the surrounding area averages 80 m above OD.
The mountain was formerly divided between Cerrig y Bleiddiau farm on the east, on which the Mona mine was developed, and Parys Farm on the west, on which the Parys mine came to be worked.

1.2 Ownership and leases

The eastern half of the mountain is owned by the Most Hon. the Marquess of Anglesey; the western half by AMplc, though a royalty is payable to the Marquess and Sir Paul Neave, who formerly owned the site in moiety. Small areas are owned by Miss R.E. Hughes and Mr A.M. Hughes. All these properties are managed by Jones Peckover, Land Agents, 129 High Street, Bangor, Gwynedd.
AMplc have a surface lease and a mineral lease of the eastern half until the year 2054, to whom planning consent was granted by Gwynedd County Council in May 1986 (No 1/11/C/79) for the exploitation of zinc, copper and lead sulphide resources. No archaeological conditions were attached to the permission. A further application was submitted by AMplc to Gwynedd County Council in February 1991 (No 1/11/c/77a) to extend the tailings disposal area to the south of the mountain, an area which includes the Dyffryn Coch precipitation pits.
WMT Australia recently announced the signing of a Term Sheet to acquire 100% of the advanced Parys Mountain copper-zinc Project from Anglesey Mining plc a UK based mining company listed on the London Stock Exchange (http://www.westernmetals.com.au/).

1.3 Access

There are believed to be no common rights over the mountain. There are a number of public and discretionary footpaths through the site.

1.4 Nature of the threat

The threat to the archaeology of Mynydd Parys derives from a number of factors. Not only is there the active possibility that mining might resume through the recent acquisition by WMT Australia, which would place much of the archaeology under risk, but the mountain is at risk from fly-tipping and domestic dumping. Vandalism is a recurrent problem. A number of the standing buildings are in danger of collapse.

1.5 Statutory protection

A number of features of within the mining complex have been scheduled as Ancient Monuments. These are:

- Mona mine windmill: A111A Trust PRN: 3497
- The Pearl engine house: A111B Trust PRN: 3499
- The Hillside precipitation pits: A111C Trust PRN: 3498
- The Great Opencast: A111D Trust PRN: 3496

Parts of the site have been designated a Geological SSSI; five are in, or are immediately adjacent to, the Great Opencast, and one is situated at Morfa Du.

Seven areas have been notified as Lichenological SSSIs, including the windmill and the Hillside precipitation pits. Operations likely to damage the Special Interest, as specified by the Countryside Council for Wales, include “construction, modification, removal or destruction of roads, tracks, walls (including buildings), fences, hard-stands, banks, ditches or other earthworks”, and would require the prior approval of CCW. CCW note “The ruined mine buildings and walls provide further distinctive micro-habitats, such as the copper-rich mortar-filled crevices in which a community characterised by *Psillechia leprosa* occurs.”

2.0 BACKGROUND INFORMATION

2.1 Topography

Mynydd Parys, known in English as Parys Mountain, is a prominent ridge whose long axis runs north-east to south-west. Two opencasts have been opened on the south-east facing flanks, near to the summit level, the Great Opencast of the Parys Mine and the Hillside Opencast of Mona Mine on the west and east sides respectively of the mountain. The flanks of the mountain are partly covered by the extensive tips from these and the underground workings. The Great Opencast covers an area approximately twice as broad as the other but is shallower.
On the north-western flank of the mountain lies the much smaller Morfa Du Mine, worked in the nineteenth century, and the focus of present operations. The recent Morris shaft was sunk here.
Ochre and precipitation pits are to be found at various points around the mountain; the important Dyffryn Adda pits and furnace lie to the north, and the Dyffryn Coch precipitation systems are situated at the foot of the southern flank of the mountain.
The town of Amlwch includes Porth Amlwch, where ore from the mountain and from other copper mines in North Wales was smelted and shipped. Town and port are connected to the mine by a roadway known as the *Lôn Gopar* ("copper road").

2.2 Geology and mine workings

Before the 1950s geological knowledge was restricted to surface exposure and accessible mine workings. However, between 1955 and 1987, 144 surface boreholes, representing a total length of 46.8 kilometres, were drilled to examine the geology and mode of mineralisation. Further boreholes have also been drilled in recent years from the bottom of the newly sunk Morris Shaft.
The mineralisation occurs within a thin sequence of rocks associated with volcanic events at the margin of an ancient sedimentary basin. The sulphide ores consist of chalcopyrite (copper, iron), sphalerite (zinc) and galena (lead). together with large amounts of pyrite (iron). An ore feature is the "bluestone", comprising an intergrowth of these minerals. The ore minerals were subsequently remobilised, giving rise to a complex ore body, occupying fissures or impregnating the surrounding rock.
Prior to recent discoveries, twelve mineral lodes had been recorded. The lodes on the south-west side are largely bluestone whilst those to the north-east yield mainly pyrite/chalcopyrite.
The Carreg y Doll lode was the most extensive, and was worked predominantly from shafts. It has a range of nearly one mile and although it maintains a thickness of some 20m along much of its length, though it dwindles rapidly to 2m at its eastern extremity and also tends to split up towards its outcrop at Mona Mine.
Several adit levels were driven to dewater the workings. The main one is the Joint Level, which emerges at the Dyffryn Adda adit; this runs northwards from the vicinity of the Carreg y Doll shaft, Parys Mine.
The deepest shaft until the sinking of Morris shaft recently was Gwen, which reaches the 150 fathom level.
The ore reserves which are presently under consideration are predominantly the sulphides of copper, lead, zinc and iron, and are contained within the contact zone of volcanic and sedimentary rocks in the vicinity of Morfa Du Mine.

2.3 Archaeological and Historical Background

2.3.1. Bronze Age Period
Prehistoric mining on Mynydd Parys was first postulated in 1796, when Christopher Sykes referred to cobblestones and fire-set drift workings, which had already been quarried away by the open-cast workings, but which were still a recent memory. He considered that these workings were pre-Roman.
In 1937 Oliver Davies investigated, with a series of trenches, an ancient tip near the Oxen Quarry on the north side of the mountain near the windmill. Within the tip he found twenty-four stone hammers and some charcoal and other artefacts, which he assigned to the "Old Celtic" or Roman Period.
A subsequent investigation by the Early Mines Research Group in August 1998 located Oliver Davies' original trenches. The Group carried out further trenching and soon found stone hammers and associated flakes. A layer of charcoal gave dates within the range 2000 - 1500 B.C., the Early Bronze Age, some of the earliest dates for Bronze Age mining recorded in Britain. Other stone hammers have being found during mining operations in the last century.

2.3.2 Roman period

The tradition that there has been Roman mining on the mountain is itself an old one; it is first recorded on a map of 1764, which shows "Roman workings", and clearly the belief was impressed on the mines' many visitors. Thomas Pennant was apparently the first to connect this tradition to the discovery of copper cakes at Llanfaethlu and at Caerhun in Dyffryn Conwy. Since then a total of twenty-seven copper ingots which can be ascribed to the Roman period has been discovered in Wales, eighteen on Anglesey (two on Mynydd Parys itself), six in the former Caernarfonshire and three in Clwyd. Analysis has revealed they contain about 98% to 99% copper. The circumstantial evidence for Roman copper working at Mynydd Parys is therefore extremely strong.

2.3.3 Medieval and Early Modern

No Medieval mining is recorded at Parys Mountain. It was however during this period that the mountain gained its present name, from Robert Parys the Younger who in 1406 was commissioned by Henry IV to collect fines from the Anglesey supporters of Owain Glyn Dwr. He was given the mountain and surrounding lands as a reward for his services. The first indication of mining after the Bronze Age is a map of Traeth Dulas and Amlwch port, annotated in secretary hand, and otherwise also typical of Tudor cartography, which records that the mines lay one mile distant, possibly at Henwaith ("old workings"), exactly a mile from the port, where later documents also suggest early mining may have taken place. Sir John Wynn on several occasions expressed an interest in the Anglesey copper mines. His letters indicate that mining was taking place on Anglesey in the 1570s for in 1607 he refers to "a great mineral work in Anglesey 28 years ago that one Mr Medley had undertaken by boiling a quantity of iron in water. It made Alum and Copperas and transmuted iron into copper." Absalom Francis, the mining engineer, who prepared a report on the Mona Mine in 1880, remarked that in an area "300 fms. to the east of the present workings" shafts and workings dating from the seventeenth century, though reworked forty years previously, were still to be seen - and that further to the east again, and reaching almost to the road, there were traces of ancient mining reaching almost as far "the road, which forms the eastern boundary 0.6km east of Carreg y Doll lies the dwelling Henwaith where a map of 1764 shows both current and past operations. When the modern phase of operations began in the 1760s, there are references to opening out old works, but no dates are mentioned. However, in 1698 there is a reference to "the prince's mines at Trysglwyn", suggesting that some working was going on in this period.

2.3.4 Modern period 1761-1851

In 1763 Messrs Roe and Co. of Macclesfield were negotiating for a lease of the eastern half of the mountain, the farm of Cerrig y Bleiddiau, the site of the future Mona mine, with Nicholas Bayly, the sole landowner, where work had been going on since about 1761. In September and October 1762 Sir Nicholas made significant discoveries and a payment is recorded to a Mr Cartwright, the agent, in 1764. Roe and Co. were granted a lease in 1765 and according to legend the discovery that confirmed the mines' future was made on 2 March 1768 by an experienced Derbyshire miner called Jonathan Roose in a shaft sunk at Golden Venture.

In 1770 Bayly had begun mining on Parys Farm, the western half of the mountain, but ran into lawsuits brought by joint owner, the Rev. Edward Hughes of Llysdulas. These were to grumble on for several years, in the course of which Hughes secured the services of the attorney Thomas Williams. By 1774 Hughes and Williams were in partnership to work the western mountain, which came to be known as Parys mine, and with Williams' outstanding commercial skills, soon established offshoots in the form of smelters at Ravenhead in Lancashire and in Swansea, warehouses at London, Birmingham and Liverpool, and works at Holywell in Flintshire, Penclawdd in Glamorgan and Temple Mills in Berkshire. For this he came to be known as "the Copper King", though to his workmen on Mynydd Parys he was always Twm chwarae teg ("Tom fair play").

This rediscovery of the mine in the late eighteenth century led to Mynydd Parys rapidly becoming the most productive copper mine in the world, resulting in a short-lived boom. Such were the numbers of ships using Amlwch as a port at that time that delays were inevitable, and an Act of Parliament was passed in 1793 which allowed for the port's deepening, widening and regulation. Business that had previously been conducted on the western side was transferred to a raw broad quay, quarried out of the rock on the eastern side, where some of the buildings still stand.

Following the exhaustion of the mines, the port became a well known centre for ship-building.

2.3.5 Post-World War II

Since the second world war a succession of companies has carried out geological exploration on Parys Mountain.

Between 1955 and 1957, Anglesey Mining Exploration Ltd, a subsidiary of New Consolidated Goldfields, carried out a detailed surface and underground geological survey on the Mona and Morfa Ddu Mines. From 1961 to 1962 exploration was continued by Anglesey Copper Mines (UK) Ltd., a subsidiary of the Irish-Canadian Northgate Exploration Ltd, who carried out further geological mapping and drilled eleven surface boreholes. Canadian Industrial Gas and Oil Ltd (CIGOL) explored the site from 1966 to 1970 with several partners, but despite drilling fifty-two boreholes, no promising reserves were found.

On 16 September 1971, the mineral lease for an area of about five square kilometres was granted to Parys Mountain Mines (UK) Ltd. for a term of ninety-nine years from 25 March 1969. A further eighteen boreholes were drilled between 1971 and 1972 by the Intermine Ltd/Noranda Ltd partnership.

Cominco Ltd, who began work in 1973, were eventually successful. Having initially concentrated exploration on the traditional bluestone areas, they turned their attention northward and by 1978 had made significant discoveries.

The present tenant, Anglesey Mining plc, a subsidiary of the Imperial Metals Corporation of Vancouver, was incorporated in 1984 and floated on the stock exchange in May 1998. They sank a vertical shaft adjacent to the proven ore reserves and drove laterals into it to test the reserves. A small building was erected to carry out milling trials.

Cementation Ltd began the sinking of Morris Shaft (named after Dr Hugh Morris, the Company Chairman) on 11 October 1998. By September 1990 the shaft was down 300 metres and a 280 metre level had been driven north-westward towards the ore reserves. A series of boreholes was also drilled to prove the immediate ore reserves in detail. Having confirmed the reserves, operations were suspended, because of the low value of metal prices on the international markets. WMT Australia recently announced the signing of a Term Sheet to acquire 100% of the advanced Parys Mountain copper-zinc Project from Anglesey Mining plc a UK based mining company listed on the London Stock Exchange

3.0 DEFINITION OF MITIGATORY RECOMMENDATIONS

Where a feature of archaeological significance is affected, mitigation measures should be instituted in accordance with current policies as recommended in Circular 60/96 for rescue archaeology. The various levels of recording are listed below, and appear in the Management field for each of the sites in the site gazetteer along with other management recommendations.

The criteria used for assessing the value of features was based upon those used by the Secretary of State for Wales when considering sites for protection as scheduled ancient monuments, as set out in the Welsh Office circular 60/96. The definitions of categories used for impact, field evaluation and mitigation are set out below.

Category A - Sites of national importance.

Scheduled Ancient Monuments, Listed Buildings and sites worthy of scheduling or listing *i.e.* those which would meet the criteria for scheduling (ancient monuments) or listing (buildings) or both.

Sites which are scheduled or listed have legal protection, and it is recommended that all Category A sites remain preserved and protected *in situ.*

Category B - Sites of regional or county importance.

Sites which would not fulfil the criteria for scheduling or listing, but which are nevertheless of particular importance within the region.

Preservation *in situ* is the preferred option for Category B sites, but if damage or destruction cannot be avoided, appropriate detailed recording might be an acceptable alternative.

Category C - Sites of district or local importance.

Sites which are not of sufficient importance to justify a recommendation for preservation if threatened. Category C sites nevertheless merit adequate recording in advance of damage or destruction.

Category D - Minor and damaged sites.
Sites which are of minor importance or so badly damaged that too little remains to justify their inclusion in a higher category.
For Category D sites, rapid recording, either in advance or, or during, destruction should be sufficient.

Category E - Sites needing further investigation.
Sites whose importance is as yet undetermined and which will require further work before they can be allocated to categories A-D are temporarily placed in this category, with specific recommendations for further evaluation.

For the purposes of this report the mitigation and rescue archaeology proposals have been divided into various levels of recording, which can be summarised as:

Level 1: Minimal recording
- A photographic record of principal external views. The photographs to be dated and indexed. Negatives should be indexed and suitably stored for archive.
- A brief summary description, related to the photographic record as appropriate.

Level 2: Basic recording
- A photographic record of all principal elevations and selected features of particular interest. Photographs to be taken, as much as is possible, at right angles to the face of the feature and should include a scale. There should also be a few general photographs to set the site in context.
- The photographs to be indexed as for Level 1 and related to a basic site plan which might be taken from a published OS map as appropriate.
- A simple description of the visible remains relating to the photographic record.

Level 3: Basic recording with survey
As Level 2 recording, but to include:
- c. A measured survey of the ground plan of the site or structure at an appropriate scale (1:200 for buildings or 1:500 for larger areas where individual buildings are of no great significance).

Level 4: Full photographic record
- A photographic record of all external and, if appropriate, internal elevations as well as any features of particular interest. The photographs should be taken, so far as is possible, at right angles to the face of the feature and should include a scale. They should be reproduced at a scale where, for example, individual stones may be identified. Steps should be taken to minimise distortion, (*eg* by use of a shift lens) and achieve a consistent scale. These photographs should be supplemented with general photographs showing the site in its setting and, if composite photographs are necessary to cover a large feature or elevation, then general shots of the feature should be included. The photographs to be indexed as for Level 1, and related to a site plan.
- A general description and a description of all the principal features.
- A measured survey of the ground plan of the building or site at an appropriate scale as for Level 3.

Level 5 Full record
- This would normally include the full photographic record as described for Level 4, but would be supplemented by a measured survey surveyed to no more than a 1% error. The record may be supplemented by elevations and sections, where appropriate, drawn at a scale consistent with the plans. Individual features should also be surveyed and drawn to scale. The full record would include a detailed description, including measurements wherever necessary.

4.0 SITE GAZETTEER

The site gazetteer identifies those features which during field visits and through advice of David Jenkins (Parys Mountain Underground Group) were seen as in requiring full recording during this first phase of recording works at Parys Mountain, due to the further study recommendations from the 1998 assessment (GAT report 292) and/or due to the monuments vulnerable state and or its association. The non-scheduled upstanding remains have been divided into geographical areas, listed in Figure 01. Each identified feature is numbered according as identified during the field visits and listed within the relevant geographical area. Recommendations for further work are given within each area entry.

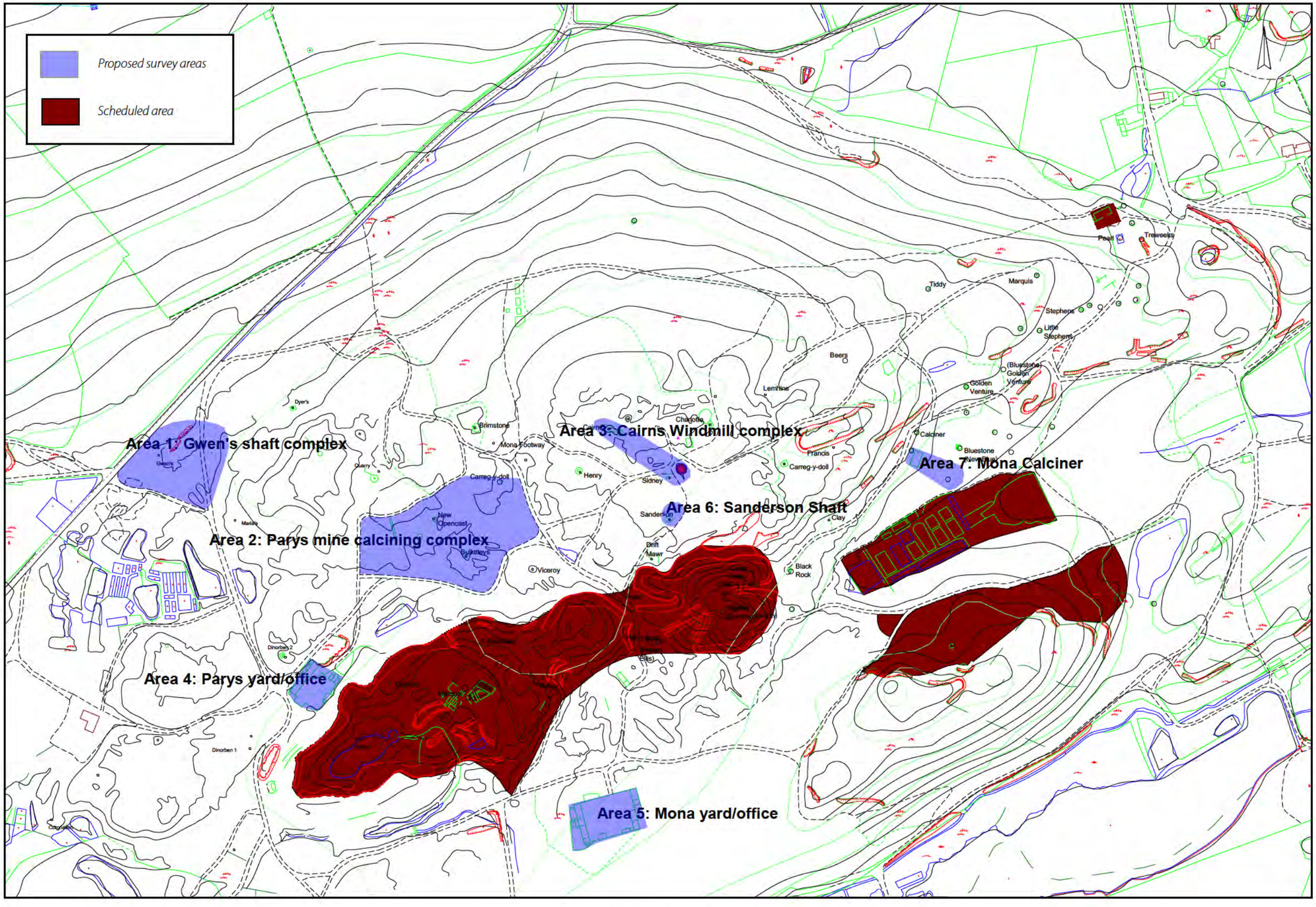

Figure 1: Area location (1:5000)

4.1 AREA 1: GWEN'S SHAFT COMPLEX

The deepest shaft until the sinking of Morris shaft recently was Gwen, which reaches the 150 fathom level.In 1859 a Henry Dennis of Rhiwabon draw a number of plans of operations at both mines. *(MMS31584)*. He listed shafts that had gone out of use as well as those that were still in use, which Gwen was included.

Feature 38: Gwen's Shaft (46): NGRSH43779053
Category:C
Site only, capped, no. 46.
Mitigatory recommendations: Level 1 recording

Feature 39: Precipitation system NGR SH43709040
Category:B
An extensive copper and ochre precipitation system, in which brick floors were noted and argia constructed out of stone enclosing heaped precipitate. The southern limit of the system has been disturbed by the construction of a recent road and spoil has been dumped on the north-west side.
Mitigatory recommendations: Level 1 recording
Feature 40: Retaining wall NGR SH43759051
Category:B
A stone retaining wall, 2m high, which has suffered some collapse in places.
Mitigatory recommendations: Level 2 recording

Feature 41: Water course NGR SH43749051
Category:C
Collapse in feature (40) has exposed some timbering, which may have formed part of a ducting system into (39).
Mitigatory recommendations: Level 1 recording

Feature 42: Unknown structure NGR SH43749050
Category:E
Two exposed timber baulks, one vertical, one horizontal, which may possibly have formed part of a wooden staging, either to carry water or a tramway.
Mitigatory recommendations: Level 1 recording

Feature 56: Engine house NGR SH43839055
Category:C
The base for the steam engine which powered Gwen's shaft (38). The base includes both stonework and brickwork, and four holding-down bolts are evident, with square-section nuts. The assemblage suggests a single-cylinder horizontal engine.
Mitigatory recommendations: Level 3 recording

Feature 58: Precipitation system NGR SH43829053
Category:C
A possible precipitation pit was identified at this point.
Mitigatory recommendations: Level 1 recording

Feature 59: Unknown structure NGR SH43829053
Category:E
Two upright timbers, lining up with (56)..
Mitigatory recommendations: Level 1 recording

4.1.1 Recommendations for further work

A greater understanding of this shaft and it's associated features will be achieved with a full EDM, REDM and photographic survey.

Area 1: Gwen's shaft complex

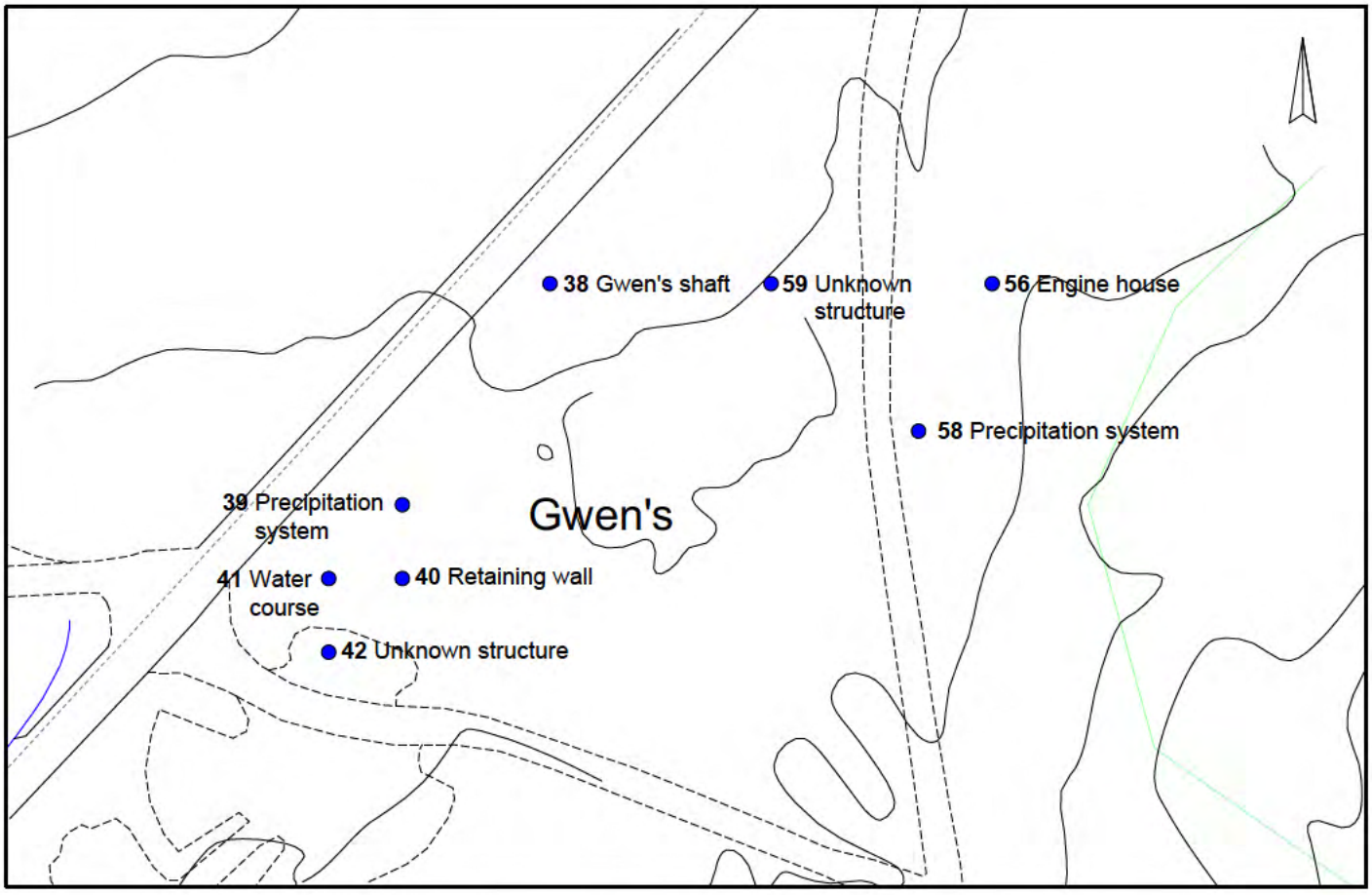

Figure 2: Plan of Gwens shaft complex (1:1000)

Plate 1: Gwens shaft complex facing north east

4.2 AREA 2: PARYS MINE CALCINING COMPLEX

Calcination is a process which removes sulphur from the ore by burning. Though initially the fumes of sulphur dioxide thus released were left to drift away, Roe and Company realised that sulphur (brimstone) could be manufactured from them, early accounts refer to a horizontal brick chimney over the roasting ore which would feed the sulphur fumes emitted from the ore into a brick arch 40 or 50 yards long and 6' high and wide. The sulphur would be condensed into a fine yellow powder 1' or more deep, then put into furnaces and gently heated into a liquid, drawn off through a cock, cooled to a solid and sold to the chemical industry and to gunpowder manufacturers.
A number of what appear to be later versions of these kilns survive, though the sulphur chambers are stone-built rather than brick. Four calcining kilns and their related flues and sulphur chambers were noted at Parys mines (features 4, 6-9, 11-13, 15-17), believed to be for copper ore. The kilns themselves are visible as rounded oval depressions, anything up to 17m long and 6m across, some of which appear to feed into long but barely defined flues and which are associated with sulphur sublimation chambers, visible as parallel stone walls, typically 16m long, 1m high, each 0.8m wide and 0.6m apart. Around the kiln-sites the spoil is a distinctive pinkish colour.

Feature 4: Flue NGR SH44079043
Category:A
A stone-built sulphur flue, consisting of two parallel stone walls 20m long, each 0.7m wide and high, separated by 0.8m. This feature is much overgrown with heather.
Mitigatory recommendations: This feature should be preserved in situ. It should be a priority for a full photographic record and measured survey, to include a contour survey of the area adjacent to it.

Feature 5: Bulkeley shaft (42) NGR SH44099042
Category:C
Site only; capped, no. 42.
Mitigatory recommendations: Level 1 recording

Feature 6: Kiln NGR SH43999042
Category:A
Site only; visible as a sub-oval depression in an area of built-up waste, approximately 2m deep, 6m wide at its widest point and 17m long. There is much pinkish discolouration in the stone. This feature appears to be related to (7).
Mitigatory recommendations: This feature should be preserved in situ. It should be a priority for a full photographic record and measured survey, to include a contour survey of the area adjacent to it.

Feature 7: Flue NGR SH43999044
Category:A
A stone-built sulphur flue, orientated north-east to south-west, related to (6) and parallel to its longer axis. The two parallel walls are 16m long, >1m high, 0.8m wide and 0.6m apart. A slot for a duct is visible in the south-west facing wall. To the north-east of the flue near its northern end is an enclosed area, visible only as the lowest courses of a stone wall, measuring 12 by 3m within the walls.
Mitigatory recommendations: This feature should be preserved in situ. It should be a priority for a full photographic record and measured survey, to include a contour survey of the area adjacent to it.

Feature 8: Flue NGR SH44019044
Category:A
A substantial stone-built sulphur flue, consisting of parallel walls T-shaped in plan, 28m long on their longer axis, 20 on the shorter (cross-stroke) axis. The walls are 1m high, 0.8m wide and 1.5m apart; there are traces of side ducts. This feature appars to be related to (9).
Mitigatory recommendations: This feature should be preserved in situ. It should be a priority for a full photographic record and measured survey, to include a contour survey of the area adjacent to it.

Feature 9: Kiln NGR SH44019044

Category:A
A substantial stone-built sulphur flue, consisting of parallel walls T-shaped in plan, 28m long on their longer axis, 20 on the shorter (cross-stroke) axis. The walls are 1m high, 0.8m wide and 1.5m apart; there are traces of side ducts. This feature appars to be related to (9).
Mitigatory recommendations: This feature should be preserved in situ. It should be a priority for a full photographic record and measured survey, to include a contour survey of the area adjacent to it.

Feature 10: Adit NGR SH44049045
Category:A
An inclined shaft, offering access to the underground workings, deliberately obscured and covered with an lockable metal grating in order to discourage unauthorised access. This leads to a three largely horizontal levels, respectively 10m, 20m and 30m below the surface, evidently for the most part of late nineteenth century date, as compressed-air piping, possibly generated in (2), survives in situ. However, at its furthest reach, it extends to an area of pre-Modern mining, in which a working area has been backfilled by a slightly later tip, in which horizons of clay were also observed, as well as a considerable number of hammer-stones. The foot of a shaft (405) is visible here.
Mitigatory recommendations: The entry is kept locked, and access to the underground workings is only possible to properly authorised persons. As the only access to underground workings, this feature is of great importance.

Feature 11: Kiln NGR SH44119042
Category:A
Visible as a depression built into a gently-sloping hillside, 3m deep on the upslope side, measuring 24m by 8m in plan.
Mitigatory recommendations: This feature should be preserved in situ. It should be a priority for a full photographic record and measured survey, to include a contour survey of the area adjacent to it.

Feature 12: Flue NGR SH44129043
Category:A
A possible sulphur condensing chamber, upslope of and associated with (11), measuring 20m by 5m, extremely dilapidated.
Mitigatory recommendations: This feature should be preserved in situ. It should be a priority for a full photographic record and measured survey, to include a contour survey of the area adjacent to it.

Feature 13: Kiln NGR SH44119044
Category:A
A substantial depression, 20m by 5m in plan, apparently a kiln-site.
Mitigatory recommendations: This feature should be preserved in situ. It should be a priority for a full photographic record and measured survey, to include a contour survey of the area adjacent to it.

Feature 14: Shaft NGR SH44069046
Category:C
Site only; capped, no. 43.
Mitigatory recommendations: Level 1 recording.

Feature 15: Kiln NGR SH44099046
Category:A
Visible as a depression built into a sloping hillside, sub-oval in plan and measuring 19m south-west to north-east, 10m south-east to north-west. It is approximately 4m deep on the upslope (north-western) side and 1m deep on the downslope face. It is associated with (16).
Mitigatory recommendations: This feature should be preserved in situ. It should be a priority for a full photographic record and measured survey, to include a contour survey of the area adjacent to it.

Feature 16: Flue NGR SH44069049
Category:A
A sulphur condensing flue, associated with (15), now extremely dilapidated.

Mitigatory recommendations: This feature should be preserved in situ. It should be a priority for a full photographic record and measured survey, to include a contour survey of the area adjacent to it.

4.2.1 Recommendations for further work

A greater understanding Parys mine calcining complex will be achieved with a full EDM, REDM and photographic survey.

Area 2: Parys mine calcining complex

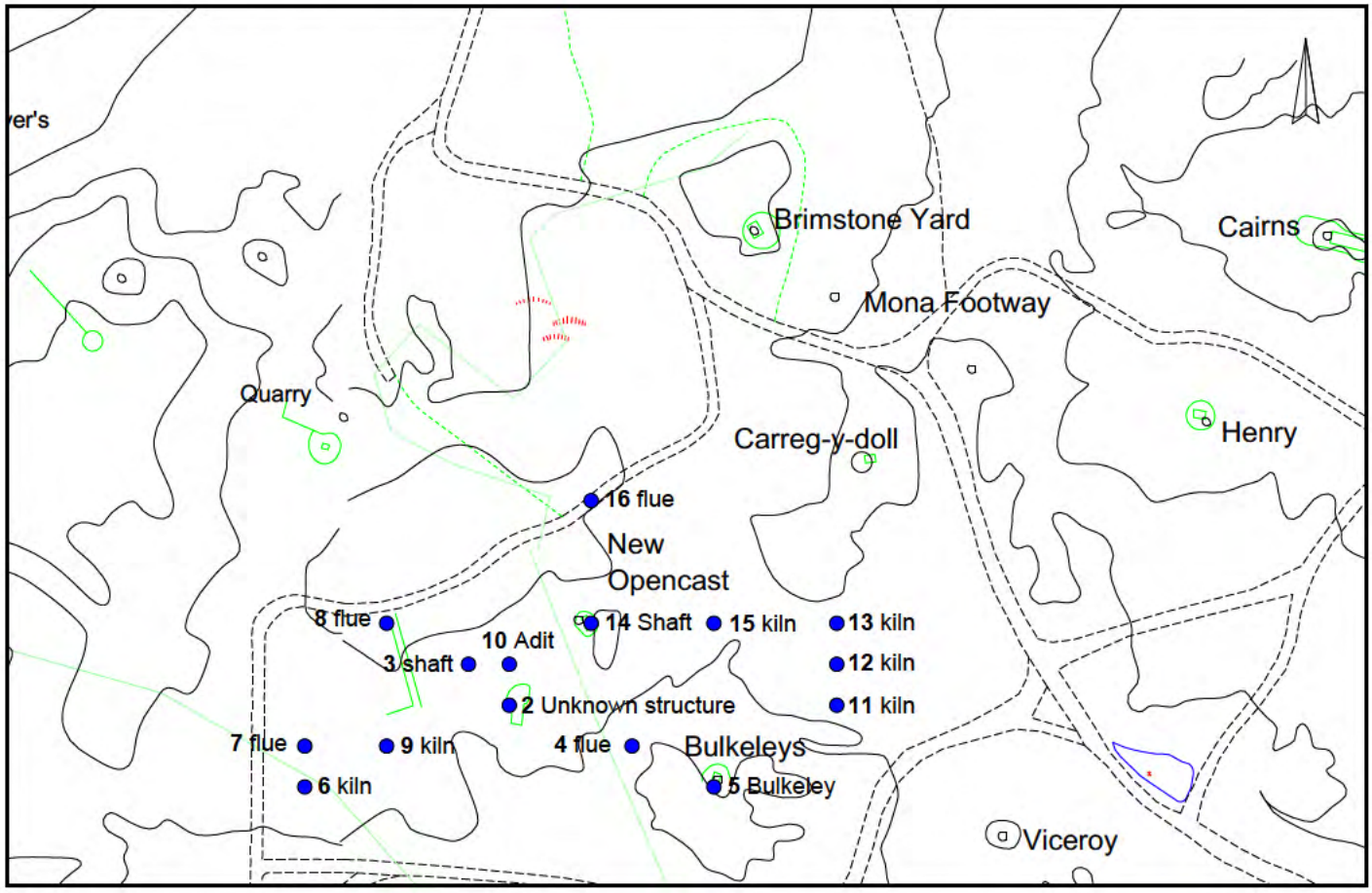

Figure 3: Plan of Parys mine calcining complex (1:1000)

Plate 2: Feature 8 flue facing north

4.3 AREA 3: CAIRNS WINDMILL COMLEX

The cairns windmill is a stone-built conical tower mill, which measures 8m in diameter across the base and stands approximately 20m high. Uniquely for Anglesey, it was a five-sailed mill; the cap and all the machinery are missing, but it is believed to have contained an upright shaft driven by bevel-gearing from the sail-shaft, which in turn operated 200' of flat-rods by means of a crank in its foot. The flat-rods operated a pump in Cairns' shaft, and were supported on intermediate dolly-posts. The windmill was still operating in 1901.99 Its importance as the only surviving pump-windmill in an extractive industry in Britain was recognized by scheduling as an Ancient Monument in 1995.
A steam winding engine at Mona mine's "New Shaft" (Cairns) is recorded in the period 1865-1870, valued at £260. Pumping this shaft was carried out by the windmill, once it had become clear that the Carreg y Doll engine was not capable of dewatering this part of the mine by itself, but the need of a more powerful engine was felt, and a pumping engine came to be erected at the head of
the Cairns' shaft. Its site is marked by a substantial stone base and twisted holding-down bolts.

Feature 74: Windmill NGR SH44329051
Category:A
A windmill constructed in 1878 as an auxiliary to the existing steam engine (109) which pumped Cairns' shaft (107), and which was connected to the engine by 200' of flatrods moving on dolly posts (108). It was unusual in having five sails. It is believed to be the only surviving windmill on an extractive site in the United Kingdom.
Mitigatory recommendations: Level 5 survey. This feature is a Scheduled Ancient Monument, and is also an element in a lichenological SSI.

Feature 104: Sidney shaft (31) NGR SH44309050
Category:C
Site only, capped, no. 31; an aperture in the windmill (74) lines up with this feature, suggesting that the windmill wound the shaft.
Mitigatory recommendations: Level 2 recording.

Feature 107: Cairn shaft NGR SH44249055
Category:A
A bracing timber for a headframe survives on the south of the pit, suggesting that the shaft uphauled as well as pumped. Power was supplied to this shaft from the windmill (74) as well as by the engine (109) by means of a flatrod-system (108).
The site is much disturbed and the identification is only tentative; it is associated with (105).
Mitigatory recommendations: Though this feature has been infilled nearly to the surface, it is of great importance for its relationship with the windmill (74) and the Cairn's engine house (109). The feature should be consolidated.

Feature 108: Flat rod system NGR SH44269054
Category:A
The site of a flatrod system which connected the Cairn's shaft (107) with the windmill (74) and the steam engine (109). Photographs shows that this was operated on dolly posts, of which no trace was observed, but a substantial balance-box pit, stone-lined, survives immediately to the south-east of the shaft.
Mitigatory recommendations: Level 2 recording: though this feature is barely evident, it is of great importance for its relationship with the windmill (74).

Feature 109: Engine house NGR SH44279054
Category:A
The remains of a once-substantial engine-house and boiler-room. The buildings themselves have left practically no visible trace, though the stone bed of a substantial horizontal steam engine is apparent, and a number of holding-down bolts are apparent, much twisted. A photograph in Owen Griffith's book shows that the buildings were constructed of stone and roofed with slate.
Mitigatory recommendations: Level 3 recording; though this building only survives in very poor condition, it is of great importance for its relationship with the windmill (74).

4.3.1 Recommendations for further work

A full REDM survey of the windmill is recommended in the parallel project taking in the monuments within the scheduled. However the windmills associated features will be surveyed using and EDM, REDM and a full photographic record. It is also recommended that the scheduled area should be increased to include these associated features.

Area 3: Cairns Windmill complex

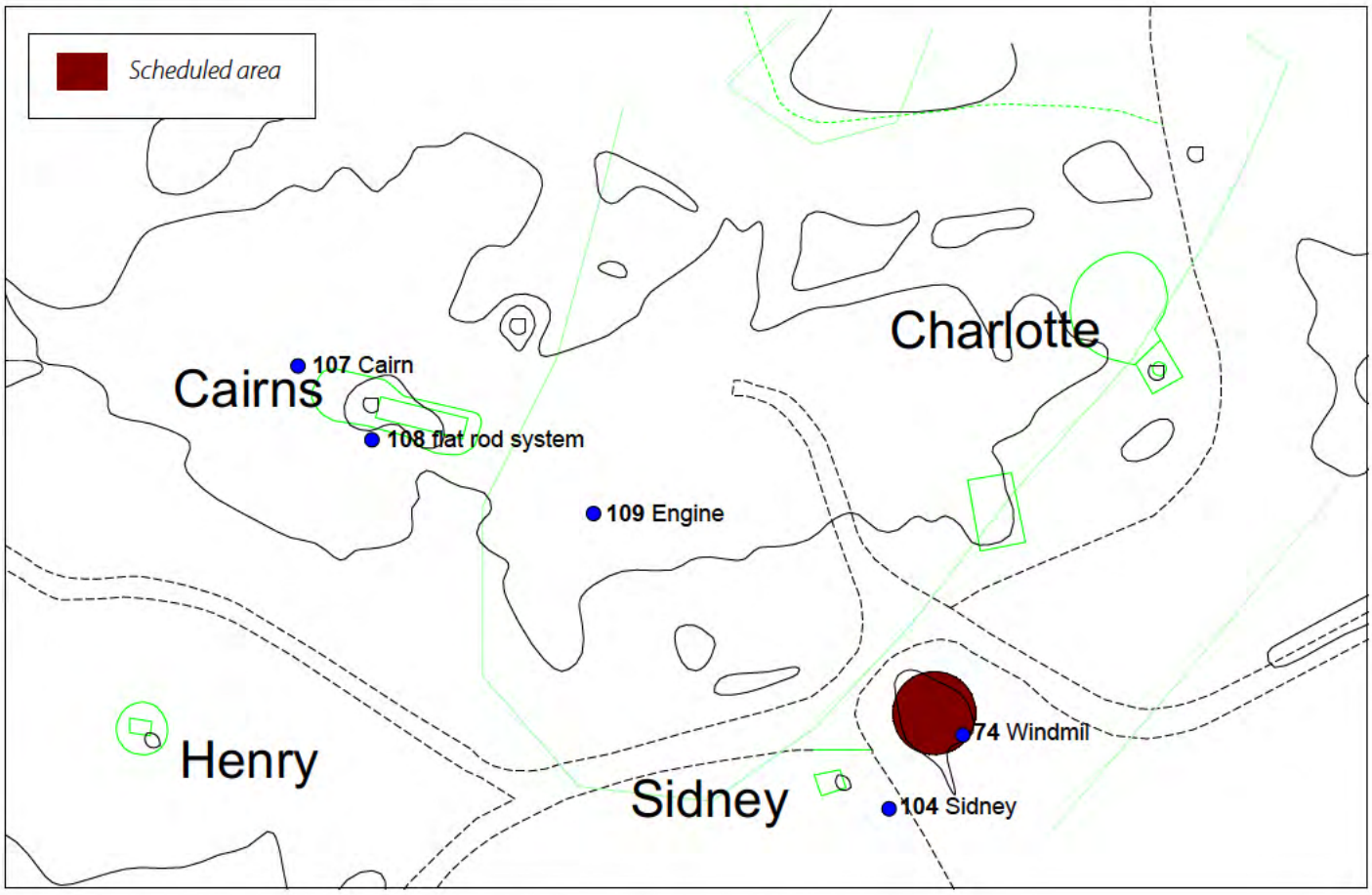

Figure 4: Plan of Parys mine calcining complex (1:1000)

Plate 3: Windmill facing north east

4.4 AREA 4: PARYS YARD/OFFICE

Very little remains of the Parys mine yard, which is shown on the 1815 map.

Feature 217: Pary Mine yard NGR SH43939028
Category:C
The former Parys mine yard, now extremely dilapidated and very densely overgrown with heather. Map evidence makes it clear that the yard was a rectangular enclosure whose longer axis ran south-west to north-east; the central building of the range alongside the south-east facing longitudinal wall survives up to 2m from ground level, but otherwise little obvious trace of former arrangements survives here.
Mitigatory recommendations: Level 3 recording

4.4.1 Recommendations for further work

A full EDM and photographic survey is recommended

Area 4: Parys yard/office

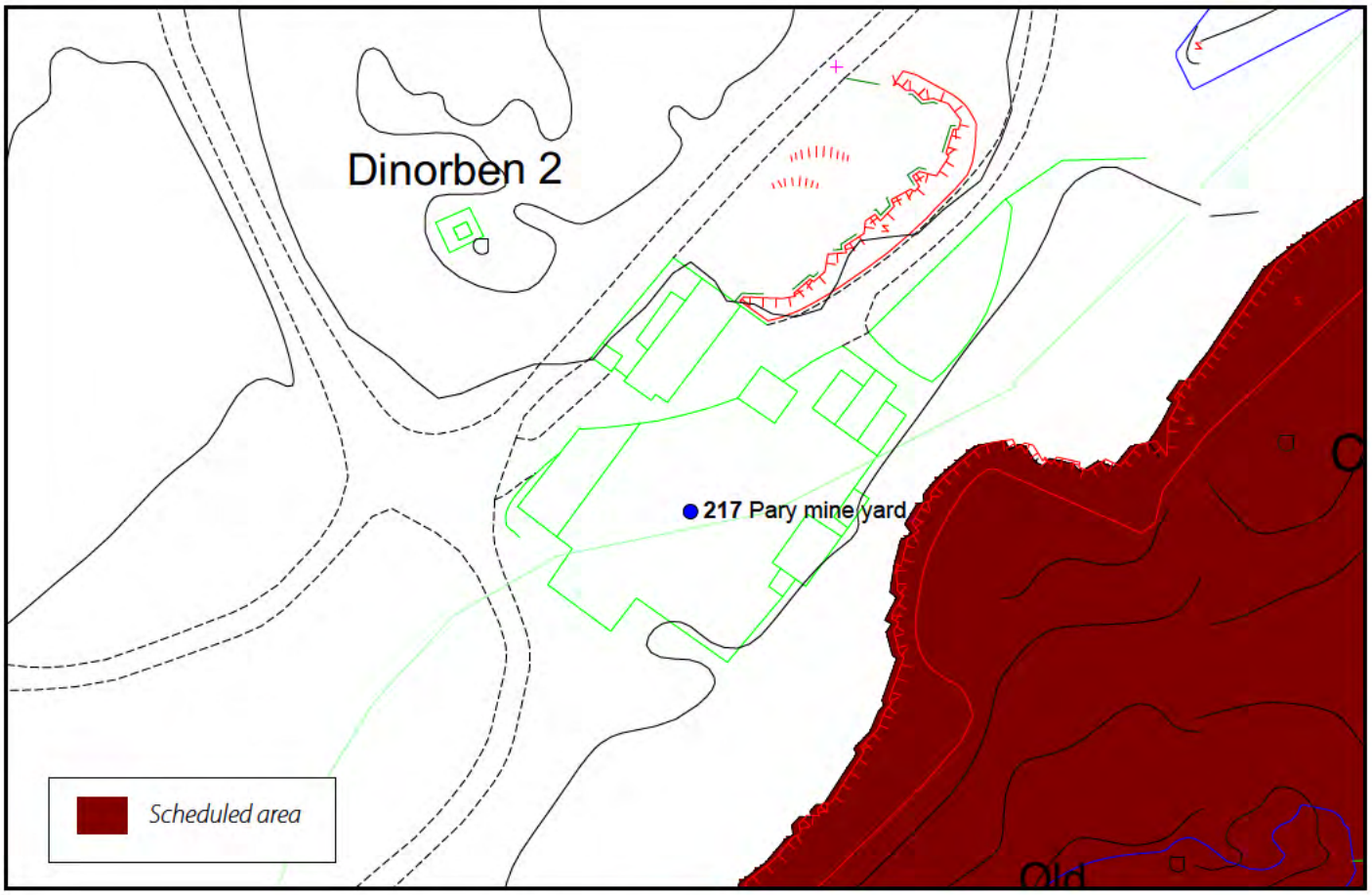

Figure 5: Plan of Parys mine yard (1:1000)

Plate 4: Parys mine yard facing east

4.5 AREA 5 MONA YARD/OFFICE

Mona Mine yard is 1786, when it is described as “New Yard”. Both are quadrangular arrangements with a cart-entrance in one wall. The Mona yard was described by Owen Griffith in 1897 as containing a smithy, lime-store, wagon shed, furnace, carpenter’s shops, assay office, stables, a turnery shed for producing the wooden piping and a place for the bier. He records that at the turn of the eighteenth and nineteenth centuries the then mine manager took it into his head to demolish the chapel at Rhos y Bol, and that the pulpit found its way to the Mona mine yard loft.Whilst the variety of buildings is typical of a large metalliferous mine, the enclosed yard is unusual.

4.5.1 Recommendations for further work

A full EDM, REDM and photographic survey is recommended.

Feature 322: Mona yard/office NGR SH44309047
Category:B
The Mona Mine yard (Iard Mona Mine); described as new on the map of 1788 and its basic arrangments appear to have undergone little alteration since.
It is an open yard on an east-west axis, constructed on bedrock, and would presumably originally have stood of more of an eminence than now, beofre tipping altered the ground levels. There is a trace of a cart-entrance on the north longitudinal wall, and buildings have been constructed all around the yard wall, both internally and externally. These are variously single-storey and two-storey buildings, roofless and dilapidated. The walls stand up to a maximum of 4m high. There are traces of possible gardens along the west wall, suggesting that these might have been offices, and a possible smithy is indicated by the traces of a hearth among the ruins on the east side of the building. A curious feature is the stone-lined cellar, 4m by 9m in plan, 1.5m deep, alongside the south longitudinal wall.
Mitigatory recommendations: Level 4 recording.

Area 5: Mona mine yard

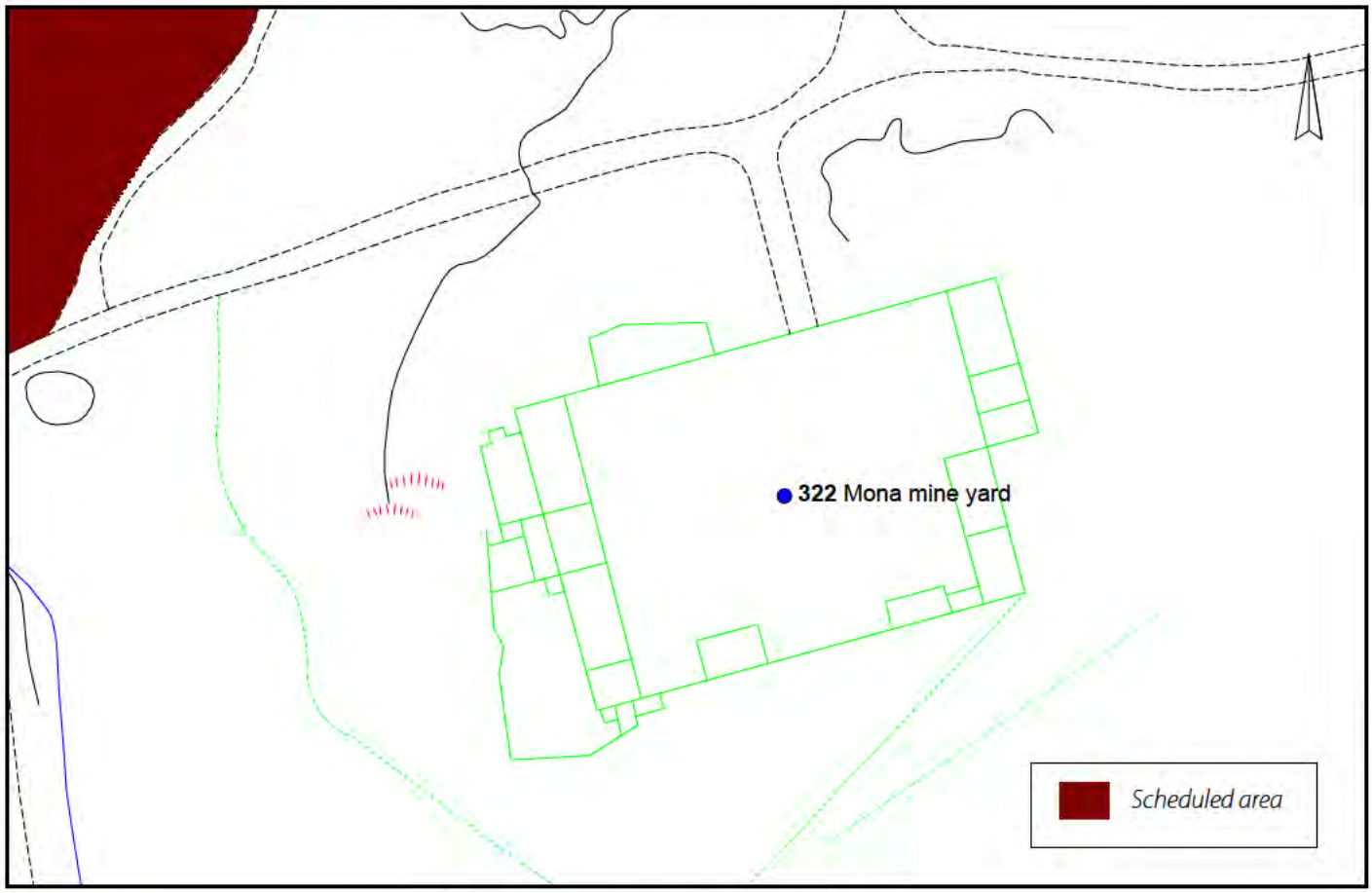

Figure 6: Plan of mona mine yard (1:1000)

Area 6: Sanderson shaft and associated features

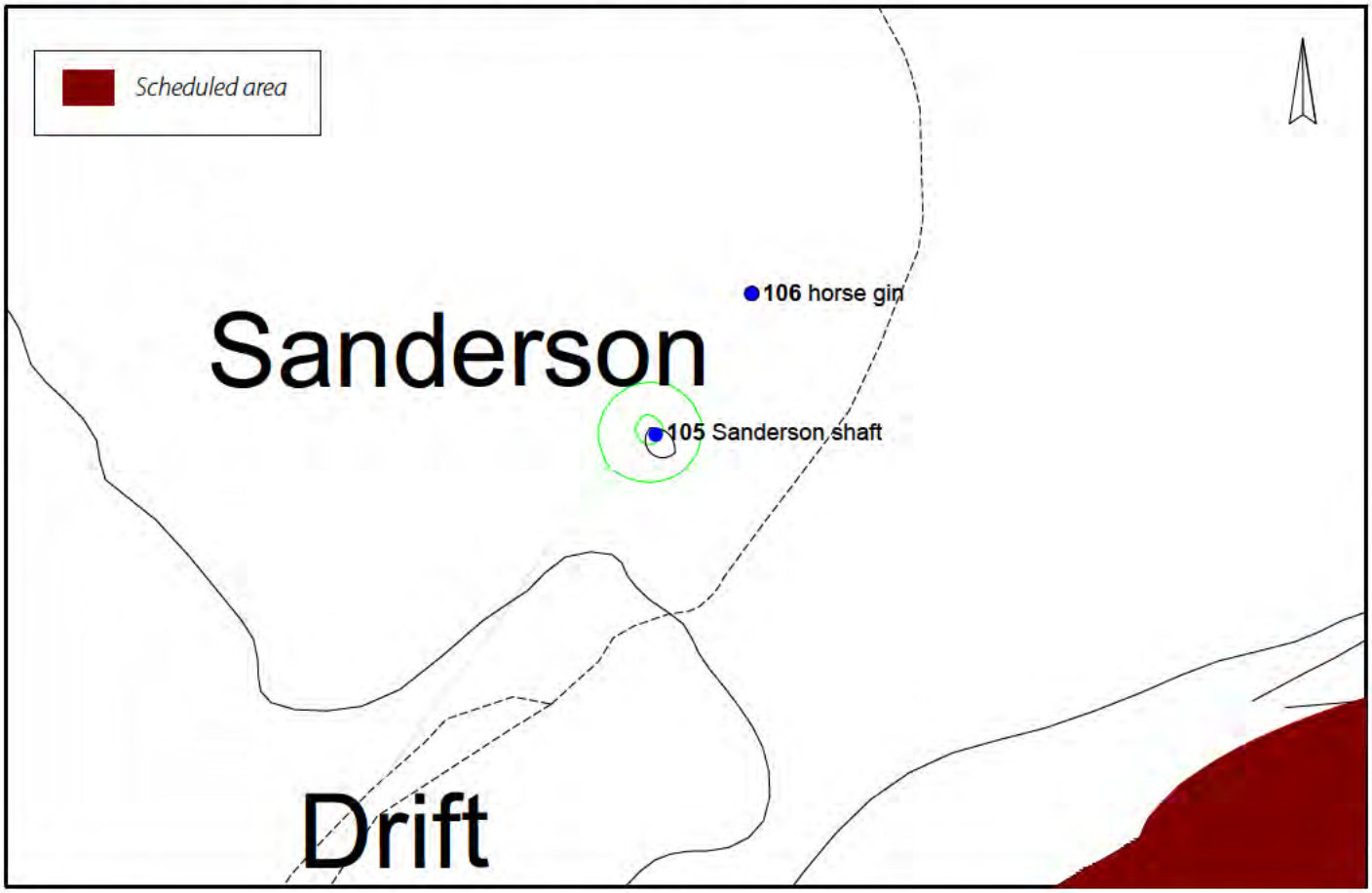

Figure 7: Plan of Sanderson shaft and associated features (1:1000)

4.6 AREA 6: SANDERSON SHAFT

As well as the open workings, mine-shafts giving access to underground workings are a common feature on Mynydd Parys. These have for the most part been capped with a concrete block, and identified by a unique number cemented into a concrete pillar set into the ground near each shaft-site. The sanderson shaft seems to have survived as a good example.

Feature 105: Sanderson shaft NGR SH44309046
Category:E
A shaft, visible as a sub-rectangular depression, 5m by 9m in plan and 2.5m deep. A cross-section through a stone-built structure, possibly a flue or a retaining wall, is exposed on the north side. Pieces of timber, possibly for a staging are exposed on the west side. The site corresponds with Sanderson's shaft.).
Mitigatory recommendations: Level 2 recording.

Feature 106: Horse gin circle NGR SH44309047
Category:C
The site is much disturbed and the identification is only tentative; it is associated with (105).
Mitigatory recommendations: The site is much disturbed and the identification is only tentative; it is associated with (105).

4.6.1 Recommendations for further work

A full EDM, REDM and photographic survey is recommended.

Area 7: Mona calciner and associated features

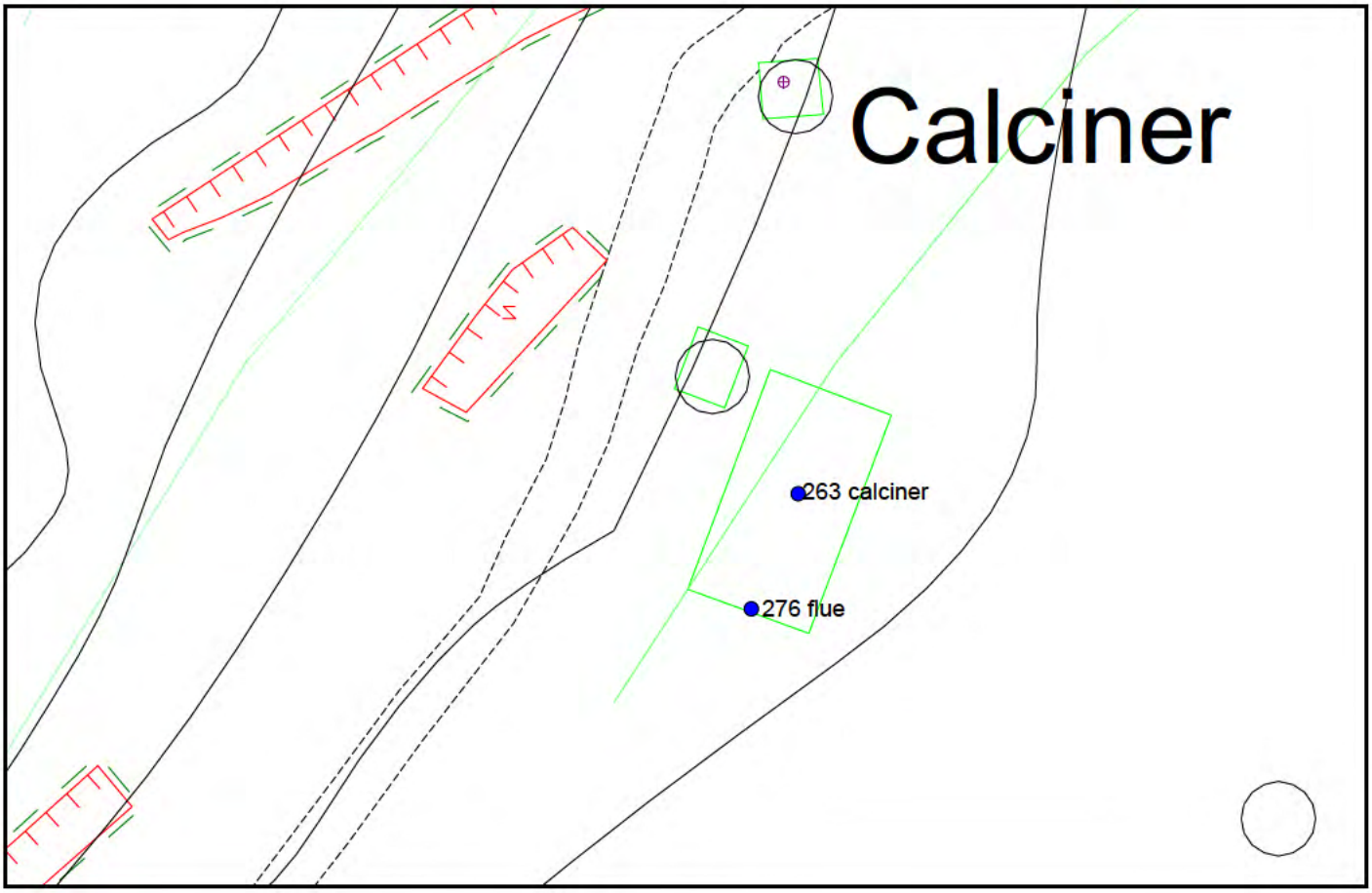

Figure 8: Plan of mona calciner and associated features (1:1000)

Plate 5: Mona calciner facing south west

4.7 AREA 7. Mona Calciner

A building at the Mona mine which has traditionally been known as the Calciner (263) bears no similarity to any of the other kilns and appears latterly at least to have housed either stamps or a rotary crusher, but is connected to a lengthy flue which climbs to the top of the nearby outcrop of Carreg y Doll.

Feature 263: Calciner NGR SH44579052
Category:E
A stone-built structure, in plan 16.5m by 9m, orientated north-east to south-west, roofless and much dilapidated, built on the bedrock of the southern slope of Carreg y Doll. The walls stand up to 4.5m high. Doors are apparent in each longitudinal wall, and what may be a series of three chutes in the north-eastern gable. There is a raised inclined walkway across the structure, which continues as a ramp on the south-east side. At its northern corner is a small stone-lined reservoir (vertically-laid stones, 5m square in plan) which feeds into the north-eastern part of the building through a pipe in the longitudinal wall (still in situ); the internal walls hereabouts appear to have spattered with a thick liquid substance which has dried and partly hardened.
This structure is associated with a water-course (264) and a feature (265) on its south side and with a flue that runs up to the summit of Carreg y Doll to the west (276), and is traditionally known as the Calciner. This interpretation apears to be supported by the flue. However, the presence of an adjacent water-holding pond and of a flume downslope, together with the suggestion of a spattered copper pulp on the northern part of the building and the chutes in the gable wall suggest that this building might have contained a set of stamps or a rotary crusher. It has also been described (Bick, 1998, 4.2.31) as the site of a horizontal steam engine for winding from several shafts and for boring wooden pipes.
Mitigatory recommendations: Level 5 recording.

Feature 264: Water course NGR SH44569050
Category:E
To the south of (263), a stone-lined water-channel, partly capped, possibly to take spent water from a wet-stamping or -crushing process in (263) to the precipitation system (288).
Mitigatory recommendations: Level 3 recording.

Feature 265: Unknown feature NGR SH44569051
Category:E
A linear feature marked as a shallow depression to the south of the Calciner (263).
Mitigatory recommendations: Level 3 recording.

Feature 276: flue NGR SH44579051
Category:B
A lengthy flue, visible in places only as a slight depression edged with stone, mainly quartz, elsewhere as a more marked growth of heather, leading from the Calciner (263) by a zig-zag course to the summit of Carreg y Doll. Capstones are visible in places on the upper section.
Mitigatory recommendations: Level 3 recording. .

4.7.1 Recommendations for further work

Based on the results of the on-site assessment at Parys Mountain and the information detailed within the gazetteer, it is recommended that the Mona Calciner (Area 7) is in a very fragile state and a full EDM, REDM and photographic survey is recommended of this building as well as it's associated features.

5.0 SOURCES

Gwyn, D. Rh. Gwynedd Archaeological Trust Report 292: Mynydd Parys Copper Mine Archaeological Assessment (G1949)

http://www.westernmetals.com.au/

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