THE FOREST OF DEAN
GLOUCESTERSHIRE

The Scowles and Associated Iron Industry Survey: Project Number 3342

Project Report

Volume 1

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Introduction

The Scowles and Associated Iron Industry project was undertaken by the Archaeology Service of Gloucestershire County Council's Environment Department, between January 2003 and March 2004. It formed a daughter project of the main Forest of Dean Archaeological Survey and was funded by the Aggregates Levy Sustainability Fund administered by English Heritage.

The project investigated the following archaeological features within the Aggregates Resource Area in the Forest of Dean, Gloucestershire:-

- *Scowles, a landscape feature unique to the Forest of Dean. These have traditionally been interpreted as the remains of early opencast iron ore extraction and range from deep irregular quarry-like features to amorphous shallow hollows. They are found within the area of the outcrops of Carboniferous Limestones (and particularly the Crease Limestone) around the edge of the central Forest of Dean.*
- *Pre-industrial revolution smelting sites, recognised primarily by deposits of iron-rich bloomery slag (cinders mounds).*

Methodology

The survey was undertaken in three phases.

Phase 1

Phase 1 was a desk-based survey to gain a greater understanding of early exploitation of the iron ore resource within the Aggregates Resource Area in the Forest of Dean to make recommendations regarding its future management and to enhance the Gloucestershire County Sites and Monuments Record.

The desk-based phase recorded the following data:

- *The location and extent of known, visible scowles, scowles which had been backfilled, possible scowles and areas where scowles were expected, but may have been destroyed.*
- *The location and extent of known and possible pre-industrial revolution smelting sites and surviving mounds of bloomery waste (cinders).*

Phase 2

Phase 2 consisted of a programme of field survey targeted mainly at scowles identified as part of the desk-based research and the identification of scowles, which had not been previously recorded. The search area was defined by the geological formations in which scowles could be expected.
The field survey also made an assessment of the management needs of recognised scowles and of identified possible bloomery sites or cinders mounds.

Phase 3

Phase 3 of the project consists of this report, which is a summary and discussion of selected parts of the Sites and Monuments Record database, which have been extracted to address specific management and research-based issues.

Results of the survey: Scowles

The formation of scowles

The traditional archaeological interpretation of scowles is that they are entirely artificial features created by the human exploitation of surface iron ore deposits in the Carboniferous Limestones of the Forest of Dean, which would necessarily have preceded subterranean mining.

Recent geological research has suggested that these features had their origins as a natural subterranean cave system, which was exposed by geological action over 150 million years ago. Following this, iron ore derived from run-off of mineral–rich solutions from the Carboniferous Coal Measures of the central Forest, was deposited in these cave systems and in the joints of the surrounding limestone. The iron ore deposits would not necessarily have formed throughout all parts of the cave system, and may have been particularly scarce where caves were exposed (i.e. scowles) and near the surface. This does not mean that the iron ores from the Carboniferous Limestones would not have been exploited from early times or that no ore would have been available as surface exposures within scowles. It does, however, have the following implications:-

- *The extent to which the present form of many of the identified scowles, or sections of scowles, are the result of natural processes rather than human intervention is not clear.*
- *It is, therefore, impossible to quantify the amount of ore removed from scowles due to the variable nature of the deposition of ore deposits and natural erosion.*
- *Subterranean deposits of iron ore may have been exploited from an earlier period than has generally been accepted.*

The date of the exploitation of scowles

The dating evidence for the exploitation of iron ore from scowles is generally based on chance finds from the area of scowles or is open to question in the light of the geological theories outlined above. Recent archaeological research has, however, shown that iron ores with a chemical signature consistent with the ores from the Carboniferous Limestones were used in the manufacture of iron implements dating from the late prehistoric and Roman periods.

The form of scowles

The field survey divided scowles into six forms based on their current physical appearance.

These forms are discussed more fully in the report, but can be broken down into the following three main types:-

- *Deep irregular, linear quarry-like features ("classic" scowles, traditionally interpreted as surface iron ore workings, but now seen as geological features, which have been subject to a varying amount of human intervention).*
- *Amorphous shallow hollows or sub circular depressions (traditionally seen as backfilled scowles, although the survey suggested that some of this category could have different origins).*
- *Natural rock outcrops.*

Management issues affecting scowles

Landuse

The majority of existing or possible scowles (70.2%) identified in the field survey were under woodland or scrub, 27.4% were under grassland, whilst the remaining 2.4%

were under a variety of landuses including cultivated land, private gardens, or orchards.

Damage

The majority of scowles (55.7%) were in good condition and were suffering no visible damage.

The single most significant management issue was dumping which affected 17.1% of scowles recognised in the field survey. This was closely followed by mineral extraction, as it was estimated that c. 15% of scowles may have been destroyed by quarrying.

Vehicle damage affected 7% of recognised scowles. Most other recorded damage was relatively slight. It was, however, noted that housing development encroaching in the vicinity of scowles could have the potential to adversely affect these features in some areas.

Results of the survey: Possible bloomery sites

The survey of possible bloomery sites differed from that undertaken for scowles in that the bulk of the survey consisted of desk-based data collection, with only 27 sites (i.e. those within the Aggregates Resource Area) visited as part of the field survey.

In total 144 possible bloomery sites were identified within the Forest of Dean survey area with an additional 18 possible sites within Gloucestershire in the area to the north of the survey area, and a further 30 in the neighbouring counties of Monmouthshire and Herefordshire.

The status of identified possible bloomery sites

The vast majority (92%) of possible bloomery sites were recognised from surface scatters of bloomery slag, field name evidence or historical references to the location of cinders mounds, which were re-smelted as technology improved in the post-medieval period.

The status or date of many of these (72.9%) has not been established.

A small number of smelting sites have been identified as a result of archaeological excavations or watching briefs. Available records, however, are often poor, or the scale of the work was insufficient to enable definitive statements to be made about the nature, scale, or date of the activity undertaken on the site.

The available evidence of the pre-industrial revolution iron industry in the Forest of Dean can be summarised as follows:-

- *There is no firm evidence for pre-Roman smelting in the Forest of Dean.*
- *The full range of 1st and 2nd century AD smelting or smithing activity is not understood, although centralised production centres, outside the central Forest area, did emerge at this time.*
- *There is no evidence that iron ore production or smelting was under the direct control of the Roman military authorities during the early Roman period.*
- *The centralised production centres outside the central Forest either closed or declined from the late 2nd century/early 3rd century AD, perhaps as markets diminished.*
- *From the later 3rd and 4th centuries AD some relatively small-scale production appears to have been taking place in association with villas, and, perhaps, other established settlements.*

- *There is no evidence for early medieval smelting or smithing, although undated bloomery slag has been found at the known pre-conquest site of Madgetts near Brockweir.*

Very little archaeological evidence exists for later medieval smelting activity, although historical records suggest this took two distinct forms:-

- *Smelting at fixed sites within or on the outskirts of established settlements.*
- *Itinerant forges, which may have moved around the central wooded part of the Forest of Dean closely linked to the cycle of charcoal production.*

Although the Forest of Dean would have been an eminently suitable area for water-powered bloomeries, which were introduced to the area in the later medieval period, no sites of these have been identified.

Some water-powered bloomeries may have been on the same sites as the early charcoal fired blast furnaces which operated in the Forest of Dean from the late 16th century.

Management issues affecting possible bloomery sites

Results of the field survey

Landuse

The majority (40.5%) of the 27 possible bloomery sites within the Aggregates Resource Area which were visited as part of the field survey were under grassland, whilst only 27% were under woodland and scrub. 13.5% were in cultivated land in 2003.

Damage

77.8% of possible bloomery sites were classed as in good condition with 63% displaying no signs of visible damage. These sites, however, are particularly susceptible to damage from agricultural agencies, particularly deep ploughing, the full effects of which would not necessarily be discernable at the level of survey undertaken as part of the 2003-04 project.

Recommendations for further archaeological research

The survey identified the following research agenda:-

- *Investigation of the status and the relationship between scowles of different forms. This could encompass exploration of the extent and date of human modification of scowles and the extent and date of exploitation of ores from subterranean deposits. This could be achieved through:-*
  - *Detailed survey work in selected areas to record evidence of geological or archaeological surfaces, and to relate selected scowles to a detailed record of their topography, geology and landuse.*
  - *Investigation of the date of the rock exposures in selected areas to establish whether these are archaeological or geological in origin.*
- *Investigation of the status and date of activity in the gaps between recognised scowles through:-*
  - *Geophysical survey, or other archaeological investigation, in those areas where scowles may have been backfilled in the past, or of selected examples of those scowle forms whose status is currently not clear.*
- *Investigation of the extent, organisation and degree of local variation in the iron ore smelting, and secondary smithing industry, the relationship between these and associated industries such as charcoal production and early coal extraction. This will be achieved through:-*

- *A review of archives of sites, which have already been investigated or recorded, to allow the available evidence to be re-evaluated.*
- *Systematic field walking of known sites, particularly where archival material is deficient, to allow the interpretation of these sites to be re–evaluated.*
- *Systematic artefact collection, both field walking and other strategies, such as watercourse surveys, to establish the status of suspected sites or identify previously unknown sites.*
- *Targeted geophysical survey and trial excavation in selected areas to determine the extent, date, status, and survival of buried archaeological deposits of these sites.*

- *Investigation of the sources of iron ore exploited in the Forest of Dean at different periods and the extent to which ore was transported either into or out of the area, through:-.*
  - *The retention of all slag and ore recovered in any archaeological operations and submission of these for specialist analysis.*

Recommendations for management of identified sites

The following management recommendations are made for identified scowles and iron working sites:-

- *The maintenance of existing landuse where this is not actively detrimental to the survival of identified scowles or possible iron working sites .*
- *Statutory protection (either heritage or conservation designations) where appropriate.*
- *Use of the planning process to control detrimental activity wherever possible, and advance archaeological research where destruction is inevitable.*
- *Provision of information and management advice to all landowners, and where appropriate, the promotion of integrated management regimes though the involvement of all interested national and local agencies, trusts, landowners and local government departments.*

1 Introduction

This report presents the results of the Scowles and Associated Iron Industry Survey (Project No. 3342/ANL) a programme of archaeological survey of early iron ore extraction sites (scowles) and associated early smelting and smelting waste sites within the Aggregates Resource Area in the Forest of Dean, Gloucestershire.

The project was undertaken in accordance with the specifications in a Project Design submitted to English Heritage in November 2002 (Hoyle 2002) which set out a proposal to expand and bring forward some elements of the existing Forest of Dean Archaeological Survey (Project No. 2727) within the Aggregates Resource Area of the Forest of Dean in west Gloucestershire.

The survey was financed by funds made available to English Heritage from the Aggregates Levy Sustainability Fund.

1.1 Location of the Aggregates Resource Area within the Forest of Dean

The Forest of Dean, to the west of the River Severn, is a very important source of aggregates in Gloucestershire. Extraction focuses on the Lower Dolomite and Lower Limestone Shales of the Carboniferous Limestone series which outcrop at the edge of the Forest of Dean syncline. These resources are currently exploited at a number of quarries; the Gloucestershire Minerals Local Plan 1997-2006 (GCC 2003, 85-96) has identified a number of additional areas of search for future extraction and it is clear that these minerals will continue to be exploited to meet the county's aggregate needs.

The survey area encompassed the Aggregates Resource Area as defined in the Gloucestershire Minerals Local Plan (GCC 2003, Plan 2), and covers an area of *c.* 50km^2 centred on Ordnance Survey grid reference SO60481049 (Figure 1, Figure 27).

The Forest of Dean was one of the seven sub-units considered by the ALSF project The Aggregate Landscape Of Gloucestershire: Predicting The Archaeological Resource (EH Project Number 3346), carried out by GCCAS in 2005, which assessed the archaeological resource threatened by the extraction of aggregate minerals within Gloucestershire (Mullin 2005).

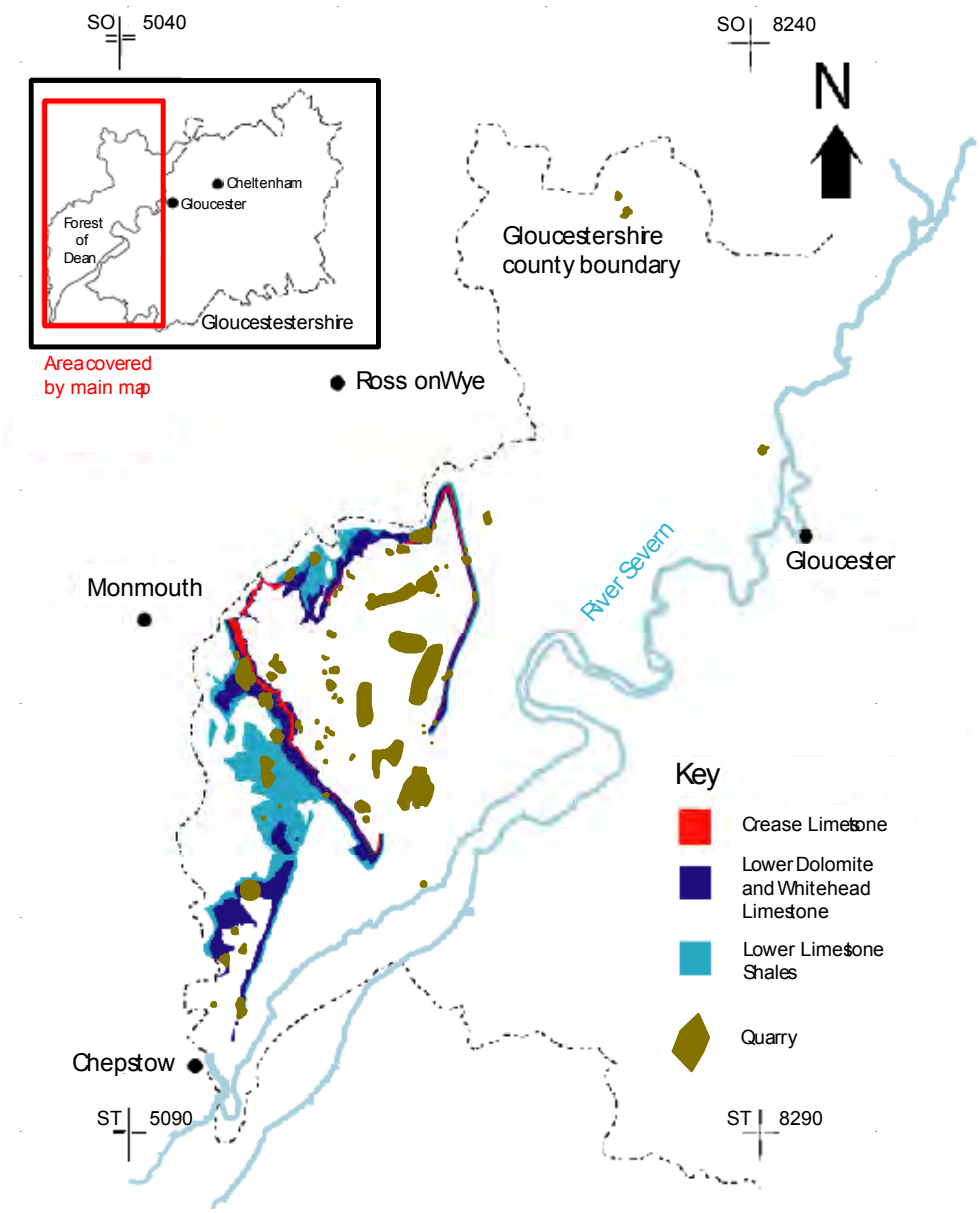

Figure 1: The Aggregates Resource Area in the Forest of Dean, Gloucestershire and the location of main quarries

1.2 Geology, topography and landuse of the Aggregates Resource Area

The survey area encompassed the Aggregates Resource Area as defined in the Revised Deposit Draft of the Gloucestershire Minerals Local Plan (GCC 2003, Plan 2; see above).

1.2.1 Geology and topography

The northern part of this Aggregates Resource Area rings the central Forest of Dean and encompasses the Lower Dolomite, the narrow outcrops of Whitehead Limestone and the iron ore-bearing Crease Limestone. These frequently follow the contour lines demarcating areas of higher ground at the edge of the Forest of Dean syncline, and are found at heights of between 150 and 200m AOD. The Lower Limestone Shales also form the solid geology of a relatively extensive area in the northern part of this zone where the ground drops below the 150m contour.

The solid geology in the south-western part of the Aggregates Resource Area consists of more extensive areas of Lower Dolomite and Lower Limestone Shales, with occasional bands of non-dolomitic Crease Limestone which do not contain iron ore deposits. The topography in this area consists of an undulating plateau with rolling ridges and valleys draining both to the River Severn in the east and the Wye to the west. Although tilted to the south, this plateau generally maintains a height of *c.* 150m AOD.

1.2.2 Landuse and landownership

Woodland (deciduous, coniferous and mixed) covers approximately 40% of the northern part of the Aggregates Resource Area. Approximately 45% of this woodland is owned and managed by a single landowner, the Forestry Commission. The remaining landuse is generally pasture within a landscape of enclosed farmland although some small patches of arable are also found. Settlement sites tend to be found only in the northern part of the Aggregates Resource Area, particularly where the Lower Limestone Shales are found at heights of less than 150m AOD. Settlement is generally sparse and dispersed. Nucleated settlements, such as Newland, Clearwell or St Briavels, tend to be found either at, or adjacent to, the edges of the Aggregates Resource Area. The continuous band of settlement (ranging from urban to semi-rural) which rings the central forest area tends to fall outside the Aggregates Resource Area, with the exception of a few areas where recent expansion of some built-up areas has encroached into it (Landsat 2000).

2 Methodology

The project was undertaken in the following three stages:-
Phase 1: Desk-based survey.
Phase 2: Field survey.
Phase 3: Report preparation.

The following outlines the methodology undertaken for Stages 1 and 2 of the project.

2.1 Phase 1: Desk-based survey

2.1.1 Introduction

This phase of the project involved "applying a targeted desk-based survey consisting of the collation of existing written, graphic, photographic and electronic information targeted at identifying the likely character, extent, quality and importance of the known or potential archaeological resource in the whole of the area designated as the Forest of Dean Carboniferous Limestone Resource Area" (Hoyle 2002).

The following is a summary and discussion of the methodology adopted. Details of this are set out in Appendix A.

Text, map and aerial photographic sources from a number of locations (see Appendix B) were accessed to:-

- Provide high quality base-line data to inform subsequent phases of the project.
- Ensure that strategies for the targeting of further archaeological investigation, or site validation (Phase 2) were based on a full appreciation of the current state of knowledge of the archaeological resource.
- Ensure that decisions about future research priorities within the Aggregates Resource Area in the Forest of Dean were based on a full appreciation of the current state of knowledge.

Information from these sources was used to define:-

- The location and extent of known, visible scowles, possible scowles, scowles, which had been backfilled, and areas where scowles were expected, but have been destroyed.
- The location and extent of known and possible pre-industrial revolution smelting sites and surviving cinders mounds.

2.1.1.1 The search area

A "search area" for the identification of scowles was not the whole of the Aggregates Resource Area, but was defined by Mark Campbell of Gloucestershire Geoconservation Trust who advised on the areas in which scowles were most likely to be located. This was determined at the outset of the project and was based on the areas where the following geological formations outcropped:-.

- Crease Limestone.
- Lower Dolomite.
- Drybrook Limestone.
- Outcrops of veins of iron ore within the Drybrook Sandstone marked on 1:50,000 scale geological maps of the area.

Although the search area for the desk-based study of possible bloomery smelting sites was the Aggregates Resource Area (Figure 27), it was considered necessary to study a wider area to allow the results to be understood within the context of the early iron industry in and around the Forest of Dean.

Accordingly desk-based research was undertaken over a much wider area in the following way:-

- Where documentary evidence for possible smelting sites was identified within the Survey area, or adjacent parts of Gloucestershire to the west of the River Severn, these were added to the project database (the County SMR).
- The project team also contacted Glamorgan-Gwent Sites and Monuments Record for evidence of iron working and extraction sites to the west of the river Wye, *c.*10km into Wales and Herefordshire Sites and Monuments Record for records of the early iron industry within about 10km from the Gloucestershire border (see Appendix X).

2.1.1.2 Data collation and presentation

The desk-based data collection of information about scowles resulted in a comprehensive database of previously unrecognised scowles, which included all sites where these features may formerly have been present, and also a record of other features (e.g. placenames, or landscape features), which suggested the presence or former presence of scowles.

In addition to this the project identified a total of 192 sites, which indicated evidence of pre-industrial revolution iron ore smelting. Of these 144 were within the Forest of Dean Archaeological Survey area (Hoyle 2001b, Figure 1), 18 were within the wider project search area in Gloucestershire, and 30 were in Monmouthshire and Herefordshire.

Information on these sites consisted of:-

- A digital map layer of identified sites within the Gloucestershire County GIS.
- A database of all identified sites included as part of the Gloucestershire County SMR and cross-referenced to the GIS.
- Tables recording information about sites derived from more general sources and which could not be located with any degree of precision, were created.

2.2 Phase 2: Field survey

2.2.1 Field survey search area

The search area for the survey of scowles was essentially based on the same search area as that already identified for the desk-based research.

The desk-based search area for possible bloomery sites was, however, relatively large and not restricted to the Aggregates Resource Area (see Appendix I). It was, however, decided that field-survey of possible bloomery smelting sites should be restricted to the 29 sites identified within the Aggregates Resource Area.

2.2.2 Objectives of the field survey

The objective of the field survey can be summarised as:-

- To gather base line data on the nature, extent and management of scowles, or possible bloomery smelting sites.

2.2.3 Field survey methodology

Field survey was undertaken in accordance with specifications prepared in advance of the fieldwork. Detailed methodological information is found in Appendix J. Copies of specifications can be found in the project archive.

Field survey consisted of –

- Investigation of areas where scowles, bloomery sites or cinders mounds or their former presence, was suspected as a result of the desk-based data collection phase of the project.
- Investigation of selected areas within the scowles search area where scowles have not previously been reported to locate previously unrecorded scowles or other iron ore extraction features.
- Recording the current condition, landuse, form and damage of recognised scowles, bloomery sites or cinders mounds, or areas where they may formerly have been present.
- Checking the visible extent of identified possible bloomery sites or cinders mounds against the information collected as part of the desk-based phase of the project.

2.2.3.1 Field team composition

Fieldwork to identify and record scowles was carried out by two teams, each consisting of one Assistant Project Officer and one Senior Site Assistant. Logistically, this meant that there were two separate areas of study being surveyed at any one time (an east and a west area).This was done to alleviate any survey duplication errors, by having teams working closely together.

As most recognised possible bloomery sites were identified within open farmland rather than woodland, it was not felt that this operation was subject to the same health and safety constraints as the field survey of scowles (Appendix E). Accordingly an Assistant Project Officer working alone undertook the fieldwork.

2.2.3.2 Paper and digital recording

In the past, surveys of this nature have mainly used a paper-based approach to the creation of field records. Although the Archaeology Service have made earlier attempts at digital recording to facilitate fast and efficient data transfer and direct feedback of results in the field, this has often proved problematic. For example, the Offa's Dyke survey (Hoyle & Vallender 1997) attempted to use both paper and digital records, but at the time the digital approach was the least efficient. This was mainly due to the cumbersome nature of the field equipment as well as the database used. However, it was felt that improvements in both hardware and software since that time have allowed for digital recording to become more efficient. Therefore an initial assessment of potential recording techniques highlighted the need to trial a digital approach for the field recording, which would more closely tie-in with the project database (the Gloucestershire County Sites and Monuments Record), as well as the project GIS (the Gloucestershire County Council Genaware GIS) in order to dramatically cut down the amount of post-fieldwork data entry and digitisation.

The use of a hand-held computer (PDA) enabled spatial data to be directly captured from user-input and GPS signals to a spatial database (GIS), as well as attribute data about the features, which could also be directly entered (often conforming to standard glossaries / wordlists). A user-friendly device, which was easy to handle in the field, as well as waterproof and relatively rugged, was assembled (see Appendix J). Strategies for the uploading of information onto the project database were relatively quick and straightforward.

This approach to recording was taken as both a trial of existing, but often little-used, technologies and working methods as well as a means to simplifying, standardising and improving the recording methodologies for the fieldwork.

As only 29 possible bloomery sites had been recognised within the Aggregates Resource Area, and many of these were expected to reveal relatively little information, it was decided that the set-up time required to construct a digital recording strategy on the handheld computer would not be warranted given the

limited nature of this part of the field survey. Accordingly all field recording of possible bloomery sites was undertaken on a paper pro-forma (Appendix K) and recorded information added to the project database (the County SMR) as a separate exercise.

2.2.3.3 Hardware and software

Hardware and software were not only chosen to meet the needs of this project, but also to assess the benefits of their use in future projects. Ease of use, compatibility with existing / future systems and cost were important issues in choosing the hardware and software.

Two near-identical sets of equipment were used by each field team. This consisted of:-

- A handheld computer (PDA) running GIS software, with additional storage and battery capabilities.
- A handheld GPS unit with connection to the handheld computer.
- A rubberised, transparent, waterproof bag.
- A digital camera.

Details of hardware and software specifications can be found in Appendix J.

3 Results of the survey

3.1 The survey of scowles

Desk-based research on the scowles of the Forest of Dean was carried out at Shire Hall in Gloucester from late January to June 2003. The main body of fieldwork for the survey took place from late June to September 2003. This was not ideal due to the density of undergrowth at this time of year, but was unavoidable given the time constraints of the Aggregates Levy Sustainability Fund project.

Unless stated otherwise, the calculations in the following discussion are based upon surface area measurements rather than on the number of sites recorded within each category as this was considered to be the most representative way of discussing the survey results.

The results of the field survey can be summarised as follows:-

- 694 separate sites were recorded by the field survey. This included areas where possible scowles were known only from cropmarks, or the site of possible scowles which may have been destroyed by later activity (see Table 5).
- The total surface area of all sites recorded by the field survey, was approximately 3.33 km^2.
- The total surface area of all recognised features which may represent scowles (Scowle forms 1-5, see Table 5) was approximately 2.64km^2
- The total area where access was denied by landowners or where landowners could not be contacted was just over 0.3 km^2.
- The total area of sites that were impenetrable because of dense undergrowth or for health and safety reasons was just under 0.6 km^2.

The fieldwork of the survey only included scowle sites within the county of Gloucestershire, although work carried out by Wildgoose has shown that scowles also exist outside the county in Lady Park Wood, Herefordshire (SO54701440), where the outcrops of Carboniferous Limestone continue (Wildgoose 1993). They are also known across the River Wye from Symonds Yat, in the vicinity of King Arthur's Cave (SO54601550), where they were not recorded by Wildgoose. "Scowles" have been reported in the area of St Arvans, Monmouthshire, on the western side of the River Wye, although as these have not been subject to the same geological processes as the scowles discussed in this report, their status as the same type of feature is unclear (Mark Campbell, Gloucestershire Geoconservation Trust pers. comm.)

The vast majority of scowles, however, are located within the outcrops of Carboniferous Limestones within Gloucestershire around the central part of the Forest of Dean, and, with the exception of a few where access was denied or impossible for undergrowth or health and safety reasons, all identified scowle sites in these areas were visited by the survey teams.

Sites known from earlier fieldwork (Wildgoose 1993, Entec 1998), and located within areas that were impenetrable or inaccessible in 2003-04, were included in the survey results because these sites had already been verified by fieldwork. They were assigned a Survey Level rating of 1, whilst Form and Landuse classifications were assigned on the basis of existing information from the descriptions given in the survey reports, or from aerial photographic data. Damage and Condition were recorded as unknown.

A number of these areas were re-visited in February 2004. These were:-

- The Lydney Park Estate (SO 610 040), where access had been denied due to the presence of young pheasant stock in the summer of 2003.

- Beech Grove near Sling (SO 586 068), where access was impossible due to the density of undergrowth in the summer of 2003.
- Great Lambsquay Wood to the north of Clearwell (SO 577 090) where difficulties in identifying ownership in the summer of 2003, made access impossible at that time.

3.1.1 Recorded distribution of scowles

The definition of the features identified as scowles during the 2003-04 survey is discussed more fully in 4.1 below. The distribution of these features is confined to specific geological formations which occur in a broken ring around the central wooded part of the Forest of Dean where outcrops of the following geological formations are found:-

- Crease Limestone
- Lower Dolomite
- Drybrook Limestone
- Outcrops of veins of iron ore within the Drybrook Sandstone marked on 1:50,000 scale geological maps of the area.

There is a theoretical predictability in this explanation of their distribution, as these geological formations constituted the search area in which field workers looked for scowles and consequently, it is of no surprise that their recognised distribution conforms to this. In practice, field workers were instructed to record all negative, scowle-like features which appeared to be contiguous with those recorded within the search area, and a number of features were recorded outside this zone (see for example Glos SMR 23726, 23754-61). Accordingly, the recorded features can be regarded as a discrete group whose distribution reflects the actual extent of negative features in those areas.

3.1.2 Geology of scowle sites recorded by the field survey

Although scowles are generally associated with the outcrops of Crease Limestone, (Wildgoose 1992, 2.1.1), the features classified as scowles within the survey area occur principally within the Lower Dolomite (47.3% of recognised scowles), whilst only 18.8% occur in the Crease Limestone. A significant proportion of these were also recorded overlying outcrops of Drybrook Sandstone and also the non-speleogenic Whitehead Limestone.

The reasons for this are not entirely clear, although it must be remembered that these figures are the result of comparison between the area covered by recorded scowles, and the geological outcrops as recorded by the British Geological Survey on the digital data derived from their 1:50,000 scale maps which generally depicts the Crease Limestone as an outcrop that is much narrower than the extent of visible scowles (BGS 1974, 1975, 1981).

Consequently, whilst this indicates that the assumption that scowles are limited to the Crease Limestone is clearly at fault, the low percentage of scowles recorded within this geological outcrop may be skewed by the inaccuracies inherent in the production of geological maps, perhaps combined with inaccuracies in the on-site digital mapping which had a tendency to over-estimate the size of the polygon being mapped (see Appendix I.v).

The table below shows the percentage of the total area of scowles within each geology type.

Table 1: Geology of scowle sites

Geology	% of total area covered by scowles within each geology type
Coal Measures	0.8

Geology	% of total area covered by scowles within each geology type
Drybrook Limestone	3.3
Drybrook Sandstone	13.4
Whitehead Limestone	13.1
Crease Limestone	18.8
Lower Dolomite	47.3
Lower Limestone Shale	2.7
Tintern Sandstone	0.5
	99.9

3.1.2.1 Discussion of scowles identified in non-speleogenic geologies

The field survey recorded numerous sites extending into geologies that are not prone to the formation of scowles and where significant deposits of iron ore are not expected. In some instances, the features recorded were wholly within these non-ore bearing outcrops. These geological anomalies are discussed below. A generalised stratigraphy of the Forest of Dean Carboniferous succession is set out in Appendix BB.

Tintern Sandstone

The Tintern Sandstone lies beneath the Crease Limestone, and is separated from it by the Lower Dolomite and Lower Limestone Shale. It was not subjected to the same geological processes and conditions as the scowle-bearing strata, and so scowles do not occur within it. However, the field survey recorded 3 sites entirely within, and 3 sites partly within the Tintern Sandstone.

Lower Limestone Shale

The Lower Limestone Shale lies between the Tintern Sandstone and the Lower Dolomite. Iron ore is recorded within the Lower Limestone Shale in the south-west of the Forest of Dean. The field survey recorded 11 sites entirely within, and 36 sites partly within the Lower Limestone Shale. Many of these sites lie at the basal edge of the outcrop of Lower Dolomite, extending only slightly into the Lower Limestone Shale, and probably represent iron ore extraction in the Lower Dolomite that has continued only slightly into the adjacent deposit.

Whitehead Limestone

The Whitehead Limestone overlies the ore-bearing Crease Limestone. The field survey recorded 53 sites entirely within, and 176 sites partly within this bed. Many of these anomalous sites are located partly within scowle-bearing strata, and probably represent features that formed initially within those strata, but which were extended, either naturally or by human intervention into the adjacent Whitehead Limestone. The base of the Whitehead Limestone, where it overlies the Crease Limestone, is pitted and uneven, and although ore bodies do not occur within the Whitehead Limestone itself, ore may have formed within these hollows. At least some of the features recorded by the survey probably represent the remains of stone quarries, for example at Scully Grove near Mitcheldean, Whitehead Limestone was exploited for use in the local cement works. A further possibility is that at least some of the features within the Whitehead Limestone represent prospecting for iron ore rather than features of geomorphological origin (see 3.1.4 below).

Coal Measures

The Carboniferous Coal Measures lie unconformably above the known ore-bearing deposits. However, the field survey recorded 4 sites entirely within, and 8 sites partly within the Coal Measures. At least 3 of these sites, located in the east of the region in

Staple Edge Wood, near Soudley, have been recorded as a result of the field teams checking features plotted by the National Mapping Programme project, which were slightly outside the search area.

Conclusion

Various explanations can be put forward for the identification of scowles within the 'wrong' geological formation.

The majority of these anomalies are essentially borderline and most are likely to simply be a product of a combination of inaccuracies inherent in the production of geological maps and/or the digital geological data obtained from the British Geological Survey and incorporated into the project GIS, combined with inaccuracies in the on-site digital mapping which had a tendency to over-estimate the size of the polygon being mapped (see Appendix I.v). This will have been particularly significant in the eastern part of the region where the ore bearing outcrops are narrow, causing any inaccuracies to have a more significant effect.

Other possible explanations for these geological anomalies are:-

- They represent prospecting for iron ore at the margins of the scowle zone. This may particularly apply where features penetrate into formations which are known to contain deposits of iron, such as the Tintern Sandstone which is known to have contained iron ore deposits in some areas (see above).
- Some may be artificial stone quarries which are not scowles, or scowles that have been extended by subsequent quarrying. Those which extend into the Lower Limestone Shales, which were exploited from the post-medieval period to provide limestone for limekilns, or those in the Upper Carboniferous Sandstones which were an important source of building stone in the post-medieval period (Herbert 1992a) may fall into this category.
- Some may represent ore deposits in scowle-bearing geologies being accessed by digging through the overlying non-scowle bearing strata. This might be the case where anomalous features occur just inside of the scowle belt, on the western part of the outcrop of Carboniferous Limestones, where the angle of dip is relatively shallow (see 3.1.5 below).

3.1.3 Scowle Type

The field survey recorded three categories of scowle type based on an assessment of their current status. Their characterisation and frequency is summarised in the table below.

Table 2: Scowle type

Scowle Type	% of total area covered by recorded scowles
Scowle – Existing *A scowle or an area of scowles that physically exists as a visible landscape feature and is locatable.*	64.9
Scowle – Possible *An area which possibly contains a scowle or number of scowles. This may include areas of uncertainty where scowles may survive but are obscured by later activity (e.g. where scowles have been backfilled) or other possible scowles.*	18.7

Scowle Type	% of total area covered by recorded scowles
Scowle - Possible Destroyed *An area where scowles, might reasonably be expected to have been present in the past, but where later activity (e.g. quarrying) will have destroyed (not just obscured) all evidence for them.*	16.4
	100

Scowle – Existing

The largest proportion of sites recorded by the field survey were 'Scowle – Existing'. These features survive in a variety of forms, ranging from shallow depressions to deep quarry-like pits. Sites which fell into this category represented 64.9% of all scowles recorded. They are distributed evenly throughout the fieldwork survey area.

Scowle – Possible

Sites recorded as 'Scowle – Possible" by the field survey represented 18.7% of all scowles recorded. The majority of these are isolated shallow depressions (Form 1, 45.2%) with no visible rock exposures, or rock outcrops (Form 7, 20.6%). 'Possible' scowles are distributed evenly throughout the fieldwork survey area.

Scowle – Possible Destroyed

Sites recorded as 'possible destroyed' by the field survey, represented 16.4% of all scowles recorded. These were mainly disused quarries located within geological outcrops where scowles would be expected, but where any evidence of scowles has been obliterated by subsequent quarrying. They are distributed evenly throughout the fieldwork survey area.

3.1.3.1 Relationship between scowle type and geology

The relationship between scowle type (i.e. existing, possible, possible destroyed) and geology was investigated.

The percentages in the table below reflect the total area of each scowle type recorded by the field survey within each geological formation.

Table 3: Relationship between scowle type and geology

Geology	% of Scowle – Existing (by area)	% of Scowle – Possible (by area)	% of Scowle – Possible Destroyed (by area)
Coal Measures	0.5	1.5	1.2
Drybrook Limestone	4.7	0.7	0.3
Drybrook Sandstone	16.4	11.6	3.8
Whitehead Limestone	15.3	12	5.5
Crease Limestone	22.9	12.9	9.3
Lower Dolomite	38.1	56.2	73.5
Lower Limestone Shale	1.5	4.6	5.1

Geology	% of Scowle – Existing (by area)	% of Scowle – Possible (by area)	% of Scowle – Possible Destroyed (by area)
Tintern Sandstone	0.2	0.5	1.4
	100.1	100	100.1

When expressed as a percentage of scowle type (as above), this analysis demonstrated no significant correlation between scowle type and parent geology. Similarly, when expressed as a percentage of each geology type (as below), clear relationships also failed to appear.

Table 4: Percentage of scowle type by geology

% Geology	% Scowle – Existing	% Scowle – Possible	% Scowle – Possible Destroyed	
Coal Measures	42.2	34.1	23.8	100.1
Drybrook Limestone	94.3	4.2	1.5	100
Drybrook Sandstone	79.2	16.1	4.7	100
Whitehead Limestone	75.9	17.2	6.9	100
Crease Limestone	79	12.9	8.1	100
Lower Dolomite	52.2	22.3	25.5	100
Lower Limestone Shale	36.4	32	31.6	100
Tintern Sandstone	31.3	19.8	48.7	99.8

3.1.4 Recorded form of scowles

The field survey divided identified scowles into seven Form categories. These were based on empirical observation and were broadly based on the categories determined by Wildgoose (Wildgoose 1993, 30). These were modified to meet the needs of the field survey by differentiating scowles not only on the basis of their size but also on the incidence of exposed rock surface. This was felt important as future work is likely to be targeted at detailed analysis of exposed surfaces to address the question of the natural or artificial origin of these features.

In addition to the seven main forms outlined below, two sites were recorded as cropmarks, and 42 sites had no form assigned. The sites where no Form was assigned were all quarry sites where scowles may have been destroyed.

Table 5: Recorded form of scowles

Scowle Form	% of scowles	Area covered (km^2)
Scowle Form 1 *Shallow depressions with or without mounds and with no visible rock exposures.*	18.7	0.636
Scowle Form 2 *Mostly small (less than c.10m diameter) hollows with few (less than c.50%) rock exposures.*	27.7	0.942

Scowle Form	% of scowles	Area covered (km^2)
Scowle Form 3 *Mostly small (less than c.10m diameter) hollows with frequent (more than c.50%) rock exposures.*	1	0.034
Scowle Form 4 *Mostly large (more than c.10m diameter) hollows or channels with few (less than c.50%) or no rock exposures. This form tends to contain scowles in excess of 2m deep.*	15.2	0.517
Scowle Form 5 *Mostly large (more than c.10m diameter) hollows or channels with frequent (more than c.50%) rock exposures. This form tends to contain scowles in excess of 2m deep.*	15	0.510
Scowle Form 6 *Large discrete quarry-like scowles with exposed rock faces and little or no apparent connection with adjacent scowles.*	0 - this category was not applied (see below)	0
Scowle Form 7 *Rock outcrop.*	4.3	0.146
Cropmark *Parchmarks within the survey area that could indicate backfilled scowles.*	0.07	0.002
Scowle Form unassigned *Possible scowle sites destroyed by later quarrying.*	16.1	0.547
	98.07	3.334

During the course of the survey it was decided that Scowle Form 6 was not applicable to any recognised features, as, by their very nature, scowle sites occur within close proximity to each other, and follow specific, clearly defined, geological outcrops. This category of Form was, therefore, abandoned.

3.1.5 Discussion of Scowle Forms recorded by the survey

It is not possible to give a definitive interpretation of all different forms of scowle recorded by the survey, as the complexity of these features does not allow for generalisation, and each form may represent the results of a range of processes. It is, however, possible to discuss the likely interpretations of each scowle form in the broad sense.

Scowle Form 1 (Figure 2)

Scowles recorded as Form 1 made up 18.7% of the total area of features identified by the field survey. These features have tended to be interpreted as backfilled scowles (Wildgoose 1993). In places, particularly open agricultural areas, this may be the case, but given that scowles are the surface expression of a subterranean cave system, however, these shallow depressions may also be:-

- Natural swallow holes.
- Indicative of the collapse of natural subterranean cavities.
- Indicative of collapse of underground mine workings.
- Partly backfilled surface workings such as bell pits.

Figure 2: Scowle Form 1 at Hangerberry, near Lydbrook (Glos SMR 25035). Copyright: Gloucestershire County Council 2004.

Scowle Form 2 (Figure 3 and Figure 4)

Scowles recorded as Form 2 made up 27.7% of the total area of features identified by the field survey. As with Form 1 scowles, these features have tended to be interpreted as backfilled or partly backfilled scowles, and some of these features may represent this. This form of scowle, however, included the majority (72%) of sites with associated mounds (see 3.1.5.4 below) and accordingly, Form 2 scowles could represent a variety of features such surface workings such as bell pits which are entirely the result of human excavation. This interpretation is particularly likely where mounds are associated with the features. This type of exploitation may have been undertaken where:-

- The iron ore deposits were very close to the surface, but not exposed. This would particularly occur immediately to the east of the western outcrops where the iron ore bearing limestones dip below the overlying sandstones at a relatively shallow angle.
- The process of cave exposure had only partially exposed ore deposits, or these had not been exposed at all, but were too close to the surface to allow for safe underground mining.
- The iron ore exploited was not actually found within the earlier cave systems, but had formed in faults and joints in the limestones between caves or as 'planar discontinuities between stratigraphic sequences of sedimentary rocks' (see Wildgoose 1993, 19). These ores would not have been within the *churns* which are characteristic of the cave systems in the Carboniferous Limestones, and could not, therefore, have been accessed in the same manner as the ores within the caves.
- The ores were from geological formations where there is little or no evidence of cave formation (e.g. the Drybrook Limestone or the Drybrook Sandstone) and may, therefore, not have formed in the same way as the *churns* or *leads* which are characteristic of the cave systems and could not, therefore, have been accessed in the same manner as the ores within the caves.
- Some of these, particularly where no mounds are present, may represent naturally occurring swallow holes, which have become partially backfilled through human agency or natural processes, but which have no bearing on the history of iron ore exploitation from the area. Wheeler excavated one of these features in 1929, at Lydney Park, the report of which implies that it was indeed a naturally occurring geological feature (Wheeler 1932).

Figure 3: Form 2 scowle (without associated mounds) at Lydney Park (Glos SMR 25045).

Figure 4: Scowle Form 2 (with associated mound) at Edgehills Plantation (Glos SMR 23726).

Scowle Form 3 (Figure 5)

Scowles recorded as Form 3 made up just 1% of the total area of features identified by the field survey, and were the least common type of feature recorded. The majority of these (47.5%) were located within the outcrop of Crease Limestone, and 40.8% were on the Lower Dolomite. These small, rocky features, which are only very rarely associated with mounds (see 3.1.5.4 below), could reflect natural variation in the surface form of the eroding cave system, and in some cases probably represent natural karstic features such as phreatic tubes, likely examples of which were identified by the field survey.

Figure 5: Scowle Form 3 at Noxon Park (Glos SMR 23944).
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Scowle Form 4 (Figure 6)

Scowles recorded as Form 4 made up 15.2% of the total area of features identified by the field survey. 54.3% of these are located in the Crease Limestone and Lower Dolomite, the outcrops where 'classic' scowles are found. The most likely interpretation for these is that they represent partially backfilled (through natural or human agency) Form 5 scowles (see below). As with Form 2 scowles, where they occur away from the Crease Limestone outcrop these features could represent small surface workings, entirely the result of human excavation to exploit deposits of iron ore which were just below the surface. This interpretation is particularly likely where mounds are associated with the features, and 9.7% of the total area of sites with mounds were recorded as Form 4 (see 3.1.5.3 below).

Figure 6: Scowle Form 4 at Blakeney Walk (Glos SMR 23621).
Copyright: Gloucestershire County Council 2004.

Scowle Form 5 (Figure 7 and Figure 8)

Scowles recorded as Form 5 made up 15% of the total area of features identified by the field survey. These are the 'classic' scowle formations, consisting of extensive areas of open caverns and irregular trenches with frequent rock exposures.

It is clear that the view that the current form of these features is entirely the result of human exploitation of the iron ore resource where it outcropped within bands of Carboniferous Limestones at the periphery of the Forest of Dean can no longer be sustained, and their geological origin as subterranean cave systems which have been exposed by later geological activity is not in doubt.

This should really only be seen as a shift in emphasis from earlier interpretations of these features as the concept that scowles, and underground mines are essentially ore-filled cavities has never really been questioned (see for example Wildgoose 1993, 19, paragraph 1.4.3). This, however, was understood to indicate that scowles had been entirely created by the removal of the ore deposits which had essentially filled them up. Although it was acknowledged that this infilling of ore was subject to variability (Wildgoose 1993, 202), this possibility tends to be regarded as an abnormal situation which simply needed to be taken into account when assessing the validity of volumetric calculations of ore removal (Wildgoose 1993, 202).

By the time human beings, who wished to exploit the iron ore resource, arrived, the cave system would already have been subjected to a continual process of erosion, which had been in progress for millions of years. Far from being uniformly filled with iron ore deposits, which expressed themselves as surface exposures, scowles, by this time, would have been a complex mix of landscape features, the result of a range of preceding factors. This would have encompassed:-

- Caves which had originally been completely choked with iron ore.
  These would take the form of :-
  - Scowles largely filled with ore as surface exposures.
  - Scowles partially filled with ore as surface exposures due to differential erosion of ore and limestone over vast periods.
  - Scowles completely devoid of ore due to differential erosion of ore and limestone over vast periods.
  - Very shallow subterranean deposits of iron ore in "almost" exposed caves which could only be safely exploited as surface outcrops.
- Caves which had originally been only partly choked with ore.
  These would take the form of:-
  - Scowles partially filled with ore as surface exposures.
  - Scowles completely devoid of ore due to differential erosion of ore and limestone over vast periods.
  - Very shallow subterranean deposits of iron ore in "almost" exposed caves which could only be safely exploited as surface outcrops.
- Caves which have never contained iron ore due to infilling by other deposits such as boulders or silts when the ore was precipitated.
  These would take the form of:-
  - Scowles completely devoid of ore due to differential erosion of cave fills and limestone
  - Scowles either completely or partially filled with boulders or silts.
- Caves which have never contained iron ore due to variation in the distribution of precipitation.
  These would take the form of:-
  - Scowles completely devoid of ore.

Figure 7: Scowle Form 5 at Puzzle Wood, Clearwell (Glos SMR 23892).
Copyright: Gloucestershire County Council.

Figure 8: Scowle Form 5 at Lydney Park: part of a linear scowle known as Devil's Ditch (Glos SMR 25073).
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Scowle Form 6

During the course of the survey it was decided to abandon the category of Scowle Form 6. This was because by their very nature, scowle sites occur within close proximity to each other, since they follow specific, clearly defined, geological outcrops.

Scowle Form 7 (Figure 9)

Scowles recorded as Form 7 made up 4.3% of the total area of features identified by the field survey. 73.3% of these were located in the Lower Dolomite. These were natural rock outcrops within the belt of Carboniferous Limestones. Although their form does not suggest surface working for iron ore from holes in the ground, iron ore may have been exploited from cracks and crevices in these rocky outcrops.

Figure 9: Scowle Form 7, near the River Wye (Glos SMR 23823).
Copyright: Gloucestershire County Council 2004.

Cropmarks

Only two sites were recorded as cropmarks by the survey representing just 0.07% of the total area of features identified by the field survey. These possibly represent the sites of backfilled scowles. They are discussed more fully in 3.1.10 below.

Summary of the interpretation of scowle forms recorded by the survey

The likely interpretations each scowle form are summarised in the table below. See 4.1.3 for a discussion of the definition of a scowle.

Table 6: Summary interpretation of scowle forms

Scowle Form	Mounds present?	Suggested interpretation
Form 1	No	Backfilled 'classic' scowles. Backfilled natural geological features (e.g. swallow holes. Subsidence of the ground surface reflecting underground caves or mines.
Form 1	Yes	Possibly backfilled surface workings
Form 2	No	Uncertain. Possibly:- Backfilled scowles Backfilled natural geological features (e.g. swallow holes or phreatic tubes). Possibly backfilled surface workings.
Form 2	Yes	Partly backfilled surface workings.
Form 3	No	Uncertain. Possibly:- Small scowles Natural features such as swallow holes or phreatic tubes.
Form 3	Yes	Possibly entirely artificial features.
Form 4	No	Scowles, partially backfilled.
Form 4	Yes	Scowles, with a degree of human intervention, or entirely artificial features.
Form 5	No	Scowles.

Scowle Form	Mounds present?	Suggested interpretation
Form 5	Yes	Scowles, with evidence of some human intervention.
Form 7	No	Natural rock outcrops with no evidence of human exploitation.

3.1.5.1 Relationship between scowle form and scowle type

The relationship between scowle form and specific type (i.e. existing, possible, possible destroyed) was analysed and the percentages in the table below reflect the total area of each scowle form within each type classification.

Table 7: Relationship between scowle form and scowle type

Scowle Type	% Scowle Form 1	% Scowle Form 2	% Scowle Form 3	% Scowle Form 4	% Scowle Form 5	% Scowle Form 7	% Cropmark	% Unassigned
Scowle: Existing	54.7	94.5	87.7	79.8	88.9	5.3	0	0
Scowle: Possible	45.3	5.5	12.3	18.2	4.7	90.5	100	6.9
Scowle: Possible Destroyed	0	0	0	2	6.4	3.8	0	93.1
	100	100	100	100	100	99.6	100	100

Analysis of this has identified a general correlation between scowle form and type.

Approximately half of Form 1 scowles sites are recorded as *Scowle-existing*, whilst the remainder are recorded as *Scowle-possible*. This is likely to reflect a level of uncertainty and subjectivity in the way in which features were recorded by the field teams, rather than representing two distinct types of Form 1 scowle. The majority of Form 7 sites (90.5%) have been recorded as 'possible' scowles, which reflects their form as rock outcrops and their uncertain status as sources of iron ore. The majority of sites with no form assigned to them (93.1%) were recorded as 'possible destroyed' scowles, because these were quarries where scowles might once have existed, but of which no surviving evidence was observed.

3.1.5.2 Relationship between scowle form and geology

The relationship between scowle form and geology is shown in the table below. The percentages in the table reflect the total area of each scowle form recorded by the field survey, located within each geological formation.

Table 8: Relationship between scowle form and geology

Geology	% Scowle Form 1	% Scowle Form 2	% Scowle Form 3	% Scowle Form 4	% Scowle Form 5	% Scowle Form 7	% Cropmark	% Unassigned
Coal Measures	0.4	1.4	0	0.4	0	1.3	0	1.2
Drybrook Limestone	0.02	9.5	0	2.4	0	0	0	0.4
Drybrook Sandstone	8.3	29.8	7.9	13.3	1.9	0.6	0	3.9
Whitehead Limestone	14.8	14.1	3.9	25.7	9.9	1	56.2	3.9
Crease Limestone	19	14.2	47.5	22.8	32.9%	18.9	13.4	8.2
Lower Dolomite	49.6	30.3	40.8	31.5	54.9	73.3	0	77.3
Lower Limestone Shale	6	0.6	0	1.8	0.4	4.6	30.9	5
Tintern Sandstone	0.5	0.03	0	0.9	0	0	0	1.4
	98.62	99.93	100.1	98.8	100	99.7	100.5	101.3

This table clearly shows that the majority of Form 5 scowles (large hollows or channels with frequent rock exposures) are located within the outcrops of Crease Limestone and Lower Dolomite.

The table below shows the relationship between scowle form and geology when expressed as a percentage of each geology type.

Table 9: Percentage of scowle form by geology

% Geology (by area)	% Scowle Form 1	% Scowle Form 2	% Scowle Form 3	% Scowle Form 4	% Scowle Form 5	% Scowle Form 7	% Cropmark	% Unassigned	
Coal Measures	10	51.1	0	8.4	0	6.8	0	23.8	100.1
Drybrook Limestone	0.1	86.8	0	11.2	0	0	0	1.9	100
Drybrook Sandstone	11.5	65.8	0.6	15.1	2.2	0.2	0	4.7	100.1
Whitehead Limestone	21.2	31.9	0.3	29.8	11.3	0.3	0.3	4.8	99.9
Crease Limestone	18.9	22.5	2.6	18.4	26.3	4.3	0.05	7	100.1
Lower Dolomite	19.7	19	0.9	10.1	17.4	6.6	0	26.3	100

% Geology (by area)	% Scowle Form 1	% Scowle Form 2	% Scowle Form 3	% Scowle Form 4	% Scowle Form 5	% Scowle Form 7	% Cropmark	% Unassigned	
Lower Limestone Shale	42.1	7.1	0	10.3	2	7.3	0.8	30.3	99.9
Tintern Sandstone	19.8	1.7	0	29.6	0	0	0	48.7	99.8

Again, this table clearly shows the relationship between the Form 5 scowles (large hollows or channels with frequent rock exposures) and the outcrops of Crease Limestone and Lower Dolomite. It also shows that features within the Drybrook Limestone are mostly Form 2 (86.8% of the total area of features in this outcrop), and that the Drybrook Sandstone also has a high incidence (65.8%) of Form 2 sites. This probably reflects differences in the mining processes employed in these geologies, where the 'classic' Form 5 scowles did not form (see 3.1.5 above).

3.1.5.3 Relationship between scowle form and occurrence of mounds

One of the frequently stated observations about scowles is that they are generally lacking in "large surface spoil heaps" (Wildgoose 1993, 202), and it was not originally envisaged that the recording of the presence (or absence) of mounds would form part of the field survey. It soon became apparent, however, that their presence might be a significant factor in the interpretation of some forms. Accordingly the presence of mounds was noted in the *area notes* field of individual scowles records. In total, 86 sites with associated external mounds were recorded, representing 19.7% of the total area covered by scowles recorded by the field survey. The relationship between sites with mounds and scowle form is summarised in the tables below.

Table 10: Scowle form and mounds

Mounds	% Scowle Form 1	% Scowle Form 2	% Scowle Form 3	% Scowle Form 4	% Scowle Form 5	% Scowle Form 7	% Cropmark	% Unassigned	
% of total area of scowle forms with mounds	13	72.3	0.6	9.7	4.4	0	0	0.07	100.07

It is clear that the majority of scowles with mounds are Form 2 (mostly small hollows, with few rock exposures). As some of these features have been interpreted as small surface workings, or test pits (see 3.1.5 above), these mounds are likely to be indicative of spoil, which would have been produced by this method of excavation.

3.1.5.4 Relationship between occurrence of mounds and geology

The relationship between sites with mounds and underlying geology is summarised in the table below. Sites with mounds covered an area measuring approximately 0.7 km^2, although this measurement refers not just to the extent of the mounds, but also to the extent of the scowles with which the mounds are associated.

Table 11: Relationship between occurrence of mounds and geology

Geology	% of total area covered by recorded scowles with mounds
Coal Measures	1.4
Drybrook Limestone	13.3
Drybrook Sandstone	32.9
Whitehead Limestone	11.7
Crease Limestone	14.6
Lower Dolomite	26
Lower Limestone Shale	0.2
Tintern Sandstone	0
	100.1

This table (above) shows that the majority (59.3%) of scowles with mounds are located within geological formations (Coal Measures, Drybrook Sandstone and Limestone formations and the Whitehead Limestone) where scowles, formed by geomorphological processes, would not be expected. This strongly suggests that in these areas shallow subterranean deposits of iron ore may have been accessed by small-scale surface workings such as bell pits. The fact that the majority of these were also recorded as Scowle Form 2 would support this interpretation (see 3.1.5 above).

The majority of the remaining scowles with mounds are located in the Lower Dolomite and Crease Limestone. The significance of this is not clear, although the majority of these (29.9% of scowles with mounds in the Lower Dolomite, and 88.5% of scowles with mounds in the Crease Limestone) are also Scowle Form 2, which would suggest that some small-scale surface extraction of this type might have also occurred in these geologies. The picture becomes clearer when the geology of scowles with mounds is expressed as a percentage of each geology type.

Table 12: Percentage of scowles with mounds by geology

Geology	Total area covered by recorded scowles with mounds as a % of each geology
Coal Measures	34.1
Drybrook Limestone	80.4
Drybrook Sandstone	48.3
Whitehead Limestone	17.7
Crease Limestone	15.4
Lower Dolomite	10.8
Lower Limestone Shale	1.3
Tintern Sandstone	0

It is clear from this analysis that the highest percentage (over 80%) of all features recorded with associated mounds are within the Drybrook Limestone, where the vast majority of scowles (86.8%) were recorded as Form 2 (see 3.1.5.2 above), including an extensive area of probable bell pits located on the Lydney Park Estate (Glos SMR 25102). Almost 50% of the area covered by features within the Drybrook Sandstone also exhibited mounds, and again, Scowle Form 2 was the predominantly recorded

form in these areas (see 3.1.5.2 above). These features, especially when associated with mounds, are almost certainly indicative of a different technique of mining adopted in outcrops where surface iron ore, or access to subterranean deposits would not have been available from the exposed and eroding cave systems which have formed scowles in other geological formations.

3.1.5.5 Primary landuse of scowle sites

A variety of landuses were recorded during the field survey, as shown in the table below.

Table 13: Primary landuse of scowle sites

Primary landuse	% of total area covered by recorded scowles
Built over	0.2
Cultivated land	0.1
Garden	0.2
Grassland	18.8
Mineral extraction	12.2
Orchard	0.1
Other: airfield	0.03
Recreational use	0.02
Scrub	3.2
Thoroughfare	0.005
Woodland: coniferous	5.9
Woodland: deciduous	26.6
Woodland: mixed	32.5
Woodland: undetermined	0.3
	100.2

The majority of scowles (65.3% of total area) are within areas of woodland, undoubtedly reflecting the fact that their physical form (areas of irregular landscape characterised by deep hollows) militates against other types of landuse.

3.1.5.6 Relationship between scowle type and primary landuse

As shown above, the majority of scowle sites recorded by the field survey are located within areas of woodland. Analysis of the relationship between landuse and scowle form is summarised in the table below. The percentages in the table reflect the total area of scowle sites of each type within each particular landuse, recorded by the field survey.

Table 14: Relationship between scowle type and primary landuse

Primary landuse	% of Scowle – Existing	% of Scowle - Possible	% of Scowle – Possible Destroyed
Built over	0.2	0	0.3
Cultivated land	0	0.6	0
Garden	0	0.6	0.3
Grassland	17.5	37.3	2.5
Mineral extraction	0	0.4	73.6
Orchard	0	0.4	0
Other: airfield	0	0	0.2
Recreational use	0.03	0	0
Scrub	0.04	3.8	5.7
Thoroughfare	0.01	0	0

Primary landuse	% of Scowle – Existing	% of Scowle - Possible	% of Scowle – Possible Destroyed
Woodland: coniferous	8.5	2	0
Woodland: deciduous	28.4	35.8	8.9
Woodland: mixed	42.5	18.9	8.5
Woodland: undetermined	0.6	0.2	0
	97.8	100	100

The majority of 'existing' scowles are located within areas of woodland, grassland and scrub. 37.3% of 'possible' scowles are located within areas of grassland. The majority of 'possible destroyed' scowles have a landuse of 'mineral extraction', indicating that these sites represent quarries where scowles might once have existed. None of these figures is particularly surprising with the exception of the relatively high percentage 56.9%) of possible scowles located within areas of woodland, although the majority of these were Scowle From 7 (natural rock outcrops), 90.5% of which were designated as possible scowles and 88.3% of which were in woodland (see 3.1.5.1 & 3.1.5.7 below). This is probably partly the result of the subjective way in which scowle type and form were assigned to features by the survey teams.

3.1.5.7 Relationship between scowle form and primary landuse

Analysis of the relationship between landuse and scowle form is summarised in the table below. The percentages in the table reflect the total area of scowle sites in each form, located within each landuse, recorded by the field survey.

Table 15: Relationship between scowle form and primary landuse

Primary landuse	% Scowle Form 1	% Scowle Form 2	% Scowle Form 3	% Scowle Form 4	% Scowle Form 5	% Scowle Form 7	% Cropmark	% Unassigned
Built over	0	0	0	1	0	0	0	0.3
Cultivated land	0.6	0	0	0	0	0	0	0
Garden	0	0	0	0.3	0	0	69.5	0.4
Grassland	76.6	2.1	0.06	17.4	5.3	3.8	30.5	1.3
Mineral extraction	0	0	0	0	0.1	4	0	74.4
Orchard	0.4	0	0	0	0	0	0	0
Other: airfield	0	0	0	0.2	0	0	0	0
Recreational use	0	0	0	0.1	0	0	0	0
Scrub	0.8	3.8	3.4	2.1	1.8	3.5	0	7.4
Thoroughfare	0	0.02	0	0	0	0	0	0
Woodland: coniferous	0	17	20.3	1.7	2.2	0	0	0.3
Woodland: deciduous	18.7	39.2	4.7	27.8	26.1	42.1	0	9.3
Woodland: mixed	2.8	37.4	71.5	49.3	63.5	46.2	0	7.7
Woodland: undetermined	0	0.5	0	0	1.1	0	0	0
	99.9	100	99.96	99.9	100.1	99.6	100	101.1

It is clear that the majority of scowle forms occur principally within areas of woodland. This is not surprising as the uneven nature of the ground where scowles are present renders these areas unsuitable for other landuses (see 3.1.5.5 above).

The exception to this is Scowle Form 1, of which 76.6% (by area) were found in areas of grassland. Form 1 scowles are defined as *shallow depressions with or without mounds and with no visible rock exposures,* and one possible interpretation of these is that they represents back-filled scowles, where previously un-usable areas of land have been reclaimed by infilling (see 3.1.5 above). The 21.5% (by area) of this form of scowles in woodland, may suggest areas where scowles were backfilled before the area became wooded. Alternatively these features may have an entirely different origin (see 3.1.5 above). Similarly, the Form 1 depressions in areas of open grassland need not necessarily represent backfilled scowles, as the shallow depressions that typify Form 1 scowles are generally not significant enough to impede a pastoral landuse.

A second group of scowles, the majority of which are not found in woodland is those which have no specific form assigned to them. 74.4% of these scowles were assigned a landuse of “Mineral Extraction” and are areas of quarrying in the zone in which scowles are anticipated, and where scowles may once have existed prior to their destruction.

3.1.5.8 Landownership of scowle sites

Table 16: Landownership and scowles

Owner	% of total area covered by recorded scowles
Forestry Commission	36.6
Gloucestershire Wildlife Trust	0.7
Lydney Park Estate	21.3
Private	35.1
Unknown	6.2
Wilderness Field Studies Centre	0.1
	100

The largest single owner of land on which scowle sites occur is the Forestry Commission, which owns 36.6% (by area) of identified scowles. This is unsurprising, since the results of the survey have already shown that the majority of scowle sites (65.3% of the total area covered by scowles) are located within areas of woodland, the majority of which is owned by the Forestry Commission. The second largest landowner is the Lydney Park Estate, who own a large scowle-rich area in the south-west of the region.

35.1% (by area) are owned by private individuals, ranging from farmers to house holders who have scowles in their back gardens (e.g. Scowles village near Coleford – SO 563 106).

3.1.6 Level of survey of scowle sites

Field survey teams recorded the level of survey undertaken on individual areas of scowles as this was variable across the survey area due to factors such as access, ground conditions and landuse.

Table 17: Level of survey of scowle sites

Level of Survey	% of total area covered by recorded scowles
Survey Level 1 *No access 2003-04. Scowles recorded by earlier fieldwork (Wildgoose & Entec).*	4.3
Survey Level 2 *Access limited to boundary of area of interest – sight of less than 50% of possible area.*	16.2
Survey Level 3 *Access limited to boundary of area of interest – sight of more than 50% of possible area.*	24.2
Survey Level 4 *Access to area of interest – sight of less than 50% of possible area.*	10.1
Survey Level 5 *Access to area of interest – sight of more than 50% of possible area.*	45
	99.8

Although the majority of sites visited had good access, with 45% of the total area of scowles recorded achieving the highest level of survey possible, better access would have been available if the fieldwork had been carried out in the winter (particularly January though to March) as these are the months when undergrowth within woodland is at its lowest. Time-tabling constraints due to the time-scale of Aggregates Levy Sustainability Fund projects required the bulk of the fieldwork to be carried out between June and September, when undergrowth was extremely dense and access often difficult.

3.1.6.1 Relationship between level of survey and landowner

The table below shows the relationship between landowner and survey level recorded by the survey. Percentages relate to the total area of scowle sites owned by each landowner.

Table 18: Relationship between level of survey and landowner

Owner	%Survey Level 1	% Survey Level 2	% Survey Level 3	% Survey Level 4	% Survey Level 5	
Forestry Commission	3.4	21.3	16.9	13.7	44.7	100
Gloucestershire Wildlife Trust	0	0	0	0	100	100
Lydney Park Estate	2.9	29.3	4.9	21.3	41.6	100
Private	3.9	4.4	42.4	0.8	48.5	100
Unknown	17.4	10.2	37.6	3.6	31.2	100
Wilderness Field Studies Centre	0	0	0	0	100	100

Where land was owned either by large organisations, such as the Forestry Commission or the Lydney Park Estate, access was generally good, and survey level tended to be limited only by factors such as undergrowth rather than consent, although some areas of scowles in Forestry Commission land had been fenced off for health and safety reasons. Although three landowners denied consent for the field teams to visit their land, access to private land was generally good. The relatively high incidence of Level 3 survey in this category reflects the fact that a higher proportion of privately owned land was farmland, rather than woodland, and that increased visibility allowed Level 3 survey to be adequate to record the scowles at the level appropriate to the 2003-04 survey.

3.1.6.2 Relationship between level of survey and landuse

The table below indicated the relationship between landuse and survey level. Percentages relate to the total area of scowle sites within each category of landuse.

Table 19: Relationship between level of survey and landuse

Primary landuse	% Survey Level 1	% Survey Level 2	% Survey Level 3	% Survey Level 4	% Survey Level 5	
Built over	0	0	0	0	100	100
Cultivated land	0	0	100	0	0	100
Garden	0	0	31.5	30	38.5	100
Grassland	4.5	0.6	18.4	0.4	76	99.9
Mineral extraction	0	17.9	81.6	0	0.5	100
Orchard	0	0	0	0	100	100
Other: airfield	0	0	0	0	100	100
Recreational use	0	0	0	0	100	100
Scrub	6	33.5	11.3	22.6	26.6	100
Thoroughfare	0	0	0	0	100	100
Woodland: coniferous	5.4	7.8	6.	5	75.1	100
Woodland: deciduous	0.9	32.3	21.1	10.4	35.1	99.8
Woodland: mixed	7.4	11.6	13.9	18.9	48.1	99.9
Woodland: undetermined	100	0	0	0	0	100

The only significant finding of the above relates to the correlation between survey level and woodland type, with the greatest level of survey achieved in coniferous woodland (where 75.1% of areas were recorded with a survey level of 5). This is indicative of the lack of ground cover in coniferous woodland, which combined with the regimented nature of the planting, allowed excellent access, and visibility even in the height of summer when vegetation growth was at its most dense in other types of woodland.

3.1.7 Recorded condition of scowle sites

Condition was principally a means of recording visible damage to identified scowle sites. Accordingly this information contains no implication of the degree to which significant archaeological deposits are contained within individual scowles or the extent to which they have been subject to modification of erosion since their original formation.

The condition of scowle sites was recorded with reference to six pre-determined categories (see Appendix E.vii.i).

Scowles that exhibited no damage at all were classed as good, whilst scowles with any form of damage were assigned a rating of fair, poor, very bad or destroyed, subject to a visual assessment of the damage level against pre-determined criteria.

In some instances, particularly where the survey level was 2 or below, it was not possible to assign a condition. The condition of these areas was classified as *Uncertain.*

Table 20: Recorded condition of scowle sites

Condition	% of total area covered by recorded scowles
Good *All or nearly all features of interest are well preserved. No sign of active damage.*	55.7
Fair *Some damage or part destruction of features of interest apparent, or some features obscured by more recent additions /alterations.*	20.4
Poor *Damage to the majority of the original features of interest is apparent. Active damage apparent.*	1.8
Very bad *The majority of features of interest are so damaged as to be not surveyable or missing.*	0
Destroyed *All features of interest have been destroyed. No further information can be gained from future investigation of the site.*	14.9
Uncertain *Features of interest cannot be investigated at the time of the assessment for any reason.*	7.2
	100

It is clear that, where scowles survive, the vast majority of them (76.1%) are in either good or fair condition, with few obvious visible signs of damage. Only 1.8% of scowles were recorded as in poor condition with visible active damage, suggesting that, with the exception of a few identifiable areas where pro-active management may be appropriate, the principal management issue associated with scowles is to ensure that they are maintained in their current management regime and condition.

3.1.7.1 Relationship between condition and landuse

The table below shows the relationship between condition and landuse. Percentages refer to the total area of scowles sites within each category of landuse.

Table 21: Relationship between condition and landuse

Primary landuse	% Good	% Fair	% Poor	% Very bad	% Destroyed	% Uncertain	
Built over	0	0	77	0	23	0	100
Cultivated land	0	0	0	0	0%	100	100
Garden	68.5	0	0	0	0	31.5	100
Grassland	84.6	2.5	1.2	0	1	10.7	100

Primary landuse	% Good	% Fair	% Poor	% Very bad	% Destroyed	% Uncertain	
Mineral extraction	0.5	0	0	0	99.5	0	100
Orchard	100	0	0	0	0	0	100
Other: airfield	0	0	0	0	100	0	100
Recreational use	0	0	100	0	0	0	100
Scrub	47.1	17.2	5.2	0	17.4	13	99.9
Thoroughfare	0	100	0	0	0	0	100
Woodland: coniferous	10.1	78.4	0	0	0.7	10.8	100
Woodland: deciduous	71.5	20.4	3.4	0	3.4	1.2	99.9
Woodland: mixed	56.9	28.9	1	0	3.2	10.1	100.1
Woodland: undetermined	100	0	0	0	0	0	100

Although the majority of scowles were considered to be in good condition, there did appear to be a relationship between landuse and scowles, which attained a lower condition score. This can be summarised as follows:-

- Almost all of the scowles designated as *Mineral Extraction* were categorised as *Destroyed* reflecting the fact that these represented possible scowle sites, which are likely to have been destroyed by quarrying. The single site currently used as an *Airfield* had also been destroyed as had 23% of sites recorded as *Built over*.
- The majority of scowles with a landuse of *Built over* were in *Poor* condition indicating the detrimental affect that proximity to human occupation, with its increased threat of rubbish dumping, can have on scowles.
- 100% of scowles designated as *Recreational use* were in *Poor* condition. All of these were sites where scowles were used as off road vehicle tracks.
- Although the majority of scowles in woodland were assigned a condition rating of *Good,* the majority of scowles in coniferous woodland were designated as *Fair.* The significance of this is not clear, but it may in fact simply reflect better visibility in these conditions where there was considerably less undergrowth to mask areas of damage (see 3.1.6.2 above**).**

3.1.7.2 Relationship between condition and ownership

The tables below show the link between landownership and the condition of scowle sites recorded by the field survey. Percentages refer to the total area of scowles sites within each category of landuse.

Table 22: Scowles owned by the Forestry Commission

Condition	% of total area of scowle sites located on land owned by the Forestry Commission	% of total area covered by recorded scowles
Good	59	21.6
Fair	23.7	8.7
Poor	1.3	0.5
Very bad	0	0
Destroyed	10	3.7
Uncertain	6	2.2
	100	

Table 23: Scowles owned by the Lydney Park Estate

Condition	% of total area of scowle sites located on land owned by the Lydney Park Estate	% of total area covered by recorded scowles
Good	60.1	12.8
Fair	33.8	7.2
Poor	2.1	0.4
Very bad	0	0
Destroyed	0.2	0.05
Uncertain	3.8	0.8
	100	

Table 24: Scowles in private ownership

Condition	% of total area of scowle sites located on land in private ownership	% of total area covered by recorded scowles
Good	50.2	17.6
Fair	10.5	3.7
Poor	2.3	0.8
Very bad	0	0
Destroyed	28.8	10.1
Uncertain	8.2	2.9
	100	

Table 25: Scowles with unknown ownership

Condition	% of total area of scowle sites located on land in unknown ownership	% of total area covered by recorded scowles
Good	58.5	3.6
Fair	14.3	0.9
Poor	1	0.1
Very bad	0	0
Destroyed	5.8	0.4
Uncertain	20.4	1.3
	100	

Table 26: Scowles owned by the Wilderness Field Studies Centre

Condition	% of total area of scowle sites located on land owned by the Wilderness Field Studies Centre	% of total area covered by scowles
Good	100	0.1
Fair	0	0
Poor	0	0
Very bad	0	0
Destroyed	0	0
Uncertain	0	0
	100	

Table 27: Scowles owned by Gloucestershire Wildlife Trust

Condition	% of total area of scowle sites located on land owned by the Gloucestershire Wildlife Trust	% of total area covered by recorded scowles
Good	0	0
Fair	0	0
Poor	0	0
Very bad	0	0
Destroyed	100	0.7
Uncertain	0	0
	100	

Although the above tables are not conclusive, there is a suggestion that scowles in private ownership (including the Lydney Park Estate) are in slightly worse condition than those owned by the Forestry Commission, the single largest landowner of scowle sites. The combined area of scowles on privately owned land in fair condition is 44.3% representing 14.6% of the total area of scowles, whilst the combined area in poor condition is 4.4%. representing 1.2% of the total area. This compares badly with the Forestry Commission, with only 23.7% of scowles in fair condition, representing 8.7% of the total area of scowles, and only 1.3% in poor condition, representing 0.5% of the total area.

The 100% of destroyed scowles in the ownership of Gloucestershire Wildlife Trust simply represents the fact that the only scowle site in their ownership is a disused quarry (Glos SMR 25160) recorded as *Scowle-possible destroyed,* and does not suggest poor management of scowles in their ownership.

3.1.8 Causes of damage / threats to scowle sites

Cause of damage was recorded as part of the field survey. The extent of individual areas of damage to each site was not recorded, and percentages are based on the total area of the scowles in which the damage was recorded. In some cases, more than one cause of damage was recorded for a single area, in which case the surface area of the site has been included twice in the calculations, once for each cause of damage. This was unavoidable in a survey of this level. Each area of damage was assigned a damage rating of potential, slight, moderate or severe. Specifications for assigning these categories are set out in E.vii.iii.

Table 28: Causes of damage / threats to scowle sites

Damage by…	% of total area covered by recorded scowles
Animal burrowing	2.4
Building work	0.7
Digging	0.1
Dumping	17.1
Forestry	0.4
Mineral extraction	14.9
Other	0.5
Stock erosion	0.03
Storm damage	0.02
Vegetation	0.4
Vehicle erosion	7
Visitor erosion	0.1
Cause of damage unassigned	0.1

The most common causes of damage to scowles in 2003-04 were:-

- Dumping, affecting 17.1% of scowles.
- Mineral extraction, affecting 14.9% of scowles.
- Vehicle erosion, affecting 7% of scowles.

These categories of damage can be further broken down as follows:-

3.1.8.1 Dumping

The most significant cause of damage to scowle sites is dumping, affecting 17.1% of the total area of scowles. This category of damage was rated as follows:-

Table 29: Dumping affecting scowle sites

Damage rating of sites affected by dumping	% of total area of scowle sites affected by dumping	% of total area covered by recorded scowles
Potential	0.001	0.0001
Slight	59	10.1
Moderate	31.1	5.3
Severe	5.4	0.9
Unknown	4.5	0.8
	100.001	

The majority of this dumping was illegal fly-tipping, consisting of a huge range of material including old refrigerators, washing machines, television sets and domestic rubbish, whilst at Noxon Park (Glos SMR 23946) a disused tractor had been dumped in the scowles. This level of dumping was categorised as either *Slight* or *Moderate*, depending on severity, and the photograph below shows an example of moderate dumping in scowles at Stock Wood, near Clearwell.

Figure 10: Dumping in scowles at Stock Wood, Clearwell (Glos SMR 23904).

The 5.4% of *Severe* dumping, which consisted of the deliberate infilling of scowles, is discussed more fully below in 3.1.10.1 below.

3.1.8.2 Mineral Extraction

The survey indicated that 14.9% of the area covered by scowles had been affected by mineral extraction. The table below shows the damage rating of these areas, although in 99.1% of cases where scowle sites (or possible scowle sites) have been affected by mineral extraction, the damage rating is severe.

Table 30: Mineral extraction affecting scowle sites

Damage rating of sites affected by mineral extraction	% of total area of scowle sites affected by mineral extraction	% of total area covered by recorded scowles
Potential	0	0
Slight	0.9	0.1
Moderate	0	0
Severe	99.1	14.7
Unknown	0	0
	100	

3.1.8.3 Vehicle erosion

The survey showed that 7% of the total area covered by scowles has been affected by vehicle erosion. The table below shows the damage rating of these areas. In 67.9% of cases where scowle sites (or possible scowle sites) have been affected by vehicle erosion, the damage rating is currently only *Slight.* This tended to be sites where vehicle erosion comprised accidental damage by vehicles during forestry operations. The 6.2% of *Moderate* vehicle erosion was identified where scowle sites were used as “off road” recreational sites.

Table 31: Vehicle erosion affecting scowle sites

Damage rating of sites affected by vehicle erosion	% of total area of scowle sites affected by vehicle erosion	% of total area covered by recorded scowles
Potential	25.9	1.8
Slight	67.9	4.7
Moderate	6.2	0.4
Severe	0	0
Unknown	0	0
	100	

Figure 11: Vehicle damage to Form 2 scowles in Edgehills Plantation (Glos SMR 23726).

Figure 12: Recreational vehicle damage to scowles at Stock Wood, Clearwell (Glos SMR 23907).

3.1.9 Structures associated with scowles

The 2003-04 field survey recorded 11 structures within scowles, affecting only 1.1% of recorded scowles (details of these can be found in the project archive).

The majority of these were semi-domestic in character (e.g. boundary walls or outhouses/sheds) and none appeared to relate to iron ore extraction with the exception of Findall's Chimney in Staple Edge Wood, Soudley (Glos SMR 23629) which is the airshaft of a post-medieval subterranean mine in the area.

Two features (both in Little Lambsquay Wood, Clearwell, Glos SMR 23908, 23901) consisted of subcircular flat-bottomed hollows with partly revetted internal sides. The status of these features is not clear, although they are thought likely to be related to

woodland management in some way, perhaps timber storage areas, or charcoal production sites.

3.1.10 Backfilled and destroyed scowle sites

3.1.10.1 Backfilled scowles

Backfilled scowles are distinct from destroyed scowles, as the features themselves may still be intact, buried by infill.

Wildgoose described many of the pits he identified as partly or wholly backfilled, although the nature of, or evidence for, this backfilling was not always clear (Wildgoose 1993). Many of these were classified as Forms 1 and 2 scowles during the 2003-04 survey, and, although these might represent backfilled scowles, particularly where they are located outside areas of woodland, their precise status is currently unclear.

A number of examples of clearly backfilled scowles were, however, identified and these are detailed below.

Clay's Wood, near Sling – SO 5838 0731

At the former Clay's Wood, in the west of the Forest of Dean, just to the south of Clay's Farm near Sling, an area of scowles perhaps once as large and impressive as others in this area, have been filled with industrial waste in the last 20 to 30 years (Glos SMR 23466). This process can be seen on Fairey Survey aerial photographs taken in 1975 and on Forestry Commission aerial photographs taken in 1983, and Wildgoose noted that it was still ongoing in 1992 (Wildgoose 1993, 140).

The loss of these scowles is also evident on early Ordnance Survey maps. The map on the left (below) shows Clay's Wood in *c.* 1900, as a linear piece of woodland which follows the Crease Limestone outcrop, and contains numerous features, whilst the aerial photograph on the right shows the area to be devoid of both trees and features.

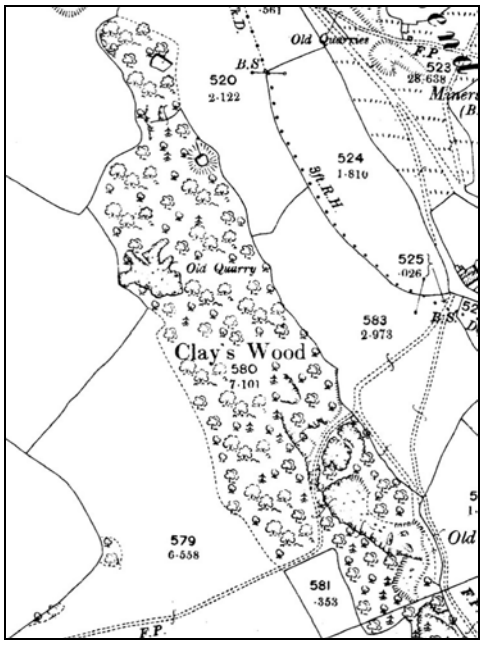

Figure 13: (left) Clay's Wood, as shown on 2nd series 25" OS map of *c.* 1900. Reproduced by permission of the Ordnance Survey and Landmark.
Figure 14: (right) Site of Clay's Wood, as shown on modern aerial photograph. Copyright: getmapping.com.

Colloe Grove Farm, near Cinderford – SO 6661 1436

Wildgoose noted that some scowles in a rough paddock at Colloe Grove Farm were actively being backfilled (Wildgoose 1993, 81). The field survey team recorded 'field depressions' (Scowle Form 1) at this location (Glos SMR 23749).

East of Cinderford – SO 6635 1376

Wildgoose noted debris from 19th century backfilling through rubbish tipping in a large field adjacent to Littledean Hill Road. This debris had been unearthed by badgers, and included pottery sherds, oyster shells, coal and glass fragments, which he interpreted as a 19th century backfilling operation using rubbish from nearby Cinderford (Wildgoose 1993, 85).

Hangerberry, near Lydrook – SO 5960 1503

Active backfilling with rubble was observed in the summer of 2003 by the survey team at Hangerberry, near Lydbrook (Glos SMR 25033). This can be seen in Figure 15, below.

Figure 15: Backfilling of scowles at Hangerberry, near Lydbrook (Glos SMR 25033).

Linegar Wood, Ruspidge – SO 6535 1162

Wildgoose reported that many of the pits in woodland to the rear of houses in Ruspidge, '…due to the hazard to children and dogs…have either been fenced off or back-filled' (Wildgoose 1993, 93). Partially backfilled pits, such as Glos SMR 23648 (Form 4), were observed here by the field team in the summer of 2003.

North of Scully Grove, near Mitcheldean – SO 6570 1890

Two thin linear strips of woodland/scrub can be seen on 1st, 2nd and 3rd series 25" Ordnance Survey maps, which date from *c.* 1880 to *c.* 1925, following the outcrop of the Carboniferous Limestones. These are located immediately to the north of an area of woodland near Mitcheldean, known as 'Scully Grove', known to contain scowles (Wildgoose 1993, 61), and whose name is almost certainly derived from the word "scowle". The western strip of woodland lies within the Crease Limestone, the strip to

the east lies within the Lower Dolomite. These strips of woodland/scrub almost certainly represent the site of scowles whose irregular and pitted surface would have been unsuited to other types of landuse. No features (other than the strips of woodland) are, however recorded in this area on any early map sources. Recent Ordnance Survey maps and aerial photographs show that the area is no longer wooded, and the photograph below, dating from *c.* 2000, suggests the presence of backfilled features, visible as parch marks. The field survey team recorded Form 1 scowles at the site of the eastern strip of woodland in 2003, which also suggests the presence of backfilled scowles.

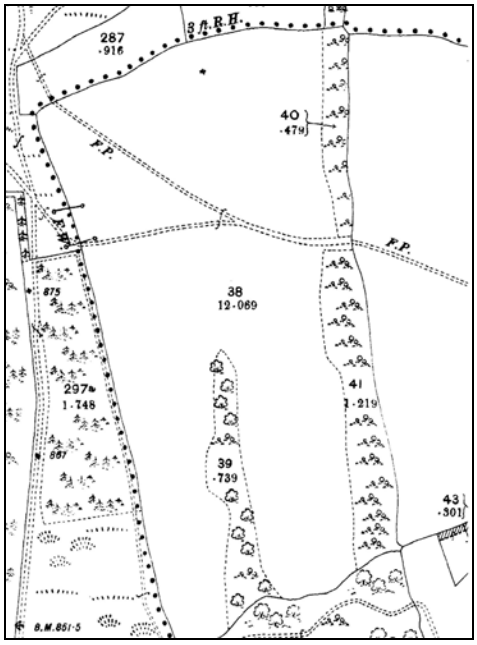

Figure 16: (left) Strips of woodland and scrub to the north of Scully Grove, near Mitcheldean, probably the sites of scowles, shown on the 2nd series 25" OS map of *c.* 1900

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Figure 17: (right) Modern aerial photograph of the area shown in Figure 16, clearly showing that the strips of woodland have been felled. The brown marks suggest backfilled features.

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St. Whites, near Ruspidge – SO 6591 1266

The farmer at St. White's Farm near Ruspidge is reported to have recalled a pit being backfilled (Glos SMR 23252) on his land, and Wildgoose noted a stone and debris scatter at SO 6591 1266 (Wildgoose 1993, 89). St. White's is believed to be the site of medieval *Ardlonde*, where iron ore was dug on land belonging to the Abbot of Flaxley in *c.* 1287. 'And the Abbot hearing of this immediately removed the miners and filled up the ditch of the mine with stones and earth…' (Hart 2002, 147). The reference to the mine as a 'ditch' suggests surface rather than underground workings.

Stock Wood, Clearwell – SO 5750 0826

Wildgoose reported severe tipping at the site of scowles in Stock Wood, near Clearwell Caves. 'Sadly, this historic mining site…is now being rapidly destroyed.' He observed that tipping was still ongoing in these scowles, and reported that the '…natural vegetation has been badly damaged by vehicle scrambling activities, and the ancient tree cover is being felled' (Wildgoose 1993, 150). Stock Wood is also the site of 'Cinderbury', a replica Iron Age settlement. The replica settlement itself is constructed in the area of backfilled scowles and the planning permission for the

development includes a requirement for a management plan for the remaining scowles in the area. It is anticipated that this will ensure the integrity of the remaining scowles in Stock Wood, and that visitors will be managed effectively.

The Wilderness, near Mitcheldean – SO 6606 1776

Active backfilling of Form 1 scowles, presumably to create a level field surface, was observed by the survey team in the summer of 2003 in a field near The Wilderness Field Study Centre, Mitcheldean (Glos SMR 25166). This can be seen in Figure 18, below.

Figure 18: Backfilling of scowles at The Wilderness, near Mitcheldean, (Glos SMR 25166).

Urban areas

Where built-up areas lie above the outcrops of scowle-bearing strata, it is likely that at least some features will have been backfilled to allow development to take place.

Examples of this are:-

- Wildgoose talks about backfilling to create gardens and building sites for the houses of Hawthorns Road at Drybrook (Wildgoose 1993, 39), near the modern Drybrook Quarry site. However, the nature of the features backfilled is not known.
- Houses on Woodfield Road, Cinderford are possibly also built upon backfilled pits. Glos SMR 23247 and 23248 record two small patches of woodland within a field, shown on 19th century maps. These patches of woodland correspond with iron ore deposits found in the Drybrook Sandstone, and may reflect the presence of pits associated with iron-ore extraction.

Local knowledge about backfilled scowles

Further information about backfilled scowles can be obtained by talking to local people and landowners. Examples of this are:-

- A copse located at the far western end of Drybrook Quarry is known to contain scowles (Glos SMR 20829). Local residents have reported several other scowle holes immediately to the north of this copse, which were filled in during the 1960s. However, in this particular instance the features described might not represent scowles, since they would have been situated outside of the scowle-bearing strata. This information might be confused with a note contained in the report of an archaeological assessment carried out in 1989 prior to the extension

of the quarry. This stated that 'until about 20 years ago…the remains of iron ore digging extended eastwards across the hill crest' from the small copse at the western end of Drybrook Quarry (Oxford Archaeological Unit 1989, 1). This description places the backfilled features securely within the Lower Dolomite.

- Wildgoose described how the farmer at Bream Court Farm recalled that surface workings in fields to the south of the farm had been filled within living memory since *c.*1930 (Wildgoose 1993, 128). No features were observed at this location by the survey team in the summer of 2003. This area (Glos SMR 23271; SO 5979 0544) was visible as irregular ground on aerial photographs taken in 1975, and was marked as fields called *The Hilles* on the 1608 map of the area (PRO 1608). Given this, it is very likely that scowles have been backfilled here.
- A resident of Puddlebrook told the survey team that 'quarries' had been backfilled in a field behind his house (Glos SMR 25182). He did not remember this event taking place, but thought it must have occurred prior to about 1930. The survey team recorded shallow amorphous depressions (Form 1) at this location. The outcrop of Crease Limestone runs through this field, and it is therefore extremely likely that the 'quarries' referred to by the local resident were in fact scowles.
- A dog-walker commented that a house at Collafield (SO 6663 1477), near Cinderford, had its foundations reinforced with concrete to prevent slipping. This house lies close to large field depressions (Form 1, Glos SMR 23751) recorded by the survey team, and is on the outcrop of Crease Limestone. The slipping may have been caused by the presence of sub-surface hollows, or settling of the fill of backfilled pits.
- Wildgoose reported that the land agent at Lydney Park Estate had 'advised that most of the evidence in the area around Redhill Farm (SO 6190 0340) has been destroyed by agricultural cultivation and the farm buildings' (Wildgoose 1993, 321). Possible scowles both in the form of configuration of woodland and cropmarks in an area of cleared woodland was identified in the vicinity of the farm as a result of the desk-based data collection (Glos SMR 23042). When the area was visited in 2003-04 scowles were recorded within surviving woodland (Glos SMR 25195), although none were visible where woodland had been cleared and converted to arable land.

These examples show the potential value of local knowledge in expanding our understanding of the former location of possible scowles and mine pits. It is also clear from these examples that much 'local knowledge' is not first hand. The possibility of events and locations being mis-remembered, or changing through re-telling should be considered.

Excavated evidence for backfilled scowles

- An archaeological evaluation (Glos SMR 17028) was carried out next to the site of Stock Farm Roman Villa in 1995, in advance of the construction of a reinforcement main for Severn Trent Water Ltd. Two of the trenches contained evidence suggesting the presence of a scowle, and pottery of probable Roman date came from the fill. This area, centred at SO 5750 0865, is in a small scowle-free island between recognised scowles in Little Lambsquay Wood (SO 5775 0877) to the north-east, and Stock Wood (SO 5753 0829) to the south-west.
- An archaeological evaluation (Glos SMR 17082) was carried out in 1998 at the site of the Stock Wood scowles. Three trenches were excavated, the first of which encountered a natural hollow. The second trench cut across a scowle, and 19th century finds indicate the date of backfilling. The third trench cut across a number of spoil heaps that appeared to have been thrown up from the nearby deep scowles.
- Evidence for backfilled scowles was identified during archaeological field evaluation and watching brief (Glos SMR 20611) immediately to the south-west of Bream Court Farm, Bream (SO 5922 0560). These features were not excavated, and the date of the backfilling was not ascertained (Derham1999; Derham 2000). They are, however, at the northern edge of a field in which

scowles are reported to have been backfilled within living memory, and which was called *The Hilles* in 1608 (see above).

- Between 2001 and 2004 members of Dean Archaeological Group undertook small-scale and intermittent excavation of a small scowle (Glos SMR 23356), known as Crab-Apple Cave, adjacent to Clearwell Caves mining museum, in the west of the Forest of Dean. The results of this excavation remain unpublished (May 2006), but interim report (Gentles & Austen 2002; Doug Gentles pers. comm.) suggest that the infill consisted largely of later post-medieval material.

Aerial photographic evidence for backfilled scowles

Amorphous shapes along the outcrops of Carboniferous Limestones are visible on some aerial photographs, and it is possible that these marks reflect the locations of backfilled scowles.

- Cropmarks in the area of Redhill Farm, Lydney (Glos SMR 23042; SO 6190 0340) have already been discussed.
- Amorphous cropmarks in grassland were recorded to the south-west of Stock Farm, Clearwell (Glos 23390). When the site of these was visited as part of the 2003-04 survey, the eastern part of this concentration was recorded as Form 1 scowles (Glos SMR 23911), whilst no surface features were recorded in the western part of the concentration.
- Features which may represent backfilled scowles (Glos SMR 23363) were also visible in the short (*c.* 300m) gap at Whippington Corner, east of Staunton (SO 5539 1253), although no visible features were recorded in the 2003 field survey. This area had also recorded as fields in 1608 (PRO 1608), which would suggest that if scowles had been backfilled here, this occurred before the early 18th century.
- The desk-based work identified a further 17 sites where possible scowles had been identified from aerial photographs, but which were not visible as landscape features when their sites were visited in 2003-04 (details of these can be found in the project archive). A few of these were cropmark sites (see above), although the majority were sites where the configuration of landscape features, such as irregular areas of woodland, suggest that scowles may have been present. Further research would be required before the status of any of these areas can be established.

Parchmarks as evidence for backfilled scowles

The field survey recorded two sites as amorphous parchmarks, which might represent backfilled scowles or mine pits. Both of these sites were located outside areas of woodland. One (Glos SMR 23772) was located in a garden, the other (Glos SMR 23789) in an area of grassland. Although both were sited in geologies where scowles would be expected, and one of the parchmarks (Glos SMR 23789) is remarkably distinct (see Figure 19 below), their interpretation as scowles is open to question, since there is no supporting aerial photographic or cartographic evidence. The field teams made no observations of irregular or undulating ground at these locations when the sites were visited in 2003.

Figure 19: Possible backfilled scowle at Wigpool, showing as a parchmark (Glos SMR 23789) Copyright: Gloucestershire County Council 2004.

Early map evidence for the sites of backfilled scowles

19 possible scowle sites were identified from early maps consulted during the desk-based phase (details of these can be found in the project archive), but were not visible as landscape features when visited in 2003.

11 of these were marked as quarries, unmarked depressions or mine shafts on the 1st, 2nd and 3rd Series Ordnance Survey maps, and their status as scowles is not clear.

Two areas (Glos SMR 23247; Glos SMR 23250) were marked as irregular woodland on the 1st, 2nd and 3rd Series Ordnance Survey maps, overlying a vein of iron ore in the Drybrook Sandstone. Both these areas were under housing development on the eastern side of Cinderford in 2003.

The remaining six were field names from 18th or 19th century maps which suggested that the area had been scowles, or at least had an irregular surface, when the maps were produced. These are:-

Table 32: Field names suggesting backfilled scowles

Field name	Glos SMR number	Date of source
The Rubbles & Stony Piece	23244	1838
Tumpy Piece	23485	1840
Scowles Meadow	23523	1792
Scowles Green	23524	1792
The Scowles	23526	1792
Tumpy Field	23527	1792

Recorded forms which may indicate backfilled scowles

The field survey identified two categories of feature, which may represent backfilled scowles particularly where they occur within areas of grassland or scrub.:-

- Form 1 - shallow depressions with or without mounds and with no visible rock exposures

- Form 2 - mostly small (less than 10m diameter) hollows with few (less than 50%) or no rock exposures.

Many of the scowles recorded by the survey are located within strips of woodland, which conform to the outcrops of scowle-bearing geological strata. These areas of woodland probably only exist because of the pits and hollows they contain; backfilling of those pits and hollows, and felling of the trees would have made that land available for other uses. A classic example of this (north of Scully Grove, near Mitcheldean) has already been discussed above, and is illustrated in Figure 16 and Figure 17 above. The landuse history of scowles is potentially significant, since pits formerly located within areas of woodland may have been backfilled to create a more useful land surface once the woodland had been cleared. However, without further investigation, Form 1 and 2 scowles could also be interpreted as the surface expression of collapsed natural subterranean cavities, natural swallow-holes, or even collapsed underground mine workings, rather than as backfilled surface features. Interpretation of Form 1 and 2 features is discussed more fully elsewhere (see 3.1.5 above) although it is clear that more research is required to establish the true origin of these shallow depressions and small hollows. Another consideration is that more Form 1 scowles may have been recorded in areas of grassland or scrub because they are more clearly visible in these areas, and it remains possible that they exist in woodland in equal (or even greater) numbers, but were not seen by the survey teams due to undergrowth.

In reality Scowle Forms 1 and 2 almost certainly reflect a range of events, with some resulting wholly from natural geological processes (e.g. slumping of the land surface above natural subterranean cavities), some resulting wholly from human intervention (e.g. bell pits), and others a combination of factors (e.g. natural cavities, purposely backfilled to reclaim otherwise unusable land).

Form 1 and Form 2 scowles not located within areas of woodland

It has already been shown that just under 6% of Form 2 sites and over 78% of Form 1 scowles were identified outside of woodland (see 3.1.5.7 above) and these could represent sites where features have been backfilled.

The table below sets out the landuse for Scowle Forms 1 and 2 where this is not woodland.

Table 33: Form 1 and Form 2 scowles not located within areas of woodland

Non-woodland landuse	% of Form 1 scowles not in woodland, located in each landuse type	% of Form 2 scowles not in woodland, located in each landuse type
Cultivated Land	0.8	0
Garden	0	0
Grassland	98.2	35.5
Scrub	1.1	64.5
	100.1	100

Form 1 and 2 scowles located within areas of woodland

31.9% (by area) of scowles identified within woodland during the 2003-04 field survey were Form 1 or 2.

Table 34: Form 1 and 2 scowles located within areas of woodland

Woodland landuse	% of Form 1 scowles in woodland, located in each woodland type	% of Form 2 scowles in woodland, located in each woodland type
Coniferous	0	18.1
Deciduous	86.9	41.6
Mixed	13.1	39.7
Undetermined	0	0.6
	100	100

Where these forms of scowle are found in woodland, their interpretation as backfilled features is problematic and raises a number of questions:-

- If Form 1 and 2 scowles represent deeper pits that have been backfilled to make otherwise unusable land available, why are they still tree-covered?
- By what process did these features become backfilled? Deliberate backfilling would seem unlikely unless the land was being reclaimed for agriculture or pasture. Similarly, backfilling by accumulated colluvium is unlikely, unless adjacent, upslope, areas were extensively cultivated at some time.

It remains possible that the scowles in these areas are indicative of one of the following:-

- Scowles deliberately backfilled to reclaim land for agricultural use, but which have more recently become colonised (or re-colonised) with woodland.
- The remains of small pits, presumably excavated to extract iron ore (as distinct from the sinuous quarry like “classic” scowles), which have been backfilled by internal collapse.
- Features, which are essentially in their natural form, have never been deep pits, and have not been subjected to backfilling.

Conclusion

It is clear that the majority of Form 1 scowles (76.6%) are located in areas of grassland, whilst the majority of Form 2 scowles (94.1%) are located within woodland. Where Form 1 features have been recorded in woodland, and Form 2 features in open areas, this may be the result of anomalous recording by the field teams, since the differences between the two forms is not always clearly defined.

It is likely that at least some Form 1 and 2 scowles, particularly where they occur in open areas, do represent backfilled scowles, although it is clear that this is less likely to be the case where these features are found in woodland.

3.1.10.2 Gaps in scowle distribution

Scowles occur within a relatively narrow, geologically pre-determined, band around the central wooded part of the Forest of Dean (see 4.1.4 below). Although the desk-based research and field survey has identified features within these geological outcrops throughout much of the region, there are some significant areas where no scowles have been identified.

Although as the distribution of these features may be naturally patchy and unpredictable and scowles may never have existed in the following areas, it remains possible that scowles have been backfilled in these locations and have left no visible surface evidence.

These gaps are:-

Lower Old Park Wood, Lydney Park, Lydney – SO 6157 0302

There is a clear decline in the density of recorded scowles in the southernmost *c.* 350m of Lower Old Park Wood, in the Lydney Park Estate. The reasons for this are not clear as the area is currently wooded, and has been since known records began. The area was, however, part of gardens associated with Lydney Park in 2003-04 and shrubs, such as rhododendrons, are likely to have obscured scowles in this area.

Pingry Farm to Scowles Village, west of Coleford – SO 5740 0970

No features have been recorded in the Crease Limestone and large parts of the Lower Dolomite for a distance of *c.* 1.5km between Pingry Farm and Scowles Village, near Coleford, although features have been recorded in the basal part of the Lower Dolomite near Breckness Court and in Galders Wood, to the west and north-west of Pingry Farm. This 'sterile' area is a region of open farmland, and it may be that pits have been backfilled to create this land surface. Another possibility is that this is a reflection of the natural variation in the distribution of scowles within the Carboniferous Limestones.

South and east of St. White's Farm, near Cinderford – SO 6590 1290

A few surface features were recorded around St. White's Farm by the desk-based research and field survey. However, their distribution is sparse when compared with other areas within the scowle belt. This paucity of features might reflect backfilling to create useable farmland, since the Crease Limestone and Lower Dolomite pass through open fields at this location. Another possibility is that this is a reflection of the natural variation in the distribution of scowles within the Carboniferous Limestones.

Northern part of the Forest of Dean between English Bicknor (SO5820 1580) and Ruardean (SO6200 1760)

In the northern part of the Forest of Dean, gaps in the distribution of scowles can be explained by the fact that the Crease Limestone outcrop disappears to the east of Symonds Yat, reappears briefly at Hangerberry, near Lydbrook, then disappears again, reappearing at Crooked End Farm, just to the west of Drybrook. Some features have been recorded at Hangerberry, where the Crease Limestone makes a brief appearance, and others have also been recorded in the Lower Dolomite to the north of the Forest, although their density is distinctly less than in the east and west of the region where the outcrops of Carboniferous Limestones are uninterrupted.

South-east part of the Forest of Dean: south of Staple Edge Wood

No scowles have been recorded in the south-east of the Forest of Dean. This is because the Carboniferous Limestones in which scowles have formed, are overlain by the Coal Measures at this point. This area was not included in the survey.

Highmeadow Wood, north of Staunton – SO 5520 1330

Although some surface features have been recorded in Highmeadow Wood, their number does not reflect the width of the Crease Limestone outcrop at this location. This outcrop is wider here than in any other part in the Forest of Dean (average width in Highmeadow Wood is *c.* 250m), and more scowles might therefore be expected.

Even though the area is currently wooded, scowles may have been backfilled in antiquity. The 1608 map of the western part of the Forest of Dean (PRO 1608) clearly shows the area of the Crease Limestone outcrop to be fields, although the significance of this is not clear (see section 3.1 above) and both Taylor's map of 1777 (Taylor 1777) and Lord Gage's map of 1792 (GCRO 1792) show the area as

scrubland, which does not appear to have been separately designated on the 1608 map.

3.1.10.3 Destroyed scowles

Some scowles have been destroyed by large modern quarries exploiting the Carboniferous Limestones of the area, such as Drybrook Quarry in the north-east of the region, which straddles the scowle belt near Drybrook. In the west of the region, Stowfield Quarry and Whitecliff Quarry are both on the edge of the scowle belt, and have probably caused the destruction of features in these areas.

Many of the sites recorded by the survey as 'possible-destroyed' and 'possible' scowles also represent sites of scowles / iron ore extraction pits that have been destroyed by subsequent quarrying. Sites recorded as specific type 'possible-destroyed' are those which could be identified as obvious quarries; although where the field teams were unable to distinguish between scowles and small abandoned quarries, these were recorded as specific type 'possible'. Significant examples of these sites are detailed below.

Clay's Wood, near Sling – SO 5838 0731

This area has been designated as the site of both 'backfilled' and 'destroyed" scowles. At the former Clay's Wood, in the west of the Forest of Dean, just to the south of Clays Farm near Sling, an area of scowles has been filled with industrial waste in the last 20 to 30 years (Glos SMR 23466). Not only have these scowles been in-filled with waste, but Paul Wildgoose describes how 'The tipping operation has involved enlargement of the mine pits by excavation…' (Wildgoose 1993, 140). This 'enlargement' process will have destroyed archaeological evidence that may have survived in these scowles.

Drybrook Quarry – SO 6413 1795

It is very likely that scowles once existed in the area now occupied by the modern Drybrook Quarry (Glos SMR 25095), as the Crease Limestone outcrops in the south-east corner of the site, and the rest of the quarry is situated within the Lower Dolomite, where scowles are often found, and scowles are visible adjacent to the western edge of the quarry, in a small copse (Glos SMR 20829). This site is located next to the basal edge of the Lower Dolomite, *c.* 200 metres north of the outcrop of Crease Limestone, and it is very likely that other scowles existed within the Lower Dolomite in this area.

Evidence for this is visible on aerial photographs taken before the quarry expanded to its current size. Features interpreted as scowles, and centred upon SO 6371 1793, are visible on photographs taken in 1975 and 1983, and an archaeological assessment carried out in 1989 prior to the extension of the quarry, noted that 'until about 20 years ago…the remains of iron ore digging extended eastwards across the hill crest' from the small copse at the western end of Drybrook Quarry (Oxford Archaeological Unit 1989, 1).

Plump Hill, near Mitcheldean – SO 6612 1717

Extensive post-medieval quarrying has taken place in this area. The scowle-bearing strata pass through this area of quarrying, and it is possible that scowles / mine pits have been destroyed here. Nicholls described how '...the new road over the Plump Hill exposed in its formation, in 1841, an ancient mine hole, in which was found a heap of half-consumed embers, and the skull of what appeared, from its tusks, to be that of a wild boar...' (Nichols 1841, 6). The exact location of this pit (Glos SMR 23509) is not known, but its relationship with the geological outcrops suggest it was either a scowle or an iron pit.

Quarry near Mitcheldean – SO 6593 1827

This quarry (Glos SMR 25160), located on the south side of The Stenders, near Mitcheldean, is now a Gloucestershire Wildlife Trust nature reserve. It worked the Lower Limestone Shales, but also cut into the Lower Dolomite, and is just a few metres (*c.* 30m) east of the outcrop of Crease Limestone. It is possible that scowles have been destroyed by this quarry.

Shakemantle Quarry, near Ruspidge – SO 6530 1140

The Crease Limestone outcrop runs through this quarry (Glos SMR 23642), which was excavated to extract the Lower Dolomite, and it is possible that this was once the site of scowles.

Whitecliff Quarry, near Coleford – SO 5660 1020

Whiteciff Quarry (Glos SMR 23873), which is now the site of an off-road activity centre, is a large post-medieval quarry to the west of Coleford. It lies within the Lower Dolomite, just west of the outcrop of Crease Limestone, and it is possible that this large quarry was once the site of scowles.

3.2 The survey of bloomery sites

The methodology of the survey of possible bloomery sites is set out in Appendix G and Appendix H. This operation was undertaken in two phases:-

- Phase 1 - The desk-based survey identified the location of a number of known and possible smelting sites within the whole of the Forest of Dean Survey Area.
- Phases 2 - Targeted field survey, of selected sites to record landuse, condition and any features that were present.

The desk-based research phase was carried out at Shire Hall in Gloucester from late January to June 2003. The fieldwork for the survey took place over 5.25 days between the 12th and 18th September 2003.

A total of 144 sites interpreted as possible bloomeries and pre-dating the blast furnace era, were identified within the Forest of Dean Archaeological Survey area. These were identified from a variety of sources of evidence discussed more fully in Appendix G.i. In addition to these, analysis of the documentary sources identified a further 18 sites outside the survey area but within the Forest of Dean District Council area. Where these sites were not already recorded on the Gloucestershire County Sites and Monuments Record (the project database), they were added, although no further investigation of these sites was undertaken, and these sites are not included in the statistics calculated below.

Contact with SMRs in Herefordshire and Monmouthshire identified 30 known and possible bloomery sites just outside the Forest of Dean. Details of these can be found in Appendix X. No further investigation of these sites was undertaken, and these sites are not included in the statistics calculated below.

3.2.1 Distribution of all bloomery sites identified within the Forest of Dean survey area

Identified bloomery sites were distributed throughout the Forest of Dean survey area (see Figure 38). There was a slightly higher density in an area corresponding to the outcrops of Crease Limestone around the central Forest of Dean, and a concentration in the vicinity of the River Severn, particularly in the parishes of Lydney and Awre.

It is clear that too little is currently known for the significance of this distribution to be understood.

3.2.2 Date of possible bloomery sites

The following table sets out the date of possible bloomery sites as currently recorded within the project database, the Gloucestershire County Sites and Monuments Record.

Table 35: Date of possible bloomery sites

Period	Number of sites	% of all possible bloomery sites
Prehistoric (500,000bc-AD43)	1	0.7
Roman (AD43-410)	23	16.0
medieval(1066-1540)	15	10.4
Unknown	105	72.9

Of the 144 bloomery sites recorded as part of the desk-based survey, the majority (72.9%) are of unknown date. It is clear from the discussion of this evidence (see 4.2.4.7 below) that the dating evidence for all possible bloomery sites with the exception of those few dated from securely excavated contexts is in need of re-assessment, and it is clear that too little is currently known about the date of these sites for the above figures to have any significance.

3.2.3 Type / form of all bloomery sites identified in the Forest of Dean survey area

The evidence for the location of possible bloomery sites was derived from a variety of sources (see Appendix G.i).

The type of evidence for the 144 possible bloomery sites identified by the desk-based phase of the project is summarised in the table below.

Table 36: Type / form of all bloomery sites identified in the Forest of Dean Survey Area

Type / Form	Number of sites	% of all possible bloomery sites
Findspot (slag etc)	52	36.1
Slag Heap	20	13.9
Excavation	28	19.4
Field Name / Place Name	42	29.2
Watching Brief	1	0.7
Documentary	1	0.7

In addition to the 144 possible bloomery sites identified by the above types of evidence, a number of features were identified which might also be linked to the bloomery industry.

- 8 cup stones (see 4.2.4.8 below), which may have been utilised in the processing of ore, were identified within the Forest of Dean survey area.
- 10 mounds of undetermined date and function, but which could possibly reflect the site of cinders mounds, were identified within the Forest of Dean survey area.

3.2.4 Scope of the field survey

The project design (Hoyle 2002) specified that the main objective of fieldwork to research possible bloomery sites was “to investigate the location and extent of recorded bloomery sites, surviving cinders mounds or the known sites of destroyed cinders mounds and validate areas where the results of Phase 1 of the project suggest that cinders mounds may either be present or were formerly present.”

This limited objective was even more constrained as only 29 of the 144 possible bloomery sites identified in the desk-based phase of the project were within the Aggregates Resource Area. All of these were visited, although access was denied to two sites and records were therefore only made of 27, representing a sample of 18.8% of all possible bloomery sites identified within the Forest of Dean survey area.

It was evident that rapid field visits alone were not adequate to fully determine the nature, date or extent of possible bloomery sites, and, in the event, the objectives of the survey were largely restricted to:-

- Identification of current landuse.
- Identification of current damage and condition.
- Identification of surface slag scatters indicative of bloomery smelting.

3.2.5 Level of survey for possible bloomery sites

Survey level was recorded for all 29 sites identified within the Aggregates Resource Area.

Table 37: Level of survey for possible bloomery sites

Level of Survey	Description	Number of sites	% of sites
Level 1	No access. Information retained as per current SMR.	2	6.9
Level 2	Access limited to boundary of area of interest – Sight of less than *c.*50% of possible area.	2	6.9
Level 3	Access limited to boundary of area of interest - sight of more than *c.* 50% of possible area.	2	6.9
Level 4	Access to area of interest - sight of less than *c.* 50% of possible area.	2	6.9
Level 5	Access to area of interest - Sight of more than *c.* 50% of possible area.	17	58.6
Level 6	Access to area of interest - Sight of more than *c.* 50% of possible area, and conditions for surface artefact search	4	13.8

3.2.6 Causes of damage / threats to possible bloomery sites

Damage was recorded for 23 of the 27 sites visited during the field survey. The majority of these sites (63%) exhibited no signs of damage whilst this could not be assessed for two of the sites visited (7.4%) due to undergrowth density. The causes and severity of damage to the remaining sites are as follows:-

Table 38: Causes of damage / threats to possible bloomery sites

Damage	Number of sites	% of sites visited	Damage rating
Stock erosion	1	3.7	Slight
Vehicle erosion	1	3.7	Slight
Arable ploughing	1	3.7	Moderate
Dumping	1	3.7	Severe

With the exception of the single site under threat from dumping (Glos SMR 23270), there was no clearly discernable threat to any of the bloomery sites visited as part of the field survey.

3.2.7 Condition of surveyed possible bloomery sites

Condition was recorded for all of the 27 sites visited. This was an assessment of the potential of each site to have surviving buried archaeological remains. The criteria used for this were the same as those used during the field survey of scowles (see Appendix E.vii.iii).

Of the 27 sites assessed, the majority were in *good* condition. Of the 3 sites that had a *fair* condition, damage was by stock erosion (*slight* damage rating), arable ploughing (*moderate* damage rating) or vehicle erosion (*slight* damage rating). The one site that was in a *poor* condition had *severe* damage caused by much tipping / dumping of modern brick, rubble and metal on this site although no visible slag finds were found in or around this site.

Table 39: Condition of surveyed possible bloomery sites

Condition	Number of sites visited	% of sites visited
Good	21	77.8
Fair	3	11.1
Poor	1	3.7
Uncertain	2	7.4

3.2.8 Landuse of possible bloomery sites within the Aggregates Resource Area

Landuse was recorded for every site visited as part of the survey, although where a site had two identified landuses both were noted. Thus, 37 landuses were recorded for the 27 sites visited.

Table 40: Landuse of possible bloomery sites within the Aggregates Resource Area

Landuse	Number of landuses recorded	% of sites visited
Built Over	3	8.1
Cultivated Land	5	13.5
Garden	1	2.7
Grassland	15	40.5
Scrub	3	8.1
Thoroughfare	3	8.1
Woodland: Coniferous	1	2.7
Woodland: Deciduous	4	10.8
Woodland: Mixed	2	5.4

Most sites visited (40.5%) were under grassland, with large numbers of sites under cultivated land (13.5%) or woodland (18.9%).

3.2.9 Artefacts found at surveyed sites

The following artefacts had been recovered from possible bloomery sites either prior to the field survey, or as a result of unrelated activities.

Table 41: Gloucestershire SMR references for artefacts found at surveyed bloomery sites

Glos SMR number.	Description	Landuse
5102	Two Roman brass coins of Victorinus and a quantity of cinders, found *c.*1881, during construction of the railway near Cherry Orchard Farm, Newland.	Scrub; Thoroughfare.
6033	Area to the west of Madgetts Farm, Tidenham.	Woodland: mixed.
6116	Site of a cinders mound of unknown date at Bicknor Court.	Cultivated land; Woodland: undetermined; Woodland: deciduous; Built over (5%).

Glos SMR number.	Description	Landuse
9739	Romano-British occupation site at Barnfield, Eastbach Court.	Cultivated land.
9875	Bloomery site, of unknown date (possibly medieval) at Warfield Farm.	Cultivated land; Grassland.
21290	Possible iron working site, Cow Meadow Farm, English Bicknor.	Grassland; Cultivated land.
21770	Two large areas of undated bloomery slag found during field-walking in Windmill Field, English Bicknor.	Grassland.
22303	Findspot of undated tapped and untapped bloomery slag, located near scowles to the east of Edgehills Lodge, Edgehills Plantation.	Woodland: coniferous.
23517	Time Team Big Dig test pit excavation to the south of Yew Tree Cottage, Brockweir.	Grassland.
23520	Undated tapped and untapped bloomery slag from the garden of March Dyke, Brockweir.	Built over; Garden.

The following artefacts were recovered during the field survey:-

Table 42: Artefacts found at surveyed bloomery sites

Artefacts	Number of sites	% of sites
Bloomery / furnace slag	1	3.7
Tap slag	2	7.4
Blast furnace slag	1	3.7
Tap slag and Bloomery / furnace slag	5	18.5
Mixed slag (tap, bloomery and blast furnace slag)	1	3.7
No artefacts	17	63.0

Slag was only found at 10 sites. The majority of these sites yielded both bloomery/furnace slag, and tap slag.

3.2.10 Summary of bloomery field survey results

The significance of the analysis of the results of the survey of bloomery sites should be treated with caution as of the 144 sites of bloomeries identified within the Forest of Dean survey area, only 29 (20.1%) were within the aggregate resource area, and of these only 27 (18.75%) were visited. Although this sample has the potential to be representative of potential smelting sites across the whole survey area, this may not be the case as the sample was restricted to a specific geologies and landuses. Although, large deposits of slag were recorded on some sites, the majority had been initially identified from surface finds, documentary evidence, placename evidence or excavation reports, and the sites themselves often provided few finds or features indicative of early iron smelting or processing.

4 Archaeological discussion

4.1 The Scowles

4.1.1 General location of scowles

The name “scowle” is given to a significant landscape feature within the Forest of Dean consisting of irregular pits and hollows which follow the outcrops of Carboniferous Limestones at the edge of the Upper Carboniferous Coal Measures in the central area of the Forest (BGS 1974; Figure 29) The formation of these features is the result of complex geological and geomorphological processes combined with human intervention and is discussed more fully below. These processes have taken place within the Crease Limestone, the Lower Dolomite, Drybrook Limestone and also dolomitic bands at the interface between the Drybrook Limestone and Drybrook Sandstone, and it is in these areas that scowles are found (Figure 1).

4.1.2 Origins of the word scowle

Scowle is a word found in the Forest of Dean to describe landscape features which have traditionally been interpreted as the surface remains of iron ore extraction.

The origin of the word scowle is not entirely clear and there are a number of suggestions as to its derivation. Perhaps the most fanciful is found in Chambers 20th Century Dictionary, which suggests that the word is derived from the English verb “to scowl” and describes the gloomy or threatening appearance of these features in certain weather conditions or seasons (Geode Consulting 1998). Smith suggests that the word is derived from “scowle” the early modern English word for rubbish or debris and is a reference to the debris which partially fills some scowles (Smith 1964). Perhaps the most likely origin of the name is that it is derived from the British word *crowll* meaning a cave or hollow or the Welsh word *ysgil* meaning a recess, both of which accurately describe the scowle’s physical appearance (Oldham 2002, 1).

The antiquity of the word is attested by the name of Scowles village, which was first recorded as *Scwelle* in 1287, and is probably a back-formation from the accepted name of the landscape features which are found within it (Smith 1964).

4.1.3 Definition of a scowle

4.1.3.1 Earlier definitions

Although there is no generally accepted definition of a scowle (see 4.1.2 above), the principal common denominator in most definitions or descriptions of these features is that they are the result of open cast iron ore extraction and are essentially ironstone quarries which were entirely created by human intervention.

The earliest literary reference to scowles (although the word “scowle” was not used) is from Camden’s Britannia of 1588 and describes those in Newland Parish as “vast Mine Pits of 60 or 70 Foot deep, and as large as a considerable Church.” (Atkyns 1715, 575). These features were also recorded as artificial in 1780 when Wyrall described them as “vast caverns scooped out by men’s hands” (Wyrall 1780).

This view of scowles as iron ore quarries has persisted into modern times. Hart described scowles as “Irregular shallow open cavities, the result of surface iron ore extraction” (Hart 2002, 558), Walters defined scowles as “The local name for the bowl-shaped hollows created by the removal of ore which outcrops on the ground surface” (Walters 1992b), and Cranstone states that scowles “consist of irregularly shaped quarries variably infilled, often with vertical limestone faces” (Cranstone 1992). In the project design for the Scowles and Associated Iron Industry Survey, this

interpretation was perpetuated by the statement that scowles were “irregular hollows caused by open cast exploitation of iron ore.” (Hoyle 2002, 1.3.3.3), and they have recently been described as “Ancient iron workings on or near ground level” (Gloucestershire Geoconservation Trust 2003).

Wildgoose, in his 1988 assessment of early iron ore mining at Wigpool (Wildgoose 1988), and later in his 1992 MLitt thesis on the Roman and medieval iron industries in the Forest of Dean (Wildgoose 1992), does not use the term “scowle”, preferring more general expressions such as “surface mines” to describe these features. His view of the origin of these features is clearly stated in his discussion of mining practice in which he states that the first step would have consisted of “prospecting to locate surface outcrops of ore or the ore-bearing rock strata” making use of such techniques as “identification by visible features such as red soil, ore fragments on the surface…plant growth such as yew trees” or ”trial pits to expose the underlying rock”. He continues to describe the process as “extraction of surface exposed ore by pits enlarging them to extract the ore”. He goes on to explain that the interlinked linear appearance of scowles results because “with shallow dipping strata, another pit could be opened rather than wasting effort on a possible blind lead, to form a linear series of pits which may interlink to form a surface mine complex.” (Wildgoose 1993, 4.2.3). Using this scenario as a basis he hoped to quantify the extent of the iron ore which was removed and processed as a result of surface exploitation, by attempting to “record the surviving evidence from surface mines within the Forest of Dean, and to estimate the quantity of iron ore extracted from them, by measuring and recording dimensions.” (Wildgoose 1993, 2.1).

More recently, Geode Consulting discussed the issue of the definition of scowles and pointed out that the term “has come to be used by a variety of people (naturalists, historians, miners and archaeologists) for differing reasons” and who “see them as a setting for their interest which will not necessarily define the feature accurately”. They went on to suggest “a purely scientific geological explanation and definition” as “the only really objective way of describing what is in fact the result of detailed geological and geomorphic processes over several hundred million years.” (Geode Consulting 1998).

Geode Consulting continued to define scowles as “the labyrinth of open elongated pits and hollows situated along the line of exposures of Carboniferous (Dinantian) Limestones, especially on the western, and to a lesser degree, on the eastern flanks of the Forest of Dean basin” and that “their maximum development is along the strike of the Crease Limestone formation and to a lesser degree in the Lower Dolomite below and the calcareous bands of the Drybrook Sandstone” (Geode Consulting 1998). The significant difference between this definition and those stated earlier was that, although in this definition, the removal of iron ore was recognized as a feature of the history of scowles, it was not considered to be an essential factor in the formation of these features which should be regarded as “essentially a natural geomorphic landform that has been latterly adulterated by ancient mining processes.” (Geode Consulting 1998).

4.1.3.2 The value of a definition

As the word “scowle” itself is colloquial and has no generally recognised scientific definition, or specific meaning, the value of assigning a strict definition to the word is not clear.

Within Dean the term is generally used to describe a hollow of varying size or depth, from which iron ore has been extracted, although some users, particularly those who are engaged in activities which take them underground, do not make a clear distinction between the surface features and the subterranean cavities which often lead directly from them.

The geologically determined Geode Consulting definition encompasses only those features, which have resulted largely from geological processes. This would exclude features, which do not comply with this geological model, and would therefore omit a number of the features recorded by the survey.

Similarly, putting undue emphasis on the need for surface iron ore extraction as a determining factor in scowles identification would have the potential to exclude a number of the features which are classic scowle formations, but may be largely geological in origin, and would also cause an unclear division between these features and those which could be interpreted as clearly artificial bell pits or mine adits.

Neither of these definitions can fully encompass the full range of scowles which are a complex mixture of features formed by a varying degree of geomorphologic processes and human intervention, and the variety of the forms of scowles" identified by the survey militates against an easy general explanation of their origins or formation.

Accordingly it is suggested that where scientific definition is required, existing, clearly defined terms should be used. For example natural formations within the limestone should be described using terms such as "karst landscape" or "swallet", whilst those of clearly artificial origin should use existing terms such as "surface iron mine" or "ironstone pit". Where it has been interpreted that a combination of factors has produced particular features, this should be clearly stated.

Throughout this report, the term "scowle" is used as a shorthand expression to describe evidence of selected features within a particular geological zone and does not carry with it any implications in terms of their origin or date.

4.1.4 Scowles as a product of cave formation

Although a definition of the word itself is not considered to be helpful (see above), it is vital that the possible geomorphologic origin of many of the features discussed in this report is considered.

This process began over 300 million years ago, when caves formed within parts of the Dinantian (Carboniferous) carbonate rocks of the Forest of Dean, which have a long history of speleogenesis (cave formation and development). Karstification, including speleogenesis took place in late Dinantian to Namurian times, and further karstification may have occurred prior to ore emplacement (Lowe 1993). It is currently unclear whether the cave system was formed in the vadose (above water table) or phreatic (below water table) zones, but it is likely that the system began in the phreatic zone, and the water table then lowered leading to vadose conditions and modification of the original phreatic tubes (Geode Consulting 1998). It is not only the eroded caves visible at the surface (scowles) that display these relict karst features as deeper mines frequently exhibit natural rather than entirely artificial surfaces. In Westbury Brook iron mine, for example, there is a 'phreatic-looking passage at the lowest point en route to Boulder Chamber, complete with elongated phreatic bells' (Solari & Lowe 1974, 68).

Evidence that the cave system extended west of the river Wye can be seen around Ban-y-Gor, where caves seen on either side of the river were once part of a continuous system (Lowe 1993). The gorge of the river Wye dates from the relatively recent Tertiary period, and cuts through earlier deposits containing the caves.

4.1.4.1 Deposition of iron ore

Much later, iron-rich solutions percolated downwards, causing precipitation of iron ore within the caves and ferrification of the bedrock, which formed the cave walls.

The source of these solutions is likely to have been the overlying Upper Carboniferous deposits (Coal Measures) with the ore-bodies forming within the pre-existing karstic cavities in pre-Triassic or Triassic times (Lowe 1993), when iron-rich solutions descended into the permeable rocks below. By this time, Variscan orogenic movements of the late Carboniferous / early Permian had shifted the strata into their present orientation (BGS 1992). Evidence that the strata had already been folded prior to formation of the ore bodies was observed by Wildgoose, who noted that the 'microstalactitic formations in internal cavities' within the ore were always orientated vertically, regardless of the angle of dip of the host strata (Wildgoose 1993). Not only caves, but also joints and bedding planes within the Carboniferous Limestones received ore from the descending iron-rich solutions, and as the iron ore was deposited from descending solutions, its frequency diminishes with depth (BGS 1992).

The formation of the iron ore deposits may have occurred in two complementary phases although the two processes may have occurred simultaneously in some areas. The first of these was alteration of the walls of the voids by metasomatic replacement of calcium and magnesium carbonate in the bedrock by hematite, causing the cavity walls to consist of a veneer of ferrified bedrock. The second was the precipitation of ore from iron rich water, which filled the cavities for considerable periods and produced the more easily won and desirable brush ore (Lowe & Solari 1974, 69 & 76).

These processes resulted in the following main forms of ore (see Wildgoose 1993, 13-14):-

- Ores formed by the precipitation of descending iron rich solutions into pre-existent cave systems are:-
    - Goethite or "brush ore", a relatively pure and friable ore containing few impurities, which would have required very little preparation in advance of smelting.
    - Impure brush ore, a version of the above material, which is "frequently found physically combined with dolomitised limestone or with sandstone of the Drybrook Sandstones" (Wildgoose 1993, 13). Separation of the ore (which is identical to the Goethite above) from the impurities (gangue) would be required before this ore was suitable for bloomery smelting.

  These iron–rich ores were relatively easy to exploit and were most suitable for bloomery smelting.
- Ferrified bedrock formed by metasomatic replacement of the calcium and magnesium carbonate in the bedrock of the exposed cave faces by hematite. This ore would have been less desirable during earlier periods as, being transformed bedrock, it was relatively difficult to recover and was comparatively low in iron. This ore would have produced considerable quantities of slag to relatively small quantities of iron and is unlikely to have been desirable for bloomery smelting.

The characteristics and differences between these two principal types of ore are well documented in early mining records. In the 19th century, Mushet described how 'The principal part of the ore is…dug easily, somewhat like gravel; but the sides of the chambers are often covered with…stony ore…which requires gunpowder to detach from the rock' (Mushet in Nicholls 1858), and at New Dunn iron mine, Clearwell, 'a churn, that is a body of brush, was found that simply ran down out of a hole in the roof. The party of men who were lucky enough to have it simply filled trams from the same pair of rails for eighteen months, until it finally ceased with the emergence of a hole at surface some 500 feet above" (Hall 1989).

Both the metasomatic replacement of the cavity walls, which resulted in a veneer of ferrified bedrock, and the precipitation process, which formed the purer "brush ore", are likely to have occurred differentially within the cave system. Although some cavities may have been completely filled with ore, others may have already been filled with other material (boulders or clay) leaving no room for the precipitation

process to take place (David Lowe pers. comm.). Exploration of Westbury Brook iron mine has demonstrated a “tide mark” of ore deposition with the higher levels of the cave system containing ore free cavities, entirely lacking in evidence of earlier mining, such as boot prints preserved in the wet clay floor. These cavities have been interpreted as remnants of the earlier cave system above the saturation level within which ore precipitation occurred, and which, consequently, were not affected by this process (Solari and Lowe 1974, David Lowe pers. comm.). Similar, although less clear examples of this phenomenon have been noted elsewhere in the Forest at Wigpool iron mine and Buckshaft scowles (Lowe 1989, 115). It is clear that not all of the palaeo-cavities would necessarily have been filled with ore, and the current drainage system beneath the Forest is likely to include other ‘pre-mineralisation dissolutional voids’ (caves) where iron ore has never accumulated (Lowe 1993). The variable nature of ore deposition was recognized by Wildgoose who stated that ”cavities within Crease Limestone may have been incompletely filled with ore” (Wildgoose 1993, 202).

These processes have produced iron ore principally within the highly speleogenic Crease Limestone, but also in the Lower Dolomite, the Drybrook Limestone and Drybrook Sandstone, and iron ore can also be found in the much less speleogenic Lower Limestone Shale sequence, although this is rare. Within the Crease Limestone, the majority of the ore bodies are located within the upper and lower parts of the bed. Lowe believes that this reflects the existence of inception horizons at these locations (Lowe 1993), where the rock is particularly susceptible to speleogenesis. The Whitehead Limestone sits unconformably upon the Crease, and may have served as an aquiclude, confining cave formation to the underlying geology and the boundary between the two deposits is not even, with the underside of the Whitehead having become pitted and irregular as a result of karst processes (Lowe 1993, 41). Within the Lower Dolomite, most of the caves are fracture guided, with the ore occurring near the major fold axes at Wigpool, Lydney and Bream (Lowe 1993). In the eastern part of the Carboniferous Limestone outcrops, two iron ore veins within the Drybrook Sandstone consist of ore bodies occupying palaeo-cavities in limestone beds within the sandstone or at its boundary with the Drybrook Limestone (David Lowe pers. comm.); palaeo-cavities in the Drybrook Limestone in the south-western part of the region were also filled with iron ore.

4.1.4.2 Exposure of caves to create scowles

Geological processes such as folding, and extensive erosion over millions of years has lead to the exposure of some of these formerly subterranean cavities, and further erosion has sculpted them into the landscape features visible today. More recently, human intervention, principally in the form of the removal of surface deposits of iron ore, which had survived former erosion, has also contributed to the present appearance of these features. Their geolomorphological origin is evidenced by water-washed surfaces, and other relict karst features, such as phreatic tubes, which can be observed on the exposed surfaces of many of the scowles.

The emplacement of ore deposits within pre-existing voids is not unique to the Forest of Dean. Lowe mentions examples in North America and Eastern Europe, and refers to deposits in North Wales around Moel Hiraddug near Rhuddlan: ‘It [iron ore] is found in pockets or widened-out spaces in joints… The pockets are irregular in shape, but generally bounded by curving vertical walls like those of a swallow-hole’ (Strahan 1885, in Lowe 1993). The importance and unique nature of the Forest of Dean scowles lies in their quality of preservation at surface, without in-filling of younger debris, or excessive damage by later mining or infilling for agriculture: ‘In this respect the Forest of Dean “scowles” are unique within the British Isles’ (Geode Consulting 1998).

4.1.4.3 Conclusion

The essential form of many of the landscape features described as scowles is predominantly geomorphologic rather than artificial in origin and is the result of a complex series of processes spanning many millions of years.

It must be stressed that there is variation in the extent to which the surface features conform to this geomorphological model, and not all exhibit clearly exposed geological features. The search for and extraction of iron ore will have lead to the destruction of natural surfaces within some scowles in some areas, and prospecting for ore, or other extraction techniques may have created features unconnected with the eroding cave system.

It is, however, clear that the principal implications of this interpretation of the origin of scowles are:-

- The extent to which the present form of many of the identified scowles, or sections of scowles, are the result of natural processes or human intervention can only be determined by detailed and intensive field recording.
- It is impossible to quantify the amount of ore removed from scowles due to the variable nature of deposition of ore deposits combined with the effect of natural erosion which may have had a significant impact, particularly on the deposits of loose brush ore.

4.1.5 Scowles as a source of iron ore

Much previous discussion of the iron industry in the Forest of Dean has been pervaded by the assumption that the iron ore deposits in the Crease Limestone, and immediately adjacent geological formations, were the only available source of iron ore in the area. This view that all early iron was sourced from "a few well known deposits of high–grade ores" has been questioned by Tylecote who also pointed out that "iron is very widespread and there is no doubt at all that local deposits were worked where there were any" (Tylecote 1986, 147). Although Tylecote was discussing the prehistoric iron industry (and particularly the assumption that all prehistoric iron from Gloucestershire was sourced from the Forest of Dean), this basic principal can be applied to later periods (Chris Salter pers. comm.). Extensive deposits of bloomery smelting waste are recorded in north-west Gloucestershire, south Herefordshire and as far north as Worcester (Wright 1854; Nicholls 1860, 236-7; Herbert 1996a, 291; Bick 1990, 41), and Bick has pointed out that "proper explanation is wanting" as to why so many of these sites are "considerably removed from the well known iron ores in the limestones of Dean", going on to suggest that "the old assumption that these ores supplied all the bloomeries for miles around is, at best, dubious" (Bick 1990, 39).

Whilst it is clear that ore deposits within the Carboniferous Limestones of the Forest of Dean were exploited as a source of iron ore, the possibility that other ore sources were also exploited from an early period is supported by recent research undertaken by Tim Young and Gary Thomas of Cardiff University (Tim Young pers. comm.). Their research has identified a number of ore sources, which they group together as the "Bristol Channel orefield". This area includes iron ore deposits from:-

- The Carboniferous Sandstones of the Worcester Graben, an area extending from Newent, Gloucestershire, in the north down to Iron Acton and Yate in the Bristol area.
- The Triassic succession of Bristol and North Somerset.
- The Carboniferous Limestones of the Mendip area.
- The Carboniferous Limestones of the Vale of Glamorgan, the Gower and South Pembrokeshire.
- The Carboniferous Limestones of Border Vale, Glamorgan.
- The Devonian Sandstones of the Tintern area (the Tintern Sandstone Group).
- The Carboniferous Limestones of the western Forest of Dean – this would include the area of the western scowles.

- The Upper Carboniferous Sandstones in the central part of the Forest of Dean, which would include the Pennant Sandstones in the Bixslade area (see below).
- The Carboniferous Limestones of the eastern Forest of Dean – this would include the eastern scowles.
- The basal Triassic formations of the Minehead area in Somerset.

The possible exploitation of iron ore from sources other than surface workings within scowles must be considered in any discussion of the early iron industry of the area, and the following summarises the known and potential exploitation of those sources within the Forest of Dean or its immediate vicinity.

4.1.5.1 Iron ores from limestone formations within the Forest of Dean

The "search area" for fieldwork on scowles (see above) was the area in which the geological process of speleogenesis (cave formation) had combined with a proximity to Carboniferous Coal Measures from which the iron-rich solutions, which had formed the iron ore deposits, were derived. This area was made up of outcrops of Crease Limestone and those other geologies in the immediate vicinity of the Crease Limestone outcrop in the periphery of the central Forest area; an area approximately analogous with Zone 1 identified in the project design to the Scowles and Associated Iron Industry Survey (Hoyle 2002, Figure 2),

Surface deposits within the Aggregates Resource Area

Iron ore is not recorded as a feature of the limestones which form the remainder of the Aggregates Resource Area within the Forest of Dean, and which consists of Lower Dolomite, Whitehead Limestone, Lower Limestone Shales and occasional outcrops of non-dolomitic Crease Limestone (BGS 1992) which form the solid geology of a broad area of upland (generally above *c.* 150m AOD) running to the south-west of the scowles search area (Zone 2 in Hoyle 2002, Fig 2).

Although geologically similar to the formations in which scowles are found, these are generally some distance from the Carboniferous Coal Measures, the source of the iron-rich solutions, which formed the iron ore deposits.

An exception to this may be the Lower Limestone Shales, which were not included in the search area, but where small deposits of iron ore have been recorded (Solari and Lowe 1974; Lowe 1989). These deposits, which were in the Aylburton area, are considered to be extremely rare and have no economic value (Sibly 1927), although this assessment was based on 20th century views of the commercial viability of a mineral resource, and need not apply to relatively localised exploitation of a resource during earlier periods. Some outcrops of Lower Limestone Shales, both to the south and north of the fieldwork search area, are close to the Carboniferous Coal measures and may, therefore, have been subject to similar processes of iron ore deposition.

Subterranean deposits within the Aggregates Resource Area

Other than possible surface exposures of iron ore within the scowles, the most obvious source of iron ore from the Carboniferous Limestones is below ground within the same geological formations of which the scowles are the surface expression.

The exploitation of iron ore from relatively shallow sub-surface workings is well attested in the Forest of Dean (Hart 1971). This mining process essentially consisted of following iron ore deposits within the subterranean cave systems downwards from the visible scowles, which were the surface expression of that geological formation. The ore was removed from the churns or leads in which it had accumulated. The lack of blasting powder (not introduced as a mining tool until the 17th century - Jarrod Publishing 2001) ensured that other material, such as the parent rock, was only removed to a degree necessary to gain access to the next churn, and the lack of mechanised pumping equipment did not allow these workings to penetrate below the

level of the water table. These “Old Mens Workings” have been recorded since at least the 19th century, when the galleries and shafts of later “industrialised” iron mining encountered evidence of earlier mines or tools left by a previous generation of miners (Nicholls 1866, 62-64).

This early form of subterranean mining within the outcrops of the Carboniferous Limestones was doubtless considerably more extensive than the records of the discovery of lost mines would suggest (the Gloucestershire Sites and Monuments Record lists only seven examples of “old mens workings”) as, not only did 19th century mines “discover” a number of “lost workings”, but others may have gone unrecorded or still await discovery. In addition to this a number of the later mines (e.g. Clearwell Caves, Glos SMR 5804) were relatively small-scale concerns in which simply applied innovations, such as explosives and pumping machinery, were employed to revive and deepen earlier mines which had either been abandoned or worked sporadically, but had never actually lost their identity as iron mines (Jarrod Publishing 2001).

Although mining in these early subterranean iron mines is a natural continuation of the exploitation of surface outcrops and has long been recognised as a feature of the pre-modern iron ore industry in the Forest of Dean (Cranstone 1982, I Standing pers. comm. in Hoyle 1994), it has generally not been considered to have been the dominant form of extraction until the 17th century (Hart 1971). This view is based largely on the assumption that, as ample iron ore was available from surface workings, it would not have been necessary to expend additional effort in following the ores underground. This view has a long history; in the late 18th century Wyrral stated that scowles represented surface mining undertaken before early miners “thought of searching in the bowels of the earth for their ore” adding that these same miners would have “naturally pursued the veins, as they found them to be exhausted nearer the surface” (Wyrral 1780), and this idea has been reproduced by most later commentators (see for example Hart 2002, 29). It is, however, clear that the extent to which iron ore was readily available from surface deposits cannot easily be quantified, and previous attempts to calculate the amount of iron ore exploited from this source may be over-estimated. Accordingly the assumption that this type of “low tech” sub-surface mining was not generally practised during earlier periods may also be at fault.

Subterranean mining is a recognized feature of early mineral extraction in the British Isles, and a number of copper mines, dating from the Bronze Age, have been investigated in North Wales (Crew & Crew 1990). There is also slight evidence to suggest that in some areas, below ground deposits of ochre may have been exploited from an early period within the Forest of Dean. It is also clear that subterranean mining was practised during earlier periods of iron ore extraction in Dean, as an example of shallow subterranean mining at Lydney Park (Glos SMR 25) is likely to date from the Romano-British period (Wheeler & Wheeler 1932).

There are also numerous medieval references to “miners” from Dean (see Hart 2002), although the implications of this designation is not clear as the word itself does not necessarily indicate subsurface workings, and the differentiation between below ground mining and surface extraction is actually an artificial one.

Throughout the medieval period Dean miners were in demand due to their expertise as military engineers (one of whose tasks was to undermine the fortifications of besieged towns or castles), or to work in iron mines in other parts of the country (Hart 2002, 19-21), both of which tasks would have necessitated some familiarity with underground excavation techniques. Thus, although it is assumed that below ground mining did become more prevalent during the 13th to 15th centuries, perhaps to meet increased demand for iron caused by warfare between England and its neighbouring powers (Cross 1982), the few historical references that exist may suggest that this was the normal rather than the exceptional extraction process during these periods.

These references are, however, problematic as no distinction is made between iron miners and coal miners, who may have adopted very different extractive techniques.

One of the privileges afforded to miners in 1282 may also be suggestive of subterranean mining as miners were granted access to *coperones* (variously rendered as "coopers stuff" or "lop and top") from the Forest to timber their mines (MaClean 1889-90; Nicholls 1866, 23; Hart 2002, 14). This reference needs to be treated with caution, however, as it does not specify whether the mines in question were for coal or iron, and the timber, assumed to have been used as shoring for underground workings, may equally have been used to construct containers (barrels) for transporting ore or coal, or as fuel for fire setting operations.

There is little firm dating evidence for general early sub-surface mining, but no systematic archaeological exploration of any subsurface mines has been undertaken. Evidence may have been masked by later mining activity where this has occurred within the same cave system, although archaeological exploration of copper mines in Wales has demonstrated that evidence for earlier mining does survive, even where this is coincident with later activity (Timberlake 1990, 20-21).

Late medieval pottery has been reported from mined out churns at Clearwell Caves (Jarrod Publishing 2001), although this was derived from surface dumped rubbish, and its status as firm dating evidence for mining activity is unclear. Pick marks have also been recorded on the walls of Clearwell caves which are encrusted with calcite deposits, and this is often cited as indicative of pre-Roman mining activity, although the early date of this activity is based on the assumption that calcite necessarily builds up over a very long period of time, a presumption which has not been investigated (Wildgoose 1993, 151).

Other artefacts such as ash or oak shovels, clay balls (nellies) for attaching a candle to a stick held in the teeth, timbers used as pit props, or the heads of single–pronged picks have also been recovered from early subterranean mines (Nicholls 1866, Forster Brown 1896-7). Where these artefacts have been interpreted as post-medieval, this tends to be on the basis of unfounded techniques such as comparison with fragments of the true cross (Forster Brown 1896-7, 160) or through dendro-chronological analysis undertaken by non-specialists and apparently without reference to established sequences (Wildgoose 1993, 141). It is clear that these dates cannot be uncritically accepted. Many of these items are depicted on the 15th century font at Abenall church, the Newland Freeminers brass (the most ubiquitous image of a Forest of Dean miner which is variously dated from the 15th to the 18th century) or 19th century engravings of Dean miners (Hart 2002, 22, Herbert 1996a, Fig 20), and these artefacts could date to any of these periods, or perhaps earlier. It is less certain that single–pronged picks could be Roman in date, as the model pick of Roman date from excavations at Lydney Park was not of this type (Wheeler & Wheeler 1932, Fig 22).

It may be of note that Nicholls recorded that some old workings (probably sub-surface mines) had been used as a temporary safe haven for the civilian population during the Civil War (Nicholls 1860), suggesting that some below ground workings may already have fallen out of use by the mid 17th century.

4.1.5.2 Iron ores from the Upper Carboniferous Sandstones within the Forest of Dean

Ore from calcareous bands within the Drybrook Sandstone

It is clear that some iron ore was available within calcareous bands of the Drybrook Sandstone where it has a boundary with the Drybrook Limestone (see above, Sibley 1927; Geode Consulting 1998; David Lowe pers comm.). These ores have been reported as a feature of the south-western part of the outcrop (Sibly 1927), and are thought to have been formed by the same geological processes as the ore deposits within the Carboniferous Limestones (see above, David Lowe pers. comm.).

Wildgoose, however, identified a number of surface workings between Cinderford and Plump Hill, which exploited an outcrop of iron ore within the Drybrook Sandstone geological formation adjacent to the eastern part of the field survey area (Wildgoose 1992, 2.3.12 - 2.3.16). To the south of the recognized iron ore outcrop, he also identified a number of pits which he considered to be test pits to assess the potential value of the Drybrook Sandstone in this area (Wildgoose 1992, 2.3.18).

These features were also recorded during the field survey (see 3.1.5.4 above), although they would not necessarily have been recorded had the iron ore exposure not been marked on the 1:50,000 scale Geological map of the area (BGS 1974. 1975), or if they were not immediately adjacent to the outcrops of Carboniferous Limestone within the field survey area, enabling them to be easily identified and recorded by both Wildgoose and the 2003 field survey. Neither Wildgoose, nor the 2003 survey, searched for similar features in other exposures of Drybrook Sandstone.

Similarly, although the Gloucestershire County Sites and Monuments Record lists three sites interpreted as the remains of surface iron–ore extraction pits (Glos SMR 4392, 13912, 17773) within the Drybrook Sandstone adjacent to the western part of the scowles search area, these sites were not visited as part of the field survey as they fall outside of the geologically determined search area (see 2.1.1.1 above).

Ore from the Pennant Sandstone within the Forest of Dean

Evidence of iron ore extraction has also been identified in the central Forest of Dean, at least 4km from the outcrops of Carboniferous Limestone, an area with an underlying geology of Pennant Mudstones and Pennant Sandstone (BGS 1974). These consist of two undated areas of small surface workings or bell pits (Glos. SMR 18439, 18433) which could have been exploited either for coal or ironstone. In addition to these, the remains of a horizontal gallery have been exposed at Bixslade Quarry in association with large fragments of iron ore (Glos SMR 10720). These have not been securely dated, but appear to represent the remains of early sub-surface iron ore mining (old men's workings) of unknown date (see above).

Figure 20: Horizontal gallery exposed at Bixslade Quarry, Glos SMR 10720

The possible extent of the exploitation of iron ore deposits from the sandstones within the central Forest of Dean (the area ringed by the Carboniferous Limestones of the

Aggregates Resource Area) has not been studied, and it is by no means clear to what extent this resource was exploited in the pre-blast furnace era, or to what extent the exploitation of this resource on anything but the most localised level was a feasible prospect.

4.1.5.3 Iron ores outside of the central Forest of Dean

The Newent area has been identified as a major (if little understood) production centre for iron during the pre-blast furnace era (Walters 1992). Large quantities of iron–rich "cinders" (effectively the residue of bloomery smelting) have been recorded in the vicinity of the town since the 18th century (Rudder 1779). There are numerous "Cinders" field names recorded in the area and Bick has estimated that there may have been 50-100,000 tons of this material in the area before much of it was removed for re-smelting in the early post-medieval period (Bick 1987).

The precise date of much of this smelting activity is not clear, although Rudder records that Roman coins and pottery (now lost) had been found during their excavation (Rudder 1779), and field walking by Dean Archaeological Group in the late 1980s reported finds of bloomery slag in conjunction with pottery of the late 1st and early 2nd centuries AD (Walters 1990). Although iron ore is known from the Newent area, the source of the iron ore for this industry is always assumed to have been from the scowles within the Aggregates Resource Area, and Walters states that "there is no evidence that this localised ore source was mined in the Roman Period" (Walters 1992b). Bick on the other hand has argued that, given the availability of wood for a charcoal resource, the proximity of ore must have been a factor in selecting processing sites. He is not able to identify for certain the possible ore sources in the Newent area which may have been used at that time, although he does suggest either the Triassic Sandstones or "older rocks" in the May Hill area (*c.* 4km to the south-west of Newent) as a possible source (Bick 1987, 59).

Iron ore resources in this area are known to have been exploited in the early post-medieval period as, between *c.* 1639 and 1751, the primary source of iron ore for Elmbridge Furnace, near Newent was recorded as "Mr ffoley's land at Aston" near the village of Aston Ingham *c.* 4km to the south-west of Newent and immediately north of May Hill. These workings are thought to have been on outcrops of the Wenlock Limestone, where abandoned surface workings have been found in an area marked "Ore Field" on the 19th century Tithe map (Bick 1987).

In the 19th century, iron ore deposits were exploited, apparently from sub-surface mines, in the Oxenhall area (*c.* 3km to the north-west of Newent) and many accounts record that iron ore was found in the sandstones of this area (Bick 1987).

Iron ore extraction from surface workings is also known at Mine Pit Wood to the south-west of Tintern, Monmouthshire, to the west of the River Wye. These are known to have been worked in the 1660s to supply the post-medieval charcoal blast furnace in the Andigy Valley to the west of Tintern (John Pickin pers. comm.). It may be notable that this source of iron ore is considerably closer to some bloomery smelting sites within the Forest of Dean, such as those in the vicinity of Madgetts south of Brockweir, than the recognised outcrops of ore within the Crease Limestone and adjacent deposits, although this would have required ore to be transported up the very steep slopes of the Wye Valley in this area.

4.1.5.4 Other types of iron ore

Iron ores take a variety of forms, many of which would not be considered to be commercially viable in terms of modern industry and are not necessarily recorded as a potential iron ore source in the available geological data. This, however, does not preclude the possibility that, where available, they were exploited as an ore source during the pre-blast furnace era.

Bog ores, a deposit formed by wet conditions, are widespread in the northern and western parts of the British Isles and are not linked to specific geologies (Tylecote 1986, 125). This material can yield very pure iron (Whitten & Brooks 1972, 56) and was exploited as a source of iron ore on a number of medieval smelting sites, such as that at High Bishopley in County Durham (Tylecote 1987, 127) and at Llwyn Du in north Wales (Crew 2002). It has been suggested that these ores may have been easier to smelt than the "stubborn hematites/limonites of Dean" (Bick 1990, 39). Although there is no direct evidence that bog ores were smelted in the vicinity of the Forest of Dean (Tim Young pers. comm.), these ores were known in Herefordshire in the 19th century (Bick 1990, 39), and have been recorded in the Trellech area of Monmouthshire (Walters 1992b, 21). They should, therefore, be considered as a possible source of ore for some smelting activities in the region.

Other authorities have suggested that further research is needed to investigate the possibility that localised iron–rich minerals either in iron pan or in the alluvial deposits of the Severn Estuary may have been exploited where they were available (Chris Salter pers. comm.).

4.1.6 Archaeological research into scowles prior to the project

Prior to the 2003-04 survey, scowles as a monument type had received very little archaeological attention, and previous work on these features has already been summarised in the project design for this survey (Hoyle 2002, 1.3.3.3; 1.4.1).

The generally accepted view of these features before the project started is discussed below, although it should be stated at the outset that much of this consists of assumptions based on evidence, which is limited, both in terms of its quality and quantity. The continual repetition of this evidence within the available literature has led to these assumptions becoming seen as established fact, or at least the interpretative norm, and accepted without further qualification.

In 1780 Wyrall described scowles as "vast caverns scooped out by men's hands…they certainly were the toil of many centuries and this, perhaps, before they thought of searching in the bowels of the earth for their ore" (Wyrall 1780), since which time it has been assumed that:-

- Scowles represent iron ore extraction of at least Roman date, if not earlier.
- The extent of scowles represents the results of many centuries of extraction.
- As surface workings, which are relatively easy to exploit, the scowles represent evidence of the earliest phase of iron ore extraction in the Forest of Dean.
- Iron ore derived from the Carboniferous Limestones (i.e. scowles) can be assumed to be the only source of iron ore, which was exploited in the Forest of Dean during the pre-modern period.

These assumptions are repeatedly stated in the available literature and in 1988 Wildgoose was making a commonplace observation when he wrote "it is generally accepted that surface mining of iron ore in the Forest of Dean dates back to Roman times …with indications of even earlier iron ore exploitation" (Wildgoose 1988). When closely reviewed, however, it is clear that these assumptions are based on very little hard evidence and are generally susceptible to alternate interpretation. The following is a discussion of the dating of scowles, and should be read in conjunction with Appendix L, which states the source of these dates.

4.1.6.1 Evidence for Pre-Roman exploitation of iron ore resources from scowles

Iron ore extraction for smelting

The likely pre-Roman date for some iron ore extraction from scowles is a commonplace assumption, although this is generally qualified with a statement of the limitations of the available evidence (see Wildgoose 1988; Hart 2002, 24). Others have suggested that this industry had "possibly Iron Age origins" (Cranstone 1992),

whilst some authorities have simply made the statement that iron ore in the Forest of Dean (and by implication iron ore derived from scowles) was exploited during the pre-Roman period, without actually detailing the source of their information (McWhirr 1981).

The only datable Iron Age artefact which has been found in association with a scowle consists of a coin of the Coriosolites (*c.* 50 BC) which was found at Bream in 1944, (Glos SMR 5141; Allen 1961, 136). It is clear that this cannot be seriously interpreted as definitive proof of a pre-Roman date for the exploitation of iron ore from these features as the exact location of the findspot in relation to the scowle was not recorded and the coin could easily have been derived from some other contemporary activity in the area. Even if the find was from within a scowle the suggestion that the form of these features may partly be the result of natural geomorphological activity rather than of human excavation (see 4.1.4 above) would render the find useless as dating evidence for the exploitation of iron ore without detailed recording and analysis of its provenance.

Another piece of evidence often cited as indicative of pre-Roman mining activity in the area of scowles (although this actually refers to below ground mining rather than scowles) is pick marks recorded on the walls of Clearwell caves which are encrusted with calcite deposits (Wildgoose 1993, 151). The validity of this as evidence for an early date for the mining is, however, based on the assumption that calcite necessarily builds up over a very long period of time, and as Wildgoose points out, further reassessment of this evidence is necessary before any clear statements can be made about the dating of this activity.

The bulk of the evidence for pre-Roman exploitation of iron ore from scowles, however, is entirely circumstantial. Walters, for example, cited the proximity of late Iron Age activity at Ariconium in Herefordshire to scowles in the area of Wigpool Common in the north-eastern part of the outcrop as evidence of exploitation during the late Iron Age (Walters 1992a, 64). Iron ore fragments associated with Iron Age metalworking at Bagendon in the Gloucestershire Cotswolds have also been identified as deriving from Forest of Dean iron ore (Clifford 1961), although this was not based on any scientific analysis of the iron.

Scientific analysis of the composition of either datable iron artefacts or processing waste has, however, been recently undertaken and this is beginning to provide the only real evidence for exploitation of the ores found within scowles at certain periods.

Middle Iron Age artefacts (currency bars) excavated at Beckford in Worcestershire had been manufactured using iron smelted from low phosphorous ores, consistent with the ores from the Carboniferous Limestones of the Forest of Dean (Hedges and Salter 1979), and slags from late Iron Age contexts at Frocester in the vale of Gloucester have a chemical make-up (a low uranium content) which suggests that they may have been derived from ore from the eastern outcrop of the Forest of Dean Carboniferous Limestones (Tim Young pers. comm.). It is likely, therefore, that iron ore from the geological formation in which scowles are found was exploited at this time, and that this ore was used to supply markets outside of the area.

Ochre extraction

Ochre deposits, soft natural pigments derived from iron oxide, are a feature of the iron ore deposits within the Carboniferous Limestones in which scowles are found (Jarrod Publishing 2001). Ochre has been used as a pigment from the earliest periods of prehistory (Bray & Trump 1982), and there is some possibility that it may have been exploited in the Forest of Dean at an earlier date than iron ore.

Two quartzitic pebbles with evidence of abrasion, suggesting that they had been used for grinding, have been reported from disused iron mines in Dean (Bowen 2003). Similar stones are known from the Cotswolds to the east, where they occur as glacial

erratics, and pebbles with worn surfaces, consistent with grinding, are known from Neolithic burial mounds (Saville 1990, 176). Although the date, function or origin of the stone tools from the Forest has not been confirmed, they were connected with surface finds reported from an area of scowles to the west of Drybrook (Glos SMR 20829). These finds consisted of fragments of limestone with evidence of grooving/notching which would have facilitated hafting to a wooden handle, and some worn limestone pebbles (Glos SMR 20829). Although interpreted as hafted stone hammer heads, the grooved limestone fragments were made of the same local limestone as the parent material, which have made them subject to high rates of use-breakage (Strassburger undated). Hammers of the same lithography as the parent geology are rare, but are not unknown (Timberlake 2001, Strassburger undated). The form of these tools is similar to tools found at Alderley Edge copper mines in Cheshire, which were associated with Bronze Age copper mining, and is consistent with an interpretation as early mining tools (Timberlake 2001).

These tools have tentatively been interpreted as evidence for prehistoric (pre-Iron Age) ochre exploitation in the region (Timberlake 2001), although this interpretation is far from unequivocal; it is not, for example, recorded that any of the tools display signs of ochre impregnation which would be expected if they had been used for this purpose (Chris Salter pers. comm.), and there is certainly no evidence that ochre was mined in Dean from the Neolithic period as has been stated (Jarrod Publishing 2001). It does, however, remain possible that ochre from the ore deposits within the Carboniferous Limestones was exploited in parts of the Forest of Dean from an early period.

Even if this were the case, however, it is not clear to what extent this exploitation would have been from surface exposures or subterranean deposits, although if the geological argument that the current form of scowles is largely the result of geomorphological processes is accepted, the latter would appear to be most likely as the soft, friable nature of ochre would have made it particularly susceptible to the millions of years of erosion which would have affected any surface exposures before human beings came to the area.

4.1.6.2 Evidence for the use of scowles as a source of iron ore during the Roman period

There is very little dating evidence for the exploitation of scowles during the Romano-British period, and much of the evidence which has been used to date their utilisation as a source of ore during this period is at best equivocal or based on an over enthusiastic interpretation of very limited evidence.

A hoard of over 3,000 3rd century Roman coins found within scowles at Puzzle Wood (Perrygrove), Clearwell (Glos SMR 5074) in 1849 (Nichols 1860) has been used to date Roman mining operations, and was used by Walters as evidence that the scowles in this area “had been worked out by the second century and had been abandoned” (Walters 1992a, 84). The exact findspot of these coins was not recorded, although the hoard was reported to have been discovered in a rock cavity within the scowles. Given that the present form of scowles may partly be the result of natural geomorphological activity rather than of human excavation (see above), these coins cannot offer definitive dating evidence for mining activity in the absence of a detailed record and analysis of their exact provenance.

Similar finds of Roman coins have also been reported from scowles at Bream in 1854 (Glos SMR 19414; Hart 1967) and 1872 (Glos SMR 6778, GADARG 1982). Again the precise details of the provenance of these finds are unclear and the limitations of their value as dating evidence are identical to the coins found at Perrygrove (see above).

The earliest evidence for exploitation of the iron ore resource from the Carboniferous Limestones was discovered during excavations at Lydney Park in 1929. The entrance to an underground mine (not a surface working) was found sealed beneath the floor

of a hut, dated by Wheeler to the latter part of the 3rd century AD (Wheeler 1932). There is no question that this feature had been modified by human mining as the 'entrance' to the mine (which was sealed beneath the floor of the hut) exhibited clear pick marks (Wheeler 1932). Wheeler also excavated one of numerous shallow depressions in the vicinity (these features were categorised as Scowle Forms 1 and 2 during the 2003 field survey). The fill of this feature contained nothing but Romano-British material to a depth of *c.* 7 feet (*c.* 2m). This sealed a further rocky infill, which was not excavated. The status of this feature remains unclear as Wheeler recorded no visible tool marks indicative of mining operations, and it may represent a natural geological feature, such as a sink hole, which was back-filled in the Roman period.

A second mine (which also exhibited pick marks) was discovered by Scott-Garret beneath the Roman bath-house at Lydney some years later. In his report on this excavation Scott-Garrett expressed surprise that part of the bath-house had not collapsed in Roman times, and concluded that the mine was of such an early date that it had been forgotten about by the time the baths were constructed in the 3rd century AD, the implication being that it was broadly contemporary with the mine discovered by Wheeler (see above) (Scott-Garrett 1959). Although this scenario is reasonable, the mine was filled with "Roman debris from the bath building" and it is equally possible that this mining operation ran under the bath-house during the post-Roman period, and that the Romano-British material in the its fill had collapsed into the mine from Romano-British deposits above and cannot be used to date the feature itself.

More recently, an archaeological evaluation (1996) adjacent to Stock Farm Roman villa at Clearwell produced Roman pottery from the upper fills of features interpreted as backfilled scowles (SMR 17028; Cook 1995). The status of these features was not established for certain by the evaluation, and the Romano-British material within their upper fills could easily be derived from activity relating to the likely Roman Villa in the vicinity (Stock Farm Villa, Glos SMR 5611). It does not establish the date of any mining activity relating to scowles in this area.

Macroscopic identification of ores found in association with Romano-British smelting activity at Chesters Roman Villa, Woolaston (Glos SMR 16), was consistent with the "goethite ores which predominate in the early Carboniferous ore-field of the Forest of Dean" (Fulford & Allen 1992, 188 and Table 3), although it was not clear whether these ores were sourced from scowles within the Forest of Dean, or some other source within the Carboniferous Limestones (Fulford & Allen 1992, 204).

Wildgoose argued that some scowles were likely to have been exploited during the Romano-British period largely on the basis of their proximity to the known Romano-British smelting site at *Ariconium,* the present Weston-under-Penyard in Herefordshire (Wildgoose 1988, Wildgoose 1993, 53-54). Although this evidence is clearly circumstantial, recent analysis of slags from 2nd and 3rd century contexts at *Ariconium* indicated that their low uranium content suggested the eastern Carboniferous Limestones of the Forest of Dean as a likely provenance of the ore. The outcrops of the Wigpool Syncline (Glos SMR 23769-23796) were suggested as the most likely source of this due to their proximity (*c.* 4km) to *Ariconium* and the possibility that contemporary roads linked *Ariconium* with this area (Young forthcoming a, 144).

In fact, the most reliable data on the likely exploitation of ores from scowles, or at least the outcrops of Carboniferous Limestone of which scowles are a part, does not come from traditional archaeological methods of dating the features but from scientific analysis of artefacts, or smelting residues to match their chemical make-up with possible ore sources.

Slags from Roman contexts at the villa site of Frocester in the Severn valley, to the east of the River Severn, have a low uranium content consistent with ores from the eastern outcrops of the Carboniferous Limestones. Whilst slags with a high uranium

content, consistent with the chemical signature of ores derived from the western outcrops of the Carboniferous Limestones, have been found from Roman contexts at both Usk and Carlaeon, suggestive that ores from this area where being exploited at that time (Tim Young pers. comm.).

No detailed analysis of any of the slags from the possible smelting sites within the Forest of Dean survey area has ever been undertaken, and apart from the macroscopic identification of "Goethite" from the 3rd – 4th century smelting site at Woolaston (see above), there is currently only an assumed association between smelting sites in the Forest of Dean and the ores from the Carboniferous Limestone outcrops.

Possible scale of the extractive industry during the Roman Period

It is likely that ores from the Carboniferous Limestones of the Forest of Dean were being exploited at this time, and attempts to calculate the scale of the processing industry may shed light on the scale of the industry, which was extracting the ores being used.

Walters estimated that in the 1st and 2nd centuries, the *Ariconium* iron smelting industry would have required 145,000 tonnes of ore based on predicted slag density estimates with a notional 1:1 slag/ore ratio (Walters 1992b, 99). Jackson, on the other hand, has argued that an estimate based on predicted furnace density is likely to be more accurate, and has suggested an annual ore requirement of between 600 and 1300 tonnes, a level of output which would have been maintained for approximately 150 years from the 2nd to early/mid 3rd century, giving a total requirement of between 90,000 and 195,000 (with a mean value of 142,500) tonnes of ore, (Jackson forthcoming, 178). Although these actual values are open to debate, it is clear that the *Ariconium* site would have required a considerable amount of iron ore during the 350 yeas in which it was in operation and at least some of this ore (although perhaps not all) was derived from the eastern Forest of Dean.

Even though extraction of ore from the Carboniferous Limestones does appear to have been a sizable industry during the Roman period, and one which was sufficiently organised to export ore out of the immediate region, this information in itself sheds no light on the way the extractive industry was organised, the precise location of Roman exploitation, or whether ores were exploited as surface outcrops, mine pits or below ground mining.

Conclusion

Whilst it is clear that ores from the Carboniferous Limestones of the Forest of Dean were being exploited at this time (see above), the general assumption that all iron produced in the region, and particularly the rest of Gloucestershire during the Romano-British period is likely to have been sourced from Forest of Dean ore (see for example McWhirr 1981) may be over simplistic. For example Romano-British artefacts from excavations at Beckford, Worcestershire, were derived from ores with a high phosphorous content which would have been sourced from the Jurassic Limestones of central England (IGS 1975) rather than the low phosphorous Carboniferous Limestones of the Forest of Dean which had been used to manufacture middle Iron Age currency bars found on the site (Chris Salter pers. comm.; see above).

4.1.6.3 Evidence for use of scowles during the medieval period

This is the period in which the customary privileges of Dean miners were officially codified (Hart 2002) and there are numerous historical references to miners and iron mines indicating that iron ore extraction and processing were significant industries regulated by the Crown at this time (Herbert 1996a). Despite this, few medieval workings can be located with any degree of accuracy.

An iron mine recorded at *Ardlonde* in 1270 and 1287 (Glos SMR 23494) has been identified as St. Whites Farm, Cinderford (Jurica 1996), where scowles (Glos SMR 25016) were recorded during the 2003 survey. This mine is recorded as having been filled in *c.* 1270 as a result of a dispute with the landowner, the Abbot of Flaxley (Jurica 1996, 146) who "filled up the ditch of the mine with stones and earth" (Hart 2002, 147) which may suggest that this was an open-cast working at that time (these scowles were recorded as shallow undulating depressions, Scowle Form 1, in 2003 which may be evidence of backfilled workings). However, this is not conclusive as mines at this period were probably almost exclusively entered through scowles, which led directly to them.

In 1282 the Forest Regard reported that the Earl of Warwick "hath a mine in his own wood of Lydeneye" which presumably refers to the area of scowles recorded in the woods of Lydney Park (SO 607 040) (Maclean 1889-90, 369; Nicholls 1866, 23). Again this record is not absolutely specific about the location of the workings or whether the "mines" in question were surface workings or subterranean.

Slags from medieval contexts have been found at Trellech in Monmouthshire, and St. Briavels in the Forest of Dean, which have a high uranium content consistent with ores derived from the western outcrops of the Carboniferous Limestones. Similarly ore fragments with this same chemical signature have been found within the medieval quay at Oldbury, South Gloucestershire, on the eastern side of the Severn (Tim Young pers. comm.), and so it is clear that these outcrops were being exploited at this time, although, as with the Romano-British industry this information in itself tells us little about the precise location of medieval exploitation, or whether ores were exploited as surface outcrops, mine pits or below ground mining.

4.1.6.4 Evidence for use of scowles during the post-medieval period

Although there are numerous post-medieval references to scowles as landscape features, these are often recorded as overgrown, mysterious features interpreted as evidence of long-gone industries (Rudder 1779; Wyrell 1780; Atkyns 1715) suggesting that few, if any, were actively in use as sources of iron ore at that time. This would accord with Hart's view that by the 17th and 18th centuries much of the ore extraction was being undertaken in relatively shallow sub-surface workings which largely followed the natural caves in which the iron ore had accumulated, and which were recorded as "old mens workings" when encountered by later 19th century miners (see above; Hart 1971).

Early map evidence also records a number of known scowles as irregular linear areas of woodland at this time (Taylor 1777; GCRO 1792) suggesting that the scowles in these areas had become overgrown and were no longer being actively exploited by that time. This landuse distinction is less clear on the 1608 map of the western part of the Forest of Dean (PRO 1608), although it is not clear to what extent the woodland on this map is a definitive record of landuse at that time. Some areas of scowles, and also some areas outside of the Carboniferous Limestone outcrops, are demarcated by pecked lines on this map. It is not clear precisely what this signifies (it may indicate the edges of scrub land or waste as opposed to the commercially useful woodland which the map identifies with a repeated tree symbol) but it does show that the scowles were present as landscape features at that time.

There are few records of post medieval exploitation of these features as a source of iron ore. During the late 18th century, about 22 poor men "search for and get … iron mine or ore in the old holes and pits in the said Forest" which had been "worked out many years" (Nicholls 1860, 239). It is clear that this represents small scale gleaning of remaining ore from features which were recognised as not being commercially viable as a source of ore at that time.

Perhaps the most recent record of iron ore extraction from scowles is contained in a BBC archive recording of 1955 when a Mr Stanley Ellis, then aged 70, recalled iron

mining from surface workings near Oakwood Mill, Bream (Jonathan Wright pers. comm.). How extensive this activity was, or to what extent it was a commercial enterprise, remains unclear.

Nicholls also records that in the 19th century some scowles or shallow mines were re-used as housing by the poor who "sought to establish themselves in the Forest" by taking "possession of the ancient mine-caves, walling up the back and front, and leaving a vent for the smoke in the former, and in the latter a gap as an entrance.' (Nicholls 1858, 152.), suggesting that mining activities were not generally undertaken in scowles at that time.

The most recent recorded use of scowles is as a community-meeting place. The scowles at Devils Chapel in Lydney Park (Glos SMR 23984) are reported to have been used by the nearby community at Bream as the site of open-air religious meetings, and band concerts as recently as the latter part of the 20th century (Brian Johns pers. comm.) Although none of these references is detailed enough to allow the scowles or mines in question to be identified, they do offer an interesting insight into the later use of these features, and one which may have implications in terms of understanding the potential significance of artefacts, or any modifications to their form or exposed surfaces.

4.2 Bloomery smelting

The aim of the survey of bloomery smelting sites was to "Map, characterise and record the current condition of identified smelting sites" (Hoyle 2002, 19), and the following is a statement of the evidence for bloomery smelting identified in the course of the project.

Details of records of bloomery smelting sites, along with a brief summary of the nature of the evidence and potential date of the sites is included in Appendix M, Appendix N, Appendix O, Appendix P, Appendix R, Appendix V.

4.2.1 The bloomery smelting process

Prior to the introduction of the blast furnace to the Forest of Dean in the later 16th century (Hart 1971, 8), iron smelting would have taken place in charcoal fuelled furnaces known as bloomeries. They consisted of "an enclosed combustion chamber" with "an aperture to enable waste gasses to escape" (Cleere and Crossley 1985, 39). These could be either partly or wholly above ground and be totally free standing or constructed into the side of a pit or a bank. As bloomeries were built from clay they would have been sited within buildings, or at least temporary shelters, to protect them from weather damage (Chris Salter pers. comm.).

4.2.2 Siting of bloomeries

4.2.2.1 Proximity to ore source

Although research into the Roman iron smelting site at Bardown in the Weald has indicated that ore was rarely transported more than *c.* 1km, and that, when nearby ore sources became exhausted, new smelting sites were set up close to the new ore sources (Cleere 1970; Cleere & Crossley 1985, 34-35), proximity to the source of ore does not appear to have been the main consideration in the siting of bloomeries in the Forest of Dean. The distance of known smelting sites from assumed ore sources in the Carboniferous Limestones has been noted as a characteristic of the Forest of Dean (Fulford & Allen 1992) and it has been suggested that ore may have been transported up to 50km to suitable smelting sites (Tim Young pers. comm.). However, movement of ore over these distances is only likely to have been a feature of the later medieval and, possibly Roman industries (Chris Salter pers. Comm.)

4.2.2.2 Proximity to charcoal source

Bloomery furnaces were fuelled by charcoal and large quantities of this material were needed. Estimates of the amount of charcoal required to produce specific quantities of iron are variable and are subject to variations between types of iron ore from different locations. The requirement of a ratio of 1 tonne of charcoal to smelt 1 tonne of raw ore is often cited as a normal fuel requirement for the bloomery process, although recent experimental work has suggested that 20.8 tonnes of charcoal would have been needed to produce 1 tonne of finished iron (Crew 1998, 51). Further quantities would have been required for subsequent smithing into a finished product and further experimental work used 61kg of charcoal to produce 0.45kg of bar iron from 7.6kg of bog ore (Crew 1991). It has also been calculated that this amount of charcoal would have required *c.* 145.8 tonnes of raw timber (Cleere 1976, 240) and some estimates suggest that 20 acres of woodland would be needed to produce the charcoal necessary to produce a single ton of iron (Jones 1996, 34). Due to its friable nature (when combined with the limitations of early communications) charcoal could not be transported for distances in excess of *c.* 5-6km without considerable and uneconomic wastage (Cleere & Crossley 1985, 135). Given this it was most economically efficient to site bloomeries in close proximity to the charcoal rather than the ore source (Jones 1996, 34).

There are some records of transportation of charcoal to fuel bloomeries within the Forest of Dean Survey area. The medieval forges at Parva Dean (Littledean) occasionally used charcoal made outside the Forest of Dean, and the 13th century forges at English Bicknor were fuelled by charcoal imported from Wales (Hart 2000, 66). Neither of these, however, indicates that charcoal was transported any great distance as Littledean is at the eastern edge of the Forest of Dean (if the Forest of Dean is defined as either the Hundred of St Briavels or the woodland within the Royal demesne, both of which are equally possible), and in the 13th century territory which could have been referred to as “Wales” is within 1-2km of English Bicknor. The numerous references to medieval “itinerant forges” from the Forest of Dean (Hart 1971) could be indicative of a close link between charcoal production and smelting operations, as these may have been relatively temporary structures which were demolished when near-by charcoal resources became exhausted and re-located to exploit a new source. It is tempting to see charcoal production and smelting as part of a single operation within the cycle of exploitation and management of the woodland, in which smelting sites would have been sited within, and acted as the focus for charcoal production within an area of woodland.

4.2.2.3 Aspect and prevailing wind

The control of airflow in bloomeries was by bellows which would have been blown through purpose built holes in the sides of the bloomery, and clay tuyeres (hollow cones), which would have protected the wooden nozzles of the bellows from the heat of the furnace, are well documented (Tylecote 1983, 141-142). It has been suggested that, even with artificial control of airflow, furnaces may have been sited to maximise natural draft, thereby reducing the manual labour needed to pump the bellows, and Roman furnaces at *Ariconium* mostly occupied south or south-western facing slopes, perhaps within open–sided structures to take advantage of the prevailing wind (Jackson forthcoming, 172). This, however, would seem unlikely as, although Roman “natural draught” furnaces, which may have relied on convection, are known from Laxton, Northamptonshire, these were of a distinctive design with multiple tuyere holes (Crew 1998) a feature not recognised in the remains of other bloomeries. If there is a correlation between the siting of bloomeries and south or south-westerly slopes (and this has not been universally investigated or established), this may have been to take advantage of the effect the wind would have in speeding up the drying of the furnace structure during construction (Chris Salter pers. comm.)

For most of the bloomery smelting period, bellows would have been powered by humans, although by the later medieval and post-medieval periods, some bloomeries

may have relied on water to power their bellows (see below). The siting of these bloomeries would have been dependant upon a suitable reliable source of running water, and the need for ancillary equipment such as water wheels and features such as water leats would have required them to be in fixed locations, probably housed within permanent structures.

4.2.3 Surviving evidence for bloomery smelting sites

The survey has identified 144 sites where pre-blast furnace smelting may have taken place within the Forest of Dean survey area, although, of these, only 29 are within the Aggregates Resource Area.

It should be emphasised that the following discussion is based on information from a variety of sources of varying quality (see Appendix K, Appendix M, Appendix N, Appendix O, Appendix P, Appendix Q). Much of this information, particularly that based on reports of surface scatters of bloomery waste associated with datable artefacts, is in need of re-assessment, and this study should be regarded as a provisional statement of the evidence as currently understood.

4.2.3.1 *In situ* furnace remains

The surviving evidence of bloomery smelting can take a variety of forms. The furnaces themselves were relatively flimsy structures constructed of clay, and although surviving *in situ* remains of these are known from the archaeological record, they generally survive only as buried archaeological features (e.g. basal furnace remains or slag tapping pits), not visible as surface remains (see for example Fulford & Allen 1992, Blake 2003a). Similarly, although bloomeries were always sited within buildings as a protection against the weather (Chris Salter pers. comm.), these structures did not need to be substantial (post-built sheds would have sufficed) and, will also only survive as buried archaeological features which cannot be identified without archaeological techniques such as geophysical survey or excavation.

4.2.3.2 Waste from the bloomery smelting process

The initial identification of bloomery smelting sites is most commonly through the identification of the waste products of the smelting process, which were dumped in close proximity to the furnaces. These take the form of deposits of tapped and untapped slag, and other debris from the smelting process consisting of '…accretions of slag mixed with ore fragments and charcoal which collected at the bottom of the bloomery furnace during the early stages of the smelting and which would have been raked out at the end of the operation.' (Cleere & Crossley 1985). Many bloomery smelting sites in the Weald were first identified by locating deposits of bloomery waste (Cleere & Crossley 1985). 19th and early 20th century records of bloomery slag finds within the Lake District National Park have been used to identify probable bloomery sites (Robert Maxwell, National Trust North-West Division Archaeologist pers. comm.), and the Exmoor Iron Project recently excavated a Romano-British smelting site characterised by a huge deposit of this material which had simply been shovelled downslope of the platform on which smelting operations had taken place (Goddard & Juleff 2003). Numerous cinders mounds have been reported throughout the Forest of Dean (Herbert 1996a, 291), although the precise location of these features was generally not specified.

4.2.3.3 Features associated with pre-smelting activity

Furnaces, slag-tapping pits and bloomery waste only represent evidence for one of the processes associated with early smelting, and sites where this occurred would be expected to display evidence for both ore and charcoal preparation which are likely to have taken place in the near vicinity to the smelting itself.

Preparation of ores consisted of crushing and, most importantly, roasting which broke down compounds within the ore and caused micro-cracking which facilitated reduction of the ore in the furnace (Historical Metallurgy Society 1995).

Charcoal, the fuel used in all bloomery smelting activity (see above), is likely to have been produced fairly close to the site of smelting activity, as it was not economically viable (or practical) to transport this material long distances (see above). This would not, however, have necessarily been produced “on site” in very close proximity to the smelting activity, although it is likely to have been stored in the immediate vicinity. Charcoal may also have been broken down into smaller pieces in preparation for use in the furnace (Crew 1991), and this may have occurred in specific areas which can be archaeologically identified.

4.2.3.4 Features associated with post-smelting activity

Post-smelting activity might also be expected in the form of refining hearths where the smelted iron, or bloom, would have been further processed to remove entrapped slags and prepare the bloom for smithing or forging. It would have been most efficient for at least the initial stages of this process to have been undertaken as the final part of the smelting process (Historical Metallurgy Society 1996).

4.2.3.5 Features associated with secondary smithing

Unless diagnostic remains have been found, it is difficult to differentiate secondary smithing (i.e. the process of transforming “blooms” into a finished product) sites from smelting sites without specialist analysis of the slag residues and a firm grasp on the actual size of the assemblage. This is so problematic that it has been suggested that “any site with only a small quantity of slag, assuming that the range of debris is representative, should be presumed to be a secondary smithing site, unless it can be shown unequivocally to be otherwise” (Historical Metallurgy Society 1996), and it may be significant that of the three sites within the survey area where secondary smithing residues have been identified (see below) the slags have been subjected to some level of specialist analysis.

Given the relatively friable nature of secondary smithing slag, however, it is unlikely that this material will have been recovered from the surfaces of cultivated fields, and consequently, slag recovered in this manner (so long as it is not clearly blast furnace slag) can be assumed to represent bloomery smelting waste (Chris Salter pers. comm.).

4.2.4 Bloomery smelting within the survey area

In 1780, George Wyrall wrote 'I do not conceive that they (bloomery cinders) belong exclusively to any particular age or people: but that they have been the work of a very long series of ages.' (Wyrall 1780, 225). The available evidence for bloomery smelting from within the survey area is indicative of, or suggests, the considerable time span in which this operation may have taken place.

4.2.4.1 Pre-Roman bloomeries

There is considerable regional variation in the evidence for prehistoric (from *c.* 750 – 700 BC) bloomery smelting in Britain.

In the early to middle Iron Age small furnaces without provision for draining (tapping) molten slag from their base may have been prevalent. In the past, these furnaces, which survive as small pits, *c.* 30cm in diameter and often filled with a cake of slag, have been described as “bowl” furnaces and assumed to have had a domed superstructure with an approximate height/width ratio of 1:1. Experimental work has demonstrated that such a structure would been extremely difficult to operate as a bloomery (which need to be at least 50cm high to tuyere level), and these furnaces

are generally considered to have been small shaft furnaces with a cylindrical superstructure (Chris Salter pers. comm.).

In some areas, larger furnaces (50-60cm in diameter), interpreted as "developed" bowl furnaces, were introduced in the later Iron Age, or perhaps earlier. Constructional details of these is not clear, although it is likely that evidence for their "domed" superstructure is a misinterpretation of the inward collapse of the furnace walls. These furnaces were unlikely to have been domed and were probably larger shaft furnaces, representing a development of the small shaft furnaces discussed above (Chris Salter pers. comm.).

During the Iron Age furnaces with slag tapping provision (often into a small pit adjacent to the furnace) were developed, although there is considerable regional variation in their introduction and the earlier type may have persisted longer in the western part of Britain (Chris Salter pers. comm.).

Evidence for Pre-Roman bloomeries within the survey area

None of the Forest of Dean smelting sites can be securely dated to the pre-Roman period, and there is a conspicuous lack of evidence for iron smelting from the early or middle Iron Age.

Small quantities of "bloomery" slag have been reported from a tree throw hollow within the Iron Age Promontory Fort at Symonds Yat (Glos SMR 19) in conjunction with pottery (Severn Valley Ware) dating from the late Iron Age/Early Roman transitional period (Walters 1992b, 6). A similar range of finds has also been reported from mole hills within the small undated enclosure of Soudley Camp (Glos SMR 444), although the finds themselves are lost, and the precise date of the Severn Valley ware pottery, or the status of the slag has not been established (Hoyle 2000, 7). The significance of these is not clear (particularly in the case of Soudley Camp where neither the artefacts nor the earthwork has been dated with any certainty) although they may tentatively suggest late Iron Age/early Roman smelting (or perhaps smithing) at these sites.

Undated bloomery slag has also been found on the eastern slopes of Welshbury Hill, Blaisdon (Glos SMR 22116) within *c.* 500m of the Iron Age hillfort (Glos SMR 5161), suggesting a connection between smelting activity and the Iron Age occupation.

At least one of the slag fragments, however, is likely to derive from a shaft furnace (Chris Salter pers. comm.), and consequently, is more likely to be later in date than the prehistoric activity in the vicinity (see 4.2.4.2 below).

4.2.4.2 Romano-British bloomery smelting

Although small non-slag tapping furnaces continued to be used throughout the Roman period, larger and more efficient shaft furnaces, consisting of a vertical cylinder *c.* 50cm in diameter and *c.* 1-1.5m high were introduced by the Romans in the 1st century AD, (Geddes 1991, 170). Although the superstructure of these features is based largely on experimental reconstructions, an almost complete example of this type of furnace has been discovered at Ashwicken, Norfolk (Chris Salter pers. comm.). These shaft furnaces also had provision for tapping molten slag from the base of the furnace and are often accompanied by small pits into which the slag was allowed to flow.

In some areas larger shaft furnaces have been identified which may have been introduced by the Roman army, and may be indicative of "military" smelting sites (Chris Salter pers. comm.). The military origin of these furnaces is not fully understood, and no furnaces of this type are known from the Forest of Dean.

4.2.4.3 Features associated with Romano-British pre-smelting activity within the survey area

Pre-smelting activity of Romano-British date is represented by:-

- Large stone slabs set into the ground at The Chesters Roman villa, Woolaston (Glos SMR 16) have been interpreted as evidence for ore-crushing, and a pit within the same structure has been interpreted as a charcoal preparation area. These features were found within the same building as the *in situ* 3rd – 4th century AD furnace bases on the site (Fulford & Allen 1992, 177-181).
- Evidence for a heavily reinforced stone base-work within a structure with masonry footings in association with 2nd-3rd century AD smelting activity recorded from excavations at Rodmore Farm, St Briavels (Glos SMR 4390; see above). This slab, which displayed no signs of *in situ* burning, and was interpreted as the remains of some process ancillary to the actual smelting, is similar to the features interpreted as ore-crushing units from The Chesters, Woolaston (see above), although no ore residues were recorded, and, unlike the Woolaston examples, the stones themselves were not scuffed in any way (Blake 2003a).
- Excavations at Popes Hill, Littledean (Glos SMR 5179), in the 1950s, found a feature interpreted as the remains of an ore-roasting hearth and also an area of stone slabs interpreted by the excavator as a furnace base. These slabs were, however, also not burnt and superficially similar to the stone slabs recorded at Rodmore Farm (see above) and may have fulfilled a similar function. The features were found in association with bloomery smelting slag and pottery dating from the 2nd – 4th century AD (Scott-Garret 1956).

Evidence for *in situ* Romano-British bloomery smelting within the survey area

Although *in situ* Romano-British bloomery hearths are known from Monmouth, Trellech and *Ariconium* outside of the Forest of Dean Survey area (Walters 1992b), few examples are known from within the Forest of Dean.

The earliest dated *in situ* remains of Romano-British bloomery smelting have been found during recent work at Rodmore Farm, English Bicknor (Glos SMR 4390) by Dean Archaeological Group. This takes the form of the remains of at least one *in situ* furnace base represented by a circular patch of burning surrounded by hard baked clay. Three small pits, possibly slag tapping pits, were also found in the immediate vicinity of the furnace base (Blake 2003a). This excavation was part of a long term investigation of a Roman iron working site (which may just be part of a larger complex fulfilling a variety of functions) which has produced pottery dating from the 2nd and 3rd centuries AD (DAG 2002).

The bulk of the *in situ* remains of Romano-British bloomery smelting dates from the 3rd and 4th centuries AD and consists of the following:-

- A furnace excavated at Eastbach Court, English Bicknor (Glos SMR 9739) which survived as a fired clay furnace base adjacent to a small pit into which tapped slag had flowed. The excavator tentatively dated this to the 4th century AD on the basis of pottery finds from the surrounding field surface (Walters 1987).
- Features interpreted as the base of shaft furnaces excavated to the south and south-west of the Roman Villa at The Chesters, Woolaston (Glos SMR 16) suggest that smelting, along with associated metallurgical processes such as ore crushing, had taken place during the 3rd and 4th centuries AD, contemporary with the occupation of the villa site (Fulford & Allen 1992).

Displaced evidence for Romano-British bloomery smelting furnaces within the survey area

In addition to *in situ* finds, furnace bases consisting of the fused mass of slag which had accumulated at the base of a bloomery, or fragments of furnace lining have been found at:-

- An excavated example at Eastbach Court, English Bicknor (Glos SMR 9739) thought to be contemporary with the *in situ* furnace remains described above (Walters 1987).
- Surface finds on the site of Park Farm Roman Villa, Lydney, located *c.* 4km to the north-east of The Chesters, Woolaston (Glos SMR 6377; Walters 1992b, 10), consisted of fragments of furnace base and evidence of both smelting and primary smithing. These were interpreted as 3rd to 4th century AD in date on the basis of their association with the site of the villa, which had been partially excavated in the late 1950s (Fitchet 1986).
- Excavations at Millend Lane, Blakeney (Glos SMR 17988) have produced fragments of bloomery furnace lining, along with tap slag, in conjunction with pottery dating from the 3rd to late 4th centuries AD (Barber & Holbrook 2000).

Other evidence for Romano-British bloomery smelting within the survey area

The remaining evidence for Romano British smelting or smithing activity within the survey area consists of:-

Table 43: Excavated slag from possible Romano-British bloomery sites

Location	Glos SMR number	Date of associated artefacts	Possible date of smelting
High Nash, Coleford.	4929	2nd – 4th century AD.	Not clear how smelting relates to Roman activity.
Stock Farm, Coleford.	5611	2nd – 4th century AD.	Two possible phases of smelting represented:- 2nd century AD. 3rd 4th century AD.
White House Farm, English Bicknor.	6090	Roman.	Roman.
Ley Pill, Woolaston .	9534	Roman.	Roman.
Legg House Blakeney.	18426	Roman.	The slag was part of a metalled surface which post-dated 1st – 2nd century AD activity on the site.

Table 44: Surface finds of slag from possible Romano-British bloomery sites

Location	Glos SMR number	Date of associated artefacts
Ruardean.	23501	1st century AD.
Holm Farm, Lydney.	5138	2nd –3rd century AD, and medieval.
Whitescroft, Awre.	9535	2nd – 4th century AD.
Hangerberry Hill, English Bicknor.	9623 & 9739	4th century AD.
Broom Hill, Blakeney.	23496	2nd –3rd century AD.
Welshbury and Chestnuts Woods, Blaisdon.	6463	Late 2nd –3rd century AD.
Cherry Orchard Farm, Newland.	5102	3rd century AD.

Location	Glos SMR number	Date of associated artefacts
Cow Meadow Farm, English Bicknor.	21290	3rd – 4th century AD These finds included a partly smithed iron billet (see above).
South of Blakeney.	18408	3rd – 4th century AD.
Sedbury Park, Sedbury.	5065	Roman – precise date not specified.
Popes' Grove, Lydbrook.	6237	Roman – precise date not specified.

Evidence for Romano-British post-smelting activity

The following records indicate Romano-British post-smelting activity with the Forest of Dean:-

- The stone slab feature at Rodmore Farm (Glos SMR 4390; see above) could be interpreted as the remains of a base to support a refining hearth, a smithing hearth or an anvil. However, the slag residues associated with this feature are reported as "definitely the result of smelting rather than smithing" (Blake 2003a), although it is not clear precisely how the slag related to this feature.
- The stone feature recorded at Popes Hill (Glos SMR 5179, see above) could also be interpreted as basework to support a refining hearth, a smithing hearth or an anvil.
- Slags relating to secondary smithing have been found at the Roman villa site at Boughspring (Glos SMR 20), which was in use from the 2nd – 4th century AD. It was not, however, clear precisely how this material related to the villa (Pullinger 1991)
- Surface finds at Cow Meadow Farm, English Bicknor (Glos SMR 21290) included a partly smithed iron billet in association with 3rd – 4th century AD pottery (Walters 1992b, 6).

4.2.4.4 Early medieval bloomery smelting

In the eastern part of Britain, furnaces that lacked provision for draining (tapping) molten slag appear to have superseded the earlier slag-tapping type from the 7th century AD (Tylecote 1986, 181). They are characterised by Tylecote as "slag pit furnaces" as slag was encouraged to accumulate in a pit directly below the furnace (Tylecote 1986, 135), and probably represent a north European tradition introduced by the Saxons (Cleere & Crossley 1985, 39). No examples of this type of furnace are known from the Forest of Dean, although examples are known in western Britain at Burlescombe on the Somerset/Devon border (Chris Salter pers. comm.).

Steel may have been first produced as a deliberate product of bloomery smelting during the early medieval period, although the actual date, and distribution of bloomery steel production sites is not well understood as steel has been found at the 2nd century AD site at Carmarthen in Pembrokeshire, suggesting that this technology may have been introduced during the Roman period. Steel producing bloomeries may display distinct structural features, such as the possible "carburisation" box attached to a 12th century bloomery from Trondheim, Norway, and should also be identifiable through specialist analysis of slag residues (Chris Salter pers. comm.).

Evidence for early medieval bloomery smelting within the survey area

None of the Forest of Dean smelting sites can be securely dated to the early medieval period which is generally under-represented in the archaeological record for this region. It should be noted that the type of bloomery in use at this time might not have produced tap slag (see above; Cleere & Crossley 1985, 39-40; Salter C, pers. comm.). Even so, non slag-tapping bloomeries would still have produced waste, and

it is possible that some of the evidence of bloomery waste from the Forest of Dean dates to this period.

4.2.4.5 Later medieval bloomery smelting

From the 9th or 10th century, shaft furnaces with slag-tapping provision were re-introduced, although it is not clear precisely how this occurred. Tylecote has suggested that this may have been an independent progression from the more "primitive" non-slag tapping type; it may equally be possible that more efficient "Roman" type shaft furnaces remained in use in parts of Europe, or indeed, parts of Britain, and were influential in this methodological change.

From the mid-12th century, water-power, a technology which had been used for centuries to power mills, was adapted to the smelting process in parts of Europe, and had reached England by the mid 14th century (Cleere and Crossley 1985, 106). Although this technology may have primarily been used to drive large hammers for smithing purposes rather than bellows, Tylecote suggests that where these sites have been excavated, water-power would generally have been sufficient to run both a large hammer and the bellows for at least two bloomeries, although bellows may have been operated manually when water supply was insufficient for both purposes (Tylecote 1986, 203-205).

Although water-power may have first been adopted as a response to man-power shortages following the population decline after the Black Death of the mid 13th century (Tylecote 1986, 205), this technological advance brought with it obvious economic benefits. Accounts from a 15th century water-powered bloomery at Byrkeknott, County Durham, record a bloom size of *c.* 195lb which could be produced for the same labour cost as the *c.* 30lb bloom typical of a medieval manually-blown furnace (Cleere and Crossley 1985, 106; Geddes 1991, 172).

There is no evidence for later medieval water-powered bloomeries from the Forest of Dean despite that fact that the numerous fast-flowing streams could have provided the necessary power for this purpose, as is evidenced by the numerous post-medieval charcoal blast furnaces, introduced to Dean in the late 16th century, which were reliant on water as a source of power.

Evidence for later medieval pre-smelting activity within the survey area

Excavations at Warfield Farm, Ruardean (Glos SMR 9875), uncovered a feature interpreted as an ore-roasting hearth (Hart 1971, plate 3) in association with smelting debris and pottery dating to the 13th century (Bridgewater 1966).

***In situ* evidence for later medieval bloomery smelting within the survey area**

There are numerous documentary references to later medieval smelting in the Forest of Dean, although the majority of these are too general to allow the smelting sites to be located with any degree of confidence.

In situ later medieval smelting is limited to:-

- A number of small pits containing deposits of tapped slag, found during a large-scale evaluation by Wessex Archaeology in the vicinity of Rodley Manor, south-east of Lydney (Glos SMR 22448). These pits were interpreted as the remains of slag-tapping pits which would have been adjacent to the bloomery furnaces (which did not survive) and were found in association with pottery dating from the 12th - 14th centuries AD (Cooke 2003).
- Four rock-cut pits (whose dimensions were not recorded) found in association with charcoal deposits, bloomery slag, and fragments of probable furnace base (see below) at Warfield Farm Ruardean (Glos SMR 9875). Although the excavator did not interpret these as furnaces bases, two of them displayed signs of *in situ* burning and they may have been slag-tapping pits. The pits had been

backfilled with material containing 13th century pottery, along with some post-medieval material (Bridgewater 1966).

There are documentary references to "itinerant forges" which were moved around the Forest of Dean during the 13th and 14th centuries (Hart 1971; Herbert 1996a). This may be a reference both to the itinerant workers themselves, and also the smelting sites themselves which were probably relatively temporary structures within insubstantial shelters which could be dismantled and re-located when the surrounding fuel was exhausted. It would seem reasonable to assume that these sites are closely associated with evidence for the cycle of charcoal manufacture in the area.

Although the sites of none of these are currently known with any certainly, two features have been found in the Forest of Dean which may represent the sites of itinerant forges from this period. It should be stressed, however, that the evidence for both of these sites is not clear:-

- Small scale excavation of a charcoal platform at Broom Hill, Soudley (Glos 23496) discovered not only evidence of charcoal residues, but also a flagged stone surface found in association with hollowed cup stones (see below) and pottery dating to the 12th and 13th centuries (Johns 1991).
- A similar feature associated with pottery dating from the Roman to the post-medieval periods was found at Chestnuts Wood, Littledean (Glos SMR 12183).

Similarly, although there is no evidence for later medieval water-powered bloomeries from the Forest of Dean, small quantities of possible bloomery slag has been found in conjunction with stone built industrial features (see Figure 21 below) which may represent the remains of wheel pits at Yew Tree Cottage, Brockweir (Glos SMR 22378).

Figure 21: Possible wheel pit remains at Yew Tree Cottage, Brockweir (Glos SMR 22378).

Scale: Folded OS Explorer map (24 x 14cm)

The status and date of these features is unclear, as is their connection with the small quantities of possible bloomery slag which were recovered in the same small field, although it is known that the Abbot of Tintern had some mineral rights in the Forest of

Dean to supply the monastery's forges (Hart 2002, 145) and Brockweir was the site of a monastic grange held by Tintern (Herbert 1996b)

Evidence for displaced later medieval bloomery smelting furnaces within the survey area

This category of evidence is limited to:-

- Fragments of bloomery furnace lining which were recovered as surface finds at Windmill Field, English Bicknor. This material was found in conjunction with pottery of 13th century date (Glos SMR 21770).
- "Pit slag lumps" *c.* 30-35cm in diameter with dished bottoms (presumably concave rather than convex) suggesting they were accumulated slag from the bases of furnaces, were found in conjunction with 13th century pottery at Warfield Farm, Ruardean (Glos SMR 9875).

Other evidence for later medieval bloomery smelting within the survey area

The remaining evidence for later medieval smelting within the survey area consists of:-

Table 45: Excavated slag from possible medieval bloomery sites

Location	Glos SMR number	Date of associated artefacts
Tidenham House, Tidenham	20246	12th century
Church Cottage, Staunton	21613	13th –20th century
Tanhouse Farm, Newland	11085	medieval
Church Road Lydney	6501 & 17216	medieval
High Meadow Farm, Newland	20487	medieval
Blakeney Sewage Treatment works	20429	medieval

Table 46: Surface finds of slag from possible medieval bloomery sites

Location	Glos SMR number	Date of associated artefacts
Etloe	18410	13th century
Windmill Field, English Bicknor	21770	13th century

None of these slag assemblages has been subjected to specialist analysis to determine whether they are indicative of water-powered bloomery smelting or steel production.

Evidence for later medieval post-smelting activity within the survey area

Secondary smithing slag has been recovered from medieval contexts at High Meadow Farm, Newland (Glos SMR 20487; Chris Salter pers. comm.) although, as few of the slag assemblages have been examined by specialists, it is possible, that a number of the excavated records of bloomery slag finds (see above) may in fact denote smithing rather than smelting activity.

4.2.4.6 Post-medieval bloomery smelting

Although charcoal-fired blast furnaces were introduced to the Forest of Dean in the late 16th century (Hart 1971), the change from bloomeries to blast furnaces need not have been either immediate or total. In the Weald, iron continued to be smelted in bloomeries for several decades after the introduction of the first blast furnaces at the end of the 15th century (Cleere & Crossley 1985, 108). At Muncaster Head in Cumbria, a bloomery was constructed as late as 1636 (Geddes 1991, 173), whilst

bloomery smelting in north Lancashire continued until the early 18th century (Cleere & Crossley 1985, 108).

Evidence for post-medieval bloomery smelting within the survey area

Although there is little direct evidence of post-medieval bloomery smelting known from the Forest of Dean, a number of the sites listed as possible medieval sites (see above) could equally well either date to, or have continued into, the post-medieval period.

***In situ* evidence for post-medieval bloomery smelting furnaces within the survey area**

The only possible evidence for *in situ* post-medieval bloomery smelting from the Forest of Dean consists of an area of burning and a large burnt limestone slab (Trench E, contexts 545 and 546) recorded during a modern archaeological evaluation at the Feathers Hotel, Lydney (Glos SMR 17802; Townsend 1999; Mack & McDonnel 1999). No datable artefacts were found in conjunction with this feature but it was within an area of settlement and industrial activity generally considered to date from the early post-medieval period (Townsend 1999) and which also produced bloomery smelting residues (Mack & McDonnel 1999). Although the exact function and date of this feature was not established with any certainty, it is consistent with evidence of bloomery smelting within an early post-medieval (16th century) context.

Evidence for post-medieval post-smelting activity within the survey area

Smithing slag, a section of smithing hearth base and a feature interpreted as "the hearth box for a waist-high forge or smithing platform" (context 542) were also found during the modern archaeological evaluation at the Feathers Hotel, Lydney (Glos SMR 17802; Avon Archaeological Unit 2001; Mack & McDonnel 1999). Although the precise date of this material could not be established, it was within an area of settlement and industrial activity generally considered to date from the early post-medieval period (Avon Archaeological Unit 2001).

4.2.4.7 Undated evidence of bloomery smelting within the survey area

In the 18th and 19th centuries, it was generally assumed that the extensive remains of bloomery waste (cinders mounds) were largely the result of Roman activity, an assumption which was supported by Wyrall's observations that "coins, fibulae, and other things known to be in use with that people [i.e. the Romans] have frequently been found in the beds of Cinders at certain places. This has occurred particularly at the village of Whitchurch, between Ross and Monmouth, where large states of cinders have been found, and some of them so deep in the earth (eight or ten feet under the surface) as to demonstrate…that they must have lain there for a great number of ages." (MaClean 1877-78, 225-6). There is considerably more documentary evidence for a major iron industry in the Forest of Dean during the medieval period (Hart 1971; Herbert 1996a), and other authorities have tended to suggest that many of the deposits of cinders, such as those recorded beneath the town of Coleford (SMR 4928/4930/11078/23503), are likely to be largely medieval in date (Standing 1986).

In fact, much of the evidence for bloomery smelting within the Forest of Dean is effectively undated, and statements about the date of origin of cinders mounds are simply assumptions, often based on very little, or no hard evidence.

***In situ* evidence of undated bloomery smelting within the survey area**

A recent evaluation at Stowe Hill, Newland, undertaken by Oxford Archaeology (Glos SMR 21477) recorded two small pits containing "slag cakes" and also two small pits containing loose slag (including tap slag). There was no dating evidence associated

with these features, and although the excavator suggested that they may be the remains of pre-Roman or Roman non-slag tapping "bowl" furnaces (Oxford Archaeology 2002, 6.2.1), the specialist report suggests that they should be interpreted as furnace bases and associated slag tapping pits of unknown date (Paynter 2002, 5.2.4).

Artefacts relating to undated bloomery smelting within the survey area

The following furnace bases, consisting of the fused mass of slag which had accumulated at the base of a bloomery have been recovered as surface finds:-

- Five furnace bases were found during a watching brief at Staunton (Glos SMR 11087; Standing 1987a). No artefacts which could date these finds were recovered during the watching brief, although it has been reported that "a section of Roman-type iron bar" was fused to one of the furnace bases (Walters 1992b, 19).
- A hearth base, "identical" to those recorded above, was found during redevelopment work on the Baptist Chapel in Newland Street, Coleford in 1986/87 (Glos SMR 19423; Standing 1987b). There was no dating evidence associated with this find.
- A fragment of undated bloomery furnace has been recovered as a surface find at Welshbury Woods, Blaisdon (Glos SMR 22116).

Other evidence for undated bloomery smelting within the survey area

The majority of remaining undated possible bloomery sites have been identified by finds of tapped or untapped bloomery slag. The bulk of this slag was not retained (or cannot be located) and the validity of some of these records is, therefore, open to question. These records consist of:-

Undated bloomery slag

Table 47: Undated surface finds of bloomery slag

Location	Glos SMR number	Comments
Pill House, Tidenham	5026	Surface finds, no actual dating evidence.
Dean Road	5904	Dean Road, which sealed slag, may not be Roman in date.
Madgetts Farm, Tidenham	6033	Slag, not found in association with datable artefacts.
Ruardean	7401	Slag found during excavation of petrol storage tank – status of slag unclear.
Horse Pill, Woolaston	9533	Surface finds of slag of unspecified type in conjunction with artefacts of Roman and medieval date.
Littledean Hall, Littledean	9782	Slag not found in association with datable artefacts.
Toads Mouth, Staunton Coleford	11087	Slag not found in association with datable artefacts.
Blakes Wood, Staunton Coleford	14880	Slag not found in association with datable artefacts.
Lydney Bypass	14936	Unspecified slag, not found in association with datable artefacts.
Stock Wood, Clearwell	17082	Unspecified slag, not found in association with datable artefacts.

Location	Glos SMR number	Comments
Dairy Farm, Lydney	17961	Unspecified slag, not found in association with datable artefacts.
Purton, Awre	18412	Slag not found in association with datable artefacts.
Glyn Farm, Redbrook	18444	Unspecified slag, not found in association with datable artefacts, some described as "glassy" suggesting that it was in fact post-medieval bloomery slag.
The Elms, Staunton Coleford.	19420	Slag, not found in association with datable artefacts and probably residual.
Newland Street, Coleford.	19423	Unspecified slag, not found in association with datable artefacts.
Plump Hill, Mitcheldean.	20664	Slag adhering to stone; no datable artefacts found.
St White's Farm, Coleford.	21270	Slag residual; found with 18th and 19th century pottery.
Wilderness Farm, Mitcheldean.	21288	Slag, not found in association with datable artefacts
Littledean.	21293	Slag, not found in association with datable artefacts.
English Bicknor.	21766	Romano-British and medieval material found but it is not clear if the slag, was associated with these artefacts.
Cinder Hill, English Bicknor.	21805	Slag, not found in association with datable artefacts.
Chestnuts Wood, Littledean.	22053	Slag, not found in association with datable artefacts.
Welshbury Hill, Blaisdon.	22116	Slag, not found in association with datable artefacts.
Edgehill Lodge, Mitcheldean.	22303	Slag, not found in association with datable artefacts.
Bream Court Farm, Bream.	23270	Slag, not found in association with datable artefacts.
Staunton House, Staunton Coleford.	23495	Slag, not found in association with datable artefacts.
Edgehills Plantation, Mitcheldean.	23498	Slag, not found in association with datable artefacts.
Allaston Court, Lydney.	23500	Slag, not found in association with datable artefacts.
Hurst Farm, Lydney.	23502	Slag, not found in association with datable artefacts.
Victoria Road, Coleford.	23505	Slag, not found in association with datable artefacts.
Lydney Park, Lydney.	23510 & 23511	Slag, not found in association with datable artefacts.
Madgetts Farm, Tidenham.	23515	Slag, not found in association with datable artefacts.
Yew Tree Cottage, Brockweir.	23517	Slag, not found in association with datable artefacts.
March Dyke, Brockweir.	23520	Slag, not found in association with datable artefacts.
Quarrel Field, St Briavels.	23521	Surface finds reported, not known if in conjunction with datable artefacts.
Drybrook.	23547	Obscure reference to bloomery slag "beneath fields and gardens".

Evidence for undated post-smelting activity within the survey area

The following undated evidence for post-smelting activity has been identified within the survey area:-

- Undated slag deposits including material described as “smithing and forging slag” from Dean Hall, Littledean (Glos SMR 9782).
- Hollowed sandstone boulder containing “forge slag” from Edgehills Plantation, Mitcheldean (Glos SMR 19400). This is recorded as a cup stone on the Gloucestershire County SMR, and is also included in the list of cup stones discussed (see 4.2.4.8 below).
- “Forging slag” filling hollow in stone from Old Sally Mine, Edge Hill (Glos SMR 19945).
- Undated bun-shaped bloom, the product of primary smithing, form Littledean (Glos SMR 21293).
- Undated bun-shaped iron ingot, the product of primary smithing, from Drybrook Quarry (Glos SMR 23497).
- Undated circular hammered bloom, the product of primary smithing, from Edgehills Lodge, Mitcheldean (Glos SMR 23499).

4.2.4.8 Features of indeterminate function which may be associated with bloomery smelting within the survey area

Another class of find which appears to be related to the smelting process are “cup stones” (see Figure 22), of which eight (Glos SMR 5126, 14037, 19400, 19918, 19945, 22304, 22305, 23496) are known from the survey area. These consist of a concave hollow (or a number of hollows) generally *c.* 20cm, in diameter and *c.* 7cm deep. Some (e.g. Glos SMR 14037) have been found in conjunction with spherical stones, suggesting that they were effectively mortars used either for crushing ore, or perhaps for grinding ochre, and similar artefacts, which date to the Bronze Age, are known from prehistoric mining sites such as the Great Orme copper mines in North Wales (Dutton 1990, Fig 5). Some examples from the Forest of Dean (e.g. The Drummer Boy Stone, Glos SMR 5126; Glos SMR 19918; Glos SMR 19945) are also found in conjunction with either smelted iron deposits or slag, suggesting a possible secondary use as smithing hearths (P Crew pers. comm. in Price 1991).

Figure 22: Cupstone located to the west of Madgett's, near Brockweir (Glos SMR 22305).

Scale: 90cm.

Another class of artefact which has been little investigated are the so-called *arrow-stones.* These are un-worked stones exhibiting apparently random grooving, generally, but not always, on one face. The date, function and precise location of these stones is not known, and they have only been discussed in a single article (Johns 1990). Although a number are reputedly found in association with the cup stones discussed above, this is not always the case. It is not clear that these stones represent a single class of artefact indicative of a specific function, or are definitely artificial, and at the time of the survey, none had been added to the Gloucestershire Sites and Monuments Record.

Other smelting sites have produced evidence of a variety of features which are likely to have been associated with the smelting process in some way, but none of these has been fully investigated, and any interpretation of their function remains obscure. These are:-

- A stone mortarium set into the ground within the 2nd – 4th century AD iron working complex at Rodmore Farm, English Bicknor (Glos SMR 4390, DAG 2002, 15).
- Stone-lined pits apparently associated with 12th – 14th century AD smelting activity to the south-east of Lydney (Glos SMR 22448; Cooke 2003).
- Pits, gulleys, ditches and walls of indeterminate function found in association with bloomery slags (but not direct evidence of *in situ* smelting) and medieval pottery, at Highmeadow Farm, Coleford (Glos SMR 20487; Barrett 2003).
- Various pits and gullies of indeterminate function associated with undated smelting activity at Stowe Hill, Newland (Glos SMR 21477; Oxford Archaeology, 6.2.1).
- Stone structures, which may be wheel pits, have been identified at Yew Tree Cottage, Brockweir (Glos SMR 23517) where undated bloomery slag has been found.

4.2.4.9 Documentary evidence for bloomery waste sites

Exploitation of cinders mounds for re-smelting

In addition to recorded finds of slag, there are numerous post-medieval documentary records of extensive deposits of partly smelted cinders mounds throughout the Forest of Dean, and as far north as Worcester. This evidence is generally taken as a testament to the scale of the pre-blast furnace iron industry (Wright 1854; Nicholls 1860, 236-7; Herbert 1996a, 291) and are also a record of the exploitation of iron-rich "cinders" during later periods.

From the 13th century, cinders became commercially valuable, and in 1247 the king received receipts from the sale of *cineribus* from the Forest of Dean. It is not clear if cinders were purchased for re-smelting at this time, although it has been suggested that these could have been smelted in later medieval bloomeries. The introduction of cinders may have improved the refractory properties of the furnace lining, allowing higher temperatures to be reached, thereby recovering iron trapped in earlier slags, and they may also have acted as a lubricant, preventing the molten iron bloom adhering to the sides of the furnace as it increased in size (Hart 1971, 3). Water powered bloomeries, which may have been introduced from the later medieval period (see above), would also have been capable of higher smelting temperatures than those dependant on human power, and may have been capable of re-smelting earlier bloomery waste. There is no evidence for this, and it is unlikely that this operation would have been worthwhile in terms of the additional iron extracted from the slag, although it is possible that cinders were added to these furnaces to act as a flux (Chris Salter pers. comm.).

Charcoal-fired blast furnaces introduced to the Forest of Dean in the late 16th century (Hart 1971, 3; Hart 1983; Herbert 1996a), allowed higher temperatures to be reached and considerable quantities of cinders are known to have been re-smelted at this time (Bick 1990), as this iron–rich resource was considerably easier and more economically efficient to exploit than ore. Consequently, the sale and movement of this valuable commodity became an industry in its own right, and there are numerous references to the sale of cinders for re-smelting. In 1692, Jephthah Wyrall sold 10,000 dozen bushels of cinders from English Bicknor, and the Lydney furnace account of 1699-1700 refers to cinders being bought, some from as far away as Staunton (Hart 1971, p82). Other cinders deposits were gathered for export, sometimes for destinations as far away as Ireland (Hart 1971 220).

The extent to which this activity would have completely obliterated any cinders mounds has not been investigated, and prior to the 2003-04 survey very little research had been undertaken to locate surviving cinders mounds or to identify areas where these are recorded as having been removed.

Many references to cinders are too general to enable the original site of the cinders mound to be identified with any precision, although some can be located, and the survey identified 19 of these sites within the Forest of Dean Survey area (see below). The majority of these are late post–medieval records of extant mounds, although some of these records (Glos SMR 6116, 21858, 23513) record sites where cinders have been removed for re-smelting.

Table 48: Documentary records of undated cinders deposits which can be located

Location	Glos SMR number
English Bicknor.	6116
Tump House, Coleford.	21218
Cinderhill, St. Briavels.	21476
Ruardean.	21858
Staunton Lane Coleford.	23504
Tuft's Brook, Lydney.	23506
Clearwell.	23512
Bilson Green.	23513
Green Bottom, Littledean.	23529
Brandricks Green.	23530
Bilson Gas Works, Cinderford.	23531
Lower Lydbrook.	23532
Upper Lydbrook.	23533
Cinderhill, Coleford.	23534
Hawkwell Green, Cinderford.	23535
Brook Street, Mitcheldean.	23536
Collafield, Littledean.	23539
Collamore, Littledean.	23540
Redbrook.	23541
White Meade.	23545

Status of recorded cinders mounds

The word "cinders" appears to have been a colloquial expression employed from the 18th century as a generic term for smelting waste. It is not clear if all references to

"cinders" actually indicate the sites of material that can confidently be taken as waste from pre-blast furnace bloomery smelting.

The waste from bloomery smelting is very different from the waste produced by post-medieval blast furnaces, which is easily distinguished by its vitreous lustre. However, there appears to have been some confusion in the past between the two types of waste. In 1780, George Wyrall described how the best of the blast furnace slag was used as an ingredient in producing common green glass, by reducing it to a fine powder with a large stamping machine (MaClean 1877-78, 217), and a similar activity is recorded in the early 19th century, utilising blast furnace slag (referred to as "cinders") from the King's Ironworks at Park End (Anstis 1998, 37). In 1854, however, Thomas Wright reports that a machine had been constructed at a site near Redbrook to convert the 'ancient scoriae' to a powder that was subsequently used to make coarse glass bottles (Wright 1854, 11). Bloomery waste would not have been suitable for processing in this way (Chris Salter pers. comm.), and so Wright was almost certainly mistaking blast furnace slag for bloomery slag, which casts doubt over his interpretation of other cinders sites as bloomery era sites.

Many of the post-medieval sources are unclear about the type of cinder being discussed. Although all references to "cinders" which are not known to be the remains of bloomery waste should be regarded with some caution, the following sites are particularly open to question:-

- References to cinders from the sites of later blast furnaces:-
  - Glos SMR 5608 – Cinders from the "old steel works" at Milkwall, presumably the 19th century Titanic Steel Works, or Dark Hill Iron Works.
  - Glos SMR 5678 – Cinders mound reported at the site of the Kings Furnace at Soudley, a charcoal-fired blast furnace.
- Sites where "cinder" or slag are reported as road metalling:-
  - Glos SMR 7234 and 7236 – Iron "cinders" reported on the surface of an "ancient" road at Mitcheldean.
  - Glos SMR 11329 – Iron slag reported within the stones of a paved trackway at English Bicknor.
  - Glos SMR 21741 – Bloomery slag on the surface of an undated road/driveway at Littledean Hall.
  - Glos SMR 23375 – Bloomery slag on the surface of an undated road at Staunton Coleford.
  - Glos SMR 23493 – Undated road repairs at Lydney Park making use of "iron dross".
- Numerous references to "ashes" generally recovered from post-medieval industrial sites, for use as railway ballast in the 19th or early 20th centuries:-
  - Glos SMR 5824 – Parkend, West Dean.
  - Glos SMR 5843 – Cannop Colliery, West Dean.
  - Glos SMR 9976 – New Bowson Colliery, Cinderford.
  - Glos SMR 9983 – Crump Meadow Colliery, Cinderford.
  - Glos SMR 9989 – Trafalgar Colliery, Cinderford.
  - Glos SMR 12924 – Steam Mills, Cinderford.

4.2.4.10 Placename evidence for bloomery waste sites within the survey area

Field and placenames were also used to locate possible bloomery sites, in addition to the direct evidence of recorded slag deposits or the documentary evidence for the location of bloomery smelting sites. It should be stressed that given the recorded confusion between bloomery waste and blast furnace slag (see above), some caution should be applied to the interpretation of all sites known only from fieldname evidence.

Twelve placenames were recorded which contained the element "cinder" or some derivative of it (see Appendix T). Of these, two were associated with known finds of bloomery slag:-

- Glos SMR 21476 – Cinder Hill, St Briavels.

- Glos SMR 21805 – Cinder Hill, English Bicknor

Other field names which may (or may not) indicate the site of former bloomery smelting sites are:-

- Four field names containing the element “Ash” (Glos SMR 23017, 23538, 23543). These are particularly suspect as sites of bloomery waste (see above).
- One field name “Burnfields Meadow” (Glos SMR 23528), contained the element “Burn”
- Three “Quarrel” fields, one of which (Glos SMR 23521) was associated with reported finds of bloomery slag.
- 22 field names containing the element “Black” or some derivative were recorded (Appendix T,
-
- Figure 39). Given the vague nature of the meaning of this name, these were not added to the Gloucestershire County Sites and Monuments Record, but were separately recorded as a GIS layer for the purpose of this survey.

4.2.4.11 Other indicators for the sites of bloomeries within the survey area

Ten undated mounds (Glos SMR 4400, 4613, 5029, 11898, 13937, 13938, 13939, 13945, 13946, 13948) were identified in the course of the survey. No archaeological investigation has been undertaken on any of these mounds. Their proximity to known or likely smelting sites, suggest that some of them may be the remains of bloomery waste sites, although this interpretation should be treated with considerable caution.

5 Summary of the archaeological results of the project

5.1 Scowles

5.1.1 Exploitation of scowles as a source of iron ore

It is not currently possible to quantify the extent to which ores from the Carboniferous Limestones which ring the Forest of Dean were exploited from:-

- Surface deposits within exposed caves (scowles).
- Near-surface deposits accessed through surface excavations such as bell pits.
- Subterranean mines within the parts of the cave system which had not been exposed by geological action.

It is also not possible to securely link individual scowles, or areas of the Carboniferous Limestone outcrops with particular periods of exploitation, except in the most general way, and it is clear that iron ore was available from a number of other sources (see 4.1.5 above) which are close to the known smelting sites within the Forest of Dean and the surrounding area.

As ore may have been transported over considerable distances to suitable smelting sites (perhaps up to 50km - Tim Young pers. comm. - see 4.2.2 above), the inter-relationship between extraction and smelting sites is likely to be considerably more complex than earlier models have suggested, and it is no longer tenable to consider the Forest of Dean iron industry in terms of the following assumptions:-

- Iron ore was only exploited from the Crease Limestone and immediately adjacent geological formations.
- Iron ore was necessarily extracted from surface exposures within scowles first, with subterranean deposits not being generally exploited until the surface deposits were exhausted.
- Smelting operations would necessarily have been supplied by the nearest source of ore.

5.2 The Forest of Dean iron industry

The following summarises the known extent, scope and date of the iron industry in the Forest of Dean based on the results of both earlier research and the results of the 2003-04 survey.

5.2.1 The Pre- Roman/early Roman iron industry – to the 1st century AD

There is some limited evidence for both the exploitation and processing of iron ore within the Forest of Dean Survey area during the later pre-Roman/early Roman periods, but it is not possible to determine the extent to which later Iron Age industries continued into the early Roman period.

5.2.1.1 Pre-Roman/early Roman extraction

It is clear that some ore was exploited from the eastern outcrops within the Carboniferous Limestones at this time and that this was exported outside Dean to Frocester and possibly other smelting sites east of the River Severn. A small scale processing industry at *Ariconium* may also have made use of ore from the same source during the late Iron Age/early Roman period (as it did during the 2nd and 3rd centuries AD), although this has not been established. The origin of the ore used at other possible late Iron Age processing sites in the area (e.g. the sites of the later villas at Hadnock, Monmouthshire and Huntsham, Herefordshire) is not known. It is also not known if the currency bars from Beckford (which are likely to have been made from Forest of Dean ore) were manufactured in the Forest, were made from

iron which had been exported from the Forest after the primary smelting and smithing process, or were the product of raw ore which had been exported outside the area.

There is not really enough available evidence to suggest the scale or organisation of the ore extraction industry at this time, although what industry existed may have been organised enough to export ore to outside markets for smelting elsewhere. It has been suggested that control of the iron ore resource may have been one of the roots of the economic prosperity of *Ariconium* at Weston under Penyard in Herefordshire during this period (Jackson forthcoming, 179). The known hillfort sites in the Forest of Dean are sited close to the outcrops of Carboniferous Limestone and around its edges. If it is postulated that these sites controlled territories of approximate equal size, their location would allow them to have more or less equal access to this resource, perhaps suggesting that the inhabitants of these sites, or their late Iron Age successors, managed the resource in some way and controlled its exploitation and distribution.

5.2.1.2 Pre-Roman/early Roman processing

Small quantities of processing waste (slag) have been found in association with transitional late Iron Age/early Roman pottery at Symonds Yat Hillfort, (Glos SMR 19; Hoyle 1997) and similar material (which cannot now be located) may have been found at the undated (but possibly Iron Age) promontory enclosure at Soudley (Glos SMR 444; Hoyle 2000). The scale of the industries represented by these finds is not clear, and the slags have not been examined to determine whether they represent smelting or smithing residues (see Historical Metallurgy Society 1996).

Bloomery slags associated with 1st century pottery have been reported as surface finds at Ruardean (Glos SMR 23501), and these may be indicative of a small-scale smelting site perhaps with its origins in the later Iron Age period. Both late Iron Age and 1st century AD pottery have also been recovered at Drybrook, Gloucestershire (Glos SMR 4371; Walters 1992b, 4), although the precise provenance of these finds is uncertain and it not clear how these relate to records of undated bloomery slag in the area (Glos SMR 23547).

A number of other 1st century sites have been identified, both within the Forest of Dean Survey area and its immediate vicinity (Walters 1992b, 45ff, Toby Catchpole, Gloucestershire County Council Archaeology Service pers. comm.). These sites are identified on the basis of slag found in association with 1st century AD pottery, and in many instances it has not been established whether the process involved was smelting or smithing. These sites are:-

- Aston Ingham, Herefordshire
- Dymock, Gloucestershire
- Great Crumbland, Trellech, Herefordshire
- Great Howle, Herefordshire
- Gwenherrion Farm, Welsh Newton, Herefordshire
- Huntley, Gloucestershire
- Hygga, Herefordshire
- Lords Wood, Herefordshire
- Lower Monkton, Herefordshire
- Sudbrook Camp, Monmouthshire
- Trellech, Monmouthshire

Walters also includes Coleford and Blakeney on his list of 1st century AD iron working sites (Walters 1992b, figure between pages 57 and 58), although there does not appear to be any evidence for this activity at these sites at that time.

In situ evidence for smelting, and smithing during this period has been found at:-

- *Ariconium*, Weston under Penyard, Herefordshire.
- Monmouth, Monmouthshire

The scale of the industry at Monmouth during this period is not known, and the evidence for smelting at *Ariconium* has recently been reviewed. The results of this work suggest that although the settlement itself is thought likely to have been "a centre of some economic importance" (Jackson forthcoming, 163), the evidence for the extent of smelting during this period suggests that it "is unlikely to have been on any great scale" (Jackson forthcoming, 179).

There are also two other sites where 1st century AD pottery is associated with evidence of secondary smithing. These are:-

- Hangerbury Hill, English Bicknor – Glos SMR 9623.
- Wonastow, Monmouthshire.

The scale, or any other details, of the activities being undertaken at many of these sites is not clear (although see *Ariconium* above). It is not known to what extent many of these sites were involved in smelting, secondary smithing, or both. Although it is not possible to determine, or even begin to suggest, the scale or organisation of the smelting or other processing industries on the basis of the available evidence, the number of sites would seem to suggest that many of these sites were small-scale, non-specialist processing sites where smelting or smithing was undertaken to meet an immediate local need rather than "specialist" processing centres.

5.2.2 The Romano-British iron industry

5.2.2.1 Imperial control of the iron industry

Earlier discussion of the Romano-British iron industry in the Forest of Dean has been dominated by the possibility that the Forest of Dean may have been an imperial estate dedicated to the extraction of iron ore during the Roman period, and it has also been suggested that the area was under the direct control of the Roman military during the 1st and 2nd centuries AD (Sindrey 1990; Walters 1992b). The basis of these theories requires examination as part of any discussion of the industry during that period.

In their discussion of the iron industry of the Weald, Cleere and Crossley state that the view that mineral resources were owned by the state during the early Roman Empire is "generally accepted" (Cleere & Crossley 1985, 66), and proceed to quote Davies who summarised this as "in the provinces…the Roman State usually took over those mines which had been Crown property at the time of the conquest, and perhaps all others known to exist" (Davies 1935, 3, quoted in Cleere & Crossley 1985, 66). It is not entirely clear to what extent this was widely applied and it may have been more of a convention than explicitly stated official procedure. In the 1st century AD, however, the emperor Vespasian may have instituted this as imperial policy when he established an extensive network of imperial estates which included the major metal producing regions (Rosrovtzeff 1957, 110).

Imperial control appears to have taken two forms. The first was direct control with the industry managed by the Roman military or a military agent. The second form was imperial responsibility for an industry but with the immediate administration in the hands of civilian entrepreneurs acting as concessionaires (Cleere & Crossley 1985, 66-67; Salway 1993, 442-443). The two forms of control are suggested by evidence of the British lead industry in the 1st century AD where lead pigs have been found which display an imperial stamp, whilst others have the stamps of private individuals. The potential complexity of the system is displayed in a lead ingot from Syde, Gloucestershire, which has both an imperial stamp and a secondary "private" stamp (Salway 1993, 442).

Cleere and Crossley have suggested that the two models may have co-existed in the Roman iron industry of the Weald in Kent where the eastern Weald may have been under the direct control of the Roman navy (the *Classis Britannica*), whilst the western Weald was managed by private individuals, although presumably within the

framework of government control (Cleere & Crossley 1985, 66-69.). The evidence for this is based largely on the incidence of ceramic roof tiles stamped with CL BR (the mark of the *Classis Britannica*) at four iron working sites in the eastern part of the Weald. This is also supported by a lack of evidence for urban settlements or villas within the whole of the iron working area. There is also a perceived difference in the focus of the iron working sites reflected by the road system which linked the western iron working sites (those under private control) along a north-south axis, whilst those to the east (under direct military control) were linked to the estuaries of the rivers Rother and Brede on the east coast (Cleere & Crossley 1985, 60-61, 69).

It may be possible to support a connection between the eastern iron industry of the Weald and the *Classis Britannica* (and hence the Roman military machine), although this close connection between the Roman navy and an industrial concern has no parallels in other parts of the empire (Cleere & Crossley 1985, 69), and there is no direct evidence that the iron industry of the western Weald was under any form of centralised control. Although "Free miners" operated on imperial estates in other provinces of the empire (Cleere & Crossley 1985, 69), the view that a similar system operated in the Weald is based on the assumption that the Roman administration would necessarily have taken overall responsibility for the administration of any mineral resource, and that a lack of evidence for direct military control inevitably indicates a structure of imperial organisation devolved to private concessions.

Even if the Wealden imperial estate model is accepted, it is not clear to what extent this can be applied to the Forest of Dean. The degree of imperial control of mineral resource areas appears to have varied across the empire and its application was based on a variety of factors, including the perceived value of the resource combined with local political and/or economic circumstance (Cleere & Cossley 1985, 66).

It is true that apparently significant smelting centres were in operation from the late 1st century AD at both *Ariconium* and Monmouth, and that ore from the Carboniferous Limestone outcrops in the Forest of Dean was being smelted at, at least, one of these (*Ariconium*, see above). Increased production at these centres may have been stimulated by an increased military need to support imperial expansion into Wales (Walters 1992b), or demands necessitated by the construction of Hadrian's Wall (Fulford and Allen 1992). A recent review of the evidence of the iron industry at *Ariconium*, however, has cast doubt on the evidence for direct military control of smelting operations, particularly the evidence for an early military fort overseeing operations, and the status of items of military equipment from the site (Jackson forthcoming, 180). Jackson suggests that 2nd century expansion may have been sustained by the requirements of a growing civilian market at emerging population centres such as Gloucester, Cirencester and Caerwent, or by a shortfall in civilian supplies caused by military demands absorbing supplies from other production centres (Jackson forthcoming 179).

Similarly, the interpretation of the well appointed 1st - 2nd century AD building at Blakeney (Glos SMR 18426) as the residence of an imperial official in charge of the empire's mining interests should be questioned as this interpretation is based on the assumption that an imperial official was in place who would have needed an appropriate residence.

The decline in the number of the sites where smelting (or other processing activities) had been taking place in the late Iron Age/early Roman period (see above) has also been taken as evidence of the Roman military taking direct control of the industry and closing down small-scale private concerns to allow resources to be concentrated on designated production centres (Walters 1992a, 1992b). This interpretation should also be treated with caution as very little is actually known about the precise date, or circumstances in which these sites fell out of use, or of their original status.

There appears to be no evidence for direct military control of the iron industry during the early Roman period, although it may have been under state control, but managed

by private individuals, operating under imperial licence. There is, however, no archaeological evidence to either validate or disprove this contention. There is, for example, no reason why local elite groups, who may have been controlling the industry and resource since the pre-Roman period (see above), did not simply continue to do so under the aegis of the new Roman administration, and indeed this model would be consistent with the Roman assimilation of local elites known from elsewhere in the empire. The ability to shed further light on this is outside the scope of this study, and would be partly dependant on a greater understanding of precisely how systems such as this were generally applied across the empire as a whole.

5.2.3 The Romano-British iron industry - later 1st – 4th century AD

The assumption that the Forest of Dean was a major producer of iron ore throughout the Romano-British period, and one of the two major iron producing areas during the 3rd and 4th centuries AD is cited in numerous general works on the Roman iron industry (Cleere & Crossley 1985; LUAU 1998, 9; Sim & Ridge 2002).

Some earlier commentators (e.g. Walters 1992a) have divided the Roman iron industry into neat and clearly defined parcels consisting of:-

- Late 1st – 2nd century expansion consisting of:-
  - Late 1st century Roman military centralisation of the industry at hugely productive regional processing centres, such as Monmouth, *Ariconium* and Whitchurch in Herefordshire.
  - Late 1st century closure of local production centres within the Forest of Dean survey area.
  - 2nd century expansion of the industry with smelting at the regional centres, and the development of new industrial towns at Newent, Coleford (Glos SMR 4929), and possibly Dymock.
  - A great increase in the output of ore extraction sites along the outcrops of the Carboniferous Limestones, in the 1st and 2nd centuries AD to meet increased demands of the expanding industry.
- Late 2nd century-early 3rd century decline including the demise of the industries in Monmouth, Whitchurch, *Ariconium* and Newent.
- Late 3rd century revival, with smelting concentrated at Villa sites with easy access to water communications.

In general this scenario corresponds to suggested developments in other sectors of the Roman economy, in which centralised 1st and 2nd century urban industries devolved into more dispersed industries centred on rural villas indicative of "…a transfer in the emphasis of activity from the cores of the *civitates* to their peripheries" (Millet 1990, 181). The available evidence for the Romano-British iron industry within the Forest of Dean would suggest that, whilst at a broad level this scenario can be supported, the details of the evolution of this industry, may have been more complex than this neat sequence would suggest.

5.2.3.1 Evidence for late 1st – early 2nd century expansion and centralisation

The lack of evidence for direct military control of the iron industry during the early Roman period is discussed above. There is, however, evidence of an expansion in smelting activity in the area from the late 1st – early 2nd century AD, with the sites at Monmouth, *Ariconium* and Whitchurch becoming significant centres, along with the development of new production centres at Newent, and perhaps Dymock in Gloucestershire (Walters 1992b, 151). Although the precise scale of these industries has not been established, a recent review of the evidence for smelting at Ariconium has suggested that earlier production estimates are likely to have been over estimated, and that the industry at *Ariconium,* although clearly significant, was not necessarily a full time industry, but may have been a specialist activity undertaken as part of the mixed economy of the settlement (Jackson forthcoming). As such, smelting may only have been undertaken when the labour force was not engaged in

other activities such as agriculture, and it may, therefore have been a seasonal activity.

Although ore from the eastern outcrops of the Carboniferous Limestones in the Forest of Dean was smelted at *Ariconium* (see above) it has not been established that this material was smelted at other sites, such as Monmouth, during this period, and these furnaces may have been supplied from other sources. There is insufficient evidence of the scale and duration of smelting activity, and the sources of the ores they used (information which can only be derived from detailed analysis of smelting residues) to allow ore requirements over specified timescales to be reliably calculated, and there is little evidence to support the thesis that ore extraction from the outcrops of Carboniferous Limestone in the Forest of Dean would necessarily have been a large-scale, dedicated, full-time and centrally organised industry during the 2nd century AD.

The available evidence does support the view that many of the sites where smelting (or other processing activities) had been taking place in the late Iron Age/early Roman period ceased to operate from the late 1st century AD. Very little is known about the status of these sites, or the precise date in which they fell out of use, and this cannot be used to support a view that they were deliberately closed down as part of a late 1st – 2nd century AD centralisation of the iron industry under direct military control (Walters 1992b).

5.2.3.2 Discussion of other 2nd century AD sites

In addition to the above there are numerous 2nd century AD sites, which display evidence of either smelting or smithing, but which do not easily fit into the model of a centralised industry.

Although the actual status and precise date range of many of these sites is not clear (nor is it absolutely clear to what extent processing consisted of smelting, smithing or both on many of these sites) they do, broadly speaking, fall into the following three main categories:-

- Sites where smelting/smithing is associated with villas.
  A number of sites appear to be associated with villas, although the 2nd century date is early for activity associated with a villa site. In all of these cases the pottery evidence indicates that activity on the site itself continued into the later Roman period. Given this, it is not at all clear whether the 2nd century date actually relates to the smelting/smithing, or an earlier phase of activity on the same site pre-dating both the villa and the smelting/smithing activity. The sites which fall into this category within the Forest of Dean Survey area are:-
  - Boughspring Roman Villa (Glos SMR 20).
  - Stock Farm, Clearwell (Glos SMR 5611).
  - Holm Farm Lydney (Glos SMR 5138).
- Sites which may be associated with established settlement. The dating issues for these sites are identical to those outlined above and all display some evidence of continuing into the later Roman period. Although the evidence for the status of these sites is generally less clear, they are all associated with either recorded masonry structures or pottery suggesting relatively high status settlement. The sites which fall into this category within the Forest of Dean survey area are:-
  - Rodmore Farm (Glos SMR 4390).
  - Popes Hill, Littledean (Glos SMR 5179).
  - High Nash, Coleford (Glos SMR 4929).
- Sites with no indication of status. The following sites are known from surface scatters of artefacts and there is no indication of their status:-
  - Whitescroft, Awre (Glos SMR 9535).
  - Broom Hill, Blakeney (Glos SMR 23496).
  - Site to the north of Chestnuts Wood, Littledean (Glos SMR 6463).

The range and profile of these sites is almost identical to those within the survey area which have their origins in the 3rd century or later. These sites are:-

- Sites where smelting/smithing is associated with villas.
  - The Chesters, Woolaston (Glos SMR 16).
  - Park Farm, Lydney (Glos SMR 6377).
- Sites which appear to be associated with undiscovered villas, or some other form of established settlement.
  - Mill End, Blakeney (Glos SMR 17988).
- Sites with no indication of status.
  - Cherry Orchard Farm Newland (Glos SMR 5102).
  - Eastbach Court, English Bicknor (Glos SMR 9739).
  - Cow Meadow Farm, English Bicknor (Glos SMR 21290).
  - Slag finds south of Blakeney (Glos SMR 18404).

Given this, it would appear that although there seem to have been changes in the structure of the iron industry between the 2nd and 3rd centuries, these changes may only have affected the relatively large-scale production centres outside of the Forest of Dean survey area. Within the survey area it is less easy to identify a clear division between a boom and bust economy of the 2nd to early 3rd century, and an economic resurgence of the mid 3rd century, and some of these smelting/smithing sites could have been operational throughout the period.

5.2.3.3 Smelting at villas in the 3rd – 4th century AD

The emergence of iron processing associated with rural villas is a clear development during this period, and these sites can be identified, not only within the Forest of Dean Survey area, but also at other villa sites in the region such as Huntsham, Herefordshire and Hadnock, Monmouthshire.

It is not the purpose of this report to enter into a discussion of the social and economic basis of the villa economy, but any analysis of the significance of smelting activity on these sites must be informed by the understanding that villas were essentially the centre of working estates, and that although the economic basis of these estates was generally farming (both agricultural and pastoral), they operated on the basis of a mixed economy which could include other "industrial" activities where resources and need allowed (Branigan 1989, 42).

Iron working is the most commonly recorded industrial activity associated with villa sites, although, as the production and maintenance of iron items would have been an important aspect of any agricultural estate, care must be taken in assuming that all evidence of smelting or smithing is necessarily indicative of a commercial enterprise (Branigan 1989, 47).

However, at The Chesters, Woolaston, (Glos SMR 16) the total area of industrial activity was estimated at *c.* 7,250m^2, and the configuration and concentration of furnaces within the excavated area, together with a lack of forging residues on the site, has been interpreted as evidence of "a highly organised enterprise" dedicated to smelting, with the bloom iron (estimated at between 62 and 180 tonnes during the life of the operation) transported to another part of the site for forging into billets (Fulford and Allen 1992, 205). The scale of this operation and its level of organisation suggests an organised industrial concern rather than a domestic operation in which tools and equipment were manufactured or repaired as required, and the evidence from the Chesters can be interpreted as an industry which would have contributed to the villa's economic basis.

The relative value of activity to the overall economy of the villa is difficult to discern, but Branigan's third level of specialisation in which "an unusual level of local supply of, or demand for, a product stimulated the development of one particular element of a broad-based market economy" (Branigan 1989, 49) would seem a likely model. In this scenario iron smelting would have been a significant "side-line", but not one on which the whole economic basis of the villa rested. Thus, smelting/smithing at these sites should be seen as just one of a whole range of activities, which may have

supported the economy of the villas in Dean. It is unlikely that these villas would have been established as iron processing sites, but are likely to have adopted this as a lucrative addition to an already established economy.

Evidence from The Chesters, Woolaston (Glos SMR 16), the only one of these sites which has been subjected to modern excavation, supports this. At this site the smelting activity has been identified as a 3rd century AD industrial activity associated with a villa, the earliest phase of which dated to the preceding century (Glos SMR 16). Given this, it is possible that other sites, where the pottery sequence suggests occupation from the 2nd century AD into the later Roman period may have been occupied from the 2nd century AD but did not become iron processing sites until a later period. It has, for example, been suggested that the smelting/smithing at Boughspring (Glos SMR 20), may even post-date the occupation of the villa whose pottery sequence ranges from the 2nd – 4th centuries AD (Pulliner 1991).

It is extremely difficult to categorically date the introduction of smelting/smithing to these sites with any degree of certainty, and accordingly it is difficult to identify this as indicative of a late 3rd century renaissance in a declining iron industry.

5.2.3.4 Location of villa sites during the 3rd- 4th century AD

Many of the villa sites (in fact many of the recognised processing sites during this period) are located within *c.* 4km of either the Rivers Severn or Wye, prompting considerable discussion about the axial role these rivers may have had in the distribution of iron outside of the region (see for example Fulford and Allen 1992, 205). Whilst this may be true, proximity to the Rivers Wye or Severn is actually a product of being sited within the Forest of Dean. The general distribution of known sites from the Roman period, and indeed any other period prior to the expansion of industrialisation of the region in the post-medieval period, places them outside the central block of woodland which characterises the Forest of Dean, and which is the land currently owned and managed by the Forestry Commission (Hoyle 2001b), and all sites outside this area are within *c.* 4km of the Rivers Severn or Wye.

The lack of known archaeological sites within this large central area of woodland is currently thought to be a product of a lack of research rather than a reflection of the actual distribution of sites (Hoyle 2001b). Accordingly the possible smelting sites known from within the central Forest area (e.g. Broom Hill, Blakeney - Glos SMR 23496) may be atypical only in so far as they have been discovered, and considerable care should be taken in any assessment of the significance of the distribution of known sites.

It is however true that a number of the sites recognised from this period, and particularly the villa sites at Boughspring (Glos SMR 20), Park Farm, Lydney (Glos SMR 6377) and Chesters, Woolaston (Glos SMR 16), are sited close to the River Severn, and are likely to have used this as a distribution route, whilst others outside the area (e.g. Huntsham, Herefordshire and Hadnock, Monmouthshire) are close to the River Wye. It is, however, difficult to see these sites being deliberately sited with available river access to ensure easy transportation of items associated with their role as iron production centres. It has already been stated that iron production is unlikely to have been the main economic impetus for these sites, and many may already have been at their present location before diversification into iron production was introduced. Consequently, although access to river transportation may have been exploited as a means of importing or exporting products associated with iron smelting, and it may even have contributed to the success of this as a commercial "side line", the siting of smelting/smithing sites at this period may owe more to the presence of villas or small settlements which were already economically viable units, and which were sited within easy access of the resources required for this process (principally charcoal), than to a deliberate exploitation of communication links.

5.2.3.5 Scale of 3rd – 4th century AD industry

Apart from the villa sites there are a number of other sites where smelting or smithing appears to have been taking place during the later Roman period (see above), but which are much less well understood in terms of their size, possible output, and social and economic basis.

The available evidence does not necessarily support the view that the shift from centralised to dispersed production centres from the 2nd century AD represents "a rise in the exploitation of the Forest of Dean ores" to exploit markets opened up by the decline of the Wealden trade, or to take advantage of the opening up of the western sea board as a trading route to military garrisons in the north, as suggested by Fulford and Allen (Fulford and Allen 1992, 205). The dispersal of production could just as easily represent a decline in the industry, perhaps caused by the removal of large military markets, and the cessation of significant urban expansion. The iron industry at this time may have diminished to become an aspect of the local economy, undertaken at local production centres, as part of a mixed economy, to supply local markets.

As with the late Iron Age/early Roman evidence for smelting within the survey area, the currently available data are inadequate to allow for clearly supportable theories to be put forward. The precise status, date, and activity being undertaken on these sites is generally not well understood, and their output (i.e. the scale of the industry), economic basis and organisation is also obscure. Although the scale of production at The Chesters, Woolaston (see above), and the access this site had to the River Severn, suggests some level of export capability, the area in which goods were disseminated from this site cannot currently be determined, and it cannot be assumed that similar production, or distribution levels applied to all, or most Forest of Dean sites during this period.

5.2.4 The post-Roman iron industry

There has been considerably less discussion of the archaeological evidence for the iron smelting industry dating to the post-Roman period, and discussion of the industry during this period has tended to be based on the available historical information (see for example Hart 1971, Jurica 1992b).

5.2.4.1 The early medieval period: Pre-Norman conquest

Virtually nothing is known about the scale or organisation of this industry between the end of the Roman period at the beginning of the 5th century AD, and the Norman conquest of 1066.

The fact that smelting was taking place during the latter part of this period is attested by the Domesday survey of 1086, which records that the tenants of Alvington paid a rent of "20 blooms of iron and 8 sesters of honey" (Moore 1982). Although this is the only direct reference to smelting in the area, the "36 measures of iron and 100 rods of iron drawn out for nailmaking" which were sent to Gloucester at this time are generally assumed to be derived from Forest of Dean ore (Walker 1976, 110).

The ores from the Carboniferous Limestones of the Forest of Dean are not known to be the source of ore for either of the activities recorded above, and in fact there is no reference for ore extraction at all from this source as the mineral resources of the Forest of Dean are not recorded at all in Domesday (Hart 1971).

5.2.4.2 The later medieval period: post Norman Conquest

The extraction industry after the Norman Conquest

Historical records attest to both mining and smelting in the Forest of Dean from the 12th century. Records are more numerous from the 13th and 14th centuries, although clear archaeological evidence is lacking.

During this period the rights of free miners were ratified and it is assumed that extraction was in the hands of small-scale private individuals working under licence from the crown. Very little appears to have been recorded about the processes or scale of mining activity during much of this period, or to what extent it was a full time occupation.

The rights of the free miners of the Forest of Dean (a complex subject in its own right) appear to have limited mining operations to the Hundred of St Briavels (with the exception of private gardens, orchards and curtelages - Hart 2002, 513). The extent to which this was enforced at various periods is not clear, although in 1287 the Abbot of Flaxley objected to free miners operating on monastic land at *Ardlonde* (near Littledean), which is outside of the Hundred of St Briavels (Hart 2002, 513).

The Hundred of St Briavels does not encompass all the outcrops of the Carboniferous Limestone and the scowles recorded within Lydney Park to the north-west of Lydney, are outside this area. Mines in Lydney Park are known to have been worked for iron by the Earl of Warwick (the landowner) rather than free miners in 1282 (Wildgoose 1993, 108), although the scale of operations, the type of mining employed (surface extraction from scowles, bell pits or subterranean mining), the precise location of the workings of this date, or the eventual destination of the ore is not known.

The Crown may also have been able to grant rights to the Forest's mineral resources to non-miners. The Abbot and convent of Tintern were entitled to take iron ore from the Forest for their forges and tithes of iron ore were paid to the Bishop of Llandaff (Hart 2002, 145). It is not, however, clear how this would have operated in practice, or exactly what resources were being exploited at this time.

The processing industry after the Norman Conquest

Much of the information concerning processing sites for this period is derived from documentary sources, either for processing operations, or for the production of charcoal, which was used as a fuel for both smelting and smithing. There is, however, little information on the actual scale or organisation of the industry during this period, and this is exacerbated by a lack of precision in the terms used in the documents, and it is not clear whether references to *fabricae, forgiae arrantes*, or *blissahis* indicate forges, smithies or bloomeries (Hart 1971, 4).

The use of the ore was carefully regulated by the crown, although unlike mining, this activity was not governed by customary right. Some furnaces were under the direct control of the Crown, and a number of these are recorded in the 13th century (Hart 1971, 4). Others were held by private individuals under licence from the Crown, or as a gifted concession to institutions such as Flaxley Abbey who were granted rights to work "any of my forges in demesne" by Henry II (Watkins 1985, 94). There was, however, considerable abuse of the system (Hart 2002, 146) and there are numerous references to illegal forges, which depleted the wood supply of the forest (for the production of charcoal) without official sanction (Hart 1971 5-8). The Eyre Roll of 1270 reported that "there are many itinerant forges and those who hold or have held them have done many evil things both concerning the tall trees as also the underwood, and also by debranching, so that by reason of these forges a great despoiling has been done to the forest" (Hart 1971).

The unregulated smelting and exploitation of the timber resource to produce charcoal prompted sporadic attempts at regulation and in 1217 the king ordered all private forges (with six exceptions) to be dismantled. Many of these were returned to their owners within three years, and by the middle of the 13th century between 25 and 30 forges were recorded, a figure which rose to 43 in 1270 and 60 in 1282 (Hart 1971, 6).

The historical evidence for the 12th–13th centuries suggests a picture of a number of "itinerant forges" many of them unregulated or operating in a "grey" semi-official capacity. The precise status of the "itinerant forge" is not clear and Hart has suggested that "itinerant" may refer to the operators rather than the furnaces themselves, indicating that they would have had to be "itinerant" in their search for charcoal or ore, which they then took to the permanent smelting site (Hart 1971, 4). This interpretation appears to be at odds with an instruction issued by the Crown in 1228, preventing the three Crown forges from moving about the Forest to preserve timber supplies (Hart 1971, 4), and it would seem more reasonable to interpret these as relatively temporary bloomery sites which were set up to exploit the charcoal resource in a particular area and then dismantled and moved on as charcoal became depleted.

One possible model is to see these itinerant forges as occupying semi-permanent sites, and operating in the following way:-

- Smelting took place at the site for as long as it took to deplete the charcoal produced from the woodland in the vicinity. It is not clear whether this timescale should be measured in weeks, months or even years, although it may have been long enough to warrant the construction of reasonably robust structures and stone surfaces.
- When the charcoal resource was depleted, the whole operation moved to a different, but already established site with a similar range of structures, in another part of the Forest. The structures at the first site would not necessarily have been dismantled.
- After a period of time in which the smelting and charcoal production operation will have re-located to a number of similar semi-permanent, and already established sites, it returned to the original site to take advantage of the timber resource which had by this time regenerated, and the whole process would have started again. Although the bloomery furnaces themselves would probably have, had to be re-built with each move, the associated structures, already on the site would have needed little re-furbishment.

Although the above model is entirely speculative and no sites of "itinerant forges" are known with any certainty in the Forest of Dean, there are African parallels for temporary smelting sites which are abandoned and re-used to tie-in with the cycle of charcoal production, and 13th – 14th century bloomeries at Coed y Brenig in Wales may have operated in this way (Chris Salter pers. comm.). Bloomeries which operated in this way should be located in the vicinity of identified areas of medieval charcoal production, and may have made use of levelled areas previously (and perhaps also subsequently) used for that purpose. This does not really help identify smelting sites as few charcoal platforms within the Forest of Dean have been dated with any certainty (Hoyle 2003).

The combination of charcoal platforms and surface finds of possible bloomery slag is known at:-

- Chestnuts Wood, Littledean (Glos SMR 5181, 5173, 6463, 22053)
- Welshbury Wood, Blaisdon (Glos SMR 22116).
- Broom Hill, Soudley (Glos SMR 23496).

The date of none of the charcoal platforms in these areas is clear, although Romano-British Pottery has been found in association with them at both Chestnuts Wood and Broom Hill. Both these sites, however, have also revealed flagged stone surfaces and other structural remains (either in the form of post holes or dry-stone walling) within

platform features which may be associated with medieval pottery (Scott-Garret 1956; Johns 1991). Given the apparently close association of both these sites with charcoal production, and the fact that they seem to be indicative of a similar activity, it is tempting to interpret both these as the sites of temporary “itinerant forges” (see above). The laying of a stone surface may seem like unnecessary effort for a temporary site, and it has already been stated, the actual timescale for smelting at individual sites is not known, although this level of input would be acceptable if there was a tendency to reuse the same smelting site on a cyclical basis as depleted areas of woodland regenerated and could be re-exploited for the production of charcoal.

It should be stressed, that the suggestion that these two sites do represent the sites of medieval “itinerant forges” is extremely tenuous and should be treated with considerable caution. Nor can it be assumed that relatively temporary bloomery sites would necessarily be associated with identifiable structural remains, such as stone floors.

Apart from the “itinerant forges” other systems of organising smelting appear to have been operative during this period.

There are references to both “large” and “small” furnaces in the reign of Edward III (1327-1377), perhaps differentiating between peripatetic woodland bloomeries (presumably the “small” furnaces) and more permanent smelting sites. All the sites where smelting activity from this period is either known or suspected, are either within or on the periphery of known medieval settlements, suggesting reasonably permanent sites determined by the geographical constraints of settlement, rather than “itinerant forges” which were moved around areas of woodland.

Given that none of the possible smelting sites known from this period within the Forest of Dean survey area is fully understood, and none of the sites of “itinerant forges” (with the possible exceptions of Broom Hill and Chestnuts Wood above) is known from the survey area (and the historical record would suggest they were very numerous) it is difficult to say anything categorical about how the two types of smelting operations related to each other in terms of date, output, economic significance, or specialisation.

A third category of “forge” referred to in the literature is the “great forge of the King” associated with St Briavels Castle (Glos SMR 15; Hart 1971, 4). This site appears to have been largely dedicated to the production of quarrels (cross bow bolt heads) for the Royal Armoury (Hart 2002), and thousands of these were produced at this site (Webb 2000, 53). This appears to have essentially been a large centre for secondary smithing and fabrication, and there are no records which specify that smelting was undertaken at this site, although it may have been a major consumer of unforged iron from the bloomery sites. It is not known precisely where this operation took place, and it may have been detached from the Castle itself. Iron slag, which may be the residue of secondary smithing, has been recorded in a field marked “Quarrel field” on the 1608 map (Glos SMR 23521; PRO 1608) and this may be the site where these objects were manufactured (Webb 2000, 56). Another field called “Quarrel” (Glos SMR 23522) was marked to the north of St Briavels on another 17th map of the area (GCRO 17th century), and may indicate another quarrel production site. However this field is marked “Worralls” on the 1608 map (PRO 1608), and so the interpretation is not clear.

Despite the lack of detailed archaeological information, it would appear that smelting within the Forest of Dean survey area during the later medieval period essentially fell into one of the following two categories:-

- Smelting taking place at the edges of, or within established communities. It is not currently possible to determine the scale of these industries (if indeed they do fall into a single class of activity), although it is tempting to view them as “cottage industries” filling a niche within the mixed economy of the settlement, mainly to meet the demands of local markets. Industrial activity at this level may have been

undertaken either seasonally or on a part time basis in combination with other activities, such as agriculture.

- An individually small-scale, but perhaps collectively large-scale industry in which ore was smelted at relatively temporary sites (the itinerant forges), which were moved around the wooded areas within the Forest of Dean (perhaps to established sites which were visited on a cyclical basis) following the availability of the charcoal supply. This industry must have been closely tied into the cycle of charcoal production, and may therefore have been undertaken on the same seasonal basis. Charcoal burning was generally undertaken in the summer and autumn months, although in some part of the country, or in some circumstances, it took place all year round (Armstrong 1978, 25). This may have been undertaken by specialist teams, which included both smelters and charcoal burners, a possibility supported by some of the named 13th century charcoal burners in the Forest of Dean also being recorded as owning forges (Armstong 1978, 13). Markets for iron produced in this way are not clear, although they may have supplied both government fabrication centres (St Briavels Castle) and local markets.

There are no references to "itinerant forges" during the latter part of this period and it may be that this practice did not continue much beyond the end of the 13th century. In 1436, 33 forges were recorded in Dean (14 in the bailiwick of Great Dean (Mitcheldean), two in Littledean, two in Ruardean, eleven in Newland, one in Lydney and three in unspecified locations (Hart 1971, 7) although the sites of none of these is known with any certainty.

Water-powered bloomeries, which may have appeared during the latter part of this period, would necessarily have been fixed structures located near suitable water sources. No sites of these are known for certain in the Forest of Dean although, at Yew Tree Cottage, Brockweir, stone built industrial features, which may represent the remains of wheel pits, have been found at a site where small quantities of possible bloomery slag have also been recovered (Glos SMR 22378) (see 4.2.4.5 above) .

5.2.4.3 The early post-medieval period

Very little is know about post-medieval bloomery smelting in the Forest of Dean, nor are there any details of the transition from bloomery to blast furnace smelting.

The only known sites are within the settlement at Lydney, and appear to represent a continuation of the state of affairs which pertained towards the end of the medieval period, although far too little is known to make any statements about the scale or organisation of the industry at this time.

6 Agenda for further archaeological research

6.1 Further archaeological research

The following research agenda has been identified as a result of the Scowles and Associated Iron Industry Survey.

This represents a short summary of key issues and research strategies. A more detailed research agenda and specifications for further archaeological research is set out in Appendix C.

6.1.1 Research agenda

1. What is the status of the full range of scowles identified by the survey?
2. What is the relationship between scowles of different forms?
3. What is the status of the gaps between visible scowles?
4. What is the origin of the iron ores smelted in the Forest of Dean and surrounding areas.
5. How extensive was the iron ore extraction industry in the area and how was it organised at different periods?
6. What is the status of smelting and smithing industries of different periods, and how do these relate to contemporary fuel production sites?
7. What changes in the technology of bloomery smelting, including early steel production, took place in the Forest of Dean over time, and how do technologically different sites relate to each other.

6.2 Strategies for further archaeological research

It is clear that not all elements of the research agenda set out in 6.1.1 above can be addressed in the short term and, whilst it is important not to lose sight of any of them, it is necessary to prioritise those which can be reasonably achieved.

The following identifies those research priorities, where strategies for further research can be envisaged. Details of these research strategies are set out in Appendix C.

6.2.1 Research agenda item 6.1.1/1

What is the status of the full range of scowles identified by the survey?

This investigates the following:-

- The extent to which identified scowles represent geomorphological, or humanly created features.
- The extent to which iron ore or ochre was extracted from scowles as surface exposures, and when this took place.
- The extent to which scowles acted principally as a conduit to subterranean iron ore or ochre deposits, and when this exploitation first occurred.

6.2.1.1 Recommended research strategies

- Detailed inspection and recording of exposed rock surfaces in scowle Forms 3, 4, 5 and 7, to differentiate surfaces which are clearly geological in origin from those which display evidence of physical ore extraction. This should be undertaken in conjunction with a specialist geologist.
- Where appropriate selected exposed rock surfaces in scowle Forms 3, 4, 5 and 7 should be subjected to scientific techniques, such as thin section analysis, Optically Stimulated Luminescence, or thermoluminesence dating to determine the extent to which these represent natural exposures or quarried faces.
- Where appropriate geophysical survey, trial excavation, the excavation of bore holes or auguring should be used to determine the form and depth of scowle Forms 1 and 2.

6.2.2 Research agenda item 6.1.1/2

What is the relationship between scowles of different forms?

Further research into this should be undertaken as part of the same operation as research into the status of recognised scowles (see 6.2.1 above)

6.2.2.1 Recommended research strategies

- Detailed survey of the physical form of all scowles within selected areas.
- Recording the topographical trends of the landscape of the survey area.
- Detailed recording of geological changes and landuse in areas selected for study. A specialist geologist and environmentalist should be consulted as part of this process.

6.2.3 Research agenda item 6.1.1/3

What is the status of gaps between scowles?

This issue is essentially investigating the extent to which these gaps represent the site of backfilled scowles, and should include investigation both of areas where historic landuse or other archaeological information suggests backfilled scowles may be present and where this is absent.

6.2.3.1 Recommended research strategies

- Where appropriate geophysical survey, trial excavation, the excavation of bore holes or auguring should be used to identify and determine the form and depth of backfilled scowles. Suitable specialist advice would be sought to determine the most appropriate methodologies to be adopted, and future projects would employ a specialist geologist as a consultant on geological formations.

6.2.4 Research agenda item 6.1.1/4

What is the origin of the iron ores smelted in the Forest of Dean and surrounding areas, how extensive was the iron ore extraction industry in the area and how was it organised at different periods?

This research question cannot easily be comprehensively addressed in the short term, although the issue is of vital importance to any understanding of the iron ore extraction industry in the area. The following should become a routine part of any archaeological activity in the area in which slag deposits or ore are anticipated

6.2.4.1 Recommended research strategies

- All finds of slag or ore from all archaeological investigation in the area should be retained.
- Ore samples should be submitted to a recognised specialist for appropriate analysis to determine the source of the ore. Advice should be sought from the recognised specialist to determine appropriate samples for this level of analysis and suitable analytical techniques.
- Where appropriate (see Appendix C.i.vi below) slag samples should be submitted to a recognised specialist for analysis to identify the ore source, or to contribute to a reference collection of slags from the area. Advice should be sought from the recognised specialist to determine appropriate samples for this level of analysis and suitable analytical techniques.

6.2.5 Research agenda item 6.1.1/5

What is the status of the smelting and smithing industries at different periods and how do these relate to contemporary fuel production sites?

These research questions cannot easily be comprehensively addressed in the short term, although they are of vital importance to any understanding of the iron ore extraction industry in the area.

The following methodologies would at least begin to clarify the validity of the existing dataset, and allow future research frameworks to be formulated based on a confident appreciation of the current state of knowledge.

6.2.5.1 Recommended research strategies

Future investigation should be undertaken in the following sequence, and at the end of each process, the collected evidence should be reviewed and decisions made about suitable sites to target with more intensive survey. Appropriate specialists should be involved at all stages of this process, both in the formulation of project designs and assessment of the results.

- Review of existing evidence for the location of smelting and smithing sites and also charcoal and coal production sites. This should focus on existing archives of surface artefact scatters which have slag finds.
- Systematic surface artefact collection, of both known and suspected sites.
- Rapid field reconnaissance in areas where charcoal production or surface coal extraction is expected.
- Other artefact collection strategies, such as streambed surveys (see Appendix C.ii.v) where possible.
- Further more detailed fieldwork using techniques such as geophysical survey, trial excavation or full excavation as appropriate on identified sites.

6.2.6 Research agenda item 6.1.1/6

What changes in the technology of bloomery smelting, including early steel production, took place in the Forest of Dean over time, and how do technologically different sites relate to each other.

This research question encompasses the following:-

- Investigation of differences between urban/suburban and rural smelting and smithing in different periods.
- Investigation of changes in the technology of bloomery smelting which took place in the Forest of Dean over time. This should be particularly targeted at:-
    - Identification of water-powered bloomery sites and their relationship to the sites of later charcoal-fired blast furnaces.
    - Identification of bloomeries in which steel was produced.

Although these research questions cannot easily be comprehensively addressed in the short term, they are material to an understanding of the smelting and smithing industries in the area, and all future research into these industries should take full account of them.

6.2.6.1 Recommended research strategies

Future research strategies should identify those sites where further more detailed research is likely to produce significant results. Detailed specifications for this are found in Appendix C.ii.x.

Selected sites should be subjected to the following:-

- Review of existing evidence, particularly archives of previous research on known sites.
- Systematic surface artefact collection, where appropriate.
- Other artefact collection strategies, such as streambed surveys (see Appendix C.ii.v), or rapid field survey of selected valleys (see Appendix C.ii.ix) as appropriate.

- Further, more detailed fieldwork on identified sites, using techniques such as geophysical survey, trial excavation or full excavation as appropriate on identified sites.

6.2.7 Outreach initiatives to investigate the location of metal working sites

In addition to further archaeological investigation targeted at identified research issues, it is recommended that an outreach project should be targeted towards engaging with members of the local community to collect information on the location of previously undiscovered iron smelting sites in their parish. Details of this proposal are set out in Appendix C.ii.xii, and it is anticipated that this should consist of small-scale research projects undertaken in conjunction with existing groups and conducted on a parish-by-parish basis.

7 Management issues and recommendations

7.1 Management recommendations for scowles

7.1.1 Statutory and non-statutory designations

7.1.1.1 Scheduled Ancient Monuments

3.9% of scowles are currently scheduled as ancient monuments under the terms of the Ancient Monuments and Archaeological Areas Act of 1979.

Only one area of scowles (Blakes Wood to the south of Staunton; Glos SMR 23838-39, 23842-50; SAM 28864-66) is currently scheduled whilst two other areas (Glos SMR 25229-32 and 25130) are scheduled by default as they lie within the scheduled areas of Lydney Park Iron Age hillfort and Roman Temple (SAM 28870), and the medieval tower keep castle and bailey on Little Camp Hill, Lydney (SAM 28869) respectively (see 7.1.3.5 below).

Details of currently scheduled scowles can be found in the project archive.

7.1.1.2 Sites of Special Scientific Interest

17.8% of recognised scowles are within Sites of Special Scientific Interest. Details of these can be found in the project archive. The majority of these are sited within SSSIs and have not been designated as scowles in their own right, although some, such as those at Devil's Chapel, Lydney are designated as bat sites, and their form, as scowles, is an intrinsic part of this designation (Charlotte Pagendam pers. comm.).

7.1.1.3 Key Wildlife Sites

27.3% of recognised scowles are designated as Key Wildlife Sites. Details of these can be found in the project archive.

7.1.1.4 Area of Outstanding Natural Beauty

16.3% of recognised scowles are within the Wye Valley Area of Outstanding Natural Beauty. Details of these can be found in the project archive.

7.1.2 Recommendations for the management of scowles

The aim of these management recommendations is to state the principles of management and management practices that should be applied to the scowles identified in the 2003-04 survey.

Full account should be taken, not only of the management needs of the scowles as features of archaeological significance, but also of their value as significant geological sites and areas with a high wildlife and conservation value, and all future management proposals should take account of these conservation interests.

Management statements compiled by Gloucestershire Geoconservation Trust and English Nature, in conjunction with Gloucestershire Wildlife Trust have been included in these recommendations which should:-

- List the archaeological, nature conservation and geological issues relating to the management of these sites.
- Summarise common management objectives.
- State management recommendations to maintain or enhance the archaeological, nature conservation and geological value of the scowles.

- Identify areas of potential conflict in proposed management regimes, and suggest a protocol for the precedence of management requirements.

7.1.3 Protocol for prioritisation of management options

The following is proposed:-

- Due regard should be taken of all statutory and non-statutory designations (whether ecological, geological or archaeological) before any management or research operations are undertaken.
- There should be a presumption against all operations, which impact on or disturb existing deposits, vegetation or other ground cover within scowles.
- Where such operations are proposed, for example to undertake further geological or archaeological research, or to clear scowles of recent infilling, methodologies should be discussed and agreed with representatives of all conservation agencies before any operations begin.
- Representatives of all conservation concerns should agree the details of all proactive management or research operations before any action is taken on site.
- There should be a presumption that the management requirements for each conservation concern should take precedence where a feature of particular interest relevant to that concern is identified. Thus:-
    - Where wildlife or botanical features of special interest or conservation value have been identified, no management or research operations shall be undertaken which may impact on these in any way, and nature conservation requirements should be presumed to take precedence over those of other agencies.
    - Where geological features of special interest or conservation value have been identified, no management or research operations shall be undertaken which may impact on these in any way, and geoconservation requirements should be presumed to take precedence over those of other agencies.
    - Where archaeological features of special interest or conservation value have been identified, no management or research operations shall be undertaken which may impact on these in any way, and archaeological requirements should be presumed to take precedence over those of other agencies.
- Where there is a conflict of management or research interest, representatives of all conservation concerns should meet to discuss management options and agree a regime, which balances the management requirements of all agencies.

7.1.3.1 Statement of geological management issues

Mark Campbell of Gloucestershire Geoconservation Trust has submitted the following statement of the way scowles should be managed to enhance and maintain their value as geologically significant features:-

Conservation value of scowles

The simplest way to consider scowles is as a habitat and not an outcrop in the normal geological conservation manner. This is partly because much of the overall value of scowles lies in the botanical interest and its detailed relationship with the rock types and structures, but also because the scowles represent a geomorphological past and present process, as well as a site for studying geological rock types, minerals and structures. The rock formations in the scowles offer huge scope for studying the complex processes that occurred during the mineral changes in the limestones as well as the many equally complex mineral exchanges that occur during the precipitation of the various types of iron ore. The access to the result of these processes is probably unique to the Forest of Dean. In geomorphological terms the sites allow an unusually deep insight into the whole area of limestone solution processes and its relationship with landforms and soils. In this respect they represent some of the richest conservation value sites in earth science conservation. The scowles are a mineralised type of Limestone Pavement, something that makes them

very rare in the British Isles and possibly much wider. This alone dictates that they require very high conservation status.

Threats and influences on scowles

Undoubtedly the main threat to the scowles at the moment is landfill/tipping. Whilst it is possible to "dig out " an old scowle, in reality this is unlikely to often happen. However should a site be illegally filled this would be the recommended course of action, since the original landform should be mostly still intact underneath. However by far the most damaging result of tipping is the results of the leachate (waters issuing from the waste and/or effects of circulating ground waters passing through the waste). As has already been described, the scowles represent "open plug holes" to a vast underground cave system that lies under the Forest of Dean. The scowles are the single, easiest way to lose fluids into what is essentially a closed hydrodynamic basin between the Severn and the Wye, underlain and overlain by far less permeable rocks. As a result they are one of the most dangerous places to put anything that might damage or harm the environment or affect watercourses.

The other threats to the scowles come from poor woodland management or intensive use. The scowles have developed and maintained their unique character from the shade they are kept in from old yew, holly and woodland cover. This is probably essential to their continued preservation. Once exposed to daylight, ground cover plants dominate so that the rocks become obscured and degraded. Where this occurs sheep and cattle should often then dominate to the detriment of the outcrops. Some scowles have recently suffered from off road vehicle courses. This has involved partial infilling and tree felling as well as breaking and erosion of the rock surfaces. Locally sites can suffer from domestication by gardeners and other private landowners.

The main threats to scowles can be set out in Table 49 *below:-*

Table 49: Recommended action for recognised threats to scowles

Threat	***Recommended action***
Natural Light	*Maintain woodland cover to exclude natural light (especially yew).*
Animal	*Ensure restricted access to larger agricultural animals.*
Human Infill	*Exclude all infill of any kind.*
Vehicle damage	*Information and advice should be offered to landowners who own scowles and who are allowing them to be damaged by vehicles.*
Agriculture	*All negative landuse changes to be kept to a minimum.*
Tourism	*Only minimal or positive development in scowle areas.*
Quarrying	*All quarrying should be excluded from scowle areas.*
Ignorance	*Positive help, and information should be offered to landowners who own scowles.*
Forestry	*Where scowles are wooded, owners should asked to retain the scowles as "ancient natural woodland".*

Proposed code of practice for managing scowles as geologically significant features

All significant scowles exposures should automatically be afforded RIGS status under the Gloucestershire RIGS group Red Site List. This in turn should almost invariably mean that they should become Key Wildlife Sites as laid down by the Gloucestershire Wildlife Trust. As yet no scowles have been nominated as SSSIs on geological grounds although their form is an intrinsic part of the SSSI designation of some scowles (see 7.1.1.2 above). It is also worth noting that almost without exception high

quality scowles sites should contain floral and faunal species and habitats that should gain KWS status on those grounds alone. It can easily be contended that as a habitat alone, scowles deserve automatic KWS listing

The following is a list of good practice for the management of scowles as geologically significant features:-

1. *Maintain and enhance all high forest species in a scowles environment.*
2. *Prevent all non-wild mammals from inhabiting or roaming scowles.*
3. *Reduce all brush/grass/ shrub species from scowles where this obscures significant geological exposures.*
4. *Prevent excessive build-up of moss ferns from vertical rock faces where these obscure significant geological exposures.*
5. *Protect and enhance all yew/holly trees in scowles.*
6. *Prevent all vehicle access to scowles environments.*
7. *Prohibit all disposal of alien material/waste/hardcore in scowles sites.*
8. *Prevent runoff of any watercourses not entirely natural in origin or of high quality.*
9. *Restore all discernible scowles sites to a high forest, cleared out state where viable.*
10. *Prevent quarrying in all areas adjacent to scowles or where they may affect the Hydrodynamic balance of scowles sites.*
11. *Prohibit any activity, which would damage the rock surfaces in a scowle.*
12. *All excavation/digging should only be conducted only after consultation with relevant archaeological /geological authorities.*
13. *All archaeological structures within scowles should be preserved in situ.*
14. *All discernible low quality scowles sites to be enhanced along the lines of points 1-8.*
15. *Where scowles have suffered deliberate neglect/damage, and where action to restore these sites can be taken (e.g. illegal tipping sites), remedial work should be undertaken to recover the habitat.*

7.1.3.2 Statement of nature conservation management issues

Charlotte Pagendam of English Nature and Colin Studholme of Gloucestershire Wildlife Trust have submitted the following statement of the way scowles should be managed to enhance and maintain their value as wildlife conservation habitats:-

Scowles: Management requirements for ecological conservation

The table below outlines the main management requirements for each of the principal habitat and species features believed to be significant in scowles within the Forest of Dean. It should be noted, however, that there is a significant degree of overlap between the requirements of these individual features, and a general management prescription to maintain their ecological value across the range of interests would be to maintain the natural habitat as it occurs rather than seek to remove or alter it greatly.

It is accepted however that there may be particular areas where the archaeological or geological significance of the scowles features may be high and the ecological interest of the features may be of less or minor significance.

Table 50: Management requirements for habitats in which scowles are found

Habitat/Species feature	*Management consideration/ requirements*
Woodland cover (particularly ancient semi-natural woodland with rich ground flora)	*Maintain characteristic tree and shrub cover and composition over and around scowles– management may be possible but nature of management (i.e. high forest versus coppice) and the intensity of management should depend on the presence of other interest features, which may have specific requirements in terms of humidity and shade.*
Lower plants (mosses and liverworts) and ferns	*These interest groups require high humidity and shade to be maintained via the retention of tree/shrub cover. Exposed rock faces may support particular species of conservation value, which may need to be considered when undertaking clearance of vegetation from faces for geological or archaeological study.*
Bats (all species but particularly lesser and greater horseshoe bats)	*Scowles often have access to underground mine workings, natural cave/tunnel systems or both, which are used by bats. These may be used all year round although largest numbers should be present between late September and April. Presence is often dictated by the weather conditions with bats moving both to and from underground sites and within them to seek optimal conditions. Scowles often also feature rock face exposures, which may also provide year round roosting locations for crevice dwelling bats. Woodland cover above scowles should therefore be retained as this is vital both for providing feeding areas, flight access but also for maintaining and regulating temperature and humidity regimes within the mine systems.*
Invertebrates	*Little is known about the invertebrate value of scowles but it is likely that scowles are an important habitat for a range of species, which favour shady and humid conditions. Some rare species such as cave spiders may also be present in cave and mine systems. Further research and evaluation of these interests is required.*

English Nature's objective for all sites is to retain the various characteristic plants and animals and their habitats. To achieve this a number of objectives for each site need to be met which involve the maintenance and, in some cases, enhancement of the qualifying features of the site. These can be either widespread or localised management needs and require both long-term and short-term prescriptions depending on the habitat or species concerned.

7.1.3.3 Statement of archaeological management issues

The following statement of archaeological management issues for scowles is based on the results of the 2003-04 survey. It sets out recommendations for the management of scowles to enhance and maintain their integrity as archaeological features:-

General archaeological value

Although the 2003-04 survey has questioned the precise status of some scowles, there is little doubt that many of the scowles categorised as forms 3, 4, and 5 have, to a greater or lesser extent, been modified by human iron ore extraction, and that some scowles in Forms 1, and 2 may be entirely archaeological in character, or represent

partly infilled archaeological features. Consequently, the assessment of the archaeological value of scowles put forward by Cranstone in 1994 (Cranstone 1994, 2), remains valid as a general statement. The following summary of the archaeological potential of scowles is based largely on Cranstone's summary with some slight modification to incorporate the results of the 2003-04 survey:-

- Scowles are a significant landscape feature in the Forest of Dean, Gloucestershire, and with the exception of a few broadly similar features in Lancashire and South Wales, are unique to the area (Hoyle 2001a). In recognition of their status, scowles within the Forest of Dean have been classified as "of great importance" in recent guidelines for the assessment of the value of archaeological sites in terms of their regional and national significance (Crossley 1992) and, in recognition of this, a section of scowles at Blakes Wood to the south of Staunton (Glos SMR 23838-39, 23842-50; SAM 28864-66) has been scheduled as nationally important ancient monuments under the terms of the Ancient Monuments and Archaeological Areas Act 1979.
- Although these features remain poorly understood in terms of the details of the processes through which they have been formed and their potential to contain archaeologically significant deposits or artefacts, it is clear that their preservation as a resource for future study is essential for a better understanding of these issues.
- Some scowles may contain evidence for extraction techniques, types of equipment used, the date range of extraction, and remains of communication links. Much of this information should be contained either within the stratified infill of the scowles, or the un-weathered rock faces protected by these infills.
- Individual scowles or groups of scowles are very difficult to date and there are no diagnostic criteria by which they can be dated simply on the basis of surface evidence. Their infill may contain a range of dateable artefacts, which could be used not only to date mining or other activity within individual scowles, but also to identify any correlation between the form of scowles and identified activities.
- In some areas, some scowles may contain the remains of features such as smithies, ore stores, and miners shelters preserved within the stratigraphic build up.
- Due to their location within limestone bedrocks, the infill of scowles is likely to be generally calcareous and well-drained, implying good preservation of environmental data in the form of animal bone, snail shells and other faunal evidence of past habitats. The preservation of plant remains, pollen, and other floral material is likely to be poor.
- The infill of some scowles may conceal the entrances to underground workings (I Standing pers. comm.). Any such entrances (even if currently infilled) are valuable in maintaining ventilation of any underground workings, which should have implications for the preservation of archaeological material relating to early subterranean mining.
- Evidence of other features relating to the early iron ore industry may also be found in association with scowles. This should encompass such features as communications routes, haulage features such as horse-gin circles, smithies, miners' shelters, the sites of bloomeries in which iron ore processing took place, or mounds of partly smelted ore indicative of on-site smelting. Where spoil heaps have been identified with some scowle forms, such features may be preserved on the undisturbed ground surface, buried beneath spoil although they may survive in the area, independent of this later protection.

7.1.3.4 General archaeological management

The general archaeological management strategy for scowles can be related to the landuses or damage factors identified. These are as follows:-

Woodland and scrub

The majority of scowles (68.5%) recorded in 2003-04 were under either woodland or scrub. Although there are archaeological management issues for sites under woodland, the actual impact of the trees themselves is not fully understood (see Hoyle 2001a, section 4.4). Woodland management operations, however will also pose a threat to archaeological remains (see Hoyle 2001a, section 4.4) and where the terrain makes access difficult (as is often the case with scowles), the processes of management operations may have greater potential to cause damage to archaeological remains than the inherent qualities of the woodland cover itself. Similarly, the woodland cover is the current ecological *status quo* on these sites and any operations, which may have an unforeseen impact on hydrology and drainage, could damage archaeological deposits.

Recommended action

- Woodland cover should be maintained where it currently exists, particularly where this is high forest and includes yew trees.
- Where possible, advice should be given to landowners to ensure that woodland management operations are undertaken in a manner which will not impact on the scowles in an adverse way. Detailed recommendations governing access arrangements and acceptable forestry operations would have to be determined on a case-by-case basis. In general, however, it is recommended that:-
    - Inappropriate forestry machinery should not be used in the vicinity of recognised scowles.
    - Care should be taken to ensure that vehicles avoid not only visible scowles, but also other earthwork features (e.g. old field boundaries, disused quarries, non-specific mounds or hollows), which may be of archaeological significance.
    - Vehicle access routes should enter and exit the area of scowles by the most direct route possible whilst avoiding visible earthworks.
    - Where potentially significant features cannot be avoided in forestry operations, brash mats, or some other appropriate prophylactic layer, should be laid to protect surfaces from vehicle damage
    - Continual re-use of precisely the same alignment within an agreed access route should, as far as is possible, be avoided in order to minimise surface erosion.
    - All woodland management operations should take place in dry conditions when the ground is firm.

Grassland

18.8% of scowles were recorded as under grassland in 2003-04. There are no management implications with this regime, and it is recommended that grassland should be maintained where this is the current landuse.

Recommended action

- Where possible, advice should be given to landowners to ensure that the grassland is maintained.

Mineral Extraction

Mineral extraction, i.e. quarrying was recorded as a landuse covering 12.2% of identified scowles. This was also identified as a threat/damage factor and recommendations mitigate the affects of this are set out below.

Other landuses

Other recorded landuses which affected scowles included:-

- Cultivated land.
- Garden.
- Orchard.
- Airfield.
- Thoroughfare.

In total these affected only 0.435% of identified scowles, and are considered to be insignificant in terms the management of these features.

Recommended action

- Where possible scowles should be afforded protected status to prevent damage of this nature. All landowners should be notified of the protected status of the scowles in their ownership, provided with definitive maps indicating the limits of the protected area and advised of the implications of protection and, in particular, of their responsibilities towards the scowles in their ownership.
- All identified scowles have been added to the County Sites and Monuments Record, as part of the 2003-04 survey. This should ensure that recognised scowles are considered in any decisions to determine future planning applications for development. Where scowles have been recognised, no further development should be permitted which will either impact on them directly or adversely compromise their setting.
- Where it is not possible to limit potentially damaging operations through the planning process information and advice should be given to all landowners setting out:-
    - The archaeological, geological and ecological value of scowles.
    - General advice on how these features would benefit from sympathetic management.

Dumping

Discernable dumping affected 17.1% of scowles. Broadly speaking, this fell into two categories:-

Fly tipping

This consists of the piecemeal dumping of domestic rubbish, often disused domestic appliances or other detritus unsuitable for removal by council refuse collectors. This activity is essentially a piecemeal, illegal operation undertaken by people who do not necessarily own the scowles in question, and is extremely difficult to police. Although 59% of this fly tipping was classed as *slight* (the remaining 31.1% was classed as *moderate*) this does detract considerably from the visual appearance of these features. Much of this was recognised in areas where scowles are sited in the vicinity of existing settlement (such as Linegar Wood near Ruspidge, SO 3654 1180, and Plump Hill near Mitcheldean, SO 6620 1690).

Recommended action

- All detritus and rubbish should be removed from scowles.
- Where possible, information and advice should be given to all landowners setting out:-
    - The archaeological, geological and ecological value of scowles.
    - General advice on how these features would benefit from sympathetic management.

Deliberate infilling

A number of scowles are being deliberately backfilled. Although active infilling only affected a small area of scowles (0.9%) this activity may have been taking place for a considerable period of time. Large areas of scowle Form 1, which may indicate backfilled scowles represented 18.7% of recognised scowles. There were also a number of unexplained gaps in the sequence of scowles which may represent backfilled scowles.

Recommended action

- Where possible scowles should be afforded protected status to prevent damage of this nature. All landowners should be notified of the protected status of the scowles in their ownership, provided with definitive maps indicating the limits of the protected area and advised of the implications of protection and, in particular, of their responsibilities towards the scowles in their ownership.
- Where this operation is occurring illegally it should be stopped through the planning enforcement system.
- Where possible, information and advice should be given to all landowners setting out:-
    - The archaeological, geological and ecological value of scowles.
    - General advice on how these features would benefit from sympathetic management.
- Where planning consent has already been granted for this, all infilling should be carefully monitored to ensure that planning consent is not exceeded.
- No further consents for the infilling of any scowles should be granted through the planning system.
- The re-excavation of infilled features would not normally be seen as an archaeological priority, as the process of re-excavation may have a greater impact on the integrity of buried archaeological deposits than the effects of infilling. Careful consideration of the potential impact of re-excavation would be required where this is proposed.

Quarrying

14.9% of recorded scowles were recorded as being damaged by quarrying, which included 73.6% of scowles recorded as *scowles possible destroyed* indicating that mineral extraction, although not the most extensive cause of damage to scowles was the most significant in terms of their total destruction.

This reflects the fact that quarrying is an important industry in some parts of the survey area, especially where the Lower Dolomite of the Carboniferous Limestone Series can be easily won at the edge of the Forest of Dean syncline, where the iron ore bearing Crease Limestone outcrops (BGS 1974) and where scowles are commonly found.

The current Minerals Local Plan for Gloucestershire (GCC 2003) identifies the Lower Dolomite of the Forest of Dean as a *significant* resource, principally for the provision of aggregate, and it is proposed to meet future provision of this resource by the extension a number of existing quarries in the area (GCC 2003, 85-96).

Recommended action

- No permissions for new quarrying should be allowed where these will affect known scowles or areas within the Carboniferous Limestone outcrops where scowles may have been backfilled.
- Where existing quarries are scheduled to extend into parts of the Carboniferous Limestone outcrops where there are no known scowles, and where there is no suggestion that scowles may have been backfilled, these areas should be subject to archaeological evaluation in line with normal archaeological procedure (IFA 2001).

Vehicle damage

The 2003-04 survey demonstrated that 7% of recognised scowles were suffering from vehicle erosion. This damage took two forms:-

- Damage from forestry operations: This encompassed the bulk of the damage, affecting *c.* 4.7% of recognised. This type of damage tended to be categorised as *slight*.
- Damage from recreational vehicle use where scowles are incorporated into off road vehicle courses. Not only does this result in erosion of the scowles' surfaces but also includes the partial infilling of some scowles and tree removal to improve vehicle access. Although this type of damage only affected *c.* 0.4% of scowles, it was classed as *moderate*, and all scowles suffering from this are in private ownership.

Recommended Action

- Where scowles are being damaged by vehicles undertaking forestry operations the recommended action is encompassed in the recommendations for woodland management set out above.
- Where scowles are being damaged by recreational vehicle use:-
    - Where possible scowles should be afforded protected status to prevent damage of this nature. All landowners should be notified of the protected status of the scowles in their ownership, provided with definitive maps indicating the limits of the protected area and advised of the implications of protection and, in particular, of their responsibilities towards the scowles in their ownership.
    - Where this operation is occurring illegally, without planning consent, it should be stopped through the planning enforcement system.
    - Where planning consent has been granted for this, the situation should be carefully monitored to ensure that planning consent is not exceeded.
    - No further consents for any use of scowles, which would expose them to possible vehicle damage, should be granted through the planning system.
    - Where it is not possible to afford scowles statutory protection, or protect them through the planning process, all landowners should be provided with information and advice on
        - The archaeological, geological and ecological value of scowles.
        - General advice on how these features would benefit from sympathetic management.

Housing and other development

Although only 0.2% of recognised scowles was designated the landuse *built over*, the survey made no attempt to quantify the extent of scowles which may have been destroyed by housing development.

Historically, there has been little occupation within the Statutory Forest with settlements growing up around its edges, the industrial development of the post-medieval period led to rapid population growth, particularly in the 19th century. Many of the existing settlements expanded at this time, and some new settlements were founded. This settlement has developed into an almost continuous ring of occupation, which ranges from the fully urbanised, through sprawling hamlets to dispersed settlement of haphazardly positioned cottages at the edge of, and encroaching into, the Statutory Forest (GCCAS 2004).

Although settlement has tended to respect the areas in which scowles are found, it has encroached into this area in the following places, which should be considered particularly vulnerable to housing development:-

- In the northern part of the area settlements such as Lydbrook, Ruardean and Drybrook either span or are contiguous with the outcrops of Carboniferous Limestone.

- The ring of variably dispersed settlement around the Statutory Forest crosses the eastern outcrops of Carboniferous Limestone between Cinderford and Upper Soudley.

Where scowles are relatively shallow features (e.g. scowle Form 1), these are at a high risk of destruction or damage from housing development.

Although the above areas can be identified as at particular risk from encroaching housing development, many of the scowles are within *c.* 1km of existing settlement and, therefore, expanding housing development to meet the needs of a growing population should be considered to be a potential risk to all scowles.

Scowles are also at risk from less direct consequences of encroaching development, these are:-

- Potentially damaging changes in hydrology or drainage patterns resulting from development in the vicinity of scowles, which may have an adverse impact on surviving archaeological deposits.
- Housing or other development in the immediate vicinity of scowles may compromise their setting and visual impact.
- Scowles in the immediate vicinity of populated areas may be at greater risk from fly tipping or recreational vehicle erosion (see above), and consequently development in the vicinity of these features should not be encouraged.

Monitoring of planning applications will not necessarily identify all types of development, which may have a detrimental affect on identified scowles. Permitted development, which does not require planning permission, is likely to be a problem in the vicinity of domestic houses where householders may construct small extensions, sheds, garages, drives or patios. Certain agricultural buildings are also not subject to normal planning constraints, and some activities associated with development, such as dumping, equipment storage or access for heavy plant, may also have a detrimental effect on recognised scowles.

Recommended action

- Where possible scowles should be afforded protected status to prevent damage of this nature. All landowners should be notified of the protected status of the scowle in their ownership, provided with definitive maps indicating the limits of the protected area and advised of the implications of protection and, in particular, of their responsibilities towards the scowles in their ownership.
- As identified scowles have been added to the County Sites and Monuments Record, as part of the 2003-04 survey, this should ensure that recognised scowles are considered in any decisions to determine future planning applications for development. Where scowles have been recognised, no development should be permitted which will either impact on them directly or adversely compromise their setting.
- Archaeological staff advising local planning authorities, however, should be fully aware of the limitations of this information particularly in areas where possibly backfilled scowles are no longer visible as surface features. Development control decisions should take full account of the possibility that unrecognised, infilled scowles or other features which may relate to the extraction of iron ore either from or through scowles, may be found in close proximity to recognised scowles. Such areas should be subject to archaeological evaluation before planning applications are determined.
- Consideration should also be given to:-
    - Potentially damaging changes in hydrology or drainage patterns, which may result from housing, or other development in the vicinity of scowles.
    - The possibility that scowles may be at greater risk from fly tipping or other damage where they are sited close to centres of population.
    - Potential damage to recognised scowles in the vicinity of housing, which may be at greater risk from excavation work undertaken by utility companies servicing the properties.

- Where possible, information and advice should be given to all landowners setting out:-
  - The archaeological, geological and ecological value of scowles.
  - General advice on how these features would benefit from sympathetic management.

Animal burrowing

Animal burrowing was recorded as affecting 2.4% of recognised scowles in the 2003-04 survey.

Most of this erosion was classified as *slight* and no general archaeological recommendations are made to mitigate this.

Other recorded damage and threats

Other identified damage to scowles included:-
- Digging.
- Stock erosion.
- Storm damage.
- Vegetation.
- Visitor erosion.
- Other.

These accounted for only 1.05% of all recognised damage and threats factors identified as part of the 2003-04 survey, and it is not thought appropriate to make specific management recommendations to mitigate these.

Some of these could, however, become more significant if the current landuse or other circumstances, of some scowles were to change. Although it is not possible at this stage to be specific about management recommendations to address these threats, the following should be take into consideration:-
- Stock erosion: This might become problematic where protective woodland cover were diminished, and it is recommended that:-
  - Where possible scowles should be afforded statutory protection. All landowners should be notified of the protected status of the scowle in their ownership, provided with definitive maps indicating the limits of the protected area and advised of the implications of protection and, in particular, of their responsibilities towards the scowles in their ownership.
  - Recommendations to maintain woodland cover set out above, would help minimise potential stock erosion.
- Visitor erosion: This might increase where scowles are sited close to established visitor attractions or included in any future tourist initiatives, and it is recommended that:-
  - Where possible scowles should be afforded statutory protection. All landowners should be notified of the protected status of the scowle in their ownership, provided with definitive maps indicating the limits of the protected area and advised of the implications of protection and, in particular, of their responsibilities towards the scowles in their ownership.
  - Planning authorities should be fully aware of the potential threat of increased visitor numbers to some scowles, and make decisions regarding planning applications which would improve visitor access to scowles based on an understanding of the possible damage which increased visitor pressure could cause to them.

7.1.3.5 Recommendations for the protection and presentation of scowles

Recommendations for further scheduling of scowles

Only one area of scowles is currently scheduled as an ancient monument under the terms of the Ancient Monuments and Archaeological Areas Act of 1979.

The scheduling in this area (Blakes Wood to the south of Staunton; Glos SMR 23838-39, 23842-50; SAM 28864-66), is in need of some revision as it does not conform to the area of the scowles identified in the 2003-04 survey.

The scheduled scowles in Blakes Wood are not known to be of greater archaeological significance, to contain higher quality archaeological deposits, or to be of higher landscape value than many of the scowles of similar type identified in the 2003-04 survey.

Accordingly, it is recommended that the scheduling of scowles should be extended to include scowles identified by the 2003-04 survey.

At this stage, scheduling is not necessarily appropriate for all features recorded in 2003-04, as the status of many of these features is not fully understood. This particularly applies to those features recorded as

- Scowle Forms 1 and 2.
- Scowle Types *Scowle - Possible* and *Scowle - Possible Destroyed*.

Further research, however, may suggest that some scowles in these categories are suitable for scheduling.

Scheduling should, however, be considered for all those features recorded as both:-

- Scowle Forms 3, 4 and 5.
- Scowle Type *Scowle – Existing.*

As part of the re-scheduling of these scowles it is recommended that:-

- All householders and landowners should be notified of the scheduled status of the scowles in their ownership.
- They should be provided with definitive maps indicating the limits of the scheduled area.
- They should be advised of the implications of scheduling and, in particular, of their responsibilities towards the management of scowles and the works for which scheduled monument consent is required.

Recommendations for other statutory or non-statutory protection of scowles

It is beyond the scope of this report to make detailed recommendations for the extension of other statutory or non-statutory protections.

It however clear that extension of both geological protection, in the form of RIGS designation and ecological protection, in the form of SSSIs or Key Wildlife sites, is likely to be appropriate.

It is, however, recommended that wherever possible and appropriate, archaeological agencies should support any proposals to extend protection for these sites, and freely provide archaeological information, and particularly information on the location and form of identified scowles to assist other conservation agencies with proposals for further protection.

Recommendations for the enhancement of public presentation of scowles

Public presentation of recognised scowles is limited to the scowles in Puzzle Wood, Clearwell (Glos SMR 23892) which were converted into a scenic walk in the 19th century and are currently operated as a tourist attraction. The information which is provided to visitors to this site emphasises the interpretation that scowles are early open cast iron extraction sites which are entirely created by human ore extraction, and considerable emphasis is given to the possible Roman date of the features at Puzzle Wood. There is also no information to indicate that the Puzzle Wood scowles are part of a more extensive group of landscape features.

The potential problems which may be caused by inappropriate visitor access to these sites has already been discussed (see above), and many scowles are potentially hazardous environments. Accordingly, no recommendations are made to attract further visitors to scowles sites, however, the following recommendations are made to enhance public awareness of these features and promote an accurate appreciation of their origins and value as archaeological, geological and ecological sites:-

- A leaflet should be produced:-
  - This should state the archaeological, geological and ecological significance of scowles, and make broad recommendations for their management.
  - The leaflet should also summarise theories about the origin and exploitation of these features. This should include a brief discussion of the historical and archaeological evidence for the early iron industry in the Forest of Dean
  - The leaflet should be produced jointly by representatives of all agencies with a management and conservation interest in scowles.
  - The leaflet should be distributed to all landowners who own scowles.
  - The leaflet should also be distributed to selected locations, such as public libraries, where they may receive wider publicity.
- The Forest of Dean Archaeological Survey should continue to promote interest in and appreciation of scowles through their outreach work. This consists of:-
  - Workshops.
  - Production of a newsletter for wide distribution.
  - Presentations to the local media.
- Wherever appropriate accurate information about the value and origins of scowles should be included in all leaflets accompanying guided walks which may encompass areas in which scowles are found. All agencies with a conservation interest in these features should be invited to comment on the information contained in such material before publication and dissemination.
- It may be appropriate to provide information panels at selected locations where visitors already have access to scowles. These should explain:-
  - The significance of scowles as a landscape feature peculiar to the Forest of Dean.
  - The archaeological, geological and ecological value of scowles.
  - A summary of theories about the origin and exploitation of these features.
  - The necessity of managing scowles in a sympathetic manner.

7.2 Recommendations for the management of bloomery sites

The aim of these management recommendations is to state the principles of management and management practices that should be applied to the bloomery sites identified in the 2003-04 survey.

7.2.1 Management constraints for bloomeries

No bloomery sites within the Forest of Dean are designated as scheduled ancient monuments in their own right, although a number of these sites are within scheduled areas, and are therefore protected.

Six of these sites are scheduled on account of the fact that they are located within scheduled sites to which they may (or possibly may not) relate. In four of these cases the whole of the possible bloomery site falls within the scheduled area, the exceptions being The Chesters Roman Villa (Glos SMR 16) and Boughspring Roman Villa (Glos SMR 437), where the scheduled area is only partly coincident with the possible bloomery site.

Table 51: Scheduled bloomery sites

Glos SMR number	SAM number	Description
15	28862	English Bicknor castle
16	102	The Chesters Roman Villa, Woolaston
19	28861	Symonds Yat Iron Age Promontory Fort
25	28870	Lydney Park Iron Age hillfort and Roman Temple
437	32	Boughspring Roman Villa
444	59	Soudley Camp

A further two sites are partly scheduled simply on account of the fact that a scheduled ancient monument (in both cases this is a section of Offa's Dyke) runs through part of the areas designated as the possible bloomery site, but which may have no direct relationship to the site.

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Table 52: Bloomery sites within the scheduled areas of other sites

Glos SMR number	SAM number	Description
6033	33477	Madgetts Farm, Tidenham – The scheduling refers to a portion of Offa's Dyke
6237	33446	Pope's Grove, Tumps Hill, Redbrook – The scheduling refers to a portion of Offa's Dyke

In addition to the six sites that have incidental scheduled ancient monument status,

- 6 bloomery sites lie within Sites of Special Scientific Interest.
- 5 bloomery sites lie within Key Wildlife Sites.
- 36 bloomery sites lie within the Wye Valley Area of Outstanding Natural Beauty.

Further details of these sites can be found in the project archive.

7.2.2 Statement of archaeological management issues

The following statement of archaeological management issues for bloomery sites is based on the results of the 2003-04 survey.

7.2.2.1 General archaeological value

It is clear from the discussion (see4.2 above) that the precise status of many of the identified sites is currently unknown. Their nature, extent and archaeological potential cannot be quantified in any meaningful way, and it is not currently possible to categorise these sites based on an informed assessment of their archaeological value.

These sites do, however, have the potential to provide vital evidence of:-

- The operational processes of early smelting or smithing.
- The sources of ore utilised at various periods.
- The scale of both the extraction and processing industries at various periods.
- The inter-relationship of contemporary sites, and their relationship with patterns of settlement, communications and other industries, particularly charcoal production and coal extraction.

7.2.3 General archaeological management

The general archaeological management strategy for possible bloomery sites can be related to the landuses or damage factors identified. It is clear that the field survey stage of the 2003-04 project was limited to visiting those recognised sites within the Aggregates Resource Area, representing only 18.75% of the possible sites identified within the Forest of Dean Survey area and only 14.13% of the possible bloomery sites identified by the survey.

It is, however, assumed that this sample is representative of the general landuse and threats to known bloomery sites.

It should be noted that the bulk of the Aggregates Resource Area is outside the main block of woodland in the central Forest area (Figure 27).The proportion of visited sites under this landuse is, however, broadly representative of the landuse of known sites, the vast majority of which are not within this central wooded area.

7.2.3.1 Landuse

Grassland

Grassland was the most common landuse, with 40.5% of possible bloomery sites recoded under this regime in 2003-04. There are no management implications for possible bloomery sites under this landuse regime, and it is recommended that grassland should be maintained on all possible bloomery sites where this is the current landuse. It should be noted that these sites are particularly under threat from changes in agricultural policy, which may promote conversion of areas currently under pasture to arable.

Recommended action
Where possible, advice should be given to landowners to ensure that the grassland is maintained on these sites.

Woodland and scrub

27% of possible bloomery sites visited in 2003-04 were under either woodland or scrub. Although there are archaeological management issues for sites under woodland, the actual impact of the trees themselves is not fully understood (see Hoyle 2001a, section 4.4).

Woodland management operations, however, can also threaten archaeological deposits (see Hoyle 2001a, section 4.4). The processes of management operations can have a greater potential to cause damage to archaeological remains than the

woodland cover itself, and woodland clearance operations may have an unforeseen impact on hydrology and drainage and could damage archaeological deposits.

The following general recommendations are proposed for these sites:-

Recommended action

- Until the extent, date and degree of surviving deposits for sites currently under woodland is better understood, and there is a greater knowledge of the actual impact of woodland or scrub on individual sites, there are no recommendations for pro-active removal of woodland or scrub. Woodland cover should be maintained where it currently exists.
- Where possible, advice should be given to landowners to ensure that woodland management operations are undertaken in a manner which will not adversely affect known sites and buried archaeological deposits. Detailed recommendations governing access arrangements and acceptable forestry operations would have to be determined on a case-by-case basis. In general, however, it is recommended that:-
    - Inappropriate forestry machinery should not be used in the area of possible bloomery sites.
    - Care should be taken to ensure that vehicles avoid all visible features of possible archaeological significance, and also areas where below ground deposits are either known or suspected.
    - Where potentially significant features or areas of archaeological potential cannot be avoided in forestry operations, brash mats, or some other appropriate prophylactic layer, should be laid to protect surfaces from vehicle damage.
    - Vehicle access routes should enter and exit identified areas by the most direct route possible whilst avoiding visible earthworks.
    - Continual re-use of precisely the same alignment within an agreed access route should, as far as is possible, be avoided in order to minimise surface erosion.
- All woodland management operations should take place in dry conditions when the ground is firm.

Cultivated land

13.5% of possible bloomery sites were recorded as under cultivated land in 2003-04, although in only one site was this landuse recorded as causing *moderate* damage. Given the current lack of detailed knowledge of the extent, status and archaeological potential of many of these sites, it would not necessarily be appropriate to recommend that these were taken out of cultivation at the present time.

Excavations undertaken at Warfield Farm, Ruardean (Glos SMR 9875) in the 1960s, identified the remains of *in situ* bloomery bases and a feature interpreted as an ore-roasting hearth in conjunction with 13th century pottery. This site is reported to have been “deep ploughed” in the spring of 2003, with an apparently detrimental effect to what would have been surviving structural remains on the site (Blake J 2003b). It is clear therefore that ploughing, and particularly ploughing to a greater depth than that which has been practised in the past, is a threat to recognised possible bloomery sites and accordingly the following is recommended.

Recommended action

- Where significant below ground deposits are known to survive on sites either under cultivation or which may be converted from pasture to arable, these sites should be considered for scheduling under the terms outlined in 7.2.4.1 below.
- Where it is not possible to afford such sites statutory protection, all landowners should be provided with information and advice on:-
    - The archaeological value and potential of possible bloomery sites in their ownership.

- General advice on how these sites would benefit from sympathetic management with particular emphasis on the threat of deep ploughing or conversion from pasture to arable.

Housing and other development

8.1% of the possible bloomery sites which were visited as part of the survey, were designated the landuse “built over”, although the survey was not able to make any assessment of the extent to which possible bloomery sites may have been destroyed by housing development.

Bloomery sites in the vicinity of existing settlement can be regarded as at particular risk from encroaching housing development, although as all possible bloomery sites identified in the 2003-04 survey have been added to the Gloucestershire County Sites and Monuments Record, these should be afforded a degree of protection from any development for which planning permission is required. The monitoring of planning applications will not necessarily identify all types of development, which may have a detrimental affect on the possible bloomery sites. Permitted development, which does not require planning permission, is likely to be a problem in the vicinity of domestic houses where householders may construct small extensions, sheds, garages, drives or patios. Certain agricultural buildings are also not subject to normal planning constraints, and some activities associated with development, such as dumping, equipment storage or access for heavy plant, may also have a detrimental effect on recognised possible bloomery sites.

Recommended action

- Where significant remains of bloomery smelting or other metallurgical processes are known, these should be considered for scheduling under the terms outlined in 7.2.4.1 below. Where sites are scheduled, all landowners should be notified of the protected status of the sites in their ownership, provided with definitive maps indicating the limits of the protected area and advised of the implications of protection and, in particular, of their responsibilities towards the sites in their ownership.
- As identified possible bloomery sites have been added to the County Sites and Monuments Record, as part of the 2003-04 survey, this should ensure that they are considered in any decisions to determine future planning applications for development. Where these have been recognised, suitable constraints should be applied to development proposals to ensure that the sites are either preserved, or subject to appropriate archaeological investigation or recording in advance of development.
- Any possible bloomery sites identified in subsequent research should be added to the County Sites and Monuments Record as a matter of priority.
- Archaeological staff advising local planning authorities, however, should be fully aware of the limitations of SMR information, and particularly the limitation of defining the boundaries of identified sites on the basis of available evidence. Development control decisions should take full account of the possibility that unrecognised bloomery sites, or other features which may relate to the processing of iron ore, may be located in the area of known sites, and particular attention should be paid to development proposals in the vicinity of:-
  - Surface finds of bloomery slag.
  - Areas adjacent to roads where bloomery slag has been recorded (see below).
  - Evidence of charcoal production sites, particularly (but not exclusively) within the area of the Statutory Forest.

  These areas should be subject to archaeological evaluation before planning applications are determined.

Roads

8.1% (3 sites) of possible bloomery sites were designated a landuse of *thoroughfare.* All of these sites were known from records of bloomery slag discovered during road improvements and their precise status is not clear.

Recommended action

- As these sites have been added to the County Sites and Monuments Record, as part of the 2003-04 survey, this should ensure that they are considered in any decisions to determine future planning applications for development in the areas immediately adjacent to the roads where slag has been recorded (see above). Where these have been recognised, suitable constraints should be applied to development proposals to ensure that the sites are either preserved, or subject to appropriate archaeological investigation or recording in advance of development.
- Sites adjacent to roads may, however, be at threat from routine maintenance operations for which planning permission is not required. Gloucestershire County Archaeology Service should maintain communication links with the County Highways Department to ensure that they are forewarned of any road works, which may affect these sites.

Garden

One site was designated the landuse of Garden. This site may be at risk from:-

- Property extensions for which planning permission would be required.
- Permitted development for which planning permission is not required.
- Unsystematic exploratory excavation inspired by popular television programmes such as Time Team (e.g. Glos SMR 23517).

Recommended action

- Where significant remains of bloomery smelting or other metallurgical processes are known, these should be considered for scheduling under the terms outlined in 7.2.4.1 below. If sites are scheduled, all landowners should be notified of the protected status of the sites in their ownership, provided with definitive maps indicating the limits of the protected area and advised of the implications of protection and, in particular, of their responsibilities towards the sites in their ownership.
- As identified possible bloomery sites have been added to the County Sites and Monuments Record, as part of the 2003-04 survey, this should ensure that they are considered in any decisions to determine future planning applications for development. Where these have been recognised, suitable constraints should be applied to development proposals to ensure that the sites are either preserved, or subject to appropriate archaeological investigation or recording in advance of development.
- Where it is not possible to afford such sites statutory protection, all landowners should be provided with information and advice on
    - The archaeological value and potential of possible bloomery sites in their ownership.
    - General advice on how these sites would benefit from sympathetic management with particular emphasis on the threat of deep ploughing or conversion from pasture to arable.

7.2.3.2 Identified damage and threats

With the exception of cultivation, which is discussed above, damage was recorded as affecting only 3 of the sites visited during the 2003-04 survey.

Dumping

Discernable dumping was identified at one site (Glos SMR 23270) where damage was classed as severe. Bloomery slag had been found at this site, located *c.* 200 metres south-west of Bream Court Farm, and in the 2003 survey significant tipping / dumping of modern brick, rubble and metal was recorded.

Recommended action

- Where significant remains of bloomery smelting or other metallurgical processes are known, these should be considered for scheduling under the terms outlined in 7.2.4.1 below. Where sites are scheduled, all landowners should be notified of the protected status of the sites in their ownership, provided with definitive maps indicating the limits of the protected area and advised of the implications of protection and, in particular, of their responsibilities towards the sites in their ownership.
- Where it is not possible to afford such sites statutory protection, all landowners should be provided with information and advice on
    - The archaeological value and potential of possible bloomery sites in their ownership.
    - General advice on how these sites would benefit from sympathetic management with particular emphasis on the threat of deep ploughing or conversion from pasture to arable.
- Where dumping on these sites is being undertaken illegally, it should be halted through the normal processes of planning enforcement.
- Where planning consent has been granted for this, all dumping should be carefully monitored to ensure that planning consent is not exceeded.
- No further consents for dumping on recognised possible bloomery sites should be granted through the planning system.
- Development Control Officers should be aware of the limitations of SMR information to provide information on the precise location of these sites and should take full account of this in determining any future permissions for dumping in line with the specifications set out above.

Other damage

Stock erosion and vehicle damage were recorded as slight damage affecting one site each, although it is likely that these are more widespread across all the possible bloomery sites identified in the survey. Given the scale of the damage, it is not thought appropriate to make detailed recommendations to mitigate these at the present time, with the following exception.

Recommended action

- Where it is not possible to afford such sites statutory protection, all landowners should be provided with information and advice on
    - The archaeological value and potential of possible bloomery sites in their ownership.
    - General advice on how these sites would benefit from sympathetic management with particular emphasis on the threat of deep ploughing or conversion from pasture to arable.

7.2.4 Recommendations for the protection of possible bloomery sites

7.2.4.1 Recommendations for further scheduling of bloomery sites

It has already been stated that too little is currently known about the status, extent and potential archaeological value of many of the possible bloomery sites identified in the course of the 2003-04 survey to make informed recommendations for the scheduling of these sites, and the majority of the sites for which this may have been appropriate are already within, or partly within scheduled areas (see 7.2.1 above).

Recommended action

- Existing scheduling should be extended on the following sites to include the known areas of bloomery smelting:-
    - The Chesters Roman Villa, Woolaston, Glos SMR 16, SAM 102.
    - Boughspring Roman Villa, Glos SMR 437, SAM 9380. In the case of Boughspring, further research into the nature of any smelting activity is required, since all finds recorded at this site have been surface finds.

8 The outreach programme

8.1 Introduction

Throughout the project, the project team were committed to raising public awareness about both scowles and the survey. As the Scowles and Associated Iron Industry Survey was a daughter project of the Forest of Dean Archaeological Survey, the outreach programmes of the two projects were combined.

The following activities were specifically directed towards raising public awareness about the value of scowles:-

8.1.1 Public workshops about scowles

Two workshops were held to disseminate information to members of local historical and archaeological societies, independent researchers, and other interested individuals. Topics included:-

- The work carried out by the project team.
- The results of the Scowles and Associated Iron Industry Survey.
- Information about scowles derived from other archaeological research, particularly English Heritage's National Mapping Programme .
- Information about scowles derived from other disciplines, particularly geological research.

Feedback received demonstrated that the public found both workshops enjoyable, interesting and informative.

8.1.1.1 First Workshop

The first workshop, held at Bream Community Centre on Saturday 12th July 2003, was held in conjunction with English Heritage's National Mapping Programme team, who were in the final stages of their work on aerial photographic collections covering the Forest of Dean area.

This workshop began with a short presentation by Jon Hoyle about the survey of scowles and the results of the desk-based phase of the project. The theory that scowles were not entirely a product of human iron ore extraction but were geomorphological in origin was also introduced to workshop participants. This was followed by a presentation by Simon Crutchley of English Heritage about the history of using aerial photographs as a means of identifying archaeological sites, and the work of the National Mapping Programme at a national level. Following the presentations attendees split into three groups who rotated around three tables where the following was discussed:-

- The work of the National Mapping Programme.
- The processes by which National Mapping Programme teams use aerial photographs to identify archaeological sites, including a practical examination of aerial photographs and an introduction to the use of a stereoscope.
- The work undertaken by the Forest of Dean Archaeological Survey team as part of the Scowles and Associated Iron industry survey. This included examples of some of the sources used to locate scowles as part of the desk-based phase of the work. There was also an introduction to the methodological approaches to the field survey including a demonstration of the small hand-held computers, used by the project team during fieldwork.

Figure 23: The project team discuss map sources with members of the public at the first workshop at Bream Community Centre.

8.1.1.2 Second Workshop

The second workshop took place when the field survey phase of the scowles survey was complete. This workshop, also at Bream Community Centre, was held on Saturday 21st February 2004.

The first part of the workshop consisted of a presentation by Jon Hoyle, which discussed the fieldwork stage of the survey of scowles and bloomery sites. This included a summary of the results of the desk-based stage of the work. The presentation also included a summary of many of the management issues and recommendations concerning scowles, together with an indication of the areas and methodologies for further research.

Following the presentation, the workshop group made a field trip to visit the scowles at Devil's Chapel in Lydney Park (Glos SMR 23984). Mark Campbell, a geologist from Gloucestershire Geoconservation Trust, led the field trip and explained the geomorphological origin of these scowles. Jon Hoyle also talked about what archaeological evidence was known about iron ore exploitation from the area of Lydney Park.

Figure 24: Mark Campbell of Gloucestershire Geoconservation Trust explains the geological formation of scowles at the second workshop in Lydney Park.

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8.1.2 Exhibition

In order to reach a wider audience, the Forest of Dean Archaeological Survey team produced a travelling exhibition for communities living in the Forest of Dean. The exhibition demonstrates the work of the Forest of Dean Archaeological Survey, and its daughter project, the Scowles and Associated Iron Industry Survey. One of the boards is dedicated to scowles, explaining their origin and stating their value as archaeological, geological and ecological features.

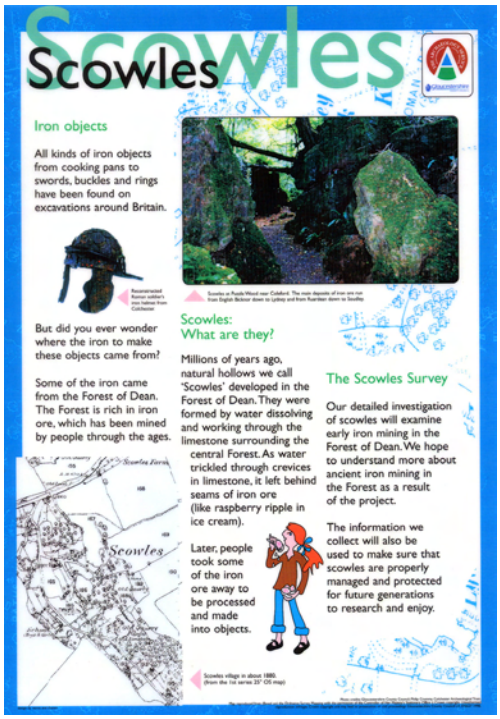


Figure 25: Scowles exhibition board

Copyright: Gloucestershire County Council 2004.

8.1.3 Newsletter

The Forest of Dean Archaeological Survey produced a biennial newsletter about the work of the project. Aimed at attracting new audiences, the newsletter was bright and colourful and was distributed to pubs, shops and cafes, as well as the more usual outlets of libraries, tourist information centres and museums. Demand for the newsletters proved to be exceptionally high, and all the feedback received was extremely positive.

The second newsletter, which came out in July 2003, featured a front page article about the Scowles and Associated Iron Industry Survey. The article also summarised the importance and origin of scowles.

The newsletter can be viewed on the project website at

http://www.gloucestershire.gov.uk/archaeology/fod/

8.1.4 Website

Summary information about the survey and scowles has been posted on the Forest of Dean Archaeological Survey's website at:-

http://www.gloucestershire.gov.uk/archaeology/fod/

8.1.5 Scowles information sheet for landowners

As part of the field survey the project team produced an information-sheet about scowles and the early iron industry, together with details about the aims of the field survey and contact details for the survey.

This information sheet was distributed to all landowners in the area as part of the project team's commitment to develop a closer working relationship with landowners in the Forest of Dean.

The information sheet is reproduced as Appendix Y.

8.1.6 Presentations and radio interviews.

Throughout the Scowles survey, information has been presented to the public through general talks about the work of the Forest of Dean Archaeological Survey. This has included:-

- A number of talks to local history societies and the University of the 3rd Age.
- Forest of Dean Community Radio as part of their History Half Hour to which Jon Hoyle is a regular contributor.
- BBC Radio Gloucestershire's "Country Matters" programme which broadcast a feature on scowles in the Forest of Dean based around an interview with Jon Hoyle.

Figure 26: Jon Hoyle talking to the Forest of Dean branch of the University of the Third Age at Lydney Library.

8.1.7 Summary

Throughout the project the survey team has, through a wide and varied programme, shared their research into scowles and the associated iron industry with the wider community in order to help to bring about a better understanding and appreciation of not just the significance of scowles, but of the wider value of archaeology in the Forest of Dean as a whole.

9 Figures

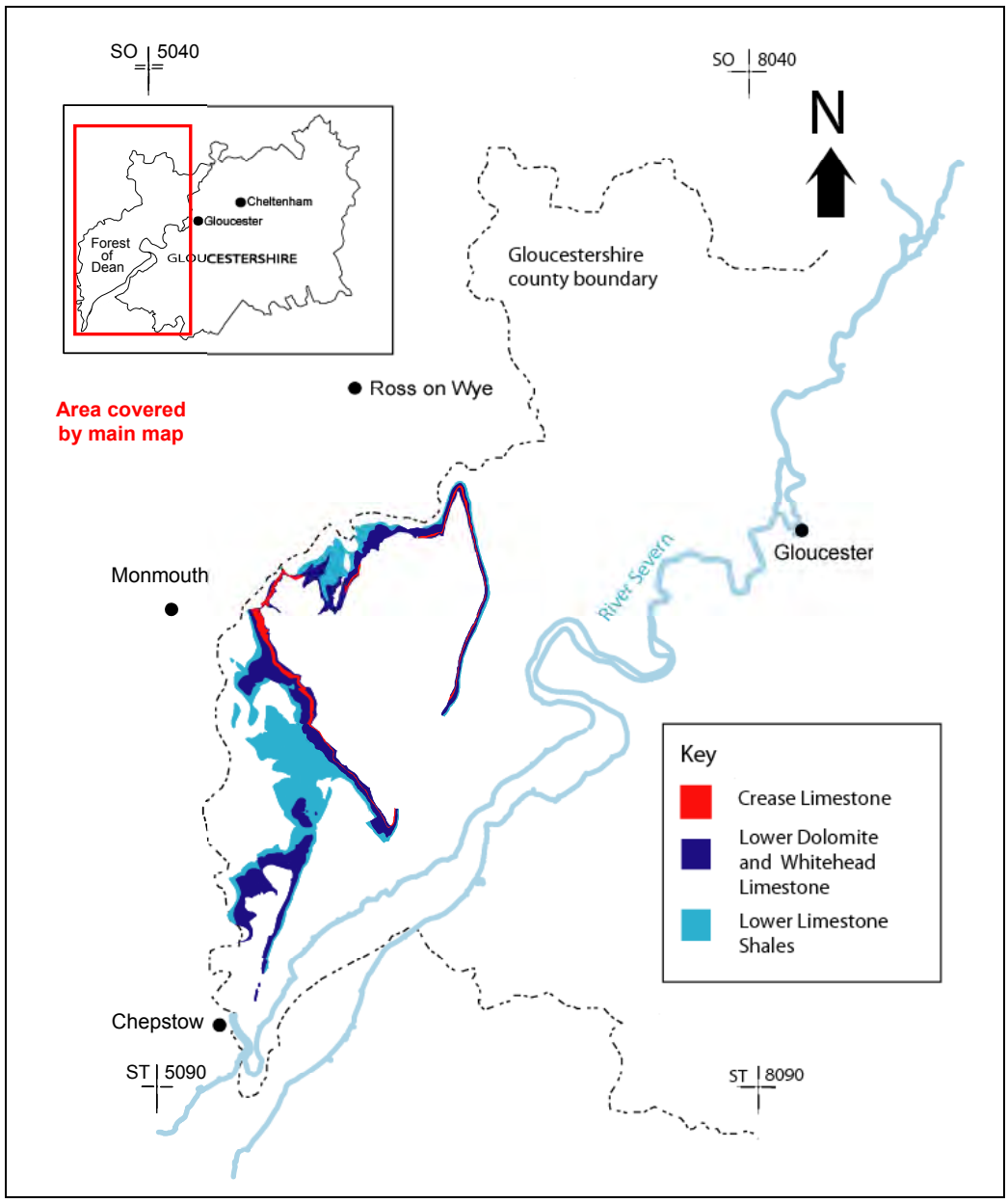
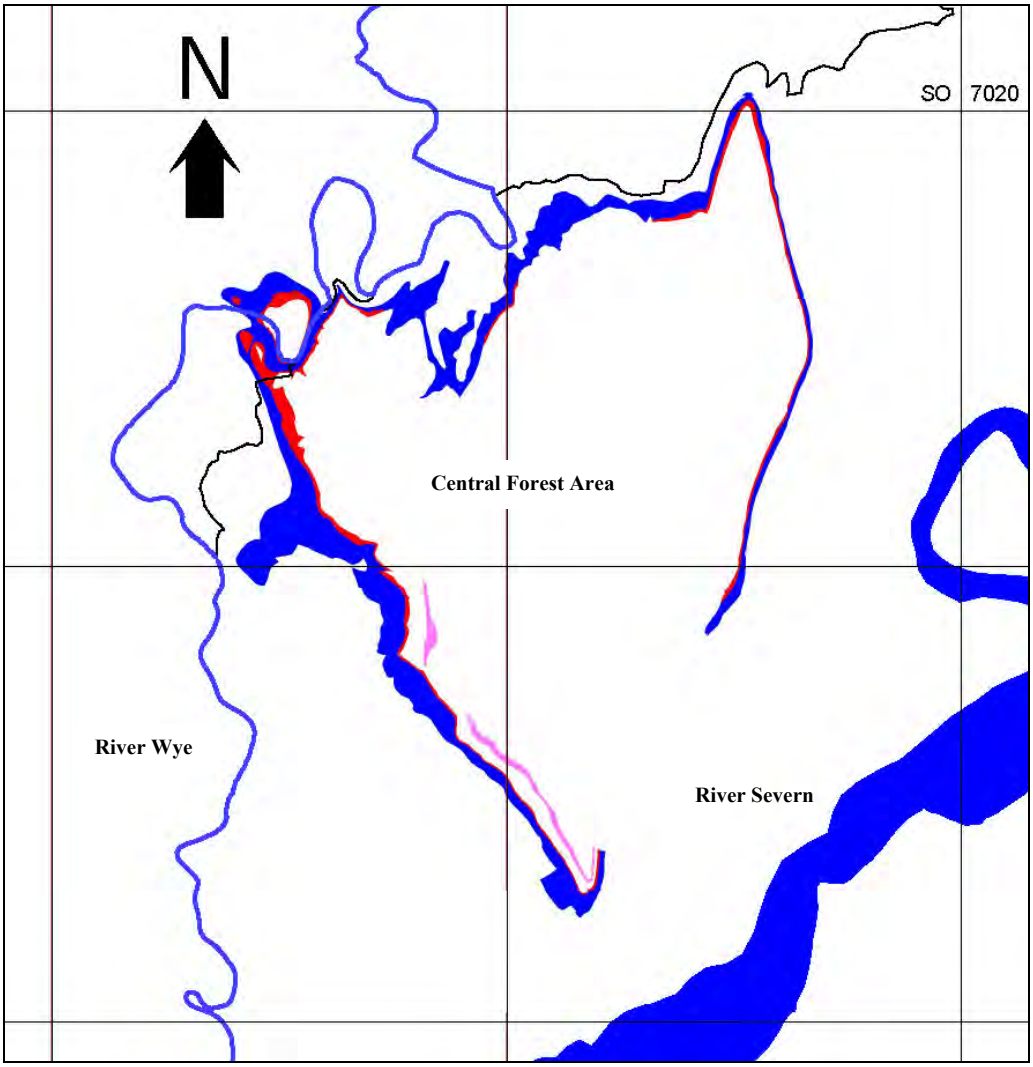


Figure 27: The Aggregates Resource Area in the Forest of Dean, Gloucestershire

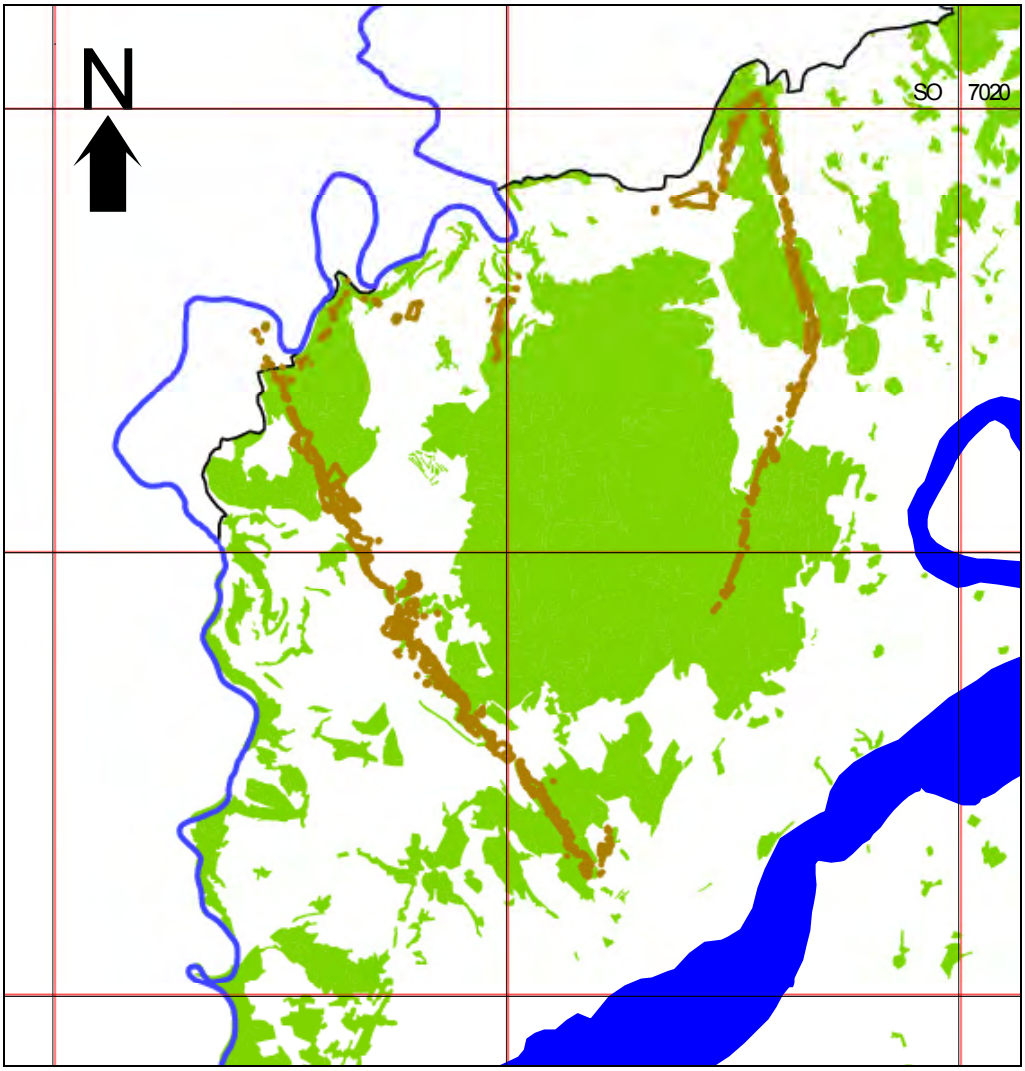


Grid at 10 km

Key:

- **Crease Limestone**
- **Lower Dolomite**
- **Drybrook Limestone**

Figure 28: Scowles fieldwork search area

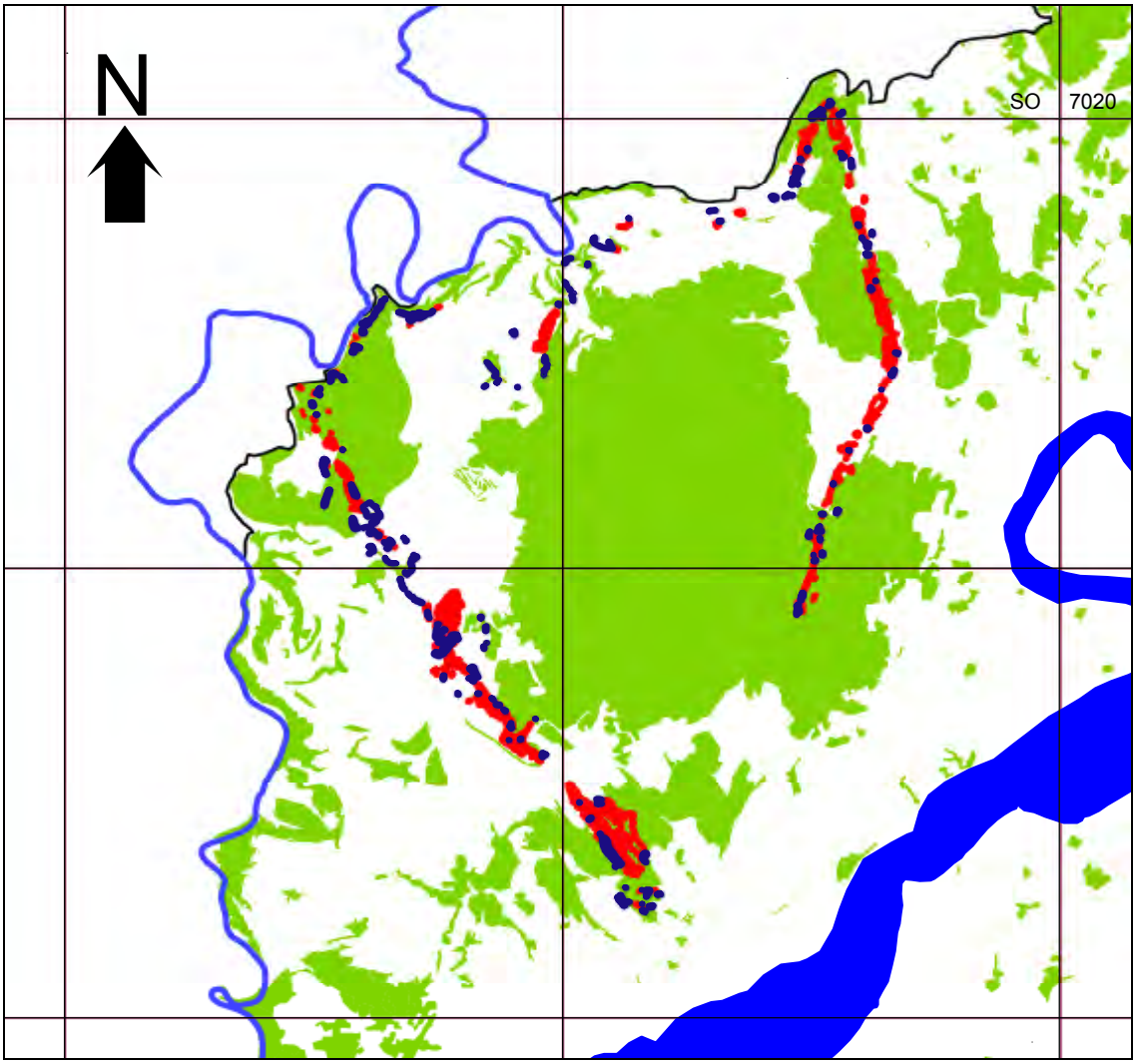


Key: **Grid at 10 km**

Woodland

All scowles identified during the desk based survey

Figure 29: All scowles identified during the desk-based survey



Key:

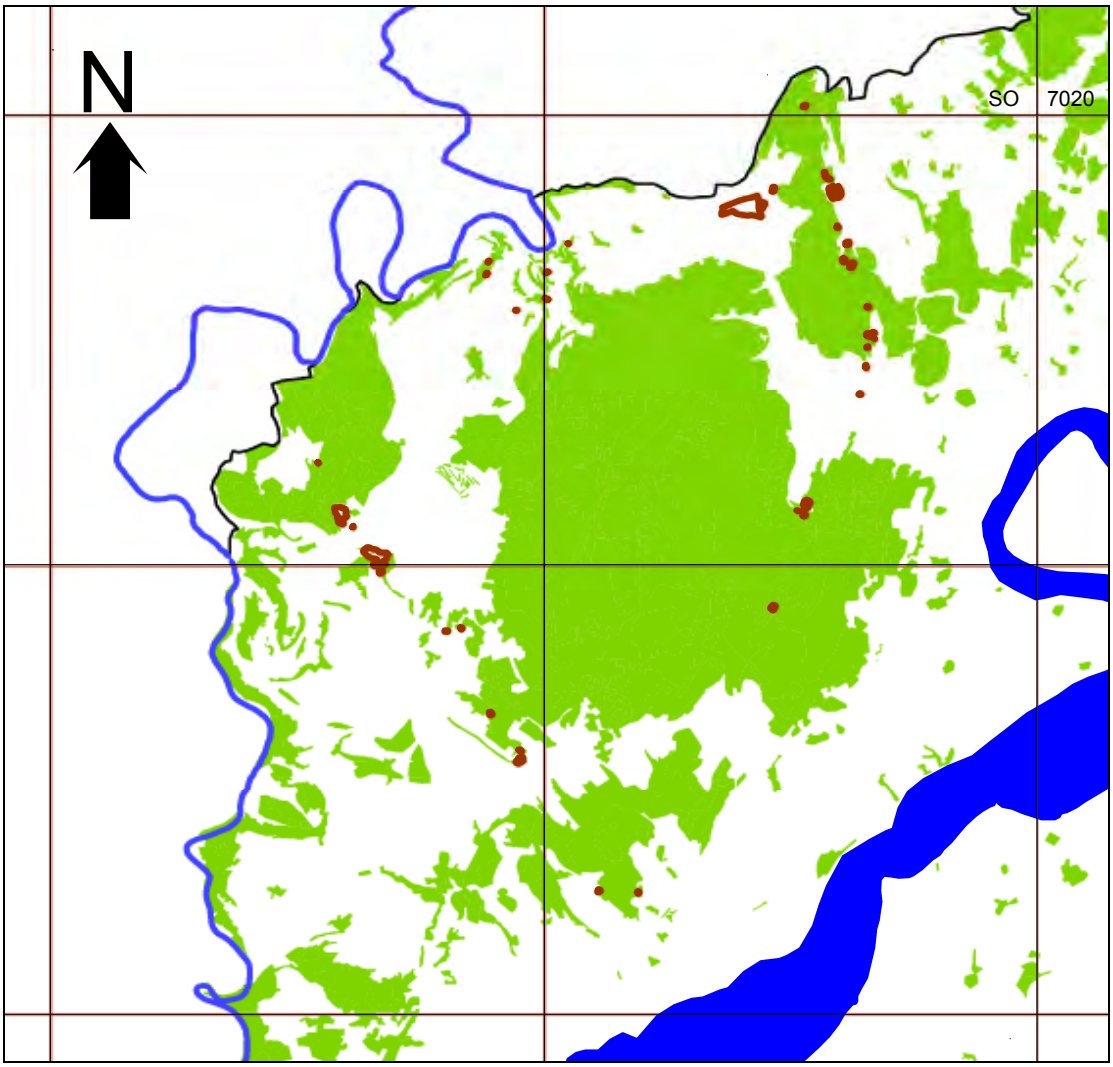
Grid at 10 km

Woodland

Existing scowles

Possible scowles

Figure 30: All existing scowles and possible scowles



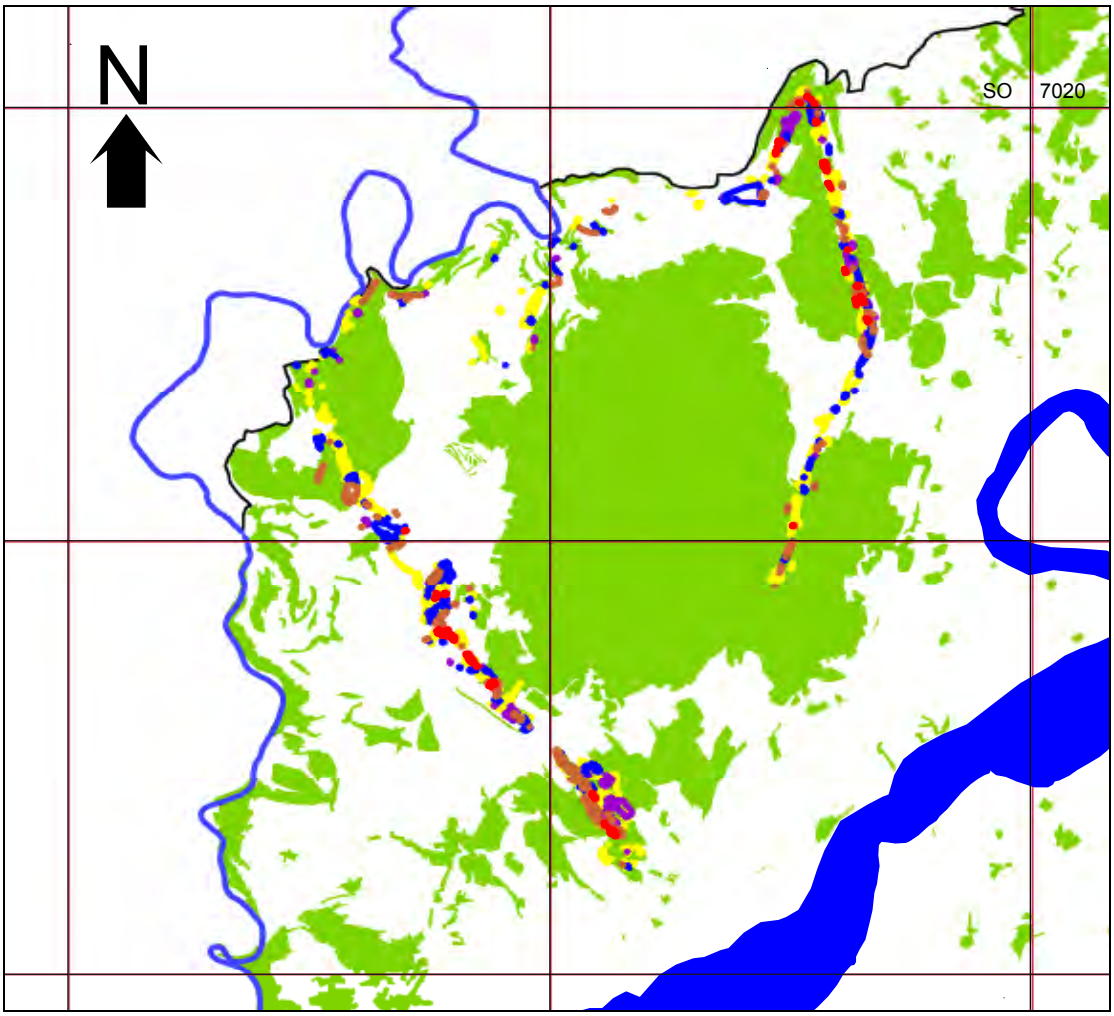
Key:

Grid at 10 km

Woodland

Possible destroyed scowles

Figure 31: Possible destroyed scowles



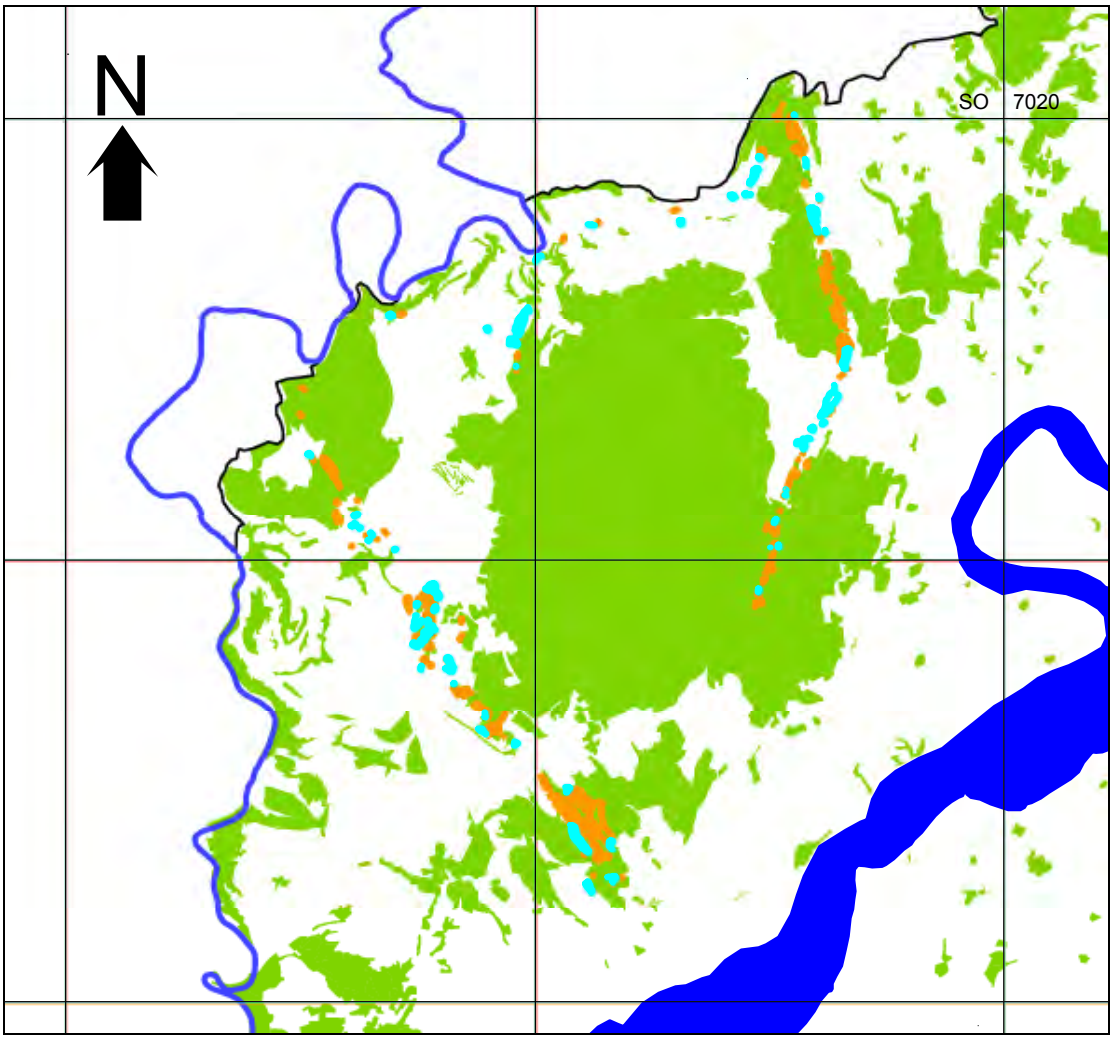
Key:

Grid at 10 km

- **Woodland**
- **Survey Level 1**
- **Survey Level 2**
- **Survey Level 3**
- **Survey Level 4**
- **Survey Level 5**

Figure 32: Scowles; level of survey

-



Key:

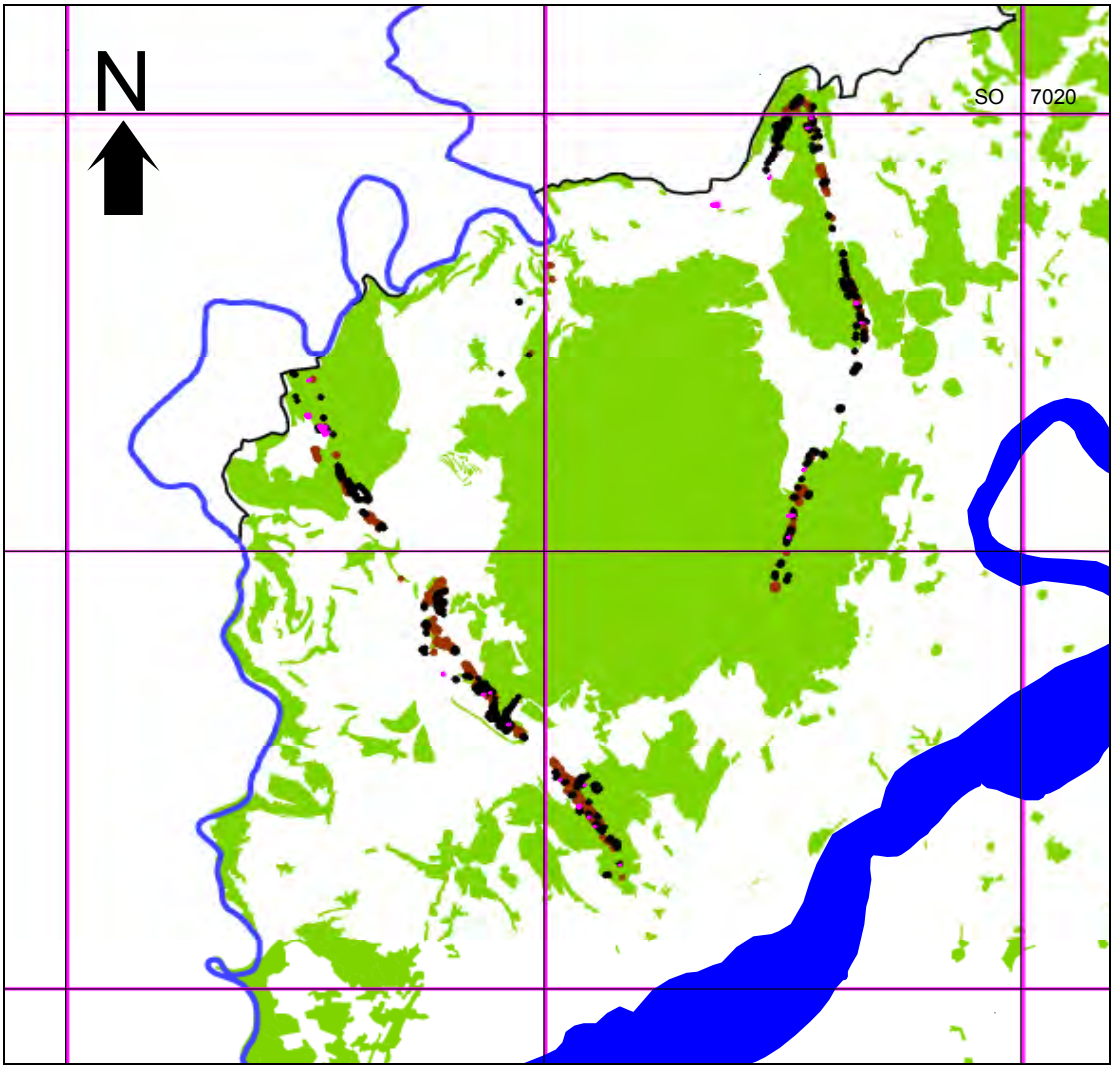
Grid at 10km

Woodland

Scowle Form 1

Scowle Form 2

Figure 33: Scowle Forms 1 & 2

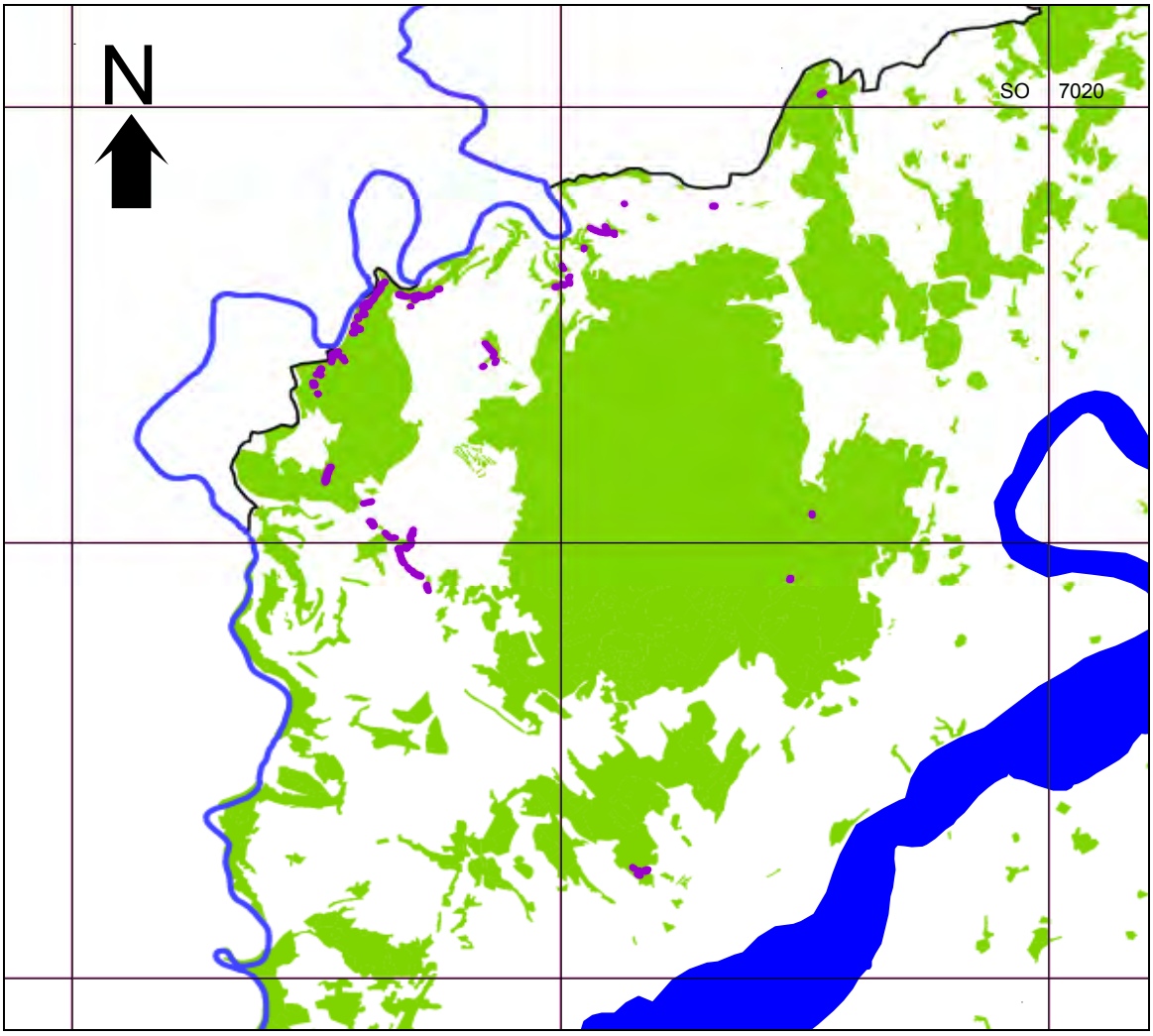


Key:

Grid at 10km

- **Woodland**
- **Scowle Form 3**
- **Scowle Form 4**
- **Scowle Form 5**

Figure 34: Scowle Forms 3, 4 & 5



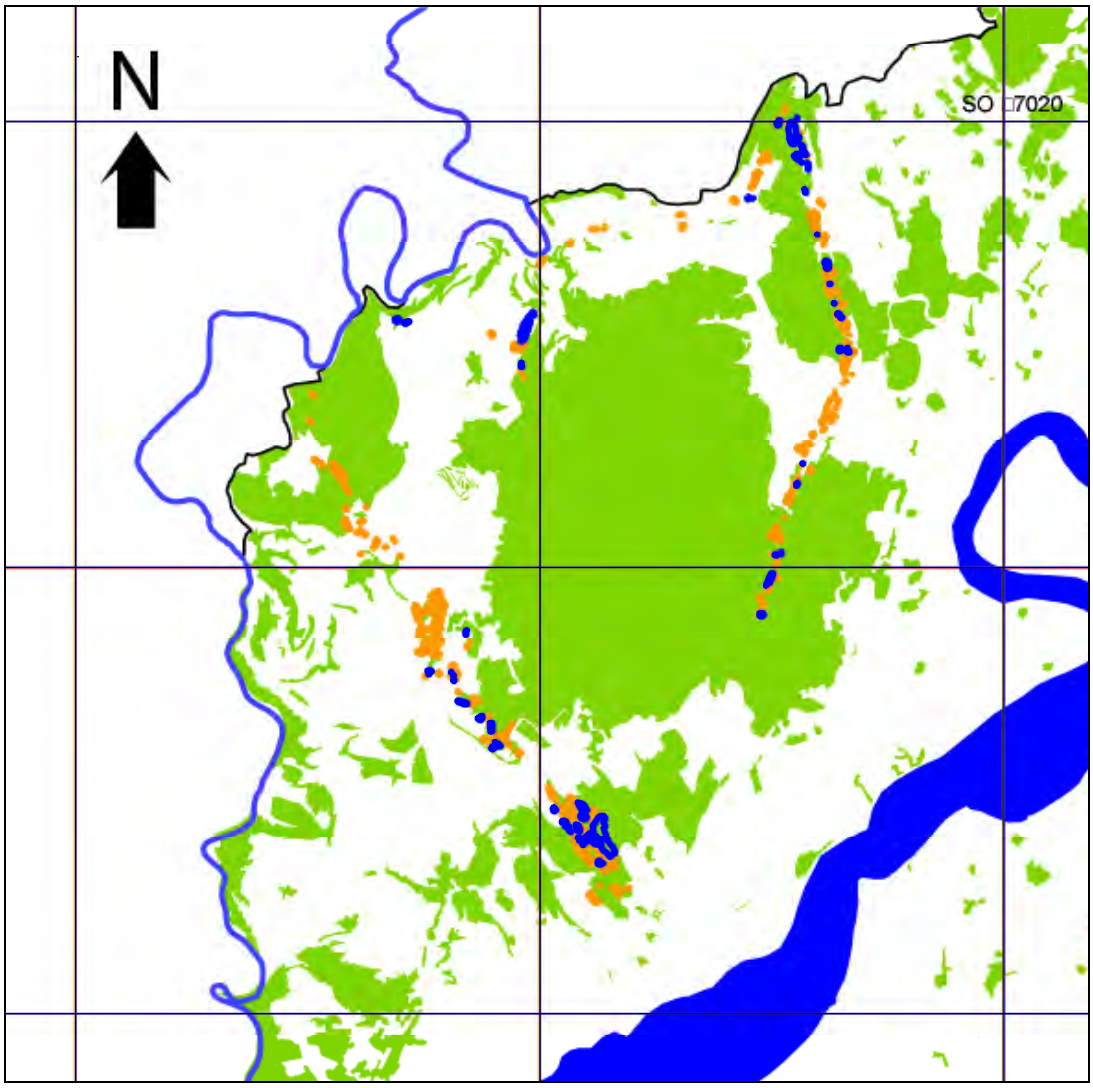
Key:

Grid at 10 km

Woodland

Scowle Form 7

Figure 35: Scowle Form 7



Grid at 10 km

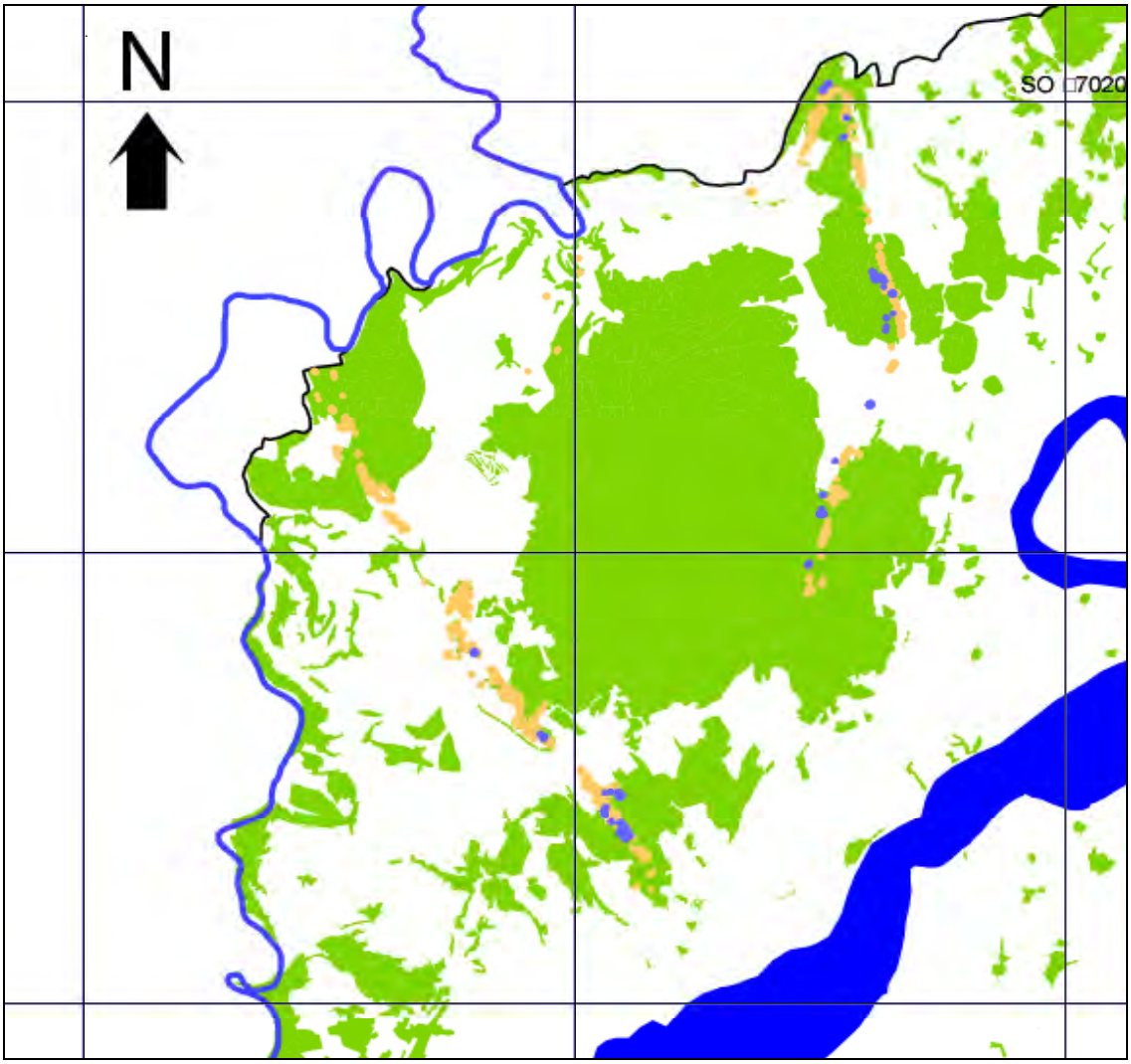
Key:

Woodland

Scowle Form 1 & 2 with mounds

Scowle Form 1 & 2 without mounds

Figure 36: Scowle Forms 1 & 2 with and without mounds



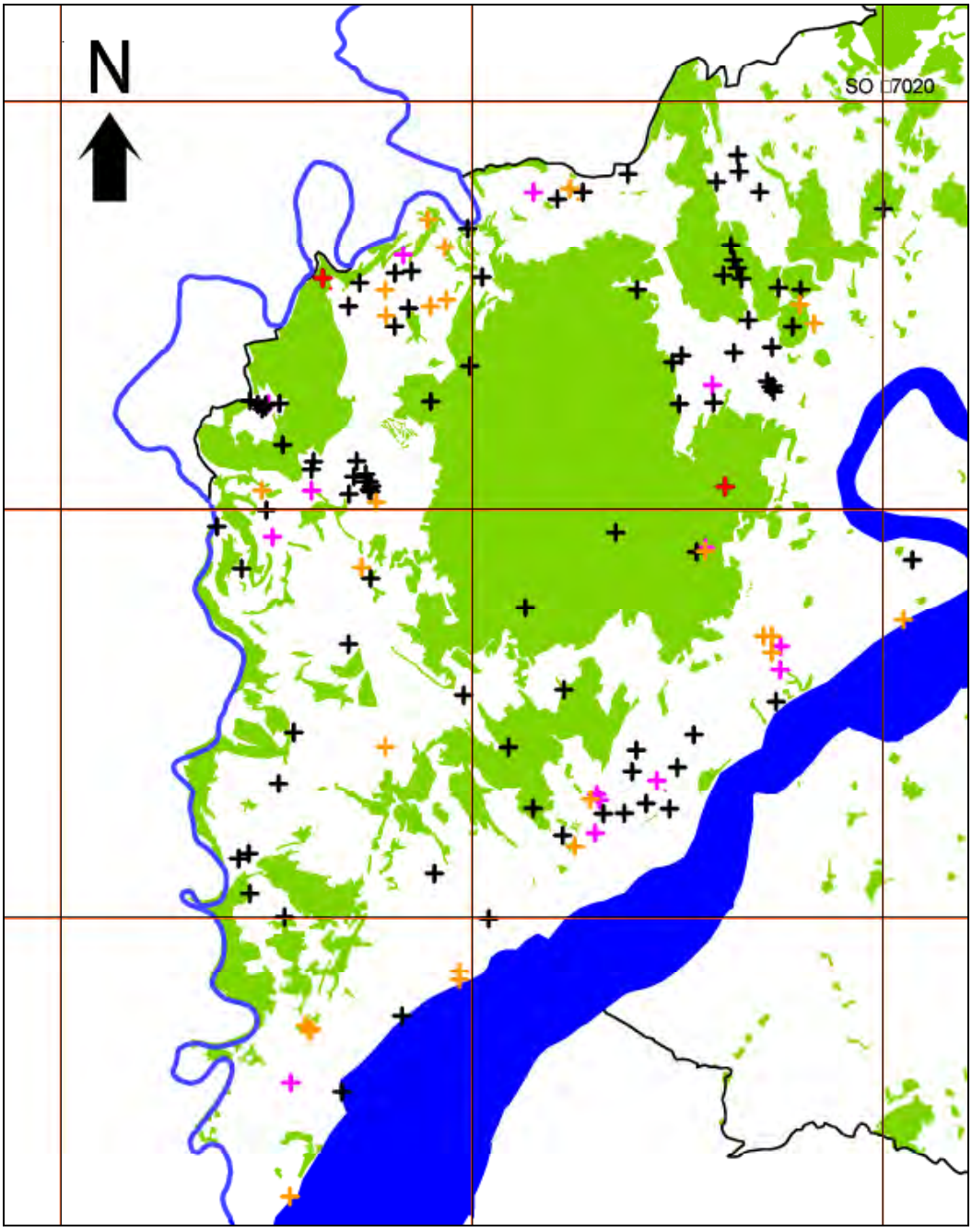
Key: **Grid at 10 km**

Woodland

Scowle Form 3, 4 & 5 with mounds

Scowle Form 3, 4 & 5 without mounds

Figure 37: Scowle Forms 3, 4 & 5 with and without mounds

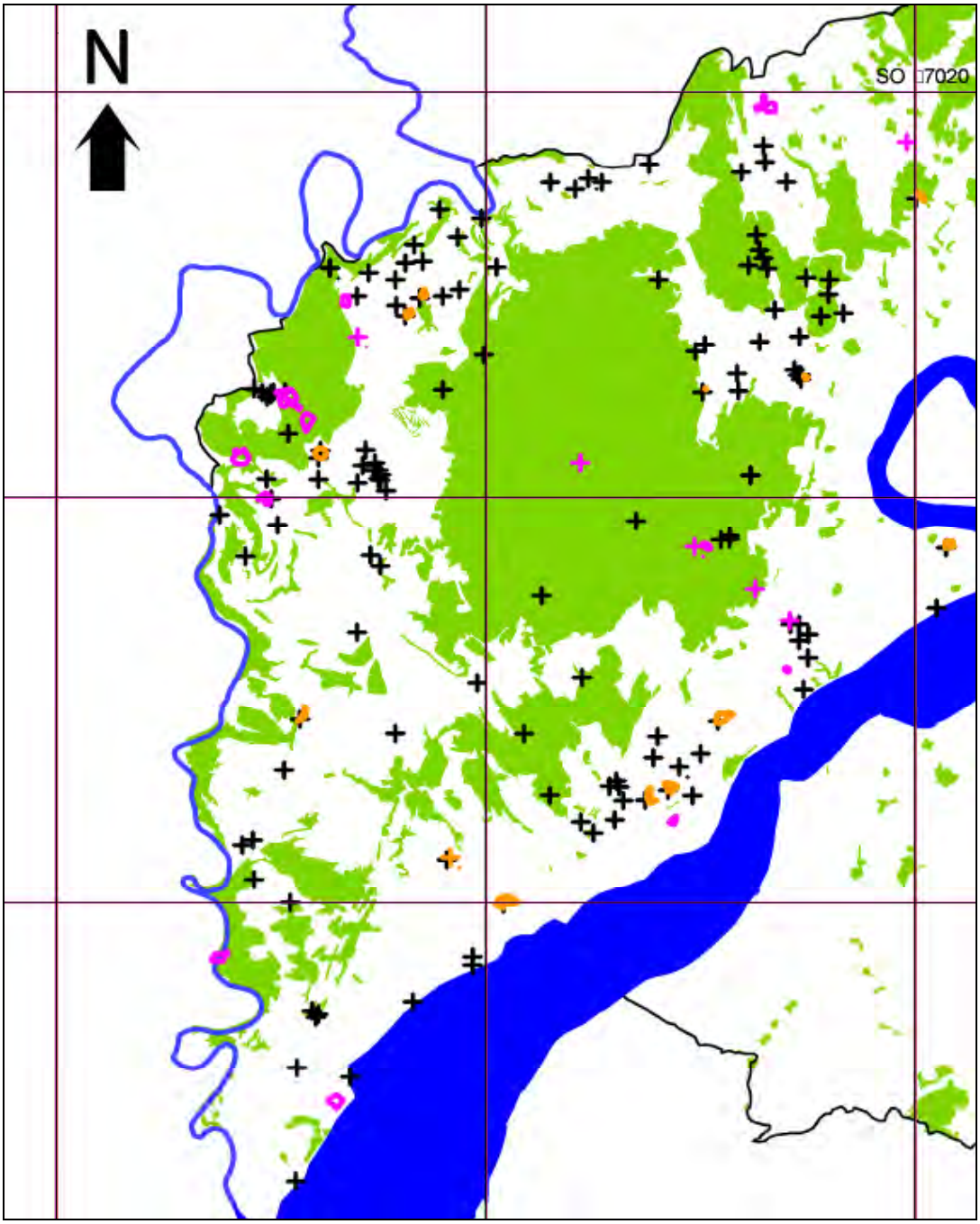


Key:

Grid at 10 km

- **Woodland**
- **Possible prehistoric bloomery sites**
- **Possible Romano-British bloomery sites**
- **Possible Later Medieval bloomery sites**
- **Undated bloomery sites**

Figure 38: All possible bloomery sites



Grid at 10 km

Key:

- **Woodland**
- **All possible bloomery sites**
- **Blacks field names**
- **Cinders field names**

Figure 39: All possible bloomery sites, Blacks field names & Cinders field names

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10.2 Map sources

BGS	1954	Geological Survey of Great Britain (England & Wales) SO61SE scale 6" to 1 mile

BGS	1974	Geological Survey of Great Britain (England & Wales) Solid and Drift Sheet 233: Monmouth scale 1:50,000 Also digital data supplied by the British Geological Survey based on the information on this sheet
BGS	1975	Geological Survey of Great Britain (England & Wales) Solid and Drift Sheet 234: Gloucester scale 1:50,000 Also digital data supplied by the British Geological Survey based on the information on this sheet
BGS	1981	Geological Survey of Great Britain (England & Wales) Solid and Drift Sheet 250, Chepstow scale 1:50,000 Also digital data supplied by the British Geological Survey based on the information on this sheet
Blunt T	1782	Plan of the Forest of Dean. Bromide copy of (original?) map kept at PRO, Kew. Reference number; F17/4 BP150. Inscribed 'To John Pitt Esq. Surveyor General of his Majesty's Woods'.
GCRO	1675	Map of Alvington and Alyburton Gloucestershire County Record Office Document GRO D.421 14
GCRO	1792	Map of Estates of Lord Gage Gloucestershire County Record Office Document GRO PC23
GCRO	17th century	17th century map bearing the coat of arms of the Gonning family. GRO photocopy 501 Original in Ipswich and East Suffolk Record Office
GCRO	17th century	Map of parts of Newland, St Briavels, Hewlesfield and Woolaston Parishes Gloucestershire County Record Office Document GRO 501
GCRO	1804	Map of Whitemead Park Gloucestershire County Record Office Document GRO 412.5
GCRO	1810	Map of Newland Gloucestershire County Record Office Document GRO D637 II/1/T1
GCCAS	2004	Mapped Information forming a layer within the Gloucestershire County corporate GIS and Supporting database.

GCC	2004a	Scanned raster images of the 1st, 2nd and 3rd edition 1:2500 OS maps dating from *c.*1880, *c.*1901 and *c.*1923 respectively and held as part of the Gloucestershire County Council corporate GIS.
GCC	2004b	Sites of Special Scientific Interest and other statutory sites in Gloucestershire Digital information held as part of the Gloucestershire County Council corporate GIS
Gwatkin G	1992	Rectified copy of Littledean Tithe Map (1839) at scale 1:10,560 (Map no: 8)
Gwatkin G	1992	Rectified copy of Blaisdon Tithe Map (1839) at scale 1:10,56 (Map no: 6)
Gwatkin G	1992	Rectified copy of Ruardean Tithe Map (1840) at scale 1:10,560 (Map no: 13)
Gwatkin G	1992	Rectified copy of Mitcheldean Tithe Map (1840) at scale 1:10,560 (Map no: 11)
Gwatkin G	1992	Rectified copy of Longhope Tithe Map (1841) at scale 1:10,560 (Map no: 11)
Gwatkin G	1992	Rectified copy of Taynton Tithe Map (1840) at scale 1:10,560 (Map no: 12)
Gwatkin G	1992	Rectified copy of Tibberton Tithe Map (1839) at scale 1:10,560 (Map no: 12)
Gwatkin G	1993	Rectified copy of English Bicknor Tithe Map (1838) at scale 1:10,560 (Map no: 20)
Gwatkin G	1993	Rectified copy of Alvington Enclosure Map (1813) at scale 1:10,560 (Map no: 25)
Gwatkin G	1993	Rectified copy of Woolaston Tithe Map (1841) at scale 1:10,560 (Map no: 55)
Gwatkin G	1993	Rectified copy of St Briavels Tithe Map (1842) at scale 1:10,560 (Map no: 22)
Gwatkin G	1993	Rectified copy of Staunton Tithe Map (1845) at scale 1:10,560 (Map no: 20)
Gwatkin G	1993	Rectified copy of Hewelsfield Tithe Map (1841) at scale 1:10,560 (Map no: 22)
Gwatkin G	1994	Rectified copy of Newland Tithe Map including Coleford (1840) at scale 1:10,560 (Map no: 47)
Gwatkin G	1994	Rectified copy of Aylburton Tithe Map (1840) at scale 1:10,560 (Map no: 49)
Gwatkin G	1995	Rectified copy of Awre Tithe Map (1840) at scale 1:10,560 (Map no: 54)

Gwatkin G	1995	Rectified copy of Lydney Tithe Map (1839) at scale 1:10,560 (Map no: 63)
Gwatkin G	1995	Rectified copy of Tidenham Tithe Map (1845) at scale 1:10,560 (Map no: 82)
Gwatkin G	1997	Rectified copy of the Map of the Board of Guardians covering East Dean Including Cinderford, Ruspidge and Soudley(1856) at scale 1:10,560 (Map no: 107)
IGS	1979	Geological Map of the United Kingdom (south) Institute of Geological Sciences 3rd Edition Solid scale 1:625,000
Landsat	2000	Landsat satellite imaging of current landuse at a resolution of *c.* 20m^2 stored as a layer on the Gloucestershire County Council corporate GIS
OS	1880	Digital facsimile of Ordnance Survey 1st Series 25" map dated to *c.* 1880 and forming a layer within the Gloucestershire County Council Geographic Information System
OS	1900	Digital facsimile of Ordnance Survey 1st Series 25" map dated to *c.* 1900 and forming a layer within the Gloucestershire County Council Geographic Information System
OS	1925	Digital facsimile of Ordnance Survey 1st Series 25" map dated to *c.* 1925 and forming a layer within the Gloucestershire County Council Geographic Information System
PRO	1608	The West Part of the Plott of the Forest of Deane in The County of Glos. Taken Anno Dni 1608 and Anno Regni Jacobi Saxtoy. Bromide copy of Public Record Document held at The Wilderness Field Studies Centre, Mitcheldean (MR 879)
Stratford F	1758	Map of part of the Forest made by order of the Lords Commissioners of the Treasury showing enclosures. Photocopy of (original?) map held by the Public Record Office, Kew. Reference number; F17/2 C5809. Inscribed 'Ferdinando Stratford, Engineer' and 'David Morns.
Taylor I	1777	Facsimile of Isaac Taylor's 1" to 1 mile map of Gloucestershire in *A Bristol and Gloucestershire Atlas* Bristol and Gloucestershire Archaeological Society 1961

Unknown	17th/18th century	Late17th/early 18th century map of the Forest of Dean titled Description of the Forest of DEANE as it lyes in several Parcels with the Inclosures. Bromide copy of Public Record Document held by the Wilderness Field Studies Centre, Mitcheldean.
Unknown	19th century	A 19th century map of Blakeney Walk Bromide copy of Public Record Document held at the Wilderness Field Studies Centre, Mitcheldean.
Unknown	1787	Geometrical plan of the Forest of Dean-By order of the Commissioners of the Land Registry dated 1787 Bromide copy of Public Record Document held by the Wilderness Field Studies Centre, Mitcheldean.
Unknown	1848	Map of the Forest of Dean Scale: 1:25,000 titled Plan of Her Majesty's Forest of Dean in the county of Gloucester with High Meadow and Great Doward Woods. Bromide copy of Public Record Document held by the Wilderness Field Studies Centre, Mitcheldean.

10.3 Aerial photographic sources

Fairey Surveys	1975	Vertical aerial photographs taken by Fairey Surveys At scale 1:10,000 and in the collection of the Wilderness Field Studies Centre, Micheldean 7514: 719 & 720 taken 21 May 1975
Getmapping.Com	unknown	Colour vertical prints held as a layer in the Gloucestershire County Council corporate GIS.
NMP	2003	Compilation of a variety of aerial photographic sources as part of the English Heritage National Mapping Programme. Preliminary paper copies consulted.
Unknown	1982	Monochrome vertical prints taken in 1982 at scale 1:3000 (with a flight plot at scale 1:12,000) held by the Forestry Commission

11 Acknowledgements

11.1 External assistance

The project team would like to acknowledge the following for their assistance throughout the project.

- Kathy Perrin of English Heritage who was the original English Heritage monitor of the project and who encouraged the preparation of the project design.
- Buzz Busby of English Heritage who took over from Kathy Perrin as the English Heritage project monitor and has provided advice, encouragement and support throughout the project, and commented on the first draft of this report.
- Dr Chris Salter of the University of Oxford Department of Materials who acted as the project's consultant on the early iron industry, and commented on relevant sections of the report.
- Mark Campbell of Gloucestershire Geoconservation Trust who discussed the geological formation of scowles with the project team, contributed towards and commented on the sections of the report dealing with geology, and the management of scowles, led the field trip on the second project workshop about scowles and is a member of the project steering group.
- Dr Colin Studholme of Gloucestershire Wildlife Trust who discussed wildlife conservation issues with the project team, contributed to and commented on, the section of the report on the management of scowles and is a member of the project steering group.
- Paul Wildgoose who discussed his work on scowles with Jon Hoyle.
- Dr David Lowe of the British Geological Survey who provided the project team with information and responded to questions about cave formation and the geology of the Forest of Dean.
- Robin Jackson of Worcestershire County Archaeology Service, who discussed his work at *Ariconium* with Jon Hoyle.
- Dr Tim Young of GeoArch Consultancy who provided information of his experimental work on the analysis of iron ore sources in early metallurgy.
- Vanessa Straker, English Heritage Regional Scientific Advisor, South West Region, who offered preliminary advice on suitable prospection techniques for further investigation of selected features.
- Charlotte Pagendam of English Nature who contributed to and commented on the section of the report on the management of scowles and is a member of the project steering group.
- Simon Crutchley, and English Heritage' s National Mapping Programme team who provided the project team with aerial photographic information, assisted with the first workshop on scowles, and is a member of the project steering group.
- Staff of the Wilderness Field Studies Centre who loaned aerial photographs and copies of early maps to the project team for use in the project.
- Dave Clarke of the Forestry Commission who loaned aerial photographs to the project team.
- Jerry Gissop of the Forestry Commission and John Harvey the Deputy Gaveller who granted permission for the project team to undertake field survey on Forestry Commission land.
- Lord Bledisloe of Lydney Park who granted permission for the project team to undertake field survey on his land, and also hold the field trip section of the second workshop at Lydney Park.
- All other landowners and tenants who allowed access to their land to enable the field survey to take place.
- Other members of the Forest of Dean Archaeological Survey steering group:-
  - Rob Guest of the Forestry Commission.
  - Bill Cronin of the Forest of Dean District Council.
  - Tim Yarnell of the Forestry Commission.
  - Kate Biggs of the Dean Heritage Centre.

  For their support throughout the project.

- The following also provided information of value to the project:-
  - Dr Doug Gentles of Dean Archaeological Group.
  - Jasper Blake of Dean Archaeological Group
  - Brian Johns, of the Forest of Dean Local History Society.
  - Dave Tuffley of the Forest of Dean Local History Society and the Forest of Dean Caving Club.
  - Jonathan Wright of Clearwell Caves.

11.2 Gloucestershire County Archaeology Service staff

The following staff members of Gloucestershire County Environment Department, Archaeology Service were involved with the project and the production of this report.

Jan Wills the Gloucestershire County Archaeologist was involved with the instigation and setting up of the project and with all discussion with English Heritage.

Jon Hoyle, Senior Project Officer who reported to Jan Wills undertook the day-to-day management of the project. He supervised the project team made up of:-
- Laura Butler: Assistant Project Officer.
- Graham Tait: Assistant Project Officer.
- Danielle Wootton: Assistant Project Officer.

Desk-based research and inputting of information into the project database (the Gloucestershire County Sites and Monuments Record) was undertaken by all members of the project team.

Desk-based research methodologies were prepared by Jon Hoyle in consultation with the project team, and Laura Butler and Graham Tait took a lead role in developing systems to integrate recorded data into the Gloucestershire County Sites and Monuments Record.

Jon Hoyle devised fieldwork methodology and logistics in consultation with members of the project team, and Graham Tait took special responsibility for the preparation of the systems used for digital recording during the fieldwork.

Danielle Wootton took a lead role in the organisation of all outreach initiatives, assisted by other members of the project team.

The fieldwork was undertaken by all members of the project team assisted by the following temporary staff members:-
- Aisling Tuohy.
- Vanessa Macri.
- Jill Martin.

Responsibility for report preparation was as follows:-

Volume 1

Section	**Main contributors**
Summary	Jon Hoyle.
Survey methodology	Graham Tait with the advice of Jon Hoyle.
Results of the survey on scowles	Laura Butler with the advice of Jon Hoyle.

Results of the survey on bloomeries	Graham Tait with the advice of Laura Butler and Jon Hoyle.
Archaeological discussion of scowles	Jon Hoyle using information from tables prepared by Laura Butler, and with advice on geology and information on geological processes from Laura Butler.
Archaeological discussion of bloomeries	Jon Hoyle using information from tables prepared by Laura Butler.
General archaeological discussion of the results of the project	Jon Hoyle using information from tables prepared by Laura Butler.
Recommendations for further archaeological research	Jon Hoyle.
Recommendations for the management of scowles	Jon Hoyle.
Recommendations for the management of bloomery sites	Jon Hoyle.
Outreach	Danielle Wootton with the advice of Jon Hoyle.
Bibliography and sources	All members of the project team with the assistance of Aisling Tuohy.
Acknowledgements	Jon Hoyle.
Illustrations	Aisling Tuohy, Jon Hoyle and Danielle Wootton, using information and a pro-forma prepared by Laura Butler.
Photographs	All photographs reproduced in the report were taken by members of the project team with the exception of Figure 7 and Figure 20 which were taken by Steve Dorey of Gloucestershire County Council Environment Department.

Volume 2: Appendices

Main contributors

Maps were prepared by Aisling Tuohy using information and a pro-forma prepared by Laura Butler.

All Tables of Evidence were prepared by Laura Butler using information generated from the County Sites and Monuments Record, the project database.

Details of desk-based and field work methodologies, and specifications for field survey hardware were prepared by Graham Tait, utilising specifications for fieldwork and desk-based research which were prepared by Jon Hoyle in consultation with the project team

The table of abbreviations was produced by Jon Hoyle in consultation with the project team.

The glossary was produced by Laura Butler in consultation with the project team.

The project team jointly undertook proof reading and text editing of the first draft of this report as required, and all members of the team have had some input into most sections of the report. The first draft of the report was also edited by Jan Wills.

Graham Tait took a lead role in the compilation of the report and formulated specifications to ensure production standards throughout.

This revisions of the report was undertaken by Jon Hoyle following circulation of the first draft to English Heritage and incorporating editorial comments from Jan Wills.

THE FOREST OF DEAN GLOUCESTERSHIRE

The Scowles and Associated Iron Industry Survey: Project Number 3342

Project Report

Volume 2 Appendices

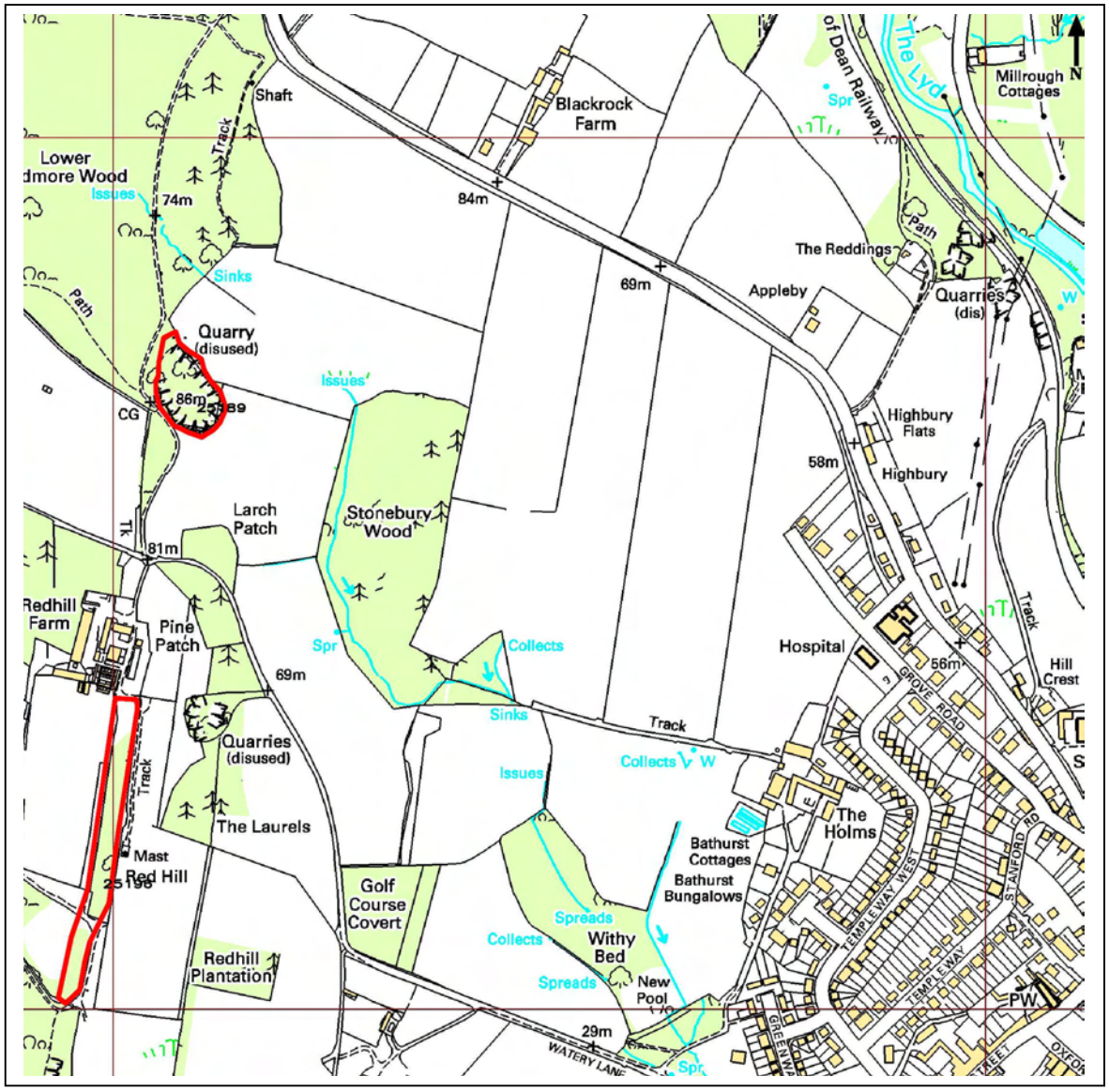
Jon Hoyle, Laura Butler,
Graham Tait, Danielle Wootton
Gloucestershire County Council
Environment Department
Archaeology Service

March 2007

Appendix A Location of scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 62 03



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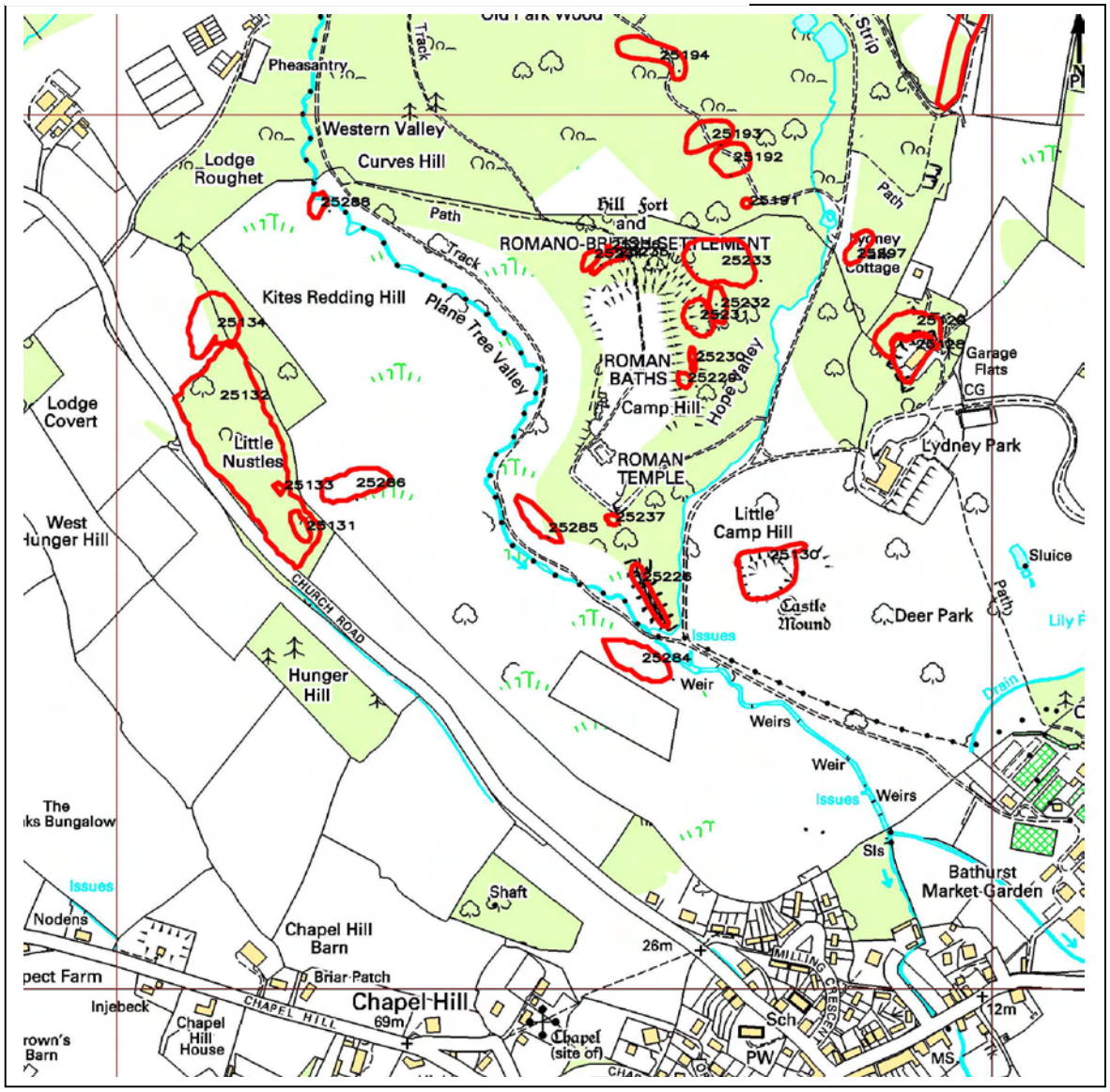

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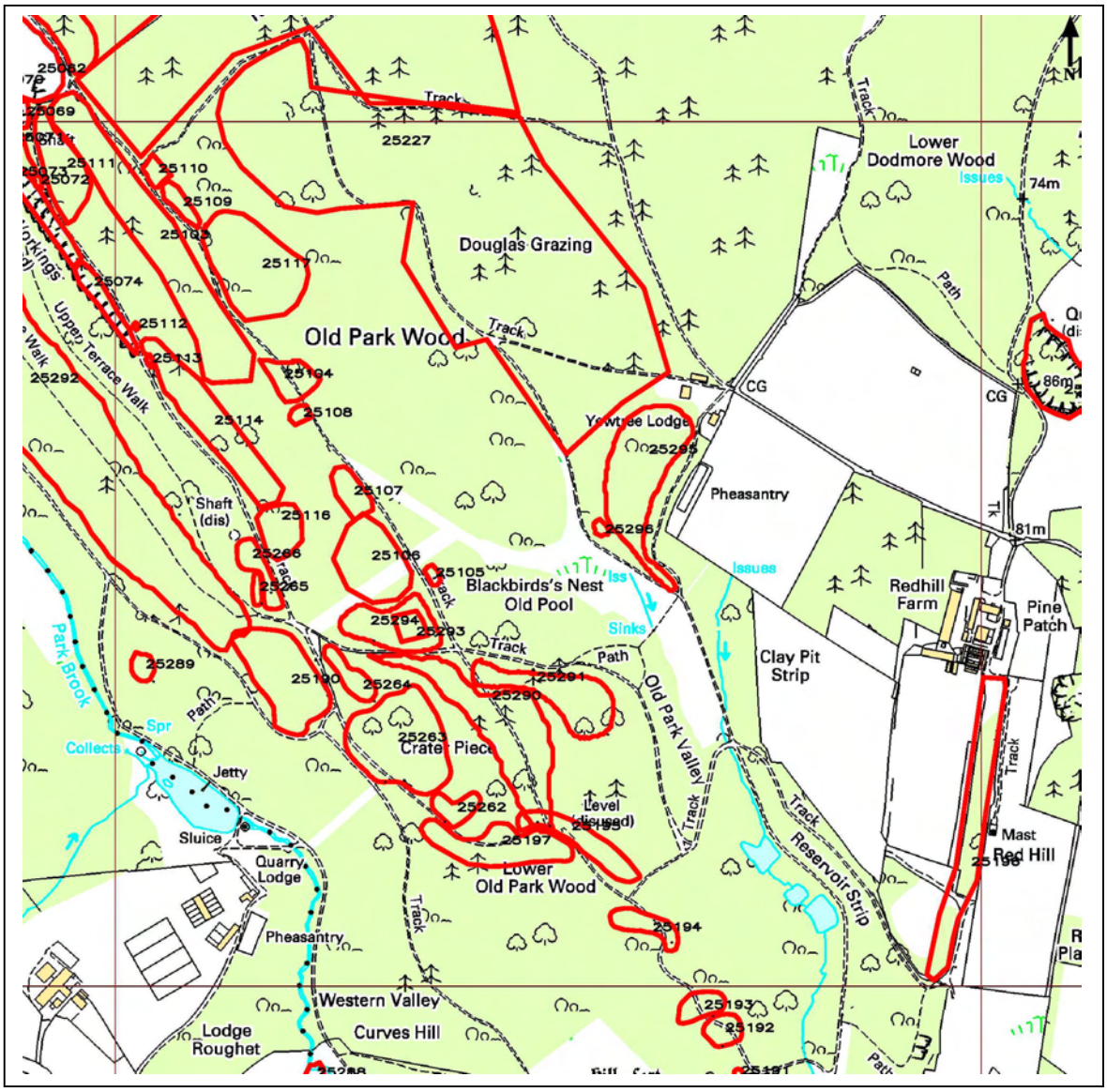

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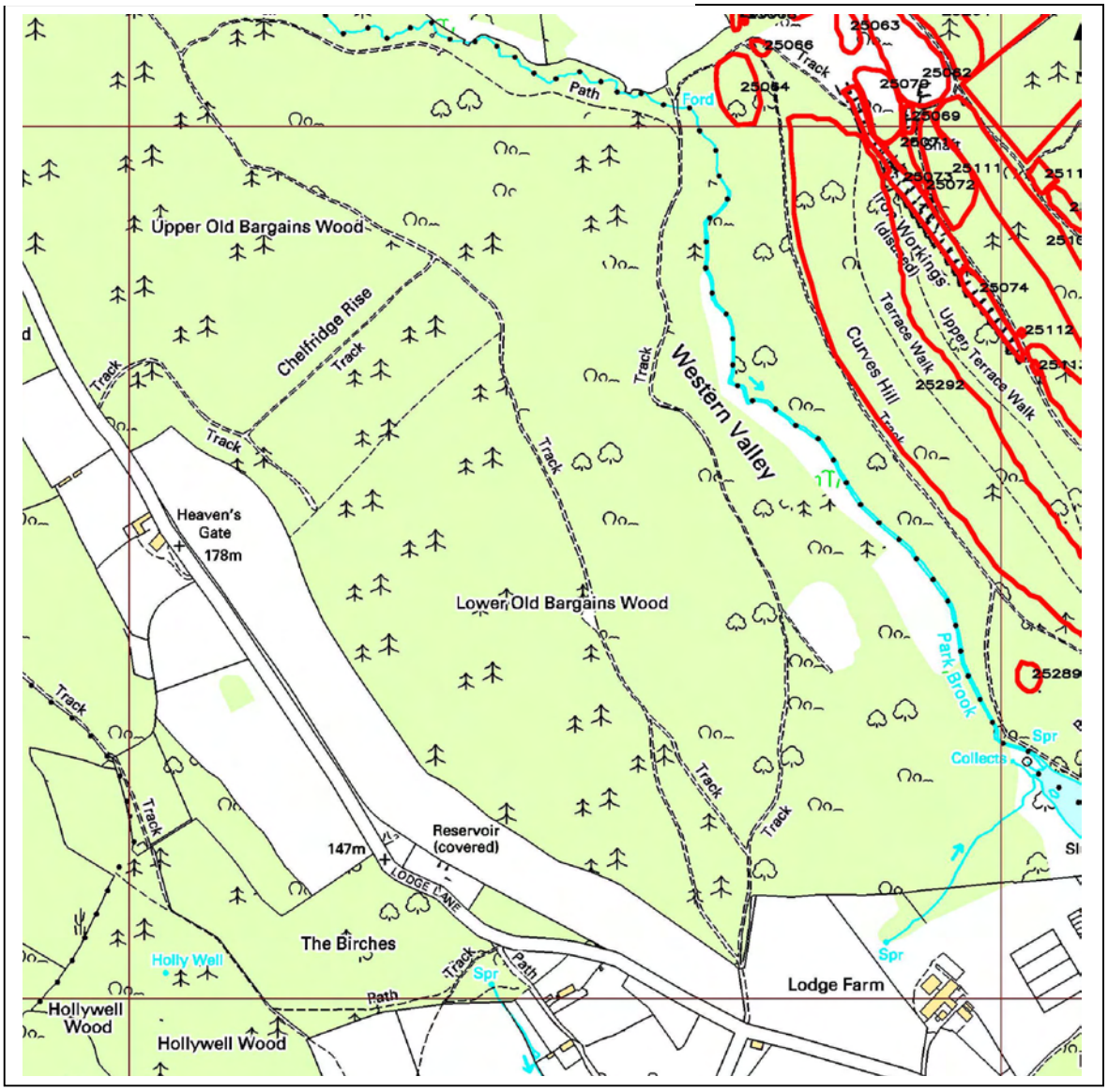

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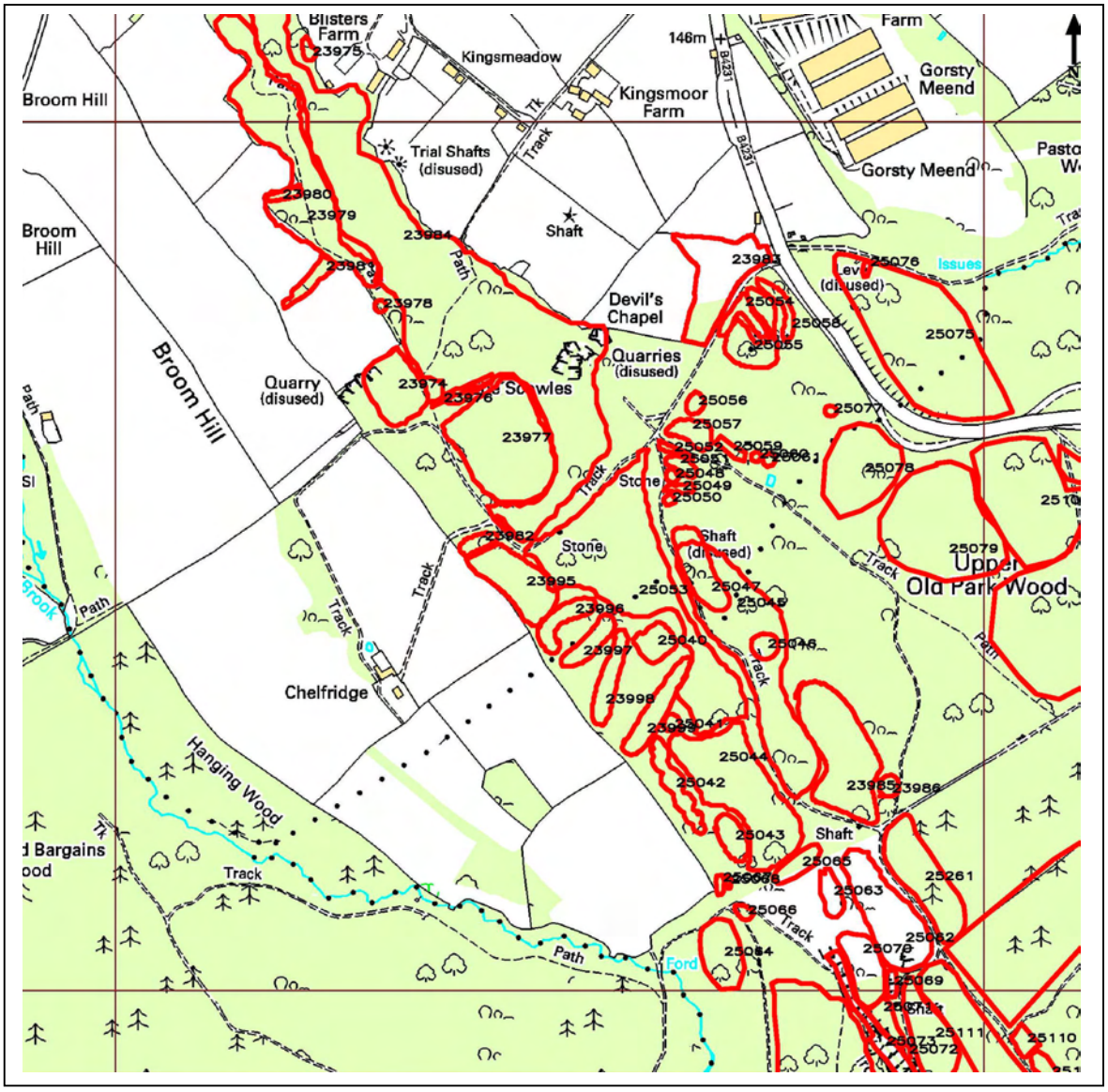

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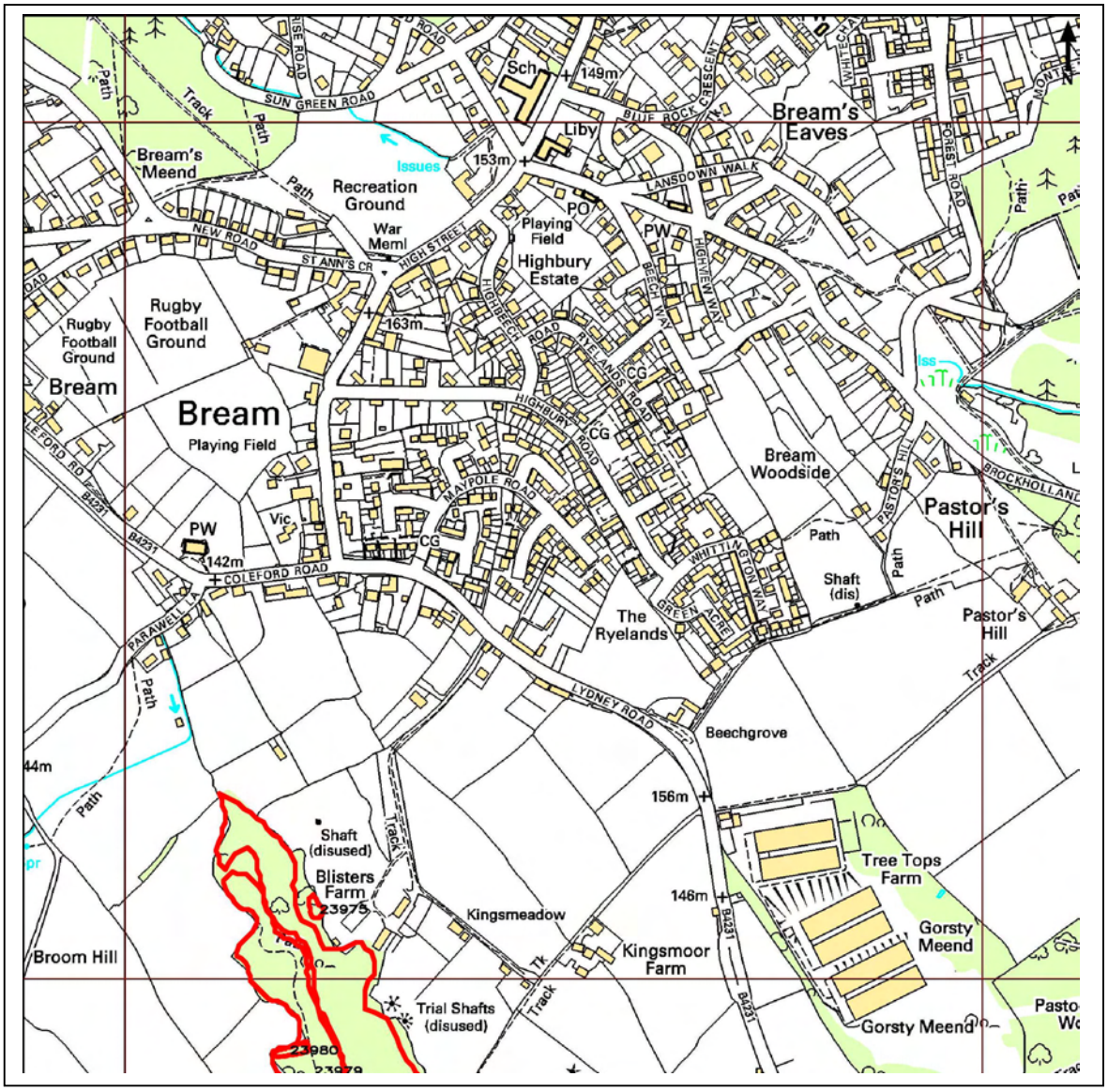

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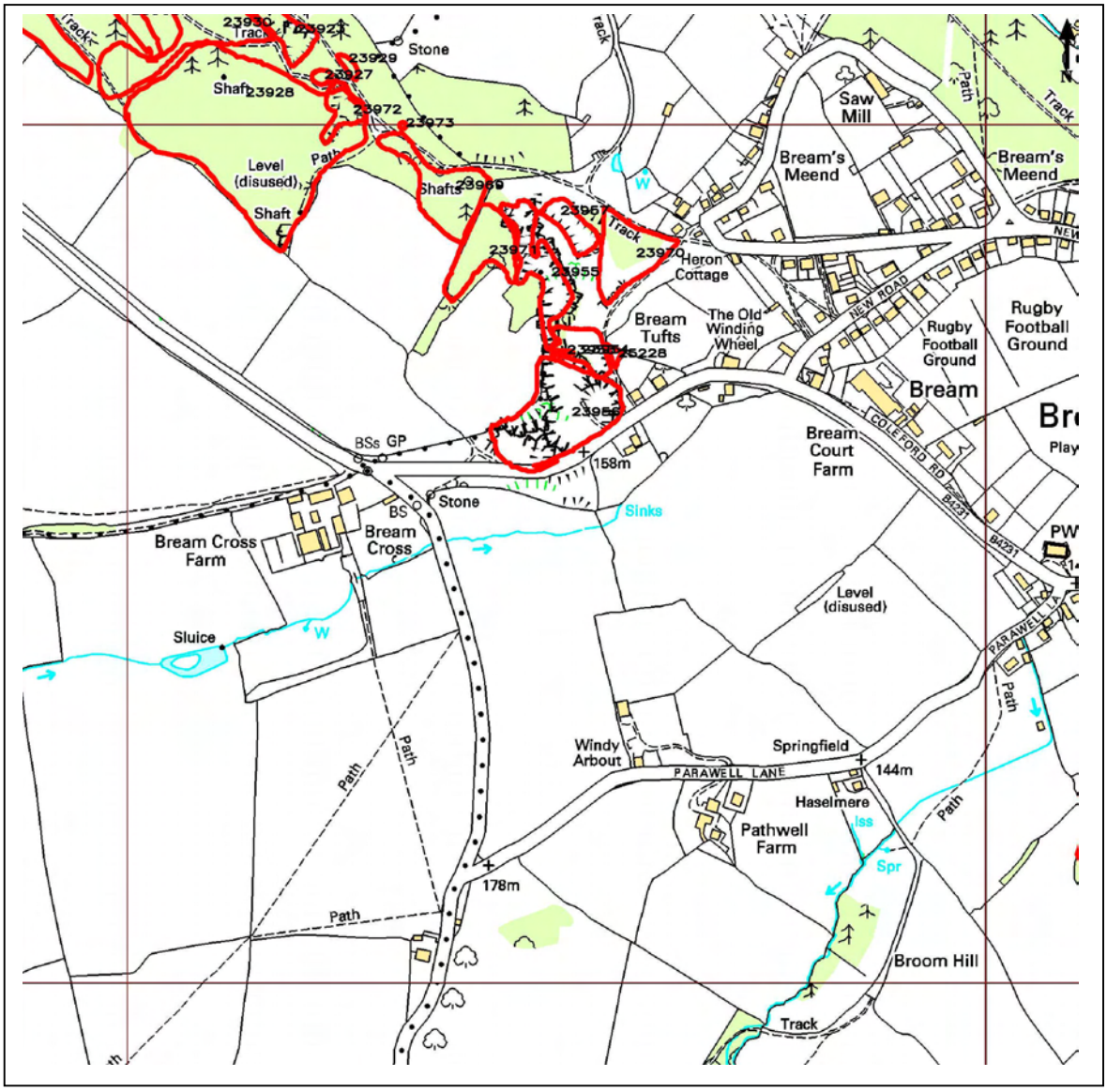

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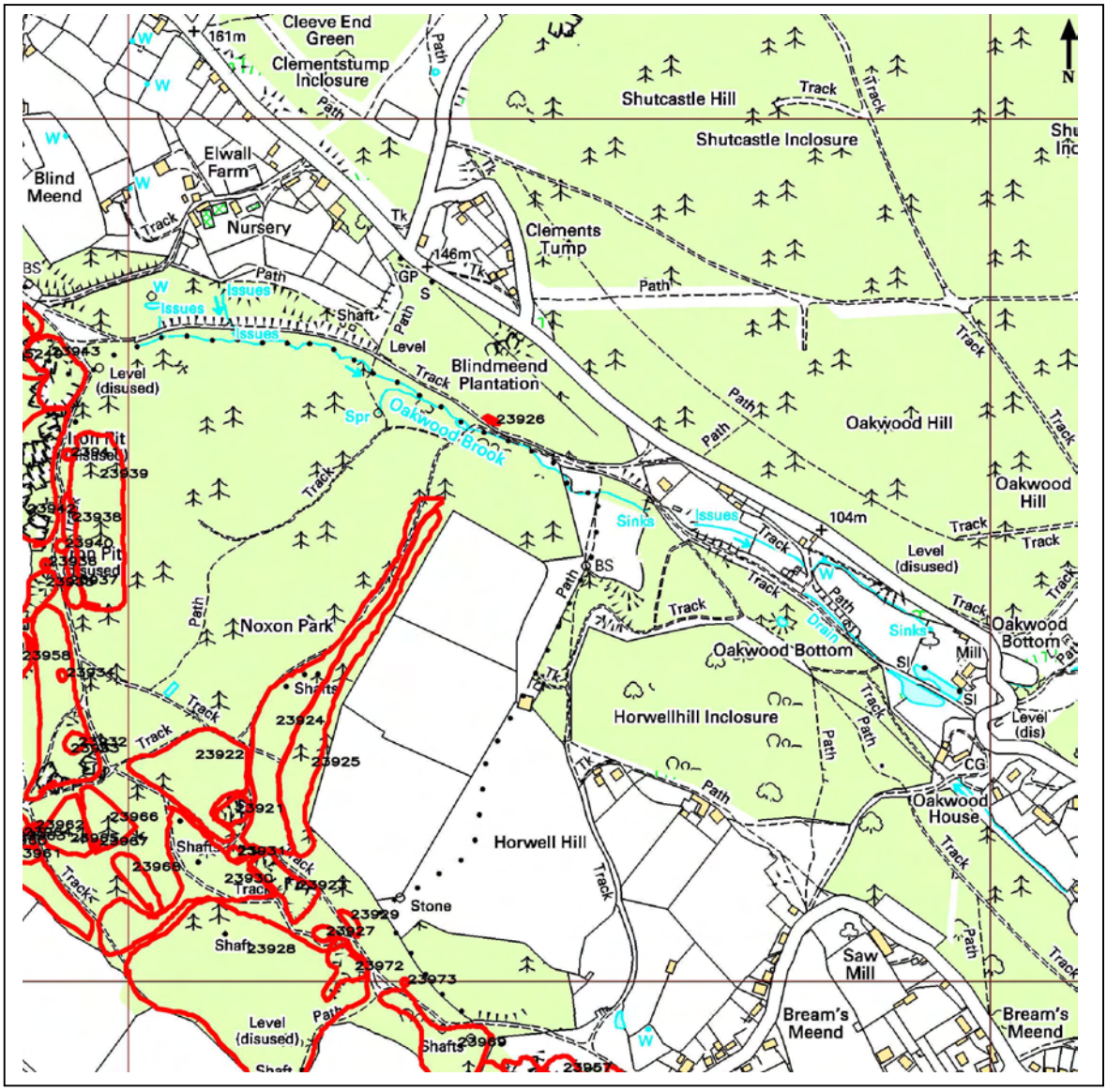

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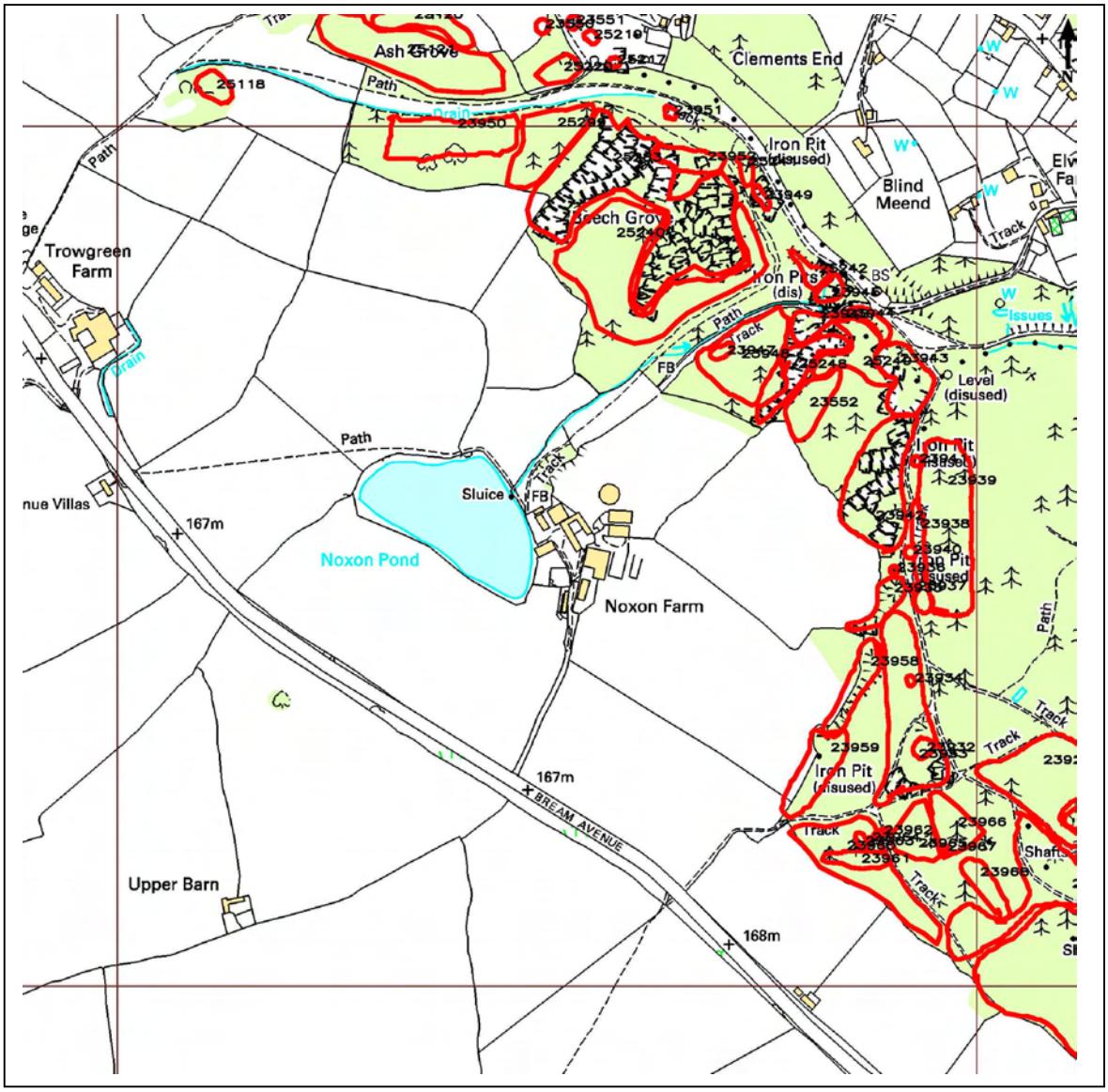

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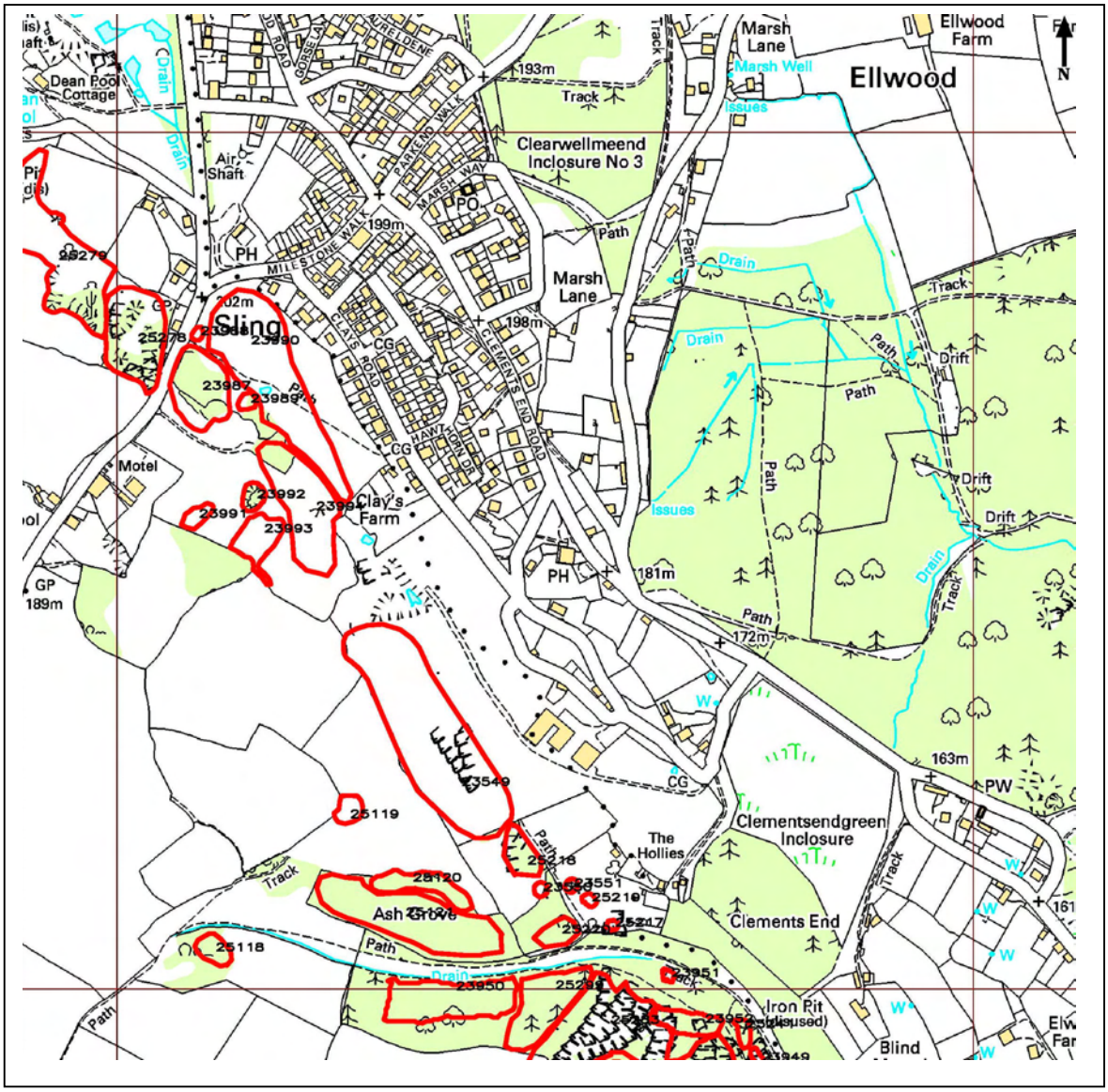

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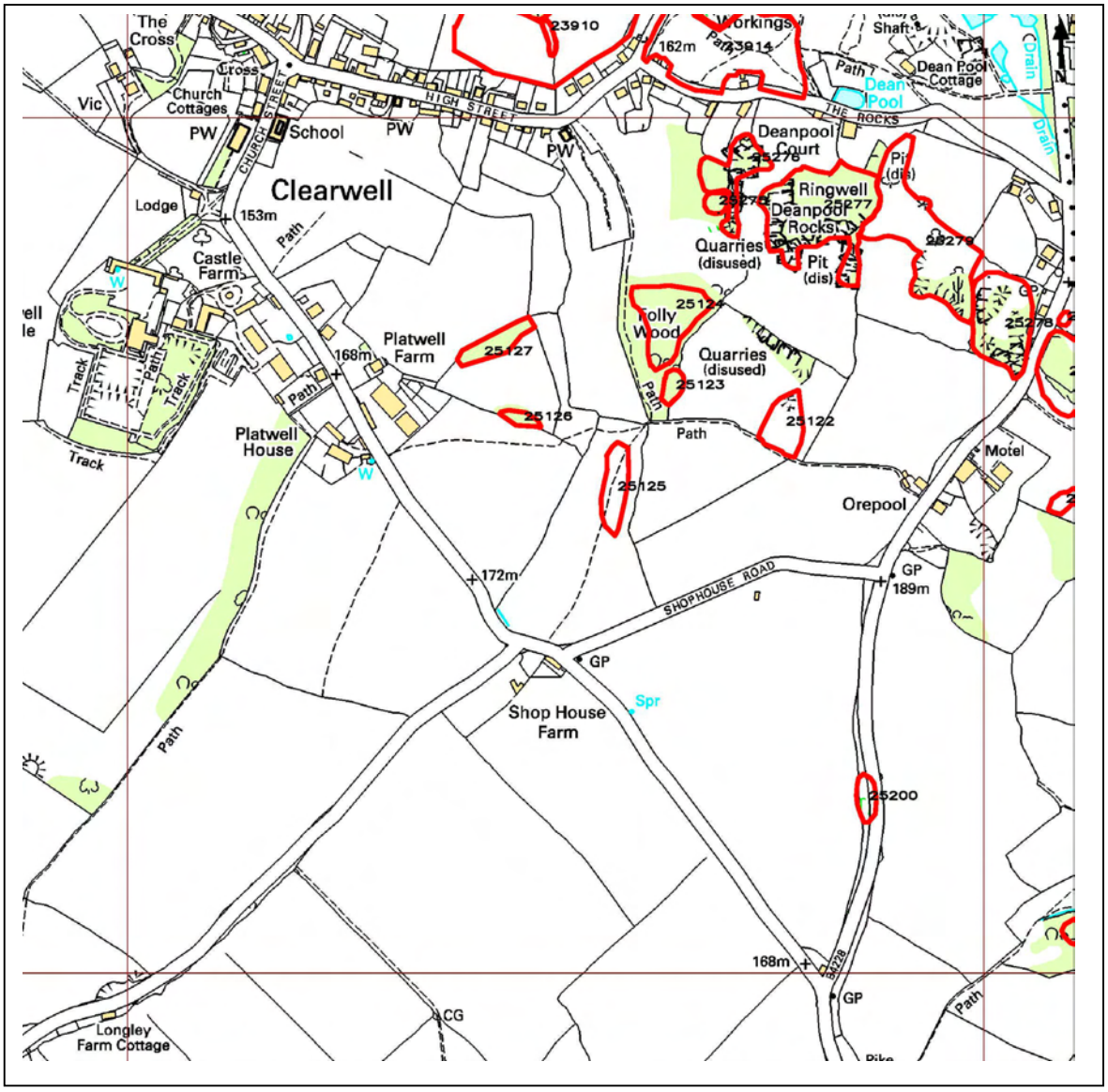
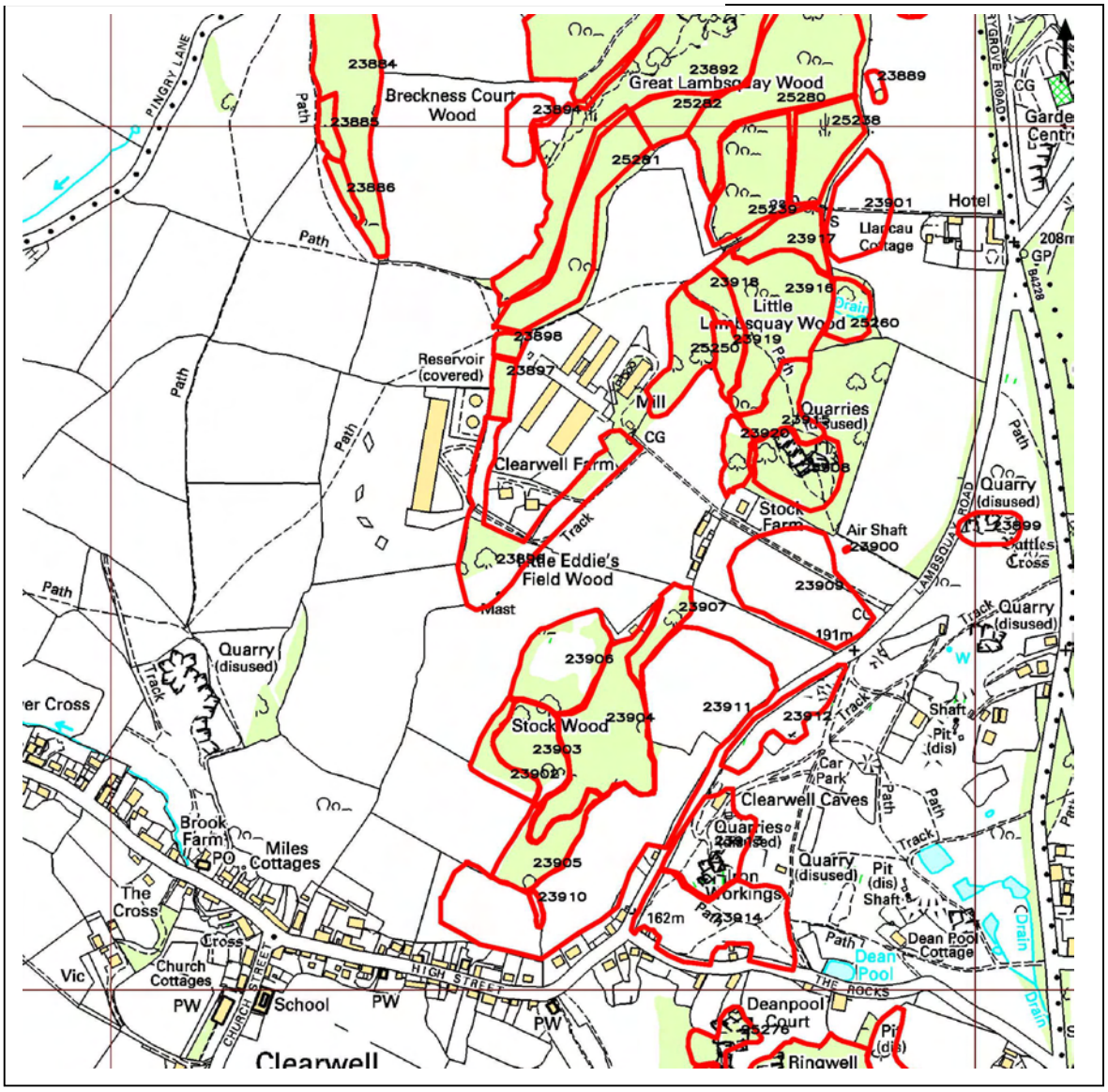


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 57 08

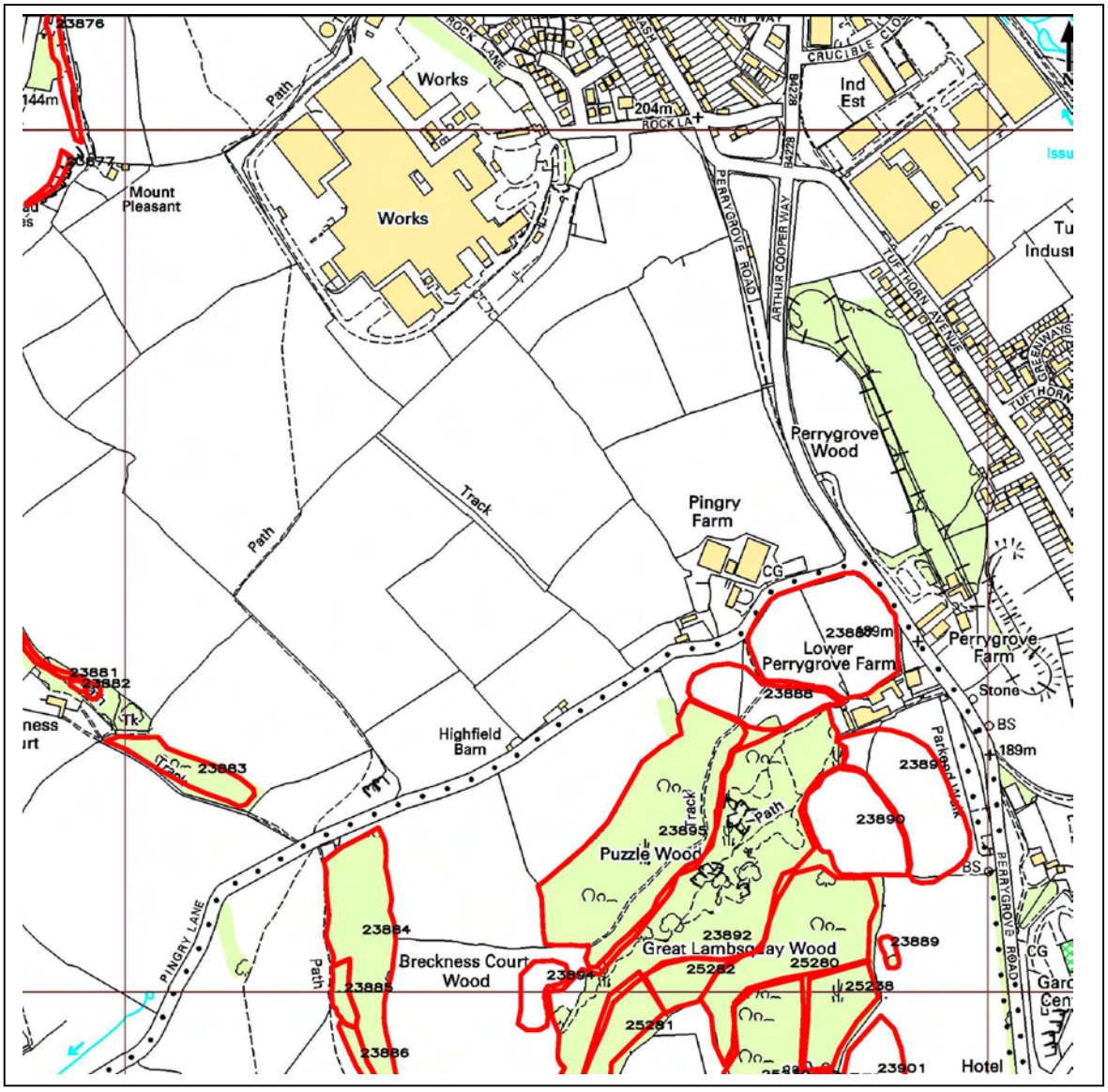


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 57 09

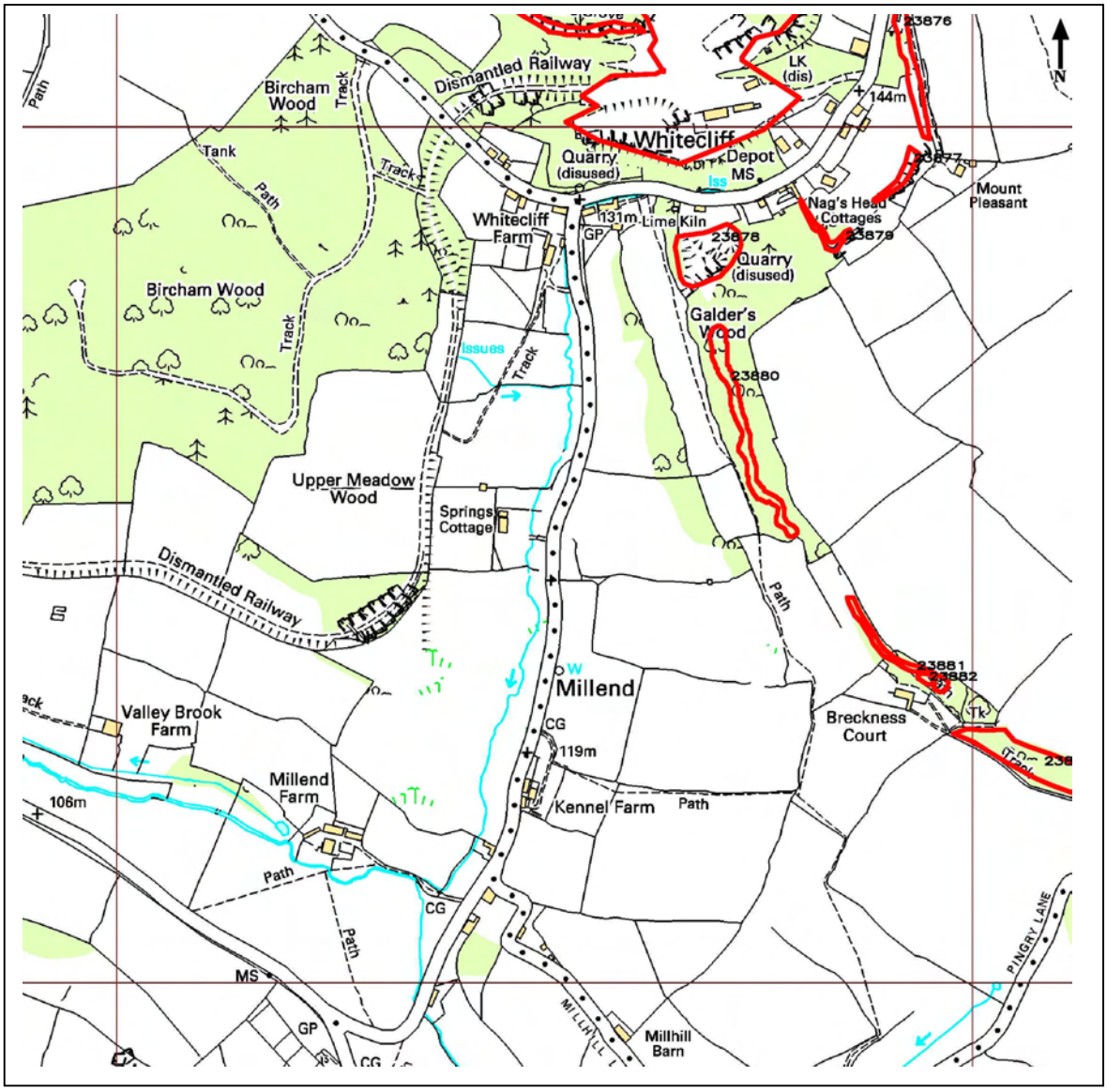


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 56 09

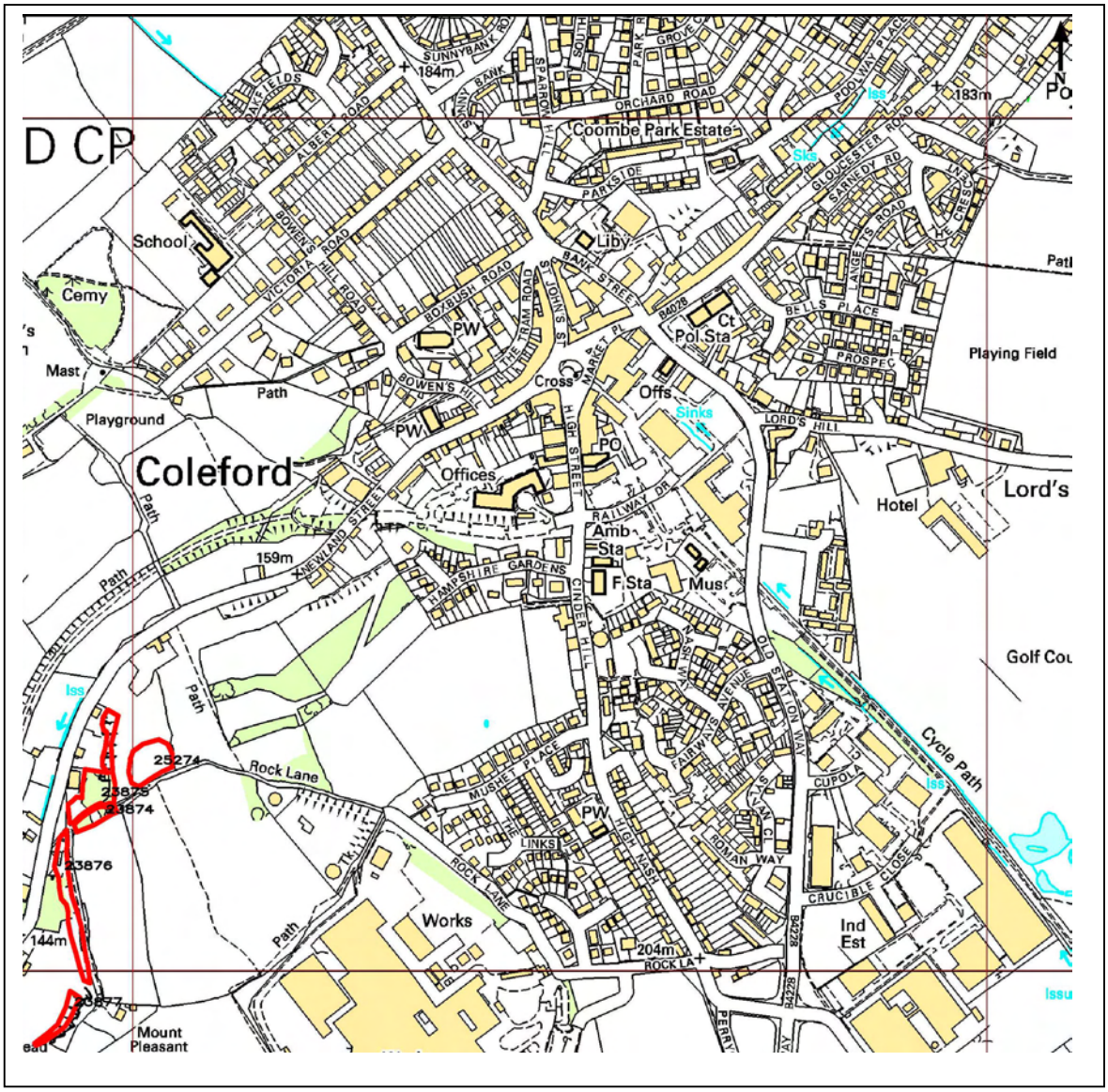


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 57 10

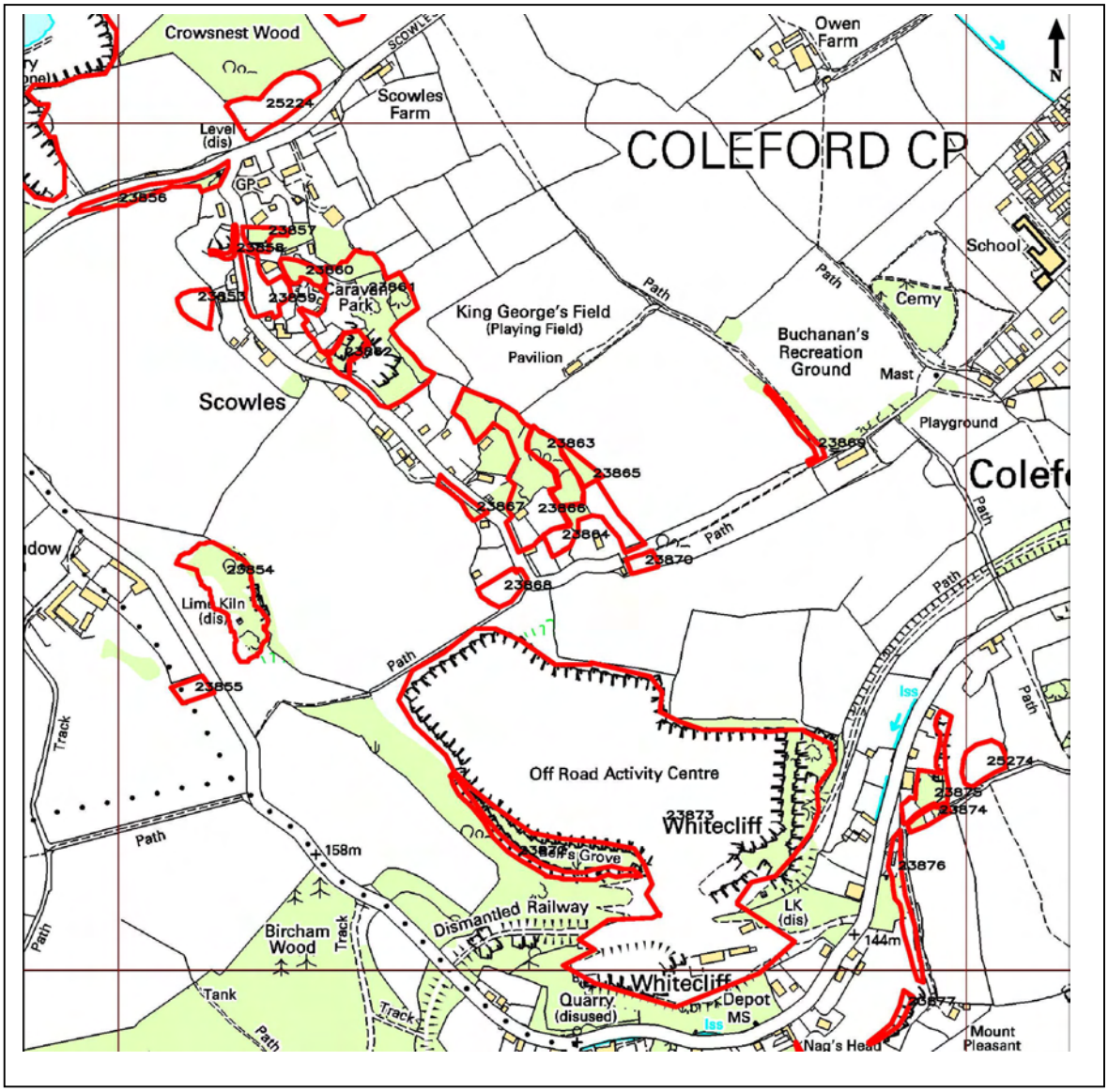


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 56 10

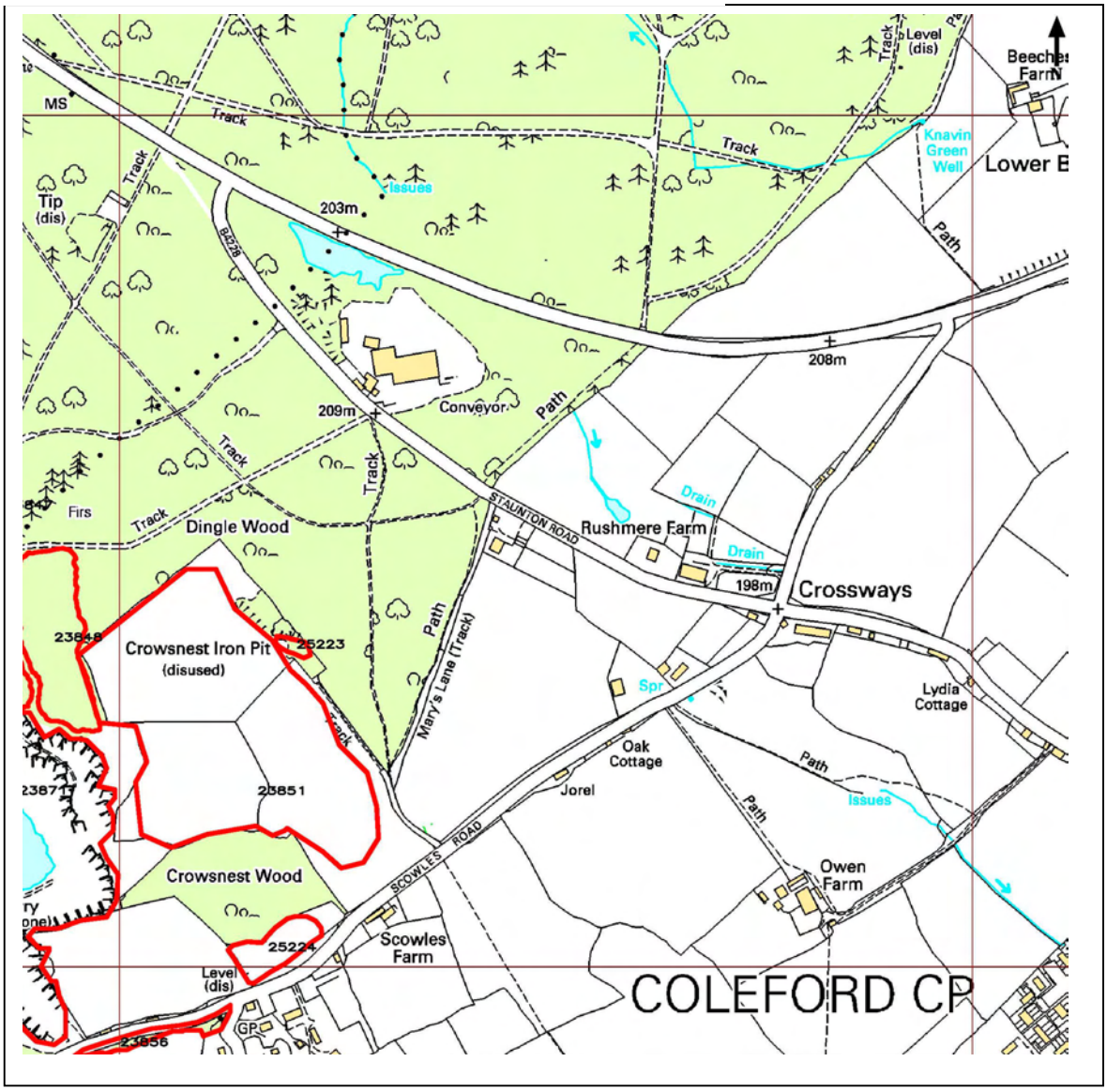


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 56 11

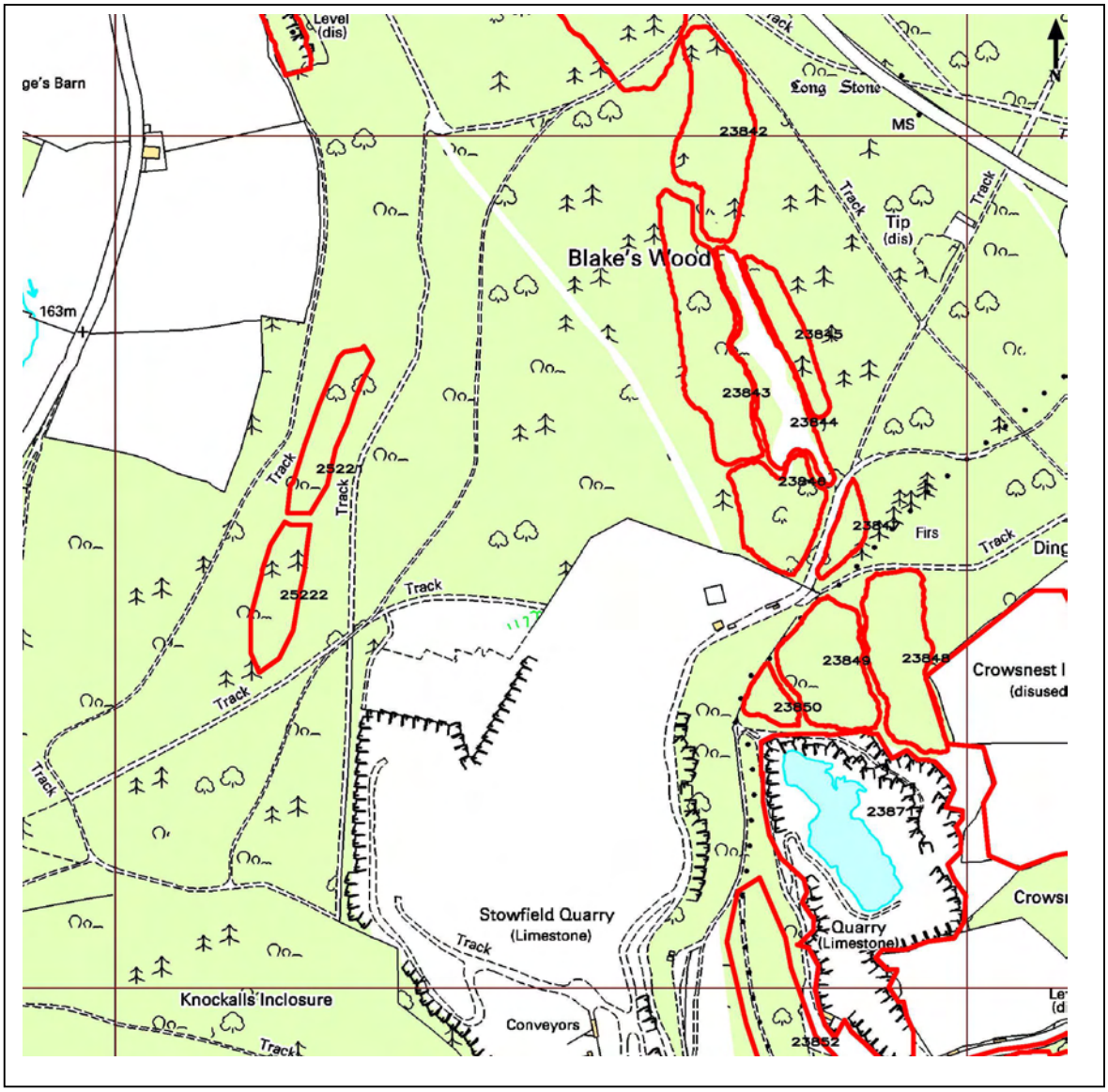


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 55 11

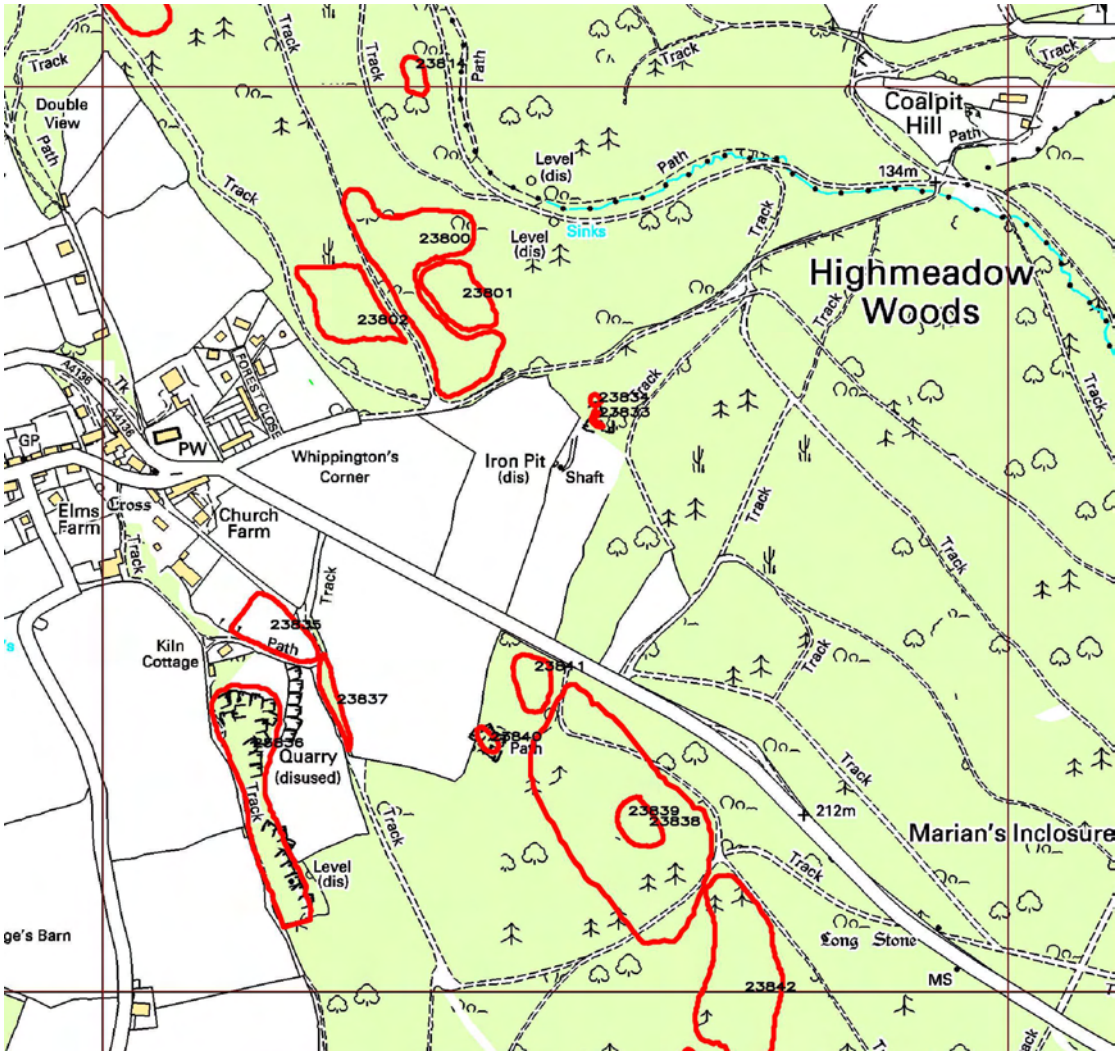


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 55 12

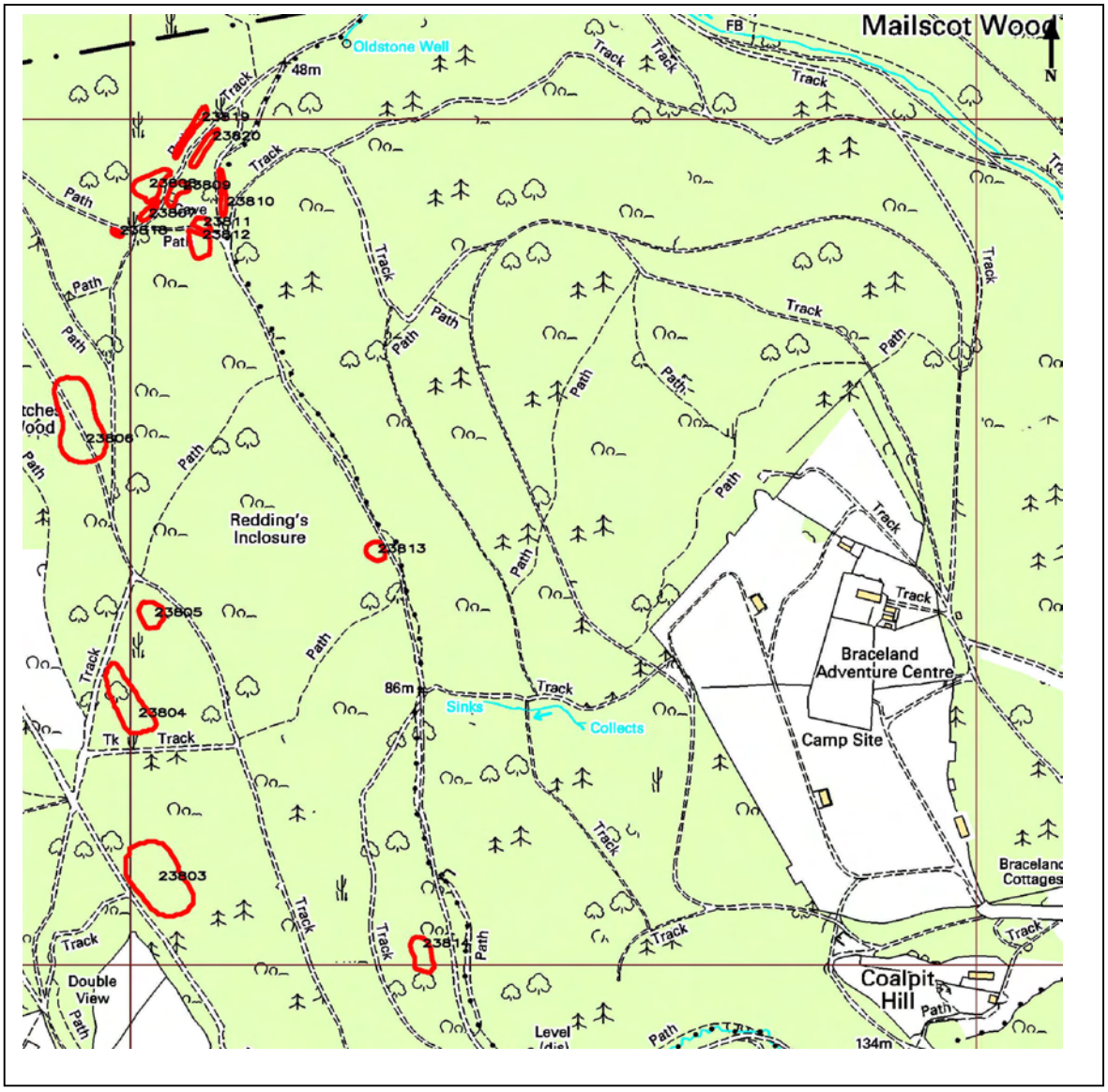


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 55 13

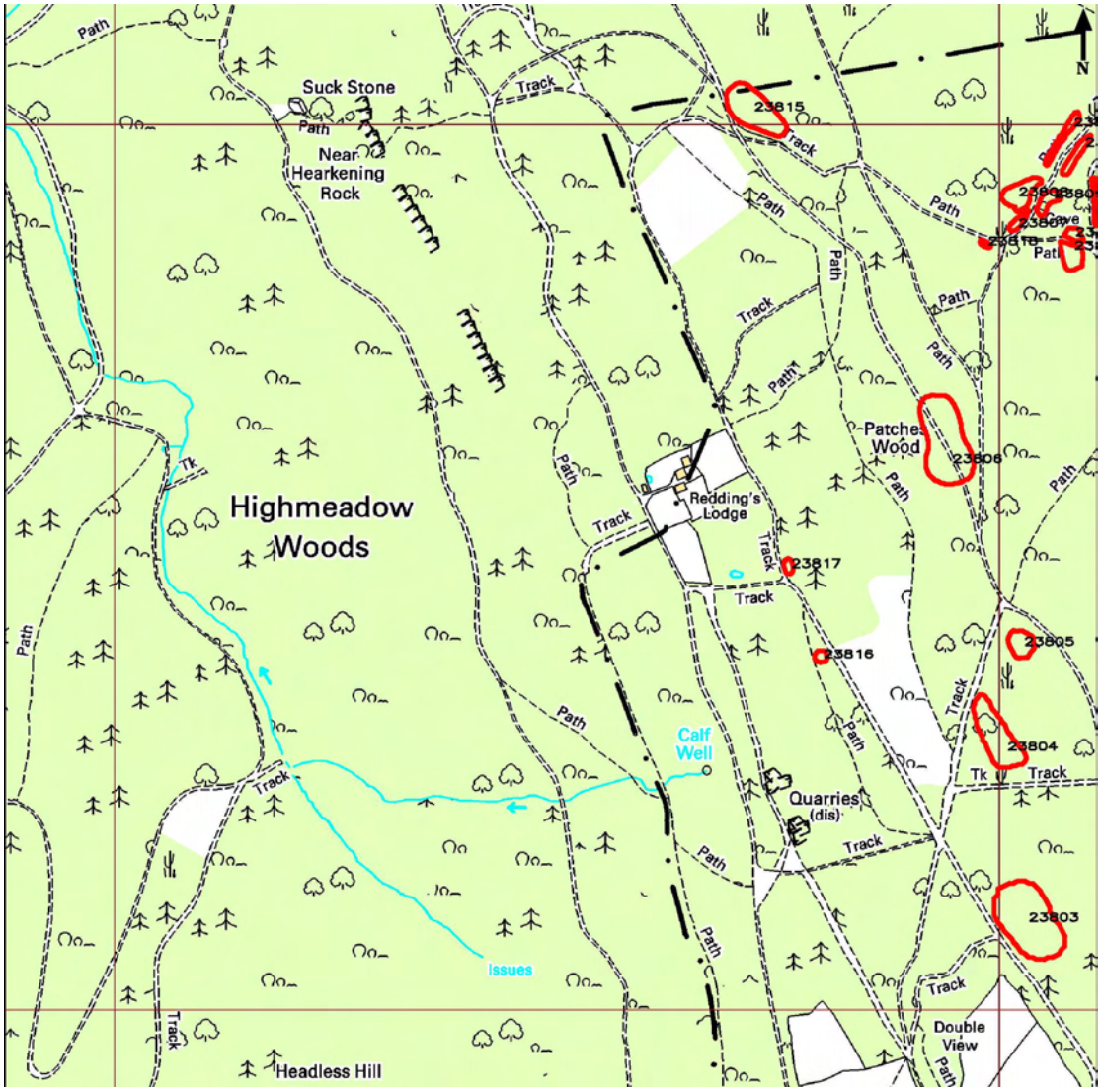


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 54 13

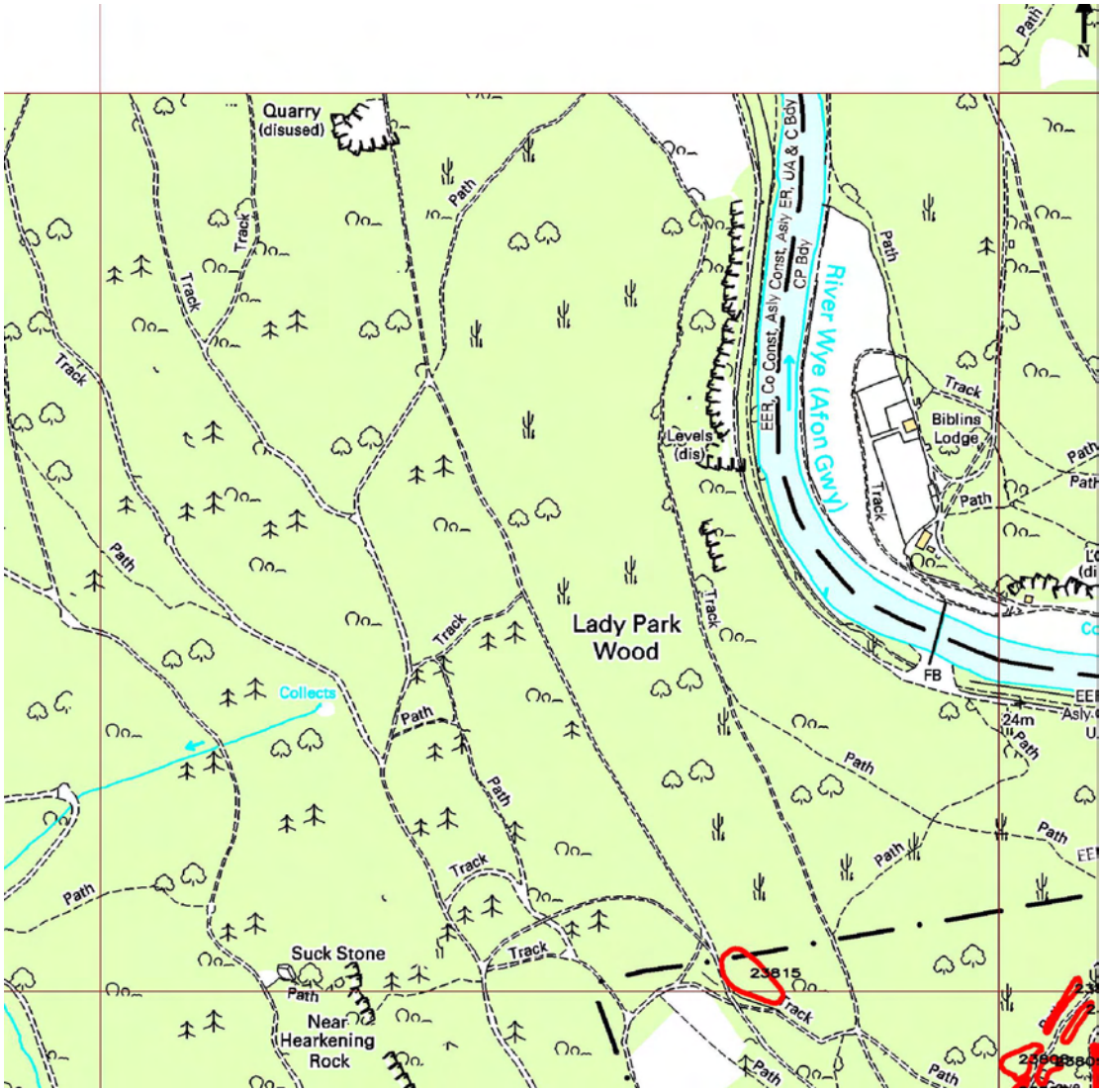


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 54 14

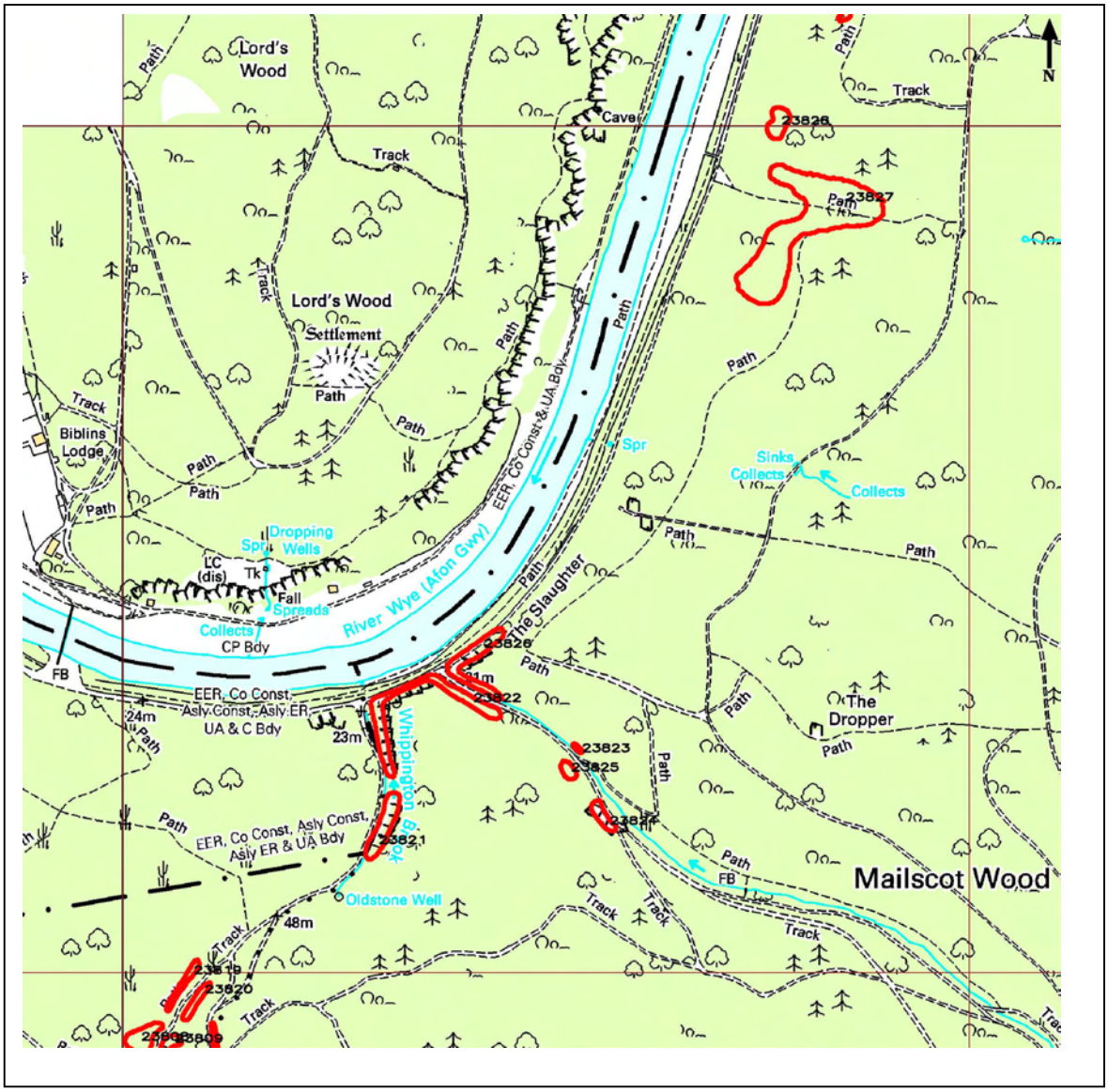


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 55 14

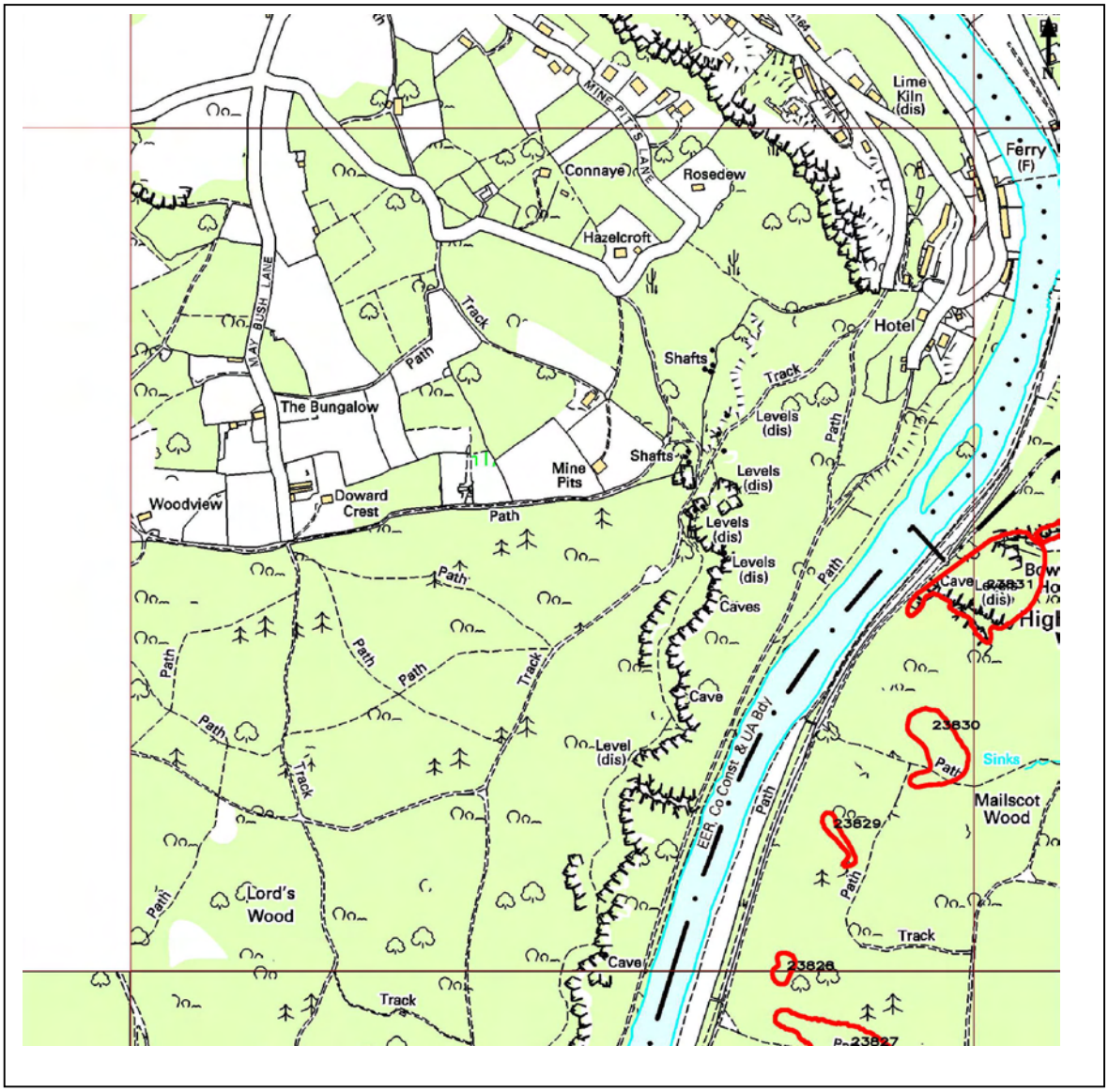


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 55 15

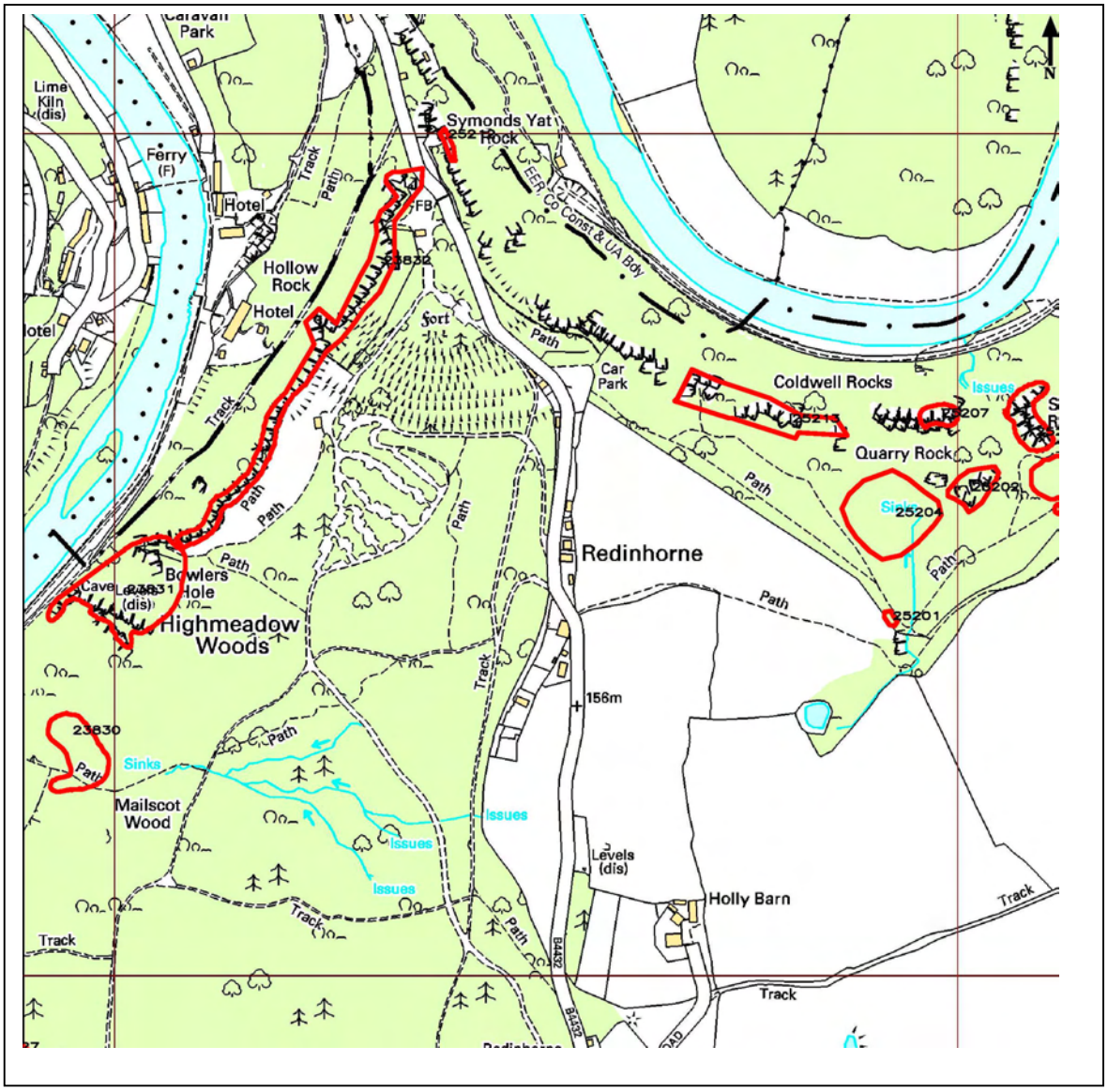


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 56 15

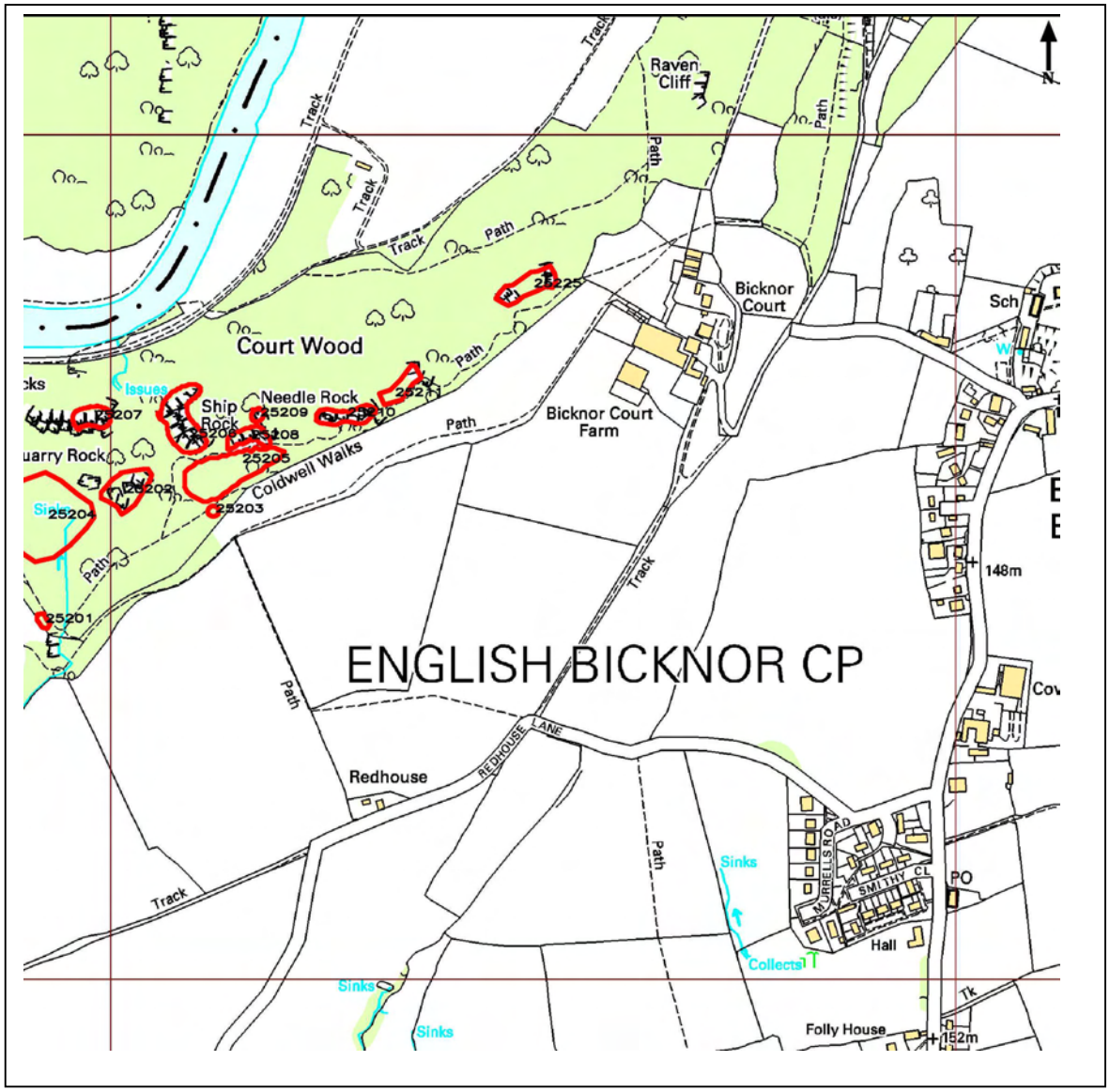


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 57 15

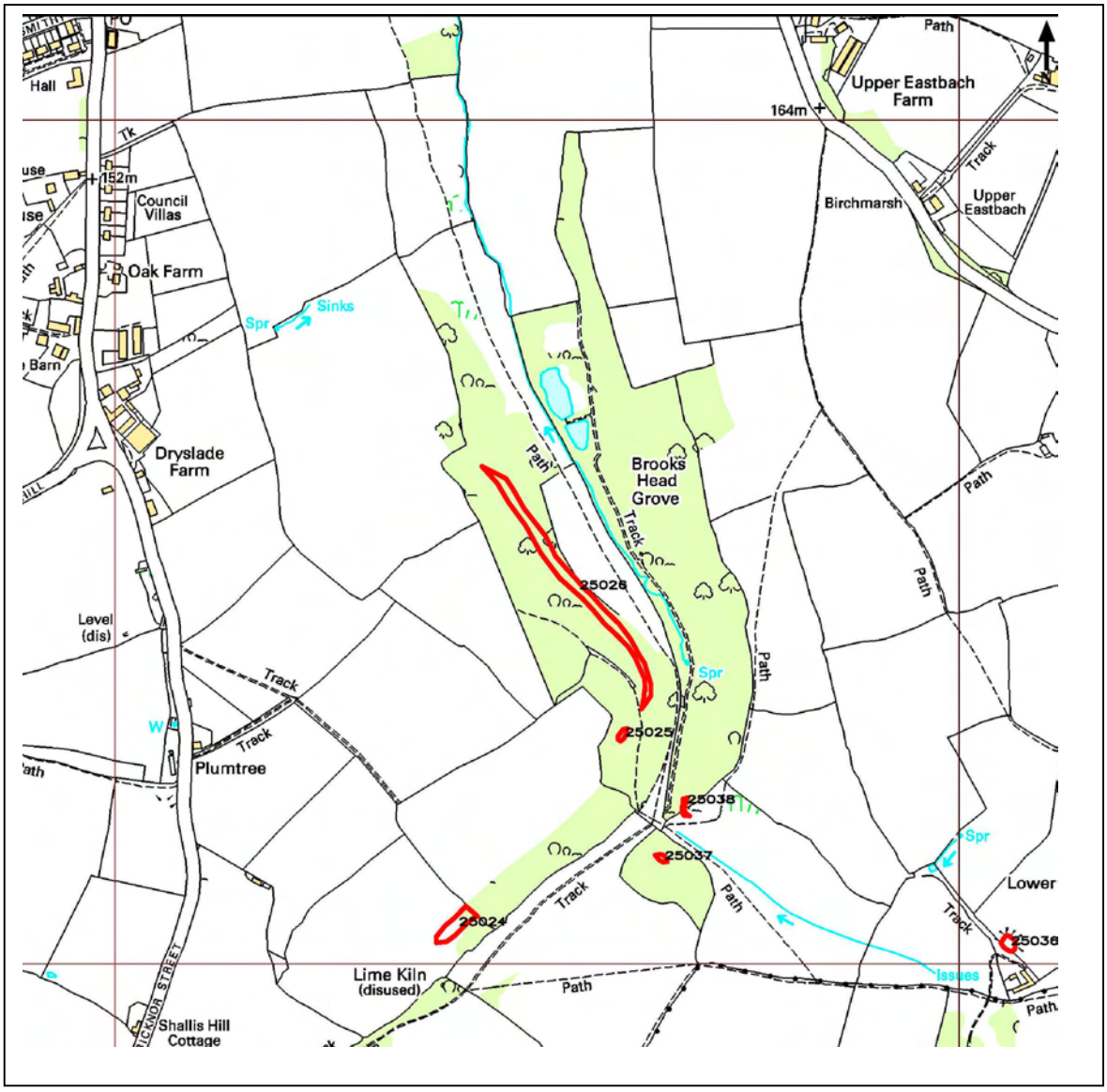


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 58 14

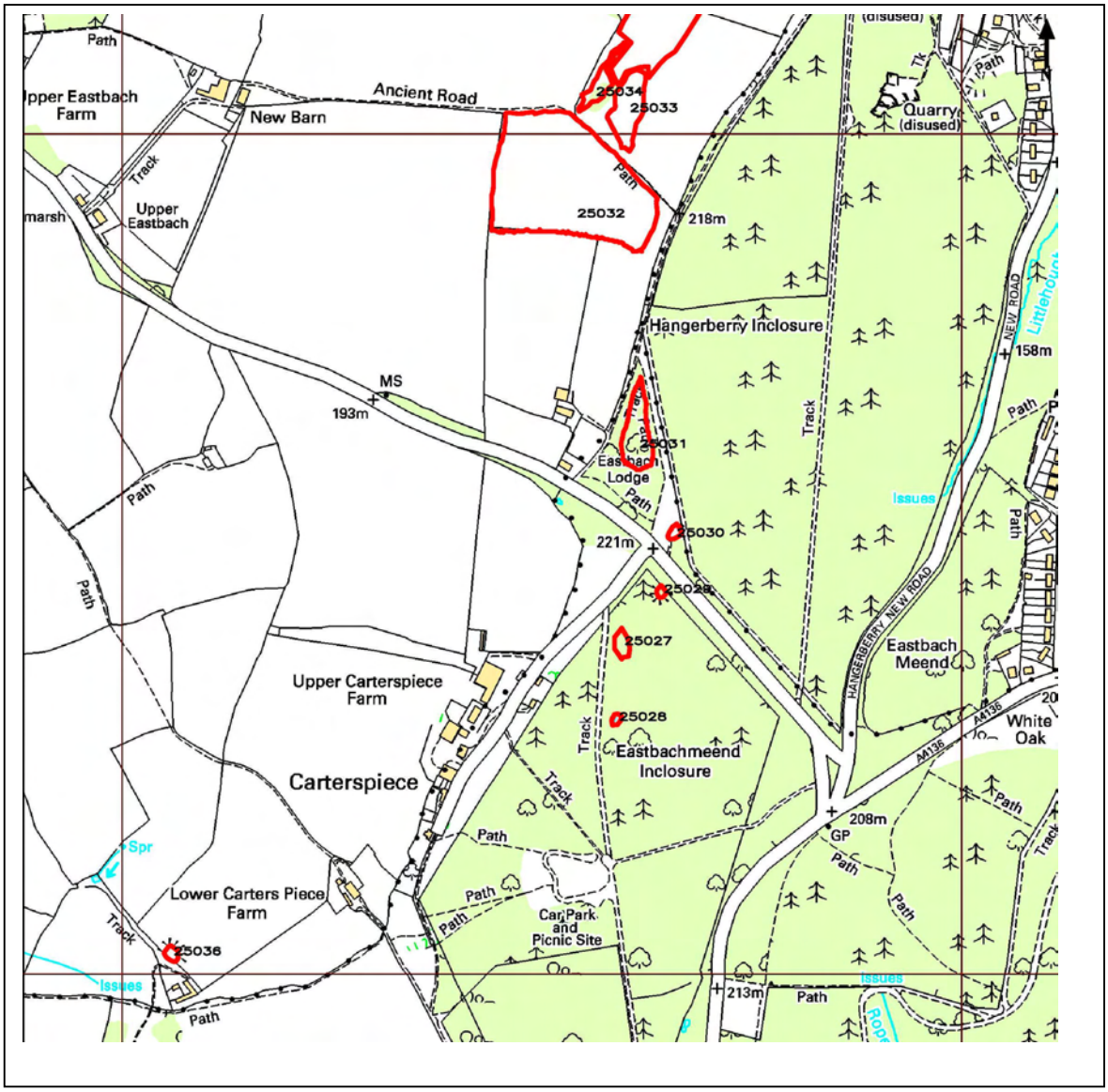


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 59 14

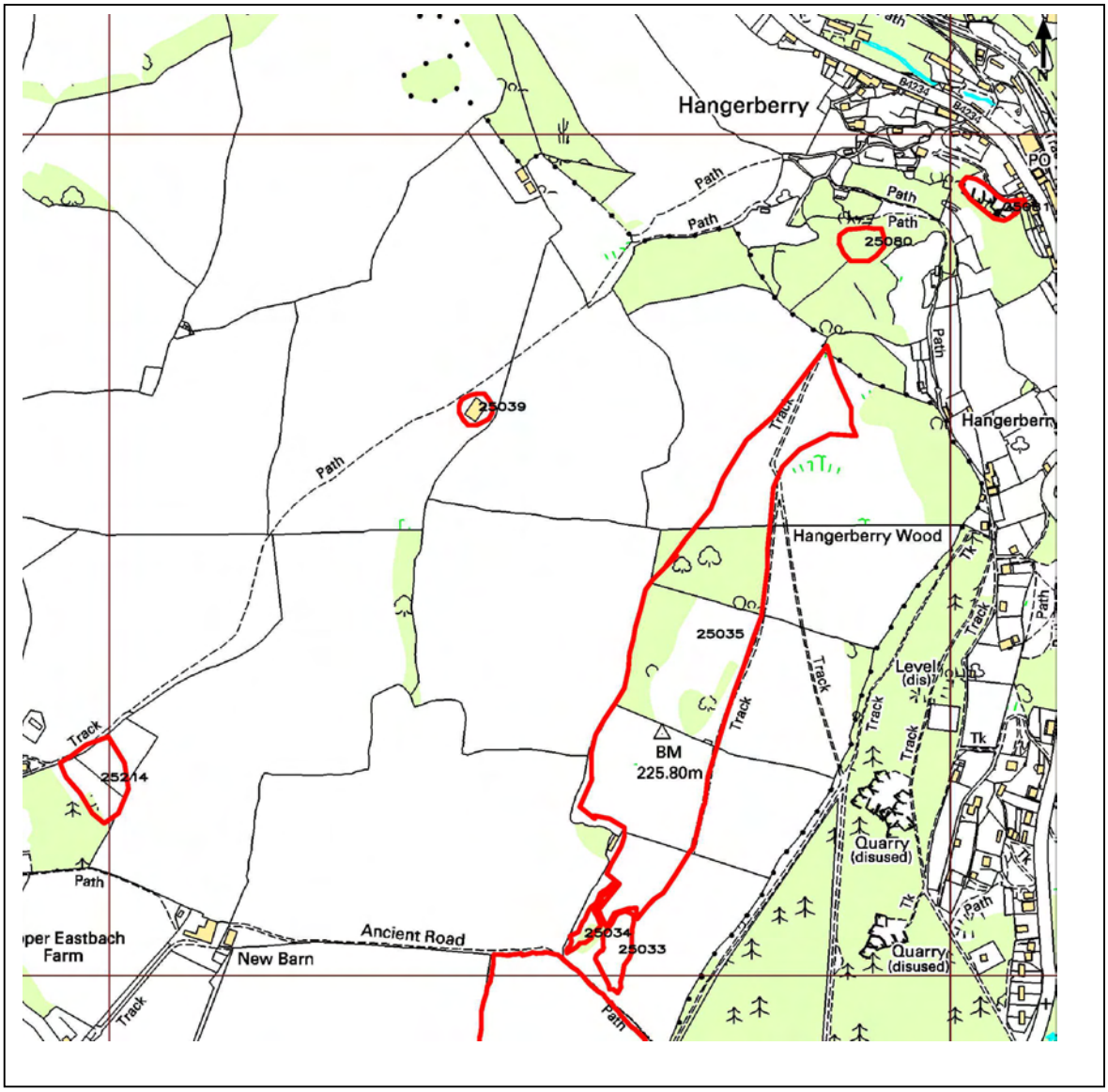


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 59 15



Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

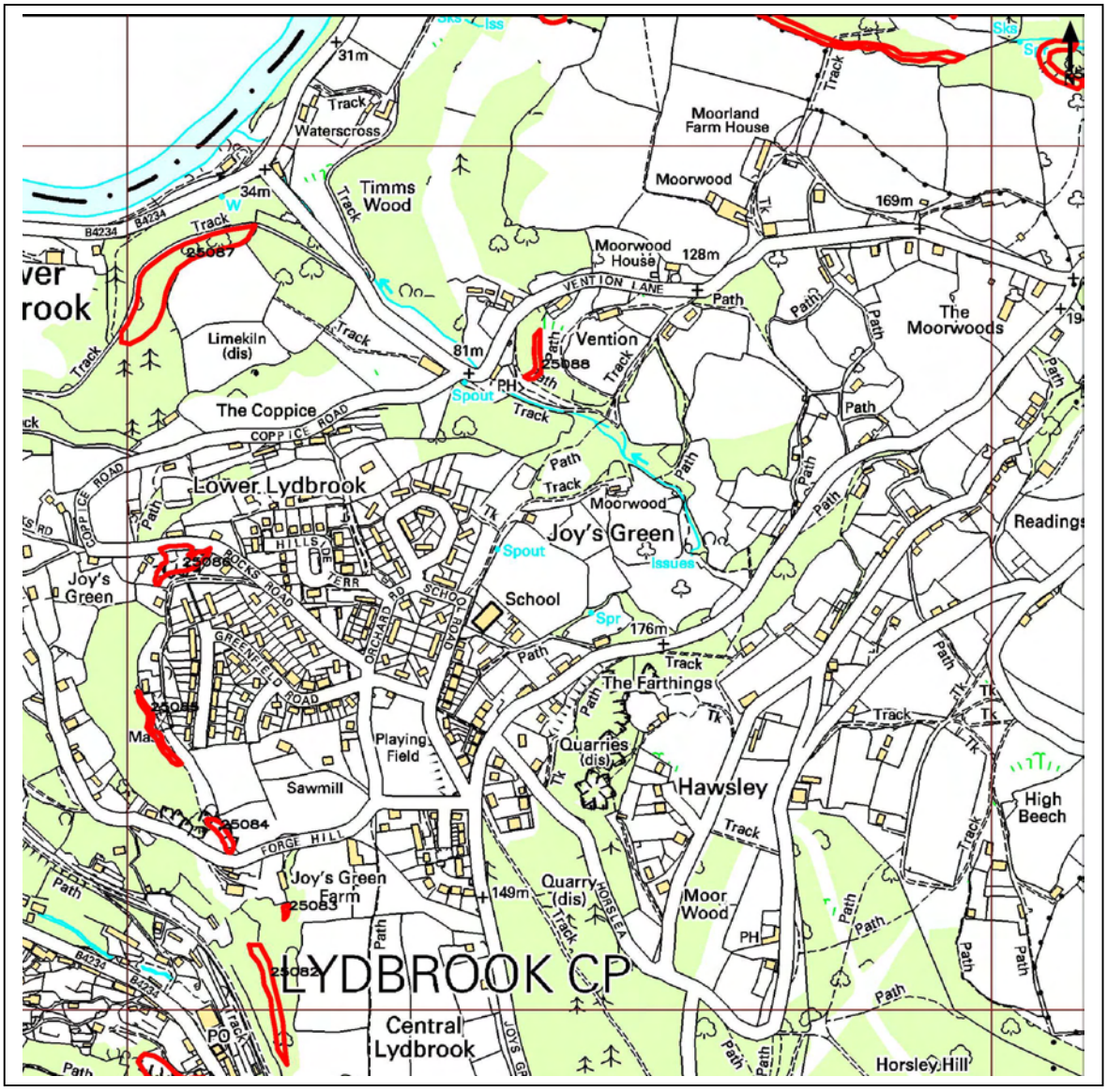
NGR SO 60 15

Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 60 16

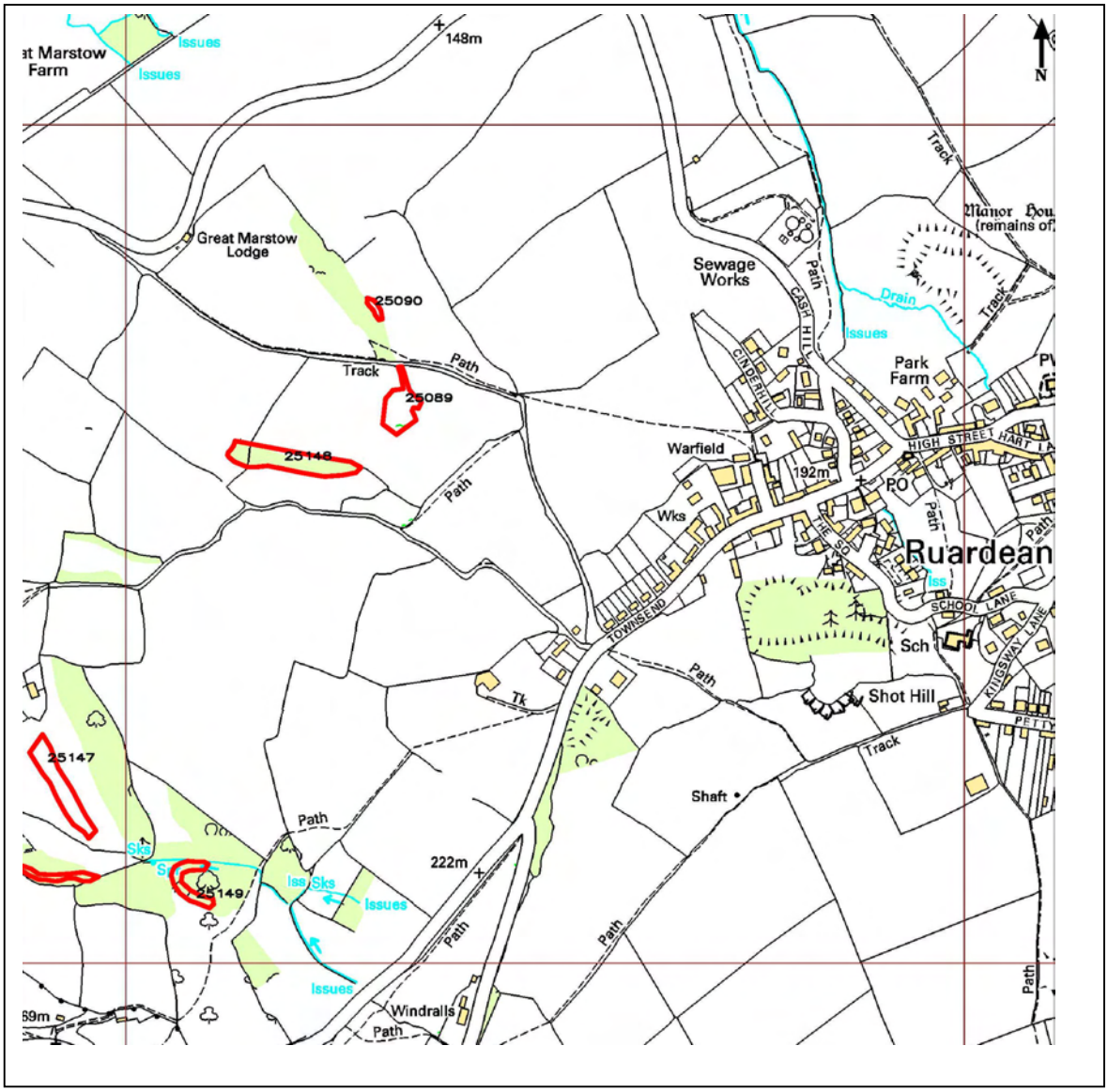


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 61 17

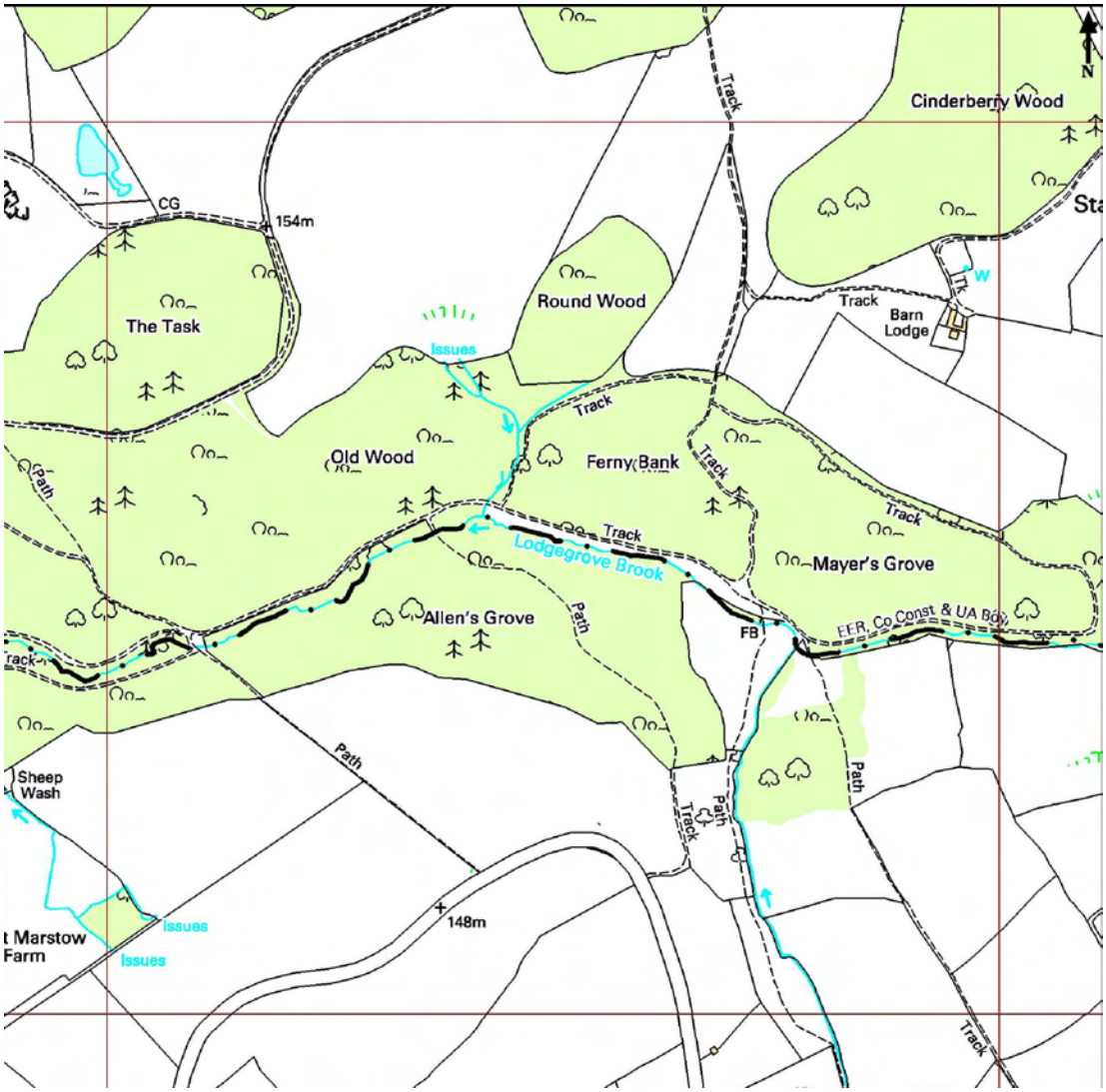


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 61 18

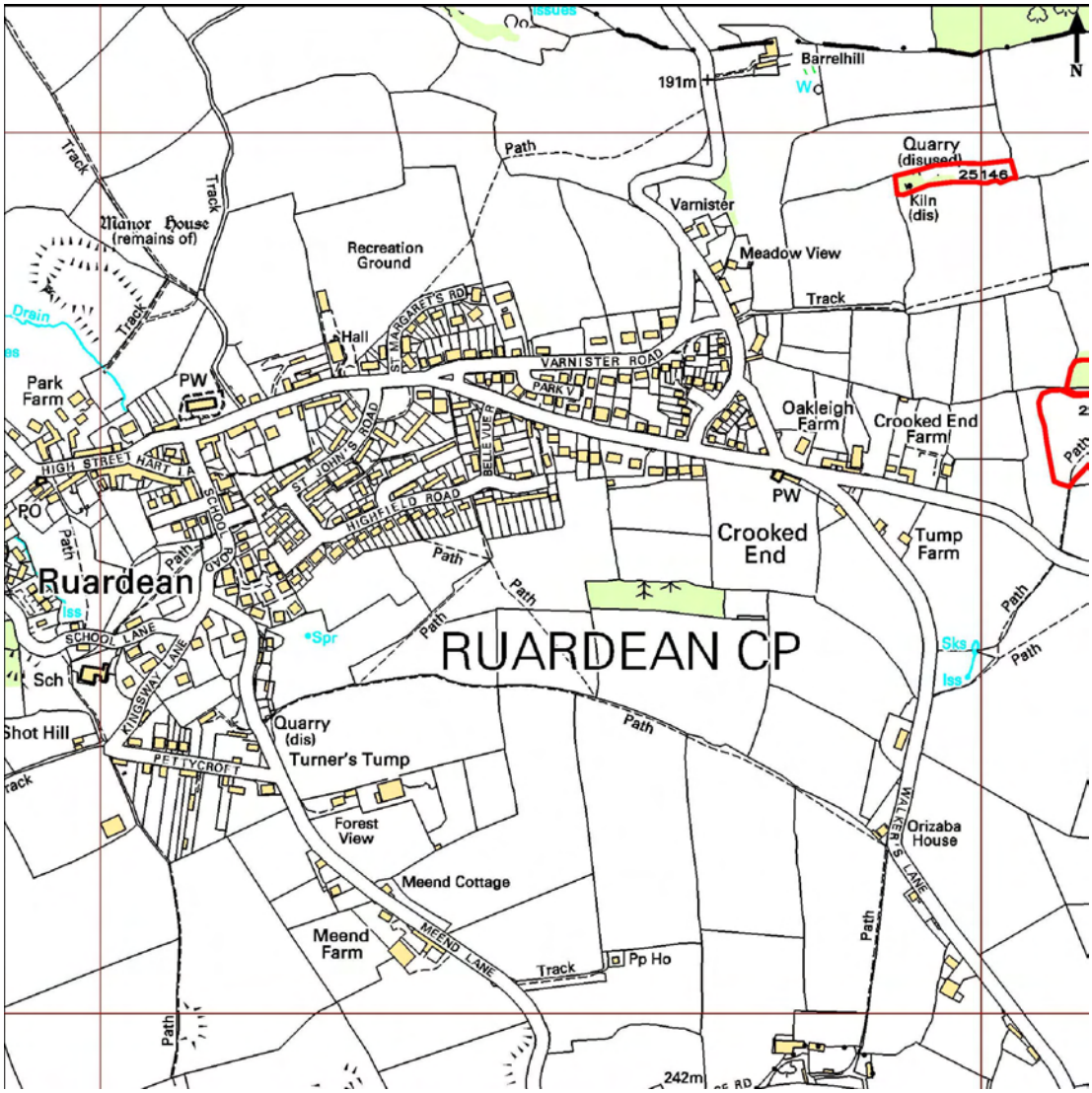


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 62 17

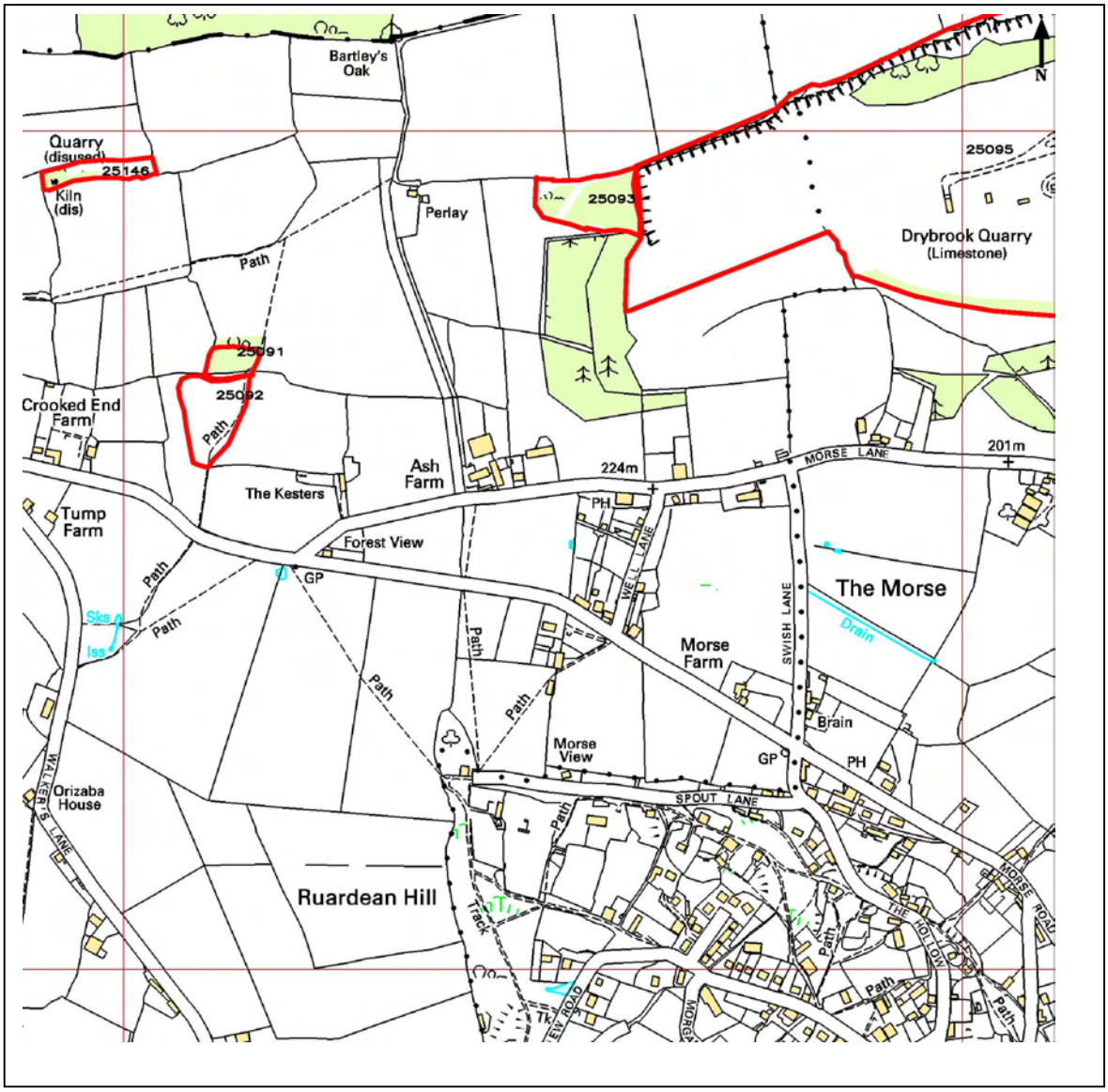


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 63 17

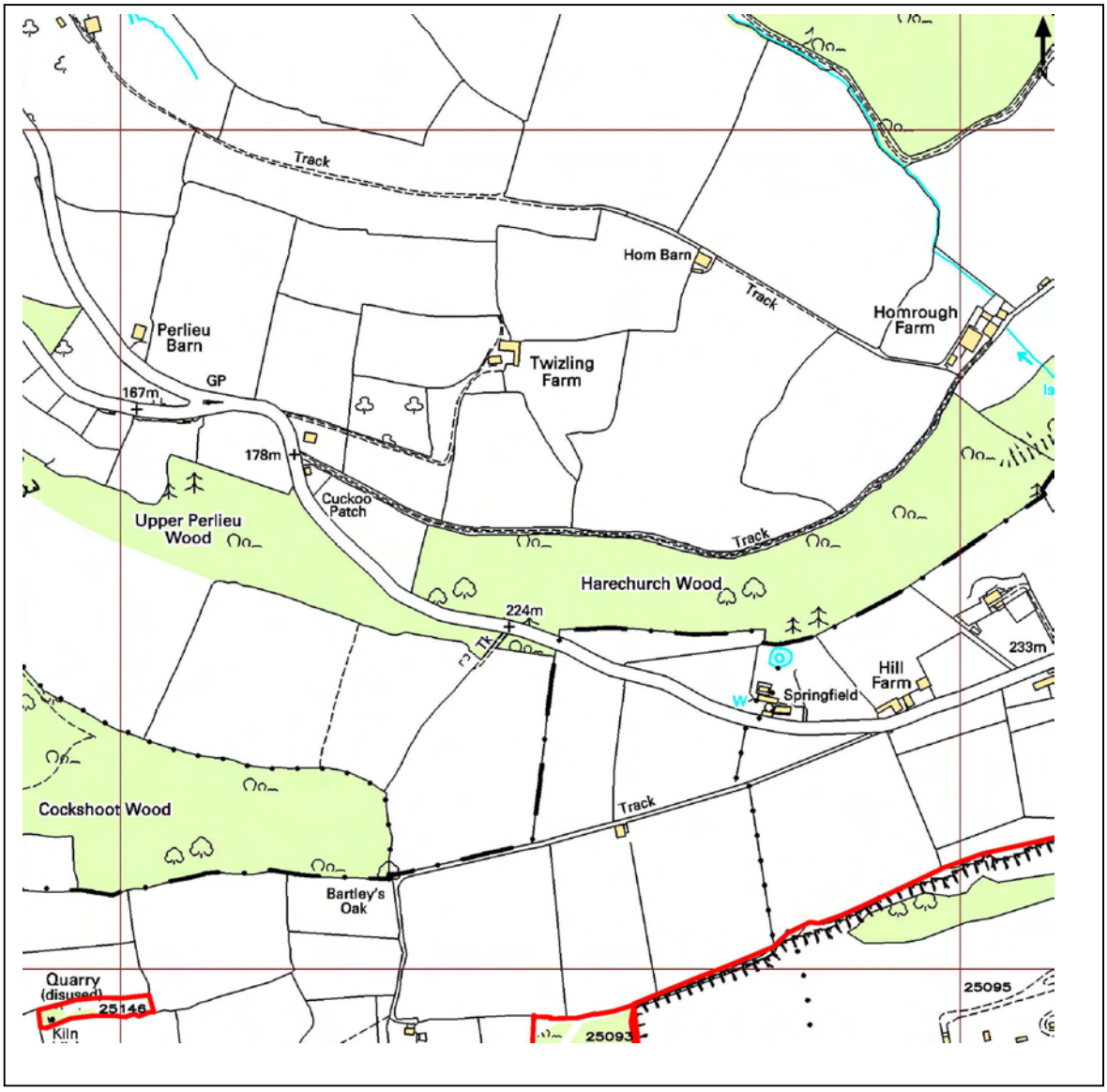


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 63 18



Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

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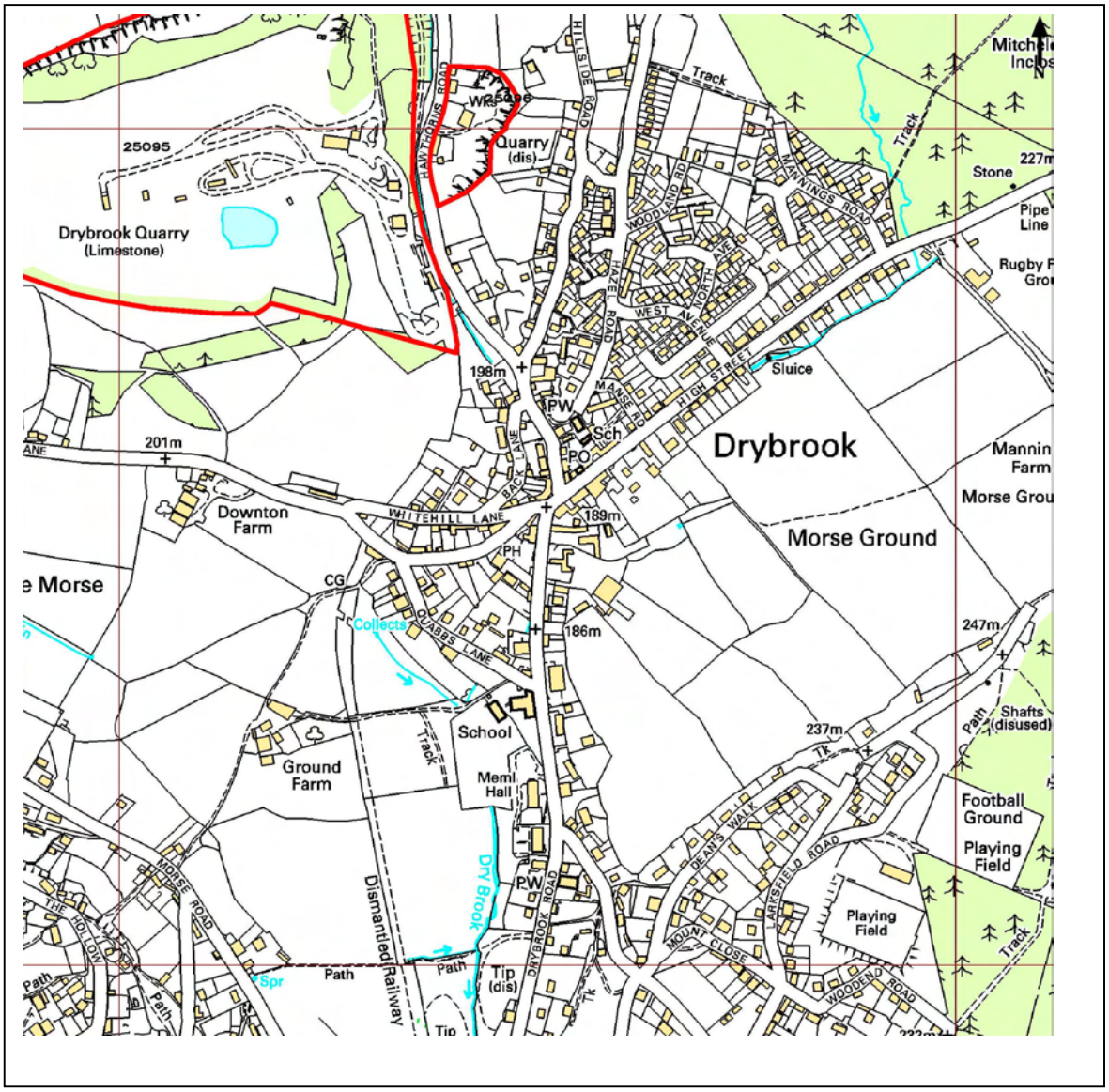

Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

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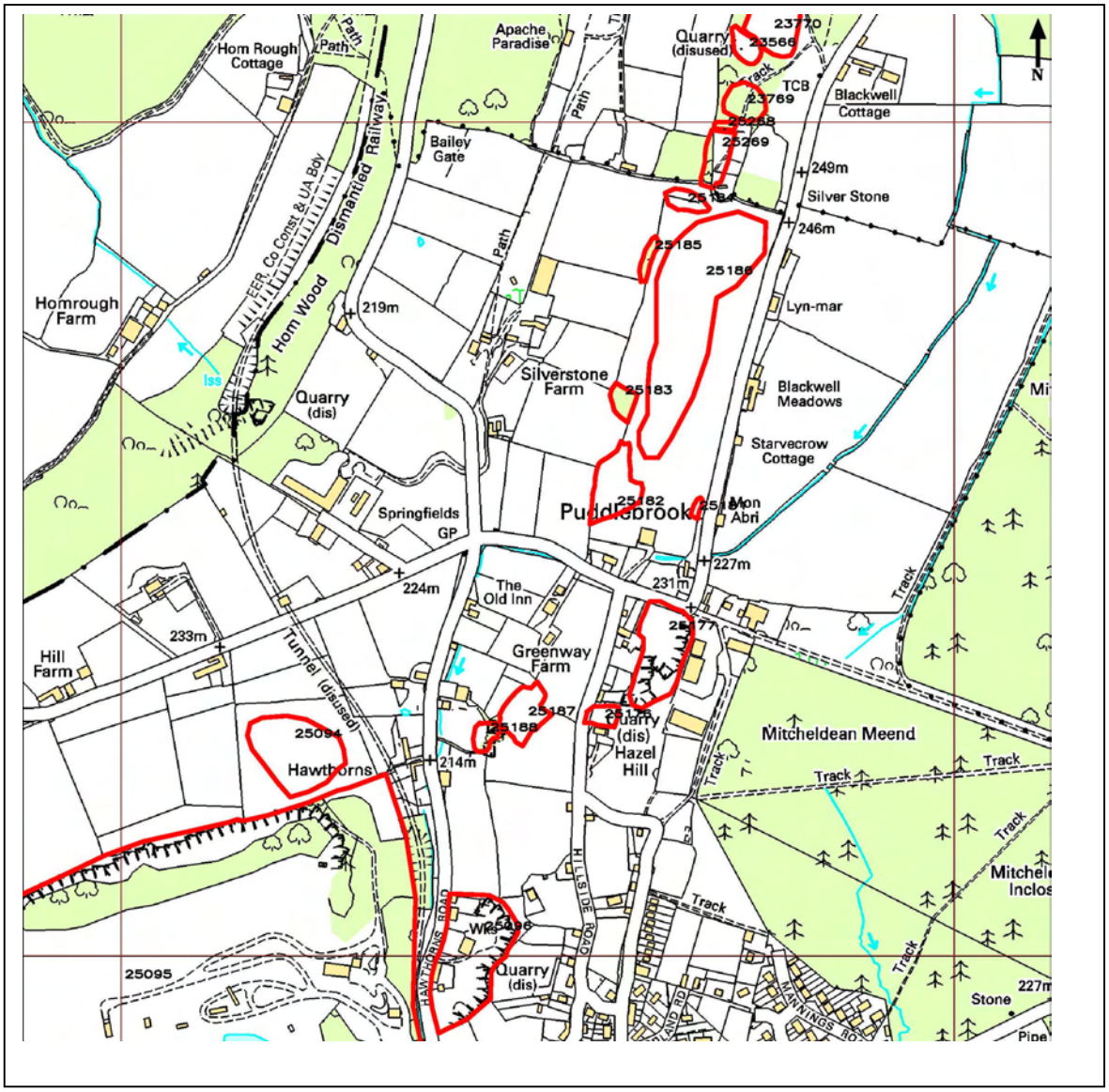
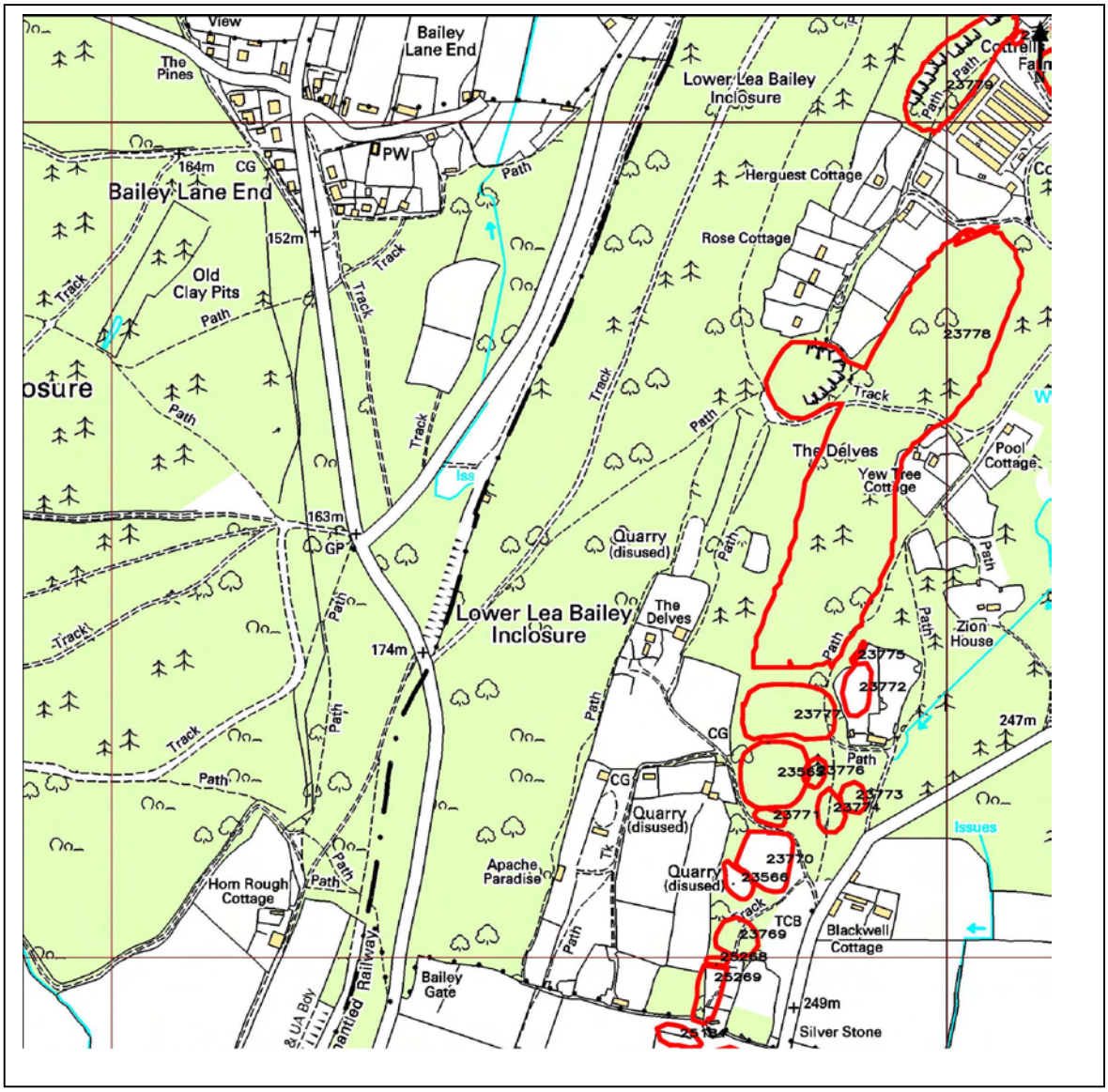


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 64 19



Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

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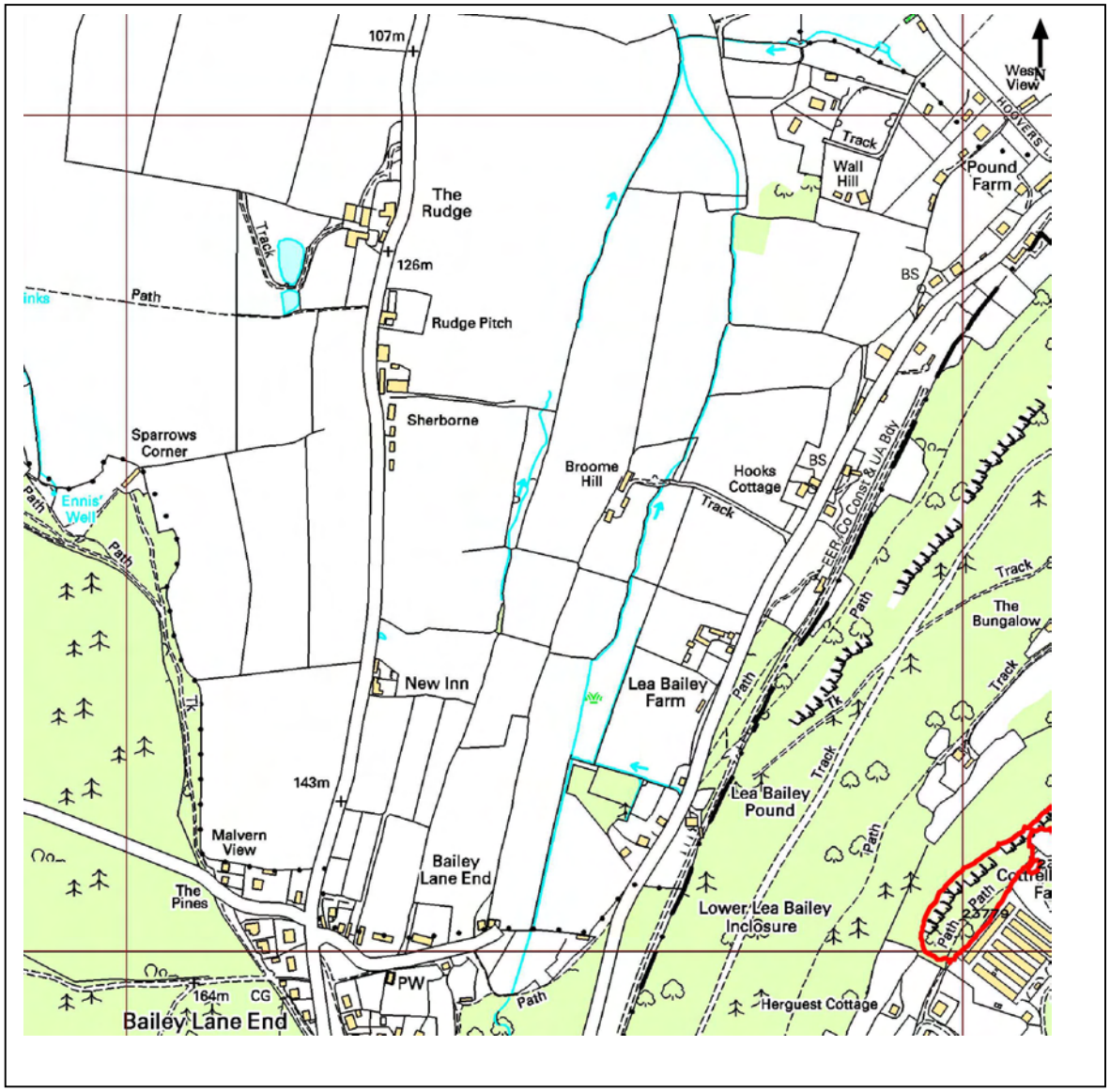

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All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

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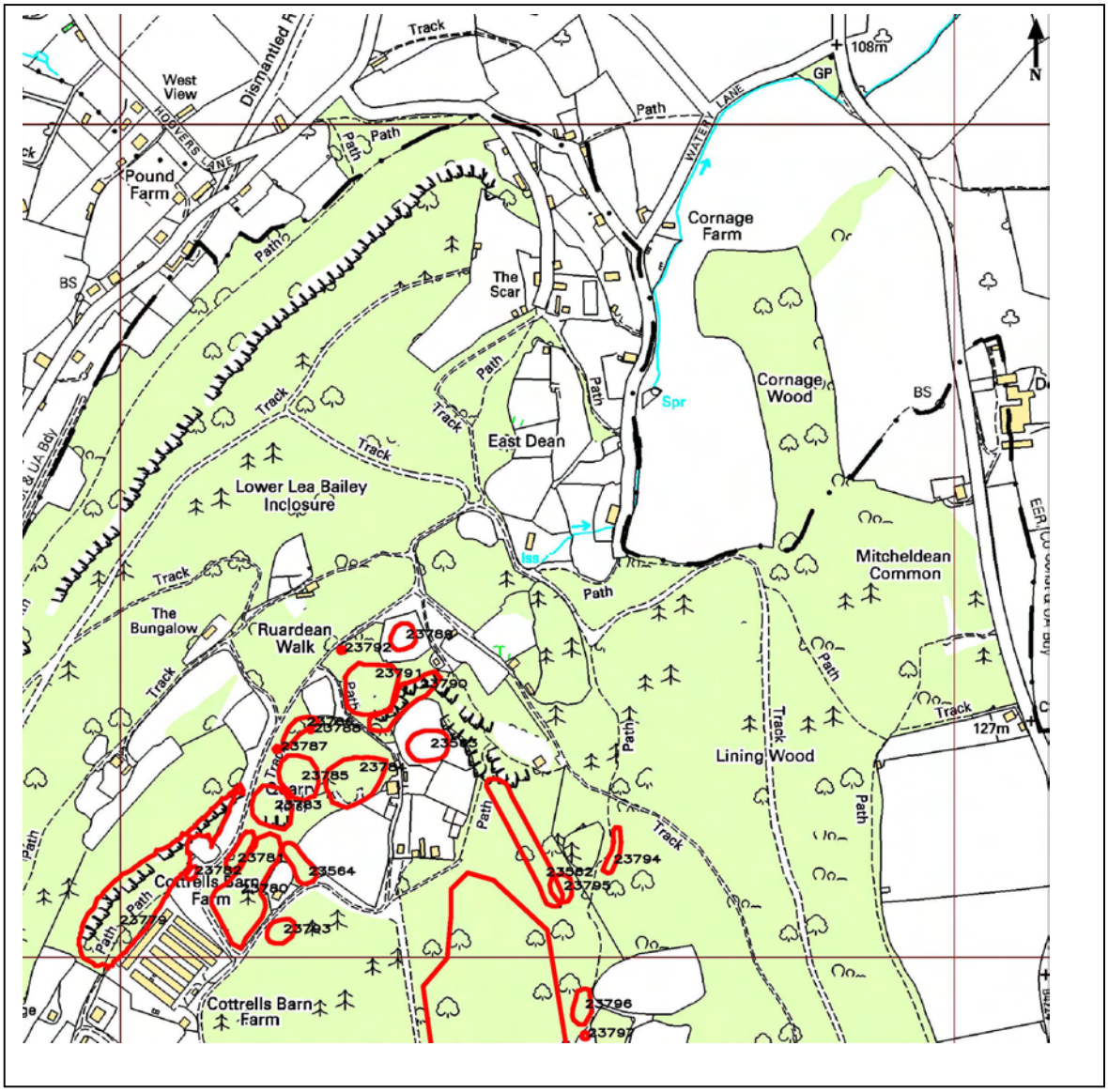

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All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

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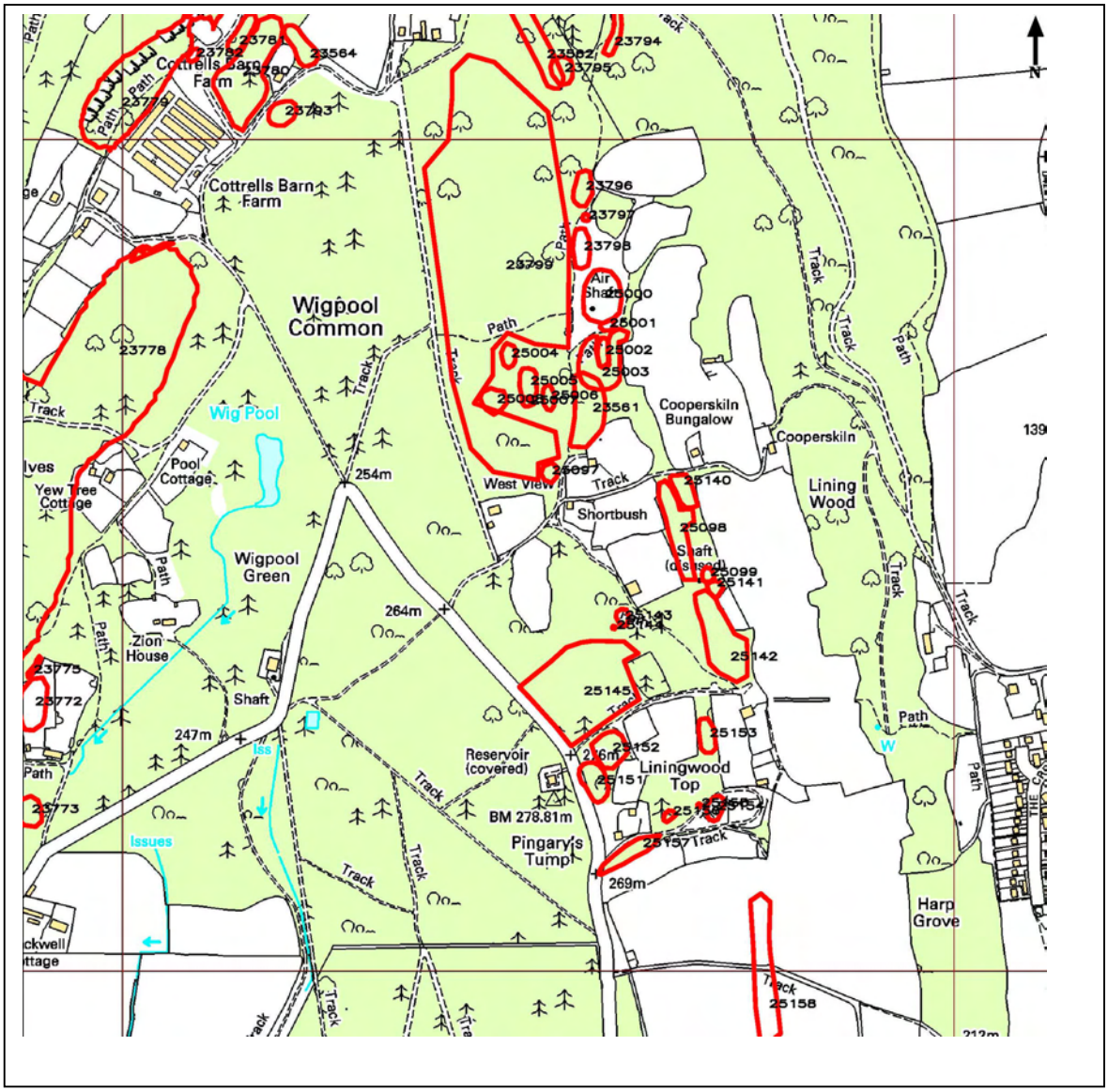
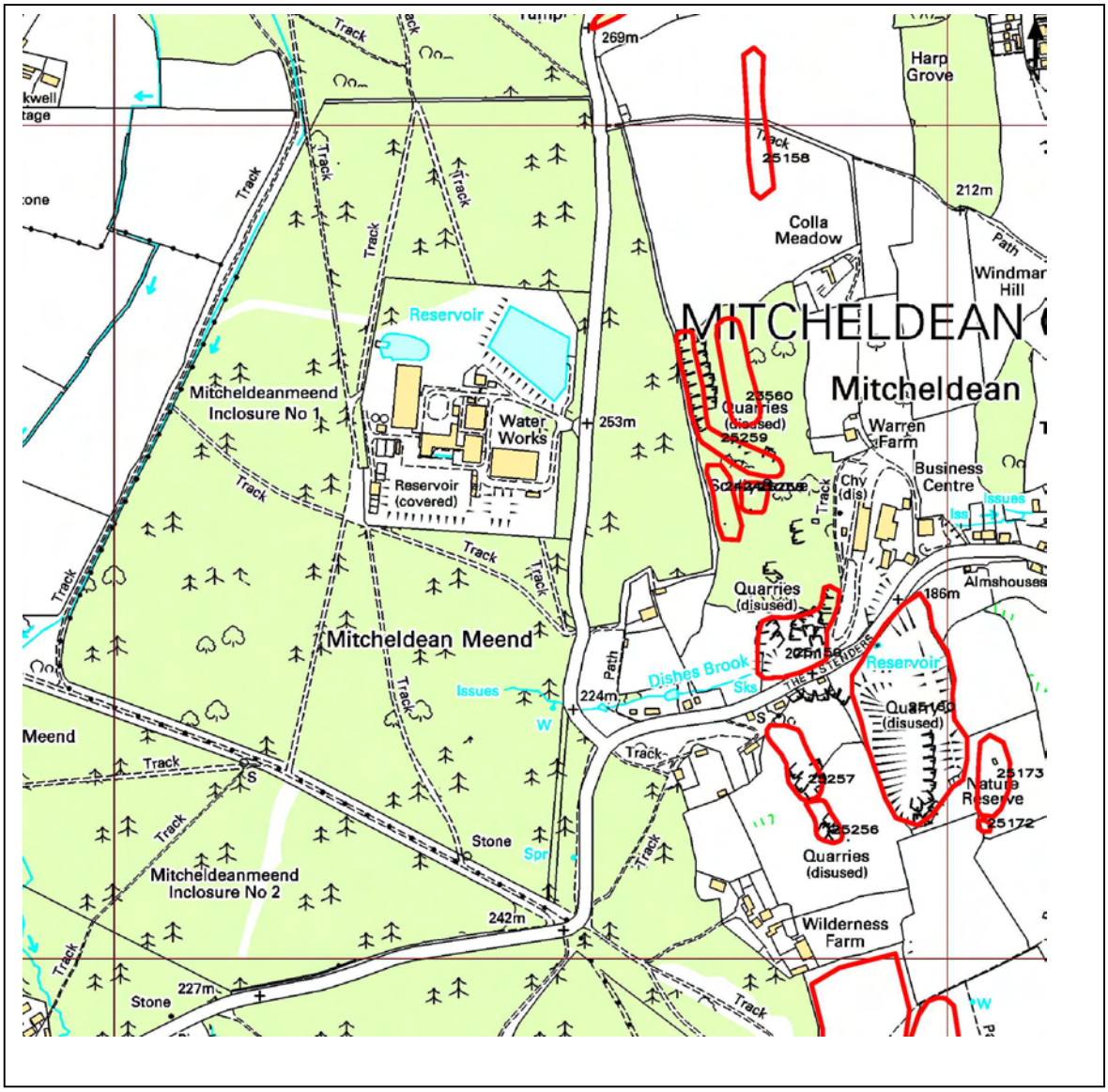


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 65 18

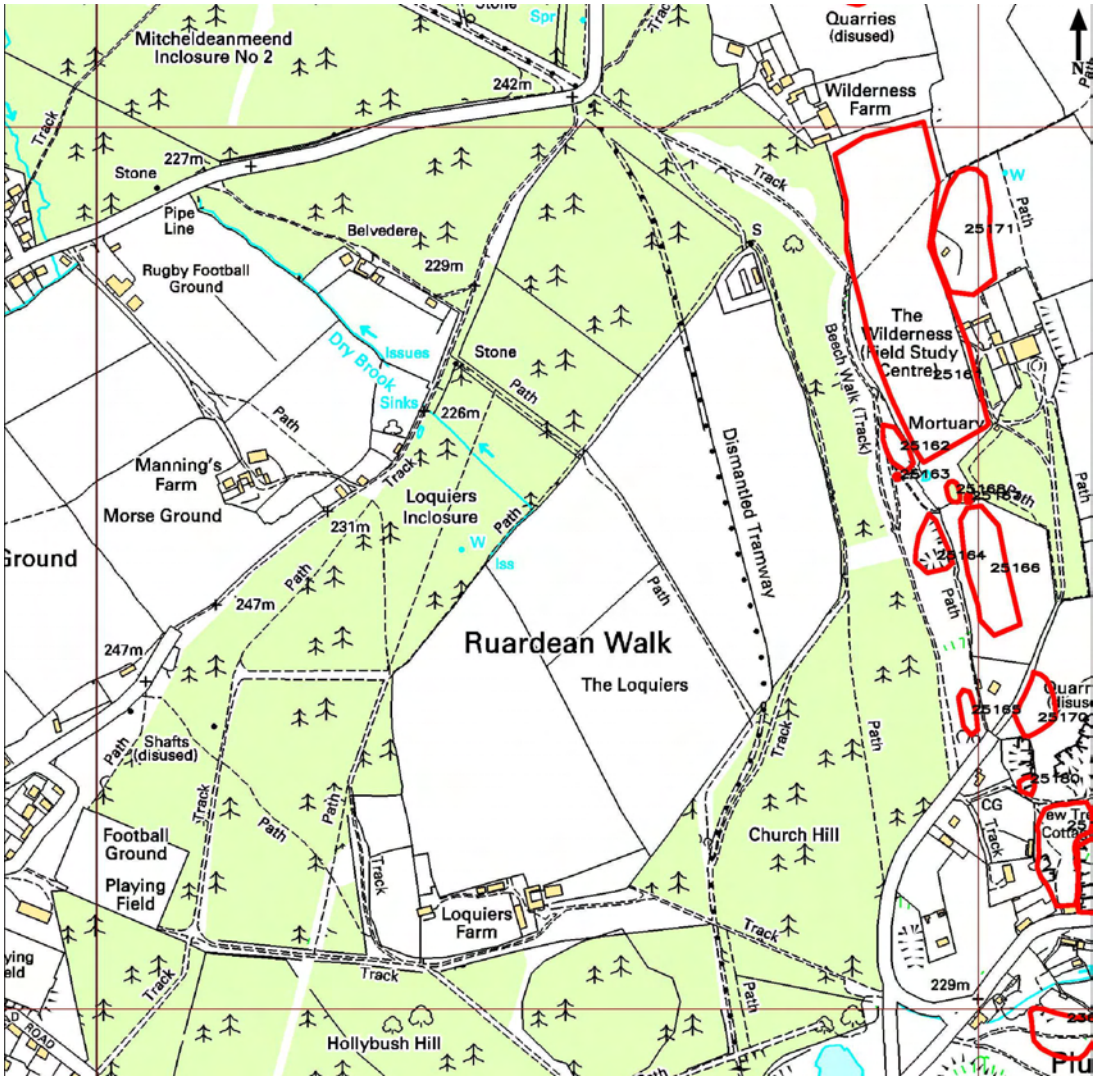


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 65 17

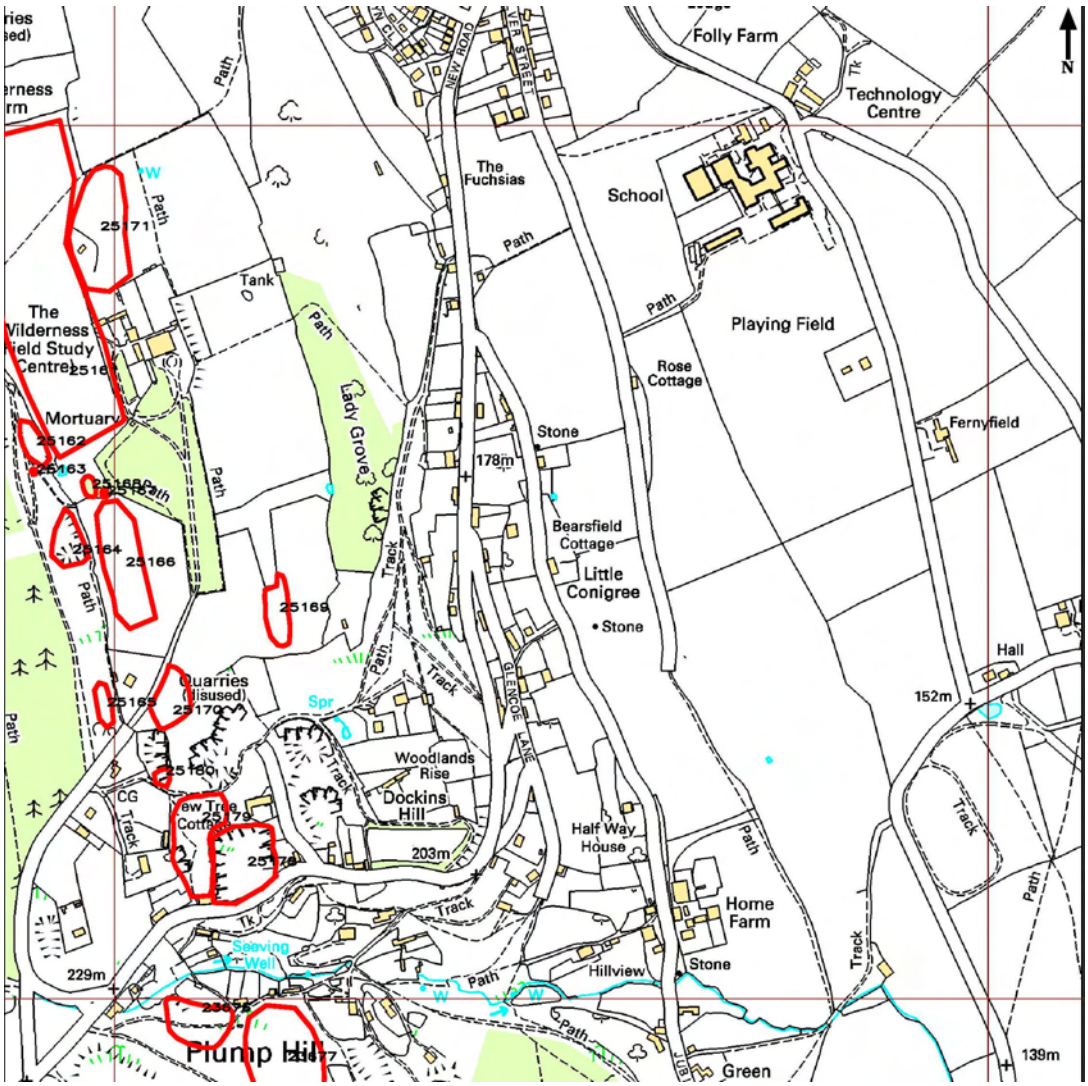


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 66 17

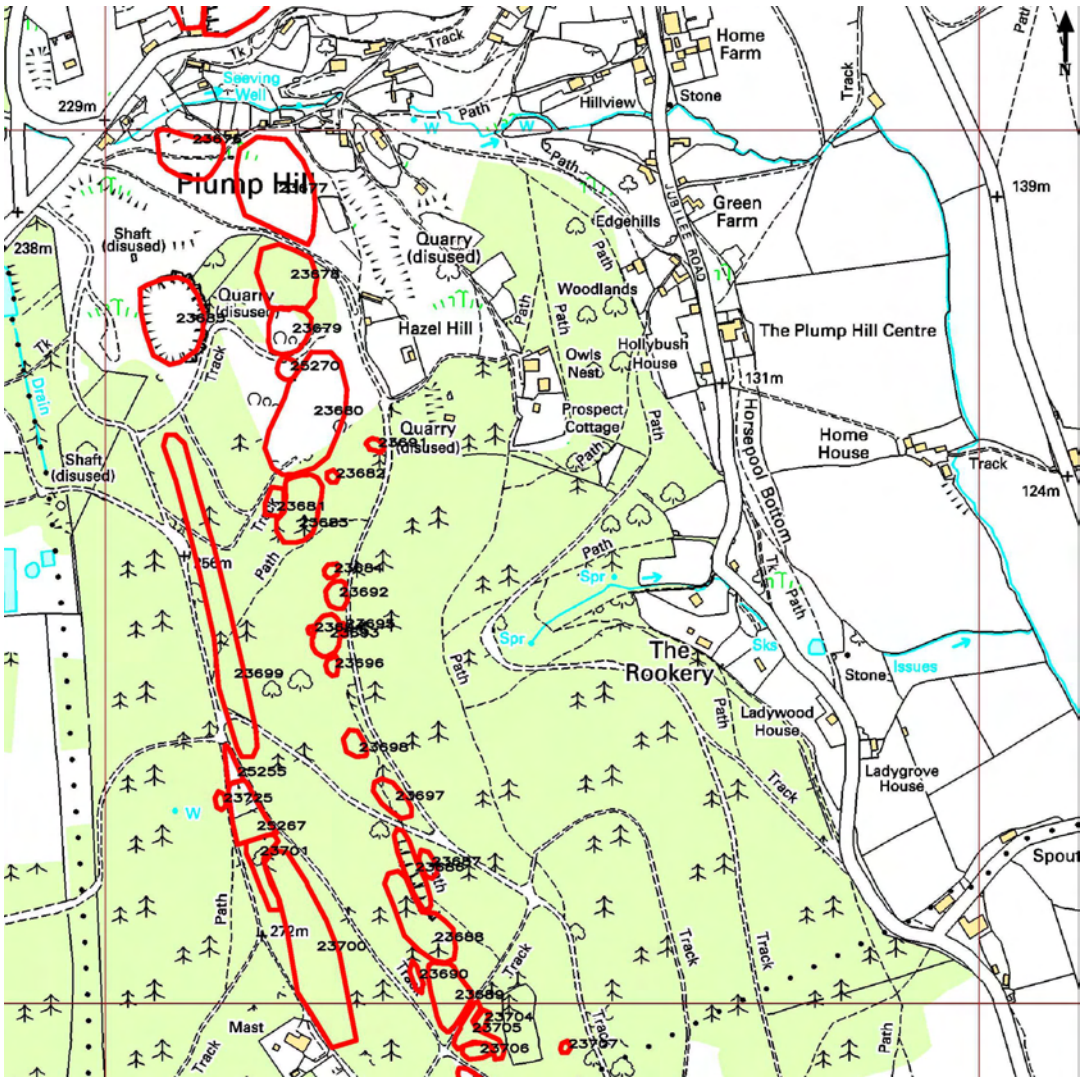


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 66 16

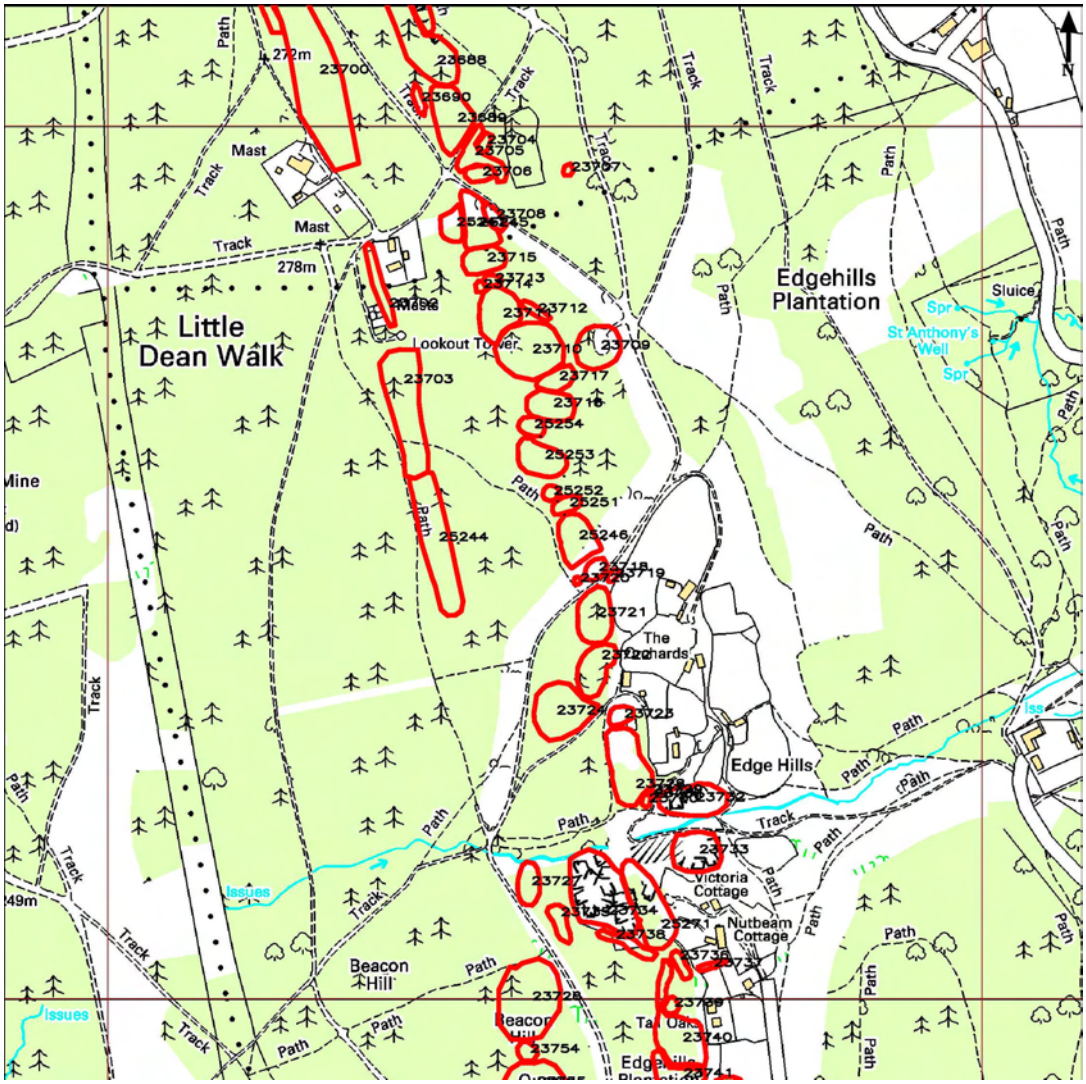


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 66 15



Key :-

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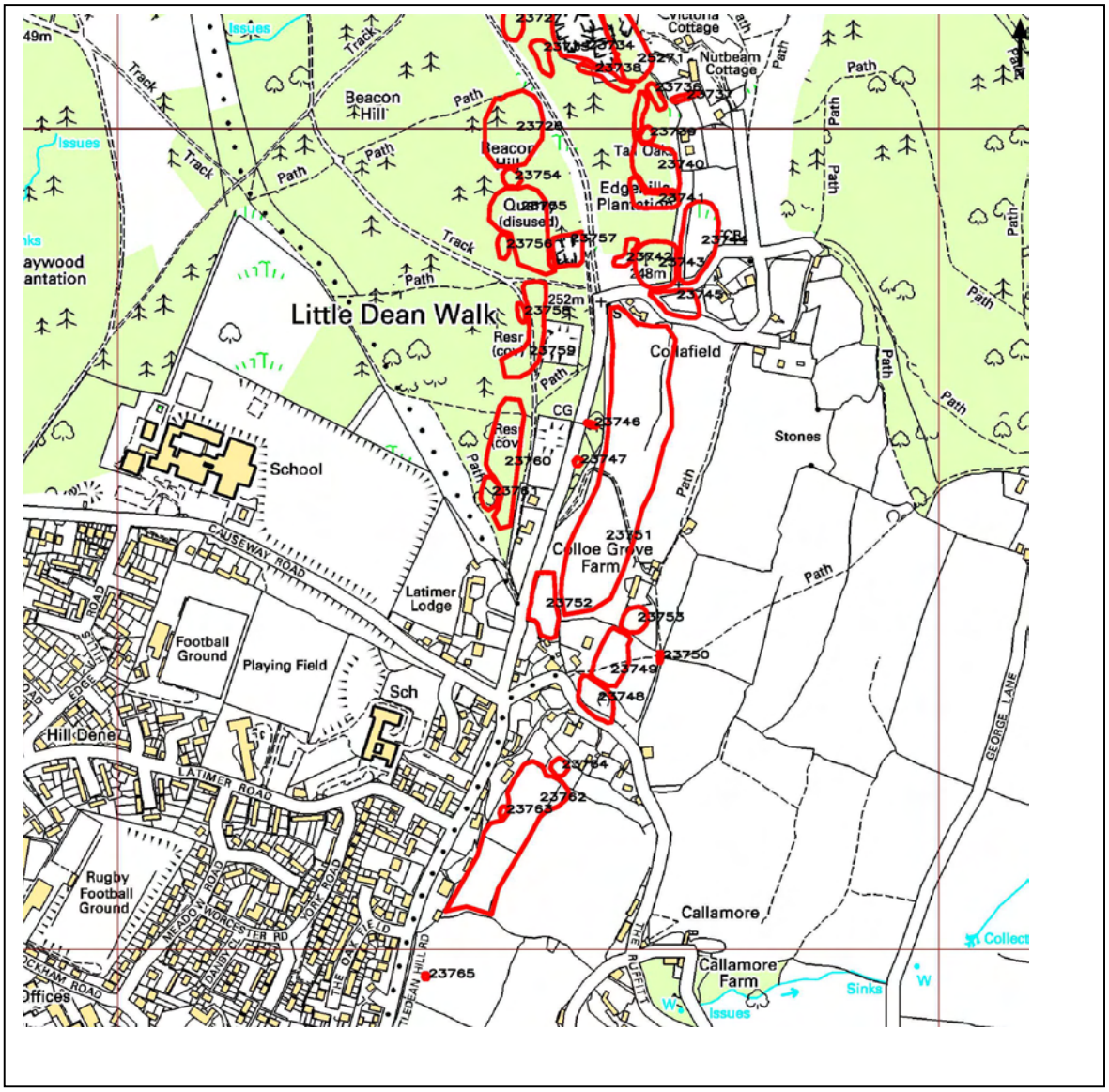
Scowles and possible scowles recorded by field survey.

NGR SO 66 14

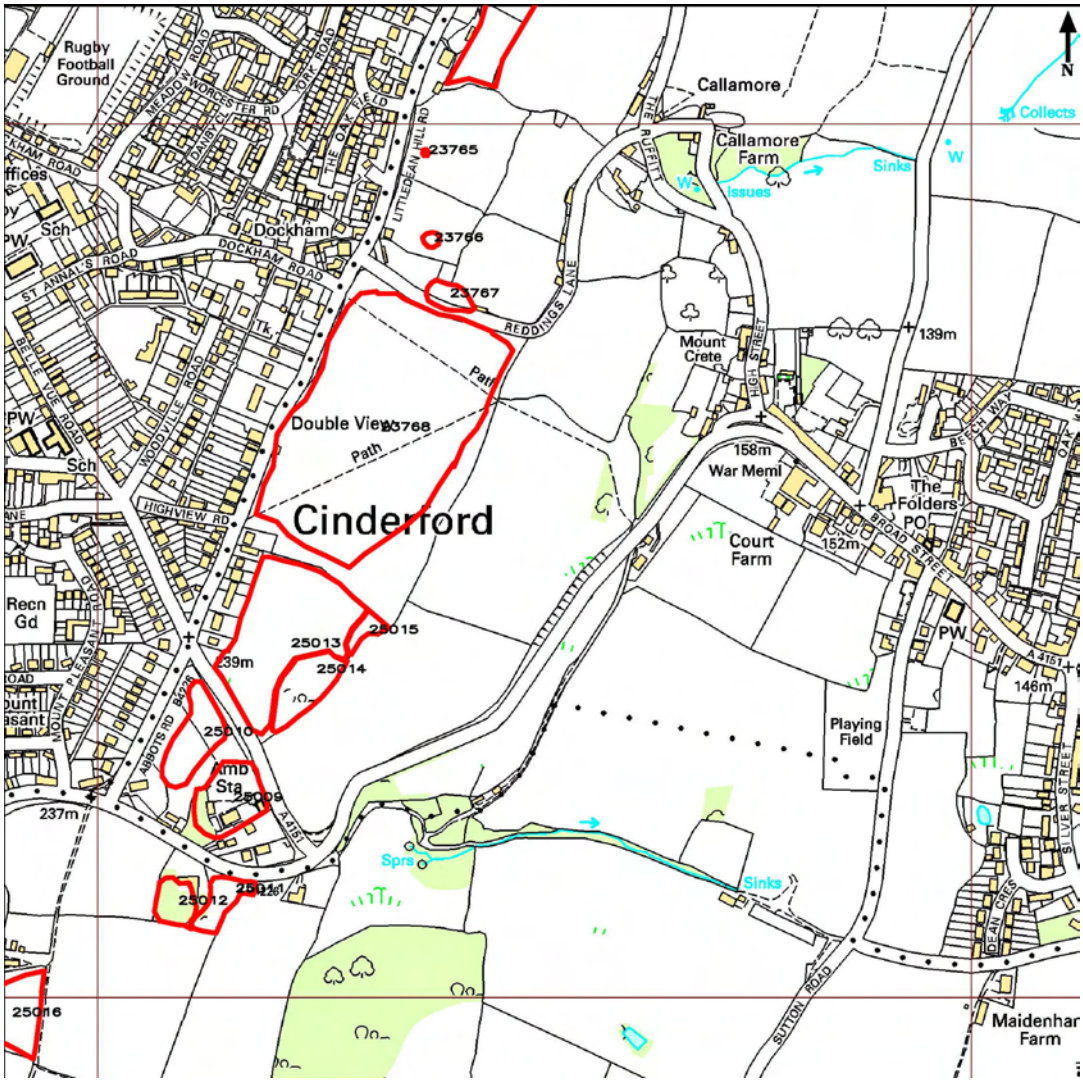


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 66 13

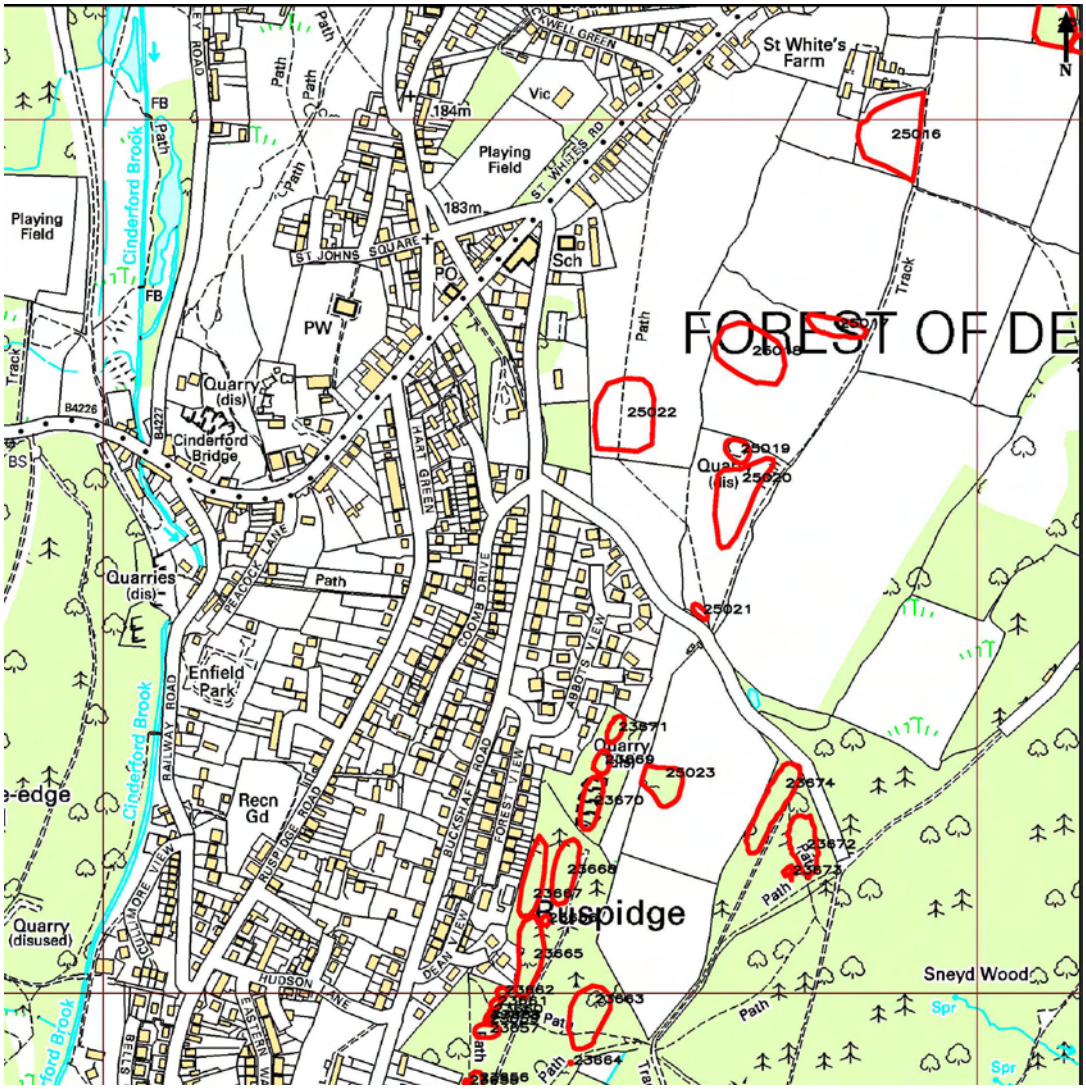


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 65 12



Key :-

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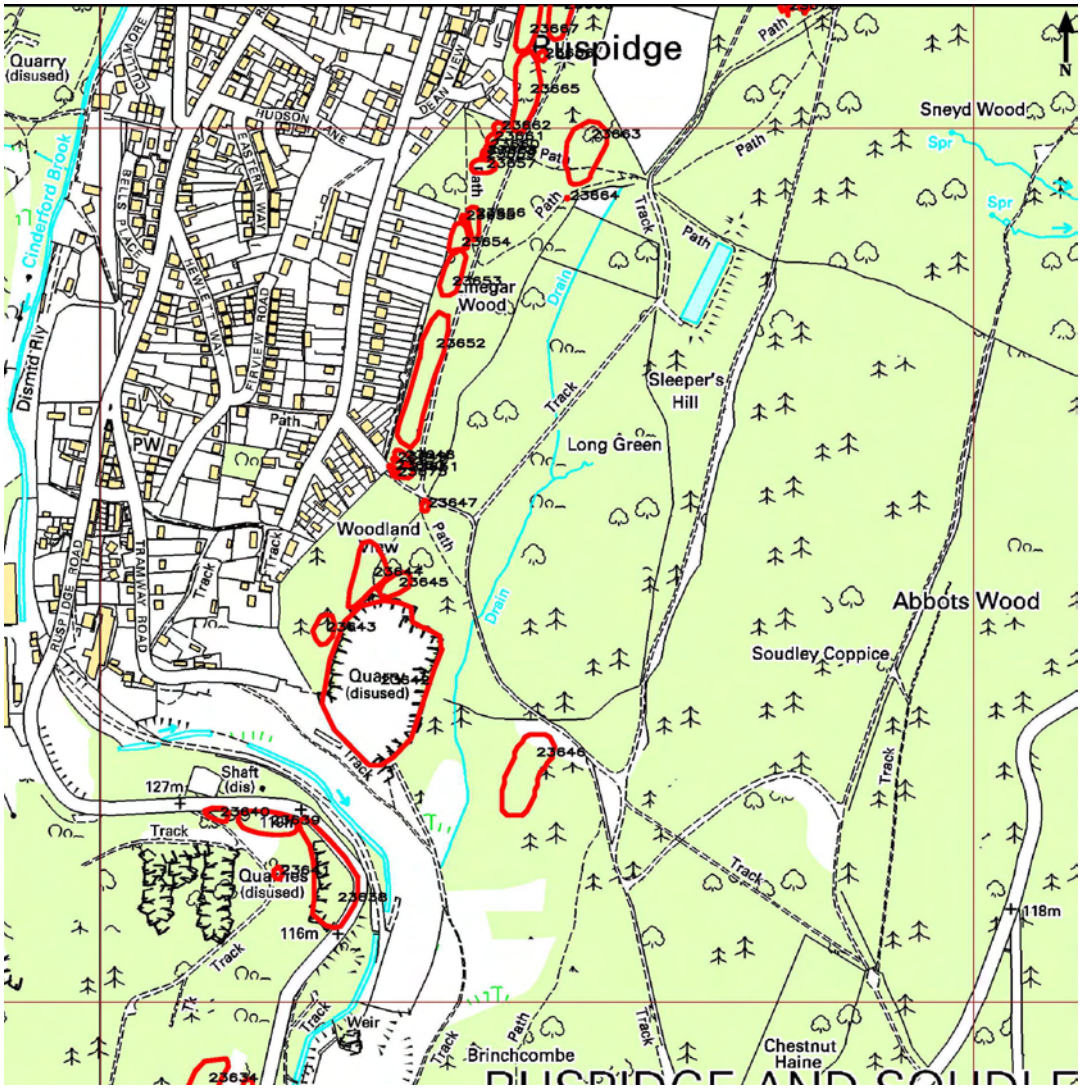
Scowles and possible scowles recorded by field survey.

NGR SO 65 11



Key :-

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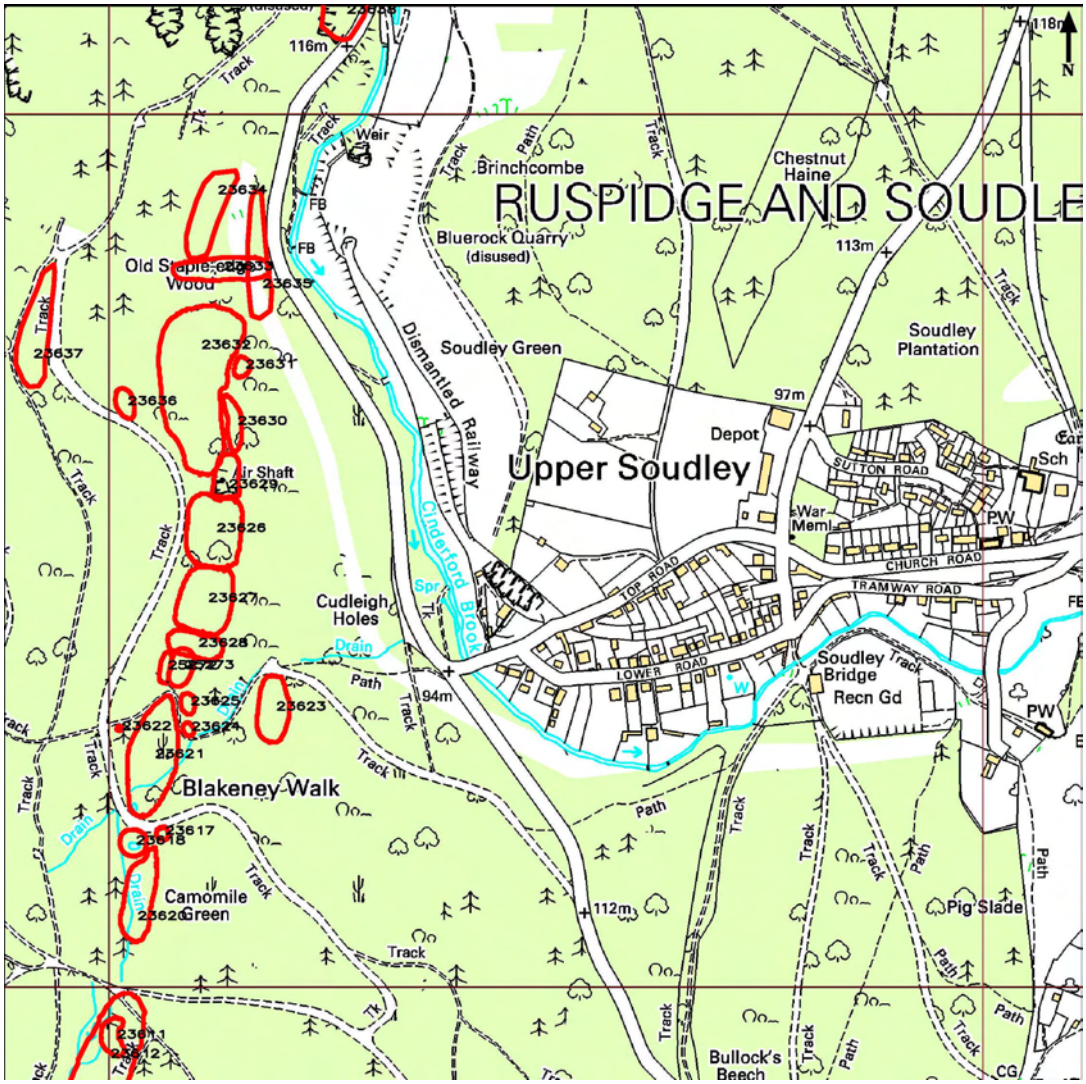
Scowles and possible scowles recorded by field survey.

NGR SO 65 10

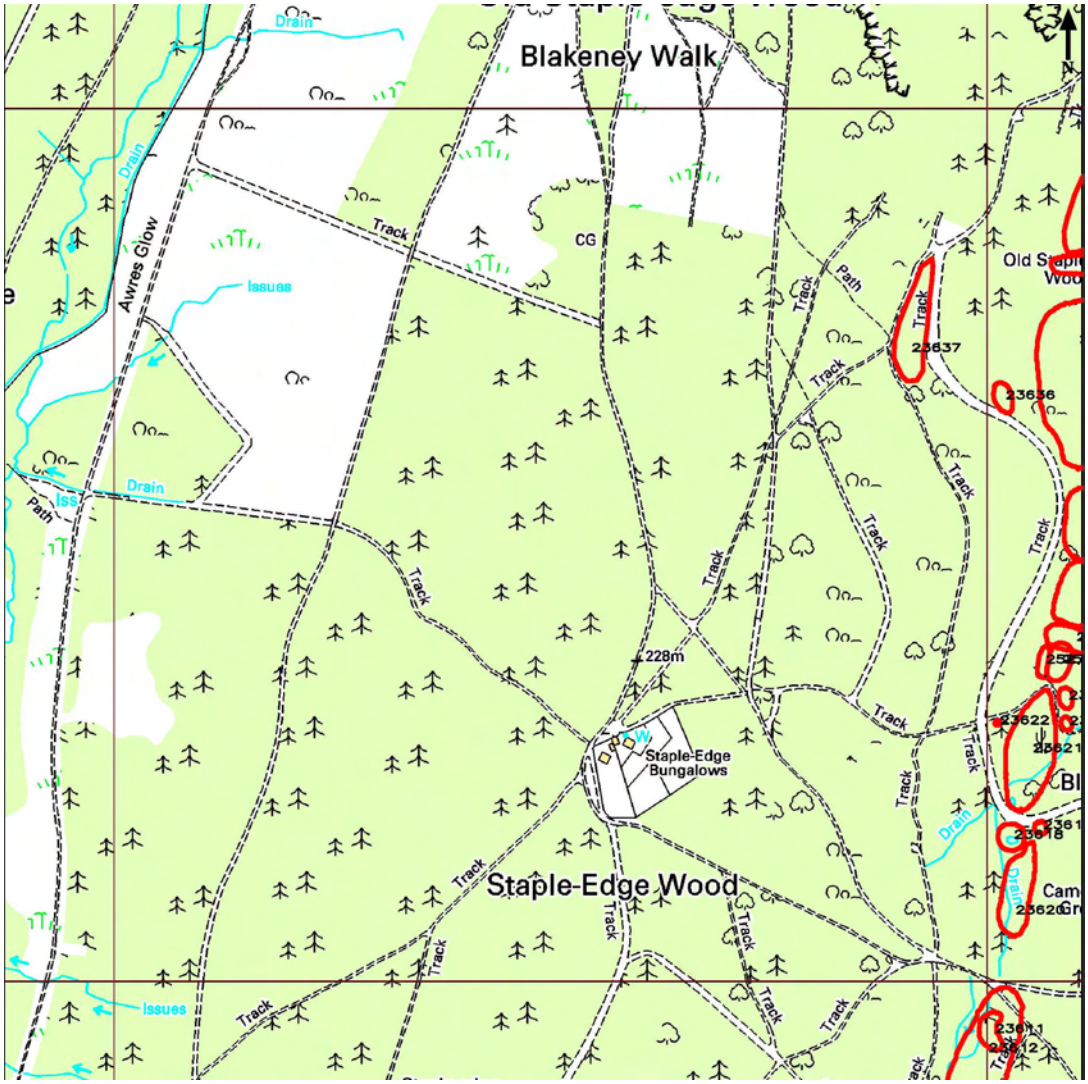


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 64 10

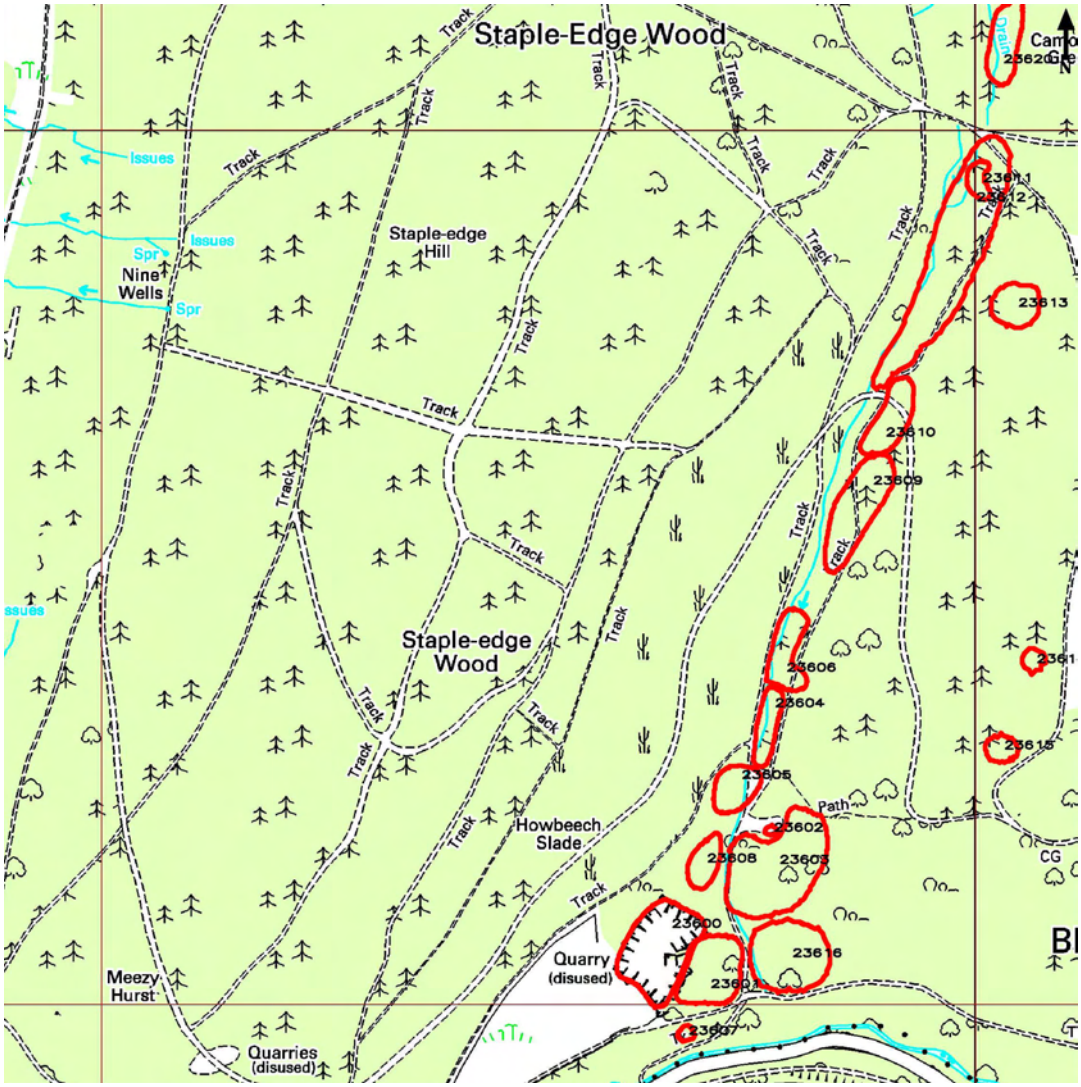


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 64 09

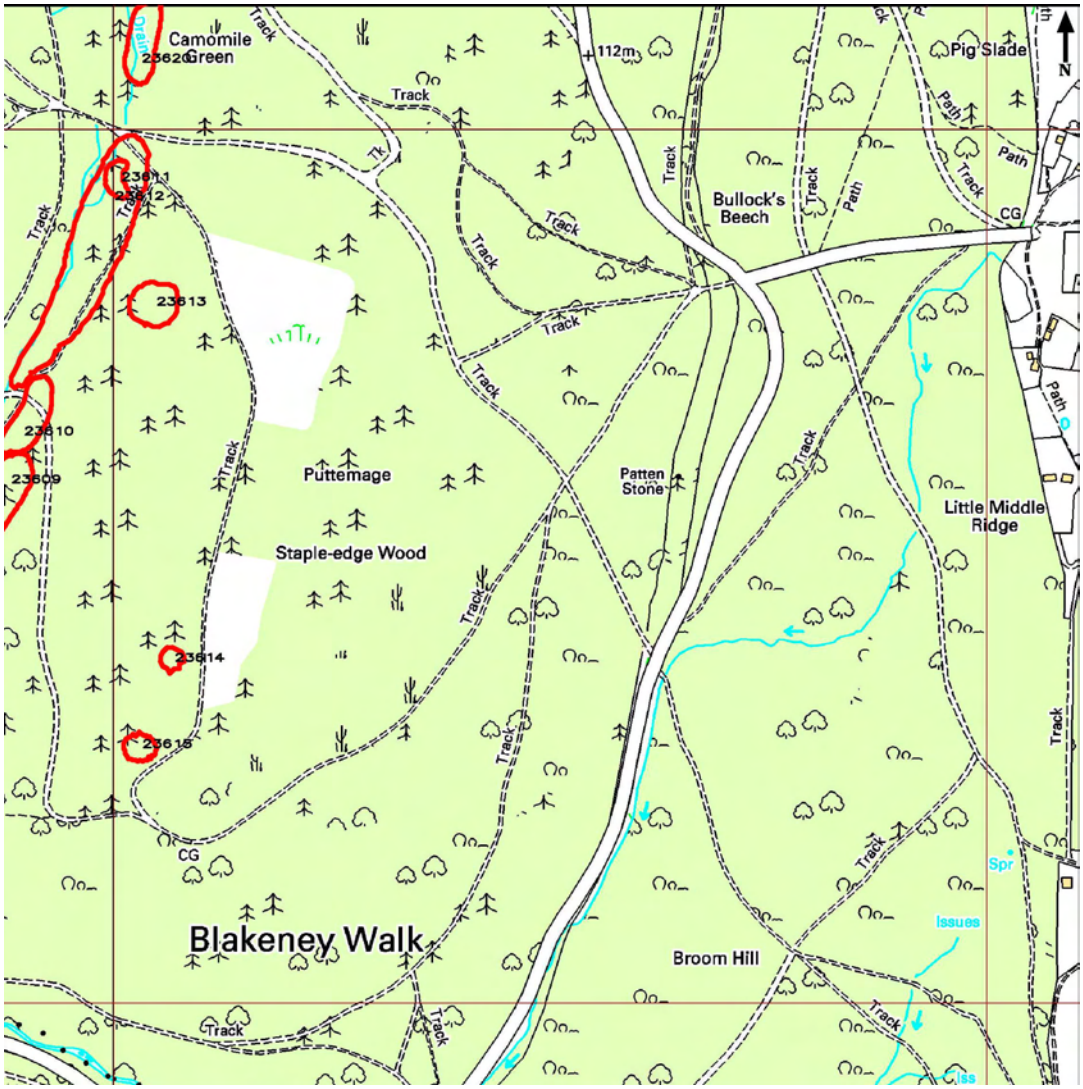


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 65 09

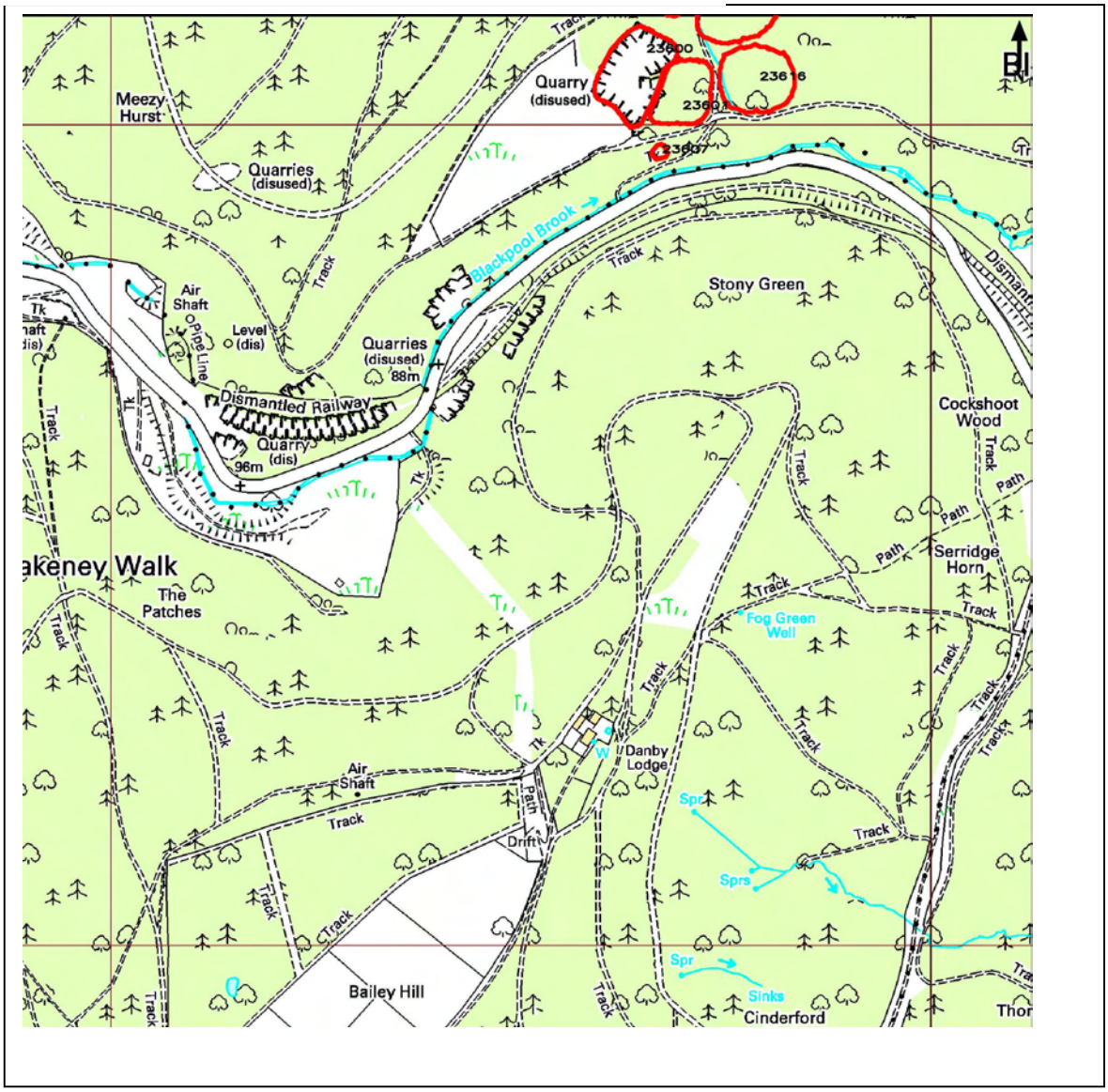


Key :-

All scowles recorded by field survey

Scowles and possible scowles recorded by field survey.

NGR SO 64 08



Key :-

All scowles recorded by field survey

Appendix B All scowles and possible scowles recorded by field survey

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23549	SCOWLE - EXISTING	358380	207310	Scowles, located in the former Clay's Wood, to the south of Clay's Farm.	FORM 5	SURVEY LEVEL 1
23550	SCOWLE - EXISTING	358490	207110	Scowle, located *c.*130 metres west of The Hollies, Clements End, Coleford.	FORM 2	SURVEY LEVEL 1
23551	SCOWLE - EXISTING	358530	207120	Scowle, located *c.*100 metres west of The Hollies, Clements End, Coleford.	FORM 2	SURVEY LEVEL 1
23552	SCOWLE - EXISTING	358800	206670	Scowles, located in Noxon Park.	FORM 2	SURVEY LEVEL 1
23560	SCOWLE - EXISTING	365740	218720	Interlinked scowles, located in Scully Grove, east of the Water Works, Mitcheldean.	FORM 5	SURVEY LEVEL 1
23561	SCOWLE - EXISTING	365550	219670	Scowles, located *c.*120 metres north-east of Shortbush Cottage, Wigpool, to the east of a footpath.	FORM 5	SURVEY LEVEL 1
23562	SCOWLE - EXISTING	365470	220170	Scowles, located at Bailey Point, *c.*150 metres east of The Haven, Wigpool.	FORM 5	SURVEY LEVEL 1
23563	SCOWLE - EXISTING	365360	220250	Scowle, located *c.*65 metres north-east of Bailey Point Cottage, Wigpool.	FORM 5	SURVEY LEVEL 1
23564	SCOWLE - EXISTING	365210	220120	Scowle, located immediately north-east of Sycamore House, Wigpool.	FORM 5	SURVEY LEVEL 1
23565	SCOWLE - EXISTING	364790	219210	Scowles, located *c.*130 metres north-west of Blackwell Cottage, Wigpool.	FORM 2	SURVEY LEVEL 1
23566	SCOWLE - POSSIBLE	364740	219090	Possible scowle, located *c.*100 metres west of Blackwell Cottage, Wigpool.	FORM 5	SURVEY LEVEL 1
23600	SCOWLE - POSSIBLE DESTROYED	364630	209066	Possible site of destroyed scowles, located in Staple Edge Wood.		SURVEY LEVEL 5
23601	SCOWLE - POSSIBLE	364696	209035	Possible scowles, located Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23602	SCOWLE - EXISTING	364764	209166	Scowle, located in Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23603	SCOWLE - EXISTING	364764	209165	Scowles, located in Staple Edge Wood.	FORM 5	SURVEY LEVEL 5
23604	SCOWLE - POSSIBLE	364756	209325	Possible scowles, located in Staple Edge Wood.	FORM 1	SURVEY LEVEL 2
23605	SCOWLE - EXISTING	364726	209241	Scowles, located in Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23606	SCOWLE - POSSIBLE	364783	209411	Possible scowle (gully?), located in Staple Edge Wood.	FORM 4	SURVEY LEVEL 2
23607	SCOWLE - POSSIBLE	364668	208968	Possible scowle, located in Staple Edge Wood.	FORM 2	SURVEY LEVEL 2
23608	SCOWLE - POSSIBLE	364691	209163	Possible scowle / rock outcrop, located in Staple Edge Wood.	FORM 7	SURVEY LEVEL 5
23609	SCOWLE - EXISTING	364867	209559	Scowles, located in Staple Edge Wood.	FORM 2	SURVEY LEVEL 3

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23610	SCOWLE - EXISTING	364898	209671	Scowles, located in Staple Edge Wood.	FORM 4	SURVEY LEVEL 2
23611	SCOWLE - EXISTING	365004	209939	Scowles, located in Staple Edge Wood.	FORM 5	SURVEY LEVEL 3
23612	SCOWLE - EXISTING	364975	209865	Scowles, located in Staple Edge Wood - west of conifer plantation.	FORM 2	SURVEY LEVEL 2
23613	SCOWLE - EXISTING	365046	209796	Scowles, located in Staple Edge Wood - in a conifer plantation.	FORM 2	SURVEY LEVEL 5
23614	SCOWLE - EXISTING	365067	209394	Scowle, located in Staple Edge Wood.	FORM 4	SURVEY LEVEL 5
23615	SCOWLE - EXISTING	365030	209291	Scowle, located in Staple Edge Wood.	FORM 4	SURVEY LEVEL 5
23616	SCOWLE - EXISTING	364785	209054	Scowles, located in Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23617	SCOWLE - POSSIBLE	365060	210175	Possible scowle, located in Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23618	SCOWLE - POSSIBLE	365028	210161	Possible scowle, located in Staple Edge Wood.	FORM 4	SURVEY LEVEL 5
23620	SCOWLE - EXISTING	365036	210102	Scowles, located in Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23621	SCOWLE - EXISTING	365047	210254	Scowles, located in Staple Edge Wood.	FORM 4	SURVEY LEVEL 5
23622	SCOWLE - POSSIBLE	365009	210292	Possible scowle, located in Staple Edge Wood.	FORM 1	SURVEY LEVEL 5
23623	SCOWLE - POSSIBLE	365184	210317	Possible scowles, located in Staple Edge Wood.	FORM 1	SURVEY LEVEL 5
23624	SCOWLE - EXISTING	365091	210293	Scowle, located in Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23625	SCOWLE - EXISTING	365089	210322	Scowle, located in Staple Edge Wood.	FORM 3	SURVEY LEVEL 5
23626	SCOWLE - EXISTING	365118	210523	Scowle, located in Staple Edge Wood.	FORM 5	SURVEY LEVEL 5
23627	SCOWLE - EXISTING	365110	210440	Scowle, located in Staple Edge Wood.	FORM 4	SURVEY LEVEL 5
23628	SCOWLE - EXISTING	365100	210390	Scowles, located in Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23629	SCOWLE - EXISTING	365133	210584	Scowle (containing chimney), located in Staple Edge Wood.	FORM 5	SURVEY LEVEL 5
23630	SCOWLE - POSSIBLE	365145	210646	Possible scowle (rock outcrop), located in Old Staple Edge Wood.	FORM 7	SURVEY LEVEL 5
23631	SCOWLE - EXISTING	365150	210711	Scowle, located in Old Staple Edge Wood.	FORM 5	SURVEY LEVEL 5
23632	SCOWLE - EXISTING	365095	210685	Scowles, located in Old Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23633	SCOWLE - POSSIBLE	365133	210822	Possible scowle, located in Old Staple Edge Wood.	FORM 3	SURVEY LEVEL 5
23634	SCOWLE - POSSIBLE	365110	210883	Possible scowles, located in Old Staple Edge Wood.	FORM 1	SURVEY LEVEL 5
23635	SCOWLE - EXISTING	365169	210831	Scowles, located in Old Staple Edge Wood.	FORM 4	SURVEY LEVEL 5
23636	SCOWLE - EXISTING	365014	210670	Scowle, located in Old Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23637	SCOWLE - POSSIBLE	364915	210743	Possible scowles, located in Old Staple Edge Wood.	FORM 2	SURVEY LEVEL 2
23638	SCOWLE - POSSIBLE DESTROYED	365261	211144	Possible site of destroyed scowles, located on the south side of Ruspidge to Soudley Road.	FORM 5	SURVEY LEVEL 3

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23639	SCOWLE - POSSIBLE	365193	211206	Possible scowles, located on the south side of Ruspidge to Soudley Road.	FORM 4	SURVEY LEVEL 5
23640	SCOWLE - POSSIBLE DESTROYED	365136	211215	Possible site of destroyed scowles, located on the south side of Ruspidge to Soudley Road.	FORM 5	SURVEY LEVEL 5
23641	SCOWLE - EXISTING	365203	211147	Scowles, located at Blakeney Walk in Old Staple Edge Wood.	FORM 2	SURVEY LEVEL 5
23642	SCOWLE - POSSIBLE DESTROYED	365318	211364	Scowles destroyed by quarrying, located at the edge of Little Dean Walk.	FORM 5	SURVEY LEVEL 5
23643	SCOWLE - EXISTING	365258	211426	Scowle, located at Little Dean Walk.	FORM 4	SURVEY LEVEL 3
23644	SCOWLE - EXISTING	365305	211492	Scowles, located at Little Dean Walk.	FORM 2	SURVEY LEVEL 5
23645	SCOWLE - EXISTING	365336	211475	Scowles, located at Little Dean Walk.	FORM 1	SURVEY LEVEL 5
23646	SCOWLE - POSSIBLE	365490	211257	Possible scowles, located at little Dean Walk.	FORM 4	SURVEY LEVEL 2
23647	SCOWLE - EXISTING	365372	211566	Scowle, located in Linegar Wood.	FORM 2	SURVEY LEVEL 5
23648	SCOWLE - EXISTING	365345	211620	Scowle, located at Linegar Wood.	FORM 4	SURVEY LEVEL 3
23649	SCOWLE - EXISTING	365334	211622	Scowles, located in Linegar Wood.	FORM 2	SURVEY LEVEL 5
23650	SCOWLE - EXISTING	365333	211610	Scowle, located in Linegar Wood.	FORM 4	SURVEY LEVEL 5
23651	SCOWLE - EXISTING	365349	211605	Scowles, located in Linegar Wood.	FORM 1	SURVEY LEVEL 5
23652	SCOWLE - EXISTING	365373	211711	Scowles, located in Linegar Woods.	FORM 2	SURVEY LEVEL 3
23653	SCOWLE - EXISTING	365401	211833	Scowles, located in Linegar Wood.	FORM 2	SURVEY LEVEL 3
23654	SCOWLE - POSSIBLE	365412	211872	Possible scowle (rock outcrop?), located in Linegar Wood.	FORM 3	SURVEY LEVEL 5
23655	SCOWLE - EXISTING	365416	211899	Scowles, located in Linegar Wood.	FORM 2	SURVEY LEVEL 5
23656	SCOWLE - EXISTING	365427	211890	Scowles, located in Linegar Wood.	FORM 2	SURVEY LEVEL 5
23657	SCOWLE - EXISTING	365439	211956	Large scowle, located in Linegar Wood.	FORM 4	SURVEY LEVEL 4
23658	SCOWLE - EXISTING	365440	211972	Scowle, located in Linegar Wood.	FORM 5	SURVEY LEVEL 5
23659	SCOWLE - EXISTING	365438	211965	Scowle, located in Linegar Wood.	FORM 4	SURVEY LEVEL 5
23660	SCOWLE - EXISTING	365443	211978	Scowle, located in Linegar Wood.	FORM 2	SURVEY LEVEL 5
23661	SCOWLE - EXISTING	365448	211987	Scowle, located in Linegar Wood.	FORM 2	SURVEY LEVEL 5
23662	SCOWLE - EXISTING	365455	212000	Scowle, located in Linegar Wood.	FORM 4	SURVEY LEVEL 5
23663	SCOWLE - EXISTING	365556	211971	Extensive area of small scowles with some associated mounds, located in Linegar Wood.	FORM 2	SURVEY LEVEL 5
23664	SCOWLE - EXISTING	365534	211919	Scowle, located in Linegar Wood.	FORM 2	SURVEY LEVEL 5
23665	SCOWLE - EXISTING	365487	212041	Two large scowles, located in Linegar Wood.	FORM 4	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23666	SCOWLE - EXISTING	365505	212082	Scowle, located in Linegar Wood.	FORM 2	SURVEY LEVEL 5
23667	SCOWLE - EXISTING	365491	212133	Large possible scowles containing several smaller, possible scowles. Located in Linegar Wood.	FORM 4	SURVEY LEVEL 4
23668	SCOWLE - EXISTING	365528	212139	Two large scowles located in Linegar Wood.	FORM 5	SURVEY LEVEL 2
23669	SCOWLE - EXISTING	365571	212264	Scowle, located in Linegar Wood.	FORM 4	SURVEY LEVEL 3
23670	SCOWLE - EXISTING	365559	212216	Large linear scowle, located in Linegar Wood.	FORM 5	SURVEY LEVEL 3
23671	SCOWLE - EXISTING	365586	212300	Line of shallow scowles, located in northern part of Linegar Wood.	FORM 2	SURVEY LEVEL 5
23672	SCOWLE - EXISTING	365798	212166	Two or three scowles, located west of Sneyd Wood.	FORM 4	SURVEY LEVEL 5
23673	SCOWLE - EXISTING	365784	212137	Small scowle, located west of Sneyd Wood.	FORM 2	SURVEY LEVEL 5
23674	SCOWLE - EXISTING	365765	212209	Two shallow scowles located west of Sneyd Wood.	FORM 2	SURVEY LEVEL 5
23675	SCOWLE - EXISTING	365339	211604	Small scowle, located in Linegar Wood.	FORM 2	SURVEY LEVEL 5
23676	SCOWLE - POSSIBLE	366097	216969	Possible scowles / quarries in overgrown area, located at Plump Hill.		SURVEY LEVEL 2
23677	SCOWLE - EXISTING	366195	216930	Scowles and mounds, located at Plump Hill.	SCOWLE FORM 2	SURVEY LEVEL 5
23678	SCOWLE - EXISTING	366206	216831	Area of small pits and mounds, located at Plump Hill.	SCOWLE FORM 2	SURVEY LEVEL 4
23679	SCOWLE - EXISTING	366208	216770	Scowles, located at Plump Hill.	SCOWLE FORM 4	SURVEY LEVEL 4
23680	SCOWLE - POSSIBLE DESTROYED	366231	216686	Large quarry / possible destroyed scowles, located in Edgehills Plantation.		SURVEY LEVEL 5
23681	SCOWLE - EXISTING	366202	216580	Scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23682	SCOWLE - EXISTING	366262	216602	Small scowle, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23683	SCOWLE - EXISTING	366221	216566	Scowles, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 5
23684	SCOWLE - EXISTING	366258	216496	Deep scowle, located in Edgehills Plantation.	FORM 5	SURVEY LEVEL 3
23685	SCOWLE - POSSIBLE DESTROYED	366072	216782	Large quarry, possible site of destroyed scowles, located at The Rookery, Edgehills Plantation.		SURVEY LEVEL 3
23686	SCOWLE - EXISTING	366355	216149	Large linear scowle, located at The Rookery, Edgehills Plantation.	FORM 5	SURVEY LEVEL 3
23687	SCOWLE - EXISTING	366367	216161	Scowles, located at The Rookery, Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23688	SCOWLE - EXISTING	366360	216100	Scowles, located at The Rookery, Edgehills Plantation.	FORM 4	SURVEY LEVEL 5
23689	SCOWLE - EXISTING	366396	216009	Scowles and mounds, located at The Rookery, Edgehills Plantation.	FORM 4	SURVEY LEVEL 3
23690	SCOWLE - EXISTING	366357	216028	Scowles, located at The Rookery, Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23691	SCOWLE - EXISTING	366308	216638	Two scowles, located at The Rookery.	FORM 2	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23692	SCOWLE - EXISTING	366264	216467	Scowles with some associated mounds, located at The Rookery.	FORM 2	SURVEY LEVEL 4
23693	SCOWLE - EXISTING	366252	216420	Elongated scowles, located at The Rookery.	FORM 4	SURVEY LEVEL 4
23694	SCOWLE - EXISTING	366236	216427	Scowle, located at The Rookery.	FORM 2	SURVEY LEVEL 5
23695	SCOWLE - EXISTING	366271	216427	Single scowle, located at The Rookery.	FORM 2	SURVEY LEVEL 5
23696	SCOWLE - POSSIBLE	366259	216386	Possible scowle, located at the Rookery.	FORM 4	SURVEY LEVEL 4
23697	SCOWLE - EXISTING	366328	216233	Scowles, located at The Rookery.	FORM 2	SURVEY LEVEL 3
23698	SCOWLE - EXISTING	366285	216297	Approximately two large, linear scowles located in The Rookery.	FORM 4	SURVEY LEVEL 2
23699	SCOWLE - EXISTING	366120	216466	Linear spread of small scowles, located at the Rookery.	FORM 2	SURVEY LEVEL 4
23700	SCOWLE - EXISTING	366234	216061	Circular scowles, located at The Rookery.	FORM 4	SURVEY LEVEL 5
23701	SCOWLE - EXISTING	366180	216149	Approximately six scowles, located at The Rookery.	FORM 2	SURVEY LEVEL 5
23702	SCOWLE - EXISTING	366314	215819	Scowles, located at The Rookery, near Edgehills Lodge.	FORM 4	SURVEY LEVEL 2
23703	SCOWLE - EXISTING	366340	215669	Scowles, located at The Rookery.	FORM 2	SURVEY LEVEL 2
23704	SCOWLE - EXISTING	366432	215979	Scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23705	SCOWLE - EXISTING	366428	215970	Scowles, some with mounds, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 5
23706	SCOWLE - EXISTING	366426	215942	Scowle, located in Edgehills Plantation.	FORM 5	SURVEY LEVEL 3
23707	SCOWLE - EXISTING	366526	215950	Single scowle, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23708	SCOWLE - EXISTING	366443	215894	Two scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 2
23709	SCOWLE - POSSIBLE DESTROYED	366561	215745	Disused quarry located in Edgehills Plantation.		SURVEY LEVEL 5
23710	SCOWLE - EXISTING	366483	215740	Large scowles, located in Edgehills Plantation.	FORM 5	SURVEY LEVEL 2
23711	SCOWLE - EXISTING	366444	215787	Scowles, some with associated mounds, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 3
23712	SCOWLE - EXISTING	366489	215785	Scowle, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 5
23713	SCOWLE - EXISTING	366439	215821	Scowle, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 3
23714	SCOWLE - EXISTING	366427	215815	Scowle with mound associated, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 5
23715	SCOWLE - EXISTING	366430	215846	Large, linear scowle, located in Edgehills Plantation.	FORM 5	SURVEY LEVEL 3
23716	SCOWLE - EXISTING	366506	215680	Two very deep scowles, located in Edgehills Plantation.	FORM 3	SURVEY LEVEL 3
23717	SCOWLE - EXISTING	366512	215710	Several small scowles with mounds, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23718	SCOWLE - EXISTING	366559	215491	Large scowle, located in Edgehills Plantation.	FORM 5	SURVEY LEVEL 3
23719	SCOWLE - EXISTING	366577	215489	Scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23720	SCOWLE - EXISTING	366538	215479	Scowle, located at Edgehills Plantation.	FORM 2	SURVEY LEVEL 2
23721	SCOWLE - EXISTING	366559	215438	Scowles, located at Edgehills Plantation.	FORM 2	SURVEY LEVEL 4
23722	SCOWLE - EXISTING	366558	215380	Two large scowles, located at Edgehills Plantation.	FORM 4	SURVEY LEVEL 3
23723	SCOWLE - EXISTING	366586	215328	Scowle, located at Edgehills Plantation.	FORM 5	SURVEY LEVEL 3
23724	SCOWLE - EXISTING	366516	215327	Numerous scowles, located at Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23725	SCOWLE - EXISTING	366128	216227	Scowle, located in The Rookery.	FORM 2	SURVEY LEVEL 5
23726	SCOWLE - EXISTING	366488	215007	Scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23727	SCOWLE - EXISTING	366486	215134	Several linear scowles, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 5
23728	SCOWLE - EXISTING	366593	215265	Several large scowles, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 2
23729	SCOWLE - EXISTING	366620	215237	Small scowle in fenced off area, located in Edgehills Plantation.	FORM 3	SURVEY LEVEL 2
23730	SCOWLE - EXISTING	366614	215226	Large scowle located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 2
23731	SCOWLE - EXISTING	366620	215236	Two scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23732	SCOWLE - EXISTING	366668	215225	Large, undated scowle, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 2
23733	SCOWLE - POSSIBLE DESTROYED	366678	215168	Large quarry (possible site of destroyed scowles), located in Edgehills Plantation.		SURVEY LEVEL 4
23734	SCOWLE - POSSIBLE DESTROYED	366567	215126	Large quarry (possible site of destroyed scowles), located in Edgehills Plantation.		SURVEY LEVEL 2
23735	SCOWLE - EXISTING	366515	215085	Scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23736	SCOWLE - EXISTING	366655	215038	Two scowles, located in Edgehills Plantation.	FORM 5	SURVEY LEVEL 3
23737	SCOWLE - POSSIBLE DESTROYED	366691	215038	Quarry / possible scowle, located in Edgehills Plantation.		SURVEY LEVEL 2
23738	SCOWLE - EXISTING	366593	215062	Scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 3
23739	SCOWLE - EXISTING	366644	214993	Large scowle, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 2
23740	SCOWLE - EXISTING	366655	214970	Several small scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 3
23741	SCOWLE - EXISTING	366654	214920	Two large scowles, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 3
23742	SCOWLE - EXISTING	366618	214850	Scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23743	SCOWLE - EXISTING	366654	214834	One large scowle, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 3
23744	SCOWLE - EXISTING	366707	214861	Scowles and field depressions, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 2
23745	SCOWLE - POSSIBLE	366678	214786	Field depressions, located in Collafield.	FORM 1	SURVEY LEVEL 5
23746	SCOWLE - EXISTING	366576	214639	Small scowle, located north-west of Colloe Grove Farm.	FORM 2	SURVEY LEVEL 4
23747	SCOWLE - EXISTING	366558	214594	Scowles, located north-west of Colloe Grove Farm.	FORM 2	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23748	SCOWLE - POSSIBLE	366582	214304	Quarry or possible scowle, located south of Colloe Grove Farm.		SURVEY LEVEL 2
23749	SCOWLE - EXISTING	366601	214354	Field depressions, located south of Colloe Grove Farm.	FORM 1	SURVEY LEVEL 5
23750	SCOWLE - EXISTING	366659	214359	Scowles, located south-east of Colloe Grove Farm.	FORM 2	SURVEY LEVEL 5
23751	SCOWLE - EXISTING	366608	214594	Large field depressions, located at Colloe Grove Farm.	FORM 1	SURVEY LEVEL 3
23752	SCOWLE - POSSIBLE DESTROYED	366517	214418	Disused, quarry (possible site of destroyed scowles), located at Colloe Grove Farm.		SURVEY LEVEL 2
23753	SCOWLE - POSSIBLE	366629	214399	Disused quarry (possible site of destroyed scowles), located on Colloe Grove Farm.		SURVEY LEVEL 5
23754	SCOWLE - EXISTING	366479	214939	Scowle, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 5
23755	SCOWLE - EXISTING	366493	214875	Several small scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23756	SCOWLE - EXISTING	366469	214855	Two scowles with associated mounds, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 5
23757	SCOWLE - POSSIBLE DESTROYED	366547	214852	Disused quarry (possible site of destroyed scowles), located in Edgehills Plantation.		SURVEY LEVEL 5
23758	SCOWLE - EXISTING	366491	214774	Two small scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 5
23759	SCOWLE - EXISTING	366510	214750	Approximately 20 small scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 4
23760	SCOWLE - EXISTING	366468	214589	Several small scowles, located in Edgehills Plantation.	FORM 2	SURVEY LEVEL 2
23761	SCOWLE - EXISTING	366457	214556	Large scowle, located in Edgehills Plantation.	FORM 4	SURVEY LEVEL 5
23762	SCOWLE - EXISTING	366474	214135	Field depressions, located to the east of Little Dean Hill Road.	FORM 4	SURVEY LEVEL 3
23763	SCOWLE - EXISTING	366469	214169	One small scowle, located east of Little Dean Hill Road.	FORM 2	SURVEY LEVEL 3
23764	SCOWLE - EXISTING	366537	214220	Scowle, located east of Little Dean Hill Road.	FORM 2	SURVEY LEVEL 3
23765	SCOWLE - POSSIBLE	366375	213967	Possible scowle, located to the east of Little Dean Hill Road.	FORM 1	SURVEY LEVEL 3
23766	SCOWLE - EXISTING	366381	213866	Field depression, located on the northern side of Reddings Lane.	FORM 1	SURVEY LEVEL 3
23767	SCOWLE - POSSIBLE DESTROYED	366403	213803	Possible quarry (possible site of destroyed scowles), located on the northern side of Reddings Lane.		SURVEY LEVEL 3
23768	SCOWLE - EXISTING	366328	213649	Field depressions, located to the east of Little Dean Hill Road.	FORM 1	SURVEY LEVEL 5
23769	SCOWLE - EXISTING	364749	219022	Two scowles, located at Wigpool.	FORM 4	SURVEY LEVEL 3
23770	SCOWLE - EXISTING	364784	219117	Possibly backfilled scowles, located at Wigpool.	FORM 1	SURVEY LEVEL 5
23771	SCOWLE - EXISTING	364787	219166	Single scowle, located at Wigpool.	FORM 4	SURVEY LEVEL 5
23772	SCOWLE - POSSIBLE	364893	219320	Possibly backfilled scowles, located at Wigpool.	CROPMARK	SURVEY LEVEL 3
23773	SCOWLE - EXISTING	364887	219191	Large scowle, located at Wigpool.	FORM 4	SURVEY LEVEL 3

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23774	SCOWLE - EXISTING	364861	219176	Four shallow, undated scowles, located at Wigpool.	FORM 2	SURVEY LEVEL 2
23776	SCOWLE - EXISTING	364841	219220	Single scowle, located on the southern edge of The Delves, Wigpool.	FORM 4	SURVEY LEVEL 3
23777	SCOWLE - EXISTING	364810	219293	Numerous small scowles, located at the southern end of The Delves, Wigpool.	FORM 2	SURVEY LEVEL 4
23778	SCOWLE - EXISTING	364928	219611	Extensive area of scowles, located at The Delves, Wigpool.	FORM 4	SURVEY LEVEL 4
23779	SCOWLE - POSSIBLE	365048	220098	Possible scowles, located in The Delves, Wigpool.	FORM 5	SURVEY LEVEL 2
23780	SCOWLE - EXISTING	365150	220076	Area of circular pits located north of the poultry farm, Wigpool.	FORM 2	SURVEY LEVEL 5
23781	SCOWLE - EXISTING	365145	220126	Two elongated scowles, located north of the poultry farm, Wigpool.	FORM 4	SURVEY LEVEL 5
23782	SCOWLE - EXISTING	365084	220099	Two scowles, located north of the poultry farm, Wigpool.	FORM 2	SURVEY LEVEL 3
23783	SCOWLE - POSSIBLE	365181	220178	Large quarry and possible scowles, located north of the poultry farm, Wigpool.	FORM 4	SURVEY LEVEL 2
23784	SCOWLE - POSSIBLE DESTROYED	365277	220206	Very large quarry / possible site of destroyed scowles, located at Bailey Point, Wigpool.	FORM 4	SURVEY LEVEL 4
23785	SCOWLE - EXISTING	365212	220213	Area of mounds and linear hollows, located at Bailey Point, Wigpool.	FORM 4	SURVEY LEVEL 5
23786	SCOWLE - EXISTING	365210	220270	Very large pit, located at Bailey Point, Wigpool.	FORM 4	SURVEY LEVEL 5
23787	SCOWLE - EXISTING	365188	220249	Scowle, located at Bailey Point, Wigpool.	FORM 2	SURVEY LEVEL 5
23788	SCOWLE - EXISTING	365228	220272	Scowle, located at Bailey Point, Wigpool.	FORM 2	SURVEY LEVEL 5
23789	SCOWLE - POSSIBLE	365335	220380	Area of parched grass, possibly indicating a backfilled scowle, located at Bailey Point, Wigpool.	CROPMARK	SURVEY LEVEL 2
23790	SCOWLE - POSSIBLE	365341	220307	Rock outcrop, located at Bailey Point, Wigpool.	FORM 7	SURVEY LEVEL 5
23791	SCOWLE - EXISTING	365300	220320	Elongated mounds and hollows, located at Bailey Point, Wigpool.	FORM 4	SURVEY LEVEL 5
23792	SCOWLE - EXISTING	365264	220369	Scowle, located at Bailey Point, Wigpool.	FORM 2	SURVEY LEVEL 5
23793	SCOWLE - POSSIBLE	365192	220030	Scowles, located at Bailey Point, Wigpool.	FORM 2	SURVEY LEVEL 5
23794	SCOWLE - POSSIBLE	365589	220128	Two linear possible scowles, located at Bailey Point, Wigpool.	FORM 4	SURVEY LEVEL 5
23795	SCOWLE - POSSIBLE	365527	220082	Possible scowles (mounds, no pits visible), located at Bailey Point, Wigpool.	FORM 1	SURVEY LEVEL 2
23796	SCOWLE - EXISTING	365552	219929	Scowle, located at Lining Wood Top.	FORM 4	SURVEY LEVEL 3
23797	SCOWLE - EXISTING	365556	219905	Small scowle with underground access, located at Lining Wood Top.	FORM 3	SURVEY LEVEL 2
23798	SCOWLE - EXISTING	365550	219870	Scowle, located at Lining Wood Top.	FORM 4	SURVEY LEVEL 2
23799	SCOWLE - EXISTING	365449	219844	Scowles, located at Lining Wood Top.	FORM 2	SURVEY LEVEL 3

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23800	SCOWLE - EXISTING	355342	212757	Scowles over an extensive area, located in Highmeadow Woods.	FORM 3	SURVEY LEVEL 5
23801	SCOWLE - EXISTING	355396	212762	Scowles, located in Highmeadow Wood.	FORM 4	SURVEY LEVEL 5
23802	SCOWLE - EXISTING	355269	212756	Scowles, located in Highmeadow Wood.	FORM 4	SURVEY LEVEL 5
23803	SCOWLE - EXISTING	355034	213091	Scowles, located in Highmeadow Wood.	FORM 3	SURVEY LEVEL 5
23804	SCOWLE - EXISTING	355001	213308	Scowles, located in Highmeadow Wood.	FORM 2	SURVEY LEVEL 5
23805	SCOWLE - POSSIBLE	355025	213410	Rock outcrop, Highmeadow Wood.	FORM 7	SURVEY LEVEL 5
23806	SCOWLE - POSSIBLE	354933	213637	Numerous rock outcrops, located in Highmeadow Wood.	FORM 7	SURVEY LEVEL 4
23807	SCOWLE - POSSIBLE	355022	213887	Rock outcrop, located in Highmeadow Wood.	FORM 7	SURVEY LEVEL 5
23808	SCOWLE - EXISTING	355022	213921	Scowles, located in Highmeadow Wood.	FORM 2	SURVEY LEVEL 5
23809	SCOWLE - EXISTING	355052	213909	Scowles, located in Highmeadow Wood.	FORM 3	SURVEY LEVEL 4
23810	SCOWLE - EXISTING	355110	213909	Two large scowles, located in Highmeadow Wood.	FORM 5	SURVEY LEVEL 5
23811	SCOWLE - EXISTING	355083	213873	Scowles, located in Highmeadow Wood.	FORM 2	SURVEY LEVEL 5
23812	SCOWLE - POSSIBLE	355080	213850	Rock outcrops in Crease Limestone, Highmeadow Wood.	FORM 7	SURVEY LEVEL 5
23813	SCOWLE - EXISTING	355289	213487	Undated possible scowle or quarry, located in Highmeadow Woods.	FORM 4	SURVEY LEVEL 5
23814	SCOWLE - EXISTING	355347	213008	Undated possible scowles, located in Highmeadow Wood.	FORM 4	SURVEY LEVEL 5
23815	SCOWLE - EXISTING	354724	214015	Undated scowles, located in Highmeadow Wood.	FORM 4	SURVEY LEVEL 3
23816	SCOWLE - EXISTING	354799	213398	Undated scowle, located in Highmeadow Wood, south of Reddings Lodge.	FORM 4	SURVEY LEVEL 5
23817	SCOWLE - EXISTING	354762	213498	Undated scowles, located in Highmeadow Wood.	FORM 4	SURVEY LEVEL 5
23818	SCOWLE - EXISTING	354984	213863	Rock outcrop, located in Highmeadow Woods.	FORM 7	SURVEY LEVEL 5
23819	SCOWLE - POSSIBLE	355071	213980	Linear outcrop of rocks, located in Highmeadow Wood.	FORM 7	SURVEY LEVEL 5
23820	SCOWLE - POSSIBLE	355086	213962	Linear rock outcrop, located in Highmeadow Wood.	FORM 7	SURVEY LEVEL 5
23821	SCOWLE - POSSIBLE	355307	214164	Rock outcrop, located to the north-east of Oldstone Well.	FORM 7	SURVEY LEVEL 5
23822	SCOWLE - POSSIBLE	355320	214330	Rock outcrop which runs parallel to the River Wye, near Biblins campsite.	FORM 7	SURVEY LEVEL 3
23823	SCOWLE - POSSIBLE	355537	214263	Rock outcrop, located in Highmeadow Wood.	FORM 7	SURVEY LEVEL 5
23824	SCOWLE - POSSIBLE	355567	214182	Rock outcrop, located in Mailscot Wood.	FORM 7	SURVEY LEVEL 4
23825	SCOWLE - POSSIBLE	355527	214236	Rock outcrop, located in Mailscot Wood.	FORM 7	SURVEY LEVEL 3
23826	SCOWLE - EXISTING	355400	214370	Rock outcrop, located at The Slaughter.	FORM 7	SURVEY LEVEL 4
23827	SCOWLE - POSSIBLE	355834	214879	Rock outcrop, located north-east of The Slaughter.	FORM 7	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23828	SCOWLE - EXISTING	355777	214998	Rock outcrop, located north-east of The Slaughter.	FORM 7	SURVEY LEVEL 5
23829	SCOWLE - EXISTING	355840	215154	Rock outcrop, located to the north-east of The Slaughter.	FORM 7	SURVEY LEVEL 5
23830	SCOWLE - POSSIBLE	355962	215258	Rock outcrop, located to the south of Bowlers Hole.	FORM 7	SURVEY LEVEL 4
23831	SCOWLE - POSSIBLE	356020	215462	Rock outcrop, located at Bowlers Hole.	FORM 7	SURVEY LEVEL 5
23832	SCOWLE - POSSIBLE	356252	215767	Rock outcrop, located at Symonds Yat.	FORM 7	SURVEY LEVEL 2
23833	SCOWLE - POSSIBLE	355541	212630	Possible scowle or quarry, located north-east of Staunton Iron Ore pit.	FORM 4	SURVEY LEVEL 5
23834	SCOWLE - EXISTING	355543	212652	Scowle, located north-east of Staunton Iron Ore pit.	FORM 4	SURVEY LEVEL 5
23835	SCOWLE - POSSIBLE	355189	212395	Possible scowle, located south of Staunton.	FORM 1	SURVEY LEVEL 5
23836	SCOWLE - POSSIBLE	355172	212192	Possible quarry or scowle, located to the south of Staunton.	FORM 5	SURVEY LEVEL 3
23837	SCOWLE - EXISTING	355253	212317	Scowles, located to the south of Kiln Cottage, Staunton.	FORM 2	SURVEY LEVEL 3
23838	SCOWLE - EXISTING	355590	212179	Scowle, located in Blakes Wood.	FORM 5	SURVEY LEVEL 3
23839	SCOWLE - EXISTING	355552	212196	Scowles, located in Blakes Wood.	FORM 2	SURVEY LEVEL 5
23840	SCOWLE - POSSIBLE DESTROYED	355426	212271	Possible quarry, located to the north of Blakes Wood. Possibly the site of destroyed scowle(s).		SURVEY LEVEL 2
23841	SCOWLE - EXISTING	355476	212336	Scowle, located to the north of Blakes Wood.	FORM 2	SURVEY LEVEL 5
23842	SCOWLE - EXISTING	355702	211996	Scowle(s), located in Blakes Wood.	FORM 2	SURVEY LEVEL 5
23843	SCOWLE - EXISTING	355693	211768	Linear scowles, located in Blakes Wood.	FORM 4	SURVEY LEVEL 5
23844	SCOWLE - POSSIBLE	355774	211711	Area of possible scowles, located in Blakes wood. (Probable tipping).		SURVEY LEVEL 5
23845	SCOWLE - EXISTING	355789	211763	Small individual scowles, located in Blakes Wood.	FORM 2	SURVEY LEVEL 5
23846	SCOWLE - EXISTING	355785	211545	Scowles, located in Blakes Wood.	FORM 5	SURVEY LEVEL 5
23847	SCOWLE - EXISTING	355865	211532	Scowles, located in Blakes Wood.	FORM 4	SURVEY LEVEL 5
23848	SCOWLE - EXISTING	355925	211367	Scowles, located in Dingle Wood.	FORM 4	SURVEY LEVEL 3
23849	SCOWLE - EXISTING	355835	211371	Scowles, located in Dingle Wood.	FORM 5	SURVEY LEVEL 3
23850	SCOWLE - EXISTING	355770	211330	Scowles, located in Dingle Wood.	FORM 2	SURVEY LEVEL 5
23851	SCOWLE - POSSIBLE	356152	211314	Possible scowles, located in the field to the south-west of Crows Nest Iron Pit.	FORM 4	SURVEY LEVEL 5
23852	SCOWLE - POSSIBLE	355769	210967	Small shallow possible scowles, located in Blakes Wood.	FORM 2	SURVEY LEVEL 2
23853	SCOWLE - POSSIBLE	356093	210775	Possible scowles, located in field to the north-east of High Meadow Farm.	FORM 1	SURVEY LEVEL 5
23854	SCOWLE - POSSIBLE	356136	210430	Rock outcrops, located within a band of woodland to the east of Highmeadow Farm.	FORM 7	SURVEY LEVEL 4

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23855	SCOWLE - POSSIBLE	356086	210322	Possible scowles, located to the south-east of High Meadow Farm.	FORM 2	SURVEY LEVEL 2
23856	SCOWLE - POSSIBLE	355990	210910	Linear outcrop of Crease Limestone(?), north-west of Scowles Village.	FORM 7	SURVEY LEVEL 5
23857	SCOWLE - EXISTING	356172	210861	Scowles, located in Scowles village.	FORM 4	SURVEY LEVEL 2
23858	SCOWLE - POSSIBLE DESTROYED	356135	210846	Possible destroyed scowle, located in Scowles Village.		SURVEY LEVEL 3
23859	SCOWLE - POSSIBLE	356171	210796	Possible scowles, located in Scowles Village.	FORM 1	SURVEY LEVEL 3
23860	SCOWLE - EXISTING	356216	210822	Scowle, located in Scowles Village.	FORM 4	SURVEY LEVEL 2
23861	SCOWLE - EXISTING	356290	210758	Scowles, located in Scowles Village.	FORM 5	SURVEY LEVEL 5
23862	SCOWLE - POSSIBLE	356268	210726	Possible scowles, located in Scowles Village.	FORM 1	SURVEY LEVEL 5
23863	SCOWLE - POSSIBLE	356520	210592	Possible scowles with possible infilling, located in Scowles Village.	FORM 1	SURVEY LEVEL 5
23864	SCOWLE - EXISTING	356563	210539	Shallow interlinked scowles, located in Scowles Village.	FORM 4	SURVEY LEVEL 5
23865	SCOWLE - EXISTING	356546	210590	Scowles, located in Scowles Village.	FORM 5	SURVEY LEVEL 5
23866	SCOWLE - EXISTING	356486	210576	Scowles, located behind the Laurels and Badger End in Scowles Village.	FORM 5	SURVEY LEVEL 5
23867	SCOWLE - POSSIBLE	356403	210552	Area of possible scowles, located opposite Badgers End in Scowles Village.	FORM 2	SURVEY LEVEL 2
23868	SCOWLE - POSSIBLE	356458	210445	Area of possible scowles, located at the south end of Scowles Village.	FORM 1	SURVEY LEVEL 3
23869	SCOWLE - POSSIBLE	356799	210641	Possible scowles, located to the south-east of Scowles recreation ground.	FORM 2	SURVEY LEVEL 2
23870	SCOWLE - EXISTING	356614	210474	Scowles, located to the south of Scowles Village.	FORM 2	SURVEY LEVEL 3
23871	SCOWLE - POSSIBLE DESTROYED	355879	211103	Modern quarry, located to the east of Stowfield Quarry. Possible area of destroyed scowles.		SURVEY LEVEL 2
23872	SCOWLE - POSSIBLE	356482	210131	Rock outcrop and possible scowle, located to the south of Whitecliff Quarry.	FORM 7	SURVEY LEVEL 3
23873	SCOWLE - POSSIBLE DESTROYED	356573	210229	Whitecliff Quarry, possibly the site of destroyed scowles.		SURVEY LEVEL 3
23874	SCOWLE - POSSIBLE	356956	210179	Rock outcrops (possible scowles?), located to the south of Rock Lane, Whitecliff.	FORM 7	SURVEY LEVEL 5
23875	SCOWLE - POSSIBLE	356953	210213	Rock outcrops (possible scowles?), located to the north of Rock Lane, Whitecliff.	FORM 7	SURVEY LEVEL 3
23876	SCOWLE - POSSIBLE	356927	210072	Rock outcrop (possible scowles?), located to the south of Rock Lane, Whitecliff.	FORM 7	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23877	SCOWLE - POSSIBLE	356920	209936	Rock outcrop (possible scowles?), located opposite to the entrance of Whitecliff Quarry.	FORM 7	SURVEY LEVEL 2
23878	SCOWLE - POSSIBLE DESTROYED	356682	209845	Possible destroyed scowle, located in Galders Wood.	FORM 7	SURVEY LEVEL 2
23879	SCOWLE - POSSIBLE	356835	209860	Rock outcrop (possible scowles?), located on the north-east of Galders Wood.	FORM 7	SURVEY LEVEL 2
23880	SCOWLE - POSSIBLE	356728	209646	Rock outcrops (possible scowles?), located in Galders Wood.	FORM 7	SURVEY LEVEL 5
23881	SCOWLE - POSSIBLE	356898	209384	Rock outcrops (possible scowles?), located east of Breckness Court.	FORM 7	SURVEY LEVEL 5
23882	SCOWLE - POSSIBLE	356942	209355	Possible scowle / possible quarry, located east of Breckness Court.	FORM 5	SURVEY LEVEL 5
23883	SCOWLE - POSSIBLE	357065	209255	Area of occasional small outcrops, located south-east of Breckness Court.	FORM 7	SURVEY LEVEL 5
23884	SCOWLE - EXISTING	357274	209043	Scowles, located in Breckness Wood.	FORM 2	SURVEY LEVEL 5
23885	SCOWLE - POSSIBLE	357244	209000	Rock outcrops (possible scowles?), located at Breckness Wood.	FORM 7	SURVEY LEVEL 5
23886	SCOWLE - POSSIBLE	357264	208925	Small rock outcrops, located at Breckness Court Wood.	FORM 7	SURVEY LEVEL 5
23887	SCOWLE - EXISTING	357807	209412	Scowles, located in Lower Perrygrove Farm.	FORM 1	SURVEY LEVEL 3
23888	SCOWLE - EXISTING	357734	209338	Scowles and rock outcrops located in Lower Perrygrove Farm.	FORM 1	SURVEY LEVEL 5
23889	SCOWLE - EXISTING	357881	209048	Two large, scowles with possible underground access, located south of Lower Perrygrove Farm.	FORM 4	SURVEY LEVEL 3
23890	SCOWLE - EXISTING	357841	209199	Scowle/s, located south of Lower Perrygrove Farm.	FORM 2	SURVEY LEVEL 3
23891	SCOWLE - EXISTING	357891	209221	Scowles, located south of Lower Perrygrove Farm.	FORM 1	SURVEY LEVEL 3
23892	SCOWLE - EXISTING	357667	209104	Large, interlinked scowles located at Puzzle Wood.	FORM 5	SURVEY LEVEL 3
23894	SCOWLE - EXISTING	357479	208996	Shallow field depressions located to the west of Puzzle Wood.	FORM 1	SURVEY LEVEL 3
23895	SCOWLE - EXISTING	357610	209180	Scowles with outcrops, located on the north-west side of Puzzle Wood.	FORM 2	SURVEY LEVEL 2
23896	SCOWLE - POSSIBLE	357504	208550	Area of possibly back-filled scowles, located at Clearwell Farm.	FORM 1	SURVEY LEVEL 5
23897	SCOWLE - EXISTING	357450	208696	Scowles, located at Clearwell Farm.	FORM 4	SURVEY LEVEL 3
23898	SCOWLE - POSSIBLE	357459	208746	Area of possible small scowles, located at Clearwell Farm.	FORM 1	SURVEY LEVEL 5
23899	SCOWLE - POSSIBLE DESTROYED	358017	208531	Possible scowle / possible quarry, located east of Lambsquay Road.		SURVEY LEVEL 2
23900	SCOWLE - POSSIBLE	357851	208509	Mine shaft / possible scowle, located to the south-east of Stock Farm.	FORM 4	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23901	SCOWLE - EXISTING	357869	208906	Large, shallow depressions, located west of Puzzle Wood.	FORM 1	SURVEY LEVEL 5
23902	SCOWLE - EXISTING	357430	208270	Several scowles of varying sizes, located at Stock Wood.	FORM 2	SURVEY LEVEL 5
23903	SCOWLE - EXISTING	357458	208276	Area containing some discrete, pits and large channels, located at Stock Wood.	FORM 4	SURVEY LEVEL 3
23904	SCOWLE - EXISTING	357562	208309	Large, interlinked scowles located at Stock Wood.	FORM 5	SURVEY LEVEL 3
23905	SCOWLE - EXISTING	357504	208172	Scowles, located at Stock Wood.	FORM 2	SURVEY LEVEL 5
23906	SCOWLE - POSSIBLE	357519	208375	Possible scowles, located at Stock Wood.		SURVEY LEVEL 5
23907	SCOWLE - EXISTING	357637	208409	Scowle/s located in Stock Wood.	FORM 2	SURVEY LEVEL 5
23908	SCOWLE - EXISTING	357798	208596	Area of large scowles, located in Little Lambsquay Wood.	FORM 4	SURVEY LEVEL 3
23908	STRUCTURE	357816	208559	Hollow, partly faced with stone and apparently associated with undated scowles, located in Little Lambsquay Wood.		
23909	SCOWLE - POSSIBLE	357805	208462	Possible field depressions (scowles?), located in a field to the south-east of Stock Wood.	FORM 1	SURVEY LEVEL 3
23910	SCOWLE - EXISTING	357492	208082	Large linear scowle, located south of Stock Wood.	FORM 4	SURVEY LEVEL 3
23911	SCOWLE - POSSIBLE	357576	208225	Vast area of shallow field depressions (possibly back-filled scowles), located south and east of Stock Wood.	FORM 1	SURVEY LEVEL 5
23912	SCOWLE - EXISTING	357780	208314	Area of numerous scowles of varying sizes, located north-east of Clearwell Caves.	FORM 2	SURVEY LEVEL 2
23913	SCOWLE - EXISTING	357692	208168	Large scowles of varying size, located south and east of Clearwell Caves.	FORM 5	SURVEY LEVEL 2
23914	SCOWLE - EXISTING	357697	208079	Small scowles located within a Forestry Commission nature reserve, south of Clearwell Caves.	FORM 2	SURVEY LEVEL 2
23915	SCOWLE - EXISTING	357763	208675	Discrete area of shallow scowles, located in Little Lambsquay Wood.	FORM 2	SURVEY LEVEL 3
23916	SCOWLE - EXISTING	357761	208767	Several large scowles, located in Little Lambsquay Wood.	FORM 5	SURVEY LEVEL 5
23917	SCOWLE - EXISTING	357761	208865	Scowles, located in Little Lambsquay Wood.	FORM 2	SURVEY LEVEL 5
23918	SCOWLE - EXISTING	357696	208800	Small, shallow scowles, located in Little Lambsquay Wood.	FORM 2	SURVEY LEVEL 5
23919	SCOWLE - EXISTING	357715	208726	Large, open scowles, located in Little Lambsquay Wood.	FORM 4	SURVEY LEVEL 5
23920	SCOWLE - EXISTING	357723	208617	Field depressions, located between Little Lambsquay Wood and Clearwell Farm.	FORM 1	SURVEY LEVEL 4
23921	SCOWLE - POSSIBLE	359119	206198	Large scowle pit or quarry, located at Noxon Park.	FORM 4	SURVEY LEVEL 4
23922	SCOWLE - EXISTING	359066	206225	Shallow, circular scowles, located in Noxon Park.	FORM 2	SURVEY LEVEL 5
23923	SCOWLE - EXISTING	359178	206107	Quarry-like scowle, located in Noxon Park.	FORM 4	SURVEY LEVEL 4

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23924	SCOWLE - EXISTING	359244	206353	Large linear scowles, located in Noxon Park.	FORM 4	SURVEY LEVEL 5
23925	SCOWLE - EXISTING	359264	206341	Medium sized scowles, located in Noxon Park.	FORM 2	SURVEY LEVEL 5
23926	SCOWLE - POSSIBLE	359421	206646	Possible scowle, located in Noxon Park.	FORM 4	SURVEY LEVEL 5
23927	SCOWLE - EXISTING	359226	206053	Scowles, located in Noxon Park.	FORM 3	SURVEY LEVEL 5
23928	SCOWLE - EXISTING	359138	205973	Large scowle, located in Noxon Park.	FORM 4	SURVEY LEVEL 4
23929	SCOWLE - EXISTING	359256	206065	Scowles, located in Noxon Park.	FORM 2	SURVEY LEVEL 5
23930	SCOWLE - EXISTING	359066	206116	Circular scowles with associated mounds, located in Noxon Park.	FORM 2	SURVEY LEVEL 5
23931	SCOWLE - EXISTING	359121	206149	Large scowle, located in Noxon Park.	FORM 4	SURVEY LEVEL 4
23932	SCOWLE - EXISTING	358938	206270	Large scowle, located in Noxon Park.	FORM 5	SURVEY LEVEL 3
23933	SCOWLE - EXISTING	358922	206324	Area of large scowles with associated mounds, located in Noxon Park.	FORM 4	SURVEY LEVEL 5
23934	SCOWLE - EXISTING	358923	206353	Scowle, located at Noxon Park.	FORM 5	SURVEY LEVEL 5
23935	SCOWLE - EXISTING	358900	206450	Scowle, Noxon Park.	FORM 4	SURVEY LEVEL 2
23936	SCOWLE - POSSIBLE	358904	206482	Possible scowle, located at Noxon Park.	FORM 4	SURVEY LEVEL 2
23937	SCOWLE - EXISTING	358927	206460	Scowle, Noxon Park.	FORM 4	SURVEY LEVEL 3
23938	SCOWLE - POSSIBLE	358930	206490	Possible scowles, Noxon Park.	FORM 1	SURVEY LEVEL 5
23939	SCOWLE - EXISTING	358970	206530	Scowles, Noxon Park.	FORM 2	SURVEY LEVEL 5
23940	SCOWLE - POSSIBLE	358918	206504	Possible scowle or air shaft, located at Noxon Park.	FORM 4	SURVEY LEVEL 3
23941	SCOWLE - EXISTING	358930	206609	Scowle with possible underground workings, located at Noxon Park.	FORM 4	SURVEY LEVEL 3
23942	SCOWLE - EXISTING	358883	206584	Large area containing numerous scowles of varying shapes and sizes, located at Noxon Park.	FORM 5	SURVEY LEVEL 2
23943	SCOWLE - POSSIBLE DESTROYED	358915	206704	Quarry (possible scowle?), located at Noxon Park.		SURVEY LEVEL 2
23944	SCOWLE - EXISTING	358845	206777	Scowle with vertical rock-faces, located at Noxon Park.	FORM 3	SURVEY LEVEL 2
23945	SCOWLE - EXISTING	358828	206810	Large scowle with underground access, located at Noxon Park.	FORM 5	SURVEY LEVEL 3
23946	SCOWLE - EXISTING	358842	206767	Scowles, located at Noxon Park.	FORM 4	SURVEY LEVEL 2
23947	SCOWLE - EXISTING	358703	206737	Scowle, located at Noxon Park.	FORM 3	SURVEY LEVEL 2
23948	SCOWLE - EXISTING	358727	206731	Area of depressions and small pits with some mounds associated. Located at Noxon Park.	FORM 2	SURVEY LEVEL 2
23949	SCOWLE - EXISTING	358750	206916	Elongated scowle, located at Noxon Park.	FORM 4	SURVEY LEVEL 3

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23950	SCOWLE - EXISTING	358388	206986	Area of undulating ground containing several small scowles, located at Noxon Park.	FORM 2	SURVEY LEVEL 3
23951	SCOWLE - EXISTING	358643	207015	Area containing possible scowles, located at Noxon Park.	FORM 2	SURVEY LEVEL 3
23952	SCOWLE - POSSIBLE	358665	206959	Area of large, deep, linear scowles with later quarrying, located at Noxon Park.	FORM 4	SURVEY LEVEL 3
23953	SCOWLE - EXISTING	359508	205732	Linear scowle, located at Bream Tufts.	FORM 4	SURVEY LEVEL 5
23954	SCOWLE - EXISTING	359528	205734	Scowles, located at Bream Tufts.	FORM 4	SURVEY LEVEL 5
23955	SCOWLE - EXISTING	359476	205824	Large, linear scowle with much underground access and several branches spreading out. Located at Bream Tufts.	FORM 5	SURVEY LEVEL 3
23956	SCOWLE - POSSIBLE DESTROYED	359500	205649	Possible site of destroyed scowles, located at Bream Tufts.		SURVEY LEVEL 3
23957	SCOWLE - POSSIBLE DESTROYED	359514	205879	Possible quarry / possible destroyed scowle, located at Bream Tufts.		SURVEY LEVEL 5
23958	SCOWLE - EXISTING	358854	206345	Large scowle, located at Noxon Park.	FORM 5	SURVEY LEVEL 3
23959	SCOWLE - EXISTING	358810	206248	Four circular scowles, located at Noxon Park.	FORM 4	SURVEY LEVEL 4
23960	SCOWLE - EXISTING	358850	206160	Area of shallow depressions, located at Noxon Park.	FORM 1	SURVEY LEVEL 5
23961	SCOWLE - EXISTING	358860	206145	Linear scowle, located at Noxon Park.	FORM 4	SURVEY LEVEL 5
23962	SCOWLE - POSSIBLE	358888	206176	Linear scowle located at Noxon Park.	FORM 2	SURVEY LEVEL 5
23963	SCOWLE - EXISTING	358865	206167	Scowles, located at Noxon Park.	FORM 2	SURVEY LEVEL 5
23964	SCOWLE - EXISTING	358875	206169	Scowles, located at Noxon Park.	FORM 2	SURVEY LEVEL 5
23965	SCOWLE - EXISTING	358929	206180	Area of circular scowles with mounds associated, located at Noxon Park.	FORM 4	SURVEY LEVEL 5
23966	SCOWLE - EXISTING	358977	206187	Area of circular scowles, located at Noxon Park.	FORM 2	SURVEY LEVEL 5
23967	SCOWLE - EXISTING	358963	206158	Deep, circular scowle, located at Noxon Park.	FORM 2	SURVEY LEVEL 5
23968	SCOWLE - EXISTING	359010	206113	Linear scowle, located in Noxon Park.	FORM 4	SURVEY LEVEL 5
23969	SCOWLE - EXISTING	359360	205925	Scowles, located at Bream Tufts, Noxon Park.	FORM 5	SURVEY LEVEL 2
23970	SCOWLE - POSSIBLE	359590	205845	Area of possible scowles, located at Bream Tufts.	FORM 1	SURVEY LEVEL 5
23971	SCOWLE - EXISTING	359410	205849	Large linear scowles, located at Noxon Park.	FORM 5	SURVEY LEVEL 3
23972	SCOWLE - EXISTING	359249	206016	Scowle with possible underground access, located at Noxon Park.	FORM 5	SURVEY LEVEL 2
23973	SCOWLE - EXISTING	359320	205998	Scowle, located at Noxon Park.	FORM 2	SURVEY LEVEL 5
23974	SCOWLE - EXISTING	360322	204693	Area of scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
23975	SCOWLE - EXISTING	360222	205084	Large scowle, located at Devils Chapel.	FORM 5	SURVEY LEVEL 3

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
23976	SCOWLE - EXISTING	360397	204690	Linear scowle, located at Devils Chapel.	FORM 4	SURVEY LEVEL 3
23977	SCOWLE - EXISTING	360441	204633	Area of scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
23978	SCOWLE - POSSIBLE	360303	204787	Possible scowle, located at Devils Chapel.	FORM 3	SURVEY LEVEL 2
23979	SCOWLE - EXISTING	360209	204967	Area of scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 2
23980	SCOWLE - EXISTING	360193	204918	Linear scowle, located at Devils Chapel.	FORM 4	SURVEY LEVEL 2
23981	SCOWLE - EXISTING	360222	204815	Linear scowle, located at Devils Chapel.	FORM 4	SURVEY LEVEL 5
23982	SCOWLE - EXISTING	360416	204514	Linear scowle, located at Devils Chapel.	FORM 5	SURVEY LEVEL 2
23983	SCOWLE - POSSIBLE	360696	204808	Possible scowles, located at Devils Chapel.	FORM 1	SURVEY LEVEL 5
23984	SCOWLE - EXISTING	360336	204866	Large interconnected scowles, located at Devils Chapel.	FORM 5	SURVEY LEVEL 2
23985	SCOWLE - EXISTING	360840	204270	Scowles, located in Old Upper Park Wood.	FORM 2	SURVEY LEVEL 3
23986	SCOWLE - EXISTING	360890	204235	Scowle, located in Old Upper Park Wood.	FORM 4	SURVEY LEVEL 3
23987	SCOWLE - EXISTING	358096	207700	Scowles, located to the north-east of the Orepool Pub.	FORM 4	SURVEY LEVEL 5
23988	SCOWLE - POSSIBLE	358093	207764	Possible scowle, located to the north-east of the Orepool pub.	FORM 2	SURVEY LEVEL 5
23989	SCOWLE - EXISTING	358151	207686	Scowle, located to the north-east of Orepool.	FORM 2	SURVEY LEVEL 5
23990	SCOWLE - POSSIBLE	358189	207692	Possible scowles, located to the north-east of the Orepool Inn.	FORM 1	SURVEY LEVEL 5
23991	SCOWLE - POSSIBLE	358093	207551	Possible scowle, located north-east of the Orepool Inn.	FORM 1	SURVEY LEVEL 5
23992	SCOWLE - POSSIBLE	358158	207573	Possible scowles, located to the north-east of Orepool.	FORM 2	SURVEY LEVEL 2
23993	SCOWLE - POSSIBLE	358164	207523	Possible scowle, located to the east of Orepool Inn.	FORM 1	SURVEY LEVEL 5
23994	SCOWLE - EXISTING	358213	207559	Scowles, located to the east of the Orepool Inn.	FORM 1	SURVEY LEVEL 5
23995	SCOWLE - EXISTING	360455	204468	Scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
23996	SCOWLE - POSSIBLE	360510	204430	Three possible scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
23997	SCOWLE - EXISTING	360544	204403	Two linear scowles, located at Devils Chapel.	FORM 4	SURVEY LEVEL 5
23998	SCOWLE - EXISTING	360568	204359	Scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
23999	SCOWLE - EXISTING	360622	204326	Scowles, located at Devils Chapel.	FORM 5	SURVEY LEVEL 3
24243	SCOWLE - EXISTING	365732	218547	Area of pits and mounds seen from edge of woodland, Scully Grove.	FORM 2	SURVEY LEVEL 3
25000	SCOWLE - EXISTING	365574	219808	Large scowles, located at Lining Wood Top.	FORM 4	SURVEY LEVEL 3
25001	SCOWLE - EXISTING	365581	219776	Scowles, located at Lining Wood Top.	FORM 2	SURVEY LEVEL 5
25002	SCOWLE - EXISTING	365578	219742	Scowle(s), located at Lining Wood Top.	FORM 4	SURVEY LEVEL 4
25003	SCOWLE - EXISTING	365577	219735	Scowles, located at Lining Wood Top.	FORM 2	SURVEY LEVEL 3

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25004	SCOWLE - EXISTING	365464	219738	Scowle, located at Lining Wood Top.	FORM 5	SURVEY LEVEL 5
25005	SCOWLE - EXISTING	365487	219704	Scowle with underground access, located at Lining Wood Top.	FORM 5	SURVEY LEVEL 5
25006	SCOWLE - EXISTING	365511	219687	Scowle, located at Lining Wood Top.	FORM 4	SURVEY LEVEL 2
25007	SCOWLE - EXISTING	365486	219684	Scowles, located at Lining Wood Top.	FORM 3	SURVEY LEVEL 2
25008	SCOWLE - EXISTING	365446	219684	Large scowle, located at Lining Wood Top.	FORM 4	SURVEY LEVEL 3
25009	SCOWLE - EXISTING	366149	213229	Scowles and mounds, located at the Cinderford Ambulance Station, Cinderford.	FORM 4	SURVEY LEVEL 5
25010	SCOWLE - EXISTING	366109	213301	Field depressions, located north-east of Cinderford Ambulance Station, Cinderford.	FORM 1	SURVEY LEVEL 3
25011	SCOWLE - EXISTING	366144	213105	Field depressions, located at Quiet End, south of Cinderford Ambulance Station, Cinderford.	FORM 1	SURVEY LEVEL 5
25012	SCOWLE - POSSIBLE	366088	213106	Possible scowle / possible quarry, located at Quiet Corner, south of Cinderford Ambulance Station.		SURVEY LEVEL 5
25013	SCOWLE - EXISTING	366221	213405	Field depressions located north of Cinderford Ambulance Station, Cinderford.	FORM 1	SURVEY LEVEL 5
25014	SCOWLE - EXISTING	366244	213353	Interconnected scowles located north of Cinderford Ambulance Station, Cinderford.	FORM 2	SURVEY LEVEL 5
25015	SCOWLE - EXISTING	366306	213420	Interconnected scowles, located north of Cinderford Ambulance Station, Cinderford.	FORM 2	SURVEY LEVEL 3
25016	SCOWLE - EXISTING	365900	212980	Field depressions and undulations, located at St White's Farm.	FORM 1	SURVEY LEVEL 3
25017	SCOWLE - EXISTING	365835	212768	Field depressions, located south of St White's Farm.	FORM 1	SURVEY LEVEL 5
25018	SCOWLE - EXISTING	365739	212731	Shallow elongated field depressions, located south of St White's Farm.	FORM 1	SURVEY LEVEL 5
25019	SCOWLE - POSSIBLE	365725	212620	Large possible scowle / possible quarry, located south of St White's Farm.		SURVEY LEVEL 5
25020	SCOWLE - EXISTING	365733	212560	Field depressions, located south of St White's Farm.	FORM 1	SURVEY LEVEL 5
25021	SCOWLE - EXISTING	365681	212435	Scowle(s) with associated mounds, located south of St White's Farm.	FORM 2	SURVEY LEVEL 5
25022	SCOWLE - EXISTING	365595	212660	Field depressions, located south-west of St White's Farm.	FORM 1	SURVEY LEVEL 5
25023	SCOWLE - EXISTING	365638	212241	Large quarry-like scowle, located south of Abbots Wood, Ruspidge.	FORM 4	SURVEY LEVEL 2
25024	SCOWLE - POSSIBLE	358405	214049	Rock outcrop, located south-east of Brookshead Grove.	FORM 7	SURVEY LEVEL 5
25025	SCOWLE - POSSIBLE	358603	214268	Rock outcrop, located at the south end of Brookshead Grove.	FORM 7	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25026	SCOWLE - POSSIBLE	358534	214444	Rock outcrop, located on the western slope of Brookshead Grove.	FORM 7	SURVEY LEVEL 5
25027	SCOWLE - POSSIBLE	359595	214393	Undated possible scowles, located at Eastbachmeend Inclosure.	FORM 1	SURVEY LEVEL 5
25028	SCOWLE - POSSIBLE	359588	214302	Possible scowle / pond, located at Eastbachmeend Inclosure.	FORM 2	SURVEY LEVEL 5
25029	SCOWLE - POSSIBLE	359642	214455	Possible scowle / possible quarry, located in Eastbachmeend Inclosure.	FORM 4	SURVEY LEVEL 2
25030	SCOWLE - POSSIBLE	359657	214526	Large, undated scowle, located south-east of Eastbach Lodge.	FORM 5	SURVEY LEVEL 5
25031	SCOWLE - POSSIBLE	359613	214654	Scowles and mounds, located north-east of Eastbach Lodge.	FORM 2	SURVEY LEVEL 4
25032	SCOWLE - EXISTING	359538	214943	Field depressions and pits, located north of Eastbach Lodge.	FORM 1	SURVEY LEVEL 5
25033	SCOWLE - EXISTING	359600	215027	Scowles located north of Eastbach Lodge.	FORM 2	SURVEY LEVEL 3
25034	SCOWLE - EXISTING	359574	215068	Scowles, located north of Eastbach Lodge.	FORM 2	SURVEY LEVEL 3
25035	SCOWLE - EXISTING	359722	215404	Scowles and mounds, located north/north-east of Eastbach Lodge.	FORM 1	SURVEY LEVEL 5
25036	SCOWLE - POSSIBLE	359059	214023	Possible scowle / possible quarry, located north of Lower Carterspiece Farm.	FORM 4	SURVEY LEVEL 3
25037	SCOWLE - POSSIBLE	358648	214125	Rock outcrop, located in the southern part of Brooks Head Grove.	FORM 7	SURVEY LEVEL 5
25038	SCOWLE - POSSIBLE			Rock outcrop, located in Brooks Head Grove.	FORM 7	SURVEY LEVEL 5
25039	SCOWLE - POSSIBLE DESTROYED	359434	215672	Quarry / possible destroyed scowle, located at Eastbach airfield.	FORM 4	SURVEY LEVEL 5
25040	SCOWLE - EXISTING	360619	204400	Scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
25041	SCOWLE - EXISTING	360640	204307	Scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
25042	SCOWLE - EXISTING	360645	204235	Scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
25043	SCOWLE - EXISTING	360707	204176	Scowles, located at Devils Chapel.	FORM 3	SURVEY LEVEL 5
25044	SCOWLE - EXISTING	360707	204176	Scowles, located at Devils Chapel.	FORM 5	SURVEY LEVEL 3
25045	SCOWLE - EXISTING	360728	204379	Linear scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 2
25046	SCOWLE - EXISTING	360728	204396	Two scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
25047	SCOWLE - EXISTING	360670	204480	Scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 3
25048	SCOWLE - EXISTING	360640	204591	Scowle, located at Devils Chapel.	FORM 4	SURVEY LEVEL 3
25049	SCOWLE - EXISTING	360648	204577	Linear scowle, located at Devils Chapel.	FORM 4	SURVEY LEVEL 3
25050	SCOWLE - EXISTING	360635	204565	Small scowle, located at Devils Chapel.	FORM 2	SURVEY LEVEL 3
25051	SCOWLE - EXISTING	360653	204606	Scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 3

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25052	SCOWLE - EXISTING	360633	204625	Linear scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
25053	SCOWLE - EXISTING	360600	204460	Scowles, located at Devils Chapel.	FORM 5	SURVEY LEVEL 2
25054	SCOWLE - POSSIBLE	360725	204778	Possible scowles, located at Devils Chapel.	FORM 4	SURVEY LEVEL 3
25055	SCOWLE - EXISTING	360730	204740	Scowles located at Devils Chapel.	FORM 2	SURVEY LEVEL 3
25056	SCOWLE - EXISTING	360667	204674	Scowles, located at Devils Chapel.	FORM 4	SURVEY LEVEL 3
25057	SCOWLE - EXISTING	360653	204635	Linear scowle, located at Devils Chapel.	FORM 4	SURVEY LEVEL 3
25058	SCOWLE - EXISTING	360772	204786	Two large linear scowles, located at Devils Chapel.	FORM 4	SURVEY LEVEL 5
25059	SCOWLE - EXISTING	360707	204624	Possible scowle, located at Devils Chapel.	FORM 4	SURVEY LEVEL 5
25060	SCOWLE - EXISTING	360736	204612	Scowle, located at Devils Chapel.	FORM 2	SURVEY LEVEL 3
25061	SCOWLE - EXISTING	360750	204609	Scowle, located at Devils Chapel.	FORM 4	SURVEY LEVEL 4
25062	SCOWLE - EXISTING	360887	204092	Large linear scowles, located at Devils Chapel.	FORM 5	SURVEY LEVEL 2
25063	SCOWLE - EXISTING	360825	204111	Scowles, located at Devils Chapel.	FORM 2	SURVEY LEVEL 5
25064	SCOWLE - EXISTING	360697	204040	Linear scowle, located at Devils Chapel.	FORM 4	SURVEY LEVEL 2
25065	SCOWLE - EXISTING	360785	204142	Possible scowle, located at Lydney Park.	FORM 2	SURVEY LEVEL 5
25066	SCOWLE - POSSIBLE	360723	204089	Possible scowles, Lydney Park Estate.	FORM 5	SURVEY LEVEL 2
25067	SCOWLE - EXISTING	360695	204121	Linear scowle, Lydney.	FORM 5	SURVEY LEVEL 5
25068	SCOWLE - EXISTING	360705	204124	Two scowles, Lydney Park Estate.	FORM 2	SURVEY LEVEL 5
25069	SCOWLE - EXISTING	360893	204007	Scowle, located near the northern end of Devil`s Ditch, Lydney Park Estate.	FORM 5	SURVEY LEVEL 5
25070	SCOWLE - EXISTING	360865	204024	Scowles and associated mounds, Lydney Park Estate.	FORM 2	SURVEY LEVEL 5
25071	SCOWLE - EXISTING	360887	203966	Scowles and associated mounds, Lydney Park Estate.	FORM 4	SURVEY LEVEL 5
25072	SCOWLE - EXISTING	360910	203928	Two scowles, Lydney Park Estate.	FORM 3	SURVEY LEVEL 5
25073	SCOWLE - EXISTING	360880	203940	Scowle, known as Devil's Ditch, Lydney Park Estate.	FORM 5	SURVEY LEVEL 2
25074	SCOWLE - EXISTING	360987	203790	Scowle known as Devil's Ditch, Lydney Park Estate.	FORM 5	SURVEY LEVEL 2
25075	SCOWLE - EXISTING	360930	204747	Area of undulating ground, including some small shallow pits, Breams Grove.	FORM 2	SURVEY LEVEL 3
25076	SCOWLE - EXISTING	360863	204831	Scowle, Breams Grove.	FORM 4	SURVEY LEVEL 5
25077	SCOWLE - EXISTING	360822	204667	Possible scowle, located on the Lydney Park Estate.	FORM 3	SURVEY LEVEL 5
25078	SCOWLE - EXISTING	360858	204600	Area of scowles (low density), Lydney Park Estate.	FORM 2	SURVEY LEVEL 5
25079	SCOWLE - EXISTING	360950	204540	Area of dense scowles, Lydney Park Estate.	FORM 2	SURVEY LEVEL 5
25080	SCOWLE - POSSIBLE	359895	215869	Possible scowles / rock outcrop, located in Hangerberry Wood.	FORM 7	SURVEY LEVEL 3

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25081	SCOWLE - POSSIBLE DESTROYED	360055	215913	Quarry / possible area of destroyed scowles.	FORM 7	SURVEY LEVEL 2
25082	SCOWLE - POSSIBLE	360170	216015	Rock outcrops, located east of Central Lydbrook, south of Joy's Green Farm.	FORM 7	SURVEY LEVEL 2
25083	SCOWLE - POSSIBLE	360183	216112	Rock outcrop, located south of Joy's Green Farm, Lydbrook.	FORM 7	SURVEY LEVEL 3
25084	SCOWLE - POSSIBLE	360110	216203	Quarry or possible scowle, located north-west of Joy's Green Farm.	FORM 5	SURVEY LEVEL 3
25085	SCOWLE - POSSIBLE	360029	216321	Area of rock outcrop, located north-west of Joy's Green Farm.	FORM 7	SURVEY LEVEL 3
25086	SCOWLE - POSSIBLE DESTROYED	360059	216518	Quarry / possible site of destroyed scowles, located south of Rocks Road, Lower Lydbrook.	FORM 5	SURVEY LEVEL 4
25087	SCOWLE - POSSIBLE	360042	216850	Possible scowles, located in woodland known as The Coppice.	FORM 1	SURVEY LEVEL 3
25088	SCOWLE - POSSIBLE	360474	216755	Rock outcrop / quarry, located east of Royal Spring Inn, Lydbrook.	FORM 7	SURVEY LEVEL 3
25089	SCOWLE - EXISTING	361330	217669	Possibe scowle.	FORM 2	SURVEY LEVEL 2
25090	SCOWLE - POSSIBLE	361298	217779	Rock outcrop / quarry.	FORM 7	SURVEY LEVEL 5
25091	SCOWLE - POSSIBLE	363128	217720	Rock outcrop / quarry, located north-east of Crooked End Farm.	FORM 7	SURVEY LEVEL 5
25092	SCOWLE - EXISTING	363108	217662	Field depressions, located north-east of Crooked End Farm, Ruardean.	FORM 1	SURVEY LEVEL 5
25093	SCOWLE - EXISTING	363558	217913	Area of scowles, located west of Drybrook Quarry.	FORM 3	SURVEY LEVEL 4
25094	SCOWLE - POSSIBLE	364212	218238	Field depressions, located in Rough Meadow.	FORM 1	SURVEY LEVEL 5
25095	SCOWLE - DESTROYED	364128	217950	Large quarry, known as Drybrook Quarry - site of destroyed scowles.		SURVEY LEVEL 3
25096	SCOWLE - POSSIBLE DESTROYED	364421	217997	Quarry, located east of Hawthorn Road, Drybrook - possible site of destroyed scowles.		SURVEY LEVEL 2
25097	SCOWLE - EXISTING	365513	219598	Scowle, located at Lining Wood Top, Wigpool.	FORM 4	SURVEY LEVEL 5
25098	SCOWLE - EXISTING	365668	219530	Scowles, located to the north of Sway Hole.	FORM 2	SURVEY LEVEL 5
25099	SCOWLE - EXISTING	365703	219476	Scowle, located immediately to the east of Sway Hole.	FORM 5	SURVEY LEVEL 5
25100	SCOWLE - EXISTING	361050	204560	Scowles, Lydney Park Estate.	FORM 4	SURVEY LEVEL 5
25101	SCOWLE - EXISTING	361110	204440	Scowles and mounds, Lydney Park Estate.	FORM 2	SURVEY LEVEL 4
25102	SCOWLE - EXISTING	361280	204230	Area of dense scowles, located in Lydney Park Estate.	FORM 2	SURVEY LEVEL 5
25103	SCOWLE - EXISTING	361050	203870	Scowles, Lydney Park Estate.	FORM 5	SURVEY LEVEL 5
25104	SCOWLE - EXISTING	361210	203700	Three small pits, may be additional pits but area impenetrable. Lydney Park.	FORM 2	SURVEY LEVEL 2
25105	SCOWLE - EXISTING	361365	203474	Scowles, Old Park Wood.	FORM 2	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25106	SCOWLE - EXISTING	361300	203480	Scowles, Old Park Wood.	FORM 2	SURVEY LEVEL 4
25107	SCOWLE - EXISTING	361270	203570	Scowles, Old Park Wood.	FORM 2	SURVEY LEVEL 2
25108	SCOWLE - EXISTING	361212	203660	Scowles, Old Park Wood.	FORM 4	SURVEY LEVEL 4
25109	SCOWLE - EXISTING	361075	203905	Linear scowle, Lydney Park.	FORM 4	SURVEY LEVEL 5
25110	SCOWLE - EXISTING	361045	203940	Scowles, Lydney Park.	FORM 2	SURVEY LEVEL 5
25111	SCOWLE - EXISTING	360940	203940	Scowles, Old Park Wood.	FORM 2	SURVEY LEVEL 5
25112	SCOWLE - EXISTING	361023	203762	Scowle, Old Park Wood.	FORM 2	SURVEY LEVEL 5
25113	SCOWLE - EXISTING	361040	203720	Deep scowle with possible underground access. Located in Old Park Wood.	FORM 3	SURVEY LEVEL 4
25114	SCOWLE - EXISTING	361120	203640	Linear scowle, located in Old Park Wood.	FORM 4	SURVEY LEVEL 4
25116	SCOWLE - EXISTING	361190	203530	Scowles, Old Park Wood.	FORM 2	SURVEY LEVEL 2
25117	SCOWLE - EXISTING	361160	203830	Numerous small pit type scowles. Located in Old Park Wood.	FORM 2	SURVEY LEVEL 4
25118	SCOWLE - EXISTING	358115	207043	Scowle located in woodland to the north-east of Trowgreen Farm.	FORM 4	SURVEY LEVEL 3
25119	SCOWLE - POSSIBLE	358270	207210	Shallow field depression, in field known as Tumpy Piece, located south-south-west of Clay's Farm.	FORM 1	SURVEY LEVEL 5
25120	SCOWLE - EXISTING	358360	207125	Large scowle, located on the north side of Ash Grove.	FORM 4	SURVEY LEVEL 5
25121	SCOWLE - EXISTING	358340	207080	Area of scowles in Ash Grove.	FORM 2	SURVEY LEVEL 5
25122	SCOWLE - EXISTING	357765	207640	Shallow scowles, located west of Orepool.	FORM 2	SURVEY LEVEL 3
25123	SCOWLE - EXISTING	357638	207685	Scowle at the south end of Folly Wood.	FORM 5	SURVEY LEVEL 5
25124	SCOWLE - EXISTING	357630	207760	Area of numerous scowles in Folly Wood.	FORM 2	SURVEY LEVEL 5
25125	SCOWLE - POSSIBLE	357570	207570	Field depressions, occurring south of Folly Wood.	FORM 1	SURVEY LEVEL 5
25126	SCOWLE - EXISTING	357460	207646	Large scowle located at field boundary south-east of Platwell Farm.	FORM 4	SURVEY LEVEL 3
25127	SCOWLE - EXISTING	357430	207732	Area of possible scowle. Located east of Platwell Farm.	FORM 4	SURVEY LEVEL 2
25128	SCOWLE - POSSIBLE DESTROYED	361910	202720	Quarry, Old Coach House (flat), Lydney Est.		SURVEY LEVEL 5
25129	SCOWLE - POSSIBLE	361900	202760	Possible Scowles, Lydney Estate.		SURVEY LEVEL 5
25130	SCOWLE - POSSIBLE	361740	202480	Area of rock outcrop, Little Camp Hill, Lydney Park.	FORM 7	SURVEY LEVEL 5
25131	SCOWLE - POSSIBLE	361210	202525	Possible scowle, located in Little Nustles.	FORM 2	SURVEY LEVEL 5
25132	SCOWLE - POSSIBLE	361150	202611	Possible scowles, located at Little Nustles, Lydney Park.	FORM 1	SURVEY LEVEL 5
25133	SCOWLE - POSSIBLE	361185	202572	Possible scowle, located in Little Nustles.	FORM 2	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25134	SCOWLE - POSSIBLE DESTROYED	361110	202760	Possible destroyed scowle, Lydney Park.		SURVEY LEVEL 5
25135	SCOWLE - POSSIBLE DESTROYED	358323	208600	Shallow quarry (possible site of destroyed scowle), located at Clearwell Meend.		SURVEY LEVEL 3
25136	SCOWLE - POSSIBLE	358420	208650	Area of mounds and hollows, located in Clearwell Meend. Located in the Drybrook Limestone.	FORM 2	SURVEY LEVEL 5
25137	SCOWLE - POSSIBLE	358324	208900	Large, disused quarry (possible site of destroyed scowles), located at Clearwell Meend.		SURVEY LEVEL 2
25138	SCOWLE - POSSIBLE	358438	208337	Possible scowle, located in Clearwell Meend Inclosure No. 2.	FORM 2	SURVEY LEVEL 5
25139	SCOWLE - POSSIBLE	358385	208235	Possible scowles, located in Clearwell Meend Inclosure No. 2.	FORM 2	SURVEY LEVEL 3
25140	SCOWLE - EXISTING	365675	219575	Possible scowles, located to the north-east of Sway Hole.	FORM 4	SURVEY LEVEL 5
25141	SCOWLE - EXISTING	365713	219457	Two scowles, located south-east of Sway Hole.	FORM 4	SURVEY LEVEL 5
25142	SCOWLE - EXISTING	365720	219399	Scowles, located to the south of Sway Hole, Lining Wood Top.	FORM 2	SURVEY LEVEL 5
25143	SCOWLE - EXISTING	365601	219423	Scowle, located south-west of Firtree Bungalow, Wigpool.	FORM 4	SURVEY LEVEL 5
25144	SCOWLE - EXISTING	365590	219412	Scowle, located in Lining Wood Top.	FORM 2	SURVEY LEVEL 5
25145	SCOWLE - EXISTING	365550	219331	Scowles, and mounds, located in Lining Wood Top.	FORM 2	SURVEY LEVEL 5
25146	SCOWLE - POSSIBLE	362973	217948	Area of probable backfilled scowles, located east of Varnister, Ruardean.	FORM 2	SURVEY LEVEL 5
25147	SCOWLE - POSSIBLE	360926	217209	Rock outcrop, located east of Glasp Farm.	FORM 7	SURVEY LEVEL 3
25148	SCOWLE - EXISTING	361203	217597	Area of field depressions and possibly back-filled scowles, located west of Ruardean.	FORM 1	SURVEY LEVEL 2
25149	SCOWLE - EXISTING	361063	217100	Area of rock outcrop, located south of Glasp Farm.	FORM 7	SURVEY LEVEL 3
25150	SCOWLE - POSSIBLE	360771	217134	Rock outcrop, located south of Glasp Farm.	FORM 7	SURVEY LEVEL 2
25151	SCOWLE - POSSIBLE	365567	219224	Possible scowle, Lining Wood Top, Wigpool.	FORM 4	SURVEY LEVEL 5
25152	SCOWLE - EXISTING	365586	219264	Scowles, located in Lining Wood Top, Wigpool.	FORM 2	SURVEY LEVEL 4
25153	SCOWLE - EXISTING	365703	219281	Scowles, located in Lining Wood Top.	FORM 2	SURVEY LEVEL 5
25154	SCOWLE - EXISTING	365714	219193	Scowle, located at Lining Wood Top.	FORM 4	SURVEY LEVEL 5
25155	SCOWLE - EXISTING	365692	219198	Scowle, located in Lining Wood Top.	FORM 2	SURVEY LEVEL 5
25156	SCOWLE - EXISTING	365658	219185	Scowles and mound, located in Lining Wood Top.	FORM 2	SURVEY LEVEL 5
25157	SCOWLE - POSSIBLE	365608	219140	Possible scowles, Lining Wood Top.	FORM 4	SURVEY LEVEL 5
25158	SCOWLE - POSSIBLE	365774	219001	Possible scowles, located at Lining Wood Top, Wigpool.	FORM 1	SURVEY LEVEL 3
25159	SCOWLE - POSSIBLE DESTROYED	365814	218373	Possible site of destroyed scowles, located north of the Stenders.	FORM 4	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25160	SCOWLE - POSSIBLE DESTROYED	365955	218296	Large, disused quarry, located in a Wildlife Trust nature reserve, on the south side of the Stenders. Possibly the site of destroyed scowles.		SURVEY LEVEL 5
25161	SCOWLE - EXISTING	365920	217813	Area of field depressions, located at the Wilderness.	FORM 1	SURVEY LEVEL 5
25162	SCOWLE - POSSIBLE	365909	217633	Possible scowles, located at the Wilderness.	FORM 4	SURVEY LEVEL 2
25163	SCOWLE - EXISTING	365907	217603	Possible scowle, located at the Wilderness.	FORM 2	SURVEY LEVEL 5
25164	SCOWLE - POSSIBLE DESTROYED	365949	217526	Large quarry or scowle, possibly the site of destroyed scowles, located at the Wilderness.		SURVEY LEVEL 3
25165	SCOWLE - POSSIBLE	365988	217335	Possible scowles, located immediately west of 'The Highlands', the Wilderness.	FORM 4	SURVEY LEVEL 2
25166	SCOWLE - EXISTING	366104	217495	Field depressions, located at the Wilderness.	FORM 1	SURVEY LEVEL 3
25167	SCOWLE - EXISTING	365988	217578	Scowle, located at The Wilderness.	FORM 2	SURVEY LEVEL 5
25168	SCOWLE - EXISTING	365970	217586	Scowle, located at Wilderness Farm.	FORM 5	SURVEY LEVEL 5
25169	SCOWLE - POSSIBLE	366186	217443	Area of field depressions and mounds, located at The Wilderness.	FORM 1	SURVEY LEVEL 5
25170	SCOWLE - EXISTING	366064	217344	Area of small, shallow depressions, located at The Wilderness.	FORM 2	SURVEY LEVEL 5
25171	SCOWLE - EXISTING	365983	217877	Field depressions, located at the Wilderness.	FORM 1	SURVEY LEVEL 5
25172	SCOWLE - EXISTING	366044	218158	Scowle, on a field boundary at Wilderness Farm.	FORM 2	SURVEY LEVEL 3
25173	SCOWLE - EXISTING	366055	218218	Rough ground and possible scowles, located at Wilderness Farm.	FORM 1	SURVEY LEVEL 2
25174	SCOWLE - POSSIBLE DESTROYED	360492	217151	Quarry (possible site of destroyed scowles), located at western end of woodland to the south of Ragman's Slade.		SURVEY LEVEL 5
25175	SCOWLE - POSSIBLE	360592	217306	Area of possible scowles / possible quarrying, located south of Ragman's Slade.	FORM 2	SURVEY LEVEL 5
25176	SCOWLE - POSSIBLE	364577	218286	Area of field depressions and mound, located east of Hazel Hill quarry.	FORM 1	SURVEY LEVEL 3
25177	SCOWLE - POSSIBLE DESTROYED			Large, disused quarry (possible site of destroyed scowles), located at Hazel Hill quarry, Puddlebrook.		SURVEY LEVEL 4
25178	SCOWLE - POSSIBLE DESTROYED	366149	217153	Large, disused quarry (possible site of destroyed scowles), located at Plump Hill.		SURVEY LEVEL 5
25179	SCOWLE - POSSIBLE	366097	217174	Area of quarrying / possible scowles, located at Plump Hill.		SURVEY LEVEL 2
25180	SCOWLE - POSSIBLE	366053	217252	Possible scowle, located at Plump Hill.	FORM 2	SURVEY LEVEL 2
25181	SCOWLE - POSSIBLE	364690	218535	Possible scowle / possible quarry, located west of Mon Abri.	FORM 3	SURVEY LEVEL 2

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25182	SCOWLE - POSSIBLE	364594	218566	Field depressions, located to the north of Old Stable, Puddlebrook.	FORM 1	SURVEY LEVEL 5
25183	SCOWLE - POSSIBLE	364600	218665	Possible quarry / possible scowle, located north of Old Stable, Puddlebrook.	FORM 4	SURVEY LEVEL 2
25184	SCOWLE - POSSIBLE	364680	218905	Probable scowle, located to the north-east of Silverstone Farm, Drybrook.	FORM 4	SURVEY LEVEL 5
25185	SCOWLE - POSSIBLE	364633	218834	Possible quarry / possible scowle, located north-east of Silverstone Farm.	FORM 4	SURVEY LEVEL 5
25186	SCOWLE - POSSIBLE	364700	218741	Field depressions, located east of Silverstone Farm.	FORM 1	SURVEY LEVEL 5
25187	SCOWLE - POSSIBLE	364485	218289	Area of depressions and mounds, located east of Yewtree House, Drybrook.	FORM 1	SURVEY LEVEL 5
25188	SCOWLE - POSSIBLE	364439	218262	Large, disused quarry (possible site of destroyed scowles), located south-east of Yewtree House, Drybrook.		SURVEY LEVEL 5
25189	SCOWLE – POSSIBLE DESTROYED	362087	203708	Quarry / possible site of destroyed scowles, to the north of Redhill Farm, Lydney Park.		SURVEY LEVEL 1
25190	SCOWLE - EXISTING	361200	203360	Scowle, Lydney Park.	FORM 5	SURVEY LEVEL 1
25191	SCOWLE - EXISTING	361723	202898	Scowle, Lydney Park.	FORM 2	SURVEY LEVEL 1
25192	SCOWLE - EXISTING	361710	202940	Scowles, Lydney Park.	FORM 2	SURVEY LEVEL 1
25193	SCOWLE - EXISTING	361680	202970	Scowles, Lydney Park.	FORM 4	SURVEY LEVEL 1
25194	SCOWLE - EXISTING	361630	203060	Scowles, Lydney Park.	FORM 2	SURVEY LEVEL 1
25195	SCOWLE - EXISTING	361550	230150	Scowles, Lydney Park.	FORM 4	SURVEY LEVEL 1
25196	SCOWLE - EXISTING	361990	203190	Scowles, to the south of Redhill Farm, Lydney Park.	FORM 4	SURVEY LEVEL 1
25197	SCOWLE - EXISTING	361440	203160	Scowles, Lydney Park.	FORM 4	SURVEY LEVEL 1
25200	SCOWLE - POSSIBLE	357860	207204	Possible scowle/possible quarry, located of west side of B4228,south of Sling.	FORM 3	SURVEY LEVEL 4
25201	SCOWLE - EXISTING	356919	215423	Rock outcrop, located to south of Quarry Rock.	FORM 7	SURVEY LEVEL 3
25202	SCOWLE - POSSIBLE	357020	215580	Rock outcrop, located south-east of Quarry Rock.	FORM 7	SURVEY LEVEL 2
25203	SCOWLE - EXISTING	357121	215553	Small pit type scowle, located south-east of Quarry Rock.	FORM 2	SURVEY LEVEL 5
25204	SCOWLE - POSSIBLE	356916	215545	Area of depressions and mounds, possible scowles. Located to the south of Quarry Rock.	FORM 1	SURVEY LEVEL 3
25205	SCOWLE - POSSIBLE	357140	215600	Possible scowles, Symonds Yat.	FORM 2	SURVEY LEVEL 5
25206	SCOWLE - POSSIBLE	357080	215660	Rock outcrop at Ship Rock, Symonds Yat.	FORM 7	SURVEY LEVEL 2
25207	SCOWLE - POSSIBLE	356980	215660	Rock outcrop at Symonds Yat.	FORM 7	SURVEY LEVEL 2
25208	SCOWLE - POSSIBLE	357171	215645	Rock outcrop at Symonds Yat.	FORM 7	SURVEY LEVEL 3

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25209	SCOWLE - POSSIBLE	357175	215666	Possible destroyed scowle, Needle Rock at Symonds Yat.	FORM 7	SURVEY LEVEL 2
25210	SCOWLE - POSSIBLE	357280	215666	Rock outcrop, located to the east of Needle Rock.	FORM 7	SURVEY LEVEL 2
25211	SCOWLE - POSSIBLE	357345	215700	Rock outcrop, Symonds Yat.	FORM 7	SURVEY LEVEL 4
25212	SCOWLE - POSSIBLE	356397	215986	Rock outcrop at Symonds Yat.	FORM 7	SURVEY LEVEL 2
25213	SCOWLE - POSSIBLE	356750	215676	Rock outcrop, Symonds Yat.	FORM 7	SURVEY LEVEL 2
25214	SCOWLE - POSSIBLE	358990	215230	Area of undulating ground, possible scowles located to north-east of Eastbach Farm.	FORM 1	SURVEY LEVEL 5
25215	SCOWLE - POSSIBLE DESTROYED	358850	216490	Possible destroyed scowle, English Bicknor.		SURVEY LEVEL 3
25216	SCOWLE - POSSIBLE DESTROYED	358870	216760	Possible destroyed scowle, English Bicknor.		SURVEY LEVEL 5
25217	SCOWLE - POSSIBLE	358579	207073	Possible scowle, located south-west of The Hollies, Sling.	FORM 4	SURVEY LEVEL 4
25218	SCOWLE - EXISTING	358470	207150	Scowle, located at The Hollies, Sling.	FORM 5	SURVEY LEVEL 5
25219	SCOWLE - POSSIBLE	358552	207102	Scowle, located at The Hollies, Sling.	FORM 2	SURVEY LEVEL 4
25220	SCOWLE - EXISTING	358515	207065	Area of scowles, located at The Hollies, Sling.	FORM 2	SURVEY LEVEL 5
25221	SCOWLE - POSSIBLE	355250	211650	Rock outcrop, located to the north of Stowfield Quarry.	FORM 7	SURVEY LEVEL 2
25222	SCOWLE - POSSIBLE	355190	211450	Small rock outcrops.	FORM 7	SURVEY LEVEL 2
25223	SCOWLE - POSSIBLE	356200	211375	Possible scowle, located immediately to the west of Crowsnest Iron Pit. Could be depression associated with iron pit.	FORM 2	SURVEY LEVEL 5
25224	SCOWLE - POSSIBLE	356190	211020	Shallow field depressions, possible scowles, located to the south of Crowsnest Wood.	FORM 1	SURVEY LEVEL 5
25225	SCOWLE - EXISTING	357490	215820	Rock outcrop, located at Court Wood.	FORM 7	SURVEY LEVEL 5
25226	SCOWLE - EXISTING	361607	202450	Rock outcrop / possible scowle, located south of Camp Hill, Lydney Park.	FORM 7	SURVEY LEVEL 3
25227	SCOWLE - EXISTING	361420	203900	Numerous small pits and mounds in Drybrook Limestone, Old Park Wood.	FORM 2	SURVEY LEVEL 4
25228	SCOWLE - POSSIBLE DESTROYED	359570	205730	Possible destroyed scowle, located at Bream Tufts.		SURVEY LEVEL 2
25229	SCOWLE - POSSIBLE	361648	202695	Possible scowle located east side of Roman temple, Lydney Park.	FORM 2	SURVEY LEVEL 5
25230	SCOWLE - POSSIBLE	361657	202719	Possible scowles located east of Roman Temple, Lydney Park.	FORM 1	SURVEY LEVEL 5
25231	SCOWLE - POSSIBLE	361664	202768	Area of possible scowles, Lydney Park Estate.	FORM 1	SURVEY LEVEL 5
25232	SCOWLE - POSSIBLE	361686	202782	Possible scowle located east slope of Roman temple, Lydney Park.	FORM 2	SURVEY LEVEL 5

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25233	SCOWLE - POSSIBLE	361688	202830	Area of possible scowles, Lydney Park Estate.	FORM 1	SURVEY LEVEL 5
25234	SCOWLE - EXISTING	361541	202832	Scowle, located north-west of Roman temple, Lydney Park.	FORM 4	SURVEY LEVEL 4
25235	SCOWLE - EXISTING	361561	202832	Area of scowles, north-west of Roman temple, Lydney Park.	FORM 1	SURVEY LEVEL 5
25236	SCOWLE - POSSIBLE	361561	202847	Possible linear scowle north of Roman temple, Lydney Park.	FORM 3	SURVEY LEVEL 5
25237	SCOWLE - POSSIBLE	361566	202536	Possible scowle with rock outcrops and underground entrance, Lydney Park.	FORM 5	SURVEY LEVEL 5
25238	SCOWLE - EXISTING	357829	208971	Shallow scowles, located south of Puzzle Wood.	FORM 2	SURVEY LEVEL 5
25239	SCOWLE - EXISTING	357737	208940	Scowles, located south of Puzzle Wood.	FORM 4	SURVEY LEVEL 5
25240	SCOWLE - EXISTING	358562	206847	Large scowles, located north of Noxon Farm.	FORM 4	SURVEY LEVEL 5
25241	SCOWLE - EXISTING	358730	206947	Large scowles, some dumping, located north of Noxon Farm.	FORM 4	SURVEY LEVEL 3
25242	SCOWLE - POSSIBLE	358807	206830	Scowle, located north-east of Noxon Farm.	FORM 4	SURVEY LEVEL 5
25244	SCOWLE - EXISTING	366379	215521	Scowles following a vein of iron ore in Drybrook Sandstone, located *c.*250 metres south of Edgehills Lodge and extending southwards for *c.*150 metres.	FORM 2	SURVEY LEVEL 1
25245	SCOWLE - EXISTING	366420	215890	Scowles, located *c.*90 metres east of Edgehills Lodge, in Edgehills Plantation.	FORM 2	SURVEY LEVEL 1
25246	SCOWLE - EXISTING	366530	215520	Scowles, located *c.*360 metres south-east of Edgehills Lodge, Edgehills Plantation.	FORM 2	SURVEY LEVEL 1
25247	SCOWLE - EXISTING	366400	215890	Scowles, located *c.*80 metres east of Edgehills Lodge, in Edgehills Plantation.	FORM 4	SURVEY LEVEL 1
25248	SCOWLE - EXISTING	358800	206750	Scowles, located in Noxon Park.	FORM 5	SURVEY LEVEL 1
25249	SCOWLE - EXISTING	358870	206750	Scowles, located in Noxon Park.	FORM 5	SURVEY LEVEL 1
25250	SCOWLE - EXISTING	357670	208740	Scowles, located in Little Lambsquay Wood.	FORM 2	SURVEY LEVEL 1
25251	SCOWLE - EXISTING	366520	215560	Scowles, located *c.*330 metres south-east of Edgehills Lodge, Edgehills Plantation.	FORM 4	SURVEY LEVEL 1
25252	SCOWLE - EXISTING	366500	215580	Scowles, located *c.*310 metres south-east of Edgehills Lodge, Edgehills Plantation.	FORM 5	SURVEY LEVEL 1
25253	SCOWLE - EXISTING	366490	215620	Scowles, located *c.*260 metres south-east of Edgehills Lodge, Edgehills Plantation.	FORM 5	SURVEY LEVEL 1
25254	SCOWLE - EXISTING	366490	215650	Scowles, located *c.*230 metres south-east of Edgehills Lodge, in Edgehills Plantation.	FORM 2	SURVEY LEVEL 1
25255	SCOWLE - EXISTING	366140	216270	Scowles following a vein of iron ore in Drybrook Sandstone, located at The Rookery, at the site of the post-medieval Tingle's Iron Pit.	FORM 2	SURVEY LEVEL 1

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25256	SCOWLE - POSSIBLE DESTROYED	365860	218150	Scowle, possibly destroyed, located *c.*125 metres east-north-east of Wilderness Farm, The Stenders, Mitcheldean.	FORM 5	SURVEY LEVEL 1
25257	SCOWLE - POSSIBLE DESTROYED	365830	218220	Scowle, located *c.*150 metres north-east of Wilderness Farm, The Stenders, Mitcheldean.	FORM 5	SURVEY LEVEL 1
25258	SCOWLE - EXISTING	365760	218550	Scowles, located in Scully Grove, east of the Water Works, Mitcheldean.	FORM 5	SURVEY LEVEL 1
25259	SCOWLE - POSSIBLE DESTROYED	365750	218600	Possible site of destroyed scowles, located in Scully Grove, east of the Water Works, Mitcheldean.	FORM 5	SURVEY LEVEL 1
25260	SCOWLE - EXISTING	357870	208770	Possible scowles, located in a small patch of woodland at the eastern edge of Little Lambsquay Wood.	FORM 4	SURVEY LEVEL 1
25261	SCOWLE - EXISTING	360930	204120	Scowles, located south-east of Devil's Chapel.	FORM 2	SURVEY LEVEL 1
25262	SCOWLE - EXISTING	361410	203220	Scowles, located in Lower Old Park Wood.	FORM 5	SURVEY LEVEL 1
25263	SCOWLE - EXISTING	361350	203280	Scowles, located at Crater Piece, Lower Old Park Wood.	FORM 2	SURVEY LEVEL 1
25264	SCOWLE - EXISTING	361270	203350	Scowles, located at Lower Old Park Wood.	FORM 5	SURVEY LEVEL 1
25265	SCOWLE - EXISTING	361165	203460	Scowle, located in Old Park Wood.	FORM 5	SURVEY LEVEL 1
25266	SCOWLE - EXISTING	361170	203480	Scowles, located in Old Park Wood.	FORM 2	SURVEY LEVEL 1
25267	SCOWLE - POSSIBLE	366160	216220	Possible site of destroyed scowles, located at The Rookery, at the site of the post-medieval Tingle's Iron Pit.	FORM 2	SURVEY LEVEL 1
25268	SCOWLE - EXISTING	364730	218995	Two scowles, located *c.*330 metres north-east of Silverstone Farm.	FORM 4	SURVEY LEVEL 1
25269	SCOWLE - EXISTING	364710	218970	Undated scowle, located *c.*300 metres north-east of Silverstone Farm.	FORM 4	SURVEY LEVEL 1
25270	SCOWLE - EXISTING	366200	216730	Scowle, located at Hazel Hill.	FORM 2	SURVEY LEVEL 1
25271	SCOWLE - EXISTING	366610	215110	Scowles, located *c.*70 metres west of 'Victoria Cottage', Edge Hill.	FORM 5	SURVEY LEVEL 1
25272	SCOWLE - EXISTING	365060	210360	Scowles, located in Old Staple Edge Wood, to the west of Cudleigh Holes, near Upper Soudley.	FORM 2	SURVEY LEVEL 1
25273	SCOWLE - EXISTING	365080	210360	Undated scowle, located in Old Staple Edge Wood, to the west of Cudleigh Holes, near Upper Soudley.	FORM 5	SURVEY LEVEL 1
25274	SCOWLE - POSSIBLE	357016	210249	Possible scowles located 300 metres east of Whitecliff Quarry, Whitecliff.	FORM 1	SURVEY LEVEL 1
25275	SCOWLE - EXISTING	357690	207910	Scowle, located at Deanpool Rocks, Clearwell.	FORM 5	SURVEY LEVEL 1
25276	SCOWLE - EXISTING	357710	207930	Scowles, located at Deanpool Rocks, Clearwell.	FORM 5	SURVEY LEVEL 1

Scowle Field Record Number	Scowle Type	Grid Ref. (Easting)	Grid Ref. (Northing)	Description	Scowle Form	Survey Level
25277	SCOWLE - EXISTING	357820	207910	Scowles and possible scowles, located at Deanpool Rocks, Clearwell.	FORM 5	SURVEY LEVEL 1
25278	SCOWLE - EXISTING	358050	207760	Scowles, located *c.*150 metres north of the Orepool Inn, on the west side of the B4228, Sling.	FORM 5	SURVEY LEVEL 1
25279	SCOWLE - EXISTING	357950	207850	Scowles and possible scowles, located *c.*200 metres south-east of Deanpool Court, Clearwell.	FORM 5	SURVEY LEVEL 1
25280	SCOWLE - EXISTING	357768	209029	Deep scowles, located south of Puzzle Wood.	FORM 5	SURVEY LEVEL 5
25281	SCOWLE - EXISTING	357534	208892	Deep scowles, located south of Puzzle Wood.	FORM 5	SURVEY LEVEL 5
25282	SCOWLE - EXISTING	357654	209006	Shallow scowles, located south of Puzzle Wood.	FORM 2	SURVEY LEVEL 5
25283	SCOWLE - EXISTING	358591	206956	Very deep scowles, located north of Noxon Farm.	FORM 5	SURVEY LEVEL 5
25284	SCOWLE - POSSIBLE	361595	202375	Possible scowle / rock outcrop, Lydney Park.	FORM 7	SURVEY LEVEL 5
25285	SCOWLE - EXISTING	361482	202538	Possible scowle / rock outcrop, Lydney Park.	FORM 7	SURVEY LEVEL 2
25286	SCOWLE - POSSIBLE	361272	202575	Possible scowle, Lydney Park Estate.	FORM 4	SURVEY LEVEL 5
25288	SCOWLE - POSSIBLE	361229	202896	Possible scowle, Lydney Park.	FORM 2	SURVEY LEVEL 5
25289	SCOWLE - POSSIBLE	361031	203369	Possible scowle, western valley, Lydney Park.	FORM 2	SURVEY LEVEL 5
25290	SCOWLE - EXISTING	361449	203311	Area of scowles, Crater Piece, Lydney Park Estate.	FORM 4	SURVEY LEVEL 2
25291	SCOWLE - EXISTING	361529	203336	Area of scowles - circular pits, Lydney Park.	FORM 2	SURVEY LEVEL 5
25292	SCOWLE - POSSIBLE	360910	203682	Possible scowles - area of circular pits and hollows, Lydney Park.	FORM 1	SURVEY LEVEL 2
25293	SCOWLE - EXISTING	361340	203415	Area of linear scowles, Old Park Wood, Lydney Park.	FORM 4	SURVEY LEVEL 5
25294	SCOWLE - EXISTING	361316	203419	Area of scowles - circular pits and hollows, Lydney Park.	FORM 2	SURVEY LEVEL 5
25295	SCOWLE - POSSIBLE	361614	203564	Area of possible scowles, Old Park Wood, Lydney Park.	FORM 1	SURVEY LEVEL 5
25296	SCOWLE - EXISTING	361561	203529	Scowle, near Yewtree Lodge, Lydney Park.	FORM 2	SURVEY LEVEL 5
25297	SCOWLE - EXISTING	361848	202847	Scowles, Lydney Park Gardens.	FORM 2	SURVEY LEVEL 5
25299	SCOWLE - EXISTING	358504	206976	Area of shallow scowles, located north of Noxon Farm.	FORM 2	SURVEY LEVEL 5

Appendix C Recommendation for future archaeological research

So little is known about the Forest of Dean iron ore extraction and processing industries from all periods that it is difficult to identify one area of research as a priority over another.

The following agenda and strategies for future archaeological research have been identified as a result of the Scowles and Associated Iron Industry Survey:-

Pre-industrial revolution extraction industry

- What is the status of the full range of scowles identified by the survey in terms of their interpretation as geomorphological features?
- What is the status of the full range of scowles identified by the survey in terms of their status as humanly excavated features, and to what extent was iron ore extracted from scowles as surface exposures, and when?
- What is the status of the gaps between visible scowles? To what extent do these represent backfilled scowles?
- To what extent were iron ores in the Carboniferous Limestone outcrops exploited as below ground deposits and when?
- To what extent were other iron ore sources exploited in the Forest of Dean area and when?
- To what extent was iron ore transported either into or out of the Forest of Dean for smelting and when?
- To what extent was ochre exploited from the Carboniferous Limestone outcrops during the prehistoric periods, either as subterranean deposits or from surface exposures?
- How extensive was the iron ore extraction industry in the Forest of Dean at different periods, and how was it organised?

Pre-industrial revolution processing industry

- How extensive was the iron ore smelting industry in the Forest of Dean at different periods, and how was it organised?
- How extensive was the secondary smithing industry in the Forest of Dean at different periods, and how was it organised?
- What is the relationship between the smelting and smithing industries at different periods?
- To what extent were ores from the Carboniferous Limestones smelted at different periods, and to what extent were ores from other sources either within the Forest of Dean, or outside the area, imported for smelting?
- What is the relationship between the smelting and smithing industries at different periods and charcoal production sites? The relationship between the sites of medieval “itinerant forges” and charcoal production sites is of particular interest.
- What is the relationship between the smithing industries at different periods and early coal extraction sites?
- What degree of local variation in the smelting and smithing industries is discernable at different periods? Of particular interest are differences between urban/suburban and rural smelting and smithing in different periods.
- What changes in the technology of bloomery smelting took place in the Forest of Dean over time? This would include:-
    - Transition from the early Iron Age, middle Iron Age and late Iron Age technologies. This would encompass change from non-slag tapping furnaces to those with slag tapping capability, and the relative distribution of these types.
    - Transition from late Iron Age to Roman technologies. This would encompass transition from Iron Age type non-slag tapping furnaces still in use during the Roman period, and Roman style shaft furnaces with slag tapping capability. Any investigation should include identification of military style shaft furnaces, which may have been introduced in the early Roman period, and may suggest direct military control of the industry at that time.

- Transition from Roman shaft furnaces with slag tapping capability to early medieval non-slag tapping furnaces.
- Transition from early medieval non-slag tapping furnaces to later medieval (post Norman conquest) slag tapping furnaces.
- Transition from manually powered furnaces to water powered bloomeries in the later medieval and early post-medieval periods.
- Transition of bloomery smelting to early blast furnaces, and particularly the relationship between bloomery smelting sites (particularly those powered by water) and early blast furnace sites.

- The transition from iron production to steel production is not understood, particularly the date in which steel was first produced in bloomeries in the area, and the developments in bloomery technology, which may have been a feature of early steel production.

It is clear that not all of these issues can be addressed in the short term and, whilst it is important not to lose sight of any of them, it is necessary to prioritise those which can be reasonably achieved.

The following identifies those research priorities, which could be pursued by envisioned actions.

C.i The Extraction industry

C.i.i What is the status of the full range of scowles identified by the survey?

This question encompasses the research priorities:-

- What is the status of the full range of scowles identified by the survey in terms of their interpretation as geomorphological features?

- What is the status of the full range of scowles identified by the survey in terms of their status as humanly excavated features, and to what extent was iron ore extracted from scowles as surface exposures, and when?

and can be broken down into the following two questions:-

C.i.ii What is the status of Scowle Forms 3, 4, 5 and 7?

This will address the following issues:-
- To what extent are these geomorphological or archaeological features?
- To what extent were individual scowles exploited as surface workings?

Recommended action

The following research could only be undertaken in scowles with frequent rock exposures: Forms 3, 5 and 7 fall into this category.

Form 5 are likely to be the most suitable for this, as they are the “classic” scowles (irregular labyrinthine hollows with exposed rock faces) although it may be useful to undertake similar tests on a sample of Form 7 (rocky outcrops) as these are not currently thought to have been ore sources, but natural rock outcrops, and the results may, therefore form a useful comparison with those from which ore may have been removed.

This phase of investigation will consist of the following:-
- Identify suitable scowles from results of the survey.
- Discuss research priorities and methodologies with landowners and gain their permission for undertaking the work. It should be noted that although many of the

scowles most suitable for this are owned by the Forestry Commission, their permission would still be required before any fieldwork could be undertaken. In addition to this a number of the scowles suitable for this purpose are in private ownership.

- Detailed inspection of exposed rock surfaces to identify traces of physical extraction.
- Detailed inspection of exposed rock surfaces, in conjunction with a specialist geologist, to identify “geological surfaces”.
- Determining the extent to which rock faces represent natural exposures or quarried faces would shed considerable light on the status of these features. Appropriate methodologies for determining the age of rock exposures will be investigated. Advice from suitable specialists will be sought to determine appropriate methodologies and sampling strategies, and all sampling of this nature would be undertaken in conjunction with specialist geologists. The following methods will be considered:-
    - Thin section analysis of selected exposed rock surfaces to look for signs of rock crystal dissolution and chemical weathering in the exposed surface cross-section. Although this methodology is partly experimental, and can be influenced by biological activity, it should distinguish between surfaces which have been exposed in recent times (within *c.* 500 years) and more anciently (more than *c.* 5000 years). Gloucestershire Geoconservation Trust is currently in the process of seeking funds from the Aggregates Levy Sustainability Fund for a project which will include this sampling on selected scowles, and the Archaeology Service will co-ordinate with this group if their application is successful.
    - Optically Stimulated Luminescence (OSL). This system allows radiation, which has built up in quartz crystals to be measured by means of inserting a dosimeter into cores cut into the rock face. The rate of radiation build-up is quantifiable, and the time-span since exposure can be measured with an accuracy of *c.* 10% (i.e. plus or minus 50 years over 500 years). This level of accuracy would be adequate to determine whether exposures were likely to be geological or archaeological in origin.
    - Thermoluminesence dating, which may be applicable where there is evidence of extractive techniques such as fire setting.

This level of survey would necessarily be experimental, and as such should be undertaken on a selected sample of suitable scowles. If results between scowles are consistent, they could then be extrapolated across other scowles of a similar type.

C.i.iii What is the status of scowle Forms 1 and 2?

This will address the issues:-

- To what extent do these represent backfilled scowles of Forms 4 or 5?
- To what extent do these represent bell pits or other artificial surface workings?
- To what extent do these represent subsidence into collapsed mining systems?
- To what extent do these represent subsidence into collapsed natural cave systems?
- To what extent do these represent choked natural geological features such as swallets or phreatic tubes?

Suitable specialist advice would be sought to determine the most appropriate methodologies to be adopted, and future projects would employ a specialist geologist as a consultant on geological formations.

Recommended action

Methodological approaches would vary between different forms of scowle.

Form 1

- Selection of suitable and representative scowles. This should include a selection of those with recorded spoil tips and those without.
- Discuss research priorities and methodologies with landowners and gain their permission for undertaking the work. It should be noted that many of the areas most suitable for this are in private ownership.
- Geophysical survey to determine the form and depth of identified features. Advice will be taken on suitable geophysical methodologies in advance of the preparation of any project designs. Vanessa Straker (English Heritage Regional Scientific Advisor, South West Region) has advised that Ground Penetrating Radar is likely to be the most suitable method of establishing details of the depth and profile of backfilled features, where terrain and ground cover conditions allow.
- Excavation of bore holes, or auguring to determine depth of features, and nature of infill. Advice will be taken on suitable techniques in advance of the preparation of any project designs as Vanessa Straker (English Heritage Regional Scientific Advisor, South West Region) has advised that these are likely to be dependant upon soil conditions of each site.
- Archaeological trial excavation of selected scowles, and their spoil heaps where these have been identified. Both the infill of the scowles and their spoil heaps should be sampled to determine:-
    - Potential for datable artefacts.
    - Potential of buried soil horizons to produce significant environmental information.
    - Potential to produce evidence of industrial activity.

Form 2

- Selection of suitable and representative scowles. This should include a selection of those with recorded spoil tips and those without.
- Discuss research priorities, and methodologies with landowners and gain their permission for undertaking the work. It should be noted that many of the areas most suitable for this are in private ownership.
- Geophysical survey to determine the form and depth of identified features. Advice will be taken on suitable geophysical methodologies in advance of the preparation of any project designs. Vanessa Straker (English Heritage Regional Scientific Advisor, South West Region) has advised that Ground Penetrating Radar is likely to be the most suitable method of establishing details of the depth and profile of backfilled features, where terrain and ground cover conditions allow.
- Excavation of bore holes, or auguring to determine depth of features, and nature of infill. Advice will be taken on suitable techniques in advance of the preparation of any project designs as Vanessa Straker (English Heritage Regional Scientific Advisor, South West Region) has advised that these are likely to be dependant upon soil conditions of each site.
- Archaeological trial excavation of selected scowles, and their spoil heaps where these have been identified. Both the infill of the scowles and their spoil heaps should be sampled to determine:-
    - Potential for datable artefacts.
    - Potential of buried soil horizons to produce significant environmental information.
    - Potential to produce evidence of industrial activity.

C.i.iv What is the relationship between scowles of different forms?

A more detailed analysis of the relationship between scowles of different forms where they occur in close relationship with each other would be of value to determine the complex geological, landuse and mineral extraction factors which may have combined in their formation.

This level of investigation will consist of the following:-

- Identification of areas of scowles suitable for this level of survey. Priority will be given to those areas where scowles have been subject to the more detailed surveys outlined above, and it is anticipated that this survey will be undertaken as part of the same operation as the above surveys.
- Discuss research priorities and methodologies with landowners and gain their permission for undertaking the work. It should be noted that many of the areas most suitable for this are in private ownership.
- Detailed survey of all scowles identified in the survey area. A suitable methodology for this level of survey will need to be formulated as part of the preparation of any project design. Survey is likely to be broadly the same level as English Heritage Level 2 surveys as outlined in Bowden 1999, and is likely to include:-
    - Recording the extent, and depth of individual scowles, phreatic tubes, or other features identified in the survey area.
    - Recording the form of individual scowles within the survey area – this is likely to consist of formulating subdivisions within the broad scowle forms used as part of the 2003-04 survey.
- Recording the topographical trends of the landscape of the survey area. This is likely to be undertaken by a series of topographical transects across survey areas.
- Detailed recording of geological changes within the survey area. This will be undertaken following consultation with a specialist geologist who will be employed as a consultant on future projects.
- Detailed recording of landuse, to include tree species identification and recording of veteran trees. This will be undertaken following consultation with a specialist environmentalist who will be employed as a consultant on future projects.

C.i.v What is the status of gaps between scowles?

This question encompasses the research priority:-

- What is the status of the gaps between visible scowles? To what extent do these represent backfilled scowles?

and can be broken down into the following two categories:-

What is the status of gaps between recognised scowles where historic landuse or other archaeological information suggests these areas may represent backfilled scowles?

This would typically include:-

- Areas where the gaps between scowles are currently under grassland, and which appear to have been under this regime (or at least, not woodland) since records began, suggesting that scowles may have been deliberately backfilled to create relatively level ground, suitable for stock or other agricultural purposes.
- Areas where the gaps between scowles are currently under woodland, but where historic landuse information suggests that they have not always been under this regime, and therefore may have originally been deliberately backfilled to create relatively level ground, suitable for stock or other agricultural purposes.
- Areas where aerial photographic or other archaeological evidence suggests that scowles may have been backfilled.

The following areas would be suitable for this:-

- The following scowle–free areas:-
  - The area around Stock Farm, Clearwell (SO 5750 0865).
  - The area between Pingry Farm and Scowles Village, west of Coleford (SO 5740 0970).
  - The area south and east of St. White's Farm, near Cinderford (SO 6590 1290).
  - Suitable sites in the northern part of the Forest of Dean between English Bicknor (SO 5820 1580) and Ruardean (SO 6200 1760).
- The area to the north of the copse to the west of Drybrook Quarry (Glos SMR 20829) where local knowledge suggests scowles may have been backfilled in the 1960s.
- The area to the south of Bream Court Farm (Glos SMR 23271) where cropmark evidence and local knowledge suggest scowles may have been backfilled.
- The area around Redhill Farm, Lydney (SO 619 034) where scowles are reported to have been destroyed by agricultural cultivation and the farm buildings (Wildgoose 1993, 321).
- The site of amorphous cropmarks to the south-west of Stock Farm, Clearwell (Glos SMR 23390), no surface features were recorded in the western part of the concentration.
- Whippington Corner, east of Staunton (SO 5539 1253), where cropmarks suggested possible scowles, but where none were recorded as visible features in the 2003 field survey.
- The site of parchmarks, which might represent backfilled scowles or mine pits, Glos SMR 23772, and Glos SMR 23789.
- Fields which may indicate the site of backfilled scowles:-
  - The Rubbles and Stony Piece, Glos SMR 23244.
  - Tumpy Piece, Glos SMR 23485.
  - Scowles Meadow, Glos SMR 23523.
  - Scowles Green, Glos SMR 23524.
  - The Scowles, Glos SMR 23526.
  - Tumpy Field, Glos SMR 23527.

Suitable specialist advice would be sought to determine the most appropriate methodologies to be adopted, and future projects would employ a specialist geologist as a consultant on geological formations.

Recommended action

- Discuss research priorities, and methodologies with landowners and gain their permission for undertaking the work. It should be noted that the areas most suitable for this are in private ownership.
- Geophysical survey to determine the location, depth and form of identified features. Advice will be taken on suitable geophysical methodologies in advance of the preparation of any project designs, and particular attention will need to be taken of terrain and ground cover conditions. Vanessa Straker (English Heritage Regional Scientific Advisor, South West Region) has advised that the following are likely to be most suitable:-
  - Scanning magnetometry for initial prospection.
  - Ground Penetrating Radar to establish profile details of identified features.
- Excavation of bore holes, or auguring to determine presence or depth of features, and nature of infill. Advice will be taken on suitable techniques in advance of the preparation of any project designs as Vanessa Straker (English Heritage Regional Scientific Advisor, South West Region) has advised that these are likely to be dependant upon soil conditions of each site.

What is the status of gaps between recognised scowles where historic landuse or other archaeological information does not suggest that these areas may represent backfilled scowles?

This would typically include:-

- Areas where the gaps between scowles are currently, under woodland and appear to have been under this regime since records began, suggesting that scowles had not been deliberately backfilled to create relatively level ground, suitable for stock or other agricultural purposes.

The following areas would be suitable for this:-

- Lower Old Park Wood, Lydney Park, Lydney – SO 6157 0302.
- Highmeadow Wood, north of Staunton – SO 5520 1330.

Suitable specialist advice would be sought to determine the most appropriate methodologies to be adopted, and future projects would employ a specialist geologist as a consultant on geological formations.

Recommended action

- Discuss research priorities and methodologies with landowners and gain their permission for undertaking the work. It should be noted that the areas most suitable for this are in private ownership.
- Geophysical survey to determine the location, depth and form of identified features. Advice will be taken on suitable geophysical methodologies in advance of the preparation of any project designs, and particular attention will need to be taken of terrain and ground cover conditions, as although many of the areas identified above were pasture in 2003, it cannot be guaranteed that this landuse will not change. Vanessa Straker (English Heritage Regional Scientific Advisor, South West Region) has advised that the following are likely to be most suitable:-
  - Scanning magnetometry for initial prospection.
  - Ground Penetrating Radar to establish profile details of identified features.
- Excavation of bore holes, or auguring to determine presence or depth of features, and nature of infill. Advice will be taken on suitable techniques in advance of the preparation of any project designs as Vanessa Straker (English Heritage Regional Scientific Advisor, South West Region) has advised that these are likely to be dependant upon soil conditions of each site.

C.i.vi What iron ores were smelted in the Forest of Dean and surrounding areas?

This question encompasses the following research priorities:-

- To what extent were iron ores in the Carboniferous Limestone outcrops exploited as below ground deposits and when?
- To what extent were other iron ore sources exploited in the Forest of Dean area and when?
- To what extent was iron ore transported either into or out of the Forest of Dean for smelting and when?
- To what extent was ochre exploited from the Carboniferous Limestone outcrops during the prehistoric periods, either as subterranean deposits or from surface exposures?

It would also encompass the following research priority linked to the investigation of smelting sites (see above):-

- To what extent were ores from the Carboniferous Limestones smelted at different periods, and to what extent were ores from other sources either within the Forest of Dean, or outside the area, imported for smelting.

These research questions cannot easily be answered in the short term, although this issue is of vital importance to any understanding of the iron ore extraction industry in the area.

Recommended action
It is recommended that the following should become a routine part of any archaeological activity in the area in which slag deposits or ore are anticipated:-

- The entire assemblage of slag, or ore deposits should be retained.
- Ore samples are submitted to a recognised specialist for appropriate analysis to determine the source of the ore. Advice will be sought from the recognised specialist to determine suitable methodologies for determination of ore source, and appropriate samples for this level of analysis.
- Slag samples are submitted to a recognised specialist for analysis. Advice will be sought from the recognised specialist to determine appropriate samples for this level of analysis and suitable analytical techniques. These are likely to include:-
    - Chemical analysis of slag to determine ore source. This is a complex and expensive technique, which is currently dependant on high quality, samples that include elements of the fabric of the furnace structure (Chris Salter pers. comm.). Although the cost of this technique is likely to be prohibitive for general sampling, its potential (and its future potential) should be considered in all future fieldwork projects.
    - Analysis to build up a reference collection of slags from the area. Subtle differences are known to exist between slags of different dates in some parts of the country, although there is currently insufficient data for Forest of Dean slags for the significance of slag characteristics to be fully understood.

C.i.vii How extensive was the iron ore extraction industry and how was it organised?

These research questions cannot easily be answered in the short term, although this issue is of vital importance to any understanding of the iron ore extraction industry in the area.

Recommended action

- All future research into the iron industry of the area should be aware of the significance of these issues, and all future interpretation of archaeological results pertinent to this should:-
    - Be fully aware of the lack of known information on these issues.
    - Avoid interpretation of results on the basis of pre-conceptions based on little hard information.
    - Take full account of the implications of the results of the work to inform these issues.
- The following should become a routine part of any archaeological activity in the area in which slag deposits are recovered:-
    - The entire assemblage of slag, or ore deposits should be retained.
    - Ore samples are submitted to a recognised specialist for appropriate analysis to determine the source of the ore. Advice will be sought from the recognised specialist to determine suitable methodologies for determination of ore source, and appropriate samples for this level of analysis.
    - Slag samples are submitted to a recognised specialist for analysis. Advice will be sought from the recognised specialist to determine appropriate samples for this level of analysis and suitable analytical techniques. These are likely to include:-
        - Chemical analysis of slag to determine ore source. This is a complex and expensive technique, which is currently dependant on high quality, samples that include elements of the fabric of the furnace structure (Chris Salter pers. comm.). Although the cost of this technique is likely to be prohibitive for general sampling, its potential (and its future potential) should be considered in all future fieldwork projects.

- Analysis to build up a reference collection of slags from the area. Subtle differences are known to exist between slags of different dates in some parts of the country, although there is currently insufficient data for Forest of Dean slags for the significance of slag characteristics to be fully understood.

C.ii The pre-industrial revolution smelting and smithing industries

Many of the archaeological priorities for an understanding of the smelting and smithing industries are so basic that many of the proposed methodological approaches cannot be period-based at this stage.

In general, future investigation to address these issues should be undertaken in the following sequence. Appropriate specialists should be involved at all stage of this process, both in the formulation of project designs and assessment of the results. At the end of each process, the collected evidence should be reviewed and decisions made about suitable sites to target with more intensive survey. The methodological approaches can be summarised as follows:-

- Review of existing evidence, particularly existing archives.
- Systematic surface artefact collection.
- Geophysical survey.
- Evaluation excavation.
- Full excavation.

C.ii.i What is the status of the smelting and smithing industries at different periods?

This research question encompasses the following:-

- How extensive was the iron ore smelting industry in the Forest of Dean at different periods and how was it organised?
- How extensive was the secondary smithing industry in the Forest of Dean at different periods and how was it organised?
- What is the relationship between the smelting and smithing industries at different periods?

These research questions cannot easily be answered in the short term, although this issue is of vital importance to any understanding of the iron ore extraction industry in the area.

The following methodologies would at least begin to clarify the validity of the existing dataset, and allow future research frameworks to be formulated based on a confident appreciation of the current state of knowledge

C.ii.ii Review of archives of known sites

The published, or reported information on many of the identified possible smelting or smithing sites within the survey area is often poor, and the evidence needs to be reviewed to establish whether the interpretations are based on an appropriate assessment of the recovered data. A few of these sites have been designated a date on the basis of associated artefacts recovered (or recorded) as surface scatters. These reports are often anecdotal and include little discussion of:-

- The full range of artefacts identified.
- The size of the assemblages.
- The special relationship of slag finds with other assemblages.
- Possible interpretations of the assemblages (other than an assumption that they indicate the site of settlement/industrial activity of a particular period).

As the first stage in any consideration of the value of the available evidence it is necessary that this evidence is reviewed and re-assessed. The following should be undertaken:-

- Identify and locate archives or other primary records of identified sites.
- Identify and locate artefact assemblages relating to identified sites.
- Check, and re-assess primary records of excavations or artefact collections available within primary data sets.
- Re-assess artefact assemblages relating to identified sites. Specialist advice on the significance of artefact assemblages will be sought where appropriate.
- Prepare a report stating the results of the re-assessment of the available evidence.

C.ii.iii Systematic field walking of selected known sites

It is anticipated that the review of existing archives will indicate that the evidence for the majority of identified sites is in need of re-assessment. Professional analysis of the assemblages has rarely been undertaken and it is anticipated that the majority of surface finds have not been retained. In addition to this it is unlikely that the absence of recorded artefacts associated with slag scatters necessarily indicates that none were found, or that they are not present.

Due to the relatively friable nature of smithing slags, it is unlikely that any smithing debris would have survived in cultivated fields and consequently the field walking survey is only likely to identify, or clarify the knowledge of smelting sites within the survey area. Consequently, further understanding of the smithing industries is likely to be dependant upon analysis of smithing slag recovered from excavations.

Recommended action

Where identified records are deficient, and where ground conditions allow, identified sites should be subjected to systematic field walking. This process should consist of the following:-

- Identification of suitable sites known only from reported surface scatters of slag.
- Identification of sites within this group, which would be suitable for field surface artefact collection. Suitable sites will need to be under an arable regime, and these will need to be identified nearer the time when future surveys may take place.
- Discuss research priorities, and methodologies with landowners and gain their permission for undertaking the work. It should be noted that the areas most suitable for this are in private ownership.
- Systematic archaeological field walking and surface artefact collection. This should consist of rapid “Traverse and stint” field walking with traverses typically at *c.* 10m with stint divisions at *c.* 30m (Liddle 1985, 7-15), although more intensive walking techniques could be applied in some areas if this was felt to be appropriate. All artefacts, and slag of whatever date, will be collected and mapped as part of field walking surveys.
- Where appropriate collected slag and other artefacts should be analysed by recognised specialists.

C.ii.iv Systematic field walking of suspected sites

Where sites have been identified as possible smelting sites by the 2003-04 survey and where ground conditions allow, systematic field walking should also be undertaken to determine the status of these sites.

Recommended action

This process should consist of the following:-

- Identification of suitable sites known only from field name or other evidence.
- Identification of sites within this group, which would be suitable for field surface artefact collection. Suitable sites will need to be under an arable regime, and

these will need to be identified nearer the time when future surveys may take place.
- Discuss research priorities, and methodologies with landowners and gain their permission for undertaking the work. It should be noted that the areas most suitable for this are in private ownership.
- Systematic archaeological field walking and surface artefact collection. This should consist of rapid "Traverse and stint" field walking with traverses typically at *c.* 10m with stint divisions at *c.* 30m (Liddle 1985, 7-15), although more intensive walking techniques could be applied in some areas if this was felt to be appropriate. All artefacts, and slag of whatever date will be collected and mapped as part of field walking surveys.
- Where appropriate collected slag and other artefacts should be analysed by recognised specialists.

This could be undertaken as part of the same operation as field walking survey of known smelting sites.

C.ii.v Other artefact collection strategies

It is clear that much of the landuse of much of the Forest of Dean is not suitable for systematic field walking survey as it is either under pasture, or most significantly, woodland, and different strategies will need to be adopted to identify smelting sites in these areas.

Recommended action
In some areas of grassland or pasture it may be appropriate to implement geophysical survey, or trial excavation without a preliminary surface artefact collection phase (see below), although the potential value of any intensive techniques will need to be carefully considered before resources are used in this way.

Although detailed project designs will be formulated in advance of any fieldwork, it is proposed to address the issue of the unsuitability of the large areas of woodland for surface artefact collection in the following way:-
- Identification of suitable streams and other water courses which run through the centrally wooded area, and which have exposed earth banks or beds.
- Discuss research priorities, and methodologies with landowners and gain their permission for undertaking the work. It should be noted that the areas most suitable for this are owned by the Forestry Commission.
- The course of each stream will be systematically walked.
- A record will be made of the location of any identified artefacts, slag fragments, or landscape features of potential significance in terms of the identification of metal working sites.
    - Mapping will be schematic in accordance with the standard of English Heritage levels 1 and 2 (Bowden 1999) as the purpose of the mapping is to identify the location of artefacts to enable them to be re-visited.
    - Surveying will principally make use of hand-held GPS, although other "low tech" surveying methods (reference to mapped landscape features, compass bearings, offsets, tapes or pacing) may be utilised if deemed logistically efficient.
    - Mapping will be directly onto a dedicated layer on hand-held computers for direct uploading into the project GIS, and new records will be inputted directly into the appropriate fields of the project database for uploading into the County Sites and Monuments Record.
    - Where artefacts are identified, the adjacent areas of woodland should be searched to determine if scatters visibly extend beyond the immediate vicinity of the stream, or if there are visible landscape features, which may be associated with metal working activity.
    - Where scatters are extensive, it will be necessary to subdivide the location of finds to ensure that their relative distribution is correctly recorded. It is

anticipated that this will be undertaken by means of dividing the area of identified scatters into arbitrary 10m squares.
    - Particular attention will be paid to recording whether scatters are discernable on particular banks of the stream, or in the streambed.
- Where possible all visible artefacts and slag fragments will be retained for further analysis. Where it is not possible to retrieve artefacts for further analysis (if, for example they are visible on the stream bed) an assessment should be made of their nature and extent. Recording criteria will be determined in advance of any projects.
- Where appropriate, collected slag and other artefacts should be analysed by recognised specialists. The analysis of slags from the vicinity of watercourses will be particularly directed at the identification of slags from water-powered bloomeries.

C.ii.vi Geophysical survey and excavation

The following methods will be used to undertake more intensive survey at selected sites if the results of the surface artefact collection stages suggest this is likely to be worthwhile:-

- Geophysical survey: This should be undertaken in selected areas to locate the sites of possible bloomery smelting or secondary smithing. Expert advice on appropriate geophysical techniques will be sought during the preparation of any future project designs. It is anticipated that high resolution magnetometry, which has been used in the past to identify both smelting and smithing sites (Crew 2002b; English Heritage 2001, 24; Vanessa Straker pers. comm.) will play a major part in any future surveys.
- Trial excavation: Where the results of geophysical surveys suggest the presence of smelting or smithing sites, trial excavation, to determine the nature, and where possible, the date of these sites should be undertaken. It may also be appropriate to undertake evaluation excavation of the area surrounding sites identified through geophysical survey to determine the extent and location of buried archaeological deposits. Strategies for this will be based on those used as part of normal development control evaluations in which excavation of a specified sample of an area is undertaken, generally by means of randomly distributed trial trenches or test pits (IFA 2001). This process will not necessarily constitute full excavation and may be limited to the level of excavation required to determine the nature, extent and date of below ground archaeological deposits. Where appropriate, expert advice shall be sought to assist in the formulation of trial excavation strategies and interpretation of the results. If appropriate identified deposits shall be sampled in line with the specification set out below.
- Trial excavation may also be undertaken to determine the presence, nature and date of possible smelting/smithing waste deposits where these are suspected either as a result of geophysical survey or other evidence. Typically this will make use of test pits or trial trenches to investigate the nature of unidentified mounds, or other areas (e.g. hollows, slopes or small valleys) where is thought likely that slag deposits may have accumulated. Excavation strategies shall adhere to all specifications for sampling and expert consultation set out above.
- Full excavation: Where appropriate the results of the trial excavation will be used to determine areas suitable for more intensive, full excavation, and develop strategies for such excavations. General excavation and recording shall be undertaken in accordance with normal archaeological procedure, (IFA 2001) and logistical considerations (e.g. trench size) shall be determined on a site-by-site basis. Expert advice shall, however, be sought on any specialist techniques or sampling appropriate to excavation of these sites. Particular attention will be paid to:-
    - Sampling of all slag and other metal working debris for chemical analysis to determine ore source (as specified above).
    - Sampling of all coal fragments for chemical analysis to determine source (as specified above).

- Sampling of all charcoal fragments for possible Carbon 14 dating, or species and age recognition (as specified above).
- Appropriate sampling techniques to ensure that hammerscale is recovered where this is likely to be found.
- Appropriate strategies and techniques for sampling preserved clay structures for archaeomagnetic dating (English Heritage 2001, 24).

C.ii.vii The relationship between smelting and smithing, and fuel production sites

This research question encompasses the following:-

- What is the relationship between the smelting and smithing industries at different periods and charcoal production sites. The relationship between the sites of medieval "itinerant forges" and charcoal production sites is of particular interest.
- What is the relationship between the smithing industries at different periods and early coal extraction sites.

These research questions cannot easily be answered in the short term, although this issue is of vital importance to any understanding of the iron ore extraction industry in the area. The following would, however contribute to an understanding of these issues.

C.ii.viii Relationship between smelting and smithing, and charcoal production sites

It has already been suggested that there is likely to be a close relationship between charcoal production sites and smelting sites (see above), and charcoal was also used as a fuel in the smithing industry. However, in order to fully understand this issue it is necessary to have a firm grasp of the following:-

- The location and date of charcoal production sites.
- The location and date of smelting or smithing sites.

It is an unrealistic goal to achieve this in the short term as the following information is lacking:-

- Knowledge of the location of charcoal production sites.
- Knowledge of the date of charcoal production at these sites. Acquisition of this information is generally problematic due to the following:-
  - The current lack of understanding of the potential of these features to be dated (see Hoyle forthcoming).
  - The current state of knowledge in the Forest of Dean only allows for the identification of charcoal production sites which may be Roman or later in date (and which leave visible evidence in the form of circular level platforms), as the method of charcoal production employed prior to that is not known.
- Knowledge of the location or date of smelting or smithing sites.

The following, however, will contribute towards a better understanding of these issues and inform strategies to address these questions in a more targeted fashion:-

- The distribution of all recognised charcoal production sites should be mapped. Although the currently known distribution of these sites simply reflects areas where field survey has been undertaken, this will identify those areas where further field survey may be unnecessary.
- The distribution of all recorded smelting/smithing sites should be mapped. This will demonstrate the relative distribution of known charcoal platforms and sites where smelting/smithing sites are known.
- Documentary research to identify areas of cleared woodland should be undertaken. This will identify sites where charcoal production may have taken place in antiquity but where visible evidence of this may no longer be detectable. This will mainly be based on information from the following sources:-

- Victoria County History.
- Early map/placename evidence.
- Other published or unpublished works of relevance to this.

- Rapid walkover survey to identify charcoal production sites in areas of woodland where these have not been previously recognised. Walkover methodologies will utilise techniques for rapid woodland survey formulated as a result of:-
  - The woodland survey seminar hosted by Gloucestershire County Council, Forest of Dean Archaeological Survey in 2003.
  - Methodologies refined as part of Stage 2 (pilot field survey) of the Forest of Dean Archaeological Survey.

  Walkover survey will target those areas where smelting/smithing sites are known or suspected, but where there is no recorded evidence of charcoal production sites.
- Targeted excavation of selected charcoal platforms known in the vicinity of smelting/smithing sites. Excavation will be undertaken in accordance with normal archaeological procedure, and will have the following objectives:-
  - To establish, where possible, the form or structure of the platform.
  - To establish, where possible, the nature of the charcoal burning process undertaken on the site.
  - To collect suitable charcoal samples for:-
    - Species identification by a recognised specialist to provide information on the contemporary environment, and coppicing cycles for charcoal production.
    - Carbon 14 dating.

    This will be achieved by manual collection during excavation and bulk dry sieving of excavated layers through a coarse mesh (not less than 2cm).
- Geophysical survey, trial excavation and targeted full excavation of selected smelting/smithing sites known in the vicinity of charcoal production sites. Identification and excavation strategies will be undertaken in accordance with the specification for identification and excavation of smelting/smithing sites set out in C.ii.vi above. This will be undertaken as part of integrated projects in conjunction with the investigation of charcoal production sites.

C.ii.ix Relationship between smelting and smithing, and coal production sites

Although coal is known to have been used both for domestic heating and as an industrial fuel (for smithing rather than smelting) during the Roman period, the relationship between smithing sites and early coal production sites has not been clearly established in the Forest of Dean. In order to fully understand this issue it is necessary to have a firm grasp of the following:-

- The location and date of coal production sites.
- The location and date of smithing sites.

It is an unrealistic goal to achieve this in the short term as the following information is lacking:-

- Knowledge of the location and date of pre-industrial revolution coal production sites.
- Knowledge of the location or date of smithing sites.

The following, however, will contribute towards a better understanding of these issues and inform strategies to address these questions in a more targeted fashion:-

- The distribution of all known pre-industrial revolution coal production sites should be mapped. Although the currently known distribution of these sites simply reflects areas where field survey has been undertaken, this will identify those areas where further field survey may be unnecessary.
- The distribution of all recorded smithing sites should be mapped. This will demonstrate the relative distribution of known pre-industrial revolution coal production sites and smithing sites.

- Documentary research to identify pre-industrial revolution coal production sites. This will mainly be based on information from the following sources:-
  - Victoria County History.
  - Early map/placename evidence.
  - Other published or unpublished works of relevance to this.
- Rapid walkover survey to identify coal production sites in appropriate geological conditions. Methodologies will be adapted from those determined for rapid walkover survey in areas of woodland (see above).

Excavation of possible coal production sites to determine date is not thought likely to produce beneficial results due to:-

- Likely lack of datable artefacts, which can be expected within features of this kind.
- Potential logistical difficulties, which are likely to be encountered in the excavation of features of this nature.

Consequently, future research into this issue should concentrate on sampling of coal from datable contexts associated with pre-industrial revolution industries, and submitting these to chemical analysis to determine the likely source of the coal. Due regard to this, and liaison with appropriate specialists, should form an integral part of the designs of all future projects where this is anticipated.

C.ii.x Local variations or developments in smelting and smithing industries

This research question encompasses the following:-

- What degree of local variation in the smelting and smithing industries is discernable at different periods? Of particular interest are differences between urban/suburban and rural smelting and smithing in different periods.
- What changes in the technology of bloomery smelting took place in the Forest of Dean over time? This will be particularly targeted at:-
  - Identification of water-powered bloomery sites.
  - Identification of bloomeries in which steel was produced.

Although these research questions cannot easily be answered in the short term, they are material to an understanding of the smelting and smithing industries in the area, and all future research into these industries should take full account of them.

Recommended action

More detailed information about smelting and smithing sites at different locations is required to inform strategies to address these questions in a more targeted fashion, and consequently it is recommended that further identification and excavation of selected sites is undertaken.

The following methodologies should be followed:-

- Suitable sites should be identified on the basis of existing evidence. Possible suitable sites are:-
  - Sites with *in situ* remains of Roman bloomeries:-
    - The Chesters Roman Villa, Woolaston, Glos SMR 16.
    - Rodmore Farm, St Briavels, Glos SMR 4390.
    - Eastbach Court, English Bicknor Glos SMR 9739.
  - Sites with *in situ* remains of medieval bloomeries:-
    - War field Farm, Ruardean, Glos SMR 9875.
    - Rodley Manor, Lydney, Glos SMR 22448.
  - Sites with *in situ* remains of undated bloomeries:-
    - Stowe Hill, Newland, undated site, Glos SMR 21477.
  - Sites with the potential to contain evidence of prehistoric bloomeries:-
    - Symonds Yat Iron Age Promontory Fort, Glos SMR 19.
    - Soudley Camp, Glos SMR 444.

        - Welshbury, Blaisdon, Glos SMR 22116.
    - Sites with the potential to contain evidence of Roman bloomeries:-
        - Park Farm Lydney, Glos SMR 6377.
        - Boughspring Roman Villa, Glos SMR 437.
        - Millend Lane Blakeney, Glos SMR 17988.
    - Sites with the potential to contain evidence of early medieval bloomeries:-
        - Madgetts Farm, Tidenham, Glos SMR 6033.
    - Sites with the potential to contain evidence of later medieval bloomeries:-
        - Highmeadow Farm, Newland, Later medieval smelting and smithing on the same site, Glos SMR 20487.
        - English Bicknor Castle, Glos SMR 21768.
        - Windmill Field, English Bicknor, later medieval fragments of furnace lining, Glos SMR 21770.
    - Sites with the potential to contain evidence of later medieval "itinerant forges":-
        - Chestnuts Wood, Littledean, Glos SMR 12183.
        - Broom Hill, Soudley, Glos SMR 23492.
    - Sites with the potential to contain evidence of water-powered bloomeries:-
        - Yew Tree Cottage Brockweir, possible water powered bloomery site, Glos SMR 23517.
- Where appropriate, field walking, or streambed survey should be undertaken to determine the distribution of smelting waste or other artefacts. These surveys should be undertaken in accordance with the specifications set out C.ii.iii, C.ii.iii and C.ii.iv above).
- The evidence from the field walking, or streambed surveys should be reviewed by appropriate specialists and areas targeted for more intensive, geophysical survey.
- Where field walking, or streambed survey has not been undertaken, other, site specific, factors should be considered to identify sites suitable for targeted geophysical survey. This is likely to include:-
    - The interior of recognised hillfort sites.
    - Areas where field name evidence, other documentary information, or physical survival of archaeological remains, suggests that more smelting or smithing may have taken place, but which were not suitable for field walking, or streambed survey.
- Where appropriate, geophysical survey, should be undertaken in selected areas to locate the sites of possible bloomery smelting or secondary smithing in accordance with the specification set out in C.ii.vi above.
- Where the results of the geophysical survey suggest this is appropriate, trial excavation should be undertaken in accordance with the specifications set out in C.ii.vi above, to determine the nature, extent and date of identified archaeological deposits. Trial excavation may also be undertaken to determine the nature of possible smelting/smithing waste deposits identified.
- Where the results of the trial excavation suggest this is appropriate, full excavation, and sampling of identified deposits should be undertaken in accordance with the specifications set out in C.ii.vi above.

C.ii.xi The relationship between early charcoal fired blast furnaces, and late medieval or post medieval water-powered bloomeries

It has already been stated that no water-powered bloomery sites are currently known in the Forest of Dean, although there are numerous suitable sites.

Recommended Action
It is likely that the early post-medieval blast furnaces in the Forest of Dean would have been sited either on or close to the sites of water-powered bloomeries to take advantage of the existing communications infrastructure both for the importation of raw material and the exporting of smelted iron. Consequently it may be beneficial to undertake fieldwork in the valleys where early charcoal fired blast furnaces are known.

Although detailed project designs will be formulated in advance of any fieldwork, it is anticipated that this operation will consist of the following:-

- Identification of suitable locations for this level of survey. This will consist of river valleys in which the sites of early charcoal fired blast furnaces is known. Suitable valleys would include:-
  - The Soudley Valley.
  - The Flaxley Valley.
  - The valley of the River Lyd.
- Discuss research priorities, and methodologies with landowners and gain their permission for undertaking the work. It is not currently clear to what extent the areas most suitable for this are in private ownership or are owned by the Forestry Commission.
- Rapid review of documentary sources – this will be largely based on the County SMR, which will already have been enhanced as a result of the Forest of Dean Archaeological Survey. This information would be used to define a research priority for each area and identify sites, which require validatory visits.
- Rapid systematic walkover within the search area based on pre-agreed methodologies, search pattern and recording agenda. Typically this will consist of transects at *c.* 30m intervals, although the methodology and search pattern will be modified to take account of different landuses and will be subject to constant review to accommodate differing topographies and ground cover. It is also anticipated that the search pattern may be modified in some areas to ensure that the full extent of selected groups of features is adequately mapped.
- All previously known archaeological sites or structures will be visited and a record made of their current visible extent and condition in accordance with pre-agreed specifications.
- Previously unrecorded earthworks, artefacts slag fragments or structures will be recorded and a record made of their current extent and condition. Recording will be in accordance with pre-determined specifications but is likely to consist of the following:-
  - Mapping will be schematic in accordance with the standard of English Heritage levels 1 and 2 (Bowden 1999) as the purpose of the mapping is to identify the location of artefacts to enable them to be re-visited.
  - Surveying will principally make use of hand-held GPS, although other “low tech” surveying methods (reference to mapped landscape features, compass bearings, offsets, tapes or pacing) may be utilised if deemed logistically efficient.
  - Mapping will be directly onto a dedicated layer on hand-held computers for direct uploading into the project GIS, and new records will be inputted directly into the appropriate fields of the project database for uploading into the County Sites and Monuments Record.
  - Where artefacts are identified, the adjacent areas should be searched to determine the extent of the scatter, or identify visible landscape features, which may be associated with metal working activity.
  - Where scatters are extensive, it will be necessary to subdivide the location of finds to ensure that their relative distribution is correctly recorded. It is anticipated that this will be undertaken by means of dividing the area of identified scatters into arbitrary 10m squares.
- Where possible all visible artefacts and slag fragments will be retained for further analysis. Where it is not possible to retrieve artefacts for further analysis an assessment should be made of their nature and extent. Recording criteria will be determined in advance of any projects.
- Where appropriate collected slag and other artefacts should be analysed by recognised specialists. The analysis of slags from these locations will be particularly directed at the identification of slags from water-powered bloomeries.
- The results of his level of survey would be used to determine suitable strategies for further, more intensive investigation of selected sites (see C.ii.x above).

These surveys could be undertaken as part of the same process as the streambed surveys outlined in C.ii.v above.

C.ii.xii Contact with landowners and local people who may have specific knowledge of the location of metal working sites

The fieldwork phase of the survey identified the value of local knowledge in the identification of possible metal working sites.

Recommended Action
It is recommended that an outreach project should be targeted towards engaging with members of the local community to collect information on the location of previously undiscovered iron smelting sites in their parish. This operation shall be undertaken on a Parish-by-Parish basis, unless there are over-riding reasons for the project to be subdivided in another way.

Although a detailed project design will be formulated in advance of any further work, it is anticipated that this operation will consist of the following:-

- A leaflet shall be produced stating the aims of the project. This shall be circulated to:-
  - Local History societies.
  - Local conservation groups.
  - Parish Councils.
  - Women's Institutes.
  - Other appropriate local groups.
- Subsequent to the circulation of the leaflet, the project team will make direct contact with one of the groups to whom the leaflet was circulated and convene a pubic meeting at which a member of the project team shall:-
  - Outline the main archaeological issues surrounding the pre-blast furnace smelting industry in the Forest of Dean.
  - Outline the scope and proposed methodologies of the project.
  - Outline the ways in which local individuals can be involved in the outreach project.
  - Introduce local volunteers to basic artefact identification, particularly bloomery slag.
- It is anticipated that a number of local field workers will be recruited at the meeting. Each one of these will be issued with:-
  - A map showing the areas they will be responsible for surveying.
  - Dedicated pro formas designed to allow them to record the information they recover.
  - A basic fact sheet about the project to distribute to landowners.
  - Details of how to record any findings and how to report them back to the project team.
- Volunteers will then contact landowners in their area asking if they are aware of slag deposits on their land, or if they can undertaken basic walkover of suitable fields to search for slag deposits.

It is proposed that this survey should be trialed in two diverse parishes within the survey area to test its value and cost-effectiveness.

Appendix D Detailed methodology of the desk-based research on scowles

D.i Data sources

The following data sources were consulted.

D.ii Sources already held by the project database

The Gloucestershire County Sites and Monuments Record (SMR) was used as the project database in accordance with the specifications set out in the project design (Hoyle 2002, 4.6.1). This already contained some limited information on selected scowles, which had been accessed from a variety of sources. Existing SMR information was integrated with new data collected as part of the project.

D.iii Text data at the Archaeology Service, or obtained through inter-library loan.

- Entec, 1998. Comparative survey of scowles in the Forest of Dean Gloucestershire. Unpublished report of Tarmac Quarry Products Limited (GCCAS DC file 513.4 vol 2). *This source contained a brief overview and very general survey of scowles. It was used to identify the location of selected known scowles.*
- Walters B, 1992b. The Forest of Dean Iron Industry – Dean Archaeological Group Occasional Publication No.4. *This source was used to identify the general location of selected known scowles and also evidence of the dates at which they might have been exploited.*
- Wildgoose P, 1993. The Forest of Dean as a major centre of the iron industry from Roman to medieval times - unpublished MLitt thesis. *This source was used to identify the location of scowles visible in the late 1980s, and also contained Wildgoose's criteria for scowle morphology. This source was easily the most comprehensive record of the location and form of scowles accessed at this stage of the project, and probably contributed c. 90% of the desk-based information about scowles.*
- English Heritage, 2002. National Monuments Record Long Listings for the survey area. *This source was used to identify the location of selected scowles.*
- GADARG, 1982. The Gloucestershire and District Archaeological Research Committee card index of sites. *This source was used to identify the location of selected scowles.*
- Herbert, 1996a. The Victoria County History of Gloucestershire vol. V, 1996 The Forest of Dean. *This source was used to identify evidence for the location of scowles and also evidence of the dates at which they might have been exploited. This source also provided landscape and landuse information, which allowed some scowles, which were no longer visible, to be identified.*
- Hart C, 1971. The Industrial History of Dean. *This source was used to identify evidence for the location of scowles and also evidence of the dates at which they might have been exploited.*
- Hart C, 1983. Coleford: A History of a West Gloucestershire Town. *This source was used to identify evidence for the location of scowles and also evidence of the dates at which they might have been exploited.*
- Hart C, 2002. The Free Miners Of The Royal Forest Of Dean And Hundred Of St Briavels. *This source was used to identify evidence for the location of scowles and also evidence of the dates at which they might have been exploited.*
- Nicholls HG, 1966. Nicholls' Forest of Dean – single volume compilation of:-
  - Nicholls HG, 1858 The Forest of Dean: an historical and descriptive account.
  - Nicholls HG, 1866 Iron making in olden times.

These sources were used to identify evidence for the location of scowles and also evidence of the dates at which they might have been exploited.

The following text sources, not specified in the project design were accessed. These are listed here as they added information of direct value to the desk-based phase of the project:-

- Forester Brown, 1896. Notes on Ancient Mining Tools Found in the Forest of Dean in Transactions of the Bristol and Gloucestershire Archaeological Society.
- Wheeler R.E.M & Wheeler TV, 1932. Report on the excavation of the Prehistoric, Roman and Post-Roman site in Lydney Park, Gloucestershire, *Reports of the Research Committee of the Society of Antiquaries IX.*
- Ryder T.A. Rev, 1929. Notes from Notes on the "Scowles" in Transactions of the Woolhope Naturalists Field Club volume for 1927, 1928, 1929, Part III (1929) 202-203.

D.iv Index searches made on the following journals for references to scowles

- The Transactions of the Bristol and Gloucestershire Archaeological Society.
- The Journal of the Dean Archaeological Group, Dean Archaeology.
- The Journal of the Forest of Dean Local History Society, The New Regard of the Forest of Dean.

These sources were used to identify evidence for the location of scowles and also evidence of the dates at which they might have been exploited. These sources also provided landscape and landuse information which may help locate features which are no longer evident.

D.v Map data held at Gloucestershire County Council Archaeology Service

- Gloucestershire County Sites and Monuments Record mapped information forming a layer within the Gloucestershire County corporate GIS and supporting database. *This source was used to identify the recorded location of selected scowles. It was updated throughout the project and acted as the principal database and mapping record for the project.*
- Scanned raster images of the 1st, 2nd and 3rd edition 1:2500 OS maps dating from *c.*1880, *c.*1901 and *c.*1923 respectively and held as part of the Gloucestershire County Council corporate GIS. *These sources were used to identify the location of selected scowles and placename evidence for the location of these features. This source also provided landscape and landuse information which helped locate features which are no longer evident.*
- Rectified copies of early 19th century parish maps (generally based on tithe award maps but other maps from the period were also used) at 6" to 1 mile scale. *This source was used to identify placename evidence for the location of scowles whether existing or no longer evident. This source also provided landscape and landuse information which helped locate features which are no longer evident.*
- Isaac Taylor 1" to 1 mile scale map of Gloucestershire – published in 1777. *This source was used to identify placename evidence for the location of scowles.*

D.vi Text sources held by Gloucestershire County Record Office

- 18th and early 19th century parish histories:-
  - Atkyns R, 1712 The Ancient and Present State of Glostershire.
  - Rudder, 1778 A New History of Gloucestershire.
  - Rudge, 1803 History of the County of Gloucestershire.

These sources provided occasional written information on the location of selected scowles, placename evidence for the location of these and also evidence of the dates at which they might have been exploited. They also provided landscape and landuse information which helped locate features which are no longer evident.

- The following documents from Gloucester County Record Office were searched:-
  - Field observations between Severn and Wye, Scott-Garrett and Harris 1932 (AR21).
  - Stigulensia – notes on remains between Severn and Wye, Ormerod 1841 (R.O.L G 5).
  - The Kings Iron Works in the Journal of the Iron and Steel Institute 1953, Vol 173 (FD8).
  - A true narrative concerning woods and iron works in the Forest of Dean dated 1670 (D3921/I/43)
  - Inventory of His Majesty's Iron Works 1635 (D 421).
  - Ramblings of a Dean Archaeologist, Notebooks of Scott Garrett (D3921/II/41).

  These sources provided occasional written information on the location of selected scowles, placename evidence for the location of these and also evidence of the dates at which they might have been exploited. They also provided landscape and landuse information, which helped locate, features which are no longer evident.

D.vii Map sources held by The Wilderness Field Study Centre at Mitcheldean

The following sources were loaned to the Archaeology Service by the Wilderness Field Studies centre and were examined at Shire Hall, Gloucestershire.

- Bromide copy of 1608 map of the Forest of Dean (PRO document MR 879).
- Bromide copy of 1680/late 18th century map of the Forest of Dean *titled A Description of the Forest of DEANE as it lyes in several parcels with the Inclosures.*
- Bromide copy of map of 19th century map of Blakeney Walk.
- Photocopy of *Map of part of the Forest made by order of the Lords Commissioners of the Treasury showing enclosures* dated 1758.
- Bromide copy of *Plan of the Forest of Dean* of 1782 by T Blunt.
- Bromide copy of *Geometrical plan of the Forest of Dean - By order of the Commissioners of the Land Registry, dated 1787.*
- Traced copy of *Map of Estates of Lord Gage in 1792*.
- Map of the Forest of Dean at *c.*1:25,000 scale, titled *Plan of Her Majesty's Forest of Dean in the County of Gloucester with High Meadow and Great Doward Woods* and dated 1848.

These sources provided some mapped information on the location of selected scowles and placename evidence for the location of these. They also provided landscape and landuse information, which helped locate, features which are no longer evident.

D.viii Aerial photographs and information based on aerial photographic sources

- Monochrome vertical prints taken by Fairey Surveys for the Forestry Commission in May 1975 at a scale of 1:10,000 and held by the Wilderness field study centre.
- Monochrome vertical prints taken in 1982 at scale 1:3000 (with a flight plot at scale 1:120;000) and held by the Forestry Commission.
- Colour vertical prints held as a layer in the Gloucestershire County Council corporate GIS. There are supplied by *getmapping.com.*
- A number of aerial photographic sources were examined as part of the National Mapping Programme (NMP), undertaken by staff at the National Monuments Record in Swindon. As part of NMP, which identifies and records all archaeological sites and landscapes visible on aerial photographs, areas of the Forest of Dean within the Aggregates Resource Area were targeted as a priority.

  Aerial photographs and aerial photographic information were used to provide the following information:-
  - Location and extent of scowles visible from the air when photographs were taken.
  - Landuse information.
  - Evidence of the former presence of scowles where these features are no longer evident.

  Although the full digitised results of NMP were not available as part of the desk-based stage of the project, paper copies of the relevant maps were obtained and information from them added to the project database.

D.ix Map sources held by Gloucestershire County Record Office

Selected copies of unpublished maps held by Gloucestershire County Record Office, and which pre-dated the rectified 6" to 1 mile scale 19th century parish maps (above). The following maps were accessed:-

Area mapped	Date	Reference
Alvington & Aylburton	1675	GRO D.421 14
Newland, St Briavels, Hewelsfield & Woolaston	C17	GRO 501
Alvington & Aylburton	1675	GRO D.421 14
Map of Estates of Lord Gage (Staunton Coleford area)	1792	GRO PC23
Whitemead Park	1804	GRO 412.5
Newland	1810	GRO D637 II/1/T1

These sources were accessed as copies were held by Gloucestershire County Council Archaeology Service

These sources provided some mapped information on the location of selected scowles and placename evidence for the location of these. They also provided landscape and landuse information, which helped locate, features which are no longer evident.

D.x Sources not examined

The following were identified as potential data sources in the project design (Hoyle 2002) but were not available for examination as part of the desk-based phase of the project:-

- Unpublished PhD Thesis "The development of the rural landscape in west Gloucestershire *c.* 1550-1800" Richard Newman, Cardiff University 1988.
- Unpublished MA thesis titled "Forest in 17th century" held by Gloucestershire County Records Office. This source may have been mis-catalogued and could not be located.
- Colour vertical prints taken in 1999 and 2000 at a scale of 1:10000 for the Countryside Commission and curated by Gloucestershire Wildlife Trust. This source was not available for long–term study due to copyright reasons, and it as felt unlikely to significantly add information not already available from other sources.
- No sources held by Gloucestershire Local History Library were consulted as a rapid search of their catalogues did not identify any appropriate sources not already accessed from elsewhere.

D.xi Collation of the data and analysis to influence fieldwork

D.xi.i Data Collection and integration into the project database

Data about the location and extent of scowles and integration of that data into the project database (the Gloucestershire County SMR) was undertaken in the following ways.

D.xi.ii Precise information on the location of scowles

The "search area" (see above) was divided into a number of discrete units consisting of 1km^2 OS map squares. For each of these map squares, a single member of the project team was responsible for examining a number of sources to determine the location and extent of scowles and possible scowles.

The following sources which provided comprehensive, and generally detailed information on the location and extent of scowles were accessed in this way :-

- Wildgoose 1993. The Forest of Dean as a major centre of the iron industry from Roman to medieval times - unpublished MLitt thesis.
- Gloucestershire County Sites and Monuments Record mapped information forming a layer within the Gloucestershire County corporate GIS and supporting database.
- Scanned raster images of the 1st, 2nd and 3rd edition 1:2500 OS maps dating from *c.*1880, *c.*1901 and *c.*1923 respectively and held as part of the Gloucestershire County Council corporate GIS.
- Rectified copies of early 19th century parish maps (generally based on tithe award maps, although other maps from the period were also used where these were available) at 6" to 1 mile scale.
- Monochrome vertical prints taken by Fairey Surveys for the Forestry Commission in May 1975 at a scale of 1:10,000 and held by the Wilderness Field Study Centre.
- Monochrome vertical prints taken in 1982 at scale 1:3000 (with a flight plot at scale 1:120;000) and held by the Forestry Commission.
- Colour vertical prints held as a layer in the Gloucestershire County Council corporate GIS.
- Data from the National Mapping Programme.

Scowle sites identified from these sources were assigned a new SMR record. Each was designated a unique number within the project database (the Gloucestershire county SMR) and digitised as a polygon on a designated layer (SCOWLE) within the project GIS.

Separately designated areas of scowles were differentiated on the basis of the following:-

- Spatial separation from other scowles - this was a rule of thumb differentiation, but there was a presumption against combining discrete scowles more than *c.*50m apart.
- Differentiation on the basis of form – at this stage of the project scowles were differentiated where:-
  - They had been assigned a different form designation in Wildgoose 1993.
  - They had been identified from different sources.
- Differentiation on the basis of survival. Scowles were divided into the following categories:-
  - Scowles present as visible features when last recorded.
  - Likely location of backfilled scowles identified from map or aerial photographic sources.
  - Possible site of scowles based on an interpretation of landscape or other information.
  - Possible site of scowles where they may have been destroyed by later activity e.g. quarrying.

The following attributes were recorded for each new record:-

- The source from which the scowle was identified (a Source Reference including page number or map number, as well as the type of evidence e.g. CIRCUMSTANTIAL, CARTOGRAPHIC, PHOTOGRAPHIC).
- A brief explanation of the information from the sourcework was recorded, to further inform the fieldwork. This consisted of a very brief textual summary of the evidence, and was recorded in the *Area Notes* field.
- The form of the scowle as recorded in Wildgoose 1993. Wildgoose recorded individual areas of scowles using the following categories, which described the visible physical form of scowle. These were:-
  - Type A - Field depressions with poorly defined outlines.
  - Type B - Shallow pits without rock exposures, less than 10m diameter.
  - Type C - Pits with or without rock exposures, more than 10m in diameter.
  - Type D - Quarried pits with steep faced rock walls.
  - Type E - Continuous interlinked surface mines, with frequent rock pillars grid tortuous channelling.
  - Type F - Fields with pronounced undulations where individual pits cannot be defined, ('humpy' fields).

  This categorisation allowed field teams to anticipate the visual appearance of areas of scowles in advance of the field survey.

- Scowle Type. The following Types were selected from the Specific Site Type Glossary;
  - SCOWLE – EXISTING: This type was assigned to scowles which were recorded as an earthwork on most recent records. In practice these were almost always scowles recorded as earthwork features in Wildgoose 1993.
  - SCOWLE – POSSIBLE: This type was assigned to the possible site of scowles based on:-
    - An interpretation of either crop mark evidence or documentary sources.
    - Circumstantial evidence, where an interpretation of earlier landuse or other information (e.g. areas of woodland or rough ground) suggested that scowles may have been present on the site.

- SCOWLE – POSSIBLE DESTROYED: This type was assigned where later activity (e.g. quarrying) is clearly evident within the search area and may have destroyed the site of former scowles. An example of this would be a large area of post-medieval quarrying which disrupts the line of recorded scowles within the area of the Crease Limestone outcrop.

- The civil parish in which the area of scowles was identified.
- A cross reference to any existing records on the Gloucestershire County Council Sites and Monuments Record (SMR).
- Ordnance Survey map sheet of scowle.

These new records and numbering system were created as part of the Gloucestershire County SMR, the project database, and structured in a similar way to that database. Records from the desk-based research were, however, created as temporary records to be updated at the end of the project and fully integrated into the SMR database.

D.xi.iii More general information about scowles

Once the data from the locational sources had been incorporated into the project database, the remaining, more general sources were then examined. These generally consisted of historical text-based sources describing the early iron industry and scowles. For each of these, the source was checked and any additional locational information incorporated into the project dataset, as described above. More general records of scowles and early iron ore extraction sites that could not be precisely located, were noted in a series of tables, along with their source work 1reference. Copies of these lists are found in Appendix Q.

Appendix E Scowles Fieldwork: Detailed methodology

E.i Data taken into the field

As part of the initial stages of the project, baseline data about scowles had been entered into the project database and GIS. Each field team was issued with the following information to inform the field survey, which they carried in the field.

- Spatial information:
  - Digital GIS layer of all known scowles, possible scowles and possibly destroyed scowles.
  - Digital GIS layer of geological information.
  - Digital background OS Land-Line data as a GIS layer, including contour data.
  - Paper copies of 1:10000 OS raster mapping.
  - Paper copies of National Mapping Programme maps.
  - Additional paper copies of OS Land-line mapping.
  - Additional paper copies of geological maps.
  - Additional paper copies of all known and possible scowles.
  - Paper Ordnance Survey 1:25000 maps of the area for orientation.

- Text-based information:
  - Digital attribute data (based on the desk-based research) on all recorded scowles, possible scowles and possibly destroyed scowles as part of the GIS.
  - Paper copies of the relevant sections of "The Forest of Dean as a Major Centre of the Iron Industry from Roman to medieval Times" (Wildgoose, 1993).
  - Additional paper copies of the attribute data (based on the desk-based research) on all recorded scowles, possible scowles and possibly destroyed scowles as part of the GIS.

These sources of data provided each team with most of the information available to enable the teams to carry out the survey. Also most of the information was available on the handheld computer, which made the carrying of equipment and entering of data much easier, especially in poor weather and on rough terrain.

E.ii Data to be captured in the field

The following four main categories of data were recorded in the field using the GIS available on the handheld computers:-

- Scowles – this consisted of polygons digitised on a separate GIS layer (*New Scowle*) representing the visible footprint of all identified scowles, regardless of whether their type was possible, destroyed or existing.
- Photographs - this consisted of points on a separate GIS layer (*Photo Scowle*). The position and details about all photographs of scowles was added to the project database.
- Inaccessible land - this consisted of polygons digitised on a separate GIS layer (*Inaccess*) and was a record of all land within the survey area that was inaccessible for whatever reason (e.g. access denied by landowner).
- Impenetrable land - this consisted of polygons digitised on a separate GIS layer (*Impen*) and was a record of all land within the survey area, which could not be investigated by the survey teams due to dense undergrowth.

The details of each of these records, along with the attributes that were recorded for each layer is as follows:-

E.iiiScowles

Separate contiguous areas of scowles containing exactly the same feature attributes (see below) were identified in the field using the following criteria for differentiation based on those used as part of the desk-based data phase (see above):-

- Spatial separation from other scowles - this was a rule of thumb differentiation, but there was a presumption against combining discrete scowles more than *c.*10m apart.
- Differentiation on the basis of Form (see below).
- Differentiation on the basis of Type (see below).

These were recorded as a single polygon within the project GIS and cross-referenced to the project database in which they were assigned a new number. At this stage no attempt was made to modify the digitised information and database records made as part of the desk-based phase, and the field work records were created as a new dataset.

The following attribute data was recorded for each scowle:-

E.ivSpecific type of scowle

Each scowle, or area of scowles was assigned one of the following types:-

- Scowle Existing: A scowle or an area of scowles that physically existed in the ground and could be located.
- Scowle Possible: An area, which possibly contained a scowle or number of scowles. This may include areas of uncertainty (e.g. where scowles have been backfilled) or other possible scowles.
- Scowle Possible Destroyed: An area in which there were no longer any scowles, but where they might reasonably be expected to have been present in the past. This would include all quarry sites within the search area, or any other sites with evidence suggesting that scowles had been destroyed.

These categories were derived from those used during the desk-based phase of the project, although the basis for these designations was modified. The selection of scowle category was based on the professional judgement of the surveyor, based on the following specifications:-

E.v Scowle Form

Identified scowles or areas of scowles were assigned one of the following seven categories of Form.

Table 53: Scowle Form criteria

Scowle Form	Description
Scowle Form 1	Shallow depressions with or without mounds and with no visible rock exposures.
Scowle Form 2	Mostly small (less than *c.*10m diameter) hollows with few (less than *c.*50%), or no rock exposures.
Scowle Form 3	Mostly small (less than *c.*10m diameter) hollows with frequent (more than *c.*50%), rock exposures.
Scowle Form 4	Mostly large (more than *c.*10m diameter) hollows or channels with few (less than *c.*50%), or no rock exposures. This form tends to contain scowles in excess of 2m deep.

Scowle Form	Description
Scowle Form 5	Mostly large (more than *c.*10m diameter) hollows or channels with frequent (more than *c.*50%) rock exposures. This form tends to contain scowles in excess of 2m deep.
Scowle Form 6	Large discrete quarry-like scowles with exposed rock faces and little or no apparent connection with adjacent scowles. Although a number of scowles were assigned this form in the field post fieldwork analysis of the data suggested that this form was not actually valid, and these scowles were assigned a new form (see 3.1.5 above).
Scowle Form 7	Rock outcrop.

As the survey was intended to provide a basic descriptive and interpretative record of identified scowles, providing general 'core' data to inform broad academic and management requirements, a detailed record of the form of the scowles was deemed unnecessary. It was, however, felt that a broad characterisation, based on the physical appearance of identified features, would inform the quantification and management needs of the survey.

E.viLevel of Surveying

An indication of the level of surveying was recorded, to allow the relative value of the survey results to be assessed if necessary. This was of particular value as most of the survey was undertaken in the summer, due to constraints in the project timetable, and dense vegetation prevented access and impeded visibility in some areas.

The following five categories were assigned to indicate level of surveying:-

Table 54: Scowle survey levels criteria

Level of Survey	Description
Level 1	No access. Impossible to accurately check Form, Condition or Footprint of scowles or other area of interest: Information retained as per current SMR. The reasons for this limitation was stated in the area description.
Level 2	Access limited to boundary of area of interest or perimeter of scowle – Sight of less than *c.*50% of internal area of scowle/ground surface.
Level 3	Access limited to boundary of area of interest or perimeter of scowle - Sight of more than *c.* 50% of internal area of scowle/ground surface.
Level 4	Access to area of interest or internal area of scowle - Sight of less than *c.* 50% of internal area of scowle/ground surface.
Level 5	Access to area of interest or internal area of scowle - Sight of more than *c.* 50% of internal area.

E.vii Condition and Damage

One of the major aims of the scowles survey was to "assess the current condition of the archaeological resource and enable recommendations to be made for its proper management" (Hoyle 2002). In order to achieve this it was necessary to make a record of the condition of identified features and any damage done to them.

These records can only be seen as a point-in-time snapshot of the condition and agents of damage for each scowle or area of scowles and the date of the field inspection, and assignation of condition or damage category was recorded. The nature of the evidence for the record of condition and damage (always "recorded evidence") was also noted.

It was also decided to record condition and damage as a general attribute of the whole scowle or area of scowles, rather than assigning condition and damage designations to smaller areas identified within them.

Throughout the project, national data standards were used for glossaries where they exist, although no agreed glossaries or wordlists existed for many of the damage and condition records. A number of wordlists were created for these categories following consultation with the Forum on Information Standards in Heritage (FISH), and it is hoped that these will contribute towards an agreed national standard for the recording of damage and condition during archaeological field survey.

E.vii.i Condition

Condition was recorded using the REP93 Condition wordlist, the agreed national standard by English Heritage Data Standards Unit (see http://www.mda.org.uk/fish/i_c.htm). The standard allowed for the interpretative nature of this recording (as given in the description, below).

Description of wordlist:	A short list of terms is used to narrow the scope for interpretation in what is an admittedly subjective indexing scheme. 'Features of interest' referred to may be defined by the user and relate to the available evidence for the monument being assessed. Thus 'features of interest' for a set of cropmarks might differ from those for an extant building. The date of a monument may also be relevant to the assessment. Thus good condition might apply equally to the foundations of a Roman Villa, but an 18th century house which only survived as foundations would be 'destroyed'.

Table 55: Scowle condition criteria

Term	Scope note
Good	All or nearly all features of interest are well preserved for the period they represent. No sign of active damage.
Fair	Some damage or part destruction of features of interest apparent, or some features of interest are obscured by more recent additions/alterations. For buildings, indicates structurally sound, but in need of minor repairs.
Poor	Damage to the majority of the original features of interest is apparent, some significant features are missing. Some features of interest remain. Active damage apparent (e.g. for buildings water penetration, rot etc).
Very bad	The majority of features of interest are so damaged as to be not surveyable or are missing. For buildings, this indicates structural failure or evident instability, loss of significant areas of roofing, or damage by a major fire or other disaster.
Uncertain	Features of interest can not be investigated at the time of the assessment for any reason, e.g. obscured by cloud-cover, vegetation, ongoing building work, below ground services etc or the site could not be found.

Term	Scope note
Destroyed	All features of interest have been destroyed. No further information can be gained from future investigation of the site. Includes demolished buildings unless foundations, basements etc exist which are of interest, for which use very bad.

E.vii.ii Damage By

"Damage by" recorded the agent of damage, and was recorded using a wordlist drawn up by Gloucestershire County Council Archaeology Service (GCCAS). This list combined terms from a list used by English Heritage's Monument Protection Programme (MPP) called *Vulnerability* and a list used by the National Trust (NT), called *Damage By*. All expected agents of damage are listed by category.

Table 56: Scowle damage types

Term	Wordlist derived from
Animal burrowing	MPP
Arable clipping	MPP
Arable ploughing	MPP
Building work	NT
Coastal erosion	MPP
Collapse	MPP
Demolition	NT
Digging	MPP
Dumping	MPP
Drying out	NT
Drainage	MPP
Deterioration as a result of neglect	MPP
Forestry	MPP
Gardening	MPP
Info not available	MPP
Metal detecting	MPP
Mineral extraction	MPP
No visible damage	GCCAS
Other	MPP
Public utilities	MPP
Road construction	MPP
Rain entry	MPP
Rot	MPP
Natural erosion	MPP
Stock erosion	MPP
Visitor erosion	MPP
Storm damage	NT
Vandalism	MPP
Vehicle erosion	MPP
Vegetation	NT
Water action	NT

E.vii.iii Damage rating

The 'severity' of the damage was rated on a four-point scale of potential to severe. This was derived directly from the list constructed by the National Trust archaeology team.

Table 57: Scowle damage rating critera

Term	Scope Note
Potential	Action which may threaten a monument, e.g. proposals for development; known risks associated with the inherent instability of a structure; potential risks arising from current use or occupancy
Slight damage	Signs of wear and tear on a monument, e.g. slight seasonal poaching by stock; invasive light vegetation such as bracken or scrub whose root systems are likely to begin to cause damage to stratification; slight deterioration of structures caused by inadequate maintenance or the effects of wind and weather
Moderate damage	e.g. broken ground surfaces at pressure points on a countryside site caused by visitors or stock; damage by tree roots or windblown trees; marked deterioration of structures
Severe damage	Severe erosion or other damage threatening important aspects of a site, e.g. the integrity of a site or landscape threatened by actual destruction, demolition or rapid deterioration of the whole or component parts; structural collapse

E.vii.iv Field Surveyor

This was the name of the field surveyor recording the data about the scowles, as well as the organisation they represented (Gloucestershire County Council Archaeology Service).

E.vii.v Landowner

Where known, the name, address and telephone number of the landowner of each scowle or area of scowles was recorded. This information has been stored within the Gloucestershire County Sites and Monuments Record in accordance with Gloucestershire County Council policies of the implementation of the Data Protection Act.

E.vii.vi Landuse

Landuse was recorded from a standard wordlist of Landuse, derived from the REP93 Landuse wordlist, the agreed national standard by English Heritage Data Standards Unit (see http://www.mda.org.uk/fish/i_lu_e.htm).

Table 58: Scowles landuse types

Term	Parent Term	Scope Note
Above high water	coastland	Coastal area above high water level.
Allotment	other	In use for small scale horticulture.
Building	other	In use as a building.
Built over	other	Site underlying a building or structure
Churchyard	other	Including ground in current use for burials and legally consecrated ground, e.g. graveyard, chapel-ground etc.
Cliff and related features	coastland	This refers to coastal cliffs.
Coastland	N/A	Landuses associated with coastal environments. Use specific term where known.
Coniferous plantation	woodland	In which a range of conifers may be planted, e.g. spruce, larch, pine etc.
Cultivated	N/A	Cultivated land. Use specific term where known.
Cultivated land	cultivated	Nature of operations undetermined.
Cultivation to a depth <0.25m	cultivated	Operations restricted to a depth of less than 25 centimetres.
Cultivation to a depth >0.25m	cultivated	Operations in excess of 25 centimetres.
Deciduous introduced woodland	woodland	Defined as species introduced after the last glaciation e.g. sycamore, sweet chestnut etc.
Deciduous native woodland	woodland	Defined as species present after the last glaciation, e.g. oak, ash, elm, beech, birch, alder, hazel, hornbeam etc.
Disturbed grassland	grassland heathland	Areas of past and current land improvement, involving operations capable of disturbing the archaeology.
Garden	other	Including private and public.
Grassland undetermined	grassland heathland	Character or management not determined.
Heathland	grassland heathland	Plant community which includes low shrubs, e.g. heathers, bilberry, gorse also the presence of bracken.
Intertidal	coastland	That area between high and low water levels.
Land boundary	other	Hedge, fence, wall etc.
Marine	coastland	That area below low water level and inside territorial waters. The term includes saline waters within tidal estuaries.
Mineral extraction	other	Mine, quarry etc.
Minimal cultivation	cultivated	Landuse involving no operations likely to be damaging to archaeological remains.

Term	Parent Term	Scope Note
Mixed woodland	woodland	In which coniferous and deciduous are present in roughly equal proportions.
Monument display	other	Use where the land on which the monument stands is dedicated to the monument itself: this may include Guardianship sites displayed, also sites which exclude any other land classification e.g. cross, commemorative monument.
Open fresh water	N/A	For inland bodies of water. Use specific term where known.
Orchard	other	In use for fruit growing or former orchard retaining trees.
Parkland	woodland	In which the density of the trees is significantly less marked than in woodland; if parkland is currently cultivated then classify land accordingly.
Recreational usage	other	Golf course, playing field etc.
Regularly improved grassland	grassland heathland	Regularly cultivated and re-seeded grassland (but not including temporary grassland within arable rotation, for which use cultivated land)
Running fresh water	open fresh water	River, stream, estuary above tidal (saline) influence.
Saltmarsh	coastland	Includes saltings etc.
Scrub	woodland	The term includes invasive woodland characterised by the presence of birch, willow, alder, ash, sycamore, and conifers as low trees with shrubs.
Standing fresh water	open fresh water	Pond, lake, artificial lake, canal (if wet) etc.
Thoroughfare	other	Path, road, track, bridge, lay-by etc.
Undetermined woodland	woodland	N/A
Undisturbed grassland	grassland heathland	If managed at all, then only to a low intensity, e.g. mowing, spraying etc involving operations, which are not archaeologically damaging.
Verge	other	Uncultivated land lying alongside a thoroughfare
Waste ground	other	N/A
Wetlands	N/A	To include areas of wet valley bogs, sphagnum bogs, fens (N.B. in large areas of wetland such as the fens or Somerset Levels most land should be classified under its current use e.g. cultivated land, woodland etc rather than as wetlands).
Woodland	N/A	Woodland landuse. Use specific term where known.

Also recorded was the coverage of this type of landuse expressed as the percentage of identified scowles or groups of scowles, which had a particular type of land-use. More than one type of landuse could be recorded for any one site, and the proportions of this known.

E.vii.vii Other information

In addition to the records outlined above, some additional data was also collected for each 'scowle' record. These were:-

- Date of site visit.
- Previous area numbers (a cross reference to the areas created in the desk-based stage of the survey).
- Photograph number.
- Any extra notes about each scowle, or area of scowles, which the field surveyor felt appropriate. In practice this field was used to record information on the depth of the identified features and the presence of visible mounds, which could indicate the presence of upcast.

In addition, other records were generated, either automatically or by human-input, after the data was collected in the field. This mainly consisted of data that was a requirement of the SMR database, such as records for parish or OS quarter-sheet map number, but also included information of direct value to the survey such as a cross reference to the photograph number of individual scowles or areas of scowles. A number of records that were date specific in the SMR (e.g. landuse, land-owner, field-surveyor) were also entered at this time.

E.viii Photographs

As part of the survey, it was decided to take at least one photograph of each area of scowles that was being recorded. A record of each photograph was made, utilising the GIS by recording each photograph as a point. A number of attributes were recorded for each photograph point;

E.viii.i Photo ID number

This referred to the frame number given by the camera, and provided a cross-reference to the photograph when downloaded at the end of each day.

E.viii.ii Direction

This field indicated one of 16 cardinal points for the direction of the photograph.

E.viii.iii Date

The date on which the photograph was taken.

E.viii.iv Description

A free-text field which allowed surveyors to record any additional information about the photograph.

E.ixInaccessible land

Land that could not be surveyed was recorded as a separate record. This was simply a digitised polygon showing the area of land that was inaccessible for whatever reason. This information allowed the survey team to identify areas, which could not

be accessed to inform planning a programme of surveying these at a more appropriate time. The main constrains on gaining access to land were:-

- Pheasant shooting season, especially within areas of Lydney Park.
- Forestry operations, which rendered an area unsafe.
- Inability to identify or contact landowner to gain permission for access.
- Refusal by the landowner to grant access.

The information was recorded in the GIS as separate polygons, with an attached attribute describing the reason for inaccessibility as a free text field.

E.x Impenetrable land

Impenetrable land was recorded in a similar way to inaccessible land. A polygon was created outlining each area of impenetrability, and a free text field recorded the reason for impenetrability. This was nearly always due to dense vegetation.

This information allowed the survey team to identify areas where dense, summer vegetation impeded access to inform planning a programme of surveying these at a more appropriate time.

E.xiMethods of data capture

E.xi.i Mapped data

Field surveyors mapped areas of scowles, possible scowles and possible destroyed scowles, as well as other information (impenetrable and inaccessible areas and photograph data). This was done in relation to the Ordnance Survey Land-Line data, as well as the results of the desk-based phase of the project.

Surveying teams were able to orientate themselves and locate their position in the field by using the hand-held GPS units provided. They were then able to digitise the spatial data directly onto the hand-held computer with reference to background mapping of OS Land-Line data held by GIS within the hand held computers.

Digitisation was done in the following three ways:-

- Where the feature was accurately marked on the OS Land-Line data, digitisation took place by tracing over the land-line data tightly zoomed-in on the GIS.
- Where accurate GPS signals were received (with an accuracy of less than approximately 6m), features were digitised from points supplied by the GPS. These points were either traced on the GIS, or used in the automatic creation of vertices.
- In areas of dense tree canopy, or where the GPS did not receive an accurate signal for some other reason, features were digitised using offsets and pacing from known features, and these were digitised on the GIS using the GIS's facilities for measuring and calculating bearings.

Photo points, and areas of inaccessible or impenetrable land were digitised in a similar way.

Ordnance Survey 1:25,000 scale paper maps (OS Explorer maps), were also used during the survey. These proved very useful for general orientation within the Forest of Dean and for locating various areas of scowles.

E.xi.ii Text based data added to the project database

It was initially planned that all the spatial and attribute data for each scowle or area of scowles would be recorded on the handheld computer, utilising paper maps only for reference.

Due to technical and time constraints it was not possible to do this at the beginning of the field survey, during which spatial data was recorded digitally on the GIS, and attribute data recorded on paper pro formas (see Appendix F). Thus, although it was possible to upload all spatial data into the project GIS from the outset, it was necessary to manually enter attribute data into the project database for this period.

After this was resolved, it was possible to digitally record both spatial and attribute data on the handheld computer for direct uploading into the project GIS and database.

The use of both manual and digital methods of recording allowed for comparison of the logistics and time effectiveness of both systems to be compared.

The fieldwork was undertaken by two teams, each of these was made up of one Assistant Project Officer and one Archaeological Assistant. Each team was provided with a set of recording equipment. The fieldwork search area was divided into two distinct areas, the eastern outcrop and the western outcrop, with each team responsible for field survey each area.

To ensure consistency of data input and approach, team members were occasionally swapped from one team to the other, depending on work rotas, although the importance of some continuity with team members was noted.

Each team had all appropriate digital data loaded onto their handheld computer before the start of the survey. In addition to this, paper copies of selected maps and source works were provided for use in the field. (see E.i above).

Each field survey area (eastern outcrop and western outcrop) was further sub-divided into 1km^2 grid squares to facilitate monitoring of field survey progress and forward planning.

Downloading of recovered data was undertaken at the end of each working day. This consisted of:-

- Downloading of the GIS spatial and attribute data from ArcPad to a PC, using the supplied cradle and connection. This included the following data:-
  - Scowles (layer *New Scowle*).
  - Photographs (layer *Photo Scowle*).
  - Inaccessible land (layer *Inaccess*).
  - Impenetrable land (layer *Impen*).

  This was kept as a backup copy, and the recorded data left on the handheld device for further work the following working day. This was considered to be a practical method of backing up the data, as well as ensuring that the current data was available on the handheld computer for the surveyors to refer to in subsequent day's surveying. It was, however, dependant upon ensuring sufficient memory space on the handheld computer's storage card.
- Digital photographs were also downloaded on a daily basis. These were downloaded to a secure server, and the images on the camera deleted daily.

E.xii Input of the data into the project database

The project database used during the survey was the Gloucestershire Sites and Monuments Record. This consisted of an Oracle database for the attribute data, and a GIS for the spatial data.

After the survey had been completed, all records were checked to ensure that all the data was present and correct. Any minor editing required was carried out, and the data imported into the relevant database.

After the majority of the fieldwork had taken place (from July to September 2003), data was imported into the relevant databases. Two main sources of data had to be integrated; spatial and attribute data.

E.xii.i Spatial data

The spatial data consisted of a number of ESRI Shapefiles, two for each of the four data types for either the western or the eastern datasets;

- Scowles (layer *New Scowle*).
- Photographs (layer *Photo Scowle*).
- Inaccessible land (layer *Inaccess*).
- Impenetrable land (layer *Impen*).

These were imported into Gloucestershire County Council's GIS.

E.xii.ii Attribute data

The Gloucestershire County Sites and Monuments database was used as the project database. This ensured that:-

- Data was stored in a recognised format, conforming to various national standards.
- The database had powerful search capabilities.
- Project data could easily be incorporated into the main body of the SMR.

Initial attribute data from the field survey of scowles was recorded on paper records (see above), and was manually entered into the SMR database. This proved to be a relatively straightforward task, although it did take a number of days to enter this data. On average it took 10 minutes for each record to be manually entered into the SMR database. Therefore, approximately 45 records could be added in a one person-day. Once attribute data was recorded in digital format, which conformed to the same data structure and standards, and used the same glossaries as the SMR, it was imported directly into the SMR database. As a similar data structure of the attribute data was captured in the field and used in the SMR database, it was possible to transfer the data directly into the SMR database. However, a small amount of data cleaning was required before this could be fully integrated into the SMR. This data cleaning consisted of adding any additional fields that may have been mistakenly left blank in the survey, and changing any obvious errors. This took approximately half a person-day to check about 150 records. When this was complete data could be almost instantaneously imported into the SMR database. However, an amount of database development was carried out to enable this to happen, and although this took approximately half a person-day, it only needed to be done once.

Appendix F **Scowles Survey Record Form**

SCOWLES SURVEY RECORD FORM

Area No.

Scowles Survey 2003	Previous area numbers (if any) ;

1. Area

Map Sheet	Not mapped

Grid reference

E						**N**						**GPS Accuracy (m)**	

Description

Location

Depth Range

2. Site

General Type	*Industrial*
Specific Type	Scowle – Existing Scowle – Possible Scowle – Destroyed
General Period	*Unknown*
Specific Period	*Unknown*

Form 1	Form 2		
Recorded		Scowle Form 1 *(c.f Wildgoose A/F)*	Shallow depressions with or without mounds and with no visible rock exposures.
		Scowle Form 2 *(c.f Wildgoose B)*	Mostly small (less than c. 10m dia) hollows with few (less than c. 50%), or no rock exposures.
		Scowle Form 3 *(c.f Wildgoose B)*	Mostly small (less than c. 10m dia) hollows with frequent (more than c. 50%), rock exposures.
		Scowle Form 4 *(c.f Wildgoose C)*	Mostly large (more than c. 10m dia) hollows or channels with few (less than c. 50%), or no rock exposures. This form tends to contain scowles in excess of 2m deep.
Form 3	Form 4	Scowle Form 5 *(c.f Wildgoose C/E)*	Mostly large (more than c. 10m dia) hollows or channels with frequent (more than c. 50%) rock exposures. This form tends to contain scowles in excess of 2m deep.
		Scowle Form 6 (c.f Wildgoose D)	Large discrete quarry-like scowles with exposed rock faces and little or no apparent connection with adjacent scowles.
		Scowle Form 7	Rock outcrop.

Level of Surveying (tick one box)

	Level 1	No access. Impossible to accurately check Form, Condition or Footprint of scowles or other area of interest: Information retained as per current SMR. The reasons for this limitation should be stated in the Area description
	Level 2	Access limited to boundary of area of interest or perimeter of scowle.– Sight of less than c.50% of internal area of scowle/ground surface
	Level 3	Access limited to boundary of area of interest or perimeter of scowle.-. Sight of more than c. 50% of internal area of scowle/ground surface
	Level 4	Access to area of interest or internal area of scowle. - Sight of less than c. 50% of internal area of scowle/ground surface
	Level 5	Access to area of interest or internal area of scowle - Sight of more than c. 50% of internal area

Date (of site visit)

3. Condition and Damage

Condition	GOOD ☐	VERY BAD ☐
	FAIR ☐	DESTROYED ☐
	POOR ☐	UNCERTAIN ☐

Evidence *Recorded*

Date (of evidence)

Damage by 1;	Damage by 2;	***Damage By***	
Damage Rating	**Damage Rating**	*animal burrowing*	*mineral extraction*
POTENTIAL ☐	POTENTIAL ☐	*arable clipping*	*natural erosion*
SLIGHT ☐	SLIGHT ☐	*arable ploughing*	*no visible damage*
MODERATE ☐	MODERATE ☐	*building work*	*other*
SEVERE ☐	SEVERE ☐	*coastal erosion*	*public utilities*
		collapse	*rain entry*
		demolition	*road construction*
		deterioration as a result of neglect	*rot*
			stock erosion
Damage by 3;	Damage by 4;	*digging*	*storm damage*
		drainage	*vandalism*
Damage Rating	**Damage Rating**	*drying out*	*vegetation*
POTENTIAL ☐	POTENTIAL ☐	*dumping*	*vehicle erosion*
SLIGHT ☐	SLIGHT ☐	*forestry*	*visitor erosion*
MODERATE ☐	MODERATE ☐	*gardening*	*water action*
SEVERE ☐	SEVERE ☐	*info not available*	
		metal detecting	

4. Contacts

Name (field surveyor)

Name (land owner)

Contact details (address and ‘phone number)

5. Land Use

Land Use 1 Description	Land Use 2 Description
Land Use % coverage %	Land Use % coverage %

Land Use Type

allotment
building
built over
churchyard
coastal - above high water
coastal - cliff and related features
coastal - intertidal
coastal - marine
coastal – saltmarsh
coastal - undetermined
cultivated land - cultivation to less than 25 centimetres
cultivated land - cultivation to more than 25 centimetres
cultivated land - minimal cultivation
cultivated land - undetermined
displayed monument
Farmyard
fresh water – running
fresh water – standing
garden
grassland - disturbed
grassland - heathland
grassland - regularly improved
grassland - undetermined
grassland - undisturbed
grassland - with less than 10% low bushes
grassland - with less than 10% mature trees
land boundary
mineral extraction
natural formation
orchard
other
other - airfield
other - car park
other - refuse dump
other - village green
parkland
recreational use
scrub
thoroughfare
verge
waste ground
wetlands
woodland 8 - coniferous, canopy cover under 65%
woodland 4 - coniferous, canopy over 65%
woodland 2 - deciduous introduced, canopy cover over 65%
woodland 6 - deciduous introduced, canopy under 65%
woodland 5 - deciduous native, canopy under 65%
woodland 1a - deciduous native, immature, canopy cover over 65%
woodland 1 - deciduous native, mature, canopy cover over 65%
woodland 9 - deciduous undetermined
woodland 7 - mixed coniferous and deciduous, canopy cover below 65%
woodland 3 - mixed coniferous and deciduous, canopy cover over 65%
woodland - undetermined

6. Photo

Photo frame no(s)	**Photo date**

Appendix G Detailed methodology of the desk-based research on possible bloomery sites

G.i Data Sources

The following data sources were consulted.

G.i.i Sources already examined by the Forest of Dean Archaeological Survey

The Gloucestershire County Sites and Monuments Record was used as the project database in accordance with the specifications set out in the project design (Hoyle 2002, 4.6.1). This already contained some limited information on selected possible bloomery smelting sites and cinders mounds, which had been accessed from a variety of sources. Existing SMR information was integrated with new data collected as part of the project.

G.i.ii Text data at the Archaeology Service, or obtained through inter-library loan.

- Walters B, 1992 The Forest of Dean Iron Industry – Dean Archaeological Group Occasional Publication No.4. This source was used to identify the general location of selected known bloomeries and cinders mounds within the Forest of Dean survey area.
- National Monuments Record Long Listings for the survey area. This source was used to identify the location of selected bloomeries and cinders mounds.
- The Gloucestershire and District Archaeological Research Committee card index of sites. This source was used to identify the location of selected bloomeries and cinders mounds.
- The Victoria County History of Gloucestershire vol. V, 1996 The Forest of Dean. This source was used to identify evidence for the location of bloomeries and cinders mounds. This source also provided landscape and landuse information to identify the sites of bloomeries or cinders mounds which were no longer visible.
- Hart C, 1971 The Industrial History of Dean. This source was used to identify evidence for the location of bloomeries and cinders mounds and also evidence for the location of these sites, which were no longer evident.
- Hart C, 1983 Coleford: A History of a West Gloucestershire Town. This source was used to identify evidence for the location of bloomeries and cinders mounds and also evidence for the location of these sites, which were no longer evident.
- Hart C, 2002 The Free Miners Of The Royal Forest Of Dean And Hundred Of St Briavels. This source was used to identify evidence for the location of bloomeries and cinders mounds and also evidence for the location of these sites, which were no longer evident.
- Nicholls HG, 1966 Nicholls' Forest of Dean – single volume compilation of:-
  - Nicholls HG, 1858 The Forest of Dean: an historical and descriptive account.
  - Nicholls HG, 1866 Iron making in olden times.

These sources were used to identify evidence for the location of bloomeries and cinders mounds and also evidence of the location of these sites, which were no longer evident.

The following text sources, not specified in the project design were accessed. These are listed here as they added information of direct value to the desk-based phase of the project:-

- Maclean J, 1877-78. Observations on the Iron Cinders found in the Forest of Dean and its neighbourhood in *Transactions of the Bristol and Gloucestershire Archaeological Society 1877-1878.*
- Jenkins R, 1925. Notes from the Iron Making in the Forest of Dean (read at the Iron and Steel Institute, November 18th, 1925) in *Newcomen Society Transactions Vol VI 1925-6, 42-65.*
- Ian Pope's notes on *post-medieval Exploitation of Cinders* GRO D9096
- Harris F.H. Notes from an article included in a scrapbook of news cuttings *The Forest of Dean-Mr F.H. Harris's Interesting Lecture* GRO D3921/II/43
- Rider T.A Rev, Notes from an untitled article included in an A5 scrapbook of news cuttings GRO D3921/II/43
- Nicholls HG, 1860. Notes from The Ancient Iron Trade of the Forest of Dean, Gloucestershire in *Archaeology Journal 1860 Vol 17 227-39*
- Cooke A, 1913.Notes from *The Forest of Dean*
- Johnson BLC, New Light on the Iron Industry of the Forest of Dean in *Transactions of the Bristol and Gloucestershire Archaeological Society 72, 1953, 129-143*
- Hart C, 2000. Verdict of the Three Foreign Hundreds in the Forest of Dean (*c.*1244) *New Regard 15 63-67*
- Jenkins R, Iron making in the Forest of Dean in *Newcomen Society Transactions Vol VI 1925-6*
- MacLean Sir J, 1876.On the Manor Advowson and Demesne Lands of English Bicknor, Co of Gloucester in Transactions of the Bristol and Gloucestershire Archaeological Society 1876

G.i.iii Index searches made on the following journals for references to bloomery smelting sites

- The Transactions of the Bristol and Gloucestershire Archaeological Society.
- The Journal of the Dean Archaeological Group, Dean Archaeology.
- The Journal of the Forest of Dean Local History Society, The New Regard of the Forest of Dean.

These sources were used to identify evidence for the location of bloomeries and cinders mounds, and evidence, which may locate the sites of recorded bloomeries or cinders mounds, which may no longer be evident. These sources may also provide landscape and landuse information, which may help locate, features which are no longer evident.

G.i.iv Map data held at Gloucestershire County Council Archaeology Service

- Gloucestershire County Sites and Monuments Record mapped information forming a layer within the Gloucestershire County corporate GIS and supporting database. *This source was used to identify the recorded location of selected bloomeries and cinders mounds. It was updated throughout the project and acted as the principal database and mapping record for the project.*
- Scanned raster images of the 1st, 2nd and 3rd edition 1:2500 OS maps dating from *c.*1880, *c.*1901 and *c.*1923 respectively and held as part of the Gloucestershire County Council corporate GIS. *These sources were used to identify the location of selected bloomeries and cinders mounds and placename evidence for the location of these features. These sources also provided landscape and landuse information, which helped locate, features which are no longer evident.*
- Rectified copies of early 19th century parish maps (generally based on tithe award maps but other maps from the period are also used) at 6" to 1 mile scale. *This source was used to identify placename evidence for location of possible bloomery sites or cinders mounds. This source also provided landscape and landuse information, which helped locate, features which are no longer evident.*

- Isaac Taylor 1” to 1 mile scale map of Gloucestershire – published in 1777. *This source was used to identify placename evidence for location of bloomeries and cinders mounds.*

G.i.v Text sources held by Gloucestershire County Record Office

- 18th and early 19th century parish histories:-
  - Atkyns R, 1712 The Ancient and Present State of Gloucestershire.
  - Rudder, 1778 A New History of Gloucestershire.
  - Rudge, 1803 History of the County of Gloucestershire.

  These sources provided occasional written information on the location of selected bloomeries and cinders mounds and placename evidence for the location of these. They also provided landscape and landuse information, which helped locate, features which are no longer evident.

- The following documents from Gloucester County Record Office were searched:-
  - Field observations between Severn and Wye, Scott-Garrett and Harris 1932 (AR21).
  - 'Strigulensia' – notes on remains between Severn and Wye, Ormerod 1841 (R.O.L G5).
  - The Kings Iron Works in the Journal of the Iron and Steel Institute 1953, Vol 173 (FD8).
  - A true narrative concerning woods and iron works in the Forest of Dean dated 1670 (D3921/I/43).
  - Inventory of His Majesty's Iron Works 1635 (D 421).
  - Ramblings of a Dean Archaeologist, Notebooks of Scott Garrett (D3921/II/41).

  These sources provided occasional written information on the location of selected bloomeries and cinders mounds and placename evidence for the location of these. They also provided landscape and landuse information, which helped locate, features which are no longer evident.
- At least six documents relating to the exploitation of Cinders Mounds in the 19th and early 20th centuries transferred to Gloucestershire County Record Office from the Public Record Office (GCRO Document - D91096). *These sources were used to provide written information on the former location of cinders mounds, which are recorded as having been removed.*

G.i.vi Map sources held by The Wilderness Field Study Centre at Mitcheldean

The following sources were loaned to the Archaeology Service by the Wilderness Field Studies centre and were examined at Shire Hall, Gloucestershire.

- Bromide copy of 1608 map of the Forest of Dean (PRO document MR 879).
- Bromide copy of 1680/late C18th map of the Forest of Dean.
- Map of the Forest of Dean at *c.* 1:25,000 scale dated 1848.
- Bromide copy of map of Blakeney Walk dated 1757 (not found in Gloucester Record Office).
- Bromide copy of Plan of the Forest of Dean of 1782.

These sources provided some mapped information on the location of selected bloomeries and cinders mounds and placename evidence for the location of these. They also provided landscape and landuse information, which helped locate, features which are no longer evident.

G.i.vii Aerial photographs and information based on aerial photographic sources

- Monochrome vertical prints taken by Fairey Surveys for the Forestry Commission in May 1975 at a scale of 1:10,000 and held by the Wilderness field study centre.
- Monochrome vertical prints taken in 1982 at scale 1:3000 (with a flight plot at scale 1:120;000) and held by the Forestry Commission.
- Colour vertical prints held as a layer in the Gloucestershire County Council corporate GIS. There are supplied by *getmapping.com.*
- A number of aerial photographic sources were examined as part of the National Mapping Programme, undertaken by staff at the National Monuments Record in Swindon. As part of NMP, which identifies and records all archaeological sites and landscapes visible on aerial photographs, areas of the Forest of Dean within the Aggregates Resource Area were targeted as a priority.

Aerial photographs and aerial photographic information were used to provide the following information:-

- *Location and extent of bloomeries and cinders mounds visible from the air when photographs were taken.*
- *Landuse information.*
- *Evidence of the former presence of bloomeries and cinders mounds where these features are no longer evident.*

Although the full digitised results of the National Mapping Programme were not available as part of the Desk-based stage of the project, paper copies of the relevant maps were obtained and information from them added to the project database.

G.i.viii Map sources held by Gloucestershire County Record Office

Selected copies of unpublished maps held by Gloucestershire County Record Office, and which pre-dated the rectified 6" to 1mile scale 19th century parish maps (above). The following maps were accessed:-

Area mapped	Date	Reference
Alvington & Aylburton	1675	GRO D.421 14
Newland, St Briavels, Hewelsfield & Woolaston	C17	GRO 501
Alvington & Aylburton	1675	GRO D.421 14
Map of Estates of Lord Gage (Staunton Coleford area)	1792	GRO PC23
Whitemead Park	1804	GRO 412.5
Newland	1810	GRO D637 II/1/T1

These sources were accessed as copies were held by Gloucestershire County Council Archaeology Service

These sources provided some mapped information on the location of selected bloomeries and cinders mounds and placename evidence for the location of these. They also provided landscape and landuse information, which helped locate, features which are no longer evident.

G.i.ix Sources not examined

The following were identified as potential data sources in the project design (Hoyle 2002) but were not available for examination as part of the desk-based phase of the project:-

- Unpublished PhD Thesis "The development of the rural landscape in west Gloucestershire *c.* 1550-1800" Richard Newman, Cardiff University 1988.
- Unpublished MA thesis "Forest in 17th century" held by Gloucestershire County Records Office. This source may have been mis-catalogued and could not be located.
- Colour vertical prints taken in 1999 and 2000 at a scale of 1:10000 for the Countryside Commission and curated by Gloucestershire Wildlife Trust. This source was not available for long–term study due to copyright reasons, and it was felt unlikely to significantly add information not already available from other sources.
- No sources held by Gloucestershire Local History Library were consulted as a rapid search of their catalogues did not identify any appropriate sources not already accessed from elsewhere.

G.ii Collation of the data and analysis to influence fieldwork

G.ii.i The project database and GIS

The Gloucestershire County SMR was used as the project database. Existing records retained their unique reference number and new sites were simply added to the existing SMR database and allocated a number within the normal sequential SMR numbering system. Each record was also added to an Excel table, indicating the area number, a brief description of the site, grid reference and whether the site was added to the "*cinders*" GIS layer (see below).

Newly identified sites were digitised either as points or polygons on the normal SMR layer within the SMR (*SMRcnty*), and all 'cinders' sites were also copied onto a dedicated project layer (c*inders*) within the GIS.

G.ii.ii Data Collection and integration into the project database

Data about the location and extent of former bloomeries and cinders mounds and integration of that data into the project database (the Gloucestershire County SMR) was undertaken in the following ways.

G.ii.iii Information already held by the Gloucestershire County SMR

The first phase of data collection consisted of examining existing records held within the Gloucestershire County SMR, which contained references to bloomeries, cinders, or early iron working sites within the search area. All such records were checked to ensure that they conformed to current Gloucestershire County Council SMR standards and were fully searchable, to allow analysis to be undertaken in further phases of the project. This information formed the base line data to which further data about cinders mounds and bloomeries could be added.

G.ii.iv Other text and map sources

References to the following were recorded from each source work:-

- Iron working sites, which pre-dated the industrial revolution.
- Iron processing sites which pre-dated the industrial revolution.

- Possible bloomery sites.
- Cinders mounds
- Records of slag, which did not clearly post-date the industrial revolution.

New information on existing sites (i.e. those already recorded on the Gloucestershire County on the SMR) was added to the existing SMR entry, and the digitised GIS data amended as appropriate.

Where new sites were identified, a new SMR entry was created, the relevant area was digitised both on the County SMR layer (*SMRcnty*) on the project GIS layer (*cinders),* and the relevant data added to the possible bloomery smelting sites Excel table (see above).

For each site, the most appropriate monument type was chosen from the glossary within the SMR database (based on English Heritage's Thesaurus of Monument Types). Monuments Types are:-

Iron Working Site – site used for the production and/or working of metallic iron.

Slag Heap – a spoil heap consisting mainly of slag, pieces of refuse material separated from a metal during the smelting process. Use for cinders mounds.

Findspot – (Artefact – Slag) – isolated slag finds.

Mound – mound of undetermined function/origin, but which *might* be a cinders mound.

Shaft Furnace – a furnace constructed as a shaft with the fire at the bottom and the fuel and ore added from the top.

Possible bloomery – a charcoal fired shaft furnace used for the direct reduction of iron ore to produce wrought iron.

Field Name – e.g. name of field indicating the presence of bloomeries, cinders mounds or other early iron industry site.

Placename – e.g. 'Cinderford'.

G.ii.v Less locatable possible bloomery smelting data

A number of references within source works could not be located with any degree of precision. Where this occurred the information was recorded in the following ways:-

If the general location of the site was known, this was added to the SMR in the usual way, but not digitised on the GIS in accordance with normal Gloucestershire County SMR practice. A note was included within the SMR entry to indicate that the site was not mapped. Where more general information about the early iron industry could not be located at all, the information was summarised within a document dedicated to each source work, and listing information relevant to the project (See Appendix Q).

Appendix H Possible bloomery sites: Detailed methodology

H.i Equipment taken into the field

The following equipment was taken into the field:-

- Handheld GPS unit to assist in locating sites.
- 8m hand tape.
- 30m tapes.
- Finds bags.
- Compass.
- Digital camera.

H.ii Data to be taken into the field

The following information was taken into the field:-

- 1:10000 scale OS map, of the relevant site.
- OS Land-Line map of the relevant area at 1:6000 scale. This was generated from the project GIS.
- Paper print-out of the SMR database record of the site, which had been either created or augmented as part of Phase 10 of the survey.
- 1:25000 OS map of the Forest of Dean to facilitate navigation to the site and orientation within it.

H.iii Data to be captured in the field

Field survey consisted of checking the information, which had already been added to the SMR during the desk-based phase and recording new data about the land-use and condition of sites. This was undertaken even where field survey did not record direct field evidence for possible bloomery smelting.

The following attributes were recorded:-

H.iii.i Features visible within the area

A record was made of any visible earthworks associated with the site. These were classified as:-

- Linear features
  - Bank
  - Hollow
  - Ditch
  - Terrace
  - Other
- Discrete features
  - Mound
  - Hollow
  - Pit
  - Platform
  - Other

A record was also made of the principal dimensions of recognised features.

H.iii.ii Artefacts

A record was made of any artefacts recovered form the site. These were classed into the following types:-

- Slag (further sub-divided into possible bloomery furnace slag / furnace lining slag, tap slag / smithing slag or blast furnace slag)
- Pottery
- Tile
- Other

H.iii.iii General description / sketch

A general description of the site was made, and, if appropriate, a sketch was made.

H.iii.iv Landuse

Landuse was recorded to the same specification as the field survey of scowles (see above).

This categorised landuse from a standard wordlist of Landuse, derived from the REP93 Landuse wordlist, the agreed national standard by English Heritage Data Standards Unit (FISH 2001).

H.iii.v Condition and Damage

The condition of each site was recorded, together with recognised damage rating to the same specifications as those used as part of the field survey of scowles (see above).

The following criteria were applied to the recording of condition:-

- Condition was recorded as “Good” where the site displayed no visible damage, (such as sites under grassland). No attempt was made to assess the survival or condition of buried archaeological deposits.

H.iii.vi Level of surveying

A record of the level of surveying was made to assess the amount of access and visibility of each site. This categorised each site, using the following six levels:-

Table 59: Bloomery survey levels criteria

Level of Survey	Description
Level 1	No access. Information retained as per current SMR. The reasons for this limitation should be stated in the Area description.
Level 2	Access limited to boundary of area of interest - Sight of less than *c.*50% of area of possible site.
Level 3	Access limited to boundary of area of interest or perimeter of scowle.-. Sight of more than *c.* 50% of internal area of scowle/ground surface Access limited to boundary of area of interest - Sight of more than *c.* 50% of area of possible site.
Level 4	Access to area of interest - Sight of less than *c.* 50% of area of possible site.
Level 5	Access to area of interest - Sight of more than *c.* 50% of area of possible site.
Level 6	Access to area of interest - Sight of more than *c.* 50% of area of possible site, and conditions suitable for surface artefact search.

H.iii.vii Contacts

There were two main contacts recorded in the field survey:-

H.iii.viii Field Surveyor

The name of the field surveyor and the organisation they represented (Gloucestershire County Council Archaeology Service) was recorded.

H.iii.ix Landowner

Where known, the name, address and telephone number of the landowner was recorded. This information has been stored within the Gloucestershire County Sites and Monuments Record in accordance with Gloucestershire County Council policies of the implementation of the Data Protection Act.

H.iii.x Spatial records

Where appropriate, the mapped records for each site were checked in the field and updated to reflect the position and extent of the site. This was undertaken in the field by annotating the paper maps generated from the project database. Locational information was derived from a combination of GPS signals or, where this proved to be unusable (for example under dense tree canopy cover), pacing and offsets were used to locate sites.

H.iii.xi Other information

In addition to the records outlined above, some additional data was also collected for each site of possible bloomery or cinders mound. These were:-

- Date of site visit
- SMR number of the site
- Grid reference
- Ordnance Survey quarter-sheet map number.

H.iii.xii Photographs

A digital photograph was taken of every site visited. For each of these a number of attributes were recorded;

H.iii.xiii Photo ID number

This was the frame number of the photograph generated by the camera.

H.iii.xiv Direction

This field indicated one of 16 cardinal points for the direction of the photograph

H.iii.xv Date

The date at which the photograph was taken.

Appendix I Input of the data into the project database: Discussion of the methodology

I.i Desk-based survey

I.ii Process of data collection and assimilation

The process of data collection and assimilation was undertaken in accordance with normal archaeological procedure (IFA 1999) and no obvious recommendations could be made to improve

The process of investigating the locationally-based source works (see above) and assimilating this data into the project database before expanding this dataset by accessing more general records allowed the search area to be divided into discrete areas, enabling team members to work simultaneously on different geographical areas without any danger of replication of effort or duplication of records.

Recommendations

It is recommended that general methodologies adopted for this survey are utilised in similar surveys undertaken in the future.

I.iii Field survey

With the exception of the survey of identified bloomery sites within the Aggregates Resource Area, fieldwork mainly used a digital approach to field recording, which had the following benefits over a more traditional paper-based approach:-

- Efficiency of data capture.
- Integrated approach resulting in less manual transfer of data and loss of quality.
- Less time spent inputting data.
- Ability to carry lots of data / mapping in the field.
- Less staff needed in the field, especially if less reliance on paper maps can be
- achieved (i.e. less to carry).
- Use of local SMR and national archaeological data standards meant that the records are more easily integrated into other databases, and information shared.

The major benefit was in achieving a faster and more efficient survey, combined with better integration of the project results with the County SMR .

As the initial phase of field work used a combination of paper and digital recording before a wholly digital recording strategy was realised, we were able to compare the two approaches and assess the effectiveness and efficiency of using a digital methodology.

The savings in integrating the data into the project databases are set out in Appendix D.xi. However, there were also benefits in carrying out fieldwork. When a paper and digital approach was initially undertaken, it took two people approximately four minutes to record one scowle record, using the paper forms and the handheld computer for digitising. However, when the recording was carried out entirely digitally, the recording process only effectively took one person about five minutes. The entirely digital approach to recording also had an appreciable benefit in terms of the amount of equipment which needed to be taken into the field, and the weather conditions in which work was possible.

I.iv Fieldwork limitations and problems

The following limitations and problems were identified:-

- Due to the timescale constraints of the project, fieldwork had to take place in July, August and September 2003. At this time vegetation and woodland growth was at its highest and a number of areas studied were either impenetrable or archaeological features were obscured. Practical experience and discussions with other archaeological woodland surveyors has indicated that the optimum time for field survey in woodland is in the late winter, particularly January, February and March.
- It was necessary to identify and contact landowners to gain access for the field survey. There is no central database of landowners and the process adopted was to make enquiries at local properties, generally the nearest farmhouse. Although earlier field surveys have identified this method as the most efficient (Hoyle & Vallender 1997), it was time consuming, and all future projects of this nature must ensure that sufficient time is factored in to their fieldwork programme to allow for this. Although this was time consuming there was an additional benefit during the survey of possible bloomery sites in that surveyors were able to ask landowners if they were aware of any possible bloomery or cinders sites, or knew of any slag finds on their land. Often farmers were able to tell if any slag had been noticed during ploughing, leading to some additional slag findspots which had not been identified during the desk-based stage of the project. Future projects of this nature should put greater emphasis on contacting a wider range of landowners and making enquiries about their knowledge of relevant artefacts from their land.
- Two-person teams working at each location was relatively inefficient in terms of person time, especially when most of the mapping and attribute data collection was carried out digitally. The rationale, and over-riding consideration, for this arrangement, however, was to ensure safe working practise as the terrain at many scowles locations consists of steep rock-face drops and uneven surfaces, and lone working was not considered safe in these conditions.
- At the beginning of the survey, when the mapping was carried out digitally and attribute data recorded on paper (see Appendix F) recording tasks could be efficiently split between two individuals by one team member creating the digital map record, and the other the paper record. Two–person field survey teams also allowed for:-
    - Wider archaeological judgement and opinion in the field.
    - Assistance in carrying equipment.

Once all data was recorded digitally it was more efficient, however, for a single individual to undertake all the recording, and this is thought to outweigh the slight logistical benefits of a two person team.

The Health and Safety benefits of two-person teams, however, are the over-riding consideration in the planning of any future projects of this kind, although it may be possible to combine these with the relative efficiency of a single fieldworker by undertaking the fieldwork in one of the following ways:-

- Teams of two with two hand-held computers:-
    - Fieldworker 1 would undertake all digital mapping.
    - Fieldworker 2 would undertake digital database recording and be responsible for all photography. This task could be swapped between team members as appropriate.

- Individual fieldworkers operating in close proximity to each other and maintaining regular contact. This methodology would require additional organisation to ensure clear demarcation of survey area to prevent duplication of effort.

The above methodologies have equal benefits in terms of sharing travel costs, and equal disadvantages in terms of extra equipment needed for the field survey (although, the second possible method would require an extra digital camera).

I.v Technical limitations and problems

- Digitising in the field using hand-held computers was not wholly accurate, with a tendency towards drawing polygons slightly larger than the features being recorded. This, however, is a product of the level of field survey, which was consistent with English Heritage levels 1 to 2 (Bowden 1999), and measurement systems adopted, rather than an intrinsic problem of digital recording. The level of error is likely to be uniform across the whole survey and will not therefore impact on the validity of any statistics generated. It is also insignificant in terms of any record of the location and extent of these features for management purposes.
- It is necessary to ensure that enough time is factored into the project timetable for the technical set-up of the relevant maps, data and glossaries for use in the field on the handheld computers. This would include both work on the set-up of the GIS, but also time to order any necessary equipment. For this survey, the ordering of equipment took approximately three days, and the set-up time for getting attribute and spatial data from the relevant databases to the handheld computers was approximately five days. These times were mainly due to complex ordering processes, and use of a GIS, which was not easily compatible with many modern GIS's. So although much of the time taken for set-up of the equipment was due to antiquated processes and software implemented by Gloucestershire County Council, there needs to be consideration of the time it takes to integrate any data-sets from large databases to handheld computer GIS applications.
- Although most sources of data that were needed by the surveying teams were available on the handheld computers (enabling a lightweight and waterproof package to be put together, suitable for most environments), not all data could be put onto the handheld computer in a useable format. This meant that some files of paper records were required, affecting the speed and number of people needed to carry out the survey. This was the case with the Area Description records (see Appendix E.i) from the desk-based survey, which were available as either a slightly difficult to access document on the handheld computer, or a paper record. A method of alleviating this problem may be to carry out more technical work on customising the GIS and associated databases.
- Although all recording was digital, field teams felt it was beneficial to carry paper maps, often at a variety of scales – e.g. 1:25000, 1:10000, for orientation purposes.
- Further technical work on the project database and GIS would have been beneficial in the following areas:-
    - Automatic generation of the date (and time), would have improved the data quality and accuracy.
    - New scowle records that were created were numbered, with the numbers derived from a paper list. The facility for automatic numbering within the hand-held computer would have avoided the possibility of number replication and unnecessary paperwork.
    - A number of fields within the SMR database (e.g. Parish) were not necessary to meet the needs of the project, but were mandatory for that database. A number of these fields could be automatically generated from other spatial data sources. For example, when an area is digitised, its parish and Ordnance Survey map sheet could be calculated by a simple spatial query. Likewise, a grid reference could be calculated by examining the centre point

of the scowle. Strategies for automating the completion of these fields would save time in the field.

- The recording system set up on the handheld computers allowed only one type of land-use to be recorded for each SMR area. The ability to record more than one category of landuse would improve the accuracy of the field survey data.
- The records that were created for *Damage By* and *Damage Rating* were derived from glossaries constructed in-house by members of the project team (see E.vii.ii and E.vii.iii). Discussion took place within the wider archaeological community (via the FISH and SMR-Forum email lists), and glossaries were drawn up, based on work by English Heritage, The National Trust and Gloucestershire County Council Archaeology Service. However, it was commonly agreed that there was a need for national data standards for this type of archaeological recording.
- Within the set-up of the GIS on the handheld computers, there was only limited automatic validation of data entered. For example, some fields could be left blank, and others (which were not glossary led) could be entered incorrectly. Further automatic validation would ensure improved accuracy of the database
- When the attribute data for each scowle was uploaded to the main project database at the end of each day, the images and their attributes (e.g. date, direction, comments) were stored in a separate database, limiting cross-referencing and use of images (and image attributes). This could be made more efficient by developing both the SMR and the importing of data to it, as well as developing the handheld computer GIS recording strategy.

I.vi Use of the Gloucestershire County SMR as the project database

The decision to use the Gloucestershire County Council Archaeology Service's Sites and Monuments Record as a database for recording the location and attributes of all recognised archaeological features was made early on in the project. The use of this database, however, had the following limitations:-

- The digitisation of spatial areas within the Gloucestershire County Council GIS was not straight-forward or easy. This was mainly due to the limitations of the GIS software used by Gloucestershire County Council, meaning digitisation was not simple or quick.
- The SMR database was not designed as a small project database, and could be unnecessarily cumbersome. In order to comply with current SMR data standards it was necessary for the project team to record some categories of information (e.g. parish), which were not absolutely necessary to meet the needs of the project. This made the process of digitising the attribute data about the scowles a slightly more lengthy process than would have been necessary with a smaller project database. Also, use of the County SMR as a project database meant that during the analysis phase many database queries and filters needed to be constructed for a simple analysis.
- Although use of the SMR had great advantages (see below), it also made the process of recording the attribute data about the recognised sites more lengthy (for example, to comply with the SMR standards, the inclusion of certain fields was mandatory (such as parish), and these may not have been included in a smaller project database).
- Use of the County SMR as the project database made it difficult to record information which may have been relevant to the project, but was not information normally recorded on the SMR (e.g. information indicating levels of uncertainty in the evidence). Separate tables, stored as part of the project archive, were compiled to record information of this type *(*see Appendix M, Appendix N, Appendix O, Appendix P, Appendix R, Appendix V).

These limitations were outweighed by the following advantages in using the County SMR as the project database:-

- It allowed for full use of, and integration of relevant information already within the SMR.
- It ensured that all records were formed in a logical way that complied with current MIDAS recommendations (MIDAS 2002).
- It ensured that the process of transferring detailed scowles information from the project database to County SMR could be achieved in a rapid and efficient manner, without any degradation of data quality.

I.vii Recommendations for future use of the SMR

It is recommended that any future project of this type should factor in both time and resources for:-

- Improvements to the SMR database could take place that allow for:-
    - More efficient integration of data from small projects into the SMR.
    - More efficient transfer of data from project datasets to and from the SMR.
    - Greater facility to record levels of uncertainly for the interpretation of identified sites.

This would greatly improve the use that projects can make of the SMR and also allow the SMR to better integrate the data from such surveys or projects.

After all sites had been visited the information derived from the survey was manually entered into the relevant records in the project database (the County SMR) from the paper records.

Appendix J Hardware and software for field survey

J.i Hardware

J.i.i Handheld computer (PDA)

The main platform for recording field data was the Compaq / HP iPAQ, running the Windows CE operating system. A Windows CE approach was used primarily because we wanted to use ESRI's ArcPad software, which only runs on the Windows CE platform (see below). Also, these devices were familiar to some of the users and had good integration with PCs used in the office.

The Compaq iPAQ has a clear screen with good visibility on outdoor conditions, relatively fast processor and is expandable with different storage and battery options. In initial testing, the battery life was considered relatively short (users would need to re-charge after less than a day in the field), so an additional expansion pack was added to the handheld computers which extended their battery and also greatly increased their storage capabilities (essential for the storage of much background mapping).

The specifications were;

2 x Compaq / HP iPAQ's with extra battery capacity.

1 x iPAQ H3970. 48MB ROM / 64 MB RAM.

1 x iPAQ 3660. 16MB ROM / 64MB RAM.

2 x 256MB Compact Flash cards (for data storage)

J.i.ii Garmin GPS

Positional information was provided partly by use of handheld GPS units. These were linked to the handheld computer, to give locational information whilst recording features in the field. The Garmin eTrex Venture GPS unit was used as it was relatively inexpensive, compact, had a clear screen capable of displaying the satellite status and position on one page, and was relatively economical on battery life.

J.i.iii Connection and case

The handheld computers and GPS devices were connected by a simple wire connecting the iPAQ's connection port to the GPS unit. Both of these were put into a single waterproof, transparent case, manufactured by a company called Aquapac, which was constructed of a particular transparent plastic which enabled the stylus to be used on the screen for input of data.

J.i.iv Digital cameras

It was decided that a photographic record of each site was to be made. Digital photographs were deemed the most appropriate, as they were relatively inexpensive and easy to view as soon as they were taken. To make sure the photographs were of a high quality, 4 and 5 megapixel cameras were assessed, and the model chosen was the Minolta DiMAGE F300 as it was compact, lightweight and produced relatively high quality images.

J.ii Software

One of the project goals was to investigate the use of mobile data capture in archaeological field recording. Although there are a few mobile GIS platforms for handheld computers available, the project investigated two of the main suppliers of GIS available on handheld devices, namely Pocket GIS and ESRI ArcPad. Both were customisable to varying degrees and both able to display OS Land-Line background mapping as well as capture new data from field input. However, ArcPad is more dynamically programmable in the field, able to display richer symbologies for points, lines and polygons, better integration of attribute data as well as a slightly better user interface and a much better integration to ESRI's ArcGIS desk-top products. These features made ArcPad worthy of being assessed in-depth during the course of the survey.

Appendix K Bloomery Survey Record Form

BLOOMERY SURVEY RECORD FORM

Area No.

1. Area

Map Sheet	Not mapped

Grid reference

E						N						GPS Accuracy (m)	

2. Features visible within area

Linear		Height	Length	Depth	Width	Lower step	Upper step
Bank							
Hollow							
Ditch							
Terrace							
Other							

Discrete		Height	Length	Depth	Width	Lower step	Upper step
Mound							
Hollow							
Pit							
Platform							
Other							

3. Artefacts

Type		Description	Retained?
Slag		[Bloomery Furnace Slag / Furnace Lining Slag] – [Tap Slag / Smithing Slag] – [Blast Furnace Slag]	
Pottery			
Tile			
Other			
Other			

4. General description/sketch (if appropriate)

5. Land Use

Land Use 1 Description	Land Use 2 Description
Land Use % coverage %	Land Use % coverage %
Land Use 3 Description	Land Use 4 Description
Land Use % coverage %	Land Use % coverage %

6. Condition and Damage

Condition of whole site	GOOD ☐	VERY BAD ☐
	FAIR ☐	DESTROYED ☐
	POOR ☐	UNCERTAIN ☐

Evidence *Recorded*

Date (of evidence)

Damage by 1;	**Damage by 2;**	**Damage by 3;**	**Damage by 4**;
Damage Rating	**Damage Rating**	**Damage Rating**	**Damage Rating**
POTENTIAL ☐	POTENTIAL ☐	POTENTIAL ☐	POTENTIAL ☐
SLIGHT ☐	SLIGHT ☐	SLIGHT ☐	SLIGHT ☐
MODERATE ☐	MODERATE ☐	MODERATE ☐	MODERATE ☐
SEVERE ☐	SEVERE ☐	SEVERE ☐	SEVERE ☐

7. Level of surveying

	Level 1	No access. Information retained as per current SMR. The reasons for this limitation should be stated in the Area description
	Level 2	Access limited to boundary of area of interest - Sight of less than c.50% of area of possible site
	Level 3	Access limited to boundary of area of interest or perimeter of scowle.-. Sight of more than c. 50% of internal area of scowle/ground surface Access limited to boundary of area of interest - Sight of more than c. 50% of area of possible site
	Level 4	Access to area of interest - Sight of less than c. 50% of area of possible site
	Level 5	Access to area of interest - Sight of more than c. 50% of area of possible site
	Level 6	Access to area of interest - Sight of more than c. 50% of area of possible site, and conditions suitable for surface artefact search

8. Contacts

Name (field surveyor)

Name (land owner)

Contact details (address and ‘phone number)

9. Photo

Photo frame no(s)	**Direction**	**Photo date**

10. Date

Date (of site visit)

Bloomery Survey – additional information

Damage By

animal burrowing
arable clipping
arable ploughing
building work
coastal erosion
collapse
demolition
deterioration as a result of neglect
digging
drainage
drying out
dumping
forestry
gardening
info not available
metal detecting
mineral extraction
natural erosion
no visible damage
other
public utilities
rain entry
road construction
rot
stock erosion
storm damage
vandalism
vegetation
vehicle erosion
visitor erosion
water action

Land Use Type		
allotment	garden	waste ground
building	grassland - disturbed	wetlands
built over	grassland - heathland	woodland 8 - coniferous, canopy cover under 65%
churchyard	grassland - regularly improved	**woodland 4 - coniferous, canopy over 65%**
coastal - above high water	grassland - undetermined	woodland 2 - deciduous introduced, canopy cover over 65%
coastal - cliff and related features	grassland - undisturbed	woodland 6 - deciduous introduced, canopy under 65%
coastal - intertidal	grassland - with less than 10% low bushes	woodland 5 - deciduous native, canopy under 65%
coastal - marine	grassland - with less than 10% mature trees	woodland 1a - deciduous native, immature, canopy cover over 65%
coastal - saltmarsh	land boundary	woodland 1 - deciduous native, mature, canopy cover over 65%
coastal - undetermined	mineral extraction	woodland 9 - deciduous undetermined
cultivated land - cultivation to less than 25 centimetres	natural formation	woodland 7 - mixed coniferous and deciduous, canopy cover below 65%
cultivated land - cultivation to more than 25 centimetres	orchard	**woodland 3 - mixed coniferous and deciduous, canopy cover over 65%**
cultivated land - minimal cultivation	other	woodland - undetermined
cultivated land - undetermined	other - airfield	
displayed monument	other - car park	
farmyard	other - refuse dump	
fresh water - running	other - village green	
fresh water - standing	parkland	
	recreational use	
	scrub	
	thoroughfare	
	verge	

Appendix L Evidence for the dates of scowles

Date given in reference	Description	Reference	Comment on date
Pre-Roman	Billon of the Coriosolites, found *c.*1944, Scowles, Bream, Lydney, and in the collection of Lord Bledisloe.	Glos SMR 5141.	Exact findspot unknown.
Roman	Walters refers to '…the prolonged period of iron production during most of the first four centuries AD.' He also states that '…most of the local outcrop deposits around Perrygrove and in Great Lambsquay Wood had been worked out during the second century and had been abandoned.'	Walters 1992a, 84.	
Roman	The Delves at Wigpool lie very near *Ariconium* (Roman iron-working site at Weston-Under-Penyard).	Wildgoose 1993, 53-4.	This is entirely circumstantial.
Roman	Iron mine found beneath a probable late 3rd century hut floor, at Lydney Park.	Wheeler 1932, 18-22.	The mine definitely appears to pre-date the hut floor. Exact date of hut floor is uncertain - late Roman or early medieval.
Roman	Iron mine found beneath the Roman bath house, at Lydney Park.	Glos SMR 25.	Could pre- or post-date the Roman site. Roman artefacts found within are likely to have fallen in from the bath-house above.
Roman	Possible iron mine located beneath the Roman guest house, at Lydney Park.	Wheeler 1932, 21.	Site not investigated. Could pre- or post-date the Roman site. Could be a natural geological feature.
Roman	Shallow depression excavated by Wheeler in 1929 at Lydney Park, found to contain Roman artefacts to a depth of 7 feet, and to continue beyond this depth.	Wheeler 1932, 21-22.	Could represent a natural geological feature filled in during the Roman period. No mention of tool marks in the report. A natural 'swallow hole' was also encountered beneath the temple site at this time.
Roman	Pick marks at Clearwell Caves, encrusted with calcite deposits from subsequent lime rich water flow - often used as evidence of a pre-Roman date - reassessment needed.	Wildgoose 1993, 151.	Calcite deposits can build up over a relatively short time.

Date given in reference	Description	Reference	Comment on date
Roman	At Perrygrove scowles, upwards of 3000 mid-3rd century coins were found in 1849. They were found hidden in three jars in a rock cavity.	Glos SMR 5074.	Scowles are now believed to be natural cavities, modified by later iron ore extraction, therefore the 'scowles' would have already existed as open features in the Roman period. The hoard does not date the iron working.
Roman	Find spot of Roman coin (Denarius of Faustina I, AD 141). Found in Bream Scowles in 1872.	Glos SMR 6778.	Exact findspot unknown.
Roman	Roman coin hoard consisting of 155 silver coins ranging from Nero to Commodus (AD54-192) was found at Bream scowles in 1854.	Glos SMR 19414.	Exact findspot unknown.
Roman	Modern archaeological watching brief (1995) and evaluation (1996) of the Central Forest Main to Sling Tanks Reinforcement Main. Two trenches contained possible evidence of a scowle, and Roman pottery was found in the fill.	Glos SMR 17028.	The pot sherds do not date the scowle or the fill - back-filling not earlier than the Roman period.
12th / 13th century	Medieval iron mine / iron works located at 'Ardlonde' on land belonging to Flaxley Abbey - possibly at or near the site of St. White's Farm.	Glos SMR 23494.	
1256	For the year ending November 16th 1256, the issue in money to the Crown 'from the great and little mines' in the Forest was £23 1*s.* 4*d*.	Kendall 1893, 24.	
1282	Forest Regard of 1282 : "Item, the Earl of Warwychiae hath a mine in his own wood of Lideneye…"	Wildgoose 1993, 108.	Mining (surface and/or sub-surface) was taking place in the Forest in 1282.
1282	Forest Regard of 1282 : mentions iron mines in the Bailiwicks of Abenhale, Bikenore, Blackeneye, Magna Dene, Birs, Staunton, and Lacu, which are mostly on the Wye side of the Forest.	Kendall 1893, 25.	
1287	Name of Scowles village first recorded.		The name is a back formation from the word.
1485	In 1485 Henry Vii (February 1st) granted the mines beneath the wood, Vocat le Gawle, to John Motten for life.	Kendall 1893, 26.	
1542	In *c.*1542, John Leland commented that the Forest of Dean '…is profitable for mining iron, and there are several iron-making forges there.'	Chandler 1993, 177.	Mining (surface and/or sub-surface) was taking place in the Forest in 1538.

Date given in reference	Description	Reference	Comment on date
17th century	Timber from old mine pit props found in mine spoil near Clay's Wood scowles was dated by dendrochronology to 350 b.p (*c.* AD 1650).	Wildgoose 1993, 140-1, 321.	This is unlikely to be a genuine dendro date. The source of the date is not known, but it may have come from a local land-owner. This date should be treated with extreme caution.
1712	Atkyns mentions in Newland 'several large hollow places under ground, occasioned by digging iron ore'.	Atkyns 1712.	Scowles and/or sub-surface workings existed in Newland parish in 1712.
1779	Rudder on Lydney : 'Not far above Mr. Bathurst's house, there is a cavern in the wood, called the *Scowls*, the entrance to which is between very long unwrought stones, serving as pillars to support a rocky roof, on which several large trees are now growing…'	Rudder 1779.	Scowles existed in 1779.
1780	Mr Wyrrall : "There are, deep in the earth, vast caverns scooped out by men's hands, and large as the isles of churches, and on its surface are extensive labyrinths worked among the rocks, and now long since overgrown with woods; which whosoever traces them must see with astonishment, and incline to think them to have been the work of armies rather than of private labourers. They certainly were the toil of many centuries and this, perhaps, before they thought of searching in the bowels of the earth for their ore - whither, however, they at length naturally pursued the veins, as they found them to be exhausted near the surface." (Scowles & Old Men's Workings)	Nicholls 1860, 228.	Scowles existed in 1780.
1788	Mr. Hopkinson (1788) mentions about 22 poor men who at times search for and get '…iron mine or ore in the old holes and pits in the said forest, and which have been worked out many years.'	Nicholls 1860, 237.	Scowles were worked 'many years' before 1788.
19th century	Excavation of scowle at Stock Wood - infill contained 19th century finds, giving date of back-filling.	Glos SMR 17082.	Back-filling of scowle not earlier than 19th century.

Appendix M Evidence for prehistoric iron working in the Forest of Dean

Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
Late Iron Age / Early Romano-British	Unknown	Bloomery slag noted beneath fallen tree (January 1990), at Symonds Yat Promontory Fort.	Smelting	Bloomery smelting slag and 1st century Severn Valley ware, found beneath a fallen tree.	Glos SMR 19.	Possibly transitional late Iron Age / Romano-British period.
Late Iron Age / Early Romano-British	Unknown	Bloomery slag, haematite and charcoal recovered from mole hills, Soudley Camp.	Smelting	Bloomery smelting slag and sherds of Severn Valley ware, found in mole hills.	Glos SMR 444.	Possibly transitional late Iron Age / Romano-British period.

Appendix N Evidence for probable Roman iron working in the Forest of Dean

Probable date of smelting	Probable date of activity on site	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
C3 C4 C5	C3 C4 C5	C3 C4 C5	Chesters Roman Villa - the remains of iron furnaces and ore crushing units were found in a building located to the south of the main villa.	Ore preparation; smelting	Excavated *in situ* furnace remains; ore crushing units	Glos SMR 16.	
Precise date unclear	C2 C3 C4	C2 C3 C4	Boughspring Roman Villa - smelting and smithing slags have been found. It is not clear how much of this is smelting slag	Smelting; smithing	Smelting and smithing slags around villa and generally in the area, but not in significant quantities.	Glos SMR 20; 5048; 9380.	Excavation report suggests that iron slag may represent post-villa activity
C2 C3	C2 C3 ?	C2 C3 ?	Roman site at Rodmore Farm - bloomery slag has been found.	Smelting; smithing	Excavated *in situ* bloomery slag, smithing debris.	Glos SMR 4390.	Mid 2nd century-early 3rd century finds included Severn Valley, Black Burnished, and grey ware and one sherd of Rhenish routletted beaker.
Precise date unclear	C2 C3 C4 ?	C2 C3 C4 ?	Roman site at High Nash, Coleford - iron ore and bloomery slag have been found.	Smelting	Excavated iron ore and tap slag.	Glos SMR 4929.	2nd to 4th century pottery found.
Precise date unclear	Roman	Roman	Roman occupation site comprising two square enclosures and associated finds (including slag), south-east of Sedbury Park.	Unknown	Roman pottery, tiles, coal, cinders, lead, glass found.	Glos SMR 5065.	

Probable date of smelting	Probable date of activity on site	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
Precise date unclear	C2 C3 C4 C5	C2 C3 C4 C5	Romano-British iron working site, located at Pope's Hill, Littledean.	Smelting and possible ore roasting hearth	Excavated limestone flagstones found in conjunction with pottery and slag.	Glos SMR 5179.	Roman pottery found dating from 2nd century onwards, not clear how this relates to date of smelting activity. Status of limestone flags also unclear, interpreted by excavator as a hearth base.
C2 C3 C4: possibly two separate phases	C2 C3 C4	C2 C3 C4	Stock Farm Roman Villa - tap slag has been found.	Smelting	Excavated pottery and tap slag within irregular pits of indeterminate function.	Glos SMR 5611.	C2 pottery with tap slag and ore, C3-C4 pottery with tap slag and ore in separate area, probably representing later phase of activity.
Precise date unclear	Roman	Roman	Roman pit containing pottery and bloomery slag found in garden of White House Farmhouse, English Bicknor.	Smelting	Excavated bloomery slag and Roman pottery within a shallow pit.	Glos SMR 6090.	
Precise date unclear	C2 C3	C2 C3	Site of Roman building - possible Villa - located in Park Farm field, east of Aylburton. Slag found here.	Smelting and primary smithing	Surface finds of "much furnace slag and hearth bases on the site" found during field survey undertaken by Brian Walters of DAG in the 1980s.	Glos SMR 6377.	Slag finds from field surface during later field walking, no slag recorded as part of excavation of buildings.
Precise date unclear	Roman	Roman	Roman material (pottery, slag) found at Ley Pill, Woolaston.	Unknown	Pottery and slag described as coming from 'primary contexts'.	Glos SMR 9534.	Probably associated with the nearby Chesters villa site (SMR 16).
C2 C3 C4: possibly two separate phases	C2 C3 C4	C2 C3 C4	Romano-British occupation site at Barnfield, Eastbach Court. Finds include two furnace bases and bloomery slag, coins and pottery.	Smelting	Excavated *in situ* clay base of a smelting shaft furnace, with two slag furnace bases.	Glos SMR 9735, 9739.	2nd to 4th century pottery found in same field as features, relationship to smelting not established.

Probable date of smelting	Probable date of activity on site	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
C3 C4 C5	C3 C4	C3 C4	Land at Millend Lane, Blakeney - evidence for Romano-British iron smelting.	Smelting	Excavated bloomery slag, furnace lining.	Glos SMR 17988.	
Precise date unclear - possibly post-Roman	C1 C2	C1 C2	Roman occupation site, Legg House Blakeney - slag finds.	Unknown	Excavated slag of unspecified type.	Glos SMR 18426	Slag forms make-up of undated hard standing which post-dates demolition of C2 building - probably relates to later smelting activity (see 17988).

Appendix O Evidence for possible Roman iron working in the Forest of Dean

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
Possible Roman activity - C3 ?	Unknown	Roman (C3)	Two Roman brass coins of Victorinus and a quantity of cinders, found *c.*1881, during construction of the railway near Cherry Orchard Farm, Newland.	Unknown	Findspot of slag and Roman coins, nature of slag unspecified.	Glos SMR 5102.	Blast furnace slag was observed here in 2003; the slag found in *c.*1881 could also have been from a post-medieval blast furnace.
Possibly Roman or medieval	Unknown	Roman	Romano-British settlement and iron working, located north-west of Chepstow to Gloucester Road, Lydney, at the site of the Holm Farm development.	Unknown	Surface finds of slag and Roman pottery.	Glos SMR 5138.	The type of slag found here is not known. C2 - C3 Olla, and stone hammerstone also found.
Roman	Unknown	Roman	Roman coins and slag, reported to have been found in Popes Grove, Lydbrook.	Unknown	Presumed to be surface finds.	Glos SMR 6237.	Exact findspot not recorded. No evidence that the coins and slag were associated with each other.
Late C2 - C3	Unknown	Late C2 - C3	Prehistoric flint finds, Roman pottery and slag, found in the area between Welshbury Wood and Chestnuts Wood.	Unknown	Presumed to be surface finds.	Glos SMR 6463.	Interpreted as a Romano-British occupation site, but no evidence for this.
C2 -C4	Unknown	C2 - C4	Roman material comprising 2nd-4th century pottery sherds and iron-making slag, found on the beach near Whitescourt, Awre.	Unknown	Surface finds of slag and Roman pottery.	Glos SMR 9535.	Finds are not in primary context; slag and pottery are not necessarily contemporary.

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
C4	Unknown	C4	Smelting furnace, possibly Roman, on Hangerberry Hill, English Bicknor. Sherds of Romano-British pottery, a brooch, a coin and three large areas of bloomery slag have also been found here.	Smelting	Three large areas of bloomery slag noted during field-walking.	Glos SMR 9623. NB probably same site as 9739.	No direct evidence of Roman date for smelting activity.
C3 - C4	Unknown	C3 C4	Evidence of possible iron working site from field at Cow Meadow Farm, English Bicknor. Bloomery slag, 3rd/4th century pottery and an iron bar have been found.	Unknown	Surface finds of bloomery slag, partly smithed iron billet, and Roman pottery.	Glos SMR 21290.	Not securely dated - all finds are surface finds.
C3-C4	Unknown	C3-C4	Undated finds including slag and Roman pottery, found to the south of Blakeney.	Unknown	Slag of unspecified type.	Glos SMR 18408.	
C2 - C3	Unknown	C2 - C3	Undated bloomery slag found at Broom Hill, Blakeneyhill Woods. Roman-British pottery also found.	Unknown	Slag is probably re-deposited.	Glos SMR 23496.	Pottery dated to C2 - C3.
C1	Unknown	C1	Undated bloomery slag deposits and 1st century AD pottery finds, Ruardean.	Unknown	Surface finds of bloomery slag.	Glos SMR 23501.	Pottery dates to C1.

Appendix P Evidence for probable and possible medieval iron working in the Forest of Dean

Probable date of smelting	Probable date of activity on the site	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
C11	C11	1086	Reference to Alvington in Domesday survey - they pay 20 blooms of iron and 8 sesters of honey.	Smelting	Documentary reference.	Moore, 1982.	
C12 - C13	C12 - C13	C12 - C13	Undated bloomery slag found at Broom Hill, Blakeneyhill Woods. Flagged stone surface found in association with hollowed cup stones and pottery dating to the 12th and 13th centuries.	Unknown	Slag is probably re-deposited.	Glos SMR 23496.	Pottery dated to C12 - C13.
C13	C13	C13	Excavation in Church Road, Lydney - depression contained a quantity of black organic material with iron slag and lumps of charcoal.	Unknown	Slag of unspecified type.	Glos SMR 6501 *c.*f. SMR 17216.	Interpreted as a hearth or shallow ditch. Finds in association with C13 Jetton.
C13	C13	C13	Bloomery site, of unknown date (possibly medieval) at Warfield Farm, Ruardean. medieval and post-medieval finds were discovered at the site.	Smelting and Ore Roasting Hearth	Bloomery slag, including pieces with curved bottoms, possibly furnaces bases.	Glos SMR 9875.	Finds were not in a primary context - described as tipped backfill.
Medieval	Medieval	Medieval	Medieval finds from the orchard of Tanhouse Farm, Newland - pottery and mass of compressed bloomery slag found.	Smelting.	Excavated bloomery slag.	Glos SMR 11085.	Medieval pottery found in abundance.

Probable date of smelting	Probable date of activity on the site	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
Medieval	Medieval	Medieval	Slag filled pit found during an archaeological evaluation and watching brief on land near Church Road, Lydney.	Unknown	Excavated slag of unspecified type.	Glos SMR 17216, cf Glos SMR 6501.	Pit was insecurely dated by a single sherd of abraded medieval pottery.
Medieval - early post medieval	Medieval - post medieval	Medieval - post medieval	Modern archaeological evaluation and watching brief on the site of the Feathers Hotel, High Street, Lydney - part of a hearth bottom, smelting, smithing and blast furnace slag was found.	Smelting, smithing.	Smithing slag lumps, part of a smithing hearth bottom, smelting slag and blast furnace slag (not known if *in situ*).	Glos SMR 17802.	Possible site of water-powered bloomery
c. 1244	*c.* 1244	*c.* 1244	Mabel de Cantelup has a forge at Etloe (Ettelawe) moving about… Slag found here.	Unknown	Spread of bloomery slag noted during dowsing.	Glos SMR 18410.	The slag does not necessarily relate to Mabel de Cantelup's forge, and is not necessarily 13th century in date.
Medieval	Medieval	Medieval	Modern evaluation at Blakeney sewage treatment works (1999) - a medieval ditch and a quantity of residual tap slag and medieval pottery were recorded	Unknown	Excavated tap slag - three fragments.	Glos SMR 20429.	
C12	C12	12th century	Desk based assessment, evaluation excavation and geophysical survey (1998) at Tidenham House - slag finds.	Unknown	Excavated slag of unspecified type.	Glos SMR 20246.	Some of the slag was found in a pit containing 12th century pottery.
Medieval	Medieval	Medieval	High Meadow Farm - bloomery slag found during an archaeological evaluation (2003).	Unknown	Excavated bloomery slag. Not known if *in situ*.	Glos SMR 20487.	At least some of the slag is probably medieval or post-medieval.

Probable date of smelting	Probable date of activity on the site	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
C13 - C20	C13 - C20	C13 - C20	A modern evaluation at Church Cottage, Staunton, carried out in June 2002 - bloomery and forging slag found.	Unknown	Two pieces of bloomery slag and forging slag.	Glos SMR 21613.	Medieval and later finds as surface scatters
C13	C13	C 13	Two large areas of undated bloomery slag found during field-walking in Windmill Field, English Bicknor	Unknown	Surface finds of bloomery slag, baked clay, furnace lining and charcoal waste.	Glos SMR 21770.	All pottery found of 13th century date.
Undated, possibly medieval	Unknown	Unknown	Modern evaluation of land east of Lydney - small number of slag-tapping pits excavated.	Smelting.	Excavated *in situ* slag-tapping pits, i.e. smelting taking place.	Glos SMR 22448.	

Appendix Q Non-specific and documentary evidence for medieval iron working in the Forest of Dean

Date given in reference	Description	Reference	Comment on date
1143	As early as 1143, Tintern Abbey was allowed a forge at St. Briavels.	Hart 1991, 19.	
1188	Gerald of Wales speaks of the noble Forest of Dean which amply supplied Gloucester with iron and venison.	Nicholls 1860, 231.	
1244	By *c.*1244 iron ore was worked in the Dean bailiwicks of English Bicknor, Staunton, Abenhall, Bearse and elsewhere in the Forest.	Hart 2002, 11.	
1282	In 1282 there were 72 intinerant forges in the forest.	Cooke 1913.	
*c.*1300	Book of Dennis / Miners Laws and Privileges written.	Kendall 1893, 25.	Iron industry was well-established at this time.
1341	In 1341, on the completion of Newland church, the Bishop of Llandaff obtained a grant of the tenth part of the ore raised in the neighbourhood.	Kendall 1893, 25.	
C12 / C13	Medieval iron mine / iron works located at *Ardlonde* on land belonging to Flaxley Abbey - possibly at or near the site of St. White's Farm.	Glos SMR 23494.	
C15	Miner's brass in Newland church.		
1541	In William Wyrall's rent roll of 1541, mention is made of '…the Synderhill at Coleford…'	Hill 1942, 193.	
1542	In *c.*1542, John Leland commented that the Forest of Dean '…is profitable for mining iron, and there are several iron-making forges there.'	Chandler 1993, 177.	

Appendix R Evidence for undated iron working in the Forest of Dean

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Late Iron Age / Early Romano-British	Unknown	Bloomery slag noted beneath fallen tree (January 1990), at Symonds Yat Promontory Fort.	Smelting	Bloomery smelting slag and 1st century Severn Valley ware, found beneath a fallen tree.	Glos SMR 19.	Possibly transitional late Iron Age / Romano-British period.
Late Iron Age / Early Romano-British	Unknown	Unknown	Bloomery slag, haematite and charcoal recovered from mole hills, Soudley Camp.	Smelting	Bloomery smelting slag and sherds of Severn Valley ware, found in mole hills.	Glos SMR 444.	Possibly transitional late Iron Age / Romano-British period.
	Unknown	Roman	Possible sites of Romano-British shaft furnaces on the bank of the River Severn, near Pill House, Tidenham - bloomery slag and two circular depressions found.	Unknown	Surface finds of bloomery slag; two depressions noted.	Glos SMR 5026.	No evidence that this material is Romano-British. Slag could be re-deposited.

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Roman	Fragments of bloomery slag found beneath the Dean Road, near Bullock's Beech, Ruspidge.	Unknown	Excavation - small lumps of bloomery slag found beneath charcoal layer beneath the Dean Road.	Glos SMR 5904.	The Dean Road is not a securely dated Roman road, therefore the slag must be described as undated.
	Unknown	Medieval or Roman	Thick deposits of bloomery slag beneath the town of Coleford.	Unknown	Bloomery slag	Glos SMR 4928, 4930, 6012, 11078, 23503.	Deposits must pre-date whatever lies above them. Not known if the slag is *in situ*.
	Unknown	Unknown	Drummer Boy Stone, a large stone with two circular depressions of unknown date that bears traces of smelted iron, located next to a stream near the Dean Road, Ruspidge.	Smelting or smithing?	*In situ* traces of smelted iron.	Glos SMR 5126.	
	Unknown	Unknown	Undated tapped and untapped bloomery slag found near earthworks to the west of Madgett's Farm, Tidenham.	Unknown	Surface finds.	Glos SMR 6033.	

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Unknown	Slag associated with road / track surfaces.	Road metalling	Bloomery and blast furnace slag.	Glos SMR 7234, 7236, 11329, 21741, 23375, 23493.	Slag was often used in road construction / maintenance.
	Unknown	Unknown	Iron furnaces and slag reported during installation of a petrol storage tank, Ruardean village.	Smelting?	Iron furnaces and slag reported.	Glos SMR 7401.	
	Unknown	Unknown	Romano-British, post-medieval and undated material found at Horse Pill, Woolaston.	Unknown	Surface finds including slag of unspecified type.	Glos SMR 9533.	Finds are not in primary context.
	Unknown	Unknown	Large, undated slag deposits found at Dean Hall, Littledean.	Smelting, smithing, forging.	Smelting, smithing and forging slag reported.	Glos SMR 9782; 21740.	
	Unknown	Unknown	Bloomery slag and five hearths of unknown date found at Toads Mouth, Staunton Coleford, on the A4136.	Smelting.	Watching brief - tapped and untapped bloomery slag, and 5 hearth bases.	Glos SMR 11087.	

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Unknown	Tapped bloomery slag retrieved from roots of fallen trees at the site of an elongated, irregular, rectilinear enclosure of unknown date, in Blake's Wood, Staunton Coleford.	Unknown	Bloomery slag find (not known if *in situ*).	Glos SMR 14880.	
	Unknown	Unknown	Modern archaeological evaluation and watching brief on A48 Lydney bypass (eastern section), near Lydney - undated slag finds.	Unknown	Slag of unspecified type.	Glos SMR 14936.	
	Unknown	Unknown	24g piece of iron slag found during an archaeological evaluation at Stock Wood Scowles in 1998, Newland parish.	Unknown	Slag of unspecified type.	Glos SMR 17082.	

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown &/or post-medieval	Unknown	Modern archaeological evaluation at Dairy Farm, Lydney, located west of St. Mary's Church - slag finds.	Unknown	Slag of unspecified type, and one piece of vitreous slag.	Glos SMR 17961.	One of the pieces of slag is described as 'vitreous', implying that it is post-medieval blast furnace slag.
	Unknown &/or post-medieval	Unknown	Bloomery and blast furnace slag, found near the River Severn shoreline, east of Purton (Awre).	Unknown	Surface finds of bloomery and blast furnace slag.	Glos SMR 18412.	
	Unknown &/or post-medieval	Unknown	Pondbay on the Valley Brook, *c.*300 metres south of Glyn Farm, Redbrook. Deposits of slag and cinders recorded here.	Unknown	The top of the dam was cut away prior to its destruction revealing at the west end a mass of furnace slag and cinder.	Glos SMR 18444.	Some of the slag is described as 'glassy', implying that it is post-medieval blast furnace slag.
	Unknown	Unknown	Undated slag findspot (hollow in sandstone boulder), located near Edgehills Plantation, Mitcheldean.	Forging?	Slag-filled hollow in boulder.	Glos SMR 19400.	Analysis of the slag suggests that it is probably forge slag rather than smelting slag.

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Unknown	Bloomery slag deposit and possible building debris of unknown date from the site of the Elms Nursing Home, Staunton.	Unknown	Bloomery slag not *in situ*.	Glos SMR 19420.	
	Unknown	Medieval	Slag of early medieval or later date and a hearth base, exposed during redevelopment of the 1828 Baptist Chapel and graveyard, Coleford.	Unknown	Small amounts of bloomery slag, and a hearth base. Not *in situ*.	Glos SMR 19423.	Slag not found in conjunction with datable artefacts
	Unknown	Unknown	Undated stone object with slag, referred to as a smithing hearth, found in a ventilation shaft at Old Sally Mine, Edge Hill.	Forging?	Slag-filled hollow in stone.	Glos SMR 19945.	

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Unknown	Scowle on Plump Hill, Littledean, containing a flueway and masonry doorway; a stone with attached bloomery slag was found just inside the doorway.	Unknown	Findspot of stone with bloomery slag attached. Not known if *in situ*.	Glos SMR 20664.	
	Unknown	Unknown	Bank of cinders 6 ft high, in field behind Tump House (now Forest House), Coleford.	Unknown	Cinders recorded in 19th century.	Glos SMR 21218.	
	Unknown	C18 C19	Bloomery slag from a filled-in scowle (back-filled in 19th century), located in a field *c.*400 metres south of St White's Farm, Ruspidge.	Unknown	Surface scatter of bloomery slag and 18th/19th century pottery.	Glos SMR 21270.	Artefacts are residual and the smelting activity cannot be dated.
	Unknown	Unknown	Undated bloomery slag from a field at Wilderness Farm, Mitcheldean.	Unknown	Surface find of bloomery slag.	Glos SMR 21288.	

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Unknown	Bloomery slag deposits and iron ingot (bun) from a field to the north of Littledean Gaol, Littledean.	Unknown	Surface finds of bloomery slag and an iron 'bun'.	Glos SMR 21293.	
	Unknown	Medieval	Deposit of cinders from medieval (?) iron working, Cinderhill, St. Briavels.	Unknown	Documentary and place-name.	Glos SMR 21476.	Circumstantial dating evidence - it was known that St. Briavels had an active iron-working industry in the medieval period.
	Unknown	Unknown	Concentration of bloomery slag found 20 metres south of English Bicknor church.	Unknown	Bloomery slag from a mole hill.	Glos SMR 21766.	Some Romano-British and medieval material also found, but association with slag is unclear.-

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Unknown	Field name 'Cinder Hill' recorded on maps of 1608 and 1838, located to the north of Brooks Head Grove, English Bicknor - large deposits of bloomery slag also reported from here.	Unknown	Bloomery slag recorded - not known if *in situ;* place-name.	Glos SMR 21805.	
	Unknown	Unknown	Slag finds from Welshbury Hill, Blaisdon, comprising bloomery furnace lining and tap slag.	Unknown	Bloomery slag recorded - not known if *in situ*.	Glos SMR 22116.	
	Unknown	Unknown	Bloomery slag recovered during a walkover survey of Chestnuts Wood, Littledean.	Unknown	Bloomery slag recorded - not known if *in situ*.	Glos SMR 22053	

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Unknown	Findspot of undated tapped and untapped bloomery slag, located near scowles to the east of Edgehills Lodge, Edgehills Plantation, in Mitcheldean parish.	Unknown	Bloomery slag recorded - not known if *in situ*.	Glos SMR 22303.	
	Unknown	Unknown	Undated bloomery slag, found *c.*200 metres south-west of Bream Court Farm, near Bream.	Unknown	Bloomery slag recorded - not known if *in situ*.	Glos SMR 23270.	
	Unknown	Unknown	Undated bloomery slag found in the garden of Staunton House, but not *in situ*, Staunton.	Unknown	Bloomery slag recorded - not *in situ*.	Glos SMR 23495.	
	Unknown	Unknown	Undated smithed iron ingot, bun-shaped and weighing 4lb, found to the north of Drybrook Quarry, Drybrook.	Smithing	Findspot of smithed iron ingot.	Glos SMR 23497.	

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Unknown	Undated bloomery slag found near a scowle, located 100 metres north-north-west of Scowles Farm, near Coleford.	Unknown	Bloomery slag recorded - not known if *in situ*.	Glos SMR 23498.	
	Unknown	Unknown	Undated circular hammered bloom weighing 5 3/4 lbs, found near scowles to the south-east of Edgehills Lodge, in Littledean parish.	Smithing	Findspot of smithed bloom.	Glos SMR 23499.	
	Unknown	Unknown	Undated bloomery slag and charcoal, found near Allaston Court, Lydney.	Unknown	Surface finds of bloomery slag and charcoal.	Glos SMR 23500.	
	Unknown	Unknown	Undated bloomery slag, found at Hurst Farm, Lydney.	Unknown	Bloomery slag recorded ('well-buried') - not known if *in situ*.	Glos SMR 23502.	
	Unknown	Unknown	Undated cinders located at 'Staunton Lane leading from Coleford', recorded in *c.*1760.	Unknown	Documentary.	Glos SMR 23504.	

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Unknown	Undated slag and iron ore finds, from the garden of a house on Victoria Road, Coleford.	Unknown	Slag of unspecified type.	Glos SMR 23505.	
	Unknown	Unknown	Undated slag heap located at Tufts Brook, on the line of the 'new' road from Miery Stock to Lydney, to the south-east of Whitecroft, in West Dean parish.	Unknown	Documentary.	Glos SMR 23506.	
	Unknown	Unknown	Undated Tapped Slag findspot, Lydney Park Estate.	Unknown	Bloomery slag recorded - not known if *in situ*.	Glos SMR 23510.	
	Unknown	Unknown	Undated Tapped Slag Findspot, Lydney Park Estate.	Unknown	Bloomery slag recorded - not known if *in situ*.	Glos SMR 23511.	
	Unknown	Unknown	Tapped and untapped Bloomery Slag from field surface south of Madgetts Farm Tidenham	Unknown	Surface finds of bloomery slag.	Glos SMR 23515.	

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Unknown	Tapped and untapped bloomery slag from Time Team Big Dig Test Pit at Brockweir.	Unknown	Test pit - bloomery slag found.	Glos SMR 23517, *c.*f. SMR 22378.	Found in association with small 'wheel pit' type features - possible early water-powered bloomery.
	Unknown	Unknown	Undated tapped and untapped bloomery slag from the garden of March Dyke, Brockweir.	Unknown	4 pieces of tapped and untapped bloomery slag - not known if *in situ*.	Glos SMR 23520.	
	Unknown	Unknown	Undated slag from 'Quarrel Field', located to the south of St. Briavels.	Unknown	Surface finds of bloomery slag.	Glos SMR 23521.	
	Unknown	Unknown	Undated tapped and untapped bloomery slag and possible furnace lining, from the garden of a house called 'The Conifers', Staunton.	Unknown	Undated tapped and untapped bloomery slag and possible furnace lining - not known if *in situ*.	Glos SMR 23546.	

Possible date of smelting	Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
	Unknown	Possibly prehistoric?	Undated bowl furnaces and small slag pits from an archaeological evaluation at Stowe Green.	Smelting	*In situ* bowl furnaces and slag pits.	Glos SMR 21477.	
	Unknown	Unknown	Bloomery slag 'beneath fields and gardens'.	Unknown		Glos SMR 23547.	Status unclear. Source of information uncertain.
	Unknown	Unknown	Bloomery slag identified by metal detector survey at the site of an undated ovoid enclosure in Sallowvallets Inclosure.	Smelting?		Glos SMR 4616.	Exact nature of these deposits is unclear from the SMR entry.
	Unknown	Unknown	Bed of scorine and clinkers of unknown date, found in the bank of a lane between English Bicknor church and the River Wye.	Unknown	Slag deposits.	Glos SMR 6014.	

Appendix S Evidence of dates for cinders mounds

Date given in reference	Description	Reference	Comment on date
Roman	Tump at Green bottom containing 'Roman' slag - found 2 bits of pottery, probably R-B, no glaze, badly burnt.	Scott-Garrett 1918-1958 (1953).	
Roman	Andrew Yarranton (1698) : '…at present great oaks are growing upon the tops of these cinder heaps, and monies continually is found amongst these cinders; but such that is found is all of the Roman coyn…'	Wright 1854, 20.	
Roman	In 1780, Mr Wyrrall of Bicknor Court describes coins, fibulae etc being found in beds of cinders, especially at the village of Whitchurch (out of county).	Nicholls 1866.	
Roman	Two Roman coins and quantity of cinders, found *c.*1881 near Cherry Orchard Farm, Newland.	Glos SMR 5102.	
1276	Ralph de Sandwico, Custos of the Castle and Manor of St. Briavels, in his return of monies received on behalf of the Crown from the iron mines and forges during the 4th of Edward I (1276), states as paid :- £5 15s 'by sale of cinders (cineribus)' and other monies...	Nicholls 1866, 19-20.	
1611	Crown 'bargayne' of 14/06/1611 mentions 'synders'…	Nicholls 1860, 235.	
1612	17/02/1612 : William Earl of Pembroke obtained a grant which included liberty to dig for and take from any part of the Forest, mine ore, cinders etc.	Nicholls 1858.	
1613	28/01/1613 : Court order that miners should be allowed to dig for mine ore and cinders…	Nicholls 1858.	
1613	Local ironmasters complained that most of Dean's ore and cinders were exported (lots went to Ireland).	Hart 1971, 219.	
1662	12/04/1662 : An elaborate return addressed to the Barons of the Exchequer, suggested that a check should be put to the practice of exporting ore and cinders from the Forest, 'lest the king's own works should need them.'	Kendall 1893, 27.	
1666	In 1666 two vessels from Pembroke, laden with cinders from Dean for Ireland, were taken by the Dutch or French.	Hart 1971, 220.	

Date given in reference	Description	Reference	Comment on date
1677	Andrew Yarranton : 'In the Forest of Dean and thereabouts the iron is made at this day of cinders…' 'And in the Forest of Dean and thereabouts, and as high as Worcester, there are great and infinite quantities of these cinders…'	Nicholls 1860, 236-7.	
1683	Deposit of cinders from medieval (?) iron working, Cinderhill, St. Briavels.	Glos SMR 21476.	
1692	Commission of 1692 : large sales of cinders were now being effected in the Forest, whereas it seems they had before been used without payment.	Hart 2002, 208.	
1692	In 1692, Jephthah Wyrall sold 10,000 dozen bushels of cinders from English Bicknor.	Glos SMR 6116.	
1699-1700	Lydney furnace account of 1699-1700, refers to cinders being bought, some from as far away as Staunton.	Hart 1971, 82.	
1707	Surveyor-general, Mr. Wilcox 27 Sept. 1707, reported on abuses in the Forest. Mentioned '…a Company at Bristol, who have lately erected a forge in the Forest near Lydbrooke…and they are now employing a great Number of them to dig for Cinders or Slagg, left formerly by the Ancient Bloomerys in many parts of the Forest…'	Hart 2002, 209-201.	
1712	Atkyns mentions iron cinders 'not well tried formerly' being dug up in Mitcheldean, and that in Dean Forest 'they burn again the old cinders, and get the best iron out of them'. Also mentions in Newland 'several large hollow places under ground, occasioned by digging iron ore'.	Atkyns 1712.	
1722	In 1722 the lord of Ruardean manor evicted four cottagers to enable cinders at Varnister Green to be mined.	Glos SMR 21858.	
1730s	Dean sent large amounts of cinders to North Lancashire, where its good fluxing characteristics were realised.	Hart 1971, 53.	
*c.*1730-35	The Bathursts allowed their ironmaster tenants to take huge quantities of cinders at market price.	Hart 1971, 226.	
1740s	Large quantities of cinders were delivered by the Wemyss family of Mitcheldean to Flaxley in 1741, 1742 and 1743…'	Hart 1971, 81.	
1760	Undated cinders located at 'Staunton Lane leading from Coleford', recorded in *c.*1760.	Glos SMR 23504.	

Date given in reference	Description	Reference	Comment on date
1780	George Wyrrall, 1780 : mentions that cinders are becoming scarce, hence the introduction of Lancashire ore into the county.	Hart 1971, .69.	
Early 19th century	Bank of cinders 6 ft high, in field behind Tump House (now Forest House), Coleford.	Glos SMR 21218.	
1866	Mounds of slag still numerous.	Hart 1971, 242.	
Unknown	Undated slag heap located at Tufts Brook, on the line of the 'new' road from Miery Stock to Lydney.	Glos SMR 23506.	
Unknown	Possible site of undated cinders mounds, reported at Clearwell Meend in 1913.	Glos SMR 23512.	
Unknown	Site of undated spoil heaps / cinders mounds, located at Bilson, exploited in the late 19th century.	Glos SMR 23513.	
Unknown	Possible site of an undated cinders mound, located near Green Bottom.	Glos SMR 23529.	
Unknown	Possible site of undated cinders mound, located at Brandricks Green.	Glos SMR 23530.	
Unknown	Undated possible cinders mound, located at the site of Bilson Gas Works, Cinderford.	Glos SMR 23531.	
Unknown	Site of an undated cinders mound, located next to the River Wye near Lower Lydbrook, recorded in 1899.	Glos SMR 23532.	
Unknown	Possible site of undated cinders, located at Upper Lydbrook, recorded in 1899.	Glos SMR 23533.	
Unknown	Site of undated cinders, located at Cinderhill, Coleford, recorded in 1908.	Glos SMR 23534.	
Unknown	Possible site of undated cinders, located at Hawkwell Green, Cinderford.	Glos SMR 23535.	
Unknown	Possible site of undated cinders mound, Brook Street, Mitcheldean.	Glos SMR 23536.	
Unknown	Possible undated site of cinders mound, at Collafield, Littledean.	Glos SMR 23539.	
Unknown	Possible undated site of cinders mound, at Collamore, Littledean.	Glos SMR 23540.	
Unknown	Possible site of cinders, located at Redbrook, mentioned in a letter of 1908.	Glos SMR 23541.	

Date given in reference	Description	Reference	Comment on date
Unknown	Possible site of cinders, exploited in the mid 17th century, on land at 'White Meade'.	Glos SMR 23545.	

Appendix T Field name and place name evidence

Field Names and Place Names – cinders:

Date given in reference	Description	Reference	Comment on date
1608 & 1838	Field name *Cinder Hill*, located to the north of Brooks Head Grove.	PRO 1608; Gwatkin 1993 (no.20); Glos SMR 21805.	
1608	Field name *Cymbers Land*, located north of Scowles village, Coleford.	PRO 1608; Glos SMR 23518.	
1758 & 1782	Place name *Cinderford Bridge*, located at Cinderford Bridge.	Stratford 1758; Unknown 17th/18th century; Glos SMR 23519.	
1813	Field names *Upper Cindermead* and *Lower Cindermead*, located on the Woolaston/Alvington parish boundary.	Gwatkin 1993 (no.25); Glos SMR 21918.	
1813	Field name *Cinder Hill*, located on the Woolaston/Alvington parish boundary.	Gwatkin 1993 (no.25); Glos SMR 21921.	
1838	Field name *Cinder Hill*, located on the east side of Bicknor Street, south of Dryslade Farm.	Gwatkin 1993 (no.20); Glos SMR 21804.	
1839	Field names *Little Cinder Hill* and *Great Cinder Hill*, located north-west of Nurshill.	Gwatkin 1995 (no.63); Glos SMR 21552.	
1839	Field names *Cinder Mead* and *Lower Cinder Mead*, located south-east of Lydney.	Gwatkin 1995 (no.63); Glos SMR 21581.	
1839	Field name *Cinderbury Croft*, located south-east of Lydney.	Gwatkin 1995 (no.63); Glos SMR 21582.	
1839	Field name *Cinder Tumps*, located south of Dean Hall, Littledean.	Gwatkin 1992 (no.8); Glos SMR 21761.	
1839	Field name *Cinder Hill*, located to the west of Blaisdon church.	Gwatkin 1992 (no.6); Glos SMR 23542.	
1840	Field name *Cinders*, located to the north of Awre village.	Gwatkin 1995 (no.54); Glos SMR 22082.	
1841	Field name *Cinder Meadow*, located on the Woolaston/Alvington parish boundary.	Gwatkin 1993 (no.25); Glos SMR 21918.	
1842	Field names *Cinderhill Meadow* and *Cinderhill Piece*, located at *Cinderhill*, St. Briavels.	Gwatkin 1993 (no.22); Glos SMR 21476	

Field Names and Place Names – blacks:

Date given in reference	Description	Reference	Comment on date
1608	Field name *Blakhedge*, located to the east of Staunton, recorded on a map of 1608.	PRO 1608.	
1608	Field name *Blackhoufe field*, located to the north-west of Newland, recorded on a map of 1608.	PRO 1608.	
1608	Field (or place?) name *Blake Thornes*, located at Hillersland, recorded on a map of 1608	PRO 1608.	
1608 & 1792	Field name *Kiln Blakes,* located to the south-east of Staunton, recorded on a map of 1608; called *Blaxe Mead* on a map of 1792.	PRO 1608; GCRO 1792.	
1608 & 1792	Field name *Middle Blakes,* located to the south-east of Staunton, recorded on a map of 1608; called *The Blaxe* on a map of 1792.	PRO 1608; GCRO 1792.	
1608 & 1792	Field name *The Blaxe,* located in Blake's Wood, recorded on a map of 1608; called *Blakes Meadow / Blakes Mead,* on a map of 1792.	PRO 1608; GCRO 1792.	
1782, ?late 18th century & 1787	Field name *Blackpenny Green*, located at Blackpennywall Well, recorded on a map of 1782 and another of ?late 18th century date; called *Blackpenny Well Green* on a map of 1787.	Blunt 1782; Unknown 17th/18th century; Unknown 1787.	
1782, ?late 18th century & 1787	Field name *Blakeney Hill*, located to the north-west of Blakeney, recorded on a map of 1782; called *Blacknies* on ?late 18th century date; called *Blackeney Hill* on a map of 1787.	Blunt 1782; Unknown 17th/18th century; Unknown 1787.	
1782 & 1787	Place name *Blakeney*, located at Blakeney, recorded on maps of 1782 and 1787.	Blunt 1782; Unknown 1787.	
?late 18th century & 1787	Place name *Blackpool,* located at Blackpool Bridge, recorded on a ?late 18th century Inclosure map; called *Blackpool Bridge* on a map of 1787.	Unknown 17th/18th century; Unknown 1787.	
1792	Field name *Blackmore Grove*, located near Upper Redbrook.	GCRO 1792.	

Date given in reference	Description	Reference	Comment on date
1792 & 1845	Field names *Blakefield / Blakewell Field,* located to the east of Staunton, recorded on a late 18th century map and on a map of 1845.	GCRO 1792; Gwatkin 1993 (no.20).	
?late 18th century & 1848	Place name *Blackeney Inclosure*, recorded on a ?late 18th century Inclosure map.	Unknown 17th/18th century.	
?late 18th century & 1848	Field name *Blackhall Colchesters,* located to the north-east of Puddlebrook, recorded on a late 18th century map; called *Blackwell Meadows* on a map of 1848.	?late 18th century Inclosure map; Unknown 1848; Glos SMR 23514.	
1838	Field name *Blakeys*, located to the north of Hillersland, recorded on a map of 1838.	Gwatkin 1993 (20).	
1839	Field name *Black Moor*, located to the north of Lydney Docks, recorded on a map of 1839.	Gwatkin 1995 (63).	
1840	Field name *Black Patch*, located to the west of Etloe, recorded on a map of 1840.	Gwatkin 1995 (no.54).	
1840	Field name *The Black Piece*, located just north of Silverstone Farm near Puddlebrook.	Gwatkin 1992 (no.13a). Glos SMR 23018.	
1840	Field names *Blackpool Piece, Little Blackpool* and *Long Blackpool*, located to the north of Mitcheldean, recorded on a map of 1840.	Gwatkin 1992 (no.11).	
1841	Place name *Blakemore*, located to the east of Longhope, recorded on a map of 1841.	Gwatkin 1992 (no.11).	
1845	Field name *Blacklands*, located to the south-east of Tidenham, recorded on a map of 1845.	Gwatkin 1995 (no.82).	
1845	Field name *Black Morgan*, located to the north-west of Tintern Quarry, next to the Wye, recorded on a map of 1845.	Gwatkin 1995 (no.82).	

Field Names and Place Names – other:

Date given in reference	Description	Reference	Comment on date
1608	Field name *Quarrel Field*, located south of St. Briavels.	PRO 1608; Glos SMR 23521.	
17th century	Field name *Quarrel*, located to the north of St. Briavels.	GCRO 17th century; Glos SMR 23522.	
17th century	Field name *Ashes Mead*, located south of St. Briavels.	GCRO 17th century; Glos SMR 23543.	
1792	Field name *Burnfields Meadow*, located west of Crossways, Coleford.	GCRO 1792; Glos SMR 23528.	
1838	Field name *Quarrell Field*, located south-west of English Bicknor.	Gwatkin 1993 (no.20); Glos SMR 23537.	
1839	Field name *Ash Plot*, located to the west of Blaisdon.	Gwatkin 1992 (6); Glos SMR 23538.	
1840	Field names *The Middle Ashes* and *In Upper Ashes Piece*, located to the east of Silverstone Farm near Puddlebrook.	Gwatkin 1992 (no.13a); Glos SMR 23017.	

Appendix U References to post-medieval cinders/slag/ashes

Date given in reference	Description	Reference	Comment on date
17th century	King's Furnace, Upper Soudley, built *c.*1612-13 and probably destroyed by the Commonwealth *c.*1650 - large slag / cinders deposits.	Glos SMR 5678.	
17th century	King's ironworks at Parkend - slag used up in stamping mill.	Anstis 1988, 16.	
17th / 18th century	Post-medieval Redbrook Iron Furnace, dating from the 17th / 18th century - slag heap. Thomas Wright (1854) mentions slag at Redbrook being reduced to a powder used in glass-making.	Glos SMR 6046. Wright 1854, 11.	
Post-medieval	Two letters dated 1898 - Cinders at Forest Vale are refuse from the engines of the wire works. Letter from Alfred Russell says the cinders are puddle and mill furnace cinders.	Pope 1991.	
Post-medieval	Letter dated 29 June 1906 - for some little time past I have been sending away from Foxes Bridge two or three truck loads a day of boiler ashes.	Pope 1991.	
Post-medieval	Letter dated 6th July 1907 - from Parkend Deep Navigation Collieries Co. - for 25 years we have been disposing of boiler ash to the railway cob's and I gather that for many years prior to that the former owners did so.	Pope 1991.	
Post-medieval	Letter dated Dec 1917 - wishing to take pit debris from Lightmoor for the Government works at Beachley.	Pope 1991.	
Post-medieval	Various references are made to the removal of ashes from New Bowson Colliery in early 20th century documents.	Glos SMR 9976; Pope 1991.	
1836	Severn & Wye Company leased an acre of land from the Office of Woods, on which to deposit unwanted cinders from the furnaces (at Parkend). Second acre also leased, and Cannop Brook diverted. *c.*12,000 tons of cinders removed and used as ballast between 1898 and 1904. Rest used to make the New Road in 1903.	Anstis 1988, 32.	
1839	Field name *Ash Plot*, located to the west of Blaisdon.	Gwatkin 1992 (6) Glos SMR 23538.	
1840	Field names *The Middle Ashes* and *In Upper Ashes Piece*, located to the east of Silverstone Farm near Puddlebrook.	Gwatkin 1992 (13a) Glos 23017.	

Date given in reference	Description	Reference	Comment on date
1908 (NOT date of cinders)	Titanic Steel Works - Two letters (10th & 11th Feb. 1908) held at Gloucestershire Record Office are applications to remove cinders from the site of the old Steel Works at Milkwall	GRO D9096/F.3/767/1185. Glos SMR 5608.	Probably post-medieval.
Unknown	Cannop Colliery - Various references are made to the removal of ashes from Cannop Colliery in early C20 documents examined by I. Pope, and held at the GRO.	Glos SMR 5843.	Probably post-medieval.
Unknown	Trafalgar Colliery - Reference is made to the removal of ashes from Trafalgar Colliery in early C20 documents examined by I. Pope, and held at the GRO.	Glos SMR 9989.	Probably post-medieval.
Unknown	Crump Meadow Colliery - Reference is made to the removal of ashes from Crump Meadow Colliery in early C20 documents examined by I. Pope, and held at the GRO.	Glos SMR 9983.	Probably post-medieval.
Unknown	New Fancy Colliery - Reference is made to the removal of ashes from New Fancy Colliery in early C20 documents examined by I. Pope, and held at the GRO.	Glos SMR 5824.	Probably post-medieval.
Unknown	Cinderford Brick Co. - Reference is made to a heap of ashes at the Cinderford Brick Co's works in a document dated 9th May 1905, examined by I. Pope, and held at the GRO.	Glos SMR 12924.	Probably post-medieval.

Road Repairs

Date given in reference	Description	Reference	Comment on date
Unknown	Iron cinders / slag on surface of old roadway (Mitcheldean parish).	Glos SMR 7234.	
Unknown	Iron cinders / slag observed on road surface (Mitcheldean parish).	Glos SMR 7236.	
Unknown	Paved trackway of unknown date, located to the west of Upper Tump Farm - slag found between stones of the trackway.	Glos SMR 11329.	
Unknown	Undated road repairs near Lydney Park, using iron dross, recorded in 1796-7.	Glos SMR 23493.	
Unknown	Fragments of bloomery slag were found in the track below Whippington Corner, Staunton Coleford parish.	Glos SMR 23375.	

Appendix V Evidence for iron working within Dean district, but outside the Forest of Dean Survey area

Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
Roman C2 C3 C4	Roman	Romano-British settlement site at Dymock - slag and Roman artefacts found.	Unknown	Slag from Roman rubbish pit.	Glos SMR 5351.	Slag from a rubbish pit containing 2nd-4th century pottery and 3rd century glass jug.
Roman C2 C3	Roman	Evidence of Roman iron working at Newent Business Park.	Unknown	Finds of slag and Roman pottery from various watching briefs.	Glos SMR 14400.	
Roman C1 C2 C3	Roman	Roman site at Dymock sewage treatment works - large amounts of slag, and fragments of mould indented with the shape of small tools or items of jewellery found here.	Smelting, iron-working	Excavated Roman finds and large amounts of smelting slag. Also small fragments of mould.	Glos SMR 15285.	
Roman ?	Roman	Roman features recorded during an evaluation on land behind The Old Forge Garage, Dymock -finds included slag fragments.	Unknown	Slag from excavated Roman features.	Glos SMR 21168.	
Roman Late R-B	Roman	Archaeological evaluation and excavation of land adjacent to the Rectory, Dymock - slag found in Roman ditch.	Smelting?	Two excavated features identified as possible truncated bases of iron smelting furnaces. Slag also found.	Glos SMR 21171.	
Roman C2, possibly also C3 C4	Roman	Modern archaeological excavation and watching brief on land adjacent to Rose Cottage and 'Winserdine', Dymock - Romano-British site with large amounts of slag.	Smelting?	Excavated slag, and possible crucible fragment.	Glos SMR 21822.	

Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
Unknown ?R-B	Roman	Roman querns, charcoal and slag from a field at Upper Buttersend Farm, Hartpury.	Unknown	Surface finds.	Glos SMR 5317.	The querns do not date the charcoal and slag. The exact findspots within the field are not known.
Unknown ?R-B	Roman	Slag and Roman objects found at Tibberton in the late 19th century.	Unknown	Surface finds.	Glos SMR 5333.	The Roman objects do not date the slag. Exact findspot(s) are not known.
Unknown	Roman	Romano-British pottery and iron slag found during cutting of a drainage ditch, Huntley.	Unknown	Lumps of iron slag found in disturbed soil.	Glos SMR 5706.	The Roman pottery does not date the slag.
Unknown	Roman	Roman iron works at Newent, implied by the discovery of cinders containing Roman coins and pottery.	Unknown	Scoriae' containing Roman coins and pottery.	Glos SMR 5719.	Not enough information.
Unknown	Roman	Roman pottery and slag scatter near Village School, Dymock parish.	Unknown	Roman pottery and slag scatter.	Glos SMR 6806.	Material recovered from topsoil removed from a building site - material not securely dated.
Unknown	Roman	Roman occupation levels in Dymock - pottery, coin(s), slag, roof tile found.	Unknown	Slag and other Roman finds reported.	Glos SMR 14040.	Not enough known about this site - exact findspots not known.
Unknown	Roman	Spread of Romano-British pottery and iron slag, Nelfields.	Unknown	Surface finds	Glos SMR 14069, 14070.	
Unknown	Roman	Romano British occupation site, located south-east of Newent - slag, furnaces, hearths, pottery found.	Smelting	14 acres covered with charcoal and slag. Several furnaces and hearths noted.	Glos SMR 14071.	Roman pottery and 2nd century brooch also found. All surface finds.
Unknown	Roman	Metal detecting finds and possible 4th century metal working site at Cinders Fields, Grove Farm, Taynton.	Smelting	Bloomery slag and 'other furnace waste' recorded during metal detecting.	Glos SMR 20593.	Not securely dated - all finds are surface finds.

Probable date	Date given in reference	Description	Nature of activity	Nature of evidence	Reference	Comment on date
Unknown	Unknown	Field walking and metal detecting finds from Hanging Nevilles field, Nelfields Farm, Newent - bloomery slag found.	Unknown	Surface finds including bloomery slag.	Glos SMR 20723.	
Unknown	Unknown	Metal working slag of unknown date found during a watching brief at Hazelfield Garden Centre, Dymock Road, Newent.	Unknown	Slag of unspecified type.	Glos SMR 20911.	
Unknown	Unknown	Four cinders names are found on the 1839 Tibberton tithe map: Lower Cinders, Common Cinders, Perry Cinders and Cindery Hill.	Unknown	Field names.	Glos SMR 19976	Iron Age, Roman and medieval finds have been recovered from this area.

Appendix W Field name and place name evidence for cinders mounds, in Dean District, but outside the Forest of Dean survey area

Date given in reference	Description	Reference	Comment on date
1839	Field name *Cinders Field*, Tibberton.	Gwatkin 1992 (no.12); Glos SMR 19976.	
1840	Field names *Upper Cinders, Middle Cinders* and *Lower Cinders*, Grove Farm, Taynton.	Gwatkin 1992 (no.12); Glos SMR 20593.	

Appendix X Evidence for pre-industrial revolution iron working in Monmouthshire and Herefordshire in the vicinity of the Forest of Dean

Site name	NGR	Date	Summary	Reference
Ariconium (Weston-under-Penyard, Herefordshire).	?	Prehistoric / Roman	Iron working site.	Robin Jackson, pers. comm.
Roundwood, Herefordshire.	?	Roman?	Bryan Walters reported the discovery of slag and smelting furnace remains with a possible Roman date.	Wildgoose 1993, 33.
Great Howle Farm, Herefordshire.	?	Roman?	Possible Romano-British site, including a probable bloomery, at Great Howle Farm, north of Ruardean in Herefordshire. A spread of Romano-British material and large amounts of bloomery slag were found here. Surface finds of 150kg of bloomery slag, including furnace tap-hole-trapped slag, was recovered. Roman pottery also recovered as surface finds, although this does not date the slag.	Glos SMR 9734.
Sudbrook Camp.	ST 505 873	1st C BC	A promontory fort on the Severn estuary and much eroded by the river. Excavations revealed slag and charcoal dated to the 1st century BC by the excavator	Walters 1992b
Talocher Farm and Court Farm.	?	Roman	Early Flavian fort site suspected. Flavian pottery and coin of Nero. Slags in plough soil, probably from smithing.	Walters 1992b
Granville St.	SO 5113 1291	Roman	Excavations cut through 13 feet of iron slag layers. Sealed 2nd century layer with much slag. SO 5114 1291-Probable Roman levels with slag. Furnaces of Roman date revealed in this area by R. Shoesmith in 1973.	Walters 1992b
Glendower Street School .	SO 50895 12765	Roman	The school playground backs onto Spencer's Yard. Rescue excavation in 1988 by Dean Archaeological Group revealed a later 1st century smithing hearth with intact fuel and a small connected slag pit. An iron hearth rake was nearby. The hearth was set to the side of a shallow ditch and was possibly used to reheat blooms in order to release entrapped slag prior to hammering off the residue and forming a billet or forgeable bar. Stratified pottery associated with the hearth was black late Iron Age type Native ware. Local parallels suggest a date range of *c.* AD 50-75. Abundant re-deposited bloomery smelting slag in nearby later features which contained plentiful later 1st and 2nd century pottery.	Walters 1992b
Town Wall by Dixton Gate 'The Burgage'.	?	Roman	Scattered slag in black loam above natural. Samian plus RB coarse pottery.	Walters 1992b
Overmonnow.	?	Roman	Overmonnow was a 3rd/4th century development to the south of Monmouth town from which it is separated by the Monnow river. It became the local iron working centre from the early 3rd century to the end of the Roman period.	Walters 1992b
Fitzroy Close.	SO 5018 1238	Roman	Furnace remains associated with 3rd century coins and RB pottery.	Walters 1992b

Site name	NGR	Date	Summary	Reference
?	SO 4871 1333	Roman	Slag, ore, fired clay, crucible sherds, 4th century mortarium and Oxfordshire colour-coated wares.	Walters 1992b
Old Vicarage Gardens.	SO 50351 12375	Roman	Early excavations by MAS revealed furnace remains. Prior to development, the Glamorgan-Gwent Archaeological Trust excavated part of the area but failed to excavate the furnace area. Oxfordshire Colour-coated ware came from their excavation. Subsequently members of MAS retrieved a goodly collection of well preserved 3rd/4th century Black Burnished wares and further Oxfordshire wares. 32 4th century coins were retrieved from the contractor's spoil heaps and one 4th century melon shaped blue glass bead.	Walters 1992b
Hadnock Roman Villa.	SO 535 151	Roman	Furnace base in villa remains. The villa is in the middle of a field, above the Wye, and 2km upstream of Monmouth. The following fields are rich in iron working debris: 1. Cinder Field -Black Barn (SO 534 152); furnace remains and heavy slag deposits. 2. Conegre Barn (SO 5362 1454); slag and samian rim. 3. SO 5324 1395; presumed iron furnace from concentration of slag. 4. SO 5310 1385; slag scatter with heavy slag deposit to east. The villa was assumed to be 2nd to 4th century including a Malvernian 'hammer rim' and limestone-tempered wares suggesting a late Iron Age origin or early Roman.	Walters 1992b
Hygga.	SO 489 040	Roman?	Roman iron furnace suggested by heavy slag deposit.	Walters 1992b
Hygga.	SO 4960 0390	Roman	1st century BC/AD continental 'Oldbury' type glass bead. Dark blue with marvered opaque white spirals, Guido Class 6.	Walters 1992b
Trellech Gaer.	SO 4930 0375	Roman	The best example of a Roman (?) iron furnace I have ever seen' (Clarke 1981) Associated RB pottery sherds.	Walters 1992b
Trellech.	SO 4915 0345	Roman	Decorated Samian Form 29, early Flavian, 70-79AD. Heavy slag at SO 491 034 plus sherds of RB pottery.	Walters 1992b
Spencers Yard.	SO 5087 1273	RB	RB pottery associated with much iron slag found in 1967 excavation.	Walters 1992b
Priory Farm.	SO 510 141	RB	A small excavation by Mr. G. Hall of Monmouth School found RB pottery associated with iron slag.	Walters 1992b
Bailey Pit.	SO 4870 1333	RB	RB pottery associated with slag, furnace lining and vitrified sandstone.	Walters 1992b
St Thomas Square.	?	RB	Heavy slag deposits 5 feet thick with RB pottery.	Walters 1992b
Great Warfield.	SO 5285 1310	RB	A very heavy concentration of slag, burnt stone and fixed clay with RB pottery. Slag remains around 20 metres diameter. Close to Roman Road from Forest to Monmouth now a hollow way here.	Walters 1992b
Hygga Farm.	SO 4802 0417	RB	Heavy slag deposits on surface suggests smelting furnace. Light scatter of RB pottery.	Walters 1992b
Hygga.	SO 4989 0404	RB	Heavy layers of iron slag. Sherds of RB pottery.	Walters 1992b

Site name	NGR	Date	Summary	Reference
Great Crumbland.	SO 4825 0248	RB	Slag concentration with light scatter of RB pottery. Further slag to south of grid ref SO 4812 0105 -Spread of slag over this field. All pottery finds of 1st century date including black Native-wares.	Walters 1992b
Wye Bridge.	SO 5115 1275	Unknown	Pile driving at Wye Bridge revealed slag many feet below the river bed but no dating evidence could be recovered.	Walters 1992b
Elstob Way.	SO 5020 1231	Unknown	Excavation prior to development revealed a shallow ditch containing Roman Pottery and slag.	Walters 1992b
Hygga.	SO 4922 0434	Unknown	Smelting furnace. Heavy areas of slag and charcoal exposed. Tap-hole slag. Considerable slag in nearby stream and bank. Trackway to Hygga partly surfaced with slag at SO 488 034.	Walters 1992b
Near Rudge Farm, Herefordshire.	?	Unknown	In…1841, when part of the old road leading up to Hawthorns from Hownal was altered, near the brook below Rudge Farm, the hearths of five small forges, cut into the sandstone rock…were laid open. An iron tube, seven or eight inches long, and one inch and a half bore, apparently the nozzle of a pair of bellows was also found; as well as scores of old tobacco pipes, as they seemed, bits of iron, much rusted, and broken earthenware, beside a piece of silver coin. Unfortunately, none of these articles were preserved...'	Nicholls 1866, 18-19.
Cinderberry Wood, Herefordshire.	?	20th century	Place name *Cinderberry Wood*, located 1.5km to the north of Ruardean, in Herefordshire.	Modern OS maps. Wildgoose 1993, 33.

Appendix Y **Scowles fact sheet**

Gloucestershire County Council Archaeology Service:

The Forest of Dean Archaeological Survey

THE SCOWLES SURVEY: FACT SHEET

Making objects from iron

All kinds of iron objects from cooking pans to spear-heads, swords, helmets, buckles and rings have been found on archaeological excavations around Britain. Some of the iron used to make such objects may have come from the Forest of Dean. Parts of the Forest are rich in iron ore and appear to have been mined throughout the ages. The iron ore is found in features called scowles which are only found in the Forest of Dean. (Examples of scowles can be found at Puzzle Wood, near Coleford).

How scowles developed

Scowles are amazing landscape features which are unique to the Forest of Dean. They have developed in a long process over millions of years. First, ancient cave systems were formed underground in the limestone that lies in a ring around the Forest of Dean. Then iron rich mineral water worked its way down from the surface and deposited iron ore in cracks and crevices. Next, the underground caves underwent several processes including erosion, and mineral formation. Long after this, further geological events re-exposed a land surface of deep hollows and exposed rock surfaces.

Since at least Roman times, people have collected Iron ore

Much later, humans realised that the iron ore could be found in veins and small pockets in the exposed rock faces of these natural features. This iron ore has been collected by people since at least Roman times. In some places, they followed the veins of iron ore deep underground when the surface exposures were exhausted.

Myth about scowles

The labyrinth of hollows we call scowles can be several metres deep. There is a common misunderstanding that humans have caused the scowles to look as they are by mining. Although humans have taken away many of the thin veins of iron ore, and removed some limestone, the depth and cavernous appearance of the scowles is natural and they look today much as they would have thousands of years ago.

P.T.O

Local iron ore processing

After the iron ore had been collected from the scowles, it had to be processed so that it could be made into objects such as buckles, rings or pans. Much of the iron ore would have been smelted locally in small furnaces known as bloomeries. In the bloomery, the iron ore was heated to a high temperature by burning charcoal, which was made from local woods. This heating process separated enough of the iron from the other impurities within the ore to allow it to be made into useful objects.

Our Archaeological Survey

The scowles in the Forest have never been fully investigated and there are many questions about them left unanswered. At the Forest of Dean Archaeological Survey, we have recently begun a project (known as the 'Scowles and Associated Iron Industry Survey') to examine early iron mining and smelting in the Forest of Dean. We are using a variety of sources ranging from old maps to aerial photographs and recent reports, in order to help us to identify and map scowles in the Forest.

The Field Survey

The next step of the scowles survey is to carry out 'field survey'. The purpose of field survey is to check if the sites mentioned in the documentary sources still exist, and to assess their landuse and current condition. During field survey we map and make records of the scowles. Back in the office, we write up our findings.

The sites will be added to the Sites and Monuments Record (SMR) database, and mapped onto the County Council's Geographic Information System (GIS). This will help to facilitate future research. It is hoped that we will be able to understand more about ancient iron mining and smelting in the Forest of Dean as a result of the project.

Want to know more?

If you…

-would like to receive our newsletter and information about events;

-want to find out more about the Scowles and Associated Early Iron Industry Survey;

-or have any other questions about the Forest of Dean Archaeological Survey:

…please contact Danielle on 01452 426245 or email:

archaeology.fod@gloucestershire.gov.uk

Visit our website at: **www.gloucestershire.gov.uk/archaeology/fod/**

Appendix Z Main archaeological and historical periods

Period	Approximate date range:	
	earliest date	latest date
Lower Palaeolithic**	500,000BC	150,000BC
Middle Palaeolithic**	150,000BC	40,000BC
Early Upper Palaeolithic** (-)	40,000BC	25,000BC
Britain too cold for human occupation between 25,000BC and 12,000BC		
Later Upper Palaeolithic (-)	12,000BC	10,000BC
Early Mesolithic	10,000BC	7,000BC
Late Mesolithic	7,000BC	4,000BC
Early Neolithic	4,000BC	3,000BC
Middle Neolithic	3,500BC	2,700BC
Late Neolithic	3,000BC	2,200BC
Early Bronze Age	2,500BC	1,500BC
Middle Bronze Age	1,600BC	1,000BC
Late Bronze Age	1,000BC	700BC
Early Iron Age	800BC	400BC
Middle Iron Age	400BC	100BC
Late Iron Age	100BC	43AD
Roman	43AD	410AD
Early Medieval	410AD	1066AD
Medieval	1066AD	1540AD
Post-Medieval	1540AD	1901AD
Modern	1901AD	Present

After MIDAS data standard – The Royal Commission on Historic Monuments (England).

*(-) - period not sub-divided on MIDAS data standard** - Britain not continuously occupied during these periods*

Appendix AA **Main stratigraphical subdivisions present at outcrop in the Bristol-Gloucester region (not to scale). The ages shown refer to the worldwide system limits and only correspond to the base of the rock units where the local succession is complete.**

Chronostratigraphical (time) units System	Series	Lithostratigraphical (rock) units	Age (10^6 years)
Quaternary	Holocene	Alluvium, peat, terrace deposits, raised-beach deposits, marine sands, head deposits, cave deposits, glacial deposits	10 000 years
	Pleistocene		about 2
Cretaceous		Chalk	
		Upper Greensand	
		Gault	130
Jurassic	Upper Jurassic	Oxford Clay and Kellaways Beds	
	Middle Jurassic	Great Oolite Group	
		Inferior Oolite Group	
	Lower Jurassic	Upper Lias	
		Middle Lias	
		Lower Lias	205
Triassic		Penarth Group	
		Mercia Mudstone Group	
		Sherwood Sandstone Group	250
?Permian		Bridgnorth Sandstone (Midlands) unnamed sandstones (South-west)	290
Carboniferous	?Stephanian	Coal Measures	
	Cantabrian		
	Westphalian		
	Namurian	Quartzitic Sandstone Group	
	Dinantian	Carboniferous Limestone	365
Devonian	Upper Devonian	Upper Old Red Sandstone	
	Lower Devonian	Lower Old Red Sandstone	400
Silurian	Přidolí	Thornbury Beds Downton Castle Sandstone	
	Ludlow	Whitcliffe Beds, Leintwardine Beds, Bringewood Beds, Elton Beds	
	Wenlock	Brinkmarsh Beds	
	Upper Llandovery	Tortworth Beds	
		Damery Beds	418
Cambrian	Tremadoc	Micklewood Beds	
		Breadstone Shales	>475

Appendix BB Generalised stratigraphy of the Forest of Dean Carboniferous succession.

	Supra-Pennant Group	*Shales and sandstones with coal seams*	UPPER CARBONIFEROUS (COAL MEASURES)
	Pennant Group	*Shales and sandstones with coal seams*	
	Trenchard Group	*Shales and sandstones with coal seams*	
	Drybrook Sandstone	*Red and variegated coarse sandstone and conglomerates divided into upper and lower divisions in the south by oolitic limestone*	LOWER CARBONIFEROUS (CARBONIFEROUS LIMESTONE)
	Whitehead Limestone	*Limestone with calcite and dolomitic mudstones*	
	Crease Limestone	*Oolitic limestone, frequently altered to dolomitic limestone*	
	Lower Dolomite	*Dolomite and dolomitic limestone*	
	Lower Limestone Shale	*Limestones with shales*	

Appendix CC Abbreviations used in the text

ALGAO	Association of Local Government Archaeological Officers
ADAS	Agricultural Development and Advisory Service
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AP	Aerial Photograph
BGS	British Geological Survey
DAG	Dean Archaeological Group
DCD	Data Collection Device
EH	English Heritage
EDM	Electronic Distance Measurer
EN	English Nature
FE	Forest Enterprise
GCC	Gloucestershire County Council
GCCAS	Gloucestershire County Council Archaeology Service
GCRO	Gloucestershire County Records Office
GIS	Geographic Information System
Glos SMR	Gloucestershire County Council, Sites and Monuments Record
GPS	Global Positioning System
GWT	Gloucestershire Wildlife Trust
Ha	Hectares
km	Kilometres
KWS	Key Wildlife Site
m	Metres
NMP	National Mapping Programme
OS	Ordnance Survey
PRO	Public Record Office
RIGS	Regionally Important Geological and Geomorphological Sites
SAM	Scheduled Ancient Monument
SMC	Scheduled Monument Consent
SMR	Sites and Monuments Record
SSSI	Site of Special Scientific Interest
TBGAS	Transactions of the Bristol and Gloucestershire Archaeological Society

Appendix DD Glossary

Aquiclude	A completely impermeable geological layer.
Billet	A small bar of iron or steel (McLeod 1982, 105).
Blast Furnace	A vertical furnace for smelting metallic ores, using an air blast to attain high temperatures. The common use of blast furnaces is for smelting iron ore to produce pig iron. Introduced into Britain in the early 16th century. Charcoal was used for fuel, with the air blast provided by water-powered bellows. (Jones 1996, 28). In the 18th century coke replaced charcoal as the fuel source.
Bloom	A mass or lump of malleable or wrought iron which, after undergoing its first hammering, is formed into a piece about 2 ft long with a square cross-section, weighing about 120 lb (Jones 1996, 32).
Bloomery	A simple shaft furnace for smelting iron ore, with a clay superstructure, fuelled by charcoal.
Churn	Regional name for a cavity or cave within the Forest of Dean limestones which may have contained iron ore deposits.
Cinders	Partly smelted iron ore, usually from the bloomery period, used for re-smelting in blast furnaces. They contained much iron, and acted as a flux in smelting. Sometimes used for road making. (Hart 2002, 552).
Doline	A synonym of swallow-hole and swallet. Natural hollow down which surface waters proceed underground in limestone country (Whitten & Brooks 1972, 131).
Dolomitisation	The process where limestone is altered to dolomite by replacement of calcium carbonate with magnesium/calcium carbonate (the mineral dolomite) (Gloucestershire Geoconservation Trust 2003).
Ferrification	The process of becoming enriched with iron.
Free Miner	A registered miner with rights of mining coal, iron ore and stone (Hart 2002, 555).
Geomorphology	The branch of geology that is concerned with the structure, origin and development of the earth's crust (McLeod 1982, 466).
Graben	A block of land downthrown between two parallel geological faults.
High Forest	Woodland which is characterised by evenly distributed mature trees.
Hydrodynamic	Relating to the force of liquid in motion.
Inception Horizon	Part of a rock sequence that is particularly susceptible to speleogenesis.

Karst	Topography produced by percolating ground waters and underground streams (Whitten & Brooks 1972, 254). Mainly formed on limestone.
Metasomatism	Changes in rocks brought about by the introduction of material from an external source, e.g. downwardly penetrating iron-rich solutions in the Forest of Dean Carboniferous Limestones.
Phreatic	Designating, or derived from water occurring below the water table.
Phreatic Tube	A smooth-sided, tube-like conduit formed by the very slow movement of water below the water table.
Roasting Hearth	A shallow hearth in which finely ground ore is continually stirred to give easy access to air. This facilitates the elimination of any sulphur present, by allowing free access of air to convert the sulphur into oxide. (Jones 1996, 310). Roasting took place before the smelting process.
Scowle	A landscape feature unique to the Forest of Dean. These have traditionally been interpreted as the remains of early open-cast iron ore extraction and range from deep irregular quarry-like features to amorphous shallow hollows. They are found within the outcrops of Carboniferous Limestone (and particularly the Crease Limestone) at the edge of the central Forest.
Shaft Furnace	A furnace constructed as a shaft with the fire at the bottom and the fuel and ore added from the top, (English Heritage 2004).
Slag	Waste from the smelting and refining processes.
Smelting	The process by which metal is obtained from ore, by the combined action of heat and fluxes (Jones 1996, 343).
Smithing	The process of working or forging metals, such as iron, by heating and hammering.
Speleogenesis	The processes of cave formation and development.
Statutory Forest	Area of Forest owned by the Crown. Now covers about 35 square miles. The boundaries are as defined in 1835 by the Commissioners appointed in 1831. Includes Abbot's Wood but not Highmeadow Wood. (Hart 2002, 558).
Swallet	See Doline
Swallow Hole	See Doline.
Tap Slag	Waste from the bloomery smelting process that has been allowed to flow from the bottom of the furnace.
Vadose	Designating, or derived from water occurring above the water table (McLeod 1982,1295).
Variscan orogeny	Episode of mountain formation at the end of the Carboniferous period.

Appendix EE Location of digital information

EE.i Field record numbers and Sites and Monuments record numbers

Throughout the Scowles and Associated Iron Industry Survey The Gloucestershire County Sites and Monuments was used as the project database and identified scowles were numbered with reference to that system (Appendix A and Appendix B). Subsequent to the field survey, and the production of the first draft of this report, the data was fully integrated into the SMR with the result that numbers identifying scowles in Appendix A and Appendix B no longer refer to the SMR and should be regarded as field survey references only.

Similarly, a number of the polygons recorded as part of the field survey have been amalgamated as part of the final transfer to the SMR.

Digital field survey data has been retained and can be found in the following files within the archaeology service digital archive

S:\FOD\SCOWLES SURVEY\SCOWLES SURVEY - DIGITAL ARCHIVE\FIELD DATA\ALL RECORDED SCOWLES EXCELL AND SHAPE FILES

EE.ii Digital field survey data

Mapped field survey polygons, cross referenced with the field survey numbers depicted in Appendix B are stored as a separate file within the Gloucestershire County Council GIS in: **M:\ENVIRONMENT\ARCHAEOLOGY\Forest of Dean Project\Scowles survey 2003-04\NewScowels.shp**

Field survey data recording inaccessible areas are stored as a separate file within the Gloucestershire County Council GIS in:
M:\ENVIRONMENT\ARCHAEOLOGY\Forest of Dean Project\Scowles survey 2003-04\Inaccessible.shp

Field survey data recording impenetrable areas are stored as a separate file within the Gloucestershire County Council GIS in:
M:\ENVIRONMENT\ARCHAEOLOGY\Forest of Dean Project\Scowles survey 2003-04\Inpenetrable.shp

Data recording the location of all photographs taken during the field survey are stored as a separate file within the Gloucestershire County Council GIS in:
M:\ENVIRONMENT\ARCHAEOLOGY\Forest of Dean Project\Scowles survey 2003-04\PhotoScowle.shp